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5090
Ser EP/ 000339
24 MAY 11

From: Commanding Officer, Navy and Marine Corps Public Health Center
To: Commander, Navy Region Europe, Africa, SW Asia

Subj: NAPLES PUBLIC HEALTH EVALUATION, PUBLIC HEALTH SUMMARY VOLUME III

Ref: (a) COMNAVREG EUR NAPLES IT ltr 5100 Ser 00/173 of 13 Jun 07

Encl: (1) NAPLES PUBLIC HEALTH EVALUATION, PUBLIC HEALTH SUMMARY VOLUME III

1. Per reference (a), enclosure (1) is provided as the final public health summary report.

2. Please direct any questions to Paul B. Gillooly, Ph.D., at COMM: (757)953-0664 or DSN: 377-0664 or via e-mail at paul.gillooly@med.navy.mil.

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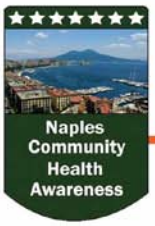

NAPLES Public Health Evaluation



Naples Public Health Evaluation

Public Health Summary

Volume III

PREPARED FOR:

COMMANDER NAVY REGION EUROPE, AFRICA, SOUTHWEST ASIA
PSC 817 BOX 108
FPO AE 09622

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MAY 2011

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ACRONYMS AND ABBREVIATIONS

Acronym	Explanation
2,3,7,8-TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
AFN	American Forces Network
ARIN	*Azienda Risorse Idriche Napoli*, or Agency for Water Resources, Naples
ARPAC	*Agenzia Regionale per la Protezione Ambientale della Campania*, or Regional Agency for Environmental Protection of Campania
ASL	*Azienda Sanitaria Locale* - Local health authority in Italy
BUMED	Navy Bureau of Medicine and Surgery
CAA	Clean Air Act (United States Code, Title 42, Chapter 85)
CAG	Community Action Group
Campania	Campania Region of Italy
CCEF	Cumulative Cancer Exceedance Factor
CEF	Cancer Exceedance Factor
CNCEF	Cumulative Noncancer Exceedance Factor
CNE	Commander, Naval Forces Europe – U.S. Naval Forces Africa/U.S. 6th Fleet
CNRE	Commander Navy Region Europe – changed name to CNREURAFSWA on 21 April 2009
CNREURAFSWA	Commander Navy Region Europe, Africa, Southwest Asia
COC	Constituents of Concern
COPC	Constituents of Potential Concern
CSM	Conceptual Site Model
DOD	Department of Defense
DODDS	Department of Defense Dependents Schools
EC	European Commission
EF	Exceedance Factor
EHIC	Environmental Health Information Center
EPC	Exposure Point Concentration
ETSA	Environmental Testing Support Assessment
EU	European Union
GIS	Geographical Information System
GPS	Global Positioning System
HAP	Hazardous Air Pollutant
ISPRA	*Instituto Superiore per la Protezione e la Ricerca Ambientale*, or Institute for Environmental Protection and Research
JFC	Joint Forces Command
MACT	Maximum Achievable Control Technology
MCL	Maximum Contaminant Level
NAAQS	National Ambient Air Quality Standards
NATO	North Atlantic Treaty Organization
NAVFAC	Naval Facilities Engineering Command
NCEF	Noncancer Exceedance Factor
NLSZ	New Lease Suspension Zone
NMCPHC	Navy and Marine Corps Public Health Center

Acronym	Explanation
NSA	Naval Support Activity
PAH	Polycyclic Aromatic Hydrocarbons
PAO	Public Affairs Officer
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene (or tetrachloroethylene or perchloroethylene)
PHE	Public Health Evaluation
PM_{10}	Particulate Matter Less than 10 microns in diameter
QAPP	Quality Assurance Project Plan
RHAWG	Regional Health Awareness Working Group
RME	Reasonable Maximum Exposure
RSL	Regional Screening Level
SIN	*Sito di Interesse Nazionale* or Italian “Sites of National Interest”
SRE	Screening Risk Evaluation
SVOCs	Semi-Volatile Organic Compounds
TEQ	Toxic Equivalent
THM	Trihalomethanes
TTHM	Total Trihalomethanes
U.S.	United States
USEPA	United States Environmental Protection Agency
USN	United States Navy
VETCOM	U.S. Army Veterinary Command
VOCs	Volatile Organic Compounds

PREFACE

The purpose of this volume is to provide a holistic assessment of public health risks, identify key data gaps, and provide additional recommendations to reduce or eliminate public health risks, where possible.

Site History

For nearly 30 years, the Campania region of southern Italy has experienced numerous challenges associated with widespread illegal dumping of waste. In 1994, the Italian national government declared the first of many emergencies in Campania, in an attempt to deal with the lack of waste disposal facilities that resulted in widespread illegal waste disposal, uncontrolled accumulation of trash, and open burning of this trash[1].

In June 2007, in response to health concerns expressed by United States Navy (USN) military and civilian personnel and their families, the Commander Navy Region Europe, Africa, Southwest Asia (CNREURAFSWA) requested that the Navy and Marine Corps Public Health Center (NMCPHC) conduct a Public Health Evaluation (PHE). The conduct of the PHE, both in scope and complexity on foreign soil in a host nation, is unprecedented for the USN and has never before been attempted within the Department of Defense (DOD).

Public Health Evaluation

As tasked by CNREURAFSWA, the PHE focused on health risks that could be associated with widespread illegal waste disposal practices, uncontrolled accumulation of trash, and open burning of this trash. The PHE focused on USN military and civilian personnel and their dependents living in the Naples area. The PHE did not focus on Italian citizens or third party nationals. It also did not focus on other risks of living in Naples, such as crime, traffic safety, radon, or quality of life, as these areas are the specific focus of other USN programs.

To the extent possible, the Volume II Screening Risk Evaluation (SRE) (PIONEER, 2010[2]) (i.e., health risk assessment) part of the PHE three-volume report was conducted in accordance with U.S. Environmental Protection Agency (USEPA) and USN Risk Assessment Guidance. Therefore, the PHE team chose to compare environmental testing results (available in Volume I) to USEPA Maximum Contaminant Levels (MCLs) for tap water; USEPA Regional Screening Levels (RSLs) for tap water, air, soil, and soil gas; and USEPA National Ambient Air Quality Standards (NAAQS) for air, rather than Italian or European Union environmental regulatory standards.

The SRE characterized the potential health risks associated with living at a residence for 30 years, which is the length of time typically used by the USEPA to evaluate residential locations. This is a conservative

[1] 2006 Italian Parliamentary Investigations Commission on Waste Recycling and Related Illegal Activities – Territorial Report on the Campania Region.

[2] Naples Public Health Evaluation: Naples Italy – Public Health Evaluation Volume II: Phase I & II Screening Risk Evaluation (PIONEER, 2010) – Revised May 20, 2011.

assumption, considering that typical tour lengths range from three to six years for active duty personnel but may be longer for civil service and Department of Defense Dependents Schools (DODDS) personnel. This conservative approach is considered generally health protective when considering the number of data gaps that make up the "environmental uncertainty" of the study area (e.g., history of illegal waste dumping, unknown and uncharacterized waste sites, low percentage of cleanup at those waste sites[3]).

Because a PHE of this scope takes more than a year to complete, a phased approach was used. Phase I, conducted between May 2008 and November 2008, was comprised of two components: 1) a month-long regional ambient air monitoring program at nine air sampling stations and 2) sampling of tap water (from both private well and municipal water sources) and irrigation wells, soil, and passive soil gas from 130 residences and 10 U.S. Government-related facilities. The selection of residential sampling locations was based on proximity to known locations of trash and chemical dump sites.

Phase II, conducted between November 2008 and October 2009, improved the spatial/geographic distribution of the sampling locations and delineated clusters of residences that exceeded risk criteria during Phase I. Two hundred and nine (209) residences were sampled during Phase II, and the ambient air monitoring program from Phase I was continued for one full year.

The final report for the PHE is comprised of three (3) volumes, each with a specific purpose:

1. **Naples Public Health Evaluation: Phase II Environmental Testing Support Assessment, Public Health Evaluation, Volume I, Naval Support Activity Naples, Italy (Tetra Tech, 2010)** – this report presents the results of the soil, soil gas, water, and ambient air samples collected for the Phase 2 investigation of the Naples PHE. This report also presents sample results associated with supplemental investigations (e.g., aqueduct source water sampling) that were concurrently performed in Phase 2. Comparisons of data to appropriate risk-based screening levels and regulatory criteria are also presented.

2. **Naples Public Health Evaluation: Naples Italy - Public Health Evaluation Volume II: Phase I & II Screening Risk Evaluation (PIONEER, 2010)** – this report presents a screening risk assessment based on the sampling results contained in Volume I and evaluates the potential for impacts to human health from exposure to chemicals in contaminated media (e.g., soil, soil gas, water and ambient air). It also presents the risk drivers associated with residences and study areas under investigation. Uncertainties and limitations involved with this investigation are also presented. In this context, this screening risk assessment is a management decision tool and does not provide absolute statements about health and environmental impacts.

3. **Naples Public Health Evaluation: Naples Public Health Evaluation Public Health Summary: Volume III (Navy and Marine Corps Public Health Center, 2011)** – this report integrates the results of Volumes I and II with other information (e.g., Epidemiological Studies) to provide a broader holistic assessment of the potential public health risks. It also identifies key

[3] 2009 ARPAC State of the Environment Report – Campania Region (2009 *Agenzia Regionale Protezione Ambientale Campania - Relazione sullo stato dell'ambiente Campania*), ISBN: 978-88-96122-07-5.

data gaps and provides recommendations to reduce or eliminate public health risks, where possible.

The PHE was a complex investigation and unique in that the objective was to assess health impacts to USN military and civilian personnel and their families at an overseas location. This investigation covered a wide geographic area, involved both transient and ill-defined contaminant types and sources, and spanned a period of more than two years. Because of this duration and complexity, different planning documents (e.g., Quality Assurance Project Plans and Work Plans) were prepared and followed during the different phases and aspects of this investigation. These are identified via text and references in the different volumes of this report. Also, because of the duration of the project and in view of the phased approach that was followed, analytical results and the evaluation of these results are provided in different reports and deliverables. The two key deliverables in terms of the results and evaluations of data collected during Phase I of the investigation are: "*Final Phase I Environmental Testing Support Assessment Report, Volume I, Naval Support Activity Naples, Italy*" and "*Naples, Italy–Public Health Evaluation, Volume II: Phase I Screening Risk Evaluation*") and the three volumes summarized above.

The approach used in this evaluation was tailored to the unique circumstances found in Naples, Italy, and would not necessarily be appropriate for use in other geographic areas. A variety of factors and assumptions have been used to conduct this evaluation that are specific to U.S. Navy personnel and their families living in Naples. Attempts to generalize or extrapolate these findings and conclusions to other populations should be done with caution, and in many cases would be inappropriate.

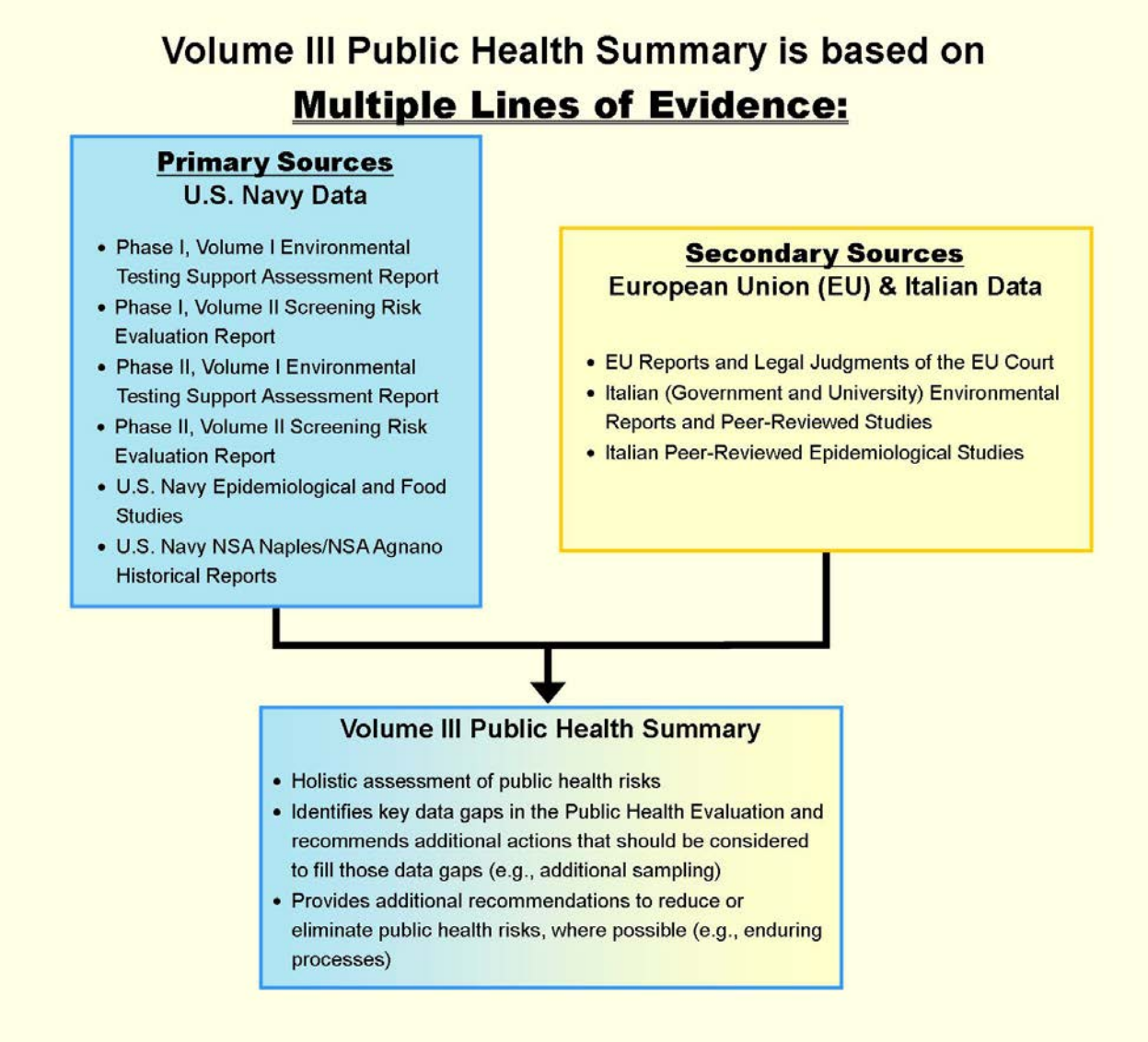
The questions a PHE tries to answer include:

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

A PHE relies upon:

- **Environmental data**, such as levels of chemicals and microorganisms (e.g., bacteria) in various media (e.g., soil, soil gas, water, air and food).
- **Exposure data,** how people could come into contact with chemicals and microorganisms.
- **Toxicity data,** what adverse health effects might be expected due to chemical exposure.
- **Epidemiological health outcome data**, including information on community-wide rates of illness, disease and death.
- **Community health concerns**, such as USN personnel's reports on disease and illness.

The chart below indicates the various sources of evidence to support the recommendations and conclusions of this Volume III report.



Project Challenges and Limitations

The lack of a DOD policy for addressing public health risks overseas results in the lack of a standardized approach to conducting evaluations overseas. While every attempt has been made to conduct the PHE in accordance with USEPA and USN Risk Assessment Guidance, this approach may not agree with the host nation guidance. It was assumed there was not a host nation regulatory framework and effective enforcement mechanism in place equivalent to the United States (U.S.). Over time, it became evident that lack of enforcement by responsible institutional bodies contributed to the current situation in Naples[3]. This resulted in many obstacles, data gaps, and uncertainties requiring maximum flexibility, professional judgment, and constant adaptation to remain focused on conducting the best science possible. In summary, there were no DOD legally enforceable standards that applied to this situation overseas, therefore USN developed their own conservative risk management criteria based on those unique circumstances.

As a guest in a host nation, the USN's ability to perform a complete human health risk assessment on Italian-private or USN-leased property, as it would do in the U.S., was extremely limited. In addition, the ability of USN to conduct the PHE was affected by the thousands of waste sites, both identified and unidentified, in the Campania region for which USN had no data concerning chemicals or their concentrations. Further investigation is needed by the Italian environmental regulatory agencies to document the nature and extent of environmental contamination. As a guest in a host nation, USN does not have formal input into this Italian regulatory process. USN input is appropriately limited to suggestions. Such an investigation in the U.S. would typically involve the following: reviewing available historical information (such as past industrial practices in the area); collecting and reviewing hydrogeology information; reviewing relevant agency databases or peer-reviewed literature that may contain valuable information concerning the nature and extent of contamination; and implementing corrective action(s) to eliminate, control, or mitigate potential risks to human health. Understanding the full extent of environmental contamination is critical to fully assessing the potential health risks to people living in the area and for determining how to deal with the contamination.

Other Significant Challenges and Uncertainties

Examples of other significant challenges and uncertainties in the PHE include:

- Requirement for landlord's permission to access property for environmental sampling.
- Lack of DOD or USN policy for what is acceptable public health risk overseas.
- Limited availability of information from Italian environmental regulators to determine the nature and extent of contamination where USN personnel reside.
- Influence of organized crime on the waste disposal industry.
- Limited access to host nation public health reports, studies, and public health officials.
- Representativeness of soil, soil gas, tap water, and ambient (outdoor) air analytical data collected during the PHE.
- Limited availability, accessibility, and suitability of residences for sampling dictated where samples were eventually collected.
- USN investigation objectives and project limitations resulted in an approach to collect a limited number of environmental samples covering a broad geographical area (e.g., regional screening assessment) with, typically, only a singular sampling event occurring at investigated properties.
- Differences in host nation risk assessment approach, policies, and procedures compared to U.S.
- Difficulties determining exact locations of the 3,000 off-base rental properties on the NSA Naples Housing List (e.g., lack of Global Positioning System [GPS] database), for the residential properties where USN personnel lived, to accommodate environmental sampling and meet PHE objectives, requiring extensive resources to fill this data gap.
- Resource issues for conducting a PHE of this scope overseas, including a myriad of logistical issues with supplies, equipment, and personnel.

Participating Organizations

A wide variety of subject matter experts have worked on the Naples PHE, representing a variety of U.S. and USN commands and organizations and private sector agencies to include:

- Commander Navy Region Europe, Africa, Southwest Asia
- Commander, U.S. Naval Forces Europe - U.S. Naval Forces Africa/U.S. 6th Fleet
- Commander, Naval Installations Command
- U.S. Navy Bureau of Medicine and Surgery
- Naval Support Activity, Naples
- Navy and Marine Corps Public Health Center
- Navy Facilities Engineering Command Atlantic
- Naval Sea Systems Command Radiological Affairs Support Office
- U.S. Naval Hospital Naples
- U.S. Consulate, Naples
- U.S. Embassy, Rome
- Tetra Tech NUS, Inc.
- PIONEER Technologies Corporation
- Katz & Associates, Inc.
- Fulton Communications
- Sistemi Industriali
- SGS Laboratories
- GEL Laboratories
- Studio Melchior

EXECUTIVE SUMMARY

The purpose of this Volume III Public Health Summary is to provide a holistic assessment of public health risks, identify key data gaps in the Public Health Evaluation (PHE) and provide recommendations that should be considered to fill those data gaps, and provide additional recommendations to reduce or eliminate public health risks, where possible.

Background

Site Location, Setting and Study Areas

The Campania region is located in southwestern Italy and is divided into five provinces: Napoli (Naples), Benevento, Avellino, Caserta and Salerno (Figure ES-1 and Figure ES-2). Each province is further divided into comuni (municipalities) (Figure ES-3). The total area of Campania covers approximately 5,250 square miles. The region has a population of approximately 5.8 million people, making it the second most-populated region of Italy. Naples is the capital city of Campania and the province of Naples and is over 2,800 years old. The population of Naples proper is approximately 1 million people.

The PHE focused on the Naples and Caserta provinces of Campania where USN personnel work and live. Since the geographical area that was investigated was very large, the study region was segregated into nine geographical study areas (Figure ES-4 and Figure ES-5). Phase I of the Screening Risk Evaluation focused on areas of Campania where the potential for detecting chemicals, based on Italian maps presenting trash and chemical dump sites, was greatest (PIONEER, 2009[4]). Phase II of the Screening Risk Evaluation (PIONEER, 2010) sought to improve the spatial/geographic distribution of the sampling locations and to delineate clusters of residences that exceeded risk criteria during Phase I.

The nine study areas are listed below along with the U.S. Government-related facilities that are located within each study area, and the approximate size of each study area in square miles.

- Study Area 1 (approximately 30 square miles) – Joint Forces Command (JFC) North Atlantic Treaty Organization (NATO) Site
- Study Area 2 (approximately 15 square miles) – U.S. Consulate, Naples
- Study Area 3 (approximately 95 square miles) – Capodichino
- Study Area 4 (approximately 30 square miles) – Carney Park
- Study Area 5 (approximately 80 square miles) – Lago Patria Receiver Site and Parco Artemide (former USN-Leased Parco)
- Study Area 6 (approximately 45 square miles) – Gricignano Support Site
- Study Area 7 (approximately 20 square miles) – Parco Eva (USN-Leased Parco)
- Study Area 8 (approximately 30 square miles) – Villa (home leased by the USN for the PHE)
- Study Area 9 (approximately 50 square miles) – Parco Le Ginestre (USN-Leased Parco)

[4] Naples, Italy–Public Health Evaluation, Volume II: Phase I Screening Risk Evaluation (PIONEER, 2009).

Risk Assessment Approach

To the extent possible, the Volume II SRE (PIONEER, 2010) part of the PHE was conducted in accordance with USEPA and USN Risk Assessment Guidance. Therefore, the PHE team chose to compare environmental testing results to USEPA MCLs for tap water[5]; USEPA RSLs for tap water, air, soil, and soil gas; and USEPA NAAQS for air, rather than Italian or European Union environmental regulatory standards.

The SRE characterized the potential health risks associated with living at a residence for 30 years, which is the length of time typically used by the USEPA to evaluate residential locations. This is a conservative assumption that is protective of public health. Typical tour lengths range from three to six years for active duty personnel. The tour length may be longer for civil service and DODDS personnel; a 30-year assumption would generally be health protective of those personnel as well. Furthermore, the 30-year assumption will generally be protective when considering the number of data gaps that make up the "environmental uncertainty" of the study area[3].

The SRE results for noncancer and cancer risks for soil, soil gas and tap water were placed into one of two risk management categories: *Acceptable* risk and *Unacceptable* risk by criteria established before the analyses. The ambient air samples collected during the PHE reflect general ambient air quality that is impacted by emissions from point (e.g., factory) and non-point (e.g., automobile exhaust) sources (i.e., they were not specific to any industry or source). In the U.S., ambient air quality is regulated via the Clean Air Act (CAA, [U.S. Code, Title 42, Chapter 85]) and this framework was used to evaluate the ambient air results from Naples.

For further discussion on these categories, see Volume II, Section 4.3 (PIONEER, 2010). 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, brushing teeth, and for pets. This was done because compliance with the *Bottled Water Advisory* (issued in July 2008 by CNREURAFSWA) cannot be confirmed.

Conceptual Site Model

One of the first activities of the PHE was to develop a conceptual site model (CSM) for Naples. A CSM is a basic description of how contaminants enter the environment, how they are transported and where exposure to humans can occur. As such, it provides an essential framework for determining which media to sample for assessing risks from contaminants, developing remedial strategies, and determining source control requirements. Development of a CSM also helps identify key additional data needs. A CSM not only captures what is known about the location, but also supports the evaluation of the uncertainty associated with decision-making based on what is currently known about the location.

Based on limited information available at the beginning of the PHE, a CSM was developed to address:

[5] Tap water refers to municipal water, private wells, and blended water sources. Blended water refers to non-permitted wells that are connected to the municipal water supply system, resulting in blended municipal water and well water.

- the source(s) of contamination (e.g., waste sites);
- the release mechanism(s) (e.g., chemicals deposited on soil may leach from soil into the underlying groundwater);
- the exposure pathway(s) (e.g., ingestion of tap water); and
- the receptor(s) (USN military and civilian personnel and their families).

A CSM for the nine study areas is presented in Figure ES-6 and discussed further in Volume II, Section 3.1 (PIONEER, 2010).

Phase I

The PHE was completed in two phases, and a pilot study was completed prior to the start of Phase I. The pilot study, involving seven off-base private rental homes, was conducted from April 2008 through June 2008 to test the process of collecting environmental samples in Italy. This was a critical step to ensure the integrity of all future testing efforts. All phases of the effort were evaluated, from environmental sampling and analysis to the process of sharing findings with the pilot study participants.

Phase I was conducted between May 2008 and November 2008 and was comprised of two components:

1. a month-long regional ambient air monitoring program at nine air sampling stations located at the U.S. Government-related facilities; and
2. sampling of soil, soil gas (using a "passive" sampling technique), tap water (from both private well and municipal water sources) and irrigation wells, where available, at 130 private rental residences (single-family homes and apartments) and 10 U.S. Government-related facilities throughout the nine study areas (see Figure ES-7).

In general, samples were analyzed for approximately 241 chemicals and microorganisms (e.g., bacteria) (depending on the medium being analyzed) that could be associated with accumulation of uncollected trash, the burning of this trash, illegal dumping of hazardous waste, and water contamination. The analytical classes are as follows:

- Aldehydes and ketones
- Alkane hydrocarbons
- Anions
- Disinfectants and disinfectant by-products in tap water
- Dioxins/Furans
- Inorganics
- Microorganisms (e.g., bacteria)
- Particulate Matter less than 10 microns in diameter (PM_{10})
- Pesticides
- Polychlorinated biphenyls (PCBs)
- Radionuclides
- Semi-Volatile Organic Compounds (SVOCs)
- Volatile Organic Compounds (VOCs)

Sampling Rationale

- The selection of sampling locations for Phase I was based on a biased approach that focused in areas and at properties where USN personnel work and live and based on their proximity to known locations of trash and chemical dump sites.

- Passive soil gas samples were collected to determine if there was a concern for indoor air contamination from subsurface sources (e.g., contaminated soil and/or groundwater). The results of the passive soil gas sampling, although qualitative in nature, indicated a potential concern for indoor vapor intrusion from subsurface sources that could enter the residence via cracks or preferential pathways in building foundations.
- Some Phase I properties were found to have concentrations of VOCs in soil gas with Unacceptable risks. This triggered the collection of additional soil gas samples in Phase II using an active soil gas sampling technique to attain quantitative results.
- *Pre-Lease Sampling* of 240 residences occurred from September 2008 through January 2009. Phase I results indicated that VOCs and bacteria (e.g., total and fecal coliform) in tap water (primarily from private wells) were of concern to human health, so based on the results of the Phase I SRE, the USN temporarily instituted a policy requiring sampling of tap water at residences located on the Italian economy prior to occupancy by U.S. personnel.
- *Step-Out Sampling* of 36 residences occurred from September 2008 through August 2009 to determine whether residences located in close proximity to a residence with risks designated as Unacceptable had Acceptable or Unacceptable risks based on the risk management criteria for the PHE. Residences located within 500 feet of the initial residence that had Unacceptable risks were sampled to make the determination as to whether or not additional actions were necessary at these residences. If the risks at residences during the first step-out sampling were Unacceptable, then additional step-out sampling was performed (typically in 500-foot increments) in the direction where the new Unacceptable risks were identified. If the risks at residences sampled during the initial round of step-out sampling were Acceptable, then no additional step-out sampling was conducted.
- Additionally, the presence of contamination in groundwater prompted the inclusion of sampling the municipal drinking source water from aqueducts that supply water to this geographical region in the Phase II investigation.
- Finally, the presence of VOCs in groundwater collected from irrigation wells at Capodichino and the Gricignano Support Site prompted investigating the potential for vapor intrusion into buildings at these two installations.

As described above, the results from the Phase I activity influenced the technical approach for Phase II. For example, the presence of tetrachloroethene (sometimes referred to as perchloroethylene (PCE) or tetrachloroethylene) in tap water collected from Phase I residential properties located in Study Area 8 (primarily from private well sources) resulted in additional sampling in a "step-out" approach from those properties to try to identify other properties potentially impacted by suspected soil or groundwater contamination. Likewise, the presence of PCE in tap water collected from homes in Villa Literno, where the principal residential source of water is also groundwater, resulted in a more extensive investigation in that town.

Phase II

During Phase II, 209 residences were sampled for tap water, active soil gas, and indoor air for selected residences from November 2008 through October 2009 (see Figure ES-7). Of the 209 residences, 139

were new locations (i.e., residences not previously sampled), and 70 were previously sampled in either Phase I, Pre-Lease, or Step-Outs, and were resampled during Phase II for any media that were not sampled during previous events. Based on the results of Phase I, the Phase II sampling was designed to improve the spatial/geographic distribution of sampling locations and to delineate clusters of residences that exceeded risk criteria. However, availability, accessibility, and suitability of residences for sampling primarily dictated where samples were eventually collected. Soil sampling was discontinued midway through Phase II because results from Phase I samples indicated that soil contamination did not pose a significant human health risk.

Ambient air samples were collected from each of the U.S. Government-related facilities as part of the one-year regional ambient air monitoring program[6]. In addition, active soil gas and indoor air samples were collected at Capodichino and the Gricignano Support Site as part of a vapor intrusion investigation[7]. Active soil gas samples were also collected at Parco Eva and Parco Le Ginestre to investigate the potential for vapor intrusion from soil gas to indoor air[8].

In all, a total of 543 residences on the economy (i.e., off-base) were sampled as part of Phase I and Phase II.

Phase I and II investigations were conducted in accordance with the Quality Assurance Project Plans (QAPP) developed for this PHE (Tetra Tech, 2008b[9]; Tetra Tech, 2010b[10]).

Regional Ambient Air Study

This investigation involved the construction and operation of a meteorological tower and nine air sampling stations located across the nine study areas. An average of 439 samples were each analyzed for VOCs, SVOCs, dioxins and furans, pesticides, PCBs, PM_{10}, PM_{10} metals, mercury vapor, and aldehydes.

The ambient air samples collected during the PHE reflect general ambient air quality that is impacted by emissions from point (e.g., factory) and non-point (e.g., automobile exhaust) sources (i.e., they were not specific to any industry or source). In the U.S., ambient air quality is regulated via the Clean Air Act (CAA, [U.S. Code, Title 42, Chapter 85]) and this framework was used to evaluate the ambient air results from Naples.

- The risks associated with exposure to ambient air in each of the nine study areas were greater than the risks associated with exposure to typical urban air in the U.S. (USEPA, 2007). However, the risks associated with exposure to ambient air in Naples are not directly comparable to the risks associated with exposure to ambient air in the U.S. because some of the constituents

[6] Tetra Tech 2010. Ambient Air Quality and Meteorological Summary Report for the Period July 9, 2008, through July 8, 2009, Naval Support Activity Naples, Naples, Italy, March 2010.
[7] Tetra Tech 2010. Vapor Intrusion Investigation Report and Mitigation Recommendations US Naval Support Activity at Capodichino and US Naval Support Site at Gricignano, February 3, 2010.
[8] Reports for Parcos Eva and Le Ginestre are available on the NSA Naples website at: https://www.cnic.navy.mil/Naples/CommandInformation/HealthAwareness/NPHEPhaseIReport/ParcoSampling/index.htm
[9] Environmental Testing Support Assessment (ETSA) Field Sampling Plan (Tetra Tech, 2008b).
[10] Quality Assurance Project Plan (QAPP) (Tetra Tech, 2010b).

detected in the nine study areas did not have corresponding values in the USEPA's 2007 Air Toxics Database. When those constituents (e.g., 1,2-dibromo-3-chloropropane, which was responsible for, on average, 80% of the cancer risks in each study area) were not included in the calculations of the cumulative exceedance factors (EFs), the cumulative cancer exceedance factors (CCEFs) 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). The cumulative noncancer exceedance factors (CNCEFs) did not change appreciably (i.e., the difference was less than one percent) when the cumulative EFs were recalculated using only constituents that had corresponding values in the USEPA's 2007 Air Toxics Database, primarily because acrolein (the constituent that contributed the majority of the CNCEF in the nine study areas) had values in both data sets. Because some constituents (including 1,2-dibromo-3-chloropropane) did not have corresponding values in the USEPA's 2007 Air Toxics Database, it was not possible to determine whether or not the cumulative ambient air risks in the Campania Region exceeded the risks from typical urban air in the U.S.

- 1,2-Dibromo-3-chloropropane and acrolein were responsible for the majority of the risks in ambient air based on data collected as part of the PHE's year-long ambient air sampling and monitoring program in the Campania Region.

Further discussion and details of this regional ambient air investigation are presented in the Ambient Air Quality and Meteorological Summary Report (AAQMSR) in Volume I, Section 2.0 (Tetra Tech, 2010), Volume II, Sections 4.4.1.6 and 5.2.5 (PIONEER, 2010), and section 2.3.4 of this Volume III.

PHE Associated Studies

Four epidemiological studies and a food study were completed examining issues and concerns regarding (1) cancer, (2) birth defects, and (3) asthma (initial study in 2008 with follow-up in 2010) for the DOD beneficiary population in Naples, and (4) food available in the Naples Commissary. A detailed discussion of these studies is presented in Section 2 of this report, and the studies are included as Appendices G, H, I, J, and L, respectively.

Finally, available Italian environmental, epidemiological, and public health reports and studies for Italy and the Campania region were reviewed for information which might be applicable to the conduct of the PHE. Appendices F and K contain lists of reports and studies reviewed. Discussion of how and why the findings presented in those documents are applicable to the PHE study, including the conclusions and recommendations, is included in Sections 1-3 of this report.

Risk Communication Activities

Communication has been an integral and critical part of the PHE since its inception. The communication program has proactively served to inform stakeholders about project activities and findings, communicate health risks and mitigation actions, and provide opportunities for stakeholder involvement. Moreover, risk communication activities were designed to allow USN personnel and their families to make informed choices for themselves and be active partners in their own health protection.

To develop a sustainable and focused communication program, USN identified three key elements: (1) communication program objectives, which describe the purpose of communicating to stakeholders and guide the communication strategy; (2) the people, agencies, and organizations considered to be "stakeholders;" and (3) the methods for reaching these identified stakeholders. These elements were identified at the beginning of the PHE to guide the overall communication strategy. In addition to the overarching PHE communication program, activity-specific communication plans were developed to guide the communication strategy for PHE activities that were anticipated to generate a heightened interest for stakeholders (e.g., 1,500-Foot Step-Out Investigation in Casal di Principe).

Public Affairs activities have been ongoing since the PHE began in 2008, and communication activities have been consistent and frequent to meet several overarching communication objectives. These communication objectives included conveying USN Leadership's commitment to the health and well-being of U.S. Naples personnel and their families, raising awareness about the PHE, and keeping stakeholders continually informed in a timely manner. The PHE team has employed a broad range of communication methods to meet the communication objectives, including the PHE website, All Hands meetings, news media, Environmental Health Information Center (EHIC), and informational materials. Methods have varied throughout the duration of the PHE to best suit the communication objective and the targeted stakeholder(s), and multiple communication methods have typically been used simultaneously to increase the likelihood of reaching all intended stakeholders.

Two-way communication has enabled the USN to not only inform stakeholders, but has also provided opportunities for stakeholders to interact directly with USN, to ask questions, express concerns, and offer feedback. Important to this concept was the establishment of the EHIC at U.S. Naval Hospital Naples. The EHIC was established as a resource to conduct one-on-one health consultations, as a repository of sampling results and informational materials (e.g., fact sheets) for handout and discussion, and to contact residents who participated in the sampling program to inform them of sampling results.

In recognition of their efforts, the CNREURAFSWA/NMCPHC public affairs risk communication team was selected by the Chief of Naval Information for its prestigious *Thompson-Ravitz Award for Excellence in Navy Public Affairs* for calendar years 2008 and 2009.

See Appendix A for a complete description of risk communication activities that have occurred during the PHE.

USN Risk Management Actions

From the very beginning of the PHE, as environmental sampling results became available, CNREURAFSWA and Naval Support Activity (NSA) Naples Leadership began the complex task of implementing risk management actions overseas in a host nation to reduce or eliminate identified potential risks where possible. A complete list is provided in Appendix B: Risk Management Actions & Enduring Processes Already Implemented.

Conclusions

- Based on the findings of the PHE, the health risks related to living on-base at the Gricignano Support Site and Capodicino are Acceptable when considering the average length of stay is 3.2 years for civilians and 2.2 years for military (average of 2.8 overall) with 94% of the total population residing less than 6 years. From a region-wide perspective, both clustered and random distributions of Unacceptable homes were found; therefore, it is not possible to predict locations of Acceptable residences.
- USN epidemiological studies (birth defects, cancer, and asthma) were conducted as a result of Italian reports of environmental pollutants (air, water, soil, food) and increased rates of cancer and long-term health effects in the Campania region. The USN study of birth defects in the U.S. population in Naples concluded that the birth defect rate was within expected limits. 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) the cancer was associated with chemicals detected in the Navy's environmental samples; and (2) the cancer had a short enough latency period that exposure and diagnosis can occur during the study period. The findings of the cancer study indicated that cancer rates for Navy and Marine Corps members and their beneficiaries were consistent with cancer rates in populations with an average age of less than 50 years old. Finally, the asthma study found a weak, positive association between increasing levels of fine particulates (PM_{10}) in ambient (outdoor) 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.
- For drinking water, multiple lines of evidence indicate widespread contamination of tap water (e.g., bacteria, PCE) in some areas for residences on private wells and, to a lesser extent, for those using a public drinking water source. This is most likely a result of public drinking water system deficiencies due to infrastructure age and maintenance, low pressure fluctuations, high incidence of non-permitted private wells interconnected to the public system, lack of backflow prevention devices, lack of compliance with and enforcement of plumbing codes, and lack of monitoring of drinking water quality at the tap water faucets inside the homes by water purveyors[3] (Tetra Tech 2008[11], 2010; PIONEER 2009, 2010).
- For soil gas, based on the sampling results of the PHE, it is not possible to make definitive recommendations regarding which study areas are more or less of a concern to human health based on exposure to chemicals in soil gas.
- For ambient (outdoor) air, because some constituents (e.g., in particular, 1,2-dibromo-3-chloropropane, which was responsible for, on average, 80% of the cancer risks in each study area) did not have corresponding values in the USEPA's 2007 Air Toxics Database, it was not possible

[11] Final Phase I Environmental Testing Support Assessment Report, Volume I, Naval Support Activity Naples, Italy (TETRA TECH, 2008).

to determine whether or not the cumulative ambient air risks in the Campania region exceeded the risks from typical urban air in the U.S.

- As identified by environmental testing in Phase I and Phase II of the PHE (discussed in Section 2), there is a widespread frequency and distribution of Unacceptable homes throughout the nine study areas (see Figure ES-9 and Figure ES-10).
- There is a decades-long (early 1980s) history of illegal hazardous waste dumping as extensively documented by the Italian Government in the Regional Agency for Environmental Protection of Campania (*Agenzia Regionale per la Protezione Ambientale della Campania* [ARPAC]) 2009 State of the Environment in Campania Report, resulting in thousands of known, and presumed unknown, waste sites in the Campania region (discussed in Section 1). In 2005, Campania listed 2,599 contaminated or potentially contaminated sites; today there are 5,281: 1,548 sites subject to uncontrolled dumping of waste and 3,773 sites contaminated or potentially contaminated, of which 462 sites present certified exceedances of contaminant concentrations over the limits set by law (199 of these are in Naples Province). Of the 3,773 sites, only 13 were reclaimed (cleaned up), while 876 are in the first stage of the reclamation process. Naples Province has the highest number with 2,532 contaminated or potentially contaminated sites (over half of Campania's overall census); they include Pianura and the eastern area of Naples and Naples Province. Caserta province has the highest number of areas where illegal dumping of waste has occurred: 851 sites which include Litorale Domizio-Flegreo and Agro-Aversano (See Figure 1-4). The majority of the USN nine study areas for the PHE lie within the footprint of one or more of these "Sites of National Interest" in Campania (see Figure 1-3).
- There is documented lack of progress by the Government of Italy in characterization and cleanup of these sites, as well as a lack of an integrated and adequate network of disposal installations required to accomplish these actions. This is documented in the March 4, 2010, European Commission Judgment of the Court against the Italian Republic for failure to implement measures to properly handle waste without endangering human health and harming the environment in the region of Campania, which is comprised of 551 municipalities, including the city of Naples (discussed in Section 1).

Recommendations and Enduring Processes

Based on the primary and secondary lines of evidence described above and throughout this report, the following are some of the more significant NMCPHC recommendations to CNREURAFSWA for consideration, to reduce or eliminate identified public health risks, and fill key data gaps in the PHE, where possible. They are organized by suggested commands. A complete list with more details is provided in Section 3.3.

CNREURAFSWA

- Until such time that risk management decisions are considered and implemented for off-base privately owned rental home options, consider the following actions for those remaining in rental homes to protect their health:
  - Maintain and update PHE maps provided to NSA Naples Housing to reflect the final sampling results for all homes in each study area.
  - NSA Naples Housing continue to maintain an area that displays the most current version of PHE maps (either via computer or by posted hard copies) for use by prospective tenants. This allows residents to easily refer to them when browsing for homes on the Housing database and enables them to lease homes where tap water, soil, and soil gas results were Acceptable.
  - Encourage/educate future residents to lease multi-story buildings and live on the first floor up from the ground floor or higher, which will significantly mitigate concerns associated with vapor intrusion from soil gas. Continue to provide fact sheets in English and Italian that discuss building construction and related potential vapor intrusion topics.
  - NSA Naples Housing maintain a list of residences that meet the multi-story criteria.
  - Finalize, and then implement, the screening process now under development using the recently completed Vapor Intrusion Attenuation Factor Technical Memorandum (PIONEER, 2010). This process will be applied to residences in proximity to locations found to be Unacceptable under the Navy's risk criteria. Once properties are assessed, a determination will be made regarding whether or not the property will continue to be available for lease by USN personnel. As this documentation is provided to NSA Housing from the PHE team, it should be linked and maintained with that property in the NSA Housing database.
  - For those houses not sampled, conduct an administrative screen to identify those personnel who have the potential to remain in one house for periods longer than three years (e.g., civil service, DODDS) and consider giving them priority to move on-base, or fund move to a multi-story building.
- Maintain indefinitely, the July 2008 *Bottled Water Advisory* for off-base personnel for drinking, food preparation, cooking, brushing teeth, making ice, and for pets.
- Ensure all drinking water systems (e.g., Parcos, Navy Exchange Teverola Warehouse) comply with the requirements as set forth by the NSA Naples Installation Drinking Water Management Board.
- For ambient (outdoor) air, no risk management actions are recommended at this time based on the ambient air results. However, the interim actions below are recommended to add more context to the decision-making process while reducing the uncertainty whether urban air in Campania is similar to urban air in the U.S. The Navy should re-evaluate the need for risk management actions for ambient air based on the results of these interim actions.
  - DBCP has been banned for use in most countries for decades (e.g., since 1985 in the U.S.). Recommend that, the Navy obtain a more detailed description of the DBCP ban in Italy (e.g., year banned, banned for registration, sale and use as pesticide, or prohibited to import, manufacture and sell as a pesticide for agricultural use).
  - Share the air monitoring data with the 3 established Italian Government points of contact for the Naples PHE, and ask them if they have any information on why DBCP would be detected

only during those 2 months and/or whether they can do further research on their existing databases (e.g., air, soil).

- The 9 air monitoring stations essentially fall within one of the Italian equivalent Superfund sites (the Domitian coast Flegreo and Agro Aversano) in Campania. Therefore, recommend that the Navy request data from ARPAC on whether DBCP has been detected in any of the characterized waste sites. In our review of Italian documents to date, we have not seen reference to this chemical. The ARPAC data (if available) may give us some indication of whether DBCP has been disposed of, legally or illegally as a hazardous waste in these areas. Since DBCP is persistent in soil and groundwater, if used legally in the past, or illegally dumped, one would expect the Italians to have detected it in soil or ground water samples.
- Since the Italians have a well established air monitoring network, the Navy could request they do some additional sampling for DBCP in air.

- Continue to use the established communication venues developed to keep USN personnel informed on future public health issues relevant to their health in Naples.
- Continue the data-sharing process with designated host nation public health officials as appropriate, and encourage Italians to investigate areas of environmental concern identified in the Phase I and Phase II final reports of the Naples PHE.

NSA Naples

- Maintain the three (3) New Lease Suspension Zones (NLSZ) indefinitely (see Figure ES-8). Residences located in the NLSZ that is located in Study Area 5, 7, and 8 (i.e., northwest-most NLSZ) exhibited significant and widespread exceedances and had the highest and most frequently Unacceptable concentrations of chemicals detected during the PHE (see Figure ES-9 and Figure ES-10). The NLSZs in Study Area 6 and Study Area 3, were developed based on Italian data, and the USN does not have detailed information regarding the nature and extent of contamination in these areas. Therefore, as a conservative health protective measure, new leases in these NLSZs should be prohibited until the proper Italian authorities have fully investigated, delineated, and remediated (cleaned up) contamination in these areas to the extent that the health risks are acceptable to the USN.
- Maintain the following private off-base rental home lease clauses:
  - If a home's tap water supply is connected to a well, the landlord must provide verification that the well is legal according to Italian law, otherwise, the home must be disconnected from the well and connected to the public drinking water system.
  - Landlords must provide containerized water, from vendors approved by U.S. Army Veterinary Command (VETCOM), for drinking, food preparation, cooking, brushing teeth, making ice, and for pets.
  - Landlords are required to clean and disinfect water holding tanks and associated plumbing every six months.
  - Landlords are required to authorize the tenant, to allow at any given time, necessary tests by USN to verify and test the quality of the water located in the unit, to include the soil and the air located around the actual building.

- Continue to maintain established communication venues used to keep USN personnel current on future public health issues relevant to their health in Naples and maintain the NSA Naples Community Health Awareness website: https://www.cnic.navy.mil/Naples/CommandInformation/HealthAwareness/index.htm

U.S. Naval Hospital Naples

- Continue to maintain the EHIC – a central location for information resources and health consultations.
- Recruit to fill the position description for the host nation bilingual Environmental Protection Specialist GS-0028 position (in progress) to monitor Italian public health and media reports and studies relevant to U.S. Government facilities and rental homes in the Naples area. Apprise NSA Naples and CNREURAFSWA Leadership of issues of concern that require action to protect the public health of USN personnel in Campania.
- As recommended in the 2010 asthma epidemiological study, U.S. Naval Hospital Naples should consider the impact of the air quality on those with documented respiratory problems, especially persistent asthma, before granting an overseas screening waiver.

Historical Timeline – Significant Milestones

June 2007 – CNREURAFSWA requested assistance from NMCPHC to evaluate the potential health risks associated with illegal waste dumping, inadequate trash collection, and the burning of the trash in the Campania region. Navy Bureau of Medicine and Surgery (BUMED) tasked NMCPHC (formerly known as the Navy Environmental Health Center) to conduct a PHE for Naples and the surrounding area.

July 2007 – PHE representatives from NMCPHC visited Naples, Italy, for initial consultation with CNREURAFSWA; U.S. Consulate, Naples; and American Embassy, Rome, officials to discuss public health issues of concern, and to request permission to work with Italian public health counterparts.

November 2007 – CNREURAFSWA and Italian authorities met in Rome and agreed to work together to identify potential health risks that may be associated with illegal dumping and inadequate garbage collection.

January 2008 – PHE representatives from NMCPHC arrived in Naples for the first scoping visit.

February 2008 – NMCPHC representatives met with CNREURAFSWA, Commander Naval Forces Europe (CNE), and ARPAC (Regional Agency for Environmental Protection of Campania) to discuss ongoing and completed Italian health studies, to request available data, and to determine the next steps to be taken.

April 2008 – Pilot Test sampling began on seven private rental homes.

May 2008 – Phase I sampling began, which included 130 private rental homes and 10 U.S. Government-related sites.

July 2008 – CNREURAFSWA issued a Bottled Water Advisory for drinking, food preparation, cooking, brushing teeth, making ice, and for pets, for personnel living off-base. The year-long regional ambient air monitoring program began.

September 2008 – Pre-Lease sampling of homes prior to occupancy began and included 240 private rental homes. Step-Out sampling of 36 private rental homes proximate to Unacceptable rental homes was conducted to determine acceptability.

November 2008 – CNREURAFSWA created three NLSZs based on U.S. and Italian environmental sampling results. Phase II sampling began and included 209 private rental homes.

April 2009 – Naples PHE Phase I Report published on NSA Naples Community Health Awareness website.

May 2009 – Phase I Report open house information sessions held.

August 2009 – PHE representatives (NMCPHC, CNREURAFSWA, NSA Naples) met with Italian officials from various levels of government to brief the results of the USN's PHE Phase I report and discuss public health issues of mutual concern. ISPRA (Instituto Superiore per la Protezione e la Ricerca Ambientale or Institute for Environmental Protection and Research) committed to forming a joint USN – Italian technical working group for issues of mutual concern. There was no further action by ISPRA and the technical group was not initiated.

May 2011 – Phase II Reports delivered to CNREURAFSWA.

June 2011 – Phase II Report open house information sessions, and resident letter meetings held.

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Figure ES-1. Naples Regional Map

Figure ES-2. Campania Provinces

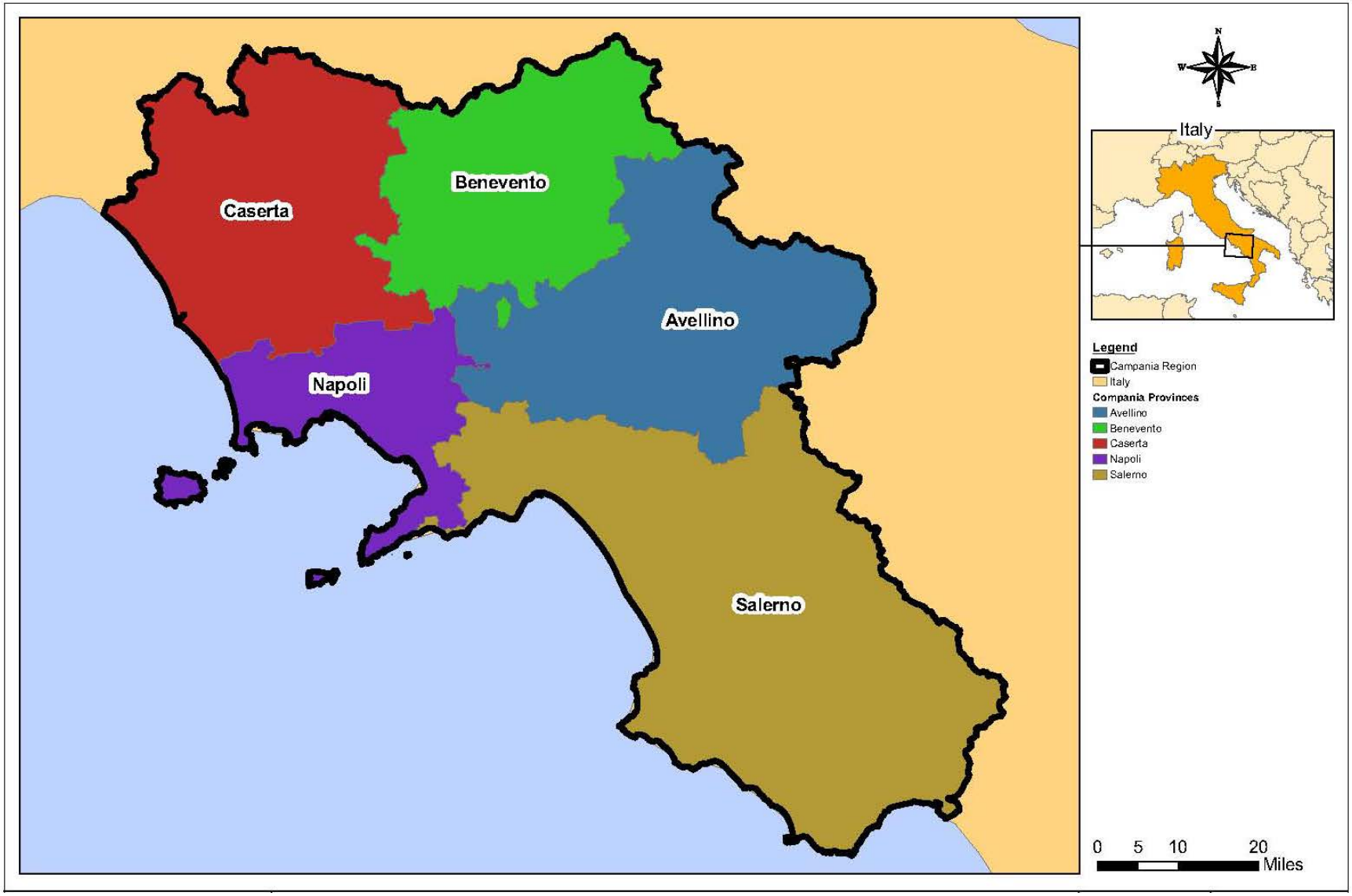


Figure ES-3. Comuni (Municipalities) of the Caserta and Naples Provinces

Figure ES-4. The Nine Study Areas of the Naples Public Health Evaluation

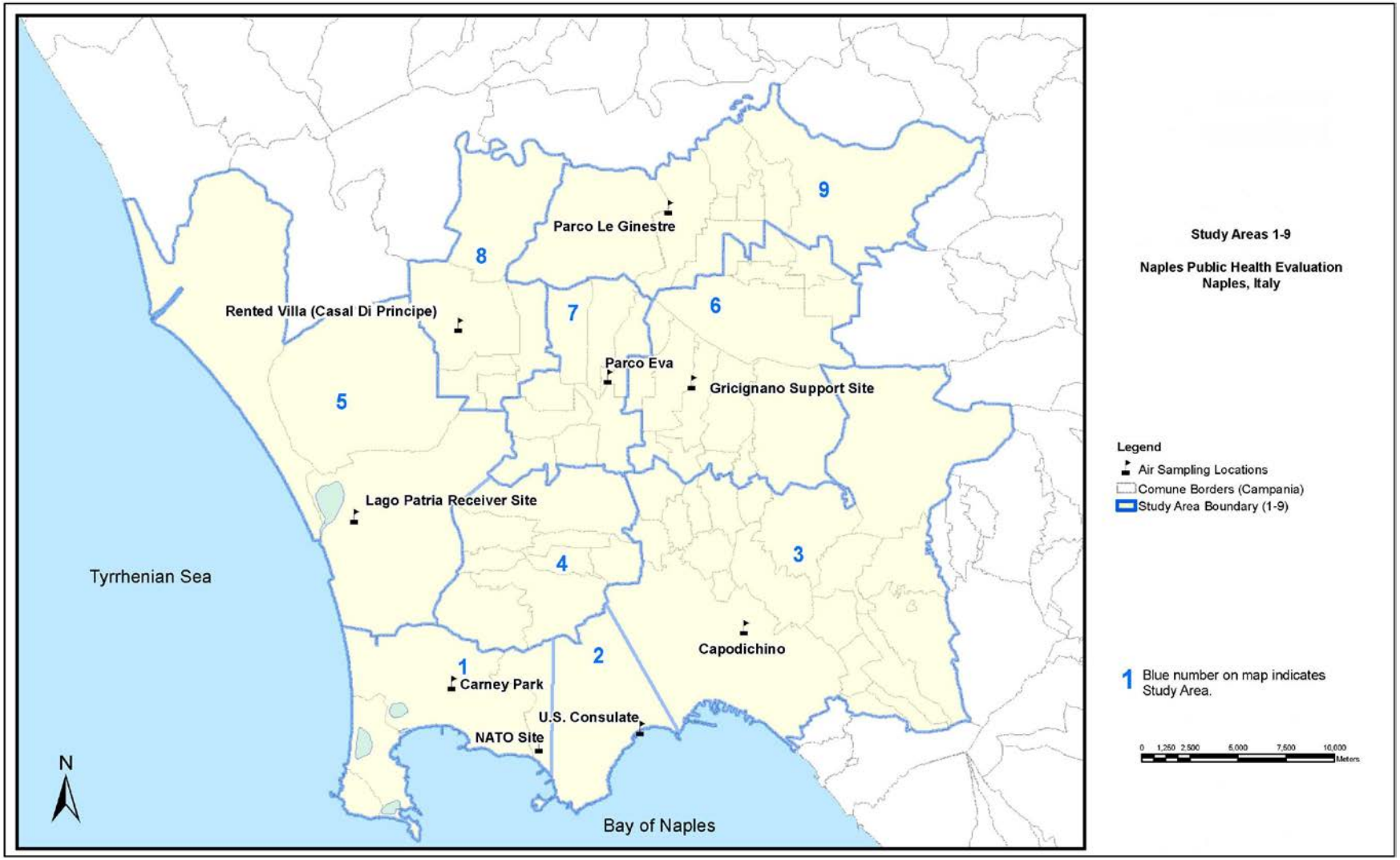


Figure ES-5. Study Areas and Trash or Potential Hazardous Waste Sites

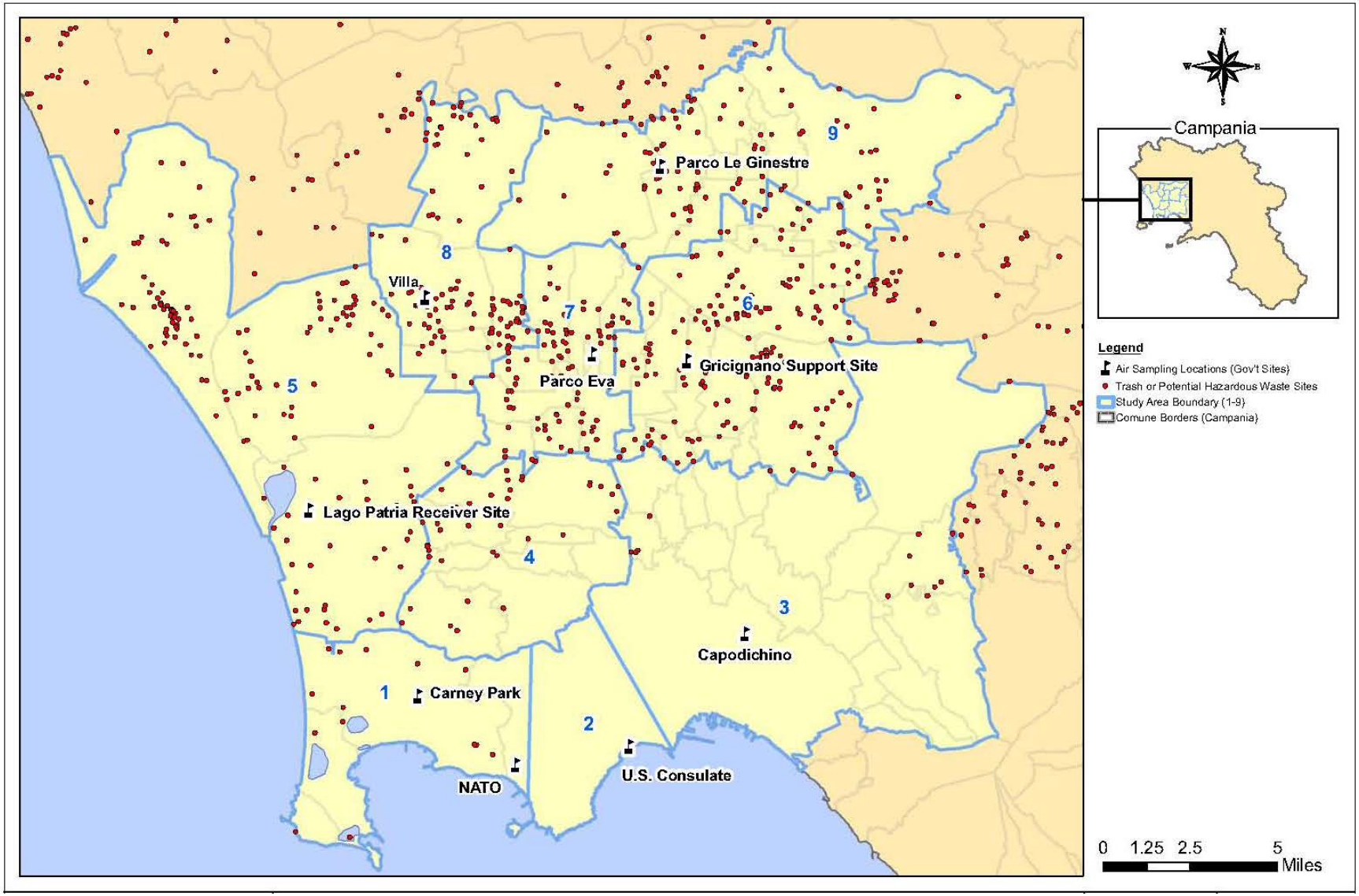


Figure ES-6. Conceptual Site Model for the Public Health Evaluation Nine Study Areas

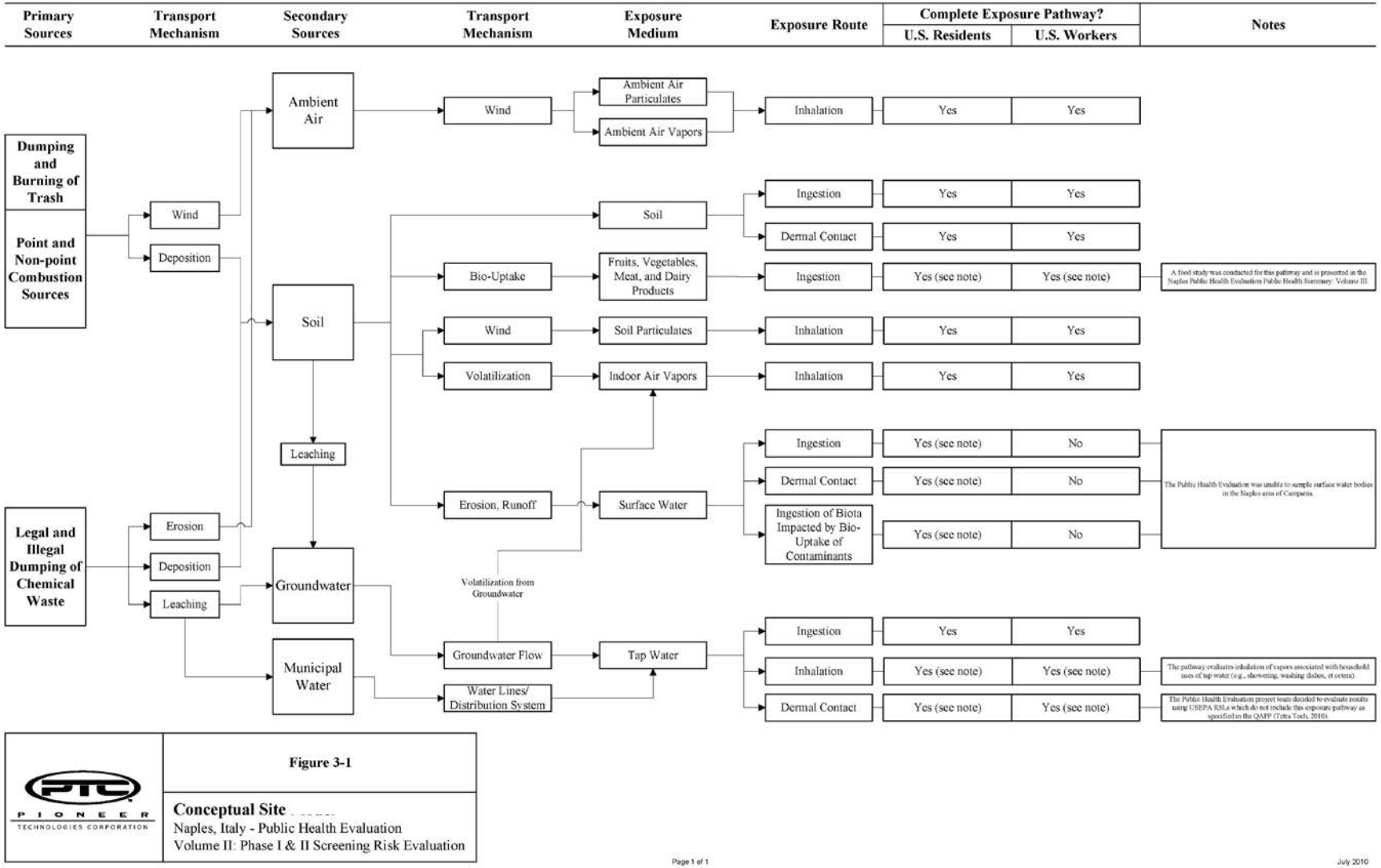


Figure ES-7. Residence/Sampling Locations in Relation to Trash or Potential Hazardous Waste Sites

