

ER Site 48: Bldg. 904 Septic System and HE Drain System (TA-II)

ADS: 1303

Operable Unit: Technical Area II

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Site History

Building 904 was constructed in 1947 in the south central portion of Technical Area-II (TA-II). It was initially used for the assembly of nuclear weapons. Building 904 was constructed with 1.5-ft thick concrete walls that separated the various weapon-assembly bays and the original 10,000 square foot floor plan was identical to that of Building 907. Building 904 was demolished in late 2002.

From 1947 through 1992, two effluent systems served Building 904. One system was for sanitary (septic) waste and the other (the High Explosive [HE] drain system) was for building fume-hood drains, sinks, and assembly bay floor drain discharges. In 1993, both drain systems were connected to the City of Albuquerque (COA) interceptor sewer line that runs along the floor of Tijeras Arroyo.

The Building 904 septic system extended westward from the northwest corner of Building 904 and consisted of a 900-gal concrete septic tank that discharged to a seepage pit and a drainfield. The seepage pit was approximately 5-feet in diameter and 15-feet deep and the drainfield consisted of approximately 150–feet of drainfield pipe.

The HE drain system extended southward from Building 904 to the northern rim of Tijeras Arroyo. Engineering drawings show that small research rooms in Buildings 913 and 914 also were connected to the HE drain system. The total length of the HE drain system was approximately 800 ft. While in service, a HE catch box collected HE particulates by mechanical filtration of the waste water. The HE catch box (also known as the solids retention tank) is located approximately 350 ft south of Building 904. The top of the catch box is 5 ft below grade. From the catch box, the HE drain system extends southward for approximately 500 more ft where the waste water discharged into a pair of

outfall ditches (ER Site 227 and ER Site 229). These two outfall sites are included in the Tijeras Arroyo Operable Unit. The HE catch box was sampled in May 2001. Nineteen drums of waste were removed in June 2003. The catch box was abandoned in place in August 2003.

Floor drains were located in each room in Building 904, including the HE assembly and packaging rooms. The floor drains, fume-hood drains, and sinks may have been cross-connected between the septic system and the HE drain system due to remodeling over the years. In 1995, the septic tank was sampled and the waste removed for proper disposal. The concrete was also sampled. The New Mexico Environment Department (NMED) inspected and approved the closure of the empty tank in late 1995. In 2000, the perimeter of the septic tank was excavated and soil samples were collected. At that time, a backhoe was used to trench across the drainfield to locate and map the drainfield laterals for later sampling. The tank and drainfield were left in place.

During nuclear weapons assembly operations in the early 1950s, eight to ten employees worked three, 8-hour shifts per day. During assembly work, HE blocks were shaved or machined to fit into the nuclear weapons. During the assembly operations, HE shavings may have fallen onto the floor, but sweeping was not permitted because the sweeping could generate static electricity and possibly trigger an explosion. The floor drains appear to have been designed to capture large volumes of water. Floor debris and explosive materials, including Baratol, Compound B, and black powder were washed into the assembly bay floor drains and into the HE drain system. The assembly bays were washed down daily; and water, and possibly a mixture of kerosene and water, may have been used to clean the floors.

Between 1948 and 1951, weapons-assembly work areas and equipment were typically cleaned with carbon tetrachloride. Up to 3 gallons-per-month may have been used until about 1951, when it was replaced with trichloroethylene (TCE) because the carbon tetrachloride vapors caused headaches. The TCE was reportedly "used like water" for cleaning and employees opened the building doors for ventilation.

In the late 1950s, nuclear weapon assembly operations were discontinued and the building was converted into an explosive testing and development facility; and a HE chemistry laboratory was also added. Chemicals used in the laboratory may have included methyl ethyl ketone (MEK), acetone, carbon tetrachloride, hexane, xylene, Freon compounds, toluene, alcohols, TCE, and methylene chloride. The explosive testing and development operations involved mixing small quantities of explosives in separate handling areas. Residues were not flushed down the floor drains; but small amounts of cleaning compounds may have been discharged to one or both of the effluent systems after cleaning the testing devices. Components were typically cleaned with toluene, petroleum distillates, isopropyl alcohol, nitromethane, acetone, and methanol.

