CHASE ENVIRONMENTAL GROUP, INC.
environmental engineering and consulting

DECOMMISSIONING PLAN FOR CIMARRON CORPORATION'S FORMER NUCLEAR FUEL FABRICATION FACILITY CRESCENT, OKLAHOMA

License Number: SNM-928
Docket Number: 70-0925

PREPARED FOR:
CIMARRON CORPORATION
OKLAHOMA CITY, OKLAHOMA

April 1995

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April 19, 1995

Mr. Michael F. Weber, Chief
Low-Level Waste and Decommissioning Projects Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Re: Docket No. 70-925
License No. SNM-928
Decommissioning Plan

Dear Mr. Weber:

In accordance with requirements for the decommissioning of licensed nuclear materials processing sites, Cimarron Corporation submits four (4) copies of the **Decommissioning Plan for Cimarron Corporation's Former Nuclear Fuel Fabrication Facility, April 1995**.

Cimarron Corporation believes that the decommissioning of the Cimarron site is greater than 95% complete and that all remaining site work can be completed by the middle of 1996. However, this schedule is dependent upon expeditious NRC approval of documents submitted by Cimarron Corporation and any subsequent NRC confirmatory sampling requirements. Cimarron Corporation respectfully requests that the NRC complete the review and approval of this Decommissioning Plan by May 31, 1995. Cimarron Corporation is committed to working closely with the NRC to attain these required approvals.

Should you have any questions or comments concerning this plan, please contact Joe Kegin at 405/282-6722 or me at 405/270-2288.

Sincerely,

Jess Larsen

Jess Larsen
Vice-President
Cimarron Corporation

Enclosures as stated

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REFERENCES

1. USNRC, "Branch Technical Position on Disposal or On Site Storage of Residual Thorium and Uranium from Past Operations", 40 FED Reg. 52061, October 23, 1981.

2. Cimarron Corporation Materials License, SNM-928 Docket No. 070-00925, Amendment N. 10, Dated November 4, 1994.

3. Chase Environmental Group, Inc. "Radiological Characterization Report for Cimarron Corporation's Former Nuclear Fuel Fabrication Facility, Crescent, Oklahoma", October, 1994.

4. Cimarron Corporation Materials License, SNM-1174, Docket No. 070-1193, terminated February 5, 1993.

5. D. Berger, L.F. Friedman, "Confirmatory Survey of the Cimarron Corporation Mixed Oxide Fuel Fabrication Plant, Crescent, Oklahoma", Oak Ridge Associated Universities, January, 1991.

6. USNRC, "Environmental Assessment for License Termination at the Cimarron Corporation's Mixed Oxide Fuel Fabrication Plant", February, 1993.

7. D. Berger, "Manual for Conducting Radiological Surveys in Support of License Termination"; Draft Report for Comment, Oak Ridge Associated Universities, NUREG/CR-5849, June, 1992

8. USNRC, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for By Product, Source, or Special Nuclear Material"; August, 1987.

9. M. Smith, "Confirmatory Radiological Survey Former Burial Ground, Cimarron Corporation Facility, Crescent, Oklahoma"; Oak Ridge Associated Universities, July, 1992.

10. M. Smith, " Confirmatory Radiological Survey of the Sanitary Lagoons of the Cimarron Corporation Facility, Crescent, Oklahoma"; Oak Ridge Associated Universities, November, 1991.

11. USNRC, SECY-91-398A from Mr. James M. Taylor, Executive Director for Operations to the Commissioner, July 15, 1992.

12. USNRC Letter from Mr. Jerry J. Swift, Section Leader Advanced Fuel and Special Facilities Section, to Dr. Edwin T. Still, Kerr-McGee Corporation, January 8, 1993.

13. Standards for Protection Against Radiation, 10 CFR Part 20, February 26, 1993.

14. USNRC, "Residual Radioactive Contamination from Decommissioning, Technical Basis for Translating Contamination Levels to Annual Total Effective Dose Equivalent", Vol. 1, NUREG/CR 5512, October, 1992.

1.0 Introduction

This Site Decommissioning Plan for the Cimarron Corporation facility at Crescent, Oklahoma, describes activities (past, present and future) involving the characterization, decontamination and decommissioning of the site. Following the completion of all decommissioning efforts, it is anticipated that the entire site will be released from License SNM-928 for unrestricted use.

Cimarron Corporation, a wholly-owned subsidiary of Kerr-McGee Corporation, continues to manage all decommissioning activities at the Cimarron Facility.

Completed decommissioning activities include the dismantling of former production equipment and the management of all waste materials associated with such dismantlement. Waste management activities have included off-site disposal of equipment and soils as well as the on-site stockpiling/disposal of soils which contain enriched uranium at Option #1 and #2 concentration levels as defined in the Nuclear Regulatory Commission Branch Technical Position (BTP)[1]. This document establishes guidelines for concentrations of uranium and thorium in soil that will limit radiation exposure to the public under the various scenarios of future land use.

Decommissioning activities completed to date in addition to those currently underway have been approved by the Nuclear Regulatory Commission (NRC) and are being conducted in accordance with all regulatory requirements including Amendment #10 of NRC License No. SNM-928.[2]

The Cimarron Facility, located near Crescent, Oklahoma, was initially licensed by the Atomic Energy Commission (AEC) in 1965 to fabricate products containing enriched uranium. Cimarron Corporation (then named Kerr-McGee Nuclear Corporation) received another license from the AEC in 1970 to fabricate mixed oxide reactor fuels. Completed decommissioning activities include the mixed oxide facility which was released from License SNM-1174 and approved for unrestricted use by the NRC in 1993. Many of the NRC approved procedures used during the decommissioning of the mixed oxide facility were also utilized to decommission numerous areas of the uranium facility.

1.1 Site Description

The Cimarron Facility is located south of the Cimarron River, approximately 0.5 miles north of the intersection of Oklahoma State

Highways #33 and #74. Figure 1.1 shows the location of the facility. The facility began operations in 1966 with the fabrication of uranium fuel. The fabrication of mixed-oxides (plutonium) reactor fuel began in 1970. The principal operations at the facility involved the fabrication of pellets of enriched uranium and the fabrication of mixed-oxides reactor fuel. Production operations at the facility ceased in 1975. Characterization and decommissioning efforts commenced in 1976 and are still ongoing. The 1994 Cimarron Radiological Characterization Report[3] (hereafter referred to as the Characterization Report) is updated further in this plan, and includes a description of the facility, the processes that were utilized during fuel fabrication, and site radiological characterization data generated to date.

Cimarron Corporation was originally licensed under two Special Nuclear Material Licenses. License SNM-928 was issued for the Uranium Plant and License SNM-1174[4] was issued for the Mixed Oxide Fuel Fabrication (MOFF) Plant. Nuclear activities on the property were conducted in an area occupying less than 60 acres of the entire 840 acre licensed site. **(It should be noted that the 840 acre licensed Cimarron site area has been incorrectly referenced as 1,100 acres in several publications. The error results from incorrectly including an additional quarter section, plus an undivided 1/11th of a second quarter section of property owned by Kerr-McGee within the vicinity and contiguous to the licensed site.)**

The process facilities included several one-story sheet metal buildings, five process related collection ponds, two original sanitary lagoons, a newer sanitary lagoon, a waste incinerator, several uncovered storage areas, and three burial areas. These areas (herein referred to as "units") are currently at differing stages of completion with respect to decommissioning. Also included on the site is the decommissioned MOFF building, the surrounding restricted area and three reservoirs. The general site layout is shown on Drawing No. 95MOST-RF7. With the exception of Reservoirs #2 and #3, which were constructed for process make-up and potable water, all units discussed above are considered affected areas. Included within these affected units are several drainage areas and the site road to the old burial area (Burial Area #1). The majority of the 840 acre licensed site was never used during nuclear fuel fabrication operations. Licensed material, including wastes generated from licensed activities, was never placed in or discharged to any of the designated unaffected areas.

1.2 License SNM-1174 Terminated by NRC

The MOFF Plant operated from 1970 until 1975. The license for the MOFF Plant (SNM-1174) included the plutonium fabrication facility, drain line to the evaporation ponds, fenced area surrounding the facility, plutonium plant evaporation and emergency ponds, east and west sanitary lagoons, several underground tanks, and a septic tank. The MOFF Plant and associated areas have been decommissioned and the plutonium license was terminated by the NRC in 1993. However, the MOFF Plant and associated areas remain under uranium License SNM 928. The exterior of the MOFF building and the fenced area surrounding the building will be included in the final radiation survey plan for the site.

Cimarron Corporation submitted a license termination request to the NRC for License SNM-1174 on August 20, 1990. This request included a complete characterization and final survey of the MOFF Plant and associated areas. A Final Confirmatory Survey of the MOFF Plant and associated areas was conducted by ORAU at the request of the NRC.[5] The survey report was submitted to the NRC in 1991 and in this report, ORAU stated the following:

> "The documentation developed by the licensee was thorough and adequately described the post decontamination status of the facility. Radiological data demonstrated that the residual activity levels satisfied the established decommissioning guidelines."

The ORAU Confirmatory Survey Report also was referenced in the "Environmental Assessment for License Termination at the Cimarron Corporation Mixed Oxide Fuel Fabrication Plant" which was issued by the NRC (NMSS) in February of 1993.[6] The NRC stated the following in this Environmental Assessment:

> "Cimarron Corporation has decontaminated and decommissioned the Mixed Oxide Facility and associated grounds to below guidelines required for unrestricted use by the NRC. It is NRC's judgment that the applied guidelines adequately protect the public health and safety, and the environment. Therefore, the NRC finds that termination of the Mixed Oxide Facility License (License No. SNM-1174) and conversion of the related facility to unrestricted use will pose no significant impact to the environment or the health and safety of the public."

The NRC terminated License SNM-1174 by letter dated February 5, 1993. The NRC stated the following in this letter (included as Attachment I-1):

> "The staff has determined that (1) all special nuclear material relating to this license has been properly disposed, (2) reasonable effort has been made to eliminate residual radioactive contamination, and (3) a radiation survey has been performed, and confirmed by the NRC, which demonstrates that the premises are suitable for release for unrestricted use."

