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PROJECT RULISON

WELL PLUGGING AND SITE ABANDONMENT PLAN

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Prepared by
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NEVADA OPERATIONS OFFICE

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
NEVADA OPERATIONS OFFICE

AUSTRAL OIL COMPANY

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I. INTRODUCTION

A. GENERAL

Project Rulison, the second nuclear gas stimulation experiment, co-sponsored by the U. S. Atomic Energy Commission, USAEC (now the U. S. Energy Research and Development Administration, ERDA), and the Austral Oil Company, was designed to determine the potential increase in production by using a nuclear explosive to stimulate and enhance natural gas recovery in the Mesaverde formation of the Rulison field, Garfield County, Colorado. (See Figure 1.)

On September 10, 1969, under the technical direction of the Los Alamos Scientific Laboratory (LASL), a 43 kiloton fission-type nuclear explosive was detonated at a depth of 8,426 feet in an Emplacement well (designated R-E) on Colorado's western slope. Re-entry drilling operations, through a separate Re-Entry well (designated R-EX) located 300 feet southeast of the emplacement well, began in April and were completed in July of 1970. This re-entry was designed to production test the stimulated zone. (See Figure 2.)

Production testing took place over a seven month period and included four separate flow periods. Between October 1970 and April 1971, approximately 455 million standard cubic feet (MMSCF) of chimney gas was produced.

The well was shut-in after the last test in April 1971, and left in a standby condition until a general cleanup was undertaken in 1972. Cleanup work at the site commenced on July 10, 1972, and was completed on July 25, 1972. The purpose was to decontaminate, if necessary, and remove from the site all equipment and materials not needed for possible future gas production. The task was accomplished and the radiological condition of the site was documented by extensive equipment and soil sampling. The Rulison Site Cleanup Report, NVO-136, September 1973, is recommended for further details.

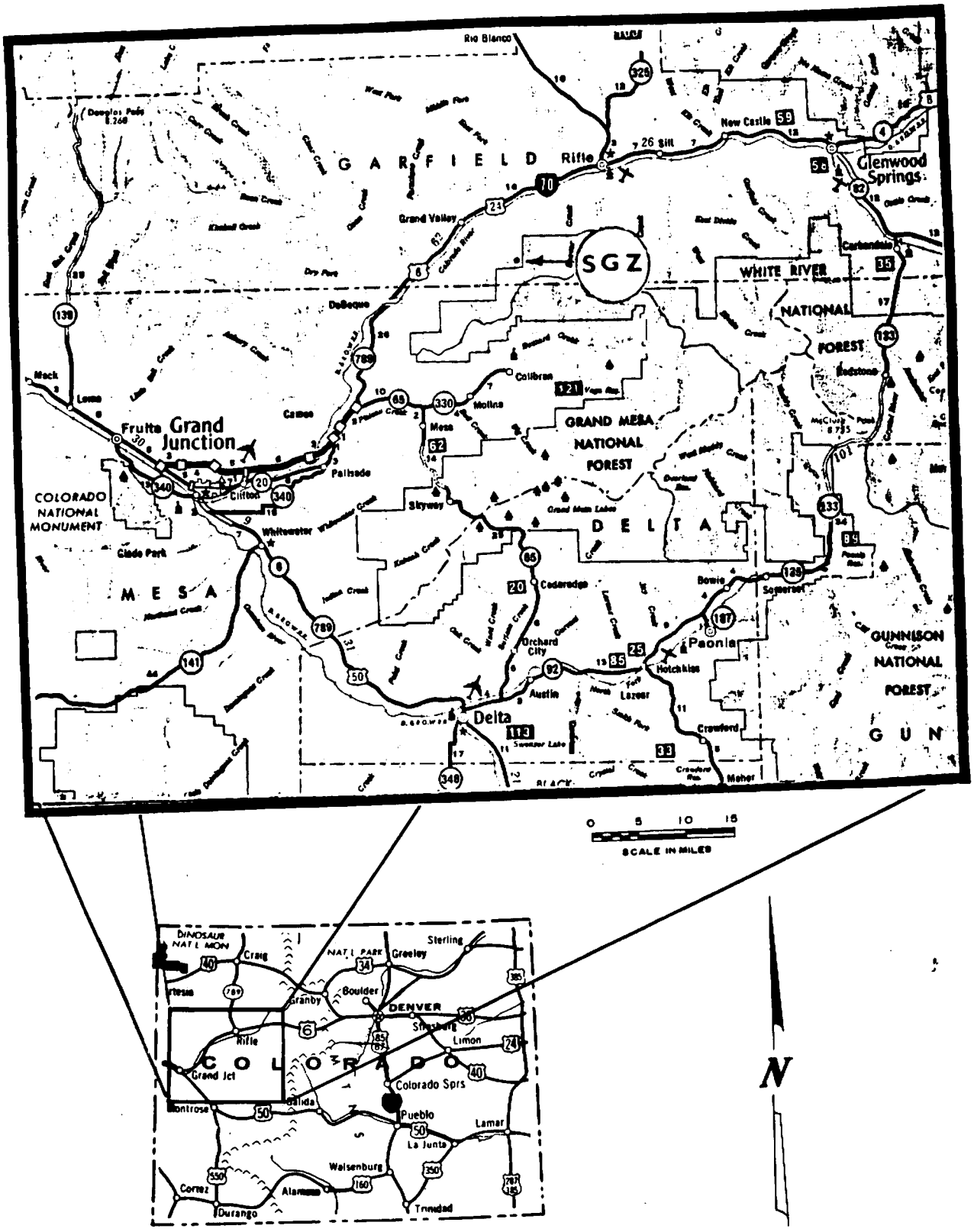


Figure 1
Location Map - Project Rulison

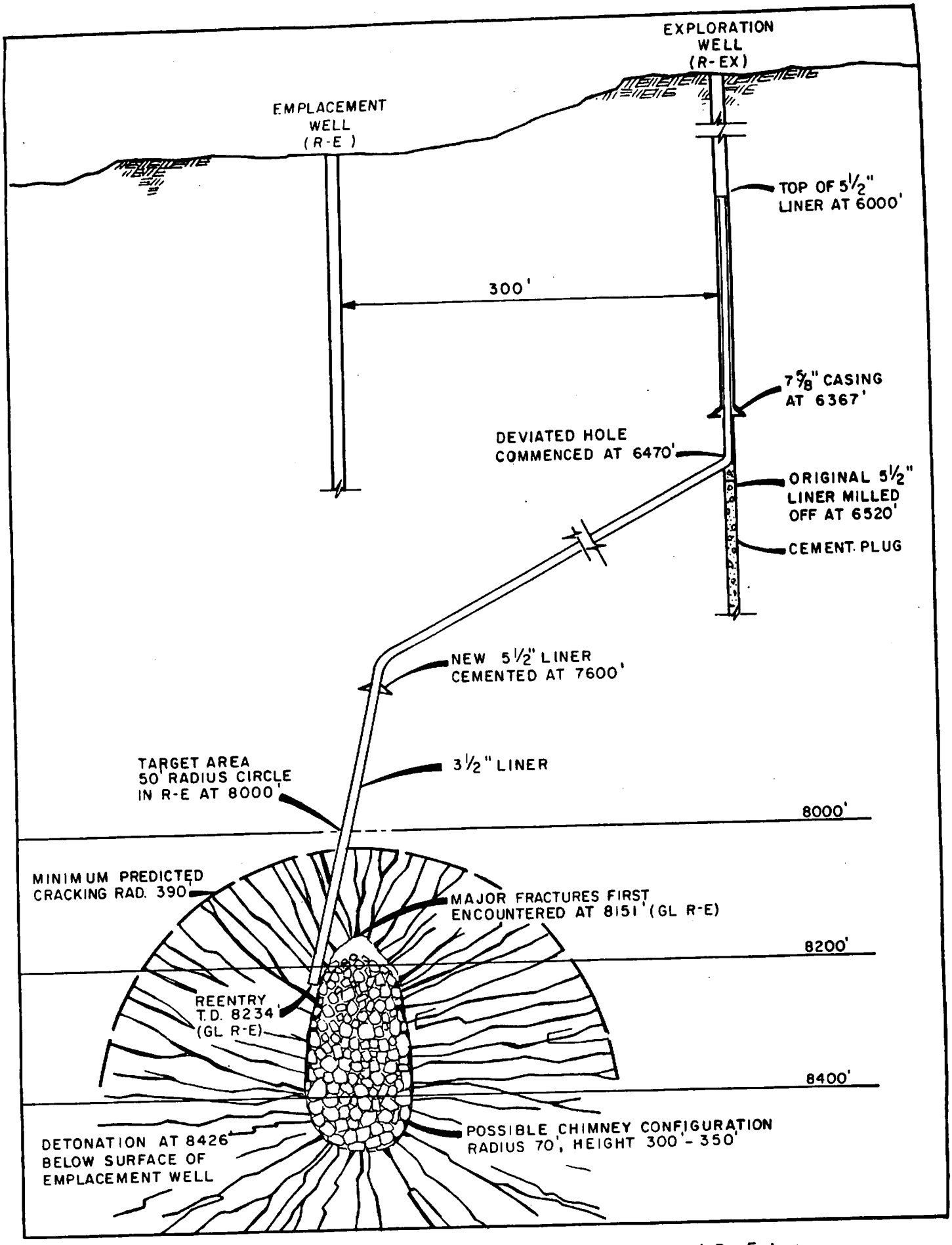


FIGURE 2 Project Rulison Emplacement and Re-Entry Well Configuration

Rulison has been shut-in since April 1971, and because neither the Austral Oil Company nor ERDA have any plans to commercially produce the available chimney gas, the wells will be plugged and abandoned and the remaining equipment at the site removed. This course of action has been mutually agreed upon by both parties and is within the provisions of ERDA Contract E(26-1)-429 and E(26-1)-667 with Austral Oil Company, Inc.

This document, in the following sections, will describe the plans and events involved in the well plugging, radiological sampling, decontamination, and site abandonment procedures.

