UNITED NUCLEAR CORPORATION

CHURCH ROCK

MILL DECOMMISSIONING REPORT

LICENSE NO SUA-1475

DOCKET NO. 40-8907

APRIL 1, 1993

VOLUME I

UNITED NUCLEAR CORPORATION

P.O. Box 3077
Gallup, New Mexico 87305-3077

Telephone: (505) 722-6651
Fax: (505) 722-6654

April 13, 1993

Mr. Ramon E. Hall, Director
U.S. Nuclear Regulatory Commission
Uranium Recovery Field Office
Region IV
P.O. Box 25325

Re: Completion of Mill Decommissioning and
Decommissioning Activities Report

United Nuclear Corporation has completed the mill decommissioning per our approved plan dated December 29, 1988, as revised by submittal dated April 10, 1990 in accordance with Condition 26 of Material License SUA-1475. Submitted here with is the Mill Decommissioning Report also required by Lincense Condition 26. This report discusses the demolition, disposal activities, and the radiation safety program utilized during the mill decommissioning. The report also includes health physics monitoring data, occupational exposures, bioassay results, and employee training and instruction records.

Enclosed are two copies of the above-mentioned report for your review.

If you have any questions, please advise.

Sincerely,

Edward M. Morales
General Manager
Radiation Safety Officer

EMM:M

Enclosures

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1.0 Introduction

The Church Rock mill owned and operated by United Nuclear Corporation is located approximately 17 miles northeast of Gallup, New Mexico, on Section 2, Township 16 North, Range 16 West, McKinley County. The mill was licensed to operate by the State of New Mexico on May, 1977. It operated until May, 1982, when it was placed on standby due to the economic condition of the uranium industry.

The plant was shut down systematically so that all ore and process solutions were completely processed through the plant before shutdown. The circuits were flushed out with water. The wooden tanks were left full of water to keep them from drying and falling apart. The exception was #6 Thickner; it was left with tailings slurry on the bottom and remainder full of water. This shutdown method made the mill decommissioning and equipment decontamination much easer.

United Nuclear determined in late 1984 that the Church Rock facility would be closed permanently. Since that time, the company has actively pursued the salvage and sale of the mill equipment and materials. A list of sold and stored decontaminated equipment was submitted in our 1988 Mill Decommissioning Plan. Information on equipment sold and stored since the 1988 list is included in this report in Appendix I.

2.0 Mill Decommissioning Activity Summary

The mill decommissioning was done in two phases. In 1991 the above-ground mill facilities and associated equipment were demolished and hauled to Borrow Pit #2 and disposed of as per our Reclamation Plan. The solvent extraction circuit was an exception due to the fact the circuit was made out of concrete. All concrete demolition was scheduled to take place in 1992.

In 1992, with the exception of concrete buried in place as explained further in this report, all cement floors, sumps, foundations, solvent extraction circuit and all underground process piping was demolished, hauled to Borrow Pit #2 and disposed of as per our Reclamation Plan. The 1992 Plan also included the excavation of contaminated soils from the mill process area, ore pad and catch basins.

3.0 1991 Mill Decommissioning Activities

3.1 Leach Circuit Demolition

The leach circuit was not a housed circuit. It did contain a closed breezeway over the top of the leach tanks. As mentioned before, tanks and breezeway were washed during our 1982 shutdown. The leach tanks, however, were flat bottom tanks which made it hard to completely clean the floors. These tanks did retain some leached ore residue.

The breezeway was demolished, loaded and hauled to Borrow Pit #2. The leach tanks were kept wet during demolition and loading. They were hauled to the south end of Borrow Pit #2 where they were unloaded in the area with the rest of the wood materials. Photographs showing the demolition, loading and Borrow Pit disposal area can be seen in Appendix A, Leach Circuit Demolition and Borrow Pit disposal.

3.2 CCD Tank and Piping Demolition

As was mentioned in our Decommissioning Plan, all tanks were cleaned during the 1982 shutdown with the exception being #6 Thickner. Most of the wood stave tanks were taken down and stored prior to 1988. Some of these staves have been planed to remove the contamination, and released for unrestricted use. Information on the procedures for planing the staves can be seen in the Radiation Work Permit section.

CCD wooden stave tanks which were demolished in 1991 were #6 Thickner, raffinate tank, overflow tank, preg tank, and back wash tank. The tanks were kept wet during demolition. The staves were loaded on dump trucks and hauled to the south end of Borrow Pit #2 where they were disposed of. The ore tailings material which had been left in #6 Thickner floor was kept wet while loading into the dump truck. The ore tailings material was disposed of in Borrow Pit #2.

