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WESTERN NUCLEAR, INC.
JEFFREY CITY, WYOMING

SPLIT ROCK MILL DECOMMISSIONING AND INTERIM SOIL COVER REPORT

To Fulfill Requirements Setforth in SUA - 56 License Condition 28
Parts A, B, and C and License Condition 33 Part A
Docket 40-1162

TEXT AND MAPS

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WESTERN NUCLEAR, INC.

SPLIT ROCK MILL

DECOMMISSIONING REPORT

OCTOBER, 1989

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I. INTRODUCTION AND EXECUTIVE SUMMARY

On November 30, 1987 Western Nuclear, Inc. (WNI) submitted to the U. S. Nuclear Regulatory Commission (NRC) and the Wyoming Department of Environmental Quality (WDEQ) a plan for the decommissioning and dismantling of the Split Rock Mill located two miles north of Jeffrey City, Wyoming. On April 18, 1988 the NRC issued Amendment 42 to WNI's Source Materials License SUA-56 approving the decommissioning plan.

A bid specification package was assembled and sent to potential bidders on April 27, 1988. After several site visits and meetings, Cook's Fabrication, Inc. (Cook's) of Mills, Wyoming was selected as the successful contractor. A contract was signed with Cook's on June 1, 1988 to decommission the Split Rock Mill complex.

Prior to the commencement of the decommissioning activities, numerous pre-decommissioning projects were completed. Included in these projects were the removal and disposal of all hazardous/toxic materials, stripping all asbestos from the mill and acid plant buildings and pipes, de-energizing the electrical power from the facility and providing alternate power for the fire protection systems, cutting and capping the natural gas pipe lines, removal of fuel tanks and performing all the required radiological surveys. All radiation and industrial safety supplies were obtained, and work was started on the writing of twenty six Radiation Work Permits (RWP). Ground surveys were performed to identify the boundaries of the burial areas and grade stakes set to control burial height. The maintenance facilities located in the mill complex were moved to the old truckshop area.

An eight hour radiation/industrial safety and health program was conducted by WNI for the construction crew on June 13, 1988. Actual decommissioning activities were started on June 14, 1988 and were completed on September 14, 1988. During this thirteen week period, in excess of 600,000 cubic feet of material was placed into the designated burial areas. Cook's crew size ranged from a high of eighteen employees to a low of four. Scheduled work weeks consisted of four ten hour days, Monday through Thursday.

The physical dismantling of the facility was accomplished by using oxygen/acetylene gas cutting equipment and the following pieces of mobile equipment:

- 1- Ford 7500 Backhoe/Loader
- 1- Case W-36 Front End Loader
- 1- 1 1/2 yard Hydro-Unit Trackhoe
- 1- Fiat-Allis HD 31 Dozer
- 2- Kenworth 5 yard End Dump Trucks
- 1- Galion 12 ton Crane

The wooden tongue and groove mill roof was removed by using gasoline engine powered circular saws. All equipment and structures were wetted down prior to any dismantling being performed and were kept wet during the entire operation.

Generally, the dismantling sequence for any specific building was as follows. First, the outer metal siding was removed by using oxy/acetylene cutting equipment, impact drivers, or power screwdrivers. The panels were allowed to fall to the ground where they were stacked and tied into bundles.

The insulation was rolled and also tied into bundles. Once the structural steel and process equipment within the building was exposed, the removal of the various tanks, piping, electrical, and work decks was started. After all the process equipment and materials had been removed from the building the cross support beams (girts) and roof supports (columns) were cut allowing the structural steel frame to fall. After the structural steel frame was reduced to ground level, the individual pieces of steel were cut to length and transported to the burial site.

The use of mobile equipment was maximized to decrease the time of dismantling and to minimize worker exposure to dusting and to reduce physical contact with contaminated process equipment. Upon removal from the building, each piece of process equipment was transported to a predetermined burial location where final dismantling occurred. Whenever possible, the larger pieces of process equipment such as the leach tanks, drag classifiers, chemical makeup tanks, solvent extraction vats, and roasters were moved intact to the burial areas in order to reduce transport time, to reduce the accumulation of debris around the work site, and to reduce the possibility of spreading contaminated material throughout the work site.

The material from treasure island was loaded onto end dump trucks with a Case W-36 front end loader and transported to the burial site. After all the material was removed from treasure island a gamma survey was performed and an additional nine cubic yards of contaminated soil was identified, removed and placed inside the vault burial area.

During the activity there was one lost-time industrial accident and one non-industrial related fatality. There were no cases of radiological overexposure as all conditions of the RWPs were strictly enforced and manual handling of highly contaminated pieces of process equipment was minimized through the extensive use of machinery.

Daily safety huddles were conducted by WNI with the crews prior to the beginning of each shift. Special attention was given to hazard recognition, radiological awareness and safety, radiological and industrial safety equipment that was available and instruction in its proper use, and the importance of washing hands prior to eating or drinking. Overall, the safety programs were effective although strict supervision was required from the Jeffrey City staff.

One site inspection was made by the Wyoming Deputy State Mine Inspector. No inspections were conducted by the NRC or WDEQ. Two internal ALARA audits were conducted by an outside consultant during the decommissioning activities. No major problems were disclosed during either audit.

During the decommissioning, at least one WNI representative was present at the work location at all times. Extensive photographic documentation was collected as the decommissioning progressed. An extensive burial site inventory was maintained daily and particular attention was paid to the burial location of the larger pieces of plant equipment and the solvent extraction circuits. Close attention was paid to the elevation of the burial areas and weekly surveys were conducted to ensure all material was below the specified elevation of 6353 feet MSL in order to allow sufficient room for placement of the interim cover.

Western Nuclear's NRC Source Materials License SUA - 56, Amendment No. 50 License Condition 28.B states:

" All decommissioning wastes which are placed in the millsite "burial" area as described in the November 30,1987 submittal shall be covered by a minimum 1 foot of soil cover no later than September 30,1989."

On March 31, 1989 WNI submitted to the Nuclear Regulatory Commission the "Reclamation Plan - Revision No. 2, Uranium Tailings Disposal Area" prepared by Canonie Environmental of Englewood, Colorado. Appendix "F" of this report detailed the extent and technical specifications for the interim soil cover to be placed over the millsite burial areas.

In June, 1989 a technical specification and bid document was distributed to numerous construction firms. Site visits and scoping meetings were held with the bidders prior to the final selection of the successful firm. Salveson Construction, Inc. (Salveson) of Casper, Wyoming was selected to perform the work. Inberg - Miller Engineers of Riverton, Wyoming was selected to perform the geotechnical evaluation and material testing of the interim cover material.

On July 21, 1989 Salveson began the mobilization of equipment to the site. An eight hour radiation/industrial safety and health training program was conducted by WNI for the construction crew on July 24, 1989. Actual work started on July 25, 1989 and was completed on September 12, 1989. The construction and maintenance crews ranged in size from a high of nine employees to a low of four employees. The work schedule was four ten hour days per week with maintenance performed during the off shifts. Most Fridays and some Saturdays were utilized for the application of construction water and to perform various types of surveys.

Equipment used on the job consisted of the following:

1- 12 G Caterpillar Motor Grader
1- D 8 H Caterpillar Dozer
2- Terex TS-24 Self-Loading Scrapers
1- Terex TS-14 Self-Loading Scraper
1- Terex S-24 Waterwagon
1- Bantam C-336 1-1/2 yard Trackhoe
Various support and maintenance equipment

During the project at least one WNI representative was present at the work locations at all times to ensure proper safety measures were being employed, the material was being placed in the correct location, to monitor the depths of cut and fill and to supervise the compaction density testing. Throughout the duration of the work, inspection and testing of all earth moving was performed by WNI's representative to ensure that specified materials were emplaced and compacted in the accordance with the Reclamation Plan.

Prior to the removal of the material, a detailed radiological survey was conducted by the Jeffrey City staff to delineate the boundaries of the windblown tails. During these surveys, particular attention was paid to the discovery of any archaeological or historical artifacts. An intensive archaeologic and historic survey was performed in this area in 1979 with no significant discoveries being made. WNI's observations supported this earlier survey.

The extent of the windblown tails and the limits of the borrow areas were flagged in preparation for contract land survey crews performing the initial baseline surveys.

Removal of the windblown tails was started on July 25, 1989. The tails were transported, via self-loading scrapers, to the old abandoned southern tails basin where the vegetative matter was separated from the tails. The separated vegetative matter was allowed to dry, stacked and burned. The resulting ash was then buried in a shallow pit to prevent windblown distribution. The clean tails were laid down in six inch non-compacted lifts.

During the removal of the windblown tails, frequent gamma surveys were performed by the Jeffrey City staff to ensure that all the tails material was being removed and that all noncontaminated topsoil was left in place for future removal.

After removal of the windblown tails from the borrow area was completed, removal and storage of the topsoil was started. Topsoil removal was essentially completed on August 8th. The topsoil stockpile was then stabilized with a hydromulch mixture consisting of 3000 pounds of wood fiber, 100 pounds of barley seed, 100 pounds of fertilizer, and 60 pounds of a tackifier.

The interim soil cover was then transported to the millsite and placed over the exposed debris and the burial areas. The fill was laid down in 4 inch lifts, wetted and compacted to a minimum of 95% Standard Proctor. Material density was determined by the nuclear inplace density method and correlated to sand cone separation analysis. Any area that failed to reach density specifications was rewetted and further compacted until specifications were obtained. The fill material, being a relatively homogeneous fine-grained sand, met or exceeded the density specifications without the use of specialized compaction equipment or the application of excessive water. Construction water was obtained from the Sweetwater River by permit from the Wyoming State Engineers Office issued to Salveson Construction.

The placement of the interim cover was completed on August 30, 1989. Post-placement gamma surveys, using an Eberline PRM-7 Micro-R meter, conducted over the interim cover yielded readings of less than 25 uR/hr.

Final land surveys were performed by both WNI and the contractor on September 2-4, 1989 on the borrow areas, fill areas, topsoil stockpile, and windblown tails. Total material moved during the project was 98,959 cubic yards. Of this total amount, 70,036 cubic yards of clean fill material was placed over the millsite and plant equipment burial areas, 19,236 cubic yards of topsoil was salvaged and stabilized and 9,688 cubic yards of windblown tailings were moved to the old abandoned tails area. Interim cover placement in the millsite averaged 5.01 feet in thickness with a maximum cover of 21.00 feet and a mininum cover of 1.00 foot.

Daily safety huddles were held with the construction crews prior to the beginning of each shift. The equipment operators were advised as to the traffic patterns to use that day, reminded to scan before eating and special radiological hazards were discussed. The safety program was successful as the contractor did not experience any industrial related accidents nor were there any cases of radiological overexposure.

One site inspection was conducted by the Wyoming Deputy State Mine Inspector with no citations being issued. One unannounced routine NRC inspection was conducted with no citations being issued. No inspections were conducted by the WDEQ. Due to the nature of the work being performed and the low risk factor of radiological exposure to the crews, no ALARA audits were conducted by outside personnel.

Photographic documention of the removal and placement of the windblown tails, topsoil, and interim cover was maintained throughout the project.

Interim stabilization of the millsite cover, windblown tails, and certain portions of the borrow area was accomplished by the utilization of wind fencing. Approximately 15,000 linear feet of fencing was installed over these areas.

In general, the Jeffrey City management is pleased with the performance of both construction firms. Throughout both projects, frequent alterations were made to the original plans in order to adapt to changing site conditions and to better utilize the available equipment and resources and not "force- fit" the work progress or schedule to any particular portion or sequencing of the original plan. These alterations were accepted, and in some cases suggested, by the contractors in a unified effort to complete the work in a timely fashion and within design specifications. Throughout both projects the Jeffrey City staff performed their job functions in an excellent and a professional manner resulting in a safe and efficient operation.

II. PRE-DECOMMISSIONING

PRE-SURVEYS

On April 18, 1988, Amendment No. 42 to condition 28 of NRC Source Materials License No. SUA-56 was issued. This amendment reads in part:

> "Perform pre-surveys of all equipment and facilities being decommissioned to assure that appropriate protective measures are applied to protect workers from undue exposure to radioactive material and any associated toxic material."

Radiation Surveys of the Mill

Gamma surveys were performed to define potential radiological hazards. Specifically, where the gamma exposure rate exceeds 2 milliRem/hour (mR/hr) additional surveys would have been scheduled during decommissioning. However, since the surveys indicated the highest reading was 0.800 mR/hr at the ground floor of the leach circuit, no additional surveys were scheduled during the decommissioning. The area survey results and occupancy time during the decommissioning were correlated with data from the TLD badges used during the decommissioning as specified in the decommissioning submittal. Refer to Section IV.

Beta surveys were also performed to define potential areas where exposure rates exceed 2 mR/hr. These areas included: portions of the classification and wash circuit (5.15 to 21.07 mR/hr), the clarification (make-up and storage) circuit (4.33 mR/hr), the solvent extraction circuit (2.76 to 63.04 mR/hr) and the precipitation/drying/packaging area (2.76 to 14.47 mR/hr). The yellowcake drum weighing scale stored in the reagent warehouse was also surveyed and eminated an exposure rate of 3.15 mR/hr. The exposure rates for these areas were used to develop dismantling techniques that would maximize the use of equipment and minimize manual dismantling thereby reducing or eliminating potential exposure. The exposure rates, where applicable depending on the dismantling procedures, were also used in developing personal protection criteria and in the determination of employee exposure during decommissioning. Refer to Section IV.

Radon daughter surveys were performed to determine locations where the concentration exceeded an action level of 0.04 working levels (WL). Six locations were identified which included: two locations on the ground floor of the leach circuit, two locations by the fine ore bins, next to #4 classifier and the floor of the vault at the foot of the stairs. These locations were subject to sampling on at least a daily basis during the decommissioning until the dismantling activities were completed or the radon daughter concentration fell below the action level of 0.04 WL. Refer to Section IV.

Instrumentation

Gamma surveys were performed using an Eberline PRM-7 Micro-R meter calibrated by an off-site service. Refer to APPENDIX K.

Beta surveys were performed using an Eberline E-140 with a HP-210 probe. In addition to off-site calibration, refer to APPENDIX K, the instrument was calibrated in-house with a strontium/yttrium-90 source to determine the layers of paper required to build a shield that would obtain a reading 1/8th of the open faced reading.

Open and closed face (the probe face was covered with the paper shield) readings were taken of an aged calcined yellowcake source to determine the calibration factor in accordance with NRC Regulatory Guide 8.30 Health Physics Surveys in Uranium Mills.

Radon daughter surveys were performed with a MDA Model 811 Instant Working Level Meter calibrated off-site. Refer to APPENDIX K.

All instruments were performance checked with their respective source(s) prior to each survey. All performance checks were within 20% of the calibration.

Survey Method

Radiation surveys were performed at specific locations within the mill and ancillary buildings. The survey results and locations are listed on their respective forms and plotted on the building drawings. Refer to APPENDIX A.

Gamma: Area surveys were performed using the PRM-7 held at waist level and recorded in micro-Rem per hour (uR/hr).

Beta: The HP-210 probe was held at waist level during the area survey. Open face and a closed face readings were taken. The difference in the readings was multiplied by the calibration factor to determine the beta exposure dose rate. Certain objects were surveyed with the HP-210 probe held 2 cm from the surface. Open and closed face readings were taken and the difference multiplied by the calibration factor to determine the beta exposure dose rate.

Radon Daughters: Samples to determine radon daughter concentration were taken using a MDA Model 811 Instant Working Level Meter and a Bendix BDX 60 constant flow pump calibrated to draw air at 2.5 liters per minute. Each sample was collected on a 25 mm Gelman type AE glass fiber filter mounted in a cassette placed in the samplers breathing zone. The filters were analyzed in the MDA to obtain the concentration of radon daughters in WL.

Following is a summary of the surveys .