B. OBJECTIVES OF DEMOBILIZATION AND SITE ABANDONMENT

1. Wells

Plug and abandon wells R-E and R-EX in a manner that will isolate and confine gas and water to their original reservoirs. This will involve plugging in such a manner as to permanently prevent migrations from one formation to another, in accordance with the criteria and detailed plans set forth in Sections III.A and B and the Rules and Regulations of the Colorado Oil and Gas Conservation Commission, the Colorado Water Quality Control Commission, and the USGS.

2. Surface Plant and Equipment

Dismantle and remove all surface plant and equipment and appropriately decontaminate or dispose of contaminated materials and equipment in accordance with the criteria and detail plans set forth in Section III.D. and in accordance with ERDA criteria and other rules and regulations applicable to on-site activity and the disposal and transport of contaminated materials.

II. CURRENT SITE STATUS

A. REAL PROPERTY

1. Surface Rights

By means of an agreement (deed) executed by Claude V. Hayward on February 23, 1969, Mr. Hayward, the owner, granted to the government the sole and exclusive right to regulate and control access to and use of the surface of Lot 11 NE 1/4 SW 1/4 of Section 25, Township 7 South, Range 95 West, 6th Principal Meridian, Garfield County, Colorado. (This amounts to 40 acres of land area.)

This agreement continues in effect for a period of five years, with the ERDA having the option to renew the government's rights for successive five-year periods by notifying Mr. Lee Hayward* in writing not less than 90 days prior to the end of each five-year period (i.e. February 23, 1979).

The ERDA has the prerogative to release to Mr. Hayward (at any time) the surface rights of the above-described land (or any part thereof) which the ERDA deems as no longer needed for security, public health,and safety reasons.

It is planned to obtain by deed the right to control drilling below a depth of 6,000 feet on Lot 11 and the right to place a monument at surface ground zero. Upon the execution of such a deed, the right under the present agreement would be released.

2. Subsurface Rights

Under the terms and conditions of the Rulison contract, E(26-1)-429, Austral Oil Company, Inc., granted to the government its subsurface operating rights ....from the surface of the earth to a depth of 500 feet below the base of the Mesaverde formation as to Lot 11 NE 1/4 SW 1/4 of Section 25, Township 7 South, Range 95 West, 6th Principal Meridian, Garfield County, Colorado.

*Mr. Claude V. Hayward is now deceased. Title to the land is now in the name of Lee Hayward (Claude Hayward's son).

B. WELLS AND SURFACE FACILITIES

The following is a summary description of those Austral-owned facilities remaining on-site as of April 1976: (There is no ERDA-owned property remaining on the site except the cable in the Emplacement well.)

1. Wells

   a. R-E, the Rulison emplacement well, is equipped with high pressure wellhead equipment and pressure gauging instruments. The wellhead is protected by a metal shed and is enclosed by a 6-foot combination barbed wire and cyclone fence with one locked vehicle gate. (Austral has posted "No Trespassing" signs on this fencing.)

   b. R-EX, the Rulison exploratory well, which also served as the post-detonation re-entry and production test well, and its wellhead equipment is configured for further gas production. However, the capability for gas flaring is no longer available.

2. Surface Facilities

   a. A 4 strand barbed wire protective fence encloses the R-EX wellhead, effluent holding tanks, and separator. The fence has one locked vehicle gate. (See Figure 3.) Those contaminated items remaining on-site are: three 210 barrel water holding tanks; a 3-phase separator which is not connected to the R-EX wellhead; a lubricator; a pipeline which once connected the wellhead to the separator; a large steel drip pan; and a wireline trailer.

   Austral has posted the perimeter fencing with "No Trespassing" signs and "Radiation Warning" signs have been affixed to those internally contaminated equipment items that remain on-site.

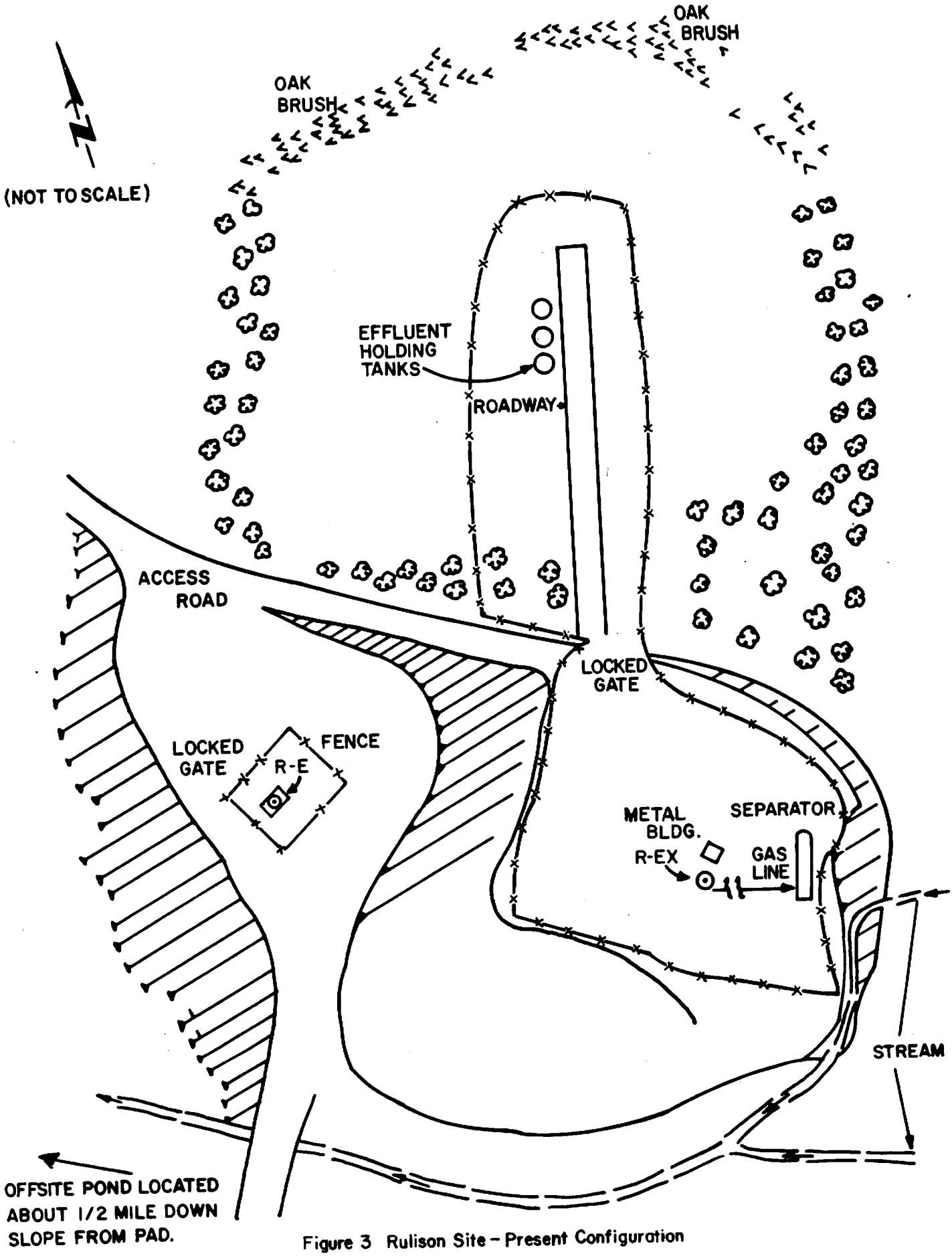


Figure 3 Rulison Site – Present Configuration

b. A tool and instrument shed is in place on the site--near the R-EX wellhead--together with some piping and drip pans which were utilized in the re-entry drilling operation.

c. Existing telephone and electric power lines will remain in place.

d. A large pit which was used for containment of surplus drilling fluids during the emplacement hole drilling operations is separately fenced with 6-foot hog wire fencing topped with three strands of barbed wire; enclosing an area of approximately two acres. The pit, which is located about one-half mile downslope to the northwest, is equipped with a spillway on the downslope side, 6 feet below the crest, and now contains fresh water from surface runoff. This pit located in Lot 5 of Section 25 is under the control of the present owner of the property, Lee Hayward--son of Claude V. Hayward. He is retaining the pit for his own use (by a separate agreement directly with Austral).

III. SITE ABANDONMENT PROGRAM

A. PLUGGING AND ABANDONMENT OF EMPLACEMENT WELL, R-E

1. Install drip pans for rig and pipe rack on Hayward "A" #25-95 (R-E).
2. Install tanks for circulation of fluid and collection of stemming material.
3. Install pump and water line to Hayward pit for water supply.
4. Install system to retain tension on cable for subsequent spool-up using sand line drum on pulling unit.
5. Bleed well off to install valves on casing head and have Eberline catch gas samples. Estimate volume of gas released during this bleeding off process. Install a Schaffer LWS with pipe rams and blind rams on top of 10" flange. Install Bowen pressure control (grease injector) equipment on cable outlet of wellhead.
6. Rig up pulling unit with double drum.
7. Circulate out stemming material inside of 10-3/4" casing with water to a depth of 2,000 feet using 2-7/8" tubing. Use Bowen Series 160 sidedoor overshot on bottom of tubing to maintain tension on cable. (See Figure 4.)
8. Cut cable, spool-up and set aside to ship as contaminated waste to the Nevada Test Site for disposal.
9. Set bridge plug at 1,900'. Spot 200' cement plug on top of bridge plug. <u>Note</u>: Class "G" cement will be used on all plugs. The cement will be tested for thickening time and compressive strength with a sample of mixing water to be used during cementing operations. The test will dictate types and amount of chemical additives needed, if any.
10. Pull and lay down 2-7/8" tubing. Spot balanced 200' of cement plug from 700' to 900'. Pull and lay down remainder of 2-7/8" tubing. Spot 200' cement plug from 200' back to surface. Water will be left between the three cement plugs.
11. Cut off 10-3/4" casing several feet below ground surface and weld on steel plate. (See Figure 5.)