The metal floc chemical tanks from the CCD circuit had been taken out and sold prior to 1988. The metal tanks remaining for demolition were seven overflow sump tanks. These tanks were demolished along with the piping from inside the CCD buildings. The tanks and piping were cut up, flattened and disposed of in Borrow Pit #2. Photographs showing some of the demolition can bee seen in Appendix A, CCD Equipment Demolition.

3.3 CCD Building Demolition

As mentioned in our decommissioning plan, the CCD Building walls and floors had all been washed during the 1982 shutdown. This building housed a wet process circuit and no dry materials were produced to cause any contaminated dust problems on the walls and insulation. As a good health protection practice, the building was kept wet during demolition. The sequence used in the demolition of this building was as follows: Remove the piping and other materials which could be reached by the demolition equipment. Cut the structural steel and collapse that portion of the building. The collapsed building portion would then get cut up and loaded into trucks for disposal in Borrow Pit #2.

3.4 Percipitation Equipment Demolition

Prior to shutting down, all yellow cake slurries in the precip circuit were processed through the dryer. The dryer, yellow cake bin, process tanks, and related equipment were then acid washed and rinsed with water and put on standby.

In 1986 in order to remove other equipment from the precipitation circuit the yellow cake dryer had to be move out of the way. The yellow cake dryer was moved outside the precip building and placed in front of the precip's north door. In late 1989, we noticed the dryer was showing signs of yellow cake leakage from insulation between the dryer walls. On March 22, 1990, the yellow cake dryer was wrapped with vent bag material and a building constructed around it to keep any yellow cake leakage contained.

In 1991 the yellow cake dryer was hauled out to its burial place in Borrow Pit #2. Procedure used in handling and disposal was as follows. Vent bag material was set on the floor of a trailer. The building containing the yellow cake dryer was taken apart, the dryer was then loaded on the trailer and wrapped by taking the vent bag material up to the top of the dryer and tying it up. The dryer was taken out to Borrow Pit #2 where it was unloaded. The dryer was unwrapped and wetted down prior to starting and during demolition.

The yellow cake bin had been left in its operating place until the day it was loaded.

The bin had been cleaned as mentioned before during shutdown. The bin contained rusted scale which could possibly contain some residual yellow cake.

No special handling was imposed on the bin during transportation other than it being secured on the truck. The bin was wet down during demolition as a precaution and as a good health physics practice. The yellow cake primary thickner and the preg solution tank were made out of steel. These tanks and process piping were cut up, flattened and disposed of with other materials in Borrow Pit #2.

The precip tanks and the barren strip tanks were made out of wooden staves. The tanks had been cleaned during shutdown; they did show some yellow stains but no actual yellow cake dust. The precip tanks were taken out whole and loaded on a flat bed, secured and taken out to Borrow Pit #2.

The barren strip tanks were demolished on site, loaded on to dump trucks and hauled to the borrow pit. All wood materials were unloaded on the south side of Borrow Pit #2 where they were later burned and buried. Photographs showing the handling and demolition of the precipitation circuit equipment can be seen in Appendix A, Precipitation Equipment Demolition.

3.5 Precipitation Building Demolition

After the removal of process equipment from within the building, demolition was started. The building walls, ceilings and floors had all been cleaned during shut down as was mentioned in our Reclamation Plan. As a good health protection practice, the building was kept wet during demolition. The demolition took place by first peeling off the outer skin of the building, then cutting down the structural steel. The building material was cut up in pieces which would fit into a 30-foot dump truck. The dump trucks hauled the material out to Borrow Pit #2 where it was dumped and later laid out by special equipment to maintain a layer of 1.0 to 2.5 feet. Photographs showing the handling and demolition of this building can be seen in Appendix A, Precipitation Building Demolition.

3.6 Disposal of Wooden Staves in Borrow Pit #2.

The wooden staves form all the wooden process tanks demolished in 1991 were disposed of by incineration in Boorw Pit #2. The ashes were buried in the south area of the borrow pit where incineration took place. Photographs showing the area and incineration can be seen in Appendix A, Wooden Stave Disposal. The burning took place on non-windy days and only few staves at a time were burned. Data Summary on air samples taking during the buring is reported on page 21. Ref: Letter of November 13, 1991, UNC reply to Notice of Violation.

3.7 Borrow Pit #2 Burial Disposal and Cover

Borrow Pit #2 was used for mill tailings solutionstorage during the mill operation. After the shutdown in 1982, neutralization of the tailings solution in the borrow pit was started and was completed July, 1983. The borrow pit was also used for storage of the water fromt he remediation pumpback system until the evaporation ponds were completed early 1989. The borrow pit was dry by end of April, 1989. The borrow pit had to be used for temporary water storage in early 1991. The pond was pumped dry by May 30, 1991. By July 17, 1991, the contractor started putting a base on the bottom of the borrow pit in order to support equipment placing the decommissioning materials in the borrow pit.

