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**RESULTS OF THE
INDEPENDENT VERIFICATION OF
RADIOLOGICAL REMEDIAL ACTION
AT 480 SOUTH MAIN STREET,
MONTICELLO, UTAH (MS00049)**

J. W. Crutcher
M. W. Smuin

MASTER

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DEPARTMENT OF ENERGY

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HEALTH AND SAFETY RESEARCH DIVISION

Nuclear and Chemical Waste Programs
(Activity No. AH 10 05 00 0; ONLWCO1)

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480 SOUTH MAIN STREET,
MONTICELLO, UTAH (MS00049)**

J. W. Crutcher and M. W. Smuin

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Work performed by the
POLLUTANT ASSESSMENTS GROUP

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ABSTRACT

In 1980 the site of a vanadium and uranium mill at Monticello, Utah, was accepted into the U.S. Department of Energy's (DOE's) Surplus Facilities Management Program, with the objectives of restoring the government-owned mill site to safe levels of radioactivity, disposing of or containing the tailings in an environmentally safe manner, and performing remedial actions on off-site (vicinity) properties that had been contaminated by radioactive material resulting from mill operations. During 1984 and 1985, UNC Geotech, the remedial action contractor designated by DOE, performed remedial action on the vicinity property at 480 South Main Street, Monticello, Utah. The Pollutant Assessments Group (PAG) of Oak Ridge National Laboratory was assigned the responsibility of verifying the data supporting the adequacy of remedial action and confirming the site's compliance with DOE guidelines. The PAG found that the site successfully meets the DOE remedial action objectives. Procedures used by PAG are described.

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INTRODUCTION

The mill at Monticello, Utah, was built in 1942 by the U.S. government through the Defense Plant Corporation to provide vanadium during World War II. Various government agencies operated the mill until 1947. In 1948 the Atomic Energy Commission (AEC) obtained the mill and operated it under contract through 1959 to provide both uranium and vanadium. Mill operations were terminated on January 1, 1960. In 1961 the mill tailings piles were leveled and graded, covered with rock and soil, and seeded with native grasses. During 1974 and 1975, the ore stockpiles were removed from the site, and the mill foundations were buried.

The Monticello mill site is a 78-acre tract along Montezuma Creek, south of the city of Monticello, in San Juan County, Utah. The site is bordered on the south and southeast by land held by the Bureau of Land Management. Other boundaries are the city of Monticello and private property.

During the AEC era, the mill processed approximately one million tons of uranium ore. Vanadium and uranium were the only substances extracted in the milling process. Other constituents of the ore remained in the tailings and were not separated prior to disposal. During the years of active mill operation, the mill tailings were normally moist, so erosion was minimal. However, throughout the mill's operating period, area residents used these tailings as fill material and as aggregate in mortar and concrete.

Under the authority of the Atomic Energy Act, the U.S. Department of Energy (DOE) initiated the Surplus Facilities Management Program (SFMP) in 1978 to ensure the safe caretaking and decommissioning of government facilities that had been retired from service but still had radioactive contamination. In 1980 the mill site at Monticello was accepted into the SFMP, and the Monticello Remedial Action Project (MRAP) was established to restore the government-owned mill site to safe levels of radioactivity, to dispose of or contain the tailings in an environmentally safe manner, and to perform remedial actions on off-site (vicinity) properties that had been contaminated by radioactive material resulting from mill operations. The Monticello mill site and the tailings remain in the custody of the

*The verification of remedial action was performed by members of the Pollutant Assessments Group of the Health and Safety Research Division at Oak Ridge National Laboratory under DOE contract DE-AC05-84OR21400 with Martin Marietta Energy Systems, Inc.

DOE Grand Junction, Colorado, Projects Office. In 1983 remedial actions for vicinity properties were separated from MRAP with establishment of the Monticello Vicinity Properties (MVP) Project.¹

During 1984 and 1985, UNC Geotech, the remedial action contractor (RAC) designated by DOE, performed remedial action on the vicinity property that is the subject of this report, a vacant lot located at 480 South Main Street, Monticello, Utah. The remedial action plan required excavation of all exterior contamination. When the excavation was completed, the property was resurveyed, including soil sampling, to ensure the removal of all contamination, backfilled with uncontaminated material, and restored to its original condition.²

The DOE adopted a policy to assign an independent contractor to verify the data supporting the adequacy of remedial action and to confirm the site's compliance with DOE guidelines. The Pollutant Assessments Group (PAG) of Oak Ridge National Laboratory (ORNL) has been assigned the responsibility of this task at the 480 South Main Street site. This report describes the methods and results of that verification.