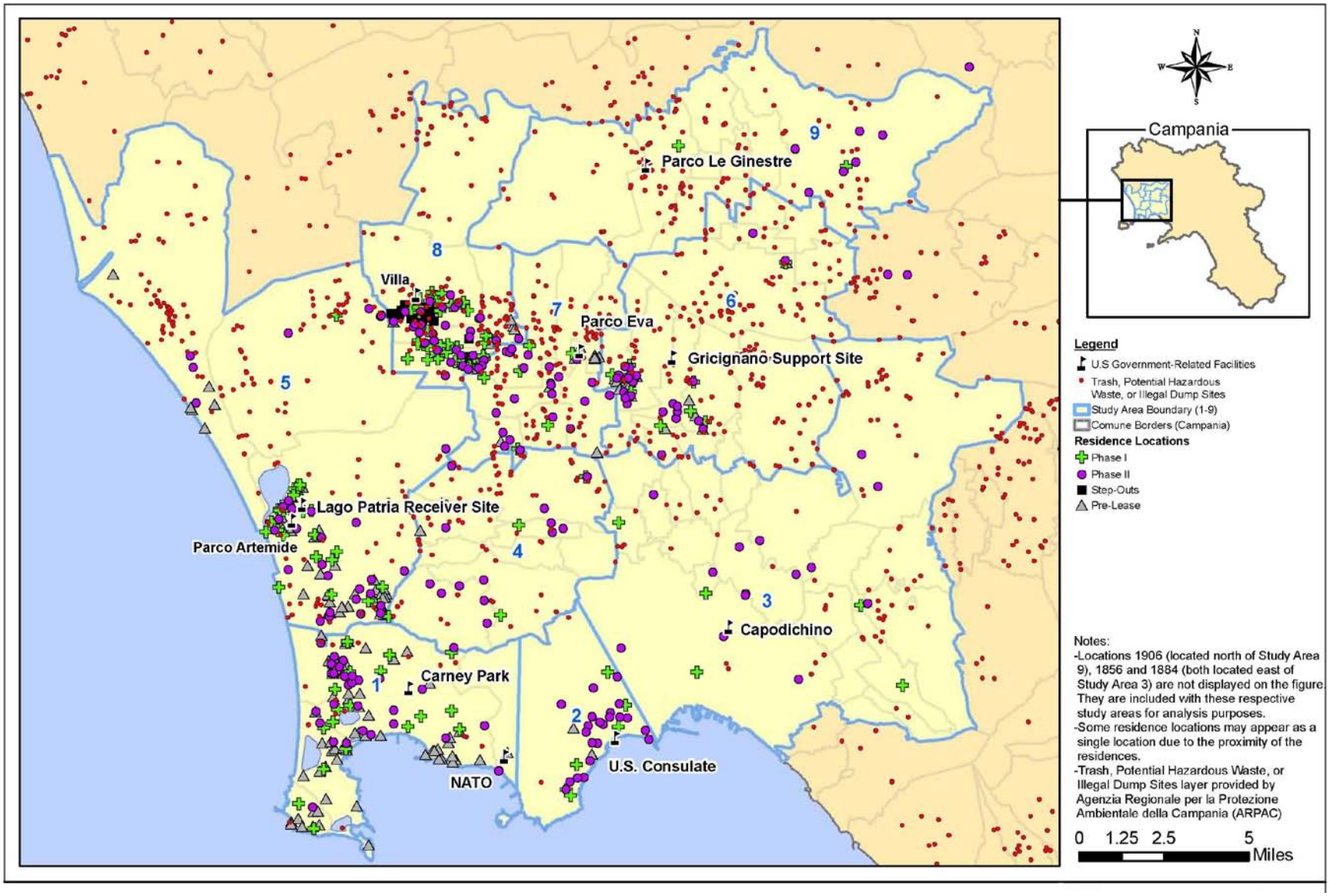


Figure ES-8. New Lease Suspension Zones

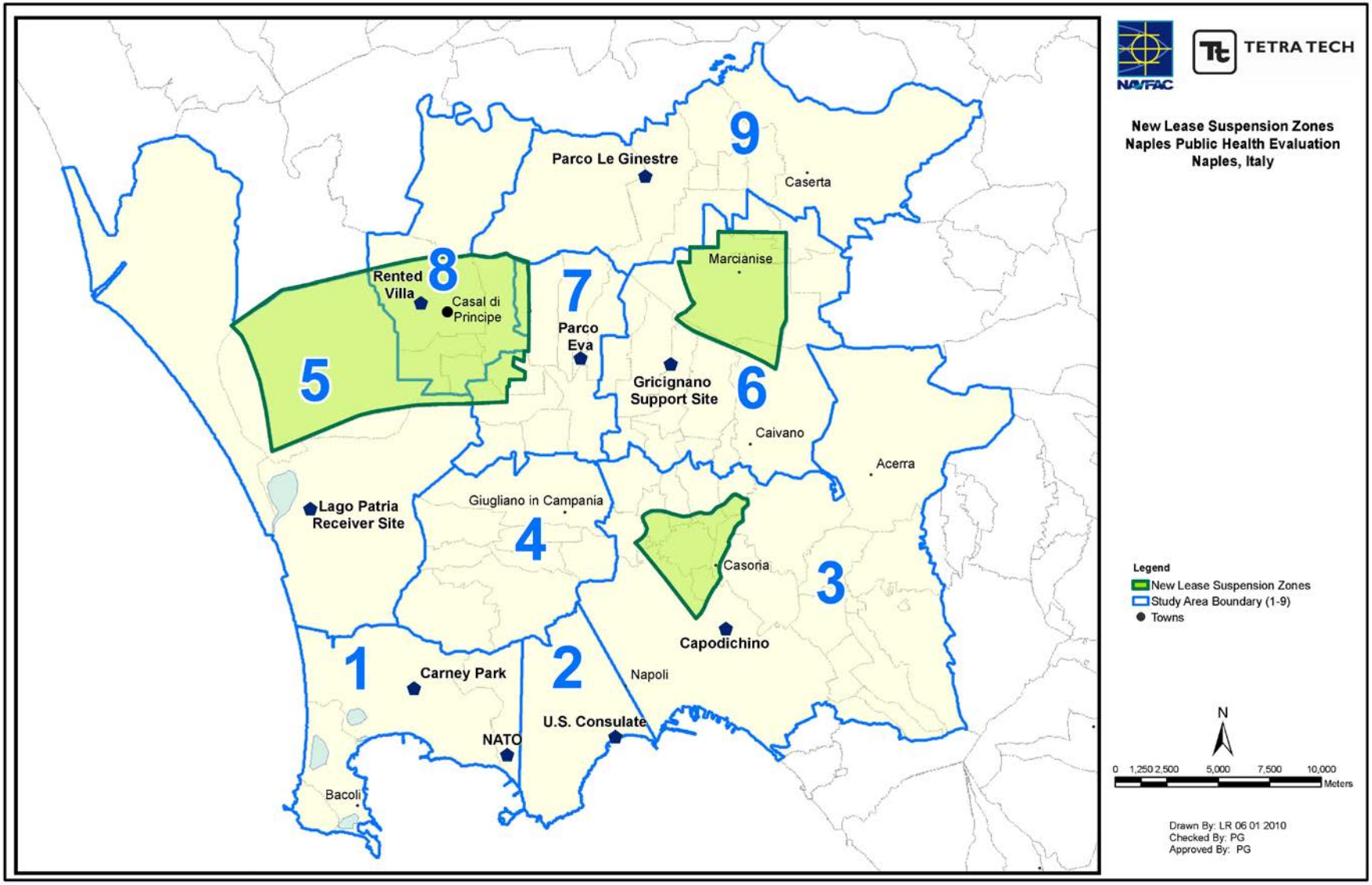
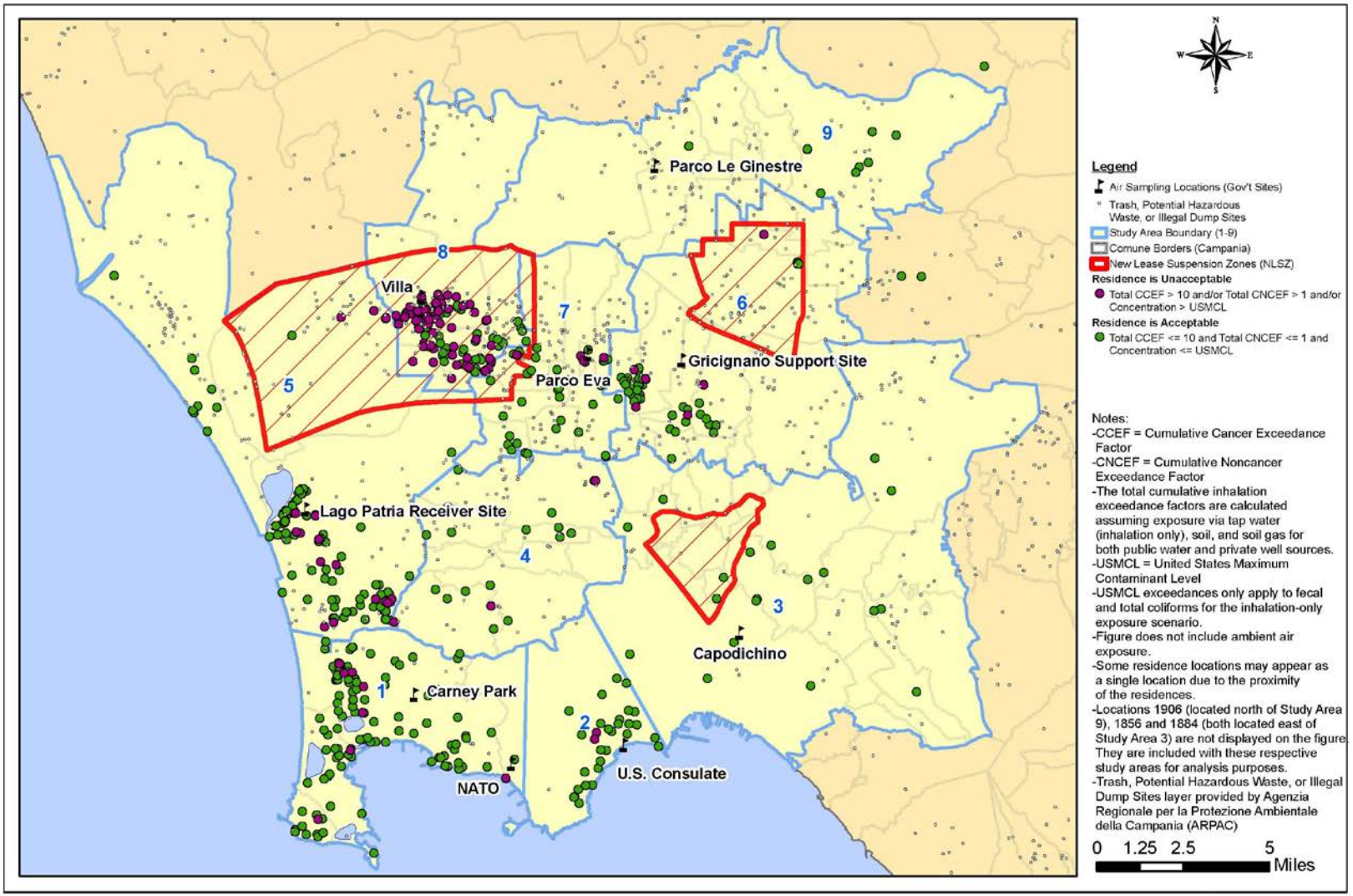
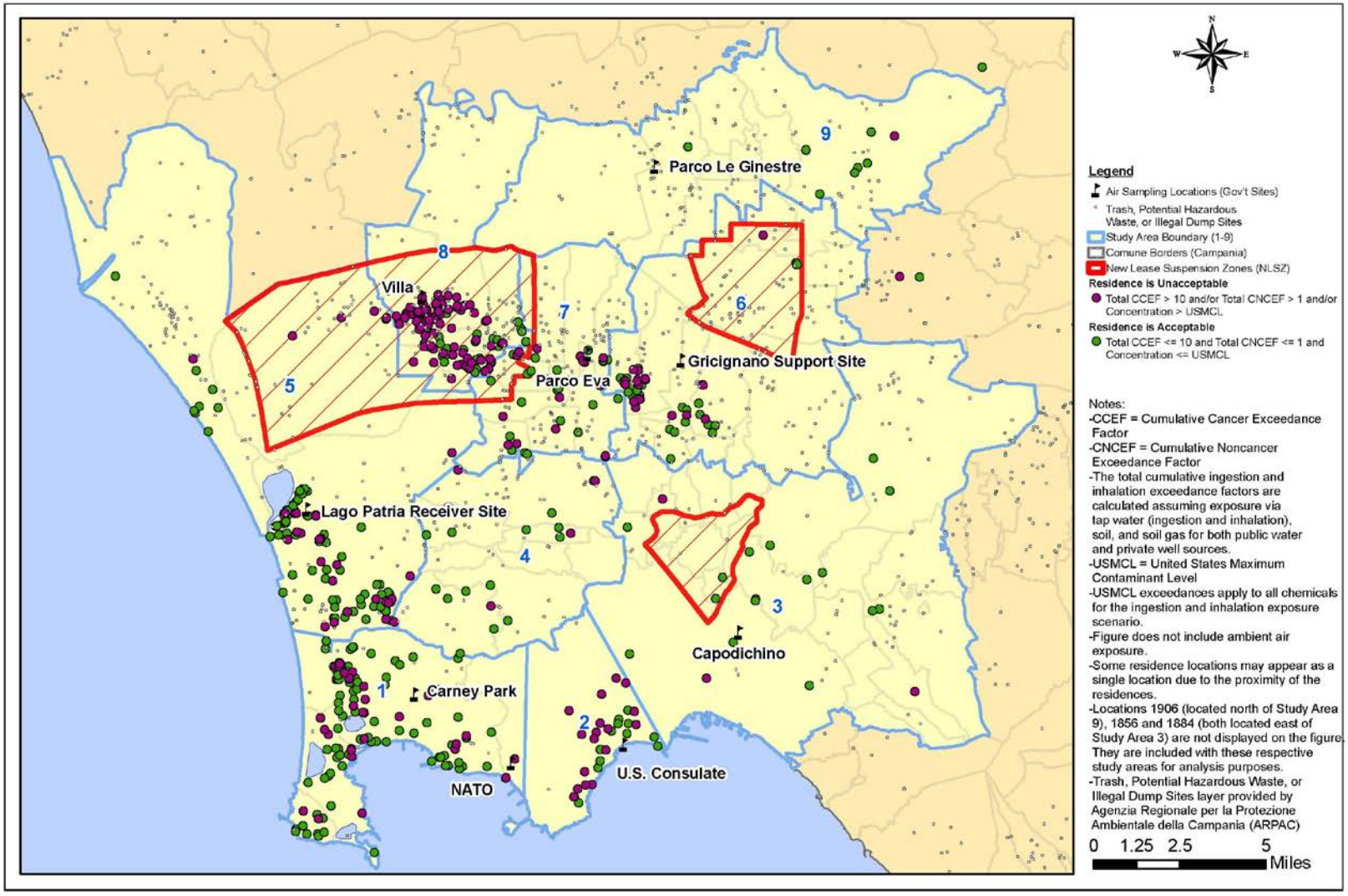


Figure ES-9. Total Inhalation Cumulative Risk Results



Total Inhalation Cumulative Risk Results
All Residences Sampled in the PHE

Figure ES-10. Total Ingestion and Inhalation Cumulative Risk Results



Total Ingestion and Inhalation Cumulative Risk Results
All Residences Sampled in the PHE

SECTION 1 – INTRODUCTION TO CAMPANIA REGION ISSUES

1.1 Site Location and Setting

The Campania region is located in southwestern Italy and is divided into five provinces: Napoli (Naples), Benevento, Avellino, Caserta and Salerno (see Figure ES-2). The region has a population of approximately 5.8 million people, making it the second most populous region of Italy. Naples is the capital city of Campania and of the province of Naples, and it is over 2,800 years old. The population of the city of Naples is approximately 1 million people.

Campania enjoys a typical Mediterranean climate with mild, wet winters and warm to hot, dry summers. The average low and high temperatures are 52 and 68 degrees Fahrenheit, respectively. The average annual rainfall is 37 inches.

The total area of Campania covers approximately 5,250 square miles. Fifty-one percent (51%) of the total area of Campania is hilly; 34% is mountainous; and the remaining 15% is made up of plains, which are found to the north in the provinces of Caserta and Benevento. Historically, this region has had significant volcanic activity. Mount Vesuvius is located approximately six miles east of Naples, and the Phlegraean Fields sit on the coast by the Gulf of Naples. Based on maps from the Water Management Plan of the Southern Apennine Hydrographic District for aquifer systems and hydrostructures holding underground bodies of water, the groundwater flows west-southwest towards the Tyrrhenian Sea.

1.2 Use of Multiple Lines of Evidence

The PHE report findings, recommendations for Enduring Processes, and conclusions are based on multiple lines of evidence. A partial list of these lines of evidence (and references) is provided below as well as in Section 3:

- USN environmental testing results (air, water, soil, soil gas) of 543 residences (total from all phases of sampling) on the economy in Campania.
- Review of existing information (reports, studies, etc.) from Italian environmental agencies (e.g., ISPRA, ARPAC), European Union (EU) Court Judgments, and other governmental reports.
- Interaction with host nation public health and environmental regulators between July 2007 and June 2010.
- March 4, 2010 – *European Commission vs. Italian Republic,* Judgment of the Court – Failure of a Member State to Fulfill Obligations – Environment – Directive 2006/12/EC.
- *Agenzia Regionale per la Protezione Ambientale della Campania* (ARPAC – Regional Agency for Environmental Protection of Campania) Publications (http://www.arpacampania.it/pubblicazioni.asp).
  - ARPAC – Report on the Environment in Campania (2009), ISBN: 978-88-96122-07-5
  - ARPAC – Report, Contaminated Sites in Campania (2008), ISBN: 978-88-96122-02-0
  - ARPAC – Campania Environmental Data Yearbook 2007 (2008), ISBN: 978-88-96122-04-4
  - ARPAC – Interactive Environmental Atlas (2008), ISBN: 978-88-96122-03-7

  - ARPAC –Waste Production and Management in Campania 2002-2007 (2008), ISBN: 978-88-96122-01-3
  - ARPAC – Air Quality Monitoring in Campania 2005-2007 (2008), ISBN: 978-88-96122-00-6
  - ARPAC – The Methodology of Control of Environmental Management in Systems of Treatment and Selection of Urban Waste (2008)
  - ARPAC - Physical Agents Monitoring in Campania 2003-2007 (2008), ISBN: 978-88-902451-8-3
  - ARPAC – Campania Environmental Data Yearbook 2006 (2008), ISBN: 978-88-902451-7-6
  - ARPAC – Water Monitoring in Campania 2002 -2006 (2007), ISBN: 978-88-902451-4-5
  - ARPAC – Regional Centre for Contaminated Sites (2007)
  - ARPAC –The Regional Department of Waste Cadastre in Campania and Urban Waste Management in Campania (2006)
  - ARPAC – First Environmental Atlas of Campania 2003 (2003)
  - ARPAC – Second Report on the Environment in Campania (2004)
  - ARPAC – Study Anthropogenic Impacts on Environmental Quality Lakes of Transition in Campania (2002)
  - ARPAC – Environmental Damage – Prevention, Responsibility, Compensation (2000)
  - ARPAC – Analysis of Data Relating to the Monitoring of Discharges of the Coast of the Town of Naples (2003)
  - ARPAC – The New Rules for the Protection of Water – The Power of Local Authorities – Legislative Decree 11/05/1999 No. 152 (2001)
  - ARPAC – Monitoring of Microbiological Parameters of Wells Adjacent to Landfill in the Province of Naples (2003)
- Instituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA – Institute for Environmental Protection and Research) – http://www.apat.gov.it/site/en-GB/Topics/Contaminated_sites/.
  - ISPRA Key Topics – Environmental Data Yearbook – Regional Agencies and Autonomous Provinces for the Protection of the Environment, ISBN: 978-88-448-0421-3
- *Ministero dell'Ambiente e della Tutela del Territorio e del Mare* (Ministry for the Environment, Land and Sea) - http://www.minambiente.it/ (report can be found at: http://www.arpacampania.it/dett_news.asp?id_news=1961).
  - First Report on the Fight Against Environmental Illegality (*Primo Rapporto sul Contrasto all'Illegalità Ambientale*), 2010
- Parliamentary Investigations Commission on Waste Recycling and Related Illegal Activities – 2006 Territorial Report on the Campania Region – Approved in the session of January 26th, 2006.

1.2.1 Italian Public Drinking Water System

Italian Aqueducts

Based on USN Water Systems Sanitary Surveys for Naples, and PHE sampling results of the source waters from the aqueducts feeding Campania, the raw water used to supply the public drinking water system appears to be of good quality.

Recently, after receiving permission from the Environmental Department Water Section of the Campania Region (*Asserato all'Ambiente della Regione Campania*), USN sampled 14 upgradient raw water sources that feed into aqueducts that then feed the nine PHE study areas (Figure 1-1). Samples from these 14 upgradient sampling locations were analyzed for bacteriological, metals, VOCs, dioxins, and gross radiological activity. These samples are from raw water upstream from any chemical disinfection or mechanical filtration.

At several sampling locations, Italian water officials from *Azienda Risorse Idriche Napoli* (*ARIN*) and *Acqua Campania* performed their own sampling. Though the sampling analyzed similar parameters as USN, not all parameters sampled were identical. The sample collection and laboratory analysis methodologies used by *ARIN* sampling technicians were not the same as the methodologies used with samples collected by USN. Therefore, the results from the samples collected by *ARIN* are not comparable to the USN sample results. USN did not design or intend the aqueduct sampling endeavor to be a split-sampling strategy because the degree of quality control and data validation observed by *ARIN* could not be determined by USN. Consequently, this Phase II report does not present the results of the samples collected by *ARIN*.

Italian law "Decree 152/2006" provides Italian water officials regulatory guidance on source water to be used for drinking water. It lists maximum contaminant limits for specific analytes (e.g., chemicals) and provides treatment measures (filtering, chemical treatment) that must be taken based on specific contamination and the specific type of water source (river, underground) in order to provide potable water.

USN was unable to perform a direct comparison to a U.S. regulation since the U.S. has no equivalent standard for source water intended for treatment to provide potable water. Considering that the collected water is untreated, the water quality is expected to be acceptable, following appropriate treatment, when compared to USEPA MCLs. In the U.S., source water to be used for potable water is analyzed, and appropriate treatment measures are employed, to remove or reduce contamination to levels deemed safe by the USEPA Safe Drinking Water Act.

- See Public Health Evaluation Volume I: Phase II Environmental Testing Support Assessment Report (Tetra Tech, 2010) Section 7 for the full aqueduct report and sampling results.

Although the source water appeared to be of good quality, once the water is transported from the main aqueducts to smaller distribution lines in the *comuni* (i.e., municipalities), the transported water has the potential for contamination due to a variety of factors, such as illegal private wells, lack of backflow prevention, cross connections, disinfectant residual, low pressure, infrastructure deficiencies, and illegally constructed homes. Shallow non-permitted wells have been installed throughout the region to augment

water pressure for household water especially in the summer when the city water pressure is low. This is a significant issue because shallow water supplies are particularly susceptible to chemical and bacteriological contamination.

Tap water samples were taken at each residence for Phase I, Pre-Lease Sampling, Step-Out and Phase II. Because chemicals and bacteriologicals can migrate from soil into groundwater wells or other drinking water reservoirs, tap water samples were collected to assess potential exposures to chemicals from drinking and showering. Because of these reasons and to provide a representative sample of potential exposures of USN personnel, sampling was performed at the tap inside each residence. As part of their required ongoing surveillance of water quality, and similar to what occurs in the United States, Italian water utility companies do not usually sample at the tap, but rather upstream at some other distribution point such as public parks or faucets installed along the water system that are only used for sample collection.

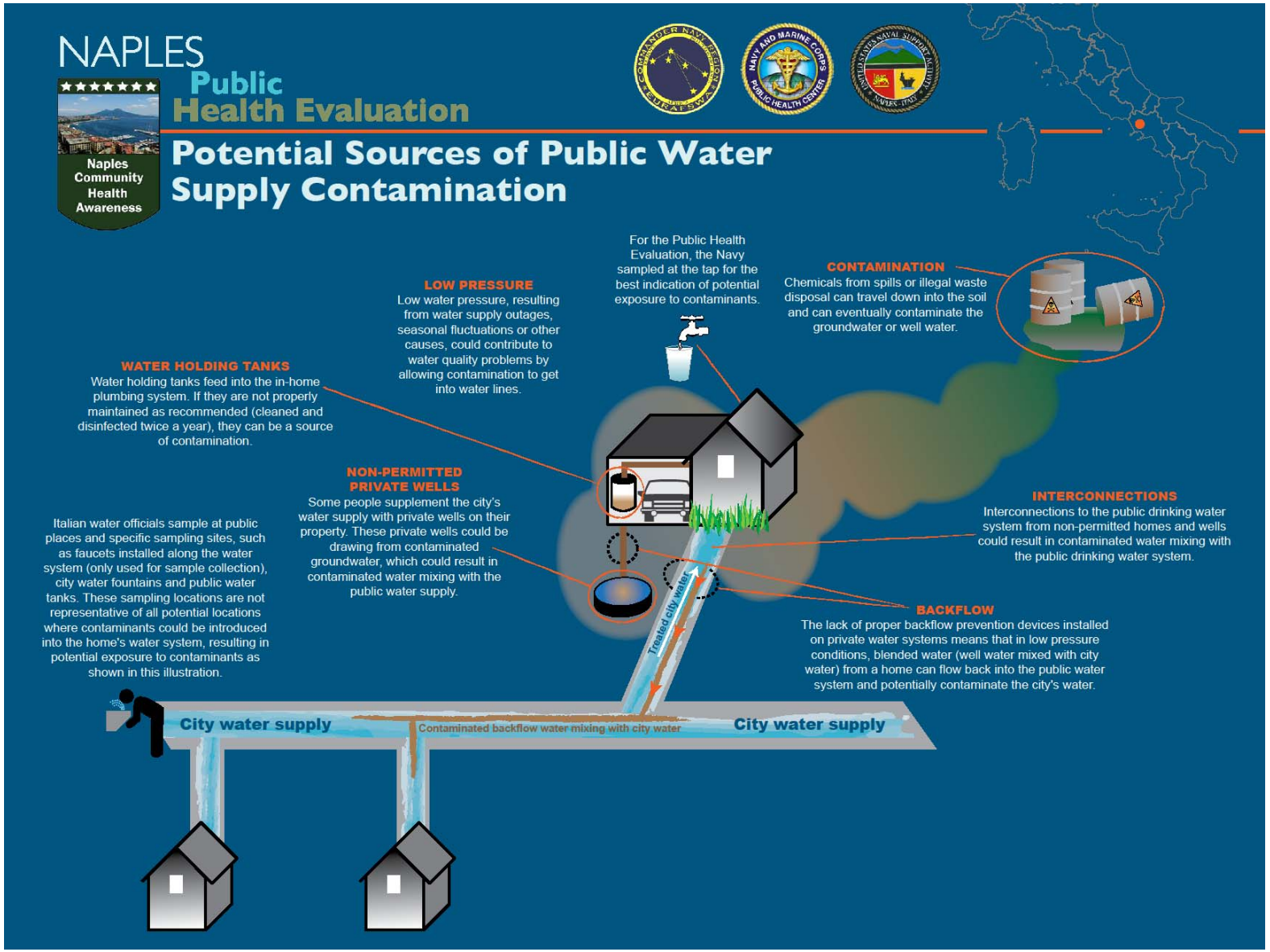
Tap water samples were compared to December 2009 USEPA 30-Year RSLs and USEPA MCLs. As presented in Volume II Tables F-17 and F-18 (PIONEER, 2010) microbiological organisms (including total coliforms and fecal coliforms) and PCE were frequently detected in tap water obtained from wells and some public sources at concentrations exceeding MCLs (microbiological organisms) and RSLs (chemicals). In addition, arsenic (which was determined to be associated with natural background in the Campania region) was present in every tap water sample at concentrations exceeding RSLs. In fact, in almost all cases, the concentrations posed an Unacceptable risk based on the risk management criteria for the PHE. The exceedances in tap water are likely due to:

- Illegal hazardous waste disposal resulting in soil and/or groundwater contamination.
- Drinking Water System infrastructure and maintenance issues.
- Code enforcement issues by Italian authorities.
- Code compliance issues by landlords.
- Code enforcement of backflow prevention laws.
- Low water pressure in the drinking water system.
- High incidence of private illegal wells.
- Interconnections from illegal wells to the public drinking water system.
- High incidence of "blended" systems (home is connected to both a private well and municipal water system) affecting homes proximate to them.
- Sewer and purification systems below national and European standards in terms of percentage of connection to purification stations for metropolitan areas (2009 ARPAC State of the Environment Report – Campania Region).

Consequently, in low pressure (down gradient) situations, as may occur in Naples, any local contamination present has the potential to contaminate the public drinking water system. The USN's environmental testing results confirm a significant presence of contaminants in the wells located in certain study areas (e.g., Study Area 8 in Casal di Principe). It is likely that many of the houses that were connected to the public drinking water system and that had Unacceptable levels of contaminants were the result of contaminated water from illegal private wells entering the public drinking water supply via blended systems (well + municipal water). In these instances, contaminated water from the well may

enter the public water supply system, because backflow preventers are not installed and the water pressure from the well is higher than the water pressure in the public water supply system. During the course of this investigation in certain comuni (e.g., Casal di Principe), USN observed construction activities indicating a transition from private wells to the public drinking water system. The graphic below illustrates the potential factors that may be affecting water quality in the distribution system.

Potential Sources of Municipal Water Supply Contamination



USN data and conclusions are similar to those in a recently published peer-reviewed study by the University of Frederico II Naples (see Appendix C: Drinking Waters in Italy – Analysis and Evaluation of Quality 2008) that examined the quality of water from home faucets in 50 Italian cities, including Naples, and indicate that the status of the water quality was of public health concern due to the presence of man-made contaminants. This study found that 77.44% of water tested showed the presence of both organohalogenated and trihalomethane (THM) compounds (VOCs). The study links the presence of THMs and other VOCs (e.g., PCE) to byproducts of disinfection and anthropogenic (man-made) pollution. Of samples tested, 24.83% showed the presence of fecal contamination, which the study links to poor maintenance of domestic/private reservoirs together with not enough residual free chlorine from the disinfection process. The study recommends that water quality monitoring be performed by municipal water companies at the home taps to get an accurate representation of water quality inside the home, as well as monitoring downstream and seasonally.

Regarding disinfection in the province of Caserta, the 2009 ARPAC Report on the State of the Environment in Campania (Chapter 10, Water, Page 290, The State of the Waters in Campania) concludes:

"The investigation has shown, overall, a serious situation in the provincial system for the treatment of urban waste waters, both due the percentage of inhabitants fully lacking in waste treatment systems, as well as due to the inadequacy of the existing plants witnessed by the fact that the waste from about 70% of the inhabitants is only treated partially, generating effluent into superficial waters which do not enter within the legislative limits, in particular for their inefficient disinfection. Therefore it can be confirmed that for the recovery of the coasts for bathing, a program aimed at the reconstruction of the existing plants is essential, under an installation and management profile, as well as the creation of new purification plants."

Further, the 2009 ARPAC Report found (Chapter 10, Water, Page 293):

"For the sewer and purification system (Figure 10.36) Campania is clearly below national and European standards, with a percentage of connection to purification stations for metropolitan areas with 15,000 inhabitants equal to 60% and with only 25% of inhabitants connected to purification stations with tertiary treatment systems, able to fight organic pollution that encourage eutrophication."

Due to the widespread detections of VOCs and bacteria (e.g., total and fecal coliform) that were detected in tap water during Phase I PHE environmental testing, CNREURAFSWA issued a *Bottled Water Advisory* in July 2008. Using emergency funds provided by the Secretary of the Navy, CNREURAFSWA distributed free bottled water to personnel living off-base as part of a short-term strategy for providing safe drinking water while developing a long-term solution. The long-term solution was for landlords to provide containerized water for their tenants. This program went into effect in November 2008 and shifted the responsibility of providing safe drinking water from the USN to local landlords. Since then, all new leases include a provision that the landlord must provide containerized water service from a VETCOM-approved vendor; more than 1,870 pre-existing leases have been modified, at the tenant's request.

However, it is important to note that VOCs and bacteria in tap water could pose health risks to residents via two exposure pathways: (1) ingestion of bacteria and VOCs in tap water when drinking, cooking, brushing teeth, etc., and (2) inhalation of VOCs in tap water via household uses, such as when showering, washing dishes and washing clothes. Although the *2008 Bottled Water Advisory* eliminates the potential exposure to chemicals and bacteria in tap water via ingestion (i.e., drinking), the advisory does not eliminate risks related to the inhalation pathway (e.g., exposure to VOCs in tap water when showering, washing dishes and washing clothes). Furthermore, there is no guarantee that the Bottled Water Advisory has been followed by every person – as such, the *Bottled Water Advisory* does not eliminate or reduce risks for those who are not following the advisory.

1.2.2 Wells

At the beginning of the PHE, USN found that many of the private rental homes on the NSA Naples Housing List had plumbing systems that were connected to wells on the property that were not legally permitted. Although there are Italian laws for constructing and permitting a legal well (RD 1775/33, D.Lgs. 152/06, D.Lgs. 275/93, D.Lgs. 152/06), there has not been any landlord that has been able to document compliance with these laws. This creates another layer of uncertainty as to the quality of water available for use at the tap at these off-base private rental homes. During the PHE, the USN found that many wells lacked sanitary seals, appeared not to be properly grouted from potential surface contamination, had inadequate well-head protection, were not properly certified by Italian authorities, and were typically shallow, making them more susceptible to infiltration of surface contamination. Therefore, USN added a new lease clause requiring landlords whose properties were connected to a private well to provide proof that the well was legal under Italian law, or disconnect the well and connect the property to the public drinking water system.

1.2.3 Water Holding Tanks

Due to a lack of constant water pressure and seasonal fluctuation of water availability, many homes use tanks to store drinking water. Many of these tanks are not routinely cleaned, maintained, and secured, which creates an environment for microbiological growth and external contamination. This is a significant problem with no discernable efforts by landlords to correct this systemic problem. Therefore, USN added a new lease clause requiring that landlords clean and disinfect water holding tanks and associated plumbing every six months.

1.3 Constraints on the USN Investigation

As a guest in a host nation, the USN's ability to do a complete human health risk assessment on Italian private or leased property is extremely limited. Further, the ability to assess risk is impacted by the thousands of waste sites, both identified and unidentified, in the Campania region that have not been characterized as to what chemicals are present and at what concentrations. As a guest in a host nation, USN does not have formal input into this Italian regulatory process. USN input is appropriately limited to suggestions. Further investigation is needed by the Italian environmental regulatory agencies (e.g., ARPAC) to document the nature and extent of environmental contamination in all affected media, such as air, soil, groundwater, and surface water. Such an investigation would typically involve the following: reviewing available historical information (such as past industrial practices in the area); collecting and

reviewing hydrogeology information; reviewing relevant agency databases or peer-reviewed literature that may contain valuable information concerning the nature and extent of contamination; and implementing corrective action(s) to eliminate, control, or mitigate potential risks to human health. Understanding the full extent of environmental contamination is critical to fully assessing the potential health risks to people living in the area and for determining how to deal with the contamination.

1.3.1 USEPA Superfund Program - Italian Sites of National Interest

Superfund is the name of the fund established in the U.S. by the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the Small Business Liability Relief and Brownfields Revitalization Act of 2002.

This law was enacted in the wake of the discovery of toxic waste dumps, such as Love Canal and Times Beach, in the 1970s. It allows the USEPA to clean up such sites and to compel responsible parties to perform cleanups or to reimburse the government for USEPA-led cleanups. The "National Priorities List" (NPL) is the list of sites among those with known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the U.S. and its territories. The NPL is intended primarily to guide the USEPA in determining which sites warrant further investigation. The Italian government has a similar list of priorities for Italy, called "Sites of National Interest" (SIN).

The equivalent Italian regulatory agency and legal framework resides in ISPRA, whose role is to formulate and update guidelines for activities related to the characterization and reclamation of contaminated sites. Its website is http://www.apat.gov.it/site/en-GB/Topics/Contaminated_sites/. See Appendix D and Appendix E for more information on ISPRA and the risk assessment approach in Italy.

1.4 Contaminated Waste Sites in Campania

As documented by Italian authorities, there are thousands of contaminated waste sites in Campania, and they are classified by ARPAC as:

- "**Abandoned Waste Sites**": Sites with uncontrolled dumping of trash. The condition of these sites is identified at the time of investigation. The condition may have changed since the initial investigation due to further dumping of other quantities or types of refuse or of their removal.
- "**Sites with Exceedances**": Sites where contamination in the environmental media was verified, during the preliminary investigations or the characterization activities. These include sites where land reclamation (clean up) is already ongoing.
- "**Sites without Exceedances**": Potentially contaminated sites for which there is no analytical data available yet to confirm contamination above the concentration threshold (Italian standard: CSC, *Concentrazioni Soglia di Contaminazione*) and for which preliminary investigations are required in order to confirm or exclude a contamination scenario.

In Italy, the term "contaminated site" refers to all areas where, following previous or current human activities, an alteration of the land, surface waters, or underground waters has been certified with concentrations exceeding standards established by regulations (http://www.apat.gov.it/site/en-

GB/Topics/Contaminated_sites/). Laws referring to contaminated sites are being amended[12]. Within this changing legal framework, ISPRA's role is to formulate and update guidelines for activities related to the characterization and reclamation of contaminated sites. Some of these regulations were developed in conjunction with the Ministry of Environment, Land and Sea Protection, as well as other regulatory bodies involved in this regulatory area.

Requests to ARPAC since January 2008 (i.e., from the beginning of the PHE) for basic information on contaminated site locations (GPS coordinates) and site characterization (e.g., what chemicals, what concentrations, relevant geology or hydrogeology) in Campania to help guide the PHE have been met with limited success. Only recently in March 2010, after Phase II environmental sampling concluded, did USN receive a list of sites by location, but with very limited site characterization information.

To add some perspective to the magnitude of this problem of waste disposal in Campania, Figure 1-2, Figure 1-3, and Figure 1-4 were generated from available data (2009 ARPAC Report on the State of the Environment in Campania). Figure 1-2 shows the known waste sites by category, superimposed over the nine PHE study areas to include the NLSZs. Figure 1-3 shows the nine PHE study areas in relation to the Italian SIN, six of which are in Campania (54 total in Italy), which are similar to the USEPA Superfund Sites on the National Priorities List. Figure 1-4 shows the nine PHE study areas and the known ARPAC waste sites by category in relation to the six Italian SIN in Campania. Study Area 2 is impacted by the Bagnoli-Coroglio Site of National Interest; Study Area 3, by the Napoli Orientale Site; and the other seven study areas lie within the footprint of the Litorale Domito Flegreo e Agro Aversano Site. Note that these are only the known waste sites. Most are not characterized in terms of extent of contamination, nor remediated (cleaned up). Additional significant uncertainties are the waste sites in Campania yet to be discovered, and any future illegal dump sites that may be created.

1.5 History of Illegal Waste Disposal in Italy and the Campania Region

It is well documented by Italian authorities (as listed in Section 1.6; 2009 ARPAC Report on the State of the Environment in Campania; and 2006 Parliamentary Investigations Commission on Waste Recycling and Related Illegal Activities) that the waste disposal industry in the Campania region is influenced by organized crime. Also documented is that much of Italy's hazardous waste has been illegally disposed of in the Campania region starting in the early 1980s. The EU is largely responsible for introducing proper waste management policies in Italy, and much of Italy's environmental laws stem from its obligation as an EU member.

Garbage problems have plagued Naples and the Campania region for decades with the latest occurring in December 2007 when collectors stopped picking up the trash, because there was no more room at the legal dumps as a result of delays in the construction of landfills and waste processing plants.

[12] Ministerial Decree no. 471/99 on "Regulations Containing Criteria, Procedures and Modalities for the Environmental Security, Reclamation and Recovery of Polluted Sites" was replaced by Section V "Reclamation of Contaminated Sites," Chapter Four of Legislative Decree no. 152/06, which is also being amended.

The city of Naples generates an estimated 8,000 metric tons of trash daily some of which was set on fire, releasing pollutants and smoke, potentially posing a health risk to residents. Firemen answered an average of 20 calls each night as blazes of rubbish lit up the countryside. From the beginning of 2008 until March 10, 2008, the Fire Departments of Campania (also assisted by squads coming from some departments from other regions) have intervened 7,462 times to fight the flames of piles of waste set on fire[13].

In the month of February 2008, the Fire Department acted 3,289 times to extinguish fires in trash bins and piles of waste with an average of 106 interventions per day. Meanwhile, in the first 10 days of March 2008 they extinguished fires 603 times in piles of waste with an average of 60 interventions per day. From 1 January - 10 March 2008, the average was 106 interventions per day. The Fire Departments put out a trash fire approximately every 13.5 minutes. The average was between four and five interventions per hour. Of the 7,462 interventions, 5,357 took place in the province of Naples.

The figure below illustrates Fire Department responses during the month of February 2008. There is very little recycling; consequently, most things get thrown away. Quickly, more than 200,000 tons of trash piled up. The piles also brought out feral animals, mostly dogs and cats, but rats as well, which posed additional potential public health risks.

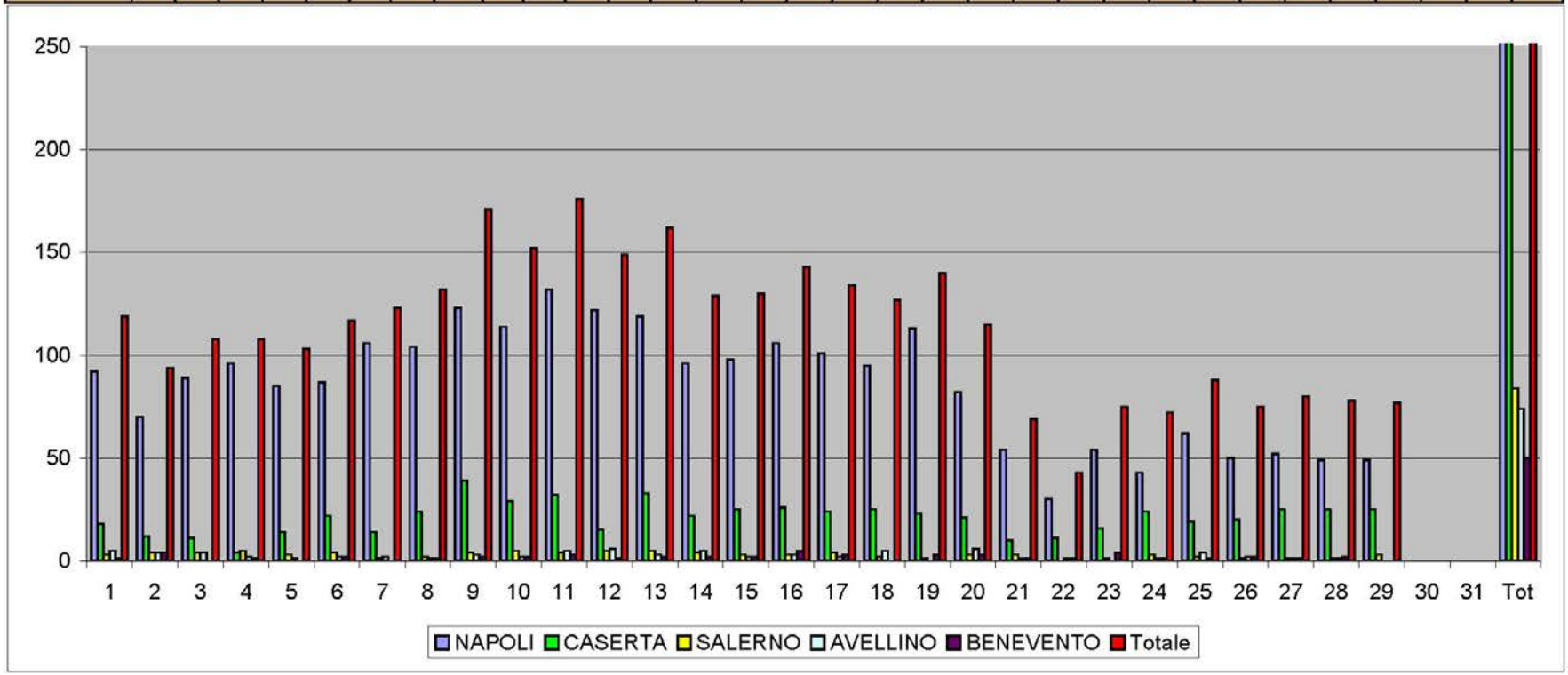
[13] *Ministero dell'Interno, Corpo Nazionale dei Vigili del Fuoco, Dipartmento dei Vigili del Fuoco, del Soccorso Pubblico e della Difesa Civile* - or Ministry of the Interior, National Fire Department, Department of Fire, Rescue, and Civil Defense, (http://www.vigilfuoco.it/notiziario/notizia.asp?codnews=5719).

Italy Fire Department Responses during the Month of February 2008

Situazione interventi per Emergenza Rifiuti nella Regione Campania

ANNO 2008

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Tot
NAPOLI	92	70	89	96	85	87	106	104	123	114	132	122	119	96	98	106	101	95	113	82	54	30	54	43	62	50	52	49	49			2473
CASERTA	18	12	11	4	14	22	14	24	39	29	32	15	33	22	25	26	24	25	23	21	10	11	16	24	19	20	25	25	25			608
SALERNO	3	4	4	5	3	4	1	2	4	5	4	5	5	4	3	3	4	2	1	3	3	0	1	3	2	1	1	1	3			84
AVELLINO	5	4	4	2	1	2	2	1	3	2	5	6	3	5	2	3	2	5	0	6	1	1	0	1	4	2	1	1	0			74
BENEVENTO	1	4	0	1	0	2	0	1	2	2	3	1	2	2	2	5	3	0	3	3	1	1	4	1	1	2	1	2	0			50
Totale	119	94	108	108	103	117	123	132	171	152	176	149	162	129	130	143	134	127	140	115	69	43	75	72	88	75	80	78	77	0	0	3289



Protesters set up barricades, and violence occurred, which resulted in USN issuing safety warnings to avoid certain areas. Temporary lodging on the USN government facilities was approved for those living off-base as a way to mitigate the risk of violence at the height of the protests.

Additionally, thousands of acres of land are filled with stacks of "ecoballs" or unsorted compressed rubbish, in which toxic waste is alleged to be mixed with ordinary household refuse and the remains of old cars.

- Existing landfills, typically former quarries, traditionally used to dump Campania wastes, are now full. Further, there has been failure to implement orders from Rome and the EU to sort the waste for recycling. The European Commission's (EC) deadline for Naples to solve its waste problems has expired, and the EC recently passed a court ruling against the Government of Italy on this issue (March 4, 2010 – *European Commission vs. Italian Republic,* Judgment of the Court – Failure of a Member State to Fulfill Obligations – Environment – Directive 2006/12/EC).

The environmental crisis began more than 16 years ago when the Campania region's dumps reached capacity. The national government first declared an emergency in Campania in 1994, appointing a special commissioner with broad powers to find solutions to what was already a mounting crisis by proposing to build more than a dozen trash incinerators in the area. Since then, there has been a succession of six special commissioners, and only one trash incinerator (Acerra) has been built. Local residents have resisted efforts to build incinerators. Authorities also blame organized crime for inciting many protests to block the incinerators, which if built, could threaten its control of the dumps and the waste transportation system.[14]

As a short-term emergency action, the Italian National Army was sent into Naples to remove the garbage and provide expertise and logistical support. Other short-term actions include sending ships laden with refuse to the nearby islands of Sardinia and Sicily, and by rail to Germany.

As the PHE progressed, and USN was able to obtain and translate studies, reports, and articles (Appendices F and K) on Campania from a variety of sources (EU, Italian regulators, universities, non-governmental organizations, etc.), and several issues arose and several questions remain, including:

- Italian regulators still need to characterize many of the known waste sites.
- Much work remains to completely clean up these waste sites after they are characterized.
- Many more waste sites in this area are expected to be discovered.
- Whether the Italian environmental laws adequately address environmental issues of concern to the USN and its personnel.
- The ability of the Italian regulatory framework to enforce and to implement these environmental laws in a manner that will address USN's concerns about environmental exposures to its personnel, especially with regard to dumping illegal wastes.

[14] Italian Parliamentary Investigations Commission on Waste Recycling and Related Illegal Activities – February 1, 2006 Report, *Territorial Report on the Campania Region*.

Therefore, even with additional environmental sampling at off-base residences, USN is unlikely to close the data gaps that are driven by unknown events (e.g., illegal waste dumping) and realities (e.g., who controls the waste industry) that may likely continue to occur.

1.5.1 2006 Territorial Report on the Campania Region

In January 2006, the (Italian) National Parliamentary Commission in charge of the investigations on waste recycling and related illegal activities produced a report titled Territorial Report on the Campania Region. The Commission deemed it appropriate to bring the waste management situation to the attention of the National Institute of Geophysics and Vulcanology, in order to decide the appropriate practical use of the best electro-magnetic technologies to detect suspicious areas that could contain noticeable amounts of iron and magnetic waste buried underground. The investigation results would be of interest, because of their possible use to identify this kind of illegally dumped waste. The first aero-magnetic campaign was carried out in Campania March 22-25, 2004, and involved the provinces of Naples and Caserta. The municipalities interested in the initiative were Acerra, Casal Di Principe, Castel Volturno, Cicciano, Grazzanise, Marigliano, Nola, Roccarainola, Santa Mara La Fossa, San Tammaro, and Villa Literno. The overall surface area tested for the presence of underground electro-magnetic waste was 100 square kilometers. The data and information collected during this campaign were entered into a database based on the "SIM" system of the Italy State Forest Corps and, along with other similar initiatives performed on the ground, allowed for the production of continuously updated maps of the Campania region.

Figure 1-1. Aqueduct Sampling Locations In or Near the Campania Region of Italy

Figure 1-2. Known Waste Sites by Category, Superimposed Over the Nine PHE Study Areas

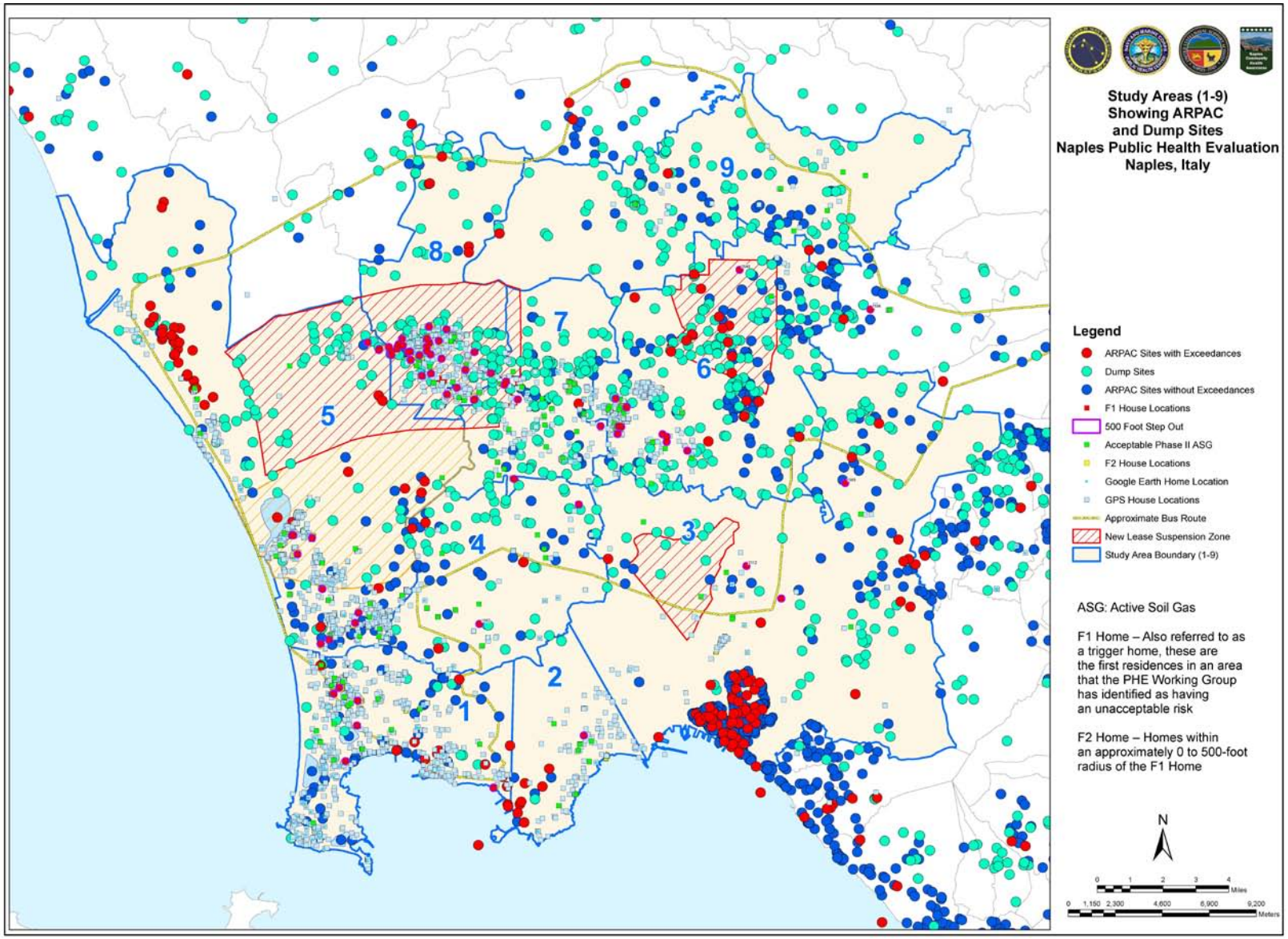


Figure 1-3. The Nine PHE Study Areas in Relation to Italian Sites of National Interest

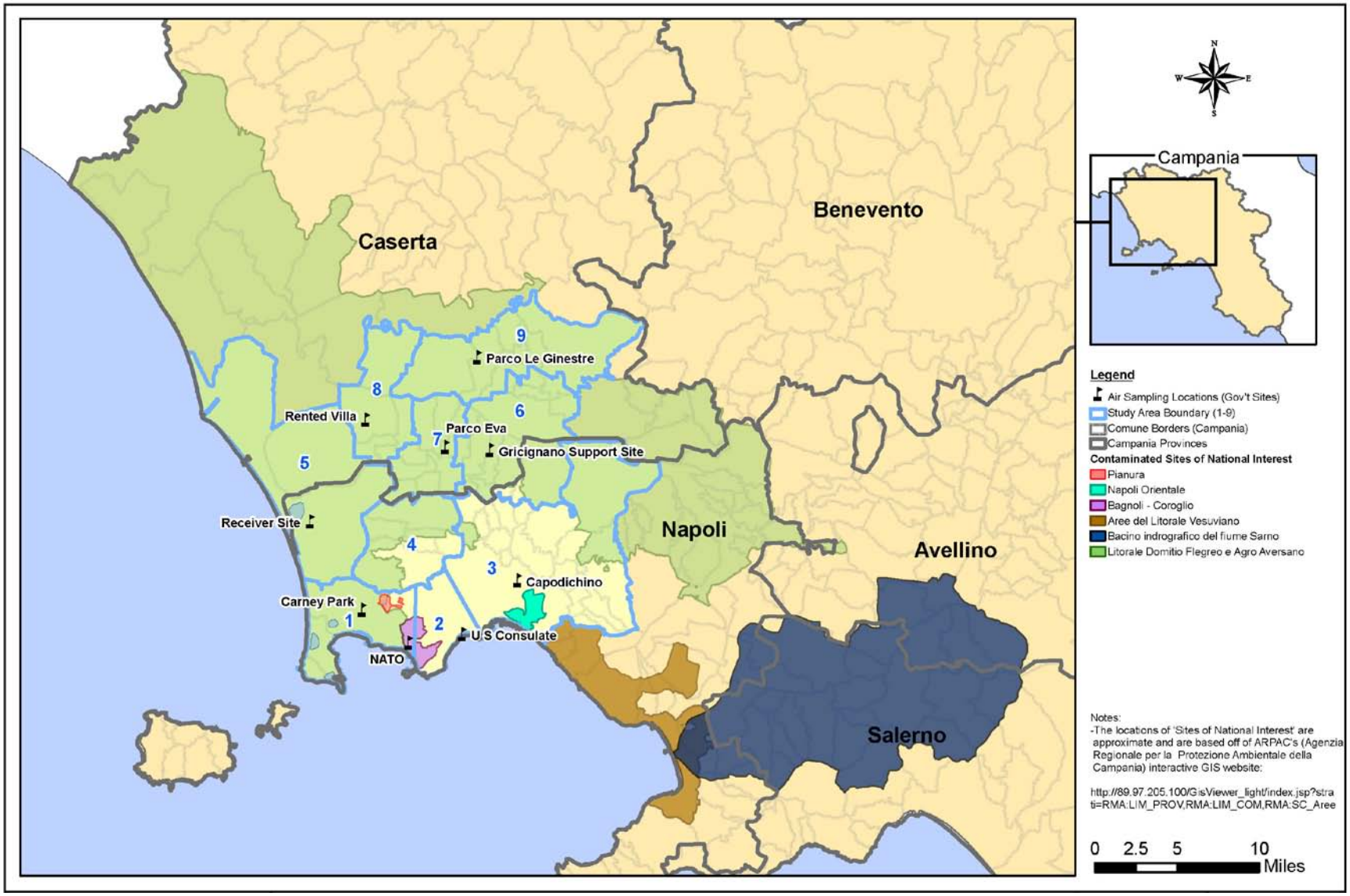
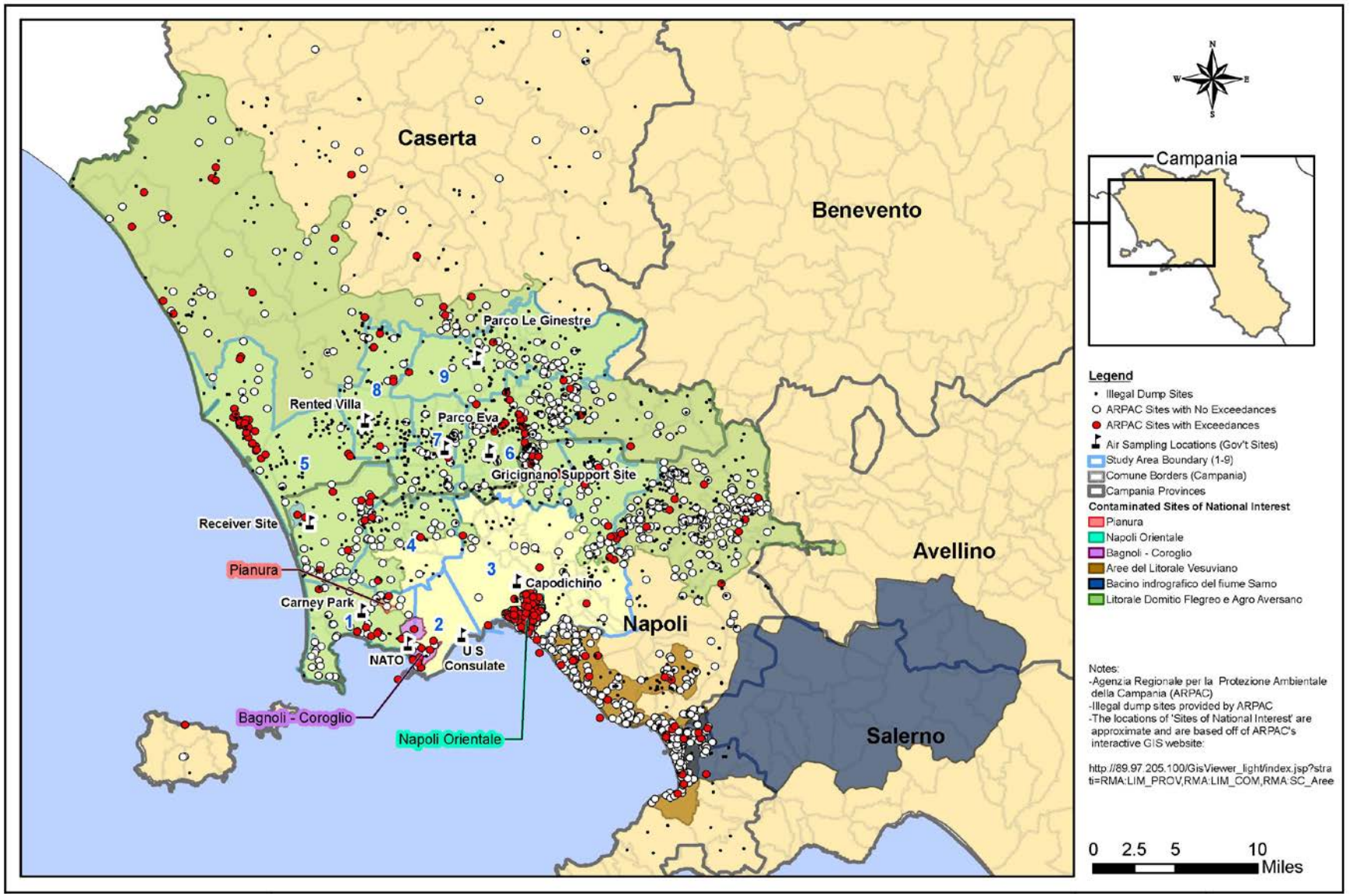


Figure 1-4. Contaminated Sites of National Interest and ARPAC Waste Sites



SECTION 2 – HEALTH RISK EVALUATION

2.1 USN Health (Epidemiological) Outcome Studies in Naples

2.1.1 Summary of Epidemiological Studies

In February 2008, CNREURAFSWA convened a meeting of USN public health experts in environmental health, epidemiology, health risk assessment, and environmental medicine to discuss the PHE. At this meeting, the team discussed available Italian literature on the health risks associated with residing in the Campania region, including Naples, from the illegal dumping of hazardous waste, uncollected trash, and the burning of trash. After having reviewed the available Italian epidemiological literature (Appendix F), USN public health experts identified two issues that could be of concern in this region – cancer and birth defects. Further, USN public health experts determined that air pollution from the urban Neapolitan environment could potentially be a health risk. However, the types of studies conducted by the Italian health and environmental researchers did not provide the USN's subject matter experts with the appropriate data to be able to evaluate the magnitude of potential health risks for the DOD beneficiary population. Therefore, to assess health risks for the DOD beneficiary population, NMCPHC conducted retrospective studies for cancer, birth defects, and asthma. NMCPHC determined that asthma prevalence and severity would be the best measures of immediate health risks associated with air pollution.

The epidemiological studies summarized below were conducted to assess the near-term impact of exposure to environmental pollutants, primarily found in the air and drinking water. The USN study of birth defects concluded that the birth defect rate of USN personnel in Naples was within expected limits as compared with birth defects in the U.S. population. 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) the cancer was associated with chemicals detected in the Navy's environmental samples; and (2) the cancer had a short enough latency period that exposure and diagnosis can occur during the study period. The findings of the cancer study indicated that cancer rates for Navy and Marine Corps members and their beneficiaries were consistent with cancer rates in populations with an average age of less than 50 years old. Finally, the asthma study found a weak, positive association between increasing levels of fine particulates (PM_{10}) in ambient (outdoor) 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. Based on the results of the 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. The epidemiological studies conducted by NMCPHC are summarized in the sections below.

2.1.1.1 Cancer Epidemiological Study

The cancer epidemiological study was completed in September 2009 and included the DOD beneficiary population in Naples from January 1, 1997, to May 15, 2009. To select the cancers for evaluation in the study, USN epidemiologists reviewed the chemicals that were detected in tap water, soil, and air samples during environmental sampling for the PHE. Information about these chemicals was then researched in the medical literature to determine whether the chemical could be potentially associated with an increase in cancer, and if so, which types of cancer were most likely to result from that exposure. From the list of resulting cancer types, epidemiologists considered each cancer's latency period. Because the latency period for most cancers is 20 years or more, only cancers that have short enough latency periods where exposure and diagnosis can occur during the study period were selected for evaluation. Further, to be included in the study, a cancer must be associated with a chemical that was found in the USN's environmental samples. The cancers selected were melanoma, non-melanoma skin cancer, and acute myelogenous leukemia (AML). This type of study is called a cancer incidence study, because each case had to meet the disease latency period for each type of cancer to be considered part of the study.

Non-melanoma skin cancer and malignant melanoma were selected because they are associated with exposure to arsenic in tap water. In the USN's environmental sampling, arsenic in tap water was measured above USEPA RSLs for drinking water. The latency period for these two cancers is about five years.

AML was selected because it is associated with exposure to benzene. In the USN's environmental sampling, benzene in the air was measured above the USEPA RSL. The latency period for AML can be from one to five years.

The number of cases of melanoma and AML for the cancer study was less than five cases for either cancer; thus, an incidence rate could not be calculated with any statistical validity. Five cases is the accepted minimum number of cases to reliably calculate incidence rates for a population of this size. For non-melanoma skin cancer, the incidence rate found in the study population was 14.4 cases per 100,000 person-years. This incidence rate is lower than the incidence for skin cancer in the U.S. population, and not statistically different (see Appendix G to review the entire study).

2.1.1.2 Birth Defects Epidemiological Study

The birth defects epidemiological study was completed in January 2009. The cohort study[15] included infants born from 2000 to 2005 to active duty military women and spouses of active duty military personnel where the mother showed continuous enrollment in an overseas Navy Military Treatment Facility (MTF) or associated clinic for the month prior to conception and the first three months of pregnancy. An infant was considered exposed to the Naples environment if all four months of the mother's enrollment were at an MTF or clinic in the Naples area, which included U.S. Naval Hospital Naples and the clinics in Gaeta and Capodichino, regardless of the infant's birth location. Naval Health Research Center used the DOD Birth and Infant Health Registry to conduct a study that would determine

the rate of birth defects in the USN population of women who conceived while residing in Naples. That rate was compared to USN births at other overseas bases and to USN births in the continental United States. The epidemiological study found that the risk of a birth defect in children conceived overseas (2.35 birth defects per 100 births) and in Naples (3.13 per 100 births) were both lower than the overall USN rate (3.6 birth defects per 100 births) during the study period. When compared to the risk of a birth defect in children conceived at other overseas facilities, the risk was higher for Naples, but the difference was not statistically significant (see Appendix H to review the entire study).

2.1.1.3 Asthma Epidemiological Study

Two asthma epidemiological studies were completed for the Naples PHE. The first asthma study was completed in October 2008 (see Appendix I) and included USN personnel that were treated for asthma at least once at U.S. Naval Hospital Naples and its branch medical clinics between October 1, 2006, and June 30, 2008. The 2008 study did not find any significant trends with regards to asthma severity or asthma medical visits during the study period. The October 2008 study lacked both the population sample size and the air pollution exposure data necessary to draw meaningful conclusions about the relationship between asthma and air pollution. For this reason, a second study was conducted to investigate any changes in asthma burden that might be associated with exposure to ambient air pollution.

The second, or updated, asthma study linked the medical visit records of U.S. personnel living in Naples who were seen for asthma, with air quality data collected from July 2008 to July 2009 from the regional ambient air monitoring study conducted for the Naples PHE. The updated asthma study included all DOD beneficiaries who received care at U.S. Naval Hospital Naples or its branch medical clinics (Capodichino and Gaeta) from July 1, 2008, to July 31, 2009. The study also included civilians and other non-military health care beneficiaries treated at Naval Hospital Naples or its clinics. Patient asthma medical information was obtained from a central USN medical data repository that records diagnosis codes. Each medical visit that resulted in a diagnosis of asthma was assigned a severity score:

1 – Mild Intermittent

2 – Mild Persistent

3 – Moderate Persistent

4 – Severe Persistent

In this study, study participants were categorized as persistent or non-persistent. The proportions for each category were compared within the study period to look for changes in asthma severity over time.

Air quality measurements were obtained from nine separate ambient air monitoring stations that were set up to collect air quality data for the Naples PHE. Based on current scientific and medical literature for asthma and the levels detected for each contaminant in the ambient air monitoring study, two

[15] In a cohort study, a group of people without a particular disease are classified by a specific exposure. They are then followed over time to see whether people with exposure had more disease than the people without the exposure.

contaminants were selected for analysis in the asthma study – PM_{10} and acrolein. PM_{10} was selected because it is a common measure of ambient air pollution and is associated with increased asthma symptoms and severity. Acrolein was selected because it exceeded the USN Risk Management Criteria established for the Naples PHE in 100% of the samples and it has some properties that may exacerbate asthma.

To further investigate asthma burden, data from an asthma case management program were obtained. This program, called the Population Health Navigator, tracks patients that meet a case definition for persistent asthma to ensure they obtain routine preventive care for their condition. Data from October 2006 through July 2009 and the results for Naples were compared to USN data for U.S. personnel stationed in Rota, Spain, and Sigonella, Italy.

In summary, the asthma study found a weak, positive association between increasing PM_{10} levels and a person being categorized as a persistent asthmatic in the U.S. Naval Hospital Naples population. 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. Based on the results of the study, NMCPHC recommended that U.S. Naval Hospital Naples consider the impact of the air quality in Naples on those with documented respiratory problems, especially persistent asthma, before granting an overseas screening waiver (see Appendix J to review the entire study).

2.1.2 Italian Epidemiological Studies

USN reviewed many other public health studies (see Appendix K) to include epidemiological studies conducted by Italian public health and environmental researchers to determine if the results of these studies were relevant to the PHE and also whether they could be applied to the U.S. beneficiary population assigned in the Campania region. Three studies (Comba, et al. 2006; Fazzo et al., 2008; and Martuzzi et al., 2002) directly addressed health risks in this region of Italy using ecological study designs. An ecological study is an attractive study design because it links environmental exposures with grouped data (e.g., people grouped by geographic location) to study specific outcomes and is typically used to generate study questions that would require more specific follow-up studies. Inferring causality from ecologic studies is not supported in the scientific literature because ecologic studies do not include exposure to a specific agent at the individual level (Greenland, 2001). All three studies found an increased risk for some cancers and birth defects in areas located near reported hazardous waste sites. However, the Italian health studies do not specifically state that the increased incidence of cancers and birth defects observed in the area were caused by exposure to environmental chemicals. The studies to investigate that causal relationship have not been reported in the scientific literature.

Cohort studies are the preferred study design to assess the strength of association between exposure to a hazardous chemical and adverse health outcomes because exposure and risk factor data are collected and analyzed at the individual level. The results of a cohort study could provide valuable information for the health risk assessment of the U.S. beneficiary population in Naples. An alternate, but less powerful, study

design that uses exposure and risk factor information at the individual level is a case-control study[16]. Case-control studies are used when the outcome is rare and a cohort study is determined to be unfeasible. The Italian health authorities have not reported the results of any cohort or case-control studies that USN is aware of as of the date of this report.

