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Canonie Environmental

Volume I - Text

Tailings Reclamation Plan
As Approved by NRC March 1, 1991
License No. SUA - 1475

Church Rock Site
Gallup, New Mexico

Prepared For:

United Nuclear Corporation
Gallup, New Mexico

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August 30, 1991
UNC/ASHQ-91-484M

Mr. Ramon Hall, Director
U. S. Nuclear Regulatory Commission
Uranium Recovery Field Office
730 Simms St., Suite 100
Golden, CO 80401

RE: NRC License SUA-1475
Submittal of Tailings Reclamation Plan

Dear Mr. Hall:

United Nuclear Corporation hereby submits the enclosed document titled "Tailings Reclamation Plan As Approved by NRC March 1, 1991, License No. SUA-1475". This document represents the single comprehensive document describing the approved composite reclamation plan including specifications and updated cost estimates based on the composite plan, as required in license condition 34. The updated cost estimate was submitted to you on June 6, 1991 and is provided herein as well as an appendix in Volume III.

If you have any questions or require additional information please do not hesitate to call.

Sincerely yours,

Juan R. Velasquez
President

JRV:jkt

cc: Ed Morales

bcc: Paul X. McLain
Ridgway Hall, Crowell & Mooring
R. Bruce Andrews, w/o attachments
Richard Lange, w/o attachments

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EXECUTIVE SUMMARY

United Nuclear Corporation (United Nuclear) operated the Church Rock uranium mill facility located in northwestern New Mexico from 1977 to mid-1982. United Nuclear is submitting this reclamation plan for the Church Rock facility, as approved by the Nuclear Regulatory Commission (NRC) March 1, 1991, that protects health and the environment consistent with the criteria set forth in the NRC regulations in Appendix A of 10 CFR 40.

Canonie Environmental Services Corp. (Canonie) was engaged by United Nuclear to develop the Church Rock reclamation plan. Canonie conducted extensive field investigations and reviewed and utilized the substantial existing data base generated by United Nuclear, the Environmental Protection Agency (EPA), and others, to develop a comprehensive and accurate depiction of site conditions. The proposed reclamation plan was originally submitted in June 1987.

The plan was approved in March 1991 with several significant technical changes from the original plan submitted. Since United Nuclear submitted the proposed Reclamation Plan on June 1, 1987, the Reclamation Plan has undergone review with subsequent revisions over a period of nearly four years. In the meantime, United Nuclear has implemented several components of the plan in accordance with the proposed plan as directed by the NRC. Specifically, United Nuclear has implemented the following actions:

1. Interim stabilization of tailings, control of blowing tailings, and cleanup of wind-blown tailings in accordance with License Conditions 16 and 33,

2. Decommissioning of the mill in accordance with License Conditions 26 and 33,

3. Collection of tailings seepage in accordance with License Condition 30, and

4. Construction of an enhanced evaporation system in accordance with License Condition 32.

This document presents the Reclamation Plan, as approved by NRC, for United Nuclear's Church Rock uranium mill and tailings disposal facility near Gallup, New Mexico as required under License Condition 34 of License No. SUA-1475. The original plan has been amended on several occasions in various documents submitted to the NRC. The surface reclamation component of the plan was approved in March 1991. The seepage component of the plan, also included, was approved before March 1, 1991 by the NRC as the Corrective Action Program (CAP) and by the EPA as the Remedial Design.

In accordance with License Condition 34, this plan represents a single, comprehensive document that describes the approved composite Reclamation Plan, including specifications and updated cost estimates based on the composite plan. This plan describes the existing site conditions and identifies in detail the appropriate mitigation measures being taken to reclaim the Church Rock site. Following is a summary of the Reclamation Plan which includes:

Section 1.0 Site Description
Section 2.0 Radiological Survey
Section 3.0 Geotechnical Investigation
Section 4.0 Interim Stabilization Plan
Section 5.0 Final Reclamation Plan
Section 6.0 Corrective Action Program
Section 7.0 Mill Decommissioning Plan

Site Description

United Nuclear's Church Rock mill processed ore from its Northeast Church Rock (NECR) and Old Church Rock (OCR) mines, as well as some ore produced from Quivira Mining Company's (Quivira) Church Rock mine. The mill was operated from 1977 to mid-1982. Tailings disposal also occurred from 1977 to late-1982, the latter disposal associated with cleaning of the mill circuits upon mill closure.