The material placed in the borrow pit in 1991 was structural steel, siding from the demolished buildings, process equipment, piping, tanks, and wooden staves. The material was covered with a minimum of 1 foot compacted soil cover. Photographs showing the borrow pit prior to any disposal or base fill through the completion of the 1991 disposal and compacted soil cover can be seen in Appendix A, Borrow Pit Disposal and Cover.

4.0 Mill Decommissioning Activities 1992

4.1 Decontamination of CCD Basement, Tunnels and Thickner Floors

The decontamination procedure used was wet sandblasting. The wet sandblasting method did a good job of decontamination as well as meeting the ALARA concept in that it eliminates any dust problems. The basement walls, tunnel walls, ceilings and thickner floors were completed first, then basement and tunnel floors were washed off removing all the sand material and proceeded to sandblast the floors. Once the stains were removed from the concrete, the contamination was removed. Reg Guide 8.30 Table 1 was the criteria used on the concrete to be buried in place. The sampling Procedures and the Data Summary on all buried concrete is reported in Pages 12 thru 15. Photographs showing the before and after sandblasting can be seen in Appendix B, Pages 3, 4, and 9.

4.2 Bulkheading CCD tunnels and Emergency Drain

The CCD basement tunnel and drain openings were buldkheaded by bolting .38 inch reinforced steel plate over the openings on the basement walls. Photographs showing the bulkheads can be seen in Appendix B, Page 6.

4.3 CCD Basement Roof Demolition

Clean soil was hauled from the borrow area by truck and dumped in the basement. A small dozer/compactor piece of equipment would spread and compact the soil. The sequence continued until the basement lacked about two feet of being full. Photographs showing filling and compacting can be seen In Appendix B, Page 6.

4.4 CCD Basement Roof Demolition

The plan was to fill the basement as full as possible, then demolish the basement roof. This way the concrete material would not go 22 feet to the bottom of the basement. Instead, it fell on top of the compacted fill which made it easier to remove and reclean the surface of the compacted soil. Photographs showing the roof demolition can be seen in Appendix B, Page 7.

4.5 Demolition of Thickner Floor Stem Wall

The stem wall was an actual cement wall which surrounded the thickner floor about 5 feet high, one foot thick, with about three feet being below ground. The wall was excavated and loaded into trucks.

Excavation of soils in the stem wall area was done to assure no soil contamination. Photographs showing the demolition of the stem wall can be seen in Appendix B, Page 9.

4.6 Bulkheading and Filling of the CCD Thickner Floors

The CCD Thickner Floor discharge cone was bulkheaded with .38 inch reinforced steel plate. The thickner floor was then filled with clean soil and compacted. Photographs showing the bulkhead and covering of the thickner floors can be seen in Appendix B, Page 10.

4.7 Demolition and Decontamination of Grizzly and the Grizzly Tunnel

This equipment was made out of concrete and was below ground level. The grizzly tunnel came at incline from the depth of 35 feet. About 20 feet of the tunnel came out of the ground. The above-ground portion was demolished so that the tunnel roof was a minimum of 1 foot below ground level. The grizzly itself had a steel sleeve which was pulled out and demolished. The concrete walls, ceiling and floors were decontaminated by wet sandblasting.

4.8 Filling and Compacting the Grizzly and Grizzly Tunnel

Both areas were filled with clean dirt and compacted. The grizzly was filled up to the tunnel opening, then both were filled and compacted at the same time. The grizzly was filled from the top and the tunnel from the incline. Photographs showing the filling and compacting can be seen in Appendix B, Pages 23 and 24.

4.9 Excavation of Foundation, Floors, and Sumps from the Following Process Areas: Leach, Grinding, Precipitation, Boiler, Clair Floc Tank, and Raffinate Tank.

All floors in these process areas had sumps and drains below ground level except the two tank areas. Excavation in those areas required from four to five feet in depth excavation. All concrete and contaminated soils were excavated and hauled to Borrow Pit #2. The procedure used in the decontamination of soil was to excavate and remove the soil until ur/hr gamma reading was 16 ur/hr or less. As per our correlation graph 16 ur/hr gamma is equivalent to 6 pci/gm Ra 226. The cleanup criteria for site is 5 pci/gm above background being 1.0 pci/gm Ra 226. The Radiological Data Summary for all soil surface is reported on Pages 16 thru 18. Photographs showing the excavation can be seen in Appendix B, Pages 17 and 18.