Although License SNM-1174 was terminated, the MOFF Plant building exterior surfaces and grounds were retained under the Uranium Facility License, SNM-928. License SNM-928 covers the entire 840 acre site (which includes the area licensed under SNM-1174). The NRC stated the following in the February 5, 1993, letter:

> "The termination of License No. SNM-1174 does not alter your Special Nuclear Materials License No. SNM-928 (Docket No. 70-925) in any way. Because the land formerly licensed under License No. SNM-1174 is contained within the bounds of License No. SNM-928, a second confirmatory survey of the former Mixed-Oxide Facility and associated grounds may be made at the time of termination of the Uranium Facility license. Any cross-contamination will be required to be remediated before the Uranium Facility license will be terminated."

Due to the MOFF plant's close proximity to the Uranium plant, Cimarron personnel performed a survey on the exterior of the MOFF plant building and yard in 1989. The purpose of the survey was to detect any uranium above release limits. The building survey indicated no elevated levels of contamination on the south, west or north sides. However, contamination was found on the east side in the vicinity of the air supply fan room stairs. A deck plate on the stair landing was found to be reading approximately 100,000 dpm/100 cm^2. An alpha pulse height analysis on a smear taken from this plate indicated enriched uranium. The deck plate was removed and disposed of off site as Low Specific Activity (LSA) radioactive waste. The area beneath the deck plate on the east wall of the building was decontaminated to meet release limits and resurveyed.

The restricted area surrounding the Plutonium Building was released by the NRC with the termination of License SNM-1174. Uranium contamination discovered during the final release survey of the MOFF Yard area was below free release limits. This data will be presented in

the final survey report for the MOFF Yard area to justify unrestricted release from License SNM-928.

1.3 Materials Licenses SNM-928 and By-Product 35-12636-02

Decommissioning work at the Uranium Plant was initiated in 1976 upon termination of production operations and is still ongoing. The goals for the decommissioning effort are two fold: to perform all decommissioning activities in accordance with applicable regulatory requirements/maintaining exposures ALARA; and to terminate License SNM-928 with unrestricted release of the entire 840 acres. Decommissioning activities are currently being conducted under NRC License SNM-928, Amendment #10. A request to revise the license was submitted to the NRC in the form of a license amendment request dated November 15, 1994. This license amendment request is intended to delete conditions that are no longer applicable. The current amendment to License SNM-928 allows for soils with concentrations of enriched uranium up to 30 pCi/g and concentrations of thorium up to 10 pCi/g (BTP Option #1 Materials) to be left in-situ. The current license amendment also allows for the on-site disposal of soil and debris contaminated with enriched uranium in the BTP Option #2 concentration range. In addition, this license amendment includes an expiration date of June 30, 1995. Based upon the remaining site work to be completed, Cimarron Corporation requests that this date be extended to December 31, 1996, with this issuance of the next license Amendment.

License SNM-928, was originally issued in 1965 to Kerr-McGee Nuclear Corporation for the fabrication of enriched uranium reactor fuels. The Uranium Plant was constructed to be a complete nuclear fuel service facility. Initial equipment provided for the production of UO_2, UF_4, uranium metal and the recovery of scrap materials. In 1968, the plant was expanded by increasing the UO_2 and Pellet facilities through the installation of another complete production line for fuel pellets. In 1969, fabrication facilities were added for the assembly of fuel pins. In 1970, facilities were added for the production of the fuel elements. Equipment initially installed for fully enriched uranium scrap recovery was only for work performed under a scrap recovery contract executed in 1970. All equipment utilized in fuel production activities has either been decontaminated and removed from the site for salvage or packaged and transported off site for disposal at a commercial LLRW facility.

A license amendment was issued by the NRC on May 3, 1977, reflecting the fact that the facility had terminated production operations and had begun decommissioning. This license amendment included the exemption from the provisions of 10 CFR 70.24. In October of 1984,

SNM-928 was amended to change the name of the licensee from Kerr-McGee Nuclear Corporation to Sequoyah Fuels Corporation, a subsidiary of Kerr-McGee Corporation. In October of 1988, License SNM-928 was amended to change the name of the licensee from Sequoyah Fuels Corporation to Cimarron Corporation, also a subsidiary of Kerr-McGee Corporation.

As stated earlier, the site has been subdivided into units. These units are naturally distinguishable or have a common history of characterization and decommissioning activities. These units are discussed in greater detail in Section 1.5. Throughout most of the decommissioning process at Cimarron a unit was characterized, remediated (if required) and resurveyed and the description of the decommissioning activities and final survey data were then submitted to the NRC for review and approval. After review of the submittal, the NRC either released the area or contracted with ORISE to perform a confirmatory survey. Based upon the ORISE confirmatory survey, the NRC would either release the area or require additional remediation. The units that have been released by the NRC are discussed in Section 1.5 and are shown on Drawing No. 95MOST-RF12. Cimarron personnel continue to remediate and/or survey units on site utilizing the same procedures previously approved by the NRC. The required final survey data is then compiled and submitted as a final report to the NRC for review and approval.

By-Product Materials License 35-12636-02 was issued to Cimarron Corporation for sealed sources utilized by site personnel for instrument calibration. An application for renewal of this license was recently submitted to the NRC. In accordance with the March 21, 1995, letter from NRC Region IV, Cimarron is under timely renewal. Upon license termination the sealed sources will be properly disposed of or transferred to other licensed Kerr-McGee facilities.

1.4 Radiological Criteria for Decommissioning

The purpose of this section is to discuss the criteria being utilized at the Cimarron site in the ongoing decommissioning process.

Additional characterization data may be required to supplement the existing data after such existing data has been reviewed and compared to the applicable criteria. Any additional characterization will be conducted in accordance with Draft NUREG/CR-5849[7] and the data will be incorporated into the Final Survey Report.

1.4.1 Buildings and Equipment

Release limits for contamination on buildings and equipment will comply with License SNM-928 and are identical to the limits specified in Table I of the NRC's "Guidances for Decommissioning of Facilities and Equipment Prior to Release for Unrestricted Use".[8]

Surface contamination on a building interior or exterior surface that is between 1 and 3 times the stated limit is acceptable, provided the area-weighted average radioactivity within a 1 m^2 area containing the elevated activity is within the stated limit.

Surface contamination on an exterior paved surface that is between 1 and 3 times the stated limit is acceptable provided area-weighted average radioactivity within a 100 m^2 area containing the elevated activity is within the stated limit.

1.4.2 Volumetric Activity of Soil

For an affected area, the guideline value for residual concentrations of uranium which may remain in soil is specified as Option #1 material (for enriched uranium, this is 30 pCi/g average above background) in Table 2 of the BTP. Hot-spot averaging will be conducted for all locations, within 100 m^2 grid areas, which contain soil concentrations in excess of 30 pCi/g total uranium above background as described in NUREG/CR-5849. The maximum enriched uranium soil concentration may not exceed three times the BTP Option #1 limit (90 pCi/g above background).

On-site disposal of BTP Option #2 material was approved by the NRC through Amendment #10 to License SNM-928. The average concentration of radioactive material that may be buried on site is 100 pCi/g total uranium above background (this assumes that the uranium is 100% soluble), and up to 250 pCi/g for insoluble uranium. The average concentrations of thorium and plutonium in the soil earmarked for disposal shall not exceed 10 pCi/g and 1 pCi/g respectively. Hot-spot averaging can be applied to any location within a 100 m^2 grid area which contains soil concentrations in excess of 100 pCi/g total uranium above background. The maximum total uranium soil concentration may not exceed three times the BTP Option #2 limit for soluble uranium (300 pCi/g above background).

For an unaffected area, NUREG/CR-5849 recommends reclassifying an unaffected area if any individual sample result exceeds 75% of the guideline value (i.e. 30 pCi/g total uranium above background). Prior to reclassifying any unaffected area as an affected area, the NRC

recommends investigating any individual sample analysis result which exceeds 25% of the guideline value. The average site background value for total uranium concentrations in soil as determined by the Cimarron soil counter is approximately 6 pCi/g. The total uranium concentration corresponding to 25% of the guideline value of 30 pCi/g is 7.5 pCi/g. This value is then added to the average background value for the Cimarron site to derive the corresponding limit of 13.5 pCi/g total uranium. Therefore, any total uranium concentrations in soil for unaffected areas which are greater than 13.5 pCi/g will be investigated further. Remediation of a small site may be applicable rather than reclassifying the entire area.

1.4.3 Gamma Surface Survey (Open Land Areas)

On occasion, Cimarron personnel utilize a shielded or unshielded 3" X 0.5" sodium iodide (NaI) detector as an additional screening device for qualitative identification of residual contamination in soil. This type of detector has been utilized primarily in affected areas to assist in remediation activities.

The unshielded (NaI) detector may be utilized during the initial survey of unaffected areas to determine if it's use would be beneficial. As stated above, this instrument is only utilized for qualitative measurements. Quantitative analysis for residual contamination levels in soil is performed with the Cimarron soil counter.

When this type of detector is required by a Special Work Permit, any survey instrument reading (in counts per minute) greater than twice background is used as an indication that an area may require additional investigation.

1.4.4 Exposure Rate Survey (Open Land Areas)

For either affected or unaffected areas, the average exposure rate may not exceed 10 μR/hr above background, at 1 meter above the surface. Background exposure rates have been established at the Cimarron site by taking micro-R readings at off-site annual environmental sample locations, in addition to Cimarron site areas which are unaffected by past operations. Site background exposure rates of approximately 7 μR/h have been observed in these areas by Cimarron personnel utilizing a Ludlum Micro-R survey meter. Site background exposure rates of approximately 7 μR/h have also been determined by ORISE personnel utilizing similar instrumentation. In addition, site background exposure rates of approximately 10 μR/h have been determined by ORISE[5]

personnel utilizing a Pressurized Ion Chamber (PIC). Based upon these numerous background assessments performed by both Cimarron and ORISE personnel, the background exposure rate at the Cimarron site ranges from 7 to 10 μR/h. Exposure rates may be averaged over a 100 m^2 grid area as described in NUREG/CR-5849. The maximum exposure rate at any discrete location within a 100 m^2 grid area cannot exceed 20 μR/hr above background. Any areas with average exposure rates greater than 10 μR/hr above background and any discrete locations within a 100 m^2 grid area with exposure rates greater than 20 μR/hr above background will be investigated further.

