7.0 MILL DECOMMISSIONING

7.1 Introduction

This section describes the mill decommissioning activities as presented in the December 1988 Church Rock Mill Decommissioning Plan (MDP) (United Nuclear, 1988).

In June 1987, United Nuclear submitted the detailed proposed Reclamation Plan (Canonie, 1987b) to the NRC. The proposed Reclamation Plan was subsequently revised with the submittal of Amendment I in July 1988. Amendment I, approved by the NRC in September 1988, contained a detailed schedule of reclamation activities to be undertaken by United Nuclear, which included decommissioning of the mill facility in 1992. In addition, NRC License Condition 26, required United Nuclear to submit a detailed mill facility decommissioning plan by December 31, 1988. The MDP was originally submitted to the NRC on December 29, 1988. In response to NRC review comments of March 5, 1990, supplemental information for this plan was provided on April 10, 1990. Mill decommissioning began in 1991, following NRC approval in January 1991.

In addition to discussing the decommissioning activities, this section describes the United Nuclear radiation protection programs established to protect personnel from undue radiological exposures and keep radiological releases as low as reasonably achievable.

7.2 Decommissioning Action

United Nuclear's schedule for reclaiming the Church Rock uranium mill and tailings facility outlines various activities through 1997. The schedule for the mill decommissioning task depends on the success of certain preceding tasks. United

Nuclear proposed to decommission the mill in 1992, assuming that Borrow Pit No. 2 had been successfully dewatered, which occurred in early 1991. Borrow Pit No. 2, an excavated pit located at the eastern end of the property, was excavated during mill operation to provide additional holding capacity for tailings water recirculation.

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 equipment and materials from the mill. To this end, much of the equipment at the mill has been decontaminated, sold and removed from the site. Other equipment has been dismantled, decontaminated and segregated into "clean" areas awaiting sale. All these areas are located outside the restricted area. Some equipment and material yet to be decontaminated for sale remain. The company continues to actively seek opportunities to sell its equipment and materials on the open market. While NRC or agreement-state licensees have purchased some equipment and material, non-licensees have bought most of the equipment. United Nuclear will continue its active sales program, until significant return can no longer be realized.

In addition, United Nuclear has identified several areas within the mill complex that will remain useful beyond the life of mill operations. These areas include the administration building, the shop/warehouse building and the guard/change house building. A radiological survey will be conducted in these facilities to allow their release for general unrestricted use after any necessary decontamination.

Finally, the remainder of the facility is being, and will continue to be, dismantled and disposed in Borrow Pit No. 2. United Nuclear is disposing of mill materials in lifts not exceeding five feet thick. Each lift of debris is covered with a minimum of one foot of compacted soil to provide a solid foundation for the next lift. United Nuclear compacts each one-foot soil lift to work the soil into existing void spaces. When Borrow Pit No. 2

(Figure 5-1) is filled completely, the radon attenuation soil-cover layer and soil/rock matrix erosion protection layer, described in Section 5.0, will be installed.

Following is a detailed discussion of the various activities anticipated in decommissioning the mill facility.

7.3 Equipment Salvage and Sale

As indicated above, United Nuclear has been actively salvaging and selling selected mill equipment since 1985. A list of equipment sold before December 1988 from the mill, or moved to the clean areas was provided in Appendix A of the MDP (United Nuclear, 1988). Appendix A of the MDP also contains the documentation of the radiological survey results conducted for each piece before its release for unrestricted use.

The Radiation Safety Officer (RSO) was, and continues to be, an integral component of the equipment sales program. He must be advised of all equipment sales so he can coordinate the surveying, decontamination (if required), preparation, loading and shipment of the materials leaving the site.

7.3.1 Salvage and Decontamination Procedure

When the mill facility was placed on standby in mid-1982, the entire circuit was flushed and cleaned of process material. Each circuit was emptied of process material in logical sequence from the front to the back of the process flow (i.e. from ore storage and conveying, through grinding, leaching, countercurrent decantation, filtering, solvent extraction and stripping and finally precipitation and packaging). All the process lines were flushed with water to remove residual process materials, and each piece of equipment was rinsed with water as it was emptied to ensure that each circuit was clean when shut down. All walls and floors were washed with water and, in some cases,

scrubbed with acid. All control rooms and instrument panels were cleaned and mothballed. All equipment was lubricated and placed on standby. All wood stave tanks were filled with water to keep them swollen tight.

The precipitation and packaging circuits were the last to be shut down, and were used until February 1983 to process liquids received from the ion-exchange (IX) plants at the mines.

Upon placing the facility on standby, the source or by-product material remaining on-site consisted of:

1. A small amount of low grade ore and pond residue at the northeast corner of the ore pad,

2. Materials recovered from the precipitation circuit during cleanup,

3. Some organic solution from the solvent extraction circuit that contained uranium,

4. The yellowcake samples retained in the metallurgical and chemical laboratories, and

5. Resin from the ion-exchange columns.

These materials were temporarily stored in drums at the mill.

