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Shoal, Nevada | Site

A VELA UNIFORM SITE/OFFSITE

This fact sheet provides information about the **Shoal, Nevada, Site**. Long-term stewardship responsibilities for this site are managed by the **U.S. Department of Energy Office of Legacy Management**.

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Site Information and History

The Shoal, Nevada, Site is on 2,560 acres of withdrawn federal lands within the north-central part of the Sand Springs Range in Churchill County, Nevada. The town of Fallon is the largest populated area in the region and is about 30 miles northwest of the site. The region around the Shoal site is sparsely populated, with military installations, recreation, ranching, and mining as the main commercial interests.

The Project Shoal underground nuclear test was part of the Vela Uniform program, sponsored jointly by the U.S. Department of Defense and U.S. Atomic Energy Commission (AEC), a predecessor agency of the U.S. Department of Energy (DOE). The purpose of Project Shoal was to detonate a nuclear device underground in an active seismic area to meet the objectives of the Vela Uniform research program.

Performed on Oct. 26, 1963, the Project Shoal test consisted of detonating a nuclear device in granite at a depth of 1,211 feet. The device was installed through a shaft approximately 1,000 feet west of surface ground zero (see subsurface layout). In preparation for the test, workers mined the shaft to a depth of 1,315 feet below ground surface. From there, they mined a drift (a nearly horizontal

tunnel) about 300 feet west and 1,050 feet east, ending in a 30-foot vertical "buttonhook," where they placed the nuclear device (see subsurface layout). Reentry drilling directly over the blast cavity showed that the Shoal device detonated as predicted. No radiation escaped to the surface during the underground nuclear test, and no further underground nuclear testing was conducted at the site.

Groundwater is present beneath the site at depths ranging from about 950 to 1400 feet (see cross section). Groundwater moves primarily through fractures in the granite and it is recharged by infiltration of precipitation in the Sand Springs Range.

Surface Conditions

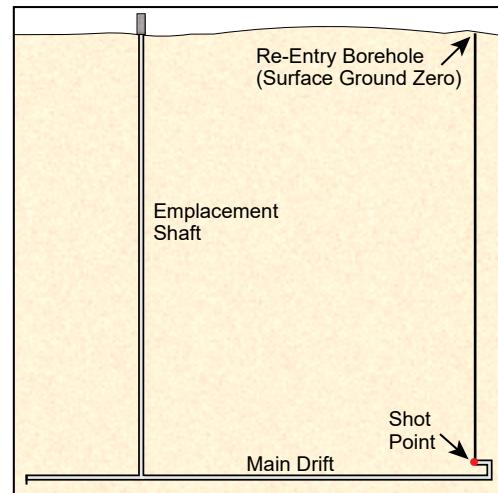
Surface contamination resulted from pre-test activities and post-test reentry drilling. The area of contamination at the surface was identified as Corrective Action Unit (CAU) 416 and was made up of three corrective-action sites: a mud pit, a muckpile, and a housekeeping area. The mud pit was filled with drilling mud contaminated with total petroleum hydrocarbons exceeding the state action level. Remediation of this location included excavating and transporting the hydrocarbon-contaminated material to the Nevada National Security Site (then known as the Nevada Test Site). The muckpile consisted of broken granite from mining the

emplacement shaft and drifts in 1963. In 1996, personnel used part of the muckpile to backfill the emplacement shaft. Chemical analysis of the remaining muckpile found no detectable levels of contaminants of concern above regulatory limits, therefore the muckpile was not removed from the site. The housekeeping area consisted of approximately 20 empty, rusted 1-quart oil cans. Remediation activities included removal, disposal, and preparation of Housekeeping Closure Verification documentation. DOE completed surface restoration in 1998 and remediation activities were summarized in the *Closure Report for CAU No. 416, Project Shoal Area*. The Nevada Division of Environmental Protection (NDEP) approved the closure report on Feb. 13, 1998, stating that no post-closure monitoring or land-use restrictions are needed at CAU 416.

Subsurface Conditions

Subsurface contamination from the underground nuclear test is identified as CAU 447. This CAU consists of the test cavity and the emplacement shaft. The original subsurface corrective-action strategy used a numerical model to help evaluate data and select a corrective action. Personnel used model results to set a contaminant boundary, or restricted region, around the nuclear detonation. The contaminant boundary represents the estimated maximum extent that groundwater contaminated with test-related radionuclides above Safe Drinking Water Act standards could travel in 1,000 years.

The original corrective-action strategy for CAU 447 required the installation of three wells to monitor groundwater and validate the model. Personnel compared monitoring data and modeling results as part of the validation process. Based on the evaluation, it was concluded that the model did not accurately predict water levels or a prevailing lateral flow direction. Because of this, the model could not be validated.