1.5 Summary of Characterization Data

Decommissioning of the Uranium Facility is still ongoing. A large step toward completing this decommissioning process was the compilation of a site-wide radiological characterization report. The Characterization Report was prepared for the Cimarron facility in accordance with license condition #20 of Cimarron Corporation License SNM-928, Amendment #9. This report was submitted to the NRC in October of 1994. The goal of the characterization program was to determine the nature and extent of contamination located on the site. Based upon the historical knowledge and characterization data available, Cimarron Corporation believes that all areas of contamination that could affect decommissioning activities have been identified, characterized and addressed.

Based upon site history and the extensive amount of characterization data generated to date, the Cimarron site has been divided into areas that are considered to be affected and unaffected. The affected and unaffected areas of the site are shown on Drawing No. 95MOST-RF2. Of the 840 acre site, approximately 60 acres are considered to be affected areas, with the remaining 780 acres being considered unaffected areas.

The historical information contained in the Characterization Report has been summarized and subdivided into separate units within the 840 acre site. The status of these units, along with additional characterization information gathered to date, are discussed briefly below:

- Uranium Process Buildings and Equipment - The decontamination and decommissioning of the uranium processing equipment and buildings was initiated in 1977. The general layout of the processing area is shown in Figure 1.2. Process equipment within the buildings that was contaminated has been either decontaminated and/or removed. A number of the walls and floor sections have been removed and decontaminated and/or disposed. Interior and exterior surfaces have

been washed, scraped, chipped and/or scabbled to remove surface contamination. Subfloor drains and the associated contaminated soils have also been excavated and removed. The status of the decontamination activities is further discussed in Section 14.0 of the Characterization Report.

Two areas within Building #1 have been decontaminated and released by the NRC for backfilling; these areas are shown on Drawing No. 95MOST-RF12. The remaining areas within Building #1 are currently being decontaminated and surveyed. The Liquid Storage Building (Building #2) has been dismantled and removed. The Solvent Extraction Building (Building #3) and the Vaporizer Room concrete floor have also been dismantled and removed.

The Uranium Warehouse Building (Building #4), which was not used as part of the fuel cycle process, is currently being utilized by Kerr-McGee for non-nuclear process development. This Building was a warehouse where some fuel assembly inspections were performed. The NRC granted approval for Kerr-McGee, to use Building #4 for non-nuclear purposes on December 28, 1979. The NRC letter is included as Attachment I-2.

Building #1 contained the offices, laboratory, change rooms and the majority of the equipment utilized for uranium fuel processing. The building is in the final stages of being decontaminated. The roof, walls, and support structures have been surveyed and decontaminated as required. In numerous areas, the concrete floor and contaminated soils under the concrete have been removed. Floor drains and other underground process lines have also been removed.

The concrete floor and soil beneath the concrete was excavated in the Wet Ceramic area; the excavated area was surveyed and sampled in 1992. ORISE completed a confirmatory survey of the Wet Ceramic area in June of 1992. Based upon the ORISE confirmatory survey results, the NRC issued a verbal approval to Cimarron personnel to backfill the area.

Final survey and soil sampling in the Scrap Recovery Area was completed in 1993. Final survey reports were submitted to the NRC on July 8, 1993, and November 15, 1993. ORISE completed a data review and submitted a report to the NRC which stated that decontamination was complete. Based upon the ORISE report, the NRC approved of the backfilling of the Scrap Recovery Area by letter dated January 8, 1993. This letter is included as Attachment I-3. It should be noted that the rear (eastern portion) of Building #1 is still

being used for decontamination activities and will be the last area which requires characterization and possible remediation. Decommissioning work on building structures and subsurface areas is approximately 95% complete. Decontamination and decommissioning of the process buildings continues to be performed in accordance with the criteria discussed in Section 1.4.

- Burial Area #1 - This burial area was constructed in 1965 and was opened for disposal of radioactive waste in 1966, including thorium-contaminated waste from the Kerr-McGee Cushing Facility. Decontamination and decommissioning activities are further discussed in Section 7.0 of the Characterization Report. Burial Area #1 was closed and capped in 1970. Because of settlement over some of the Burial Area #1 trenches, an investigation was initiated in 1984 to establish appropriate remedial action. In February, 1985, several monitoring wells were installed at the burial area; one up-gradient and three down-gradient to the burial area. In May 1985, soil samples from nine bore holes around the perimeter of this area were obtained to a maximum depth of twelve feet. A bore hole gamma scan was conducted in 1986 on four trenches and the surrounding areas contained within Burial Area #1. Based upon the slumping over the burial area and the borehole sampling data, the decision was made to excavate and remediate Burial Area #1. From 1986 through 1988 the trenches were excavated and the waste was shipped off-site for disposal at a licensed LLRW disposal facility. Based upon confirmatory surveys by ORAU[9], the NRC released Burial Area #1 for backfilling with clean soil on December 28, 1992. This letter is included as Attachment No. I-4. Decontamination and decommissioning of this area is considered complete by Cimarron Corporation.

- Uranium Plant Yard Areas - The restricted areas surrounding the Uranium Process Building (Building #1) and Warehouse Building (Building #4) have been extensively characterized and remediated. Decontamination and decommissioning activities are further discussed in Section 13.0 of the Characterization Report. Portions of these areas also contain the four stockpiles of Option #2 materials; Stockpile #1 and #2 will have been disposed on site within the on-site disposal cell by the time this plan is issued. These soils are being disposed in accordance with Amendment #10 of License SNM-928. The NRC agreed with Cimarron's soil characterization data for Stockpiles #1 and #2 by letter dated February 16, 1995 from Mr. David Fauver, thus approving the soils for on-site disposal. The disposal of the third pile is pending NRC approval of the soil characterization data submitted to

the Agency by letter dated April 7, 1994. The fourth pile is receiving material generated by the on-going remediation activities.

The Uranium Plant Yard has been divided into four sections. They are the area north of Building #1 and surrounding Building #4, the area south of Building #1, the area east of Building #1 and Building #4, and the parking area west of Building #1. Stockpiles of Option #2 materials were located in the areas north and east of Building #1. The general layout of the Uranium Plant Yard is shown on Figure 1.2.

The area surrounding Building #4 was excavated to a depth of up to four feet in 1993. Both Option #2 and #4 materials were removed. As stated above, Option #2 materials were stockpiled in the Uranium Plant Yard area. Option #4 material was packaged and shipped off-site for disposal at the Barnwell LLRW Facility. The remediated area was surveyed and sampled on a 10 x 10 meter grid after the remediation was completed. The characterization data generated by Cimarron personnel which documents that the remediation is complete is contained in Section 13.0 of the Site Characterization Report. Following NRC staff review, verbal permission was received by Cimarron personnel from the NRC (phone conversation between Mr. Gary Comfort, NRC Headquarters, and Dr. Ed Still, Kerr-McGee) to backfill the area around Building #4 in 1993. The area was backfilled soon after NRC verbal approval.

The area south of Uranium Building #1 (South U-yard) contained the UF_6 Receiving Areas (Vaporizer Room), Tank Storage building (Building #2), Solvent Extraction Building (Building #3), Liquid Storage Area and UF_6 Storage Area. After removal of the equipment, buildings, and concrete floors, large volumes of Option #2 and #4 contaminated materials were removed. Remediation of this area was completed in 1994. A report on the South Uranium Yard remediation, including final survey and soil sampling data, was submitted to the NRC on November 17, 1994. This Report was submitted to the NRC in order to request unconditional release of the subsurface area and permission to backfill.

The areas east of Buildings #1 and #4 have not been completely characterized because the BTP Option #2 stockpiles are/were located in this area. Two stockpiles have just recently been relocated and disposed in the on-site disposal cell. This area will be characterized and remediated in accordance with the criteria described in Section 1.4. Characterization data for this area, completed in 1990, prior to stockpile placement, indicates concentrations of uranium above background levels in the soil at shallow depths. (Refer to

Characterization Report, page 13-1.) The areas under stockpiles 3 and 4 will be characterized once these piles are disposed.

The area west of Building #1 includes the facility parking lot. The characterization work conducted in 1990 showed that soil samples taken from the parking lot were within the guideline value for BTP Option #1 material. No remediation is required for this area. This area will be included in the final status survey report.

- Burial Area #2 and North Field - This area was utilized in the 1970's for the disposal of industrial solid waste generated on site. During an investigation of this area in 1990, contaminated materials were found in this burial area. Decontamination and decommissioning of this area are discussed in detail in Section 8.0 of the Characterization Report. Remediation of this area began in 1991, with the removal of BTP Option #2 material. Several small areas in the North Field contain Option #2 material that is currently being removed. The final status survey for this area is currently in progress and is being performed in accordance with the criteria discussed in Section 1.4.

- Burial Area #3 - This area was originally constructed for disposal of non-radioactive solid waste materials. However, the 1990 soil sampling program and gamma survey completed for this area indicated that radioactive waste materials may be present in the buried waste. The initial 1990 survey led to a characterization of the area and the subsequent remediation of this area. Decontamination and decommissioning of this area are discussed in detail in Section 9.0 of the Characterization Report. Portions of Burial Area #3 are still being remediated. A final status survey of this area will be conducted when remediation is complete.

- Trash Incinerator - This incinerator was utilized to incinerate non-radioactive waste materials released from restricted areas during site operations. The incinerator was located just east of the New Sanitary Lagoon. Due to the concentration of residual materials resulting from incineration, uranium concentrations above background levels were present in the ash. The incinerator was dismantled in 1992. Ash materials were surveyed, and if required, placed in drums and shipped off-site to a commercial LLRW disposal facility. No further remediation is required for this area. This area will be included in the final status survey report.

