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**Vieques, Puerto Rico In Focus  
Environmental and Health Impacts of Navy Training A Crisis and its Causes  
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# **Vieques, Puerto Rico In Focus**

## **Environmental and Health Impacts of Navy Training A Crisis and its Causes**

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### **Abstract**

The authors explore the health conditions in Vieques and what is known about the possible causes of health problems in Vieques, Puerto. The authors conclude by calling for the immediate cessation of military activities in the island, full environmental decontamination, thorough evaluation of the health situation and improvement of the health care services in Vieques. Environmental alarms have been sounding in Vieques for more than twenty years and people are at health risk of the environmental damage that already have been done on this island.

### **Introduction**

In Vieques, Puerto Rico, the Navy has used three quarters of the island since 1940 for bombardment, munitions storage and disposal, weapons testing, and other training. The island's 9,300 residents, sandwiched between Navy activities on the western and eastern sides, have long resisted the Navy bombing, but since 1999 the Navy's use of Vieques has become a matter of international controversy.

Media coverage of the controversy in Vieques frequently states that opponents of the US Navy's bombing "allege health and environmental damage from military practices" and that "the Navy denies those claims." Yet the critical health situation in Vieques is at the heart of why more than two-thirds of the island's residents voted for an immediate cessation of naval bombing and a full environmental cleanup.

This Issue Brief explores health conditions in Vieques and what is known about the possible causes of health problems there. It concludes by calling for the immediate cessation of military activities in the island, full environmental decontamination, thorough evaluation of the health situation and improvement of the health care services in Vieques.

### **Environmental Background**

Environmental alarms have been sounding in Vieques for more than twenty years. A Water Quality Survey conducted by the Navy in 1978 detected high levels of zinc and lead in surface water in eastern Vieques.

The same study showed the presence of RDX - a toxic component of military explosives - in civilian land, sediments and several drinking water supply sources.

From 1985 to 1999, the Navy reported to the Environmental Protection Agency (EPA) its measurements of discharges of heavy metals and other materials into the waters of eastern Vieques where the impact area is located. The measurements show that lead, barium, cadmium, arsenic, boron, cyanide, hexavalent chromium, and 13 other substances were repeatedly discharged at levels that violated the Clean Water Act and Puerto Rico Water Quality Standards.

The Navy fired depleted uranium (DU) ordnance on Vieques in violation of U.S. law. According to Navy documents, in February 1999 two Marine Corps jets fired 263 rounds, each containing 148 grams of uranium, onto the Vieques range. Only 57 of the rounds were recovered in March 1999. A study conducted in late 1999 found significantly higher radiation levels than background measurements outside

of the site. These observations suggest that DU may have been used on several occasions in Vieques. Measurements taken in the civilian sector during Navy exercises in September- October 2001, when dust is raised by bombing impacts, showed dramatic increases of radioactive gamma rays 225%-248% - from previous readings in the same sites.

Furthermore, intensive soil analysis carried out by several independent groups of researchers between April 1999 and May 2000, revealed high levels of arsenic, barium, cadmium, chromium, cobalt, copper, lead, nickel, tin, vanadium, zinc and cyanide. Munitions and targets used by U.S. Navy and NATO forces in Vieques contain many of the same metals.

Prevailing tradewinds on Vieques blow from east to west around 80% of the time, and the sea breezes are strong, occasionally up to hurricane strength. During the early 1980s the former departmental chief of the Puerto Rico Environmental Quality Board, Rafael Cruz Pérez, demonstrated in mathematical studies and field trials that particulate matter raised by munitions impacts in the bombing range reaches Vieques' populated areas.

Since May 2000, the Navy has used "inert" or practice munitions, which also contain an array of toxic materials in their propellants, bodies, and smoke-producing substances. In addition, the Navy continues to dispose of live ordnance in the Vieques Eastern Maneuver Area through open burning and open detonation (OB/OD). In January 2000, EPA noted that OB/OD contaminates the surrounding environment with 13 types of toxic substances, including benzene and toluene. The federal Agency for Toxic Substances and Disease Registry (ATSDR) recently identified these two contaminants in the groundwater under civilian sectors of Vieques. Yet the Navy withdrew its permit application for ongoing OB/OD, so these activities NOW occur with no reporting to or oversight by EPA.