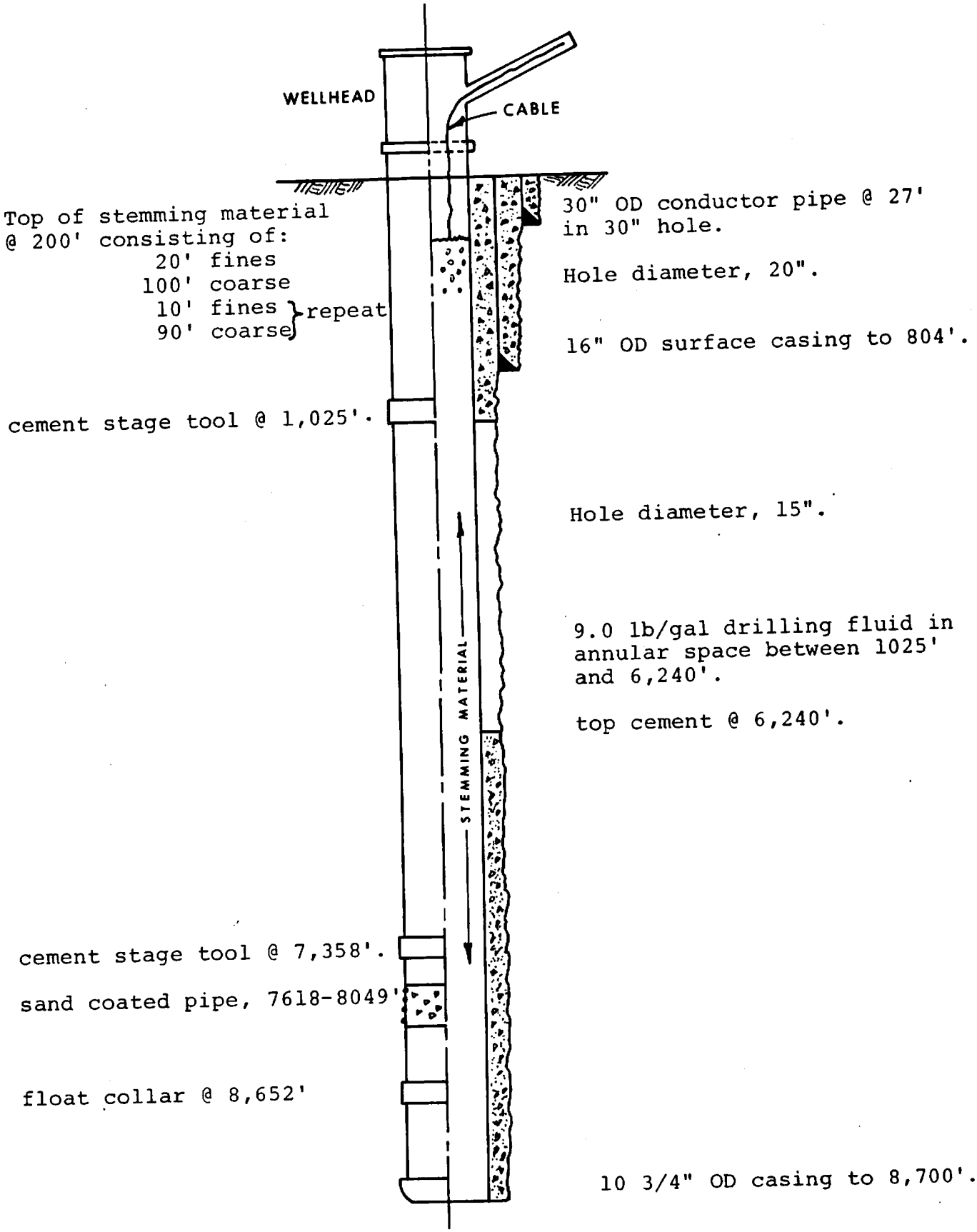


FIGURE 4
RULISON EMPLACEMENT HOLE R-E - PRESENT CONDITION

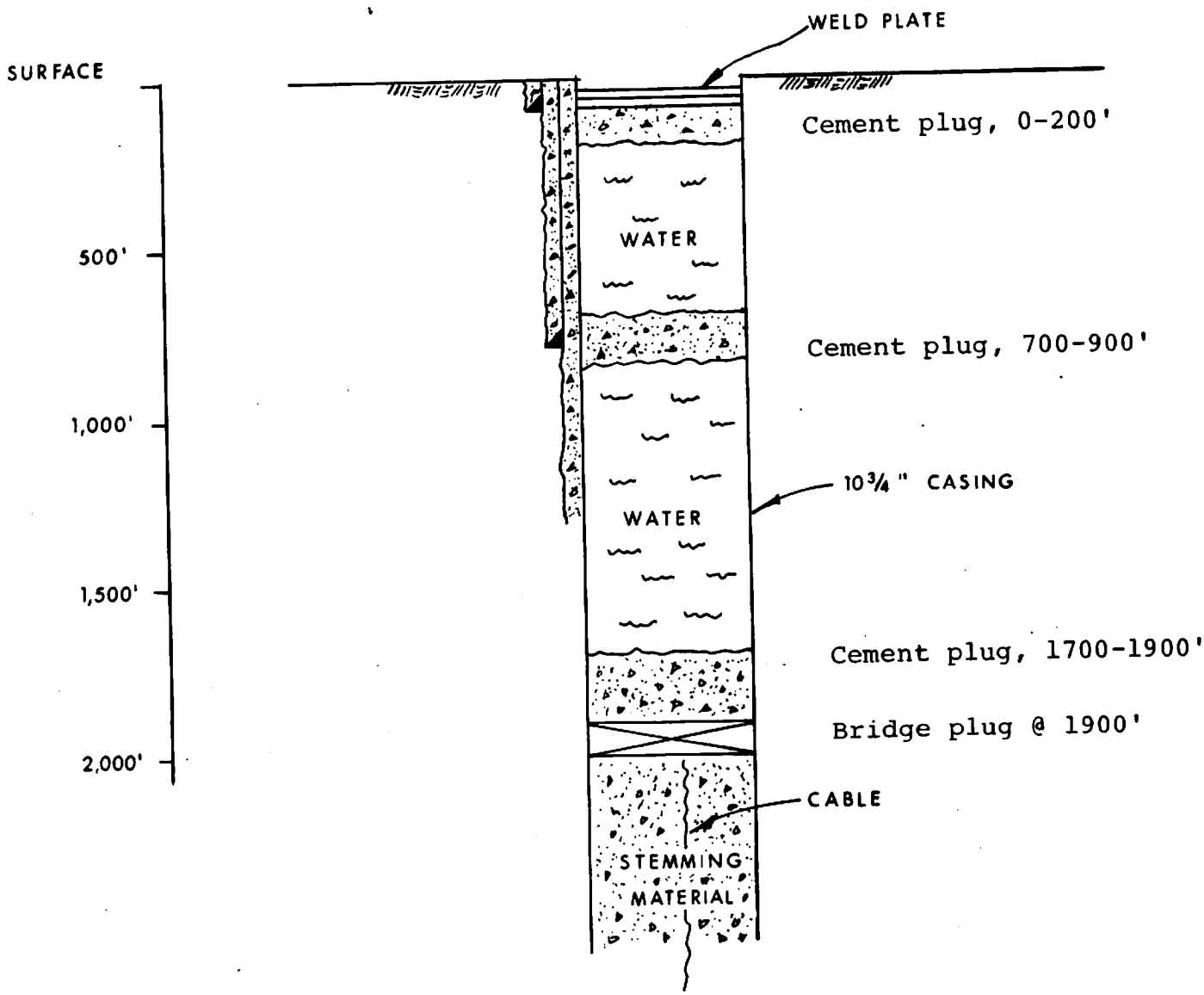


FIGURE 5
RULISON EMPLACEMENT HOLE R-E
PLUGGED AND ABANDONED CONDITION

11. Decontaminate 2-7/8" tubing (if needed) and return to supplier.

12. Move pulling unit to the Hayward #25-95 (R-EX) well, and backfill cellar.

13. Sample stemming material for radioactivity and either barrel for disposal as contaminated waste or discard by spreading on site if uncontaminated.

B. PLUGGING AND ABANDONMENT OF RE-ENTRY WELL, R-EX

1. Rig up on Hayward #25-95 (R-EX). An attempt will be made to decontaminate the tanks, separator and flow lines on-site. If unsuccessful, equipment will be prepared for subsequent transport to an approved disposal site. Prior to moving in rig, upper portion of Christmas tree with lubricator and flow lines at wellhead should be disassembled and decontamination procedures commenced. During any bleeding off of pressure, Eberline will catch gas samples. An estimate of the volume of gas released will be required for release reporting purposes. Wireline unit and lubricator will also be decontaminated (if needed). Use of drip pans from the R-E Well will be required.

2. Pump excess water (collected from plugging the R-E Well) into the R-EX Well, after recording volume and obtaining samples from Eberline of any material that is pumped into the well. (See Figure 6.)

3. Perforate 3-1/2" tubing at 5,300 feet in order to allow surplus water from tubing-casing annulus to gravitate into cavity.

4. Set Otis plug choke in S-1 nipple and bleed pressure (if any) through 3-1/2" tubing. Collect gas samples. Load tubing and annulus with fresh water.

