SAFETY EVALUATION REPORT

BY THE OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS

OF THE PROPOSED DECOMMISSIONING PLAN AND OTHER PROPOSALS

RELATED TO THE CIMARRON CORPORATION

FORMER FUEL FABRICATION FACILITY

DOCKET NO. 70-0925

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FOREWORD

This Safety Evaluation Report (SER) evaluates conformance of Cimarron Corporation's (Cimarron's) proposed actions with U.S. Nuclear Regulatory Commission's (NRC's) regulations and regulatory guidance. In connection with the review of the proposed action, NRC has also prepared an Environmental Assessment which reviews the environmental impacts of certain decommissioning actions proposed by Cimarron at its facility in Crescent, Oklahoma. This SER concludes that Cimarron's proposed actions should be modified in one or more respects to more fully comply with NRC regulations and guidance. Such modifications to the proposed plan, should they come about and be implemented, are unlikely to have a significant bearing on the overall environmental impact of the proposed decommissioning and are not likely to change the conclusions of the EA.

TABLE OF CONTENTS

LIST OF FIGURES

1. INTRODUCTION

The U.S. Nuclear Regulatory Commission (NRC), Office of Nuclear Material Safety and Safeguards, and Region IV prepared this Safety Evaluation Report (SER).

This SER:

(1) Evaluates the acceptability of Cimarron Corporation's (Cimarron's) proposed decommissioning plan (DP) (Reference 1) for the Cimarron facility;

(2) Evaluates proposed revisions to License SNM-928 to establish a cleanup standard for the Cimarron site, to better delineate the handling of various classifications of contaminated material at the site, and to revise references to licensee commitments;

(3) Evaluates proposed revisions to the "Radiation Protection Plan" (RPP); and

(4) Evaluates proposed revisions to Cimarron's organizational structure.

1.1 Background

The Kerr-McGee Corporation (KMC) operated two plants at the Cimarron facility between 1965 and 1975, each under its own separate Atomic Energy Commission license. Radioactive Materials License SNM-928 was issued under 10 CFR Part 70 for the uranium fuel fabrication facility, and Radioactive Materials License SNM-1174 was issued for the mixed oxide fuel fabrication (MOFF) facility. In 1983, when KMC was divided into Sequoyah Fuels Corporation (SFC) and Quivera Mining Corporation, SFC became the owner of the Cimarron Facility. Subsequently, in 1988, Cimarron, a subsidiary of KMC, became responsible for the Cimarron facility. Although the Cimarron facility poses no immediate threat to public health and safety, it is listed in the Site Decommissioning Management Plan (SDMP) to ensure timely decommissioning.

1.2 Purpose and Need for Proposed Actions

The proposed actions are necessary for Cimarron to complete the remaining decommissioning activities needed for NRC to release the Cimarron site for unrestricted use and to terminate Radioactive Materials License SNM-928.

License termination is a separate action that requires an NRC finding that the premises are suitable for release.

1.3 Description of Proposed Actions

The objectives of the proposed actions are to decontaminate and decommission the Cimarron site to permit release for unrestricted use of the site and termination of Radioactive Materials License SNM-928. In accordance with 10 CFR 70.38(g) Cimarron submitted a proposed DP. In conjunction with this proposal, Cimarron has also proposed revisions to Radioactive Materials License SNM-928, changes to the RPP, and changes to its organizational structure. The details of these proposals are provided in the following subsections.

1.3.1 Decommissioning Plan

Cimarron submitted its DP on April 19, 1995 (Reference 1). Responses to NRC staff comments on the DP were submitted on September 9, 1996, and May 6, 1997, to clarify statements made in the DP. Decommissioning activities have been ongoing since 1976 when production activities were terminated. Many of the decommissioning activities at the site have been completed under existing license conditions. For example, the facilities and grounds were decontaminated under License Condition 20 of the March 31, 1983, license renewal; contaminated solid waste was shipped to a licensed low-level radioactive waste (LLW) disposal site, under License Condition 18; and contaminated soil was disposed of onsite under License Condition 23 (Amendment No. 10). Other activities were conducted pursuant to NRC staff's approval of Final Status Survey Plans (FSSPs).

Based on historical knowledge of the site, the Cimarron site was divided into three major areas (phases) containing affected and unaffected areas. These major areas were then subdivided into subareas. The Phase I FSSP was approved by the staff's letter of May 1, 1995; the Phase II FSSP was approved by the staff's letter of March 14, 1997; and the Phase III FSSP was approved by the staff's letter of September 11, 1998. More discrete activities -- such as the backfilling in Subarea L and the emplacement of ground-up asphalt into a disposal cell -- were approved by NRC letters dated November 8, 1996, and April 28, 1998, respectively.

On July 30, 1998, Cimarron submitted the "Decommissioning Plan Groundwater Evaluation Report" (hereafter "Groundwater Evaluation Report") (Reference 2) for the Cimarron site. This report was required because Cimarron did not

address groundwater concerns in its DP. Additional clarification of the "Groundwater Evaluation Report" was provided in Cimarron's March 4, 1999, letter. The results of staff's review of this document, which was conducted in coordination with the Oklahoma Department of Environmental Quality (ODEQ), are also discussed in this SER.

Decommissioning activities remaining to be performed at the Cimarron facility include: decontamination and decommissioning of facility structures; onsite disposal of contaminated soil meeting the Option 2 criteria of NRC's 1981 Branch Technical Position (BTP), "Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations" (Reference 3); offsite disposal of soil or material exceeding the BTP Option 2 criteria; and groundwater remediation.

1.3.2 Revisions to License

On April 30, 1997, Cimarron requested an amendment to its license to add a new license condition specifically establishing the BTP (Reference 3) Option 1 unrestricted-use residual-contamination criteria as the cleanup standard for the Cimarron site.

In addition, on June 30, 1997, Cimarron submitted an amendment request to:

(1) Modify License Conditions 18 and 23 to better delineate the handling of various classifications of contaminated material at the site; and

(2) Revise references to other licensee commitments in License Condition 10.

In response to April 3, 1998, comments from NRC, additional revisions to both of these requests were proposed by letter of June 29, 1998.

1.3.3 Revisions to the RPP

The RPP was first approved on July 7, 1997 (License Amendment No. 14). While the NRC staff was completing its approval of the RPP, on June 30, 1997, Cimarron proposed additional revisions to the RPP. These are minor changes to clarify statements made in the RPP. The intent of these proposed revisions was to:

(1) Incorporate references to a Quality Assurance Plan (QA); and

(2) Revise the Environmental Sampling Schedule.

In response to April 3, 1998, comments from NRC, further revisions to this request were proposed by letter of June 29, 1998.

1.3.4 Revision of Organizational Structure

By letters dated January 23, 1998, June 29, 1998, October 26, 1998, and July 27, 1999, Cimarron proposed amending its license to incorporate changes in its organizational structure. These changes were necessitated by downsizing of staff at the Cimarron site as decommissioning activities were being completed.

2. FACILITY DESCRIPTION

2.1 Site Locale and Physical Description

The Cimarron facility is located 8 kilometers (km) (5 miles) south of the city of Crescent, Oklahoma and approximately 0.8 km (0.5 miles) north of the intersection of Oklahoma State Highways Numbers 33 and 74 in Logan County, Oklahoma (Figure 2.1). The terrain of the region is rolling pasture land. Site elevations range from 286 to 309 meters (m) (938 to 1013 feet (ft)) above sea level. The entire Cimarron site encompasses approximately 3.4 x 10E6 square meters ($m^{2)}$ (840 acres).

2.2 Description of Facilities

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 disposal areas. These process facilities are currently at differing stages of decommissioning. The site also includes the decommissioned MOFF building, the surrounding restricted area, and three reservoirs. The general site layout is shown in Figure 2.2. With the exception of Reservoirs 2 and 3, which were constructed for process make-up and potable water, all process facilities discussed above are considered affected areas. Included within these affected process facilities are several drainage areas and the site road to the old disposal area (Burial Area 1). The majority of the 3.4 x 10E6 m^2 (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.