The Church Rock mill is located approximately 17 miles northeast of Gallup, New Mexico in McKinley County, approximately one mile south of the Navajo Indian Reservation, in Section 2, Township 16 North, Range 16 West. United Nuclear owns the surface of Section 2 and Section 36 immediately to the north.

The entire region is sparsely populated. The city of Gallup, 17 miles southwest of the site, is the largest population center in the county. The nearest residence to the site is located approximately one mile northwest of the site. The nearest point of ground water use is located 1.7 miles northeast of the perimeter of the site.

The mill facility and associated tailings disposal area cover approximately 125 acres. The site is situated in an alluvial valley known as Pipeline Arroyo Canyon. Pipeline Arroyo is an ephemeral channel that traverses the site to a point southwest where it joins the Rio Puerco, a larger ephemeral drainage.

The site is located in an arid region typical of the southwestern United States, where evaporation significantly exceeds precipitation. The annual average rainfall in this area is approximately 12 to 14 inches per year. The average net-pan evaporation rate is approximately 60 inches per year.

Geological Setting - The tailings disposal site is located in the Pipeline Canyon, an alluvial valley drained by the Pipeline Arroyo. The site is situated on alluvial valley fill and sandstones and shales of Cretaceous age. The stratigraphic units identified in the site area, in descending order, include:

1. Alluvium (sand, silts, clays and gravels)

2. Dilco Coal Member of the Crevasse Canyon Formation (Dilco)

3. Upper Gallup Sandstone, divided into:

    - Zone 3, upper sandstone
    - Zone 2, shale and coal
    - Zone 1, lower sandstone

4. Upper D-Cross Tongue Member of the Mancos Shale (Mancos)

The alluvium and, to a limited extent, Zone 3 and Zone 1 of the Gallup Sandstone are in direct contact with the tailings and show evidence of limited tailings seepage. The Dilco, Zone 2 of the Gallup Sandstone, and the Mancos are not affected by tailings seepage because the permeability of these units is too low to allow seepage to migrate into or through their layers. These units are considered to be aquitards in this vicinity.

Structural features within the site were identified on cross sections developed from geophysical and lithological logs of wells drilled on site. Preparation of the cross sections identified several areas of flexure with associated fracturing and/or faulting in Zone 3 and Zone 1 of the Upper Gallup Sandstone. The fracturing was evident in three areas along the east and north sides of the borrow pits and two areas north and east of North Cell. Fracture zones influence the direction of flow because they generally

have higher permeability than the surrounding rock matrix. However, the data indicate that these fractures do not affect the rate of flow.

Hydrological Setting - Site hydrogeologic conditions were determined from the significant volume of data and reports compiled for this site since the time the original Environmental Report, which accompanied the license application for the site, was prepared. The majority of the geohydrologic data has been synthesized in the Geohydrologic Report (GHR) prepared by Canonie in 1987 (Canonie, 1987a). Since that time, additional monitoring data have been gathered and Canonie has continued to update its understanding of the geohydrologic conditions at the site. This plan cites the pertinent data sources used where appropriate.

Prior to mining and milling activities, no contiguous ground water system was known to exist in the near-surface geologic units, including alluvium and Zone 3 and Zone 1 of the Gallup Sandstone, in the general area of the tailings disposal (Canonie, 1987a). Water was first introduced to formations underlying the site by the discharge of mine water into Pipeline Arroyo, and later by seepage of tailings liquids from the tailings impoundment and Borrow Pit No. 2.

Mine water was discharged to Pipeline Arroyo for a period of approximately 17 years. The mine water partially saturated the alluvium and Zone 3 and Zone 1, creating a temporary artificial ground water system. Since discharge of the mine water ceased, the artificial system has been dissipating and returning to the natural unsaturated conditions. Declines in water levels and flow rates since cessation of mine water discharge are evidence of the dissipation of the artificial system (Canonie, 1987a).

Hydrogeochemistry - The geochemistry of the of the water present in the formations of concern has been evaluated and the results were presented in several previous reports

including the "Geochemical Background Investigation" by Billings (1986) and the "Evolution of Ground Water Chemistry" by Canonie (1988a). These studies indicate that the geochemistry of the artificial system evolved as the mine water migrated first through the alluvium and then into the underlying Zone 3 and Zone 1. As the mine water percolated through the alluvium, it reacted with the soil materials, dissolved various soluble constituents, and evolved into the water chemistry present today in areas outside the influence of tailings seepage. As the water migrated into the Upper Gallup Sandstone, the chemistry did not change because these strata are essentially chemically inert.