5. Spot balanced 1,000 foot cement plug from 5,300 feet to 4,300 feet. (See Figure 7.)

6. Perforate tubing at 1,000 feet. Spot balanced 600 foot cement plug from 1,000 feet to 400 feet.

7. Cut 3-1/2" tubing off at 200 feet and spot cement plug from 200 feet up to 2 feet below surface.

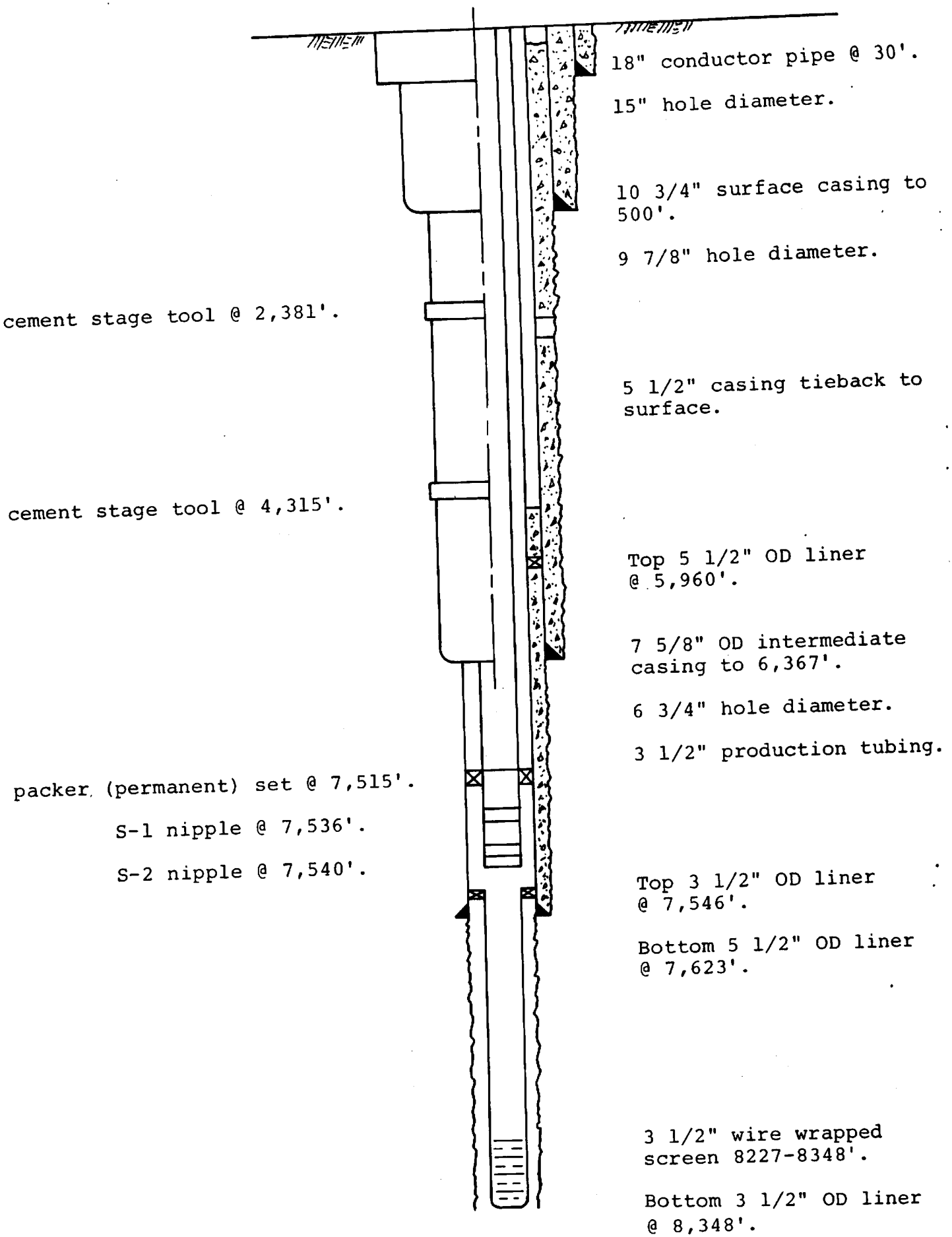
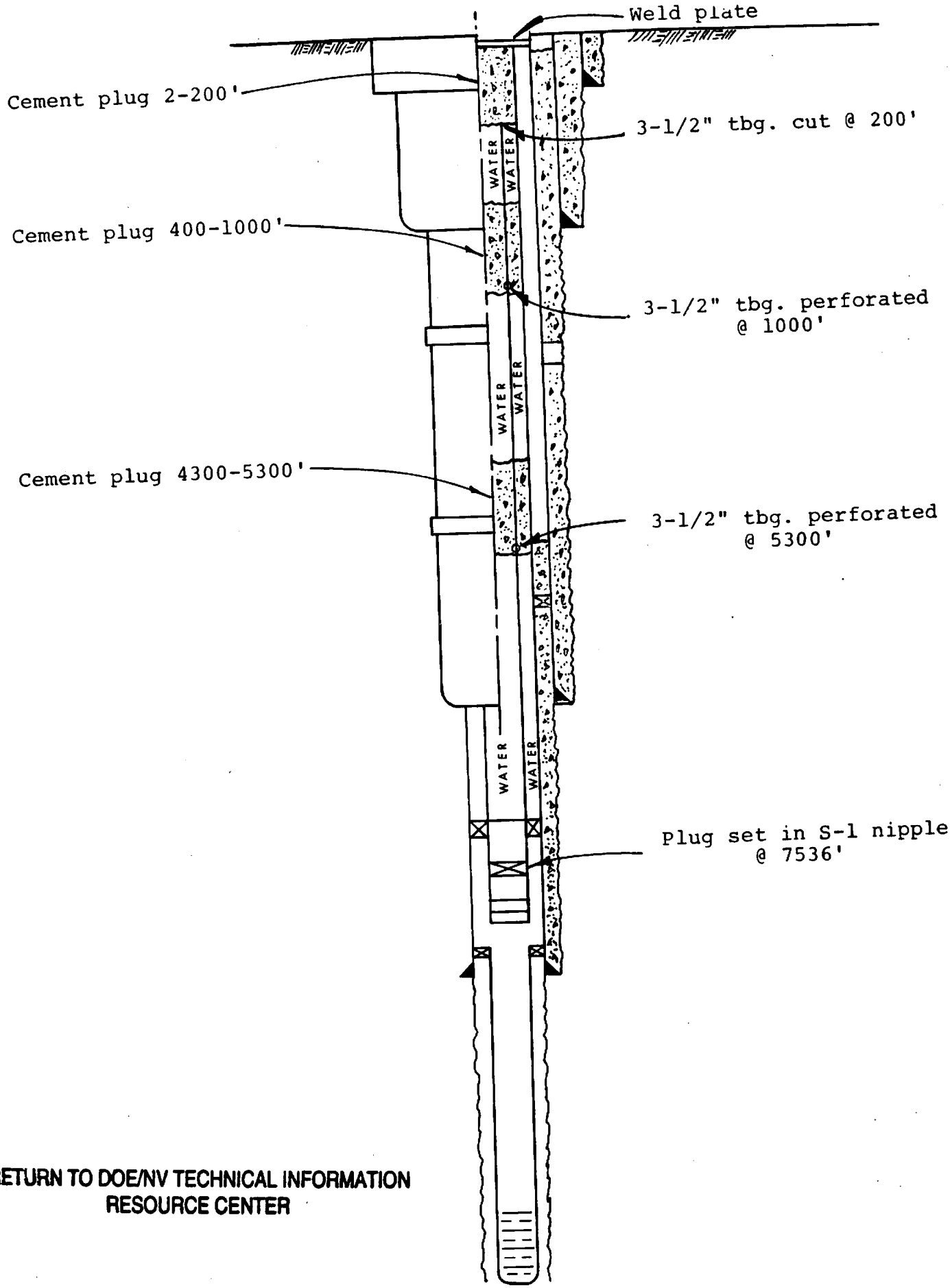


FIGURE 6
BULISON RE-ENTRY WELL R-EX - PRESENT CONDITION



RETURN TO DOE/NV TECHNICAL INFORMATION
RESOURCE CENTER

FIGURE 7
BULLSON RE-ENTRY WELL B-EX
PLUGGED AND ABANDONED CONDITION

8. Pull and lay down recovered 3-1/2" tubing. Wash external surface of tubing as it is being pulled so that any contamination will fall back into well. Cut off casing below ground level and weld on steel plate.
9. Decontaminate recovered 3-1/2" tubing.
10. Decontaminate rig and move out, and backfill cellar.
11. Finish decontaminating equipment and move out. Use hot oil truck to vaporize excess water or ship as liquid waste to an approved disposal site.
12. Decontaminate pans and remove.
13. Take soil samples and barrel contaminated soil to remove, if needed.

C. SURFACE FACILITIES

The surface facilities will be dismantled, inspected, surveyed for radiation and prepared for shipment in a manner consistent with well abandonment and radiological decontamination and shipping procedures.

1. The three 210 bbl holding tanks will be decontaminated if possible with cleaning solutions, detergents, and fresh water from the Hayward pit. If "clean" they will then be loaded on flatbed trucks and shipped to a location designated by Austral. If these tanks cannot be satisfactorily decontaminated, they will be sealed and shipped to an approved disposal site. The decontaminated water will be pumped into the R-EX well prior to plugging.
2. The separator and decontamination water will be treated in the same manner as the three holding tanks.
3. The fence surrounding the emplacement well, R-E, will be taken down, loaded and shipped to an Austral designated location. All other fencing around the perimeter of the site will remain at the discretion of the land owner.

4. All surface piping (mostly between the wellhead R-EX and the separator) will be decoupled or cut into 30-40 foot lengths, checked for contamination, and decontaminated, if necessary. It will then be shipped to a location designated by Austral. If the pipe cannot be satisfactorily decontaminated, it will be sealed and shipped to an approved disposal site.
5. The two buildings will be dismantled, checked for contamination and shipped to a location designated by Austral. However, both buildings may temporarily be used as shelter and office space until the latest possible time.
6. All access roads will remain as they are and be left intact for the landowners use.
7. All wellhead equipment will be removed from the well, decontaminated and shipped to a location designated by Austral. If decontamination is not successful, shipment will be made to an approved disposal site.

D. PACKAGING AND TRANSPORTATION PLAN

All materials, particularly radiologically contaminated materials, will be packaged, prepared for shipping, and shipped in a manner that assures protection of the public health and safety during transport.