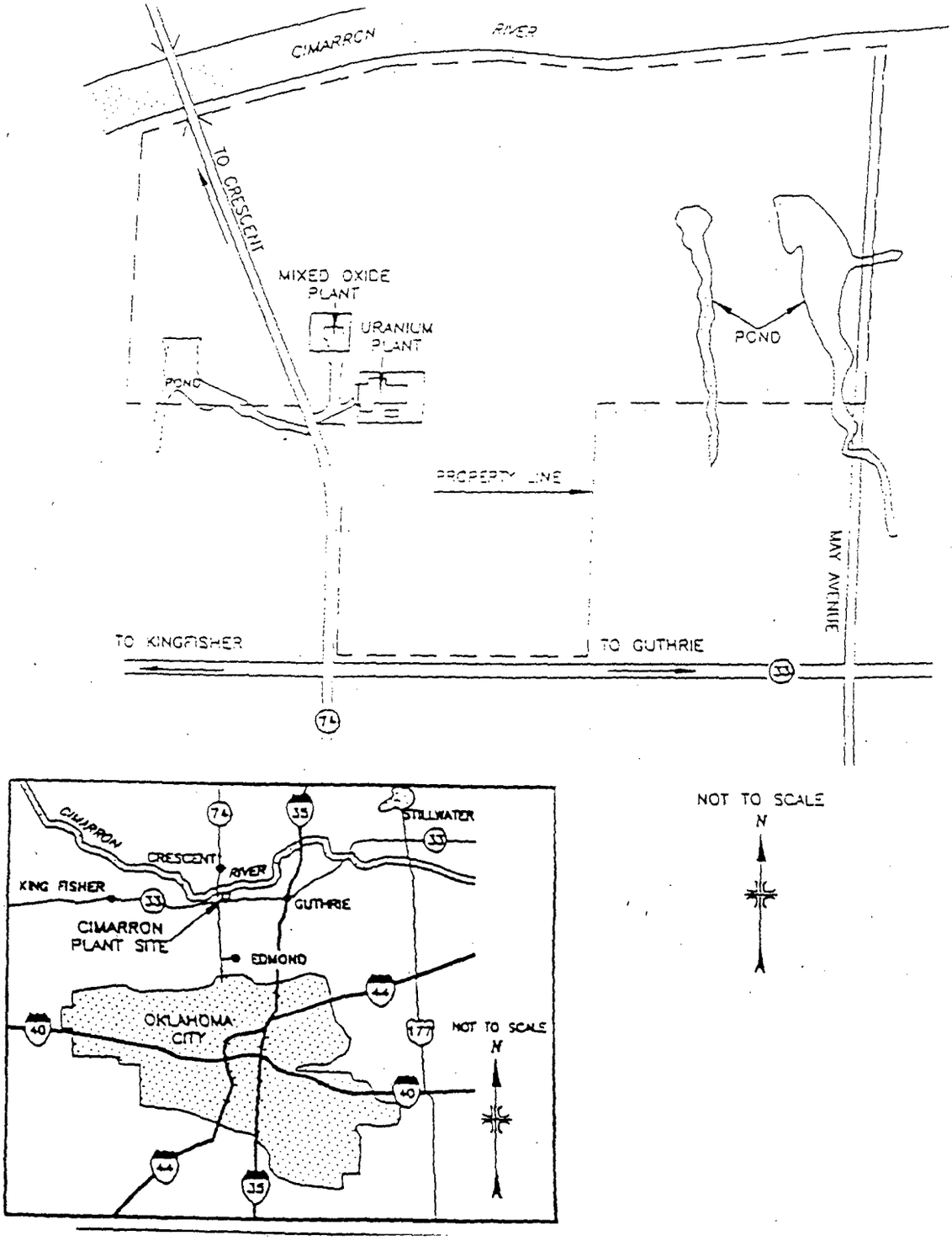

Figure 2.1: Area Map

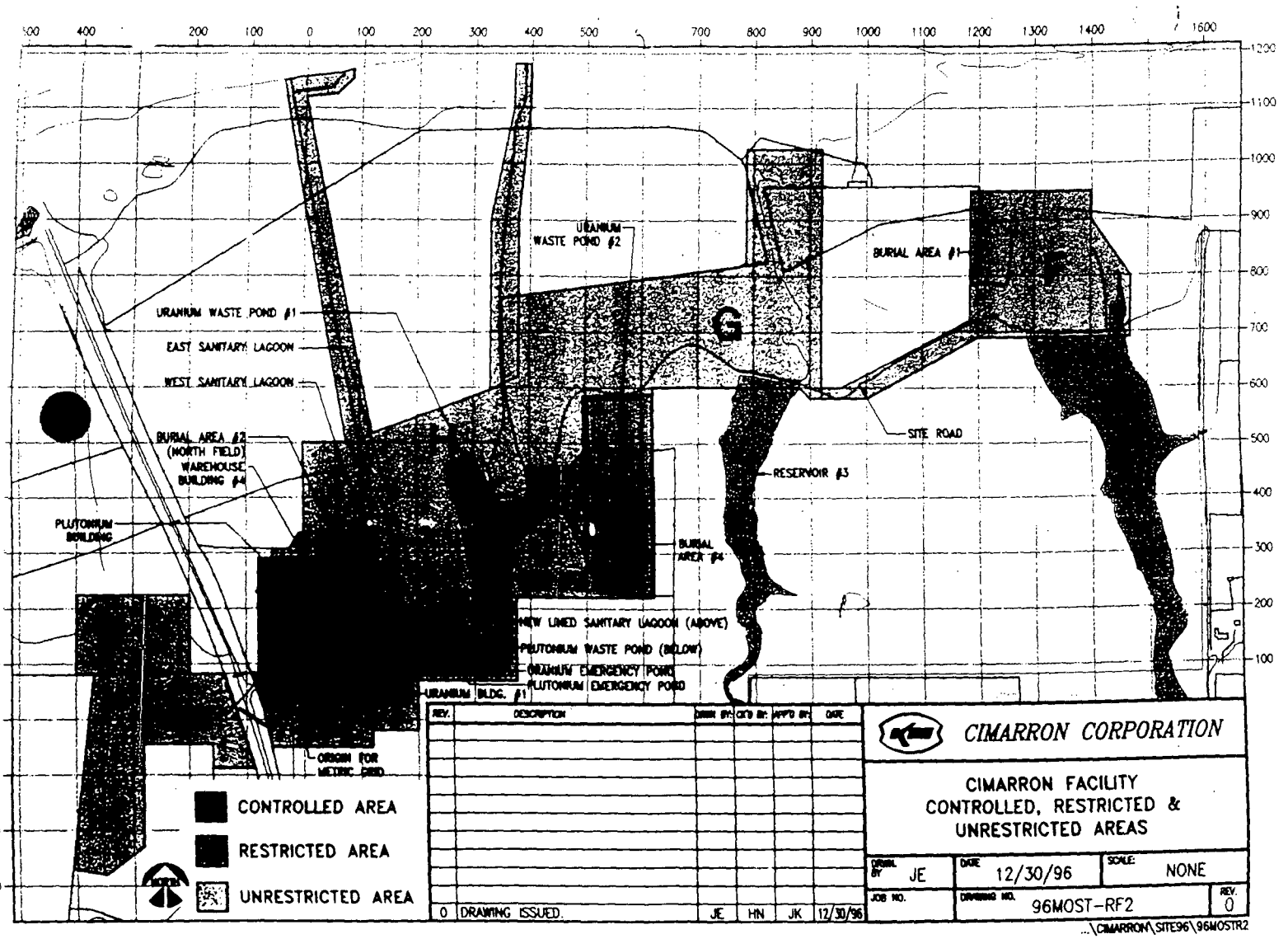

Figure 2.2: General Site Layout

2.3 Chronological Description of Facility Development and Operations

Cimarron began decommissioning the facility in 1976. Decommissioning activities at the MOFF Facility (License SNM-1174) were completed in 1990 and NRC terminated license SNM-1174 on February 5, 1993. However, NRC did not release the land surrounding the MOFF Facility nor did it terminate license SNM-928. Cimarron has already completed a large portion of the decommissioning activities for license SNM-928 under previous license approvals.

Based on Cimarron's October 1994, "Radiological Characterization Report" (hereafter "Characterization Report") of October 1994 (Reference 4), the Cimarron site has been divided into areas that are considered to be "affected" or "unaffected." Per NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination," (Reference 8) unaffected areas are areas of the site "not expected to contain residual radioactivity, based on knowledge of the site history and previous survey information." Of the 3.4E-6 m^2 (840 acres) at the site, only 2.42E-5 m^2 (60 acres) are considered to be affected; and 3.15E-6 m^2 (780 acres) are unaffected. These areas are further divided into subareas that are naturally distinguishable or have a common history of characterization and decommissioning activities. Throughout most of the decommissioning process at Cimarron, a unit was characterized, remediated, surveyed, and then descriptions of the decommissioning activities were submitted to NRC for review and approval. After review of the submittal, NRC would perform a confirmatory survey using an NRC inspector or the assistance of Oak Ridge Institute for Science and Education. Based on the results of the survey, NRC would either release the area or require additional remediation.

2.4 Description of Radioactive Material Management Activities and Practices

Much of the remediation activities at the Cimarron site has been completed. Remaining activities include soil sampling and surveying, decontamination and dismantlement of buildings and drain lines, and the appropriate disposal of contaminated material. These activities will be completed using standard construction equipment.