*Heavy metals in flora & fauna.* A study conducted in February and March 2000 by biologist Arturo Massol and radiochemist Elba Díaz, researchers at the University of Puerto Rico, found high levels of cadmium, cobalt, nickel and manganese in violin crabs. Vegetation samples at the Vieques bombing range showed similar enrichments with toxic metals, including lead. The metal concentrations were above excessive levels and significantly higher than control populations collected from similar geoclimatic regions in Puerto Rico. For example, the levels of cadmium in violin crabs near the impact area (8.06 µg/g) exceeded levels for critical concern (6 µg/g) established by the FDA. At another site the level of cadmium exceeded over a thousand times the maximum tolerable dose for ingestion established by the World Health Organization. Massol points out that these toxic heavy metals are "biomagnified" in plant tissue and accumulate in the terrestrial and marine food chain. These metals are known carcinogens.

*Heavy metals in edible crops.* Another study released in January 2001 by Massol and Díaz showed that vegetables and plants growing in the civilian area of Vieques are highly contaminated with lead, cadmium, copper and other metals. Edible crops showed metals substantially above the maximum levels set by the European Union Council, and far exceeded plants tested from several locations in Puerto Rico.

The most affected species were those with shallow root systems, such as chili peppers, pigeon peas, pasture grass and squash, while trees are less contaminated. This is consistent with the thesis that heavy metals are deposited in the civilian area through air dispersion by wind from the bombing zone. In a recent soil contamination analysis done by ATSDR, the agency completely excluded the results of the two Massol studies and of soil studies showing excessive heavy metals, using only studies that support the Navy's assertion that decades of bombing are having absolutely no effect on the environment.

The Food and Drug Administration has conducted studies of lead and cadmium in plants. Of 286 analyses of squash in the United States conducted by the FDA, it found an average lead concentration of 0.007 µg/g, or 6,000 times lower than concentrations found in squash leaves from Vieques.

*Heavy metals in the bodies of Vieques residents.* Of 49 Vieques residents who participated in a study in June 2000, 22 of them - or 45% - had excessive levels of mercury in their hair or fingernails (one microgram per gram). Six of the subjects had high levels of lead as well. Naval training is the only known source of mercury contamination in Vieques, according to Dr. Carmen Ortiz Roque, the epidemiologist and

pediatrician who carried out the study. Lead ingestion or inhalation causes problems to the central nervous system, blood, lungs, liver and reproductive system.

The Navy maintains that the heavy metal contamination in Vieques is a result of natural background concentrations of the metals in seawater. But the measurements on which the Navy bases its estimates of background concentrations were taken from a single well in eastern Vieques, close to an area known as the "reef of bombs," used by the military for many years to blow up waste munitions for disposal.

#### *Problems with Current Environmental Practice on Vieques*

The precise ways that heavy metals and other contaminants reach the people, animals and plant tissue in the civilian area are not completely understood. The EPA has identified possible pathways of contaminants from the Live Impact Area to civilian sectors of Vieques, including the food chain, water, and air dispersion (the explosion of a 105mm projectile brings particulate matter into the air, and prevailing winds move from the impact area toward the population). It is fairly easy to understand the source of the contamination. Vieques has no industry that could provide an alternative source of pollutants. The Navy is the only known source of the contaminants coursing through the island's lifestream. In addition, Navy bombs and shells land outside the target area, causing direct damage to eco-systems, leaving dangerous unexploded ordnance, and violating environmental law.

*Coral Reefs damaged by Navy bombs.* Dr. James Porter, a respected expert in coral reefs from the University of Georgia, led a team that conducted underwater inspections of the coral reefs around Vieques in July 1999. "Each bomb dropped on, and each shell fired at Vieques creates an imminent and substantial risk of irreparable harm to the coral reefs," Porter concluded in his study. The Navy told Puerto Rican government officials that holes in the reefs were the result of hurricane damage. The existence of shrapnel in the holes indicates otherwise.

According to Porter, "The most serious risk is that a large bomb or shell will miss the target and land on a reef. The evidence shows that this is a frequent occurrence." Noting that coral reefs are declining worldwide, he called the situation in Vieques "urgent," and the need to protect the reefs on Vieques a top priority.