United Nuclear retains detailed records of the activities undertaken during the standby period in the offices of the RSO. These records are available for inspection on request.

The procedure followed during standby made the task of mill decommissioning much easier.

After deciding to close the facility, United Nuclear acted to dispose of the remaining materials in storage. The low-grade ore and pond residues were deposited in the tailings area. The material recovered from the yellowcake precipitation circuit and yellowcake samples were shipped to another mill in the area for processing. The organic solvent from the solvent extraction, and the resin from the IX plants were sold to other licensees. The water from the wood stave tanks was disposed in tailings and through evaporation.

United Nuclear initiated an equipment salvage and sales program designed to recoup some of the investment in the mill equipment. The above actions made it much easier to decontaminate the equipment at the time of sale. All potentially salable mill components were identified and surveys were conducted by the RSO to identify levels of contamination, as well as to establish decontamination protocol and ultimate segregation of contaminated and clean materials. The equipment was removed under the supervision of the RSO. All equipment was inventoried using a reference number as established from the original construction drawings and specifications for the mill.

The precipitation building was used as the cleaning area. The equipment was dismantled to its most basic parts, and if contaminated, the parts were steam cleaned. If needed, the parts were also washed with muratic acid, then steam cleaned again. Any equipment with a gamma reading of twice background or more than 300 counts per minute (cpm) Alpha, on the surface or from a swipe sample, was rewashed. A record was kept of all equipment cleaned this way, and is available for inspection on request.

As a matter of policy, all equipment sold was resurveyed before it left the site as a precautionary measure. No equipment has been allowed to leave the restricted area unless it has met the following criteria: gamma readings of less than twice background (approximately 40 μR/hr.) and less than 5,000 cpm Alpha as a surface reading, or less than 1,000 cpm on a swipe reading. This system was established to provide strict controls for ensuring all materials were adequately decontaminated before they were released for unrestricted use, and will be followed during any future equipment sales.

7.4 Mill Decommissioning Activities

This section describes how the major identifiable areas of the mill have been, and will continue to be, decommissioned. Figure 1-5 depicts the general mill facility layout and identifies the major processing components. The overall objective of decommissioning the facility is to remove all residual radioactive materials from the site so the whole physical plant area may be released for unrestricted use.

7.4.1 Truck Scale and Scale House

This portion of the facility contains remnants of ore residual, as it is where ore entered the restricted area. These facilities are not considered to be significantly contaminated (if at all) and are identified for sale. The truck scale and scale house are still being used, and will continue to be used until, they become an obstacle to the demolition activities. If a sale has not been effected by the time they become an obstacle to mill demolition activities, the truck scale and scale house will be surveyed and decontaminated, if necessary, using techniques consistent with those described in Section 7.3.1, and removed to one of the clean storage areas.

7.4.2 Ore Receiving Bin

This portion of the facility is not considered significantly contaminated, if at all. The bin consists of a surface-metal grizzly screen and hopper enclosed on three sides with concrete vault. The metal grizzly and hopper were removed and disposed of in Borrow Pit No. 2. The vault itself is a poured concrete, below-grade structure. The vault walls will be surveyed. If any contamination can be removed from the concrete, it will be cleaned with either an acid wash or scrabbled to remove surface contamination. If any contamination cannot be removed from the concrete, it will be excavated and disposed of in Borrow Pit No. 2. The remaining vault void or open excavation will be filled with soil and graded smooth at the surface.

7.4.3 Conveyor

The conveyor belt system feeding from the bottom of the ore hopper into the semi-autogenous grinding (SAG) mill has been removed. It was surveyed and decontaminated consistent with procedures described in Section 7.3.1, and was sold. The metal conveyor housing structure was also decontaminated and sold. The part of the above-ground concrete structure connected to the grizzly vault will be crushed and disposed in Borrow Pit No. 2.

7.4.4 Mill Building

The mill building contains several discrete processing areas, including the SAG mill, boiler room, motor control room, precipitation section, yellowcake drying and packaging, and a maintenance shop area. The mill building, SAG mill, the boilers and the sulfuric acid tank have been sold and were shipped from the site. Many processing pumps and related equipment from this area have also been decontaminated and sold, or stored in a clean area. The remainder of the former mill equipment, including a

number of wooden and steel tanks, filters, pumps, and motors, were decontaminated and sold, or are in clean storage awaiting sale. The yellowcake dryer and packaging system and related equipment have been crushed and disposed in Borrow Pit No. 2.

Most of the equipment that could reasonably be decontaminated and salvaged has been removed, decontaminated and stored in clean storage area, if not already sold and shipped off-site. Some stainless steel pumps, which could not meet releasable standards, were sent to another licensee. All unsold equipment from this area has been cut, crushed or otherwise condensed to minimize void space, and disposed in Borrow Pit No. 2.