- East & West Sanitary Lagoon - These ponds received all liquid process waste from the Uranium Plant from 1966 through 1970. Decontamination and decommissioning of this area is discussed in

Section 11.0 of the Characterization Report. In 1970, all liquid process wastes from the Uranium Plant were diverted to other lined uranium evaporation ponds located on-site. From 1970 until 1985, the MOFF Plant septic tank, the Uranium Plant septic tank, the Uranium Plant laundry, the Uranium Plant lab, the Uranium Plant dock drain, and numerous floor drains in the Uranium Plant discharged into the East and West Sanitary Lagoons. In early 1986 both the East and West Sanitary Lagoons were removed from service. Both Lagoons had been previously isolated to prevent discharge to the Cimarron River in 1977. These lagoons were remediated in 1986, with final surveys conducted by Cimarron personnel in September, 1990. Confirmatory surveys and soil sampling was conducted by ORAU[10] in November, 1990. The NRC authorized backfilling of the East and West Sanitary Lagoons under Amendment #9 of License SNM-928, issued December, 1992. The NRC letter issued with Amendment #9 is included as Attachment I-4. Decontamination and decommissioning of this area is considered complete by Cimarron Corporation. This area will be included in the final status survey report.

- New Sanitary Lagoon - This lagoon is hypalon-lined and was installed in January, 1986 to replace the East and West Sanitary Lagoons. The New Sanitary Lagoon was utilized from early 1986 to October, 1992. This lagoon is now isolated which results in the collection of rainwater. The decommissioning of this area is addressed in Section 2.2 of this plan.

- Five Former Waste Water Ponds - The five former waste water ponds, (Uranium Waste Ponds #1 and #2, the Plutonium Evaporation and Emergency Ponds, and the Uranium Emergency Pond), were all closed by the end of 1979. The sludge within the ponds was treated, packaged and transported to a commercial LLRW disposal facility. On March 2, 1978, Cimarron received written permission from the Oklahoma State Department of Health to cover the five former waste water ponds. On July 10, 1978, Cimarron received written permission from the NRC to backfill and cover the five former waste water ponds. These approval letters are included as Attachment I-5.

  Follow-up characterization has been performed on Uranium Waste Pond #1 and #2 areas by Cimarron personnel. This characterization data and an analysis of previous data are discussed at length in Section 2.1 of this plan. Additional characterization has been completed in the areas formerly occupied by the Uranium Emergency Pond and Plutonium Emergency Pond. All five ponds are also discussed further in Section 2.1 of this plan.

- Drain Lines - The areas occupied by the former drain lines to the Sanitary Lagoons, Evaporation Ponds, Uranium Waste Ponds, and the two lines to the Cimarron River are considered part of the affected area. These drain lines have been removed and the areas were surveyed at the time of line removal or during subsequent characterization efforts. The decontamination and decommissioning of these drain lines are discussed in detail in Section 15.0 of the Characterization Report.

  More recent characterization data for the areas traversed by the drain line from U-Building to Uranium Waste Pond #1 (U-Pond #1) has been collected. Four soil sample locations exceeded the guideline value of 30 pCi/g total uranium above background; two locations exceeded the "three times average" guideline value. These locations will be remediated as required. Follow-up data analysis will be conducted to determine if remaining concentrations are less than $(100/A)^{1/2}$ times the guideline value. Locations exceeding this limit will also be remediated. The analytical data for this characterization effort is further discussed in Section 2.1. With the exception of the two areas discussed above, Cimarron Corporation considers decontamination and decommissioning of these areas to be complete.

- Reservoir No. 1 - This reservoir received run-off from the U-Plant restricted area and is included in the environmental sampling program for the site. In 1991, the drainage area leading to the reservoir was characterized and remediated. This area is discussed further in Section 16.0 of the Characterization Report. A release survey of this area will be performed as part of the final status survey in accordance with the criteria discussed in Section 1.4.

  The Characterization Report, in Section 16.0 (page 16-2) incorrectly referenced a "typical" surface water sample for the reservoir from the pre-1976 environmental program sampling to be 8.28 dpm/l plutonium. This was a typographical error and should have been 3.28 dpm/l. In addition, this sample was in fact not typical because three follow-up samples showed plutonium concentrations at background levels. Cimarron Corporation believes that the 3.28 dpm/l value was due to laboratory error.

- Drainage Areas - Several drainage areas are also included in the affected areas as they either received drainage from a process area or had concrete placed in these areas for erosion control which was surveyed and released from the Uranium Plant. The decontamination and decommissioning of these areas will be performed in accordance with the criteria discussed in Section 1.4. These areas are also

discussed further in Section 16.0 of the Characterization Report. These drainage areas will be included in the final status survey. The concrete that was surveyed and released to drainage areas for erosion control is discussed in Section 2.3 of this Report.

- MOFF Plant and yard - This facility was licensed under SNM-1174 which was terminated by the NRC in February, 1993 (letter included as Attachment I-1). The termination of SNM-1174 did not alter License No. SNM-928. Because the land formerly licensed under SNM-1174 is contained within the bounds of SNM-928, the area has been included within the affected area for uranium contamination only. This area, including the exterior surfaces of the MOFF building, will be included in the final status survey and decontaminated/decommissioned in accordance with the criteria discussed in Section 1.4. This area is discussed further in Section 17.0 of the Characterization Report.

- On Site Roads - The roads from the U-Plant restricted area to the former Burial Ground #1 area were utilized for the transport of waste materials. Therefore, this road has been included in the affected area and will be surveyed as such during the final status survey. The decontamination and decommissioning of this area will be performed in accordance with the criteria discussed in Section 1.4.

1.6 License Amendment for On-Site Disposal

On September 4, 1987, Cimarron Corporation submitted a license amendment request to the NRC for on-site disposal of soils and incidental construction debris containing uranium and thorium meeting the NRC BTP Option #2 criteria. As part of the decommissioning process, Cimarron personnel excavated, sorted, and stockpiled Option #2 materials in anticipation of disposing of these materials on site. On November 4, 1994, the NRC issued Amendment #10 to License SNM-928, approving on-site disposal of up to 500,000 ft^3 of Option #2 materials at the location described in Cimarron's October 1989 submittal. The November 4, 1994, letter of approval, transmitting the license amendment, is included in Attachment I-6. Materials that had been placed in the East Stockpile (#2) and North Stockpile (Stockpile #1), as a result of the ongoing site decommissioning activities have been approved for disposal in the on-site disposal cell. A third smaller Stockpile (Stockpile #3), located east of the North Stockpile, has been characterized. This material will be disposed of on-site, upon NRC approval. The area located beneath these stockpiles will be further characterized and remediated as required.

1.7 Discussion on 10 CFR 70.38

On June 17, 1988, the NRC published amendments to the regulations contained in 10 CFR 70 prescribing specific criteria for the decommissioning of nuclear facilities which would become effective July 27, 1988 (53 FR 24018). The decommissioning process at the Cimarron Facility began prior to July 27, 1988, when the new requirements of 10 CFR 70.38 went into effect.

10 CFR 70.38 was amended to require that certain licensees submit, on or before the license expiration date, a plan for completing decommissioning when the licensee decided to terminate active operations. Specifically, 10 CFR 70.38 requires a licensee to submit a plan for completion of decommissioning if the procedures necessary to carry out decommissioning have not been previously approved by the NRC and could increase potential health and safety impacts to workers or to the public. 10 CFR 70.38(c)(2)(i) (g)(1) states the following:

> "...the licensee shall submit a plan for completion of decommissioning if the procedures necessary to carry out decommissioning have not been previously approved by the NRC and could increase potential health and safety impacts to workers or to the public such as in any of the following cases:
>
> (A) Procedures would involve techniques not applied routinely during cleanup or maintenance operations; or
> (B) Workers would be entering areas not normally occupied where surface contamination and radiation levels are significantly higher than routinely encountered during operation; or
> (C) Procedures would result in significantly greater airborne concentrations or radioactive materials than are present during operation; or
> (D) Procedures could result in significantly greater releases of radioactive material to the environment than those associated with operation."

The decommissioning work being performed at the Cimarron Facility has been ongoing since 1976. The methods and procedures necessary to carry out decommissioning activities have been reviewed, inspected and approved by the NRC. This approval is based upon the number of final release confirmatory surveys which have been performed by either the NRC or ORAU, as well as the number of areas at the Cimarron Facility which have already been released for final closure by the NRC. Most

recently, a license amendment for on-site disposal of contaminated soil and debris has been issued which provides NRC approval and the associated conditions for on-site disposal. An Environmental Assessment for the on-site disposal of contaminated soil and debris was also completed by the NRC as part of the process in issuing Amendment #10 to License SNM-928. This Decommissioning Plan provides a summary of approved decommissioning activities conducted to date at the Cimarron Facility, with the exception of those proposed decommissioning activities described in Section 2.0 of this Plan. For the reasons described above, a comprehensive Decommissioning Plan addressing all procedures currently employed for the ongoing decommissioning efforts at the Cimarron site is not required.

Cimarron will continue to perform all decommissioning work in accordance with approved methods and procedures and submit individual requests for approval and/or release to the NRC as specific areas of the Cimarron site are decommissioned.

2.0 Proposed Decommissioning Activities

Cimarron Corporation is currently characterizing, decontaminating and decommissioning all affected areas on site in accordance with the criteria discussed in Section 1.4. All unaffected areas are also being characterized in accordance with the criteria discussed in Section 1.4. This section addresses several areas which were previously closed and/or decommissioned based upon regulatory criteria in effect at that time. In addition, one of these areas (the five former waste water ponds) was released by the NRC in 1978. Data will be presented to justify why closure for these areas has been achieved.

Also included in this section is the approach to be followed in decommissioning the New Sanitary Lagoon and an update of the site environmental monitoring data.

2.1 Five Former Waste Water Ponds

The purpose of this section is to justify closure of these pond areas based upon both previous and more recent characterization data. The five former waste water ponds, discussed in this section, provided a method of liquid waste control during facility operations. These waste ponds include U-Pond #1 and #2, the Plutonium Evaporation and Emergency Ponds and the Uranium Emergency Pond. By early 1977, these ponds contained no free-standing liquid. The sludge remaining, due to the evaporation of waste water, was removed, mixed with cement and shipped off site for disposal at a licensed LLRW burial site. Closure of these ponds is discussed in greater detail in Section 12.0 of the Characterization Report.