LOCATION Vault (includes the fine ore bins)

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	50	0.00	0.01
High	100	0.00	0.11
No. of survey points	3	3	3
Average	72	0.00	0.05

LOCATION DSM Screens

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	80	0.00	0.00
High	160	1.97	0.00
No. of survey points	3	3	3
Average	120	0.71	0.00

LOCATION Shifters Office and Electric Control Room

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	35	0.00	0.01
High	36	0.00	0.01
No. of survey points	2	2	2
Average	35	0.00	0.01

LOCATION Leach Circuit

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	300	0.00	0.01
High	800	1.97	0.07
No. of survey points	10	10	9
Average	570	0.35	0.03

LOCATION Classification and Wash Circuit

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	300	5.15	0.01
High	480	21.07	0.04
No. of survey points	3	4	4
Average	393	14.38	0.02

LOCATION Resin in Pulp (RIP) Circuit

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	100	0.24	0.00
High	200	1.58	0.02
No. of survey points	9	9	9
Average	120	0.72	0.01

LOCATION Clarification (Make-up and Storage) Circuit

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	100	0.78	0.02
High	200	4.33	0.03
No. of survey points	2	8	2
Average	150	1.51	0.02

LOCATION Solvent Extraction Circuit

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	30	0.00	0.00
High	80	63.04	0.01
No. of survey points	4	9	3
Average	68	8.62	0.01

LOCATION Precipitation/Drying/Packaging Area

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	80	0.35	0.01
High	360	14.47	0.01
No. of survey points	13	12	6
Average	185	5.67	0.01

LOCATION Machine and Mill Maintence Shops

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	40	0.00	0.00
High	40	0.00	0.00
No. of survey points	2	2	2
Average	40	0.00	0.00

LOCATION Sodium Chlorate Room

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	50	0.00	0.00
High	50	0.00	0.00
No. of survey points	1	1	1
Average	50	0.00	0.00

LOCATION Acid Plant

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	10	0.00	0.00
High	140	0.00	0.00
No. of survey points	5	5	5
Average	60	0.00	0.00

LOCATION Mill Warehouse and Offices

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	18	0.00	0.00
High	22	0.00	0.02
No. of survey points	5	5	5
Average	20	0.00	0.01

LOCATION Reagent Warehouse

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	24	0.00	0.00
High	100	3.15	-
No. of survey points	3	3	1
Average	68	1.12	0.00

LOCATION Chemical Lab/Sample Prep/Instrument Repair Building

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	20	0.00	0.00
High	100	0.00	0.00
No. of survey points	4	4	4
Average	45	0.00	0.00

LOCATION Fire Protection building

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	60	0.00	0.00
High	60	0.00	0.00
No. of survey points	1	1	1
Average	60	0.00	0.00

LOCATION Electric Shop / Ambulance Barn

	Gamma uR/hr	Beta mR/hr	Radon daughter WL
Low	160	0.00	0.00
High	160	0.00	0.00
No. of survey points	2	2	2
Average	160	0.00	0.00

Radiation Surveys - Treasure Island
A gamma survey was performed at the treasure island location to identify potential radiological hazards and specific equipment or material that would eventually be deposited in the vault burial area. An Eberline PRM-7 Micro-R meter calibrated by an off-site service was used to perform the survey. The instrument was performance checked with a Cesium-137 check source prior to use. The performance check was within 20% of the calibrated value.

The survey was performed along a meandering path beginning at the northeastern end of treasure island and terminating at the southwestern end. The meter was held at waist level during the meander, however, whenever a suspect item was encountered, the meter was held two inches away from the item. Suspect items were identified by above background reading near the item, visible contamination on the item or knowledge that the item was used in an area of the mill where it could have been contaminated. All equipment or material exceeding 100 uR/hr gamma dose rate was identified and marked for subsequent disposal in the vault burial area. All other equipment and material was scheduled to go to burial area No. 9 . Refer to APPENDIX A.

Radiation Surveys - Outlying Areas
A pre-decommissioning gamma survey of areas outside the mill complex buildings but inside the restricted area was completed by a contractor during September 1987. This survey was discussed in Section 3.0 of Revision 1, submitted March 1, 1988, of the WNI Split Rock Mill Reclamation Plan. Figure C-1 from that report is included for reference in this report as MAP DR-4.

Toxic Material Survey
Specific chemicals used in the mill process were identified from the mill operating procedures. Storage vessels and pipelines containing toxic or hazardous chemicals were either marked or identified by their location in the mill complex.
Listed below are the chemicals and their locations.

Sulfuric Acid

A. Acid Plant
   1. Four storage tanks
   2. Reaction towers
   3. Cooling towers
   4. Pipe lines
   5. Molten Sulfur tank

B. Mill
   1. Pipe lines

Note: The sulfuric acid storage tank by the trestle was removed prior to commencement of mill decommissioning activities.

Ammonia

A. Reagent Warehouse
   1. Ammonia Pumps
   2. Pipe lines

B. Mill
   1. Steam operated ammonia vaporizer.
   2. Pipe lines

Note: The three ammonia storage tanks were removed prior to commencement of mill decommissioning activities.

Sodium Chlorate

A. Mill
   1. Storage tanks
   2. Pipe lines

Organic (Kerosene)

A. Solvent Extraction addition to mill.
   1. Make up tank
   2. SX cells
   3. Pipe lines

Note: The Kerosene storage tank outside the SX was removed prior to commencement of mill decommissioning activities.

Laboratory Reagents

All reagents were removed prior to commencement of mill decommissioning activities. These chemicals were disposed of by GSX Services in accordance with all current EPA requirements.

Asbestos

All asbestos material was removed from the acid plant and the mill prior to commmencement of the decommissioning activities. The material from the acid plant was transported to the Fremont County Sand Draw Landfill. The material from the mill was placed into twenty four 40 gallon steel drums and stored in the warehouse until placement into the north fine ore bin during the decommissioning activities.

REMOVAL OF BUILDINGS, EQUIPMENT AND MATERIALS

Between February 6, 1986 and June 11, 1988, buildings, equipment and material were removed from the Split Rock Mill complex by various individuals and companies. All items removed were released in accordance with Attachment No. 1 to NRC Source Material License SUA-56, GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE . This document provides for a gross alpha radiation survey and decontamination (cleaning) if necessary of any buildings, equipment and material leaving the restricted area. This area includes the mill storage areas, mill shops, warehouse, the mill and any other area or building within the boundries of the fence labeled "Restricted Area". Refer to APPENDIX S for the inventory.

Other equipment and material not listed on the inventory which were released in accordance with Attachment No. 1 are described below.

Chemical Marketing Services

Between October 2, 1986 and July 28, 1988, Chemical Marketing Services from Riverton, Wyoming removed various pieces of equipment from the acid plant and mill complex that would meet the requirements of the conditions for release to an unrestricted area. The major items include; a Gardner Denver air compressor and receiver tank, a 25,000 gallon acid storage tank, a stainless steel tank, a 500 gallon fiberglass tank, a 12,000 gallon ammonia tank, a 18,000 gallon ammonia tank, a 30,000 gallon ammonia tank, two steam pumps, a cation-anion water treatment system, two turbines, economizer and the propeller fan with the shroud from the cooling tower. Additional equipment included; chairs, desk, various pipes, valves, fittings and various types of electrical equipment.

Split Rock Oil and Energy

Split Rock Oil and Energy was awarded the exclusive right to all salvageable scrap iron and steel that would meet the requirements of the conditions for release to an unrestricted area. This company shipped five flatbed truck loads of scrap between April 21, 1988 and June 11, 1988. The material was primarily from treasure island, however, some scrap was gathered from the area around the mill maintenance shop.

Wegner Brothers

The Wegner brothers were awarded the exclusive right to all salvageable scrap copper, brass, aluminium, and stainless steel that would meet the requirements of the conditions for release to an unrestricted area. This company shipped nine pickup loads of scrap between April 14, 1988 and May 26, 1988.

PHYSICAL PREPARATION

Industrial Safety Program

The industrial safety program was designed to allow completion of the decommissioning activities in a timely manner without compromising the health and safety of the contractor's employees. In addition to the State and Federal Safety Standards, the four areas of concern which were analyzed are:

Chemical
Electrical
Mechanical
Personal Safety

Chemical

All chemicals were removed from the mill complex, however, various storage tanks and pipelines were suspect of containing some residual liquids. These storage tanks and pipelines were identified by location or tagged if they were in an area which did not fully identify the pipeline or chemical. Personal protective equipment ordered included : respirators and cartridges, clear lens goggles, eye wash bottles, and two portable eye wash stations. Instruction in the various chemicals and their reactions were discussed during the eight hour training session conducted prior to the commencment of decommissioning activities.

Electrical
The electrical power was disconnected from the mill building and acid plant, however, electrical power was still availiable at the mill maintenance shop and the warehouse building. A power line was routed under the road from the mill maintenance shop to the leach area in the mill building to provide power to the fire protection booster pump and area sampling pumps.

The contractor's employees were instructed to treat all lines as active unless otherwise advised by their supervisor or WNI.

Mechanical
Since the contractor was required to provide the dismantling machinery and equipment, he was required to designate a competent person who would inspect all machinery and equipment prior to each use and during use to make sure it was in safe operating condition. Any deficiencies were repaired or defective parts replaced before continued use.

Personal Safety
The contractor ensured that all their employees were equipped with hard hats, safety shoes, safety glasses and protective work clothing. The contractor also provided fall protection, gas cutting goggles and shields. WNI made available rubber boots, disposable coveralls, clear goggles and rubber, cloth, or leather gloves.

WNI provided an 8 hour safety training program to the contractor's employees which included the following topics:

First Aid
Hazard Recognition
Electrical Hazards
Chemical Hazards
Transportation and Communication Systems
Health and Safety Aspects of the Job
Firewarning and Firefighting
Radiation Safety
Respiratory Devices.

In addition to the preceeding training program, daily safety huddles were held at the beginning of each shift to instruct the workers in the industrial and radiation safety precautions to be taken during the assigned days work. These safety huddles were also used as refresher training.

Radiation Safety Program
A Radiation Safety Program was established under the guidelines of the NRC concept of maintaining exposures to employees As Low As Reasonably Acheivable (ALARA). The program included: training commensurate with 10 CFR 19.12, radon daughter surveys, beta surveys, gamma surveys, airborne radionuclide surveys, respirator protection, bioassays, contamination control, protective clothing and the developement and initiation of Radiation Work Permits (RWP).

Radiation Surveys
In addition to the pre-surveys, WNI also scheduled surveys during the decommissioning activities to supplement the pre-survey information. The information from these surveys enabled WNI and the contractor to determine the sequence of dismantling, type of machinery required and type of personal protective equipment required. This information was also used in calculating beta dose and correlating gamma dose from the TLD badges. Refer to Section IV.

Beta surveys were performed in the scrubber area during dismantling to provide additional information for calculating beta dose. The beta dose was calculated from the exposure rate and the occupancy time documented during the decommissioning activities. Refer to Section IV.

Radon daughter surveys conducted during the decommissioning indicated concentrations less than an action level of 0.04 WL, therefore, no radon daughter exposures were calculated. Refer to Section IV.

WNI contracted with Tech/Ops Landauer, Inc. to provide thermoluminescent dosimeter (TLD) badges on a quarterly basis for the detection of gamma radiation. The gamma dose from the TLD badges was correlated with gamma dose calculations derived from the gamma surveys and the time studies conducted during the decommissioning activities. Refer to Section IV.

Airborne Radionuclide Surveys
Decommissioning activities were expected to generate some dust with the accompanying resuspension of residual airborne radioactive material that could follow an inhalation pathway which could result in internal exposure. Since the potential for resuspension of radioactive material existed during all phases of decommissioning, samples for airborne radioactive particulates were taken by two methods. Personal lapel sample pumps were carried by 25% of the workers, except those workers assigned to the precipitation/drying/packaging areas where each worker would carry a lapel sample pump. Area high volume air samples were also taken at locations determined by the RSO.

WNI selected Bendix BDX-60 Constant Flow Pumps with Gelman 25 mm Type A/E glass fiber filters in Gelman 25mm sample holders for personal lapel sampling. The sampling pumps, calibrated weekly to draw 2.0 liters of air per minute through the 25 mm filter, were placed on one fourth of the workers. However, in the precipitation/drying/packaging areas, each worker was provided with a personal lapel sampling pump. Eberline RAS-1 high volume pumps with Geleman 25 mm Type A/E glass fiber filters in Geleman 25 mm sample holders were selected for area sampling. Each high volume pump was calibrated weekly.

The air sample filters were routinely analyzed for uranium using a gross alpha analysis on a Ludlum Model 2000 scaler with a Ludlum Model 43-9 scintillation detector. Results of the area air sampling data were correlated with the personal lapel sampling data to calculate employee exposures in accordance with 10 CFR 20.103. Refer to Section IV

Respirator Protection
Due to dust and resuspended airborne radionuclides, respirators were required in areas designated by the RSO.

The respirator protection program was administered under the provisions of NRC Regulatory Guide 8.15 "Acceptable Programs for Respirator Protection". Pulmonary function tests were performed by medical personnel on all the contractor's employees to determine if the workers were capable of breathing through a filter equipped respirator.

Half-mask MSA Comfo-II respirators with type H cartridge (for radionuclides) or type GMC-H combination cartridge (for acid mists and radionuclides), half-mask Norton Model No. 7580 respirators with appropriate cartridge and half-mask MSA positive pressure battery powered respirators with appropriate filters were provided to the workers as required. The respirators were turned in at the end of each shift for cleaning and sanitizing. After cleaning, 25 % of the respirators were swiped and analyzed for residual contamination using a gross alpha analysis on the Ludlum 2000 scaler. New or cleaned and sanitized respirators with the appropriate cartridges were issued at the beginning of each shift. The used cartridges were discarded and disposed of into the vault.

Battery powered positive pressured half-mask respirators were issued to workers assigned to the precipitation/drying/packaging area. The respirators were turned in at the end of each shift for cleaning and sanitizing. Prior to cleaning, the inside of the pump assembly, hose and mask were swiped and analyzed for residual contamination using a gross alpha analysis on a Ludlum 2000 scaler. Cleaned and sanitized respirators with the appropriate cartridges were issued at the beginning of each shift. The used cartridges were discarded and disposed of in the vault.

Workers received instruction on respirator protection during the mandatory 8 hour class which included; mechanics of the respirator, cartridge selection, proper fitting, and the importance of bioassays in a respirator protection plan.

Bioassay

Controls for Environmental Pollution (CEP) was contracted to provide primary urine analysis for uranium (Unat) on all samples. Energy Laboratory, Inc. (ELI) was contracted to provide secondary or check analysis for uranium and would receive sample splits from 25% of the total samples.

Both laboratories were instructed to perform the analysis according to NRC Regulatory Guide 8.22 "Bioassay at Uranium Mills" and condition 60 of WNI's NRC Source Material License No. SUA-56.

The contractor's employees were given instructions on bioassay which included; purpose of the bioassay, what the 15 and 30 ug/l Unat limits represent and the actions required if the limits were exceeded, where and how the samples were to be taken, when the samples needed to be taken and those workers providing split samples should do so from the same void. Refer to Section IV.

Contamination Control

Contamination control was provided, in part, by the use of four Ludlum Model 177 personal survey monitors each coupled with a Ludlum Model 43-5 hand held scintillation detector. Workers were also instructed to wash hands before eating, drinking, dipping or smoking.

In addition to the written procedures posted near the monitors, workers were instructed in the proper use of the instrument. Results of the survey were documented on a form posted near the instruments. Constancy checks were performed and documented on a daily basis. At least once per week, the RSO or his designate performed and documented the constancy check to insure instrument performance was within 20% of the anticipated check source response determined by off-site calibration.

Should the worker scan and trigger the preset alarm indicating the action level of 1000 dpm total alpha/100cm2 was exceeded, the worker was instructed to reset the instrument and scan again. If the preset alarm was triggered again, the worker was instructed to decontaminate (wash or shower) the contaminated area and rescan. If after repeated scanning and decontamination, the preset alarm was still activated, the worker was instructed to notify the RSO or his designate in order to determine the cause of the apparent high reading. Should the worker be required to wash or shower, the contractor made availiable washrooms, shower facilities, change room and toilets for which WNI provided electricity, water and sewer hookups. Refer to Section IV.

Contamination control of the office area, eating area and change/shower area was accomplished by daily cleaning and weekly surveying for gross alpha contamination using an Eberline Model PAC-6 with an Eberline AC-24 proportional air alpha detector or an Eberline Model PMR-6 with an Eberline AC-3 scintillation probe. Refer to Section IV.

Protective Clothing

All workers were required to change into protective work clothes at the beginning of each shift, and into street clothes at the end of each shift or before leaving the restricted area. A washer and drier was availiable for laundering work clothes.

For work in the precipitation/drying/packaging areas of the mill where beta contamination existed, workers were provided with disposable tyvek coveralls, rubber or leather gloves, and rubber boots. The rubber boots were washed onsite while the coveralls and gloves were deposited into a contaminated clothing barrel. The contents of the barrel were bagged and placed in the vault for final disposal.