2.2 Food Study

Part of the Naples PHE included a food study in which certain foods available at the NSA Naples Gricignano D'Aversa Navy Commissary (Commissary) were tested. The study was performed in February 2008 and was conducted in response to various media reports claiming that high levels of dioxins and other chemicals were present in air, water, and soil as a result of Italy's waste crisis. Further, articles in newspapers and in some Italian scientific journals alleged links between adverse health effects and the toxic waste dumps in the Campania region. These articles implicated locally grown vegetables, fruits, livestock and mozzarella di bufala (an unpasteurized cheese) as possibly contaminated foods. This in turn created a concern within the USN community that the foods they were purchasing in the Commissary could be contaminated as well. Although there are multiple layers of protection in place for USN personnel when purchasing food items at the Commissary, the presumed higher potential for environmental contaminants to be present in the Campania region led the USN to conduct a study on commissary foods grown locally, particularly fresh fruits and vegetables, which are exempt from inspection by VETCOM. VETCOM is the DOD executive agent for food safety and quality assurance.

An assessment of the Commissary was conducted by NMCPHC and VETCOM on February 5, 2008, and the following information was collected:

- **Meats:** No meats produced in the Campania region are sold in the Commissary. Therefore, no meats were evaluated in the study.
- **Poultry:** Fresh poultry (chicken) sold in the Commissary at the time of the inspection was produced by the Arena Group in their facility located at Localita Monteverde, Bojano, Italy. Although this facility is not immediately located in the Campania region, the chicken was tested because it was the only fresh meat product that was sold in the Commissary and raised near the Campania region. At the time of the study, the Arena Group poultry plant was listed on VETCOM's Approved Source list[17]. Chicken was evaluated in the study.
- **Dairy:** No dairy products, to include mozzarella di bufala, produced in the Campania region are sold in the Commissary. Therefore, no dairy was evaluated in the Study.
- **Fruits and Vegetables:** Numerous unprocessed fruits and vegetables are locally grown within the Campania region. Due to the heightened concerns of potential soil contamination from improper waste disposal, several plant products that have the ability to potentially uptake contaminants through their root system (phyto-uptake) were evaluated in the study.

[16] In a case-control study, a group of diseased people (the case group) and a group of non-diseased people (the control group), who are similar in every way possible, were compared to see if people with the disease were more likely to have a particular exposure than people without the disease.

The selection of products tested as part of the study was based on whether or not the:

- Products were available for sale at the Commissary at the time of the study.
- Fruits and vegetables were grown within the Campania region.
- Products were root plants or grown close to the soil and had the potential for plant uptake of contaminants in the soil through the plant's root system (phyto-uptake). Root plants are those that have fleshy, edible underground roots or tubers.
- Sources of fresh meat or poultry products (e.g., beef, chicken) were raised near Campania.

The study went beyond routine visual inspections of food products by performing various laboratory analyses that are normally not mandated by VETCOM. This was especially important for fresh fruits and vegetables, which are not required to undergo routine testing[18]. Unprocessed fruits and vegetables (raw and have not been chemically or thermally altered) are exempt from inspection by VETCOM. This allows the Commissary and other food service establishments (e.g., Navy Exchange food court) flexibility to purchase unprocessed fruits and vegetables from local Campania producers without approval from VETCOM.

The following products met the above criteria and were sampled for analytes that could be associated with waste disposal, such as microorganisms (e.g., bacteria), metals, pesticides, dioxins, PCBs, or a combination of these analytes.

- Artichokes
- Cabbage
- Carrots
- Celery
- Chicken
- Mushrooms
- Spinach

In addition, tap water from the washing sink of the Commissary's produce department and the Arena Group poultry plant were tested to ensure they complied with the safe drinking water standards outlined in the U.S. Final Governing Standards for Italy and Italian Legislative Decree nº31 of February 2, 2001.

Based on the limited samples of this study, results demonstrate that the fruits and vegetables grown in the Campania region that are sold in the Commissary met the food safety criteria for consumption. In addition, chicken products sold in the Commissary and produced by the Arena Group at the time of the evaluation (February 2008) met the food safety criteria for consumption. Tap water in the washing sink of the Commissary's produce department met the water safety criteria for drinking and washing. Tap water from the washing sink at the Arena Group poultry plant initially exceeded the zero tolerance level criteria for coliform causing them to be suspended from VETCOM's Approved Source list; when the poultry plant corrected the bacteria discrepancy, they were later reinstated.

[17] The Arena Group poultry plant requested to be delisted from VETCOM's Approved Source list in December 2009 and was removed.
[18] VETCOM Circular 40-1, Appendix A, Section 2.

Uncertainties inherent in the food study include: a limited number of samples taken in one month at one point in time; whether the fresh fruit and vegetable suppliers may change; and whether the suppliers always use the same farm location to obtain produce. Additionally, the potential for food contamination may be altered by rainfall, phyto-uptake changes, contamination deposition and handling practices. Furthermore, if feed or water is contaminated, it may potentially affect the level of chemicals (e.g., PCBs) in poultry (see Appendix to review the entire study).

2.3 Screening Risk Assessment Findings

This section summarizes the information presented in Appendix F of Volume II Phase I & II Screening Risk Evaluation (PIONEER, 2010).

This section presents general conclusions about the potential health risks associated with living in the Naples area of Campania based on the results of all residences sampled during the SRE. These conclusions and any future conclusions, statistical evaluations, summaries, and risk management decisions should consider/incorporate the limitations of the methodology used in the risk assessment and the unique conditions/limitations under which the PHE was performed.

For example, the Phase I and the Step-Out sampling events were based on a *biased* sampling design and were intended to identify "worst-case" locations and further investigate areas proximate to residences with Unacceptable risks, respectively. In contrast, the Phase II sampling event was based on a *random* sampling design and was intended to obtain broad geographical coverage throughout each study area. These sampling designs were established to answer very specific, and different, questions. Therefore, when evaluating these data collectively, as presented in this section, it is not appropriate to present specific conclusions, such as the average risk in a study area or compare average risks between study areas.

In addition, the USN could not sample or investigate (e.g., install groundwater monitoring wells) potential or suspected areas of contamination resulting from illicit disposal activities as it would in the U.S. Therefore, only residences on the Italian economy where USN personnel lived could be sampled. This limitation influenced the aggregate percentages of Unacceptable homes that are presented in this section.

2.3.1 Risk Management Categories for Evaluating Incremental Screening Risks

This section characterizes the potential health risks associated with living at a residence for 30 years. This is a conservative assumption because typical tour lengths for USN personnel stationed overseas typically range from three to six years. However, DODDS personnel can remain at one location for 30 years or longer. Therefore, the USEPA's 30-year standard residential RSLs were used in order to ensure that the SRE was protective of reasonable maximum exposure (RME) individuals, which are DODDS personnel.

2.3.1.1 Risk Management Criteria for Soil, Soil Gas, and Tap Water

The SRE results (incremental screening risks) associated with exposure to soil, soil gas, and tap water at a residence for 30 years were placed into one of two categories:

1. Acceptable Risks – The noncancer and cancer screening risks at this residence are considered Acceptable based on the PHE risk management criteria (presented below).

2. Unacceptable Risks – The noncancer and cancer screening risks at this residence are considered Unacceptable based on the PHE risk management criteria (presented below).

The PHE agreed-upon approach for evaluating the risks associated with exposure to trihalomethanes (THMs) was to compare concentrations to the Total THM (TTHM) MCL, rather than to the individual RSLs. THMs (i.e., bromodichloromethane, chloroform, bromoform, and dichlorobromomethane) are water-supply disinfectant byproducts, and are typically detected in municipal water supplies. For this evaluation, if the concentration of an individual THM in tap water exceeded the RSL, but was less than the TTHM MCL, the risk was considered Acceptable.

PHE Risk Management Categories for Soil, Soil Gas, and Tap Water

Scenario	Criteria for Acceptable Incremental Risks	Criteria for Unacceptable Incremental Risks
Scenario 1 – Tap Water (via Inhalation-Only), Soil, and Soil Gas Exposure Scenario	Total CNCEF less than or equal to 1; and Total CCEF less than or equal to 10; and Concentration less than or equal to MCL (tap water). Applies only to fecal coliform and total coliforms.	Total CNCEF greater than 1; or Total CCEF greater than 10; or *Concentration greater than the MCL (tap water). Applies only to fecal coliform and total coliforms.*
Scenario 2 – Tap Water (via Ingestion+Inhalation), Soil, and Soil Gas Exposure Scenario	Total CNCEF less than or equal to 1; and Total CCEF less than or equal to 10; and Concentration less than or equal to MCL (tap water). Applies to all COPCs.	Total CNCEF greater than 1; or Total CCEF greater than 10; or Concentration greater than the MCL (tap water). Applies to all COPCs.

Notes:

NCEFs were calculated by dividing the maximum-detected concentrations by noncancer-based USEPA RSLs.

CEFs were calculated by dividing the maximum-detected concentrations by cancer-based USEPA RSLs.

The individual NCEFs and CEFs were summed to provide the CNCEF and CCEF, respectively.

An NCEF of 1 corresponds to a screening HI of 1.

A CEF of 1 corresponds to a cancer screening risk of 1E-06 (one in a million). A CEF of 10 corresponds to a cancer screening risk of 1E-05 (one in a 100,000).

Total CNCEF is the result of summing the individual NCEFs for all COPCs for all media that were sampled at a residence.

Total CCEF is the result of summing the individual CEFs for all COPCs for all media that were sampled at a residence.

Scenario 1 – The tap water RSLs used to evaluate residences that DO NOT use tap water for drinking, cooking, brushing teeth, and making ice were based on inhalation during household uses (e.g., showering) of tap water only. This evaluation also included RSLs for evaluating soil and soil gas, as appropriate.

Scenario 2 – The tap water RSLs used to evaluate residences that DO use tap water for drinking, cooking, brushing teeth, and making ice were based on ingestion and inhalation during household uses (e.g., showering, washing clothes) of tap water. This evaluation also included RSLs for evaluating soil and soil gas, as appropriate.

The PHE agreed-upon approach for this SRE was to evaluate the risks associated with exposure to THMs using the TTHM MCL, rather than individual RSLs. THMs (i.e., bromodichloromethane, chloroform, bromoform, and dichlorobromomethane) are water-supply disinfectant byproducts, and are typically detected in municipal water supplies. For this evaluation, if the concentration of an individual THM in tap water exceeded the RSL, but was less than the TTHM MCL, the risk was considered Acceptable.

2.3.1.2 Risk Management Criteria for Evaluating Ambient Air

The ambient air samples collected during the PHE reflect general ambient air quality that is impacted by emissions from point (e.g., factory) and non-point (e.g., automobile exhaust) sources (i.e., they were not specific to any industry or source). In the U.S., ambient air quality is regulated via the Clean Air Act (CAA, [U.S. Code, Title 42, Chapter 85]) and this framework was used to evaluate the ambient air results from Naples.

Under the CAA, the USEPA does not use a risk assessment "bright line" (e.g., a cancer risk of $1x10^{-6}$ to $1x10^{-4}$ or a hazard quotient greater than 1) to make risk management decisions based on the risks associated with generalized ambient air samples. The USEPA uses a technology-based and performance-based approach to significantly reduce emissions of air toxics from major sources of air pollution, followed by a risk-based approach to address any remaining, or residual risks. These are known as Maximum Achievable Control Technology [MACT] standards. MACT standards:

- consider cost and other non-air-quality factors,
- are based on emissions levels that are already being achieved by the better-controlled and lower-emitting sources in an industry group (i.e., similar industries),
- can be made more stringent by the USEPA when it makes economic, environmental, and public-health sense,
- are based on performance levels (40 CFR Part 63) where industry chooses technology to achieve a performance level that is practicable and cost effective, and
- consider residual risk. Residual risk is evaluated by the USEPA based on residual concentrations of hazardous air pollutants (HAPs) that are emitted to the atmosphere.

The CAA requires a residual risk standard for any source that is emitting a cancer-causing pollutant that poses an added risk of more than $1x10^{-6}$ to the most exposed receptor, while taking into consideration costs, energy, safety and other relevant factors. HAPs information is used to direct research into new areas where technologies can be developed to improve MACT standards, and consequently reduce risks associated with HAPs.

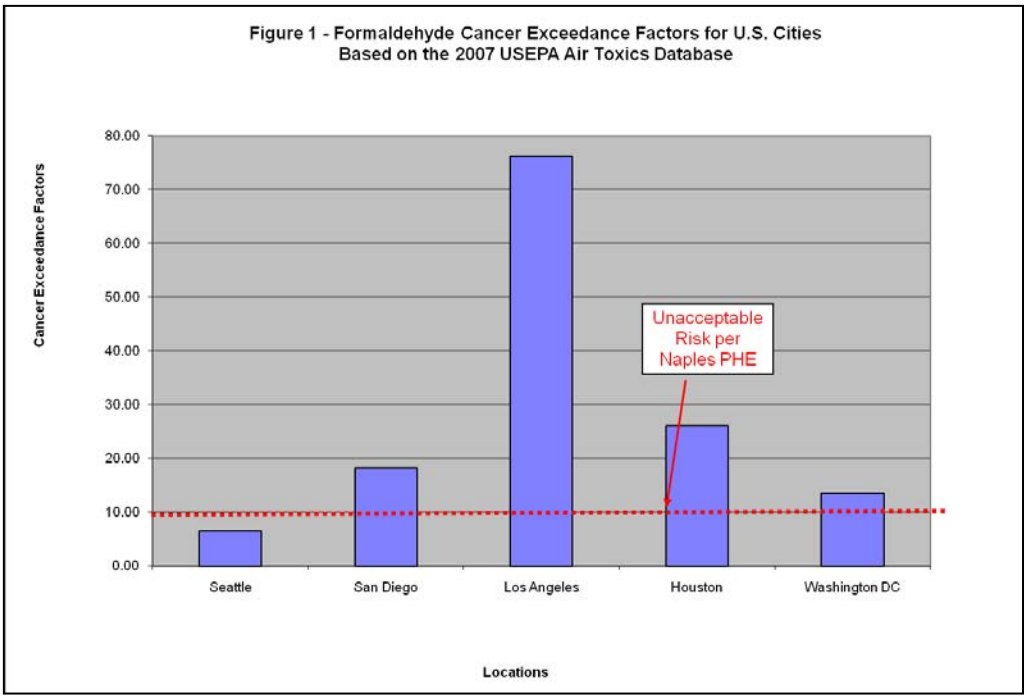
The cancer and noncancer risks associated with generalized ambient air sampling results are typically used by the USEPA to:

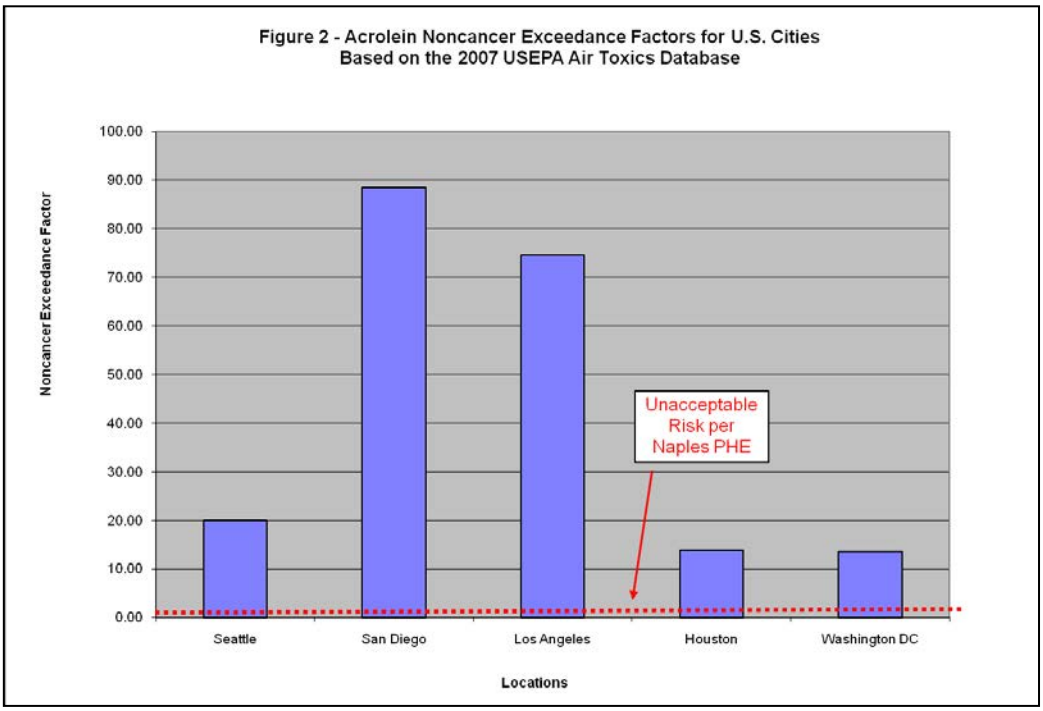
1. identify the chemicals that are responsible for the majority of the risks in ambient air; and
2. identify the major point and non-point sources of those chemicals.

This information is used to help focus research and development so that new pollution control technologies or changes in processes can be used to significantly reduce emissions of these chemicals through the permitting process. In other words, the USEPA recognizes that there will be cancer and noncancer risks associated with emissions from point and non-point sources, but it implements risk management actions at the source (e.g., stack or pipe) rather than at the point of exposure (i.e., the general air we breathe) because it is more feasible/practicable to reduce overall risks at the source or point of release rather than after a chemical has entered the atmosphere.

Implications/Consequences of Using a "Risk Assessment Bright Line" (e.g., either there is risk or there is no risk) to make Risk Management Decisions Based on Generalized Ambient Air Samples

Consider that DoD/Navy have personnel in CONUS (e.g., San Diego, Washington D.C.) that are exposed to air pollution in excess of our Naples risk management criteria (see Figures 1 and 2).





DoD/Navy appropriately accepts the Clean Air Act as a framework for evaluating air pollution for our personnel in CONUS. Accordingly, we are not moving people or restricting tour lengths because of these exposures. Specifically, the USEPA evaluates the ambient air data and then targets industries that are responsible for the chemicals of concern in order to potentially establish more restrictive MACT on those industries (if practicable) when their permits are up for renewal. The USEPA may decide not to grant a permit in instances where there is a non-attainment of standards.

Using a different framework to evaluate generalized ambient risks in Naples would set a precedent and expectation that would apply to Navy locations both CONUS and OCONUS – and, by extension, any similar urban area in the world where we have Federal employees. As illustrated below, if one applied the Bright Line risk management criteria/precedent for the ambient air risks in Naples to the ambient air risks in the U.S., it would drive action throughout the entire country as demonstrated in the Case Study presented below.

In 2006, the USEPA published the results of the 1999 national-scale assessment to characterize the quantitative estimates of risk posed by 177 common air pollutants identified by the USEPA's Integrated Urban Air Toxics Strategy. This was a subset of the air toxics on the Clean Air Act's list of 187 air toxics plus diesel particulate matter (diesel PM). These air toxics were chosen because they posed the greatest potential risks to public health in urban areas (http://www.epa.gov/ttn/atw/nata1999/chartrisk99.html). This risk characterization considered the risk of both cancer and noncancer effects from inhalation of these air pollutants nationwide, in both urban and rural areas.

For Cumulative Cancer Risks the USEPA added the cancer risks from all air toxics compounds listed as known, probable, or possible carcinogens. The combined upper bound lifetime cancer risk exceeded $1x10^{-5}$ (which would be considered unacceptable if the risk management criteria for the Naples PHE were used as a "Bright Line" to evaluate these results) for the entire United States. Furthermore, the combined upper bound lifetime cancer risk exceeded $1x10^{-4}$ for more than 10 million people.

For Noncancer Risks (i.e., hazard quotients/hazard indices), the USEPA added the hazard quotients from all air toxics compounds listed as with respiratory effects. The median hazard index exceeded 1 (which would be considered unacceptable if the risk management criteria for the Naples PHE were used as a "Bright Line" to evaluate these results) for the entire United States. Furthermore, the median hazard index exceeded 10 for approximately 50 million people. Acrolein was responsible for the majority of the noncancer risks associated with exposure to ambient air. In fact, approximately 250 million of 285 million people had hazard quotients greater than 1 associated with exposure to acrolein in ambient air alone.

In summary, this Bright Line Risk Management approach requires the risk manager to essentially disregard all the data and take action to reduce or mitigate exposure(s) regardless if they are logical, feasible, or practicable.

Of note, the Naples PHE second asthma epidemiological study used the acrolein data from the air pollution study because it exceeded the USN Risk Management Criteria and it has some properties that may exacerbate asthma. Neither the monthly asthma visit rate, nor asthma severity were significantly associated with the acrolein concentrations (July 2008 – July 2009). The risk management recommendation from this study was for U.S. Naval Hospital Naples to continue their current policy to consider the impact of the air quality on those with documented problems, especially persistent asthma, before granting an overseas waiver (see Section 2.1.1.3 above and Appendix J to review the entire study).

2.3.2 Regional Summary of Incremental Risks for All Residences Sampled During the PHE

Five hundred and forty-three (543) residences were sampled for tap water, soil, and soil gas during the PHE (although not all media were sampled at every residence). Of the 543 residences, 130 were sampled as part of the Phase I Sampling Event, 240 were sampled as part of the Pre-Lease Sampling Event, 36 were sampled as part of the Step-Out Sampling Events, and 209 were sampled as part of the Phase II Sampling Event [19]. As discussed in the introduction to Volume II Appendix F (PIONEER, 2010), the incremental risks in this SRE were calculated for two different scenarios for all media: (1) assuming tap water exposure via ingestion and inhalation and (2) assuming tap water exposure via inhalation only. Table F-2 in Appendix F of Volume II presents detailed risk information for every residence that was sampled during the PHE. Tables F-3 through F-11 in Appendix F of Volume II summarize the information presented on Table F-2 by presenting the number of residences with Unacceptable risks, range of total cumulative noncancer exceedance factors (CNCEFs) and total cumulative cancer exceedance factors (CCEFs), and media and constituents responsible for the majority of the risks for each study area.

Twenty-two percent (118 of 543) of the residences sampled during the PHE had Unacceptable risks based on the Tap Water (Inhalation-Only), Soil, and Soil Gas Scenario (32% [41 of 130] and 22% [46 of 209] of the residences sampled during Phase I and Phase II, respectively had Unacceptable risks). Thirty-nine percent (211 of 543) of the residences sampled during the PHE had Unacceptable risks based on the Tap Water (Ingestion+Inhalation), Soil, and Soil Gas Scenario (48% [62 of 130] and 42% [88 of 209] of the residences sampled during Phase I and Phase II, respectively had Unacceptable risks). The table below summarizes the number of residences with Unacceptable risks per study area.

Number of Residences with Unacceptable Incremental Risks Per Study Area for All Residences[1] Sampled During the PHE

Study Area 1	Study Area 2	Study Area 3	Study Area 4	Study Area 5	Study Area 6	Study Area 7	Study Area 8	Study Area 9	All
Phase I Only Scenario: Risks Based on Tap Water (Ingestion+Inhalation), Soil, and Soil Gas									
4 of 21 (19%)	6 of 8 (75%)	2 of 5 (40%)	0 of 3 (0%)	11 of 32 (34%)	5 of 13 (38%)	4 of 7 (57%)	30 of 39 (77%)	0 of 2 (0%)	62 of 130 (48%)
Phase II Only Scenario: Risks Based on Tap Water (Ingestion+Inhalation), Soil, and Soil Gas									
8 of 30 (27%)	13 of 22 (59%)	1 of 14 (7%)	4 of 14 (29%)	15 of 33 (45%)	13 of 30 (43%)	9 of 24 (38%)	24 of 34 (71%)	1 of 8 (13%)	88 of 209 (42%)
All Residences Sampled During the PHE Scenario: Risks Based on Tap Water (Ingestion+Inhalation), Soil, and Soil Gas									
26 of 125 (21%)	18 of 30 (60%)	3 of 21 (14%)	4 of 19 (21%)	31 of 114 (27%)	20 of 59 (34%)	18 of 41 (44%)	89 of 123 (72%)	2 of 11 (18%)	211 of 543 (39%)
Phase I Only Scenario: Risks Based on Tap Water (Inhalation-Only), Soil, and Soil Gas									

[19] Six hundred fifteen samples were collected from 543 residences during the PHE. Seventy-two of the residences were sampled (and re-sampled) during multiple sampling events (for a total of 615 samples). In most cases, the 72 residences were only re-sampled for media that were not sampled during previous sampling events.

Number of Residences with Unacceptable Incremental Risks Per Study Area for All Residences[1] Sampled During the PHE

Study Area 1	Study Area 2	Study Area 3	Study Area 4	Study Area 5	Study Area 6	Study Area 7	Study Area 8	Study Area 9	All
0 of 21 (0%)	0 of 8 (0%)	0 of 5 (0%)	0 of 3 (0%)	9 of 32 (28%)	4 of 13 (31%)	2 of 7 (29%)	26 of 39 (67%)	0 of 2 (0%)	41 of 130 (32%)
Phase II Only Scenario: Risks Based on Tap Water (Inhalation-Only), Soil, and Soil Gas									
5 of 30 (17%)	2 of 22 (9%)	0 of 14 (0%)	2 of 14 (14%)	10 of 33 (30%)	5 of 30 (17%)	4 of 24 (17%)	18 of 34 (53%)	0 of 8 (0%)	46 of 209 (22%)
All Residences Sampled During the PHE Scenario: Risks Based on Tap Water (Inhalation-Only), Soil, and Soil Gas									
8 of 125 (6%)	2 of 30 (7%)	0 of 21 (0%)	2 of 19 (11%)	21 of 114 (18%)	6 of 59 (10%)	8 of 41 (20%)	71 of 123 (58%)	0 of 11 (0%)	118 of 543 (22%)
Phase I Only Number of Residences Sampled that Obtained their Water from a Private Well									
3 of 21 (14%)	0 of 8 (0%)	0 of 5 (0%)	0 of 3 (0%)	6 of 32 (19%)	1 of 13 (8%)	1 of 7 (14%)	25 of 39 (64%)	0 of 2 (0%)	36 of 130 (28%)
Phase II Only Number of Residences Sampled that Obtained their Water from a Private Well									
0 of 30 (0%)	0 of 22 (0%)	0 of 14 (0%)	0 of 14 (0%)	5 of 33 (15%)	1 of 30 (3%)	0 of 24 (0%)	7 of 34 (21%)	0 of 8 (0%)	13 of 209 (6%)
All Residences Sampled During the PHE Number of Residences Sampled that Obtained their Water from a Private Well									
3 of 125 (2%)	0 of 30 (0%)	0 of 21 (0%)	0 of 19 (0%)	11 of 114 (10%)	1 of 59 (2%)	1 of 41 (2%)	60 of 123 (49%)	0 of 11 (0%)	76 of 543 (14%)
Phase I Only Number of Residences Sampled that Obtained their Water from a Public Source									
18 of 21 (86%)	8 of 8 (100%)	5 of 5 (100%)	3 of 3 (100%)	26 of 32 (81%)	12 of 13 (92%)	6 of 7 (86%)	14 of 39 (36%)	2 of 2 (100%)	94 of 130 (72%)
Phase II Only Number of Residences Sampled that Obtained their Water from a Public Source									
30 of 30 (100%)	22 of 22 (100%)	14 of 14 (100%)	14 of 14 (100%)	28 of 33 (85%)	29 of 30 (97%)	24 of 24 (100%)	27 of 34 (79%)	8 of 8 (100%)	196 of 209 (94%)
All Residences Sampled During the PHE Number of Residences Sampled that Obtained their Water from a Public Source									
122 of 125 (98%)	30 of 30 (100%)	21 of 21 (100%)	19 of 19 (100%)	103 of 114 (90%)	58 of 59 (98%)	40 of 41 (98%)	63 of 123 (51%)	11 of 11 (100%)	467 of 543 (86%)

[1]All residences sampled during the PHE represent samples collected during all Sampling Events (i.e., Phase I, Pre-Lease, Step-Outs, and Phase II).

As shown on Figure 2-1 and Figure 2-2, the residences with Unacceptable risks are located throughout the study areas, with the highest number of Unacceptable risks observed in Study Area 8 (60 of the 89 residences with Unacceptable risks obtained their tap water from a private well and 60 of the 60 residences that obtained their tap water from a private well had Unacceptable risks). This result was expected. Prior to commencing the PHE, Italian maps (Figures 1-2, 1-3, 1-4) and discussions with Italian regulatory organizations[20] regarding historical waste disposal practices in agricultural areas (such as

[20] January 2008 Naples, Italy Public Health Evaluation Scoping Trip by Navy and Marine Corps Public Health Center and Meeting with ARPAC and the Regional Centre for Contaminated Sites (CRSC - *Centro Regionale Siti Contaminati*).

Study Areas 5, 6, 7, 8, and 9), which were presented in the press and other literature and reviewed for the PHE, indicated that Study Area 8 would likely 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 typically more susceptible to contamination from localized dumping of industrial/chemical waste than public water supply systems. The results from Phase I and Phase II indicate that residences that obtained their tap water from private wells (regardless of the study area) had higher frequencies of Unacceptable risks than residences that obtained their tap water from a pubic source. For example, during Phase I, 30 of the 36 (83%) residences that obtained their tap water from a private well had Unacceptable risks, whereas 18 of the 94 (19%) residences that obtained their tap water from a public source had Unacceptable risks (PIONEER, 2009). The results from Phase II were consistent with Phase I, as 13 of the 13 residences (100%) that obtained their tap water from a private well had Unacceptable risks. Study Areas 3 and 9 had the lowest percentage of Unacceptable risks but also had the fewest number of residences sampled, so it is not possible to reach any conclusion regarding the significance of these findings. The number and frequency of Unacceptable risks for Study Areas 1 and 2 were unexpected because these areas are densely populated and do not have expansive agricultural areas or open space which could potentially be used for illegal waste disposal activities. In addition, all of the Phase II residences in Study Areas 1 and 2 obtained their tap water from a public source.

Residences with Acceptable risks and Unacceptable risks were distributed throughout the study areas and often were located very close to each other. In other words, the residences with Unacceptable risks were generally randomly distributed (with some exceptions) within the study areas (see Figure 2-1 and Figure 2-2). Exceptions to this general observation are identified below:

- **Risks Based on Tap Water (Inhalation-Only), Soil, and Soil Gas (Figure 2-2)**
  - There was a cluster of Unacceptable residences in Study Area 8 within the NLSZ.
  - Unacceptable residences located outside of Study Area 8 were often found in clusters of two or three.
- **Risks Based on Tap Water (Ingestion+Inhalation), Soil, and Soil Gas (Figure 2-1)**
  - There is a cluster of Unacceptable residences located in:
    - Study Area 1, western half of the study area;
    - Study Area 2, near the U.S. Consulate;
    - Study Area 5, south of Lago Patria Receiver Site;
    - Study Area 6, southwest of the Gricignano Support Site; and
    - Study Area 8, within the NLSZ.

2.3.3 Constituents Responsible for the Majority of the Incremental Risks Based on All Residences Sampled During the PHE

Samples were collected from tap water, soil, soil gas, and ambient air during Phase I and Phase II of the SRE. A number of constituents of potential concern (COPC) were detected in tap water (16), soil (2), soil gas (18), and ambient air (27) at concentrations exceeding RSLs and/or MCLs[21]. All of these exceedances warrant concern and further consideration. However, with a large regional study such as the

PHE, it is appropriate for the primary focus to be on the study area-wide or region-wide risks because they are likely to represent the potential effects the contamination may have on a majority of the population (e.g., USN personnel who may work, play and/or live at different facilities in the study areas at different times). The COPCs with exceedances of RSLs and/or MCLs were further evaluated to identify COPCs that were potentially of concern study area-wide or region-wide.

The table below includes the constituents of concern (COCs) that are responsible for the majority of study area-wide and region-wide risks related to tap water, soil and soil gas.

COCs Based on All Residences Sampled During the PHE

Tap Water[1]	Soil	Soil Gas[2]	Ambient Air
PRIVATE WELLS **RSLs Exceedances:** Copper Fluoride Nitrate (measured as NO3-) Tetrachloroethene Total Dioxin/Furans (2,3,7,8-TCDD TEQs) Uranium **MCL Exceedances:** Fecal Coliform Nitrate (measured as NO3-) Tetrachloroethene Total Coliforms **PUBLIC WATER** **RSLs Exceedances:** Lead Tetrachloroethene Total Dioxin/Furans (2,3,7,8-TCDD TEQs) Uranium **MCL Exceedances:** Total Coliforms	**RSLs Exceedances:** Total Carcinogenic PAHs (BaP TEQs)	**RSLs Exceedances:** Benzene Chloroform Ethylbenzene Tetrachloroethene	**RSLs Exceedances:** 1,2-Dibromo-3-Chloropropane 1,2-Dichloropropane Acetaldehyde Acrolein Arsenic Benzene Hexane Tetrachloroethene Total Dioxin/Furans (2,3,7,8-TCDD TEQs)

[1]Tap water RSLs include both tap water (ingestion+inhalation) and tap water (inhalation only)

[2]Soil gas COCs include those that were identified as VI COPCs, as per *Technical Memorandum: Identification of Chemicals in Soil Gas that may be Associated with Vapor Intrusion*, which is presented in Appendix D of the main text (PIONEER, 2009).

2.3.4 Regional Distribution of Incremental Risks

The evaluation of the regional distribution of incremental risks in the Campania region was complicated by the spatial/geographic distribution of sampling locations, various sources of tap water (e.g., public or private wells), and biased sampling that was limited to locations where USN personnel work and live and where the tenant and landlord agreed to allow sampling. Based on all residences sampled during the PHE, COCs in the tap water obtained from private wells (see Figure 2-3) and soil gas (see Figure 2-4) were responsible for the majority of the Unacceptable risks. These results are consistent with the Phase II results, but contrast with the Phase I results that indicated tap water obtained from private wells was responsible for the majority of the risks (i.e., soil gas was only responsible for Unacceptable risks at eight

[21] MCLs only apply to tap water.

of 110 (7%) residences where soil gas was sampled during Phase I versus 32 of 175 (18%) residences where soil gas was sampled during Phase II). However, this difference might be explained by the fact that active soil gas samples were collected during Phase II (i.e., TO-15/SUMMA Canisters) rather than the passive soil gas samples (i.e., Gore-Sorber®) that were collected during Phase I. General observations regarding the regional distribution of risks for each medium sampled are presented below.

- **Tap Water (Inhalation-Only Scenario)** – The majority of residences with Unacceptable concentrations in tap water (based on inhalation only) were located in Study Area 8 where the tap water was obtained from private wells. This observation is consistent with results based solely on Phase I and also with results based solely on Phase II. In the remaining study areas, the frequency of Unacceptable residences was very low and the residences with Unacceptable tap water concentrations were typically (but not in all cases) geographically grouped (i.e., multiple Unacceptable locations were near each other). Therefore, if a residence obtained tap water from a public source and was not located in Study Area 8 or an NLSZ, then the regional data indicated that it was likely that tap water was Acceptable based on the PHE risk management criteria. Fecal coliform, total coliforms, and tetrachloroethene were responsible for the majority of the Unacceptable risks associated with exposure to tap water (via inhalation only).
    - **Tap Water from a Public Source:** Based on the PHE risk management criteria, the regional data indicated that the tap water was likely to be Acceptable if it was obtained from a public source (i.e., 435 of the 459 residences sampled [95%] had Acceptable tap water). This observation is consistent with results based solely on Phase I (92% of tap water results obtained from a public source were Acceptable) and also with results based solely on Phase II (96% of tap water results obtained from a public source were Acceptable). The COCs responsible for the majority of the risks are summarized below:
        - Total coliforms (including fecal coliform) – Five percent of residences sampled had Unacceptable concentrations in their tap water. The Unacceptable total coliforms (including fecal coliform) results were found in all study areas except Study Areas 3 and 9. However, the majority of the Unacceptable results (i.e., 18 of the 24 residences sampled [75%]) were found in Study Areas 5, 7, and 8. One possible explanation for these results is the lack of routine disinfection of household tap water holding/storage tanks that are used to maintain the water supply/pressure tanks in residences despite fluctuations in the public water supply distribution system. If these holding/storage tanks are open at the top, animals and other material can enter the tank and may result in an unsanitary condition.
    - **Tap Water from Private Wells:** Based on the PHE risk management criteria, the regional data indicated that the tap water was likely to be Unacceptable if it was obtained from a private well (i.e., 51 of the 65 residences sampled [78%] had Unacceptable tap water). The frequencies of residences with Unacceptable risks based solely on Phase I results and solely on the data for Phase II results were similar at 78% and 80%, respectively. The COCs responsible for the majority of the risks are summarized below:
        - Fecal coliform (28% of residences sampled had Unacceptable concentrations in their tap water). The Unacceptable fecal coliform results were found in Study Area 5 (four of the 11 residences sampled) and Study Area 8 (12 of the 41 residences sampled). This is not

surprising because at the time samples were collected, the majority of residences that obtained their tap water from private wells were located in these study areas. These results may be explained by the lack of routine disinfection of household tap water holding/storage tanks, as discussed above, as well as agricultural activities in the area.

- Tetrachloroethene (37% of residences sampled had Unacceptable concentrations in their tap water). The Unacceptable tetrachloroethene results were detected in Study Areas 5 and 8.
- Total coliforms (including fecal coliform) (82% of residences sampled had Unacceptable concentrations in their tap water). The Unacceptable total coliforms (including fecal coliform) results were found in Study Areas 5, 6, 7, and 8. However, the majority of the Unacceptable results (i.e., 45 of the 57 residences sampled [79%]) were found in Study Areas 5 and 8. One possible explanation for these results is the lack of routine disinfection of household tap water holding/storage tanks that are used to maintain the water supply/pressure in residences. If these holding/storage tanks are open at the top, animals and other material can enter the tank and may result in an unsanitary condition.

- **Tap Water (Ingestion+Inhalation Scenario)** – The majority of residences with Unacceptable concentrations in tap water, based on ingestion and inhalation exposure pathway, were located in Study Area 8 where the tap water was obtained from private wells. This observation is consistent with Phase I results and also with Phase II results. However, there was a greater frequency of Unacceptable results observed in Study Area 8 during Phase I, which may be associated with the fact that a greater percentage of residences sampled during Phase I obtained their tap water from private wells than those sampled during Phase II. As presented in Figure 2-5, with the exception of Study Area 8, residences with Unacceptable risks were randomly distributed throughout the study areas, and the majority of these residences obtained their tap water from a public source. Study Areas 3, 4, and 9 had the fewest number of residences with Unacceptable tap water. However, Study Area 1 (20 of the 125 residences [16%] sampled), and Study Area 2 (17 of the 30 residences [57%] sampled) had a higher-than-expected frequency of Unacceptable concentrations in tap water. These areas are densely populated and do not have expansive agricultural areas or open space, which could potentially be used for illegal waste disposal activities. In addition, all of the residences sampled during Phase II in Study Areas 1 and 2 obtained their tap water from a public source.

  Results of aqueduct sampling performed during the Environmental Testing Support Assessment (ETSA) (Tetra Tech, 2010) indicated that water quality from the aqueduct, which is the source of the municipal water supply for the Campania region, should be Acceptable when compared to USEPA MCLs following treatment and filtration. Therefore, the constituent contamination that was frequently detected in tap water samples from residences that obtained their tap water from a public source likely entered the public water supply distribution system after the source water had been disinfected. One possible explanation for the presence of contamination in the public water distribution system is backflow of contamination from wells into the public water distribution system from residences that have blended or dual water supplies (i.e., they obtain their water from a municipal supplier and also from a private well). If these residences did not have a backflow preventer or other device that isolated the public water supply line, then when private well water

was used to supply water to the residences, contaminants in the well water would have entered the public water distribution system due to the pressure differences in the lines.

- **Tap Water from a Public Source**: The regional data indicated that it was likely that the tap water was Acceptable based on the PHE risk management criteria if it was obtained from a public source (i.e., 348 of the 459 residences sampled [76%] had Acceptable tap water). This observation is consistent with results based solely on Phase I (75% of tap water results obtained from a public source were Acceptable) and also with results based solely on Phase II (74% of tap water results obtained from a public source were Acceptable). The COCs responsible for the majority of the risks are summarized below:
  - Lead (5% of residences sampled). The Unacceptable lead results were distributed throughout all study areas, except for Study Area 4.
  - Total coliforms (including fecal coliform) (5% of residences sampled). The Unacceptable total coliforms (including fecal coliform) results were found in Study Areas 1, 2, 4, 5, 6, 7, and 8. However, the majority of the Unacceptable results (i.e., 18 of the 24 residences sampled [75%]) were found in Study Areas 5, 7, and 8). One possible explanation for these results is the lack of routine disinfection of household tap water holding/storage tanks that are used to maintain the water supply/pressure in residences despite fluctuations in the public water supply distribution system. If these holding/storage tanks are open at the top, animals and other material can enter the tank and may result in an unsanitary condition.
  - Total dioxins/furans [2,3,7,8-TCDD TEQs] (i.e., 62 of the 459 residences sampled [14%]), and uranium (i.e., 141 of the 458 residences sampled [31%]) were detected throughout all nine study areas in tap water and at concentrations exceeding the RSL but below the PHE's risk management criteria for Unacceptable risk. However, the concentrations did not exceed the MCL, and the uranium exceedances are most likely associated with natural background concentrations rather than illegal disposal of radioactive waste.
  - Tetrachloroethene in tap water exceeded its RSLs at 77 of the 459 residences sampled [17%]. RSLs were exceeded in all study areas except for Study Area 5 and Study Area 9.
- **Tap Water from Private Wells:** The regional data indicated that it was likely that tap water was Unacceptable based on the PHE risk management criteria if it was obtained from a private well (i.e., 60 of the 65 residences sampled [92%] had Unacceptable tap water). The frequencies of residences with Unacceptable risks based solely on Phase I results and solely on the data for Phase II results were similar at 86% and 100%, respectively. The COCs responsible for the majority of the risks are summarized below:
  - Copper (11% of residences sampled had Unacceptable concentrations in their tap water). All of the Unacceptable results were detected in Study Area 8.
  - Fecal coliform (28% of residences sampled had Unacceptable concentrations in their tap water). The Unacceptable fecal coliform results were found in Study Area 5 (four of the 11 residences sampled) and Study Area 8 (12 of the 41 residences sampled). This is not surprising because at the time samples were collected, the majority of residences that obtained their tap water from private wells were located in these study areas. These

results may be explained by the lack of routine disinfection of household tap water holding/storage tanks, as discussed above, as well as agricultural activities in the area.

- Fluoride (12% of residences sampled had Unacceptable concentrations in their tap water). The Unacceptable fluoride results were detected in Study Areas 5, 7, and 8.
- Nitrate (84% of residences sampled had Unacceptable concentrations in their tap water). The Unacceptable nitrate results were detected in Study Areas 5, 6, 7, and 8, which might be explained by the use of nitrogen-based fertilizers in theses extensive agricultural areas.
- Tetrachloroethene (58% of residences sampled had Unacceptable concentrations in their tap water). The Unacceptable tetrachloroethene results were detected in Study Areas 5, 7, and 8. Tetrachloroethene also exceeded its RSL in 51 of 65 residences sampled (78%).
- Uranium (5% of residences sampled had Unacceptable concentrations in their tap water). The Unacceptable uranium results were detected in Study Areas 5 and 8. Uranium also was detected in tap water at concentrations exceeding the RSL but below the PHE's risk management criteria for Unacceptable risk in 50 of 57 residences sampled (88%). However, the concentrations did not exceed the MCL, and the uranium exceedances are most likely associated with natural background concentrations rather than illicit disposal of radioactive waste.
- Total coliforms (including fecal coliform) (82% of residences sampled had Unacceptable concentrations in their tap water). The Unacceptable total coliforms (including fecal coliform) results were found in Study Areas 5, 6, 7, and 8. However, the majority of the Unacceptable results (i.e., 45 of the 57 residences sampled [79%]) were found in Study Areas 5 and 8. One possible explanation for these results is the lack of routine disinfection of household tap water holding/storage tanks that are used to maintain the water supply/pressure in residences. If these holding/storage tanks are open at the top, animals and other material can enter the tank and may result in an unsanitary condition.
- Total dioxins/furans [2,3,7,8-TCDD TEQs] were detected in tap water at concentrations exceeding the RSL but below the PHE's risk management criteria for Unacceptable risk in 8 of the 57 residences sampled (14%). It exceeded the RSL in Study Areas 5 and 8.

- **Soil** – Two (2) of 184 residences (1%) sampled for soil had Unacceptable risks due solely to COCs in soil. Total Carcinogenic PAHs (BaP TEQs) were responsible for the Unacceptable risks at both locations in Study Area 5. Remedial actions were implemented at both residences and the risks associated with exposure to soil were then considered Acceptable. Soil sampling was discontinued midway through Phase II because results from Phase I and Phase II samples indicated that soil contamination did not pose a significant human health risk (see Figure 2-6).
- **Soil Gas** – Forty-nine (49) of the 300 residences (16%) sampled for soil gas had Unacceptable risks due solely to COCs in soil gas. These results are dominated by the results from Phase II where 32 of 175 residences (18%) sampled for soil gas had Unacceptable risks due solely to COCs in soil gas. In contrast, only eight of 110 residences (7%) sampled for soil gas during Phase I had Unacceptable risks due solely to COCs in soil gas. However, this difference might be explained by the fact that active soil gas samples were collected during Phase II (i.e., TO-15/SUMMA Canisters) rather than the passive soil gas samples (i.e., Gore-Sorber®) that were collected during Phase I. As presented in Figure 2-4, the majority of residences with

Unacceptable concentrations in soil gas were located in Study Area 8. There also was a cluster of Unacceptable soil gas results comprised of three residences located in Study Area 6 west of the Gricignano Support Site near the border with Study Area 7. The remaining study areas had very low frequencies of Unacceptable soil gas. Despite the low frequency in Study Area 1, it was difficult to explain the soil gas exceedances in this area because it was expected to have a high frequency of Acceptable soil gas results (based on the history of urban development, lack of open space which would typically discourage dumping of waste, and tap water results from Phase I of the PHE). In addition, Study Area 5 had two clusters of soil gas exceedances: (1) comprised of four residences located just south of Lago Patria, and (2) two residences located immediately north of the border with Study Area 1.

Chloroform and tetrachloroethene were responsible for the majority of the risks associated with soil gas. Twelve (12) of the 300 (4%) residences sampled had Unacceptable risks associated with chloroform in soil gas. The Unacceptable soil gas results for chloroform were distributed throughout four of the nine study areas (1, 5, 6, and 8). Twenty-eight (28) of the 300 (9%) residences sampled had Unacceptable risks associated with tetrachloroethene in soil gas. The Unacceptable soil gas results for tetrachloroethene were distributed throughout four of the nine study areas; there was a higher frequency of Unacceptable results attributable to tetrachloroethene in Study Areas 5, 6, and 8. The COCs benzene and ethylbenzene were less frequently associated with Unacceptable risks (2% and 1%, respectively), but were frequently detected at concentrations above the RSL but below the PHE's risk management criteria for Unacceptable risk (10% and 11%, respectively). Other COPCS, such as 1,4-dichlrobenzene, carbon tetrachloride, hexane, and trichloroethene were infrequently detected in soil gas at Unacceptable concentrations. While the health risks at the specific locations where these COPCs were detected in soil gas were of concern, they were not included in this discussion because the focus of this discussion was on region-wide impacts rather than impacts at individual residences.

Residences in the proximity of residences that were sampled for soil gas and were considered Acceptable were more likely to have Acceptable results than residences that were located near residences with Unacceptable results. However, it was not possible to quantify the probability of finding Acceptable versus Unacceptable residences based solely on soil gas results in the Campania Region because, unlike tap water results, the distribution of Unacceptable soil gas results appeared to be more random, and not correlated with a specific geographic area. Therefore, based on the results of the PHE, it was not possible to make definitive recommendations regarding which study areas were more or less of a concern to human health based on exposure to COPCs in soil gas alone

2.3.5 Summary of Ambient Air Risks

Incremental risks could not be calculated for ambient air because background concentrations were not available for Naples, Italy. Therefore, only total risks could be calculated. The following information is based on total risks. Key findings of the year-long ambient air sampling and monitoring program include the following:

- 1,2-Dibromo-3-chloropropane contributed the majority of the CCEF (average of 80%) for the nine study areas. The COC-specific CEF ranged from 397 to 727. 1,2-Dibromo-3-chloropropane

was not included in the USEPA's 2007 Air Toxics Database so the ambient air concentrations from the PHE could not be compared with typical urban ambient air from the United States.

- Acrolein contributed the majority of the CNCEF (average of 95%) for the nine study areas. The maximum NCEF (247) calculated for Study Area 7 was greater than the NCEF calculated for acrolein in typical urban air in the USEPA's 2007 Air Toxics Database (29). Acrolein also contributed the majority of the NCEF for typical urban air in the United States (average of 89%).
- 1,2-Dichloropropane contributed an average of 3.5% to the cancer risk and 1.1% to the noncancer risk in the nine study areas.
- The six other COCs contributed an average of less than two percent each to the cumulative cancer and noncancer risk for the nine study areas.
  - EPCs for total dioxins/furans varied significantly among study areas. Study Areas 6, 8, and 9 were the only study areas where the COC-specific CEF exceeded 10.
  - Arsenic EPCs were less than the EPC in typical urban air in the USEPA's 2007 Air Toxics Database in all study areas except for Study Area 3 where the COC-specific CEF was 16. Slightly elevated arsenic concentrations in Study Area 3 could be associated with more volcanic activity in the area.
  - The maximum CEF for benzene was detected in Study Area 8 at a concentration of 68, which was approximately 10 times higher than the CEF for typical urban air in the U.S. (i.e., 5.2). The CEFs for benzene in the other eight study areas were less than 10.
- With the possible exception of total dioxins/furans in Study Areas 6, 8, and 9, no obvious trends were indicative of localized concentrations that might be associated with trash burning, trash dumping, or other point and non-point sources. Typically, there was not a significant difference in EPCs between study areas for the COCs, indicating that the concentrations represented typical urban air in the Campania Region.
- 1,2-Dibromoethane and formaldehyde together contributed to 65% of the CCEF in the USEPA's 2007 Air Toxics Database (USEPA, 2007a) but were not significant contributors to the ambient air risk in the nine study areas (6%).
- Cumulative risks in the nine study areas exceeded the cumulative risks for typical urban air calculated from the USEPA's 2007 Air Toxics Database (USEPA, 2007a). However, because some constituents (including 1,2-dibromo-3-chloropropane, the major cancer risk driver in the Campania Region) did not have corresponding values in the USEPA's 2007 Air Toxics Database, it was not possible to determine whether or not the cumulative ambient air risks in the Campania Region would have exceeded the risks from typical urban air in the U.S. The risk-driving COPCs for cancer risks based on the USEPA's 2007 Air Toxics Database (i.e., 1,2-dibromoethane and formaldehyde) together contributed to 65% of the typical urban air CCEF. These constituents were not significant contributors to cancer risks in the nine study areas. For a more complete summary of the year-long ambient air sampling and monitoring program, please see the Ambient Air Quality and Meteorological Summary Report for the Period July 9, 2008 through July 8, 2009 (Tetra Tech, 2010).

2.3.5.1 Availability of Background Ambient Air Data from Cities in Italy

Determining representative background concentrations for constituents in ambient air is necessary to accurately characterize risks. Background ambient air concentrations for the Campania Region were not available for the nearly 241 constituents that were analyzed as part of the PHE – Italian background ambient air data were limited to priority pollutants such as particulate matter less than 10 microns in diameter (PM_{10}), ozone, et cetera. Therefore, ambient air concentrations from representative cities in the U.S. were evaluated and compared to Naples ambient air sampling results to put the Naples air concentrations into context with regard to what USN Personnel might be exposed to in typical urban air if they were stationed in the U.S. The 95% UCL on the mean ambient air concentrations from six U.S. cities (i.e., San Diego, California; Los Angeles, California; Seattle; Washington; Houston, Texas; Midlothian, Texas; and Washington, DC) found in the USEPA's 2007 Air Toxics Database (USEPA, 2007) were used to represent typical urban ambient air concentrations in the U.S. These cities were selected because they have one or more attributes that are similar to Naples and the Campania Region, such as (1) availability of ambient air data, (2) dense residential, urban, and industrial development, (3) coastal location, and (4) USN presence.

We believe this additional step provides line risk managers with the context necessary to make informed risk management decisions. In the absence of any DoD or Navy OCONUS environmental/public health risk policy guidance for these situations, the general PHE approach was to benchmark our study design, risk management criteria and risk management actions against what would normally occur in the U.S. This issue (equivalent protection) has evolved over the years to the point where now our personnel expect a similar level of environmental and public health protection as would be afforded them in CONUS.

This concept of equivalent protection is typically integrated into the Final Governing Standards for DoD environmental compliance where the strictest of either the Host Nation or USEPA standards are used for compliance. The difference in this instance is that the PHE is evaluating exposures to our personnel <u>from</u> Host Nation pollution. This approach has been used in other similar situations (e.g., NAF Atsugi Japan Incinerator).

Thus, the assumption that urban air in the Campania Region is similar to urban air in the U.S. remains an uncertainty in this analysis. This uncertainty adds to the complexity of determining whether or not the ambient air results in Naples are similar to ambient air risks in the six U.S. cities. As a result, this limits the ability to reach a firm conclusion on the ambient air risks in Naples as either less than or greater than the ambient air risks in the six selected U.S. cities.

2.3.5.2 Comparison of Naples and U.S. Ambient Air Data

In order to compare Naples ambient air data and risks to U.S. ambient air data and risks, a data set with identical contaminant lists and timeframes was needed. A U.S. urban ambient air data set with an exact "one-to-one" correspondence to the ambient air data collected in Naples was not available, which led to some degree of uncertainty regarding the evaluation of risks (i.e., risk could have been underestimated due to a lack of data or overestimated due to additional data).

Moreover, no one city's data set could be considered a perfect comparison to Naples. For example, New York may be considered most representative of Naples because of its large, densely-populated, industrial and urban setting. However, the rural portion of Naples (located outside of the downtown area) could result in the presence of other contaminants that are typically uncharacteristic of New York. In addition, "behavioral" differences between U.S. cities and Naples could result in the presence of different constituents. For example, acrolein is a principal air constituent in Naples, likely because of the abundant presence of diesel exhaust emissions, whereas diesel engine use in the U.S. is less prevalent.

2.3.5.3 Approach Used to Identify Ambient Air Concentrations in U.S. Cities for Comparison to Naples

Finding constituent values in the USEPA's 2007 Air Toxics Database that corresponded with the constituents detected in Naples was paramount to this investigation. When obtaining comparison values, priority was given to finding values in the 2007 USEPA Air Toxics Database for constituents that were detected in ambient air samples from the Naples PHE that exceeded their RSLs. Twenty one of the 27 constituents in Naples ambient air that exceeded their RSLs (21 of 27 or 78%) had corresponding values in the USEPA's 2007 Air Toxics Database. Comparison values were not available in the USEPA's 2007 Air Toxics Database for the following six constituents that exceeded their RSLs in Naples ambient air:

1. 1,1,1,2-Tetrachloroethane – The CEFs from the nine study areas ranged from 0.3 to 1.1.
2. 1,2-Dibromo-3-chloropropane – The CEFs from the nine study areas ranged from 397 to 727.
3. Bromodichloromethane – The CEFs from the nine study areas ranged from not detected to 2.3.
4. Cobalt – The CEFs from the nine study areas ranged from 0.52 to 1.7.
5. Dibromochloromethane – The CEFs from the nine study areas ranged from not detected to 2.3.
6. Total Dioxin/Furans (2,3,7,8-TCDD TEQs) – The CEFs from the nine study areas ranged from 0.60 to 40.

The lack of corresponding values for these six constituents, especially for 1,2-dibromo-3-chloropropane, had a significant impact on the uncertainty of the risk assessment of ambient air. When all constituents that were detected in ambient air in Naples, regardless if they had corresponding values in the USEPA's 2007 Air Toxics Database or not, were included in the risk calculations, the CCEFs for the nine study areas were, on average, approximately five times higher than the CCEF calculated based on the USEPA's 2007 Air Toxics Database. However, when only constituents that were detected in ambient air in Naples that had corresponding values in the USEPA's 2007 Air Toxics Database were included in the risk calculations, the CCEFs for the nine study areas were, on average, approximately 0.8 times lower than the CCEF calculated based on the USEPA's 2007 Air Toxics Database and within the USEPA risk management range (1 in 10,000 [1×10^{-4}] and 1 in 1,000,000 [1×10^{-6}]. This is a significant finding and demonstrates the sensitivity of the CCEF results to the inclusion of the 1,2-dibromo-3-chloropropane concentration detected in ambient air in Naples. It is important to note that this finding does not indicate that risks associated with ambient air in Naples are similar to the risks associated with ambient air in the U.S. It is not possible to make this determination without corresponding values from the U.S. Key information regarding 1,2-dibromo-3-chloropropane that should be considered when making risk management decisions regarding ambient air samples collected during the Naples PHE is discussed in the following subsection.

2.3.5.4 1,2-Dibromo-3-Chloropropane

Of the six constituents that were detected in ambient air in Naples at concentrations that exceeded their RSLs and for which comparison values were not available in the USEPA's 2007 Air Toxics Database, 1,2-dibromo-3-chloropropane was responsible for the majority of the cancer risks in nine study areas. 1,2-Dibromo-3-chloropropane is a nematicide and was used in agriculture as a soil fumigant (i.e., it was not applied using aerial sprayers). It was typically applied via covered shallow trenches where liquid was deployed and then the 1,2-dibromo-3-chloropropane quickly evaporated in the soil column where the subsoil was then fumigated (Albrecht et al. 1985). Based on the typical application method, it would be unusual to detect 1,2-dibromo-3-chloropropane in ambient air at locations distant from the point of application.[22] 1,2-Dibromo-3-chloropropane was banned in the U.S. in 1979; however, Hawaii was allowed to use 1,2-dibromo-3-chloropropane until 1985. 1,2-Dibromo-3-chloropropane is persistent in soil and groundwater and takes several months to breakdown in air (ATSDR, 1995). As presented in Table 4-20, 1,2-dibromo-3-chloropropane was responsible for, on average, 80% of the ambient air CCEFs for the nine study areas, but a corresponding value was not available (i.e., samples were not analyzed for it) in the USEPA's 2007 Air Toxics Database. The lack of an available corresponding 1,2-dibromo-3-chloropropane value in the USEPA's 2007 Air Toxics Database is a significant data gap in the PHE because a direct comparison between cancer risks in Naples and U.S. can't be performed. In addition, circumstantial evidence adds to the uncertainty of the representativeness of the ambient air results for 1,2-dibromo-3-chloropropane evaluated in the PHE, which include:

1. No information currently available that definitively documents that 1,2-dibromo-3-chloropropane is banned in Italy, similar to its ban in most countries. It takes only months for DBCP to breakdown in air, and if banned, it is unlikely to be in ambient air at this point in time.
2. 1,2-Dibromo-3-chloropropane was infrequently detected in ambient air samples collected during the Naples PHE (i.e., 30 of 441 [6.8%]).
3. 1,2-Dibromo-3-chloropropane was detected in all nine study areas (approximately 400 square miles) at similar concentrations just above the detection limit of 0.0001 mg/m^3.
4. The detection limit (i.e., 0.0001 mg/m^3) is 625 times greater than the RSL which is (1.6E-07 mg/m^3). This is important because half the detection limit was included in the calculation of the EPC.
5. All of the 1,2-dibromo-3-chloropropane detections occurred only between June 2009 and August 2009. It is unclear why 1,2-dibromo-3-chloropropane was only detected during this time frame and was not detected during the previous summer, fall, winter, or spring. These detections were observed in all nine study areas over the same time period, but did not correlate with agricultural areas. For example, 1,2-dibromo-3-chloropropane was detected in ambient air in Study Area 2 where the sampling station was located at the U.S. Consulate. The U.S. Consulate is located on the waterfront in downtown Naples, Italy and is miles from any agricultural area.

[22] Albrecht,William, et al. 1985. Dissipation of 1,2-dibromo-3-chloropropane (DBCP), cis-1,3-dichloropropene (1,3-DCP), and Dichloropropenes from Soil to Atmosphere. Bulletin of Environmental Contamination and Toxicology (1985) 34:824–831.

6. 1,2-Dibromo-3-chloropropane is persistent in soil and groundwater long after it is applied as a nematicide, yet DBCP was not detected in any soil (70,688 analyses) or water samples (138,110 analyses) taken during the PHE.

Despite these uncertainties, there was no technical reason, to exclude the ambient air results for 1,2-dibromo-3-chloropropane from the Naples PHE. However, these uncertainties should be considered when making risk management decisions. Therefore, before any final risk management actions are considered, and to add more context to the decision-making process while reducing the uncertainty whether urban air in Campania is similar to urban air in the U.S., consider the following interim actions:

- DBCP has been banned for use in most countries for decades (e.g., since 1985 in the U.S.). Recommend that, the Navy obtain a more detailed description of the DBCP ban in Italy (e.g., year banned, banned for registration, sale and use as pesticide, or prohibited to import, manufacture and sell as a pesticide for agricultural use).
- Share the air monitoring data with the 3 established Italian Government points of contact for the Naples PHE, and ask them if they have any information on why DBCP would be detected only during those 2 months and/or whether they can do further research on their existing databases (e.g., air, soil).
- The 9 air monitoring stations essentially fall within one of the Italian equivalent Superfund sites (the Domitian coast Flegreo and Agro Aversano) in Campania. Therefore, recommend that the Navy request data from ARPAC on whether DBCP has been detected in any of the characterized waste sites. In our review of Italian documents to date, we have not seen reference to this chemical. The ARPAC data (if available) may give us some indication of whether DBCP has been disposed of, legally or illegally as a hazardous waste in these areas. Since DBCP is persistent in soil and groundwater, if used legally in the past, or illegally dumped, one would expect the Italians to have detected it in soil or ground water samples.
- Since the Italians have a well established air monitoring network, the Navy could request they do some additional sampling for DBCP in air.

2.3.6 Incremental Risk Results for U.S. Government-Related Facilities

In order to calculate risks, risk assessors typically delineate an exposure unit, which is a geographic area that is assumed to be where exposure is likely to occur. For example, in economy residences, the exposure unit is the residence and surrounding yard. Soil samples, soil gas samples, and tap water samples are all collected from within this exposure unit. Therefore, a cumulative risk can be calculated that reasonably reflects the risks to people within that exposure unit.

However, at the U.S. Government-related facilities, it is difficult to delineate reasonable exposure units because environmental samples were collected from multiple, disparate locations which were spatially distributed throughout the sites. In addition, soil samples, soil gas samples, and tap water samples were not co-located. This type of sampling approach is typically used in the first phase of a screening evaluation (such as this) in order to provide a general indication of the levels of contamination that may be present. As such, these types of sampling results are typically not used to calculate cumulative risks across media because it is unlikely that the same person would be exposed to media that are not co-located (i.e., we cannot delineate reasonable exposure units). Therefore, instead of calculating cumulative

risks at each location across all media, the analytical data were compared to RSLs in order to provide an indication of the media and constituents that exceed risk-based screening levels, and therefore, may require additional investigation in the future. The results are summarized below:

- Tap Water – The risks for tap water were typically Acceptable. The following U.S. Government-related facilities had Unacceptable concentrations of COCs in tap water:
  - Parco Artemide
    - Lead – maximum NCEF = 1.4
    - Nickel – maximum NCEF = 11.4
    - Naphthalene – maximum CEF = 48.1
  - Parco Eva
    - Nickel – maximum NCEF = 1.2
  - Parco Le Ginestre
    - PCE – maximum CEF = 22.8
    - Total coliforms (including fecal coliform) – exceeded the MCL
  - Flag Officer Quarters
    - Total coliforms (including fecal coliform) – exceeded the MCL
- Irrigation Water – The risks for irrigation water were frequently Unacceptable. The following U.S. Government-related sites had Unacceptable concentrations of COCs in irrigation water:
  - Parco Le Ginestre
    - Bis(2-ethylhexyl)phthalate – exceeded the MCL
    - Fecal coliform – exceeded the MCL
    - Nitrate – exceeded the MCL and maximum NCEF = 1.1
    - PCE – maximum CEF = 10.1
    - Total coliforms (including fecal coliform) – exceeded the MCL
    - Uranium – exceeded the MCL
    - Zinc – maximum NCEF = 1.1
  - Gricignano Support Site
    - Nitrate – exceeded the MCL
    - Nitrite – exceeded the MCL
    - Total coliforms (including fecal coliform) – exceeded the MCL
    - Total Dioxins/furans (2,3,7,8-TCDD TEQs) – maximum CEF = 10.4
  - Capodichino
    - Nitrate – exceeded the MCL
  - Carney Park
    - Nitrate – exceeded the MCL
    - THMs (chloroform) – maximum CEF = 29.1
    - Total coliforms (including fecal coliform) – exceeded the MCL
- Soil – The risks for soil were typically Acceptable; however, the following U.S. Government-related facilities had Unacceptable concentrations of total carcinogenic PAHs (BaP TEQs) in soil when compared with the 30-year residential RSL. These sites were reevaluated for a three and

six-year residential exposure since individuals living on-base would likely remain for one or two tours of duty. The result of this evaluation indicated that residence FQ05 was Acceptable for three years but not for six years and would require risk management actions:

- Flag Officer Quarters (FQ05) – maximum CEF = 86.2
- Gricignano Support Site – maximum CEF = 25.7
- Capodichino – maximum CEF = 12.0
- JFC NATO – maximum CEF = 13.3
- U.S. Consulate, Naples – maximum CEF = 17.2

- Soil Gas – The risks for soil gas were typically Acceptable. The following U.S. Government-related facilities had Unacceptable concentrations of COCs in soil gas:
  - Gricignano Support Site[23]
    - PCE – maximum CEF = 25.7
  - Capodichino[23]
    - PCE – maximum CEF = 12.0
  - JFC NATO
    - PCE – maximum CEF = 13.3
  - U.S. Consulate, Naples
    - PCE – maximum CEF = 17.2
  - Parco Eva
    - Chloroform – maximum CEF = 34.3
    - PCE – maximum CEF = 83.3
  - Parco Le Ginestre
    - PCE – maximum CEF = 35.2

[23] This summary does not include information from the soil gas and indoor air samples that were collected at the Gricignano Support Site as part of a vapor intrusion investigation that was performed from December 2008 through June 2009. The results of this investigation are presented in the Vapor Intrusion Investigation Report and Mitigation Recommendations U.S. Naval Support Activity at Capodichino and U.S. Naval Support Site at Gricignano (Tetra Tech, 2010).