After the sludge was removed, Cimarron staff, the Oklahoma State Department of Health (October, 1977), and the NRC (November 1977), sampled the soils/liners from each of the five ponds. Based upon the analysis results, Cimarron Corporation received written permission from the Oklahoma State Department of Health to backfill and cover these ponds on March 2, 1978. Cimarron Corporation received written permission from the NRC to backfill and cover these ponds on July 10, 1978. These five ponds were backfilled and covered between August 3, 1978 and November 1, 1978. An October 30, 1978, NRC inspection, which was reported by letter dated December 14, 1978, states that burial of the "five liquid effluent retention ponds was completed during the inspection". Initial seeding as well as fencing of the areas was performed between November 2, 1978 and March 20, 1979. Sprigging and fertilizing of the cap soil was performed from July 18, 1979 to October 30, 1979. Cimarron Corporation maintains that closure of these ponds has been completed with NRC approval.

Although closed in 1978 with NRC approval, these ponds were further discussed in the February 5, 1993, Environmental Assessment and Findings of Significant Impact prepared by the NRC for termination of License SNM 1174. This document included the following statement:

> "NRC and the Oklahoma State Department of Health (OSDH) verified Kerr-McGee's soil sample data independently sampling the pond bottoms in November 1977 for uranium and plutonium. The NRC results were generally less conservative than the Kerr-McGee results, and the OSDH noted that the concentration of radioactive materials in the soil in these areas is less than those concentrations which are exempted from regulation under the Radiation Protection Regulations. The state approved the plans for decommissioning and forwarded the data to EPA Region VI. EPA noted that the residual radioactivity following decontamination was well under EPA's recommended "screening level" for plutonium in the general environment (0.2 $\mu Ci/m^2$ - "a conservatively developed level at which, for most situations, radiation dose will not exceed 1 mrad/yr lung dose or 3 mrad/yr bone dose") and that Kerr-McGee's plan was appropriate for returning the pond areas to a condition suitable for safe unrestricted use. The ponds were closed in 1978."

Additionally, in SECY-91-398A[11], the NRC makes the following statement:

> "Although Uranium Waste Ponds #1 and #2, in particular, may have concentrations of uranium contamination which exceed current guidelines for release for unrestricted use, the ponds appear to have been closed in accordance with all procedures and requirements in effect in 1978. Even though the license itself was not terminated in 1978, it would conform to the principles of the policy on finality expressed in the Action Plan enclosed with SECY 92-106 to not reopen this issue."

Even though closed in accordance with "current guidelines" by letter dated January 8, 1993[12], the NRC informed Cimarron Corporation that "the five former waste water ponds that were closed in 1978 must be addressed in detail". In response to this letter, additional characterization work has been conducted in these pond areas and is discussed in detail in Section 12.0 of the Characterization Report.

As discussed in Section 1.4.2, on-site disposal for BTP Option #2 material was approved by the NRC through Amendment #10 to License SNM-928. The guideline value for contaminated soil and debris to be disposed on site is 100 pCi/g total uranium for 100% soluble uranium (and up to 250 pCi/g for insoluble uranium). The soils left in place during the closure of these five former waste ponds in 1978 are to meet this guideline value.

2.1.1 Plutonium Evaporation Pond, Plutonium Emergency Pond and Uranium Emergency Pond

The Plutonium Evaporation Pond and the Plutonium Emergency Pond were utilized during the operation of the MOFF Plant and were included under License SNM-1174. In addition to being released for closure by the NRC in 1978, these ponds received final release from the NRC with the termination of License SNM-1174 in 1993.

Although closed in 1978, portions of the Uranium Emergency Pond and the Plutonium Evaporation Pond areas were cored down to a depth of four feet in 1990 on a 10m x 10m grid. The 95 soil samples taken within the areas of these two ponds all had concentrations below 30 pCi/g total uranium. This data is presented in the Characterization Report, Section 12.0. To further characterize the soils in the area east of the electrical substation which includes these two ponds, a characterization on a 5m x 5m grid system was completed in 1994 to a depth of 4 feet. The area sampled, the survey data, and soil sample analytical results are shown on Drawing Nos. 94PRES3D-0, 94PRESSS-0 thru -4 and 94PRESUR-0 and -1. Over 1,870 soil samples were collected and analyzed for total uranium and thorium with the on-site soil counter. Twelve sample locations outside of the boundaries of these two ponds were identified for further investigation in that they exceeded 30 pCi/g total uranium (above background). No samples located within the old pond perimeters exceeded the guideline value of 100 pCi/g total uranium; in fact, no samples exceeded 30 pCi/g total uranium. The 1994 survey and soil analytical data for the pipeline traverse to the U-Ponds are also included on the referenced drawings.

The Plutonium Evaporation Pond and a portion of the Plutonium Emergency Pond areas are located where the New Sanitary Lagoon was constructed. This lagoon, although out of service, still contains rain water and sediments. Closure of this lagoon, including further characterization, is discussed in Section 2.2. During the construction of the New Sanitary Lagoon a french drain was constructed under the liner to divert perched water that may collect under this lagoon.

2.1.2 Uranium Waste Ponds #1 and #2

After receiving State and NRC approval to close these two ponds in 1978, they were backfilled by crushing and/or disking the liners into the subsoil and then bull-dozing the dikes into the ponds. Clean soil for final contouring was then placed over the area for capping. The closure of these two ponds is discussed in Section 12.0 of the Characterization Report.

Even though these ponds were closed in accordance with guidance in effect at the time of closure as stated by the NRC, Cimarron Corporation made the decision to gather additional characterization data where possible as requested by the NRC's 1993 letter.

Accessible areas of U-Ponds #1 and #2 were cored and sampled in 1993. Sampling was performed on a 10m x 10m grid to comply with the general guidance in NUREG/CR-5849. Samples were collected and composited at one foot intervals down to a depth of six feet. Samples were collected and composited at one-foot intervals below six feet if residual contamination was present at the six foot interval. This data is presented in Section 12.0 of the Characterization Report.

The 1993 sampling data for total uranium was compared to the 1977 soil sample analysis results available. In addition, the 1993 sample analysis results were utilized to perform "hot-spot" averaging as generally defined in NUREG/CR-5849.

2.1.2.a. Data Comparison, 1977 to 1993

The 1977 soil data was reviewed to determine the amount of residual contamination present at the time of pond closure. For U-Ponds #1 and #2, the calculated average μg/g for total uranium was 183 and 172, respectively, for the NRC data and 144 and 118 for the Cimarron data (sample locations for Cimarron data is shown in Figures 2.1 and 2.2). This data represents soil samples collected within the liner or shallow soil zone below the pond's former surface. These results are shown on Tables 2.1 and 2.2. To compare this 1977 data with the 1993 soil corings completed within the boundaries of both ponds, an average total uranium value in μg/g was calculated for each composite soil sample thickness from 0-1 feet down to 11-12 feet. The amount of total uranium in μg/g was assumed to be equally dispersed throughout each one foot soil layer and each one foot soil layer was then summed. The average total uranium in μg/g was calculated to be 12.0 and 9.9 μg/g and produced a total uranium value of 144.5 and 118.9 μg/g for U-Ponds #1 and #2

respectively. These results are shown on Table 2.3. These values are comparable to the values calculated from the 1977 NRC and Cimarron data.

The 1993 data was generated utilizing the on-site multi-channel analyzer with an EG & G Ortec Adcam Computer Analysis Program. The soil analytical data generated in 1977 by Cimarron was performed with a liquid scintillation detector. Soil samples were composited from several locations within the pond at depths from 0 to 10 inches. The NRC samples were analyzed by Argonne National Laboratory.

The 1977 Oklahoma State Department of Health (DOH) soil sampling results for U-Ponds #1 and #2 were also reviewed. Soil samples were collected at 2 inch intervals down to a depth of 5 feet for U-Pond #1 and down to a depth of 3 feet for U-Pond #2. The DOH described their soil sample analysis as follows:

> "Samples were logged in and dried in an oven at 100°C overnight. Approximately 40 grams of each sample (dry weight) was then pulverized and a 10 gram aliquot was used in the analysis. One hundred milliliters of single distilled water were added to each 10 gram sample and allowed to leach overnight. The samples were filtered using double thickness Whattman number 42 filter paper and evaporated in a tared planchet to dryness. Each planchet was counted for ninety minutes on a modified Canberra low level alpha/beta proportional counter, to determine gross alpha activity."

The leach testing results produced measured uranium activities of 24.7 pCi/g at grade, 4.5 pCi/g at one foot below grade, and 0.5 pCi/g at 3 feet below grade for U-Pond #1; and 16.7 pCi/g at grade and 0.7 pCi/g at 4 inches below grade for U-Pond #2. These 1977 analysis results indicate that the residual contaminants were retained in the pond liner and/or shallow pond soils prior to closure.

2.1.2.b. Data Comparison, Draft NUREG/CR-5849 Methodology

In order to compare the results of the sampling performed on U-Ponds #1 and #2 with the guideline value of 100 pCi/g total uranium, the "hot-spot" averaging guidance from NUREG/CR-5849 was utilized to determine the concentration limits. The 100 pCi/g guideline value is for 100% soluble enriched uranium meeting the BTP Option #2 limit as defined in the recent Cimarron license amendment (Amendment #10) for on-site disposal.