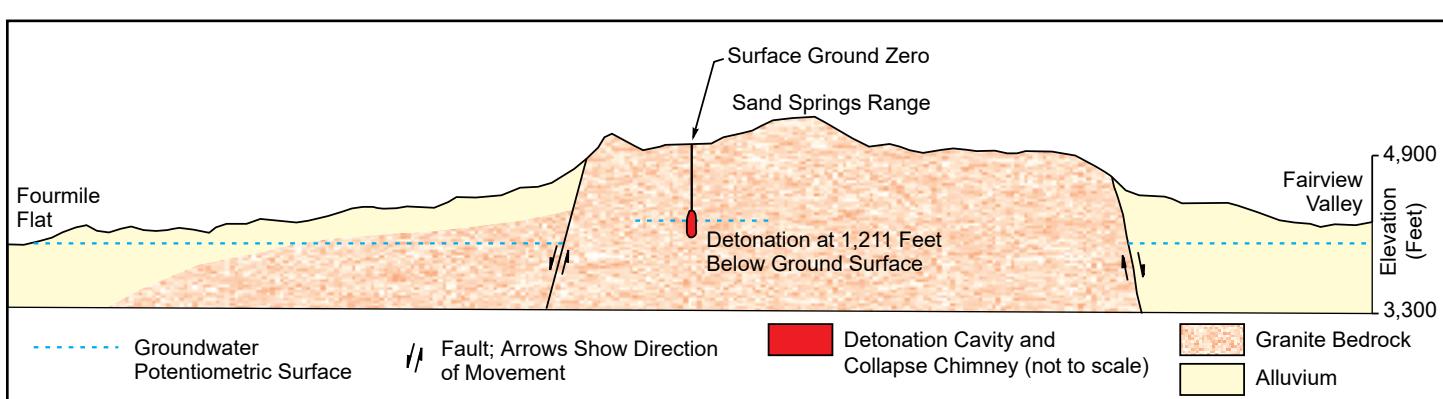


Subsurface layout of the Shoal site underground nuclear test.

This led to a revised corrective-action strategy that would validate the compliance boundary through monitoring and institutional controls, rather than relying on the model. The revised approach included improving the monitoring-well network, updating the site conceptual model, and monitoring for five years to confirm that data was sufficient to move on to closing the site. The revised corrective-action strategy also revised the contaminant boundary and expanded the compliance boundary so it aligns with the subsurface use-restriction boundary. These changes were included in the closure report for CAU 447, approved by NDEP in 2020. The closure report outlines the long-term post-closure monitoring requirements for the site.

Long-Term Hydrologic Monitoring Program

The U.S. Environmental Protection Agency (EPA) monitored groundwater quality at and near the site annually from 1972 until 2008 as part of its Long-Term Hydrologic Monitoring



Schematic geologic cross section of the Shoal site area.

Program. EPA personnel collected samples from 11 on-site monitoring wells and six off-site sample locations (three wells, two windmills, and one spring). No radionuclides from the nuclear test were ever found in any of the samples from the off-site locations, so DOE developed a more refined monitoring network for the site that focuses on monitoring the on-site wells. DOE personnel monitored the on-site wells annually from 2009 through 2019 and still monitor them in accordance with the closure report for CAU 447.

Land Use

AEC withdrew the Shoal site from the U.S. Bureau of Land Management in September 1962 for all forms of appropriation, including mining and mineral exploration, and reserved it to AEC for the Project Shoal experiment. In Title XXX of the National Defense Authorization Act of 2000, the surface of the Shoal site, along with the surrounding area, was reserved to the U.S. Navy for tactical maneuvering and air support testing and training. Under this same act, DOE kept responsibility and liability for subsurface interests.

The region around the Shoal site is sparsely populated. There are military installations nearby, and recreation, ranching, and mining are the main activities in the region. No residences or habitable structures are on the site.

Institutional Controls

No institutional controls are required for the surface of the Shoal site. A monument near surface ground zero gives notice of restrictions for the subsurface. The restrictions prohibit excavation, drilling, and removing material in an area

between elevations of 5,050 feet and 3,530 feet above mean sea level (or about 200 to 1,720 feet below ground surface) and extending horizontally 3,300 feet in any direction from surface ground zero.

Regulatory Setting

Environmental restoration at Shoal is regulated under the Federal Facility Agreement and Consent Order (FFACO 1996, as amended). The FFACO is a three-party agreement between DOE, the state of Nevada, and the U.S. Department of Defense. Shoal is identified as an Offsite in the FFACO, which is a category of sites that have a specific corrective-action process within the FFACO. The original Offsites consisted of sites in five states (Nevada, Alaska, Colorado, Mississippi, and New Mexico); however, only the sites in Nevada are managed by the FFACO. NDEP has regulatory authority over the corrective-action process and cleanup work. LM is responsible for complying with FFACO requirements and carrying out long-term stewardship at the Shoal CAU.

Legacy Management Activities

LM monitors the Shoal site long term to make sure conditions at the site continue to protect human health and the environment. These monitoring activities are conducted in accordance with the approved subsurface closure report for the site. Results from these activities are provided in the associated monitoring report.

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Contact Information

In case of an emergency at the site **contact 911**.

LM toll-free emergency hotline: **(877) 695-5322**

Site-specific documents related to the **Shoal, Nevada, Site** are available on the LM website at www.energy.gov/lm/shoal-nevada-site.

For more information about LM activities at the **Shoal, Nevada, Site**, contact:

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