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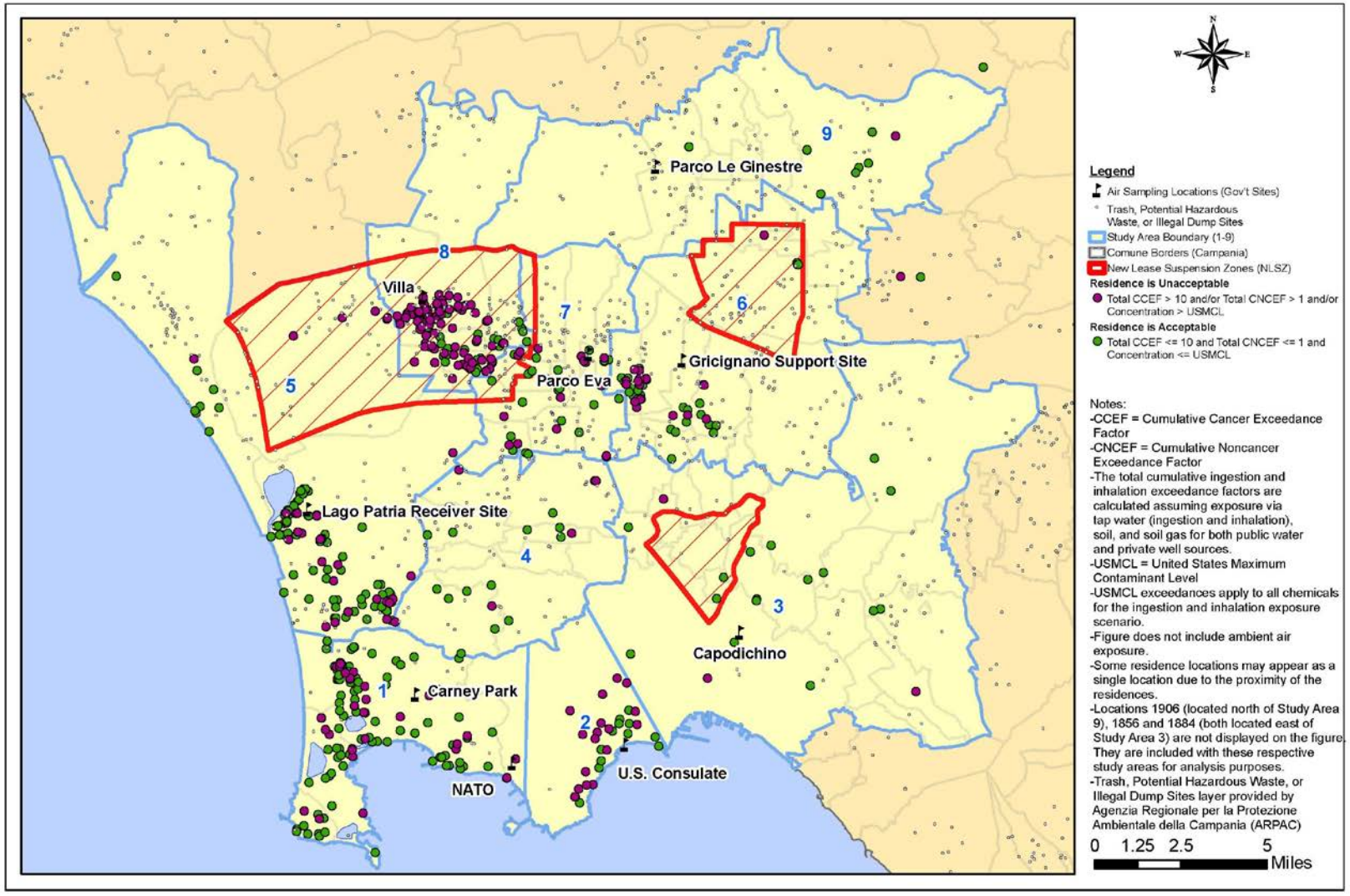
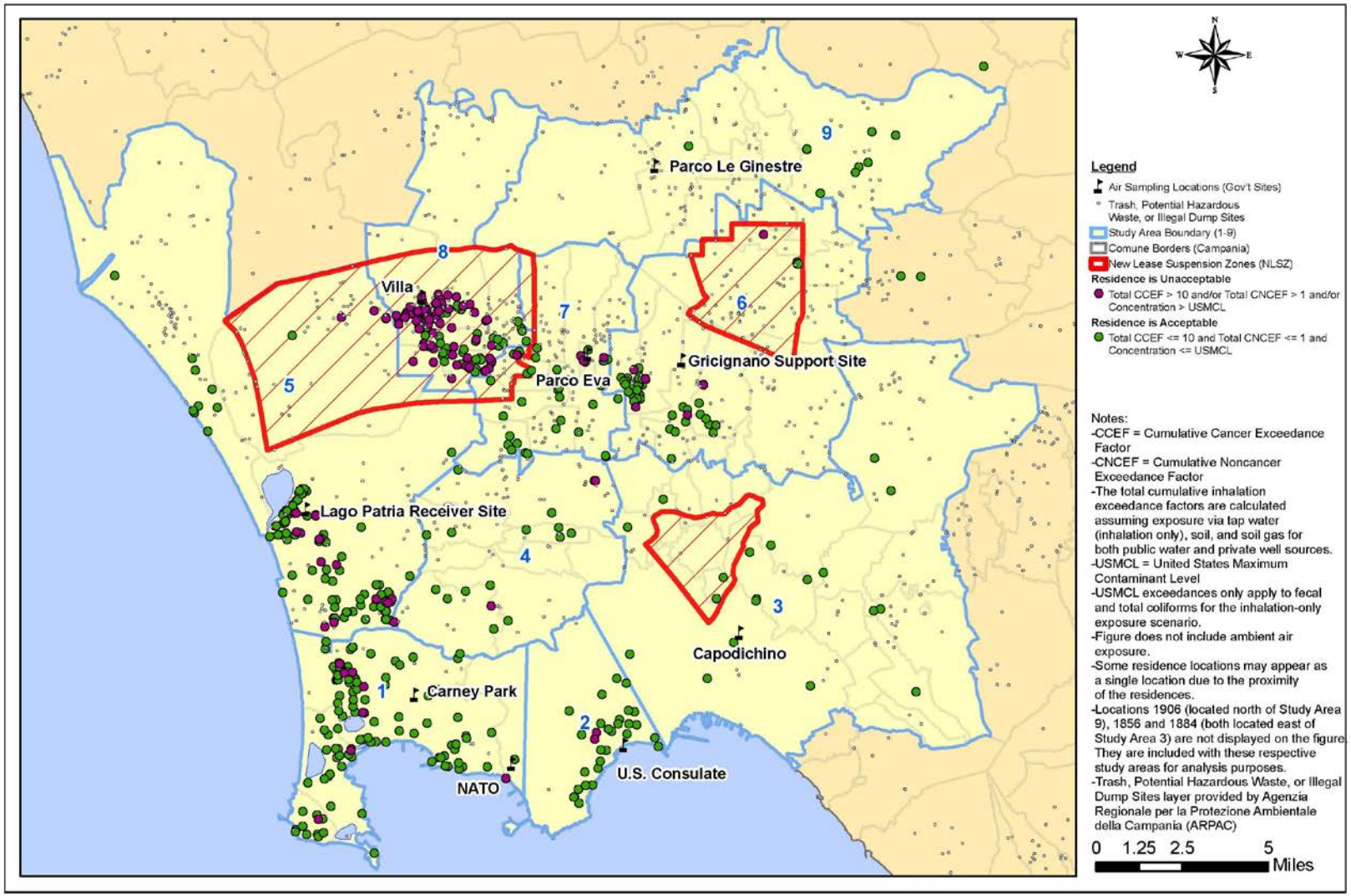
Figure 2-1. Total Ingestion and Inhalation Cumulative Risk Results



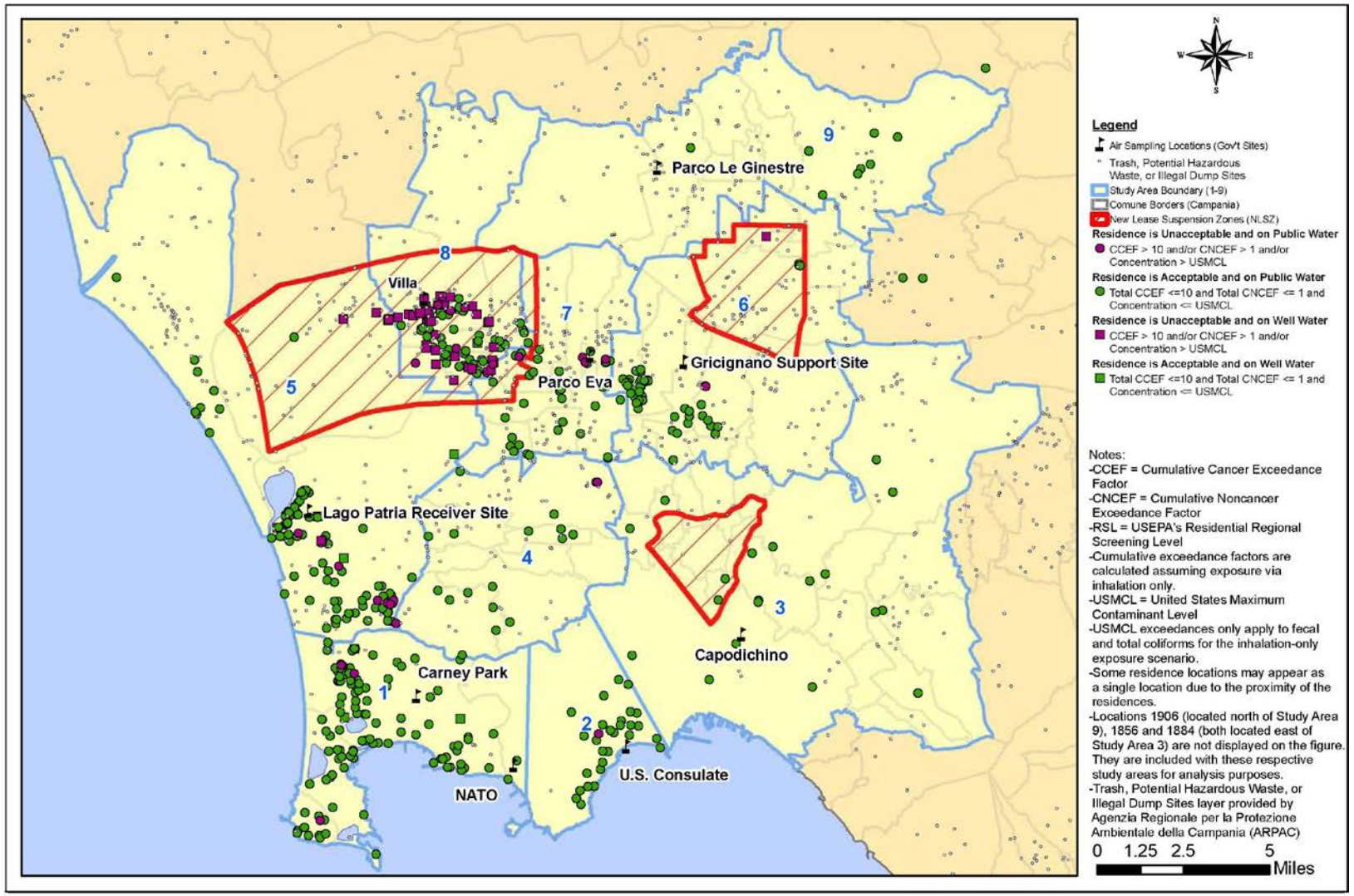
Total Ingestion and Inhalation Cumulative Risk Results
All Residences Sampled in the PHE

Figure 2-2. Total Inhalation Cumulative Risk Results.



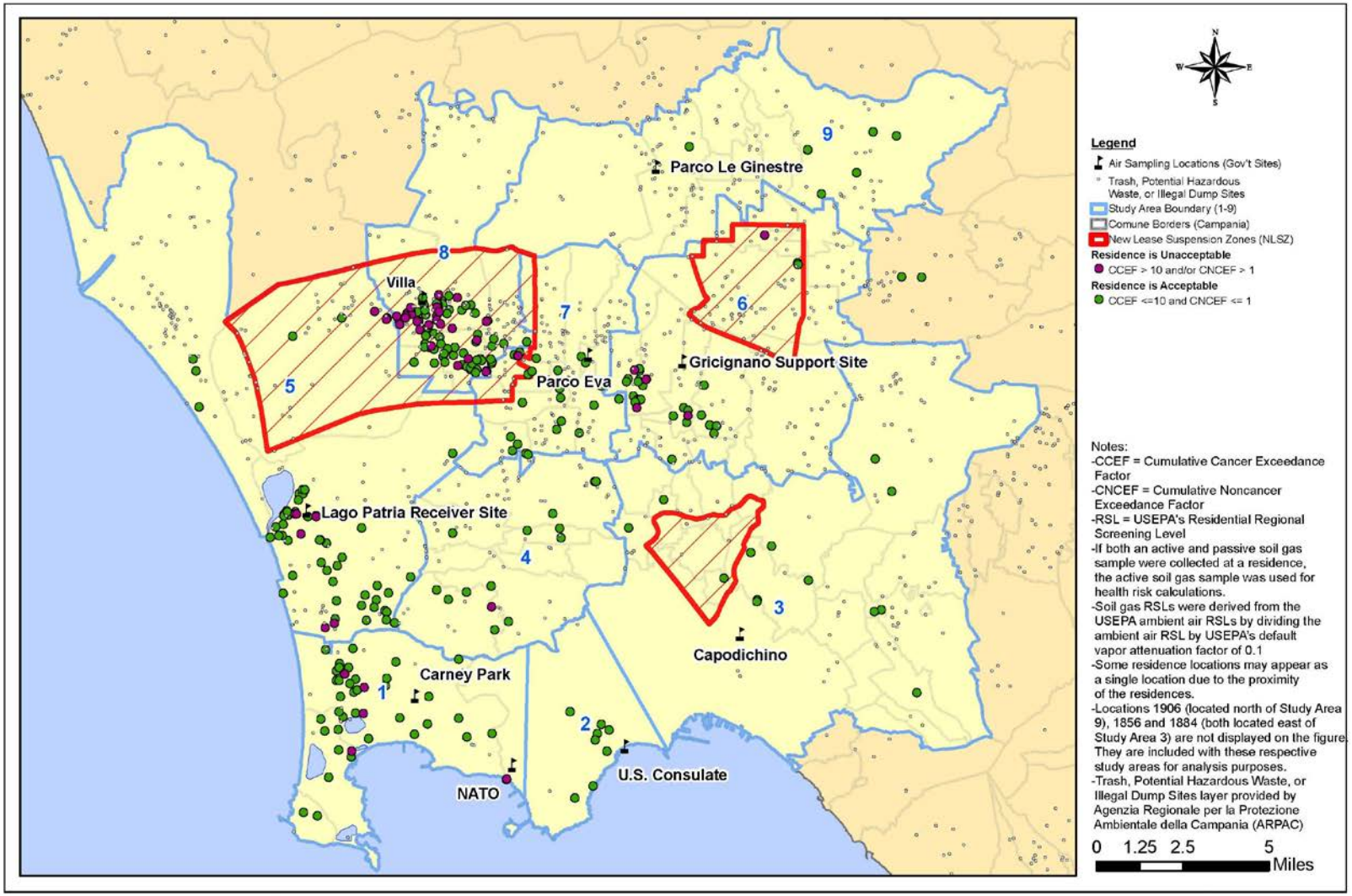
Total Inhalation Cumulative Risk Results
All Residences Sampled in the PHE

Figure 2-3. Tap Water Inhalation Cumulative Risk Results



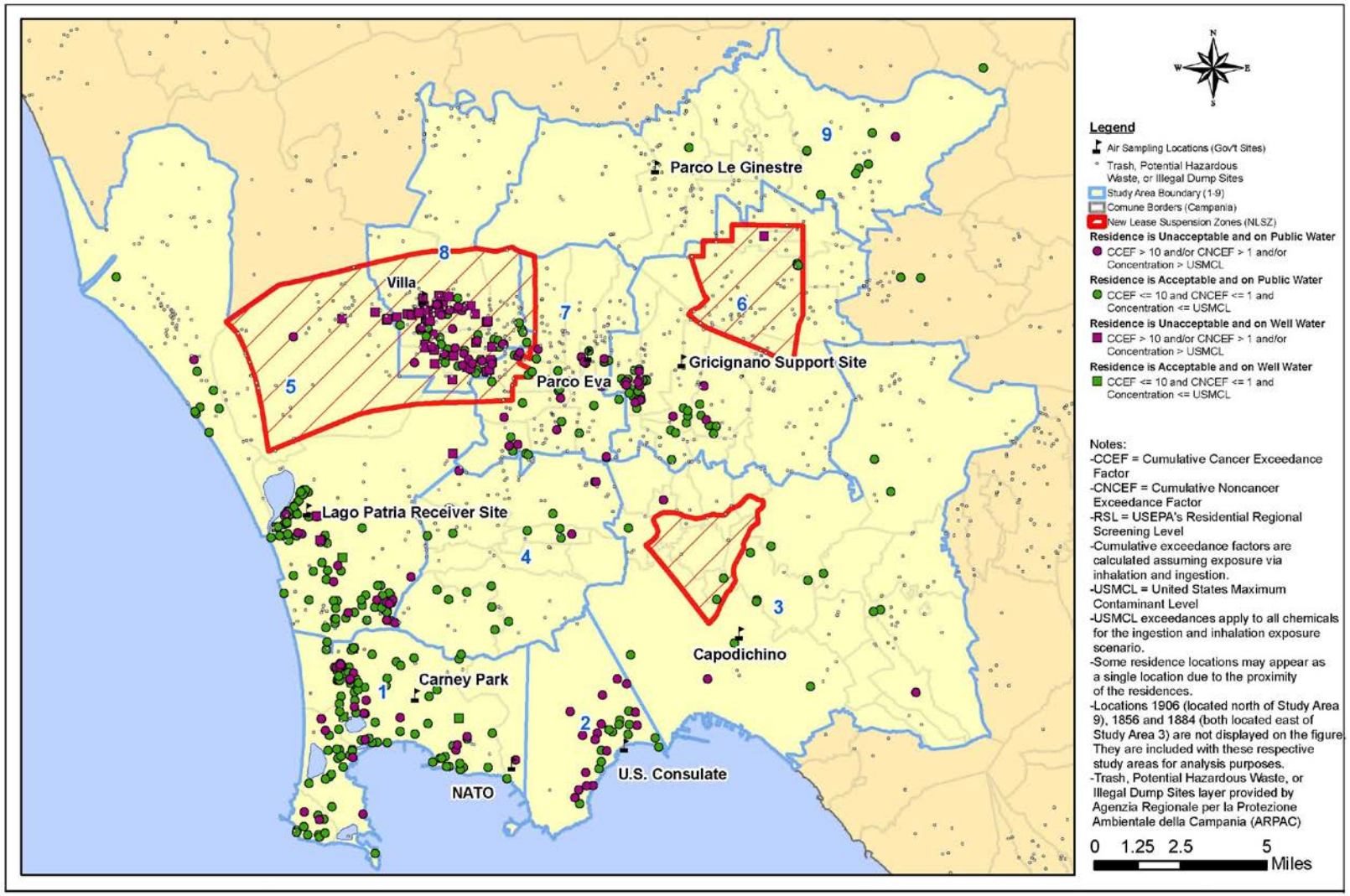
Tap Water Inhalation Cumulative Risk Results
All Residences Sampled in the PHE

Figure 2-4. Soil Gas Cumulative Risk Results



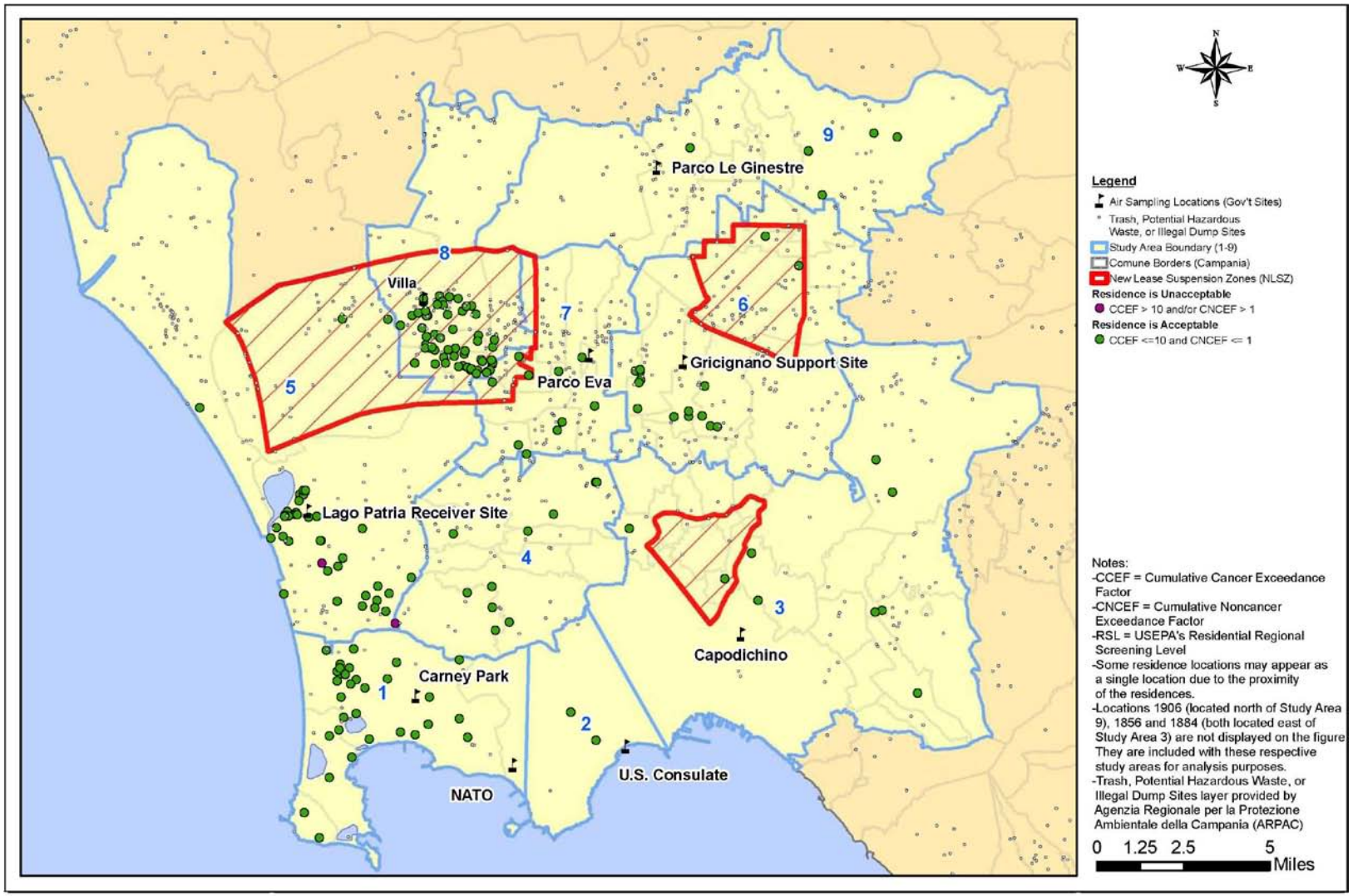
Soil Gas Cumulative Risk Results
All Residences Sampled in the PHE

Figure 2-5. Tap Water Ingestion and Inhalation Cumulative Risk Results



Tap Water Ingestion and Inhalation Cumulative Risk Results
All Residences Sampled in the PHE

Figure 2-6. Soil Cumulative Risk Results



Soil Cumulative Risk Results
All Residences Sampled in the PHE

SECTION 3 – FINDINGS AND RECOMMENDATIONS

The purpose of this section is to provide recommendations to reduce or eliminate identified public health risks to USN personnel living in Campania as a result of historical widespread illegal dumping of hazardous waste, and the accumulation of uncollected trash and the uncontrolled open burning of this trash due to lack of adequate disposal facilities.

Section 3.3 provides recommendations for actions to reduce or eliminate those identified risks, where possible; identifies key data gaps in the PHE; and recommends additional actions that should be considered to fill those data gaps (e.g., additional sampling).

A variety of factors and assumptions have been used to conduct this evaluation that are specific to USN personnel and their families living in Naples, Italy. Attempts to generalize or extrapolate these findings and conclusions to other populations should be done with caution, and in many cases would be inappropriate.

3.1 Limitations and Uncertainties

The conduct of the PHE on foreign soil in a host nation, both in scope and complexity, is unprecedented for the USN and has never before been attempted within the DOD. As might be expected, there were considerable limitations resulting in uncertainties that impact the results of this evaluation, and require consideration to put the conclusions and recommendations presented in this section into perspective.

Examples of the more significant limitations include:

- Requirement for landlord's permission to access property for environmental sampling.
- Lack of DOD or USN Policy for what is an acceptable public health risk overseas, nor an established process to evaluate those risks.
- Limited access to host nation public health reports, studies and public health officials.
- Differences in host nation risk assessment approach, policies and procedures (e.g., vapor intrusion) compared to U.S.
- Resource constraints for conducting a PHE of this scope, including a myriad of logistical issues with supplies, equipment, and personnel to conduct the PHE.
- Restrictions on implementing risk management actions in a host nation to reduce or eliminate identified potential risks.
- Difficulties determining exact locations of the 3,000 off-base rental properties on the NSA Naples Housing List (e.g., no GPS database), for the residential properties where USN personnel lived, to accommodate environmental sampling and meet PHE objectives, requiring extensive resources to fill this data gap.

Examples of the key uncertainties include:

- Extensive history of illegal hazardous waste dumping in Naples.

- Organized crime's influence on the waste industry.
- Representativeness of soil, soil gas, tap water, well water, and ambient air analytical data:
  - Lack of historical data and institutional knowledge about contaminated waste sites in Campania.
  - Sampling design based on where people lived/worked and where tenant/landlord approved of sampling, vice an even-spatial distribution of sampling locations throughout the region.
  - Representativeness of a single sampling event for a specific residence or to evaluate long-term exposure.
  - Lack of long-term sampling to estimate long-term exposures.
  - Spatial sampling density in representing a 395 square-mile area.
  - Passive soil gas sample results that were difficult to quantitate.
  - Identification of chemicals in soil gas that may be associated with vapor intrusion.
  - Uncertainties associated with lines-of-evidence for distinguishing between a vapor intrusion chemical of potential concern (VI-COPC) and a non VI-COPC, and between a global VI-COPC and a localized VI-COPC.
  - Vapor attenuation factors used to predict indoor air concentrations from soil gas.
  - Determination of well water versus municipal water.
  - Impact of analytical data on the SRE.
  - Tetra Tech determined that naphthalene and acetaldehyde in soil gas was deemed to be of insufficient quality for incorporation in a quantitative risk assessment.
  - Lack of speciated or radionuclide screening analysis results for locations with radionuclides in tap water due to lack of access to obtain data.
  - Step-out sampling data gaps.
  - Determining representative background concentrations of inorganic chemicals in soil and tap water.
  - Determining representative background concentrations of chemicals in ambient urban air
  - Conceptual Site Model and exposure assumptions.
  - Toxicity values.

These key uncertainties are discussed in detail in Volume II, Section 5 (PIONEER, 2010).

In summary, while there is uncertainty in this SRE with regard to the representativeness of the analytical data, data quality itself is not an issue. In all cases where uncertainty existed in the assessment, assumptions and inputs were selected to err such that site risks would not be underestimated. These uncertainties did not impact the confidence in the conclusions of the assessment. Nevertheless, as stated in the "Preface," the screening risk assessment procedures used in the PHE were developed to inform management decisions, and the results do not provide absolute statements about health and environmental effects or expected, actual risks.

3.2 Findings Based on Lines of Evidence Evaluated in the PHE

Because of the limitations and uncertainties inherent in the PHE, it was necessary to evaluate *multiple lines of evidence* that were available, in order to provide a broader holistic assessment of the public health

risks to USN personnel in the Campania region. There are numerous approaches for evaluating multiple lines of evidence and typically their evaluation relies, at least partially, on using best professional judgment. This was true for the PHE with its inherent challenges and evolving nature due to day-to-day changes in information and knowledge, requiring constant adaptation.

Primary lines of evidence evaluated were obtained from sampling results and observations described in the below listed documents or as a result of the below listed issues:

- USN Phase I Volume I Environmental Testing Support Assessment Report (Tetra Tech, 2008)
- USN Phase II Volume I Environmental Testing Support Assessment Report (Tetra Tech, 2010)
- USN Phase I Volume II Screening Risk Evaluation (PIONEER, 2009)
- USN Phase II Volume II Screening Risk Evaluation (PIONEER, 2010)
- USN Phase II Volume III Public Health Summary (NMCPHC, 2011)
- USN Epidemiological and Food Studies
- USN NSA Naples/NSA Agnano Historical Information
- PHE Phase I and Phase II Report environmental testing results (air, water, soil, soil gas) of 543 residences on the economy in Campania, indicate a high degree of contamination of tap water in some areas for residences on private wells and, to a lesser extent, for those using a public drinking water source; and for soil gas, widespread frequency and distribution of Unacceptable homes throughout the nine study areas.
- Commercial and Residential Development - In Study Areas 5, 6, 7, 8 and 9, development in these formally rural areas that were more susceptible to illegal dumping of hazardous waste, now increases the possibility (and attendant uncertainty) of living in housing that may be built over waste sites in these areas.
- Cyclical trash crises dating back to 1994, when the first trash emergency was declared, which lasted 12 years with little improvement in the construction of landfills and/or incinerators, resulting in repeated actions by the EU against Italy.

Secondary lines of evidence included information obtained from the below listed documents or issues:

- Italian environmental reports and peer-reviewed studies
- Italian peer-reviewed epidemiological studies
- Review of existing information (reports, studies, etc.) from Italian environmental agencies (e.g., ISPRA, ARPAC), European Union Court Judgments, other governmental and non-governmental organization reports
- Systemic public drinking water system deficiencies due to infrastructure, maintenance, low pressure fluctuations, high incidence of illegal private wells interconnected to the public system, lack of backflow prevention devices, lack of compliance with and enforcement of plumbing codes, illegal home construction, and no monitoring of drinking water quality at the tap water faucets inside the homes by the water purveyors (2009 ARPAC Report on the State of the Environment in Campania).
- As documented by the Italian Government, decades-long history of illegal hazardous waste dumping resulting in thousands of known, and presumed unknown, waste sites in the Campania

region. Nearly all of the nine study areas fall within the footprint of an Italian Site of National Interest (e.g., Superfund).

- Both the ARPAC *2009 Report on the State of the Environment in Campania* and the *2008 Report Contaminated Sites in Campania* provide more description of the thousands of waste sites in Campania.
- Documented limited progress by the Government of Italy in characterization and cleanup of these sites, as well as a lack of an integrated and adequate network of disposal installations required to accomplish these actions, as illustrated in the March 4, 2010, *European Commission Judgment of the Court* against the Italian Republic for failure to implement measures to properly handle waste without endangering human health and harming the environment in the region of Campania.
- Interaction with host nation public health and environmental regulators between July 2007 and June 2010.
- 2006 Italian Parliamentary Investigations Commission on Waste Recycling and Related Illegal Activities – Territorial Report on the Campania Region.

3.3 Recommendations

Based on the primary and secondary lines of evidence described above and throughout this report, the following are NMCPHC's recommendations to CNREURAFSWA for consideration, to reduce or eliminate identified public health risks, and fill key data gaps in the PHE, where possible. They are organized by suggested commands. A list of Enduring Processes already implemented is provided in Appendix B.

3.3.1 CNREURAFSWA

The institution of some or all of the recommendations provided below will depend on risk management decision(s) made by USN Leadership after further analysis and study of all options available.

- Based on the findings of the PHE, the health risks related to living on-base at the Gricignano Support Site and Capodicino are Acceptable when considering the average length of stay is 3.2 years for civilians and 2.2 years for military (average of 2.8 overall) with 94% of the total population residing less than 6 years. From a region-wide perspective, both clustered and random distributions of Unacceptable homes were found; therefore, it is not possible to predict locations of Acceptable residences. This uncertainty is potentially increased more when considering the following:
  - The extensive history of illegal dumping of waste;
  - The magnitude of known, suspected, and the potential for undiscovered waste sites;
  - Limited environmental regulatory action to identify, characterize and cleanup contaminated waste sites;
  - The Campania region environmental crisis resulting from lack of adequate waste disposal facilities;
  - The municipal drinking water system deficiencies; and
  - The inability for USN to eliminate the data gaps that are driven by unknown events (e.g., illegal waste dumping) that may continue to occur.

- Until such time that risk management decisions are considered and implemented for off-base privately owned rental home options, consider the following actions for those remaining in rental homes to protect their health:
  - Maintain and update PHE maps provided to NSA Naples Housing to reflect the final sampling results for all homes in each study area.
  - NSA Naples Housing continue to maintain an area that displays the most current version of PHE maps (either via computer or by posted hard copies) for use by prospective tenants. This allows residents to easily refer to them when browsing for homes on the Housing database and enables them to lease homes where tap water, soil, and soil gas results were Acceptable.
  - NSA Naples Housing maintains a list of residences that meet the multi-story criteria (residents live on the first floor up from the ground floor or higher the garage is on the ground floor).
  - Encourage/educate future residents to lease multi-story buildings and live on the first floor up from the ground floor or higher, which will significantly mitigate concerns associated with vapor intrusion from soil gas. Continue to provide fact sheets in English and Italian that discuss building construction and related potential vapor intrusion topics.
  - Finalize, and then implement, the screening process now under development using the recently completed Vapor Intrusion Attenuation Factor Technical Memorandum (PIONEER, 2010)[24]. This process will be applied to residences in proximity to locations found to be Unacceptable under the Navy's risk criteria. Once properties are assessed, a determination will be made regarding whether or not the property will continue to be available for lease by USN personnel. As this documentation is provided to NSA Housing from the PHE team, it should be linked and maintained with that property in the NSA Housing database.
  - For those houses not sampled, conduct an administrative screen to identify those personnel who have the potential to remain in one house for periods longer than three years (e.g., civil service, DODDS) and consider giving them priority to move on-base, or fund move to a multi-story building.
- Maintain indefinitely, the July 2008 *Bottled Water Advisory* for off-base personnel, for drinking, food preparation, cooking, brushing teeth, making ice, and for pets, due to the widespread presence of contaminants (e.g., arsenic, fecal coliform, PCE) as measured in the tap water, as well as the other drinking water system infrastructure deficiencies.
- For ambient (outdoor) air, because some constituents (e.g., in particular, 1,2-dibromo-3-chloropropane, which was responsible for, on average, 80% of the cancer risks in each study area) did not have corresponding values in the USEPA's 2007 Air Toxics Database, it was not possible to determine whether or not the cumulative ambient air risks in the Campania Region exceeded the risks from typical urban air in the U.S. Before any final risk management actions are taken, and to add more context to the decision-making process while reducing the uncertainty whether urban air in Campania is similar to urban air in the U.S., consider the interim following actions:
  - Because the circumstances of the 1,2-dibromo-3-chloropropane (DBCP) results are irregular, have Tetra Tech formalize their laboratory quality assurance review for DBCP regarding

[24] Pioneer 2010 – Appendix B: Naples, Italy – Public Health Evaluation: Development and Application of Multistory Vapor Intrusion Attenuation Factors to Residences in Naples, Italy.

issues such as analytical methods used, method detection limit, and potential for any known interferences or false positives, into a Tech Memo (in progress). Once complete, this tech memo should be reviewed by an external third party Analytical Data Validator.

- Because DBCP is banned for use in most countries (e.g., since 1985 in U.S.), obtain a more detailed description of the DBCP ban in Italy (e.g., year banned, banned for registration, sale and use as pesticide, or prohibited to import, manufacture and sell as a pesticide for agricultural use).
- Share the air monitoring data with the 3 established Italian Government points of contact for the Naples PHE, and ask them if they have any ideas on why DBCP would be detected only during those 2 months and/or whether they can do further research on their existing air databases.
- Because the 9 air monitoring stations essentially fall within one of the Italian equivalent Superfund sites (the Domitian coast Flegreo and Agro Aversano) in Campania, request data from ARPAC on whether DBCP has been detected in any of the characterized waste sites. In our review of Italian documents to date, we have not seen reference to this chemical. That may give us some indication of whether it has been disposed of, legally or illegally as a hazardous waste. Since DBCP is persistent in soil and groundwater, if used legally in the past, or illegally dumped, one would expect the Italians to have detected it in soil or ground water samples.
- Since the Italians have a well established air monitoring network, the Navy could request they do some sampling for DBCP in air.

- Maintain the PHE Administrative Record website on the CNIC Portal. Work with the Department of the Navy, Director of Records, to ensure the most appropriate standard subject identification code (SSIC) is assigned for the final disposition and records retention period. It is likely these records will require retention to span the amount of time USN has been in Naples, Italy.
- Continue the data-sharing process with designated host nation public health officials as appropriate, and encourage Italians to investigate areas of environmental concern identified in the Phase I and Phase II final reports. The SRE has identified a number of areas throughout the Campania region that appear to be impacted by unregulated releases of chemicals to the soil and/or groundwater. Volume II Figures 4-9 and 4-7 present locations with Unacceptable risks associated with chemicals in tap water and/or soil gas. However, it is important to note that the USN was limited (being a guest in the host nation of Italy) with regards to where samples could be collected and which media were sampled at those locations. The USN could only collect samples from residences that were leased through the USN Naples Housing Office and where the tenant and landlord consented to sampling. Without unrestricted access to all houses and media, the USN could only identify areas of potential concern with Italian leased homes. The USN should continue to request that the appropriate Italian regulatory agencies fully investigate the environmental issues (areas of concern) identified during the PHE.

3.3.2 NSA Naples

- Maintain the three (3) *New Lease Suspension Zones* (NLSZs) indefinitely. Residences located in the NLSZ that is located in Study Areas 5, 7, and 8 (i.e., northwest-most NLSZ) exhibited significant and widespread exceedances and had the highest and most frequently Unacceptable

concentrations of chemicals detected during the PHE (see Figure ES-9 and Figure ES-10). The NLSZs in Study Areas 6 and 3 were developed based on Italian data, and the USN does not have detailed information regarding the nature and extent of contamination in these areas. In addition, only three of the residences sampled as part of the PHE are located within these NLSZs. Therefore, as a conservative health protective measure, new leases in these NLSZs should be prohibited until the proper Italian authorities have fully investigated, delineated, and remediated (cleaned up)/mitigated contamination in these areas to the extent that the health risks are acceptable to the USN.

- Ensure all drinking water systems (e.g., Parcos) comply with the requirements as set forth by the NSA Naples Installation Drinking Water Management Board.
- Continue to maintain the NSA Naples Community Health Awareness website: https://www.cnic.navy.mil/Naples/CommandInformation/HealthAwareness/index.htm. Consider the addition of a section for Italian landlords that provides pertinent information in Italian.

3.3.3 NSA Naples Public Works

- Maintain warning signs posted for irrigation water usage at Capodichino, Gricignano Support Site, Carney Park, and Parco Le Ginestre. Also, establish and assign a process and schedule for periodic inspections to ensure signage remains in place and is legible, and to repair or replace as necessary.
- Implement a program to track and regularly monitor the status of implemented mitigation systems (e.g., Capodichino Child Development Center Vapor Intrusion Mitigation Ventilation System).

3.3.4 NSA Naples Housing

- Maintain the following private off-base rental home lease clauses:
  - If a home's tap water supply is connected to a well, the landlord must provide verification that the well is legal according to Italian law. Otherwise, the home must be disconnected from the well and connected to the public drinking water system.
  - Landlords must provide containerized water (from VETCOM-approved vendors) for drinking, food preparation, cooking, brushing teeth, making ice, and for pets.
  - Landlords are required to clean and disinfect water holding tanks and associated plumbing every six months.
  - Landlords to authorize the tenant, to allow at any given time, necessary tests by USN to verify and test the quality of the water located in the unit, to include the soil and the air located around the actual building.
- Coordinate with other entities (e.g., legal) to implement a program to track and regularly monitor the status of residences where Unacceptable risks were mitigated, if the residence is still occupied by or will potentially be occupied by USN personnel in the future. The USN should focus on verifying that institutional and/or engineering controls that have been implemented (assuming that the residence has not been remediated to Acceptable risk levels) remain in place and continue to work as designed to protect human health.
- Maintain NSA Naples Housing Site database, which is based on information acquired from a hand-held GPS that is being used to develop/support a Geographical Information System (GIS) database.

- Continue to organize a thorough and usable database of landlords associated with rental properties throughout the region. The database should be updated to provide for querying specific to the PHE, such as sampling results, and should provide multiple means of contact (mail, electronic mail, telephone, cell phone).
  - Provide for routine updates of landlord contact information. Routine updates of contact information should be part of any scheduled interaction with a landlord.
  - The database should track interactions/correspondences with the landlord.
- Maintain communication efforts between NSA Naples Housing Staff, landlords and their tenants.
  - Continue to keep landlords apprised of new information that may impact the landlord's ability to rent the property and to stay on the Naples housing database. Timely communication can help continually inform landlords, ease their frustration, and minimize misinformation.
  - Plan in advance for known communication - such as new policies or mitigation actions - and plan for translation services so that information will reach landlords promptly.
  - Explore ways to mass distribute information to landlords, such as collecting e-mail addresses and sending mass e-mails, or developing notices that can be mailed to landlords or made available at Housing.
  - Ensure Housing representatives receive up-to-date information about future sampling activities, policy changes, and mitigation actions, and are trained in key messages to respond to landlords with consistent messages.
  - Host an annual open house informational meeting for both prospective landlords and current landlords. This would provide an opportunity for landlords to become more familiar with the USN's housing policies, and for the USN to potentially find new landlords that could help expand housing options.
  - Provide tenants with landlord-focused information, using tenants as an additional means for disseminating information to landlords, but not as the primary or only source. Since tenants are among the first informed, it may be possible for them to share information with their landlords before the USN has the opportunity.
- Develop a fact sheet to define process by which USN personnel living in off-base private rental homes can get their tap water tested by the local Italian health authorities (e.g., ASL).

3.3.5 CNREURAFSWA/NSA Naples Public Affairs – Communication

- Continue to use the established communication venues used to keep USN personnel current on future public health issues relevant to their health in Naples:
  - All Hands e-mails.
  - Community town hall meetings to discuss health-related topics, as needed or at least annually.
  - All Hands CNREURAFSWA, CNE and NSA Naples staff meetings.
  - Provide health protection articles in the NSA Naples newspaper, *Panorama*, as needed and
    - During permanent change of station (PCS) season, publish articles on Enduring Processes, health protection, mitigation actions, and informational resources (i.e.,

Housing and working with landlords; EHIC health consultations), to include the Naples Community Health Awareness website address.
    - Publish general information about Enduring Processes, health protection, and mitigation actions on a monthly basis.
    - Publish availability of informational/educational resources and health consultation opportunities at EHIC and Naples Community Health Awareness website weekly or monthly.
  - PAO Notes.
  - American Forces Network (AFN) Europe Naples articles, radio and television stories.
  - Continue to scan, translate and distribute relevant articles of public health interest appearing in Italian media.
  - Although not highly used during the PHE, communication may benefit from employing new social media sources being used at NSA Naples. These include the AFN Facebook page and the NSA Naples Facebook page, where health protection topics can be posted.
- Periodically review and update relevant fact sheets with assistance from appropriate subject matter experts.
- Conduct risk communication and key message training as needed.
- Consider an annual survey of U.S. personnel to check their knowledge of health protective actions, health-related concerns, satisfaction with health-related communication activities, and compliance with mitigation measures. An annual survey can provide a measurable way to assess the effectiveness of communication activities.

3.3.6 U.S. Naval Hospital Naples

- Continue to maintain the EHIC – a central location for information resources and health consultations.
- Recruit to fill the position description (now pending) for the host nation bilingual Environmental Protection Specialist GS-0028 position (in progress) to monitor Italian public health and media reports and studies relevant to U.S. Government facilities and rental homes in the Naples area. Apprise CNREURAFSWA and NSA Naples Leadership of issues of concern that require action to protect the public health of USN personnel in Campania.
- Provide medical support to help implement relevant public health Enduring Processes.
- As recommended in the 2010 asthma epidemiological study, U.S. Naval Hospital Naples should consider the impact of the air quality on those with documented respiratory problems, especially persistent asthma, before granting an overseas screening waiver.
- For personnel concerned about their exposure and appropriate medical testing, continue to recommend health screening for eligible beneficiaries in accordance with the U.S. Preventive Services Task Force's (USPSTF) Guide to Clinical Preventive Services. This includes recommendations for cancer screening. Beneficiaries should discuss these recommendations with their health care provider. The USPSTF guidelines are already widely used and considered the standard of care within the medical community. The USPSTF, established in 1984 under the U.S. Department of Health and Human Services, has routinely published recommendations for primary care practitioners on what medical testing or procedures should be provided to apparently healthy

persons based on age, sex, and risk factors for disease. These are general medical screening recommendations that are appropriate for any and all members of the U.S. population and provide early detection of diseases ranging from cancer to mental health conditions. These recommendations can be accessed at: http://www.ahrq.gov/clinic/prevenix.htm.

APPENDIX A: NAPLES PUBLIC HEALTH EVALUATION RISK COMMUNICATION AND PUBLIC OUTREACH PROGRAM

Introduction

Communication has been an integral and critical part of the Naples Public Health Evaluation (PHE) since its inception. The communication program has served to proactively inform stakeholders about project activities and findings, communicate potential health risks and mitigation actions, and provide opportunities for stakeholder involvement. Moreover, it has built community trust in the study results and has helped U.S. Navy personnel and their families be active partners in their own health protection. The purpose of this appendix is to provide an overview of risk communication and public outreach activities that have occurred to support the Naples PHE, from the initiation of the project to the project's completion (2008 – 2010). In addition to documenting communication and outreach activities, this appendix provides an overview of the communication approach. Recommendations for future communication activities can be found on the following pages, under "Enduring Processes."

Communication Approach

To develop a sustainable and focused communication program, the Navy identified three key elements: (1) communication program objectives; (2) the people, agencies, and organizations considered to be "stakeholders;" and (3) the methods for reaching these identified stakeholders. These elements were identified at the beginning of the PHE to guide the overall communication strategy. They are described below.

In addition to the overarching PHE communication program (described in this section and in the section "Ongoing Outreach Methods"), activity-specific communication plans (e.g., 1,500-Foot Step-Out Investigation in Casal di Principe) were developed to guide the communication strategy for PHE activities that were anticipated to generate a heightened interest for stakeholders. The framework of these communication plans is described below in "Activity-Specific Outreach Methods."

Communication Objectives

Communication objectives describe the purpose of communicating to stakeholders and guide the communication strategy. The following are communication objectives that were developed for the Naples PHE.

- Increase confidence in Navy Leadership's commitment to the health and well-being of U.S. Naples personnel and their families.
- Raise awareness about the Naples PHE, including findings and mitigation actions.
- Establish trust in the Naples PHE, environmental sampling results, and recommended mitigation actions.

- Establish two-way communication and designate staff resources for U.S. personnel and their families, and other stakeholders.
- Fully inform stakeholders and work to provide context for identified risks.
- Communicate Navy actions as appropriate, timely and responsive.
- Keep stakeholders continually informed in a timely manner.
- Encourage "residents" (i.e., U.S. personnel living off-base) and landlords to follow recommended mitigation actions.
- Build and foster cooperative relationships with Italian authorities and landlords.
- Encourage and support appropriate action from Italian authorities and landlords.

Communication objectives were also developed for specific PHE activities that were anticipated to generate a heightened interest for stakeholders and were included in the communication plan developed for that specific activity.

Key Messages

Key messages support the communication objectives and are the fundamental "take-home" messages that need to be conveyed to, and understood by, stakeholders, in addition to being understood and followed by people involved with the PHE. Key messages were incorporated into virtually all communication materials and presentations. The following are key messages that were developed for the Naples PHE.

- The Navy is committed to ensuring our military families are safe while serving our country at home and overseas.
- The Navy is committed to sharing important health information and will continue to share important health information in a timely and transparent manner.
- The Navy is working with Italian authorities and sharing the results of the study.
- For any health-related questions or concerns, contact the Environmental Health Information Center.

Key messages were also developed for specific PHE activities that were anticipated to generate a heightened interest for stakeholders and were included in the communication plan developed for that specific activity.

Stakeholders

The term "stakeholder" is used throughout this document to describe those individuals, groups or agencies that have had an interest in or have been affected by the Naples PHE. The term is used broadly to include media outlets. The following are stakeholders that were identified for the PHE. Of special note are three stakeholder groups to which the communication program has been focused: U.S. military and civilian personnel, Italian regulatory agencies, and landlords. A discussion of these stakeholder groups can be found below under "Primary Stakeholders."

Navy Leadership

- Secretary of the Navy (SECNAV)

- Chief of Naval Operations (CNO)
- Commander, Navy Installations Command (CNIC)
- Commander, U.S. Naval Forces Europe – U.S. Naval Forces Africa
- Commander, Navy Region Europe, Africa, Southwest Asia (CNREURAFSWA)
- Naval Support Activity (NSA), Naples
- U.S. Navy Bureau of Medicine and Surgery (BUMED)
- Navy and Marine Corps Public Health Center (NMCPHC)
- U.S. Naval Hospital Naples

U.S. Military and Civilian Personnel

- U.S. military active duty, reserve and civil service personnel, and their dependents in Naples
- U.S. Navy medical community
- Department of Defense Dependents Schools (DODDS) staff and their dependents in Naples
- North Atlantic Treaty Organization (NATO) community in Naples
- U.S. Navy personnel that were formerly assigned to Naples and those negotiating orders to Naples

State Department

- U.S. Consulate, Naples
- U.S. Embassy, Rome

Italian Agencies and Elected Officials

- Italian local, regional and national health and environmental regulatory agencies, including water authorities
  - ISPRA (*Istituto Superiore per la Protezione e la Ricerca Ambientale*)
  - ARPAC (*Agenzia Regionale per la Protezione Ambientale della Campania*)
  - National Department of Civil Protection (*Dipartimento Nazionale della Protezione Civile*)
  - Health Department, Campania Region (*Assesorato alla Sanita'*)
  - Environmental Department, Campania Region (*Assesorato all'Ambiente*)
- Italian local (commune, province) and regional government elected officials whose constituents live in one of the nine PHE study areas

Landlords

- Landlords of homes leased by Navy personnel
- Landlords of Parco properties leased by the Navy

Media

- *Panorama* (Internal media)
- American Forces Network (AFN), Naples (Internal media)
- Navy NewsStand (Internal media)
- *Stars and Stripes* Europe
- Italian media

- RAI 3 – regional television news edition of RAI State TV
- ANSA – Italian newswire agency
- *Il Mattino* – Naples' top-circulation daily newspaper
- *La Repubblica* – a top circulation newspaper in Italy
- Mediaset – owns television, radio and newspapers
- *Corriere del Mezzogiorno* – daily, local edition and insert of top circulation
- *Corriere della Sera* – daily, local edition and insert of top circulation

Communication Methods

The PHE team has employed a broad range of communication methods to meet the communication objectives. Methods have varied throughout the duration of the PHE to best suit the communication objective and the targeted stakeholder(s). Multiple communication methods have typically been used simultaneously to increase the likelihood of reaching all intended stakeholders.

An important component of the communication program was establishing methods for two-way communication. Two-way communication has enabled the Navy not only to inform stakeholders, but has also provided opportunities for stakeholders to interact directly with the Navy, to ask questions, express concerns, and offer feedback. Many of the methods listed below have promoted two-way communication. Methods have primarily included the following:

- PHE/Health Awareness dedicated website
- PHE dedicated e-mail address
- Informational materials, such as fact sheets, frequently asked questions (FAQs) and brochures, which were made available both as handouts and on the website
- Weekly column in the NSA Naples base newspaper *Panorama*
- All Hands e-mails
- Plan of the Week
- Flyers/Notices, including those distributed to individual residences
- All Hands meetings hosted by NSA Naples or CNREURAFSWA
- Briefings to chain-of-command and other stakeholders
- Public open-house style meetings
- Small-group meetings for Phase I and Phase II residents (i.e., study participants) and landlords
- Informational resources and consultations at the Environmental Health Information Center (EHIC)
- Ombudsman network
- Interviews and news stories on AFN Naples Television and Radio
- News releases, responses to inquiry, and interviews for *Stars and Stripes*, Navy NewsStand, and Italian media outlets
- Telephone notification calls by the EHIC
- Large-scale and electronic maps of study areas, sampling locations and results available at Housing Office

Health and Environmental Risk Communication Training

Risk communication training sessions were held at the initiation of the PHE to help PHE team members build or refresh the skills necessary to communicate complex environmental health risks to stakeholders. Below is a summary of risk communication trainings provided by NMCPHC and Fulton Communications (risk communication consultant). Attendees have included Naples program managers, subject matter experts, Naples Navy Leadership, and Navy public health professionals from U.S. Naval Hospital Naples.

A risk communication training session was also held for PHE team members in preparation for the Phase I open house sessions. The training was held on 05 May 2009 – one day prior to the first open house session. The training was attended by PHE team members and subject matter experts that were assigned a role at the open house sessions. The training covered risk communication concepts and skills, key messages, FAQs, rules of engagement with stakeholders, and a walk through of the poster stations. The poster stations dry run included a mock question and answer session to prepare team members for interfacing with stakeholders. At the time of this report, a risk communication training session is to be planned to prepare PHE team members for the Phase II open house sessions.

- Specialized risk communication training (focusing on aspects of the PHE) for CNRE, NSA Naples, and U.S. Naval Hospital Naples personnel: 29–31 January 2008
- Two 1-day risk communication sessions for U.S. Naval Hospital Naples and CNE/CNRE staff: 1 February 2008
- Three 2-day specialized risk communication workshops for PHE team personnel: 31 March through 1 April; 2–3 April; and 7–8 April 2008
- One 1-day media training for PHE team personnel: 9 April 2008
- One 1-day session for spouses of personnel in leadership positions: 10 April 2008
- Executive brief for CNREURAFSWA Admiral: 11 April 2008
- Specialized risk communication training for U.S. Naval Hospital Naples staff: 14–16 October 2008
- Specialized risk communication workshop for personnel in the CNREURAFSWA Area of Responsibility. Main topics included PHE and pandemic influenza: 28–30 October 2009

Naples Public Health Evaluation Communication Team

Planning and implementing the risk communication and outreach program has been a collective effort of several PHE team members representing various commands and departments. The following sections describe the role of each command or department as it pertains to the PHE communication program.

Navy and Marine Corps Public Health Center

The NMCPHC Environmental Programs Directorate has been the science technical lead for the PHE to include risk communication to guide the strategy for environmental health communication efforts. NMCPHC has provided briefings to Navy Leadership, Italian regulatory agencies, and residents. NMCPHC has also supported the EHIC in consultations with U.S. personnel, as needed. This role has included providing technical information and call lists for various types of notifications to residents.

NMCPHC contracted with the public affairs firm Katz & Associates to augment risk communication expertise. NMCPHC has worked closely with CNREURAFSWA Public Affairs to plan and carry out communication activities. NMCPHC has also worked closely with Fulton Communications, a firm specializing in risk communication, to provide risk communication trainings to CNREURAFSWA and NSA Naples Leadership, PHE team members, and U.S. Naval Hospital Naples personnel.

CNREURAFSWA Public Affairs

CNREURAFSWA Public Affairs, with risk communication support from NMCPHC, has been the lead for executing internal and external communication activities, including coordination with the media and U.S. Consulate, Naples. Other general responsibilities of CNREURAFSWA Public Affairs have included drafting and coordinating the publication of weekly articles for the *Panorama* PHE column, All Hands e-mails, website updates, and Public Affairs Guidance.

To support the robust communication program, a Public Affairs Officer (0-5/Commander) and a bilingual community relations specialist were dedicated with primary duty for the PHE.

Environmental Health Information Center

The EHIC, located at U.S. Naval Hospital Naples, was established at the initiation of the PHE as a health information and consultation resource. The office is managed by the Director for Occupational Health and Preventive Medicine (also the CNREURAFSWA Public Health Emergency Officer [PHEO]) and the Environmental Health Officer, with assistance from Preventive Medicine Technicians (PMTs).

As an important health consultation resource, the EHIC has served as the primary point of contact (POC) for U.S. personnel. Personnel have been encouraged to contact the EHIC for questions regarding environmental sampling results, mitigation actions, and personal health concerns as they relate to the PHE.

Another important function of the EHIC has been its participation in the notification process to residents regarding sampling results and required mitigation actions, particularly relocation. Additionally, when the sampling results of a residence indicated a potential health concern, the EHIC placed a phone call to the resident to notify them of the testing results and potential health risks (see “Immediate Notifications” for more information).

NSA Naples Housing Office

The NSA Naples Housing Office has been the designated POC for landlords regarding the PHE. Housing staff, who are bilingual, work closely with landlords to ensure the listed property meets the Navy’s leasing standards and continues to be suitable for renting to U.S. personnel. This role has included implementing new lease requirements and other mitigation actions that may be required for the property. Staff have been kept updated on PHE activities and findings so that they could provide current information to landlords.

Housing staff have also worked closely with U.S. personnel, to help guide them in making informed decisions when selecting a rental home using available PHE sampling results. For this purpose, the PHE team supplied Housing with large-scale and electronic maps that depict sampling locations and findings for each of the nine study areas. Housing established a dedicated room with posted maps and computers so that residents could easily refer to them when browsing homes from the Housing database. The maps would help guide residents to select homes away from known areas of contamination. Below is a rendering of this room.

Rendering of Map Room at NSA Naples Housing Office

Tetra Tech NUS

Tetra Tech NUS has been the prime contractor providing environmental sampling support for the PHE. As such, they have conducted environmental sampling at the homes of U.S. personnel and have interacted with residents and landlords when collecting the samples or when scheduling appointments for sampling.

When interacting with residents and landlords, Tetra Tech provided technical information regarding the environmental sampling process and did not discuss environmental health risks. Residents were referred to the EHIC, and landlords were referred to NSA Naples Housing, to discuss health concerns.

Tetra Tech subcontracted with the Italian environmental firm Sistemi Industriali. In addition to environmental services, Sistemi has provided translation and interpretation services. When collecting

samples at the residences of U.S. personnel, technicians from Sistemi Industriali were present to support the Tetra Tech technicians. This allowed for Sistemi technicians, who are fluent in Italian, to assist in interacting with landlords, if needed.

U.S. Consulate, Naples

The U.S. Consulate, Naples engages in a full range of U.S. Government activities and services to look after its commercial interests and the welfare of U.S. citizens in Naples. The U.S. Consulate, Naples has provided guidance and aid to PHE team members in regards to the best methods for contacting and coordinating with Italian regulatory authorities and elected officials.

Primary Stakeholders

Although various stakeholder groups have been a part of the PHE communication program, communication activities have primarily been focused on three stakeholder groups: U.S. military and civilian personnel, Italian regulatory agencies, and landlords. Following is a discussion of activities that have occurred for these stakeholders.

U.S. Military and Civilian Personnel

U.S. military and civilian personnel and their families living in Naples have been the principal stakeholder group for the PHE. The PHE was conducted for the health and safety of U.S. personnel and their families serving in Naples. As such, the communication strategy for the PHE has centered on this stakeholder group. Communication activities for U.S. personnel and dependents have been ongoing, to promote frequent and consistent communication about the PHE, as well as activity-specific, for those PHE activities that were anticipated to generate a heightened interest or concern. See below for an overview of the communication objectives and activities.

Italian Regulatory Agencies

Building relationships with Italian elected officials and regulatory agencies and fostering those relationships throughout the PHE and beyond has been important to the success of the PHE.

The Italian Government designated three POCs to whom Navy correspondence, updates, and requests for information could be addressed. The three POCs were from the following agencies: (1) National Department of Civil Protection (*Dipartimento Nazionale della Protezione Civile*), General Director, International Relations Office, Rome; (2) Health Department, Campania Region (*Assesorato alla Sanita'*), Councilman, Naples; (3) Environmental Department, Campania Region (*Assesorato all'Ambiente*), Councilman, Naples.

To provide consistency in communication, the PHE team members designated the Regional Health Awareness Working Group (RHAWG) team leader and the EHIC as the points of contact for the Italian POCs. The U.S. Consulate, Naples has provided counsel to the Navy regarding timing of communication activities and methods of communication.

To promote working relations and encourage Italian governmental action, the three POCs and, as needed, other Italian regulatory agencies and elected officials, have been kept apprised of PHE activities and findings. Depending on the topic of communication, these stakeholders were usually apprised of new information prior to notification to the media and/or general public. The primary methods of communication have been by e-mail and official letter correspondence. Less frequently, communication methods have included telephone calls and briefings.

Prior to the initiation of the PHE, a meeting was held in November 2007 in Rome, Italy, between CNREURAFSWA and Italian authorities to discuss the Navy's objectives in conducting the PHE and to seek approval to conduct the study. CNREURAFSWA and the Italian authorities agreed to work together to identify potential health risks that may be associated with illegal dumping and inadequate garbage collection.

To update the Italian environmental authorities and promote working relations, PHE team members met with key members of the National Institute for Environmental Protection and Research (ISPRA - *Istituto Superiore per la Protezione e la Ricerca Ambientale*) on 26 August 2009 in Naples. A second purpose of this briefing was to promote the exchange of scientific and technical information. After a detailed briefing on the history of the PHE and findings of Phase I sampling, the 1,500-foot Step-Out investigation in Casal di Principe, activities in Phase II, and an overview of the epidemiological studies, ISPRA suggested an Italian working group be established to interact jointly with the Navy. There was no follow-up by ISPRA with the Navy, and therefore this technical working group was never established.

Landlords

There are approximately 3,800 off-base private rental properties listed in the NSA Naples Housing Office database. These properties are located throughout the PHE's 395-square-mile study area. Through NSA Naples Housing, the Navy has had direct relationships with the landlords of these properties. Additionally, there are currently two government-leased Parco properties (Parco Le Ginestre and Parco Eva) that exclusively house U.S. personnel. Coordination with the landlords of these Parco properties has been administered through Naval Facilities Engineering Command (NAVFAC) EURAFSWA Real Estate.

NSA Naples Housing Office has assisted U.S. personnel in negotiating leases with the off-base private rental properties, and as a result of the PHE, has worked with landlords to ensure that the landlords understand the required mitigation measures that must be implemented at the property.

Overall, routine Navy interaction with landlords on PHE housing issues has been frequent, with most communication taking place over the phone or in-person at the Housing Office. Communication to landlords usually has been about issues specific to the property, such as sampling results, required mitigation actions, or ability to maintain their property on the housing referral list. To aid in the availability of information, pertinent fact sheets have been translated into Italian and distributed on an as-needed basis. PHE-related fact sheets have generally been provided to a landlord by the sampling team while collecting samples at a property, or by Housing personnel at the Housing Office.

On 28 August 2009, the PHE team hosted a meeting for landlords at the NSA Naples Housing Office. The purpose of the meeting was to inform landlords from the Casal di Principe area about the 1,500-foot Step-Out groundwater investigation and subsequent relocation of Navy families. The PHE team also discussed the New Lease Suspension Zones (NLSZs) and provided an opportunity for landlords to voice questions and concerns. Landlords were told of the Navy's 26 August 2009 meeting with Italian authorities and were encouraged to talk to their local environmental and public health representatives. Nearly 50 people attended the meeting, including elected official representation and family members and friends.

Ongoing Outreach Methods

Public Affairs activities have been ongoing since the PHE began in 2008. Communication activities have been consistent and frequent to meet several overarching communication objectives, including increasing confidence in Navy Leadership's commitment to the health and well-being of U.S. Naples personnel and their families, raising awareness about the Naples PHE, and keeping stakeholders continually informed in a timely manner.

This section provides a summary of communication methods that have been ongoing throughout the PHE communication program. The purpose of using several communication methods has been to increase the likelihood of reaching all intended stakeholders.

Media

There are several media outlets that have covered the PHE. They are described below.

Panorama

The *Panorama* has included a weekly column dedicated to the PHE. Articles, reviewed by NMCPHC (and select PHE team members depending on the topic), have been submitted by CNREURAFSWA Public Affairs.

The *Panorama* is a base newspaper published electronically and in hardcopy on Fridays and is available for free at NSA Naples newsstands. An electronic copy can be downloaded from the NSA Naples website. Many Italian media outlets have monitored the *Panorama* for PHE-related news stories. The website address is https://www.cnic.navy.mil/Naples/Newsroom/Panorama/index.htm.

American Forces Network (AFN), Naples

Informational news spots have aired, and a link to the PHE website has been posted on the AFN Naples website. CNREURAFSWA Public Affairs has been informing AFN when there is a news story of potential interest to stakeholders. Additionally, AFN has been used to raise awareness of PHE activities and mitigation actions.

AFN Naples is a U.S. Navy, Air Force, and Army staffed radio and television station serving the greater Naples and Gaeta areas. It provides radio and television service to more than 15,000 Department of Defense (DOD) and NATO military and civilian personnel and their families. The station is owned and

operated by the Defense Media activity as part of the American Forces Network Europe. One of its missions is to broadcast command information products designed to keep the community informed. Many Italian media outlets have monitored AFN for PHE-related news stories or have used AFN footage in their news coverage. Its website address is http://naples.afneurope.net/Default.aspx.

Stars and Stripes, Europe

This daily newspaper has periodically published news articles about the PHE, and frequent inquiries from its reporters have been received by CNREURAFSWA Public Affairs. On occasion, CNREURAFSWA has granted permission to PHE team members, particularly the NMCPHC technical leader, to participate in in-person or phone interviews. CNREURAFSWA Public Affairs has routinely informed *Stars and Stripes* reporters of new PHE activities or findings as a means to distribute information to U.S. personnel.

Stars and Stripes is a DOD-authorized, editorially independent, daily newspaper distributed overseas for the U.S. military, DOD civilians, contractors and their families. Readership of the European edition is about 80,000 people, and distribution includes Belgium, England, Germany, Luxembourg, Italy and Spain. Many Italian media outlets have monitored this newspaper for PHE-related news stories. Its website address is http://www.stripes.com/.

Navy NewsStand

The mission of the Navy NewsStand is to serve as the official source for U.S. Navy news. Typically, PHE news releases have been sent to the Navy NewsStand to broadcast information to a wider audience. The website address is http://www.navy.mil/swf/index.asp.

Italian Media

Several Italian newspapers have frequently published articles about the PHE and the widespread illegal waste disposal in the Naples area. CNREURAFSWA Public Affairs has distributed news releases to major local Italian media outlets, has worked closely with reporters, and has occasionally received inquiries and requests for interviews. Reporters were invited to attend the Phase I and Phase II open house sessions. Italian media are listed below.

PHE-related press releases are distributed to:

- RAI 3 – regional television news edition of RAI State TV (http://www.raitre.rai.it/dl/RaiTre/home_r3.html)
- ANSA – Italian newswire agency that has frequently publishes PHE-related stories on their website (http://www.ansa.it/)
- *Il Mattino* – Naples' top-circulation daily newspaper; has been highly interested in the PHE and frequently submits inquiries (http://www.ilmattino.it/)
- *La Repubblica* – a top circulation newspaper in Italy with local editions; it has occasionally published PHE-related stories (http://www.repubblica.it/)
- Mediaset – owns television, radio and newspapers; PHE-related stories have been published on the Tgcom news website

- *Corriere del Mezzogiorno* – daily, local edition newspaper of top circulation
- *Corriere della Sera* – daily, local edition newspaper of top circulation; has occasionally published PHE-related stories

In addition to the above, the following Italian media are monitored for PHE-related news coverage, but are not on the press release distribution list:

- Mediaset Tgcom – news website (http://www.tgcom.mediaset.it/)
- *Il Roma* – newspaper owned by Mediaset (http://www.ilroma.net/)
- *L'Espresso* – Friday publication issue of *La Repubblica* (http://espresso.repubblica.it/)
- *L'Unità* – daily newspaper (http://www.unita.it/pubblicita)
- *Cronache di Napoli* – local newspaper for Naples (http://www.cronachedinapoli.org/)
- *Corriere di Caserta* – local newspaper for Caserta (http://www.corrieredicaserta.net/index.htm)

All Hands E-mails and Meetings

Updates, advisories and meeting notices have been provided to personnel on an as-needed basis through All Hands e-mails and All Hands meetings. Updates have also been provided to personnel via their chain-of-command. All Hands town hall meetings covering issues related to the PHE have been occurring on a regular basis since early 2008.

Website

A public website for the PHE, called the "Naples Community Health Awareness" website, was established at the onset of the PHE and has included information and documents related to the project. The website address has been included on all informational materials, including All Hands e-mails and articles published in the *Panorama*. The weekly *Panorama* articles have been posted under the "What's New" section of the website. Links to the website could be found from the CNREURAFSWA and NSA Naples home pages, as well as the home pages of AFN and of Commander U.S. Naval Forces Europe/U.S. Naval Forces Africa/U.S. Sixth Fleet.

The website has also included a Web-based form called "Health Risk Assessment Questions Form" that viewers can use to submit questions or comments to the PHE team. The form has been accessible through the "Contact Us" link on the website, and viewers have had the option of requesting a response to their submission. This feature was introduced in March 2008.

The PHE website address is
https://www.cnic.navy.mil/Naples/CommandInformation/HealthAwareness/index.htm.

