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PROJECT RULISON

RADIOLOGICAL OPERATIONS

ROLLUP PLAN

JULY 1972

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INTRODUCTION

The purpose of this rollup is to remove from the Rulison site those materials which have radioactive contamination in excess of cleanup criteria provided by AEC Headquarters and are not needed for future operations at the site.

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PROJECT RULISON RADIOLOGICAL OPERATIONS

ROLLUP PLAN

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I. Radiation Monitoring Plan

A. Personnel Monitoring

All personnel will wear thermoluminescent dosimeters (TLD) during the hardware dismantling phase of the operation. Baseline urine samples are to be collected prior to initiation of work with any radioactive materials and a final urine sample is to be submitted at the completion of the rollup operation or upon termination of individual work requirements. Anti-C clothing will be worn as required.

B. Material and Hardware

All items scheduled for release off site will be surveyed by a β-γ survey meter with not more than 7 mg/cm^2 window thickness. Appropriate swipes for checking of removable radioactive material are to be made and documented. All released material must meet the criteria outlined in Table I of Appendix A.

II. Decontamination and Disposal

A. Disposal

Materials containing radioactivity in excess of cleanup criteria and scheduled for disposal as radioactive waste will be suitably packaged and shipped to a burial ground operated by the Nuclear Engineering Company, Inc. (NECO) at Beatty, Nevada. Materials which can be decontaminated to cleanup criteria will be so decontaminated if Austral considers such action to be economically feasible.

B. Equipment

1. The flare stack will be pulled down, cut into sections and either decontaminated or packaged for shipment to the NECO site at the option of Austral.

2. All appropriate piping connecting the wellhead (R-EX), stack, tanks, etc. will be taken up and decontaminated or packaged for shipment to NECO. Water in the piping containing more than 300 pCi/ml of tritium will be collected and shipped to the NECO site. Water containing less than 300 pCi/ml will be steamed.

3. The separator will be plugged and left on site as is (i.e., contaminated internally) for probable use at such time as the well is placed on line for commercial gas production.

4. The contaminated water storage tanks (3 of 210 bbl. capacity each) will be drained as low as possible (a few inches or less). The material removed will be disposed of by NECO. Any material remaining within the barrel will be solidified in place.

5. The contaminated hydrocarbon storage tanks (2 of 10 bbl. capacity each) will be drained, plugged and left as is for future storage during possible gas production.

6. A wire-line rig and associated equipment for use with downhole temperature and pressure measurements will remain on site for future use.

C. Soil

Soil found to be above criteria levels will be appropriately packaged for removal by NECO.

The drip pans are to be removed upon completion of decontamination activities and swiped for contamination. After removal of the pans the soil previously covered by the pans will be sampled and analyzed. Disposition of pans will be dictated by Austral after monitoring.

Trenching beneath the water storage tanks will be done so that appropriate soil samples may be taken.

D. Water Disposal

Effluent water from the cleanup operations containing less than 300 pCi/ml of tritium is to be steamed through the stack from a hot oil truck steamer. Water containing more than 300 pCi/ml will be shipped to the NECO site.

Sludge and nonsteamable fluids containing more than 300 pCi/ml of tritium will be shipped to the NECO site.

E. Flare Stack

The flare stack will be disassembled and decontaminated or packaged for shipment to the NECO site. The effluent water resulting from the decon operation will be steamed if it contains less than 300 pCi/ml of tritium. If the water contains more than 300 pCi/ml of tritium, it will be shipped to the NECO site.

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III. Packaging and Shipping

A. Shipping Procedures

1. Shipping and Packaging Criteria

Based on all available survey and swipe data at the Rulison site, the only radionuclide containment expected to be present in excess of cleanup criteria will be tritium. The amount of tritium is sufficiently low that it should be possible to make all radioactive shipments under the DOT exemptions entitled (a) Small Amounts, and (b) Low Specific Activity.

Listed below are the definitions and conditions covering each category:

a. Small Amounts

(1) Tritium content must not be greater than 1.0 millicurie (mCi) per package.

(2) Package Requirements

(a) The materials are to be packaged in strong, tight packages such that there will be no leakage of radioactive materials under conditions normally incident to transportation. Skid-mounted components, drill pipe, tanks, etc., which meet the conditions outlined below will serve as their own containers.

(b) The surface dose rate must not be greater than 0.5 mrem/hour contact open window at any point on the external surface of the package.

(c) Packages must not have any significant removable surface contamination (activity of swipes not greater than 2,200 d/m/100cm^2).

(d) The outside of the inner container must be marked radioactive (each shipping unit is to be labeled with sticker labeled "Radioactive").

b. Low Specific Activity (When transported in sole use category vehicles must meet the requirements of Title 49, Code of Federal Regulations, Parts 173.392 c & d.)

(1) Externally contaminated nonradioactive materials may be considered as low specific activity provided the radioactive contamination is not readily dispersible

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and the surface contamination when averaged over one square meter does not exceed 2.22×10^6 d/m/cm^2. Such materials must be suitably wrapped or enclosed.