Seepage from tailings has altered the chemistry of the artificial system created by mine water discharge. Seepage effects on the artificial system have varied depending on whether seepage migrated through the alluvium, which has favorable geochemical properties, or through the geochemically inert Upper Gallup Sandstone, i.e., Zone 3 or Zone 1, without passing through the alluvium. Analyses of samples from the alluvium identified the presence of calcium carbonate, iron hydroxide, natural organic carbon, and clay material with significant cation-exchange capacity (Canonie; 1987a, 1988). These properties give the alluvium the ability to neutralize acidic seepage and to precipitate or reduce concentrations of metals and radionuclides in the seepage.

Conversely, Zone 3 and Zone 1 lack the favorable geochemical properties necessary to neutralize the acidic seepage. Therefore, the primary mechanism for neutralizing the seepage in Zone 3 and Zone 1 is its dilution by the mine discharge water which saturated Zone 3 and Zone 1 prior to deposition of tailings. Seepage migrating directly into the Gallup Sandstone created a plume evident in Zone 3 north and east of the North Cell where tailings were placed directly on Zone 3 outcrops. The plume is also evident in Zone 1 east of Borrow Pit No. 2 which was excavated into Zone 1 sub-crop.

Radiological Survey

A survey of the site was conducted to assess the radiological characteristics of the site. Background values were established by surveying areas unaffected by facility operations to determine action levels for possible remediation. In accordance with the guidelines of Appendix A of 10 CFR 40, remediation of soil is required in areas where the Ra-226 activity concentrations due to by-product (i.e., tailings material) are observed to be greater than specified levels above background Ra-226 concentrations.

Several areas were identified as requiring remedial action resulting from the deposition, transport or release of such materials. Specifically identified areas included:

1. The mill site,

2. Limited wind-blown tailings areas to the northeast of the tailings disposal area,

3. Catch basins and drainage areas, and

4. Several areas of tailings deposition adjacent to the tailings disposal area.

Geotechnical Investigation

A geotechnical investigation was conducted to provide the data needed to develop the specifications for the planned remedial actions, including regrading and tailings disposal area soil cover design, borrow and riprap source delineation, and geomorphologic considerations related to the Pipeline Arroyo and control of the Probable Maximum Flood (PMF). A number of borings were drilled and test pits excavated to provide data for the reclamation design. Laboratory testing performed in developing the plan included testing of soil to determine physical properties used in the cover design. The

geotechnical investigation indicated that sufficient borrow material exists on-site to provide adequate cover for the tailings disposal area to provide long-term protection from radon emissions and to ensure the protection of the tailings facility for the 1,000-year design period to the extent reasonably achievable.

Investigations were also conducted to identify potential sources of suitable riprap material for erosion protection. Local sources of riprap of adequate quality are available within reasonable transport distances from the site. Sources of riprap with even greater quality are available at a much greater distance from the site.

Interim Stabilization Plan

United Nuclear has implemented the interim stabilization portion of the plan designed to minimize the potential for release of contaminants to the environment. The interim stabilization plan focuses on the elimination of significant pathways for potential release, such as the seepage routes and the air route via wind-blown tailings and radon emanation. Interim stabilization was initiated in 1989 in accordance with NRC directives. The interim reclamation concept has provided an opportunity for monitoring the success of the program and allows for necessary adjustments prior to initiation of final reclamation. Indeed, using data gathered during implementation of interim stabilization in the North and Central Cells of the tailings disposal area, the radon attenuation soil cover layer design was reduced from 3.6 feet, originally proposed in 1987, to the 1.5 feet, approved in March 1991.

Interim stabilization minimizes infiltration from precipitation by regrading and recontouring the tailings disposal area. Conduits of potential seepage migration have been eliminated by plugging selected wells. Interim stabilization consists of placing an interim soil cover and revegetation in some areas to eliminate wind-blown tailings, to reduce infiltration of precipitation, and to reduce radon flux from the tailings. This

interim cover makes up the first 1.0 foot of the 1.5 feet of radon attenuation soil cover called for in final reclamation. The following actions have been accomplished during the first three years of implementation of interim stabilization:

1. Disposed of the neutralized water stored in Borrow Pit No. 2 by using it on tailings to assist in control of wind-blown tailings. During interim stabilization, United Nuclear dewatered Borrow Pit No. 2.