Cimarron has a licensed disposal cell for Option 2 material (Reference 3) and has specific waste packaging and transportation methods for material exceeding Option 2 criteria (Reference 3) that will be shipped offsite to a licensed LLW disposal facility. These methods will comply with NRC and U.S. Department of Transportation (DOT) packaging and shipping requirements. Waste shipments will comply with applicable NRC and State waste disposal requirements.

3. RADIOLOGICAL STATUS OF THE FACILITY

Cimarron divided the site into subareas that are naturally distinguishable or have a common history of characterization and decommissioning activities. These subareas are indicated in Figure 2.2.

Under Phase I of its decommissioning activities, Cimarron identified as unaffected 2.81 x 10E6 m^2 (695 acres) of land that were never used for licensed activities and requested that this land be released for unrestricted use. As noted on Figure 2.2, the Phase I acreage is comprised of Subareas A, B, C, D, and E. Cimarron submitted final survey data for this area on October 20, 1994. Based on NRC staff review and follow-up confirmatory surveys, on April 4, 1996, the license was amended accordingly to release this area for unrestricted use (Amendment No. 13).

Phase II includes both affected and unaffected areas. As noted on Figure 2.2, the Phase II area is comprised of Subareas F, G, H, I, and J. In July 1995, Cimarron submitted an FSSP for Phase II. NRC staff approved the Phase II FSSP on March 14, 1995. Cimarron will be submitting final status survey reports (FSSRs) for Phase II subareas as decommissioning activities in these subareas are completed. To date, FSSRs have been submitted for Subarea F and J. Both are currently under NRC staff review.

Phase III contains affected areas only. As indicated on Figure 2.2, Phase III is comprised of Subareas K, L, M, N, and O. Cimarron submitted a Phase III FSSP in June 1997. In May 1996, Cimarron submitted an FSSR for Phase III Subarea L and requested NRC approval to backfill, grade, and seed the subarea, which was comprised of three former waste ponds and new lined sanitary lagoon areas. Based on its review of this FSSR, by letter of November 8, 1996, NRC staff approved Cimarron's request to backfill, grade, and seed this subarea. On July 27, 1998, Cimarron submitted its Phase III Subarea L FSSR and requested unrestricted release of this subarea from the license. NRC staff is currently reviewing this FSSR.

3.1 Radiological Status of all Structures and Systems

The radiological status of all structures and systems has been documented in the DP (Reference 1) and Cimarron's "Characterization Report" (Reference 4). The primary source of contamination was from the use of enriched uranium. When the "Characterization Report" was submitted, surface contamination of buildings and concrete areas described in Section 1.5 of the DP ranged from background to

40,000 disintegrations per minute (dpm) gross beta-gamma per 100-square centimeters (cm^2) (15.5-square inches (in^2)) and from background to 6000 dpm/100 cm^2 (6000 dpm/15.5 in^2) gross alpha. The highest surface contamination readings were observed on concrete rubble located in drainage ways in Phase II, Subarea F, that had been surveyed and released for unrestricted use based on gross alpha measurements taken in the late 1970s. However, the surface contamination release criteria in effect during the early phases of facility decommissioning were not as restrictive as those currently in place and the early surveys did not include beta-gamma activity before release, which is now the accepted practice for contaminants known or believed to be enriched uranium. Radiological exposure rate surveys performed in the areas described in Section 1.5 of the DP ranged from background of 1.8-2.6 pico Coulombs (pC) per kilogram (kg) (7-10 micro Roentgens (μR) per hour (hr)) to approximately 5.2 pC/kg (20 μR/hr).

Since submittal of the DP (Reference 1), the majority of the site areas have been decommissioned to meet the free release criteria of "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source, or Special Nuclear Material" (Reference 5). Cimarron will be submitting FSSRs to demonstrate that all remaining site areas meet the BTP Option 1 criteria (less than 1.1 Becquerel per gram (Bq/g) (30 pico Curies per gram (pCi/g)) total uranium (Reference 3) or the guidance contained in the aforementioned guidelines for decontamination. Major areas of concern in regard to radiological status are summarized below.

Uranium Process Buildings and Equipment - Decontamination and decommissioning of the uranium processing equipment and buildings were initiated in 1977.

The Uranium Warehouse Building was released in 1980 for non-nuclear use as a coal liquification processing building. Additional surveys in 1993 showed elevated levels of beta activity that required decontamination. An alpha survey conducted at the same time, in 1993, showed a maximum fixed activity of 500 dpm/100 cm^2 (500 dpm/15.5 in^2) and an average of 200 dpm/100 cm^2 (200 dpm/15.5 in^2).

The Uranium Building is a one-story metal building 49 m x 104 m (160 ft × 340 ft) which contained offices, laboratory, and change rooms plus the majority of the equipment used for uranium fuel processing. A general layout of the processing area is shown in Figure 3.1. Contamination levels on

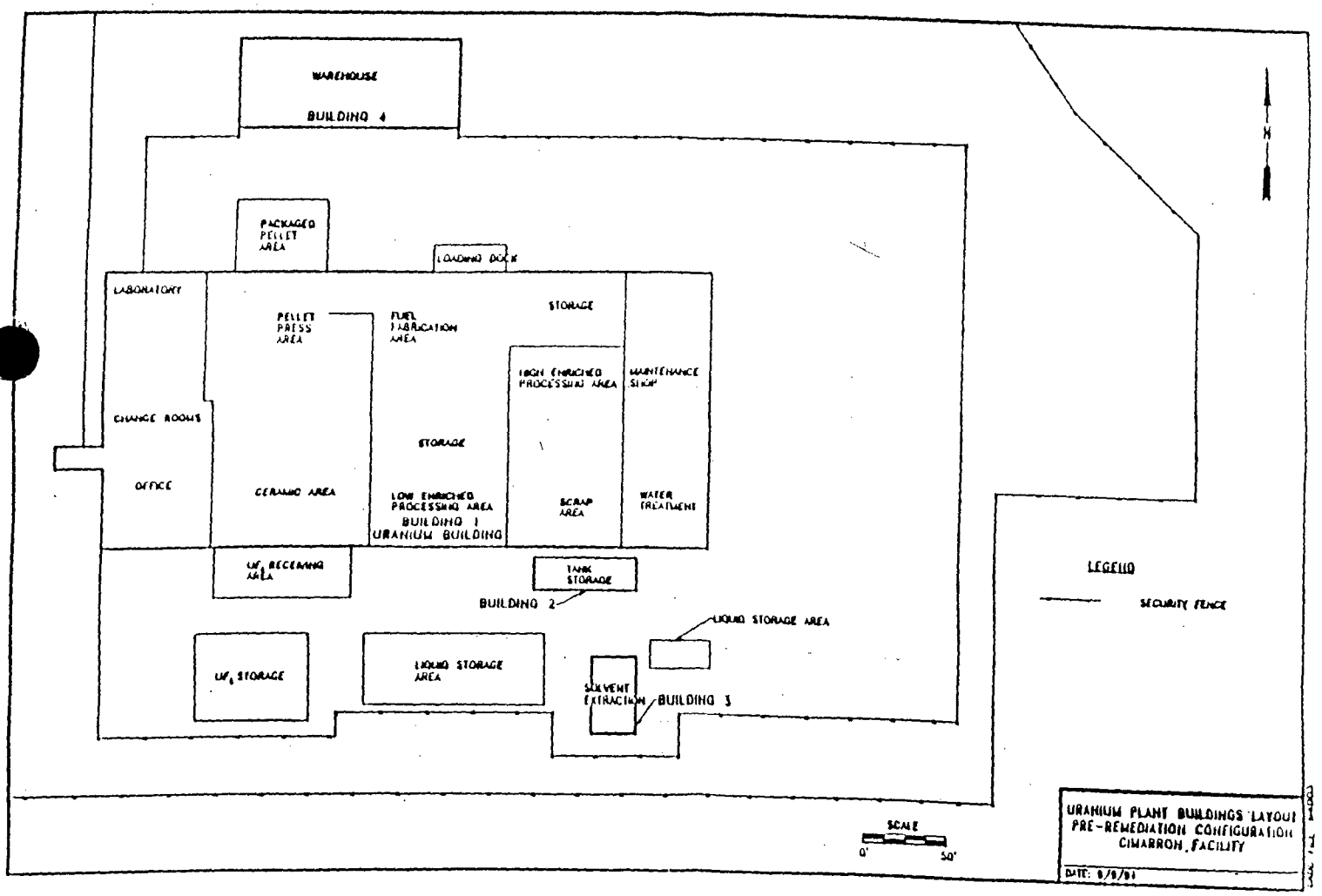

Figure 3.1: Uranium Building Processing Area

building surfaces, including the concrete floors, ranged from background to approximately 27,000 dpm/100 cm^2 (27,000 dpm/15.5 in^2) direct alpha and from background to approximately 10,000 dpm/100 cm^2 (10,000 dpm/15.5 in^2) smearable alpha. Process equipment within the buildings that was contaminated has been either decontaminated or removed. A number of the walls and floor sections have been removed and decontaminated or disposed of. Interior and exterior surfaces have been washed, scraped, chipped, or scabbled to remove surface contamination. Subfloor drains and the associated contaminated soils have also been excavated and removed. In 1997, the area formerly comprised of the laboratory, change rooms, office, pellet press area, and ceramic area was reconfigured into an area that is currently being used for storage of equipment and soil samples.