Radiation Work Permits

All decommissioning activities were performed under the auspices of Radiation Work Permits (RWP). The RWPs were prepared by WNI in order to maintain control of the decommissioning activities, to provide direction in maintaining ALARA and to insure that the health and safety of the contractor's employees would not be compromised. Refer to APPENDIX D.

The RWPs were developed, in part, from the information derived in the radiation and toxic pre-surveys. RWP No. 100 is a general permit identifing the scope of the decommissioning and general radiation and industrial safety rules. The rest of the RWPs divided the decommmissioning activities by building or area with respect to phase. Each RWP included the following protocol:

A. Identify the building or area where the dismantling activitie shall be conducted and to which burial area the material shall be taken. The RWP number, decommissioning phase, date and time the dismantling activities started and were completed shall also be noted.

B. The protective equipment available for this dismantling activity shall be listed.

C. The record of pre-survey results for gamma (uR/hr) and beta (mR/hr) radiation and radon daughter concentration (working level) for each specific building or area shall be listed.

D. The record of radiation surveys performed during the decommissioning activity shall be kept in a separate file and shall include gamma, beta, radon daughter, personal lapel samples and airborne radionuclide surveys.

E. Job specific radiation safety instructions shall include; type of respirator and filter cartridge required, type of protective clothing required, location and kind of radioactive contamination that may be encountered, precautionary measures required during the dismantling, how many workers shall wear a personal lapel sampler and a reminder to workers to wash hands before eating, drinking, dipping or smoking.

F. Job specific industrial safety instruction shall include; type of industrial safety equipment required, chemical hazards that may be encountered, precautionary measures required during the dismantling, and other instructions that may be unique to this RWP.

G. Workers shall be required to scan (and document) themselves before eating and before leaving the restricted area.

H. All workers assigned to perform the decommissioning activities specified in the RWP shall be required to read and sign the RWP.

I. The RSO or his designate shall initiate the RWP by signing and dating the form on the space provided.

Fire Protection

Since the decommissioning plan called for the dismantling of the fire suppression water storage tank, fire pump building and the gasoline engine powered fire pump, WNI elected to use the existing fresh water storage tank coupled with an electric powered booster pump as the fire protection system.

The fire protection system would use the existing pipe line from the fresh water storage tank to a location at the west end of the leach circuit. An electric powered booster pump was installed and hooked up to the incoming water line. Two existing natural gas pipe lines within the mill were incorporated into the system delivering water from the booster pump to locations at the west and the east end of the mill. One hundred feet of 1 1/2 inch fire hose with nozzles were connected to each location. A manually operated push button electric control box for the booster pump was temporarily located at the top of the stairs by the operators control room in the center of the mill. This electric control box could be moved to the area of need.

During normal operation, water would be delivered from the storage tank, through the inactive booster pump, through the pipe line and hose to the area being dismantled. However, during a fire emergency or if more water at a higher pressure was needed, the booster pump would be turned on at the electric control box.

Burial Locations

The approved burial area locations are outlined on Figure 2, "Mill Site Burial Area" of the decommissioning plan. This area was surveyed on May 26, 1988 and posts were placed to locate the extent of the burial area for the contractor. Grade stakes were set around the perimeter to establish burial height control. See MAP DR-3 for the combined extent of the burial areas used at the completion of the dismantling activities and the pre-decommissioning boundarys.

III. DECOMMISSIONING ACTIVITIES

Weekly Work Location Summary

During the dismantling of the mill complex, progress was monitored daily and compiled weekly. This summary describes weekly work locations during the project. See MAPS DR-1 "Dismantling Completetion Dates", DR-2 "Split Rock Mill Layout Plan" and DR-3 "Burial Area Utilization". Also refer to APPENDIX O "Daily Logs", APPENDIX P "Contractors Daily Time Reports" and APPNEDIXC Q "Weekly Reports".

WEEK 1 6/13/88 to 6/17/88

Ten Cook's employees received eight hours of safety and radiation training. Work began on the laboratory, reagent warehouse and fire protection building.

WEEK 2 6/20/88 to 6/24/88

Eleven additional Cook's employees received eight hours of safety and radiation training. Work began on the mill roof, solvent extraction (SX) building, acid plant, treasure island and the electric shop/ambulance barn. Work was completed on the laboratory, reagent warehouse, fire protection building and the electric shop/ambulance barn.

WEEK 3 6/27/88 to 7/1/88

Work continued on the mill roof, SX building, acid plant and treasure island.

WEEK 4 7/4/88 to 7/8/88

Work began on the water storage tank and the sodium chlorate building. Work continued on the mill roof and siding. The acid plant and SX building were completed.

WEEK 5 7/11/88 to 7/15/88

Work began on the fine ore bins, screens and walkways in the grind area. Work continued on the mill roof and siding. The water storage tank and sodium chlorate building were completed.

WEEK 6 7/18/88 to 7/22/88

Work began on the warehouse addition and mill electric/control room, while continuing on the mill roof, mill siding, fine ore bins, screens, walkways and treasure island.

WEEK 7 7/25/88 to 7/29/88

Work continued on the mill siding and structure, treasure island and warehouse. Work was started on the resin-in-pulp (RIP) section, machine and maintenance shop, drying/packaging siding and mill (boiler room) addition. The mill roof, screens and walkways were completed.

WEEK 8 8/1/88 to 8/5/88

Work began in the precipitation area, continued on the mill structure, fine ore bins and RIP section. The mill siding was completed.

WEEK 9 8/8/88 to 8/12/88

Work began on the leach circuit, classification area and scrubbers, while continuing on the mill structure, precipitation area, machine shop, warehouse and treasure island. The fine ore bins and the RIP section were completed.

WEEK 10 8/15/88 to 8/19/88

Work began on the drying/packaging structure, storage room control panels and the clarification (makeup and storage) section, while continuing on the warehouse and treasure island. The scrubbers, precipitation tank, thickener tank, Texas slurry tank, clarification (makeup and storage) section, machine shop, leach circuit, drying/packaging siding and classification area were completed.

WEEK 11 8/22/88 to 8/26/88

Work began on the roasters and hopper in the drying/packaging area and continued on the mill structure and treasure island. In the drying/packaging area, the roasters and hopper were completed.

WEEK 12 8/29/88 to 9/2/88

Work began on the retaining walls and continued at treasure island. The warehouse, drying/packaging structure, mill structure and maintenance shop were completed.

WEEK 13 9/5/88 to 9/9/88

Burial area clean-up, equipment decontamination and repair was initiated. Work was completed on the retaining walls and treasure island.

WEEK 14 9/12/88 to 9/16/88

The burial area clean-up was completed and the equipment was decontaminated, repaired and removed from the site.

INDUSTRIAL SAFETY

Training

On June 13, 1989, ten Cook's employees received the mandatory 8 hour safety training. On June 22, an additional eleven Cook's employees recieved the mandatory safety training. Safety orientation was provided for three Cook's employees on August 9, 1988 and for two additional Cook's employees on August 10, 1988 who had previously received the radiation training. Refer to APPENDIX R.

Safety Huddle

Safety huddles were conducted each morning before work commenced during the dismantling activities. Industrial safety topics included: barricading work areas, operation of the trailer mounted 500 gallon water pumper (demonstration), the need for equipment operators to watch for traffic, workers on roof to tie off to the center girt, proper girt cutting techniques, demonstrated the use the of eye wash stations, cautioned workers in the acid plant about sulfuric acid and oleum (review), posting of mill building while workers are dismantling the roof, communications review, accident analysis and smoking restrictions in mill (review). Refer to APPENDIX O.

Personal Protection Equipment

Although the workers were required to provide safety shoes, Cook's provided hard hats and safety glasses. Cook's also provided additional safety equipment such as fall protection, safety rope and gas cutting goggles. WNI provided ear plugs, disposable coveralls, rubber boots, and rubber, cotton or leather gloves.

WNI also provided eye wash stations and bottles and first aid equipment. Emergency Medical Technicians and first aid trained personnel were on site at all times.

Inspections

Industrial and radiation inspections were conducted daily. Results of the inspections were recorded on each days log form. Refer to APPENDIX O.

Don Stauffenberg, Deputy Inspector of Mines, conducted an industrial inspection on July 26, 1988. Five requested corrective actions were abated. Refer to APPENDIX M.

Accidents

Minor accidents which required on site first aid included: acid burns, a bruised thigh, thermal burns and sawdust in eyes.

A lost-time accident occured on July 25, 1988 when M. Castor fell 20 feet to the ground from the grating on which he was cutting. Refer to APPENDIX M. One non-industrial fatal heart attack occurred on June 27, 1988.

Fire Protection

In addition to the WNI fire protection system, Cook's also provided a 500 gallon water tank mounted on a flat bed trailer using a gasoline engine powered generator to operate an electric pump. This unit was used as a portable water pumper and as an emergency shower.

Conclusion
Except for the one lost-time accident, the industrial safety program functioned as anticipated. The first aid accidents were incidental to the type of work performed and were treated by WNI personnel on site. Constant safety contacts by the WNI staff, the information disseminated during the safety huddles and the safety awareness by the contractor's employees contributed to the low frequency of accidents.

RADIATION SAFETY

Training
Radiation safety training was conducted during the mandatory 8 hour training course provided by WNI. Several of the employees had received previous radiation safety training at either Bear Creek Uranium or WNI. Refer to APPENDIX R.

The radiation training which was in accordance with 10 CFR 19.12 included; location radioactive material, types of radiation that were encountered during the project, biological effects of the radiation, protective measures, types of detection equipment and their use, respiratory protection devices, bioassy criteria, ALARA concept and introduction to NRC Form 3.

Safety Huddle
In addition to industrial safety instruction, radiation safety was also discussed during the safety huddles. Major topics included: employees must be clean shaven every morning (review), contaminated clothing was to be disposed of in a specially marked barrel, respirators were to be turned in at the end of each shift, the proper techniques for personal scanning (review), discussion of ways to maintain exposures ALARA (review), the proper method of using respirators (review), bioassay criteria (review), the types of radiation and protective measures (review) and airborne exposures. Refer to APPENDIX O.

Personal Protective Equipment
WNI provided disposable coveralls, rubber boots, respirators with the appropriate cartridges and rubber, cotton or leather gloves. WNI also provided instrumentation for detection of radioactive contaminates, and airborne radionuclides.

Respirator Program
All Cook's employees had pulmonary function tests performed by medical personnel prior to being assigned work on the decommissioning project. Training on the mechanics and the proper use of the two types of respirators provided by WNI was conducted during the initial 8 hour training and during the safety orientation course. All employees were tested for proper fit of the Mine Safety Appliance (MSA) Comfo-II half-mask respirator using amyl acetate respirator fit-test ampules. Select employees were fit-tested for the MSA positive pressure battery powered half-mask respirator or the Norton Model No. 7580 half-mask. Refer to APPENDIX J.

Used respirators were turned in at the end each shift. New or cleaned and sanitized respirators with the appropriate cartridges were issued at the beginning of each shift and as needed throughout the day. Employees were instructed to use the MSA prescribed positive/negative fit-test method each time a respirator was worn.

Respirators were cleaned and sanitized using MSA cleaner-sanitizer following the prescribed directions. One quarter (1/4) of the washed and air dried respirators were swiped with a 25 mm Gelman type AE glass fiber filter and analyzed for gross alpha on a Ludlum 2000 scaler. Refer to APPENDIX J.

Each hose, mask and blower assembly of the battery powered respirator was swiped with a 25 mm Gelman type AE glass fiber filter and analyzed for gross alpha on a Ludlum 2000 scaler prior to cleaning and sanitizing. All clean and sanitized respirators were packaged in a new clean plastic bag prior to issue. Refer to APPENDIX J.

Discarded respirator filters and cartridges were bagged and placed in the vault for diposal. Refer to APPENDIX C.

Airborne Radionuclide Sampling

WNI provided the lapel sampling apparatus which consisted of a Bendix BDX-60 constant flow pump attached to a 25 mm filter cassette via a flexible tube. The cassette held a 25 mm Gelman type AE glass fiber filter and was positioned at the breathing zone of the wearer. Each pump was calibrated weekly and performance checked at the beginning of each shift. All pumps were charged overnight prior to use. Refer to APPENDIX K.

The original concept was to place lapel samplers on one quarter (1/4) of the workers. Due to the diversity of the work, WNI elected to place at least one lapel sampler per one worker per work location which met or exceeded the original lapel sampling criteria. Lapel samplers were worn by each worker in the precipitator/drying/packaging area. Lapel samplers were assigned at the beginning of each shift, and turned in at the end of each shift to a WNI representative. The filters were allowed to undergo radioactive decay for 24 hours then analyzed for gross alpha on a Ludlum 2000 scaler. Refer to APPENDIX E.

Eberline RAS-1 high volume pumps were used for area sampling and were calibrated weekly. The pump was placed in a work area designated by the RSO as early in the shift as possible. Samples were collected on Gelman 25 mm type AE glass fiber filters mounted in a 25 mm filter cassette. The pump and/or cassette was collected by a WNI representative at the end of each shift. The filter was allowed to undergo radioactive decay for 24 hours then analyzed for gross alpha on a Ludlum 2000 scaler. Refer to APPENDIX E.

Gross alpha concentration values from the area sample and the lapel samples which were taken in the same area were compared, and the highest value was used in calculating the employee exposures. Refer to Section IV.

Airborne Radionuclide Exposures

Employees exposures were calculated as soon as the sample was analyzed to determine if work restrictions would be required in the area where the sample was taken. The calculated exposures were entered into each person's file for storage. The lapel samples concentrations were used for the exposure calculations since they were always higher than the area samples. Refer to Section IV.

Contamination Control
All workers were required to scan before eating and before leaving the restricted area using a Ludlum 177 detector with a Ludlum 43-9 hand held probe. If the scanning triggered the preset alarm indicating the action level of 1000 dpm total alpha/ 100 cm2 had been exceeded, the employee was instructed to reset the instrument, set the fast/slow switch to slow and scan again. If the alarm was triggered again, the employee was instructed to decontaminate (wash) and scan again. If the alarm was triggered again, the employee was instructed to notify the RSO and determine the cause of the high reading.

Although the employees were instructed how to use the instrument during the initial 8 hour training or the safety orientation course, it became apparent from observation that some employees were not scanning correctly. The daily safety huddles were used to demonstrate the correct scanning procedure. WNI personnel also assisted workers who were not scanning properly during coffee breaks, lunch and at the end of shift. Refer to Section IV.

Surveys for alpha contamination in the lunch room, bathroom trailer and the office trailer were performed weekly. All surveys indicated the contamination levels were below the 1000 dpm gross alpha/100cm2 action level. Daily cleaning by the contractor and controlling access to these areas contributed to the radiologically clean environment. Refer to Section IV.

Gamma Exposures
Thermoluminesent detectors (TLDs) furnished by Tech/Ops Landauer, Inc. were provided by WNI to the contractor's employees to monitor gamma radiation exposure.

Each badge, assigned to a specific employee, was issued at the beginning of each shift and picked up at the end of each shift by a WNI representative. The badges were stored in a lead lined box when not in use. The badges were exchanged quarterly. Information from the pre-surveys and time card data was used to calculate potential gamma exposure. This exposure was correlated to the TLD data to determine the accuracy of the TLDs. Refer to Section IV.

Beta Exposures
In addition to the pre-decommissioning beta survey, WNI personnel also performed beta surveys during the dismantling of the drying/packaging area to determine the beta exposure rate at specific locations not surveyed during the pre-survey.

Beta exposures were calculated from the pre-survey information, decommissioning survey information and the occupancy time of each individual in the drying/packaging area. Refer to Section IV.

Protective clothing issued to the workers in the drying/packaging area to control beta contamination included: disposable tyvek coveralls and hoods, rubber or leather gloves and nondisposable rubber boots. All disposable clothing was placed into a contaminated clothing barrel. The contents of the barrel were bagged and placed in the vault for final disposal. The rubber boots were washed after each use.

Radon Daughter Exposures

Before work commenced in the interior of the mill, radon daughter surveys were performed in the locations identified during the pre-survey as being over 0.04 WL. The resurveys revealed the radon daughter concentrations had been reduced to 0.01 WL or less, therefore, exposure calculations were not required. Refer to Section IV.