Materials to be transported consist of the surface equipment, wellheads, and appurtenances as previously described plus associated subsurface well items to be removed during plug and abandonment operations. Also included among transportable materials will be radiological contaminated soil and/or left over liquid.

Packaging, labeling, marking and transportation will be in accordance with the Department of Transportation (DOT) requirements under Title 49 of the Code of Federal Regulations (CFR) parts 170 through 189.

The transportation mode will be commercial trucks. The final destination will be a location designated by Austral for materials which were decontaminated, and an approved disposal site for other materials which could not be decontaminated below levels provided by the Radiological Safety Guides (Appendix A). The one exception is the R-E cable which will go to the NTS for disposal.

The general approach to packing and shipping will involve separate operations for clean and contaminated materials. Large items of clean hardware such as metal buildings will be loaded directly onto flatbed trucks and transported. Smaller miscellaneous items of clean hardware such as fittings, valves, flanges, wrenches, and similar materials located in the buildings will be handled and shipped by Austral personnel. Breakable items such as meters, gauges, and other instruments should be packaged separately within crates appropriately labeled. Clean tubular goods such as line pipe and casing, if any, will be handled in 30' to 40' sections and loaded onto flatbed trucks.

Contaminated items will be handled in a similar manner with packaging and labeling conforming to DOT regulations for hazardous materials. Large items, if any, such as water storage tanks will have all openings sealed, decontaminated externally, and shipped as individual units acting as their own container for contaminated materials. Tubular goods will have open ends sealed and where feasible large diameter sections can be used as containers for smaller diameter pipes. NV Form 152 will be completed on all radioactive material shipments. One copy will be provided each of the following: Shipper, NV Radiation Branch, carrier, Eberline and container packing envelope.

E. BURIAL AND DISPOSAL OF CONTAMINATED MATERIALS AND FLUIDS

It is anticipated that at the conclusion of cleanup operations, there will have accumulated miscellaneous materials plus items of equipment which are either uneconomical to decontaminate or cannot be decontaminated to permit release for unrestricted use. These items plus contaminated soil and fluids will require

packaging as stated in the previous section and disposal at an approved facility.

The ERDA site representative will be advised of the radioactively contaminated materials to be disposed of and he shall coordinate the required ERDA and recipient notifications and/or approvals prior to commencement of transport.

F. WELL AND LOCATION MARKING

Wells R-E and R-EX will be appropriately marked by the monuments as prescribed by the Colorado Oil and Gas Conservation Commission rules and regulations.

Well R-E will be further marked by a monument including a plaque denoting the sites historic significance and stating the restrictions imposed against subsurface drilling within a prescribed area and depth.

The inscription on the plaque will read:

> Project Rulison
> Nuclear Explosive Emplacement Well (R-E)
>
> Site of the second nuclear gas stimulation experiment in the United States. One 43 kiloton nuclear explosive was detonated in this well 8,426 feet below the surface on September 10, 1969.
>
> No excavation, drilling, and/or removal of subsurface materials below a depth of 6,000 feet is permitted within Lot 11, NE 1/4 SW 1/4, of Section 25, Township 7 South, Range 95 West, 6th Principal Meridian, Garfield County, Colorado, without U. S. Government permission.
>
> U. S. Energy Research and Development Administration
> August 1976

IV. RADIOLOGICAL SAFETY PROGRAM

A. PURPOSE

The purpose of this section is to establish general guidelines, methods, and standards to ensure that cleanup operations are conducted in a manner (1) that precludes radiation exposure to participating personnel or the public, (2) that does not add significant radiological contamination to the Rulison site or adjacent surfaces, and (3) that is technically and economically practicable.

B. RADIOLOGICAL CONDITIONS

The radiological condition of the Rulison site was documented by a comprehensive document titled "Rulison Site Cleanup Report, NVO-136" of September 1973. At that time, no external radiation levels were above ambient background on the site. Surface equipment is not known to be externally contaminated, however, internal areas of this equipment are (or are presumed to be) contaminated with low-level amounts of tritium. Surface water at the site was not contaminated. As of July 1972, there were only three soil samples out of a total of 426 that indicated greater than 0.030 uCi/ml residual tritium in soil moisture -- the specific concentrations were 0.034, 0.035, and 0.047 uCi/ml. These samples are now expected to be less than the 0.030 uCi/ml guide as a result of the affect of time and weather. There are no alpha or gamma emitting contaminates at the Rulison site.

C. SAMPLING AND DECONTAMINATION PROCEDURES

1. General

The containment of all liquids that could possibly be contaminated with tritium above the limits stated in this Section will be a basic work concept. Liquids will be released for disposal on the basis of radio-

chemical analysis. The analytical laboratory capability established at the Rio Blanco site will be used to analyze water, soil, and swipe samples to support the Rulison site effort. Both surface and subsurface work will be radiologically monitored by the Eberline Instrument Corporation.

Sampling and identification tasks are based upon the assumption that all decontamination will be accomplished on-site. The general approach will be to first designate clean and contaminated holding areas. Next, survey materials that have not been in contact with radioactive liquids or gases and move them to the clean holding area. A release log will be maintained in the clean area describing each item and identifying its radiological condition. Disassembly operations and radiological monitoring will take place concurrently so that the radiological condition of the equipment may be identified. All liquids from the decontamination and disassembly operations will be contained and monitored to determine proper disposal method. Materials will be moved to the appropriate holding area and properly labeled. The cable removed from R-E will be assumed to be contaminated. It will be monitored with portable instruments but not sampled and shall be properly packaged and shipped to the NTS for disposal as contaminated waste.

A final site survey shall be performed prior to release of the site. A report of the cleanup effort and survey results will be prepared and submitted in accordance with ERDA Appendix 5301, Part VI. A description of physical and legal measures taken to prevent deep drilling and mining or other prohibited use of the site will be included. Documentation in NVO-136 (September 1973), where not affected by work done pursuant to NVO-174, will be included in this survey and report by reference.

2. Soil Sampling Program

The collection of soil samples will be limited to locations of known or possible spill areas and to the locations that were above 0.030 uCi/ml tritium in soil moisture in July 1972. The first samples will be taken at the suspected source. If significant contamination is detected, sampling will continue outward on a radial pattern until that area is fully documented. All samples will be analyzed for tritium. All samples will be taken from the surface only unless a positive analysis indicates a need for subsurface information. Sample collections will be scheduled to follow the completion of other work in each area. An estimated 25 samples will be taken.

3. Water Sampling Program

The only water on the site that could possibly be contaminated is that which might result from decontamination or abandonment work. If water is produced from the wells, it will be sampled and analyzed for tritium. Water from the creek and spring on site will be analyzed downstream upon work completion.

4. Site Exposure Rate Survey

The disturbed areas (pads and tank areas) will be surveyed on a 50 foot grid. Areas of known or possible contamination will be surveyed on a 10 foot grid. These surveys will be made at 1 cm distance with an EIC HP-210 probe having less than 7 mg/cm^2 of absorbent material.

5. Decontamination and Release Program

a. Three areas will be designated and delineated: a decontamination area, a "clean" holding area, and a contaminated material holding area.

(1) Decontamination Area

The facility for decontamination will be limited to a large open-air metal pan with sump. Detergents and solvents will be used direct and with steam application. Harsher methods will not be used and should not be necessary.

(2) Holding Areas

As the names imply, the "clean" and contaminated holding areas will be roped-off areas used to hold uncontaminated and contaminated items, respectively, for disposition. Items of material and equipment will be partially dismantled and surveyed in place. If they meet the release criteria, they will be so marked and be moved to the "clean" holding area; if not, they will be moved to the decontamination area. After a reasonable decontamination effort, an item will be surveyed again. If it now meets release criteria, it will be so marked and be moved to the "clean" holding area; if not, it will be properly marked and moved to the contaminated material holding area. Items in the "clean" holding area will be available for return to unrestricted use by owners. Those in the contaminated material area will be disposed of as contaminated waste.

b. Items of equipment having inaccessible interiors will initially be flushed through with steam and appropriate cleaning solutions. When the exiting flush materials are below detection sensitivity for tritium, the item will be set aside for a 24-hour waiting period. As a final check for tritium following the 24-hour waiting period, an appropriate amount of distilled "clean" water (commensurate with the size of the

internal area being checked, but not to exceed one (1) liter), will be placed in contact with a portion of the surface being tested, e.g. pouring a liter of water through a pipe or allowing one liter of water to puddle on the inner surface of a tank for minimum of 30-seconds. Most of this water will be collected and one cc aliquot analyzed for tritium. If the concentration of tritium in this sample exceeds 5000 dpm/ml, then the item will be considered unfit for release.

In addition, representative wet swipes and beta sensitive contact reading (dpm/100 cm^2) using a portable instrument having less than 7 mg/cm^2 of absorbent material will be taken (and recorded) of the accessible inner and outer portions of the item being tested.

c. A release log will be kept to record the release of all material from the site. Criteria for release to unrestricted use will be that stated in this Section which now includes a reference to the American National Standard Institute proposed standard ANSI N328-1976, "Control of Radioactive Surface Contamination on Materials, Equipment and Facilities to be Released for Uncontrolled Use" and the special criteria for internal inaccessible surfaces in item b above.

d. Items of materials and equipment or waste not released to unrestricted use will be shipped to an approved disposal site. Packaging and shipments will be in accordance with DOT regulations. Probable Transportation Group is IV. A packaging exemption will apply because packages will contain radioactivity in small amounts and classed as low specific activity as defined by the DOT. Shipments will be unclassified.

e. Waste liquids from the major decontamination and the R-E well abandonment effort will be pumped down the R-EX well. Plugging of the R-EX well will not start until the major decontamination effort is finished. Subsequent waste water will either be barreled or disposed of as steam if it exceeds the criteria for release cited in this Section.