5.0 Paving and SX Catch Basin Excavation

The excavation of the process area paving and the catch basin was performed by using a dozer and front end loader. The catch basin was excavated until contaminated soils were removed. The excavated materials were loaded on dump trucks and hauled to Borrow Pit #2 where they were disposed of. Photographs showing the before and after excavation can be seen in Appendix B, Pages 15 and 16.

5.1 Excavation of the Only On-site Process Underground Piping

The process piping going from the SX Circuit to the emergency catch basin and to the raffinate tank were excavated with a backhoe. Excavation of soils was done in the buried pipe area to assure no contaminated soils were left in the area. Photograph showing excavation can be seen in Appendix B, Page 15.

5.2 Demolition of Solvent Extraction Circuit (SX)

The solvent extraction and strip circuit compartments were constructed out of concrete with steel plate tops. The solvent extraction scrub compartment was entirely made out of steel plate. The piping for the SX circuit was all internal or overhead with the exception as mentioned in 5.1 of this report.

The scrub compartment was decommissioned by using a cutting torch. The purpose of using the cutting torch on this piece of equipment was that the steel plate was used as bulkhead material for the CCD tunnels and thickner cone openings, but only after it met releaseable standards. The scrub compartment contained a sump which needed special handling. The sump was a small rectangular tank made out of steel which contained some yellow cake residual. The sump was removed and the opening was covered with a tarp. The area was then roped off until the sump was loaded and hauled out to the borrow pit.

Some of the steel top material from the rest of the SX circuit was also used for bulkheads and some was put in storage, again only after it met releasable standards. The rest of the steel material was cut up and hauled to Borrow Pit #2.

The SX circuit was surrounded by an emergency catch impoundment. This impoundment was excavated and hauled out to the borrow pit. The rest of the SX circuit concrete walls and floors were demolished and hauled to the borrow pit. The SX circuit area soils were excavated for the purpose of removing contaminated soils. Photographs showing the SX circuit demolition can be seen in Appendix B, Pages 11 through 14.

5.3 Ore Pad Excavation

The ore pad was located on the east side of the process area. The ore pad was not used for process functions other than ore storage. The ore pad had been contaminated by the ore which had been stored during the years of operation.

The ore pad was excavated from 2 to 4 feet in order to remove the contamination. The excavated material was hauled to the borrow pit where it was used as cover for the mill decommissioning materials disposed of in the borrow pit. Photographs showing excavation and before and after pictures of the ore pad can be seen in Appendix B, Pages 19 through 21.

5.4 Catch Basin Excavation

The catch basins were situated east of the mill site across State Highway 566 on the tailings side of Section 2. The north basin (#1) which was used to hold runoff from the mill site had to be excavated an average of 3 feet in order to be decontaminated. The south catch basin (#2) which was used as an emergency catch basin for CCD spills had to be excavated an average of 4 feet to remove the contaminated soils. The excavated soils from both basins were used as cover in Borrow Pit #2 for the disposed mill materials. Photographs showing the before and after excavation can be seen in Appendix B, Pages 19 and 20.

5.5 Borrow Pit #2 Disposal, Burial and Cover

The material disposed of in Borrow Pit #2 in 1992 was mostly concrete and a small amount of structural steel, piping and wooden staves. The soil used for cover was mainly excavated soils from the mill site, ore pad and catch basins. The average thickness of concrete placed in the borrow pit was about 3 feet; there was some concrete which measured 5 feet in size. Photographs showing the 1992 before and after, the spreading of the concrete, and the disposed material can be seen in Appendix B, Pages 27 through 30.

5.6 Removal of Sewer Plant and Excavation of Sewer Plant Area

The sewer system at United Nuclear's Church Rock site was as follows: The Chem. and Met. Laboratories drained to the CCD sump which would then put it back into the CCD thickner circuit. The car wash sump also drained to the CCD sump. The soil material from the car wash sump was hauled to the ore pad to be processed with the ore. The showers and laboratories in the process areas all drained to sumps in the circuits. Human waste and the shower discharge from the main change hosue were the only items received by the sewer plant. The sewer plant discharge went to the CCD tailing sump which was then discharging to tailings along with the tailings from the process. The sewer plant was shut down and emptied out in 1985. The sewer system was changed at that time to a septic tank system.

Before removal of the sewer plant it was flushed out and surveyed. The plant was pulled and put in storage. This area was then excavated and graded. The contaminated soils were disposed of in Borrow Pit #2. Photographs showing the sewer plant area excavation can be seen in Appendix B, Pages 25 and 26.

5.7 Removal of East Perimeter Fence and Excavation of the Contaminated Soils from the Area

A temporary fence was installed 30 feet inside the restricted area so that the east perimeter fence could be removed to complete the clean-up of contaminated soils. The perimeter fence was removed, the area was excavated, and the contaminated soils were hauled to Borrow Pit #2. The perimeter fence was re-installed and the temporary fence taken down. Photographs showing the fencing and excavation can be seen in Appendix B, Page 26.