*Abandoned underwater barrels.* Between 1990 and 1992, two vessels loaded with hundreds of barrels of unidentified toxic waste were sunk by the Navy below the surface on the coral reefs off the southern coast of Vieques. The two sites have a total of about 1100 barrels, containing both solid and liquid material. Both sites are blanketed by live artillery shells and bombs, which fall up to 400 yards offshore.

*Noise impacts.* Depending on weather and the intensity of training, the sound of explosions can be focused and magnified within civilian areas. In August 2001, Vieques residents reported negative effects from explosions, ranging from cracked roofs and walls to severe emotional disturbance among school children. Noise from ship firing and from active sonar has been shown to affect marine mammals, including whales beached near Vieques. Similar complaints have been registered for years.

*Other ecological impacts.* Naval bombardment has also severely damaged the island's freshwater sources. The eastern end of Vieques used to be a wetlands complex, and it was very easy for species - including people - to go from one side to the other. However, the constant bombing of lagoons in the area, as well as the construction of a road that cut them off from the sea, have destroyed the lagoons.

In the civilian area, EPA has noted the emergency use of local well water as recently as 1988 during Hurricane Georges, and the ATSDR water assessment resulted from a petition to find out whether emergency water supplies are safe. Yet ATSDR analyzed water piped to Vieques from the big island, not emergency wells or rooftop tanks. Instead, ATSDR relied on data from wells in areas where one would not expect to find contamination and did not carry out a study designed to be indicative of the quality of the aquifer.

*Violations of environmental laws.* The EPA declared in August 1999 that the Navy had committed 102 violations of the Clean Water Act for releasing pollutants into waters of the Vieques training area. In addition, by refusing to conduct a biological assessment of the effects of navy training on endangered

species before the issuance of a biological opinion in July 2000, the Navy is in violation of the Endangered Species Act. The Navy also operated an open burning and open detonation disposal site for explosives in Vieques for 15 years (1985-2000) with no permit, in open violation of the Resource Conservation and Recovery Act.

*Abdicating environmental responsibility in western Vieques.* Under the 2001 military spending bill, the Navy was required to transfer 8,000 acres of land in western Vieques to the Fish & Wildlife Service (4,000 acres), the municipality of Vieques (3,200 acres) and the Puerto Rico Conservation Trust (800 acres). The legislation considerably reduced incentives for the Navy to conduct an adequate cleanup of contaminated areas, by waiving CERCLA (Superfund) law requirements prior to transfer. Of 17 areas identified by the Navy as potentially contaminated, 14 are located on land transferred to the town of Vieques.

In addition, the transfer occurred when the Navy had scheduled training on Vieques for the first time in over four months and as nearly two hundred nonviolent protesters, including the town's mayor, were arrested. In this context, the Navy presented a deed to Vieques officials that dumped onto the municipality responsibility for remediation of contamination discovered after transfer - a provision that would be unthinkable in other such transfers. The exclusionary process and diminished Navy responsibility for cleanup call into question the legitimacy of the deed's cleanup provisions and set a bad precedent for what might occur on the eastern end of Vieques.

*No meaningful standard for cleanup of the impact area.* The Navy has announced that it will cease operations in Vieques by May 2003. Under current law, cleanup of contamination in the bombing range is governed by a directive issued by President Clinton in January 2000. That directive said that cleanup would be to the "Weymouth" standard of Noman's Island Massachusetts, an island belonging to the Wampanoag Tribe and formerly a bombing range used by the Navy until 1996. That island, however, has only been swept on the surface; no real cleanup has ever taken place. This lack of a cleanup standard has already presented itself on the western end, where the Navy has simply erected fences around contaminated areas and proclaimed them "conservation zones." Such similar inaction on eastern Vieques would be ecologically disastrous.

*Lack of public participation.* Because community members are most affected by cleanup of contaminants on military bases, they need to participate in decision-making. However, in Vieques the Navy established a restrictive Technical Review Committee, which holds meetings closed to the public. According to one of the committee's community members, the Navy representative to the TRC has indicated that the Navy will proceed with its plans regardless of community members' input. In August 2002, the EPA held a "public information meeting" in Vieques to discuss a work plan for cleanup of twelve RCRA sites in eastern Vieques. However, at the time of the public meeting, the EPA had not made the work plan publicly available, making meaningful discussion impossible. Moreover, neither the EPA nor the Navy have made documents available in Spanish, further limiting public participation.