2. Regraded and recontoured the tailings materials to provide drainages to allow the North and Central Cells of the tailings disposal area to shed precipitation, reduce recharge, and eliminate ponding. Recontouring was designed to place coarse tailings over fine tailings to reduce radon flux from the tailings disposal area.

3. Collected wind-blown tailings north and east of the tailings disposal area, on Section 36, Township 17N, Range 16W, and Section 1, Township 16N, Range 16W property immediately adjacent to the tailings disposal area and placed the affected soils in the tailings disposal area.

4. Placed the 1.0-foot interim soil cover over the North and Central Cells of the tailings disposal area to stabilize the site during the interim period and reduce erosion and further minimize radon releases. The South Cell will be regraded and covered in 1991.

5. Plugged selected wells.

6. Initiated the CAP approved by the NRC and the RD approved by the EPA, which included the installation of extraction wells and construction of

evaporation ponds and an enhanced evaporation system to dispose of collected seepage.

7. Initiated mill decommissioning.

Final Reclamation Plan

United Nuclear plans to conduct final reclamation activities commencing at the satisfactory completion of the seepage collection program. The primary tasks to be accomplished in final reclamation include:

1. Completing backfilling and grading Borrow Pit No. 2,

2. Regrading and covering the evaporation ponds,

3. Placing the final radon attenuation soil cover and the soil/rock matrix erosion protection cover,

4. Constructing surface water control channels, diversion ditches, drainage swales, Pipeline Arroyo low flow channel, and the buried jetty, and

5. Revegetating disturbed areas and securing reclaimed areas.

The final reclamation actions will be implemented in compliance with Appendix A of 10 CFR 40. The plan meets the objectives of Appendix A of 10 CFR 40, to the extent practicable by minimizing final slopes, containing and controlling major flood events, minimizing radon emanation from the tailings disposal area, and maximizing the long-term stability of the reclaimed site.

The final tailings area radon attenuation soil cover has been designed to provide reasonable assurance that control of radiological hazards will be effective for 1,000 years and that releases of Rn-222 to the atmosphere will not exceed an average release rate of 20 picoCuries per square meter per second, to the extent practicable, throughout the design life of the cover. Soil used for the final cover that meets the gradation requirements specified in the design model, will be obtained from borrow areas adjacent to the tailings disposal area. A radon attenuation soil cover having a total thickness of 1.5 feet (1.0 foot during interim stabilization, 0.5 foot during final reclamation) will be placed over the tailings to provide the required reduction in release rates specified by NRC.

Final reclamation activities will include various actions to protect the tailings disposal area from the effects of storm and flood events. The Probable Maximum Precipitation (PMP) and the Probable Maximum Flood (PMF) were selected as the precipitation and flood events used for hydraulic designs to control surface water in the reclamation plan.

Following placement of the radon attenuation soil cover, a soil/rock matrix layer will be placed over the tailings cover to protect it from water and wind erosion. Rock riprap will also be placed in certain critical areas, such as in diversion ditches, drainage swales, and in construction of the buried jetty. The soil/rock matrix layer, the rock mulch, and rock riprap have been designed to protect the tailings disposal area and drainage channels from damage from the PMF and lesser storm events. Runoff control and diversion ditches at the tailings disposal area will be constructed and modified to ensure long-term protection of the tailings disposal area from the PMF and lesser storm events.

The Pipeline Arroyo, the principal surface water drainage on the property, will be modified to ensure that the PMF will pass without damage to the tailings disposal area. The low-flow channel in the modified arroyo will also protect against the long-term geomorphic changes resulting from storms having less intensity than the design events.

Areas outside the tailings disposal area disturbed by grading activities will be revegetated with natural species. Existing fencing will be used to control access into the majority of the reclaimed areas. Additional fencing will be installed around the area to be deeded to the U.S. Department of Energy prior to transfer of the property.

Corrective Action Program

United Nuclear was required to implement active seepage remediation at the Church Rock site because constituent concentrations in the ground water exceeded:

1. Ground water protection standards established by the NRC and documented in Condition 30 of United Nuclear's Source Materials License, and

2. Applicable or Relevant and Appropriate Requirements (ARARs) established by the EPA and documented in the Record of Decision (ROD) dated September 30, 1988.