Bioassays

WNI contracted with Controls for Environmental Pollution, Inc (CEP) as a primary laboratory and with Energy Laboratory, Inc. (ELI) as a secondary laboratory to provide analysis of urine samples for natural uranium (Unat). Both laboratories were instructed to perform the analysis according to NRC Regulatory Guide 8.22 "Bioassay at Uranium Mills" and condition 60 of WNI's USNRC Source Materials License No. SUA-56.

Baseline samples of all contractor employees were collected on the morning of the first day of work. One quarter (1/4) of the employees were required to turn in two samples from the same void.

Employees assigned to work in the mill interior were required to turn in urine samples on a weekly basis. All other employees were required to turn in urine samples on a monthly basis. Sample bottles were issued at the end of the work week and were required to be returned on Monday of the next week. One quarter (1/4) of the employees were required to turn in two samples from the same void.

Samples were labeled with name, date and packaged for shipment not later than the day after collection. Sample analysis results were received within twenty days of the sample collection and stored in each participants file. Refer to Section IV.

IV. EVALUATION OF RADIOLOGOCAL PROGRAMS

Bioassay Program

In accordance with NRC Reg. Guides 8.22, "Bioassay at Uranium Mills" and 4.15, "Acceptable Programs for Respirator Protection", urine samples were collected from workers and analyzed for uranium content (Unat).

Baseline bioassay analyses were performed on all workers with the results of these tests all below the allowable limit of 15 micro grams per Liter (ug/L) Unat.

Urine samples were collected on a weekly basis for activities involving the leach, resin-in-pulp, solvent extraction, classification and precipitation/drying/packaging areas; with samples collected on a monthly basis for all other areas.

Except for one analysis, all bioassay analysis results received (including the results of split samples sent to a separate laboratory for quality control) were less than the 15 ug/L Unat allowable limit.
Refer to APPENDIX H.

The analysis result of one sample from one laboratory indicated 75 ug/L Unat. However, the split sample sent to a separate laboratory revealed a concentration of 5 ug/L Unat indicating the possibility of extraneous non-uranium contamination giving false results. An investigation was conducted, additional samples were analyzed which were all below 15 ug/L Unat and tested negative for albuminurea. Review of the work records indicated that the individual was not working in an area where elevated levels of soluble uranium were expected.

Bioassay results of the other workers on that crew were all less than 15 ug/L Unat. See APPENDIX H for a copy of the investigation report.

The results of the bioassay program confirm the low internal exposures determined from both personal and area air sampling. These analyses also confirm the effectiveness of the respiratory protection program as bioassay analysis results did not exceed the action levels.

Whole body (in-vivo) counting was not required for any workers as the Quarterly MPE (Maximum Permissable Exposure - 520 MPE hours) for insoluble uranium was not exceeded. The maximum potential exposures to insoluble uranium were: 19.4 MPE hours from work in the grind area and 111.2 MPE hours from work in the drying/packaging area. The potential exposure was calculated using the highest concentrations from either the lapel or area air sampling pumps used in those areas with insoluble uranium. The sum of these exposures is 25 % of the 520 Quarterly MPE hours allowed.

Internal Exposure

Internal exposure control was monitored by daily calculation of exposure to airborne radionuclides through the use of personal lapel air sampling and area air sampling. Protection factors were assigned whenever respirators were required by a RWP.

The highest weekly exposure during the decommissioning period from 6/14/88 through 9/15/88 was 9.89 Maximum Permissible Concentration (MPC) hours.

This exposure is less than 25% of the 40 MPC hours allowed. Average weekly exposures were less than 10% of the 40 MPC hours allowed. Refer to APPENDIX E.

Comparisons of area air sampling to lapel air sampling show approximately ten times higher concentrations with the lapel air sampling pumps throughout the decommissioning. This difference in concentration can be attributed to the necessity of locating the area pump so it would not be destroyed during the dismantling process. Exposures were calculated with the higher concentration values obtained through lapel air sampling for each crew in each work area or from each individual's lapel air sampler while working in the precipitation/drying/packaging section. Refer to APPENDIX E.

Radon Daughter Exposure
Pre-surveys revealed six (6) locations inside the Mill building with radon daughter concentrations above 0.04 Working Level (WL). As indicated in section 4.5.1. of the decommissioning plan, areas exceeding 0.04 WL were resampled during dismantling except for the vault which was filled with debris and next to #4 classifier which was dismantled with the trackhoe.

Location	No.	Radon Daughter Concentration in WL Pre-Survey	During Dismantling
Leach Tank #1 ground floor	32	0.07	0.00
Leach Tank #3 ground floor	33	0.05	0.01
Grind area under screens	53	0.05	0.01
Grind north of fine ore bin	54	0.05	0.02

All radon daughter concentrations during decommissioning decreased due to increased ventilation from the removal of the roof and exterior walls before interior dismantling was started. Since these concentrations were below the action level of 0.04 WL, employee exposure calculations were not required. Refer to APPENDIX B.

Personal Contamination Control
All workers involved in decommissioning work were required to change clothing before leaving the site and monitor themselves prior to leaving the property. Workers were trained in this procedure during the radiation safety training sessions and these procedures were reviewed during safety huddles. A written operating procedure for this monitoring was posted for each monitoring instrument. Performance testing of the monitors was completed weekly. No workers exceeded the action level of 1000 dpm/100 cm2.

In addition, work done in the precipitation/drying/packaging areas required the use of disposable protective clothing, rubber gloves and boots. A shower or washing of hands was required under the RWP's for these areas. All contamination surveys were documented on log sheets. Refer to APPENDIX L.

Gamma Exposure
External gamma radiation exposure was monitored with individual thermoluminesent dosimeter (TLD) badges. The highest individual exposure for the entire decommissioning period was 30 millirems for the 3rd Quarter 1988. This 30 millirem exposure is 2% of the allowable 1250 millirems per quarter. Refer to APPENDIX G.

The highest expected exposure, 29 millirems, was calculated from the number of hours worked in each location and the gamma exposure rate for that location determined from the pre-surveys. This close correlation of monitored to calculated exposure confirms the expected low gamma exposure. Refer to APPENDIX G.

Beta Exposure
External beta exposure calculations were done for the nine individuals who worked in areas indentified during presurveys as being above 2.00 mRem/hr. Additonal sampling was conducted during dismantling to supplement information from the presurveys. Dismantling was accomplished in these areas in eight working days during the period from 8/8/88 through 8/29/88. The highest individual daily exposure was 42.7 mRem to the hands. The lowest individual daily exposure was 3.44 mRem to the hands. The highest accumulative total exposure was 50.59 mRem to the hands, which is 0.27% of the Quarterly MPE (18.75 Rem). The average of the accumulative total exposures for the nine individuals was 24.55 mRem to the hands. Two workers were assigned beta exposures to the skin of 4.14 mRem which is less than 1% of Quarterly MPE (7.5 Rem). No trend for beta exposure was evident during this short period of activity in the yellowcake processing and packaging area. Refer to APPENDIX F.

Alpha Scanning of Office, Eating and Wash Areas
Throughout the decommissioning project, a weekly alpha survey was conducted in the office trailer, the wash trailer and the dry (eating and wash area) of the mill office/warehouse building.

Each survey location was assigned a reference number in order to record the CPM (counts per minute) and DPM (disintegrations per minute) levels of each specific area. The instruments used to conduct the surveys were an Eberline PRM-6 and a PAC-6 which were calibrated by an off-site service. Refer to APPENDIX K. Each instrument was performance checked before use to verify the response value was within 20% of the calibration value.

During the thirteen week period the alpha surveys were conducted, the survey levels were 35.7 dpm to 100 dpm. These levels are below the decontamination and resurvey limit of 200 dpm/100cm2. Refer to APPENDIX N.

ALARA Review
No overexposures occurred during the decommissioning activities. Several factors contributed to maintaining low worker exposures.

Information from the pre-surveys of the mill complex was used to develop RWP's (Radiation Work Permits) for each work area. Review of each RWPs' requirements when it was issued, daily safety huddles to remind workers of those requirements and continuous supervision of work in progress ensured that radiation protection procedures were followed to keep exposures As Low As Reasonably Achievable. Refer to APPENDIX I for employee exposure records.

Mechanical equipment was used extensively rather than hands on, piece by piece dismantling. The use of equipment increased the distance from contaminated materials, reduced physical contact with the material and reduced the time of exposure in any particular area.

In the precipitation/drying/packaging area, disposable protective clothing, rubber gloves, rubber boots and battery powered positive pressure respirators were used. All openings to the scrubbers and yellowcake dryers were sealed prior to movement to the vault. Water was used to reduce dusting.

Two independent audits of all radiation associated practices were conducted by Radiant Energy Management Co. to verify compliance with radiation protection requirements. Refer to APPENDIX M.

The first audit was conducted on July 19-20, 1988. Three items were noted and addressed.

1. Item: Unless there is an industrial hazard, there should be more airborne sampling in case the lapel samplers assigned to work groups fail.

Response: Area air sampling was done wherever practical without causing a hazard. The extensive use of mechanical equipment precluded keeping an area air sample pump directly in the area of demolition without damaging the pump or creating an electrical hazard.

2. Item: The files for people trained but who have not actually worked should be kept separately from the active personnel files which show exposure.

Response: Exposure files for each worker were separated as to active and inactive status for clarity, as some workers did not work throughout the entire project.

3. Item: Only one of the two laboratories used for the bioassay analyses had submitted surface contamination survey data.

Response: The laboratory doing bioassay analyses which had not submitted lab surface contamination survey results was contacted and these laboratory surface survey results were included in subsequent reports.

The second audit conducted on September 6, 1988 found all decommissioning documentation complete with no deficiencies noted.

Photographic Documentation

Photographs were taken on a timely basis from varying viewpoints to document the pre, during, and post decommissioning activities of each individual work area. A log was kept of each photograph to document the picture number, direction from which it was taken, date and work area. A reference guide was also used to relate a specific building or work area to the picture.

The overall views section highlights progress of the entire mill complex decommissioning project. The remaining sections document chronological progress of pre-decommissioning activities, specific work areas and buildings by phase, burial areas, miscellaneous items for vault disposal, and decontamination and removal of contractor equipment.

Refer to APPENDIX T for the photographs and the accompanying log. See MAP DR-6 to locate individual work areas.

V. MATERIALS HANDLING

The complexity of the dismantling project required the contractor to provide various pieces of equipment which included: a Hydro-Unit trackhoe, a Case W-36 front end loader, a Ford 7500 backhoe/loader, a Fiat-Allis dozer, two dump trucks, a Galion 12 ton crane, a wall climber, a trailer mounted 500 gallon water tank for fire protection, an office trailer and a bathroom/toilet trailer. Additional equipment included: oxygen and acetylene gas bottles, gas hose, regulators, cutting torches, gasoline engine powered circular saws, electric powered portable drills, two gasoline engine powered generators, pneumatic jackhammers and drilling machines, a portable air compressor, chains, slings and miscellaneous hand tools.

All material was placed in their designated burial site as specified by the decommissioning plan except those items which were above the WNI gamma radiation action level of 100 uR/hr or exhibited visible yellowcake. These items were placed into the vault. Refer Section VI.

A brief description of the methods used to dismantle the various parts of the mill complex follows. Refer to MAP DR-3 for burial area locations

Acid Plant:
All workers were required to wear respirators equipped with chemical cartridges. Although eyewash stations were provided, the trailer mounted water tank stationed at the acid plant for fire protection proved to be the best emergency wash station.

A crew cut around the circumference of the north acid storage tank, dividing it in half. The top half was transported by dozer to burial area 7 where it was inverted and vertical cuts made at 10 foot intervals from top to bottom. The trackhoe pushed the side sections into the middle of the top creating a 30 foot diameter one foot thick disk.

Vertical cuts were also made at 10 foot intervals from top to bottom of the remaining bottom half. The trackhoe pushed the side sections into the middle of the bottom. The 30 foot diameter disc was transported to burial area 7 using the dozer.

A circular cut was made along the inside edge of the top of the south acid storage tank allowing the top to fall inside the tank. Vertical cuts were made at 6 foot intervals from top to bottom. The trackhoe pushed the side sections into the bottom of the tank. The 30 foot diameter disc was transported by dozer to burial area 7 .

Extraneous material was cut off the two reaction tanks prior to being pulled over to their side by the dozer. The tanks were transported to burial area 2 .

The molten sulfur storage tank was transported to burial area 7 where a crew cut the tank into flat sheets. Copius amounts of water was applied to the interior of the tank during the cutting exercise to prevent ignition of the residual sulfur.

All smaller tanks were cut into manageable flat sheets and transported to burial area 7 .

The apparatus on the second floor of the control room was cut free and removed with a crane. The second floor structural steel was cut into manageable pieces and removed with a crane. The material was transported by dozer to burial area 7 .

All pipes, ladders, and structural steel were cut at strategic locations to facilitate the pushing over of the control room with the dozer. The material was pushed into burial area 7 with the dozer.

While the dismantling was in progress, certain items were removed intact, scanned for alpha contamination, released and shipped to the Chemical Marketing Service acid plant in Riverton, Wyoming.

Reagent Warehouse:

All shelving, pumps, motors and pallets were removed and transported to burial area 1 prior to dismantling. A yellowcake drum weighing scale was transported to the vault with the backhoe.

Chisels and hammers were used to knock off the bolts attaching the roof and side panels. The panels were stacked into manageable bundles and transported to burial area 1 by backhoe. The ammonia pump and ancillary pipes were cut free and transported to burial area 1 . Respirators with ammonia cartridges were worn by the crew during this exercise to prevent exposure to ammonia fumes.

The support steel structure was cut at strategic locations at the foot of the columns and where the columns join the rafters.

Cables were attached to the east side and the structure was pulled to the ground with the trackhoe where a crew cut the steel into manageable pieces. The material was loaded onto dumptrucks with a crane and transported to burial area 2 .

Solvent Extraction (SX) Building:

Copius amounts of water were used anytime oxy/acetylene cutting occurred to prevent ingition of any residual solvent and during removal of the SX tanks to prevent dispersal of radioactive contaminated material. Crews wore half-mask respirators with combination chemical/radionuclide cartridges to prevent unnecessary exposure to solvent vapors and radionuclide particulates.

Electric powered portable drills with the appropriate sockets were used to remove the screws attaching the roof and side panels. The panels were stacked into manageable bundles and transported to burial area 2 by backhoe. The fiberglass insulation was rolled into bundles and transported to burial area 2 by backhoe.

The north structural steel section was removed by cutting the bolts off the foot of the columns, the girts cut free of the next section and cables attached to top of the section. The trackhoe pulled the section to the ground where it was cut into manageable sections. The material was transported to burial area 2 .

The walkway grating surrounding the SX tanks was cut free and removed with the crane. The grating was transported to burial area 2 .

The trackhoe was used to remove the soda ash storage tank, kerosene storage tank and the SX tanks from the SX building. The tanks were transported to burial area 3 . The soda ash and kerosene tanks were cut without incident. Because of the toxic fumes that would have been generated while cutting the fiberglass lined SX tanks, WNI elected to have the contractor invert the tanks, rip holes in the bottom using the ripper attachement on the dozer to facilitate drainage, and bury the tanks rightside up. The interior of the tanks was filled with debris (pipes, valves, etc) from the SX building.

The bolts securing the columns of the remaining structural steel to the foundations were cut off enabling the contractor to use the track hoe to pull the remaining structural steel to the ground. The material was transported to burial area 2 with the backhoe.

Laboratory/Sample Prep/Instrument Repair Building:
Chisels and hammers were used to knock off the bolts securing the roof and side panels of the laboratory building. The panels were stacked into manageable bundles and transported to burial area 2 by backhoe. The insulation was scooped up with the bucket of the backhoe and also transported to burial area 2 .

The chlorate digestion hood was removed without incident. The crew used hand tools to remove the bolts that secured the hood to the building. One crew member directed a stream of water on the hood during the entire operation to prevent ignition of any chlorate inpregnated material. The hood was transported to burial area 2 via backhoe.

The remainder of the building was knocked to the ground with the trackhoe and the backhoe. The accumlated debris was transported to burial area 2 with the front end loader and backhoe.

Due to the dust generated during this operation, all crews wore respirators with dust/radionuclide cartridges.

Fire Protection Building:
Electric portable drills were used to remove the screws securing the roof and side panels. The panels were stacked into manageable bundles and transported to burial area 2 by backhoe. The insulation was rolled into bundles and also transported to burial area 2 . The steel structure and water storage tanks were cut into manageble pieces and transported to burial area 2 with the backhoe.