Trash Incinerator - This incinerator was used to incinerate non-radioactive waste materials released from restricted areas during site operations. The incinerator was located just east of the New Sanitary Lagoon. Because of 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 offsite to a commercial LLW disposal facility. Five soil samples were taken from the area beneath the incinerator and counted onsite. The highest count for any of these samples was 0.48 Bq/g (13.07 pCi/g) total uranium, which is below the BTP Option 1 criteria for unrestricted release. Therefore, no further remediation is required for this area. This area will be included in the FSSR for Phase III Subarea M.

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. Before remediation, soil samples from areas surrounding the main drain line ranged from 0.1 Bq/g (3 pCi/g) to 122 Bq/g (3300 pCi/g) total uranium. The high count from this area was caused by a known break in this drain line. After remediation, soil samples were below the BTP Option 1 criteria (Reference 3) of 1.1 Bq/g (30 pCi/g). Other samples from a drain line from the Sanitary Lagoon to the Cimarron River averaged 0.32 Bq/g (8.7 pCi/g) total uranium. The decontamination and decommissioning of these drain lines are discussed in detail in Section 15.0 of the "Characterization Report" (Reference 4). The results of additional work on the drain lines will be reported in Phase II and Phase III FSSRs.

3.2 Radiological Status of Surface Soils and Subsurface Soils

The radiological status of all surface and subsurface soils has been documented in the DP and Cimarron's "Characterization Report" (Reference 4). The primary source of contamination was from the use of enriched uranium. The concentration range for surface soil was from background levels of 0.15 Bq/g (4 pCi/g) total uranium to isolated spots of 122 Bq/g (3300 pCi/g) total uranium. Cimarron intends to demonstrate, through the submittal of FSSRs, that all soils meet the BTP Option 1 criteria (less than 1.1 Bq/g (30 pCi/g) total uranium) (Reference 3). The only exception to this is the NRC-approved BTP Option 2 disposal cell where the average soil concentration is approximately 1.6 Bq/g (44 pCi/g) total uranium. Major areas of concern in regard to radiological status of soils are summarized below.

Burial Area 1 - This 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" (Reference 4). Burial Area 1 was closed and capped in 1970. However, based on borehole sampling data, in 1986, Cimarron decided to excavate and remediate Burial Area 1. From 1986 through 1988 the trenches were excavated and 1840 m^3 (65,000 cubic feet (ft^3)) of waste exceeding BTP Option 2 criteria were shipped offsite for disposal at a licensed LLW disposal facility. Approximately 450 cubic meters (m^3) (16,000 ft^3) of BTP Option 2 waste from Burial Area 1 was disposed of at the onsite BTP Option 2 disposal cell. Based on confirmatory surveys by Oak Ridge Associated Universities (ORAU) in December 1991, NRC released Burial Area 1 for backfilling with clean soil on December 28, 1992. At that time, Cimarron surveys showed samples with up to 0.85 Bq/g (23 pCi/g) total uranium and 0.2 Bq/g (5 pCi/g) total thorium. Final exposure rate surveys conducted in 1993 showed surface readings at 1 m (3.3 feet) above the surface in the 1.6-2.1 pC/kg (6-8 μR/hr) range with background included. This is well below the 1987 Guidelines (Reference 5) acceptance level of 2.6 pC/kg (10 μR/hr) above background at 1 m (3.3 ft) above the surface.

Uranium Plant Yard Areas - The restricted areas surrounding the uranium process building and warehouse building have been extensively characterized and remediated. Decontamination and decommissioning activities are further discussed in Section 13.0 of the "Characterization Report" (Reference 4). Before remediation, the highest soil concentrations ranged from background to 59 Bq/g (1600 pCi/g) total uranium (average 37 Bq/g (1000 pCi/g)) in the uranium tank storage building, where there had been several spills when the

uranium plant was in operation. Similarly, the solvent extraction building had concentrations of up to 24 Bq/g (650 pCi/g) (average 13 Bq/g (350 pCi/g)) and the Vaporizer Room had concentrations up to 13.5 Bq/g (364 pCi/g) (average 1.5 Bq/g (41.7 pCi/g)).

Approximately 2300 m^3 (80,000 ft^3) of BTP Option 4 soil were shipped offsite to a licensed LLW disposal facility. The uranium plant yard areas also contained four stockpiles of BTP Option 2 material. To date, three of the stockpiles have been disposed of within the onsite disposal cell. The fourth stockpile, which is comprised of asphalt rubble that was ground into soil-like material in 1997, will be emplaced in the final lift of the third disposal cell. When this stockpile is removed, Cimarron will survey the underlying area and remediate as needed.

Burial Area 2 and North Field - This area was used in the 1970s for the disposal of industrial solid waste generated on the site. During an investigation of this area in 1990, contaminated materials were found in this disposal area. Soil sample concentrations within Burial Area 2 ranged from background to 46 Bq/g (154 pCi/g) total uranium and background to 5.5 Bq/g (150 pCi/g) total thorium. Decontamination and decommissioning of this area are discussed in detail in Section 8.0 of the "Characterization Report" (Reference 4). Remediation of this area began in 1991, with the removal of BTP Option 2 material. Several small areas in the North Field contained BTP Option 2 material that was removed. The final status survey for this area was submitted in Cimarron's May 1996 Phase III Subarea L FSSR. Based on its review of this FSSR, by letter of November 8, 1996, NRC staff approved Cimarron's request to backfill this subarea. An FSSR for the Subarea L surface area was submitted on July 27, 1998. NRC staff is currently reviewing this FSSR.

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 identified five samples that exceeded the BTP Option 1 guideline value of 1.1 Bq/g (30 pCi/g). These samples ranged from 1.3 to 3.5 Bq/g (35 to 95 pCi/g). The initial 1990 survey led to a characterization of the area and the subsequent remediation. Decontamination and decommissioning of this area are discussed in detail in Section 9.0 of the "Characterization Report" (Reference 4). A final status survey of this area (Phase III Subarea M) will be conducted when remediation is complete.

East & West Sanitary Lagoon - These ponds received all liquid process waste from the uranium plant from 1966 through 1970. In 1970, all liquid process

wastes from the uranium plant were diverted to other lined uranium evaporation ponds located onsite. 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. All results showed concentrations to be within the BTP Option 1 guideline value of 1.1 Bq/g (30 pCi/g) (Reference 3). ORAU conducted confirmatory surveys and soil sampling in November 1990. NRC authorized backfilling of the east and west Sanitary Lagoons under Amendment No. 9 of License SNM-928, issued in December 1992. Cimarron considered that decontamination and decommissioning of this area complete and discussed this matter in Section 11.0 of the "Characterization Report" (Reference 4). This area will be included in the Phase II Subarea H FSSR.

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 used from early 1986 to October 1992. Soil sample concentrations noted in Cimarron's characterization report ranged from 0.81 to 0.96 Bq/g (22 to 26 pCi/g) total uranium. The final status survey data for this area were submitted in Cimarron's May 1996 Phase III Subarea L FSSR. Based on its review of this FSSR, by letter of November 8, 1996, NRC staff approved Cimarron's request to backfill this subarea. NRC will require a final status survey before NRC staff can consider releasing this subarea from the license.

Five Former Waste Water Ponds - The five former waste water ponds (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 LLW 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 NRC to backfill and cover the five former waste water ponds. More recently, NRC staff has raised concerns about uranium contamination in the areas of waste ponds 1 and 2. As noted in the "Characterization Report" (Reference 4), several soil sample locations exceeded the 1987 BTP Option 1 criteria (Reference 3). Soil samples from waste pond 1 showed concentrations up to 6.1 Bq/g (167 pCi/g) total uranium and soil samples from Waste Pond 2 showed concentrations up to 9 Bq/g (243 pCi/g) total uranium.

Reservoir No. 1 and Drainage Area - This reservoir received run-off from the uranium plant restricted area and is included in the environmental sampling program for the site. This area is discussed further in Section 16.0 of the "Characterization Report" (Reference 4). In 1991, the drainage area leading to the reservoir was characterized and remediated. Soil concentrations, before remediation, ranged up to 2.6 Bq/g (70 pCi/g) total uranium. In September 1997, Cimarron submitted an FSSR for this area (Phase II Subarea J). NRC staff has reviewed the report and conducted a confirmatory survey of the area. The staff is currently in the process of making a finding.

