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Conf-821005--8

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AND
DECOMMISSIONING PROJECT*

August 1982

CONF-821005--8

DE82 020395

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*Work supported by the U. S. Department of Energy Nevada Operations Office Health Physics Division under Contract No. DE-AC08-76NV00410.

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ABSTRACT

In July 1977, DOE/Headquarters directed DOE/NV to design a decontamination and decommissioning plan for the Gnome site, 48 kilometers southeast of Carlsbad, New Mexico. The plan incorporated three distinct phases. During Phase I, both aerial and ground radiological surveys were conducted on the site. Radiological decontamination criteria were established, and a decontamination plan was developed based on the radiological survey results. During Phase II, site preparatory and rehabilitation work was completed. The actual land area decontamination was accomplished during Phase III with conventional earthmoving equipment. A gravity water injection system deposited 36,700 metric tons of contaminated soil and salt in the Gnome cavity. After completion of the decontamination and decommissioning operations, the Gnome site was returned to the Bureau of Land Management for unrestricted surface use.

INTRODUCTION

The Gnome site, located approximately 48 kilometers southeast of Carlsbad, New Mexico, was selected in 1960 for the first experiment in the Plowshare Program. Gnome was detonated December 10, 1961 in bedded rock salt, 361 meters below the surface, with a nuclear yield of 3.1 kilotons. During 1968-1969, a decontamination and decommissioning (D/D) operation was accomplished within guidelines that specified removal of all contaminated material above 0.1 mR/h beta plus gamma as measured with a 30 mg/cm² Geiger-Mueller portable survey instrument.

During an inspection of the site in April 1972, exposed radioactive debris was discovered in the salvage yard and the contaminated waste dump. The contaminated debris had previously been covered by 0.6 meter of clean earth fill. Radiation threshold levels of concern and measurement had also become more conservative since the 1968-1969 cleanup. For these reasons, in July 1977, DOE/Headquarters directed DOE/NV to design a D/D plan for the Gnome site.

The D/D plan consisted of three distinct phases. During Phase I, aerial and ground radiological surveys were conducted, radiological decontamination criteria were established, and an operational plan was developed based on radiological survey results. During Phase II, existing wells were cleaned out and preparations were made for the D/D work. During Phase III, the operational plan was executed. Phase I activities were accomplished in two parts: Phase IA and Phase IB. Phase IA extended from August 1 through September 30, 1977 and Phase IB extended from March 1 through September 1978. Phases II and III were initiated by DOE/NV in March 1979 and completed September 23, 1979.

The guidelines for the D/D of the Gnome site called for decontamination to levels below 0.87 Bq/g for beta-gamma emitters in soil averaged over 0.25 hectare, and 1.3 kBq/ml of tritium in soil moisture. Since cesium-137 was identified as the only significant beta-gamma emitter, the decontamination criteria were applied as if all contamination was cesium-137 and tritium.

Phase I

An aerial survey of the Gnome site was conducted to identify areas containing contamination above the acceptable limit*. The aerial detector array consisted of twenty, 12.7 x 5.1 cm sodium iodide (NaI (Tl)) crystals. A grid system, based on New Mexico coordinates, was then established to facilitate ground surveys and soil sampling programs. Ludlum Model 19 Micro-R-Meters, containing 2.54 x 2.54 cm NaI (Tl) crystals, were used to make radiological ground surveys. A Garrett Master Hunter Metal Detector was also used to survey all operational areas. Subsequently, a backhoe was used to investigate subsurface metal indications. Surface soil samples were collected, and various augering equipment was used to collect subsurface and profile soil samples to determine the depth of contamination levels above the established decontamination criteria. Long-term ground surveys were accomplished using thermoluminescent dosimeters to provide additional documentation of the ambient exposure rates. Concurrent with the soil surveys, vegetation samples were collected on and adjacent to the site. The vegetation and soil samples were analyzed for radionuclide content.

Phase II

The site access road was rehabilitated and utility-generated power was installed. A U. S. Geological Survey water well was rehabilitated and a pump was installed to provide an operational water supply. Two Gnome reentry holes, SR-2A and LRL-7, were cleaned out and reopened. A tritium effluent filter system, consisting of a diesel-powered compressor in line with an air cooling system and a 0.6 cm mesh Drierite air drying bed was fabricated and installed at LRL-7. A crushing plant and a down-hol. disposal system were installed to facilitate the disposal of crushed soil and salt.

Phase III

Soil was removed from contaminated areas by a variety of methods. On small, well defined surface areas, contaminated materials were isolated and removed manually with shovels. On larger, well defined areas of buried contamination and areas where the contamination was dispersed throughout a large, generalized area, a backhoe, a frontend loader, and/or a bulldozer were used to remove the contaminated soil. The material removed from the area was loaded into dump trucks and transferred to the

*The aerial radiation survey results cannot be presented in this paper due to the necessity of color graphics. The survey results are presented and discussed in publication DOE/NV/00410-59 which is available through the National Technical Information Services (Reference 1).

REFERENCES

1. BERRY, H., Gnome Site Decontamination and Decommissioning Project:
Radiation Contamination on Clearance Report March 28, 1979 - September 23,
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