Informational Materials

Fact Sheets

Numerous fact sheets covering a wide range of topics related to the PHE have been developed. These fact sheets have been made available on the PHE website, at the EHIC, the Capodichino Clinic, and NSA

Naples Housing Office. The fact sheets have also been distributed at meetings, such as the Phase I open house sessions. In addition, some fact sheets have been translated into Italian. Fact sheet topics include:

- Active Soil Gas Sampling (English and Italian)
- Air Quality and Meteorological Monitoring Program
- Asthma Epidemiological Study
- Background Arsenic Levels in Soil and Water
- Birth Defects Epidemiological Study
- Bottled Water Safety
- Building Structures and Vapor Intrusion (English and Italian)
- Cancer Epidemiological Study
- Chemicals and Microorganisms Analyzed
- Drinking Water Disinfection
- Drinking Water Testing Parameters
- Drinking Water Notification for Total Coliform/Fecal Coliform (English and Italian)
- Epidemiology
- Food On and Off Base
- Hard Water
- Investigating Groundwater in Casal di Principe (English and Italian)
- Mozzarella di Bufala Cheese
- Navigating the Agenzia Regionale per la Protezione Ambientale della Campania (ARPAC) Website
- Nitrate in Tap Water
- Passive Soil Gas Sampling
- Public Health Evaluation Phase I Summary of Findings
- Sampling of Vacant Homes (English and Italian)
- Tap Water Bacteria
- Tap Water and Soil Sampling
- Understanding the Vapor Intrusion Mitigation System being Installed at the Capodichino Child Development Center
- Vapor Intrusion
- Volatile Organic Compounds
- Water Contamination (English and Italian)
- Water Holding Tank Disinfection (English and Italian)
- Water Quality Monitoring
- What Happens after Samples are Collected from my Residence?
- What is a Public Health Evaluation?

Handouts

Handouts (in both English and Italian) have been developed to assist landlords and residents with the completion of required mitigation actions, and to provide information to stakeholders on other PHE topics. These handouts have been made available through the NSA Naples Housing Office, PHE website, and meetings such as the Phase I open house sessions.

- Phase I PHE Air Sampling Schedule
- Naples Community Health Awareness brochure
- Approved Water Vendors
- New Lease Requirements
- Water Service Request Form

Frequently Asked Questions

Documents containing "Frequently Asked Questions" have been typically prepared for PHE activities anticipated to generate a heightened interest from stakeholders. The FAQs documents contain anticipated stakeholder questions and plain-English responses. FAQs have been posted to the PHE website, and have been used to prepare PHE team members to interact with stakeholders or to become more familiar with the PHE activity in question.

Area Orientation and Outgoing Personnel Briefs

New personnel arriving to NSA Naples must attend an orientation/welcome brief once they arrive. An overview of the PHE has been provided at the briefs, and attendees have been made aware of the EHIC and its resources. The Housing Office also explains any leasing restrictions or requirements related to the PHE for those people seeking off-base housing.

When personnel leave their tour of duty in Naples, they must leave forwarding contact information (e.g., mailing address, e-mail address) with NSA Naples Housing Office. This has been useful to the PHE team in providing a way to contact personnel who leave Naples, for instances when the resident has left Naples prior to the completion of the environmental sampling report (i.e., "resident letters") for their home. With the forwarding contact information, the PHE team has been able to send the resident letter to the new address.

Immediate Notifications

The PHE technical team established an "Immediate Notification" process that outlined the steps to determine when preliminary laboratory testing results are of potential concern so as to notify the resident of the results as soon as possible. Residents that met the criteria for an "Immediate Notification" received a phone call from the EHIC. Using a call script developed by NMCPHC, the EHIC notified the residents of the preliminary laboratory testing results, explained the required or recommended actions the residents should take to reduce their health risk, and offered in-person health consultations. The EHIC was also able to answer health-related questions during the call.

The personal phone call has been an essential tool to personalize the information, deliver it in a sensitive and empathetic manner, and offer the opportunity for questions and an in-person health consultation.

Notification of Relocation

Residents of homes that showed a potential for vapor intrusion met the criteria for Immediate Notification. The required mitigation action was relocation to another home, depending on the resident's Projected Rotation Date (PRD). The communication process for relocation was as follows:

- A phone call to the resident explaining the testing results and the need for relocation was made by the EHIC. Using a call script developed by NMCPHC, the EHIC notified the resident of the testing results and health risk assessment, explained the need to relocate, and offered an in-person health consultation.
- The resident received a formal "Orders to Move" letter from NSA Naples.
- The resident worked with NSA Naples Housing Office and the landlord to move forward with relocation.
- The landlord received a formal sampling report of the property after the resident received their sampling report.

Community Action Group

A Naples area Community Action Group (CAG) was established to serve as a liaison between CNREURAFSWA and NSA Leadership and military and civilian personnel. Although the CAG has not recently convened, it has been used to disseminate information to U.S. personnel and dependents. The CAG is made up of various representatives and ombudsmen from NSA Leadership, Public Works, Public Affairs, Protocol, CNREURAFSWA, Joint Forces Command Naples, Housing, DODDS, and the Naval Hospital Naples.

The CAG initially convened in November 2007. NSA Naples hosted the CAG every other week for six weeks, after which meetings continued monthly. In 2009, CAG meetings were hosted as needed.

Activity-Specific Outreach Methods

Activity-Specific Communication Plans

Activity-specific communication plans were developed to guide the PHE team in communicating activities that were anticipated to generate a heightened interest for stakeholders. In general, each communication plan included the following elements:

- Description of the purpose of the communication plan.
- Identification of stakeholders that may be affected or interested in the specific issue at hand.
- Description of the background and purpose of the PHE activity.
- Identification of potential communication issues that may result because of the activity.
- Development of communication objectives.
- Development of key messages.

- Identification of POCs for the identified stakeholders.
- Identification of communication methods to best interact with the identified stakeholders.
- Development of a timeline for the communication activities.
- Development of anticipated stakeholder questions.

Activity-specific communication plans were developed for the following sampling activities and PHE documents:

Sampling Activities

- Additional sampling at Parcos Eva and Le Ginestre
- 1,500-foot Step-Out sampling in Casal di Principe
- Vapor intrusion investigation for U.S. Government sites
- Vapor intrusion investigation sampling results and installation of a vapor intrusion mitigation system for the Capodichino Child Development Center

PHE Documents

- Phase I report
- Phase II report
- Epidemiological studies (Cancer, Asthma, Birth Defects)

Once the communication program for the specific activity was completed, communication materials that were developed specifically for that purpose were included as an appendix to the communication plan. For example, the appendix may have included fact sheets/handouts, flyers, call scripts, *Panorama* articles, All Hands e-mails, news releases, and media coverage.

Phase I Report Rollout

The Phase I report was a significant milestone in the PHE. Public release of the Phase I report took careful planning to ensure that all stakeholders were properly notified and had the opportunity to be involved. Residents and landlords involved in Phase I sampling were notified of the testing results for their home prior to the public release of the report. The U.S. Consul General, Naples and Italian regulatory agencies and elected officials were notified of the report and its overall findings. Local Italian media and American media (*Stars and Stripes*, AFN) were also notified and invited to the open house sessions. CNREURAFSWA Public Affairs, the EHIC, and NMCPHC were available to respond to stakeholder inquiries upon release of the report.

Communication Objectives

The following are communication objectives that were identified for the release of the Phase I report.

- Raise awareness about the Naples Public Health Evaluation and study results.
- Establish transparency (i.e., share results and significant findings).
- Foster trust in results.
- Communicate POCs and information resources.

- Promote appropriate level of concern.
- Communicate Navy actions as appropriate, timely and responsive.
- Encourage appropriate resident action.
- Build and foster cooperative relationships with Italian authorities and coordinate consistent messaging among them and the Navy.
- Encourage and support appropriate action from Italian authorities.

Key Messages

The following key messages were developed to support the communication objectives for the release of the Phase I report.

- The U.S. Navy is committed to ensuring our military families are safe while serving our country at home and overseas.
  - The Naples Public Health Evaluation is designed to evaluate the potential short and long-term health risks associated with living in the Naples area as a result of inadequate trash collection, uncontrolled open burning of uncollected trash, and widespread dumping of waste.
  - The Navy continues to evaluate potential health risks associated with living in the Naples area. A year-long Phase II effort is underway to better understand the extent of health risks across the Naples region.
  - The Navy provides ongoing recommendations on actions our military families can take to protect their health and safety.
- The Naples Public Health Evaluation is being conducted in multiple phases of sampling so that information learned during a phase can be used to shape how subsequent phases are conducted.
  - Although the Navy is taking immediate actions to address identified health concerns, the Navy cannot make conclusive determinations regarding all health risks and the path forward until all phases are completed.
  - The sampling phases include: the pilot study, conducted from April to June 2008; Phase I, conducted from June to November 2008; and Phase II, currently underway.
- The Navy is committed to continually sharing important health information.
  - The Navy has established an Environmental Health Information Center to provide staff to answer questions and provide up-to-date information about the Public Health Evaluation.
  - Updates and information about the Public Health Evaluation can be found on the NSA Naples Community Health Awareness website, weekly articles in the *Panorama*, All Hands e-mails and AFN news spots.
- The Navy is working with Italian authorities and sharing the results of the study.
  - Although the Navy does not have authority over Italian citizens, we feel it is important to share the results of our study and the Navy's actions so that Italian authorities can take appropriate actions as necessary for their citizens.
  - The Navy will provide whatever assistance we can to Italian authorities in understanding and interpreting the study results.

In preparation for interfacing with stakeholders and media during the Phase I open house sessions, key messages were also developed for each specific topic area.

Accomplished Milestones

- A Pilot Study resident meeting with pilot study tenants was held to debrief them on their individual letter reports (i.e., "resident letters"), get feedback, and incorporate lessons learned into the Phase I Study: 17 June 2008
- Phase I resident meetings were held to provide an overview of the PHE and discuss resident letters: February 2009
- The Phase I three-page Executive Summary and translated copy were sent to Italian officials, along with a CD-ROM of the Phase I Report: in April just prior to its release in May 2009
- The Phase I three-page Executive Summary was posted to the PHE website: 23 April 2009
- The Phase I Report was posted to the PHE website: 04 May 2009
- A risk communication training and dry run was held for the PHE team in preparation for the open house sessions: 05 May 2009
- Open house sessions were held at Capodichino and the Support Site Gricignano: 06 May and 07 May 2009
- A debrief for the PHE team was held to evaluate the open house sessions: 08 May 2009

Distribution of Phase I Resident Letters

Phase I included the collection of samples at 130 off-base private rental homes occupied by U.S. military and civilian personnel and their families. The individual letter reports for each home, referred to as "resident letters," were prepared as official Navy correspondence (i.e., serialized and signed by the NSA Naples Commanding Officer). The resident letters included a summary of the health risk evaluation for the individual home, laboratory testing results, comparison of testing results to U.S. Environmental Protection Agency standards and the Navy's PHE Risk Management Criteria, attachments describing the PHE risk assessment process, and fact sheets describing the chemicals of concern for that home.

To distribute the resident letters to the study participants, the EHIC contacted each resident via telephone. Residents had the option to either visit the EHIC to pick up their letter, attend one of the resident meetings to pick up their letter, or wait for it to arrive in the mail. Each "letter" was a packet that contained a cover letter summary of the health risk assessment and several attachments, including the testing results.

Phase I Resident Meetings

Small-group informational sessions were held in February 2009 for residents that participated in Phase I sampling. The purpose of the informational sessions was to present an overview of the Phase I testing results and resident letters, and to distribute the letters. Members from NMCPHC, PIONEER Technologies and the EHIC led the meetings. NSA Naples Housing staff was also available to answer questions during one-on–one conferences with residents.

Meetings were held over a one-week period, and a set number of meetings with specific times and locations was scheduled. Make-up sessions for those residents that were unable to attend the regularly

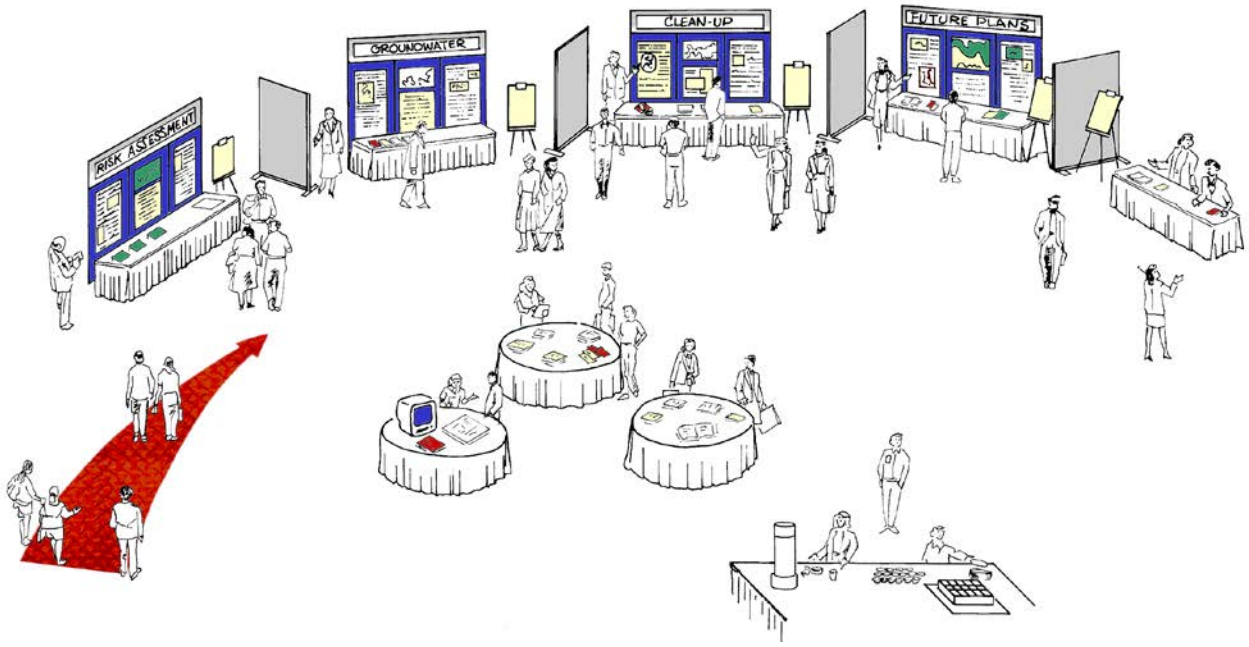
scheduled meetings were held the following week. NMCPHC led the first week of meetings and held two meetings per day. Approximately 10 to 15 individuals attended each meeting. The EHIC led the make-up sessions.

To organize attendance for the meetings, the EHIC contacted all Phase I residents by either phone or e-mail and asked which meeting they would like to attend. If a resident did not arrive at the meeting prior to its start, the EHIC called the resident to remind them of the meeting.

Phase I Open House Sessions

On 06 and 07 May 2009, open-house style information sessions were held to provide U.S. personnel and other interested parties the opportunity to speak with the Naples PHE team and subject matter experts concerning the PHE and Phase I results. An "open house," as used in this context, is a type of informal informational meeting designed so that interested parties can arrive and leave at any time during the event's duration. Informational poster displays with supporting materials, such as fact sheets and background documents, were set up in stations around the meeting room. This format allowed attendees to access information at their own pace and encouraged one-on-one interactions with the PHE team. The drawing below illustrates the setup of an open-house style poster station meeting.

Illustration of an Open-House Style Poster Station Meeting



Three sessions were held to maximize attendance. The first session was held at Capodichino Ciao Hall on 06 May 2009 from 1100-1400. The second and third sessions were held at the Support Site Gricignano Community Center on 07 May from 0930-1300 and 1530-1900.

At Capodichino, 31 attendees signed in. At the Support Site, a total of 35 attendees signed in (11 attendees in the morning session; 24 attendees in the afternoon session). Evaluation forms were available

to attendees throughout the open house sessions to collect information that would help improve future open house sessions and other PHE communication activities.

Meeting Objectives

The following are the objectives that were identified for the open house sessions.

- Foster open and transparent communication with military, civilian personnel and families.
- Communicate with a wider Navy audience, including on-base residents, off-base housing residents whose homes were not tested, and former off-base housing residents that had relocated to base housing.
- Inform military and civilian personnel about the PHE and significant findings of Phase I.
- Encourage appropriate resident action.
- Communicate Navy risk management actions.

Audiences

The targeted audiences for the Phase I open house sessions are listed below. Because the open house sessions were held on base, attendance was limited to those with access to the base and those who could be escorted on base.

- U.S. personnel and their family members living in Naples.
- Italians employed at the base that may live in one of the study areas.
- Media (*Stars and Stripes*, AFN, and Italian media (escorted on base)).
- Italian landlords of U.S. Government Leased properties (escorted on base).

Open House Stations and Topics

Each "station" included: one or two posters and supporting fact sheets; other informational materials such as background documents, reports and videos; and an open house/PHE evaluation form. One or two PHE team members or subject matter experts staffed each station to address concerns and questions from attendees. The following were the station topics:

- Welcome/Sign-In
- Purpose of the Naples PHE and Results of PHE Phase I (Risk Assessment)
- Navy Actions
- Food
- Water
- Air
- Soil
- Soil Gas (Vapor Intrusion)
- Health and Epidemiology
- Housing

Key Messages and Talking Points

Key messages and talking points were developed for each poster station. The purpose of key messages and talking points was to focus on the most important information and/or concepts that Navy desired each attendee to understand as they left each station.

Phase II Report Rollout

The Phase II report, like the Phase I report, is a significant milestone in the PHE. The identification of targeted stakeholders, communication activities, and team preparation will be similar to the release of the Phase I report.

Communication Objectives

At the time this report was written, communication objectives were not finalized.

Key Messages

At the time this report was written, key messages were not finalized.

Accomplished Milestone Dates

- A *Panorama* article and All Hands e-mail was published to notify residents that the Navy is preparing to send Phase II sampling reports to residents whose homes were sampled, via a new website distribution system: 19 March 2010.

Distribution of Phase II Resident Letters

As a more efficient method to printing and mailing numerous resident letters to residents that participated in Phase II sampling, a Web-based distribution system was created. In this distribution system, Phase II residents could retrieve their sampling reports online. The planned process is as follows: an automatic e-mail is generated and sent to all Phase II residents to notify them of the availability of their report. The e-mail contains a link to the distribution website, as well as an introduction to the sampling report. By accessing the link, residents can download and print the environmental sampling report for their home. An added benefit of the online distribution system is that personnel who have transferred from Naples could still access their report from any location where Internet access is available.

To aid residents in understanding how to read the resident letter, a "Quick Start Guide" was also developed and posted to the website. In addition, the website provides the EHIC's contact information, in case residents would like to discuss their report, and contains a link to the PHE website. At the time this report was written, to further assist residents in understanding their report and to address health-related concerns, informational meetings for Phase II residents are planned to be held, as was done in Phase I.

Phase II Resident Meetings

At the time this report was written, small-group informational sessions are planned to be held for residents that participated in Phase II sampling. Although residents will have already received their letter

of sampling results via the new Phase II notification website (discussed above), the informational sessions will be held to present an overview of the Phase II testing results and provide technical experts to answer questions and speak one-on-one with residents. Members from NMCPHC, PIONEER Technologies and the EHIC are planned to lead the meetings. NSA Naples Housing staff will also be available to answer questions during one-on–one conferences with residents.

At the time this report was written, meetings are planned to be held over a one-week period, and a set number of meetings with specific times and locations will be scheduled. In addition, make-up sessions for residents that are unable to attend the regularly scheduled meetings will be held the following week.

At the time this report was written, to organize attendance for the meetings, the EHIC will contact all Phase II residents by either phone or e-mail and ask which meeting they would like to attend. If a resident does not arrive at the meeting prior to its start, the EHIC will call the resident to remind them of the meeting.

Phase II Open House Sessions

At the time this report was written, open-house style information sessions are planned to be held to provide U.S. Navy personnel and other interested parties the opportunity to speak with the Naples PHE team and subject matter experts concerning the PHE and Phase II results, as was done for the Phase I report. These open house sessions will be held over multiple time periods and at both Capodichino and the Support Site in Gricignano to help maximize attendance.

Evaluation of the Communication Program

In 2008 at the onset of the PHE, four focus groups were conducted with the Chief's communities of major commands in Naples (NSA Naples, Region, CNE-C6F, Naval Computer and Telecommunications Station (NCTS)). The purpose of the focus groups was to seek ways to improve communication efforts specific to the PHE. Topics discussed included information resources, PHE awareness, and PHE-related health concerns.

Evaluation forms collected from U.S. personnel at various informational sessions were positive. Responses on these evaluation forms demonstrated that U.S. military and civilian personnel have been pleased with the communication program, including communication methods, content of informational materials, and frequency of communication.

In addition to the evaluation forms and focus groups, the following parameters have been used to assess the effectiveness of the PHE communication program:

- Media coverage has been generally positive and balanced.
- Italian authorities have acknowledged the PHE sampling results and have generally concurred with Navy actions.
- The Navy has built and fostered credibility as well as a positive working relationship with the Government of Italy and Italian officials.

- Off-base housing residents and incoming personnel have been aware of the PHE and advisories issued by the command and have been taking appropriate actions.
- Outgoing personnel have left forwarding contact information and have been informed as to who to contact for health-related questions.
- The Navy has been established as the "go-to" or primary source of information, and as a credible source.

As a result of a successful proactive communication program, the Naples PHE received the 2008 and 2009 Thompson-Ravitz Award for Excellence in Navy Public Affairs, for the category of internal communications for small shore installations. The Thompson-Ravitz Awards Program is designed to: (a) Recognize and reward the accomplishments and achievements of command public affairs programs and personnel; and (b) Encourage Navy units to maintain a public affairs program designed to: keep the internal and external audiences informed on current U.S. Navy activities, promote community relations, and foster continued mutual support in total force public affairs to include special projects and events (OPNAVINST 5305.7B of 17 Nov 08).

Enduring Processes

Although the PHE has ended, the implementation of mitigation actions or Enduring Processes will be ongoing. The frequent rotations of new personnel into the area will require that these personnel are informed of Enduring Processes and health protective actions, especially those mitigation actions that personnel are required to implement. A list of recommended Enduring Processes for risk communication and outreach can be found below and in Section 3.3. Previous residents can access the website to obtain information or post questions.

Methods for Continued Success

Although it is not an inclusive list, the following methods have contributed to the effectiveness of the PHE communication program. It is suggested that these methods continue to be implemented for continued success in communicating health protective actions.

- Continue to periodically assess feedback from U.S. personnel through evaluation forms and comment forms regarding the effectiveness of communication activities about Enduring Processes and other health protective measures.
- Continue to distribute information in a timely and consistent manner to all stakeholders, including personnel, Italian representatives, landlords, and media.
- Continue to update the Naples Community Health Awareness website in a timely manner.
- Continue to implement suggestions received by U.S. military and civilian personnel and their families, as appropriate.
- Continue to maintain the EHIC and inform U.S. personnel about the availability of health consultations and information resources at the EHIC.
- Continue to use the established communication methods to reach stakeholders.
- Continue to plan ahead for health-related communication activities, including identifying communication objectives and key messages, targeted stakeholders, and communication methods.

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APPENDIX B: RISK MANAGEMENT ACTIONS & ENDURING PROCESSES ALREADY IMPLEMENTED

Communication/Awareness/Outreach

- The following communication venues have been routinely used to keep U.S. Navy (USN) personnel current on Naples Public Health Evaluation (PHE) results:
  - Hands e-mails
  - Community town hall meetings
  - All Hands Commander Navy Region Europe, Africa, Southwest Asia (CNREURAFSWA) and Commander, Naval Forces Europe (CNE) staff meetings
  - Weekly PHE updates in the Naval Support Activity (NSA) Naples newspaper *Panorama*
  - CNRE Flag weekly updates to the Chain of Command
  - *Stars and Stripes* (European edition All) articles
  - American Forces Network (AFN) Naples articles, radio, and television stories
  - Periodic press conferences with Italian media (e.g., *Il Mattino*, *La Repubblica*, *Il Roma*, *L'Espresso*)
  - Hired full-time Italian translator to scan, translate and distribute relevant articles of public health interest appearing in Italian media
  - Periodic meetings between CNREURAFSWA/NSA Naples/U.S. Consulate, Naples/North Atlantic Treaty Organization (NATO) Leadership and Italian government officials
- Developed and maintained NSA Naples Community Health Awareness website at: https://www.cnic.navy.mil/Naples/CommandInformation/HealthAwareness/index.htm, which includes the following content: weekly updates, fact sheets, frequently asked questions (FAQs), links, correspondence, archives, maps, historical timeline, medical studies, and PHE reports.
- A full-time Reserve Commander Public Affairs Officer (PAO) was mobilized and assigned as primary PAO to the Naples PHE.
- U.S. Naval Hospital Naples, under the direction of the Director of Occupational and Environmental Medicine, established and staffed an Environmental Health Information Center (EHIC), which acts as a central point of contact for concerned personnel to either call or visit to obtain information regarding PHE findings and to have their health concerns discussed. In addition, the EHIC also makes immediate notification calls to residents whose homes were sampled and that may have results that exceed the USN's risk management criteria for notification and/or relocation.
- Weekly PHE technical teleconferences between CNREURAFSWA/NSA Naples Action Officers, NMCPHC, NAVFAC and contractors (e.g., Tetra Tech, PIONEER) to discuss technical issues, project schedule and review project status. Minutes are generated.
- Biweekly teleconference Regional Health Awareness Working Group (RHAWG – members include: CNREURAFSWA, NSA Naples, NMCPHC, PAOs, Housing, Legal, Naval Hospital,

Environmental, PHE Technical Team) to discuss any and all issues germane to conducting the PHE. Minutes are generated.

- Chartered the Community Action Group (CAG), chaired by the NSA Executive Officer and comprised of ombudsmen, CNREURAFSWA and NSA Naples Leadership and community representatives who have met periodically to address issues of concern regarding the PHE and the health and environmental issues it is addressing. Minutes are generated.
- For the first time, Water Quality Consumer Confidence Reports (CCRs) were developed and posted on the NSA Naples website for Capodichino, Gricignano Support Site and Gaeta at: https://www.cnic.navy.mil/Naples/Departments/EnvironmentalSupport/DrinkingWaterCCR/index.htm.
- Established both the local and regional CNREURAFSWA Water Boards to address drinking water quality issues pertinent to their area of responsibility (AOR) in Europe and Southwest Asia.
- Posted Non Potable Warning Signs for sprinklers on Government Sites based on sampling results from irrigation water wells that exceeded the Navy's risk management criteria.

Legal

- Developed and managed the CNREURAFSWA Administrative Record Portal to record and maintain proper documentation of PHE-related records.
- Obtained legal opinion from Italian legal authorities on obligations and liabilities of the U.S. Government in connection with the conduct of the PHE in the provinces of Naples and Caserta.

Legal – Water Quality

- CNREURAFSWA requested the Secretary of the Navy to authorize the use of Emergency and Extraordinary Expense EEE funds for the provision of potable water to USN personnel in homes privately leased in the Naples and Caserta provinces of the Campania region. The Secretary of the Navy (SECNAV) granted the request, and NSA Naples and Navy Exchange (NEX) Naples began distributing bottled water within hours of CNREURAFSWA's receipt of the EEE funds ($144,000 or 457,143 liters). In addition, a second request to SECNAV for $118,000 was requested and received.
- Requested advice from the U.S Department of State, Office of Allowances, regarding the use of allowances for containerized water and that an "out-of-cycle" utilities survey be conducted for the greater Naples area at the earliest possible date.
- Requested that the Department of Defense (DOD) Per Diem Travel & Transportation Allowance Committee grant a temporary augmentation of the military utilities allowance for containerized water and conduct an accelerated "out-of-cycle" utilities survey for the greater Naples area at the earliest possible date.
- Directed NSA Naples to modify economy leases to require all landlords to provide tenants with a containerized water service that is from a Navy-approved source for drinking, food preparation, cooking, brushing teeth, making ice, and pets.
- Directed Naval Facilities Engineering Command (NAVFAC) EURAFSWA to modify leases for U.S. Government quarters to require all landlords to provide tenants with a containerized water

service from a Navy-approved source at all U.S. Government Parcos and Flag Officer Quarters for drinking, food preparation, cooking, brushing teeth, making ice, and pets.

- In Phase I, directed NSA Naples to limit Housing Eligibility List to only those homes with proven safe-water sources through "pre-screening" sampling prior to move-in.
- Directed NSA Naples to modify economy leases to require all landlords to clean and disinfect all supplementary drinking water systems (e.g., storage tanks) every six months.
- Directed NSA Naples to modify economy leases to require that if a home's tap water supply is connected to a well, the landlord must provide verification that the well is legal according to Italian law. Otherwise, the home must be disconnected from the well and connected to the public drinking water system.
- With the assistance of the U.S. Consulate, Naples, NMCPHC and NAVFAC EURAFSWA, CNREURAFSWA defined high-risk areas and directed that NSA Naples suspend all new leases in those areas until further notice. Similarly, when environmental sampling results indicated a house was Unacceptable, CNREURAFSWA directed that NSA Naples suspend further leasing of homes pending completion sampling and analysis.
- Directed NSA Naples to remove Unacceptable economy homes from the eligibility list until the appropriate Italian governmental agencies have concluded that (and the U.S. Navy has concurred) the nature and extent of contamination has been fully characterized, remedial actions are in place, and soil, soil gas, and tap water concentrations are protective of human health.

Science

- Developed and maintained an Environmental Information Management System (EIMS) website for technical team members to access reports, sampling results, maps, and other technical information.
- New Lease Zones (NLZs) were defined preventing signing of any new leases in these areas pending completion of additional sampling and evaluation. This was accomplished using multiple lines of evidence, discovered during Phases I and II of the PHE process:
    - Sampling results (both U.S. and Italian) for arsenic, nitrates, bacteria and volatile organic compounds (VOCs) showing Unacceptable levels in tap water, irrigation wells, and private wells
    - Illegal hazardous waste dumping and potential soil and/or groundwater contamination
    - The age of the municipal drinking water distribution system
    - Lack of code enforcement by Italian authorities
    - Lack of code compliance by landlords
    - Lack of compliance with backflow prevention laws
    - Systemic low pressure issues
    - High incidence of illegal private wells
    - High incidence of illegal interconnects to the public drinking water system
    - High incidence of "blended" systems (well + municipal water) due to illegal interconnections
- 2008 First "step-out" investigation (500 ft) was begun in response to sampling results indicating potential soil and/or groundwater contamination with tetrachloroethene (PCE).

- 2009 second "step-out" (1500 ft) sampling, including active soil gas sampling, in the New Lease Suspension Zone (NLSZ) was begun to determine the boundary of the suspected soil and/or groundwater contamination.
- Forty (40) families whose homes had Unacceptable sampling results that could not be mitigated, thus necessitating a move out, have been contacted by the EHIC. Commanding Officer NSA Naples has sent an official letter directing relocation to all 40 families concerned, and NSA Naples Housing monitors the timeline on mandatory move-out dates. In addition, there were 21 families that voluntarily chose to move out of the NLSZs.

Science – Epidemiological Studies

The following epidemiological studies were released upon completion and are included as appendices to this report.

- Asthma study – Completed on 10 October 2007
- Updated asthma study – Completed on 07 June 2010
- Birth defects – Completed on 22 December 2008
- Cancer study – Completed on 31 March 2009

Review of Italian Health and Environmental Literature

Eighty eight (88) Environmental documents and 16 health documents have been translated and reviewed for validity and pertinent information of use to the Naples PHE.

Science – Water Quality

- On 30 July 2007, CNRE signed a Drinking Water Management Instruction (COMNAVREGEURINST 11330.1) which established the policy for management of drinking water systems at CNRE installations.
- In Phase I, based on preliminary findings of widespread bacterial exceedances in tap water (well water and blended water), CNRE implemented a Bottled Water Advisory in July 2008. This advisory recommended that all USN personnel residing off-base use containerized water for drinking, food preparation/cooking, ice-making, and brushing teeth.
- Negotiated the supply of potable water from the Town of Pozzuoli into the Carney Park Recreation Facility to service various activities (e.g., pools, showers, golf course, restaurant, cabins, etc.) used by USN and host nation personnel.
- In fiscal year 2009, procured funding and installed a Water Treatment System at the Naval Computer and Telecommunications Station (NCTS) Lago Patria Receiver Site to bring in potable water for the first time.

Host Nation Cooperation & Coordination

- Working with the U.S. Embassy in Rome, and the U.S. Consulate, Naples, established three permanent Italian Government Liaisons to share sampling results and consult with:
  - **Civil Protection:** Dott. Agostino Miozzo
    Mailing Address: General Director, International Relations Office

Via Vitorchiano 400189 Roma
Phone: 329.410.4386
E-mail: agostino.miozzo@protezionecivile.it

- **Assesorato alla Sanita'**: Assessore (Councilman): Mario Santangelo
  Mailing Address: Regione Campania - Assessorato alla Sanita', Centro Direzionale - Isola C3, 80143 Napoli
  Phone: 081.796.9271/081.796.9272; Fax: 081.796.9377
  E-mail: ass.santangelo@regione.campania.it
- **Assesorato all'Ambiente**: Assessore (Councilman): Prof. Walter Ganapini
  Mailing Address: Via De Gasperi, 28 - 80134 Napoli
  Phone: 081.796.3030/081.796.3032; Fax: 081.796.3207
  E-mail: ass.ganapini@regione.campania.it

- The Naples PHE Phase I data summary for water, soil and soil gas environmental sampling, the nine study area map, the summary of the U.S. Environmental Protection Agency (USEPA) methods that were used to analyze the samples along with their respective method detection limits, and translated cover letter was emailed to the three official Italian points of contact and the U.S. Consulate, Naples on 9 January 2009. Following this, the entire Final Phase I report was posted to and available on the NSA Naples website.
- This process (as described above) has been repeated for the Naples PHE Phase II Report.

Enduring Processes

As a result of the Navy's proactive approach to PHE findings, the following Enduring Processes have been implemented to protect the health of U.S. personnel now and into the future.

- NLSZs limiting rental access to housing areas with demonstrated Unacceptable levels of health risk due to tap and groundwater contamination.
- Directive issued to use only "bottled water" for all ingestion purposes (drinking, food preparation/cooking, ice-making, and brushing teeth).
- Lease clause requiring landlords to provide only Navy-approved containerized water service.
- Only homes with proven connection to the municipal water supply or with certified legal wells (none certified to date) are available to lease through NSA Naples Housing.
- Lease clauses now require landlords to clean and sanitize all water holding tanks and distribution systems prior to new lease and every six months thereafter.
- Establishment of the EHIC at Naval Hospital Naples.
- Data sharing process established with host nation public health officials.
- Creation and maintenance of NSA Naples Community Health Awareness website – a central repository for up-to-date information pertaining to the PHE.
- Creation of an Administrative Record website on the CNIC Portal.
- Creation of a NSA Naples Housing Site database based on information acquired from a hand-held Global Positioning System (GPS) that is being used to develop/support a Geographic Information System (GIS) database (in progress).

- Successfully negotiated with the city of Pozzuoli bringing in municipal drinking water to the U.S. Navy Carney Park Recreation Facility to replace reliance on bottled water.
- Successfully funded and installed a Water Treatment System at the U.S. Navy Lago Patria Receiver (Telecommunications Station) to replace reliance on bottled water.
- Installed a Vapor Intrusion Mitigation System at the Capodichino Child Development Center. Although the sampling results were Acceptable, this was done as a conservative health protective measure due to the sensitive population.

These and other planned initiatives have fundamentally changed the way we screen, evaluate, and list houses for rent on the economy, and provide drinking water to our outlying government facilities.

APPENDIX C: DRINKING WATERS IN ITALY – ANALYSIS AND EVALUATION OF QUALITY 2008

By M. Imperato, M. Guida, and M. Trifuoggi
University of Frederico II Naples

This Italian study has been translated into English and can be found on the following pages.

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READY FOR PRINTING

Rivista Italiana d'Igiene, vol. 68 (4-6), 1-17, 2008

Drinking water in Italy: quality analysis and evaluation

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INTRODUCTION

The health and hygiene issues associated with water usage have for years aroused the interest of the scientific community and especially of the consumer. The Italian scientific literature in this field mainly refers to the contaminated state of the subterranean water destined for drinking use due to geoenvironmental and anthropogenic factors and often demonstrates a significant reduction in the quality of water resources at their source (1-4).

The objective of this study, conducted on a national scale, is to assess the quality of the water "drunk" by the Italians, on the basis of characteristic elements, trace elements and contaminants. The results obtained are not compared to the limits dictated by the regulations currently in force (legislative decree 31/2001, ministerial decree 542/1992 and subsequent additions and modifications). State agencies verify compliance with these limits through a rigorous and comprehensive system of testing and monitoring. However, the plans for water surveillance may turn out to be insufficient in all countries, regardless of their level of socio-economic development, particularly with regards to the assessment of microbiological and chemical risks. Hence, for some years now the aim has been to use what is defined as the *Water Safety Plan* (5), an integrated plan aimed at prevention and identification of the critical points in the entire system in order not only to reach the minimum criteria required by the regulations currently in force, but above all to continually improve the quality of the water used.

To this end, the study, by examining the quality of the water actually "drunk" in Italy, aims to identify the critical elements, and also takes into account all the adverse changes caused by unexpected variables.

MATERIALS AND METHODS

Field of application

This study examined the water drunk in Italy: potable water (AP[1]) from the water distribution network and bottled mineral water (AM[2]). The AP was sampled directly at the point of use, the household tap, whereas the AM was purchased in retail outlets all over the country.

Sampling

In the period from November 2008 to February 2009, 209 samples of potable water from the water distribution network were taken in 17 of Italy's regions. More specifically, the samples were taken in 50 cities with an estimated total resident population of 12,055,969 inhabitants thus distributed: Piedmont (1,051,611), Liguria (701,698), Lombardy (1,704,272), Trentino-alto Adige (199,935), Veneto (779,440), Friuli-Venezia Giulia (306,214), Emilia-Romagna (1,513,832), Tuscany (636,280), Umbria (254,143), the Marche (167,152), Latium (2,448,519), Abruzzo (184,789), Molise (21,152), Campania (1,214,896), Basilicata (69,060), Puglia (673,768), Calabria (129,208). The number of samples taken in each city was chosen so as to achieve a sampling density of 1:60,000 with respect to the number of inhabitants.

Over the same period, 144 samples of mineral water of 24 different brands from retail outlets packaged in 1-, 1.5- and 2-litre PET bottles were taken so as to cover 73% of the total Italian market (6). In this case, the products used as samples were always purchased in regions other than the production site.

Chemical and physico-chemical analyses

All the chemical and physico-chemical analyses were carried out according to standard methods (7, 8).

In particular, the residual chlorine and all the related chemical species (free, combined and total residual chlorine; monochloroamine; dichloroamine; chlorine dioxide and chlorite) were determined following reaction with N, N,-diethyl-p-phenylenediamine (DPD), using spectrophotometric titration at a wavelength of 510 nm. The *in situ* measurements were carried out using a Hach-Lange spectrophotometer.

The determination of the anions was carried out using a Metrohm chromatographic system, based on a

[1] AP stands for "acqua potabile", meaning potable water, from the original text.
[2] AM stands for "acqua minerale", meaning mineral water, from the original text.

733 IC separation centre, a 754 IC dialysis unit for chemical suppression, a 853 CO_2 suppressor and a double detection system (819 IC conductivity detector and Lambda 1010 UV detector) with a Metrosep A SUPP 5 250 column (4.0 mm x 250 mm), styrene/divinylbenzene resin with quaternary ammonium groups and a Metrosep A Supp 1 GUARD precolumn made from the same material; 1.0 mM $NaHCO_3$ and 3.2 mM Na_2Co_3 as elements.

The determination of the cations was carried out using a Metrohm 761 IC system with a Metrosep C2 150 column (4.0 mm x 150 mm) made of silica with carboxyl groups and Metrosep C2 GUARD precolumn of the same material; 4.0 mM tartaric acid and 0.75 mM dipicolinic acid as eluents.

The determination of the metals and trace elements was carried out using a plasma inductance coupling technique with a quadrupole mass spectrometry detector (ICP-QMS); for this purpose an Agilent Technologies 7500 ICP-MS device with a Babington nebulizer, glass spray chamber and one-piece quartz torch with autosampler probe was used.

The determination of the THMs and volatile organohalogen compounds was carried out using gas chromatography with ECD and FID detectors (HP Agilent 6890 EPC with micro-ECD and HP Agilent 6890 EPC with FID), Zebron ZB 624 columns (0.25mm id, 1.4 μm stationary phase film thickness). The samples, collected in 20 ml vials, were pre-heated at 60°C for 45 minutes; the headspace (0.5 ml) was injected into the gas chromatography instrument at a programmed temperature T = 30°C for 5 minutes; from T = 30°C to T = 180°C at 4°C/min; at T = 180°C until the exit of the last analyte, for a total of 40 minutes. The analyses were carried out between 1 and 5 days after sampling, on samples stored at 4°C.

Microbiological analysis

The microbiological analysis was conducted on an aliquot of the total samples (5 regions for a total of 64 samples). The analyses were carried out according to the requirements laid down by the regulations currently in place for health and hygiene checks on water destined for human consumption (legislative decree 31/01) and mineral water (ministerial decree 542/1992, modified by the Health Minister's decrees of 31/05/2001 and 29/12/2003 and subsequent additions and modifications).

Statistical analyses and spatial distribution map

The data was subjected to statistical and descriptive analysis in order to define the frequency distributions. The calculation of the degree of association between the Normally-distributed variables was based on the calculation of the value of the correlation coefficient (r) tested at the 5% significance level according to the following formula:

$$[|t\text{-test}| = |r| \quad \sqrt{(n-2)/(1-r^2)} \quad > t(n-2; \alpha/2)]; \ 5\% \ SL$$

The analysis of the geometric distribution of all the variables was carried out to check the spread of the data and help interpret the results.

The total concentrations of certain analytes were used to construct *contour maps* using *Kriging* geostatistics (9).

RESULTS AND DISCUSSION

Characteristic elements

The descriptive statistics of the analyses carried out on the AP and AM relative to the characteristic elements is shown in Table 1. The bicarbonate concentration ranges from 4 a 1345 mg/L for the AM and from 31 to 555 mg/L for the AP, with very similar median values, respectively 270 and 275 mg/L. In much the same way, very similar median values were found for potassium, silica and calcium, for which the minimum and maximum values varied respectively from 0.10 a 53 mg/L for the AM and from 0.20 a 26.4 mg/L for the AP, from 1.80 to 80 mg/L for the AM and from 1.10 a 46 mg/L for the AP and lastly, from 0.90 to 353 mg/L for the AM and from 5.90 to 141 mg/L for the AP.

Sodium and chloride showed fairly similar statistical distributions. For the former, the concentration ranges for the AM between 1.10 and 69 mg/L and for the AP between 1.70 and 178 mg/L, with median values respectively 4.80 and 11.25 mg/L; for the latter, the concentration ranges between 0.30 and 74 mg/L for the AM and between 0.40 and 112 mg/L for the AP, with median values respectively 7 and 17.35 mg/L.

Furthermore, from the analysis of the geometric distribution of the data, visualized using box plots (Figure 1), following the 75th percentile for the AM, it can be seen that water with significant levels of nutrient mineral elements may be found on the market

Table 1 - Characteristics of water sampled, minimum, maximum, median, mean and standard deviation values shown.

		AM					AP				
	Units	**min**	**max**	**median**	**mean**	**s.d.**	**min**	**Max**	**median**	**mean**	**s.d.**
EC	µS/cm	20	1698	423	569	501	48	1066	491	506	190
Bicarbonate	mg/L	4	1345	270	342	366	31	555	275	287	102
Silica	mg/L	1.80	80.00	9.30	17.66	22.44	1.10	46.00	12.00	13.08	7.93
Chloride	mg/L	0.30	74.00	7.00	12.28	18.50	0.40	112.00	17.85	23.08	22.21
Sulphate	mg/L	0.80	380.00	13.00	38.30	82.82	0.50	180.00	29.80	37.01	36.33
Sodium	mg/L	1.10	69.00	4.80	14.43	19.61	1.70	178.00	11.25	18.90	23.92
Potassium	mg/L	0.10	53.00	1.00	7.33	15.22	0.20	26.40	1.70	2.83	3.44
Calcium	mg/L	0.90	353.00	56.00	92.60	107.98	5.90	141.00	69.00	74.79	29.24
Magnesium	mg/L	0.50	48.50	10.40	13.97	13.43	0.80	37.10	16.20	17.09	8.09

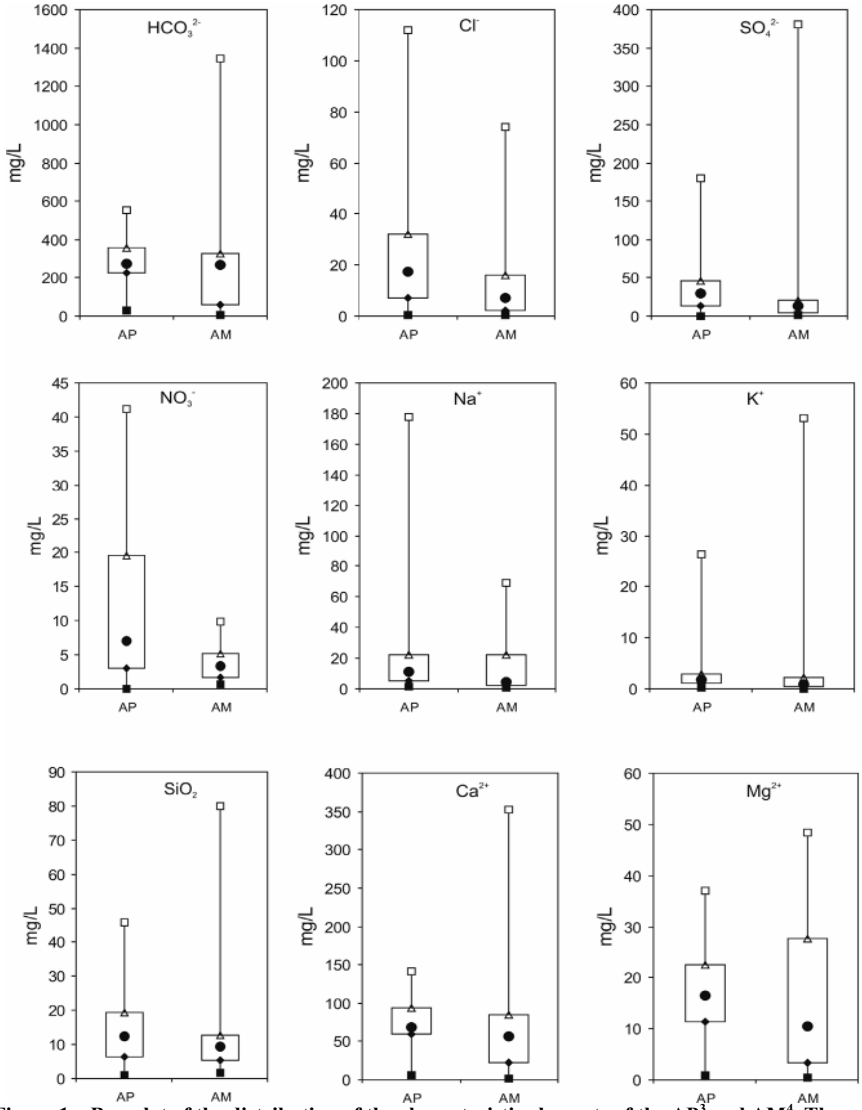

Figure 1 – Box plot of the distribution of the characteristic elements of the AP[3] and AM[4]. The box represents the 25th and 75th percentiles. The filled circle represents the median.

[3] AP stands for "acqua potabile", meaning potable water, from the original text
[4] AM stands for "acqua minerale", meaning mineral water, from the original text.

(potassium, calcium, magnesium, bicarbonate, sulphate and silica). The geometric distribution of the nitrates shows significantly inferior concentrations for the AM in the four percentiles, which points to a more protected geological environment in the reservoir areas.

Trace elements

The descriptive statistics for the trace elements is shown in Table 2. The concentrations of the elements examined may be due to local hydrogeochemical conditions and thus related to the natural environments at the reservoir sites. Phenomena of local pollution cannot be excluded, in reference to the concentrations of chromium, lead, mercury and cadmium, for the AP in some sites where samples were taken. No particular conditions of pollution were shown except those attributable to the solubilisation of copper and zinc probably originating from the galvanized iron tubing of the water distribution network. Zinc is a heavy metal that is not considered toxic by WHO. Its concentrations are not subject to control by the regulations currently in force which govern the characteristics of mineral and drinking water. However, its presence in the water may be an indicator of the state of use and maintenance of the water distribution networks.

Microbiological contaminants

The analysis of the data obtained shows that in no case were any indicators of faecal contamination found in the bottled water. Hence, the health and hygiene risks in this respect may be considered minimal as long as all the normal procedures for minimising the risks along the production chain are complied with (10).

On the other hand, a different situation emerges from the analyses carried out on the AP, where 24.83% of the samples showed evidence of faecal contamination. In particular *Escherichia coli* was found in 5.56% of the samples, in 18.52% overall coliform bacteria were found, in 2.00% *Pseudomonas aeruginosa* was present, in 15.09% of samples *Aeromonas hydrophila* was found and 11.11% contained *Enterococcus faecalis*; this is probably related to the poor maintenance of the domestic outlets or reserve tanks, where indicators of contamination may be present concurrent with a limited, if not nil, concentration of free residual chlorine.

Table 2- Analysis of the trace elements, minimum, maximum, median, mean and standard deviation values shown.											
		AM					AP				
	Units	min	max	median	mean	s.d.	min	max	median	mean	s.d.
Aluminium	µg/L	< 20	314	20	34	64	< 20	276	82	106	46
Iron	µg/L	< 20	47	20	21	6	< 20	124	29	39	18
Manganese	µg/L	< 1	305	1	19	66	< 1	68	3	5	6
Barium	µg/L	< 10	500	30	76	114	< 10	324	40	51	56
Boron	µg/L	< 100	800	100	171	182	< 100	200	100	126	54
Copper	µg/L	< 1	1	1	1	0	< 1	185	6	10	15
Zinc	µg/L	< 1	15	1	2	3	< 1	2480	31	85	210
Lithium	µg/L	< 1	254	6	37	68	< 1	47	5	8	9
Strontium	µg/L	8	7763	282	944	1785	15	2312	409	539	426
Arsenic	µg/L	< 1	9	2.0	3.2	3.2	< 1	9	2.1	2.8	1.7
Cadmium	µg/L	< 0.3	0.3	0.3	0.3	0.0	< 0.3	0.6	0.4	0.4	0.1
Chromium	µg/L	< 1	5	2.0	1.7	1.0	< 1	12	3.2	3.7	2.1
Mercury	µg/L	< 0.2	< 0.2	-	-	-	< 0.2	0.5	1.0	0.4	0.0
Nickel	µg/L	< 1	2	1.0	1.0	0.2	< 1	6	1.6	1.9	1.0
Lead	µg/L	< 1	< 1	-	-	-	< 1	92	2.0	10.0	6.6
Antimony	µg/L	< 0.5	2.0	0.5	0.7	0.4	0.7	1.2	1.1	1.1	0.3

Selenium	µg/L	< 1	3	1.0	1.1	0.5	< 1	4	2.0	1.7	0.7
Uranium	µg/L	< 1	7	1.0	1.9	1.9	< 1	8	2.0	2.5	1.8

Chemical contaminants

All the samples underwent analysis for some compounds of anthropogenic origin, indicative of water pollution. No significant presence of benzene, vinyl chloride, chloromethane or bromomethane was found in any of the samples analysed. While analysis of the results shows that for the AP 32.82% of samples analysed are affected by the presence of organohalogen compounds (OHCs: trichloroethylene and tetrachloroethylene), 72.82% of samples were affected by trihalomethanes (THMs: bromoform, bromodichloromethane, chloroform, dibromochloromethane), while 77.44% of samples revealed the presence of OHCs or THMs. None of the AM analyzed showed the presence of these compounds using an instrument sensitivity limit of 0.1 pg/L. The statistical description of the analytes which resulted positive for the AP is shown in Table 3.

On this matter, it should be stressed that recently the scientific community's attention has turned to the complex system of disinfection practices for distributed water and the possible consequences on human health (11-15). The mostly widely adopted procedure is chlorination with sodium hypochlorite followed by chlorine dioxide, but the use of chlorine gas (Cl_2) is fairly widespread while ozone is particularly used in surface water treatment plants as the primary oxidant. The use of chlorine, in all its

Table 3 – Analysis of contaminant elements resulting positive in the AP, minimum, maximum, median, mean and standard deviation values shown.

		AP				
	Units	**min**	**max**	**median**	**mean**	**s.d.**
Organohalogen compounds	pg/L	0.2	7.0	1.60	2.12	1.59
Tetrachloroethylene	pg/L	0.1	4.0	1.20	1.35	1.10
Trichloroethylene	pg/L	0.1	2.9	0.60	0.92	0.66
Total trihalomethanes	pg/L	0.2	40.0	2.80	6.11	7.92
Bromoform	pg/L	0.1	11.2	1.00	1.91	2.34
Bromodichloromethane	pg/L	0.1	14.6	1.05	2.64	3.45
Chloroform	pg/L	0.1	15.8	1.60	3.14	3.84
Dibromochloromethane	pg/L	0.1	12.1	0.50	1.52	2.36

forms, for controlling the microbial load, is accepted by all the health authorities, and was even imposed under past regulations (Prime Minister's decree, d.P.R. 236/88) and advised under the regulations currently in place in Italy (legislative decree 31/01). Furthermore, it is used successfully to ensure the disinfection of water after processing. However, notwithstanding its great usefulness, chlorination gives rise to a series of by-products formed during the disinfection treatment as a result of substances present in the water (organic substances, bacterial load and/or pathogenic organisms) and additives. These compounds are generally referred to by the term DBP (disinfection by-products) among which trihalomethanes are the most widespread. The dangers for human health posed by newly-formed compounds is the subject of numerous epidemiological studies and much scientific research but the proposed solutions to these health concerns are often contradictory (16-19).

The analysis of the geographical distribution of the contaminants (Figure 2) shows a high prevalence of organohalogens (tetrachloroethylene and trichloroethylene) compounds in the north of the country (Figures 2a, 2b, 2c) probably related to the water reservoir areas, while in regions of the south (Puglia and Calabria) total trihalomethanes predominate, particularly chloroform (Figures 2e, 2f, 2h). This last piece of data may be related to the relationship between the degree of chlorination and the state of maintenance of the water distribution networks and/or the length of the distribution circuits. Bromoform is present in higher concentrations in the coastal zones of Tuscany and Liguria and the regions of Puglia bordering the Ionic sea (Figure 2g), probably due to a greater concentration of bromide in the water source.

The data obtained for each sampling site was used to calculate an enrichment factor (p) defined by the following formula:

$$p = (C_C - C_{AM})/ C_{AM}$$

where C_C is the concentration of a given analyte in the sample examined and C_{AM} is the concentration of the same analyte at the natural background level found in the mineral water, given by the lower limit of sensitivity of the method.

The average values of p (*p*) are shown in Table 4 in which the analytes most affected by the anthropogenic activity with values well above unity may be seen. Based on the value

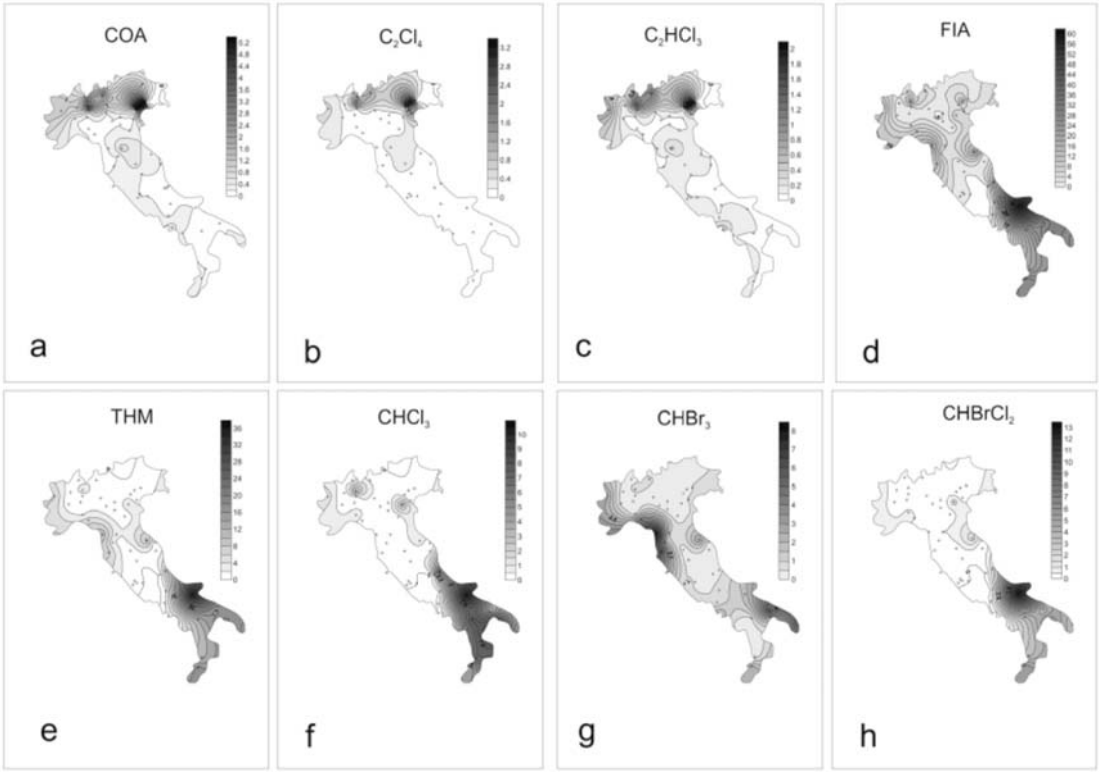

Figure 2 – "Contour map" graphs using Kriging geostatistical representation for the contaminant elements: (a) µg/L total organohalogen compounds, (b) µg/L tetrachloroethylene, (c) µg/L trichloroethylene, (d) Anthropogenic Impact Factor, (e) µg/L total trihalomethanes, (f) µg/L chloroform, (g) µg/L bromoform, (h) µg/L bromodichloromethane.

Table 4 – Average value of p, minimum, maximum and standard deviation values, calculated for all the AP sampled. Analytes demonstrating anthropogenic impact on the water analysed are shown.

Analyte	$\underline{p}$	min	max	s.d.
Benzene	0.00	0	-	-
Vinyl chloride	0.00	0	-	-
Chloromethane	0.00	0	-	-
Bromomethane	0.00	0	-	-
Chloroform	13.27	0	157	29.43
Trichloroethylene	2.55	0	28	5.26
Bromodichloromethane	8.54	0	145	23.30
Tetrachloroethylene	3.51	0	39	8.08
Dibromochloromethane	7.67	0	120	18.70
Bromoform	11.38	0	111	20.52

of $\underline{p}$, the water analysed is affected by the presence of anthropogenic elements in the following order: chloroform > bromoform > bromodichloromethane > dibromochloromethane > tetrachloroethylene > trichloroethylene.

The analytes with $\underline{p}$ greater than 1 may be considered to be indicators of anthropogenic pollution and used to evaluate the level of quality of the water using the "anthropogenic impact factor", AIF defined as:

$$AIF = (\sum \underline{p})/n$$

where n is the number of analytes considered (in this case n = 6).

A synthetic view of the distribution of this indicator is given in Figure 2d (*contour map*) where the indicators of contamination may be observed to have a substantial and homogeneous distribution in almost all the regions analysed.

THMs: seasonal variations

Recent studies show strong variations in the concentration of trihalomethanes in the drinking water in relation to the seasons (20). The authors demonstrate a sharp increase in the formation of trihalomethanes with the rise in temperature in summer; during the hot season

faster reactions mean larger doses of chlorine are needed to disinfect the water and this increases the formation of chlorination by-products. To this end, the data obtained and discussed in this study, relative to the sampling campaign carried out from November 2008 - February 2009 on the AP, was compared to a preliminary analysis conducted in 5 sample cities with samples carried out between June and July 2008. In Figure 3 the average data obtained in the two sampling programmes in relation to the five sites considered (2 cities in the north, 2 in the centre and 1 in the south) is shown. From the average trends a significant reduction in the total trihalomethane concentrations in the winter period may be observed, in agreement with Fayad's findings (21). This last piece of data may suggest to the legislative authorities the need to carry out at least 4 annual verification checks on these parameters, considered critical, with particular frequency in the hot season.

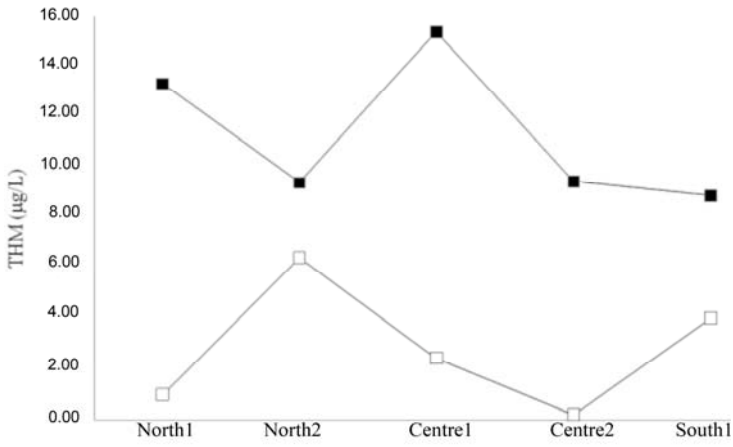

Figure 3 – Comparison of average data from five Italian cities, 2 in the north, 2 in central Italy and 1 in the south. The filled squares refer to the period from June – July 2008; the blank squares refer to the period from November 2008 - February 2009.

CONCLUSIONS

The study conducted examines the quality of the water from household taps (AP) in 50 Italian cities in 17 regions and the quality of 24 different brands of mineral water (AM) packaged in PET bottles.

The results obtained indicate critical points important for health and hygiene for the AP, mainly due to the presence of chemical (organohalogen compounds and trihalomethanes) and microbiological anthropogenic contaminants.

Indeed, in 77.4% of cases analysed, (the presence of organohalogen compounds and trihalomethanes) was found in the following order: Chloroform > Bromoform > Bromodichloromethane > Dibromochloromethane > Tetrachloroethylene > Trichloroethylene. This phenomenon is probably connected with the formation of chlorination by-products and with the water reservoir areas. Enrichment phenomena interfering with domestic tubing and tanks may not be excluded.

The analysis of the seasonal variations registered in 5 sample cities shows a significant reduction in the concentration of total trihalomethanes during the winter period.

With regards to the microbiological aspects, 24.83% of the samples show indications of faecal contamination, probably due to the poor maintenance of the domestic outlets or reserve tanks, concurrent with a limited, if not nil, concentration of free residual chlorine.

No anthropogenic contaminants were found in any of the AM analysed. This is probably due to geological protection of the reservoir areas and technological evolution in bottling and production sites.

SUMMARY

The study conducted examines the quality of the water from household taps (AP) in 50 Italian cities in 17 regions and the quality of 24 different brands of mineral water (AM) packaged in PET bottles.

The results obtained indicate relative homogeneity of the characteristic elements while significant differences were shown for other analytes:

– *Trace elements*. The concentrations of the trace elements revealed in both the AP and the AM may be attributable to

hydrogeochemical conditions of the sites and thus related to the natural environment at the reservoir site. For some of the AP analyzed, phenomena of local pollution cannot be excluded in relation to the concentrations of chromium, lead, mercury and cadmium. Particularly high levels of enrichment with zinc and copper in the AP may be an indicator of the state of use and maintenance of the water distribution networks.

– *Chemical contaminants*. The analysis of the contaminants of anthropogenic origin showed that for the AP 32.82% of the samples were affected by organohalogen compounds (OHCs), 72.82% of samples was affected by trihalomethanes (THMs), while 77.44% of samples contained OHCs or THMs. The geographical distribution of the contaminants shows a net prevalence of organohalogen compounds (tetrachloroethylene and trichloroethylene) in the north of the country while in the southern regions (Puglia and Calabria) the total trihalomethanes, and in particular chloroform, prevail. Bromoform is present in higher concentrations in the coastal areas of Tuscany, Liguria and the regions of Puglia bordering the Ionic sea. The comparison of the data from the November 2008 – February 2009 on the AP with an analysis carried out in 5 cities in June and July 2008 shows a significant reduction in the total trihalomethane concentration in the winter period, in agreement with the findings of Fayad and Ristoiu et al.

– *Microbiological contaminants*. Indications of faecal contamination were found in 24.83% of the AP analysed. In particular, *Escherichia coli* was found in 5.56% of the samples, total coliform bacteria in 18.52%, *Pseudomonas aeruginosa* in 2.00%, in 15.09% *Aeromonas hydrophila* was found and 11.11% contained *Enterococcus faecalis*. There were no cases of indicators of faecal contamination found in any of the AM.

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APPENDIX D: ITALIAN AGENCIES WITH ENVIRONMENTAL RESPONSIBILITIES

Parliament of the Republic

The Republic is composed of Municipalities, Provinces, Metropolitan Cities, Regions and the State. Under Article 117 of the Constitution, as amended by L.cost.3/2001, legislative power is vested in the state and the regions in accordance with the Constitution and with the constraints deriving from community law and international obligations. This new approach requires that, based on the principle of subsidiarity, the regions have legislative powers in respect to any matters not expressly reserved to the state. Further, cities and provinces hold their own functions and those conferred on them by state law and the region, according to the principle of subsidiarity. Towns/municipalities are also an autonomous organization with statutory, legislative, organizational and administrative and fiscal autonomy.

Ministry for the Environment, Land and Sea

The Ministry for the Environment, Land and Sea (*Ministero dell'Ambiente e della Tutela del Territorio e del Mare*) is the environmental organization of the Italian government responsible for environmental policy. The organization was established in August 1986 by L.349/1986 as "Ministry for the Environment" and underwent organizational reform in 1999 by D.Lgs. n 300/99 (Art.35 seq.), which became effective in 2001 by Presidential Decree 175/01. In 2003, 2006 and 2009, the organization underwent further reform. The Ministry for the Environment collaborates with the following agencies:

- Command of the Carabinieri of the Environment (*Comando Carabinieri per la Tutela dell'Ambiente*): Responsible for supervision, prevention, inspection and prosecution of violations that damage the environment, and acts at the request of the Ministry for the Environment, the Judicial Authority, Command of the Carabinieri, citizens (individuals or associations) and on its own initiatives, throughout Italy.
- State Forestry (*Corpo Forestale dello Stato*): Reports directly to the Ministry of Agriculture and Forestry, which works for the preservation of forest ecosystems and land and in some cases the management of national parks and nature reserves.
- Port Authority (*Corpo delle Capitanerie di Porto*): Generally responsible for all maritime activities. It is overseen by the Ministry for Infrastructure and Transportation.
- Customs (*Corpo della Guardia di Finanza*): Responsible for border control and for investigating fraud. It is organized under the Ministry for the Economy and Finance.

(roughly translated from http://it.wikipedia.org/wiki/Ministero_dell%27Ambiente_e_della_Tutela_del_Territorio_e_del_Mare

The Institute for Environmental Protection and Research (ISPRA)

Website: http://www.isprambiente.it/site/en-GB/

The Institute for Environmental Protection and Research (ISPRA – *Istituto Superiore per la Protezione e la Ricerca Ambientale*) acts under the vigilance and policy guidance of the Ministry for the Environment, Land and Sea. The agency was established by Decree no. 112 of June 25, 2008, which was converted into Law no. 133 (with amendments) on August 21, 2008. ISPRA, as a newly created agency, performs the duties of the former three Italian environmental agencies and guides the provincial and regional agencies:

- ex-APAT, Italian Environment Protection and Technical Services Agency (*Agenzia per la Protezione dell'Ambiente e per i servizi Tecnici*);
- ex-INFS, National Institute for Wildlife (*Istituto Nazionale per la Fauna Selvatica*); and
- ex-ICRAM, Central Institute for Scientific and Technological Research applied to the Sea (*Istituto Centrale per la Ricerca scientifica e tecnologica Applicata al Mare*).

(http://www.isprambiente.it/site/en-GB/ISPRA/The_Institute/)

Local and Regional Environmental Agencies

In 1993 a referendum was passed to abolish the powers of the National Health Service (NHS) and the Local Sanitary Unit (USL) in the field of environmental control and prevention. The referendum led to the creation of regional and provincial agencies and the establishment of what is known today as ISPRA.