Drainage Areas - Several drainage areas are also included in the affected areas as they either received drainage from a process area or had concrete rubble, placed in these areas for erosion control, that was previously surveyed and released from the Uranium Plant. Radiation surveys indicated that some pieces of concrete in the drainage areas exceeded 15,000 dpm/100 cm^2 (15,000 dpm/15.5 in^2) fixed beta/gamma acceptable surface contamination levels stated in NRC's 1987 Guidelines (Reference 5). The maximum reading was 40,000 dpm/100 cm^2 (40,000 dpm/15.5 in^2). The decontamination and decommissioning of these areas will be performed in accordance with the NRC 1987 Guidelines (Reference 5) as discussed in Section 1.4 of the DP (Reference 1). These areas are also discussed further in Section 16.0 of the "Characterization Report" (Reference 4). These drainage areas will be included in the final status survey. The concrete rubble was surveyed and released to drainage areas for erosion control and it is unlikely that it will be moved in the future. This is discussed in Section 2.3 of the DP.

MOFF Plant and yard - This facility was licensed under SNM-1174, which NRC terminated in February 1993 (letter included as Attachment I-1 of the DP) after being surveyed for plutonium. 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. Several borehole samples in this area ranged from 1.34 to 1.39 Bq/g (36.3 to 37.6 pCi/g) total uranium. However, other samples are much lower and it is expected that average levels will be below the 1.1 Bq/g (30 pCi/g) 1981 BTP Option 1 criteria for unrestricted release. This area, including the exterior surfaces of the MOFF building, will be included in the final status survey and will be decontaminated and decommissioned in accordance with the criteria discussed in Section 1.4 of the DP. This area is discussed further in Section 17.0 of the "Characterization Report" (Reference 4).

Onsite Roads - The roads from the uranium plant restricted area to the former Burial Ground 1 area were used for the transport of waste materials. Therefore, these roads have been included in the affected area and will be surveyed as such during the final status survey. The roads have not been surveyed. However, the plans for a survey of these roads are included in Cimarron's FSSPs for Phases II and III. The decontamination and decommissioning of the onsite roads will be performed in accordance with the criteria discussed in Section 1.4 of the DP.

3.3 Radiological Status of Ground and Surface Water

As noted in Cimarron's "Groundwater Evaluation Report" (Reference 2) uranium concentrations in the groundwater range from background to 74 Bq/liter (l) (2000 pCi/l) total uranium and exceed the U.S. Environmental Protection Agency (EPA) proposed groundwater standard of 1.1 Bq/l (30 pCi/l). The highest concentrations are in the vicinity of burial area 1. Well 1315 peaked in March 1990 at 300 Bq/l (8080 pCi/l) total uranium. By September 1990, concentrations at this well had decreased to 88 Bq/l (2386 pCi/l) total uranium. Concentrations at Well 1315 decreased to 81 Bq/l (2200 pCi/l) in March 1998. Supplemental information provided by Cimarron's letter of March 4, 1999, indicated that concentrations had dropped further to 21.3 Bq/l (580 pCi/l) by September 1998.

Data presented in Cimarron's "Groundwater Evaluation Report" (Reference 2) indicates a decreasing trend in groundwater concentrations over time. Other areas where uranium concentrations have exceeded the 1.1 Bq/l (30 pCi/l) groundwater standard include Waste Pond 1, where Well 1312 ranged from approximately 2.2 Bq/l (60 pCi/l) total uranium, in 1988, to under 0.7 Bq/l (20 pCi/l) in 1997, and Well 1313 ranged from approximately 7.4 Bq/l (200 pCi/l) in 1988 to 0.9 Bq/l (25 pCi/l) in 1997. Likewise, at Waste Pond 2, the total uranium concentration ranged from approximately 3 Bq/l (80 pCi/l), in 1988, to approximately 1.2 Bq/l (32 pCi/l) in 1997. A seep down gradient from Waste Pond 2 has also been monitored, showing a decreasing trend from 11.2 Bq/l (303 pCi/l), in 1993, to 1.8 Bq/l (48.4) pCi/l, in March 1998.

In October 1996, Cimarron first reported the occurrence of technetium-99 contamination in a groundwater monitoring well and a seep in a cliff, both situated down gradient of waste pond 2. At that time, technetium-99 concentrations were as high as 176 Bq/l (4760 pCi/l) which equates to slightly more than the 0.04 mSv/yr (4 mrem/yr) total effective dose equivalent (TEDE) allowed by EPA "National Primary Drinking Water Regulations" (40 CFR Part 141)

for beta emitters. This EPA regulation is referenced in the SDMP Action Plan as one of the cleanup criteria. However, data reported in Cimarron's groundwater evaluation report demonstrated a decreasing trend in technetium-99 concentrations to 68.74 Bq/l (1856 pCi/l) in Well No. 1312 and 20.8 Bq/l (562 pCi/l) in Well No. 1313. These concentrations equate to a dose well below the EPA 0.04 mSv/yr (4 mrem/yr) standard.

4. EVALUATIONS

4.1 Decommissioning Task Management Program

By letters of January 23, 1998, June 29, 1998, October 26, 1998, and July 27, 1999, Cimarron proposed to restructure its organization because of downsizing at the site. The latest restructured organization is presented in Figure 4.1. As a result of the downsizing, the Vice President of Cimarron is also serving in the subordinate position of Site Manager for the Cimarron site. The new organization provides for independence of the QA Coordinator and the Radiation Safety Officer (RSO) from Site Manager. This enables the QA Coordinator and the RSO to focus on quality and safety of the operations while the Site Manager focuses on the day-to-day operation of the site. By letter of September 16, 1998, and telefax of August 5, 1999, Cimarron provided a description of personnel qualification requirements for the positions described in its organizational chart as well as a description of the qualifications of staff currently in those positions.

In addition, by letter of October 26, 1998, Cimarron noted its plans to discontinue security guard coverage. The elimination of security guard coverage is evaluated in Section 4.10 of this SER.

NRC staff reviewed these aforementioned Cimarron submittals and determined that the qualification requirements and the qualifications of the incumbents in those positions were adequate for conducting decommissioning activities at the site. Furthermore, NRC staff found that this organization provides sufficient independence for identifying QA issues and health and safety issues to appropriate levels of management. NRC staff also found this restructured organization to be acceptable for the remainder of decommissioning activities to be performed at the site.