### **Vieques's Health Crisis**

**Children at risk?** When she was just two years old, Milivy Adams' parents, José and Zulayka, noticed a bulge on the child's head. It was diagnosed as a tumor and removed, but there were other tumors in her kidney, her left hand and leg, and shoulders. José had been a baker in Vieques, but brought the family to New Jersey, where Milivy received chemotherapy and radiation treatment at nearby Philadelphia Children's Hospital; at present her condition is deteriorating.

For many Puerto Ricans, Milivy Adams' struggle to live has become symbolic of the many people in Vieques who have contracted cancer and other serious diseases during the years that the Navy has used the eastern end of the island as a bombing and training area. This was demonstrated in a Puerto Rico Department of Health publication (November, 1997), which showed that Vieques had a 27% higher cancer rate than the rest of Puerto Rico from 1985 to 1989. Subsequent studies and observation have confirmed the excessive risk of developing and dying from cancer among *viequenses*. From 1995 to 1998, *viequenses* under 50 years old had 56% greater risk of dying from cancer than Puerto Ricans of the same age living in the main island. The increased risk of *viequenses* of developing and dying from cancer since 1970 is

significant.

While every cancer death affects the family, in a small community the impact is multiplied. Therefore, when in a single week in February 2002, six *viequenses* died of cancer, not only the immediate family was affected, but a distressing signal also reached the entire community: Who will be next?

The poor health situation in Vieques is not limited to cancer. In 1998, the crude death rate from heart disease in Vieques was 251.6 per 100,000, compared to 157.5 in Puerto Rico. Vieques has no long-term or heavily contaminating industries, except for the military. Other towns in Puerto Rico with evident environmental contamination or with limited access to health care experienced lower mortality rates from heart disease during that year.

Between 15 - 32% of Vieques public school students reported respiratory ailments in the annual health report of the Puerto Rican Department of Education from 1995 to 1999. During 1998 the Puerto Rico Health Department conducted two health surveys using a sample of 215 households in Vieques. One of the surveys, sponsored by the federal Centers for Disease Control, is known as the Behavior Risk Factor Surveillance Survey (BRFSS). The BRFSS is a survey designed to gather information from a representative sample of the population on their habits as they affect health, such as cigarette smoking (considered the most important risk factor for developing cancer) and measures for early detection of disease (a positive factor for a better quality of life).

The official report from the Department of Health reported that while there were no significant ( $p>0.05$ ) differences between those living in Vieques and the main island regarding physical activity, cigarette smoking, vitamins and supplement consumption, and many demographic characteristics, the reporting of premature sexual development (telarchia) in girls under eight years old was significantly ( $p=0.005$ ) higher in Vieques (7.2%) than the rest of Puerto Rico, which already has extremely high rates (3.0%). Puerto Rico's high rates most likely stem from the presence of high levels of phthalates from manufacturing. Phthalates are chemical compounds which mimic hormones. The most probable sources of phthalates and other ecoestrogens in Vieques are military explosives components.

Infant mortality in Vieques is decreasing more slowly than in Puerto Rico: in Puerto Rico a 71% decrease was observed when infant mortality rates from 1960-1964 were compared to 1990-1994, while it only decreased 27% in Vieques during the same 30 years. In fact, between 1990 and 1997 the risk of a baby dying before his or her first birthday was about 25% higher for babies born from women living in Vieques than one born in Puerto Rico.

**Cancer risk.** Many years before David Sanes was killed by two off-target bombs in Vieques in 1999, the people of Vieques were already dying of catastrophic illnesses such as cancer at a higher rate than expected for a population of less than 10,000. In fact, when cancer rates in Vieques during 1970-1974 are compared to their cancer rates from 1985-1989, the risk of *viequenses* contracting cancer was 66% higher than in the previous period. This means that the cancer risk in Vieques has been increasing steadily in statistically significant proportions since the early 1970s, when bombing and military practices in Vieques also intensified.

In September 2002, the Puerto Rico Health Department released data through the year 2000 demonstrating that the incidence of cancer continues "a tendency to increase," with 30 to 40 new cases of cancer annually. Health Secretary Johnny Rullán announced that Puerto Rico was beginning an epidemiological study, but at the same time suggested that Vieques' elevated cancer rates may be due to "genetic causes," a racist premise with no basis in fact.