In Italy, there are currently 21 regional agencies (ARPA – *Agenzia Regionale per la Protezione dell'Ambiente* – Regional Agency for the Protection of the Environment) and provincial agencies (APPA – *Agenzia Provinciale per la Protezione dell'Ambiente* – Provincial Agency for the Protection of the Environment) established with specific regional laws (roughly translated from http://www.apat.gov.it/site/en-GB/APAT/Agencies_System/default.html). The system of agencies represents a network structure that, in respect of the different territorial realities, promotes sharing and collaborative activities designed to coordinate, promote and compare information on national technical and operational methods for the pursuit of its regional agencies. The Naples and Caserta provinces are overseen by the regional agency ARPA Campania.

Agenzia Regionale per la Protezione Ambientale della Campania (ARPAC)

Website: http://www.arpacampania.it/index.asp

The Regional Agency for the Protection of the Environment, Campania (ARPAC) established by Regional Law 10 of 29 July 1998, develops monitoring, prevention and control processes to protect the quality of the Campania environment and helps overcome the many critical environmental issues in the region.

The institutional activities carried out by ARPAC are related to the functions of protection and environmental restoration to include surveillance and enforcement of regulations, technical and scientific support to local authorities, provision of analytical performance of both environmental and health relief, creation of the Environmental Information System, research and information.

The structure of ARPAC consists of a central unit based in Naples that includes General Management, Technical Management and Administration, five Provincial Departments and Centers of thematic expertise.

The headquarters is responsible for developing policy guidance, to coordinate technical, scientific and administrative activities and the activities of the Provincial Departments, units and crisis centers and thematic services, and to establish information and communication strategies for the Agency.

The Provincial Departments are the operational headquarters of the Agency in each province of Campania and carry out the task of coordinating and integrating laboratory activities, environmental control, and supervision and inspection.

Each Provincial Department includes two divisions: the Territorial Department, which oversees the activities of supervision and control, and the Technical Department, which implements all activities related to laboratory environmental analysis.

The following are specialized agencies under ARPAC:

- Regional Center for Atmospheric Pollution (CRIA – *Centro Regionale di Inquinamento Atmosferico*);
- Regional Center for Radioactivity (RRC – *Centro Regionale Radioattività*); and
- Regional Center for Contaminated Sites (CRSC – *Centro Regionale Siti Contaminati*).

Furthermore, because of the environmental crisis in Campania, ARPAC established the Environmental Emergency Service (SEAm – *Servizio Emergenze Ambientali)*.

(roughly translated from http://www.arpacampania.it/chisiamo.asp)

Management of ARPAC

This system of environmental protection agencies, made by the Agency for Environmental Protection and Technical Services (APAT) and 21 Regional Agencies (ARPA) and provincial (APPA), was established by Law No. 61 of 21 January 1994 in order to create a modern and efficient network of environmental monitoring and prevention after the results of a referendum in 1993 resulted in the abrogation of the responsibilities of the National Health Service in the Environment.

The main tasks of the agency is monitoring and control of environmental matrices and territorial technical and scientific support to the institutional referents (Region, Provinces, Municipalities) in environmental matters.

The system of agencies represents a network structure that, in respect of the different territorial realities, promotes sharing and collaborative activities designed to coordinate, promote and compare information on national technical and operational methods for the pursuit of its regional agencies.

The Federation Council, composed of representatives of statutory agencies to protect the environment, has an advisory function in allocating funding and use of resources, rather than the technical issues of operational activities of ARPA-APPA.

Other structures common to several agencies are the National Points (CTN) and the Working Groups, through which the Agencies participating in joint projects according to their specificity and technical excellence.

The system of environmental agencies, with other actors, including the Ministry of Environment, Regions, Istat and Unioncamere, feeds the information base of SINAnet (National System Cognitive and environmental monitoring).

ARPA is the acronym for the Regional Agencies for Environmental Protection.

In 1993 a referendum to abolish the powers of the National Health Service (NHS) and the Local Sanitary Unit (USL) in the field of environmental control and prevention was passed. It thus created a vacuum of competence that was filled in 1994 which entrusted these tasks to appropriate "Regional Agencies." The law also established a 61/94 ANPA (National Agency for Environmental Protection), then APAT (Agency for Environment Protection and Technical Services) and today ISPRA (Institute for Protection and Environmental Research) with the task of guiding and coordination of regional agencies and the agencies of the autonomous provinces.

Today, all Italian regions and autonomous provinces have with their own agencies totaling 21 agencies and two provinces with autonomous regional agencies. This is similar to the U.S. Environmental Protection Agency with its 10 regional offices.

- ARTA Abruzzo
- ARPA Basilicata
- ARPA Calabria
- ARPA Campania
- ARPA Emilia Romagna
- ARPA Friuli Venezia Giulia
- ARPA Lazio
- ARPA Liguria
- ARPA Lombardia
- ARPA Marche
- ARPA Molise
- ARPA Piemonte
- ARPA Puglia

- ARPA Sardegna
- ARPA Sicilia
- ARPA Toscana
- ARPA Umbria
- ARPA Valle D'Aosta
- ARPA Veneto
- APPA Bolzano
- APPA Trento

Environmental Organizations

The following list includes many environmental organizations recognized by the Ministry for the Environment, Land and Sea. This list is from available sources and may not be all-inclusive.

- A.C.L.I - Anni Verdi
- Agriambiente
- Agriturist
- Environment and / is life
- Friends of the Earth
- ANEV - National Association of Wind Energy
- ANIS - National Association of Underwater Instructors
- Association of Environmental and Labor
- Rangers of the National Association of Italy
- National Association for the Protection of the Environment (ANTA)
- Association Green Environment and Society (V.A.S.)
- A.S.T.R. Environment
- Italian Alpine Club
- Center for Conservation of Nature
- Tourist Center Student Youth (C.T.S.)
- Codacons-HK
- Ekoclub International
- Democratic National Board of Social Action (ENDAS)
- Italian Environment Fund (F.A.I.)
- Making Green
- National Federation of Pro Natura
- Italian Federation Ornicoltori - F.O.I.
- F.I.A.B. - Italian Federation of Friends of the Bicycle - Onlus
- F.I.E. - Italian Federation Hiking
- F.I.P.S.A.S. - Italian Federation of Sport Fishing and Diving
- Greenpeace Italy

- Ecological Research Groups (ERG)
- National Institute of Urban Planning (I.N.U.)
- Our Italy
- Kronos
- The Altritalia Environment
- League Abolition Hunting (L.A.C.)
- Legambiente
- Italian League of the Rights of the animal (L.I.D.A.)
- Italian Bird Protection League (LIPU)
- Italian Naval League
- L'Umana Dimora
- MareAmico
- Marevivo
- Mountain Wilderness Italy
- Movimento Azzurro
- MSP Italy - Movimento Sport Azzurro Italy
- Dominula onlus
- Società Italian Geographic
- Italian Speleological Society
- Terranostra
- The Jane Goodall Institute - Italy / Roots & Shoots - Italy
- Italian Touring Club (T.C.I.)
- UGAI - Union National Garden Clubs and similar activities in Italy
- WWF Italy

Other Environmental Agencies of the Italian Government

The following are other ministries and organizations of the Italian government that have some environmental functions. This list is from available sources and may not be all-inclusive.

- Ministry of Defense – Air Force Weather Service (*Ministero della Difesa*): In addition to military and civil defense responsibilities, it is responsible for continued attention to weather conditions and making weather data from the National Center for Aeronautical Meteorology and Climatology available in real-time to the Ministry of the Interior, Department for Civil Protection in order to prevent harm to persons and property due to natural disasters and extreme weather events.
- Ministry of Agricultural, Food, and Forestry Policies (*Ministero delle Politiche Agricole, Alimentari e Forestali*): Develops and coordinates policies related to agriculture, forestry, food and fisheries.

- Ministry of Infrastructure and Transport (*Ministero delle Infrastrutture e dei Trasporti*): Responsible for all transport infrastructure (roads, motorways, railways, ports, airports) as well as general transport planning and logistics.
- Ministry of Cultural Heritage and Activities (*Ministero per i Beni e le Attività Culturali*): Principally concerned with culture, tourism, and the protection and preservation of artistic sites and property and landscape.
- River Basin Authorities: Oversee the conservation, protection and enhancement of soil and water for Italy's river basins.
- Park Authorities: Oversee regional and national parks and protected natural areas such as nature reserves.
- Civil Protection Department of the Presidency of the Council of Ministers (*Dipartimento della Protezione Civile, Presidenza del Consiglio dei Ministri*): The operative arm of the President of the Council when it comes to coping with the protection of the country's people and goods, undergoing particular threats and dangers deriving from conditions of natural, environmental or anthropogenic risk. (www.protezionecivile.it/cms/attach/brochuredpc_eng2.pdf)

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APPENDIX E: ITALIAN RISK ASSESSMENT APPROACH

Characterization and Documentation

Sites of National Interest

On 21 Aug 2008, by Italian Decree no. 112 of 25 June 2008, ISPRA was established to perform the functions of the former APAT (Italian Environment Protection and Technical Services Agency), former INFS (National Institute for Wildlife), and former ICRAM (Central Institute for Scientific and Technological Research).

Information in the following sections was taken directly from the ISPRA website:

http://www.apat.gov.it/site/en-GB/Topics/Contaminated_sites/Characterization_and_documentation/

Italian "Sites of National Interest" (SIN) are areas of the national territory defined according to the characteristics, quantity and danger of the existing pollutants, the impact on the surrounding environment in terms of sanitary and ecological risk, and the damage to the cultural and environmental heritage. These sites are identified and their perimeters are outlined in accordance with a decree of the Ministry of Environment, Land and Sea Protection, in agreement with the regions involved. The SIN differ from other contaminated sites because their reclamation procedure is under the Ministry of Environment, Land and Sea Protection, which can also seek assistance from other agencies such as APAT, ARPAT and Istituto Superiore di Sanità (ISS- National Institute of Health) among others.

Currently there 54 SIN sites. Some of them cover very extensive areas, such as the Domizio Flegreo-Agro Aversano coast, the Vesuvian coast, and the Sarno Basin.

Characterization of Contaminated Sites

Italy's process in characterizing contaminated sites involves conducting investigations (surveys, piezometer-readings, chemical analyses, etc.) in a contaminated site or in a site that is potentially considered as such with the main aim of defining the geological and hydrogeological structure, verifying whether the land and water is contaminated, and developing a conceptual model of the site Register of Contaminated Sites

The Italian Register of Contaminated Sites is a tool prepared by regions and autonomous provinces, as provided by regulations on contaminated sites (Article 17 of Ministerial Decree no. 471/99 and Article 251 of Legislative Decree no. 152/06). The Register contains the list of sites submitted for reclamation and environmental recovery interventions as well as interventions carried out for the same sites; the bodies in charge of reclamation activities, and the public bodies which the region makes use of to carry out its duties in case of failure of the bodies in charge.

The contents and structure of the Register's essential data for sites requiring reclamation were defined by APAT in conjunction with the regions and ARPA agencies. The first version of these criteria was published during the course of 2001.

Risk Analysis

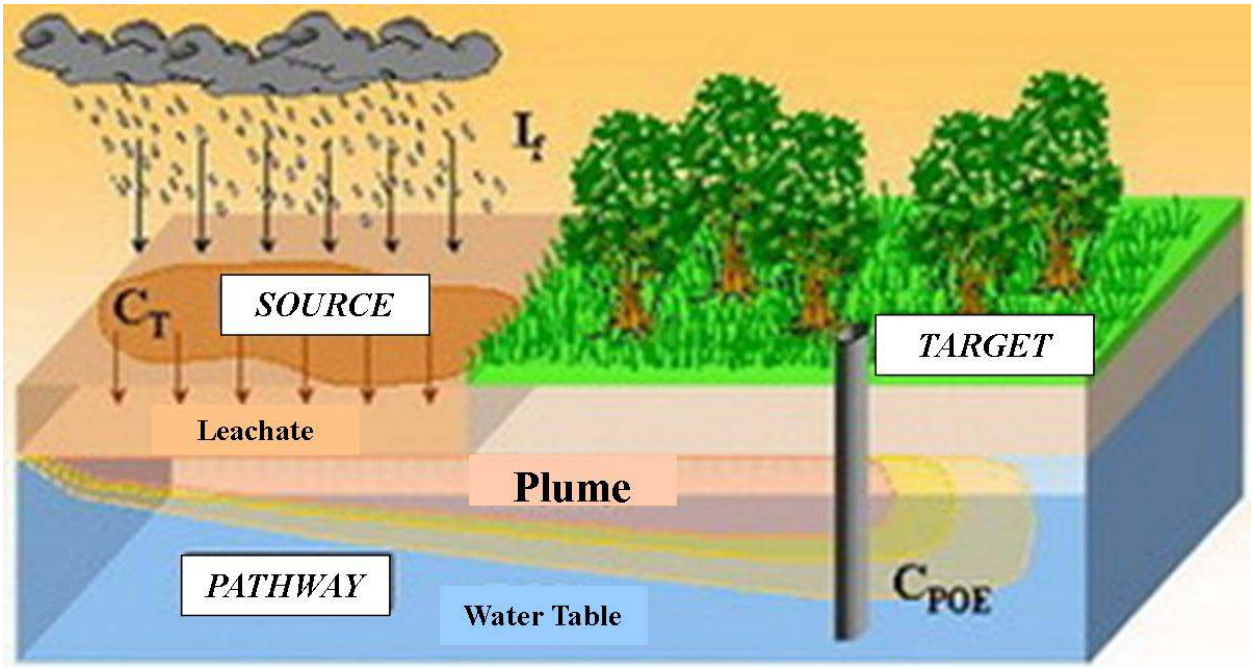
Sanitary and Environmental Risk Analysis

Analyzing the sanitary and environmental risk is currently the most advanced tool supporting decisions for the management of contaminated sites. It enables a quantitative evaluation of human health risks related to the presence of pollutants in the environment.

The starting point for the application of a risk analysis is the development of a Site Conceptual Model (figure below), based on the identification and parameter setting of three main elements:

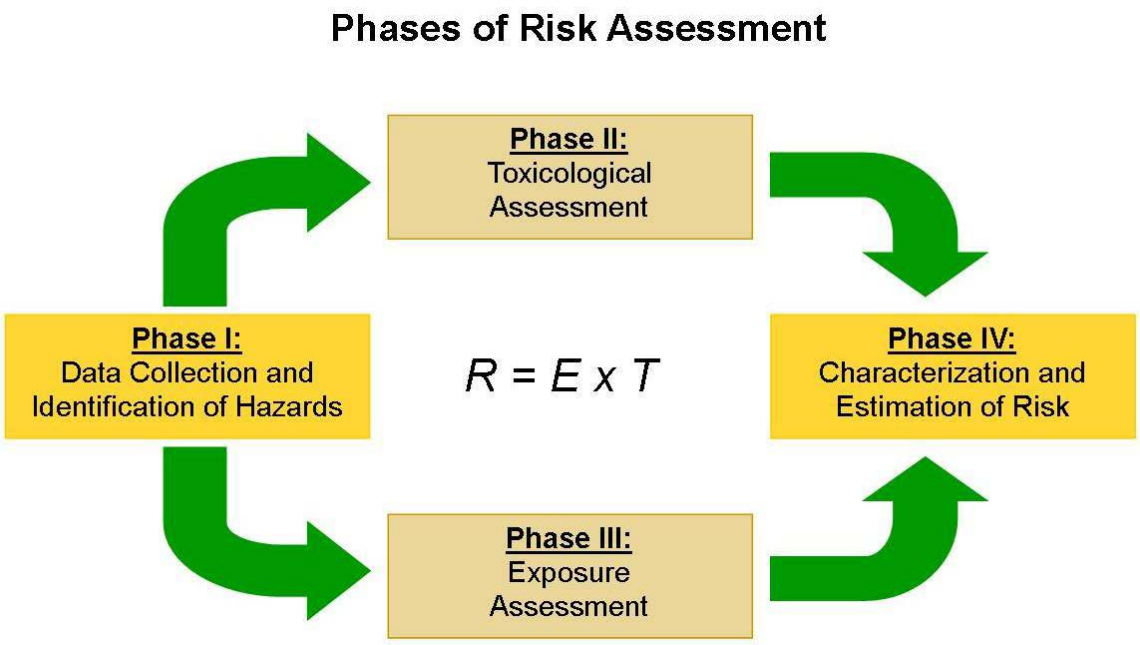
- the contamination source
- the pollutants' migration routes in the environment, and
- the contamination targets or receptors in the site or its surroundings.

A human health risk can only be determined if these three elements exist and are related in a given site.



Site Conceptual Model

Calculating the risk as codified by the National Academy of Science (NAS, 1983) is done in four stages (see figure below). The estimated risk is compared with acceptance criteria defined by the regulations. Risk analysis can be applied as described above either in a direct (forward) way, by estimating the risk in relation to the site's contamination conditions, or in a (backward) way, starting from risk acceptance criteria and fixing acceptable contamination levels and reclamation objectives for the site of reference.



The Four Phases of Risk Assessment

Method Criteria for Applying the Absolute Risk Analysis

The documents entitled "*Criteri metodologici per l'applicazione dell'analisi assoluta di rischio ai siti contaminati*" (Method criteria for applying the absolute risk analysis to contaminated sites) and "*Criteri metodologici per l'applicazione dell'analisi assoluta di rischio alle discariche*" (Method criteria for applying the absolute risk analysis to dumps) were prepared by the ARPA/APPA, ISS, Istituto Superiore per la Prevenzione e la Sicurezza sul Lavoro (ISPESL – Higher Institute for Prevention and Safety at Work), and ICRAM (Central Institute of Applied Marine Research) task force, which was established and coordinated by APAT (Italian Environment Protection and Technical Services Agency). The purpose of the task force was to develop and revise technical documents containing theoretical and application indications for technical staff of public administrations, researchers, professionals and operators of the sector who prepare and/or evaluate reclamation projects for contaminated sites, including those who process sanitary and environmental risk analyses. The handbook's approach refers to the American Society for Testing and Materials Risk-Based Corrective Action (ASTM's RBCA) standard (E 1739-95, E 2081-00).

ISS/ISPESL Database "Chemical/physical and toxicological properties of pollutants"

ISS and ISPESL developed a database of chemical/physical and toxicological properties for the main types of chemical pollutants. These chemical/physical and toxicological properties are required in applying the risk analysis procedure. Appendix O of "Method criteria for applying the absolute risk analysis to contaminated sites" describes the procedure adopted in selecting values to be included in the database. The Civil Engineering Department of the "Tor Vergata" University of Rome also participated in the development of this database. The ISS/ISPESL database can be downloaded at: http://www.apat.gov.it/site/_files/Suolo_Territorio/Banca_dati_ISS_ISPESL_Maggio_2008.xls

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APPENDIX F: ITALIAN EPIDEMIOLOGICAL STUDIES REVIEWED BY NMCPHC

The following are epidemiological studies conducted by Italian health and environmental researchers and reviewed by NMCPHC public health experts as reference to the public health risks of living in the Naples area.

Altavista P, Belli S., F. Bianchi, A. Binazzi, Comba P., R. Del Giudice, L. Fazzi, A. Felli, M. Mastrantonio, M. Menegozzo, Musmeci L., Pizzuti A., Savarese A., Trinca S., R. Bird – Mortality due to an area of Campania with many landfills. – Epidemiology & Prevention, 2004, 28, Vol.6, pp. 311-321.

Andrisani, M.G., P. White, R. Belluomo, et al. 2003. Emergency waste Campania region update on the census of polluted sites-coast Domitio-Flegreo and Agro Aversano. ARPA Campania. Naples.

APAT - Guidelines for the application of risk analysis to landfills - Working for the CTN TES: ARPA Marche, ARPA, ARPA Liguria, Emilia Romagna ARPA, ARPA Toscana - 2004.

APAT - ARPAS - ISS - ISPESL - Guidelines for the application of health risk analysis for contaminated sites - 2005.

ARPA Campania – *Ingegneria Ambientale - Valutazione delle pressioni ambientali legate allo smaltimento illegale di rifiuti* – 2004.

Bianchi, F., P. Comba, M. Martuzzi, et al. 2004. Italian "Triangle of death." Lancet Oncol. 5: 710.

Boyle E., Johnson H., Kelly A., McDonnell R. - Congenital anomalies and proximity to landfill sites. – Ir Med J. 2004 Jan; 97(1):16-8.

Comba P., Bianchi F., Fazzo L., Martina L., et al. – Cancer Mortality in an Area of Campania (Italy) Characterized by Multiple Toxic Dumping Sites – Ann.N.Y Acad. Sci. 1076 :449-461, 2006.

Dolk H., Vrijheid M., Armstrong B., Abramsky L., Bianchi F., Garne E., Nelen V., Robert E., Scott J.E., Stone D., Tenconi R. - Risk of congenital anomalies near hazardous-waste landfill sites in Europe: the EUROHAZCON study. - Lancet. 1998 Aug 8; 352(9126):423-7.

Elliott, P., D. Briggs, S. Morris, de Hoogh C., Hurt C., Jensen T.K., Maitland I., Richardson S., Wakefield J., Jarup L. Risk of adverse birth outcomes in populations living near landfill sites. Br. Med. J. 2001 Aug 18; 323(7309): 363–368.

Fazzi, S. Belli, F. Mitis, M. Santoro, L. Martina, R. Pizzuti, P. Comba, M. Martuzzi - Cluster analysis of mortality in an area with a widespread presence of sites for the disposal of municipal and hazardous waste in Campania. – In: XXX Italian Congress of Epidemiology IEA, Palermo 4-6 October 2006.

Fielder H.M., Poon-King C.M., Palmer S.R., Moss N., Coleman G. - Assessment of impact on health of residents living near the Nant-y-Gwyddon landfill site: retrospective analysis. - 1: BMJ. 2000 Jan 1; 320(7226): 19-22.

Jarup L., Briggs D., de Hoogh C., Morris S., Hurt C., Lewin A., Maitland I., Richardson S., Wakefield J., Elliott P. - Cancer risks in populations living near landfill sites in Great Britain. - Br J Cancer. 2002 Jun 5; 86(11):1732-6.

Lauria L, Spinelli A., Trinca S. – Exploratory Study on reproductive outcomes in areas with presence of landfill. - In: Evaluation of environmental health risks of disposing of municipal waste and hazardous waste, by L. Musmeci, Rapporti ISTISAN, 2004, 04 / 5: 105-1 22.

M. Bellino, Falleni F., T. Forte, A. Piccardi, S. Trinca – Environmental characterization of landfill sites under study. – In: Evaluation of environmental health risks of disposing of municipal waste and hazardous waste, by L. Musmeci, Rapporti ISTISAN, 2004, 04 / 5: 7-57.

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APPENDIX G: CANCER EPIDEMIOLOGICAL STUDY, SEPTEMBER 2009

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DEPARTMENT OF THE NAVY
NAVY AND MARINE CORPS PUBLIC HEALTH CENTER
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PORTSMOUTH VA 23708-2103

3900
Ser EP/001253
21 Sep 09

From: Commanding Officer, Navy and Marine Corps Public Health Center
To: Commander, Navy Region Europe, Africa, Southwest Asia (CNREURAFSWA)

Subj: CANCER EPIDEMIOLOGICAL STUDY: ANALYSIS OF ENVIRONMENTAL EXPOSURES AND CANCER RISK FOR U.S. NAVY AND MARINE CORPS ACTIVE DUTY AND FAMILY MEMBERS LOCATED IN NAPLES, ITALY

Ref: (a) Naples, Italy - Public Health Evaluation Volume II: Phase I Screening Risk Evaluation, March 27, 2009

Encl: (1) Cancer epidemiological study, September 2009

1. Per reference (a), the following summary is provided.

2. Background. In 2006, Italian researchers suggested that an excess risk of cancer mortality in the Campania Region of Italy might be associated with a history of illegal dumping and disposal of hazardous wastes. Italian press interest in the article followed the 2007 trash collection strike and subsequent increase in illegal trash burning in the streets. As part of efforts to assess the public health risk to U.S. military and civilian personnel and their families living in the greater Naples area, the Navy and Marine Corps Public Health Center conducted this study to determine if there were any observable differences in cancer rates related to the chemicals that exceeded the recommended screening levels in outdoor air, tap water, and surface soil.

3. This study included Navy and Marine Corps active duty members and their beneficiaries who resided for at least six months in housing available through U.S. Naval Support Activity (NSA) Naples between January 1997 and May 2009. The study population included 16,134 people. Chemicals of concern were identified in the Phase I report of the Naples Public Health Evaluation and are listed in this study. The types of cancer selected for this study were based on the chemical of concern, the target organ, and the cancer latency period. Three cancers were identified for the study due to their relatively short latencies - acute myelogenous leukemia (AML), non-melanoma skin cancer and melanoma. Some cancers were not evaluated in this

study because they had latency periods longer than the study period. Incidence rates and 95 percent confidence intervals (95 percent CI) were calculated where appropriate.

4. The study found nine cases of non-melanoma skin cancer, less than five cases of AML, and less than five cases of melanoma. The unadjusted incidence rate for non-melanoma skin cancer was 14.4 cases (95 percent CI: 6.6 - 27.4) per 100,000 person-years. Because most cancer rates are highly influenced by age, rates should be adjusted to account for the distribution of age in a study population. The number of cases found in this study was too small to use the age adjustment methods recommended by the National Cancer Institute. Even though the study was unable to age-adjust the rates, the most conservative comparison was well below the incidence rates published in the professional literature. The incidence rates for AML and melanoma were not calculated due to the low numbers of cases.

5. Overall, the findings of this study did not suggest an excess of cancer and were consistent with cancer rates observed in populations with an average age less than 50 years old.

6. My point of contact for this study is Dr. Chris Rennix, ScD MS CIH, at (757) 953-0955 or christopher.rennix@med.navy.mil.

B. A. COHEN

Study title

Analysis of Environmental Exposures and Cancer Risk for U.S. Navy and Marine Corps Active Duty and Family Members Located in Naples, Italy.

Background

In 2006, Italian researchers suggested that an excess risk of cancer mortality (Comba et al. 2006) in the Campania Region of Italy might be associated with a history of illegal dumping and disposal of hazardous wastes. Italian press interest in the article followed the 2007 trash collection strike and subsequent increase in illegal trash burning in the streets. These events prompted Commander, Navy Region Europe, Africa, Southwest Asia (CNREURAFSWA) to request a public health evaluation from the Navy and Marine Corps Public Health Center to assess the public health risk to U.S. military and civilian personnel and their families living in the greater Naples area. As part of these efforts, this cancer study was conducted to determine if there were any observable differences in cancer rates related to the chemicals that exceeded the recommended screening levels in outdoor air, tap water, and surface soil.

As part of Phase I of the Naples Public Health Evaluation, selected off-base rental homes and government sites were sampled for environmental contaminants in tap water, soil, and soil gas. In addition, regional ambient (outdoor) air monitoring was conducted. The Phase 1 sampling results were reviewed to determine specific chemicals of concern. Chemicals of concern were defined as those chemicals detected in the ambient air, soil, or tap water that were above the U.S. Environmental Protection Agency Regional Screening Levels (RSLs). An RSL is defined as a risk-based concentration that is protective for human health and is used as an initial cleanup goal for remediation of contaminated sites. RSLs apply to drinking-water, ambient air, soil and soil gas, and can be combined to calculate total risk from these media.

Methods

Due to limitations on access to complete historical and current medical data for all Naval Support Activity (NSA) Naples residents, this study was limited to U.S. Navy and Marine Corps active duty members and their beneficiaries stationed at NSA Naples between 1 January 1997 and 15 May 2009. Housing data were obtained from the electronic Family Housing Database (eFH) maintained by the Naval Facilities Command, Commander Naval Installations Command (CNIC) Fleet and Family Readiness Division. Available housing data were matched to the Defense Enrollment Eligibility Reporting System (DEERS) to obtain unique identifiers for matching with medical databases. Study members with missing unique identifiers or date of arrival at NSA Naples were excluded from the study. Also, those with less than six months in residence at NSA Naples were also excluded.

A literature review was conducted to determine if these chemicals of concern could be potentially associated with an increase in cancer. Table 1 provides a list of the

chemicals that exceeded the RSLs, the type of cancer associated with exposure to each chemical, and the latency period for developing cancer. For this study, it was assumed that the disease process began at the time of first exposure (e.g. arrival in the greater Naples area) for the outcome to be possibly associated with exposures that occurred while living in Naples.

Table 1: Chemicals of concern, cancer types, and latency

Chemicals of Concern	Cancer Type(s)	Source	Latency	Reference for Latency
Volatile Organics				
1,1,2,2-Tetrachloroethane	liver	IRIS	20-30 years	Schottenfeld et al
1,2-Dichloropropane	liver	Cal EPA	20-30 years	Schottenfeld et al
1,3-Butadiene	lymphosarcoma, reticulosarcoma	IRIS	10-20 years	IRIS
Acrylonitrile	lung, colon, prostate, brain, lymph, stomach	IRIS	13+ years	Chen 1987
Benzene	leukemia (AML)	IRIS	1-5 years	IRIS
Bis(2-Chloroethyl)ether	liver	IRIS	20-30 years	Schottenfeld et al
Chloroform	liver	IRIS	20-30 years	Schottenfeld et al
Chloromethane	kidney	IRIS	20-30 years	Vamvakas 1998
Ethylbenzene	liver, kidney, endocrine	Cal EPA	20-30 years	Schottenfeld et al
Hexachlorobutadiene	kidney	IRIS	20-40 years	Vamvakas 1998
Tetrachloroethene	liver	IRIS	20-30 years	Schottenfeld et al
Dioxins				
Dioxin Toxic Equivalent (TEQ)	soft tissue sarcomas, liver	IRIS	20+ years	Ketchum 1999
Carcinogenic Polycyclic Aromatic Hydrocarbons				
Benzo-a-pyrene (BaP) TEQ	Lung	IRIS	20+ years	Schottenfeld et al
Pesticides/PCB's				
Dieldrin	liver, gastric, lymphosarcoma, rectal, hematopoietic, esophagus, lung	IRIS	10-20 years	IRIS
Aldehydes				
Formaldehyde	lung, nasopharyngeal	IRIS	10-20 years	IRIS
Inorganics				
Arsenic	liver, lung, kidney, bladder	IRIS	10-20 years	Schottenfeld et al
Arsenic	skin	IRIS	5 years	WHO 2003
Chromium VI	lung	IRIS	10-20 years	Luippold 2003

Cal EPA - California Environmental Protection Agency
IRIS – Integrated Risk Information System

References for target organs: (California Environmental Protection Agency 2009; U.S. Environmental Protection Agency 2009)

References for latency periods: (Schottenfeld and Fraumeni 1996; U.S. Environmental Protection Agency 2009; Chen et al. 1987; Howard 2003; Ketchum et al. 1999; Luippold et al. 2003; Vamvakas et al. 1998)

Based on the latency periods for each type of cancer, it was determined that acute myelogenous leukemia, non-melanoma skin cancer, and melanoma would be included in the study. Cases were obtained from inpatient and outpatient electronic medical encounter records for visits at military healthcare facilities and reimbursed care at non-military health care facilities from 1 January 1997 to 15 May 2009.

a. Non-melanoma skin cancer (NMSC). All incident cases of basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) (International Classification of Diseases, 9th edition, Clinical Modification (ICD-9-CM) codes 173.0-173.9) diagnosed on at least two separate medical encounters were considered for the study. Because the latency of skin cancer associated with exposure to arsenic in tap water is five years, the first known diagnosis of skin cancer had to be at least five years after the person first resided in Naples to be included in the study. Although arsenic exposure is primarily associated with BCC and SCC, a recent study suggests that it may also lead to increased

rates of malignant melanoma (Beane Freeman et al 2004). Several similar health studies recommend using a minimum of two medical visits as part of the case definition because using just the first visit was associated with a high percentage of false positives.

b. Malignant melanoma. All incident cases of malignant melanoma (ICD-9-CM codes 172.0-172.9) diagnosed on at least two separate medical encounters were also considered because of their potential relation to arsenic exposure. Cases of melanoma had to be diagnosed five years after the initial diagnosis because the latency of skin cancer related to arsenic exposure is five years. Although arsenic exposure is primarily associated with BCC and SCC, a recent study suggests that it may also lead to increased rates of malignant melanoma (Beane Freeman et al 2004).

c. Acute myelogenous leukemia (AML). All incident cases of AML (ICD-9-CM codes 205.0 and 207.0) diagnosed on at least two separate medical encounters were considered for the study. Because the latency period for AML associated with exposure to benzene is one year, the first known diagnosis of AML had to be at least one year after the person first resided in Naples to be included in the study.

Person-time at risk for each study member was calculated based on data of first arrival at NSA Naples and by the month a person was diagnosed with the selected outcome, left active service or the end of the study period (15 May 2009), whichever came first. If a person left active service before the end of the study, then the ability to track the case status for the study would end and person-time would stop accumulating. The Poisson distribution was used to estimate the 95% confidence intervals (95% CI) for the observed incidence rate. Five or more cases were required to reliably calculate incidence rates (Greenland 1989) and 16 or more cases were required to reliably calculate age-adjusted rates (Singh et al. 2003).

Results

The study population began with 17,624 Navy and Marine Corps active duty members and beneficiaries. When the study criteria were applied, 1,490 people (8.4%) were excluded because they lived less than six months in Naples, leaving a final study population of 16,134 active duty Navy and Marine Corps sponsors and family members that resided in Naples during the study period. The average person-time contributed by each person was 5.25 years, ranging from 6 months to 12.2 years. The total person-time available for this study was 84,703 person-years. The study identified nine cases of NMSC, less than five cases of melanoma, and less than five cases of AML. The unadjusted incidence rate for NMSC was 14.4 cases per 100,000 person-years with a 95% CI of 6.6-27.4 cases per 100,000 person-years based on 62,384 person-years and a five-year latency period.

Discussion

The observed incidence rate of skin cancer was lower, but not significantly different from the range of incidence rates reported in the literature or U.S. cancer

registry reports. The NMSC unadjusted incidence rate for the study population was 14.4 (95% CI 6.6-27.4) cases per 100,000 person-years. NMSC is not a reportable cancer and standardized rates were not available from the National Cancer Institute. In the U.S., skin cancer is typically treated as an outpatient visit in a dermatology clinic or doctor's office and compliance with cancer registry requirements is unknown, leading to an underestimation of the true incidence rate (Chen 1995). The most recent journal article provided separate rates by gender for BCC and SCC in the U.S. population, limiting the ability to draw direct comparisons with the rates observed in Naples. Miller and Weinstock (1994) reported age-adjusted incidence rates of SCC at 26 cases per 100,000 person-years in women and 81 cases per 100,000 person-years in men. The rates for BCC were 212 cases per 100,000 person-years in women and 407 cases per 100,000 person-years in men. Other studies reported higher rates of NMSC ranging from 233 cases (including BCC and SCC) per 100,000 person-years in the U.S. (Scotto et al. 1983) to 321 cases of SCC per 100,000 person-years and 788 cases of BCC per 100,000 person-years in Australia (Staples et al. 1998).

There were several factors that limited the study, and the results should be carefully interpreted. First, the study population was small and relatively young. Most cancer cohort studies include a wide distribution of ages and have a large population from which to find cases. When cancer is rare in a population and the population is small, the rates are typically unstable due to low study power. Second, almost all cases of cancer diagnosed in a military beneficiary population are captured by the electronic data systems used to track medical visits. Cancer registries may not have comparable data collections systems as many are passive and require the health care provider to file a report. Because the military healthcare system has a more efficient method for identifying cases, the military beneficiary population may appear to have a higher rate than a comparable civilian population. Finally, the active duty population has a lower prevalence of some risk factors for cancer, like obesity and sedentary lifestyles. The best population to use for a comparison to the study population would be another military group. At this time, there are no published studies of NMSC in a military population for comparison.

Because it takes 20 to 50 years from first exposure for most cancers to develop (Schottenfeld and Fraumeni 1996), it was unlikely that this study would find an excess in the other cancers (see Table 1) associated with exposure to chemicals found in the tap water, soil, and ambient air at this time. While the reported sampling results in Phase 1 of the Naples Public Health Evaluation have several instances that exceeded the recommended screening levels, the risk for cancer at these levels is based on a lifetime of exposure and conservative screening levels. It is unlikely that a person will accumulate sufficient exposure time for the lifetime risk of cancer to be significantly increased.

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APPENDIX H: BIRTH DEFECTS EPIDEMIOLOGICAL STUDY, DECEMBER 2008

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Executive Summary for Naples Birth Defects Study
Navy and Marine Corps Public Health Center
27 January 2009

For more than a decade, the Campania region of Italy has experienced numerous environmental crises resulting from inadequate trash collection, burning of trash in the streets, and reports of illegal hazardous waste disposal. In 2007 these concerns peaked, in part, due to Italian health publications citing an increase in cancer rates and long term health effects in certain locales of the Campania Region due to environmental conditions. This prompted the Navy to initiate a Public Health Evaluation. The Public Health Evaluation, directed by the Navy and Marine Corps Public Health Center (NMCPHC) includes three primary efforts:

1. Three epidemiology studies: asthma, cancer and birth defects;
2. A human health risk assessment based on air, tap water, soil, soil gas sampling;
3. Limited testing of commissary foods.

Based on concerns raised by the Italian health studies, NMCPHC asked the DoD Birth and Infant Health Registry to conduct a study of birth defects among DoD beneficiary infants who got pregnant (conceived) in and around Naples, Italy. The DoD Birth and Infant Health Registry (Registry), managed by the DoD Center for Deployment Health Research, located at the Naval Health Research Center, San Diego, captures comprehensive healthcare data to define all live births and infant health outcomes among infants born to DoD beneficiaries. Registry professionals used enrollment records of U.S. Military personnel and beneficiaries to overseas Navy Military Treatment Facilities (MTF) and Clinics, who gave birth from January 2000 through December 2005, to identify the study sample.

The study included infants born from January 2000 through December 2005 whose mother was enrolled to an overseas MTF or clinic during the month prior to conception and the following three months. Additionally, these four months of enrollment were required to be at a facility within the same parent MTF, and the sponsor was active duty or activated reserve/guard at the time of birth. Infants with these four months of enrollment at the U.S. Naval Hospital Naples, or the clinics in Gaeta or Capodichino, were considered to be exposed to the Naples environment. A total of 894 births attributed to Naples were included in the study.

The birth defects study was designed to answer one fundamental question:

> Was the risk of a birth defect in children who were conceived while the mothers were enrolled in Naples significantly different from children born to mothers who were enrolled to other overseas facilities?

The study concluded:

1. The risk of a birth defect in children conceived overseas and in Naples were both lower than the overall Navy rate during the study period.

2. When compared to the risk of a birth defect in children conceived at other overseas facilities, the risks were higher, but the difference was not statistically significant.

3. Environmental testing results from the ongoing Naples Public Health Evaluation, once completed, and specific behavioral information from the parents might be used to better assess the effects of exposure on the adverse birth outcome rate.

Additional technical details are available in the full study.

For further questions locally please contact:

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IN REPLY REFER TO:
3900
Ser 00/195
22 Dec 08

From: Commanding Officer, Naval Health Research Center, San Diego
To: Commanding Officer, Navy and Marine Corps Public Health Center, 620 John Paul Jones Circle, Ste 1100, Portsmouth, VA 23708-2103

Subj: ANALYSIS OF RECENT MILITARY BIRTH DEFECTS FROM NAPLES

Encl: (1) Characteristics of Navy gestated infants, 2000 – 2005
(2) Multivariable Logistic Regression Modeling Results

1. The following summary and enclosure (1) are forarded per your request.

2. There are concerns the dumping and burning of trash in and around Naples, Italy, posses a public health risk to the health of US military personnel and their families living in the region. Recent studies conducted by the Italian government appear to suggest an increased risk of cancer and birth defects among their citizens in this area of Italy. As part of efforts to assess the public health risk to US military personnel and their families living in the region, the DoD Birth and Infant Health Registry, located at Naval Health Research Center, was asked to conduct a study of birth defects among infants who gestated in and around Naples.

3. This study included infants born to active-duty military women and spouses of active-duty military in the calendar years 2000 through 2005 where the mother showed continuous enrollment to an overseas Navy Military Treatment Facility (MTF) or Clinic (under the same parent DMIS) for the month prior to conception and the following three months of pregnancy. The final cohort included 8,678 infants. An infant was considered exposed if all four months of the mother's enrollment were at an MTF or clinic in the Naples area (Naval Hospital Naples and the clinics in Gaeta and Capodichino), regardless of the infant's birth location.

4. Analyses included descriptive investigations of demographic and occupational characteristics stratified by maternal enrollment location. Preliminary univariate analyses, including chi-square and odds-ratio were performed to assess the significance of associations between the outcome of interest and exposure. An exploratory model analysis was completed to assess regression diagnostics, significant associations, and collinearity, while simultaneously adjusting for all other variables in the model. Multivariable logistic regression models were used to estimate the adjusted odds ratios (ORs) and 95% confidence intervals (CIs) of birth defects among infants with the exposure of concern. All statistical analyses were performed using SAS software (Version 9.2, SAS Institute, Inc., Cary, NC).

5. Among the 8,678 infants, 894 showed first trimester exposure to the Naples area and 7,784 showed first trimester exposure to other overseas Navy enrollment sites. The overall rate of birth defects in the Navy is 3.6 per hundred births for the study time period. The rate of birth defects for infants exposed to Naples was 3.13 per hundred births vs. 2.35 per hundred births for other Navy overseas sites (Table 1). The unadjusted odds ratio between the two was 1.34 but was not statistically significant (95% CI: 0.90 – 2.01). After adjusting for birth plurality, infant gender, maternal age, sponsor race/ethnicity, maternal military status, sponsor pay grade, sponsor duty

occupation, and sponsor duty status the adjusted odds ratio was 1.36 and was not statistically significant (95% CI: 0.90 – 2.06) (Table 2).

6. Other associated factors included increased odds of birth defects in military mothers when compared to dependent mothers, and advanced maternal age (>=35 years). Sponsor's race/ethnicity of Black, not Hispanic vs. White, not Hispanic was significantly associated with decreased odds of a major birth defect (Table 2).

7. Overall, these analyses do not suggest a statistically significant increase in the birth defect rate of infants who gestate in the first trimester of their development in the Naples area compared to infants who gestate in the first trimester of their development in other overseas Navy areas. Although reassuring, additional surveillance in the region should continue in order to further evaluate the effect of specific exposures potentially influenced by the trash situation such as air and water. Identifying the individuals' various exposure levels could also provide additional insight into this potential environmental problem affecting a specific subset of the military population. As always, the DoD Birth and Infant Health Registry will be standing by to assist in these future investigations.

8. My scientific point of contact for this report is Dr. Ava Marie S Conlin, DO, MPH, telephone (619) 767-4489.

K. R. THOMPSON

Copy to:
CO, Naval Medical Research Center
COM, Navy Medicine Support Command

Characteristics of Navy gestated infants, 2000 – 2005

	Enrollment to Navy site							
	Enrolled in US Navy Site		Enrolled in Other Over-Seas Navy Site		Enrolled in Naples		All	
	Count	Percent in group	Count	Percent in group	Count	Percent in group	Count	Percent in group
All	72683	100	7784	100	894	100	81361	100
Any birth defect								
No	69984	96.29	7601	97.65	866	96.87	78451	96.42
Yes	2699	3.71	183	2.35	28	3.13	2910	3.58
Estimated gestational age								
Full term	66746	91.83	7340	94.3	859	96.09	74945	92.11
Preterm	5937	8.17	444	5.7	35	3.91	6416	7.89
Birth plurality								
Singleton	71870	98.88	7698	98.9	886	99.11	80454	98.89
Multiple	813	1.12	86	1.1	8	0.89	907	1.11
Infant gender								
Male	37407	51.47	4069	52.27	458	51.23	41934	51.54
Female	35276	48.53	3715	47.73	436	48.77	39427	48.46
Maternal age								
< 35	65545	90.18	6852	88.03	766	85.68	73163	89.92
>=35	7138	9.82	932	11.97	128	14.32	8198	10.08
Sponsor race/ethnicity								
white, not Hispanic	46988	64.65	4241	54.48	548	61.3	51777	63.64
Black, not Hispanic	10762	14.81	1435	18.44	157	17.56	12354	15.18
Hispanic	8638	11.88	967	12.42	95	10.63	9700	11.92
Other/Unknown	6295	8.66	1141	14.66	94	10.51	7530	9.26
Maternal military/marital status								
Dependent spouse	61082	84.04	5553	71.34	614	68.68	67249	82.66
Military sponsor	11601	15.96	2231	28.66	280	31.32	14112	17.34
Sponsor service branch								
Navy	47529	65.39	5066	65.08	779	87.14	53374	65.6
Other Military	25154	34.61	2718	34.92	115	12.86	27987	34.4
Sponsor pay grade								
Enlisted	58770	80.86	6360	81.71	700	78.3	65830	80.91
Officer	13913	19.14	1424	18.29	194	21.7	15531	19.09
Sponsor duty occupation	52689	72.49	5880	75.54	657	73.49	59226	72.79
Other occupation								
Infantry, gun crews, seamen	13052	17.96	1031	13.25	111	12.42	14194	17.45
Health care	6942	9.55	873	11.22	126	14.09	7941	9.76
Sponsor duty status								
Regular	64963	89.38	7229	92.87	819	91.61	73011	89.74
Reserve/Guard	7720	10.62	555	7.13	75	8.39	8350	10.26

Multivariable Logistic Regression Modeling Results

Variable		OR	95% CI	
Enrollment site	Naples vs other over-seas Navy site	1.36	0.90	2.06
Birth plurality	Multiple vs singleton	1.44	0.45	4.59
Infant Gender	Male vs female	1.29	0.98	1.71
Maternal age	**>=35 vs < 35**	**1.77**	**1.22**	**2.57**
Sponsor race/ethnicity	**Black, not hispanic vs White, not hispanic**	**0.56**	**0.37**	**0.86**
	Hispanic vs White, not hispanic	0.89	0.58	1.37
	Other/unknown vs White, not hispanic	0.82	0.54	1.26
Maternal military status	**Military sponsor vs Dependent spouse**	**1.53**	**1.13**	**2.07**
Sponsor service branch	Other military vs Navy	1.20	0.89	1.62
Sponsor pay grade	Officer vs enlisted	0.94	0.61	1.45
Sponsor duty occupation	Health care vs Other occupation	0.83	0.51	1.36
	Infantry, gun crews, seamen vs Other occupation	0.92	0.59	1.42
Sponsor component	Reserve/guard vs Regular	0.81	0.41	1.59

Enclosure (2)

APPENDIX I: ASTHMA EPIDEMIOLOGICAL STUDY, OCTOBER 2008

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Navy and Marine Corps Public Health Center

Naples Public Health Evaluation

Asthma Epidemiological Study

10 October 2008

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Executive Summary for Naples Asthma Study

Navy and Marine Corps Public Health Center

For more than a decade, the Campania region of Italy has experienced numerous environmental crises resulting from inadequate trash collection, burning of trash in the streets, and reports of illegal disposal of hazardous wastes. In 2007 these concerns peaked, in part due to Italian health publications citing an increase in cancer rates and long-term health effects in certain locales of the Campania Region due to environmental conditions. This prompted the Commander Navy Region Europe to initiate a Public Health Evaluation. The Public Health Evaluation, directed by the Navy and Marine Corps Public Health Center (NMCPHC) includes three primary efforts:

1. Three epidemiology studies: asthma, cancer, and birth outcomes.
2. A human health risk assessment based on air, tap water, soil, soil gas sampling.
3. Limited testing of commissary foods.

NMCPHC determined asthma was the best health outcome to study as an indicator of illness associated with exposure to smoke from illicit trash burning. Asthma is a reversible obstructive airway disease and is associated with allergies, exposure to very fine particulates, and some industrial chemicals.

The asthma epidemiology study was designed to answer two fundamental questions:

1. Does the frequency and severity of asthma symptoms worsen for Navy active duty and family members while living Naples?

2. Are personnel more susceptible to asthma 4-6 months after arriving in Naples?

The study concluded:

1. There are no significant associations or trends between exposure to the environment in Naples and asthma severity over the study period.

2. Asthma severity does not appear to increase significantly within the first six months of arriving in Naples. However, based on the data available for this study; this question could not be fully answered.

This study linked medical visit records with housing records to identify Naples residents that were seen for asthma. It included all residents living in U.S. government housing (family, bachelor, and leased) who were treated for asthma at U.S. Naval Hospital Naples and its branch clinics from October 2006 to June 2008. This time period was selected because asthma severity codes were required in the medical record starting in October 2006 and the housing records available for the study ended on 1 July 2008. Navy housing areas located at Naval Support Activity Capodichino, Support Site Naples, and

Naval Support Activity Gaeta were included in the study. Naval Support Site Gaeta was included because some people live in Gaeta but work or attend school at Naval Support Site Naples and/or Naval Support Activity Capodichino. The study also included civilians and other non-military healthcare beneficiaries treated at U.S. Naval Hospital Naples or its clinics; however, the medical information available for these patients was limited because of lack of documentation in Navy records prior to their arrival in Naples. Therefore, civilian medical information was only available for use in answering question number two above.

Patient asthma medical information was obtained from two sources – a printout of electronic health records from the U.S. Naval Hospital Naples and clinics, and from a central Navy medical data repository that records diagnosis codes. Each medical visit that resulted in a diagnosis of asthma was assigned a severity score:

1 – Mild Intermittent
2 – Mild Persistent
3 – Moderate Persistent
4 – Severe Persistent

In this study, the scores were averaged to obtain the monthly asthma severity. The averages were compared within the study period to look for changes in asthma severity over time.

Numerous statistical models were used to investigate possible relationships between arriving in Naples before and after widespread trash burning began in May 2007 and changes in asthma severity. None of the models resulted in any significant associations or trends between exposure to the environment in Naples and the severity of asthma over the study period.

In order to further investigate a possible connection between asthma and exposures to smoke from burning trash, NMCPHC will continue to collect and analyze the medical visit data for the Naples study population for the next 6 months. NMCPHC will provide an updated report of findings in June 2009. U.S. Naval Hospital Naples will continue to provide current residents with health information on preventing and reducing the severity of upper respiratory system illness.

NMCPHC EpiData Center October 2008

Preliminary Findings for Asthma in Naples

1. **Study title:** Analysis of asthma for residents of U.S. Navy facilities located at Naples, Italy.

2. **Study questions:**

a. Do asthma symptoms worsen for Navy active duty and family members while living in Naples?

b. Are personnel more susceptible to asthma 4-6 months after arriving in Naples?

3. **Study background:**

a. This study was designed to measure changes in asthma diagnoses for residents of U.S. Navy facilities in Naples including Capodichino, Support Site, and Gaeta. Gaeta was included as some people live in Gaeta but work or attend school at Support Site and/or Capodichino. Asthma is a reversible obstructive airway disease and is associated with allergies, exposure to very fine particulates, and some industrial chemicals. Some residents of Naples are concerned that recent past and current environmental conditions increased the severity and frequency of asthma cases.

b. Historic diagnoses of asthma in Naples were analyzed to measure any changes in severity of disease over time within the study population and for individual cases. Severity for the purpose of the study is defined as the numeric extender code assigned to the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) as part of the medical encounter module of AHLTA:

- 1 – Mild Intermittent
- 2 – Mild Persistent
- 3 – Moderate Persistent
- 4 – Severe Persistent

c. One of the primary reasons for conducting this study was to determine if exposure to the smoke from burning trash increased the severity of asthma in this population. Based on a review of available news reports and newspaper articles, the first mention of trash fires was 18 May 2007. For the purpose of this study, 01 May 2007 was set as the start for trash burning.

4. **Study population**: All personnel that received care at U.S. Naval Hospital Naples and its branch medical clinics from 01 October 2006 to 30 June 2008 were included in this study. While civilians and other non-military healthcare beneficiaries were eligible for the study, the lack of documentation of their asthma information prior to arrival in Naples limited their full participation.

a. Inclusion criteria: Treated for asthma at U.S. Naval Hospital Naples or its branch medical clinics at least once between October 2006 – June 2008. Branch Medical Clinic Gaeta was included because some residents live in Gaeta but work or attend school in Naples.

b. Exclusion criteria: Medical visits that were outside of the Military Healthcare System (MHS) were not captured by this study. This may include any civilians or other non-military healthcare beneficiaries that were diagnosed prior to reporting to Naples. While some of these individuals may be included in the study, some were excluded due to incomplete records within the MHS.

5. **Data sources:**

a. Diagnosis and patient/provider comments - AHLTA electronic health record narratives and M2 data systems provide information about the encounter between the healthcare provider and the patient including a coded diagnosis.

b. Location of residence – NSA Family Housing records

6. **Case definition:** Asthma: A diagnosis of ICD-9-CM 493.0x – 493.9x during the study period. The AHLTA extender codes were used to determine severity and changes in severity. AHLTA extender codes did not consistently appear in the Military Health System (MHS) for asthma until October 2006.

7. **Methods:**

a. Asthma case finding: All available medical data systems were searched to obtain cases of asthma and potential cases of asthma using the following ICD-9-CM codes: Asthma: 493.0x – 493.9x plus DoD ICD-9-CM extender codes.

b. Latency: Normally, it is accepted that there be a specific time between the first exposure and the clinical diagnosis of disease for the exposure to be linked to the illness. In the case of asthma, that time can be very short when the level of exposure is high or the person is particularly sensitive to the agent.

c. Competing risks: An analysis of cases as described below used two significant exposure events – first arrival in Naples and first exposure to the smoke from burning trash. To attempt to assess those cases that might be associated with exposure to the smoke, it is necessary to control for those cases that might be associated with other risk factors.

d. Analysis: A comparison of asthma severity was conducted at various time windows of exposure. Because the clinical diagnosis may vary between medical providers, changing environmental conditions, and parental concerns, confidence

intervals were calculated at the 80% level. This means that the calculated values presented in this report are less sensitive to diagnosis miscoding or differences in diagnosis that may occur between healthcare providers. The analysis included:

(1) A general description of asthma severity over time using a trend analysis since arrival in Naples.

(2) The change in average asthma severity within the first 180 days since arriving in Naples.

(3) The severity of asthma was compared between pre- and post-exposure to the smoke among people acclimatized to the Naples area before 01 May 2007.

(4) A descriptive analysis of comments recorded in the narrative section of the AHLTA medical record.

8. **Sources of bias:**

a. Missed cases: The initial review of these cases was based on healthcare provider diagnosis and the use of the proper ICD-9-CM codes. While a diagnosis of asthma is fairly well defined, the use of other upper respiratory illness diagnosis codes in place of clinical asthma can occur. It is possible that some true asthma cases were missed if they were coded and treated as some other upper respiratory illness.

b. Environmental risk: In a population that is highly aware of the health effects of air pollution and unsure of the exposure levels that increase their risks, it was expected (and understandable) that they might seek medical care earlier and more frequently than those unaware of their environmental conditions or the health effects of exposure. Medical providers may also provide more aggressive treatment to avoid severe asthma attacks due to the unpredictability of the environmental conditions. The effects of these practices may cause the severity and frequency of asthma attacks to appear higher than the true risk.

c. Healthy population effect: Prior to accepting overseas orders, the member and, if accompanied, family must be medically screened for overseas duty. When a person has a condition that may exceed the medical capability of the receiving command, a waiver/permission must be obtained prior to executing permanent change of duty station orders. It is possible that exposure to atmospheric pollutants in a healthy population may not have the same effect as the same exposure in the general population. The impact of atmospheric exposure on asthma incidence and/or severity in a healthy population is unknown when it cannot be compared to a similar population living under the same conditions but without exposure to these specific atmospheric conditions.

d. Confounding: Associating all cases of asthma with the increased fine particulates in the air due to the smoke from burning trash may be misleading. Asthma can also be triggered by allergens like mold, exercise, abrupt changes in the weather, and

air pollution from traffic and agricultural activities. The Campania Region has high levels of fine particulates as a result of urban and agricultural activities. The medical literature describes a period of adjustment called acclimatization for asthmatic individuals that move to a new area or are exposed to new respiratory irritants. While some people may experience an increase in asthma symptoms, others may not. Without baseline data prior to the trash problems, determining the actual contribution of new or more severe cases due to the trash was not possible. An analysis of those that were acclimatized to the Naples environment prior to the burning of the trash should reduce this bias.

9. **Results:**

a. Demographics. The study population was largely Navy (74%) and 59% were children. A child is defined as less than 20 years old at the time of the medical visit. Table 1 provides a breakdown by Service and age group.

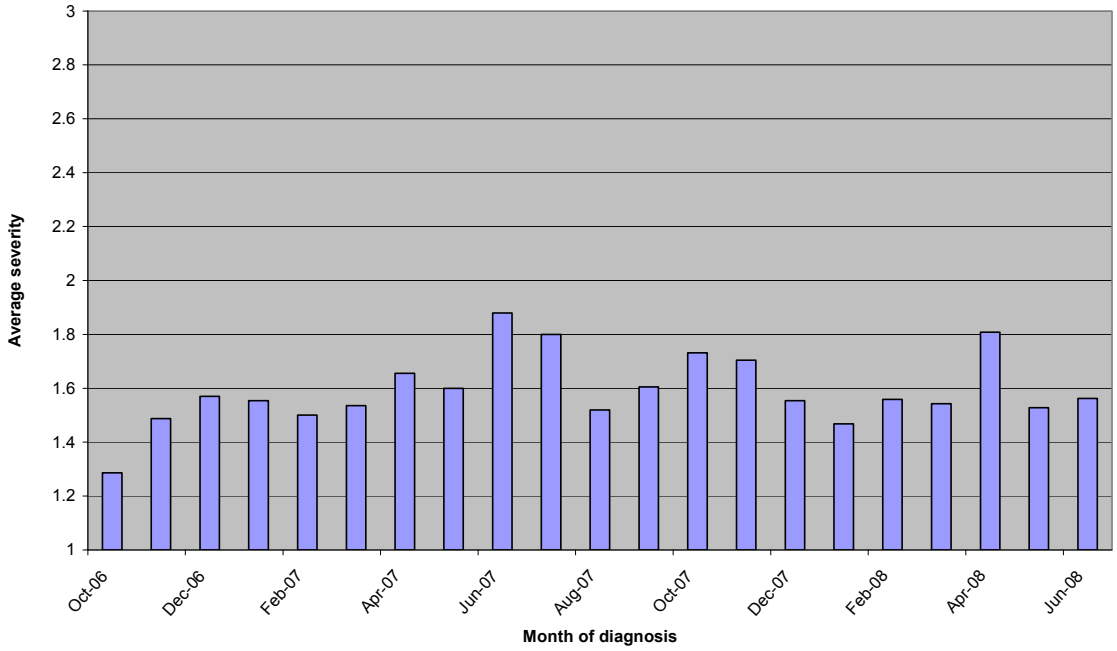
Table 1. Study Cases by Sponsor's Service and Age group

Sponsor's Service	Age Group		Total
	CHILD	ADULT	
Army	31	36	67
Coast Guard	3	1	4
Air Force	15	6	21
Marine Corps	10	6	16
Navy	260	168	428
Other*	22	23	45
Total	341	240	581

* - includes Civil Service and Foreign National

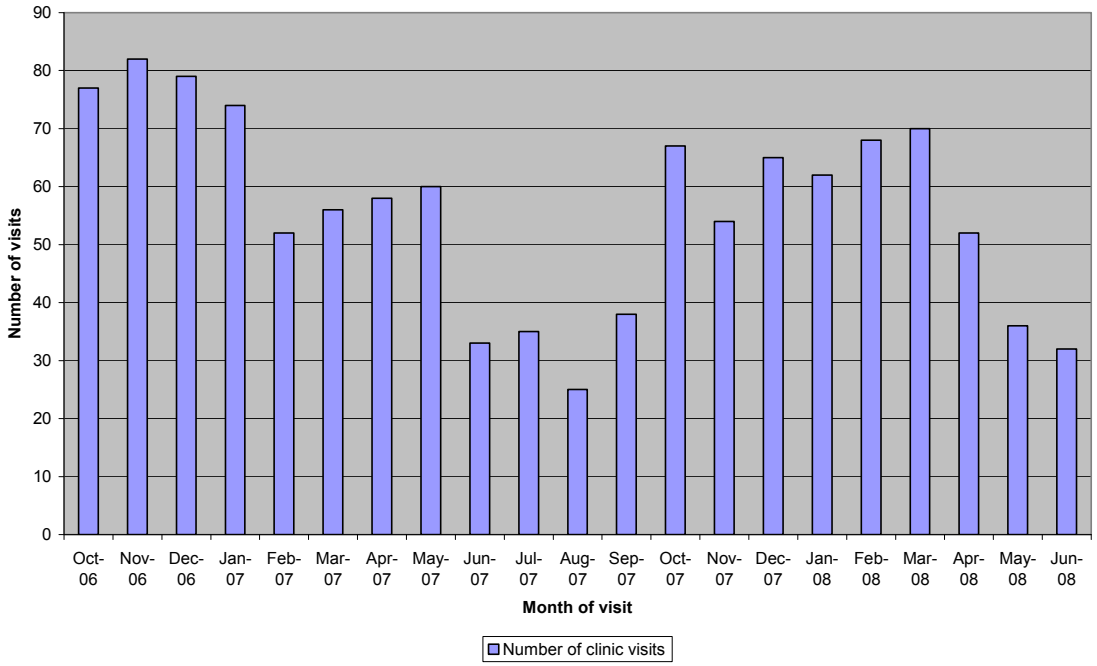
b. Average asthma severity for entire study population. Figure 1 illustrates the monthly variation in average asthma severity by month from October 2006 through June 2008 for 581 individuals (Figure 1) and 1175 medical visits. There were three peaks – June and July 2007; October and November 2007; and April 2008. The largest difference in average severity score between two peaks was between October 2006 and June 2007. The two biggest monthly increases in average severity were between May to June 2007 and March to April 2008. The two biggest monthly decreases in average severity were July to August 2007 and April to May 2008. Though not displayed in this figure, it is also important to note that for the study period of October 2006 – June 2008, there were only 5 people who had at least one visit scored as severe, representing lass than 1% of all asthma cases.

Figure 1. Average asthma severity score by month of clinic visit, all Naples residents, October 2006 - June 2008



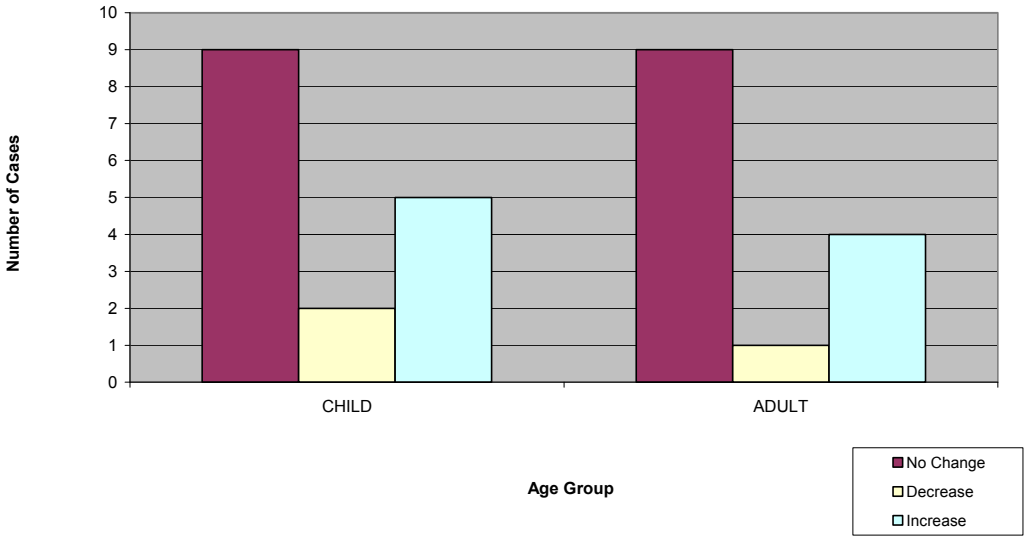
c. Clinic visits resulting in a diagnosis of asthma. Figure 2 illustrates the number of medical treatment facility (MTF) visits that resulted in a diagnosis of asthma by month for 581 individuals and 1175 medical visits.

Figure 2. Number of clinic visits resulting in a diagnosis of asthma for Naples residents, October 2006 - June 2008



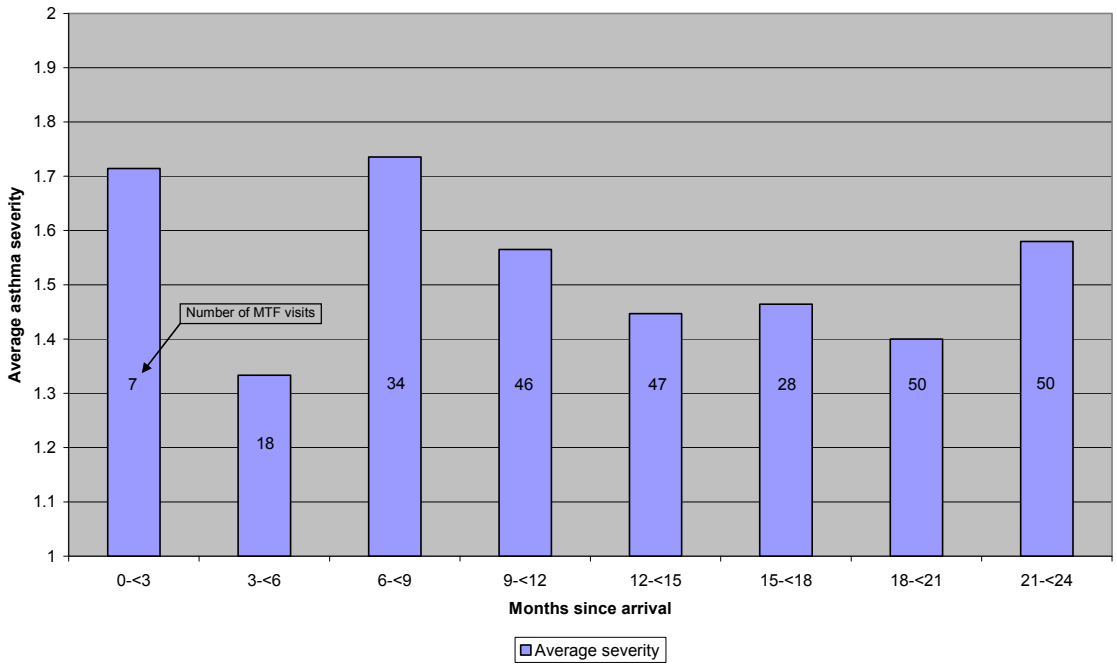
d. Changes in asthma severity within 6 months of reporting to Naples. Figure 3 illustrates change in severity codes in patients with a diagnosis of asthma within their first six months of reporting to Naples. Of the 103 people seen for asthma during their first six months in Naples, 30 (29%) had at least two visits during that time period. Twenty-one of 30 (70%) had either no change or a decrease in their severity score. In Figure 3, a child is defined as less than 20 years old.

Figure 3. Changes in severity codes for all asthma cases between first and last clinic visit within 6 months of arriving in Naples by age group (n= 30)



e. Average asthma severity for those that arrived on or after 01 October 2006. Figure 4 illustrates the average asthma severity based on the time since arrival in Naples for 146 individuals that arrived on or after 01 October 2006. The numbers in each bar represent the number of visits diagnosed as asthma in that quarter (total = 280 medical visits)

Figure 4. Average asthma severity for those Naples residents that arrived after 01 OCT 2007 and the number of months between arrival and MTF visits



f. Comments in the narrative section of the electronic health records. A total of 834 records for 297 individuals were reviewed to extract comments by the patient (or parent/guardian of the patient) or medical provider that were related to either being stationed in Naples or the environmental conditions. There were 68 records for 57 (19.2%) patients who expressed concern due to living in Naples and/or the environmental conditions. This came in many forms: some providers just noted parental concern about the area, some noted exacerbations of asthma due to environmental exposures, some noted smoke exposure in the Naples community; and others following symptoms noted that the person was new here as though it may explain some symptoms. Of these patients, 35 were coded as children (61.4%), 7 were sponsors (6 active duty), and 15 were spouses.

10. **Discussion:** Navy & Marine Corps Public Health Center (NMCPHC) was tasked to answer two questions:

a. Do asthma symptoms worsen for Navy active duty and family members while living in Naples?