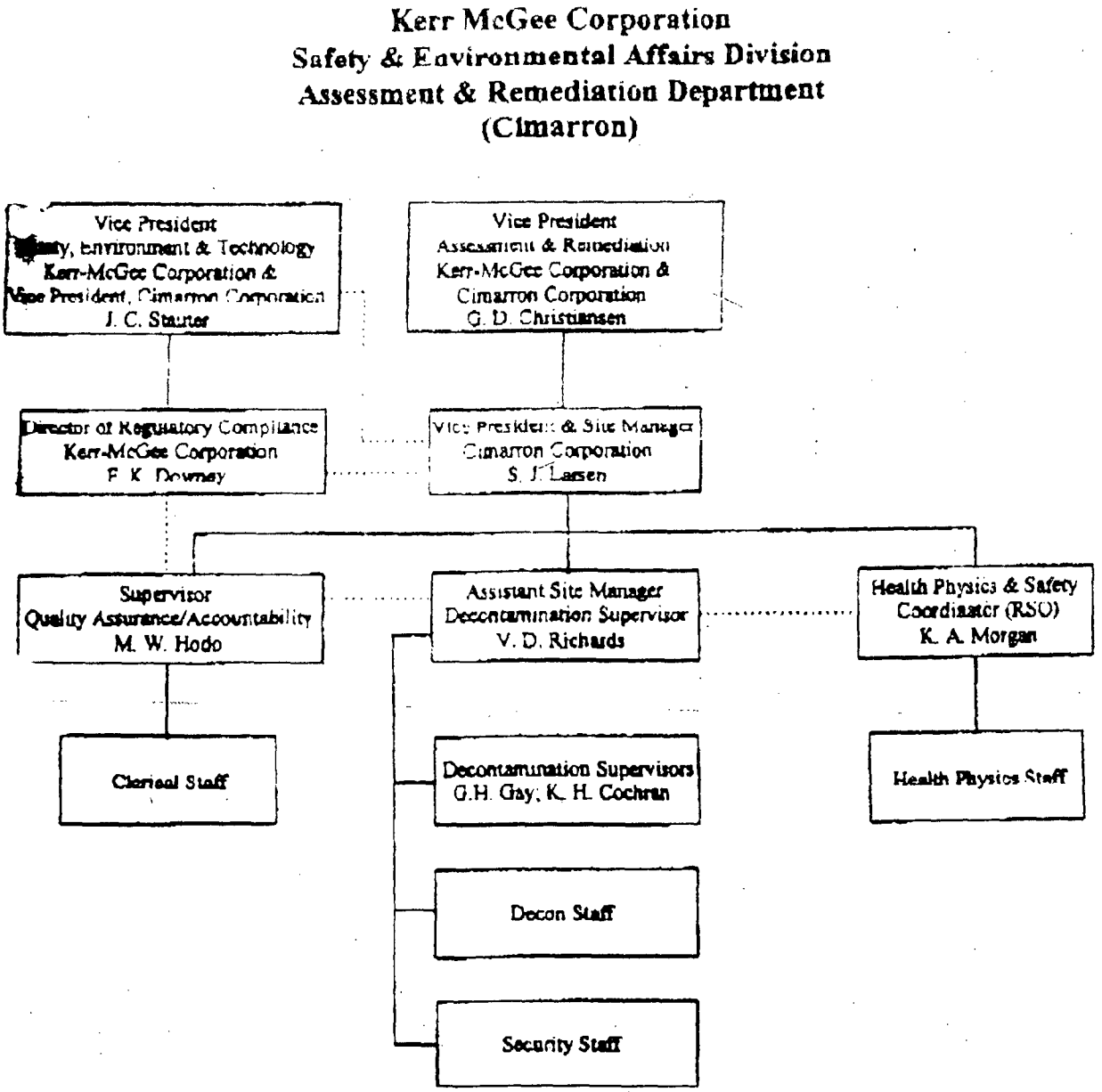

Figure 4.1: Organizational Chart

4.2 Occupational Safety and Industrial Hygiene Programs

Cimarron has a Health and Safety Plan (HASP) in place to implement Occupational Health and Safety Administration requirements for minimizing exposures to hazardous substances and conditions related to its decommissioning project. Applicability of the HASP extends to all Cimarron employees, government employees, contractors, subcontractors, and visitors. Under the HASP, all personnel on site, contractors, subcontractors, and visitors are informed of the site emergency response procedures and any potential fire, explosion, health, or safety hazards of the operation. Visitors are escorted by qualified Cimarron staff responsible for ensuring HASP compliance and informing visitors of proper responses in an emergency.

NRC staff found that Cimarron's HASP will provide adequate protection to workers or visitors while the decommissioning activities are being conducted at the site.

4.3 Radiation Protection Programs

The goal of the radiation protection program is to ensure that remediation activities are conducted in full compliance with all NRC regulations, and that all occupational radiation exposures are within the limits of 10 CFR Part 20 and are reduced to levels as low as is reasonably achievable (ALARA). The Radiation Protection Program is described in the RPP, as supplemented by submittals dated January 2, 1997; June 30, 1997; January 23, 1998; June 29, 1998; October 26, 1998; and July 27, 1999. The Radiation Protection Program describes the responsibilities of the RSO, the ALARA program, radiation safety training requirements, environmental and personnel monitoring requirements, a special work permit program, radioactive materials control program, contamination control program, radiation protection instrumentation program, and health physics procedures.

The President of Cimarron has the ultimate responsibility for ensuring that the radiation protection program is developed and implemented in a manner consistent with regulatory requirements and company policies. The Vice President is responsible for assuring that an effective radiation protection program is developed and implemented. This responsibility is delegated via the Cimarron Site Manager to the RSO. The RSO is responsible for development, implementation, and oversight of the Radiation Protection Program. The Radiation Protection Program will be implemented by qualified staff under the direction of the RSO.

As described in the licensee's letter, dated September 16, 1998, the RSO designated for the Cimarron site has 17 years of relevant experience in health physics. The Site Manager is responsible for having the necessary resources available for the Radiation Protection Program. The Cimarron Site Manager designated for the Cimarron site has 20 years of experience as a manager at KMC. The ALARA Committee is responsible for reviewing and approving the RPP.

An ALARA program will be implemented to ensure that exposures are reduced to ALARA levels. This program will encompass work task preparation and planning, engineering controls, personnel, design, equipment, monitoring devices and controls, and training. This program includes such measures as: site safety training, standard operating procedures, radiation exposure control measures, establishment of administrative control limits, issuance of Special Work Permits (SWPs), and personal protective equipment. The licensee will have an ALARA Committee that will ensure that ALARA policy, philosophy, commitments, and regulatory requirements are integrated into all appropriate work activities.

All persons permitted to enter the facility's restricted area will receive training in radiation safety commensurate with their levels of involvement at the site. Furthermore, the licensee's radiation workers attend an appropriate classroom training session upon employment and receive periodic review training at least annually. The licensee's training requirements and policy will meet the training requirements of 10 CFR Parts 19 and 20.

The licensee is committed to following the guidance of Regulatory Guide 8.25, "Air Sampling in the Workplace," as a guide for an acceptable air sampling and monitoring program. The licensee will perform continuous air sampling whenever airborne activity levels exceed 10 percent of the derived air concentration (DAC). Environmental monitoring will be performed at the controlled area boundary and at various locations outside of the restricted areas to ensure compliance with conditions of Cimarron's license and all applicable regulations. The environmental monitoring program covers such activities as sampling environmental air, soil, and vegetation -- and monitoring surface water, ground water, and ambient radiation. The environmental monitoring program also has specific provisions for quality control, instrument checks and calibration, audits, and actions to be taken if action levels are exceeded.

The licensee incorporates 10 CFR Part 20 dose limits for workers and the public and complies with the 10 CFR Part 20 requirements for personnel monitoring and for reporting exposures. Personnel external monitoring will be accomplished

through the use of individual monitoring devices, film badges, and radiation surveys. The film badges will be processed for dose reading by a laboratory or vendor accredited under the National Voluntary Laboratory Accreditation Program. Personnel surveys will be performed before exiting radiologically controlled areas. Personnel internal monitoring will be accomplished through the air monitoring program, and in-vivo or in-vitro bioassay sampling. Bioassay sampling will be performed at the direction of the RSO and whenever a calculated intake of 40 DAC-hours may have occurred in any one incident based on air sampling data, accident conditions, equipment failure, external contamination, or other conditions.

SWPs are required when the RSO and the Health and Safety Officer have determined that hazardous or radioactive materials are present in quantities that could result in health hazards because of work to be performed, or when the work to be performed is hazardous because of the presence of industrial materials. Activities such as contaminated earth moving, placement of materials in the disposal cell, decontamination of buildings and equipment, work with sealed sources, and work that could generate contaminated airborne material will be performed under the direction of an SWP. SWPs will be issued, with input and approval from appropriate departments, as necessary to inform individuals of the radiological and non-radiological conditions that exist in the work area and the safety requirements for the job. All SWPs will be approved by the RSO or a designee.

Radiation protection surveys are used to identify, quantify, and evaluate potential radiological hazards and assist in the development of SWPs. The licensee has committed to perform its decommissioning surveys, to the extent practical, in conformance with: NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination"(Reference 8); the BTP, "Disposal or Onsite Storage of Uranium and Thorium From Past Operations" (Reference 3); and the NRC "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material" (Reference 5). Radiological surveys will be performed by radiation workers who have been trained commensurate with the type of surveys to be performed.

As part of the radioactive materials control program, the licensee has committed to comply with the requirements of 49 CFR for transportation, and 10 CFR Parts 20, 30, and 70 for receipt, labeling, storage, shipment, transfer, and theft or loss of radioactive material as well as for the control of sealed radioactive sources. Most of the waste generated at the site is in the form of

soils and is therefore not well suited for significant compaction or other types of volume reduction. The licensee minimizes the generation of waste by training its workers to keep unnecessary materials out of restricted areas.

The licensee's contamination control policy is to minimize the spread or buildup of radioactivity in the facility or environment from decommissioning operations. The licensee's contamination program for contamination control includes a commitment to maintain restricted areas of the facility below the smearable contamination limit of 5,000 dpm/100 cm^2 gross alpha and to establish contaminated area controls whenever smearable contamination in an area exceeds 1,000 dpm/100 cm^2. Furthermore, The licensee is committed to the ALARA philosophy when selecting decontamination methods and in not allowing a person whose skin or clothing is contaminated above specific release criteria to exit a controlled area without prior approval of the site manager or RSO. Any individual who cannot be decontaminated to background levels is instructed by the RSO or designee regarding the risks involved and follow-up actions that may be necessary.

The licensee's radiation protection program conforms with its QA plan. The licensee's QA plan is designed to implement the applicable requirements of the "Quality Assurance Requirements for Nuclear Facility Applications (ASME/NQA-1)." The licensee had audits and surveillances in place to assure that its radiation protection program activities comply with the license and regulatory requirements and are performed within established policies and recognized good practices.

Instrumentation requirements at the site will vary as the decommissioning process continues. The licensee will use, as guidance, ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration," for calibration, operation and response tests, and quality control. It also references Regulatory Guide 4.14, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Stream Environment," for laboratory instrumentation.

