

# Environmental Restoration Project



## ER Site No. 108: Firing Site (Bldg 9940)

ADS: 1335

Operable Unit: Southwest Test Area

Site History .....	1
Conventional Explosives Tests .....	2
Hydrogen Combustion Experiments .....	2
FCI Experiments .....	3
Constituents of Concern .....	3
Current Hazards .....	4
Current Status of Work .....	4
Future Work Planned .....	4
Waste Volume Estimated/Generated .....	4

Primary Contact: [Dick Fate](#)

Office Phone: 284-2568

### Site History

ER Site 108 is located in the Coyote Test Field Area east of Technical Area (TA) III. The site encompasses a bunker (Building 9940) and the Fully Instrumented Test System (FITS) building (Building 9940A, which is situated on top of the bunker), as well as miscellaneous storage sheds and office trailers. The site consists of soils on top of the bunker and surrounding the structures. Releases of radiological material and possible hazardous chemicals resulted from the fuel coolant interaction (FCI) experiments conducted at the site. This site was originally a firing site where releases of high explosives (HE) may also have occurred.

ER Site 108 is on land owned by the U.S. Air Force that is permitted to DOE and SNL/NM and is located approximately 3,000 feet east of TA-III. It covers approximately 0.4 acre at an elevation of 5,530 feet above mean sea level. Current and projected land use for SWMU 108 is industrial.

ER Site 108 lies on the western margin of the Sandia Fault Zone. The geologic materials underlying the site consist of thick alluvial sediments that overlie deep bedrock. An alluvial fan and piedmont colluvium overly the Santa Fe Group Strata. The Santa Fe deposits are estimated to be approximately 3,000 feet thick beneath ER Site 108.

Site-Wide Hydrogeologic Characterization Project (SWHCP) soil surveys and surficial mapping provide general soil characteristics for the area around ER Site 108. The dominant soil groups in the area include the Tome very fine sandy loam and the Tijeras gravelly fine sandy loam. The estimated recharge rate for soils in the area range between 0.002 and 0.071 centimeters per year (cm/yr), which yields downward seepage velocities ranging between 0.03 and 11.8 cm/yr.

No perennial surface-water bodies are present in the immediate vicinity of ER Site 108. The nearest principal ephemeral surface drainage is the Arroyo del Coyote, which is about 1 mile north of the site. Drainage of the Arroyo del Coyote and an unnamed arroyo about 500 feet to the south of the site flows westward toward the Rio Grande.

ER Site 108 lies in the HR-2 geohydrologic region described in the SWHCP report. This region is an intermediate geohydrologic zone between the HR-1 zone to the west and the HR-2 zone to the east. This region is an intermediate geohydrologic zone between the HR-1 zone to the west and the HR-2 zone to the east. The uppermost interval of groundwater saturation in HR-2 will be found as unconfined to semiconfined aquifers in the alluvial facies of the Santa Fe Group and Piedmont alluvium and as semiconfined to confined aquifers in the local bedrock units. Examples of these two aquifer models are found in two wells located near the site. Monitoring well AVN-1 (7,000 feet northwest of Building 9940) is screened in the Santa Fe Group alluvial fan facies. Depth to groundwater in this well is 508 feet below ground surface (bgs). Monitoring well LMF-1 is 6,800 feet southeast of the site. Depth to groundwater in this well is 347 feet bgs. This well is screened in the Abo Sandstone.

The Building 9940 complex was originally built in the 1960s to serve as an explosive testing complex and was originally owned by Organization 2510, the Explosives Components Organization. At that time, firing tests involved conventional explosives, but there are no records of the tests performed. Outside the complex was a metal test chamber that was used for firing charges up to 2 pounds. The precise location of this chamber is unknown. The debris from these shots was placed in a dumpster.

In the late 1970s and early 1980s experiments at the Building 9940 complex shifted toward reactor safety issues (primarily hydrogen combustion and FCIs). From 1983 to 1988 FCI experiments were conducted, as were experiments with conventional HE. The various types of tests performed are described below.