Some portions of the mill building structure itself, particularly those areas containing the ore grinding circuit, boiler, motor controls, and the maintenance shop, were only marginally contaminated, if at all. These portions of the mill building have been sold and removed. Dismantling the building was done in accordance with procedures developed by the RSO. The RSO developed all necessary Radiation Work Permits (RWPs) consistent with United Nuclear's license requirements, monitored all work, and implemented personnel and area monitoring as necessary. All dismantled materials removed off-site were surveyed and decontaminated consistent with the procedures described in Section 7.3.1.

7.4.5 CCD Thickeners and Associated Tanks and Buildings

This area consisted of six countercurrent decantation (CCD) thickener tanks, one enviroclear thickener tank, the CCD pump-house building and sumps, one raffinate tank, one clarifier-flocculator tank, one overflow surge tank and a sodium chlorate storage building.

The CCD tanks were constructed of wood with concrete flooring, and all six have been dismantled. The wood slats from five of the six CCD tanks are presently being decontaminated before sale. The wooden slats from the walls of Thickener No. 6 were dismantled and burned in Borrow Pit No. 2 due to poor quality for salvaging. A small amount of tailings residue remaining in the bottom of the tank was transported to the tailings pile for disposal. The enviroclear thickener has been decontaminated, sold and shipped off-site. Some walkways, rakes, pumps and motor drives were decontaminated and sold, or are in clean storage awaiting sale. Others were crushed and disposed in Borrow Pit No. 2. The mechanical drive motors, pumps and rakes were decontaminated and moved to clean storage.

The thickener area consists of the tank bottom concrete slabs, the CCD pump house building and the associated tanks, sumps and equipment. Some equipment was salvaged, decontaminated and has either been shipped off-site or is in clean storage. The building and any associated unsold equipment was dismantled, cut, crushed or otherwise condensed to minimize void spaces, and disposed of in Borrow Pit No. 2.

The concrete slabs will be surveyed to determine the extent of contamination. Depending on the extent of contamination, the slabs may either be acid-washed, scrabbled to remove surface contamination, or extracted and disposed in the Borrow Pit. These decisions will be made in the field during decommissioning. The basement sump area below the CCD tanks will be filled in with clean soil once equipment has been removed, the area decontaminated, and surveys conducted to confirm that it is clean.

The raffinate, clarifier-flocculator and overflow surge tanks were all constructed of wooden slats with concrete aprons. The wooden slats were dismantled in the same fashion as the CCD tanks and either salvaged or burned in Borrow Pit No. 2, if the

quality was too poor for salvaging. The concrete aprons around these tanks will be crushed and buried in Borrow Pit No. 2.

The sodium chlorate building was dismantled and removed from the restricted area. This work was done under instructions from United Nuclear's RSO, using RWPs where necessary. The RSO monitored all work, and implemented personnel and area monitoring as necessary. The dismantled building was taken off-site after the appropriate surveys and decontamination procedures. The equipment previously contained in the building was decontaminated and sold or crushed and disposed in Borrow Pit No.2.

7.4.6 Solvent Extraction Area

The solvent extraction area consists of a series of concrete tanks poured in place, covered with steel walkways, railings and covers, and one steel tank. All the tanks are empty of process material as they have been since the facility was placed on standby, except for some rainwater. Rainwater will be pumped to the lined evaporation ponds for disposal. Some of the hand rails and piping have been dismantled, crushed, and disposed in Borrow Pit No. 2. The remaining handrails, piping, walkways and steel covers will be cut or crushed to minimize void spaces before disposal in Borrow Pit No. 2. All the tanks are assumed to be significantly contaminated. Therefore, these tanks will be rubblized, or cut into pieces for excavation, removal and disposal in Borrow Pit No. 2.

7.4.7 Administration, Guard/Change House and Warehouse Buildings

These three buildings, as indicated previously, will be surveyed, decontaminated (if necessary) and released for unrestricted use, as it is anticipated that these facilities will be useful beyond the life of the mill. Two associated facilities (i.e., the lube storage area

and the tire storage shed) will also be cleaned and released for unrestricted use. Preliminary surveys were conducted of these facilities in 1987. A summary of these results is included in Appendix B, MDP (United Nuclear, 1988). The results indicated all these areas were clean. Additional surveys will be conducted of all these areas, as necessary, to ensure their cleanliness before release.

7.4.8 Miscellaneous Surface Facilities

The miscellaneous facilities include the emergency solvent dump pond, kerosene tank holding area, ammonia storage tank area, fuel-oil storage tank area, the storm drainage pond, the sewage treatment plant, and electrical sub-station. Most of these areas were not significantly contaminated, if at all. The emergency solvent dump pond was constructed for emergency use in the event of overflow, spill or break in the solvent extraction circuit. The pond is lined with gunite and sealed with a rubberized coating. This lining will be stripped from the surface and disposed of in the tailings pile. Because this pond may have received liquids from the solvent extraction circuit from time to time, particular attention to soil surveys will be paid to this area. After appropriate decontamination procedures have removed any contaminated soils, the pond depression will be filled with clean soil.