MILL BUILDING:

Grind Section:
Power tools were used to remove the roof and side panels. The crew was elevated to the roof on a basket equipped crane and worked on the side in a wallclimber. The panels were stacked into manageable bundles and transported to burial area 2 with a backhoe. The fiberglass insulation was rolled into bundles and also transported to burial area 2 .

The grating and the DSM screens were cut free from the structural steel and removed from the building with the crane and the trackhoe. The walkways and pipe at the top of the fine ore bins were cut free and removed with the crane.

The bolts were cut off the feet of the west section columns, the girts cut free from the next section and a cable attached from the top of the rafter to the dozer. The dozer pulled the section to the ground where it was cut into manageable pieces and transported to burial area 2 . Four sections were dismantled in this manner.

A cut was made around the circumference of each fine ore bin at ground level. Cables were attached from the dozer to each bin. The dozer pulled the south bin to the ground first, then the north bin. The bins were pulled to the ore pad where they were cut into manageable pieces and transported to burial area 2 .

The compressor air intake feed tube was cut around the circumference at the top of the shifters control room and removed with a crane. The tube was transported to burial area 2 and cut into manageable pieces.

The shifters control room and the electrical control room were knocked to ground level with a trackhoe. The debris was transported to burial area 2 with a front end loader.

Roof:

The tongue and groove wood construction of the roof covered with at least two layers of asphalt shingles caused some delay in the dismantling process. After three days of trial and error methods, the contractor settled on using gasoline engine powered circular saw turning a carbide tipped blade to cut the multi-composition roof.

The wooden roof was cut a section at a time between the steel rafters and allowed to fall into the interior of the mill. A six foot wide access strip of roof was left along the north and south eaves and along the east end. Respirators with combination radionuclide/chemical cartridges and goggles were worn by the crews.

Electric powered portable drills were used to remove the screws that secured the roof panels to the sodium chlorate storage and the boiler room additions. The panels were stacked into manageable bundles and transported to burial area 2 .

Sodium Chlorate and Boiler Room Additions:

Anytime oxy/acetylene cutting techniques were used, a fire guard was posted with a charged fire hose. The fire guard wet the area prior to and during the cutting to prevent fires.

The rafters of the chlorate addition were cut where they attached to the main mill building, then the bolts of the foot of each column were cut. The trackhoe was used to pull the structure, with the siding still attached, to the ground.

After the debris was transported to burial area 10 with the backhoe, the sodium chlorate storage and make up tanks were dragged to burial area 8 . As one crew member sprayed the interior of each tank with water to prevent ignition of chlorate impregnated material, the other crew member cut the tank into manageable pieces.

The rafters and columns of the boiler addition were cut and the structure handled by the previously described method.

Techniques for removing the wooden tanks in the mill were developed while trying to remove the two wooden leach tanks in the boiler addition. The contractor decided to encircle a tank with a heavy wire rope sling attached to the dozer and pull the tank to its assigned burial area where the dozer operator demolished the wooden tank. The boiler was removed and transported to burial area 10 with the backhoe.

Siding:
After the ammonia vaporizer addition was pushed to burial area 7 with the dozer, work began on the mill siding.

The sequence for removing the north and south mill siding was as follows: all the girts, except the top girt, were cut between select columns, a cable was attached from the top girt to the trackhoe, then the top girt was cut, and the trackhoe would pull that section of siding to the ground. The debris was transported to burial area 2 with the backhoe and front end loader. This technique removed the siding, the structural steel (girts) and the 6 foot access strip of roof between the columns.

The east siding and structural steel was removed after the trestle legs were cut, the trestle pulled to the ground and transported to burial area 2 . The sequence for completing this phase of the project was as follows: the girts were cut free along the third rafter from the east, the east columns were partially cut at the second story concrete deck level, a cable was attached from the east end of the ridgepole to the dozer, then the dozer pulled the structure and attached siding to the ground.

A crew was assigned to cut the debris into manageable pieces and transport to burial area 7 . While this procedure effectively opened up the second floor of the precipitation/drying/packaging area, some siding remained on the east side ground floor. This siding was remove with the trackhoe while one worker sprayed water on the exposed beams to the reduce possibilitly of dispersing any radioactive contaminated material. The siding was taken to burial area 7

Resin in Pulp (RIP) Circuit:
All oxy/acetylene cutting activities were performed while a fire guard continuously sprayed water on the wooden tanks below the area being cut. Prior to working in the RIP area, the accumulated roof debris was manually removed to facilitate removal of the RIP circuit.

The pipe and walkway on the north side of the mill was cut into sections between the columns, moved to the ground with a crane, and transported to burial area 4 with the backhoe.

The steel deck beams on top of the RIP tanks were cut free from the north and center columns. The deck was cut into sections and removed onto the ground with the crane. After each section of RIP deck was removed , the trackhoe operator dragged each exposed tank out of the mill where cables were attached to the tank from the dozer. The tanks were pulled to burial areas 4 and 5 and demolished with a dozer.

Leach Circuit:
The leach circuit deck was dismantled using similar fire protection and demolition techniques as used on the RIP circuit. After the deck was removed, cables were attached to each tank from a dozer and pulled to burial areas 4 and 5 where they were demolished.

Classification and Wash Circuit:
After the siding had been removed from the south side of the mill, all pipes, walkways and electric cable were cut from between the columns and allowed to drop to the ground. The debris was transported to burial areas 4 and 5 with the backhoe.

The classifier tubs and wooden support structure were dragged out of the mill using the trackhoe. As each tub was pulled out of the mill, the backhoe immediately transported it to burial areas 4 and 5 . The wooden support structure debris was also transported to burial areas 4 and 5 by the backhoe where it was placed into the tubs.

Although the potential for beta contamination existed, use of mechanical equipment to move the debris eliminated manual contact with tubs and structure, thereby eliminating any potential exposure.

Clarification (Eluant Make-up and Storage):
All the pipe and electric cables were cut and removed. The walkway, operators control room and the wooden support structure were knocked to the ground using the trackhoe and transported to burial area 4 . The trackhoe was used to move the wooden tanks outside the mill where cables were placed around each tank and attached to the dozer.

The tanks were transported to burial area 6 where they were demolished by the dozer. The remaining metal tank was moved out of the mill and transported to the northwest corner of the vault using the trackhoe.

Precipitation/Drying/Packaging:
Prior to dropping the east structure and siding, the lime precipitation tank was moved to the vault. The outlet pipe at the bottom of the tank and all other pipes were removed. Two steel H-beams were placed under the tank to prevent breaking off the nipple at the bottom the tank while in transit. Cables were attached from the front of the H-beams to the ripper attachment of the dozer. The back end of the beams were placed in the front end loader bucket. As the dozer operator raised the ripper attachment, the front end of the beams were also elevated, suspending the tank between the two machines. With both machines moving slowly and in unison, the precipitation tank was moved to the vault where it was placed into the south ore bin using the trackhoe.

All workers handling the following material were required to wear disposable Tyvek coveralls, rubber boots, rubber or leather gloves and a battery powered half-mask respirator. Equipment operators were required to wear a half-mask MSA Comfo-II or equivilant respirator.

The interior of the yellowcake thickener tank was throughly washed into the sump below the tank. The outlet pipe at the bottom of the tank was removed and the steel grating cut free from the tank. The dozer operator used the blade to tilt the tank while moving through the vacated RIP area and to place the tank in the north fine ore bin.

The remaining small yellowcake precipitation tank was transported to and placed in the northeast area of the vault using the trackhoe.

The dismantling of the scrubbers occurred in the following sequence. The bolts were cut off all the pipe flanges, the ends of the pipe sections covered with plastic sheets to prevent dipersion of yellowcake, and the pipe sections lifted to the bed of a dumptruck using the crane. Plastic sheets were taped over all openings of the scrubbers. The bolts were cut off the feet of the support structure then the grating and rails were cut free. The scrubbers and associated material were lifted to the bed of a dumptruck using the crane. All scrubber material was placed in the south section of the vault.

The control room and remaining siding was removed using the trackhoe and transported to the vault with the backhoe.

The roasters were removed in the following sequence. Pneumatic jackhammers were used to make openings on the north and south side of the second floor concrete deck next to each roaster. The grating, pipe and electric cables were cut free and removed. Steel plates were welded over the inlet and outlet pipes of the roasters. All the observation doors were welded closed. The bolts that secured the roasters to the floor were cut. A cable was attached from the top of the south roaster to the dozer. The dozer pulled the roaster onto a bed of sand and then pulled the roaster to the vault where it was pushed into the southwest end of the vault. The north roaster was removed in the same manner and was placed next to the south roaster in the vault.

The hopper and remaining material (grating, pipe, etc) was removed using the trackhoe and transported to the vault with the backhoe.

The second floor concrete deck was dropped by partially cutting the north columns at the foot and the top, cutting the support beams next to the middle columns, cutting and removing the crossbraces. As the trackhoe pulled on the weakened north columns, the north third of the deck fell to the ground. The middle third of the deck was dropped in the same mannner. The south third of the deck which previously covered the drying/packaging apparatus, was dropped by partially cutting the remaining columns at the foot and the top, then pushing the deck to the ground with the dozer. All material was pushed to the vault with the dozer.

Mill Structure Steel:
After all the material from the interior of the mill had been removed, preparation for dropping the mill building structure began. A cable was attached from the top of a southwest column to the foot of a column on the north side of the warehouse to provide stability while cutting was in progress. A crew working out of a basket equipped crane, made partial cuts on the north side of the columns, near the rafters. Another crew made partial cuts on the south side of the columns, near the footings. Three cables were attached to the top of the north side, one at the west end to the trackhoe, one at the middle to the front end loader, and one at the east end to the dozer. The area was cleared of personnel, the stability cable released from the warehouse column, then the three machines began to move in unison pulling the structure to the ground. After crews cut the structure into manageable pieces, a backhoe was used to transport the material to burial area 6 .

Warehouse, Mill Maintenance Shop and Mill Machine Shop:
Each building was dismantled in the following sequence. Power tools were used to remove the screws securing the roof panels. The panels were stacked into manageable bundles, while the fiberglass insulation was rolled into bundles, then the material was transported to the appropriate burial area. The side panels and insulation from the warehouse addition was removed and handled in the same manner. All electric and water lines to the buildings were deenergized.

The trackhoe was used to demolish each building. The debris was transported to the appropriate burial area using the backhoe and front end loader.

Treasure Island:
Previously identified contaminated items were transported to the vault using the backhoe or the front end loader. The large tanks were dragged to burial area 5 using the dozer or the front end loader. The remaining debris was loaded into dumptrucks using the backhoe and transported to burial area 7 .

Retaining Walls and Loading Ramp:
The contractor acquired the services of a subcontractor with mining and explosives expertise to assist in the demolition of the concrete retaining walls.

Holes were partially drilled through the west wing wall at six foot intervals along the bottom of the wall with a pneumatic drilling machine and drill steel. Several holes were also drilled along the middle of the wall.

Each hole was charged with one explosive stick tied with detonation cord, tamped and packed with dirt. The detonation cord attached to the main fuse.

All employees were evacuated to a predetermined safe area, all access routes to the area were blocked and the charges were set off. The blast weakened the reinforced concrete wall enough that the dozer knocked the wall to the ground. The rubble was pushed into the vault. The east wing wall, tunnel and the face wall were removed in a similar manner.

Once the retaining walls were removed, the front end loader was used to remove the dirt from under the ramp. Three reinforced concrete pilings were exposed during this operation. Holes were drilled into the bottom of the pilings and at select locations along the ramp. Each hole was charged as previously described. The area was vacated and the charges set off. The rebar in the pilings was cut and the ramp knocked down. The rubble was pushed into the vault.

<u>Decontamination of Equipment</u>
All of Cook's equipment was moved to the warehouse building slab for decontamination by washing with water. The equipment was then surveyed for alpha contamination with an Eberline PAC-6 instrument. The survey results were below the allowable limit of 1000dpm/100cm2 and the equipment was released in accordance with Attachment No.1 of NRC Source Materials License SUA-56. Refer to APPENDIX S for equipment releases.

VI. BURIAL AREA INVENTORY

During the decommissioning of the mill complex, burial of materials was monitored on a daily basis. A burial area summary was completed at the end of each week. The summary consists of a log and pencil sketch of the burial areas used and materials placed in each area during the week.

The Split Rock Mill burial area consists of eleven (11) sites and the vault. As noted in the following breakdown of the areas, site number 11 was not needed and no material was buried in this site.

Refer to APPENDIX C for the weekly burial inventory summaries and pencil sketches. See MAP DR-3 for the site location of materials listed in the burial inventory.

Burial Area 1

- Reagent warehouse shelving, motors and scrap
- Drisco pipe

Burial Area 2

- Electric shop/ambulance barn, chem lab/sample preparation, Reagent warehouse
- Solvent extraction building, roof and framework
- Mill grind building roof, compressor/electric transformer room cement blocks
- Fire protection building and tanks
- Fiberglass tanks and material from RIP circuit, crushed and piled
- Mill grind building siding, insulation and structure
- DSM screens from grind area
- Walkways and grating from grind area
- Mill building steel and miscellaneous scrap siding
- Top half of the fine ore bins
- Mill maintenance shop
- Lime storage tank pieces
- Reaction vessels (from the acid plant)

Burial Area 3

- Solvent extraction tanks

Burial Area 4

- Solvent extraction tanks
- RIP tank and section pieces
- RIP section - piping, walkways, tanks
- Drag classifiers
- Piping, walkways and structure from clarification circuit
- Mill building steel columns, beams and roof supports
- Lime storage tank pieces
- Remaining mill building steel structure
- Warehouse walls and steel structure

Burial Area 5

RIP tank and section pieces
RIP section - piping, walkways, tanks
Drag classifiers
Piping, walkways and structure from clarification circuit
Leach tank agitators
Crusher building pieces
Mill building steel columns, beams and roof supports
Maintenance shop pieces
Lime storage tank pieces
Remaining mill building steel structure
Warehouse walls and steel structure
Two 1/2 cylinder tank pieces (from treasure island)

Burial Area 6

Leach tank agitators
Leach tank agitator support structure from tops of leach tanks
RIP tanks and section pieces
Crusher building pieces
Leach tank pieces and piping
Clarification circuit tank pieces and piping
Classification circuit piping, walkways and scrap
Maintenance shop pieces
Remaining mill building steel structure

Burial Area 7

Acid Plant building, piping and tanks
Water tank
Probe source pipes
Treasure Island material
Miscellaneous roof pieces from above the dry pack area
Miscellaneous piping, walkways from classification circuit
Ammonia vaporizer addition

Burial Area 8

Oxidizer tank
Water tank pieces
Chlorate tanks
Maintenance shop pieces

Burial Area 9

Miscellaneous scrap pipe, wood, and fencing

Burial Area 10

Chlorate building
Boiler room addition
Leach tanks #10 and 11
Machine shop roof, walls and structure
Treasure island material
Warehouse building siding
Four fiberglass lined tanks
Two classifier bases
Wooden tank pieces

Burial Area 11

Area was not used

Vault

Yellowcake drum weighing scale
Solvent extraction tank slats
Bottom half of the north & south fine ore bins
Lime precipitation tank
Yellowcake slurry thickener tank
Twenty-four drums of asbestos material
Two vacuums from the yellowcake packaging room
Yellowcake precipitation tank
Clarifying pressure vessel (from treasure island)
Probe calibration source
Yellowcake area walls, siding, steel structure and scrap
Yellowcake storage room walls, siding and structure
Texas slurry tank
Pregnant eluent tank
Yellowcake packaging control room panels
Scrubbers and scrubber piping
Treasure island material
Nine yards of contaminated soil from treasure island
North and south yellowcake dryer/roaster
Yellowcake hopper and packaging equipment (conveyors)
Concrete from upper deck of precipitation and yellowcake areas
S.A.G. mill wire screens (from treasure island)
Papers from the upstairs of warehouse
Classifier wheel (from treasure island)
Concrete and steel from 1st and 2nd decks of the yellowcake area
Concrete retaining walls from the ore loading ramp
Concrete tunnel and conveyor from old ore storage building foundation
Plastic bags containing contaminated clothing
Plastic bags containing used respirator filters and cartridges

Treasure Island Material Deposited in the Vault

The following items were identified for disposal in the vault during the gamma pre-survey of the treasure island area, with instrument readings above 100 uR/hr, using an Eberline PRM-7 Micro R Meter.
The following items were placed in the vault.