6.0 Disposal Data 1991 and 1992

6.1 1991 Material Disposed in the Borrow Pit #2

1991 material disposed in the borrow pit was structural steel, siding from demolished buildings, process equipment, piping, tanks and wooden staves. Before disposal commenced, a 3-foot lift of soil was placed on the bottom of Borrow Pit #2. The disposed material was placed in 2.5 feet maximum lifts using special equipment to place it. The material was then covered with 2 feet of soil which was worked into the disposed material. More dirt was then placed over the disposal area and compacted.

6.1.1 1991 Summary of Total Feet Placed in Borrow Pit #2 over 4 acres.

- 3 feet of soil for base
- 2.5 feet of disposed material
- 1.5 feet of soil for cover
- 7 total feet placed in Borrow Pit #2

Detailed material disposal survey included in Appendix C, Figure 1 and Table 1.

6.2 1992 Material Disposed in Borrow Pit #2

1992 material disposed in the borrow pit was mostly concrete from process area foundations, sumps, floor and the SX circuit. Other materials which were disposed of were structural steel, piping, and wooden staves. The average thickness of concrete placed was about 3 feet; there was some concrete that measured 5 feet in size. The other material placed averaged about 2 feet in thickness. The material was then spread out with a dozer, then soil was placed over it, and worked into the concrete and other material layers. More dirt was then placed over the disposal area and compacted.

6.2.1 1992 Summary of Total Feet Placed in Borrow Pit #2 over 5 acres

- 3.5 average feet of concrete and other disposed material
- 4.0 feet of soil cover
- 7.5 total feet placed in Borrow Pit #2

Detailed material disposal survey included in Appendix C, Figure 2 and Table 2.

7.0 Concrete Material Buried in Place

As per Section 4.9 of our approved Mill Decommissioning Plan and submittal of June 8, 1992, the listed concrete materials were buried in place.

- ° CCD basement walls and floor
- ° CCD thickner floors
- ° CCD tunnel floors, walls and ceilings
- ° Grizzly tunnel and basement
- ° Electrical vault

7.1 Concrete and Soil Radiological Sampling Procedure

- ° The 125-foot diameter thickner floors were divided into four (4) equal pie shapes. Each pie-shape was cored at about mid-point.
- ° The basement floor was divided into four (4) quarters. A core was done on each quarter; also, two in the sump area and one in the north section.
- ° The tunnel floors were cored in two (2) places--one in the cone and underflow pump area and the other at mid-point of tunnel.
- ° The grizzly tunnel area was cored at mid-point.
- ° The cement cores were surveyed for radiation and the soil below the cement core was sampled and sent to Energy Labs for Radium 226 and Uranium analysis. When possible, the coring was done on a cement seam or crack. The contractor's coring reports, the core radiation surveys, soil sample analysis, and the concrete surface radiological survey data are enclosed in Appendix D.
- ° After sandblasting, the remaining concrete surfaces were surveyed on a 10-foot grid pattern for Gamma and Alpha Radiation.

7.2 Summary of Concrete Radiological Data

The summary shows the highest data results recorded which are always less than allowable. Only the side and bottom Alpha survey data on the concrete cores were used in summary. The top surface was still contaminated when the coring was performed.

- ° 47 core samples surveyed   Alpha 828 dpm/100 cm^2 Gamma 12 ur/h
- ° 47 soil samples assayed   Ra226 1.3 pci/gm *U nat 29 pci/gm

*There were six soil samples with readings of 17 through 29 pic/gm u nat. the rest were less than 11 pci/gm u nat.

	Survey Points	Fixed Alpha dpm / 100 cm^2	Gamma ur/hr
° CCD Basement	87		
Walls	48	355	16
Floor	35	310	14
Pillar	4	177	12
Openings on drain pipes	12	835	15
° CCD Thickner #1	175		
Tunnel walls	20	753.9	12
Tunnel floor	10	931	12
Tunnel ceiling	10	443	12
Cone tunnel wall	7	443	12
Cone tunnel floor	4	886	12
Cone tunnel ceiling	4	532	12
Thickner floor	120	975	9
Thickner floor rim		221	9
° CCD Thickner #2	179		
Tunnel walls	22	798	12
Tunnel floor	11	886	12
Tunnel ceiling	11	953	12
Cone tunnel wall	7	133	13
Cone tunnel floor	4	155	13
Cone tunnel ceiling	4	103	13
Thickner floor	120	886	9
Thickner floor rim		221	9
° CCD Thickner #3	175		
Tunnel walls	20	938	14
Tunnel floor	10	820	13
Tunnel ceiling	10	997	12
Cone tunnel wall	7	842	12
Cone tunnel floor	4	731	12
Cone tunnel ceiling	4	578	12
Thickner floor	120	909	7
Thickner floor rim		221	7