### **Conventional Explosives Tests**

Very little information is available regarding the HE tests performed at ER Site 108. Most of them were performed prior to 1978 before the current owners occupied the facility, and individuals involved with these tests could not be located. Based upon available information, except for the metal test chamber described above, the tests were conducted in the boom room, which is an underground tunnel inside Building 9940 complex that was specifically designed to contain these tests. The boom room is an active facility. Because the boom room was designed to fully contain the explosives, it is believed that no release to the environment occurred as a result of the boom room tests.

### **Hydrogen Combustion Experiments**

The purpose of the hydrogen combustion experiments was to test the flammability limits created by igniting a mixture of hydrogen, air, and steam. Other than hydrogen, no other hazardous material was used in these tests.

## **FCI Experiments**

The FCI experiments involved the reaction of depleted uranium (DU) and corium thermite, which is essentially a compound of stainless steel, zirconium, iron-oxide, nickel-oxide, chromium oxide, and molybdenum-oxide powder. The intent of the experiments was to simulate the reaction of molten core materials and water.

Occasionally, a small detonator was used to trigger an explosion, but usually the interactions were not triggered in this fashion. The detonator typically had a charge of about 50 milligrams (mg) of explosives. The types of explosives used are unknown.

Experiments involving corium thermite at Building 9940 began in 1979 and continued until 1982. Most of the experiments conducted at the Building 9940 facility involved iron/alumina thermite melts.

Two structures at ER Site 108 were critical to the tests using corium thermite: the FITS tank, housed in Building 9940A and the EXO-FITS facility located south of Building 9940A. The FITS tank is a 5.6-cubic-meter vessel standing about 5 meters tall and is approximately 1.5 meters in diameter. The EXO-FITS facility consisted of an angle-iron superstructure that suspended the thermite/melt crucible and a water chamber on a concrete pad. These structures were located on top of the bunker, Building 9940.

Two series of experiments were conducted using corium thermite: the Melt Development-Corium (MDC) Series and the FITS-C Series. The purpose of the MDC Series was to refine the experimental techniques to ensure repeatability in the subsequent FCI experiment. The MDC experiments were conducted in the EXO-FITS facility. The FITS-C Series was the FCI test with corium thermite using melt delivery techniques developed in the MDC Series.

COCs at the site include DU and chromium, which is derived from corium thermite used in the tests at the site. The FCI tests were conducted on top of the bunker, Building 9940. According to personnel familiar with the experiments, chromium and DU would be co-located, and the fragments from the blast did not extend more than 50 to 100 feet from the test site. Water used in the contained firing tests inside the FITS tank on top of the bunker was discharged onto the ground just outside the FITS building near the test pad (Marshall August 1993). The volume of water released was not documented. Other potential residues from the tests are nickel-oxide.

Because of the reported explosives testing in the early history of the site, there is also the potential for residual HE. Therefore, HE is a contaminant of concern at this site.

## **Constituents of Concern**

DU

HE

Chromium

## **Current Hazards**

There are no current hazards at this site related to contamination of the surface or subsurface soils.

## **Current Status of Work**

The site background investigation for the Resource Conservation and Recovery Act (RCRA) Field Investigation (RFI) is complete. The first draft of the RFI work plan was completed in December 1995. Radioactive constituents were removed in a Voluntary Corrective Measure (VCM) conducted in 1995. A risk-based no further action (NFA) proposal was submitted to New Mexico Environment Department (NMED) in June 1998. In June 1999 NMED deemed the NFA proposal acceptable. The NFA was approved by NMED in July 2000 after completing the public review and permit modification process.

## **Future Work Planned**

No additional work is planned at this site.

## **Waste Volume Estimated/Generated**

Around 273 55-gallon drums of radioactive waste were generated.

**Information for ER Site 108 was last updated Jan 22, 2003.**