Treasure Island Location No.	Item	uR/hr
1	One drum of pipe fittings	100
2	Green pressure tank & top	100
3	An 8′ shaft with stainless impellers	1000
5	Green centrifugal pump housing	250
7	Green 4′ x 4′ pressure vessel	700
11	Section of drum roller/conveyor	250
12	Janitrol heating unit	150
13	** Black grainy material on soil (approx. 4′x15′ area)	1000
14	Drum with yellowcake on pipe fittings	200-400
15	Old green scrubber box tank and fittings	1500
17	Rubber covered wheel stirrer/mixer	450
19	Drum filter unit	100
21	Crusher liners - pile - trash and old ore	50-450

**Loose ore - split samples from mill laboratory

A gamma survey conducted immediately after the clean up of treasure island identified about nine cubic yards of contaminated soil which was transported to the vault. Refer to APPENDIX A for the pre-survey list, APPINDIX B for the during survey list, MAP DR-5 and MAP DR-5A. Also, refer to APPENDIX T "Photo Documentation".

VII. INTERIM SOIL COVER

PRE-CONSTRUCTION SURVEYS

Radiation Surveys

A gamma survey conducted during September, 1987 by Radiant Energy Management (REM) determined the approximate extent of the windblown tails in the northwest valley. Soil samples collected during the survey enabled REM to correlate the average radium-226 content of the soil with corrected and uncorrected gamma readings. REM determined that an average radium-226 soil concentration at the surface of 5 pico-curies (pci) per gram (g) and the average background radium-226 soil concentration of 1.4 pci/g predicts an uncorrected gamma reading of 39 micro-Rems (uR) per hour (h) with an accuracy of ninety percent. This survey was discussed in Section 3.0 of Revision 1, submitted March 1, 1988, of the WNI Split Rock Mill Reclamation Plan. Figure C-4 from that report is included for reference in this report MAP DR-5.

A gamma survey was conducted during July, 1989 by the WNI staff over the windblown tails area in the northwest valley to establish base line values. Gamma readings were taken with an Eberline PRM-7 Micro-R meter on fifty foot centers and recorded in uR/h. WNI elected to use a conservative 30 uR/h uncorrected gamma reading as an upper limit for uncontaminated soil. Baseline gamma surveys were also performed over the mill burial area and the old abandoned southern tails basin (old tails basin). The instrument was calibrated by an off-site service on June 23, 1989 and was performance checked with a source prior to each survey. The performance checks were within 20% of the calibrated value. Refer to APPENDIX A.

Land Surveys

The windblown tails area boundaries in the northwest valley as identified in Appendix F of the Reclamation Plan were determined by metes and bounds and delineated with wire flags. Steel fence posts were set at corners and high points of the terrain. The proposed borrow area boundaries within the windblown tails area were also determined by metes and bounds and delineated with four foot laths.

The mill burial area corners were surveyed and set with steel fence posts. The perimeter was delineated with wire flags. The end points of the cross section lines were also surveyed and set with wooden stakes. Twenty-five foot offset stakes were placed off the ends of the cross section lines to provide a reference point in case the end points were destroyed.

A contract survey crew ran a series of cross section surveys across the mill burial area to determine the amount of borrow material required to bring the fill to the required grade. A series of cross section surveys were also run across the old tails basin to establish a baseline in the area where the windblown tails from the northwest valley were to be placed. Another series of cross section surveys were run across the windblown tails area of the northwest valley to establish control points for material excavation.

INDUSTRIAL AND RADIATION SAFETY

Training

On July 24, 1989, sixteen prospective Salveson employees and the two principals of the corporation received the mandatory industrial and radiation safety training. Refer to APPENDIX R.

Specific industrial training included: first aid with an emphasis on heat induced ailments, health and safety aspects of the work, communications and emergency notification, transportation controls, introduction to WNI and Salveson safety regulations and introduction to the work environment.

The radiation training which was in accordance with 10 CFR 19.12 included: types of radiation that would be encountered during the project, biological effects of radiation, types of detection equipment and their use, contamination control, ALARA concept, bioassay criteria and respirator protection.

Personal Protective Equipment

Workers were required to wear hard hats, safety shoes and safety glasses. Disposable earplugs were provided by the contractor. Respirators with the appropriate filters were provided by WNI.

Safety Huddles

A safety huddle was held each morning before work commenced during the construction activities. In addition to the contractor outlining the days work, an industrial and/or a radiation safety topic was discussed. Refer to APPENDIX O.

Industrial safety topics included: there are rattlesnakes in the area, be alert; discussion of the inspection by the Deputy State Mine Inspector; reminder that hard hats are required while working (three different days); traffic control (three different days when the traffic pattern was changed); seat belts must be worn while operating equipment; no passengers on heavy equipment; WNI water line has been relocated and buried; low clearance electric power line in burial area no. 2 (power line raised by WNI maintenance) and watch for WNI personnel crossing burial area.

Radiation safety topics included: scan before eating and at the end of the shift; sample pumps shall be placed on equipment; discussed results of air samples (two different days); be careful when handling debris in burial area, it may be contaminated with radioactive material and all personnel must scan before eating and at the end of the shift.

Fire Protection

All motorized equipment was equipped with an appropriate charged fire extinguisher. The diesel fuel storage tank was placed in a bermed area to contain any spilled fuel. An area was cleared of all combustible material for a distance of twenty-five feet from the fuel storage tank. The area was posted with NO SMOKING signs and a fire extinguisher was located by the storage tank.

Inspections

Mr. Don Stauffenburg, Wyoming Deputy Inspector of Mines, conducted an industrial inspection on July 25, 1989. No corrective actions were identified. Refer to APPENDIX M.

On September 7, 1989 Mr. Scott Grace, a NRC inspector, conducted an inspection. No violations of WNI's USNRC Source Materials License SUA-56 were identified. Refer to APPENDIX M.

Accidents

There were no accidents or personal injury incidents reported during the project.

Contamination Control

All employees working in the restricted area were required to scan and document before eating and before leaving the job site. A Ludlum Model 177 detector with a Ludlum Model 43-9 hand held probe was located in the office/eating and storage trailer. If the scanning triggered the preset alarm indicating the action level of 1000 dpm total alpha/100 cm2 had been exceeded, the employee was instructed to reset the instrument and scan again. If the alarm was triggered again, the employee was instructed to decontaminate (wash) and scan again. If the alarm was triggered again, the employee was instructed to notify the RSO who would then determine the cause of the apparent high reading. In addition to the written procedures posted near the monitor, workers were instructed in the proper use of the instrument. Results of the survey were documented of a form posted near the monitor. A battery and constancy check were performed and documented daily.

Except for the two readings taken on August 8, 1989, all of the remaining readings taken while scanning were less than 20 counts per minute. The service crew had handled one of the pressure filter screens while they were setting the rainbird sprinkler on burial site no. 7. The resultant contamination was detected before the crew began their lunch break. The contaminated gloves and coveralls were deposited in burial site no. 2. Subsequent scanning revealed a reading of less than 20 counts per minute. Refer to APPENDIX L.

Surveys for alpha contamination in the office/eating area and portable toilet were performed weekly with an Eberline PAC-6 Proportional Air Counter coupled with an AC-24 probe. All surveys indicated contamination levels were at 35.7 dpm total alpha/100 cm2 which is below the 1000 dpm/100 cm2 action level. Refer to APPENDIX N.

Airborne Radionuclide Sampling

WNI provided the lapel sampling apparatus which consists of a 25mm filter cassette attached to a portable Bendix BDX-60 constant flow battery powered pump via a flexible hose. The cassette held a 25 mm Gelman type A-E glass fiber filter and was positioned at the breathing zone of the equipment operator. Each pump was calibrated weekly and performance checked at the beginning and end of each shift. All pumps were charged overnight prior to use.

At least weekly, a lapel sampler was placed on at least one piece of equipment to monitor for airborne radionuclides. A lapel sampler was placed in the motor grader while grubbing and clearing the vegetation in the windblown tails area was in progress. Another lapel sampler was placed in the lead scraper during the removal of the windblown tails. A visual survey revealed that most of the airborne dust activated while loading the windblown tails enveloped the second scraper. The lapel sampler was transferred to the second scraper for the duration of the project. A lapel sampler was placed in the trackhoe while the crew separated brush from the windblown tails.

The lapel sampler was placed in the equipment at the beginning of the shift and removed at the end of the shift. The filter was allowed to undergo radioactive decay for at least 24 hours, then analyzed for gross alpha on a Ludlum Model 2000 scaler. The values obtained were used to calculate employee exposures. Refer to APPENDIX E.

Airborne Radionuclide Exposures

Employee exposures were calculated as soon as the sample was analyzed to determine if work restrictions would be required in the area where the sample was taken. As expected, even though a high volume of dust was created during the moving of the windblown tails and borrow material, the exposure to airborne radionuclides was very low. Exposures for the equipment operators ranged from a low of 0.07 MPC-hours for a 10.25 hour shift during the moving of the borrow material and a high of 0.796 MPC-hours for a 10.33 hour shift during the moving of the windblown tails. The crew separating the brush from the windblown tails in the old tails basin experienced exposures that ranged from 0.36 MPC-hours for a 2.00 hour shift to a high of 1.04 MPC-hours for a 8.67 hour shift. Although exposures were low, respirators were provided to the workers for protection from the dust generated during the construction project. Refer to APPENDIX E.

Gamma Exposures

Because of the relatively short length of the project, WNI elected to calculate the employee gamma exposure rather than issue TLD badges.

The gamma exposures were calculated from the information derived during the pre-construction surveys of the windblown tails area, the mill burial area and the old tails basin; information derived from the surveys performed during the project and from the number of hours worked, which was documented in the occupancy log. Employee gamma exposures ranged from a high of 19.05 milli-Rems to a low of 2.46 milli-Rems. Refer to APPENDIX G.

ALARA Review

Due to the short duration of the project and the low exposures expected during the project, an ALARA audit by an outside consultant was not conducted. However, to assure worker exposures were maintained as low as reasonably achievable, an inhouse ALARA review program was maintained. In addition to worker notification of potential radiological hazards, the WNI staff reviewed the exposure data weekly and conducted daily site inspections. No trends were noted nor were any conditions on noncompliance identified. Refer to APPENDIX I for employee exposure records.

PLACING OF INTERIM SOIL COVER

In order to accomplish the work in a safe and timely manner, the contractor provided the following major pieces of equipment: two Terex TS-24 self-loading scrapers, one Terex TS-14 tandem self-loading scraper, one Terex S-24 waterwagon, one Caterpillar D8H dozer, one Caterpillar 12H motor grader and one Bantam C-336 trackhoe. Other equipment provided included: two diesel engine powered water pumps, 6,100 feet of 4 inch aluminum pipe, one skid mounted rain bird sprinkler, one 5000 gallon portable diesel fuel tank, one 500 gallon diesel fuel truck, one lubrication truck, one maintenance truck, one shop trailer, one office and eating area/storage trailer and one portable toilet. The contractor also provided the tools and equipment necessary to maintain the equipment.

Salveson selected seven workers from a pool of sixteen prospective workers who attended the WNI initial Industrial and Radiation safety training to operate and service the equipment. Radiation Work Permit No. 125 was initiated on July 24, 1989 to cover the scope of the interim soil cover project.

Work progressed in five distinct phases which included: site preparation, grubbing and clearing, removal of windblown tails, removal of the topsoil and haulage of the borrow material to the burial area. In order to utilize men and equipment effectively, the contractor worked several phases concurrently.

A brief description of the work activities follows:

Site Preparation
The contractor elected to use a site outside of the restricted area boundary near Ore Road as a staging area. One hundred feet of an existing trail from Ore Road to the proposed staging area was widened and cleared of brush. A 0.7 acre staging and storage site was cleared of brush and six inches of topsoil was salvaged. The brush and topsoil were transported to the topsoil storage area. A fifty feet by one-hundred feet spill containment enclosure with a two feet high berm was constructed on the southern corner of the staging area for the 5000 gallon portable diesel fuel tank.

A portable diesel engine powered water pump was located at a small pond west of Well 2. Approximately 100 feet of 4 inch aluminum pipe was laid from the pump to a water loading area. This system was used to fill the contractor's waterwagon and the landscaping company's hydroseeder.

Another portable diesel engine powered water pump was located on the banks of the Sweetwater River. Approximately 6,000 feet of 4 inch aluminum pipe was laid from the pump to the mill burial area where it terminated with a skid mounted rain bird sprinkler. This system was used to wet specific areas of the interim soil cover to provide the necessary moisture to achieve maximum compaction density.

To facilitate efficient equipment movement, haulroads were established in the following areas: from the staging area to the topsoil stockpile and to the borrow area, through the borrow area via various routes, from the borrow area to the mill burial area, through the mill burial area and to the old tails basin.

In most areas a motor grader was used to clear the proposed route of brush, windblown tails, topsoil and to establish a firm road bed. A dozer was used to cut and fill the route between the borrow area and the mill burial area and the route from the mill burial area to the old tails basin. The motor grader was used to grade the roads to their final contour. In order to establish and maintain a firm stable road, the S-24 waterwagon was used to wet the roads while the motor grader bladed the roads throughout the project.

Traffic control during the project included: establishing a traffic pattern which allowed the equipment to operate at maximum efficiency while moving material, instructions to the contractor and WNI employees that all heavy equipment had the right of way and erecting stop signs at specific locations in the mill burial area.

Clearing and Grubbing

A motor grader was used to clear and grub the vegetation from the windblown tails area north of the restricted area fence. The vegetation and soil was graded into windrows where it was picked up with the TS-24 scrapers and transported to a location within the old tails basin. The contactor used the TS-24 scrapers to clear, grub and transport the vegetation off the windblown tails area south of the restricted area fence. At the location in the old tails basin, a Bantam C-336 trackhoe was used to lift the soil and vegetation onto a large piece of grating inclined against a support frame. The soil fell to the ground while the vegetation was raked off the grating, piled and subsequently burned. The ashes were buried in a shallow pit to prevent blowing. The soil was dozed into a flat pile and stabilized with wind fencing.

Windblown Tailings

The TS-14 and the two TS-24 self-loading scrapers were used to pick up and transport the windblown tails to the old tails basin. After an area had been scraped, WNI personnel performed a gammma survey to confirm whether all the windblown tails had been picked up. WNI elected to use a conservative 30 uR/hr uncorrected gamma reading as the upper control limit for uncontaminated soil. Refer to APPENDIX B. While most areas required only one six inch deep pass, the area southeast of the restricted area fence required about eighteen inches of soil to be removed before the control limit was reached. Appproximately 9,688 cubic yards of material from approximately 25.1 acres were removed from the windblowm tails area to a one acre site located within the old tails basin. The one acre site was stabilized with wind fencing to prevent wind dispersal and subsequent redeposition of the windblown tails.

Topsoil

The contractor elected to use only the area north of the restricted area fence as a source of borrow material. This was the only area stripped of topsoil. The three scrapers stripped the area of topsoil which was transported to the topsoil storage pile. About 6 to 18 inches of topsoil which totaled 19,236 cubic yards was removed from approximately 16.9 acres inside the borrow area boundaries.

A landscaping company was contracted to stablize the 1.5 acre topsoil stockpile with hydromulch. The company applied 100 pounds of barley seed and 100 pounds of fertilizer over the topsoil pile during the first pass. The five subsequent cover passes applied a total of 3,000 pounds of Conwed wood fiber mulch in conjunction with 60 pounds of Terra Tack 1 tackifier over the topsoil stockpile.

Borrow Material

As soon as sufficient topsoil had been removed to expose the borrow material, an Inberg - Miller Engineers representative took a soil sample to determine the Standard Proctor (ASTM D698) parameters, moisture content, and the amount of material passing through a #200 sieve. The tests indicated the material met or exceeded the specifications set forth in Appendix F of the Reclamation Plan. Refer to APPENDIX P.

The first 2400 cubic yards of borrow material hauled to the mill burial area were used to construct access routes to the mill debris located in the northern half of the mill burial area. As the borrow material accumulated, the dozer distributed the soil over the mill debris and worked it into the debris. Water from the skid mounted rainbird sprinkler was sprayed over the area to aid in the distribution of the material into the debris.

Once the debris was adequately covered, the borrow material was laid down in 4 to 6 inch lifts. The waterwagon followed the scrapers as they unloaded to thoroughly wet and compact the soil by continuously driving over the borrow material. The motor grader also traversed the compacted areas, bringing the material to grade, maintaining a stable driveway and aiding in soil compaction.