The kerosene tank has been surveyed, decontaminated and sold. The containment dikes are coated with gunite, which will be stripped off and disposed of in the tailings pile. The dikes will be collapsed into the emergency containment area to fill the depression, after verification surveys have been conducted. The same procedure will be used to reclaim the fuel-oil storage tank area and storm drainage pond. The ammonia storage tank was surveyed, decontaminated and sold. The lube storage building was sold.

The sewage treatment plant may be surveyed, decontaminated if necessary, and released for unrestricted use. During operation, the treatment plant was plumbed to discharge to the tailings area. However in 1985, a septic tank and leach field were installed outside the restricted area to which the sanitary sewer from the facilities now discharges. The piping from the plant to the tailings disposal area was dismantled, crushed and disposed in Borrow Pit No. 2. The leach field facility is a part of the administrative/guardhouse and warehouse complex, which United Nuclear will retain for unrestricted use.

The electrical sub-station, depicted on Figure 1-5, has been dismantled. Power is now supplied by a much smaller unit located at the shop/warehouse building. This unit will remain as part of the facilities described in Section 7.4.7.

7.4.9 Foundations, Floors and Supports

Insignificant contamination of concrete floors, supports and foundations is anticipated. Except for hot spots from spills or overflow, much of the foundations, supports and flooring should not be contaminated. Surveys will identify those concrete areas that might require decontamination or removal. Contaminated concrete structures will be evaluated to determine the feasibility of decontamination. Those structures that can be easily and economically decontaminated by processes such as acid-rinsing, sandblasting or scabbling will be treated as appropriate. It may be more efficient and economical to rubblize, cut, blast or otherwise remove contaminated concrete structures for disposal in Borrow Pit No. 2. These decisions will be made in the field as decommissioning progresses. The RSO will provide appropriate RWPs and attendant monitoring when necessary.

7.4.10 Buried Lines and Plumbing

Most of the process lines at this facility were located overhead. These pipes have been dismantled, crushed and disposed in Borrow Pit No. 2. However, a few buried lines exist at the process plant, one 4-inch and one 12-inch line connecting the solvent extraction circuit to the raffinate tank, the overflow lines from the solvent extraction circuit to the emergency pond, and the drains from laboratories to the CCD sump. These lines will be excavated to the extent practicable and disposed in Borrow Pit No.2. If excavation becomes impractical, the lines will be surveyed at their access points. If they indicate contamination, reasonable efforts will be made to excavate them. If deemed impractical, appropriate exception approvals will be sought from the NRC. On receipt of specific exception approvals from the NRC, the access points will be plugged with concrete and reburied. Drainage sumps will similarly be decommissioned. Buried utility lines such as electrical conduit, water lines, etc., will be abandoned in place. Where necessary, such lines will be cut off and plugged below the ground surface and reburied.

The tailings discharge lines, previously leaving the mill site at the southeast corner of the facility and crossing under the highway and over Pipeline Arroyo, were removed and disposed in Borrow Pit No. 2. The covered pipe trestle will be salvaged. Catch Basins No. 1 and No. 2, shown on Figures 2-2 and 2-3, will be excavated and placed in Borrow Pit No. 2.

7.4.11 Mill Facility Soils and Ore

Section 2.0 of this Reclamation Plan presents a detailed site radiological survey, which included three background areas, the soils around the tailings facility to determine the extent of wind-blown tailings, as well as the mill site and facilities area, excluding the actual structures. Details of the survey methods and procedures are contained in

Section 2.0, including the use of gamma ray exposure surveys, borehole logging surveys for sub-surface characterization and sample collection and sample analysis for Radium.

Section 2.3.2 of the Tailings Reclamation Plan discusses the results of the survey conducted at the mill. Figure 2-5 and Tables 2.10, 2.11 and 2.12 contain the survey results. Generally, these results indicate overall gamma exposure rates on-site were slightly elevated above background, probably due to the proximity to the ore storage pad. The Ra-226 concentrations from by-product material in the mill area appear limited and, where detected, are located near the ground surface. Therefore, decommissioning activities with regard to mill area soils will be limited to removing the asphalt surface in all areas (except around the administration building, warehouse, lube storage area, tire storage shed and guard/change house buildings) and scraping approximately six inches of soils beneath the asphalt to remove possible surface contamination. In addition, any ore materials remaining in the ore storage area will be removed and disposed in the tailings disposal area. Approximately six inches of surface material will then be scraped from the ore storage area to remove possible surface contamination.