PROCEDURES

Objective

The objective of the verification activities was to confirm (1) that available documentation adequately and accurately describes the post-remedial action radiological conditions of the entire property that is to be certified and (2) that the remedial action reduced contamination to within applicable DOE guidelines.

Document Reviews

Review of the property completion report prepared by UNC Geotech² indicates the property was evaluated by the DOE on the basis of Environmental Protection Agency standards³ and that excess residual radioactive materials were present. Thus it was appropriate to designate this property for remedial action.

The pre-remedial action survey performed by UNC Geotech identified 17.6 m³ (23 yd³) of mill tailings from 15 to 30 cm (6 to 12 in.) deep. After the removal process had been initiated, previously unidentified contamination was identified. A total of 26 m³ (34 yd³) of contaminated earth and uranium mill tailings were removed.

A post-excavation survey performed by UNC Geotech, consisting of a surface gamma scan with a scintillometer and soil sampling, was performed prior to backfilling of the excavated area. Samples were taken at each 9.3-m² (100-ft²) grid block in the area of excavation, and these samples were blended to form three composite soil samples.

VERIFICATION OF REMEDIAL ACTION

All measurements presented in this report are gross readings. Background radiation levels have not been subtracted. Similarly, background concentrations have not been subtracted from radionuclide concentrations in soil samples. Applicable DOE guidelines for protection against radiation are given in Table 1.

Gamma Measurements

Measurements of the gamma exposure levels taken by UNC Geotech from the excavated areas prior to backfilling determined that the surface exposure rate ranged from 12 to 21 $\mu\text{R/h}$.

Soil Sample Analysis

Soil samples representative of the 15-cm (6-in.) thick soil layer at the bottom of the excavation were taken by UNC Geotech prior to backfilling. These samples were blended to form three composite samples that were analyzed by UNC Geotech to determine the concentrations of radium-226. Concentrations of radium-226 ranged from 0.8 to 2.6 pCi/g and averaged 1.6 pCi/g. These soil samples were obtained by ORNL PAG, and a confirmatory analysis was performed. Results of UNC Geotech and ORNL soil sample analyses are given in Table 2.

CONCLUSION

Results of UNC Geotech soil sample analysis and confirmatory split soil sample analysis by ORNL show that radionuclide concentrations are within applicable DOE guidelines.

Based upon the results of the post-remedial action data, which are confirmed by the verification assessment data, these radiological measurements fall below the limits prescribed by DOE guidelines. It is concluded that the site successfully meets the DOE remedial action objectives.

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2. UNC Geotech, *Property Completion Report for Monticello Vicinity Property Remedial Action for DOE ID NO: MS-00049-VL, Address: 480 South Main Street, Monticello, Utah 84535*, UNC Geotech, Grand Junction, Colorado, October 1987.
3. *Guidelines for Residual Radioactivity at Formerly Utilized Sites, Remedial Action Program and Remote Surplus Facilities Management Program Sites*, Rev. 2, U.S. Department of Energy, March 1987.

Table 1. Applicable guidelines for protection against radiation

Mode of exposure	Exposure conditions	Guideline value
Radionuclide concentrations in soil	Maximum permissible concentration of the following radionuclides in soil above background levels, averaged over a 100 m ² area ²²⁸ Ra ²²⁶ Ra	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g when averaged over 15-cm-thick soil layers more than 15 cm below the surface

Source: Adapted from Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites, Rev. 2, U.S. Department of Energy, March 1987.

Table 2. Results of ORNL analysis of UNC Geotech soil samples from 480 South Main Street, Monticello, Utah (MS00049)

ORNL sample No. ^a	UNC Geotech sample No.	Depth (cm)	²²⁶ Ra concentration (pCi/g)	
			ORNL	UNC Geotech
<i>Composite samples^b</i>				
X1	MAY 778	15-30	1.2	0.8
X2	MAY 779	15-30	1.1	1.5
X3	MAY 780	15-30	2.6 ^c	2.6

^aAn X-type sample is a split of the sample taken by the remedial action contractor.

^bSoil samples were taken at each 9.3-m² (100-ft²) grid block and blended to form composite soil samples, which are representative of the designated areas.

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