The Inberg - Miller Engineers representative began a series of inplace nuclear density tests which continued daily until all of the interim soil cover had been placed and had met the 95% compaction criteria. All areas where the tests failed to meet the 95% compaction criteria were further wetted and compacted until the nuclear density testing indicated the 95% compaction criteria had been met. The representative used a Troxler Electronic Laboratories Model 3401-B Surface Moisture-Density Gauge which utilized a Cesium-137 source for the density determination (ASMT D2922) and a Americium-241:Beryllium source for the moisture determination (ASMT D3017). The nuclear density tests were correlated with a series of Density of Soil Inplace by the Sand-Cone Method (ASMT D1556) tests. These tests were performed at specific locations along the surveyed cross section lines. See APPENDIX P.

As the interim soil cover on the northern half of the mill burial area was brought to the specified grade, the scraper crews began to spread the borrow material in 4 to 6 inch lifts onto the southern half of the mill burial area. Grade surveys were continually run to determine the areas which required additional fill. Borrow material was deposited until all the delineated burial area was covered with the specified amount of interim soil cover.

The contractor routed the loaded scrapers and waterwagon over the just laid borrow material to insure all the material was adequately compacted. This procedure and the constant wetting with the skid mounted rain bird sprinkler and the waterwagon eliminated the use of specialized compaction equipment to achieve the compaction criteria. Approximately 70,036 cubic yards of loose borrow material was moved from 16.9 acres in the borrow area and placed and compacted over 8.2 acres in the mill burial area. The mill burial area and the borrow area were stablized with wind fencing.

Demobilization

Salveson regraded all roads used during the project. All haul roads that were constructed were graded to the existing ground contours. Fences and gates were repaired as required by WNI. The staging area was cleaned and the access road was blocked.

All equipment used in the restricted area was scanned for potential alpha contamination and released in accordance with Attachment No. 1 of USNRC Source Materials License Number SUA-56. Refer to APPENDIX S.

Final Land Survey

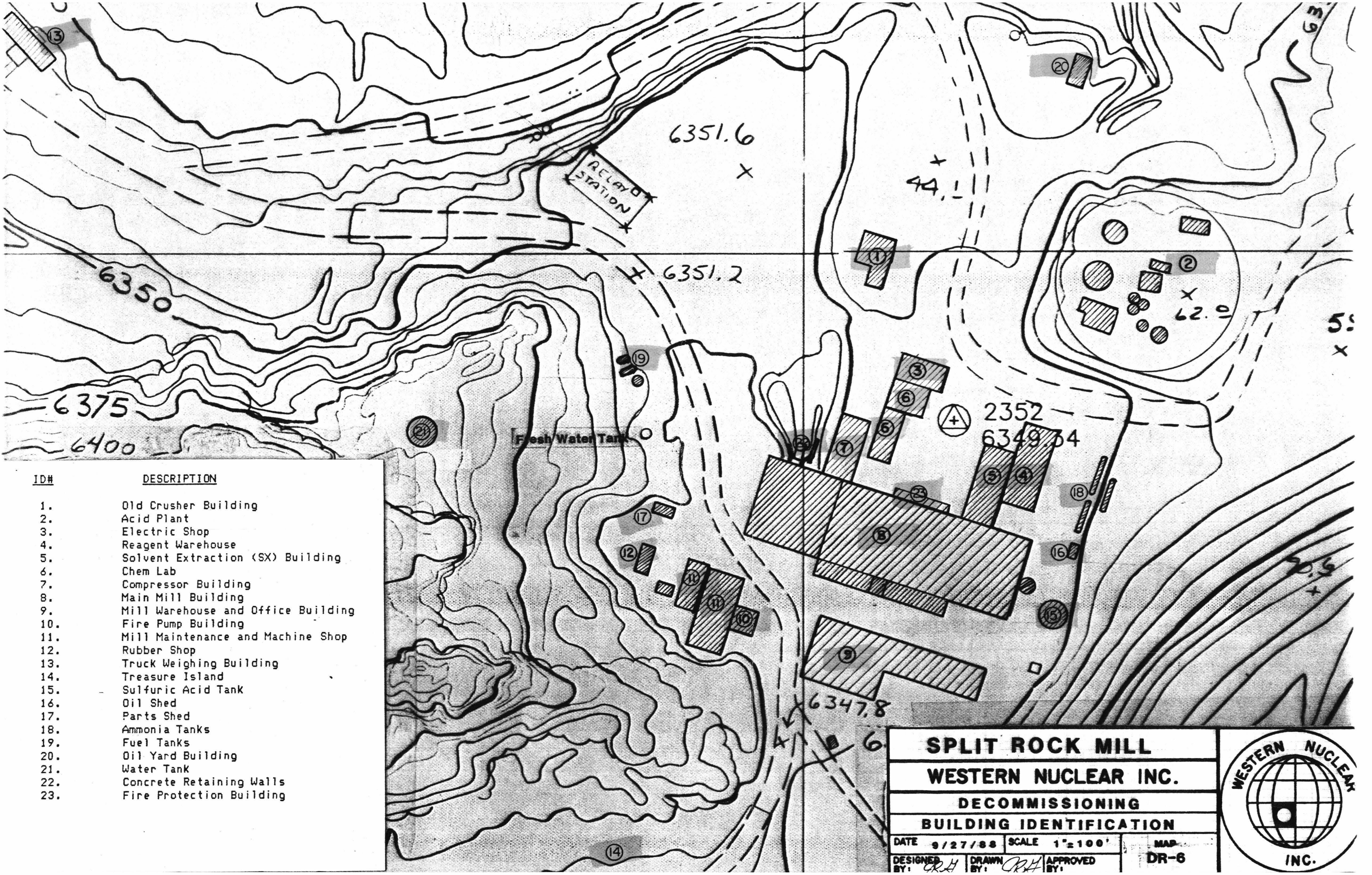
A final land survey was performed by WNI and the contractor during September 2 to 4, 1989 to determine the amount of windblown tails, topsoil and borrow material that had been moved. The survey also included; delineating the extent of the windblown/borrow area, the interim soil cover area, the topsoil storage area and the windblown tails depository. Refer to MAP DR-7.

Interim Stabilization

On September 27, 1989 a contract crew began the installation of four foot high "Canadian" style wind fencing to protect the interim soil cover, borrow area, and the relocated windblown tails from wind erosion. This project was completed on October 5, 1989. Approximately 15,000 linear feet of fencing was installed over these areas.

Photographic Documentation

Photographs were taken on a timely basis to document the pre-existing conditions, removal of the windblown tails, placing of the borrow material and completed interim soil cover conditions. A log was kept of each photograph to document the date, picture number and work area. Refer to APPENDIX T for the photographs and accompanying log. See MAP DR-7 to locate work area locations.



ID#	DESCRIPTION
1.	Old Crusher Building
2.	Acid Plant
3.	Electric Shop
4.	Reagent Warehouse
5.	Solvent Extraction (SX) Building
6.	Chem Lab
7.	Compressor Building
8.	Main Mill Building
9.	Mill Warehouse and Office Building
10.	Fire Pump Building
11.	Mill Maintenance and Machine Shop
12.	Rubber Shop
13.	Truck Weighing Building
14.	Treasure Island
15.	Sulfuric Acid Tank
16.	Oil Shed
17.	Parts Shed
18.	Ammonia Tanks
19.	Fuel Tanks
20.	Oil Yard Building
21.	Water Tank
22.	Concrete Retaining Walls
23.	Fire Protection Building

SPLIT ROCK MILL

WESTERN NUCLEAR INC.

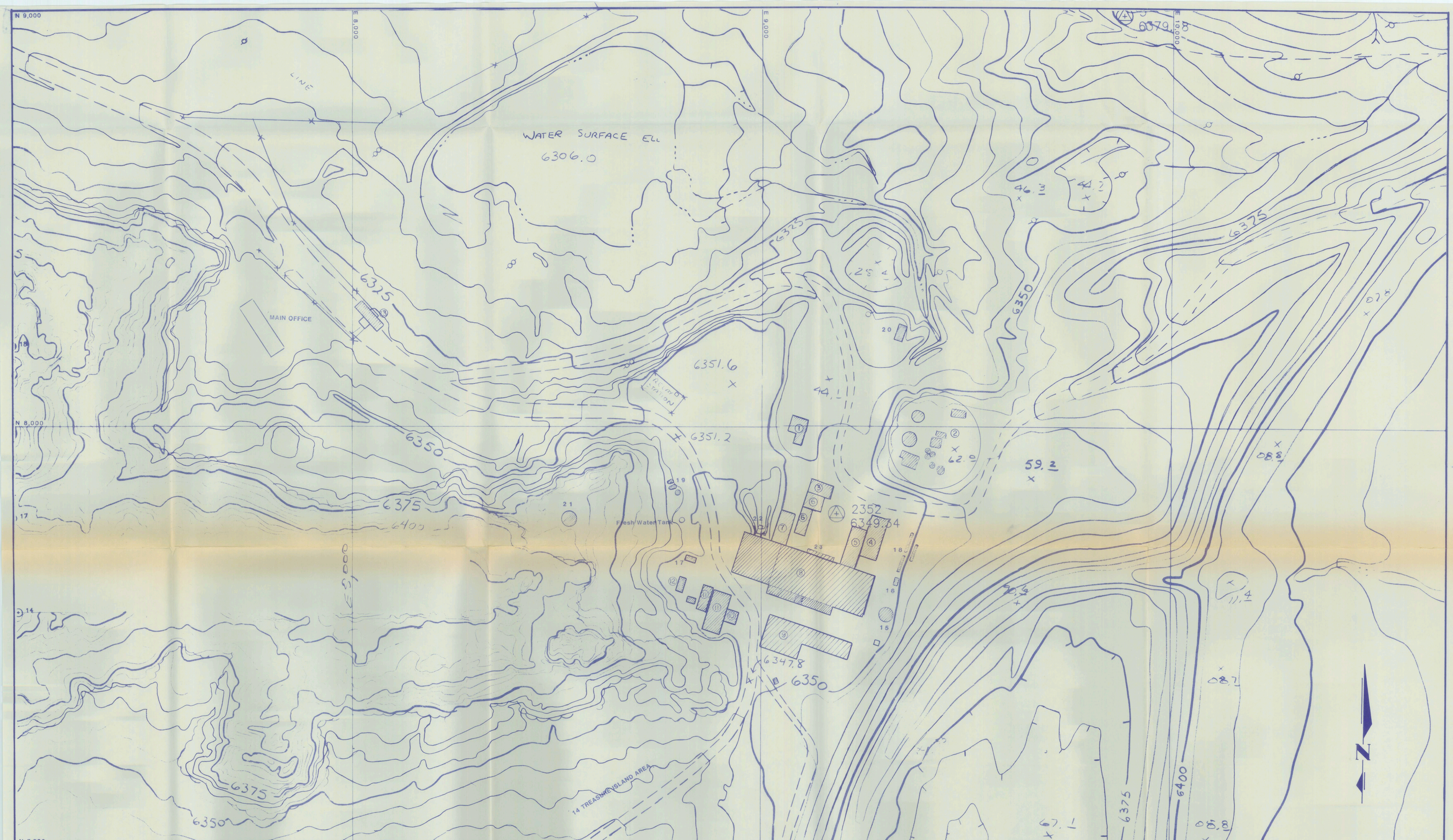
DECOMMISSIONING

BUILDING IDENTIFICATION

DATE 9/27/88 | SCALE 1"=100' | MAP DR-6

DESIGNED BY: GRH | DRAWN BY: GRH | APPROVED BY:

WESTERN NUCLEAR INC.



DISMANTLING COMPLETION DATES

1 OLD CRUSHER 3/14/88
2 ACID PLANT 7/7/88
3 ELECTRIC SHOP 6/21/88
4 REAGENT WAREHOUSE 6/21/88
5 SX BUILDING 7/5/88
6 CHEM LAB 6/17/88
7 COMPRESSOR BUILDING 6/2/88
8 MAIN MILL BUILDING 8/30/88
9 MILL WAREHOUSE & OFFICE BUILDING 8/31/88
10 FIRE PUMP BUILDING 5/21/88
11 MILL MAINTENANCE & MACHINE SHOP 8/31/88
12 RUBBER SHOP 4/23/88
13 TRUCK WEIGHING BUILDING 5/25/88
14 TREASURE ISLAND 9/8/88
15 SULFURIC ACID TANK 2/26/88
16 OIL SHED 3/31/88
17 PARTS SHED 4/15/88
18 AMMONIA TANKS 5/3 & 5/5/88
19 FUEL TANKS 5/14/88
20 OIL YARD BUILDING 5/28/88
21 WATER TANK 7/15/88
22 CONCRETE RETAINING WALL 9/7/88
23 FIRE PROTECTION BUILDING 6/21/88

Indicates Structure Dismantled

DATE OF PHOTOGRAPHY
4/16/87

0 50 100 200 300 FEET

CONTOUR INTERVAL 5 FT.

REVISIONS		
DATE	BY	
7/7/88	JRG	Decommissioning Progress Dates
7/22/88	JRG	" " "
7/29/88	JRG	" " "
8/5/88	JRG	" " "
8/19/88	JRG	" " "
9/1/88	JRG	" " "
9/7/88	JRG	" " "

PROJECT AREA: WESTERN NUCLEAR, INC.
SPLIT ROCK MILL

STATE WYOMING COUNTY FREMONT

SECTION 1, 2, 11, 12 TWP. 29 N RGE. 92W

TITLE:

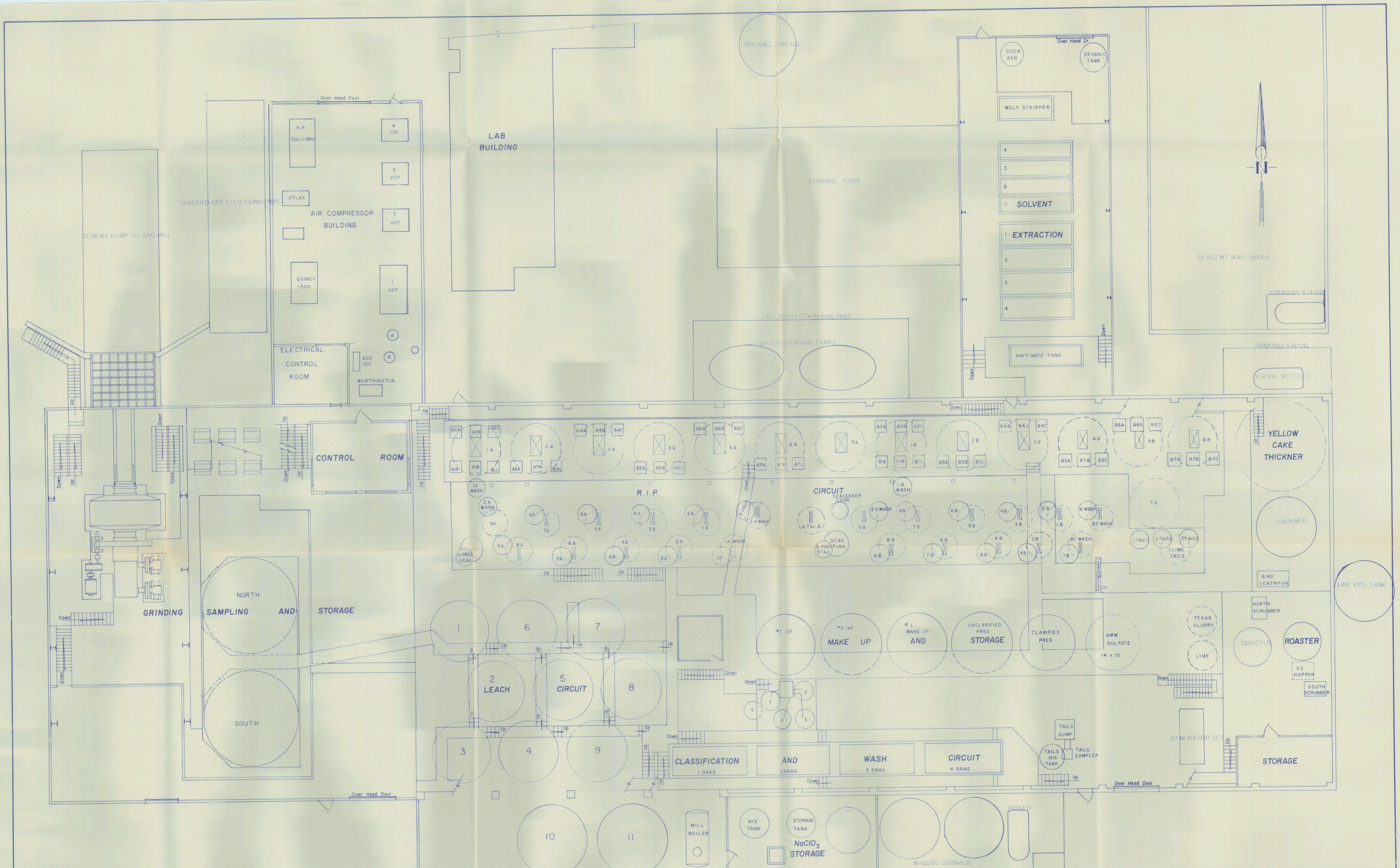
DISMANTLING COMPLETION DATES

Design By RWC	Scale 1" = 100'	Date 7/7/88
Drawn By JRG	Checked By RWC	Sheet 1 of 1

WESTERN NUCLEAR INC.

