



# Vieques

Environmental Restoration  
Fact Sheet

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## Open Detonation Fact Sheet

### Summary

On Vieques, open detonation is used in remote areas to destroy unexploded munitions that are designed to be destructive rather than toxic or poisonous. During open detonation, the explosive chemicals are consumed, releasing a powerful shockwave, metal fragments, and non-toxic gases that are naturally present in the atmosphere. Extensive air monitoring has shown that the open detonations do not affect the health of Vieques residents. Open detonation is the safest method for site workers because it can be performed with little or no handling of dangerous unexploded munitions. Open detonation is also safest for the public because it supports all cleanup requirements and minimizes explosive hazards. Without open detonation, the munitions on Vieques would need to be left in place, and the cleanup could not be completed as required.

### What kind of munitions are found on Vieques?

The Vieques cleanup involves high explosive munitions, including bombs, projectiles, mortars, rockets, grenades, and submunitions, which are designed to be destructive, rather than toxic or poisonous. Cleanup workers also encounter white phosphorous, flares, and spotting charges, which are designed to produce heat, light, or puffs of smoke. The munitions on Vieques are classified as unexploded ordnance (UXO) because they have been fuzed and fired, but somehow failed to explode as expected. UXO items are especially dangerous because they are set to explode and may do so without warning. The Vieques cleanup does not involve toxic chemical weapons.

### What are high explosive munitions made of?

The outer casing and internal parts are made of metal – mainly iron, aluminum, and copper. Internal parts may also include small amounts of asphalt, wax, alcohols, solvents, petroleum, and other substances. The explosive chemicals are mostly made of carbon, oxygen, hydrogen, and nitrogen, but they may also include aluminum or other metals to increase explosive power or produce light. TNT, RDX, and HMX are common high explosive chemicals.

### What happens during an open detonation?

The explosive chemicals react and break apart, producing extreme heat, a high pressure blast, large amounts of gas, and a sharp bang. Dirt and metal fragments are blown into the air, and trace amounts of organic chemicals and metal compounds are released at very low concentrations (EPA, 1998 and SEESAC, 2004). The explosive chemicals are changed into non-toxic gases – mostly nitrogen, carbon dioxide, hydrogen, and water vapor, plus small amounts of carbon monoxide, nitrogen oxides, and other gases. These gases are common components of the earth's atmosphere. For example, the atmosphere is 78% nitrogen and 0.04% carbon dioxide.

### Why is open detonation used on Vieques?

Open detonation is conducted in a manner that is protective of public health, and it is the safest method for site workers to destroy unexploded munitions. Without open detonation, the cleanup could not be completed as required.





## How do open detonations affect public health?

The environmental and health effects of open detonations have been studied by the US Environmental Protection Agency, the US Department of Defense, and governmental agencies overseas. The results show that open detonations can be conducted in a manner that is protective of public health and the environment (EPA, 1998 and SEESAC, 2004). This general conclusion has been confirmed many times on Vieques, as the Navy has conducted extensive air monitoring during open detonations. From 2005 to 2013, over 1,600 air samples were collected during 177 open detonation events, and the samples were analyzed for explosive chemicals, metals, and particulate matter (dust and soot). No explosive chemicals were detected during any of the air monitoring events; concentrations of all metals were at least 99% below health based standards; and concentrations of particulate matter were within regulatory standards.

## How do open detonations affect the safety of site workers?

In order to protect the safety of site workers, it is standard practice in the munitions cleanup industry to avoid the movement and handling of unexploded munitions as much as possible. Historical records show that explosive accidents usually occur after someone has picked up or moved an unexploded munition (EPA, 2001). With open detonation, the most sensitive munitions are destroyed in place and never touched, while more stable items can be moved a few feet for consolidated detonation if the UXO Safety Officer determines that the risk of such minimal movement will create a safer, more effective process overall. During the past 14 years, site workers on Vieques have encountered and destroyed over 100,000 unexploded munitions, and tens of thousands remain. Given this large number of chances for an accident, it is essential for workers to use the safest possible approach. Open detonation is the safest method because it can be performed with little or no handling of munitions.

## How do open detonations affect public safety?

Open detonation increases public safety because it can be used to destroy all types of munitions found on Vieques. Without open detonation, the UXO on Vieques would need to be left in place, and the cleanup could not be completed as required. In contrast, open detonation supports all cleanup requirements and minimizes the risk that residents and tourists may encounter munitions.

## Why not use detonation chambers?

The Vieques cleanup involves tens of thousands of UXO scattered across miles of rugged, hilly terrain. In order to use a detonation chamber on Vieques, site workers would need to carry UXO for hundreds of yards across difficult terrain, load the UXO onto trucks, transport UXO over miles of unimproved roads, move UXO into and out of storage, and set up each UXO item for treatment. Such long-distance transport and repeated handling of tens of thousands of UXO would expose site workers to the very real danger of being injured or killed in an accidental explosion. Overall, detonation chambers would create significant danger for site workers, fail to support cleanup requirements, and provide no public health benefits. For these reasons, detonations chambers are not used on Vieques.

### References

1. *Emission Factors for the Disposal of Energetic Materials by Open Burning and Open Detonation (OB/OD)*, US Environmental Protection Agency, EPA/600/R-98/103, 1998.
2. *SALW Ammunition Destruction – Environmental Releases from Open Burning (OB) and Open Detonation (OD) Events*, South Eastern Europe Clearinghouse for the Control of Small Arms and Light Weapons (SEESAC), 2004.
3. *UXO Incident Report*. DPRA Inc. for the US Environmental Protection Agency (EPA), 2001.

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