This seepage remediation program, referred to here as the CAP, evolved over 2 years from 1987 through 1989, and was based on requirements established by the NRC and later, the EPA. The NRC's involvement with the site began in 1986 when licensing authority was transferred from the State of New Mexico to the NRC. The EPA initially became involved when the site was placed on the National Priorities List in 1981 and later took a more active role when it conducted a remedial investigation/feasibility study of the site and published its ROD pursuant to Comprehensive Environmental Response, Compensation and Liability Act.

NRC and EPA signed a Memorandum of Understanding (MOU) to delineate the responsibilities of the two agencies for administering the remedial action at the site. The

MOU was signed in August, 1988 and established the agencies responsibilities as follows:

1. NRC - source control and on-site surface reclamation pursuant to the License,

2. EPA - off-site ground water remediation pursuant to the ROD, and

3. NRC and EPA - integration of ground water remediation pursuant to the NRC License and EPA's ROD.

The CAP for collection of tailings seepage was developed in response to the NRC license condition No. 30 of Amendment No. 4 to the Source Material License SUA-1475 issued on January 3, 1989, and the EPA ROD for the United Nuclear Church Rock site issued September 30, 1988 (EPA, 1988a). The CAP presents the technical basis for the detailed design of the tailings seepage active remedial action to be taken.

The CAP was presented to the NRC and EPA in April 1989 in the document entitled "Remedial Design Report" (RD) prepared by Canonie (1989). The program was initiated in May 1989 and has been operating for almost two years. This plan incorporates the RD describing the CAP, because it has been implemented with changes implemented as a result of annual performance evaluations and agency comments.

Corrective Action Description and Design - Seepage corrective action at the Church Rock site consists of extraction of tailings seepage from Zone 3, Zone 1, and the Southwest Alluvium and dewatering of Borrow Pit No. 2 to remove the source of tailings seepage to Zone 1. The collected tailings seepage is disposed of by evaporation.

1. Zone 3 - Remedial action in Zone 3 consists of pumping 23 extraction wells to create a hydraulic barrier against further migration of the plume and to

dewater the target area and Point of Compliance (POC). The extractable volume of the target area in Zone 3 is estimated to be 200 million gallons or less, based on a target area of 100 acres, an observed average saturated thickness of 60 feet, and an extractable porosity of 10 percent. However, monitoring of hydrogeologic conditions during remediation will determine the duration and magnitude of pumping actually required.

2. Zone 1 - The remedial action for Zone 1 consists of dewatering Borrow Pit No. 2 and continued pumping from several extraction wells. Originally, the extraction wells were to be decommissioned after dewatering the borrow pit was complete because additional pumping in Zone 1 was considered impracticable and unnecessary due to the low permeability of the formation within the target area. However, due to NRC and EPA requirements, the Zone 1 extraction wells are still in operation.

3. Southwest Alluvium - Remedial action for the Southwest Alluvium consists of pumping four wells for the purpose of creating a barrier against further seepage migration and extracting seepage from the Southwest Alluvium. The system is located downgrade of the southern edge of the South Cell of the tailings impoundment and upgrade of the POC wells identified by the NRC in the Southwest Alluvium.

4. Disposal of Extracted Tailings Seepage - Seepage collected by the extraction wells is disposed of by evaporation. The evaporation disposal system consists of two, five-acre, lined evaporation ponds equipped with an enhanced evaporation mist system and a separate mist or spray evaporation system installed on the surface of the tailings. The evaporation disposal system is installed and is operating entirely within the tailings disposal area.

Performance Criteria - Ideally, the objective of the remedial action is to clean up the target areas and POCs to the ground water protection standards established by the NRC in the License and the ARARs designated by the EPA. However, the following factors will influence the degree to which the remedial action is successful in meeting these standards:

1. Background values established by the NRC and the EPA may not reflect site conditions because adequate consideration may not have been given to the fact that "background" (i.e., pre-tailings water quality) resulted primarily from the evolution of the mine water chemistry as it percolated through previously dry sediments. Therefore, in many instances, background levels exceed the water quality standards established by the NRC and the EPA.

2. With time, dewatering may preclude operation of individual wells.

3. Performance monitoring may demonstrate that it is technically impractical to meet the regulatory standards, despite a reasonable expenditure of time and efforts. For example, it is possible that portions of the system may always be capable of sustaining limited pumping without realizing cleanup benefits.