The results of the analysis are inconclusive. When Figures 1 and 2 are considered together, there is a general, inverse trend between the number of visits per month and the average asthma severity. While the number of visits may have increased during times of heightened concern for asthma, the increased number of visits did not always result in a higher average asthma severity code. The highest number of visits occurred before the fires started in May 2007. This could be due to several factors that may be unrelated to the burning trash. Naples is an urban and agricultural area with high levels of industrial and traffic-related pollution and seasonal periods of high agricultural activity; both of which are recognized risks for asthma. If exposure to the smoke from the burning trash was significantly increasing asthma severity in those already diagnosed with asthma, then a concurrent increase in the number of visits and the average severity would be expected. This was observed only once during the study period, from August to October 2007, but the trend was not supported over the entire study period.

b. Are personnel more susceptible to asthma 4-6 months after arriving in Naples?

The results of the study are inconclusive. Asthma severity does not appear to increase significantly within the first six months of arriving in Naples (Figure 3), however, based on the data available for this study; this question could not be fully answered. It is very difficult to estimate the true number of patients with a decrease in their severity score because those that improved to the point that they were not considered an asthma case did not receive a code in the records because they were no longer considered to have asthma. Also, it is unknown if those with only one clinic visit within the first six months of arriving in Naples improved, received care outside of the MHS, or did not require follow-up care due to a sufficient supply of medication. Figure 4 illustrates that average severity does not exhibit a trend of increasing severity once a person arrives in Naples.

c. Conclusion. This study was unable to identify any significant trends that might associate increased exposure to smoke from burning trash with either an increase in average asthma severity or number of medical visits diagnosed as asthma.

11. **Recommendations:**

a. NMCPHC will continue to collect and analyze the medical encounter data for Naples study population data for the next 6 months and provide an updated report in June 2009.

b. U.S. Naval Hospital will continue to provide current residents with health information on preventing and reducing the severity of upper respiratory system illness.

APPENDIX J: UPDATED ASTHMA EPIDEMIOLOGICAL STUDY, JUNE 2010

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DEPARTMENT OF THE NAVY
NAVY AND MARINE CORPS PUBLIC HEALTH CENTER
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PORTSMOUTH VA 23708-2103

5090
Ser EDC/000749
8 JUN 10

From: Commanding Officer, Navy and Marine Corps Public Health Center
To: Commander, Navy Region Europe, Africa, SW Asia

Subj: NAPLES PUBLIC HEALTH EVALUATION UPDATED ASTHMA EPIDEMIOLOGICAL STUDY

Ref: (a) COMNAVREG EUR NAPLES IT ltr 5100 Ser 00/173 of 13 Jun 07

Encl: (1) Executive Summary for Updated Asthma Epidemiological Study
(2) Naples Public Health Evaluation Updated Asthma Epidemiological Study

1. Per reference (a), enclosure (1) is provided as the executive summary of the subject epidemiological study and should be included with the full report in enclosure (2).

2. Please direct any questions to Dr. Chris Rennix, Ph.D. at commercial: (757)953-0664, DSN: 377-0664, or via e-mail at christopher.rennix@med.navy.mil.

M. J. Macinski

M. J. MACINSKI
Acting

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Executive Summary for Updated Asthma Epidemiological Study
Naples Public Health Evaluation
Navy and Marine Corps Public Health Center
07 June 2010

For more than a decade, Naples and the Campania region of Italy have experienced numerous environmental crises resulting from inadequate trash collection, burning of trash in the streets, illegal disposal of hazardous wastes, and reported contamination of some foods produced in the region. In 2007 these concerns peaked, in part due to Italian health publications citing an increase in cancer rates and long-term health effects in certain locales of the Campania region due to environmental conditions. This prompted the Navy to initiate a Public Health Evaluation to assess potential health risks to U.S. military and civilian personnel and their families living in the this region. The Public Health Evaluation, directed by the Navy and Marine Corps Public Health Center (NMCPHC), included three primary efforts:

1. Three epidemiology studies: asthma, cancer, and birth outcomes;
2. A human health risk assessment based on air, tap water, soil, and soil gas sampling;
3. Limited testing of commissary foods.

NMCPHC determined asthma was the best health outcome to study as an indicator of illness associated with exposure to smoke from illicit trash burning and general urban and agricultural air pollution. Asthma is a reversible obstructive airway disease and is associated with allergies, exposure to very fine particulates, and some industrial chemicals. NMCPHC completed the first asthma epidemiology study in October 2008, which did not find any significant trends with regards to asthma severity or asthma medical visits during the study period. The October 2008 study lacked both the population sample size and the air pollution exposure data necessary to draw meaningful conclusions about the relationship between asthma and air pollution. For this reason, a second study, reported here, was conducted to investigate any changes in asthma burden that might be associated with exposure to ambient air pollution.

This study linked the medical visit records of U.S. personnel living in Naples who were seen for asthma, with air quality data collected from July 2008 to July 2009 from the regional ambient air monitoring study conducted for the Naples Public Health Evaluation. The updated asthma study included all U.S. Department of Defense (DOD) beneficiaries who received care at U.S. Naval Hospital (U.S. NH) Naples or its branch medical clinics (BMC Capodichino and BMC Gaeta), from 01 July 2008 to 31 July 2009. Naval Support Site Gaeta was included because, until recently, some people lived in Gaeta but worked or attended school at Naval Support Site Gricignano and/or Naval Support Activity Capodichino. The study also included civilians and other non-military healthcare beneficiaries treated at Naval Hospital Naples or its clinics.

Patient asthma medical information was obtained from a central Navy medical data repository that records diagnosis codes. Each medical visit that resulted in a diagnosis of asthma was assigned a severity score:

1 – Mild Intermittent
2 – Mild Persistent
3 – Moderate Persistent
4 – Severe Persistent

In this study, study participants were categorized as persistent or non-persistent. The proportions for each category were compared within the study period to look for changes in asthma severity over time.

Air quality measurements were obtained from nine separate ambient air monitoring stations that were set up to collect air quality data for the Naples Public Health Evaluation (PHE). Based on current scientific and medical literature for asthma and the levels detected for each contaminant in the ambient air monitoring study, two contaminants were selected for analysis in the study – particulate matter less than 10 microns in diameter (PM10) and acrolein. PM10 was selected because it is a common measure of ambient air pollution and is associated with increased asthma symptoms and severity. Acrolein was selected because it exceeded the U. S. Navy Risk Management Criteria, established for the Naples PHE, in 100% of the samples and it has some properties that may exacerbate asthma.

To further investigate asthma burden, data from an asthma case management program were obtained. This program, called the Population Health Navigator, tracks patients that meet a case definition for persistent asthma to ensure they obtain routine preventive care for their condition. Data from October 2006 through July 2009 and the results for Naples were compared to Navy data for U.S. personnel stationed in Rota, Spain, and Sigonella, Italy.

In summary, this study found a weak, positive association between increasing PM10 levels and a person being categorized as a persistent asthmatic in the U.S. Naval Hospital Naples population. 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. Based on the results of the study, it is recommended that U.S. Naval Hospital Naples consider the impact of the air quality on those with documented respiratory problems, especially persistent asthma, prior to granting an overseas medical screening waiver.

Navy and Marine Corps Public Health Center

Naples Public Health Evaluation

Updated Asthma Epidemiological Study

June 2010

Enclosure (2)

Study Title: Updated analysis of asthma burden among U.S. Department of Defense beneficiaries located in Naples, Italy, between October 2006 and July 2009

Study Question: Are there observable increases in asthma burden (measured by the number of asthma visits and severity) for U.S. Department of Defense beneficiaries living in Naples, and is asthma burden related to exposure to air pollution?

Background

For more than a decade, the Campania region of Italy has experienced numerous problems with inadequate trash collection, burning of trash in the streets, and reports of illegal disposal of hazardous wastes. In 2007, concerns over these incidents peaked, in part due to Italian health publications citing an increase in cancer rates and long-term health effects in certain locales of the Campania region due to environmental conditions. These events prompted Commander, Navy Region Europe, Africa, Southwest Asia (CNREURAFSWA) to request a Public Health Evaluation (PHE) from the Navy and Marine Corps Public Health Center to assess the public health risk to U.S. military and civilian personnel and their families living in the greater Naples area. The PHE included three separate epidemiologic analyses of health outcomes among U.S. service members stationed in Naples: asthma, cancer, and birth defects.

As part of the effort to assess the public health risk of air pollution to U.S. military and civilian personnel and their families in the region, a second asthma study was conducted as a follow-up to an earlier study of asthma in Naples conducted in October 2008. The October 2008 study lacked the air pollution exposure data necessary to draw meaningful conclusions about the relationship between asthma and air pollution. This second study was designed to include air quality data collected from July 2008 through July 2009 as well as medical encounter data from that same time period to identify and describe trends in asthma and to determine if those trends were influenced by air pollution.

Asthma is a reversible obstructive airway disease that is associated with exposure to allergens, very fine particulates, urban air pollutants, and some industrial chemicals. Asthma burden is defined (in this study) as the frequency and severity of asthma-related occurrences in the population. For the purposes of this study, asthma burden was measured in two ways: the rate of medical encounters coded for asthma (asthma visit rate) and the asthma severity score associated with each asthma visit. These measures and how they were calculated are described in more detail in the Methods section of this report.

Air pollution released by the burning of various organic and inorganic materials, including trash, is known to increase concentrations of particulate matter and other pollutants in ambient air. There are many other potential sources of air pollution in Naples, including exhaust from automobiles and other vehicular traffic, industrial activity, agricultural burning and harvesting, and construction. Ambient particulate matter of various chemical compositions and physical properties less than 10 microns in diameter (known as PM10) is small enough to be inhaled and accumulate in the respiratory system. A 10-micron particle is about 0.0004 inches in diameter or

about one-seventh the width of a human hair. PM10 is widely recognized as a primary component of air pollution that is associated with poor health outcomes, and has been the focus of many studies of the effects of air pollution on lung function. Studies suggest that PM10 is associated with an increase in asthma burden, specifically, as PM10 concentrations increase, asthma symptoms worsen and the number of medical encounters resulting in a diagnosis of asthma increase (Anderson, 1998; Atkinson et al., 1999; Choudhury, 1997; Donaldson, Gilmour, & MacNee, 2000; Lipsett, Hurley, & Ostro, 1997; Peters, Dockery, Heinrich, & Wichmann, 1997; van der Zee et al., 1999).

Exposure to PM10 usually results in increased asthma symptoms within a very short time period, typically within one day of exposure (Fadel, 2000; Keiding, 1995; Choudhury, 1997). The relationship between PM10 concentration and asthma exacerbation appears to be linear, with increasing PM10 resulting in a corresponding increase in asthma medical visits and asthma severity. There is no clear threshold of PM10 at which asthma severity dramatically increases (Baldi, 1999; Donaldson et al., 2000; Johnston, 2002; Whittemore, 1980). One review found that for each 10 microgram per cubic meter ($\mu g/m^3$) increase in PM10 concentration, asthma hospitalizations and related visits increased by 2% and asthma symptoms increased by 3% (Pope, 1999). The U.S. Environmental Protection Agency (U.S. EPA) National Ambient Air Quality Standard (NAAQS) for PM10 is 150 $\mu g/m^3$ for a 24-hour average, however there is no monthly or yearly NAAQS for PM10. The 24-hour standard of 150 $\mu g/m^3$ was exceeded in 3% of the samples detected in the PHE Phase I and Phase II year-long ambient air monitoring study. NAAQS are standards set by the U.S. EPA that apply to outdoor air and are designed to protect human health.

Other pollutants are also associated with asthma, including particulate matter less than 2.5 microns in diameter (PM2.5), sulfur dioxide, oxides of nitrogen, carbon monoxide, acrolein and formaldehyde (Kieding and Rindel, 1995; Woodruff et al., 2007). Acrolein was also evaluated in this study because all 299 samples exceeded the U.S. Navy (USN) Risk Management Criteria established for the Naples PHE in the Phase I and Phase II ambient air monitoring studies (NMCPHC, 2009). Other pollutants including sulfur dioxide, oxides of nitrogen, carbon monoxide, and ozone were not found in exceedance of U.S. EPA NAAQS in the Phase I and Phase II ambient air monitoring studies and were therefore not studied (AAQMSR 2010).

Methods

Study population

The primary study population included all U.S. Department of Defense (DOD) beneficiaries who received care at U.S. Naval Hospital (U.S. NH) Naples or its branch medical clinics (BMC Capodichino and BMC Gaeta), from 01 July 2008 to 31 July 2009. Throughout this report, the abbreviation "U.S. NH Naples" will refer to all three medical facilities. A secondary population was also examined in order to provide a historical perspective of asthma visits and the number of persons with persistent asthma. This secondary population included all persons who were stationed in Naples from October 2006 to July 2009.

Air quality measurements

As part of the Naples PHE, regional ambient (outdoor) air monitoring was conducted for 12 consecutive months, from July 2008 to July 2009. Air samples were collected from each of nine air monitoring stations established for the Naples PHE. These locations are represented as blue stars in Figure 1. Measurements of the following seven contaminants were generally taken three to five times per month at each air monitoring station:

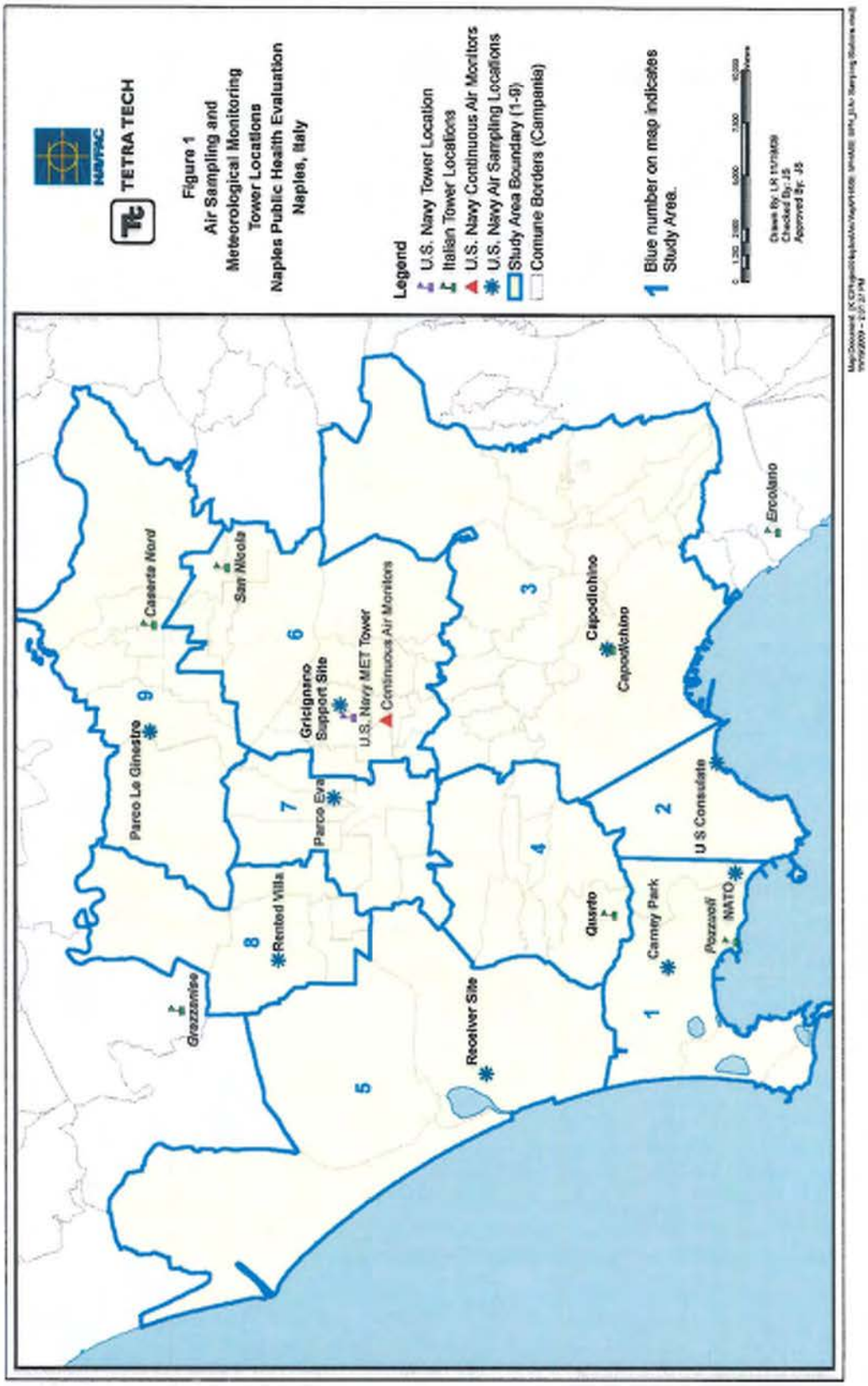
- PM10 metals
- Mercury vapor
- Volatile organic compounds
- Semi-volatile organic compounds
- Aldehydes and ketones
- Pesticides and polychlorinated biphenyls (PCBs)
- Dioxins and furans

While many pollutants have been associated with asthma, two were selected for analysis in this study: PM10 and acrolein. PM10 was chosen because it is a common measure of ambient particulate air pollution, and because previous studies found PM10 to be associated with increased asthma symptoms and severity (Anderson, 1998; Atkinson et al., 1999; Choudhury, 1997; Donaldson et al., 2000; Lipsett et al., 1997; Peters et al., 1997; van der Zee et al., 1999). Although PM10 is often associated with increased asthma symptoms, only 13 out of 431 total samples detected (3%) in the PHE Phase I and Phase II ambient air monitoring study were higher than the U.S. EPA NAAQS of 150 $\mu g/m^3$ for PM10 for a 24-hour average (U.S. EPA 2009-1).

Acrolein has also been found to be associated with aggravation of asthma symptoms (Woodruff et al., 2007), although the association is not as well established in the scientific literature as that of PM10. Acrolein exceeded the USN Risk Management Criteria established for the Naples PHE, of 0.021 $\mu g/m^3$, in 299 out of 299 (100%) total samples detected. The USN Risk Management Criteria was based on U.S. EPA Regional Screening Levels (U.S. EPA 2010). The Agency for Toxic Substances and Disease Registry (ATSDR) has established an acute minimal reference level (MRL) of 7 $\mu g/m^3$ for exposure to acrolein at which acute respiratory effects would be observed in humans (U.S. EPA 2009-2). The MRL is an estimate of the level of daily human exposure to a hazardous substance, below which excess risk of adverse non-cancer health effects is not likely to occur (U.S. EPA 2009-2). The MRL for acrolein was exceeded in 9 out of 299 (3%) samples detected.

Monthly averages of both acrolein and PM10 were calculated for the entire region (all nine study areas) by adding all measurements for each pollutant taken at all Naples PHE air sampling locations in a given month and dividing by the total number of measurements taken that month. Because daily air monitoring results could not be linked to individuals in each air sampling location, average monthly PM10 and acrolein concentrations for the entire Campania region were used.

Figure 1: Locations of Air Monitoring Stations in Campania Region of Italy



Assessment of asthma burden

Medical encounter data were obtained from the Military Health System (MHS) Management Analysis and Reporting Tool (M2), which creates a record of every visit within the MHS using codes that indicate the reason for the visit. Inpatient and outpatient medical encounter records were used to identify medical visits resulting in an asthma diagnosis and the asthma severity associated with each of those visits. The two primary measures of asthma evaluated in this study were the asthma visit rate and the severity of asthma.

1. Asthma visit rate: Unique asthma visits were defined as any inpatient or outpatient medical visit resulting in an asthma diagnosis. Duplicate asthma visits for the same person on the same day were deleted; however, visits for the same person on different days were retained. Inpatient and outpatient medical encounter records were obtained from M2. All inpatient and outpatient records with diagnoses for asthma, identified by International Classification of Disease-9th Edition-Clinical Modification (ICD-9) codes from 493.0x to 493.9x, were included in the study. The number of asthma visits each month was divided by the total number of beneficiaries enrolled at Naples medical treatment facilities each month to come up with a monthly asthma visit rate per 1000 enrollees.

2. Asthma severity: Each asthma ICD-9 diagnosis code is appended with a severity code represented by a number ranging from 0–4. Each of these values represents an asthma severity category that was assigned by the health care provider at the time of diagnosis. The values of each severity code category are as follows:

0 = unspecified/unknown severity
1 = mild intermittent
2 = mild persistent
3 = moderate
4 = severe

Because an individual with multiple visits on the same day would likely have repeated coded encounters with similar severity scores, retaining these extra visits could bias the results toward people with multiple visits. In order to represent each person's severity score equally, individual asthmatics were used as the unit of measurement for analyses of asthma severity. Records of multiple visits by the same person during the study period were removed and only the visit for each person with the highest severity was retained. By including only the highest recorded severity score for each person, it was assumed that air pollution and asthma severity were compared at the time of the visit with the worst severity. People with unknown severity were also removed from the analysis of asthma severity (however they were retained in the asthma visit rate analysis).

After discussions with health care providers regarding the clinical treatment of asthma, the asthma severity score was classified into two groups, *non-persistent* and *persistent*. Individuals with a severity score of 1 in their medical encounter record were classified as non-persistent. People in the non-persistent category typically experienced symptoms 2 times per week or less and were most likely to be treated with short-term asthma medication or no medication

(VHA/DOD 1999). Individuals in the persistent group had a severity score of 2, 3, or 4. People in the persistent category typically experienced asthma symptoms more than 2 times per week and were more likely to be treated with long-term asthma medications or multiple medications (VHA/DOD 1999). Severity scores are intended for use as clinical tools, and although several studies examining the relationship between asthma severity and various risk factors exist (Ortega et al. 2001), the use of severity scores has limitations. Although it is assumed that U.S. DOD guidelines for diagnosing asthma were followed when providers assigned severity scores (VHA/DOD 1999), it is likely that there was some degree of misclassification depending on the provider and regional differences in the use of these guidelines. Providers may assign severity scores differently based on local clinic guidelines, training, or other factors. These limitations may be mitigated in this study by the collapsing of the severity into non-persistent/persistent categories, in which non-persistent asthmatics are generally not treated with long-term medications and experience less frequent asthma symptoms.

Health Plan Employer Data Information Set (HEDIS) asthmatics

Additional data were available from the Population Health Navigator, a case management system that tracks persons with persistent asthma as part of the managed care program for U.S. NH Naples. Analyses of HEDIS asthmatic data included all HEDIS asthmatics who received treatment at U.S. NH Naples, as well as U.S. NH Sigonella and U.S. NH Rota, from October 2008 to July 2009.
Population Health Navigator uses HEDIS definitions to identify persons with persistent asthma. To be identified as a HEDIS asthmatic individual, a person must have been continuously enrolled at a military treatment facility (MTF) for the past 24 months, and have met at least one of the following four criteria in each of the previous two 12-month periods:

1. At least four outpatient asthma visits with asthma as one of the listed diagnoses and at least two asthma medication dispensing events
2. At least one acute inpatient discharge with asthma as the principal diagnosis
3. At least one Emergency Department (ED) visit with asthma as the principal diagnosis
4. At least four dispensing events of specified asthma medications

It is important to note that this measure is a clinical care metric and has not been validated as a surveillance tool. While the intent of this metric is to ensure that individuals with chronic asthma receive quality treatment, HEDIS can also provide an estimate of the persistent asthma burden. For this study, the HEDIS asthma metric was used to determine if there were any trends in the number of persons with persistent asthma over time. The HEDIS asthma counts and denominators for Rota, Spain, and Sigonella, Italy, were used as comparisons for Naples. While the environmental exposures in Rota and Sigonella may be different from Naples, the process for medically screening persons prior to assignment overseas was the same for all three locations.

Statistical analyses

All data analyses were completed using SAS version 9.2 statistical software. Asthma visit rates were calculated by adding the total number of unique medical encounters at U.S. NH Naples in a given month and dividing by the total number of service members enrolled at Naples for that

month. To evaluate the relationship between the asthma visit rate and ambient air pollution using PM10 and acrolein as exposure surrogates, two linear regression models were used with the monthly asthma visit rate as the outcome: one with the monthly mean PM10 concentration as the exposure variable and the other using the monthly mean acrolein concentration as the exposure variable. The two variables were considered significantly associated if the R-squared value was greater than or equal to 0.60.

Analyses of the relationship between the asthma severity category and PM10, and between the asthma severity category and acrolein, were conducted independently of one another. Bivariate analyses were conducted to determine if the asthma severity category was independently related to the demographic variables of age category and gender. Variables that were significantly associated with asthma severity category at the $p \leq 0.20$ level were included in the multivariate analysis. The relationship between the asthma severity category and the air pollution was assessed using logistic regression models for asthma severity as an outcome and monthly mean PM10 or acrolein as the exposure. Both logistic regression models were adjusted for age. Odds ratios (OR) in which the 95% confidence interval (CI) did not capture 1.00 were considered statistically significant, indicating a significant association between the outcome and exposure variables.

HEDIS asthmatic prevalence was calculated by obtaining the total number of HEDIS asthmatics reported for each location in a given month and dividing by the total number of service members enrolled at that specific MTF in that month. Both of these values were obtained from the MHS Population health portal.

Results

Mean PM10 concentrations from July 2008 to July 2009 had peaks in October 2008 and February 2009, but no significant increasing trend was observed over this time period (Figure 2). Mean acrolein concentrations peaked in September 2008, December 2008 and March 2009. No significant increasing trend in acrolein concentrations was observed over the time period from July 2008 to July 2009 (Figure 3).

Figure 2: Monthly Mean PM10 Concentrations in Campania Region (Jul 2008-Jul 2009)

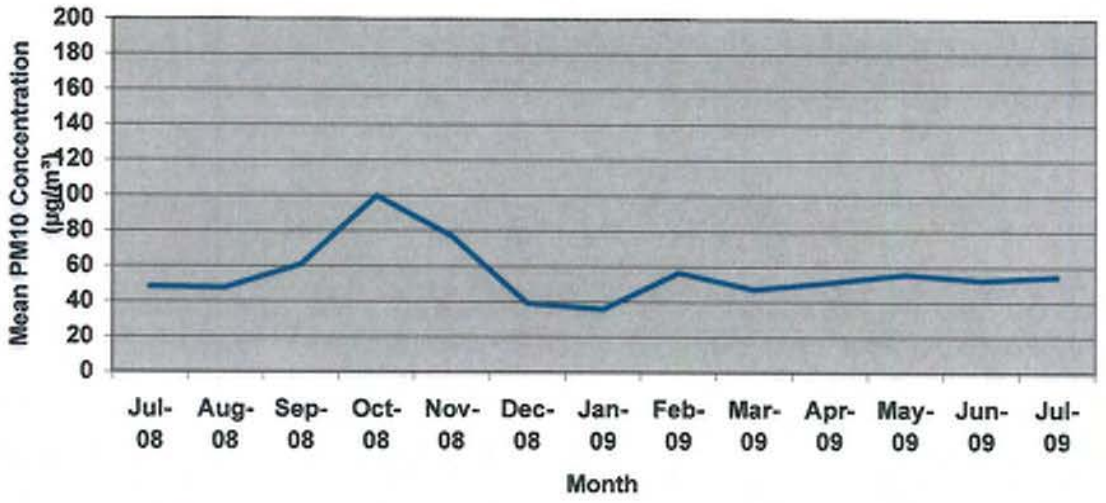
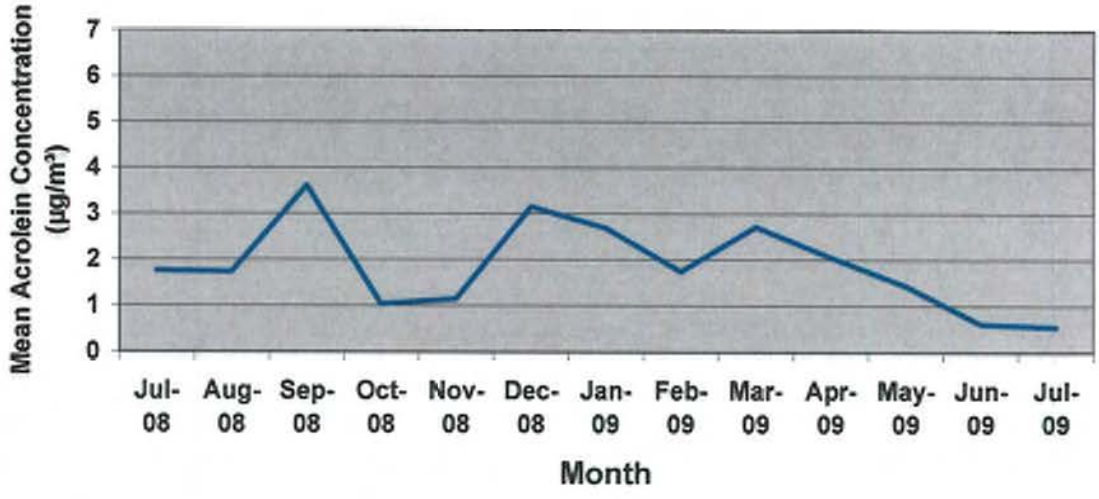


Figure 3: Monthly Mean Acrolein Concentrations in Campania Region (Jul 2008-Jul 2009)

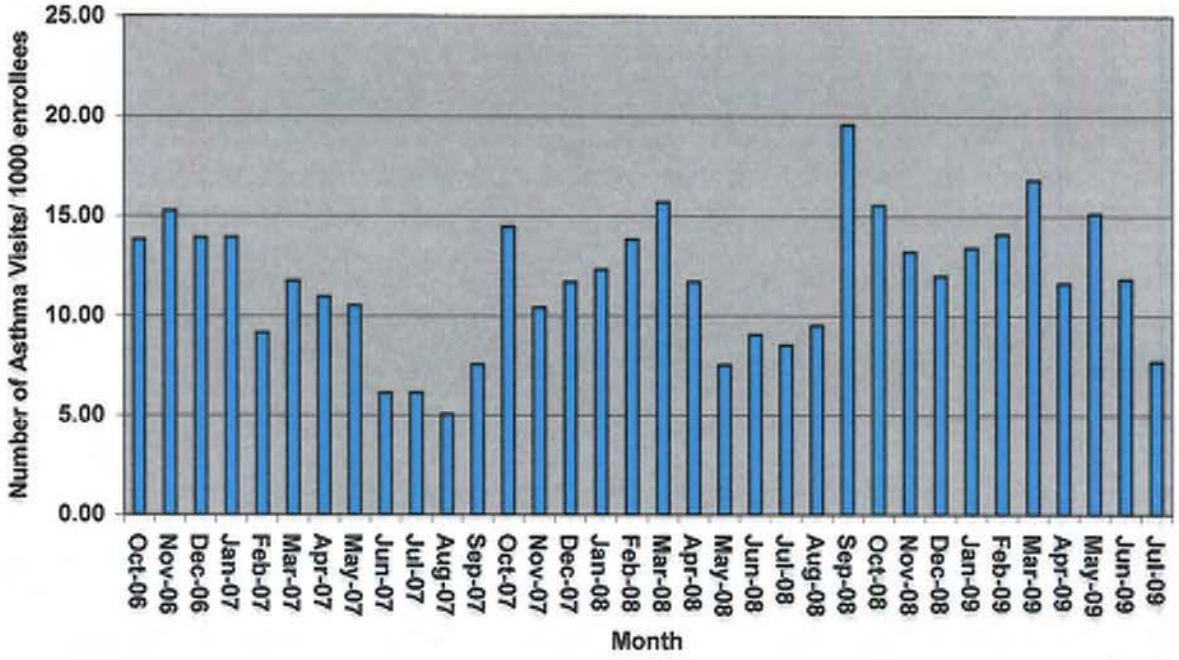


Asthma visit rate analyses

Historical Trend:

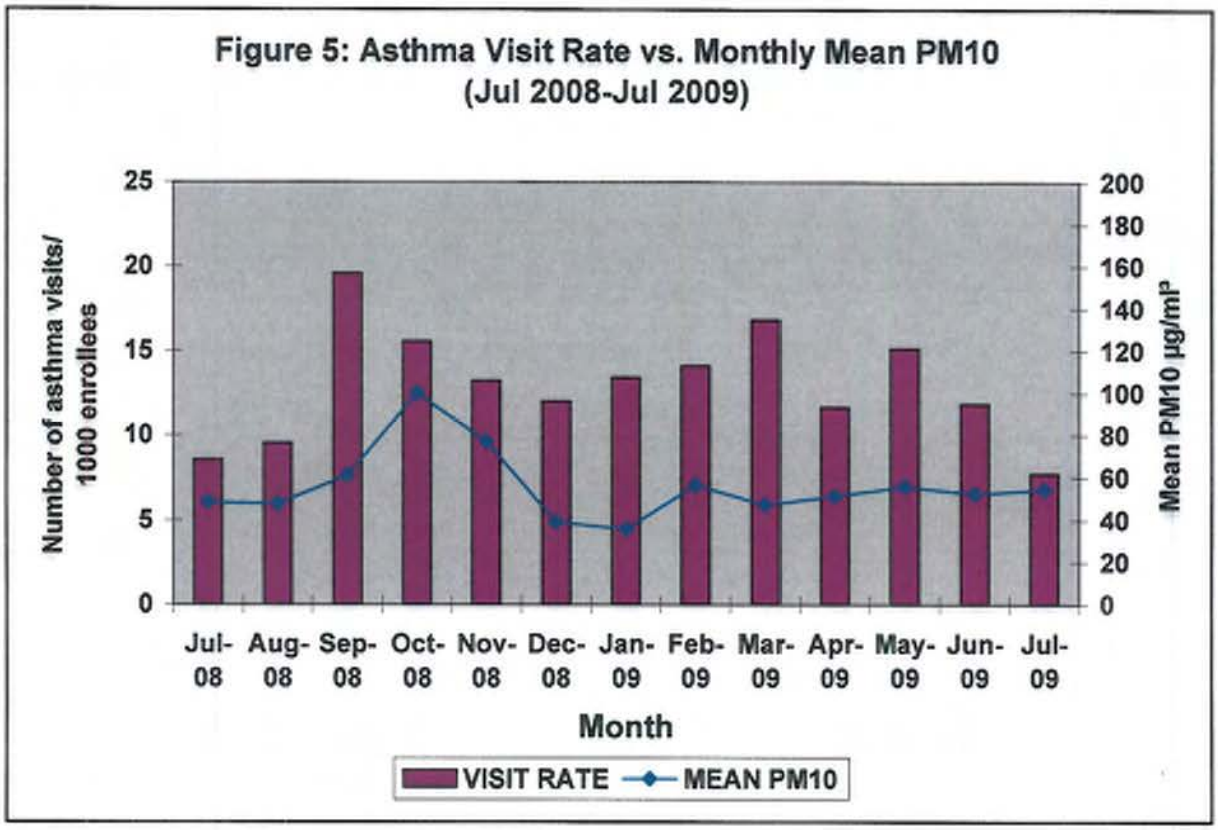
Figure 4 illustrates the number of MTF visits that resulted in a diagnosis of asthma per 1000 people enrolled at U.S. NH Naples by month. The mean visit rate per month over the period from October 2006 to July 2009 was 11.8 asthma visits/1000 enrollees. The number of enrollees was relatively constant over this period, with a mean of 6039 enrollees per month and a range of 5669–6562. A seasonal variation was observed in the asthma visit rate over the period from October 2006 to July 2009, with peaks in the fall and low points in the summer. This asthma trend has been observed in other studies, and asthma is widely considered to vary seasonally with peaks in fall and low points in the summer (Khot et al., 1984; Gergen et al., 2002). Despite normal cyclical variation in asthma visits, there was no significant linear trend in the asthma visit rate during this period.

Figure 4: Asthma Visit Rate by Month at U.S. NH Naples (Oct 2006 - Jul 2009)



Asthma Visit Rate vs. PM10 Concentration:

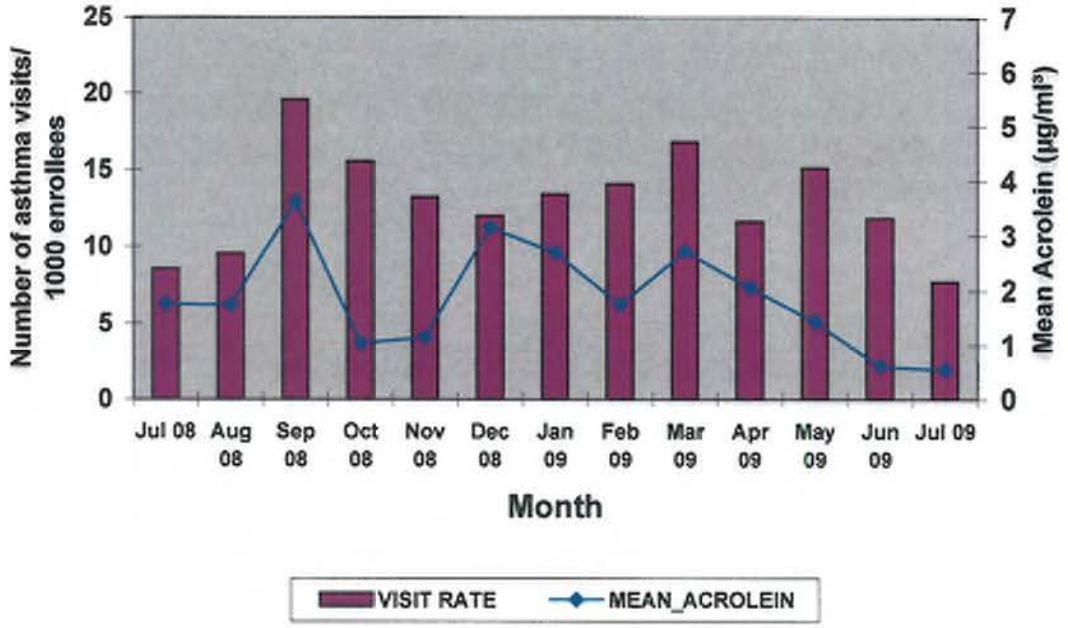
Figure 5 shows the monthly asthma visit rate at U.S. NH Naples represented as bars, and the monthly mean PM10 concentration represented by the line. The monthly asthma visit rate did not significantly vary over the 13 month period. There was one notable peak in the asthma visit rate in September 2008. The mean PM10 concentrations also did not significantly vary over this period, but showed a peak in October 2008. Linear regression was used to assess the significance of the association between the asthma visit rate and monthly mean PM10. The relationship between the average monthly PM10 concentrations and monthly asthma visit rate was not statistically significant.



Asthma Visit Rate vs. Acrolein Concentration:

Figure 6 shows the monthly asthma visit rate at U.S. NH Naples represented as bars, and the line represents the monthly mean acrolein concentration. The mean acrolein concentrations also did not significantly vary over this period, but showed a peak in September 2008. Linear regression was used to assess the significance of the association between the asthma visit rate and monthly mean acrolein concentrations. The relationship between the average monthly acrolein concentrations and monthly asthma visit rate was not statistically significant.

Figure 6: Asthma Visit Rate vs. Monthly Mean Acrolein (Jul 2008-Jul 2009)



Asthma severity analyses

Bivariate Analyses:

There were 439 total unique people with an asthma diagnosis that had a severity score ranging from 1–4 at U.S. NH Naples from July 2008 to July 2009 (some of them having multiple visits). Of these individuals, 219 were categorized as non-persistent, while 220 were categorized as persistent. Age was divided into two categories: "Adult" included all individuals 20 years and older; "Child" included all individuals less than 20 years of age. About 60% (263) of the participants were in the Child category, with about 40% (176) in the Adult category. Bivariate analyses showed that age category was significantly associated with the asthma severity category, but gender was not. For this reason, both multivariate logistic regression models for PM10 and acrolein were adjusted for age category, but not for gender.

Asthma Severity vs. PM10:

A logistic regression model was used to assess the relationship between asthma severity and PM10 concentration, with asthma severity category as the binary outcome variable and two independent variables: mean PM10 concentration and age category. After adjusting for age category, mean PM10 was weakly but significantly associated with the asthma severity category (OR= 1.02, 95% CI 1.00-1.03), with increased average PM10 concentration resulting in increased risk of being classified as having persistent asthma. Age category was also significantly associated with the asthma severity category (OR=2.32, 95% CI 1.57-3.45), with adults having approximately 2.3 times greater risk of being categorized as having persistent asthma than children.

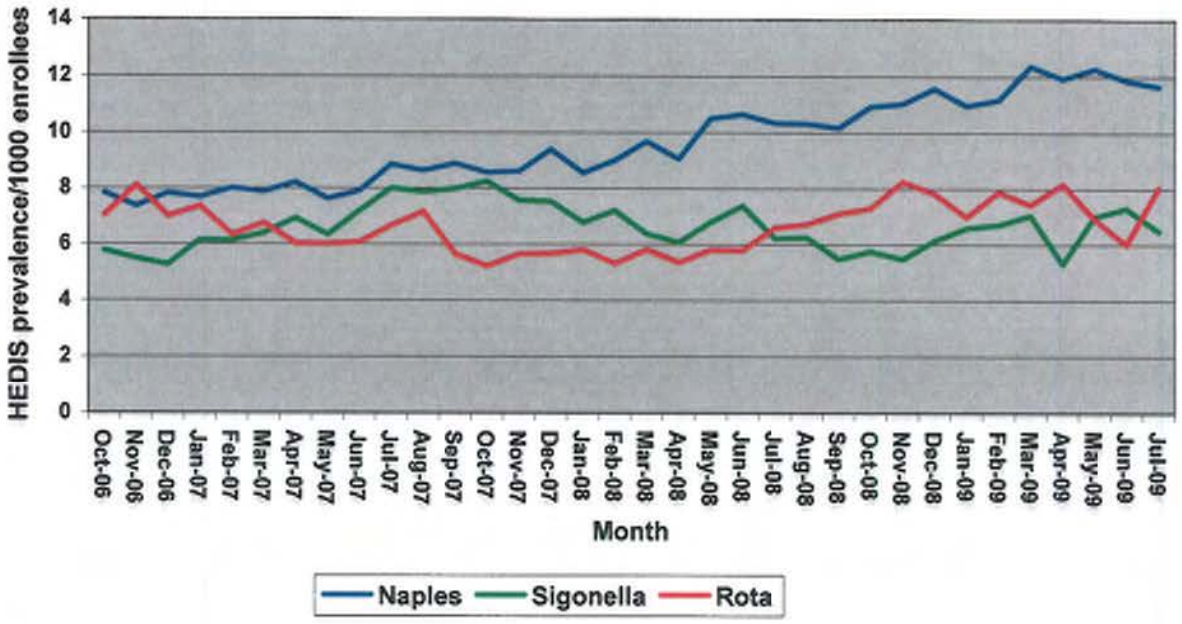
Asthma Severity vs. Acrolein:

In the logistic regression model assessing the relationship between asthma severity category and acrolein concentration, asthma severity category was the binary outcome variable with two independent variables: mean acrolein concentration and age category. After adjusting for age category, mean acrolein was not significantly associated with the asthma severity category (OR= 0.97, 95% CI 0.80-1.18). Age category was again significantly associated with the asthma severity category (OR=2.317, 95% CI 1.567-3.427), with adults having approximately 2.3 times greater risk of being categorized as having persistent asthma than children.

HEDIS asthmatic analyses

Figure 7 depicts the number of HEDIS asthmatics per 1000 enrollees by month at U.S. NH Naples, U.S. NH Rota, and U.S. NH Sigonella from October 2006 through July 2009. The monthly prevalence of HEDIS asthmatics at Naples increased linearly over this time period (R-squared = 0.93), while the monthly prevalence at Rota and Sigonella remained relatively constant (R-squared = 0.00 and 0.08 respectively).

Figure 7: HEDIS Monthly Asthma Prevalence at Naples, Sigonella, and Rota (Oct 2006-Jul 2009)



Discussion

The purpose of this study was to identify trends in medical visits for asthma and asthma severity, and to determine if those trends were associated with air pollution in Naples. While there are many air pollutants known to be associated with exacerbation of asthma, two were selected for this study. PM10 was selected because evidence on the association between PM10 and asthma is well established in the scientific literature. Acrolein was selected because it has been found to be associated with asthma (Woodruff et al. 2007), and because it was found to exceed U.S. EPA NAAQS in 100% of the samples detected in the PHE Phase I and Phase II year-long ambient air monitoring study (AAQMSR 2010). Other pollutants found in the scientific literature to be associated with asthma exacerbation were not studied because they did not exceed U.S. EPA NAAQS in any samples detected.

The rate of medical visits resulting in a diagnosis of asthma fluctuated seasonally in Naples enrollees, but did not increase or decrease linearly over the period from October 2006 to July 2009. This seasonal fluctuation is typical with asthma, with peaks for asthma medical visits in fall and winter and low points in summer months (Khot et al., 1984; Gergen et al., 2002). The monthly asthma visit rate was not significantly associated with monthly mean ambient PM10 or acrolein concentrations over the period from July 2008–July 2009. These results suggest that neither PM10 nor acrolein significantly influenced the total number of asthma visits at Naples MTFs during the time period observed. Seasonal variation was observed and it is possible that specific seasonal allergens (e.g., pollen, ragweed) may have played a part in driving the asthma visit rate in this population. About 70% of all asthma cases are related to exposures to allergens (Bousquet, 2007).

Another measure of asthma exacerbation evaluated was the asthma severity category, in which people were categorized into two groups, persistent or non-persistent. Persistent asthma was not significantly associated with gender or with the mean acrolein concentration, but was significantly associated with adult age (20 years and older) and with increased mean PM10 concentration. The positive, but weak, association between the mean PM10 concentration and being in the persistent asthma category was consistent with the scientific literature (Anderson, 1998; Atkinson et al., 1999; Choudhury, 1997; Donaldson et al., 2000; Lipsett et al., 1997; Peters et al., 1997; van der Zee et al., 1999). Because the study was limited to using average PM10 concentrations, it is possible that the true effect of PM10 was attenuated and the association is actually stronger than reported here. PM10 has many sources, including agricultural burning, trash burning, vehicle exhaust, construction work, and agricultural harvesting. These sources are all found in abundance in Naples and the surrounding areas of Campania, making it difficult to determine the primary driver of PM10 concentrations in the region.

A strong, positive linear trend was observed in the percentage of HEDIS asthmatics enrolled at U.S. NH Naples over the period from October 2006 to July 2009. The same trend was not observed in two other overseas Navy hospitals in Europe. It is possible that this difference is due in part to differences in the environments between Naples and the other two locations, as Naples is more urban and industrial than either Rota or Sigonella. However, for Rota and Sigonella, air quality data were not available as they were for Naples, so the levels of air pollution could not be directly compared. Also, the trend may be influenced by increased awareness and attention to

asthma-like symptoms by the medical providers and community in Naples due to the ongoing PHE. Asthma is a condition that can rapidly progress to a serious medical situation, encouraging some providers to treat the condition aggressively. One treatment objective may be to prevent a serious asthma event, typically through preventive medications. In an environment with high levels of allergens, a diagnosis of asthma will most likely be treated as a chronic condition, hence the increasing HEDIS asthmatic metric.

In summary, this study found a weak, positive association between increasing PM10 levels and being categorized as a persistent asthmatic in the U.S. NH Naples population. 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. NH Naples population. This study also observed a statistically significant linear trend in the proportion of HEDIS asthmatics since 2006, while similar trends were not observed in Rota, Spain or Sigonella, Italy.

Recommendations

U.S. NH Naples should consider the impact of the air quality on those with documented respiratory problems, especially persistent asthma, before granting an overseas screening waiver.

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APPENDIX K: LIST OF ITALIAN ENVIRONMENTAL AND HEALTH STUDIES AND REPORTS TRANSLATED AND REVIEWED

1. 15 May 2003 – Organised Environmental Crime in the EU Member States – for the Commission by Betreuungsgesellschaft für Umweltfragen Dr Poppe MbH Umweltgutachtorganisation in cooperation with Max-Planck Institute for Foreign and International Criminal Law Freiburg, (Germany). Case 106; See http://europa.eu.int/comm/environment/crime/organised_environmental_crime_in_member_states

2. 2000 – Criminal Organisations and Crimes Against the Environment: A Desktop Study – United Nations Interregional Crime and Justice Research Institute (UNICRI), Rome.

3. Locality of "Giardino ex Ghetto" – Characterization Plan. Municipality of Villa Literno; 2001.

4. Characterization plan for the Bagnoli-Coroglio site of national interest: Defining natural background values. Bagnoli futura S.p.A.; 2003.

5. Investigation for the definition of basic PCDDs, PCDFs, and PCBs values found in soil in the vicinity of Acerra. Government Commissioner for the Waste Emergency in the Campania Region; 2003.

6. Project for mitigation works for the protection of groundwater in the territory of Acerra (NA). Rome, Italy: Golder and Associates s.r.l.; 2003.

7. Water Protection Plan. Region of Campania; 2003.

8. Linee guida per l'applicazione dell'analisi di rischio alle discariche - Gruppo di lavoro per il CTN TES. APAT (with ARPA Marche, ARPA Liguria, Emilia Romagna ARPA, ARPA Toscana; 2004.

9. Rapporto sullo Stato dell'Ambiente della Provincia di Napoli [Report on the state of the environment in the Province of Naples]. Province of Naples; 2004.

10. Valutazione delle pressioni ambientali legate allo smaltimento illegale di rifiuti. ARPA Campania: Ingegneria Ambientale; 2004.

11. Assessment of analytical results relating to beaches at the north of the waste dump of Bagnoli. APAT-ISS-ICRAM (Agency for Environment Protection and Technical Services – Superior Health Institute – Marine Scientific and Technological Research Institute); 2005: 8.

12. Criteri metodologici per l'applicazione dell'analisi assoluta di rischio ai siti contaminati. [Guidelines for the application of health risk analysis for contaminated sites.] Agenzia per la Protezione dell'Ambiente e per i Servizi Tecnici (APAT); 2005.

13. Region of Campania: Regional plan for the recovery and maintenance of air quality. In: *Bollettino Ufficiale della Regione Campania.* Campania Region; 2005: Attachment 2.

14. Transmission of the data in relation to the groundwater and leachate tests from the waste disposal sites present in the Giugliano in Campania and Villaricca territory. The sampling and the tests were carried out by ARPAC – Report. In. Naples, Italy: Campania Region NA2 - Local Health Authority: Prevention Department: Hygiene and Public Health Service; 2005.

15. *Parliamentary investigations commission on waste recycling and related illegal activities.* XVI edn: CARLO COLOMBO PRINT SHOPS; 2006.

16. Technical report: preliminary investigations as per bid POR Campania 2000/2006 – measure 1.8 – Regional Decree N. 400/06, on consortium landfill located in "Masseria del Pozzo-Schiavi," Site code CPSI 3034°012. ISOGEA s.r.l.; 2006.

17. Trattamento dei rifiuti in Campania: impatto sulla salute umana – Studio di correlazione tra rischio ambientale da rifiuti, motartlità e malformazioni congenite [Waste treatment in Campania: Impact on human health – Study of correlation between environmental risk from waste, mortality, and congenital malformations]. WHO, European center of environment and health, ISS, CNR (National Research Council), Regional Epidemiological Observatory; 2006.

18. Acqua - Il Monitoraggio in Campania 2002–2006 [Water: monitoring in Campania 2002–2006]. ARPA Campania; 2007.

19. Air. In: *Technical-scientific consultancy on environmental subjects of interest in relation to the territory of Giugliano in Campania.* vol. 1: Seconda Università degli Studi di Napoli (Second University of Naples); 2007.

20. Decree of the President of the Republic 470/82 – 2007 "Bathing Waters" Bylaw N.436 issued by the Campania Regional Council on 16/03/2007. ARPA Campania: Provincial Department Naples; 2007.

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APPENDIX L: FOOD STUDY

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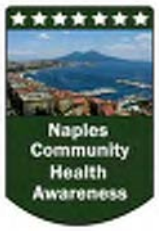

Naples Public Health Evaluation

Commander, Navy Region Europe, Africa, Southwest Asia /
Naval Support Activity Naples

Food Study

June 2010



Prepared by:

Navy and Marine Corps Public Health Center
Portsmouth, Virginia

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Executive Summary

Introduction

As requested by Commander, Navy Region Europe, Africa, Southwest Asia (CNREURAFSWA), the Navy and Marine Corps Public Health Center (NMCPHC) is conducting a Public Health Evaluation (PHE) in the Campania region of Italy in response to concerns that poor waste disposal practices (dumping and open burning of uncollected trash and illegal dumping of waste) may present a risk to United States (U.S.) Navy (USN) personnel (active duty, civilians, and their families) who are residing in the Naples and Caserta provinces of Campania. Part of the Naples PHE includes a Food Study (Study) in which certain foods available at the Naval Support Activity (NSA) Naples Gricignano D'Aversa Navy Commissary (Commissary) were tested. The Study was performed in February 2008.

Navy Community Concerns

The Study was conducted in response to various media reports claiming that high levels of dioxins and other chemicals were present in air, water and soil as a result of Italy's waste crisis. Further, articles in newspapers and in some Italian scientific journals alleged links between adverse health effects and the toxic waste dumps in the Campania region. These articles implicated locally grown vegetables, fruits and mozzarella di bufala (an unpasteurized cheese) as possibly contaminated foods. This in turn created a concern within the USN community that the foods they were purchasing in the Commissary could be contaminated as well.

Food Study

There are multiple layers of protection in place for USN personnel when purchasing food items at the Commissary. Food provided on base is monitored on an ongoing basis for the continued safety of USN personnel as follows:

- U.S. Naval Hospital Naples Preventive Medicine routinely inspects all dining facilities on base to ensure that food is properly stored, maintained and prepared.
- The U.S. Army Veterinary Command (VETCOM) ensures the following within Navy Commissaries as directed by Department of Defense (DOD) Directive 6400.4[1]:
  - Inspectors are stationed in the Commissary and consistently monitor food products
  - All food products are from VETCOM-approved sources that have been inspected

[1] DOD Directive 6400.4, "DOD Veterinary Services Program," August 22, 2003.

- Buying from approved sources is required for all meat, dairy, eggs, prepared vegetables and bottled water (fresh produce is exempt in Western Europe)
- Proper facility sanitation
- Personal hygiene practices of food service workers
- Education of food service managers and employees about food safety

Because of the presumed higher potential for environmental contaminants to be present in the Campania region, the Naples PHE team decided that foods grown locally, particularly fresh fruits and vegetables, which are exempt from inspection by VETCOM, required a closer look.

Commissary Assessment

An assessment of the Commissary was conducted by NMCPHC and VETCOM on February 5, 2008, and the following information was collected:

- **Meats:** No meats produced in the Campania region are sold in the Commissary. Therefore, no meats were evaluated in the Study.
- **Poultry:** Fresh poultry (chicken) sold in the Commissary at the time of the inspection was produced by the Arena Group in their facility located at Localita Monteverde, Bojano, Italy. Although this facility is not immediately located in the Campania region, the chicken was tested because it was the only fresh meat product that was sold in the Commissary and raised near the Campania region. Chicken was evaluated in the Study.
- **Dairy:** No dairy products produced in the Campania region are sold in the Commissary. Therefore, no dairy was evaluated in the Study.
- **Fruits and Vegetables:** Numerous unprocessed fruits and vegetables are locally grown within the Campania region. Due to the heightened concerns of potential soil contamination from improper waste disposal, several plant products that have the ability to potentially uptake contaminants through their root system (phyto-uptake) were evaluated in the Study.

VETCOM is the DOD executive agent for food safety and quality assurance and is responsible for providing direct assistance to all DOD agencies requiring support with respect to food safety and food defense as it applies to the approved sources of food procurement within the DOD.

Sampling Approach and Data Evaluation

The selection of products tested as part of the Study was based on whether or not the:

- Products were available for sale at the Commissary at the time of the Study.

- Fruits and vegetables were grown within the Campania region.
- Products were root plants or grown close to the soil and had the potential for plant uptake of contaminants in the soil through the plant's root system (phyto-uptake). Root plants are those that have fleshy, edible underground roots or tubers.
- Sources of fresh meat or poultry products (e.g., beef, chicken) were raised near Campania.

The Study went beyond routine visual inspections of food products by performing various laboratory analyses that are normally not mandated by VETCOM. This was especially important for fresh fruits and vegetables, which are not required to undergo routine testing[2]. Unprocessed fruits and vegetables (raw and have not been chemically or thermally altered) are exempt from inspection by VETCOM. This allows the Commissary and other food service establishments (e.g., Navy Exchange food court) to purchase unprocessed fruits and vegetables from local Campania producers without approval from VETCOM.

The following products met the above criteria and were sampled for analytes that could be associated with waste disposal, such as microorganisms (e.g., bacteria), metals, pesticides, dioxins, polychlorinated biphenyls (PCBs) or a combination of these analytes:

- Artichokes
- Cabbage
- Carrots
- Celery
- Chicken
- Mushrooms
- Spinach
- In addition, tap water from the washing sink of the Commissary's produce department and the Arena Group poultry plant were tested to ensure they complied with the safe drinking water standards outlined in the U.S. Final Governing Standards (FGS) for Italy (Chapter 3, July 2008) and Italian Legislative Decree nº 31 of February 2, 2001.

Exposure Pathways

The ingestion pathway is the only pathway that was evaluated for this Study.

[2] VETCOM Circular 40-1, Appendix A, Section 2.

Risk Evaluation

Samples were compared to various guidance and regulatory standards, based on the type of sample, in order to characterize the potential health risks. Because foods in the U.S. and Europe may contain pathogenic bacteria, naturally occurring metals, and residues of pesticides and other man-made chemicals, regulatory standards are typically used to determine the threshold of contamination that warrants further investigation. The following standards were applied in this Study to evaluate the safety of the food, and include:

- VETCOM-listed action levels (VAL)
- U.S. Food and Drug Administration 2006 Total Diet Study (TDS)
- 21 Code of Federal Regulations (CFR), Title 21, Volume 2
- European Commission Scientific Co-operation 2004 Report on Task 3.2.11 (SCOOP 2004)
- European Union Commission Regulation (EC) No 1881/2006 (EUCR 2006)

Results Summary

Laboratory results of the foods sampled as compared to guidance and regulatory standards described above resulted in the following findings:

- Microorganisms and Pesticides
    - All food items met the standards for microorganisms and pesticides.
- Metals
    - Arsenic, lead, cadmium and mercury concentrations found in artichokes, cabbage, celery, carrots and mushrooms were below the upper range of concentrations for these items listed in the TDS.
    - Arsenic levels in spinach were slightly higher than the maximum concentration listed for spinach in the TDS for the U.S. However, the arsenic concentration was in the same order of magnitude as arsenic concentration in spinach from other European countries, and lower than that in other food groups (e.g., fish and crustaceans) (SCOOP 2004).
    - Lead concentration in spinach was also slightly higher than the maximum level concentrations listed for spinach in the TDS, but lower than the maximum allowable contaminant level set by the EUCR 2006.
- Polychlorinated Dibenzo-*p*-dioxins and Polychlorinated Dibenzofurans (Dioxins/Furans)
    - Dioxins and furans concentrations found in chicken breast and carrots were lower than the maximum allowable levels set by the EUCR 2006.
- Dioxin-like PCBs

  - Dioxin–like PCBs concentrations found in chicken breast were lower than the maximum allowable levels for poultry set by the EUCR 2006.

- Tap water from the washing sink of the Commissary's produce department had analyte concentrations below action levels and therefore met the water safety criteria as set forth in the U.S. Environmental Protection Agency (USEPA) Safe Drinking Water Act (SDWA) and FGS for Italy for drinking and washing fruits and vegetables. Tap water from the Arena Group poultry plant had concentrations of coliform that exceeded the zero tolerance level criteria for total coliform and was therefore suspended from VETCOM's Approved Source list. The poultry plant corrected the bacteria discrepancy and was later reinstated on VETCOM's Approved Source list after VETCOM re-inspected the plant.

Conclusions

The results of the Study demonstrate that the fruits and vegetables grown in the Campania region that are sold in the Commissary met the food safety criteria of the Study for consumption in the U.S. and Europe. In addition, chicken products produced by the Arena Group also met food safety criteria for consumption. Tap water in the washing sink of the Commissary's produce department met the safety criteria for drinking and washing fruits and vegetables. Tap water from the washing sink of the Arena Group poultry plant exceeded the zero tolerance level criteria for total coliform. The poultry plant corrected the bacteria discrepancy and was later reinstated on VETCOM's Approved Source list.

Uncertainties

Uncertainties inherent in this Study include: a limited number of samples taken in one month, whether the fresh fruit and vegetable suppliers may change, and whether the suppliers always use the same farm location to obtain produce. Additionally, the potential for food contamination may be altered by rainfall, phyto-uptake changes, contamination deposition and handling practices. Furthermore, if feed or water is contaminated, it may potentially affect the level of chemicals (e.g., PCBs) in poultry.

Community Awareness

Findings of the Study were provided to Navy Leadership, U.S. Consulate Naples, Host Nation officials, media, and the Navy community beginning in May 2009. Information about the Study and the findings, including a fact sheet on this topic, were provided during the Naples PHE Phase I open house sessions held on May 6 and May 7, 2009, as well as a dedicated *Panorama* article published on May 22, 2009. General findings of the Study were also discussed during an American Forces Network (AFN) Naples radio interview on October 1, 2009.

A fact sheet about the Study is posted on the Naples Community Health Awareness website:
https://www.cnic.navy.mil/Naples/CommandInformation/HealthAwareness/FactSheets/index.htm

This Study report has also been posted to the Naples Community Health Awareness website, as an appendix to the Naples PHE Phase II Volume III report:

https://www.cnic.navy.mil/Naples/CommandInformation/HealthAwareness/index.htm

Naples Public Health Evaluation Food Study

Introduction

As requested by Commander, Navy Region Europe, Africa, Southwest Asia (CNREURAFSWA), the Navy and Marine Corps Public Health Center (NMCPHC) is conducting a Public Health Evaluation (PHE) in the Campania region of Italy in response to concerns that poor waste disposal practices (dumping and open burning of uncollected trash and illegal dumping of waste) may present a risk to United States (U.S.) Navy (USN) personnel (active duty, civilians, and their families) who are residing in the Naples and Caserta provinces of Campania. Part of the Naples PHE includes a Food Study (Study) in which certain foods available at the Naval Support Activity (NSA) Naples Gricignano D'Aversa Navy Commissary (Commissary) were tested. The Study was performed in February 2008.

Background

Naples is located within the Campania region of Italy, which is divided into five provinces: Naples, Benevento, Avellino, Caserta and Salerno (see Figure 1 and Figure 2). The central coast of the region is mostly high and rocky, with volcanic ridges, including the crater of Vesuvius. The region has a population of approximately 5.8 million people, making it the second most populous region of Italy. Naples, more than 2,800 years old, is the capital city of Campania and of the province of Naples. The population of Naples proper is approximately 1 million people. While the interior of Campania is mountainous, the northern and southern coastal areas are fertile plains, famous since ancient times for their agricultural output. The region's farms produce a variety of products, including grapes, citrus fruit, olives, grain, and numerous vegetables.

Industry is mostly clustered along the shore of the Bay of Naples. Manufactured products include textiles, shoes, chemicals, pharmaceuticals, refined petroleum, metal goods, wine, and processed food.

According to numerous Italian media reports and peer reviewed environmental studies, Italy's Campania region has dealt with illegal dumping of waste for decades. For example, a practice reported in the Italian media is disguising toxic waste as fertilizer and selling the fertilizer to unsuspecting farmers to be used on their farmland to grow fruits, vegetables and feed for animals. Italy itself declared a state of emergency for waste in the Campania region in 1994. More recently in the summer of 2007, a crisis surrounding garbage accumulation in the streets and the burning of this garbage occurred and resulted in angry, local protests. In January 2008, the European Commission gave the Italian government one month to clean up the most current waste crisis plaguing Naples or face a costly lawsuit. In May 2008 the European Commission sued Italy before a European Union (EU) court for failing to heed repeated warnings over violating the EU's Waste Framework Directive in regards to the garbage situation in Campania and for risking the spread of disease and the pollution of water, land and air for the period June 2007 to March 2008. This process ended on March 4, 2010, with the EU infringement procedure

against Italy, with a penalty for waste management following the development of a waste disposal crisis in Campania in 2007. The EU Court of Justice declared that, "… Italy has not adopted all the measures necessary for the disposal of waste in the region of Campania - That situation has endangered human health and damaged the environment" (EU Court of Justice Press Release No. 20/10). Throughout this time, the Italian government has made some limited progress to clean up areas that were once overrun with waste and to control waste disposal by opening up landfills, shipping trash to other countries, and finalizing plans for a regional trash incinerator.

Figure 1: Provinces of Campania Region

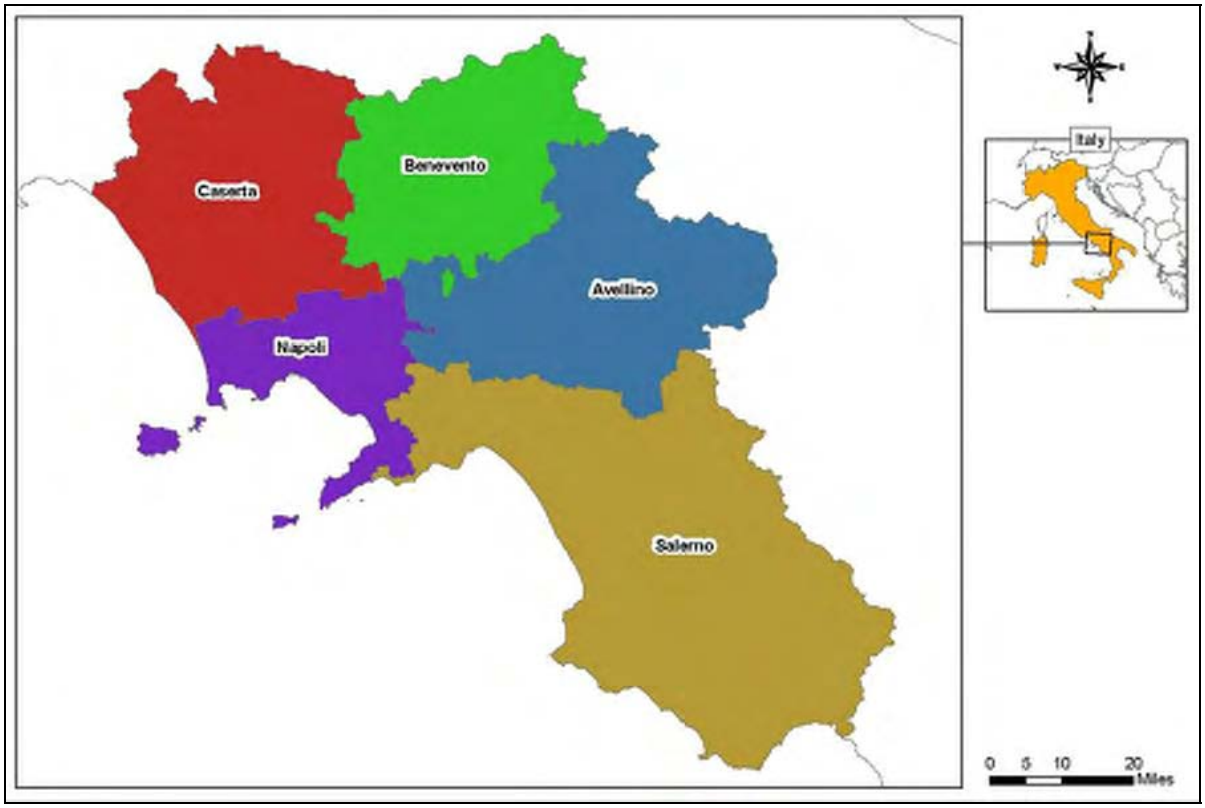

Figure 2: Naples Region

Navy Community Concerns

As a result of Italy's trash and hazardous waste disposal practices and reports in the Italian media that high levels of dioxins have been detected in some mozzarella di bufala cheese, some members of the USN community in Naples expressed concern that the foods they were purchasing in the Commissary may be contaminated with various chemicals including dioxins.

Responding to these concerns, NMCPHC, in collaboration with the U.S. Army Veterinary Command (VETCOM), investigated certain foods produced in the Campania region that are sold in the Commissary.