Finally, a verification gamma survey will be conducted to identify any remaining hot spots. Hot spots identified will be dealt with on a case-by-case basis. For example, individual hot spots may be easily removable by additional removal of minor amounts of soil. It may be necessary in some cases to characterize the "hot" area further to determine its overall condition once an average over a grid section is identified. These decisions will be made in the field as decommissioning progresses.

7.4.12 Schedule For Mill Decommissioning

As indicated, certain mill buildings or portions of buildings were sold and removed before 1991. The main mill building structure (except the precipitation and packaging

section, which were disposed in Borrow Pit No. 2), the sodium chlorate building and the sample preparation section of the scale house were sold and removed off-site. These facilities were dismantled, cleaned and removed under the supervision of the RSO, as described in Sections 7.3 and 7.5 of this plan.

It is anticipated the truck scale and the remaining portion of the scale house will also be sold before commencing further mill decommissioning activities in 1992. The CCD building structure, and the precipitation and packaging section of the mill building have been dismantled and disposed in Borrow Pit No. 2. All salable equipment will be removed to a clean area or sold by 1992. The following sequence of events occurred in 1991:

1. Dismantled all remaining wood stave tanks.

2. Removed equipment attached to the precipitation and CCD building frames.

3. Removed standing equipment within the floor space of the CCD and precipitation buildings that would impede disassembly of the structures.

4. Dismantled the CCD and precipitation building structures.

5. Removed any remaining equipment within the concrete foundations of these buildings.

6. Dismantled piping and structures in the SAG mill conveyor housing and the grizzly.

7. Removed and cut some steel storage tanks.

8. Removed the tailings discharge lines and the support structures over Pipeline Arroyo.

The cutting, crushing, or other size reduction of scrap equipment proceeded simultaneously with the above activities to minimize void space during burial.

The following sequence of events is anticipated for 1992:

1. Remove and cut any remaining steel storage tanks.

2. Remove the support structures over Pipeline Arroyo.

3. Remove the covers, walkways and platforms associated with the solvent extraction tanks.

4. Demolish the solvent extraction tank concrete.

5. Demolish other above-grade or on-grade concrete.

6. Decontaminate below-grade concrete, if feasible, followed by backfilling of void space with clean soil.

7. Rip and remove the asphalt paving and the solvent extraction dump pond.

8. Radiologically survey the exposed soil and buried piping.

9. Remove contaminated soil and seal buried pipe openings.

10. Remove radium-contaminated soils in and near the Catch Basins.

11. Remove the mill yard fencing.

12. Strip the surface of the ore storage area.

13. Final grade for drainage.

14. Revegetate the disturbed area.

7.5 Radiation Protection Program

This section describes the programs implemented by United Nuclear to ensure that personal exposures and releases to unrestricted areas are kept as low as reasonably achievable. This program includes radiation safety organization and responsibilities, internal and external exposure protection, radiation safety training, RWPs, controlled area designation, health physics monitoring and record keeping.

7.5.1 Radiation Safety Organization and Responsibilities

The General Manager (GM) of the Church Rock Operations is the senior manager responsible for all activities on-site. The RSO is also the GM and oversees all aspects of the Radiation Protection Program. The RSO has the responsibility and authority to ensure that all activities related to decommissioning activities are conducted to keep all personal exposures and releases to unrestricted areas as low as reasonably achievable.

All decontamination activity has been, and will continue to be, conducted by United Nuclear personnel or contractors to United Nuclear. United Nuclear personnel report directly to the RSO, effecting maximum control of decontamination activities. All decontamination contractors are managed by the RSO, again effecting maximum control of decontamination activities.

United Nuclear uses this reporting structure because the RSO has the technical experience and the educational background to undertake such a responsibility. The RSO was the mill superintendent of the operating mill, and supervised some of its construction. The RSO also placed the facility on standby and oversaw its eventual shutdown. Finally, the RSO has been a integral part of the equipment sales team and presently provides its direct supervision. The company's radiation protection responsibilities have been paramount during all of these activities and will continue through the decommissioning phase.

United Nuclear currently has one full-time radiation safety technician. One other technician has been trained to assist in additional decommissioning activities. Their training is discussed in Section 7.5. The RSO and his staff perform the following duties as part of the decommissioning plan:

1. Implement and oversee the Radiation Protection Program.

2. Establish a radiological monitoring program for each activity to provide data for calculating radiation exposures and keeping adequate records.

3. Review radiological monitoring data to evaluate exposures and ensure that the radiation exposures are as low as reasonably achievable.

4. Evaluate control measures to ensure that the potential for radiological exposures are kept as low as reasonably achievable.

5. Implement and maintain a dosimetry program, as necessary.

6. Advise, instruct, and train personnel in their radiation safety responsibilities.

7. Observe site activity to ensure compliance with the Radiation Protection Program and cease the work activity if a potential exists for inadvertent, excessive radiation exposure to personnel or the general public.