The 1993 soil samples were taken at depth from U-Ponds #1 and #2. These samples were taken at each 10m x 10m grid intersect point for both ponds. The entire area of each pond was then utilized to calculate the weighted average concentration values for each one foot layer. Concentrations from each layer were calculated and the results are shown in Table 2.4. The weighted average was calculated as follows:

$$x_w = OA[NE/(ON + NE)] + EV[1-(NE/(NE + ON))]$$

where:

OA - "Non-elevated average", average of samples less that 100 pCi/g uranium
ON - Number of sample locations outside elevated area
NE - Number of sample locations having elevated readings above 100 pCi/g
EV - "Elevated average", average of samples exceeding 100 pCi/g uranium
x_w - Weighted Average in pCi/g

The calculated weighted averages were then compared to the guideline value of 100 pCi/g. The calculated weighted averages for all areas were found to be below this value. (See Table 2.4)

The maximum average allowable concentration within each layer was calculated by taking the square root of the total area sampled (equivalent to number of sample locations) divided by the area (equivalent to number of sample locations) containing the elevated reading and multiplying by the guideline value. The maximum average allowable concentration was calculated as follows:

$$MA = [(TN/NE)^{.5}](100)$$

where;
MA - Maximum average allowable activity within each layer in pCi/g
TN - Total number of sampling locations
NE - Number of locations having elevated readings above 100 pCi/g

The average concentration within the elevated areas was then compared to the maximum allowable activity for those areas having concentrations below three times the guideline value. Areas having a concentration of less than the maximum allowable activity and less than three times the

guideline value or 300 pCi/g are considered to have met the guidance criteria.

The results of these calculations are presented in Table 2.4 for U-Ponds #1 and #2. The results of the "hot-spot" averaging show that the guidance criteria in NUREG/CR-5849 is met in all cases with the exception of one location in U-Pond # 2 at a depth of 4-5 feet. This location at N540 x E580, and 347 pCi/g will be characterized and remediated as required to remove the contaminated material which exceeds the guidance criteria, i.e. 300 pCi/g. This material will be packaged and shipped off site for disposal.

2.1.2.c. Uranium Waste Pond #2-South Area

The 1993 characterization data did not include the southern area of U-Pond #2. Three 10 m grid nodes located within the area of the pond were not sampled because of a clean soil stockpile located over this area. This clean soil was stockpiled in this area during excavation of the on-site disposal cell. This area included the highest pond bottom elevation, i.e. shallowest with drainage toward the north. The data presented in the Characterization Report verifies that this is the case, i.e., higher residual contamination is located in the northern (deeper) portion of the pond.

An analysis of the soil characterization for Uranium Waste Pond #2 has been performed to determine whether the areas of the pond not sampled are expected to be less than 100 pCi/g total uranium. Each of the sampling intervals was evaluated independently.

An average soil concentration was determined for each of the three sample grid rows north of the area which was not sampled; specifically, the rows at North 500, 490, and 480. A linear regression analysis was conducted with these average values to estimate the expected soil concentrations at the southern-most edge of the pond. The North 440 grid represents the southern boundary of the pond. Layers (in feet) 0-1, 1-2, 2-3, and 3-4 show a general downward trend which results in either negative or less than the average of the previous three rows (negative numbers are listed as 0). Layers 4-5 and 5-6 show a very slight upward trend; however, these estimates show an expected result substantially below the 100 pCi/g guideline criteria. The results of the regression analysis are provided in Table 2.5 (located on page 2-8).

Based upon this analysis, coring and sampling of the southern area of U-Pond #2 is not expected to generate results which would affect the "hot-spot" averaging discussed in Section 2.1.2.b. In fact, this data would reduce the overall residual contamination average.

Table 2.5
Regression Analysis Results

	Analysis (pCi/g)					
Sample Depth (ft.)	0-1	1-2	2-3	3-4	4-5	5-6
Average N.G. 500	7.1	16.6	31.5	22.0	17.7	10.6
Average N.G. 490	6.4	8.4	41.5	23.5	15.1	14.1
Average N.G. 480	6.0	5.8	11.6	13.4	20.0	12.8
Expected Result N.G. 470	5.4	0	8.3	11.0	20.6	14.7
Expected Result N.G. 460	4.8	0	0	6.7	22.2	15.7
Expected Result N.G. 450	4.3	0	0	2.4	23.9	16.8
Expected Result N.G. 440	3.7	0	0	0	25.5	17.9

NOTE: N.G. represents northern grid location.

2.1.2.d. U-Pond #2 - Final Cap

The 1993 sample analytical results for U-Pond #2 indicates that three feet of additional soil cover should be placed over this area. This is necessary in light of the requirement that four feet of soil be placed above Option #2 materials. The uppermost clean soil layer will be stripped of vegetation and three additional, one-foot compacted layers of clean soil will be placed over this area and seeded. This cap will be constructed after the one location addressed in Section 2.1.2.b has been remediated.

2.1.3 Conclusion - Five Former Waste Water Ponds

As requested in the 1993 NRC letter, Cimarron has gathered additional characterization data for the five former waste pond areas. This data was presented in Section 12.0 of the Characterization Report and has been analyzed further herein. With the exception of one location in U-Pond # 2 (N540 X E 580, at depth from 4' to 5') Cimarron Corporation believes that the soil contained within U-Ponds #1 and #2 meets the present guideline value, i.e. 100 pCi/g total soluble uranium. Cimarron Corporation also believes that the Plutonium Emergency Pond, Plutonium Evaporation

Pond, and Uranium Emergency Pond areas meet the BTP Option #1 criteria for total enriched uranium.

2.2 New Sanitary Lagoon

The New Sanitary Lagoon was installed in January 1986 to replace the East and West Sanitary Lagoons. The New Sanitary Lagoon was utilized from early 1986 to October 22, 1991, at which time it was isolated. This pond did not receive any process liquid. However, the pond did receive liquids from the Uranium Plant floor drains during a portion of the plant's decommissioning. Sediment samples taken after pond isolation show concentrations which range from 22 pCi/g to 26 pCi/g total uranium.

The New Sanitary Lagoon was installed directly above the closed Plutonium Evaporation Pond and a portion of the closed Plutonium Emergency Pond. These two ponds were closed and backfilled in accordance with the July 10, 1978, NRC approval letter.

Prior to constructing the New Sanitary Lagoon, a french drain was installed to divert perched water that may collect beneath this lagoon and raise the liner. The most recent annual environmental sampling of the rainwater within the new sanitary lagoon (sample location #1214) was performed on June 27, 1994. A gross alpha concentration was measured at 43 pCi/l. This measurement is supported by fluorimetric measurements on the same sample for total uranium (0.012 mg/L). Isotopic concentrations of U-234, U-235, and U-238 also confirm the gross alpha and total uranium results and were reported as 37 pCi/l, 9.5 pCi/l, and 16.6 pCi/l, respectively. Summation of these isotopic concentrations produces a total uranium concentration of approximately 63 pCi/l. The measured concentration for total uranium in this sample is approximately 20 percent of the effluent concentration limit in 10 CFR 20[13], Appendix B, Table 2, Column 2, (i.e. 300 pCi/l for U 234, U-235, and U-238). Measurements of gross beta concentrations in the same sample indicate a concentration of less than 20 pCi/l.

2.2.1 Lagoon Decommissioning

The rainwater which has been collected within the isolated lagoon will be evaporated and the sediments dewatered and sampled. All sediment samples will be analyzed for total uranium.

All sediments will be removed and any BTP Option #2 material will be placed in the on-site disposal cell. The liner surface area will then be surveyed in accordance with NUREG-5849 criteria. Any liner area found

not to meet the free release criteria will be decontaminated and/or disposed. The liner will be cut into sections for removal.

The surface soil (after liner removal) will be surveyed at the surface and at 1 meter utilizing a Micro R meter. A 5m x 5m grid area will be established to facilitate this survey. Any location noted to be twice background will be marked. At the locations marked and at the grid intersects, composite soil samples of 0"-6" in depth below grade will be collected for analysis. The samples will be analyzed for total uranium. Any area found to contain residual contamination greater than the BTP Option #1 limit will be further characterized or "hot spot" averaging will be performed in accordance with NUREG/CR-5849. If required, these areas will be remediated.

2.3 Concrete in Drainage Areas

Cimarron personnel initiated the decontamination and removal of concrete rubble from pads, building floors, and support piers within the restricted area in 1986. The decontamination of the process buildings are further discussed in Sections 2.0 and 14.0 of the Characterization Report. Concrete rubble was generated during the decontamination of various concrete surfaces, support structures and pads. Contaminated concrete rubble was decontaminated to meet unrestricted release limits prior to placement in on-site drainage areas using various mechanical means.

Prior to 1989, all concrete placed in on-site drainage areas was surveyed for fixed and removable alpha contamination. These surveys were performed in accordance with the "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Materials" (NRC Office of Nuclear Material Safety and Safeguards, 1987)[8]. These guidelines state that acceptable surface contamination levels for U-234, U-235, U-238, and associated decay products are 5,000 dpm/100 cm^2 alpha fixed (average), 15,000 dpm/100 cm^2 alpha fixed (maximum), and 1,000 dpm/100 cm^2 alpha removable. Certain beta-gamma emitters are addressed separately in the NMSS guideline document and share the same numerical surface contamination limits as uranium. Cimarron personnel acted responsibly in surveying the concrete rubble and releasing surveyed items to unrestricted areas in accordance with regulatory requirements; all materials were released in accordance with the guidelines for uranium and associated decay products. Surveys were performed and materials released with the full knowledge of NRC inspectors.

Concrete rubble (currently located in drainage areas) released from restricted areas after 1989 was surveyed for both alpha and beta/gamma

(fixed and removable) contamination. Release limits for residual contamination on all concrete and rubble complied with Cimarron's radioactive materials license conditions and are identical to the limits specified above in the NRC's 1987 "Guidelines for Decontamination". The beta-gamma surveys performed after 1989 were performed using a geiger-mueller pancake probe. The intent of the beta-gamma surveys was to demonstrate that the guideline value of 0.2 mrad/h (average) and 1.0 mrad/h (maximum) at one centimeter, measured through an attenuator of 7 mg/cm^2 or less (per NMSS Guidelines), was not exceeded at the concrete rubble surfaces.

The following areas located on-site contain concrete rubble that requires final release and are therefore addressed in this plan.

- Concrete in Drainage Area between Waste Ponds #1 & #2;
- Concrete in Drainage Area North of Reservoir #3;
- Concrete in Drainage Area Northeast of Burial Ground #1;
- Concrete in Drainage Area North of Reservoir #2;
- Concrete in Drainage Area between New Lined Sanitary Lagoon and Incinerator / Burial Area #3.