VETCOM is the Department of Defense (DOD) executive agent for food safety and quality assurance[3] and is responsible for providing direct assistance to all DOD agencies requiring support with respect to food safety and food defense as it applies to the procurement of food from approved sources within the DOD. In accordance with tri-service regulations[4], VETCOM performs sanitation and food defense audits at commercial establishments that require approval and listing on the DOD Directory of

[3] DOD Directive 6400.4, August 22, 2003.
[4] AR 40-657, NAVSUP 4355.4H, and MCO P10110.31H.

Sanitarily Approved Food Establishments for Armed Forces Procurement[5]. The Directory lists approximately 250 establishments that provide food items to U.S. military installations in Europe.

Food Study

There are multiple layers of protection USN personnel receive when purchasing food products on base. Food provided on base is monitored on an ongoing basis for the continued safety of USN personnel as follows:

- U.S. Naval Hospital Naples Preventive Medicine routinely inspects all dining facilities on base to ensure that food is properly stored, maintained and prepared.
- VETCOM ensures the following within Navy Commissaries as directed by DOD Directive 6400.4[6]:
  - Inspectors are stationed in the Commissary and consistently monitor food products
  - All food products are from VETCOM-approved sources that have been inspected
  - Buying from approved sources is required for all meat, dairy, eggs, prepared vegetables and bottled water (fresh produce is exempt in Western Europe)
  - Proper facility sanitation
  - Personal hygiene practices of food service workers
  - Education of food service managers and employees about food safety

Because of the presumed higher potential for environmental contaminants to be present in the Campania region, the Naples PHE team decided that food grown locally, particularly fresh fruits and vegetables, required a closer look. This was especially important for fresh fruits and vegetables, which are not required to undergo routine testing[7]. Unprocessed fruits and vegetables (raw and have not been chemically or thermally altered) are exempt from inspection by VETCOM. This allows the Commissary and other food service establishments (e.g., Navy Exchange food court) to purchase unprocessed fruits and vegetables from local Campania producers without approval from VETCOM.

[5] VETCOM Circular 40-1. http://vets.amedd.army.mil/86256F90007C2D1D/Europe
[6] DOD Directive 6400.4, "DOD Veterinary Services Program," August 22, 2003.
[7] VETCOM Circular 40-1, Appendix A, Section 2.

Commissary Assessment

An assessment of the Commissary was conducted by NMCPHC and VETCOM on February 5, 2008, and the following information was collected:

- **Meats:** No meats produced in the Campania region are sold in the Commissary. Therefore, no meats were evaluated in the Study.

- **Poultry:** Fresh poultry (chicken) sold in the Commissary at the time of the investigation was produced by the Arena Group in their facility located at Localita Monteverde, Bojano, Italy. Although this facility is not immediately located in the Campania region, the chicken was tested because it was the only fresh meat product that was sold in the Commissary and raised near the Campania region. At the time of the Study, the Arena Group poultry plant was listed on VETCOM's Approved Source list[8]. Chicken was evaluated in the Study.

- **Dairy:** No dairy products produced in the Campania region are sold in the Commissary, including mozzarella di bufala cheese. Therefore, no dairy was evaluated in the Study. The Campania region is famous for mozzarella di bufala – a unique cheese produced from water buffalo milk. The region exports the cheese throughout the world and recently achieved Protected Designation of Origin (DOP) status from the EU. Research conducted for this Study revealed that the majority of mozzarella di bufala producers in the Campania region do not pasteurize this product. Prudent public health practice is to only buy and consume pasteurized products. Recently, due to suspected dioxins contamination of the mozzarella di bufala from illegal waste dumping, evidence of brucellosis in numerous herds, and due to foreign bans from several countries on imports of this cheese, Italy quarantined some buffalo herds and agreed to a temporary recall of the cheese. However, the Commissary does not provide mozzarella di bufala cheese that is produced in the Campania region, nor does it provide unpasteurized cheeses. Although there was heightened concern over mozzarella di bufala produced in the Campania region, because it is not offered at the Commissary or other on-base food establishments, it was not included in this Study.

- **Fruits and Vegetables:** Numerous unprocessed fruits and vegetables are locally grown within the Campania region. Unprocessed fruits and vegetables are raw, (not cut, chopped, pealed, or canned) and not chemically or thermally altered. These types of fruits and vegetables are exempt from inspection by VETCOM per the Directory of Sanitarily Approved Food Establishments for Armed Forces Procurement[9]. This allows the Commissary and other food service establishments to purchase unprocessed fruits and vegetables from local producers without prior

[8] The Arena Group poultry plant requested to be delisted from VETCOM's Approved Source list in December 2009 and was removed. Since that time, there have been no local acquisitions for fresh poultry. Frozen poultry is imported from Germany or the United States.
[9] VETCOM Circular 40-1, Appendix A, Section 2.

approval from VETCOM. If there is evidence that a particular item or vendor may pose a public health risk, that item or vendor can be barred as a procurement source. Due to the heightened concerns of potential soil contamination from improper waste disposal, several plant products that have the ability to potentially uptake contaminants through their root system (phyto-uptake) were tested. Phyto-uptake, also known as phyto-accumulation, is the uptake of contaminants by plant roots into plant shoots and leaves. Metal uptake in plants varies due to plant structure, soil composition, soil pH, soil organic matter, cation exchange capacity, nutrient competition and soil moisture.

Sampling Approach and Data Evaluation

The selection of products tested as part of the Study was based on whether or not the:

- Products were available for sale at the Commissary at the time of the Study.
- Fresh fruits and vegetables were grown within the Campania region.
- Plant products were root plants or grown close to the soil and had the potential for plant uptake of contaminants in the soil through the plant's root system (phyto-uptake). Root plants are those that have fleshy, edible underground roots or tubers.
- Sources of fresh meat or poultry products (e.g., beef, chicken) were raised near Campania.

The Study went beyond routine visual inspections of food products by performing various laboratory analyses, which are normally not mandated by VETCOM. The following products met the above criteria and were sampled for microorganisms (e.g., bacteria) and chemicals that could be associated with waste disposal, such as metals (arsenic, lead, cadmium and mercury), pesticides (N-methylcarbamate and organophosphate insecticides), polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans (dioxins and furans), and dioxin-like polychlorinated biphenyls (PCBs). Table 1 presents a summary of food items sampled and specific food analyses conducted.

- **Artichokes** were analyzed for microorganisms and pesticides screening.
- **Cabbage** were analyzed for microorganisms and pesticides screening.
- **Carrots** were analyzed for microorganisms, metals and pesticides screening, dioxins and dioxin-like PCBs. Carrots were specifically chosen for a complete chemical analysis, such as metals, dioxins and dioxin-like PCBs, because carrots are a root plant. As a root plant, they have direct soil contact with the portion that is edible and they have a greater probability of phyto-uptake.
- **Celery** were analyzed for microorganisms and pesticides screening.

- **Chicken** were analyzed for microorganisms and pesticides screening, dioxins and dioxin-like PCBs. In poultry, the uptake of dioxins and dioxin-like PCBs can potentially occur through the ingestion of contaminated feed and/or water. Food of animal origin is the predominant route of human exposure to dioxins due to the bioaccumulation of these substances in the lipid (fat) component of these animal food sources[10].

- **Mushrooms** were analyzed for microorganisms and pesticides screening.

- **Spinach** were analyzed for microorganisms, metals and pesticides screening. Though metal uptake in plants varies due to plant structure, soil composition, soil pH, soil organic matter, cation exchange capacity, nutrient competition and soil moisture, spinach was specifically chosen for metals testing because of its greater propensity for phyto-uptake of trace metals compared to other vegetables. The bioaccumulation of metals can occur in the leaf structure, which is the plant part that is ingested by humans. This type of accumulation occurs through the internal structure of the plant and therefore cannot be washed or cooked out of the plant.

- **Tap water** from the washing sink of the Commissary's produce department and from the Arena Group poultry plant were analyzed for microorganisms, organic and inorganic chemical compounds, disinfection compounds, physical appearance and radionuclides.

NMCPHC collaborated with VETCOM and VETCOM Laboratory Europe to test and analyze several Commissary products that were produced in the Campania region. Each specific food product was collected in sufficient quantities using aseptic (sterile) techniques. The food samples were placed in individual sterile containers. Each sample was kept refrigerated at a temperature below 41ºF (5ºC) during transport. Water samples for microbiological examination were collected in sterile plastic bottles. Aseptic Sampling Procedure were employed to collect water samples. Samples were placed on ice packs during transit to the laboratory to maintain a temperature below 10ºC.

The food and water samples were shipped to the VETCOM Laboratory Europe. The VETCOM Laboratory conducted all microbiological analyses and pesticide screenings. Additionally one chicken breast sample and one carrot sample were analyzed for dioxins and dioxin-like PCBs. One spinach and one carrot sample were analyzed for four metals (arsenic, lead, cadmium and mercury). The VETCOM Laboratory contracted the analyses of metals, dioxins and dioxin-like PCBs to the Institut Dr. Appelt Laboratory located in Germany and contracted the analyses of dioxins and PCBs to Wessling Laboratories, also located in Germany.

[10] CFR, Title 21, Volume 2, Part 109.

Table 1 – Food Samples and Analysis Summary

	Food Analyses Performed				
Food Items	Microorganisms	Pesticides	Metals	Dioxins and Furans	Dioxin –like PCBs
Vegetables					
Artichoke	X	X			
Cabbage	X	X			
Carrots	X	X	X	X	X
Celery	X	X			
Mushrooms	X	X			
Spinach	X	X	X		
Meats					
Chicken	X	X		X	X

Table 2 presents the sampling results for each chemical in the analysis of the vegetables and meats. The **bolded** results exceeded at least one of the comparison values.

Table 2 – Comparison of Metals, Dioxins and Dioxin-like PCBs Concentrations in Meat and Vegetables in Naples Commissary Foods with U.S. Food Diet Surveys and EU Standards

Chemical	Food	Sampling Results	2008 USDA FSIS Dioxin Survey in Meat and Poultry) (USDA 2009)	EU Community Commission Regulation (EUCR 2006)	U.S. FDA Total Diet Study - Market Baskets Surveys 1991-3 through 2004-4 (US FDA 2006)
Dioxins					
Dioxins/Furans (TEQ Non-Detect = LOQ)	Chicken Breast	< 0.12 ppt	NA*	2 ppt fat	
	Carrot	< 0.12 ppt	NA	NA	
Dioxin/Furans (TEQ Non-Detect = ½ LOQ)	Chicken Breast	<0.06 ppt	0.12 ppt	NA	
	Carrot	<0.06 ppt	NA	NA	
Dioxin-like PCBs					
Dioxin-like PCBs (TEQ Non-Detect = LOQ)	Chicken Breast	0.24 ppt	NA	2 ppt fat	
	Carrot	< 0.08 ppt	NA	NA	
Dioxin-like PCBs (TEQ Non-Detect = ½ LOQ)	Chicken Breast	**0.12 ppt**	0.05 ppt	NA	
	Carrot	< 0.04 ppt	NA	NA	
Metals					
Arsenic	Spinach	**0.05 mg/kg**		NA	0.0-0.043 mg/kg
	Carrot	0.073 mg/kg		NA	0.00-0.4 mg/kg
Lead	Spinach	**0.14 mg/kg**		0.3 mg/kg	0.0-0.062 mg/kg
	Carrot	0.03 mg/kg		0.1 mg/kg	0.0-0.18

Cadmium	Spinach	0.03 mg/kg		0.2 mg/kg	0.045-0.524 mg/kg
	Carrot	0.003 mg/kg		0.05 mg/kg	0.005-0.168 mg/kg
Mercury	Spinach	0.007 mg/kg		NA	0.0-0.018 mg/kg
	Carrot	0.005 mg/kg		NA	NA

* NA means not analyzed

Exposure Pathways Evaluated in the Study

In order for a chemical, biological or other harmful substance to pose a risk to human health, a complete exposure pathway must be present. A complete exposure pathway consists of the following four elements:

1. A source and mechanism of release of a chemical, biological or other harmful substance to the environment (e.g., burning trash, dumping of chemical waste).
2. An environmental transport medium for the released chemical (e.g., air).
3. An exposure point (i.e., a point where humans contact the contaminated medium) that includes the location where humans are present and where there is activity that results in exposure (referred to as an "exposure scenario").
4. An exposure route at the point of exposure. There are three usual exposure routes (i.e., ingestion, inhalation, dermal contact).

The degree or extent of exposure is determined by measuring the amount of the hazardous substance at the point of contact, whether that contact occurs in the lungs of someone who has breathed in the hazard, the stomach lining of someone who has ingested it, or the skin of someone who has touched it. For this Study, only the ingestion of food exposure pathway was evaluated; the other pathways (inhalation, dermal contact) are not applicable.

In some cases, food may be contaminated as a result of its direct exposure to the hazardous substance during processing or while it is growing (e.g., fruits and vegetables). Examples of this type of contamination include contaminated water being used in irrigation or a chemical in the soil coming into direct contact with the food product. Soil contamination can occur from atmospheric deposition of man-made sources (e.g., lead, mercury, and dioxins from burning trash and/or dumping of waste), or natural geological conditions (e.g., arsenic and other metals from volcanoes).

Indirect contamination occurs when bacteria or chemicals contact food during processing or handling from sources such as a contaminated table top, hands, equipment or clothing (e.g., tap water in the sinks of the Commissary and Arena Group poultry plant). In other cases, food contamination may occur through the food chain. For example, hazardous substances can collect in the fatty tissues of animals that ingest contaminated plants. Chemical contamination of animal products can also occur through an animal's ingestion of contaminated feed. The contamination can then be transferred to the animal's natural predators, and eventually to people.

Risk Evaluation

Because foods in the U.S. and Europe may contain pathogenic bacteria, naturally occurring metals, and residues of pesticides and other man-made chemicals, the Study's analytical results were compared to the following standards and guidelines to evaluate the safety of the food for consumption.

- Bacteriological sample results were compared to VETCOM's DOD Food Safety and Quality Assurance Action Levels[11] (See Appendix A). Action levels determine the threshold of contamination that warrants further investigation. VETCOM's action levels were approved by the DOD's Joint Services Food Risk Evaluation Committee.

- Dioxins and Furans Total Equivalent Quotient (TEQ) and Dioxin–like PCBs TEQ results in the chicken breast samples and carrot samples were compared to the mean compound levels in domestic meat and poultry, listed in the 2008 U.S. Department of Agriculture (USDA) Food Safety Inspection Service (FSIS) Dioxin Survey in Meat and Poultry (USDA 2009) conducted from September 2007 to September 2008, and the European Union Commission Regulation (EC) No. 199/2006 (EUCR 2006) maximum levels. No dioxin levels were available for carrots.

  The European Union Community Commission sets maximum levels for certain contaminants in foodstuffs based on approaches that ensure that food business operators apply measures to prevent and reduce the contamination as far as possible to protect public health and is appropriate for the health protection of infants and young children. It establishes the lowest maximum levels, which are achievable through a strict selection of the raw materials used for the manufacturing of foods for infants and young children. The regulation states that foodstuffs shall not be placed on the market if the foodstuff contains one of the chemicals, listed in the regulation, at a concentration above its regulation level.

- Dioxin-like PCBs concentrations were also compared to mean concentrations in domestic meat and poultry, listed on the 2008 USDA FSIS Dioxin Survey in Meat and Poultry (USDA 2009) conducted from September 2007 to September 2008, and EC No. 199/2006 (EUCR 2006) maximum levels.
- Pesticides were screened in chicken breast samples to determine either their presence or absence.

- For the assessment of metals (arsenic, lead, cadmium and mercury) in the spinach and carrot samples, there are no regulatory limits available in the United States. Element analytical results in food and nominal element analytical limits from the U.S. Food and Drug Administration (FDA) Total Diet Study (TDS) (FDA 2006)

[11] October 31, 2007

were used as comparison values. The metal concentrations in spinach and carrots were compared to the upper range concentration of these metals found in spinach and carrots in the U.S. They were also compared to EC No. 199/2006 (EUCR 2006) maximum levels for certain contaminants in foodstuffs.

> The TDS, sometimes called the "market basket study," is an ongoing FDA program that measures levels of various chemicals and nutrients in foods. From this information, dietary intakes of those chemicals by the U.S. population can be estimated. Since its inception in 1961 as a program to monitor for radioactive contamination of foods, the TDS has grown to encompass additional chemicals, including pesticide residues, industrial chemicals, and toxic and nutrient elements. A unique aspect of the TDS is that food products are prepared as they would be consumed (table-ready) prior to analysis, so the analytical results provide the basis for realistic estimates of the dietary intake of these chemicals. It is important to note that the TDS does not set regulatory limits of the food products it has analyzed. However, it gives scientists and health officials an estimate of routine exposures to various chemicals in the United States.

- Tap water sampling results were compared to the U.S. Environmental Protection Agency's (USEPA) maximum contaminant level (MCL) for drinking-water as set forth in the Safe Drinking Water Act (SDWA) and the National Primary and Secondary Drinking Water Regulations[12]. Tap water results were also compared to the DOD Final Governing Standards (FGS) for Italy[13]. The FGS standards were developed by comparing and adopting the more protective requirements of the DOD Overseas Environmental Baseline Guidance Document (OEBGD) and Italian national, regional and local environmental laws and regulations, and applicable international agreements. These standards are minimum requirements and the single definitive source of environmental compliance criteria applicable to DOD Components at installations in Italy.

Results

The following is a summary of the results from testing of the food products and tap water. Appendix B provides a detailed listing of the laboratory testing results and action levels.

- **Artichokes:** Laboratory testing results demonstrate that artichokes met the microorganism and pesticide food safety criteria for consumption.

- **Cabbage:** Laboratory testing results demonstrate that cabbage met the microorganism and pesticide food safety criteria for consumption.

[12] Title 40 CFR 141.1- 141.571 and 143.1-143.4
[13] Chapter 3, July 2008

- **Carrots:** Laboratory testing results demonstrate that carrots met the micro-organism and pesticide food safety criteria for consumption. Analytical results for dioxin in carrots were below non-detect values for dioxins and dioxin-like PCBs. Laboratory testing results demonstrate that metal concentrations found in carrots were below TDS levels.

- **Celery:** Laboratory testing results demonstrate that celery met the microorganism and pesticide food safety criteria for consumption.

- **Chicken:** Laboratory testing results demonstrate that chicken met the microorganism and pesticide food safety criteria for consumption. Analytical results for dioxin TEQ and dioxin-like PCBs TEQ in chicken were non-detect values and were below the maximum levels set by EC No. 199/2006 (EUCR 2006), and mean concentration in chicken on the 2002-2003 USDA FSIS Dioxin Survey in Meat and Poultry. Therefore, chicken breast met the food safety criteria for consumption.

- **Mushrooms:** Laboratory testing results demonstrate that mushrooms met the microorganism and pesticide food safety criteria for consumption.

- **Spinach:** Laboratory testing results demonstrate that spinach met the microorganism and pesticide food safety criteria for consumption. Laboratory testing results demonstrate that metal concentrations found in spinach were below the values listed for spinach on the TDS levels, except for lead and arsenic which were slightly above. However, the arsenic concentration was in the same order of magnitude as arsenic concentration in spinach from other European countries, and lower than that in other food groups (e.g., fish and crustaceans) (SCOOP 2004). Lead concentration in spinach was also slightly higher than the maximum level concentrations listed for spinach in the TDS survey for the U.S. (FDA 2006), but lower than the maximum level set by the European Union Community Commission (EUCR 2006).

- **Tap water (Commissary Produce Department):** Laboratory testing results demonstrate that all chemical concentrations found in tap water in the Commissary produce department were below action levels. Tap water from the Commissary's produce department's sink met the water safety criteria as set forth in the SDWA and FGS for Italy for drinking and washing fruits and vegetables.

- **Tap water (Arena Group Poultry Plant):** Laboratory testing results demonstrate that all chemical concentrations found in tap water in the Arena Group poultry plant were below action levels, with the exception of coliform. The sampling result exceeded the zero tolerance level criteria for total coliform. Due to the presence of coliform in the poultry plant's tap water, the water was not considered safe to drink or use in the washing of poultry. The poultry plant was suspended from the VETCOM Approved Source list because of this discrepancy. The plant corrected the bacteria discrepancy in their drinking water and was later reinstated on VETCOM's Approved Source list after VETCOM re-inspected the

plant. However, in December 2009, the Arena Group poultry plant requested to be delisted from VETCOM's Approved Source list and was removed.

Conclusions

The results of the Study demonstrate that the fruits and vegetables grown in the Campania region that are sold in the Commissary and were tested, meet food safety criteria for the U.S. and Europe for consumption. Chicken products produced by the Arena Group also met the food safety criteria for consumption. Tap water in the washing sink of the Commissary's produce department is safe for drinking and washing fruits and vegetables. Tap water from the washing sink at the Arena Group poultry plant exceeded the zero tolerance level criteria for total coliform. The poultry plant corrected the bacteria discrepancy and was later reinstated on VETCOM's Approved Source list.

Uncertainties

Uncertainties inherent in this Study include: a limited number of samples taken in one month, whether the fresh fruit and vegetable suppliers may change, and whether the suppliers always use the same farm location to obtain produce. Additionally, the potential for food contamination may be altered by rainfall, phyto-uptake changes, contamination deposition and handling practices. Furthermore, if feed or water is contaminated, it may potentially affect the level of chemicals (i.e., PCBs) in poultry.

Community Awareness

Findings of the Study were provided to Navy Leadership, U.S. Consulate Naples, Host Nation officials, media, and the Navy community beginning in May 2009. Information about the Study and the findings, including a fact sheet on this topic, were provided during the Naples PHE Phase I open house sessions held on May 6 and May 7, 2009, as well as a dedicated *Panorama* article published on May 22, 2009. General findings of the Study were also discussed during an American Forces Network (AFN) Naples radio interview on October 1, 2009.

A fact sheet about the Study is posted on the Naples Community Health Awareness website:
https://www.cnic.navy.mil/Naples/CommandInformation/HealthAwareness/FactSheets/index.htm

This Study report has also been posted to the Naples Community Health Awareness website, as an appendix to the Naples PHE Phase II Volume III report:
https://www.cnic.navy.mil/Naples/CommandInformation/HealthAwareness/

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Appendix A:
Department of Defense Food Safety & Quality Assurance Action Levels

31 October 2007

List of Acronyms:

CFU/g: colony forming unit per gram
CFU/mL: colony forming unit per milliliter
m/m: mass of the total solution
mU/L: milliunit per liter
ppb: parts per billion
ppm: parts per million
sq cm: square centimeter

Microorganisms Analyses

Sample	Micro-organisms Tested	Test Method	Action Limits Reference
Bagged Salad, Fresh Cut Fresh Fruits & Vegetables (FF&V)	E. coli	APHA[1], SMD Ch7, Petrifilm	100 CFU/g [3]
	E. coli 0157:H7	APHA[1], SMD Ch7, Petrifilm	Zero tolerance [3, 4]
	Salmonella	AOAC[2] 996.08, Vidas	Zero tolerance [3, 4]
	Listeria genus	AOAC[2] 996.06, Vidas	Zero tolerance [5]

Notes:

Other tests may be performed at the discretion of the laboratory.

1. American Public Health Association, http://www.apha.org/
2. Association of Analytical Communities, http://www.aoac.org/
3. Food Risk Evaluation Committee (FREC) approved, 31 Oct 2007. Estimated counts derived from comparison to select pathogen growth characteristics using the USDA Pathogen Modeling Program (PMP).
4. United States Department of Agriculture Food Safety and Inspection Services, FSIS Directive 10,240.3.
5. Code of Federal Regulations Title 9 Part 430.4 (for *Listeria monocytogenes*)

Chemical Analyses

Chemicals Tested	Test Method	Results Compared To
Arsenic	Hydridtechnik/FIAS[1]	TDS
Cadmium	Graphitrohr-AAS[2]	TDS
Lead	Graphitrohr-AAS[2]	TDS
Mercury	Hydridtechnik/FIAS[1]	TDS
Pesticide Screen	CHARM[3]	(not applicable – tested for presence or absence)
Polychlorinated Dibenzodioxins, food	EPA[4] 16134	CFR, Title 21, Vol 2, Part 109
Polychlorinated Dibenzofurans, food	EPA[4] 16134	CFR, Title 21, Vol 2, Part 109

Notes:

1. Atomic spectroscopy method for the quantitative and qualitative determination of elements used.
2. Graphite furnace atomic absorption is a type of spectrometry that uses graphite-coated furnace to vaporize the sample.
3. Charm Science Inc., http://www.charm.com/
4. U.S. Environmental Protection Agency method 1613 for isomer-specific determination of the 2,3,7,8-substituted, tetra through octa-chlorinated, dibenzo-p-dioxins and dibenzofurans in aqueous, solid, and tissue matrices by isotope dilution, high resolution capillary column gas chromatography/high resolution mass spectrometry

Appendix B:
Laboratory Testing Results

TESTING RESULTS

		Food Product:	Spinach	AL/TDS	Cabbage	AL/TDS
		Sample Date:	20080205	See footnotes	20080205	See footnotes
Parameter	Fraction	Units	Sample Number: F08-0029-00217		Sample Number: F08-0029-00218	
COLIFORM	MICRO	Petri	<10EEC	*	<10EEC	*
AEROBIC COUNT	MICRO	Petri	NA	*	NA	*
E.coli	MICRO	Petri	<10EEC	100 CFU/G***	<10EEC	100 CFU/G***
SALMONELLA	MICRO	25mL	NEG	0.0***	NEG	0.0***
LISTERIA	MICRO	25mL	NEG	0.0***	NEG	0.0***
PESTICIDES	MISC	CHARM	ND	*	ND	*
ARSENIC	METAL	mg/kg	0.052	0.043**	NA	0.011**
LEAD	METAL	mg/kg	0.137	0.062**	NA	0.008**
CADMIUM	METAL	mg/kg	0.03	0.524**	NA	0.012**
MERCURY	METAL	mg/kg	0.007	0.018**	NA	*
2,3,7,8-TCDD	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,7,8-PeCDD	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,4,7,8-HxCDD	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,4,6,7,8-HxCDD	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,4,7,8,9-HxCDD	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,4,6,7,8-HpCDD	DIOXIN	ng/kg	NA	*	NA	*
Octa CDO	DIOXIN	ng/kg	NA	*	NA	*
2,3,7,8-TCDF	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,7,8-PeCDF	DIOXIN	ng/kg	NA	*	NA	*
2,3,4,7,8-PeCDF	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,4,7,8-HxCDF	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,6,7,8-HxCDF	DIOXIN	ng/kg	NA	*	NA	*
2,3,4,6,7,8-HxCDF	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,7,8,9-HxCDF	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,4,6,7,8-HpCDF	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,4,7,8,9-HpCDF	DIOXIN	ng/kg	NA	*	NA	*
Octa CDF	DIOXIN	ng/kg	NA	*	NA	*
I-TE(NATO CCMS) excl LOQ	DIOXIN	ng/kg	NA	*	NA	*
I-TE(NATO CCMS) incl LOQ	DIOXIN	ng/kg	NA	*	NA	*
TEQ(WHO1997) excl LOQ	DIOXIN	ng/kg	NA	*	NA	*
TEQ(WHO1997) incl 1/2LOQ	DIOXIN	ng/kg	NA	*	NA	*
TEQ(WHO1997) incl LOQ	DIOXIN	ng/kg	NA	*	NA	*
PCB no 77	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 81	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 126	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 159	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 105	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 114	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 118	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 123	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 156	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 157	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 167	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 189	DIOXLIKE	ng/kg	NA	*	NA	*

TESTING RESULTS

		Food Product:	Spinach	AL/TDS	Cabbage	AL/TDS
		Sample Date:	20080205	See footnotes	20080205	See footnotes
Parameter	Fraction	Units	Sample Number: F08-0029-00217		Sample Number: F08-0029-00218	
PCB-TEQ(WHO1997) excl LOQ	DIOXLIKE	ng/kg	NA	*	NA	*
PCB-TEQ(who1997) incl LOQ	DIOXLIKE	ng/kg	NA	*	NA	*

LEGEND

AL-Action Levels
CFU/G-colony forming unit per gram

CHARM-Pesticide screen device
EEC-Estimated Colony Count
LOQ-Limit of Quantitation
mg/kg-milligram per kilogram
MICRO-Microbiology
MISC-Miscellaneous

DIOXIN-Petroleum-derived chemicals which are produced when herbicides are made or when plastics are burned.
DIOXLIKE-Chlorinated chemicals with comparable structural and biochemical properties to dioxins.

METAL-Metal chemical element that is a good conductor of electricity & heat and forms cations and ionic bonds with non-metals.
mL-milliliter
NA-Not Analyzed
ND-Not Detected
NEG-Negative
ng/kg-microgram per kilogram
TDS-Total Diet Study (FDA)

*No Action Limits or guidance found on this analyte.

**Figure derived from the FDA Total Diet Study August 2006. Analytical results in food and nominal element analytical limits are provided as a sample. No regulatory authority is provided or implied.

***Pathogenic Microbiological Action Levels for ready-to-eat foods and quality assurance levels provided by U.S. Army Veterinary Command (VETCOM).

****No guidelines for specific congeners. 21 Code of Federal Regulations, Title 21, Vol 2, 2003, Part 109 states that the temporary tolerance for residues of polychlorinated biphenyls (PCBs) for poultry is 3 parts per million.

TESTING RESULTS

		Food Product:	Mushrooms	AL/TDS	Carrot	AL/TDS
		Sample Date:	20080205	See footnotes	20080205	See footnotes
Parameter	Fraction	Units	Sample Number: F08-0029-00219		Sample Number: F08-0029-00214	
COLIFORM	MICRO	Petri	<10EEC	*	<10EEC	*
AEROBIC COUNT	MICRO	Petri	NA	*	NA	*
E.coli	MICRO	Petri	<10EEC	100 CFU/G***	<10EEC	100 CFU/G***
SALMONELLA	MICRO	25mL	NEG	0.0***	NEG	0.0***
LISTERIA	MICRO	25mL	NEG	0.0***	NEG	0.0***
PESTICIDES	MISC	CHARM	ND	*	ND	*
ARSENIC	METAL	mg/kg	NA	0.203**	0.073	0.043**
LEAD	METAL	mg/kg	NA	0.016**	0.03	0.017**
CADMIUM	METAL	mg/kg	NA	0.016**	0.003	0.068**
MERCURY	METAL	mg/kg	NA	0.027**	0.005	0.101**
2,3,7,8-TCDD	DIOXIN	ng/kg	NA	*	<0.02	****
1,2,3,7,8-PeCDD	DIOXIN	ng/kg	NA	*	<0.03	****
1,2,3,4,7,8-HxCDD	DIOXIN	ng/kg	NA	*	<0.06	****
1,2,3,4,6,7,8-HxCDD	DIOXIN	ng/kg	NA	*	<0.06	****
1,2,3,4,7,8,9-HxCDD	DIOXIN	ng/kg	NA	*	<0.06	****
1,2,3,4,6,7,8-HpCDD	DIOXIN	ng/kg	NA	*	<0.1	****
Octa CDO	DIOXIN	ng/kg	NA	*	<0.2	****
2,3,7,8-TCDF	DIOXIN	ng/kg	NA	*	<0.04	****
1,2,3,7,8-PeCDF	DIOXIN	ng/kg	NA	*	<0.03	****
2,3,4,7,8-PeCDF	DIOXIN	ng/kg	NA	*	<0.03	****
1,2,3,4,7,8-HxCDF	DIOXIN	ng/kg	NA	*	<0.06	****
1,2,3,6,7,8-HxCDF	DIOXIN	ng/kg	NA	*	<0.06	****
2,3,4,6,7,8-HxCDF	DIOXIN	ng/kg	NA	*	<0.06	****
1,2,3,7,8,9-HxCDF	DIOXIN	ng/kg	NA	*	<0.06	****
1,2,3,4,6,7,8-HpCDF	DIOXIN	ng/kg	NA	*	<0.1	****
1,2,3,4,7,8,9-HpCDF	DIOXIN	ng/kg	NA	*	<0.1	****
Octa CDF	DIOXIN	ng/kg	NA	*	<0.2	****
I-TE(NATO CCMS) excl LOQ	DIOXIN	ng/kg	NA	*	0	****
I-TE(NATO CCMS) incl LOQ	DIOXIN	ng/kg	NA	*	0.101	****
TEQ(WHO1997) excl LOQ	DIOXIN	ng/kg	NA	*	0	****
TEQ(WHO1997) incl 1/2LOQ	DIOXIN	ng/kg	NA	*	0.0578	****
TEQ(WHO1997) incl LOQ	DIOXIN	ng/kg	NA	*	0.116	****
PCB no 77	DIOXLIKE	ng/kg	NA	*	<2	****
PCB no 81	DIOXLIKE	ng/kg	NA	*	<1	****
PCB no 126	DIOXLIKE	ng/kg	NA	*	<0.5	****
PCB no 159	DIOXLIKE	ng/kg	NA	*	<1	****
PCB no 105	DIOXLIKE	ng/kg	NA	*	<10	****
PCB no 114	DIOXLIKE	ng/kg	NA	*	<2	****
PCB no 118	DIOXLIKE	ng/kg	NA	*	<20	****
PCB no 123	DIOXLIKE	ng/kg	NA	*	<2	****
PCB no 156	DIOXLIKE	ng/kg	NA	*	<2	****
PCB no 157	DIOXLIKE	ng/kg	NA	*	<2	****
PCB no 167	DIOXLIKE	ng/kg	NA	*	<2	****
PCB no 189	DIOXLIKE	ng/kg	NA	*	<2	****

TESTING RESULTS

		Food Product:	Mushrooms	AL/TDS	Carrot	AL/TDS
		Sample Date:	20080205	See footnotes	20080205	See footnotes
Parameter	Fraction	Units	Sample Number: F08-0029-00219		Sample Number: F08-0029-00214	
PCB-TEQ(WHO1997) excl LOQ	DIOXLIKE	ng/kg	NA	*	0	****
PCB-TEQ(who1997) incl LOQ	DIOXLIKE	ng/kg	NA	*	0.0667	****

LEGEND

AL-Action Levels
CFU/G-colony forming unit per gram

CHARM-Pesticide screen device
EEC-Estimated Colony Count
LOQ-Limit of Quantitation
mg/kg-milligram per kilogram
MICRO-Microbiology
MISC-Miscellaneous

DIOXIN-Petroleum-derived chemicals which are produced when herbicides are made or when plastics are burned.
DIOXLIKE-Chlorinated chemicals with comparable structural and biochemical properties to dioxins.

METAL-Metal chemical element that is a good conductor of electricity & heat and forms cations and ionic bonds with non-metals.
mL-milliliter
NA-Not Analyzed
ND-Not Detected
NEG-Negative
ng/kg-microgram per kilogram
TDS-Total Diet Study (FDA)

*No Action Limits or guidance found on this analyte.

**Figure derived from the FDA Total Diet Study August 2006. Analytical results in food and nominal element analytical limits are provided as a sample. No regulatory authority is provided or implied.

***Pathogenic Microbiological Action Levels for ready-to-eat foods and quality assurance levels provided by U.S. Army Veterinary Command (VETCOM).

****No guidelines for specific congeners. 21 Code of Federal Regulations, Title 21, Vol 2, 2003, Part 109 states that the temporary tolerance for residues of polychlorinated biphenyls (PCBs) for poultry is 3 parts per million.

TESTING RESULTS

		Food Product:	Celery	AL/TDS	Artichoke	AL/TDS
		Sample Date:	20080205	See footnotes	20080205	See footnotes
Parameter	Fraction	Units	Sample Number: F08-0029-00215		Sample Number: F08-0029-00216	
COLIFORM	MICRO	Petri	<10EEC	*	40EEC	*
AEROBIC COUNT	MICRO	Petri	NA	*	NA	*
E.coli	MICRO	Petri	<10EEC	100 CFU/G***	<10EEC	100 CFU/G***
SALMONELLA	MICRO	25mL	NEG	0.0***	NEG	0.0***
LISTERIA	MICRO	25mL	NEG	0.0***	NEG	0.0***
PESTICIDES	MISC	CHARM	ND	*	ND	*
ARSENIC	METAL	mg/kg	NA	0.0**	NA	*
LEAD	METAL	mg/kg	NA	0.012**	NA	*
CADMIUM	METAL	mg/kg	NA	0.094**	NA	*
MERCURY	METAL	mg/kg	NA	*	NA	*
2,3,7,8-TCDD	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,7,8-PeCDD	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,4,7,8-HxCDD	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,4,6,7,8-HxCDD	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,4,7,8,9-HxCDD	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,4,6,7,8-HpCDD	DIOXIN	ng/kg	NA	*	NA	*
Octa CDO	DIOXIN	ng/kg	NA	*	NA	*
2,3,7,8-TCDF	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,7,8-PeCDF	DIOXIN	ng/kg	NA	*	NA	*
2,3,4,7,8-PeCDF	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,4,7,8-HxCDF	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,6,7,8-HxCDF	DIOXIN	ng/kg	NA	*	NA	*
2,3,4,6,7,8-HxCDF	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,7,8,9-HxCDF	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,4,6,7,8-HpCDF	DIOXIN	ng/kg	NA	*	NA	*
1,2,3,4,7,8,9-HpCDF	DIOXIN	ng/kg	NA	*	NA	*
Octa CDF	DIOXIN	ng/kg	NA	*	NA	*
I-TE(NATO CCMS) excl LOQ	DIOXIN	ng/kg	NA	*	NA	*
I-TE(NATO CCMS) incl LOQ	DIOXIN	ng/kg	NA	*	NA	*
TEQ(WHO1997) excl LOQ	DIOXIN	ng/kg	NA	*	NA	*
TEQ(WHO1997) incl 1/2LOQ	DIOXIN	ng/kg	NA	*	NA	*
TEQ(WHO1997) incl LOQ	DIOXIN	ng/kg	NA	*	NA	*
PCB no 77	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 81	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 126	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 159	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 105	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 114	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 118	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 123	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 156	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 157	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 167	DIOXLIKE	ng/kg	NA	*	NA	*
PCB no 189	DIOXLIKE	ng/kg	NA	*	NA	*

TESTING RESULTS

		Food Product:	Celery	AL/TDS	Artichoke	AL/TDS
		Sample Date:	20080205	See footnotes	20080205	See footnotes
Parameter	Fraction	Units	Sample Number: F08-0029-00215		Sample Number: F08-0029-00216	
PCB-TEQ(WHO1997) excl LOQ	DIOXLIKE	ng/kg	NA	*	NA	*
PCB-TEQ(who1997) incl LOQ	DIOXLIKE	ng/kg	0	*	0	*

LEGEND

AL-Action Levels
CFU/G-colony forming unit per gram
CHARM-Pesticide screen device
EEC-Estimated Colony Count
LOQ-Limit of Quantitation
mg/kg-milligram per kilogram
MICRO-Microbiology
MISC-Miscellaneous
DIOXIN-Petroleum-derived chemicals which are produced when herbicides are made or when plastics are burned.
DIOXLIKE-Chlorinated chemicals with comparable structural and biochemical properties to dioxins.
METAL-Metal chemical element that is a good conductor of electricity & heat and forms cations and ionic bonds with non-metals.
mL-milliliter
NA-Not Analyzed
ND-Not Detected
NEG-Negative
ng/kg-microgram per kilogram
TDS-Total Diet Study (FDA)

*No Action Limits or guidance found on this analyte.

**Figure derived from the FDA Total Diet Study August 2006. Analytical results in food and nominal element analytical limits are provided as a sample. No regulatory authority is provided or implied.

***Pathogenic Microbiological Action Levels for ready-to-eat foods and quality assurance levels provided by U.S. Army Veterinary Command (VETCOM).

****No guidelines for specific congeners. 21 Code of Federal Regulations, Title 21, Vol 2, 2003, Part 109 states that the temporary tolerance for residues of polychlorinated biphenyls (PCBs) for poultry is 3 parts per million.

TESTING RESULTS

Parameter	Fraction	Units	Chicken Breast 20080129 Sample Number: F08-0019-00165	Chicken Breast 20080129 Sample Number: F08-0019-00166	Chicken Breast 20080129 [1]00165 + 00166	AL/TDS See footnotes
COLIFORM	MICRO	Petri	<10EEC	<10EEC	NA	*
AEROBIC COUNT	MICRO	Petri	720,000	230,000	NA	*
E.coli	MICRO	Petri	<10EEC	<10EEC	NA	*
SALMONELLA	MICRO	25mL	NA	NA	NA	*
LISTERIA	MICRO	25mL	NA	NA	NA	*
PESTICIDES	MISC	CHARM	ND	NA	NA	*
ARSENIC	METAL	mg/kg	NA	NA	NA	0.081**
LEAD	METAL	mg/kg	NA	NA	NA	0.015**
CADMIUM	METAL	mg/kg	NA	NA	NA	0.003**
MERCURY	METAL	mg/kg	NA	NA	NA	0.0**
2,3,7,8-TCDD	DIOXIN	ng/kg	NA	NA	<0.02	****
1,2,3,7,8-PeCDD	DIOXIN	ng/kg	NA	NA	<0.03	****
1,2,3,4,7,8-HxCDD	DIOXIN	ng/kg	NA	NA	<0.06	****
1,2,3,4,6,7,8-HxCDD	DIOXIN	ng/kg	NA	NA	<0.06	****
1,2,3,4,7,8,9-HxCDD	DIOXIN	ng/kg	NA	NA	<0.06	****
1,2,3,4,6,7,8-HpCDD	DIOXIN	ng/kg	NA	NA	<0.1	****
Octa CDO	DIOXIN	ng/kg	NA	NA	<0.02	****
2,3,7,8-TCDF	DIOXIN	ng/kg	NA	NA	<0.04	****
1,2,3,7,8-PeCDF	DIOXIN	ng/kg	NA	NA	<0.03	****
2,3,4,7,8-PeCDF	DIOXIN	ng/kg	NA	NA	<0.03	****
1,2,3,4,7,8-HxCDF	DIOXIN	ng/kg	NA	NA	<0.06	****
1,2,3,6,7,8-HxCDF	DIOXIN	ng/kg	NA	NA	<0.06	****
2,3,4,6,7,8-HxCDF	DIOXIN	ng/kg	NA	NA	<0.06	****
1,2,3,7,8,9-HxCDF	DIOXIN	ng/kg	NA	NA	<0.06	****
1,2,3,4,6,7,8-HpCDF	DIOXIN	ng/kg	NA	NA	<0.1	****
1,2,3,4,7,8,9-HpCDF	DIOXIN	ng/kg	NA	NA	<0.1	****
Octa CDF	DIOXIN	ng/kg	NA	NA	<0.2	****
I-TE(NATO CCMS) excl LOQ	DIOXIN	ng/kg	NA	NA	0	****
I-TE(NATO CCMS) incl LOQ	DIOXIN	ng/kg	NA	NA	0.101	****
TEQ(WHO1997) excl LOQ	DIOXIN	ng/kg	NA	NA	0	****
TEQ(WHO1997) incl 1/2LOQ	DIOXIN	ng/kg	NA	NA	0	****
TEQ(WHO1997) incl LOQ	DIOXIN	ng/kg	NA	NA	0.116	****
PCB no 77	DIOXLIKE	ng/kg	NA	NA	5.09	****
PCB no 81	DIOXLIKE	ng/kg	NA	NA	<3	****
PCB no 126	DIOXLIKE	ng/kg	NA	NA	<1.5	****
PCB no 159	DIOXLIKE	ng/kg	NA	NA	<3	****
PCB no 105	DIOXLIKE	ng/kg	NA	NA	39.2	****
PCB no 114	DIOXLIKE	ng/kg	NA	NA	<6	****
PCB no 118	DIOXLIKE	ng/kg	NA	NA	<60	****
PCB no 123	DIOXLIKE	ng/kg	NA	NA	<6	****
PCB no 156	DIOXLIKE	ng/kg	NA	NA	<6	****
PCB no 157	DIOXLIKE	ng/kg	NA	NA	<6	****
PCB no 167	DIOXLIKE	ng/kg	NA	NA	<6	****
PCB no 189	DIOXLIKE	ng/kg	NA	NA	<6	****

TESTING RESULTS

Parameter	Fraction	Units	Chicken Breast 20080129 Sample Number: F08-0019-00165	Chicken Breast 20080129 Sample Number: F08-0019-00166	Chicken Breast 20080129 [1]00165 + 00166	AL/TDS See footnotes
PCB-TEQ(WHO1997) excl LOQ	DIOXLIKE	ng/kg	NA	NA	0.00453	****
PCB-TEQ(who1997) incl LOQ	DIOXLIKE	ng/kg	NA	NA	0.201	****

[1]Chicken F08-0019-00165 & F08-0019-00166 combined for dioxin sampling.

LEGEND

AL-Action Levels
CFU/G-colony forming unit per gram

CHARM-Pesticide screen device
EEC-Estimated Colony Count
LOQ-Limit of Quantitation
mg/kg-milligram per kilogram
MICRO-Microbiology
MISC-Miscellaneous

DIOXIN-Petroleum-derived chemicals which are produced when herbicides are made or when plastics are burned.
DIOXLIKE-Chlorinated chemicals with comparable structural and biochemical properties to dioxins.

METAL-Metal chemical element that is a good conductor of electricity & heat and forms cations and ionic bonds with non-metals.
mL-milliliter
NA-Not Applicable
ND-Not Detected
NEG-Negative
ng/kg-microgram per kilogram
TDS-Total Diet Study (FDA)

*No Action Limits or guidance found on this analyte.

**Figure derived from the FDA Total Diet Study August 2006. Analytical results in food and nominal element analytical limits are provided as a sample. No regulatory authority is provided or implied.

***Pathogenic Microbiological Action Levels for ready-to-eat foods and quality assurance levels provided by U.S. Army Veterinary Command (VETCOM).

****No guidelines for specific congeners. 21 Code of Federal Regulations, Title 21, Vol 2, 2003, Part 109 states that the temporary tolerance for residues of polychlorinated biphenyls (PCBs) for poultry is 3 parts per million.

TESTING RESULTS

	Food Product:		Tap Water Produce Dept. Commissary	Tap Water Arena Group Poultry Plant	FGS ITALY
	Sample Date:		20080205	20080129	Jul-08
			Sample Number:	Sample Number:	
Parameter	Fraction	Units	F08-0040-00263	F08-0030-00222	MCL (mg/L)
Appearance	PA	NP	Normal	Normal	W1
Color	PA	NP	Normal	Normal	Acceptable to consumer
Texture	PA	NP	Normal	Normal	W1
pH	MISC	NP	7.52	7.69	6.5-9.5
Heterotrophic Plate Count	MICRO	cfu/mL	4200	<400 EHPC	W2
Coliform Count	MICRO	cfu/250 mL	<1 ECC	56	0
Pseudomonas aeruginosa count	MICRO	cfu/250 mL	<1 EST	<1 EST	W3
Streptococcus count	MICRO	cfu/250 mL	<1 EST	<1 EST	W3
Pesticide Screen	OC	NP	ND	ND	W4
Chloride	D	mg/L	8	<5.0	250
Antimony	IOC	mg/L	<0.0002	<0.0002	0.005
Arsenic	IOC	mg/L	<0.003	<0.003	0.01
Barium	IOC	mg/L	0.015	0.005	2
Beryllium	IOC	mg/L	<0.0002	<0.0002	0.004
Cadmium	IOC	mg/L	<0.0002	<0.0002	0.005
Chromium	IOC	mg/L	<0.002	<0.002	0.05
Copper	IOC	mg/L	0.018	<0.002	1
Fluoride	IOC	mg/L	<0.1	<0.1	1.5
Iron	IOC	mg/L	<0.005	<0.008	0.2
Lead	IOC	mg/L	0.0016	0.0008	0.025
Manganese	IOC	mg/L	<0.002	<0.002	0.05
Mercury	IOC	mg/L	<0.0001	<0.0001	0.001
Nickel	IOC	mg/L	0.001	0.001	0.02
Nitrate (NO3), as N	IOC	mg/L	0.7	0.5	10
Nitrite (NO2), as N	IOC	mg/L	<0.03	<0.03	0.15
Selenium	IOC	mg/L	<0.003	<0.003	0.01
Silver	IOC	mg/L	<0.001	<0.001	0.1^{SS}
Sulfate	IOC	mg/L	11	<5.0	250
Thallium	IOC	mg/L	<0.0002	<0.0002	0.002
Zinc	IOC	mg/L	2.1	0.053	5^{SS}
Gross Alpha Activity	RADIO	pCi/L	1.2	0.24	15
Gross Alpha Min. Detect Act.	RADIO	pCi/L	1.5	0.62	W5
Gross Alpha Uncertainty (±)	RADIO	pCi/L	1.3	1	W5
Gross Beta Activity	RADIO	pCi/L	1.8	-0.064	50
Gross Beta Uncertainty	RADIO	pCi/L	1	0.76	W5
Gross Beta Min. Detect. Act.(±)	RADIO	pCi/L	1.1	1.1	W5

LEGEND

CFU/mL-colony forming unit per milliliter

D-Disinfection

DIOXIN-Petroleum-derived chemicals which are produced when herbicides are made or when plastics are burned.

ECC-Estimated Colony Count

EHPC-Estimated Heterotrophic Plate Count

EST-Estimated

TESTING RESULTS

	Food Product:		Tap Water Produce Dept. Commissary	Tap Water Arena Group Poultry Plant	FGS ITALY
	Sample Date:		20080205	20080129	Jul-08
			Sample Number:	Sample Number:	
Parameter	Fraction	Units	F08-0040-00263	F08-0030-00222	MCL (mg/L)

IOC-Inorganic Chemical
MCL-Maximum Contaminant Level
mg/L-milligram per liter
MICRO-Microbiology
MISC-Miscellaneous
ND-Not Detected
NP-Not Provided by Lab
OC-Organic Chemical
PA-Physical Appearance
pCi/L-picocuries per liter.
RADIO-Radionuclides
SS-U.S. Environmental Protection Agency (EPA) secondary non-enforceable guidelines that may cause cosmetic effects (such as skin/tooth discoloration) or aesthetic effects (such as taste, odor, color) in drinking water.
W1-Subjective appearance as compared to a clear, colorless and odorless sample of water.
W2-<500 bacterial colonies per millilter; any samples above 500 warrant further investigation.
W3-Limits are not defined by FGS Italy 2008. No current primary or secondary standard by EPA.
W4-EPA specifies specific chemicals that may be used in pesticide. Lab performed a general pesticide screening. Result is either detect or nondetect. No MCL available.
W5-Within MCLs as reported by Commander Veterinary Lab Europe (CHPMM-E)

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APPENDIX M: COMMANDER NAVY REGION EUROPE, AFRICA, SOUTHWEST ASIA – NAVAL SUPPORT ACTIVITY NAPLES

History

Commander Navy Region Europe, Africa, Southwest Asia (CNREURAFSWA) traces its roots back to a hand shake between Winston Churchill and General Dwight D. Eisenhower in 1941. In 1942, Admiral Harold F. Stark set up offices at 20 Grosvenor Square (7 North Audley Street), Westminster, London, United Kingdom, marking the beginning of the leadership of U.S. Naval Forces Europe (CNE).

In November 2001, as part of a realignment effort undertaken by CNE, Rear Adm. David T. Hart Jr., as CNE Deputy, took on the additional duty as Navy Region Europe's (CNRE) commander. Three years later, Commander Maritime Air Allied Naval Forces South (COMMARAIRSOUTH) was renamed Commander Maritime Air Naples (CMAN) under CNRE's cognizance. It was at this time that CNRE started relocating from London to Naples, Italy, relinquishing the lease on the Navy building rented from the Duke of Westminster for £100 per year.

In January 2009, operational and logistical shore service support of Navy Region Southwest Asia, along with Camp Lemonnier, Djibouti, was realigned under the scope of Navy Region Europe. On April 21, 2009, Navy Region Europe officially changed its name to Commander Navy Region Europe, Africa, Southwest Asia.

CNREURAFSWA Area of Responsibility

Naval Support Activity Naples

U.S.S. *Mount Olympus (AGC-8)* sailed into Naples during the summer of 1951 to establish what is now known as Naval Support Activity (NSA) Naples as documented by the two following excerpts from the Naval Historical Center:

- She became flagship and temporary headquarters for Commander, U.S. Naval Forces, Eastern Atlantic and Mediterranean/Commander in Chief, Allied Forces Southern Europe (CINCNELM)/CINCSOUTH) in the Mediterranean, 21 June 1951.
- Relieved by *Adirondack* in August 1951, U.S.S. *Mount Olympus (AGC-8)* returned to Norfork and duty as Amphibious Group 2 flagship.

NSA Naples was established to support the Naples North Atlantic Treaty Organization (NATO) installation and the Navy Support Element. During the 1950s, the NSA offices were scattered around Naples in rented spaces mainly along Via Corso Vittorio Emanuele. In the early 1960s, NSA Naples slowly consolidated into the active volcanic crater of Agnano. During those years, there was no "Navy Housing" as seen today at the Naval Support Site Gricignano di Aversa. Navy housing was scattered all over the countryside with some consolidation of Americans and British at Lago Patria. Toward the end of

the 1970s, sailors were renting housing out toward Pinetamare. A local businessman capitalized on the military housing concept and built the Towers complex on the beach at Pinetamare and, later, a Temporary Living Allowance hotel.

Photo of NSA Naples

In 1982, the Naval Support Activity located in Agnano was shaken by a sizable earthquake. Damage resulted to the infrastructure of the base, and despite the large amount of money spent on repairs, it was decided that the Navy community in Naples was in critical need of new facilities. *Project Pronto* was planned to move all operational and support facilities out of Agnano to a 250 acre site near Capua, Italy. The project ended in 1988 when the U.S. Congress concluded it was too expensive and when the Italian Ministry of Defense purchase of the site fell through.

However, because of bradyseismic activity and other force protection issues, Navy Leadership proposed an alternate plan in 1989 to move the support site in Agnano to another location, as well as relocate housing, the Navy Exchange, Commissary and other support facilities. Thus was born the Naples Improvement Initiative.

In 1990, the decision was made to locate and build the operational aspect of the community in Capodichino – site of the civilian airport which has shared its runways with the U.S. Navy (USN) for many years. The U.S. Government had control of some of the property alongside the runway since World War II. An agreement was made with the Italian government to expand the operations side there. It was a $260 million military construction project.

Aerial Image of NSA Naples

Additionally, a support site which would consist of housing, schools, hospital, Navy Exchange, and all aspects of community support would be privately built then leased in the town of Gricignano, about 15 miles north of Capodichino. By June 2005, the entire Agnano facility was closed. The support site and Capodichino moves were advantageous in that they eliminated over 15 separate contracts and landlords.

Naples Population Served by CNREURAFSWA/NSA Naples

The approximate population served breaks down into the following categories:

- U.S. Military: 2,100
- U.S. Civilians: 900
- Local Nationals: 1,200
- Dependents: 3,500

Support Services

NSA Naples provides the following support services:

- Security
- Air/Port Operations
- Facilities
- Logistics
- Housing

- Administrative Support
- Morale, Welfare & Recreation (MWR)
- Postal Service

Additional Support is provided to:

- Department of Defense Dependents Schools (DODDS)
- Navy Exchange (NEX)
- Defense Commissary Agency (DeCA)
- U.S. Naval Hospital Naples

Operational Customers are:

- CNE/CAN/C6F
- CNREURAFSWA
- NCTS
- JFC/NATO
- Others (28 commands total in Naples area)

Housing Department

The NSA Naples Housing Department's area of responsibility is spread out over 500 square miles. Housing policies are modified based on occupancy rates. There are approximately 3,800 private rental homes on the Housing Eligibility List. In addition to the base housing at the Support Site, there are two Government-leased Parco complexes, Parco Eva (leased in March 2003) and Parco Le Ginestre (leased in August 2007).

Below is the distribution percentage of USN personnel for the various housing options that are available:

- Support Site: 30% (Note: the Support Site is currently at 98% capacity)
- Government-leased Parcos off-base: 3%
- Private rental homes off-base: 58%
- Single sailors occupying quarters (E-4 and below)
  - Capodichino: 6%
  - Support Site: 3%

The following are the approximate number of housing units available in the Housing database:

- Support Site: 971 units
- Two Government-leased Parcos (Parcos Eva, Le Ginestre): 89 units
- Bachelor Enlisted Quarters: 369 units
- Private rental homes located off-base: Approximately 3,800 homes are on the approved Housing Inventory List

Capodichino Complex

The Capodichino complex is the main work site which includes the Command, Control, Computing, Communication and Intelligence (C4I) Building and Airfield.

The mission of the airfield is to provide:

- Services to station and transient aircraft in support of operational tasking
- Air Mobility Command (AMC) services support to transient aircraft
- Passenger and Cargo Handling

The current annual Operational Tempo (OPTEMPO) is:

- Processed 5,800 aircraft evolutions up to and including C-5/C-17/DC-10 aircraft
- 2,300 tons of cargo
- 34,500 passengers
- Support DOD, NATO, State Department, and Foreign Military Aircraft

Port Operations offices are located at Port of Naples Statione Maritima and Capodichino Air Terminal. All ports can accommodate small units, and only Trieste and Naples can accommodate carriers at anchor. Visits by USN ships in mainland Italy average 40 per year. Port Operations functions include:

- Provide port liaison services to the port of Naples and all 14 mainland Italian ports, and
- Provide administrative and husbanding agent liaison services.

Gricignano Support Site

The Naples Improvement Initiative was the largest quality-of-life improvement project in Europe. This $700 million project affected virtually every military command, all military members and their families, and DOD civilians in the greater Naples area. The project began after the Naval Support Activity, located in Agnano, was shaken by a sizable seismic event.

Construction of NSA Naples Support Site in Gricignano

In February 1996, construction commenced in Gricignano, the location of the Support Site. The lease program was implemented in four phases. The first increment included an elementary school, a high school, and 864 housing units. The housing units have many amenities of stateside living, with 110-volt electrical current, potable water, central heating and air conditioning, and full-size appliances, including dishwashers. The first units were accepted in 1997 and the rest of the 876 available housing units were finished in the summer of 2001.

Increment II included the construction of many community support facilities, such as the Child Development Center, a community fire station, the base Main Gate Complex, which houses NSA Security and the Human Resources Office, the Village Forum complex, which houses the Navy Lodge Hotel, an NEX mini-mart, laundry and video store, motor vehicle office, personal property office, family service center, a new chapel, library, and community center and youth center. The Village Forum became operational in the summer of 2002. Other Increment II facilities completed include an auto hobby shop, a Public Works facility, POV lot and facility, environmental facility, and AFN TV's new facility. All of these buildings became operational in 2002.

Increment III included the construction of a new state-of-the-art medical/dental facility for the community. This 170,000 square-foot, three-story facility has a dedicated central energy plant, offers 20 inpatient beds and outpatient and clinical services. The hospital became operational in 2002.

Increment IV provided the final touches to completing the support community at Gricignano. The facilities associated with this increment include a new retail center, which includes an NEX main store, a mall, and the Commissary. Other facilities include a fitness center with outdoor pool, a bowling center with an MWR club, a veterinary clinic and dog kennel, an Enlisted Bachelor lodge, and an auto service center. These facilities were completed in 2004.

Annual operating costs are approximately $41 million, which includes lease, utilities, maintenance, housing, etc.

Carney Park Recreation Facility

Carney Park, established on May 21, 1966, by USN, initially consisted only of ball fields. In 1969, NATO (at the time AF South, now JFC) began development of the golf course. The golf course was turned over to NSA Naples in 1995. The park is the focal point for all MWR outdoor activities, including athletics, outdoor recreation, and special events. Patronage exceeds 350,000 per year.

Carney Park facilities include:

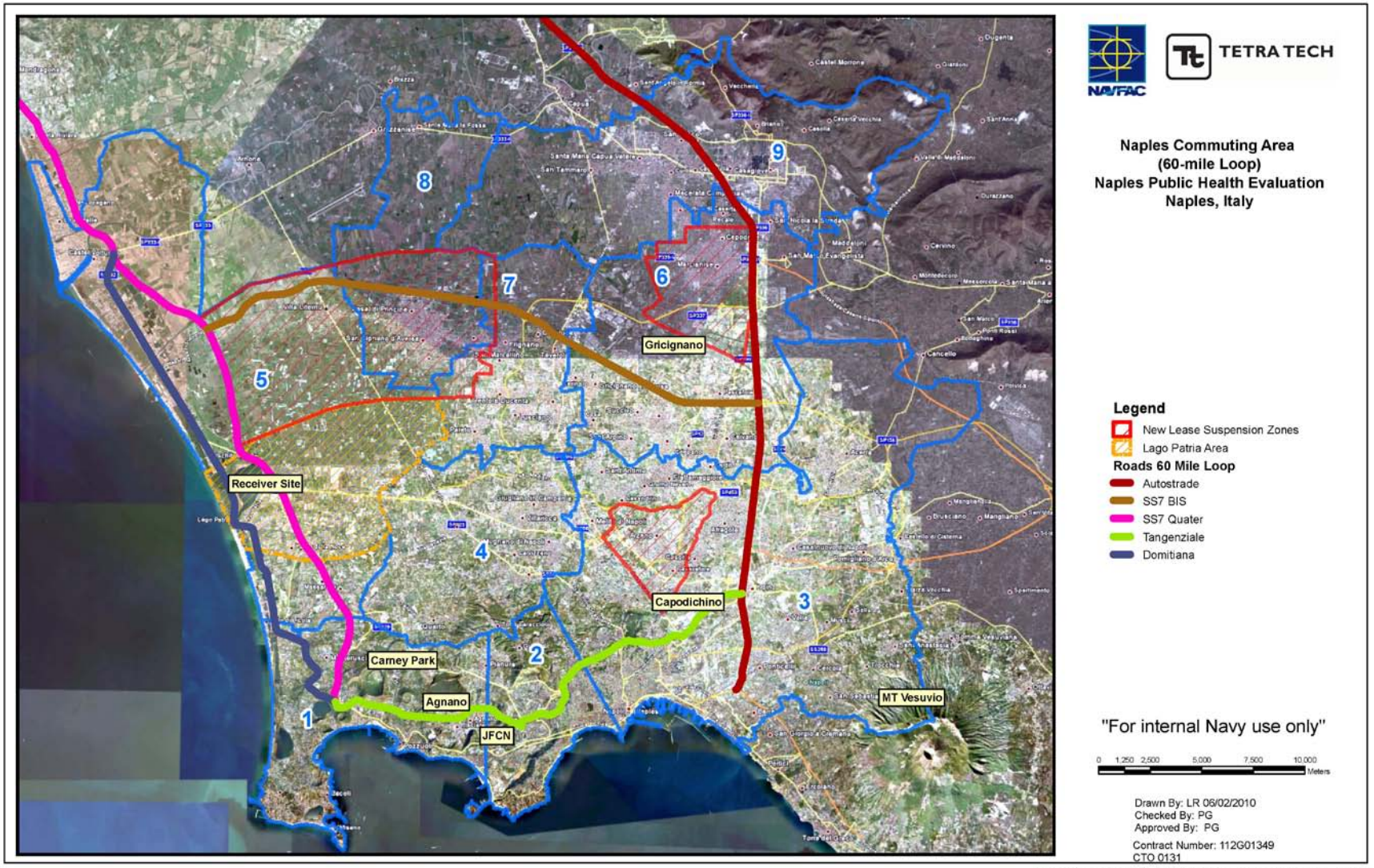
- 25 picnic areas
- 15 athletic fields
- 9-hole golf course
- Olympic-size swimming pool
- Rental cabins
- Fitness center
- Paint ball range
- Tennis courts
- Mini-Mart/Pizzeria

NAVSATCOMFAC Lago Patria

Satellite Communications Facility (NAVSATCOMFAC) Lago Patria is responsible for the operation and maintenance of Defense Information Systems Agency fixed satellite earth terminals. With the technical expertise of both military personnel and civilian contractors, NAVSATCOMFAC provides satellite connectivity for Defense Information Infrastructure (DII) global long haul communications and Standardized Tactical Entry Point (STEP) communication trunks and services to fleet and ground mobile forces operating in the east Atlantic, Mediterranean, South West Asia, and Indian Ocean areas of operation. Lago Patria is the future home of Allied Joint Forces Command Naples.

The map below displays the main USN sites and the distances between them.

The Naples area – Five Sites; 60-Mile Loop



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APPENDIX N: LIST OF REVIEWED HISTORICAL U.S. NAVY NAPLES PLANNING DOCUMENTS

Upgrading the Naples Complex: An Overview, February 1985, Commander in Chief U.S. Naval Forces Europe. Report highlights the need for support of essential U.S. Navy missions by the facilities in the Naples region. It is a summary document based upon an extensive Navy planning effort that examined the importance of the mission and numerous problems with the existing base complex. The major conclusion is that there is a need to develop a new base site in Naples through land acquisition and military construction as well as to expand and improve existing sites.

New Base Plan Ultimate Development Plan Naval Support Activity Naples Italy, 1 May 1986, EDAW inc., in association with Dames & Moore for NAVFAC Atlantic Division. Document provides the plan for the development of a new base for the total relocation of the Naval Support Activity Naples Italy. The plan was created on a "fast track" schedule with key facility designs proceeding on parallel paths. The plan provides for the development of the site outside the city of Capua due north of Naples.

Agnano A Basis for Decisions Volume 1: Report and Unclassified Appendices, January 1987, Commander in Chief U.S. Naval Forces Europe. Submitted as requested by the House Committee on Appropriations Military Construction Subcommittee Report #99-648. Three major areas concerning seismic safety have been reviewed in detail by three separate consulting firms. A classified annex to the report addresses the major operational and security requirements related to both the existing facilities at Agnano and the new site at Capua. Lease and construction costs are discussed.

Report for House Committee on Appropriations Subcommittee on Military Construction Investigation Potential for Relocating the Naples Complex to Comiso, September 1987, Office of the Secretary of Defense. Summary – Relocation of the U.S. Naval Support Activity in Naples to Comiso Air Station is operationally and financially less efficient than other available sites. Comiso Air Station has the added disadvantage of not being available in the timeframe needed for Project PRONTO.

Report for House Committee on Appropriations Subcommittee on Military Construction Naples Relocation Investigating the Alternatives Volume II, March 1988, Commander in Chief U.S. Naval Forces Europe. In Fiscal Year 1988 Conference Report on Military Construction Appropriations, Congress requested the Navy "develop an operationally and effective but more economical plan" to the Naples relocation project, PRONTO. This report responds to the Congressional request. It outlines the methodology of the study effort and describes seven possible solutions to the facility shortfalls in Agnano.

Naples Support Facilities Land Requirements, March 1991. This document has been prepared to provide the background for the land required to provide support facilities in the Naples area. The land required is intended to be obtained through a solicitation for proposals to lease-construct the facilities listed in the report.

Report for the Committees on Armed Services and Appropriations Subcommittee on Military Construction Naples Support Facilities Modernization Plan, March 1992, Office of the Secretary of Defense. Response to the Congressional Appropriations Committee language requiring submission of a comprehensive report on plan for the U.S. military presence in the Naples Italy area with emphasis on the provisions to be provided to improve the living conditions of military personnel and their families.

Special Planning Study for Naples Support Site Planning Data, 2nd DRAFT Report, 10 August 1992, Interplan s.r.l. Architects & Engineers, Naples Italy Contract N62745-90-d-1209 for NAVFAC Atlantic Division. This study/report deals with the anticipated highway and air traffic around the Naples area.

House and Senate Appropriations Committees Member's Staff Attachments, January 1995:

- Naples Improvement Initiative and Support Site Point Paper, 10 January 1995
- Agnano Compound Photos, early 1980s
- Naples Lease Photos, January 1995
- Facility Conditions Western Towers and Parco Saraceno, October 1994
- Naples Housing Point Paper, January 1995

MAP: Site Development Plan and Facility Concepts, Site Development Composite Plan Zones A, B, C, D, U.S. Naval Support Site Gricignano Italy, 17 July 1996, revised 11 February 1997, Rogers, Lovelock & Fritz, Inc., for NAVFAC Atlantic Division. Map shows the four construction increments and the areas they are scheduled to cover.

Naples Hospital Summary of Information, May 1997. Provides a summary of source material concerning the history of the replacement of the Naples Hospital back to 1984. Contents are background use only. Includes earthquake studies (For Official Use Only).