6. R-E Well Circulation Fluid

While this circulation fluid is removing stemming material, the fluid will be continuously contained and will be sampled at every 400 feet of stemming removal at its discharge port into the containment tank -- a total of 5 samples. The samples will be analyzed for tritium and gamma scanned. If results indicate the presence of nuclides not naturally occurring, further analyses may be required. In addition, the radiation level of the stemming containment tank in use will be continuously monitored for beta-gamma emissions with a portable gamma instrument. If an unlikely abnormality is discovered the ROS will be consulted and operational direction developed.

7. Gas Sampling

Lawrence Livermore Laboratory (LLL) will furnish bottles and shipping containers for the required gas samples. Gas samples will be taken of any pressure bleed down expected to release more than 2 cubic feet (STP) of gas. Estimated quantities of gas released (STP) will be furnished by the Austral representative to Eberline who will record for effluent reporting purposes.

D. OPERATIONAL CONDITIONS

1. Abandonment operations will occur in warm weather so that progress is not impeded by freezing conditions.

2. All operating personnel (normally those handling or controlling the handling of contaminated material) will submit a urine sample to Eberline before the onset of operations or upon an individuals arrival on-site and upon

permanent departure from the site. Eberline will assay the samples for tritium and any other analysis deemed appropriate by the ROS. A report of these analyses will be submitted to the NV Radiological Branch after the completion of the project.

3. Personnel participating in abandonment activities will not require dosimetry unless they are working with calibration or other sources.

4. Combustible wastes having insignificant contamination will be burned on-site consistent with State of Colorado requirements.

5. Moisture in soil samples will be analyzed for tritium with a detection sensitivity of 2 pCi/ml.

6. The nominal gamma scan detection sensitivity will be 1 pCi/g based on the energy of ^{137}Cs.

V. GENERALIZED SITE ACTIVITIES

A. COMMUNICATIONS

The existing telephone system at the Rulison site will be maintained by Austral. The users shall bill the toll call charges to their respective organizations.

B. VEHICLES

Project participants will be responsible for providing and maintaining their own vehicles.

C. GENERAL OPERATIONAL AND LOGISTICS SUPPORT

Austral will provide the following general logistical and operational support as required. Some of these requirements are:

1. Workover Rig (pulling unit)
2. Miscellaneous Items
3. Potable Drinking Water
4. Electrical Power
5. Fire Protection
6. Sanitary Facilities
7. Access Road Maintenance
8. Pumps and pressure systems for decontamination fresh water supply.
9. Steam cleaner

D. OCCUPATIONAL HEALTH AND SAFETY

1. General

All operations and activities will be conducted in accordance with the standards of the Occupational Safety and Health Act of 1970 (OSHA).

All participating organizations are responsible for the health and safety of their own personnel and for conducting all activities in accordance with procedures that assure:

a. A safe and healthful environment for the employees.

b. Control and minimization of hazards to the public and to personnel of other participants.

c. Minimization of the accidental damage or loss of equipment, materials, and property.

2. First Aid

ERDA will provide each participating agency contacts with local medical facilities and physicians in the Grand Junction, Rifle, and Meeker areas for use in the event of occupational accident or occupational illness. However, each individual or organization will be responsible for their own medical bills. Emergency transportation of injured persons of all agencies to a medical facility will be provided by Austral. ERDA will arrange for and provide first aid supplies as approved by a physician. These supplies will be controlled and maintained by Eberline.

3. Fire Protection

Austral will provide hand-operated fire extinguishers at the well locations at points convenient to each significant structure or piece of equipment. Extinguisher types will be varied and sized for control of Class A, B, or C fires, as appropriate.

4. Sanitation

Austral will provide potable water for drinking. One chemical toilet will be provided and serviced as required. Solid wastes will be disposed of in accordance with local regulations.

VI. ENVIRONMENTAL IMPACT ASSESSMENT

An environmental assessment was prepared in accordance with the requirements of Title 10, part 11, of the Code of Federal Regulations, dated February 16, 1974, which prescribes the procedures to be followed for ERDA implementation of the National Environmental Policy Act of 1969. The purpose of this assessment is to present a brief description of activities proposed for the Rulison site abandonment and an evaluation as to whether or not an Environmental Statement need be prepared.

It is the determination of the assessment that the requested action does not constitute a major federal action significantly affecting the environment in the sense of the National Environmental Policy Act of 1969, Section 102(2)(c).

This assessment is available from the Industrial Applications Division, Nevada Operations Office of the U. S. Energy Research and Development Administration, Las Vegas, Nevada, 89114.

VII. PUBLIC INFORMATION AND OPEN FILES

A. GENERAL

For general policy guidance, the following will apply to the Project Rulison site abandonment operation.

1. News Announcements

   a. A comprehensive public announcement will be made in advance of Austral seeking approval from state and Federal agencies on the well plugging and site abandonment plan. The announcement will include start-up date and estimated completion date. No other announcements are planned.

   b. All accidents and incidents of consequence will be reported publicly as soon as possible and will be reported to the NV Office of Public Affairs.

   c. An incident involving the unplanned release of any radioactive material, or deviation from planned procedures involving radioactive material will be reported to the NV Office of Public Affairs.

2. Briefings and Meetings

   a. State officials will be informed prior to the first public announcement with a cover letter including the public announcement.

   b. Individual newsmen and officials should be escorted to the site on request and briefed by on-site personnel whenever possible.

3. Open Files

   Upon completion of the site abandonment operations, all final reports will be placed in the Rulison open files.

VIII. CLASSIFICATION AND SECURITY

Basic classification guidance for Project Rulison-related activities is contained in the Classification Guide for the Peaceful Application of Nuclear Explosives (CG-PNE-2, dated March 1973), as supplemented by the Project Rulison Classification Guide (dated April 11, 1969).

The only classified interest remaining at the Rulison site is the nonvolatile radioactive debris in the chimney. This debris is classified Secret, Restricted Data, until analyzed. It is protected by approximately 8,000 feet of overburden.

Periodic site surveillance visits will be conducted.

IX. PROGRAM MANAGEMENT

A. U. S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION/NEVADA OPERATIONS OFFICE (ERDA)

1. General

The ERDA, through the Manager, NV, shall appoint an ERDA Project Director responsible for all project-related activities. The ERDA Project Director shall further establish and staff the necessary elements to satisfy those responsibilities.

The areas of authority and responsibility of the ERDA Project Director are as follows:

a. Administer Contracts E(26-1)-429 and E(26-1)-667 with Austral Oil Company, Inc., for well plugging and abandonment activities, decontamination and radiological safety programs, and provide general logistical support as described in the appropriate sections of this plan.

b. Provide a drilling engineer from Fenix & Scisson, Inc., (F&S), to assist Austral in the plugging and abandonment operations.

c. Review and certify the provisions for safety of on- and off-site personnel. Radiological operations will be directed by an ERDA Radiological Operations Supervisor (ROS) who will also provide and interpret radiological control and documentation criteria to the Project Director.

d. Approve all major changes to this plan.

e. Coordinate the on-site activities of Austral, Eberline Instrument Corp., F&S and ERDA.

2. Field Operations

The ERDA Project Director will be represented on-site by individuals with the following areas of responsibility and authority:

a. An ERDA Project Engineer will be responsible for the general day-to-day coordination of the Austral well plugging and abandonment, surface cleanup and logistical support effort and coordination of all radiological related support (i.e. decontamination, monitoring and sampling) with the Radiological Operations Supervisor. Additional responsibilities include, but are not limited to, keeping the Project Director advised of the daily status of the work.

   The Project Engineer shall have authority to make ERDA program execution decisions as required to expedite project accomplishment.

b. An ERDA Radiological Operations Supervisor (ROS) shall have the responsibility for the technical direction of the Eberline radiological support effort and to assure that the support efforts are in accordance with the program requirements. He shall keep himself continuously informed of the radiological conditions, keep the Project Engineer advised of the status of the radiological operations and assist the Project Engineer in the coordination and interface of the Eberline radiological support for the several categories of site abandonment activities.

   The ROS will maintain a daily log of significant events and provide other guidance as required on the reports and other areas of the radiological operations.

B. AUSTRAL OIL COMPANY, INC.

Austral, under contract to the ERDA, will appoint a Project Manager to work with ERDA and Eberline. This individual, or his designee, will be responsible for coordination of this plan with the Water Quality Control Division and the Oil and Gas Commission of the State of Colorado and appropriate Federal agencies such as the U. S. Geological Survey. Austral will be responsible for the direction of all well plugging and site abandonment activities as required, including procurement of all materials and services (including radiological safety services) required for the field operation. Austral will also be responsible for providing advice to the Eberline Instrument Corporation and ERDA regarding the best plug and abandonment procedures for the most economic methods of accomplishment.

The Austral Project Manager may delegate his authority as required for efficient operation of the project and will provide the staff necessary to satisfy the Austral responsibilities.

The Austral Project Engineer shall keep the ERDA field representative advised of the daily activities.

The Austral Project Engineer has the authority to suspend site activities and initiate emergency procedures if, in his judgment, any operation in progress jeopardizes the safety of personnel in connection with the conduct of the program.

C. EBERLINE INSTRUMENT CORPORATION

Eberline, under contract to Austral, will provide an On-Site Supervisor to direct the radiological safety monitoring, decontamination activities, and sampling program during operations. This Supervisor will be responsible for the direction of his staff and coordination of daily activities with ERDA and Austral.

D. FENIX AND SCISSON, INC. (F&S)

F&S will provide a drilling engineer to assist Austral with the well plugging and abandonment operations.

F&S will prepare an as-built report on the R-E and R-EX wells at the completion of plug and abandonment operations.

X. TECHNICAL REPORTING

Certain reports will be required during and after the field operations. These reports will document the progress of the program while underway and the results when completed. The reports required and the responsible organization follow:

A. AUSTRAL REPORTING OF WELL PLUGGING AND SITE ABANDONMENT

1. Austral will provide the ERDA Project Engineer a brief, daily report of field operations. This report should contain all information pertinent to the field operation for the past 24 hours, or for the period 8:00 a.m. to 8:00 a.m., including any significant problem areas delaying the operation.
2. Austral will provide for all reporting required by the State of Colorado and the U. S. Department of the Interior, U. S. Geological Survey, etc., and shall coordinate its radiological operations with the ERDA ROS.
3. Austral will provide technical data on all well plugging and abandonment work in sufficient detail to permit F&S to prepare as-built reports to be included in the ERDA Final Site Abandonment Report.