	Survey Points	Fixed Alpha dpm 100 cm²	Gamma ur/hr
° CCD Thickner #4	175		
Tunnel walls	20	931	12
Tunnel floor	10	990	12
Tunnel ceiling	10	510	12
Cone tunnel walls	7	487	13
Cone tunnel floor	4	960	13
Cone tunnel ceiling	4	488	13
Thickner floor	120	886	7
Thickner floor rim		369	7
° CCD Thickner #5	179		
Tunnel walls	22	975	13
Tunnel floor	11	997	13
Tunnel ceiling	11	990	13
Cone tunnel walls	7	244	13
Cone tunnel floor	4	266	13
Cone tunnel ceiling	4	376	13
Thickner floor	120	990	7
Thickner floor rim		369	7
° CCD Thickner #6			
Tunnel walls	20	931	15
Tunnel floor	10	931	15
Tunnel ceiling	10	577	15
Cone tunnel walls	7	709	18
Cone tunnel floor	4	487	18
Cone tunnel ceiling	4	576	18
Thickner floor	120	960	8
Thickner floor rim		369	8
° Grizzly Basement	36		
Basement walls	30	886	16
Basement floor	6	569	16
Basement pipe inlet	1	221	18
Tunnel walls	26	753	15
Tunnel floor	13	975	15
Tunnel ceiling	13	222	15

	Survey Points	Alpha dpm / 100 cm²	Gamma ur/hr
° Electrical Vault			
Walls	4	133	10
Floor	1	110	10

Detailed Concrete Radiological Data is enclosed in Appendix D.

8.0 Radiological Survey on Process Area Soil Surface After Excavation

A reading of 16 ur/hr shielded gamma is equal to 6.0 pci/gm Ra226.

All gamma surveys were performed on a 10-meter grid system using a Ludlum Model 19 or 12S with a shield. The instrument was function checked prior to daily use.

8.1 Ore Pad. 246 gamma survey points and 43 soil samples.

4 survey points with 15 ur/hr   242 survey points below 15 ur/hr

5 soil samples with gamma spec 7.2 through 21.1 pci/gm Ra226, and 38 survey points at < 5.7 pci/gm.

3 soil samples with Chemical Ra226 at 6.0 to 7.5 pci/gm and 7 soil samples at < 2.4 pci/gm.

8.2 Grizzly. 14 gamma survey points and 1 soil sample.

2 survey points at 13 ur/hr   12 survey points below 13 ur/hr.

1 soil sample with gamma spec 4.1 pci/gm Ra226.

8.3 Precipitation. 28 gamma survey points and 1 soil sample.

1 survey point at 13 ur/hr   27 survey points below 13 ur/hr.

1 soil sample with gamma spec 2.1 pci/gm Ra226.

8.4 Precipitation Area Drainage Pond. 4 gamma survey points.

2 survey points at 14 ur/hr   2 survey points below 14 ur/hr.

8.5 Solvent Extraction (SX) 43 gamma survey points and 3 soil samples.

1 survey point at 11 ur/hr   42 survey points below 11 ur/hr.

1 soil sample with gamma spec 3.7 pci/gm Ra226 and 2 soil samples below 3.7 pci/gm.

8.6 Solvent Extraction Emergency Catch Basins. 13 gamma survey points and 1 soil sample.

2 survey points at 13 ur/hr and 11 survey points below 13 ur/hr.

1 soil sample with gamma spec 5.3 pci/gm Ra226.

8.7 CCD Pump House (CCD Building). 18 gamma survey points and 2 soil samples.

1 survey point at 12 ur/hr and 17 survey points below 12 ur/hr.

1 soil sample with gamma spec 7.1 pci/gm Ra226.

Same soil above with chemical at 5.5 pci/gm Ra226.

8.8 Inactive Basin. 18 gamma survey points.

1 survey point at 13 ur/hr   17 survey ponts below 13 ur/hr

8.9 Sewage Plant. 2 gamma survey points and 1 soil sample.

1 survey point at 15 ur/hr and 1 survey point below 15 ur/hr.

1 soil sample gamma spec 2.7 pci/gm Ra226.

9.0 Leach. 19 gamma survey points and 2 soil samples.

1 survey point at 14 ur/hr and 18 survey points at below 14 ur/hr.

1 soil sample gamma spec 4.2 pci/gm Ra226 and 1 soil sample below 4.2 pci/gm Ra226.