8. Maintain records of radiological monitoring and exposures, as necessary.

9. Provide radiation safety training to all individuals conducting decommissioning activities.

10. Implement and maintain an effective respiratory and bioassay program, as necessary.

11. Maintain all radiation survey instruments properly calibrated and certified.

12. Conduct a documented daily inspection of all work areas while dismantling and decommissioning the mill. This inspection will occur only during those times when work is actually being performed, as sometimes physical activity may not occur.

United Nuclear may contract all or part of the health physics monitoring and assistance in radiation protection to a qualified radiological service contractor for monitoring and surveys required by the license conditions and 10 CFR Part 20. Such a contractor may also provide a qualified health physicist to act as the RSO's designee, capable of assisting the implementation and supervision of the Radiation Protection Program, as well as contamination surveys for equipment released to the unrestricted area.

United Nuclear may hire contractors to conduct the dismantling, decommissioning activity. The RSO will supervise the work and will ensure that the contractors' employees receive adequate radiation training and protection. The contractor will

ensure his personnel follow the Radiation Protection Program to keep personal exposures and releases to the unrestricted area as low as reasonably achievable, and to avoid inadvertent exposures to radiation. The contractor will also be responsible for knowing the radiation hazard conditions in the work place and the use of radiation protection equipment. Any violation of radiation safety procedures or presence of hazardous conditions reported to the contractor by his employees will be conveyed to the RSO as soon as practicable. The RSO will take appropriate steps to correct those violations. Each individual worker, whether a contractor or company personnel, will be responsible for understanding and adhering to the Radiation Protection Program. All workers will be required to understand the radiological conditions of the specific area to which they are assigned. Individuals will be instructed to stop work if problems arise that might increase radiation exposure, and they must notify their supervisors and the RSO, who will evaluate the situation. Each individual will be required to report any conditions that may lead to a violation of the Radiation Protection Program to their supervisor, health physicist or the RSO. Workers will be made aware of their rights of radiation protection under the law.

7.5.2 Exposure Controls and Monitoring

Decommissioning activity is likely to increase the potential for the release of airborne radioactive materials, thus increasing the potential for internal and external exposure. United Nuclear has developed the Radiation Protection Program to minimize potential exposures to personnel in the restricted area, as well as release and exposure in the unrestricted area. Regulations 10 CFR Part 20, specify the maximum permissible concentration (MPC) of radioactive materials for restricted-area occupational exposures, as well as releases to unrestricted areas and non-occupational exposures.

7.5.2.1 Restricted Area

Exposures to individuals in the restricted area has been, and will continue to be, kept within the limits set by NRC's regulations. The key to controlling exposures in the restricted area is a combination of adequate employee training so the worker knows the hazards and participates actively to protect himself; the use of effective engineering and work techniques to minimize the pathways of exposure; and adequate monitoring programs to aid in evaluating conditions. Section 7.5.3 discusses United Nuclear's Radiation Safety Training Program in detail. The techniques used to minimize the exposure pathways for external and internal doses, and the monitoring designed to evaluate working conditions are discussed in this section.

All personnel are instructed in procedures necessary to minimize internal exposures via ingestion. Eating and smoking are prohibited in restricted areas except in designated "clean" areas. Exposure controls will be achieved through use of radiation work permits, personal monitoring, evaluation of radiological status, posting areas and specific personal protective equipment, as well as the use of dust suppression techniques to minimize airborne contamination. Exposures are also controlled by utilizing engineering measures, such as ventilation and wetting down, and removing any loose contamination. Personal protective equipment is issued or required of contractors, as necessary to conduct specific tasks. The RSO determines the appropriate protective equipment. All employees are required to use the equipment issued as a condition of continued employment. When necessary, instructions and/or training in the use of the equipment is provided to the employee. Areas are posted to inform employees when entering a radiation area.

External exposures are also minimized and kept within applicable NRC regulations with the techniques described above.

Area air sampling is performed as necessary to monitor the concentrations of airborne radionuclides for evaluating the individual exposures in work areas. The RSO will evaluate the potential for elevated concentrations of airborne radioactive materials. Working area air sampling will be conducted to monitor the concentrations of airborne radionuclides, as well as for calculating exposure to individuals working in the area. An individual of the group in the work area will be equipped with a personal air sampler. Individual breathing zone sampling will be conducted as indicated on the RWP, based on the RSO's evaluation of the potential for significant exposure to airborne radioactive materials. A conservative air concentration measurement of either the personal air sample or general area sample will be used to determine exposure for the workers in that area. To assess the adequacy of radiation protection and air sampling, bioassay (urinalysis) will be performed biweekly on employees working in the yellowcake areas of the mill and monthly for other employees working on mill decommissioning. In addition, pre-employment and termination urinalysis will be run for all employees involved in mill decommissioning. A blank and spiked sample will be submitted for analysis with each set of urine samples for quality control. "Airborne Radioactivity Area" signs will be posted where monitoring shows airborne concentrations of radionuclides exceeding 25 percent of those specified in 10 CFR Part 20, Appendix B (Table I, Column I).