(2) Package Requirements

(a) Materials must be packaged in strong, tight packages so that there will be no leakage of radioactive material under conditions normally incident to transportation.

(b) Packages must not have any significant removable surface contamination (activity of swipes not greater than 2,200 d/m/100cm^2).

(c) External radiation levels must not exceed 200 mrem/hour at surface of the vehicle, 10 mrem/hour at 6 feet from the vehicle surface, or 2 mrem/hour in occupied positions.

(d) The outside of each outside package must be stenciled or otherwise marked "Radioactive-LSA."

B. Arrangements for shipping and disposal will be made by Austral for shipment by the Nuclear Engineering Company, Inc. to their Beatty, Nevada disposal site.

IV. Sampling

A. Soil

1. Stack Vicinity

Sampling points consisting of two inner circles (from previous grid) will be repeated for 25 sampling locations. Samples will be collected at depths of one inch and twelve inches. Five additional random cores will be collected at the surface and depths of 6, 12, 24, and 48-inch intervals.

Total soil samples for ^{3}H analysis are estimated at 75. Samples will be selected at random for gamma spectral analysis.

2. Storage Tanks and Pipeway Vicinity

a. Potentially contaminated areas (i.e., known spills) will be specifically sampled. Depth of sampling will be determined on a case-by-case basis.

b. A 10-foot grid encompassing this area of ~50' x 125' is to be completed. Samples will be collected at ~62 sampling locations at depths of one inch and twelve inches.

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c. Five random cores are to be collected with samples collected at the surface and 6, 12, 24, and 48-inch intervals.

d. Samples from underneath the tanks will be collected from the most likely area of ground contamination at the tank edge and underneath the center. Samples will be taken at the surface and at a depth of 12 inches for each tank, for a total of 12 samples.

e. Specific samples (2.a. above) and core samples will fill the requirement of the grid point nearest the specific sample location. Total samples for ^3H analysis for this area are estimated at 146. Random samples will be selected for gamma spectral analysis.

3. Reentry Pad Area

a. Sampling on a 10' x 10' grid covering an ~100' x 125' area is to be completed. Samples will be collected at depths of one inch and twelve inches yielding an estimate of 250 samples.

Ten random cores sampled at 24 and 48 inches are to be completed. The number of sampling points below the drip pans is contingent upon the area of the drip pans actually removed.

b. Total samples are estimated at 270.

B. Water Sampling

Just prior to the final rollup phase (i.e., after all decontamination is completed), water samples are to be collected from on-site sources for ^3H analysis.

Water used for decontamination purposes will be sampled and the results documented.

C. Vegetation Sampling

Eight sampling points on the 500' and 1,000' arc are to be sampled and analyzed for ^3H. Several grab samples from vegetation growing in known spill areas will be collected for ^3H analysis. Vegetation samples will be returned to Eberline Instrument Corporation (EIC), Albuquerque, New Mexico for analysis.

D. Air Sampling

Appropriate air sampling for ^3H analysis is to be run concurrently through the rollup operation. Particulate air samples will be collected for documentation.

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V. Long-Term Surveillance Program

Periodic inspection trips will be made by NV staff to the Rulison site on at least an annual frequency.

Water samples will be collected and analyzed by the Western Environmental Research Laboratory of the Environmental Protection Agency annually for an indefinite period at locations listed below:

1. Battlement Creek - nearest down gradient accessible location.
2. Two existing private wells in alluvium on Morrisania Mesa.
3. Water supply springs for Grand Valley.
4. A few selected springs and wells close to Surface Ground Zero.
5. Hydrologic test well (just above the CP area).

VI. Final Site Survey and Reports

A report of the site survey results is to be transmitted to AEC Headquarters: Assistant General Manager for Environment and Safety, Division of Applied Technology, Division of Biology and Medicine, Division of Waste Management and Transportation, and Division of Operational Safety in accordance with the cleanup criteria provided by AEC Headquarters (see Appendix A).

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Chief Counsel

Director, Peaceful Applications Division

Acting for William D. Smith, Jr.
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APPENDIX A

PROJECT RULISON

ROLLUP AND DISPOSAL GUIDES*

1. Site Disposal

Decontamination and cleanup, prior to release of control and responsibility for the site by the AEC, shall be effected after consideration of the following factors: (1) external radiation levels, (2) migration of radionuclides to man through resuspension in air, movement in water, or passage through food chains, (3) unrestricted property use, immediate and potential, (4) decay and other removal processes tending to reduce potential exposure to man, and (5) the feasibility, cost, and relative effectiveness of further decontamination activities. The cleanup shall be continued until potential future exposures to man are not likely to exceed a few percent of the limits specified in AEC Appendix 0524, paragraph II.A.

Numerical guidance provided herein should not be exceeded without careful consideration of the reasons for doing so. Different values than those provided here may be approved by AEC Headquarters, on a case-by-case basis.