9.1 Clair Floc, Raffinate Tank Areas. 15 gamma survey points and 2 soil samples.

1 survey point at 10 ur/hr and 14 survey points below 10 ur/hr.

1 soil sample gamma spec 1.3 pci/gm Ra226 and one at 1.2 pci/gm Ra226.

9.2 Sodium Chlorate Storage (Chemical Building). 2 gamma survey points.

1 survey point at 13 ur/hr and 1 survey point below 13 ur/hr.

9.3 Thickner Floor Stem Wall Area.

The stem wall surrounding each thickner floor was removed and the area excavated to assure removal of any contaminated soils. Each thickner stem wall area was gamma surveyed at 12 survey points and 1 to 3 soil samples taken. Total survey points 72. Total soil samples 14.

1 survey point at 16 ur/hr and 71 survey points below 16 ur/hr.

1 soil sample gamma spec 4.0 pci/gm Ra226 and 13 soil samples below 4.0 pci/gm Ra226.

1 soil sample chemical Ra226 0.7 pci/gm and others below 0.7 pci/gm Ra226.

9.4 Solvent Extraction (SX) Impoundment. 18 gamma survey points and 4 soil samples.

The SX impoundment was made out of concrete and surrounded the SX circuit.

1 survey point at 15 ur/hr and 17 survey points below 15 ur/hr.

1 soil sample gamma spec 3.0 pci/gm Ra226 and 7 soil samples below 3.0 pci/gm Ra226.

9.5 Borrow Soil Area. 15 gamma survey points and 8 soil samples.

The soil from the borrow areas was used to fill all mill site excavated areas, CCD basement , CCD thickner floors and grizzly tunnel and basement.

1 survey point at 7 ur/hr and 14 survey points below 7ur/hr.

1 soil sample gamma spec 2.1 pci/gm Ra 226 and 7 soil samples below 2.1 pci/gm Ra226

1 soil sample chemical Ra226 0.4 pci/gm and 7 soil samples below 0.4 pci/gm Ra226

9.6 North, South Catch Basins (1 and 2)

These catch basins wre excavated to remove contaminated soils and then regraded.

° (1) North Catch Basin. 152 gamma survey points and 21 soil samples.

8 survey points at 15 ur/hr and 144 survey points below 15 ur/hr.

1 soil sample gamma spec 6.0 pci/gm and 20 soil samples below 5.5 pci/gm Ra226.

1 soil sample chemical 4.7 pci/gm Ra226 and 1 soil sample at 0.9 pci/gm Ra226.

° (2) South Catch Basin. 124 gamma surveypoints and 26 soil samples.

12 survey points at 15 ur/hr and 112 survey points below 15 ur/hr.

3 soil samples gamma spec 6.5, 6.7 and 7.0 pci/gm Ra226 and 23 soil samples at below 5.5 pci/gm Ra226

1 soil sample chemical 9.0 pci/gm Ra226 and 1 soil sample at 1.0 pci/gm Ra226

Radiological data for all soil surface areas is enclosed in Appendix E. All tables should be referenced to Figures A and B for actual survey and sampling points. The data in Figures C, D, and E do not require a reference table.

Radiological data for the correlation of gamma ur/hr vs. pci/gm Ra226 is enclosed as Appendix F. Our control for the site is 6.0 pci/gm Ra226. 16 ur/hr = 6.0 pci/gm Ra226.

10.0 Radiation Protection Program

10.1 Responsibility

The General Manager/Radiation Safety Officer was responsible for all activities on site. The General Manager has a wealth of technical experience as well as the educational background to have been able to take on such a responsibility. The General Manager was the mill superintendent and also supervised some of its construction. He has also been the RSO for United Nuclear since 1983 after he completed the shutdown of the IX plants and the yellowcake circuit. United Nuclear also has one full-time radiation safety technician who has at his disposal two other employees which have been trained in radiation protection, operation of monitoring equipment, soil sampling and recording of monitoring data. Documentation of training is listed in Appendix G.

10.2 Exposure Controls and Monitoring.

10.2.1 The Exposure Controls Used for the Decommissioning Activities for Both 1991 and 1992.

- Sign in and out roster for contractor's employees.
- Kept the area wet when necessary to control dusty conditions.
- Wore a dust mask or half mask respirator as required by the RWP.
- Washed hands and face prior to eating.
- Ate only in designated lunch areas.
- Took showers and changed clothes if required by the daily exit survey results or by the RWP.
- The decommissioning area was roped off and only authorized personnel were allowed in that area.
- Control spillage from trucks hauling contaminated material from mill site across unrestricted areas to disposal site.
- Good housekeeping and cleanup practices.
- Decontamination of equipment or materials leaving the site.
- Issued (RWP) Radiation Work Permits as per task requirements.
- Incinerating of wooden staves controlled by burning a few at a time rather than all at once. Burn dates were August 2, 5, 7, 8, 9, 13, 14, 20, 26, 27, and 29.