It is important to note that among *viequense* children up to nine years old, the risk of developing cancer was double the risk for children of the same age in the rest of Puerto Rico from 1985 to 1989. Even more significant is the fact that during the same time period children in Vieques from 10 to 19 years old had 3.5 times the risk of developing cancer, compared with children of the same age in Puerto Rico. In 1999 --- the year David Sanes died the risk of dying of cancer in Vieques was 61% higher than in Puerto Rico. These statistics represent the reality of the health situation in Vieques, according to official data from the Puerto

Rico Department of Health.

In Vieques, cancer deaths are under-reported because many cancer patients move to other municipalities to receive treatment, and are thus more likely to die away from their residence.

How can we explain the elevated risks of developing and dying from cancer in Vieques? Health surveys show that socioeconomic differences, lifestyle, or even age distribution among *viequenses* compared to Puerto Ricans in the main island do not account for the high risk of developing cancer in Vieques. Epidemiological studies are required to further evaluate the influence of such factors in cancer etiology. But based on the official data available from scientific studies, the evidence points elsewhere.

A very few small industries have been established in Vieques for short periods, none of which have been large enough or operated long enough to account for the serious and widespread health crisis in Vieques. By contrast, for more than 60 years the US Navy has actively bombed and openly burned conventional weapons in Vieques, fired unconventional weapons, and experimented with unknown materials and substances.

It is reasonable to focus on the activities and wastes of industries with a high potential for contaminating the environment where they are located. This is why regulatory and environmental agencies are charged with actively monitoring such activities and wastes. Any industry not complying with these laws and regulations is subject to fines, as well as requirements to clean up the contamination and compensate for damages.

**Navy activities, cancer and other diseases in Vieques.** Toxic wastes produced by military activities have been verified by information provided by the Navy and manufacturers of weapons components such as explosives, propellants, and munitions casings. The available information usually does not include the weapons used in an experimental stage, or those used by other nations' militaries that rent the impact area in Vieques. The limits on available information further indicates the need to investigate the links between health problems and environmental contamination in Vieques, using sound scientific methods.

The Navy has argued that there are no links between military practices and health problems in Vieques. Yet the precautionary principle argues that identifiable sources of health hazards must be controlled, even in the absence of "absolute proof." If we value the health of the people living on Vieques, then "absolute proof" is not necessary. Among the factors that might explain the high cancer rate and other health problems in Vieques, environmental contamination appears to be most important. There already is enough evidence to conclude that naval bombing has imposed and continues to impose enormous risks on the health of islanders.

**What we know.** The information currently available allows us to discuss the biological plausibility that contamination from naval activities can cause many health problems in Vieques. For example, some explosives such as TNT and RDX are classified by the Environmental Protection Agency (EPA) and by the International Agency for Research on Cancer (IARC) as possible carcinogens. RDX contamination only results from military activities, and traces of this toxic element have been detected in Vieques. Even bombs that do not contain large amounts of explosives use propellants such as DNT, which is also a probable carcinogen. Studies of animal exposure to DNT have shown that a reduction in the numbers of red blood cells, nervous system disorders, and liver and kidney damage can occur.

The structural parts of munitions also have components such as arsenic, cadmium and lead, which the EPA has classified as carcinogenic, based on studies showing that humans and animals exposed to these substances have an increased risk of developing cancer. Other carcinogens related to military activity are: pyrotechnic products (hexachloroethane and lead, both probable carcinogens), and combustion products (Nitrosodiphenylamine, classified as a probable carcinogen by EPA). Military training also destroys vegetation using chemical compounds such as dioxins, which have toxic effects on humans. Exposure to dioxin increases the risk of autoimmune diseases such as diabetes, as reported by a recent Air Force Health Study (2001).

Are people in Vieques exposed to these compounds? In the 1978 the Navy conducted a study of water wells in Vieques aimed at measuring the presence of materials from explosives in the island's water sources. The study found RDX (0.00004 parts per million) in all samples except one, and also found the explosive Tetryl in a water tank in Isabel Segunda, the island's main town. The amount of contaminants measured is not as important as what they establish: that there exists an exposure pathway between the toxic materials used in munitions in the impact area and people's water in the civilian area of the island. It should be noted that naval bombing intensified in the years following the 1978 well study.