The licensee will implement health physics procedures that will control work activities through the use of approved, written, administrative, and field procedures. All personnel entering controlled radiation areas will be assigned personnel dosimeters. Workers will be assigned appropriate protective clothing and gear based on work area radiation surveys and the type of work to be performed. All work will be performed in accordance with SWPs documenting area radiation hazards and contamination levels and the required radiation exposure

protective and monitoring equipment. All radiation exposure information will be obtained, processed, and recorded in accordance with 10 CFR Part 20.

NRC staff found that the licensee's RSO qualification, ALARA program, training program, environmental and personnel monitoring programs, SWPs, radioactive materials control program, contamination control program, radiation protection instrumentation program, and health physics procedures are acceptable for complying with NRC regulations.

4.4 Radiological Accident Analysis

NRC staff reviewed the licensee's estimated potential consequences of postulated accidents, submitted in a letter dated July 1, 1998. The licensee evaluated two hypothetical worst-case accident scenarios--offsite spillage of a shipment of radioactive material during transport to an LLW disposal facility, and rupture and spillage of a drum onsite. Two calculations, estimating TEDE to a cleanup worker and to a member of the public, were performed for the offsite spillage of a shipment of uranium soils and debris. A calculation to estimate the TEDE was also performed, for a radiation worker, from the potential onsite spillage of a drum containing uranium soils and debris.

The postulated offsite scenarios assumed that the transport vehicle is involved in an accident, and the entire shipment of 58 208-l (55 gallon) drums is breached. This volume is based on Cimarron's waste shipment No. 50 in June 1997. According to the licensee, this shipment is representative of the soil shipments, from the Cimarron site, that exceeds the BTP Option 2 limits. This was the last shipment from the Cimarron site. According to the licensee, the concentration of soil from waste shipment No. 50 is higher than average compared with other soil shipments in the previous year from the site.

In the accident scenario, the assumptions are: (1) the inhalation and direct exposures are the exposure pathways; (2) the time an individual is exposed cleaning up the spill is 24 hours; (3) the individual of interest is always downwind of the spill; (4) there is no atmospheric dispersion at right angles to the wind direction; (5) the dispersion of the spilled materials has a maximum height of 2 m (6.6 ft) the same as the breathing zone; (6) average total uranium concentration is 23 Bq/g (617 pCi/g), based on the activity of total uranium reported for Cimarron waste shipment No. 50; (7) the breathing rate is 1.2 m^3/hr (42.4 ft^3/hr); (8) the dose conversion factors (DCFs), from EPA's Federal Guidance No. 11 (Reference 9), of all uranium isotopes are the

same as those for uranium-235, which is the most conservative; and (9) there is no respiratory protection.

The cleanup worker is assumed to be at the spill location, whereas the member of the public is assumed to be 1 km (3048 feet) from the spill and is continuously in the plume centerline downwind in a very stable atmosphere. The maximum dose, to the clean up worker, from the offsite spillage of a shipment of uranium soils and debris, from both direct exposure and inhalation pathways, is 0.062 mSv (6.2 mrem) TEDE. For comparison purposes, the 10 CFR Part 20 limit is 0.05 Sv/yr (5 rem/yr) for occupational exposure. The maximum dose to a member of the public from the same offsite spillage is 9E-5 mSv (0.009 mrem) TEDE. For comparison purposes, the 10 CFR Part 20 dose limit is 1 mSv/yr (100 mrem/yr) for members of the public.

The onsite scenario assumed that the drum containing 113 Bq/g (3054 pCi/g) is ruptured and the entire contents are spilled. 113 Bq/g (3054 pCi/g) are the highest concentration of total uranium based on the activity of total uranium reported for Cimarron waste shipment No. 50. In this case, the inhalation and direct exposures are the exposure pathways; the time used to clean up the spill is 4 hours; the worker is always downwind at the edge of the spill; there is no atmospheric dispersion at right angles to the wind direction; and the dispersion of the spilled materials has a maximum height of 2 meters (6.6 ft). The maximum dose to a radiation worker from the onsite spillage of a drum containing uranium soils and debris is 0.04 mSv (4 mrem) TEDE. For comparison purposes, the 10 CFR Part 20 limit is 0.05 Sv/yr (5 rem/yr) for occupational exposure.

NRC staff determined that these postulated accidents do not have the potential for onsite or offsite radiation doses that exceed the 10 CFR Part 20 limit of 1 mSV/yr (100 mrem/yr) for members of the public or of 0.05 Sv/yr (5 rem/yr) for workers. These postulated accidents will not result in any significant health and safety issues, and are, therefore, acceptable.

4.5 Radioactive Waste Management Program

In accordance with the established limits for BTP Option 1 material (Reference 3), Cimarron is proposing to leave in-place, soils with concentrations up to 1.1 Bq/g (30 pCi/g) total uranium and up to 0.4 Bq/g (10 pCi/g) total thorium. Cimarron is also proposing in the DP (Reference 1), release limits for contamination on buildings and equipment to comply with NRC's "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted

Use or Termination of License for Byproduct, Source, or Special Nuclear Material" (Reference 5).

On November 4, 1994, Cimarron's license was amended (Amendment No. 10, License Condition 23) to allow for the onsite disposal of BTP Option 2 material. Under the BTP Option 2 criteria, the average concentration of radioactive material that may be disposed of onsite is 3.7 Bq/g (100 pCi/g) total uranium above background (this assumes that the uranium is 100 percent soluble) and up to 9.3 Bq/g (250 pCi/g) for insoluble uranium. The average concentrations of thorium and plutonium in the soil will not exceed 0.4 Bq/g (10 pCi/g) and 0.04 Bq/g (1 pCi/g), respectively. Soils meeting the BTP Option 2 limits are proposed for disposal in the onsite disposal cell. Under Cimarron's License Condition 18, wastes that exceed the BTP Option 2 limits will be shipped offsite to a licensed LLW disposal site.

Most of the radioactive waste at the site has already been characterized and disposed of in accordance with the BTP. Under License Amendment 10, Cimarron was authorized to dispose of up to 1400 m^3 (500,000 ft^3) of BTP Option 2 radioactive waste. As of March 1998, approximately 9,910 to 11,326 m^3 (350,000 to 400,000 ft^3) have been emplaced in the onsite BTP Option 2 disposal cell. By letter dated April 17, 1998, Cimarron estimated that a total 13,000 m^3 (450,000 ft^3) of soil will be disposed of in the onsite disposal cell.

Radioactive waste exceeding BTP Option 2 criteria have been shipped to licensed LLW disposal facilities at Sheffield, Illinois; Beatty, Nevada; Barnwell, South Carolina; Richland, Washington; and Clive, Utah. As noted in a letter from Cimarron dated September 4, 1998, a final total of 7417 m^3 (261,945 ft^3) of material exceeding BTP Option 2 criteria had been shipped offsite. The most recent shipments went to the Envirocare LLW disposal facility in Clive, Utah. If additional material exceeding BTP Option 2 criteria are found at the site, it will also be shipped to the Envirocare LLW disposal facility in Clive, Utah. The State of Utah licenses the Envirocare site for LLW disposal. Disposals will be made in compliance with 10 CFR Part 20 and State of Utah requirements. The shipments to the disposal facility will comply with NRC and U.S. Department of Transportation (DOT) packaging and shipping requirements.

NRC staff found that Cimarron's radioactive material management activities and practices are being conducted in accordance with pertinent guidance and requirements. To date, more than 75 percent of the material designated for the onsite BTP Option 2 disposal cell have been emplaced in the cell and all known material exceeding BTP Option 2 criteria have been shipped offsite to a

licensed LLW disposal facility. The staff does not anticipate Cimarron exceeding the limit on BTP Option 2 material that can be placed in the cell and has confirmed that Cimarron has made arrangement for the proper disposal of any additional material, found at the site, that exceeds BTP Option 2 criteria.

4.6 Radiological Impacts on the Public and Workers

Radiological impacts on members of the public may result from inhalation or ingestion of releases of radioactivity in air and in water during the remediation operations, direct exposure to radiation from radioactive materials at the site during remediation operations, and from transport for disposal. The public will also be exposed to radiation as a result of onsite disposals. Decommissioning workers may receive doses primarily by inhalation and direct exposure during the remediation activities. The potential radiological impacts of accidents are considered in Section 4.4. NRC staff found no significant impacts on health and safety.