10.2.2 Monitoring Performed During Decommissioning Activities for Both 1991 and 1992

- Continuous, grab and breathing zone air samples taken.
- Working level readings of work areas.
- Bioassay sampling.
- TLD badges for exposure monitoring were issued to personnel.
- Daily visual inspections.
- Lunch room and change room surveys.
- Personnel exit surveys and spot checks by Rad Technician.
- Exit surveys of material and equipment.
- Gamma surveys of work areas.
- Gamma surveys of truck haulage road.

10.3 Summary of Health Physics Monitoring Data 1991

The summary shows the highest data recorded which is less than allowable unless otherwise indicated in summary.

Personnel

	° Internal exposure	3.73 mpc hours in 424 hours worked
	° Personnel (TLD) Whole Body Dose	24 mr/cal. qtr.
	° Personnel Bioassay	6.3 mg/l U Exception of Anomolies
	° Respirator Survey	= 259 dpm/100cm² (replaced respirator) more tha the 100dpm/100cm² allowable
	° Personnel Alpha Surveys Spot Check	= 628 dpm/100cm²
*	° Personnel Alpha Survey	= 1,244 dpm/100cm² (clothing), allowable 1000 dpm/100cm²
	° Personnel Alpha Survey (next highest)	= 311 dpm/100cm²
	° Lowest Rad Test Score	70% (passing 70%)

(* The clothing was left on site and laundered to decontaminate it.)

Environmental

° Area Gamma Survey	340 to 360 ur/hr
° Area Gamma TLD	11.5 mr/wk
° Air Sample Radon	$1.4E^{-9}$ uci/ml
° Air Sample Uranium	$5.06E^{-14}$ uci/ml
° Alpha Surface Survey	602 dpm/100cm² (change room floor)
° Contractor's Equipment Survey	900 dpm/100cm²
° Truck Haulage Road Survey	40 ur/hr Site Entrance 12 ur/hr State Road 566

° Borrow Pit #2
Stave Burning

Air Samples in uci/ml U Nat

Date	Grab Sample	Breathing Zone	Continuous	% mpc
8/8/91	$9.28E^{-13}$			0.92
8/9/91		$6.07E^{-12}$		6.0
8/12 to 8/26			$2.05E^{-14}$	0.02
7/1 to 10.7			$5.70E^{-15}$	0.006

10.4 Summary of Health Physics Monitoring Data 1992

The summary shows the highest data recorded which is less than allowable unless otherwise indicated in summary.

Personnel

° Internal exposure	4.22 total mpc hours in 790 hrs. worked
° Personnel TLD whole body dose	11 mr/cal qtr.
° Personnel Bioassay	13.8 mg/1 U Nat Exception Anomolies
° Respirator Survey	56.2 dpm/100 cm²
° Personnel Alpha Survey Spot Check	148.1 dpm/100 cm²
° Personnel Alpha Survey	754.7 dpm/100 cm²
° Lowest Rad Training Score	72% (passing 70%)
° Working Level (radon)	0.02 wl

Environmental

° Area Gamma Survey	310-320 ur/hr
° Area Gamma TLD	11.8 mr/wk
° Air Sample Radon	$8.0E^{-10}$ uci/ml
° Air Sample U Nat	$3.03E^{-14}$ uci/ml
° Alpha Surface Survey	174.6 dpm/100 cm²
° Contractor's Equipment	398.3 dpm/100 cm²
° Truck Haulage Road Surveys Shielded Gamma Survey	Entrance to Mill Site 150 ur/hr
° Truck Haulage State Road 566 Surveys	
Gamma Survey	10 ur/hr
Alpha Survey	264 dpm/100 cm²
° Personnel Survey	* 1330 dpm/100 cm² on clothing * After Washing, 37 dpm/100 cm² All other data below 755 dpm/100 cm²

Appendix G contains other monitoring program information not addressed in this summary.

11.0 Closing Remarks

The Mill Decommissioning was completed as per United Nuclear's Approved Decommissioning Plan.

United Nuclear is in the process of performing a complete clean-up and radiological survey of the Mill Site including buildings and materials left on site. A priliminary clean-up and radiological survey had been performed on buildings designated to be left on site as mentioned in United Nuclear Approved Decommissioning Plan.

United Nuclear will be submitting a final Radiological Survey Report in its request to release the site to unrestricted use.

Borrow #2 is scheduled for reclamation in 1994. The criteria for the Borrow Pit's designed cover is addressed in United Nuclear's Approved Reclamation Plan submittal of March 1, 1991.