Starting about 1968, Building 904 was used as an environmental and functional testing laboratory for weapon components. In 1969, Building 904 was enlarged with the addition of a darkroom for processing X-ray film. Photographic processing solutions, which may have contained cadmium, silver, chromium, and cyanide, may have been discharged to the Building 904 effluent systems.

During the 1970s, an explosive shock test facility was also located in the building, and in 1975, several rooms were converted for nuclear materials safeguards and security research using chemical deterrent foams and smokes. Some organic compounds and cleaning agents were also used, including acetone, methylene chloride, ammonium hydroxide, titanium, and carbon tetrachloride.

In summary, effluent waste water may have contained:

- organic compounds including acetone, methylene chloride, TCE, MEK, nitromethane, carbon tetrachloride, toluene, xylenes, FreonTM compounds, hexane
- various alcohols (methanol and isopropyl)
- metals (barium, cadmium, chromium, lead, silver, and titanium)
- HE compounds such as Baratol, Compound B, and black powder
- inorganic compounds including ammonium hydroxide and cyanide
- petroleum distillates such as kerosene
- and possibly traces of radionuclides such as cesium-137, uranium-235/238, plutonium-239, and tritium.

Building 904 was connected to an extension of the City of Albuquerque sanitary sewer system in 1993, and the effluent systems were disconnected and abandoned in place at that time.

The site is approximately 91 meters (300 feet) above the perched aquifer and 166 meters (545 feet) above the regional aquifer.

Corrective Action

Passive soil vapor surveys were conducted at TA-II, including ER Site 48, from November 1993 to February 1994. No significant volatile organic compound (VOC) or semi-volatile organic compound (SVOC) anomalies were detected as a result of this survey.

A total of 178 confirmatory soil samples were collected at Site 48 from November 1993 through December 2001. Samples were collected from eight boreholes, trenches, and HE catch boxes at depths ranging from 0.5 to 50.5 feet. The samples were analyzed for VOCs, SVOCs, polychlorinated biphenyls (PCBs), HE compounds, cyanide, metals including hexavalent chromium, tritium, and radionuclides by gamma spectroscopy.

Very low levels of eight VOCs, five SVOCs, and cyanide were detected, and PCBs, and HE compounds were not detected in the samples. Antimony, barium, cadmium, copper, lead, mercury, silver, thallium, vanadium, and zinc were detected at concentrations slightly higher than background in some of the metals samples. Cesium-137 was also detected at levels slightly higher than background.

The septic tank effluent was sampled for waste characterization purposes in November 1994.

In November 1994 additional confirmatory soil samples (described above) were collected from two boreholes at the site.

In June 1995 a No Further Action (NFA) proposal for ER Site 48 was submitted to the NMED.

A third round of soil sampling (described above) from two additional boreholes was conducted at the site in August 1995.

NMED responded with comments on the June 1995 NFA proposal in November 1995.

In early 1996 effluent was removed from the septic tank, and it was decontaminated and backfilled in place with clean soil. The Bldg. 904 effluent drain lines were not removed from the site, and were abandoned in place.

In 1999 and 2000 all seepage pits in TA-II, including the seepage pit connected to Bldg. 904 were backfilled in place with clean soil.

In May 2000 samples were collected from the ER Site 48 HE catch box. A fourth round of soil sampling was conducted at the site in August 2000. In October 2000, a fifth round of soil sampling was conducted at the site, and additional samples were collected from the HE catch box in December 2001. In August 2003, the contents (mainly soil) were removed from the HE catch box, and the unit was backfilled in place with clean soil.