When civil disobedience camps were established in the bombing zone of eastern Vieques (between May 1999 and May 2000), several researchers (Jorge Fernández Porto, Neftalí García Martínez and others) took soil samples that provided scientific evidence of the presence of toxic substances in the Vieques firing range. A research group from the University of Puerto Rico School of Public Health (Nazario et al) found cadmium, arsenic and lead in the surface dust accumulated inside homes in Vieques. Hair samples of *viequenses* taken in 1999 and 2000 showed high levels of cadmium, lead and mercury.

**What do health professionals say?** In 2001, the American Public Health Association adopted a resolution calling on the President to order a permanent cessation of military exercises on Vieques and to establish a cleanup program to restore the island's environment. The resolution pointed out that cancer rates for Vieques "exceed the alert levels adopted by the surveillance system as defined by the Agency for Toxic Substances and Disease Registry." The American Nurses Association has also approved a resolution supporting an end to naval bombing in Vieques. Moreover, in June 2000, 21 Puerto Rican physicians were arrested for entering the firing range in Vieques. They announced that by engaging in peaceful civil disobedience they observed their Hippocratic Oath, in an act of concern for the health of soldiers as well as of islanders.

A Different Policy Toward Ecology and Health in Vieques

## **Recommendations**

*End the source of contamination and environmental degradation:* cease bombing, including with practice bombs, and open burning/open detonation. In other locations, military policy has sought to reduce the source of waste and pollution before tackling remediation of waste. That principle should also apply in Vieques, where no other source exists for the contamination that is effectively poisoning the people.

*Program for cleanup of military and civilian sectors.* Regardless of how extensive the negative health impacts of contamination from the Navy's activities are, people should not be exposed to these toxins at levels that have been established as dangerous. The federal executive should initiate and Congress should fully fund removal of the existing contaminants to which people in Vieques are exposed, with a complete cleanup program of the island's lands and waters. The framework established for the cleanup of the former naval bombing range in Kaho'olawe, Hawai'i could serve as a starting point for such an agreement. There, the federal government appropriated funds for cleanup and mandated a transfer of the island to a native Hawai'ian body, while the state of Hawai'i appointed a council to oversee the cleanup process. Priorities should be established for the cleanup, focusing first on immediate health risks.

*Conduct adequate studies* of water, soil and health in Vieques by independent scientific entities. This includes bringing the Vieques cancer registry up to date. Only with current and reliable data can human health and the environment be protected and adequately cleaned up.

The lands and waters used by the Navy should be turned over to an island *community land trust* whose establishment is already well under way - under the authority of the people of Vieques, ensuring its conservation and sustainable use. The island has rich ecology, and private and public institutions have a stake in supporting such a land trust controlled by the island's residents.

*Citizen participation in cleanup decision-making.* Environmental restoration should be guided by a citizen council with the authority to guide the cleanup and a public transparent process, with the municipality and people of Vieques in the driver's seat.

A complete and up-to-date epidemiological study of the causes of cancer and other health problems in Vieques should be initiated as soon as possible. Whether the study is underwritten by an international organization such as the Pan-American Health Organization, the U.S. government, the Puerto Rican government, or another party, it is crucial for *viequenses* to be integrally involved in the study's design and execution.

It is critical that health care services in Vieques be improved and made comprehensive. For example, while the recently opened new birth center is a good step, pre-natal services are even more important and urgently needed.

Resources

Print

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Erick Suárez, "Incidencia y Mortalidad de Cáncer en Vieques," presentation to the First Puerto Rican Conference on Public Health, San Juan, April 10, 2002.

Web-Sites

Vieques Libre - Information in English and Spanish from the movement for peace in Vieques, with links to many sites and documents

<http://www.viequeslibre.org>

*Puerto Rico Update* - Newsletter of the Fellowship of Reconciliation

[http://www.forusa.org/Programs/Puerto Rico](http://www.forusa.org/Programs/PuertoRico)

Slide show on heavy metal contamination and health effects on Vieques residents

<http://www.eaveslaw.com>

Center for Public Environmental Oversight - databank and listserve on military base cleanup

<http://www.cpeo.org>

Navy documents and information on the western end of Vieques  
<http://www.vieques-navy-env.org/>

Military Toxics Project - resources, actions, listserves  
<http://www.miltoxproj.org/>

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