B. EBERLINE REPORTING OF RADIOLOGICAL OPERATIONS

1. Eberline will provide the ERDA ROS a brief narrative daily report of field operations. This report should contain information on the radiological progress for the past 24 hours, or for the period 8:00 a.m. to 8:00 a.m., including any significant problem areas delaying the operation.
2. Eberline shall also provide Environmental Monitoring Summary Reports to fulfill the requirements of ERDA Manual Chapter 0513 and the Contamination Clearance Report, as required by ERDA Manual Chapter 5301.

C. ERDA FINAL SITE ABANDONMENT REPORT

ERDA will prepare a final report which will record the site status at the conclusion of abandonment procedures and the final disposition of all project facilities, equipment and material as well as recording the "as built" status of all wells at the completion of plugging.

XI. LONG-TERM RADIOLOGICAL SURVEILLANCE PROGRAM

A. HYDROLOGY

A Hydrologic Program Advisory Group (HPAG) reviewed the hydrologic monitoring program proposed for the Rulison site at a meeting in December of 1971. They found the program adequate and recommended its immediate initiation. The U. S. Environmental Protection Agency's Environmental Monitoring and Support Laboratory, (EPA/EMSL), Las Vegas, Nevada, has been conducting the monitoring program since that time.

1. Sampling points

The sampling points, as shown in Figure 8 are listed below:

a. Battlement Creek at the nearest down gradient accessible location in T7S, R95W, Sec. 15 SE 1/4 NE 1/4.

b. Two private wells in alluvium on Morrisania Mesa.

Locations:

(1) T7S, R95W, Sec. 10 NE 1/4 SE 1/4 NW 1/4 (Lee Hayward Ranch).

(2) T7S, R95W, Sec. 3 SW 1/4 SE 1/4 SE 1/4 (Glen Schwab Ranch).

c. Water supply springs for Grand Valley located at: T7S, R95W, Sec. 5 SE 1/4 SW 1/4 SE 1/4.

d. Two springs and two wells located close to surface ground zero:

(1) Well: T7S, R95W, Sec. 20 NE 1/4 NW 1/4 NW 1/4 (Albert Gardner Ranch).

(2) Well: T7S, R95W, Sec. 6 NE 1/4 SE 1/4 SE 1/4 (Felix Sefcovic Ranch).

(3) Spring: T7S, R94W, Sec. 4 SW 1/4 SE 1/4 NW 1/4 (Bernklau Ranch).

(4) Spring: T6S, R94W, Sec. 31 NW 1/4 NW 1/4 NW 1/4 (Potter Ranch).

e. The Austral well located in T7S, R95W, Sec. 14 SW 1/4 SW 1/4.

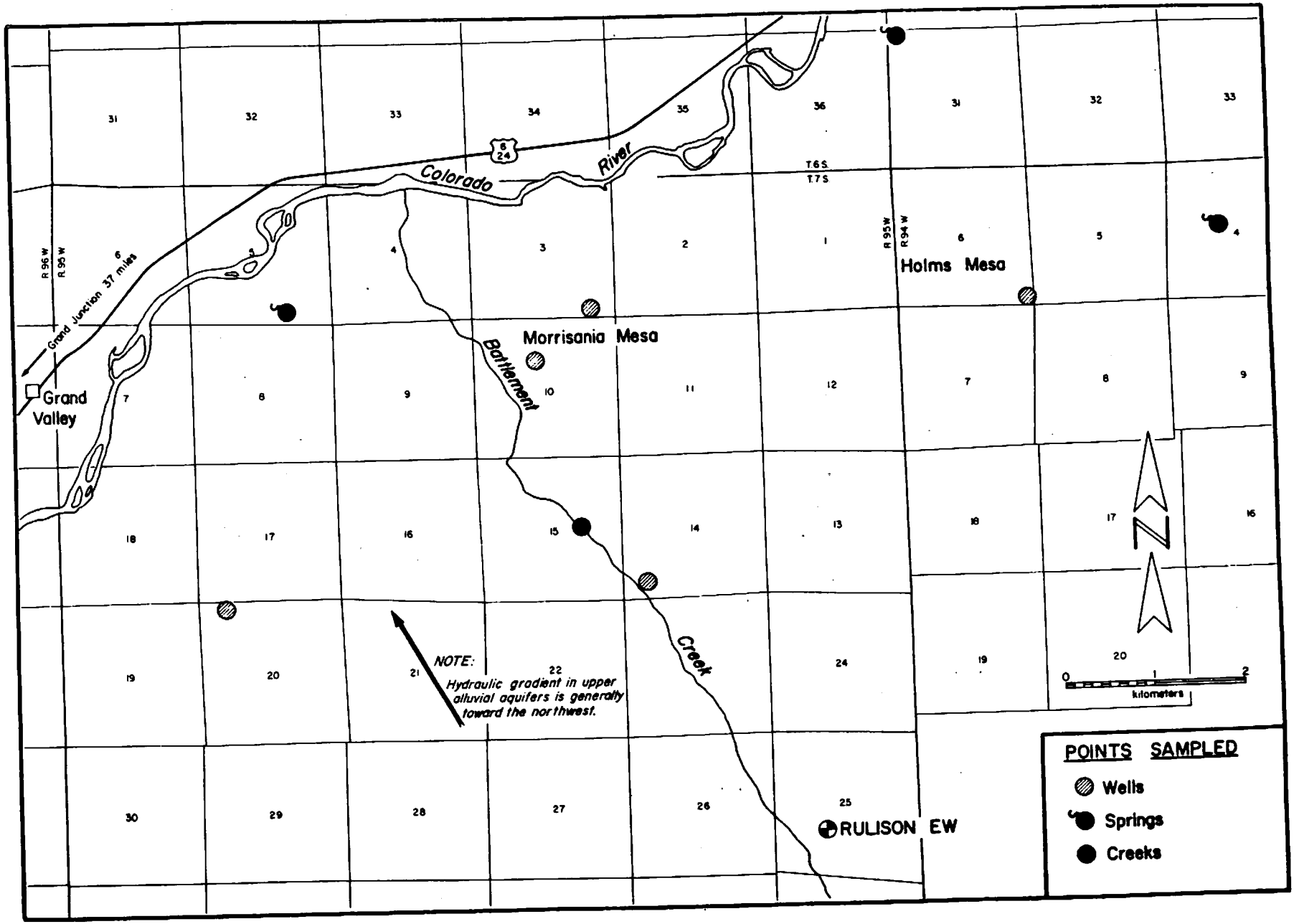


FIGURE 8 HYDROLOGIC SAMPLING POINTS - RULISON

2. Sample Analysis

Unless otherwise specified, all samples are analyzed for tritium using a technique with a detection sensitivity of 150 tritium units.* All samples are analyzed for gross alpha and gross beta radioactivity and are given a gamma spectral scan. Gross chemistry analyses, comparable to the USGS chemical water quality analyses, were performed on all samples collected on the initial sample run. Based on the results of these analyses, suspect samples will be analyzed for appropriate naturally occurring and man-made isotopes. Splits of each sample collected will be retained by EPA/EMSL for this purpose until it is demonstrated that the need to retain them does not exist.

3. Frequency

Each water source is sampled once a year, preferably in the early spring, weather permitting.

4. Reports

The initial annual report will continue to contain but not be limited to the following:

a. A description of the basic hydrologic system.

b. Pertinent historic data including prediction of groundwater contamination and event effects.

c. Description of sampling network.

d. Results.

e. Explanation of results.

f. Evaluation of the program.

g. Suggested modifications for program improvements.

*One tritium unit equals 3.3 pCi/ℓ

Subsequent annual reports need only address items number c through g unless data are obtained which changes the basic hydrologic concepts.

5. Duration

The monitoring program is to continue until, based on the results, a decision is made by ERDA/NV to terminate monitoring for any or all of the water sources.

B. BIOENVIRONMENT

No need for monitoring the bioenvironment of this site on an annual basis has been demonstrated. Therefore, until such time as the monitoring of surface or groundwater indicates a reason for collecting and analyzing samples of the plant and/or animal species of the area, no collection will be made.

C. LAND SURFACE AND SOILS

No requirement for radiation monitoring instrument surveys or analysis of soil samples on an annual basis has been demonstrated. Therefore, until such time as the monitoring of surface or groundwater indicates a reason for these types of surveillance, none will be made.

ADDENDUM TO
APPENDIX A

RADIOLOGICAL SAFETY GUIDES*
PROJECT RULISON

The following guidelines apply to Project Rulison. It is recommended that design and operational activities be conducted within these guidelines in such a manner as to reduce the release of radioactive effluents and radiation exposures to personnel, on- and off-site, to the lowest practicable levels. Further, with respect to planned operations and any associated controlled releases, exposures to members of the public should not exceed 10 percent of the limits specified in ERDA Appendix 0524. For situations involving inadvertent or accidental releases, the overall design of the experimental program should be carefully reviewed to ensure that during the lifetime of the project, there will be no significant uncontrolled release of radioactivity off the controlled area.

A. General Radiological Criteria

The following radiological safety criteria shall apply during the entire operation period of these projects:

1. For individuals within the controlled area, the radiation protection standards set forth in ERDA Appendix 0524, paragraphs I-A and IV shall apply.

2. For individuals and population groups in uncontrolled areas, 10 percent of the radiation protection standards set forth in ERDA Appendix 0524, paragraph II-A shall apply. It is noted that the potential for radiation exposure to individuals in the uncontrolled area from planned operations exists only during the time of production testing (flaring) activities.