Water Quality Standards - The NRC ground water protection standards established for this site are either Maximum Contaminant Levels designated in Table 5C of title 10 Code of Federal Regulations (CFR) 40 Appendix A, or background values, whichever are greater.

The EPA determined the contaminant-specific ARARs for the site by reviewing pertinent federal, state, and health based standards and background levels for the constituents of concern. The background levels established for constituents by the EPA were set as the ARARs if such levels were deemed by the EPA to be at

higher concentrations than federal, or state, or health-based standards for that constituent. The federal, state, or health-based standard was set as the ARAR when the EPA determined that background was below the standard for the constituent.

Ideally, the objective is to clean up to those levels. However, achievement of the NRC's ground water protection standards and the EPA's ARARs may not be attainable due to the unrealistically low background levels which were established. In recognition of this problem, the NRC states in Appendix A of 10 CFR 40 that it may be necessary to set Alternate Concentration Limits (ACLs) for the NRC ground water protection standards identified at this site.

Similarly, the EPA stated in its ROD that should additional information become available that would significantly alter estimation of background levels, such information would be evaluated in terms of its impact on remedial action in each formation of concern. The EPA has further determined in its ROD that operational results may demonstrate that it is technically impractical to achieve all cleanup levels (ARARs). Consequently, waivers to meet certain contaminant-specific ARARs may require reevaluation (EPA, 1988a).

Operational Limitations - The EPA has determined that the probability of significant reductions in the saturated thickness of these formations at the site must be considered during performance evaluations since much of the water underlying the tailings disposal area is the result of mine water and tailings discharge, both of which no longer occur. It has also recognized that in the event that saturated thicknesses cease to support pumping, remedial action would be discontinued or adjusted to appropriate levels (EPA, 1988a). Performance monitoring may demonstrate significant declines in pumping rates, with time, due to insufficient natural recharge of the Southwest Alluvium. As a result, individual wells may be

decommissioned after obtaining the necessary approvals because they can no longer sustain pumping while others will be decommissioned based on criteria as described later herein.

Performance Monitoring - A program of performance monitoring is used to evaluate the success of the remedial action in meeting design expectations. Performance monitoring may indicate that the objectives have been met and the remedy is complete. The results of the monitoring may also indicate that it is technically impractical to achieve all cleanup levels in a reasonable time period and that it may be necessary to set ACLs and waive the requirements to meet certain contaminant-specific ARARs.

The objective of the monitoring program is to provide statistically valid water level and water quality data, which can be used to evaluate the performance of the extraction system in meeting regulatory criteria. Water chemistry analysis for the monitoring program is conducted for the chemical constituents including all constituents which are in exceedance of ground water protection standards and ARARs at the site. Water chemistry data are used 1) to monitor compliance with License Condition 30, Part B criteria at POC wells, 2) to monitor and assess trends in water quality which may develop in response to pumping, 3) to evaluate the effectiveness of cleanup within the target area, 4) to provide an adequate database for development of ACLs (NRC) and waivers to ARARs (EPA), if necessary, and 5) to supplement the existing database. In addition, background water quality plays a very important role in setting both the NRC's ground water protection standards and the EPA's ARARs. Therefore, the monitoring program is also designed to further aid in establishing background water quality conditions.

Water-level data are used to determine the effects of the system on geohydrological conditions including creation and performance of the hydraulic barriers and to monitor

the decreases in saturation which will occur as pre-mining natural conditions are re-established.

System Decommissioning - The CAP sets forth conditions by which the system would be decommissioned. While these conditions set forth physical parameters used to define when systems or components thereof become candidates for decommissioning, in accordance with NRC License Condition 30C, no program component meeting the decommissioning criteria will be decommissioned without prior approval from NRC.

The objectives of the extraction system in Zone 3 and the Southwest Alluvium are to create a hydraulic barrier to prevent further migration of tailings seepage and concurrently, dewater the identified target area in Zone 3. Additionally, operation of the system may provide an opportunity to clean up water quality in strata subject to remedial action to the NRC ground water protection standards and the ARAR levels established by the EPA in the ROD. However, both agencies have recognized that modifications may have to be made to these standards. The NRC regulatory mandate recognizes the possibility of not achieving the cleanup standards by providing in Appendix A, 10 CFR 40 the option of establishing ACLs. Further, the EPA also provides an alternative approach of establishing waivers to the ARARs as stated in Appendix A to the ROD (EPA, 1988a).