SNL submitted a Request for Supplemental Information (RSI) response and proposal for Corrective Action Complete (CAC) for ER Site 48 to the NMED in June 2004. This document described the results of environmental investigation work completed at Site 48 since the June 1995 NFA report was written, and also included an updated risk assessment evaluation for the site.

NMED approved the RSI response/CAC proposal for ER Site 48 in October 2004, but required institutional controls for the site. Information about the site was presented at a public poster session in March 2005.

In February 2005 a portion of the ER Site 48 septic system drain line was excavated as a result of new construction activities in TA-II.

In May 2006 SNL submitted a letter to NMED objecting to the NMED decision to require controls at ER Site 48 and 7 other SNL ER sites. NMED in turn issued a letter for final NFA approval with institutional controls for ER Site 48.

Constituents Investigated

VOCs, SVOCs, PCBs, HE compounds, cyanide, metals including hexavalent chromium, tritium, and radionuclides by gamma spectroscopy.

Current Regulatory Status

Corrective action is complete at Site 48, and no further action is needed to meet NMED requirements. This site is acceptable for residential land use. NMED approved completion of corrective action in June 2006.

Institutional Controls

This is a site with Institutional Control (IC) land use restrictions. The designated land use is industrial. This determination is based on either environmental regulatory requirements and/or SNL Corporate requirements.

Additional information regarding Institutional Controls at this site can be obtained from the SNL IC tracking database. For access to and/or more information, please contact the LTES Program office at 505 284-9883.

Results of Risk Analysis

Because COCs were present in concentrations greater than background-screening levels or because constituents were present that did not have background-screening numbers, it was necessary to perform a risk assessment for the site. The risk assessment analysis evaluated the potential for adverse health effects for an industrial and residential land-use scenario. The results of the risk assessment were below the NMED risk guidelines for both the industrial and residential land-use scenarios. As summarized in the table below, constituents antimony, barium, selenium, and thallium were the main contributors to the overall risks.

Sampling conducted at Site 48 has indicated that there is no evidence of radiological contamination, and the site has been approved by the U.S. Department of Energy for unrestricted radiological release.

Using the SNL predictive ecological risk assessment methodology, the ecological risk for ER Site 48 is predicted to be low.

In conclusion, human health and ecological risks are acceptable per NMED guidance for an industrial or residential land-use scenario. However, the NMED concluded that institutional site controls would be required for Site 48.

Risk Assessment Values for SWMU 48 Nonradiological COCs

COC Name	Maximum Concentration (mg/kg)	Residential Land Use Scenario	
		Hazard Index	Cancer Risk
Inorganic			
Antimony	6	0.20	--
Barium	808 J	0.15	--
Cadmium	3.92	0.10	3E-9
Copper	52.7	0.02	--
Cyanide	0.64	0.00	--
Mercury	0.8	0.04	--
Selenium	53.0	0.14	--
Silver	14.2	0.04	--
Thallium	1.1	0.22	--
Vanadium	41.8	0.08	--
Zinc	215	0.01	--
Organic			
2-Butanone	0.036 J	0.00	--
Acetone	0.017 J	0.00	--
Benzene	0.0014 J	0.00	2E-9
Butylbenzyl phthalate	0.064 J	0.00	--
Chlorobenzene	0.0014 J	0.00	--
Fluoranthene	0.069 J	0.00	--
Methylene chloride	0.0083	0.00	1E-7
Phenanthrene	0.061 J	0.07	--
Pyrene	0.047 J	0.00	--
Tetrachloroethene	0.0020 J	0.00	1E-9
Toluene	0.0025 J	0.00	--
Trichloroethene	0.0022 J	0.00	5E-8
Xylene	0.0013 J	0.00	--
Total		1.06	2E-7

-- = Information not available.

Waste Volume Estimated/Generated

Five 55-gallon drums of mixed waste were removed when the septic tank was pumped out in 1995. In June 2003, nineteen 55-gallon drums of waste were removed from the HE catch box. All wastes were managed according to SNL/NM policy and were disposed of off-site.