RWPs include a description of the monitoring activity conducted in performing the task. All personnel working in the restricted area will wear personnel thermoluminescent dosimeter (TLD) badges. The following is the procedure for the personal dosimetry program:

1. The personal TLD badge will be exchanged and analyzed quarterly.

2. The TLDs will be assigned at the beginning and returned at the end of the day shift at the access control point.

3. All TLDs will be worn as instructed by the RSO.

4. All exposures will be determined and recorded from the analyses of TLD badges. If an individual loses the TLD badge, the RSO will investigate the exposure conditions of the work area to estimate the external exposure for that period.

5. All personnel will notify their supervisor or RSO if they lose their TLD badges. A thorough search will be made to obtain true exposure. The individual will be assigned a new TLD badges, if the search fails.

Should exposure results approach the maximum limits of 10 CFR Part 20, an investigation will be conducted. This investigation will include a radiation survey of the area and immediate analysis of the TLD badge. Should an individual whose exposure is under investigation lose the TLD badge, this individual will be removed from the work area until the investigation is complete.

In keeping with the ALARA Policy and to prevent any inadvertent overexposure, United Nuclear's action limit for airborne radioactive materials is established at 25 percent of the MPC specified in 10 CFR Part 20. This control limit will be used as an action level to implement measures for reducing airborne concentrations. If such practical and reasonable engineering and administrative control measures are not feasible or effective, the acceptable respiratory protection program as defined in the NRC Regulatory Guide 8.15, will be implemented.

7.5.2.2 Unrestricted Area

United Nuclear will continue monitoring airborne concentrations of radioactive materials in the unrestricted area during decommissioning by operating its monitoring program,

as specified in its NRC License No. SUA-1475. The limits for release of radioactive material in the air to the unrestricted area shall be those specified in 10 CFR Part 20, Appendix B (Table II, Column I).

7.5.3 Radiation Safety Training

United Nuclear considers the training aspect of radiation protection essential to the success of minimizing exposures. NRC regulations require all personnel working in or frequenting any portion of a restricted area be informed of the storage, transfer or use of radioactive materials or radiation in such portions of the restricted area. The regulations further require all personnel be instructed in the health protection problems associated with exposure to radioactive materials or radiation, in precautions or procedures that should be used to minimize exposure, and in the purposes and functions of protective devices employed. All personnel are to be instructed in, and to observe, the applicable regulations for protecting personnel from radiation or radioactive material exposures in such areas. Instruction will also include the responsibility to report promptly, to their supervisor, any condition that may lead to or cause a violation of the regulations or unnecessary radiation or radioactive material exposure; instruction in the appropriate response to warnings made for any unusual occurrence or malfunction involving exposure to radiation or radioactive material; and information about the radiation exposure reports, which they may request pursuant to the regulations.

7.5.3.1 Program Description

All personnel are trained according to their work assignments. The Radiation Safety Training Program includes the following topics:

1. Fundamentals of Health Protection

- Radiological and toxic hazards of exposures to uranium and its daughters
- Pathway of uranium and its daughters into the body
- ALARA Policy for exposure to uranium and its daughters

2. Radiation Protection and Personal Hygiene
   - Protective clothing
   - Proper use of respirators
   - Eating, drinking and smoking in designated areas only
   - Radiation Work Permit and access controls
   - Methods of personal decontamination

3. Health Physics Monitoring
   - Airborne radioactive material measurement
   - Bioassay
   - Material exposure rate survey and personal dosimetry

4. Radiation Monitoring
   - Operation of monitoring equipment
   - Function checking of equipment
   - Calibration of air sampling equipment
   - Maximum limits of exposure or contamination
   - Record keeping of monitoring data
   - Sampling and monitoring procedure
   - Monitoring requirements per License Conditions

To assess comprehension of the training, all personnel receiving radiation safety training are given a written test. The results of the test are reviewed with the employee. Employees receiving a non-passing score will be re-tested. Individuals sign an

acknowledgement that they have received the radiation training and will comply with the Radiation Protection Program.

7.5.4 Radiation Work Permit

While much of the mill decommissioning work will be conducted as a matter of normal work-day activity, some specific tasks may have a potential for significant radiation exposure. Also, instances may occur where no standard operating procedure (SOP) exists for a task. Such work will be carried out under a RWP to ensure the task is conducted to minimize exposures and releases to the environment. The RWP will be used to control radiation exposure by implementing specific radiological protection and monitoring tailored for the task. The RSO will develop the RWP for the task. No work requiring a RWP will be carried out without an approved RWP. The personnel conducting the RWP work will be given specific instructions by the RSO for that task, so they are aware of the hazards and understand the use of special radiation protection equipment and/or procedures. The RWP will include location and description of work, names of all workers involved, radiological protection equipment to be used, special monitoring required, any special instructions given, date of issue and expiration if appropriate, the results of radiation surveys and RSO's approval. The RWP work area will be designated a controlled area and isolated from the restricted area. The access will be limited to trained individuals involved with the controlled area work, to minimize the spread of contamination and to control exposures.