*These guides were extracted from letter, Kelly to Miller, April 17, 1972, "Radiological Safety Guidance for Experiments Involving Nuclear Stimulation of Natural Gas Wells," and letter, Biles to Johnson, April 5, 1973, same title, and from American National Standards Institute, ANSI N328-1976.

3. In the unlikely event that an inadvertent release of radioactivity to the uncontrolled area occurs, every effort shall be made to reduce potential radiation exposure to individuals off-site to the lowest practicable level. Exposure control guideline shall be consonant with the principles and levels of protective action guidance provided in Federal Radiation Council Reports 5 and 7.

4. All personal property, i.e. buildings, equipment, and materials, to be removed from the site for uncontrolled use shall meet the criteria specified in Table 1 or Table 2 and the special criteria for internal inaccessible surfaces in Appendix A, Item D.8. All personal property, transferred from this site to another location where radiological controls are in effect, shall have the external surfaces of such property meet the criteria specified in Table 1 or Table 2 and be packaged for transport in compliance with ERDA Appendix 0529.

B. Site Disposal

Decontamination and cleanup, prior to release of control and responsibility for the site by the ERDA, 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 ERDA 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 ERDA 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. Surface Waters

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

2. Buildings, Equipment and Materials

   All personal property remaining at the site shall be decontaminated as near as practicable to the criteria specified in ANSI Standard N328-1976 specifically Table 1 or 2 (attached).

3. Soil

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

   a. Soil containing residual tritium concentrations exceeding 3×10^{-2} uCi/ml of soil moisture shall be excavated for disposition by means approved by ERDA Headquarters.

   b. 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 ERDA 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. All measurements shall be done with a probe having not more than 7 mg per cm^2 of absorbing material.

TABLE 1

SURFACE CONTAMINATION LIMITS[1/]

The levels may be averaged* over the 1 m^2 provided the maximum activity in any area of 100 cm^2 is less than three times the limit value.

Nuclide	Limit (Activity) dpm/100 cm^2 Total	Removable
Group 1: Nuclides for which the nonoccupational MPC_a** is 2×10^{-13} Ci/m^3 or less or for which the nonoccupational MPC_w*** is 2×10^{-7} Ci/m^3 or less; includes Ac-227; Am-241, -242m, -243; Cf-249, -250, -251, -252; Cm-243, -244, -245, -246, -247, -248; I-125, -129; Np-237; Pa-231; Pb-210; Pu-238, -239, -240, -242, -244; Ra-226, -228; Th-228, -230.****	100	20
Group 2: Those nuclides not in Group 1 for which the nonoccupational MPC_a ** is 1×10^{-12} Ci/m^3 or less or for which the nonoccupational MPC_w*** is 1×10^{-6} Ci/m^3 or less; includes Es-254; Fm-256; I-126, -131, -133; Po-210; Ra-223; Sr-90; Th-232; U-232.****	1,000	200
Group 3: Those nuclides not in Group 1 or Group 2.	5,000	1,000

1/Taken from ANSI N328-1976.

* See Note following Table 2 on application of limits.

** MPC_a: Maximum Permissible Concentration in Air applicable to continuous exposure of members of the public as published by or derived from an authoritative source such as NCRP, ICRP or NRC (10 CFR, Part 20, Appendix B, Table 2, Column 1).

*** MPC_w: Maximum Permissible Concentration in Water applicable to members of the public.

**** Values presented here are obtained from 10 CFR Part 20. The most limiting of all given MPC values (e.g. soluble vs insoluble) are to be used. In the event of the occurrence of mixtures of radionuclides, the fraction contributed by each constituent of its own limit shall be determined and the sum of the fractions must be less than 1.

TABLE 2
ALTERNATE SURFACE CONTAMINATION LIMITS[1/]

(All alpha emitters, except U-nat and Th-nat are considered as a group.)

The levels may be averaged over 1 m^2* provided the maximum activity in any area of 100 cm^2 is less than three times the limit value.

Nuclide	Limit (Activity) dpm/100 cm^2 Total	Removable
If the contaminant cannot be identified; or if alpha emitters other than U-nat and Th-nat are present; or if the beta emitters comprise Ac-227, Ra-226, Ra-228, I-125 and I-129.	100	20
If it is known that all alpha emitters are generated from U-nat and Th-nat; and beta emitters are present which, while not identified, do not include Ac-227, I-125, I-129, Ra-226 and Ra-228.	1,000	200
If it is known that alpha emitters are generated only from U-nat and Th-nat; and the beta emitters, while not identified, do not include Ac-227, I-125, I-129, Sr-90, Ra-223, Ra-228, I-126, I-131 and I-133.	5,000	1,000

1/Taken from ANSI N328-1976.

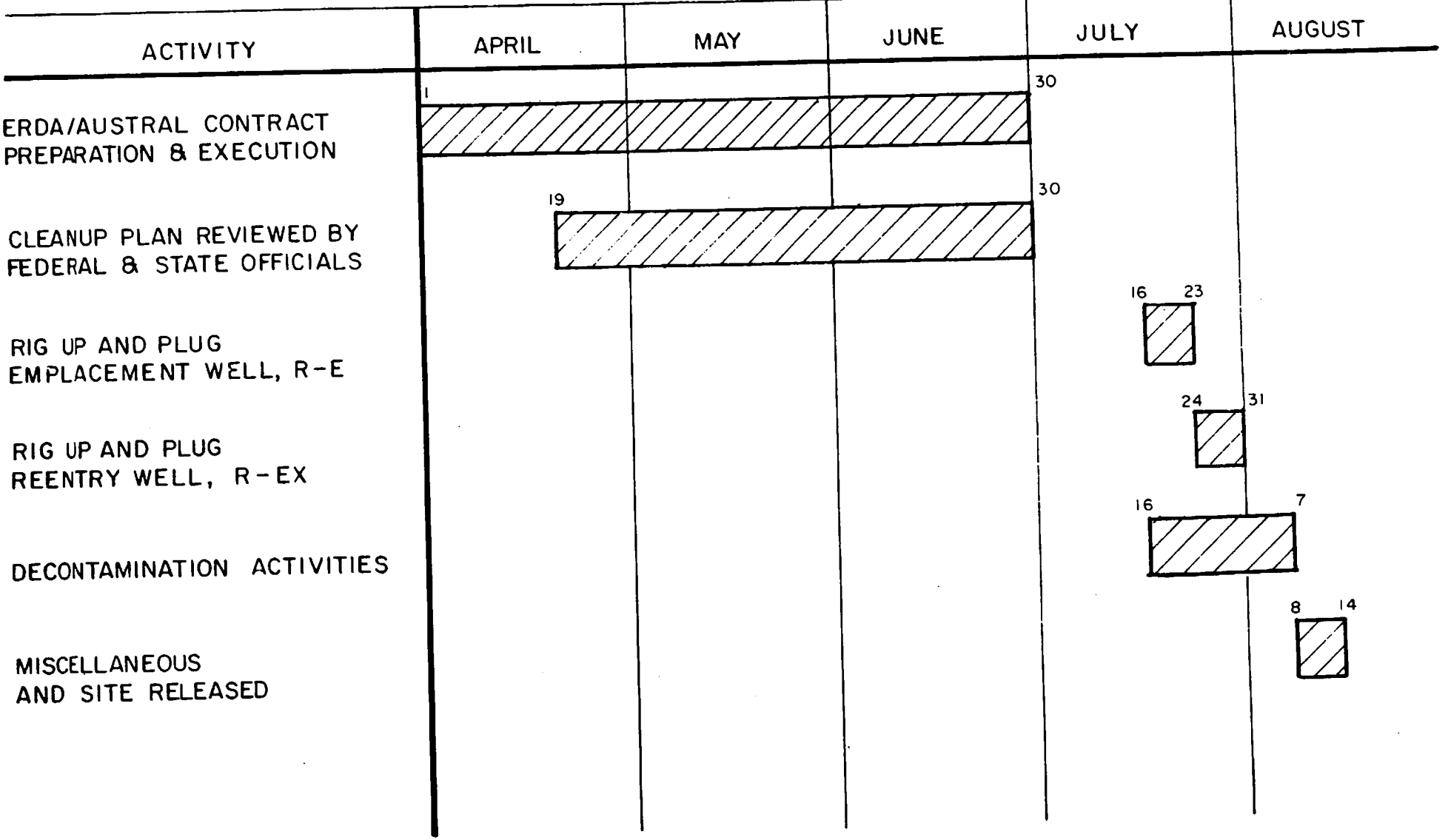
*NOTE ON APPLICATION OF TABLES 1 AND 2 TO ISOLATED SPOTS OF ACTIVITY:

For purposes of averaging, any m^2 of surface shall be considered to be contaminated above the limit, L, applicable to 100 cm^2 if:

a. From measurements of a representative number, n, of sections, it is determined that $1/n \sum_n Si \geq L$, where Si is the dpm/100 cm^2 determined from measurement of section i; or
b. On surfaces less than 1 m^2, it is determined that $1/n \sum_n Si \geq AL$, where A is the area of the surface in units of m^2; or
c. It is determined that the activity of all isolated spots or particles in any area less than 100 cm^2 exceeds 3L.

APPENDIX - B

PROJECT RULISON - SITE ABANDONMENT SCHEDULE



Distribution:

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Capt. A. R. Phillips, DMA, HQ
T. F. Cornwell, DMA, HQ
A. J. Hodges, DMA, HQ (2)
J. Ham, Ofc of AA/FE, HQ
J. W. Watkins, Div. of OG&ST, HQ
D. C. Ward, Div. of OG&ST, HQ
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J. C. Hopkins, LASL, Los Alamos, NM
R. Campbell, LASL, Los Alamos, NM
A. Holzer, LLL, Livermore, CA
L. B. Ballou, LLL, Livermore, CA
P. L. Randolph, EPNG, El Paso, TX
A. E. Doles, EIC, Santa Fe, NM (5)
M. Reynolds, Austral Oil Co., Houston, TX (12)
T. King, Austral Oil Co., Lamesa, TX (2)
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C. H. Atkinson, BERC, Bartlesville, OK
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