The systems in Zone 3, Zone 1, and the Southwest Alluvium are performance based, i.e., their success will be measured against their ability to produce compliance with agency water quality standards, or in the case of Zone 3, dewater the target area. Achievement of either condition will merit considering the system as a candidate for decommissioning. Additionally, the inability of the systems to meet the above performance criteria would indicate the need to evaluate an application for ACLs (NRC) and ARAR waivers (EPA).

Implementation - Implementation of the CAP has progressed as scheduled and the remedial action systems are all performing as designed. In accordance with the requirements of the License and the ROD, implementation and evaluation of the performance of the CAP are documented annually in a report submitted to the EPA and NRC. To date, two reports, the 1989 and 1990 Annual Review (Canonie; 1989c, 1990a) have been submitted to the agencies.

1. Zone 3 - The Zone 3 system has been operating since August 1989 and is successfully dewatering the target area and providing a hydraulic barrier to further migration of seepage. As of fourth quarter 1990, the saturated thickness in the eastern margins of the target area was near zero and the area of intense dewatering delineated by the 10-foot contour of reduced saturated thickness covered 60 percent of the Zone 3 target area. Also, the areal extent of the plume has remained at its reduced configuration since the extraction wells were turned on in 1989. By October, 1990, a total of approximately 27.3 million gallons had been extracted from Zone 3.

2. Zone 1 - The Zone 1 remediation was scheduled to be completed at the end of April 1989 when Borrow Pit No. 2 was dewatered. However, the NRC and EPA have required that United Nuclear continue to operate the Zone 1 pump-back wells. The Zone 1 wells have continued to pump at low rates, typically at rates of less than 1.0 gpm, with no benefit in terms of accelerating the rate of dissipation of the seepage mound or reduction in contaminant concentrations. Rather, the mound has been dissipating naturally at the rate predicted based on the performance monitoring data. Programs are presently in place to develop data to be used in preparing a request for the setting of ACLs and a waiver of the ARARs for Zone 1.

3. Southwest Alluvium - The Southwest Alluvium system has been operating since October, 1989 and is successful in creating a barrier to prevent further migration of seepage and extracting seepage. The extent of the plume has remained stable confirming that the wells are controlling migration of seepage. Between October 1989 and October 1990 a total of approximately 7.4 million gallons had been extracted from the Southwest Alluvium.

4. Evaporation Disposal System - The evaporation disposal system has operated since January, 1989, when extracted seepage from the then existing pump-back wells and Borrow Pit No. 2 began to be discharged to the evaporation ponds. The system has operated as designed with some adjustments to account for actual operational inflows and outflows. The primary adjustment occurred in 1991, between January and April, when pumping rates in the extraction wells were reduced and some extracted seepage was discharged to Borrow Pit No. 2 for temporary storage. These adjustments allowed for continued operation of the extraction wells and at the same time prevented exceeding the maximum safe operating capacity of the evaporation ponds. The seepage temporarily stored in Borrow Pit No. 2 was removed by the end of May, 1991 and disposed of through the spray evaporation system.

Mill Decommissioning

United Nuclear initiated mill decommissioning in 1991 and will complete mill decommissioning by the end of 1992 in accordance with NRC License requirements.

Upon placing the mill facility on standby in 1982, the entire mill was flushed and cleaned of process material following a logical sequence through the processing circuits. Pipelines and equipment were rinsed and emptied to ensure that closed circuits were clean. All instrumentation and equipment was cleaned and lubricated. This cleaning

process has made the job of mill decommissioning much less onerous. United Nuclear has been actively salvaging and selling selected mill equipment since 1985. Any equipment remaining on-site will be decontaminated and sold, if possible, or crushed and disposed of in Borrow Pit No. 2.

During mill decommissioning, United Nuclear will:

1. Dismantle the portions of the mill that will not be salvaged,

2. Clean and decontaminate foundations that are to remain in the mill area,

3. Excavate foundations that cannot be decontaminated, and

4. Dispose of mill debris and contaminated foundation material in Borrow Pit No. 2.

In conducting these activities, United Nuclear will continue to implement a comprehensive radiation safety program including monitoring, record-keeping, and reporting requirements. In addition, United Nuclear will continue to provide security in the mill area during decommissioning to prevent unauthorized access.

The portion of the mill complex that is decommissioned will be backfilled, graded, and revegetated during final reclamation.