7.5.5 Designated Controlled Areas

Each area of the mill site represents its own unique potential radiation hazard. Areas will be designated based on the nature and degree of potential for radiation exposure. The controlled areas will be established to limit radiation exposures to site workers, visitors and the general public. The designation of an area and associated posting,

barriers and necessary precautions will be established, changed or removed only on RSO approval.

7.5.5.1 Restricted Area

The fenced part of the mill site, which contains the process buildings and tanks, support shops, and the warehouse on the west side of state highway 566, is designated the Restricted Area, for mill decommissioning. All entrances to the restricted area are posted with signs that indicate, "Any Area Within This Mill May Contain Radioactive Material". All personnel involved with mill decommissioning activities in the restricted area will be provided radiation safety training.

7.5.5.2 Radiation Areas

An area where a worker could receive a radiation dose of 5 mrem per hour or 100 mrem during five consecutive work days will be designated and posted as a "Radiation Area". The RSO will use radiological surveys to designate radiation areas. All personnel in the radiation area will wear a dosimetry badge and access will be limited to authorized personnel only.

7.5.5.3 Airborne Radioactivity Areas

A respiratory protection program is used to meet the requirements of 10 CFR 20.103(c). Any area where the airborne radioactive material concentrations exceeds 25 percent of the maximum permissible concentrations specified in 10 CFR Part 20, Appendix B (Table I, Column I), will be designated and posted as an "Airborne Radioactivity Area". Respiratory protection will be provided for all individuals in this area.

7.5.5.4 Clean Areas

Any area where the radioactivity is not high enough to require radiation protection is considered a "Clean Area." The clean area will not exceed the surface contamination levels of 5,000 cpm of alpha/100cm^2 average for one square meter, 15,000 cpm/100cm^2 maximum and 1,000 cpm/100cm^2 removable alpha contamination. All the areas of the mill site outside the restricted area and some within the restricted area may be designated clean areas. Eating, drinking and smoking will be permitted only in a designated clean area. Designated clean areas within the restricted area are surveyed weekly for total and removable surface contamination. Wash facilities are conveniently located near the designated clean areas. All personnel are required to wash before eating, drinking, or smoking.

7.5.6 Health Physics Monitoring Procedures and Calibration

All procedures used by the RSO for radiation surveys and health physics monitoring will meet the LLD requirements and quality assurance program as defined in the NRC Regulatory Guide 8.30, "Health Physics Surveys in Uranium Mills" and Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring". Radiological field and laboratory analyses equipment will be calibrated using National Bureau of Standards (NBS) traceable standards. Calibration frequency will be performed as defined in United Nuclear's equipment calibration procedures contained in its license. A background and function check will be made on each radiological instrument daily or before use.

7.5.7 Records and Reports

Records of radiological monitoring, surveys, exposures, calibrations, reports, inspections, training, investigations, corrective actions and submittal of reports will be maintained. The following lists the specific records and reports that will be monitored:

1.	10CFR 19.11	Posting of Notice
2.	10CFR 19.12	Instruction to Worker
3.	10CFR 19.13	Reports to Individuals
4.	10CFR 20.401	Records of Survey, Radiation Monitoring and Disposal
5.	10CFR 20.403	Notification of Incidents
6.	10CFR 20.405	Reports of Overexposure and Excessive Concentrations
7.	10CFR 20.407	Personnel Monitoring Reports
8.	10CFR 20.408	Reports of Personnel Monitoring Upon Termination of Employment
9.	10CFR 20.4095	Notification and Reports to Individuals

7.6 Security

United Nuclear will continue to provide security at the Church Rock Uranium Mill site throughout the facility's decommissioning. All gates and entrances to the restricted area are posted with signs that comply with the NRC Material License SUA-1475. The entry gates will be locked during non-working hours and access controlled during normal working hours. All site visitors will be required to log in before entering the restricted area and log out when leaving. All individuals, equipment and items leaving the site

must comply with radiological requirements defined in the Radiation Protection Program. A daily record book will be maintained regarding the activities related to access, release and other security matters.

All employees entering the restricted area monitor themselves with an alpha survey meter before leaving the restricted area. If the alpha survey indicates contamination of 1000 cpm/100 cm^2, or if the individual is known to have been working in a yellowcake dust area, where the potential for exposure is significant, the individual will be required to shower and change clothing before leaving the restricted area. Documentation of all surveys and shower requirements will be maintained.

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