For purposes of planning for disposal of a site for uncontrolled use, the following radiological safety guidance is provided:

1.1 Surface Waters:

Contaminated surface waters in excess of 0.1 times the concentration values listed in AEC Appendix 0524, Annex A, Table 2, Col. 2, shall be disposed of by methods approved by AEC Headquarters.

1.2 Buildings, Equipment, and Materials:

Residual radioactive contamination remaining after cleanup operations shall not exceed the levels specified in Table 1.

1.3 Soil:

Residual contaminated soil to a depth of about 4 feet shall be decontaminated or treated to the extent practicable and any radioactive waste pits exceeding 4 feet in depth shall be decontaminated to the full depth of the waste in accord with the following criteria.

1.3.1 Soil containing residual tritium concentrations exceeding 3×10^{-2} μCi/g of soil shall be excavated for disposition by means approved by AEC Headquarters.

*Memorandum, Kelly/Miller, dated April 17, 1972 "Radiological Safety Guidance for Experiments Involving Nuclear Stimulation of Natural Gas Wells"

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1.3.2 Soil containing residual $\beta\gamma$ radiation levels exceeding 0.2 mrad/hr, above background (including worldwide fallout) measured at 1 cm shall be excavated for disposition by means approved by AEC Headquarters. After surface restoration the final average radiation levels shall not exceed 0.05 mrad/hr $\beta\gamma$ above background (including worldwide fallout) measured at 1 cm.

1.3.3 Soil gradients shall be examined by suitable sampling and residual contamination shall be removed and disposed of by methods approved by AEC Headquarters when these levels exceed 10^{-5} μCi/g for $\beta\gamma$ decay modes (except tritium) above background (including worldwide fallout). It is not anticipated that radioactivity with an α decay mode will be encountered. If such should be the case criteria will be provided by AEC Headquarters.

1.4 A final site survey shall be performed prior to release of the site and copies of a report of the cleanup effort and survey results shall be transmitted to AEC Headquarters/AGMES, AT, BM, WMT, and OS. The report on the site cleanup operation shall include a description of the physical and legal measures taken to prevent deep drilling, mining, or other restrictions on use of the site. Agreements or arrangements for subsequent monitoring should also be described. The certification requirement, associated with this report, is defined in IAD-5301-8, dated February 3, 1972, for all real property and related personal property prior to any disposal or excessing action.

1.5 Effective site cleanup should eliminate the need for periodic terrestrial and bioenvironmental surveys and only annual surface and ground water samples should be required for a period of about five years or until there is reasonable assurance that no transport problems exist. Reports of the annual surveys shall be sent to AEC Headquarters/AGMES, AT, BM, WMT, and OS.

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TABLE I

Isotope[2/]	Surface Contamination Levels[1/] Removable[3/]	Total[4/] [5/]
U nat, U-235, U-238, Th nat, Th-232, and associated decay products	1,000 dpm or 450 pCi alpha on any 100 cm^2	10,000 dpm or 4,500 pCi alpha on any 100 cm^2
Other isotopes which decay by alpha emission or by spontaneous fission	100 dpm or 45 pCi alpha on any 100 cm^2	1,000 dpm or 450 pCi alpha on any 100 cm^2
Beta-gamma emitters (isotopes with decay modes other than alpha emission or spontaneous fission)	1,000 dpm or 450 pCi beta-gamma on any 100 cm^2	0.4 mrad/hr[6/] at 1 cm from the surface

1/ As used in this table, dpm (disintegrations per minute) or pCi (picocurie) means the rate of decay by radioactive material as determined by correcting the counts per minute observed by an appropriate detector and count rate meter, for background, efficiency, and geometric factors associated with the instrumentation and survey procedures.

2/ Where surface contamination by both alpha and beta-gamma emitting isotopes exists, the limits established for alpha and beta-gamma emitting isotopes shall apply independently.

3/ The amount of removable radioactive material on any 100 cm^2 of surface area may be determined by wiping that area with dry filter or soft absorbent paper and with the application of moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known background, efficiency and geometry. In determining removable contamination on objects of surface area less than 100 cm^2, the pertinent levels shall be reduced proportionately, and the entire surface shall be wiped. Alternately, it may be assumed that all of the radioactive material remaining on a surface may be removable, and that amount of radioactive material may be determined by direct measurement with survey instrumentation of sufficient sensitivity to detect levels equivalent to these limits.

4/ Alternatively, for total contamination one may elect to use an average level one-half of that listed in this column, provided that:

(a) The average shall be taken over the total area of 10 square meters, whichever is the lesser; and

(b) At no location shall the maximum exceed 2.5 times the level listed in this column.

5/ It is assumed that measurements of total contamination are made with instruments having a sensitive cross sectional area of 100 cm^2. Measurements made with instruments having more or less than 100 cm^2 of sensitive area may be related to levels proportionately adjusted, or additional

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measurements may be made on contiguous areas totaling 100 cm^2 and the findings added for comparison with the specified levels.

6/ Measured through not more than a total of 7 milligrams per square centimeter of absorbing material.

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