As previously discussed, the concrete was removed during the decontamination and decommissioning of the facility. Tables 2.6 through 2.9 list the concrete rubble according to the area from which it was removed and provides estimated dimensions and volumes. The concrete rubble originated from the Uranium Plant, Vaporizer Room, Uranium Yard, Buildings #2 and #3, and the Plutonium Plant. The total volume for all the concrete rubble is estimated to be approximately 32,000 ft^3.

2.3.1 Results of Additional Surveys Performed on Concrete Rubble

In order to address concerns regarding the release of rubble prior to 1989, Cimarron personnel conducted a preliminary assessment in 1993 utilizing a gas proportional survey instrument. The purpose of the survey was to identify any concrete rubble which exceeded current NRC surface contamination limits and to perform surveys to determine the average and maximum surface contamination levels. Personnel with historical knowledge of plant operations and plant areas from which the concrete rubble was removed selected rubble to be surveyed. The survey results were biased toward locating elevated areas of beta-gamma radioactivity. The 1993 assessment identified several pieces of concrete in drainage

areas (released prior to 1989) with hot-spots exceeding 15,000 dpm/100 cm^2 (maximum) fixed beta/gamma and 5,000 dpm/100 cm^2 (average) fixed beta/gamma.

Follow-up surveys were conducted in May and July, 1994, on concrete rubble placed in several drainage areas. These surveys also identified some concrete rubble with beta-gamma fixed contamination exceeding the NRC surface contamination limits. The 1994 surveys were also considered to be biased toward locating elevated areas of beta-gamma radioactivity.

The May 1994 survey included rubble in the drainage area northeast of Burial Ground #1. The concrete rubble was surveyed using a Ludlum model 2220 with a 43-68 probe. Of the 41 pieces of concrete surveyed, six showed readings exceeding 15,000 dpm/100 cm^2 fixed beta-gamma (the maximum reading was 24,000 dpm/100 cm^2 fixed beta-gamma). Maximum beta-gamma residual contamination on the 41 concrete slabs ranged from 3,000 to 24,000 dpm/100 cm^2 fixed beta-gamma. When averaged over surface areas up to one square meter in accordance with NUREG/CR-5849, the ranges were 2,000 to 8,000 dpm/100 cm^2 fixed beta-gamma.

Concrete rubble located in the drainage area downstream of Reservoir #2 (East Lake) was also surveyed in May 1994. Forty-nine large pieces of rubble were surveyed, with 11 readings exceeding 15,000 dpm/100 cm^2 fixed beta-gamma. Maximum readings for the concrete ranged between 1,000 and 40,000 dpm/100 cm^2 fixed beta-gamma. Fifteen pieces of concrete rubble exceeded the average beta-gamma release limit of 5,000 dpm/100 cm^2 fixed beta-gamma. Average beta-gamma contamination on the slabs ranged from 500 to 15,000 dpm/100 cm^2 fixed beta-gamma.

The May 1994 survey also included exposure rate measurements for concrete rubble east of Burial Ground #1. A micro-R survey meter was utilized to measure exposure rates. A Ludlum Model 2220 with a 43-68 probe was utilized to measure surface contamination levels for averaging purposes. Surface contamination levels on the six pieces of concrete rubble that were evaluated ranged from 2,450 dpm/100 cm^2 (slab #R-12) to 39,700 dpm/100 cm^2 (slab #R-13). Exposure rates at the surface of the concrete rubble ranged from 8 to 10 μR/h with average surface contamination levels ranging from 6,200 to 14,400 dpm/100 cm^2. Surveys performed at one meter above the surface for these same pieces ranged from 7 to 8 μR/h. These measurements are comparable to a 7 uR/h background measurement taken using the same instrument at an off-site location (#1 highway marker). Other measurements taken at one meter

above concrete rubble ranged from 6 to 8 μR/h in various areas along the north side and center of the concrete rubble. The concrete rubble does not appear to contribute to ambient radiation levels and is within the range of background levels for the site.

A September 1994 survey was performed on the drainage area immediately down-stream from the concrete rubble north of Reservoir #2 (East Lake). This survey was performed with a shielded 3" by 0.5" sodium iodide detector. Background was established as 3,220 cpm on the bank of the drainage area. The entire drainage area from the north edge of the concrete rubble to the Cimarron River was surveyed. No areas were found exceeding twice background. Three surface soil/sediment samples were collected at locations with the highest survey readings, as well as at the location where the background measurement was taken. Total uranium in the three samples ranged from 6.85 pCi/g to 8.08 pCi/g, which is within the range of site background soil concentration (approximately 6 pCi/g) for the on-site soil counter. Total thorium concentrations in the three samples ranged from 1.45 pCi/g to 2.44 pCi/g. These sample results are less than twice the site background total thorium concentration of 1.5 pCi/g.

2.3.2 Pathway Evaluation for Residual Uranium Present in Concrete

No significant removable surface contamination is present on the concrete rubble. Any removable surface contamination present would be assumed to have been dispersed through weathering effects. Contamination dispersed through this process would be found in surface water and sediments down-gradient of the concrete rubble.

The concrete rubble contains fixed contamination which can only release slowly through degradation and leaching over time. This contamination could, although highly unlikely, result in contamination of surface and groundwater, surrounding soils and sediments.

Ground water in the area of the facility is high in salinity and is not suitable for drinking. Therefore, releases to ground water from this pathway are only of concern with respect to pathways other than drinking water. The surface water effluent for drainage areas on the site is the Cimarron River. Cimarron river water is not a potable water source, and cannot be used for agricultural purposes. Contamination of surface soils and sediments through degradation of the concrete can be transferred to humans through other agricultural pathways (i.e. consumption of vegetables grown on the land or through consumption of meats from animals grazing on the land).

The direct exposure pathway could also contribute to the total effective dose equivalent. However, this exposure pathway can be considered to be negligible based upon the results of the May 1994 surveys described above.

Pathways of concern will be evaluated using the guidance contained in NUREG/CR-5512[14], "Residual Radioactive Contamination from Decommissioning", through the use of the RESRAD computer code, or other acceptable methods. This analysis will be performed to demonstrate that the estimated doses due to pathways of concern for the concrete rubble are equivalent to or less than those associated with the 1981 BTP Option #1 limit for enriched uranium (pCi/g). The analysis will consider the most restrictive scenarios first in order to establish the bounding scenarios for release of the concrete rubble materials.

2.3.3 Quantitative Assessment of Residual Uranium Present in Concrete

Cimarron Corporation intends to demonstrate that the residual contamination present in concrete rubble in drainage areas is well within the BTP Option #1 criteria. This demonstration will require that the residual contamination present be quantified and that the average radionuclide concentration be calculated. Field instrument measurements and laboratory analyses will be utilized to perform this evaluation. In addition, Cimarron intends to conduct limited confirmatory surveys and measurements to validate the calculated concentration estimates. Thus, the quantitative determination of uranium concentrations in the concrete rubble will be based upon analytical and calculated methods.

The survey results discussed in Section 2.3.1 should represent the upper bound for surface contamination on the concrete rubble. Evaluations will be performed to estimate the average total uranium concentration in the concrete rubble based upon these measurements. The evaluation will produce a conservative estimate of total uranium concentration in concrete rubble. This is due to the fact that the evaluation is based upon a survey which is biased in a conservative manner by using the highest survey readings for the concrete rubble.

In addition, Cimarron Corporation also has data from the analysis of dust collected during the final decontamination of the concrete rubble prior to placement of the rubble into the drainage areas. This data can also be used to represent the upper bound of residual contamination for the concrete rubble.

2.3.4 Criteria for Unconditional Release of Concrete in Drainage Areas

The proposed guideline criteria for unconditional release of concrete rubble located in drainage areas are those provided in the BTP for Option #1 material for enriched uranium. This criteria has been used throughout the Cimarron site to determine whether or not soil must be excavated/removed. The concrete rubble presents pathways of concern similar to those for soils.

The justifications for leaving the concrete in place are:

- There is a potential personnel hazard in removing the large sections of concrete rubble from the drainage areas.
- The low levels of contamination and potential environmental effects resulting from removal of the concrete rubble justify leaving the rubble in place.
- The concrete rubble currently serves the useful purpose of preventing unnecessary erosion in drainage and spillway areas.
- The concrete rubble is expected to have total uranium concentrations considerably below the BTP Option #1 limit.

Cimarron Corporation will demonstrate that the concrete rubble is below the BTP Option #1 limit based upon averaging the total activity over the volume of the concrete rubble. In addition, Cimarron Corporation will show that external doses due to exposures from the concrete rubble are similar to background dose rates. Thermoluminescent dosimeters will be placed near the concrete rubble to document exposure rates for comparison to background exposure rates.

In order to demonstrate that the leaching of radionuclides from the concrete rubble is not occurring at any significant rate, if at all, surface water (where available) and sediment samples will be obtained downstream of the concrete rubble in the drainage areas. These samples will be compared with background samples and other unaffected area samples.

2.4 Environmental Monitoring (1994)

This section provides information regarding the environmental monitoring program and special environmental samples collected on and in the vicinity of the Cimarron site. The Characterization Report describes the Cimarron environmental monitoring program in detail, giving sample locations, frequencies of sampling, and analyses performed. The Characterization Report includes a discussion of environmental data for the site through 1993. The results of monitoring performed in 1994 as

well as special groundwater samples collected for wells #1315 and #1316 that are not a normal part of the environmental monitoring program are discussed in this section. Special sampling was initiated at these wells in order to identify the direction of trends after elevated concentrations of uranium were detected in these wells. Where possible, concentrations are compared with the most restrictive release limit from Appendix B of 10 CFR 20. It is assumed that the known emissions from the facility are due to U-234, U-235, and U-238, unless specific isotopic analysis information is available.

2.4.1 Air

Environmental air samples were collected weekly during 1994 at three locations, numbered #1101, #1102, and #1103. Sample results are presented in Table 2.10. Gross alpha sample concentrations ranged from 1.1 E-15 μCi/ml to 2.1 E-14 μCi/ml and are consistent with previous years results. Sample concentrations did not vary greatly between the three locations. One sample was not included during the year due to a pump failure at location #1102. All sample concentrations were below the most restrictive 10 CFR 20 Appendix B effluent concentration limits for uranium (U-234) in air (5.0 E-14 μCi/ml). It should also be noted that the site sample concentrations discussed above include contributions due to background activity.