DWG. NO. DR-1

~~9001040178~~



REVISIONS		
NO.	DATE	BY
1	8-6-76	HRR
2	3-1-77	
3		
4		
5		

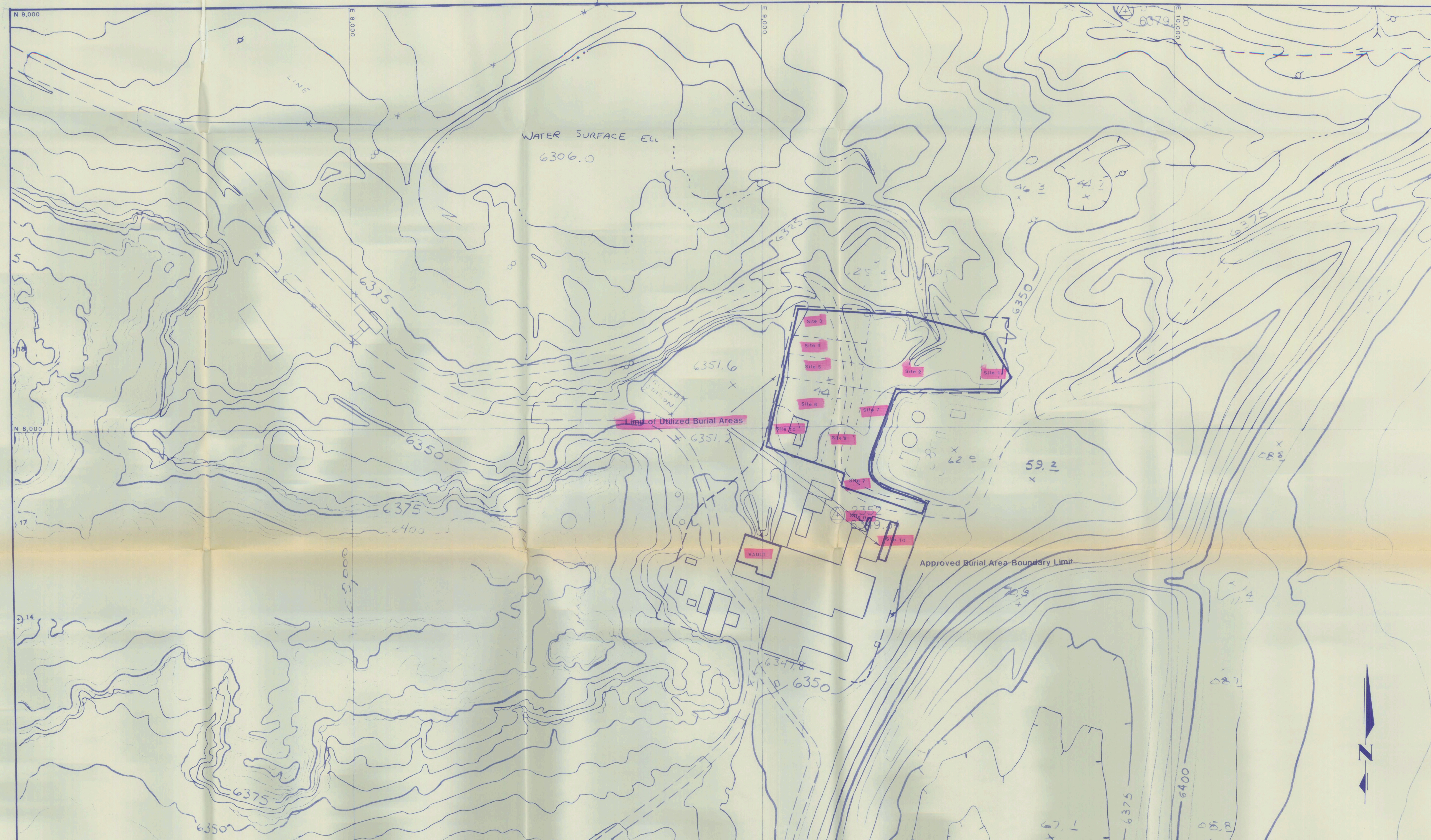
SPLIT ROCK MILL

WESTERN NUCLEAR, INC.

MILL LAYOUT PLAN

DATE 12/9/75	SCALE 3/32" = 1'-0"	DRAWING NUMBER
DRAWN BY:	CHECKED BY: HRR	DR-2

9001040183



Burial Area Utilized

Burial Area Boundary

DATE OF PHOTOGRAPHY
4/16/87

0 50 100 200 300 FEET

CONTOUR INTERVAL 5 FT.

REVISIONS		
DATE	BY	

PROJECT AREA: SPLIT ROCK MILL

STATE: WYOMING COUNTY: FREMONT

SECTION: 1,2,11,12 TWP: 29N RGE: 91W

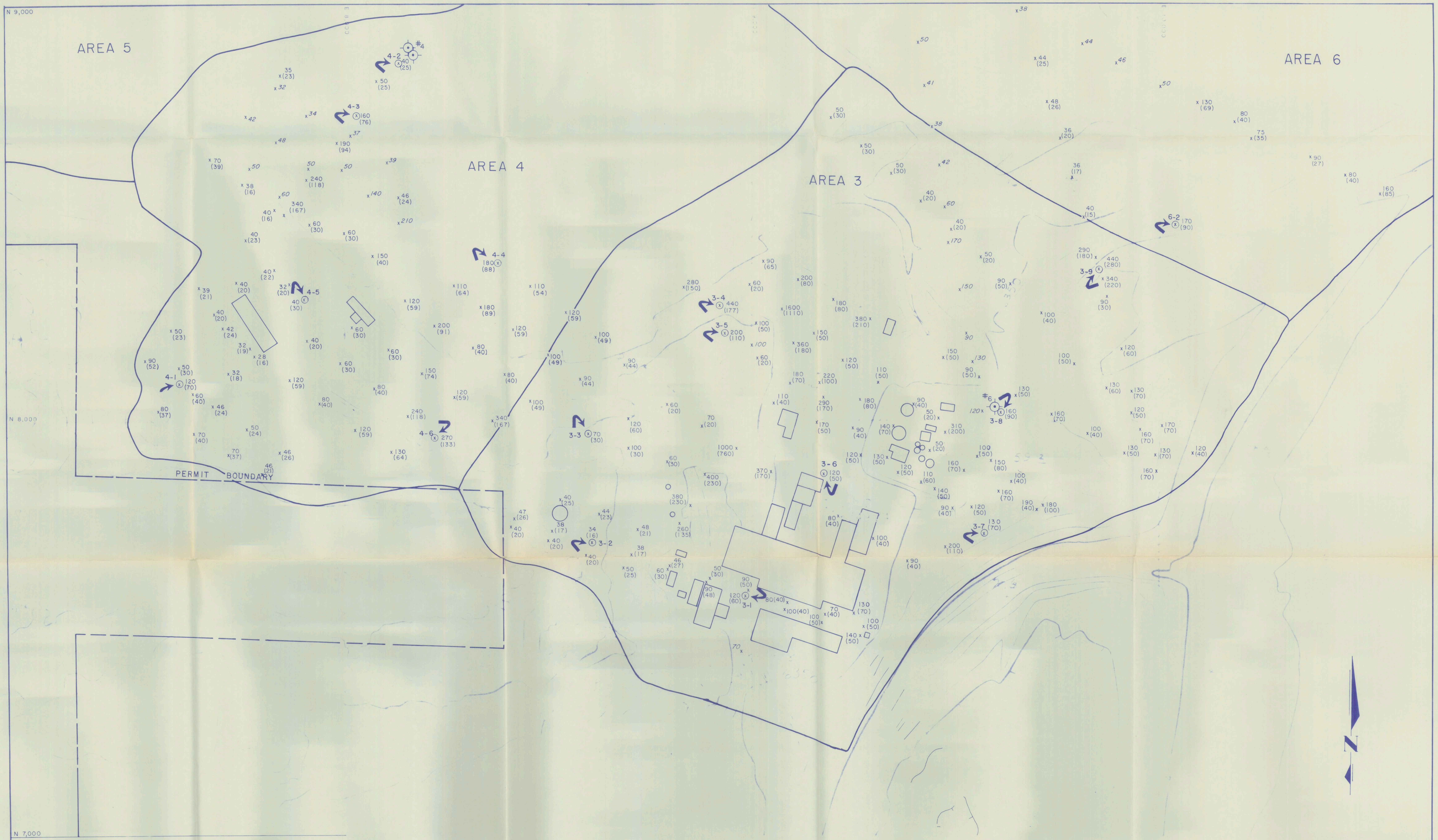
TITLE: **DECOMMISSIONING**

BURIAL AREA UTILIZATION

WESTERN NUCLEAR INC.

Design By: JRG	Scale: 1" = 100'	Date: 10-13-88	DWG. NO.
Drawn By: JRG	Checked By:	Sheet 1 of 1	DR-3

~~9001040186~~



LEGEND

- x — LOCATION OF EXTERNAL GAMMA RAY EXPOSURE RATE READING
- x 90 — UNCORRECTED GAMMA EXPOSURE RATE (μR/hr) AT LOCATION x
- x (44) — CORRECTED GAMMA EXPOSURE RATE (μR/hr) AT LOCATION x
- ⓧ — LOCATION OF SOIL SAMPLE
- 2-1 ⓧ — LOCATION OF SOIL SAMPLE #1 / GAMMA READING IN DESIGNATED AREA 2
- #6 — GROUNDWATER MONITORING WELL #6

DATE OF PHOTOGRAPHY
4/16/87

0 50 100 200 300 FEET

CONTOUR INTEVAL 5FT.

REVISIONS		
DATE	BY	

PROJECT AREA

STATE COUNTY

SECTION TWP RGE

TITLE
PRE-RECLAMATION
RADIOLOGICAL SURVEY
SEPTEMBER, 1987

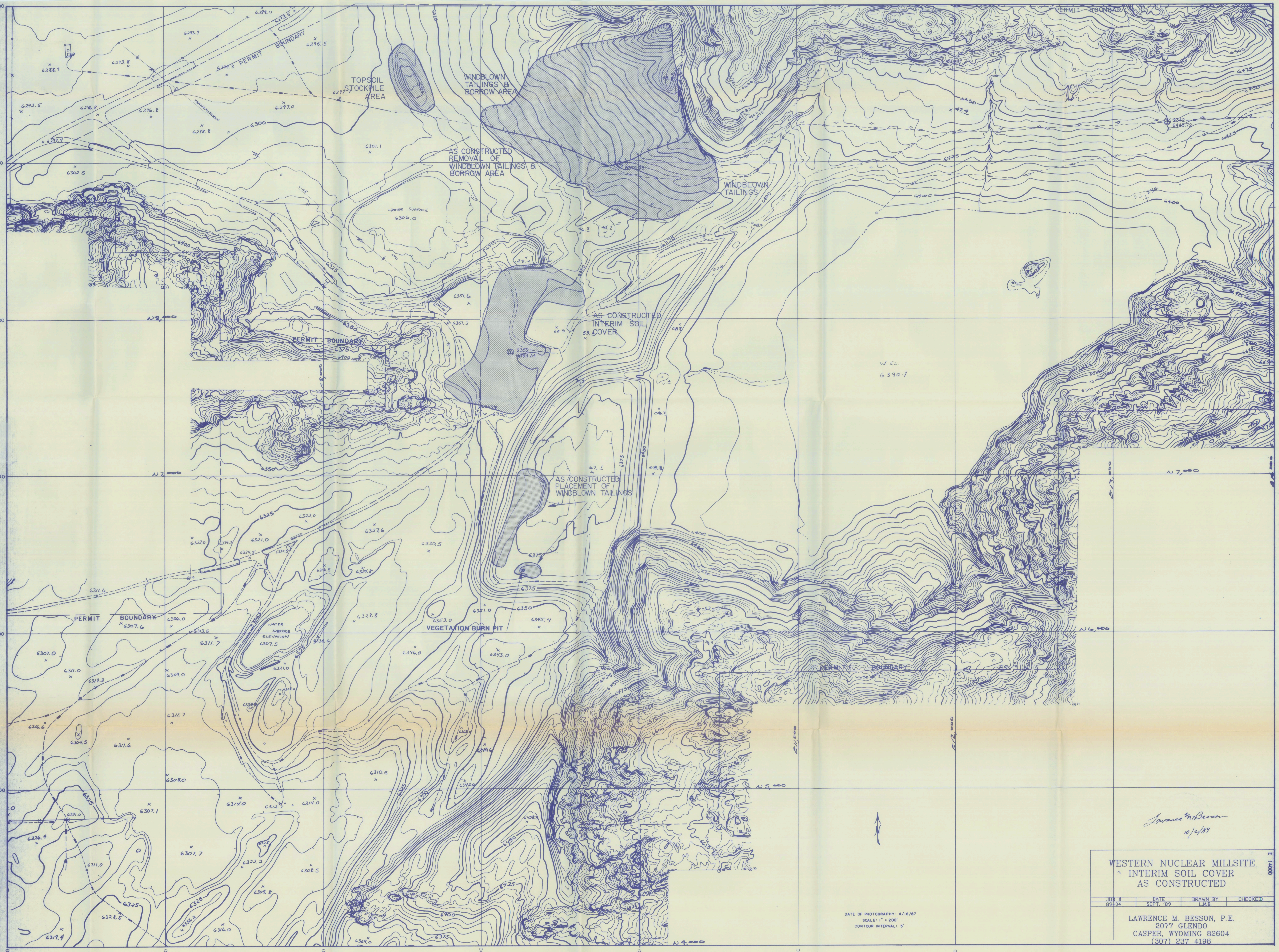
Design By L. W. H.	Scale 1" = 100'	Date
Drawn By	Checked By S. J. B.	Sheet ___ of ___

WESTERN NUCLEAR INC.

DWG. NO. DR-4

9001040188

PERMIT BOUNDARY
AREA 5
AREA 6
AREA 3
AREA 7
Outline of area plotted on 1" = 100' scale
SHEET INDEX
1 2 3 4 5
LEGEND
x LOCATION OF EXTERNAL GAMMA RAY EXPOSURE RATE READING
x 90 UNCORRECTED GAMMA EXPOSURE RATE (μR/hr) AT LOCATION x
x (44) CORRECTED GAMMA EXPOSURE RATE (μR/hr) AT LOCATION x
LOCATION OF SOIL SAMPLE
2-1 LOCATION OF SOIL SAMPLE #1 / GAMMA READING IN DESIGNATED AREA 2
#6 GROUNDWATER MONITORING WELL #6
DATE OF PHOTOGRAPHY 4/16/87
SCALE 1" = 200'
CONTOUR INTERVAL 5'
Prepared by
IntraSearch
Denver Colorado
REVISIONS
DATE
BY
PROJECT AREA
STATE
COUNTY
SECTION
TWP
RGE
TITLE
PRE-RECLAMATION
RADIOLOGICAL SURVEY
SEPTEMBER, 1987
Design By L. W. H.
Scale 1" = 200'
Date
Drawn By
Checked By S. J. B.
Sheet 3 of 5
WESTERN NUCLEAR INC.
DWG NO
DR-5



prepared by INTRASEARCH, Denver, Colorado

REVISIONS	
DATE	BY

PROJECT AREA

STATE ______ COUNTY ______

SECTION ______ TWP. ______ RGE. ______

TITLE: **MAP**

DR-7

Design by | Scale | Date

Drawn by | Checked

WESTERN NUCLEAR INC.