2.4.2 Surface Water

Surface water sampling was performed at eight locations as specified in Table 2.11. Samples from three locations exceeded the action level for gross alpha or gross beta and were subsequently re-sampled for isotopic uranium analysis. Results of initial sampling as well as from the re-sampling are discussed in this section.

Gross alpha concentrations ranged from less than 10 pCi/L (MDA) to 1,010 pCi/L at the stream northwest of Uranium Pond #2 (location #1208) and gross beta concentrations ranged from less than 20 pCi/L to 2,360 pCi/L. Total uranium analyses were less than 0.005 mg/L except at location #1206 (0.14 mg/L) and #1214 (0.012 mg/L). Samples analyzed for isotopic uranium were collected at locations #1206, #1208, and #1214. The highest isotopic uranium concentrations were found at location #1206 (U-234: 252 pCi/L, U-235: 83 pCi/L, and U-238: 182 pCi/L).

Location #1208, which had the highest gross alpha and gross beta concentrations, is being re-sampled to determine the accuracy of the

analytical results. This re-sampling and evaluation is being performed due to apparent inconsistancies within the analytical data for 1994.

The 10 CFR 20, Appendix B, isotopic uranium effluent concentration limit of 3 E-07 μCi/ml (300 pCi/l) was exceeded for the annual sample collected at location #1206. Application of the unity equation for this sample results in a concentration value 1.72 times the effluent concentration limit. The elevated concentrations in this area are thought to be the direct result of remedial activities. Recent activities up-gradient from this location include the removal of waste materials, drums, and several pieces of scrap metal as well as the dismantlement of the incinerator. The excavated waste contained total uranium concentrations of up to 6,000 pCi/g.

Trends of sample results collected from locations #1206 and #1208 indicate increasing concentrations of gross alpha, gross beta, and isotopic uranium over the past several years. Analysis of uranium concentrations at location #1214 indicate a decreasing trend for total uranium; decreasing from 0.023 mg/L (35 pCi/L) in 1993 to 0.012 mg/L (18 pCi/L) in 1994. Isotopic results, however, were not consistent with total uranium results and indicated a general increase in uranium concentrations. Differences between the results for this location may be attributable to the sampling of the media. Two samples were collected at location #1214 for submittal to different off-site laboratories. Sampling of the shallow waters in the sanitary lagoon may have disturbed sediments, thus allowing them to be suspended and collected in the second sample. Future samples will be collected and composited prior to their separation for analysis at off-site laboratories.

2.4.3 Groundwater

Annual groundwater samples were collected from 25 on-site wells during 1994. Results of the monitoring program are presented in Table 2.12. Gross alpha concentrations ranged from less than 10 pCi/l to 1,710 pCi/l (well #1315). Gross beta concentrations ranged from less than 20 pCi/l to 1,240 pCi/l (well #1313). Well #1336A also had a gross beta concentration of 1,100 pCi/l. Total uranium concentrations ranged from less than 0.005 mg/L to 1.3 mg/l (well #1315). The average uranium enrichment for the facility is assumed to be 2.7 percent by weight. Therefore, the specific activity of the uranium is calculated as 1.5 pCi/μg (1500 pCi/mg) using the equation in footnote 3 to Appendix B, 10 CFR 20. Use of this conversion factor enables the comparison of the results obtained from total uranium analysis with those obtained from isotopic uranium analysis. The results from the two analysis methods for well #1315 compare favorably and indicate good agreement. Based upon the isotopic uranium sample analysis results, well #1315; although not located

at the site boundary, exceeded the uranium effluent concentration limit in Appendix B of 10 CFR 20. However, it should be noted that this groundwater is not potable and therefore does not present a direct exposure pathway to humans.

Additional groundwater samples were collected in addition to the normal environmental monitoring program at wells #1315 and #1316 beginning in March 1994. These additional samples were analyzed and the results were utilized to trend uranium concentration in these two wells. These analysis results are shown in Table 2.13.

Results for well #1315 decreased from 2,190 pCi/l gross alpha in March 1994 to 1,710 pCi/l in June 1994. Gross beta results at this well followed a similar trend, decreasing from 427 pCi/l in March 1994 to 148 pCi/l in June 1994. Total uranium concentrations followed a general decreasing trend and ranged from 2,040 pCi/l in May 1994 to 969 pCi/l in October 1994. December 1994 total uranium concentrations in well #1315 were 874 pCi/l. Isotopic uranium concentrations in well #1315 also trended lower during 1994. Uranium-234 decreased from 1,490 pCi/l in March 1994, to 457 pCi/l in November 1994. Uranium-235 concentrations did not show any observable trend during 1994. Concentrations of U-235 ranged from 170 pCi/l in May 1994 to 43.1 pCi/l in September 1994. Uranium-238 results for well #1315 followed a general decreasing trend during 1994, ranging from a high of 969 pCi/l in March 1994 to 399 pCi/l in November 1994.

Sample results for well #1316 also indicate a gradual reduction in total uranium concentrations during 1994. Isotopic results for well #1316 indicate a general trend toward decreasing uranium-234 concentrations, but do not appear to show similar decreases in U-235 and U-238 concentrations. The U-238 concentrations for well #1316 increased from March 1994 through April 1994, then declined through September 1994, before increasing to its maximum annual concentration in November 1994. Results of U-235 concentrations in this well vary in a similar fashion. However, the overall trend for this well since 1992 is toward decreasing concentrations of uranium. Periodic fluctuations in uranium concentration can be caused by precipitation and groundwater flow rates. Additional sampling and trending are planned during 1995 on these wells.

2.4.4 Soil

Soil sampling is performed at 11 locations on an annual basis. Samples are collected at the surface and sub-surface in accordance with the environmental monitoring plan. Total uranium concentrations ranged from

0.6 μg/g at location #1405 (surface) to 7.5 μg/g at locations #1402 and #1403. These mass concentrations can be related to radioactivity concentrations through use of the conversion factor 0.67 pCi/μCi, derived through the equation in footnote 3 to 10 CFR 20, Appendix B. This conversion factor is based upon the assumption that the uranium enrichment at these locations is naturally occurring. Using this assumption, the uranium concentrations at locations #1402 and #1403 are approximately 5 pCi/g. The soil sampling results are shown in Table 2.14.

2.4.5 Vegetation

Vegetation sampling was performed at four locations during 1994. Sample results are shown in Table 2.15. All sample results were reported as less than 2 μg/g total uranium.

2.4.6 Monitoring Wells

All monitoring wells that are currently sampled in accordance with the environmental monitoring program will be closed upon license termination. All such wells will be closed in accordance with all applicable requirements of the State of Oklahoma.

2.5 Administration

Cimarron Corporation anticipates that the current organizational structure will remain in place throughout the duration of the remediation and decommissioning process. The Cimarron RSO/Health Physics Supervisor, QA/QC Manager, Operations Manager and Project Managers report directly to the Site Manager. The Site Manager reports directly to the Vice President of Cimarron Corporation.

2.6 Training

Cimarron Corporation provides continuing training for Cimarron personnel and any other personnel (i.e., contractors, visitors, etc.) who are allowed access to the site. All members of a project team are required to attend an in-house training session prior to commencement of work under a special work permit. All survey procedures, sample procedures and quality assurance requirements are reviewed during this training session.

2.7 Schedule

Cimarron Corporation believes that the decommissioning of the Cimarron site is greater than 95% complete and that all remaining site work, including those discussed in this section, can be completed by the middle of 1996. However, this schedule is dependent upon expeditious NRC approval of documents submitted by Cimarron Corporation and any subsequent NRC confirmatory sampling requirements. Cimarron Corporation respectfully requests that the NRC complete the review and approval of this Decommissioning Plan by May 31, 1995. Cimarron Corporation is committed to working closely with the NRC to attain these required approvals.

Amendment #10 to SNM-928 includes a license expiration date of June 30, 1995. Based upon the remaining site work to be completed, Cimarron Corporation requests that this date be extended to December 31, 1996. Presently, Cimarron Corporation has submitted a license amendment to SNM-928 to delete certain license conditions that are no longer applicable. We request that this amendment, when issued, reflect a December 31, 1996, expiration date.

3.0 Radiation Protection Program

3.1 Health and Safety

The Cimarron Radiation Protection program ensures that all employees, visitors and the general public are protected from radiological hazards which may be present due to licensed activities conducted at the Facility. Cimarron maintains a radiation protection program which meets and/or exceeds all of the applicable regulatory requirements associated with all activities conducted under Special Nuclear Materials License SNM-928 and By-Product License 35-12636-02.

The Cimarron Program currently in place for all decommissioning activities is administered through the use of the following documents:

- Cimarron Radiation Protection Procedures
- Cimarron Site Health and Safety Plan
- Cimarron Quality Assurance Plan and Procedures
- Cimarron Emergency Plan

The overall Cimarron Program is audited on a periodic basis by Kerr-McGee Corporate personnel, NRC Region IV and Headquarters staff, Oklahoma Department of Health staff, and Cimarron site support staff. The most recent NRC Inspection Report #70-925/95-01, dated February 21, 1995, page 5, Section 2.4, lists the following conclusions:

> "No noncompliances were identified during the inspection. Additionally, the soil movement was observed to be a well controlled and executed activity with a high emphasis being placed on safety. Excellent radiological controls were in place to monitor the occupational exposures to workers and potential exposures to the environment. Procedural guidance was determined to be adequate for the work in progress. Records of the activities were thorough and were being maintained in one location. The work activity appeared to have little impact on the environment."

It is the policy of Cimarron Corporation to perform all work in strict compliance with all applicable regulatory and internal requirements. The goal of the Cimarron Decommissioning effort is to conduct all operations at a level of excellence which exceeds regulatory requirements. Cimarron staff will continue to exercise appropriate radiation protection precautions throughout the remaining decommissioning work and final survey process.