4.6.1 Radiological Impacts on the Public

Of the areas currently under Cimarron's license, the BTP Option 2 disposal cell located in Subarea N and the groundwater underneath the site have the greatest potential for radiological impact on the public under intruder or resident homeowner scenarios. The concentration of uranium in the BTP Option 2 disposal cell ranges from 1.56 to 1.67 Bq/g (42 to 45 pCi/g), based on sampling results of materials disposed of there so far. A value 1.67 Bq/g (45 pCi/g) of uranium was used to estimate a conservative dose to the public resulting from the potential radiological exposure from the soil in the disposal cell. In addition, Cimarron has requested the concentration of 6.7 Bq/l (180 pCi/l) of uranium as the release limit of the groundwater underneath the site. This value was used to estimate a conservative dose to the public resulting from the potential ingestion of groundwater. The contributions of total uranium activity of the various uranium isotopes were estimated for uranium-234 (U-234), uranium-235 (U-235), uranium-238 (U-238) to be about 79 percent, 1.7 percent, and 20 percent, respectively (Reference 10).

The resident-farmer scenario is more conservative, although less probable, than an intruder or a resident-homeowner scenario. For conservatism, the site use is assumed to be equivalent to the resident-farmer scenario described in NRC Policy and Guidance Directive PG-8-08 (Reference 11). Under this scenario, it is assumed that a farmer moves onto the site, builds a home, and raises crops and livestock for consumption. This farmer represents the individual

reasonably expected to be the most highly exposed to a radiological dose. Pathways through which the farmer could receive a radiological dose from the soil are: (1) direct radiation; (2) inhalation; (3) ingestion of plant foods grown on the contaminated soil; (4) ingestion of milk and meat from livestock raised and fed from the contaminated area; and (5) ingestion of fish raised in a nearby pond. In addition, the farmer ingests water from a nearby well that pumps water from the shallow aquifer underneath the Cimarron site. This well is assumed to contain the concentration of uranium that the licensee requested as the release limit, 6.7 Bq/l (180 pCi/l).

Dose assessments were performed using RESRAD computer code, Version 5.82 (Reference 12). NRC staff then performed an analysis to calculate the dose from groundwater contamination as a result of ingesting the water from the aquifer underneath the site.

The RESRAD dose assessments were performed by using site-specific source-term data provided by the licensee and also by using data taken from previous reports (References 4, 10, and 13). For parameters without any site-specific values, PG-8-08 (Reference 11) or the RESRAD defaults (Reference 14) were used.

The soil disposal cell for the BTP Option 2 waste is approximately 55 m (180 ft) wide by 163 m (535 ft) long (Reference 10). The maximum thickness of the disposal cell containing contaminated materials is 1.8 m (6 ft). Thus, the maximum volume is 16,137 m^3 (5.75E5 ft^3). The disposal cell has at least 1.2 m (4 ft) of clean soil covering the contaminated soil. The depth to the groundwater in the areas around the disposal cell is about 9.1 m (30 ft) below ground level (Reference 10). Thus, the average thickness of the unsaturated zone, which is between the bottom of the contaminated material and the top of the groundwater, is 6.1 m (20 ft).

In the area around the disposal cell, there is a layer of resistant mudstone at a depth of about 1.8 to 2.1 m (6 to 7 ft), dipping to the east (Reference 10). After heavy rains, infiltrating water perches on this mudstone layer and continues to travel above this layer along the dip to the east. The mudstone layer directs seepage across the area of the disposal cell. As a result, the water is less likely to enter the disposal cell. For conservatism, no credit is given to this layer of mudstone.

The measurement of the distribution coefficient (K_d) value for uranium is based on five samples taken from around the Cimarron site, and the values ranged from 339 to 2829 milliliters per gram (ml/g) (5.4E-3 to 4.5E-3 ft^3/lb)

(Reference 10). For conservatism, the lowest measured K_d value of 339 ml/g (5.4E-3 ft^3/lb) is used in this analysis. Also, the licensee performed a sheet erosion analysis that indicated approximately 0.69 m (27 in) of soil would be removed by sheet erosion in a 1000-year period (Reference 10). Thus, the erosion rate of 6.9E-4 m/yr (2.3E-3 ft/yr) is used for the cover soil and the contaminated material in this analysis.

The gradient of the shallow groundwater at the Cimarron site averages approximately 0.025 percent, except where it steepens as a result of proximity to discharge areas (Reference 10). A value of 2.5E-4 is used in this analysis. For additional conservatism, the water table drop rate is assumed to be zero. Also, according to Cimarron's Site Investigation Report (Reference 13), the measured hydraulic conductivity values of the shallow aquifer ranged from 76 m/yr (250 ft/yr) to 1798 m/yr (5900 ft/yr), and the average hydraulic conductivity value measured in the wells near the disposal cell is 363 m/yr (1190 ft/yr). This value is used in the analysis.

The result of the calculation is shown in Figure 6.1. The dose was estimated for a time period of 1000 years. The maximum dose from soil contamination for the uranium concentration is estimated as 0.0086 mSv/yr (0.86 mrem/yr) at 1000 years. The dose is almost zero for several hundred years after the disposal cell is closed.

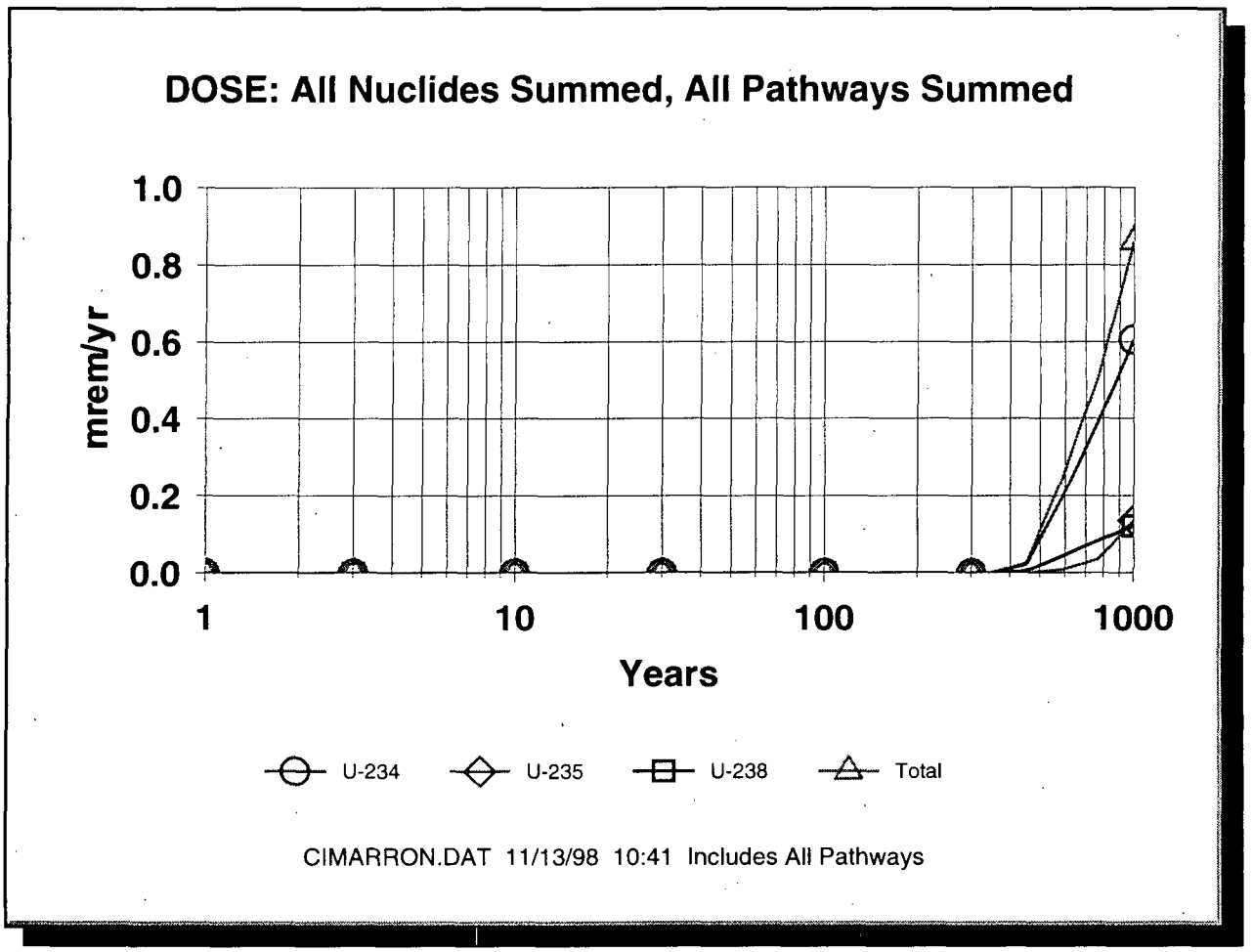

Figure 6.1: Resident-Farmer Scenario Doses for the Cimarron Disposal Cell With Cover

For comparison purposes, another dose assessment was performed assuming that no soil cover was over the contaminated material. The maximum dose from soil contamination is estimated as 0.049 mSv/yr (4.96 mrem/yr) at zero years, as shown in Figure 6.2.

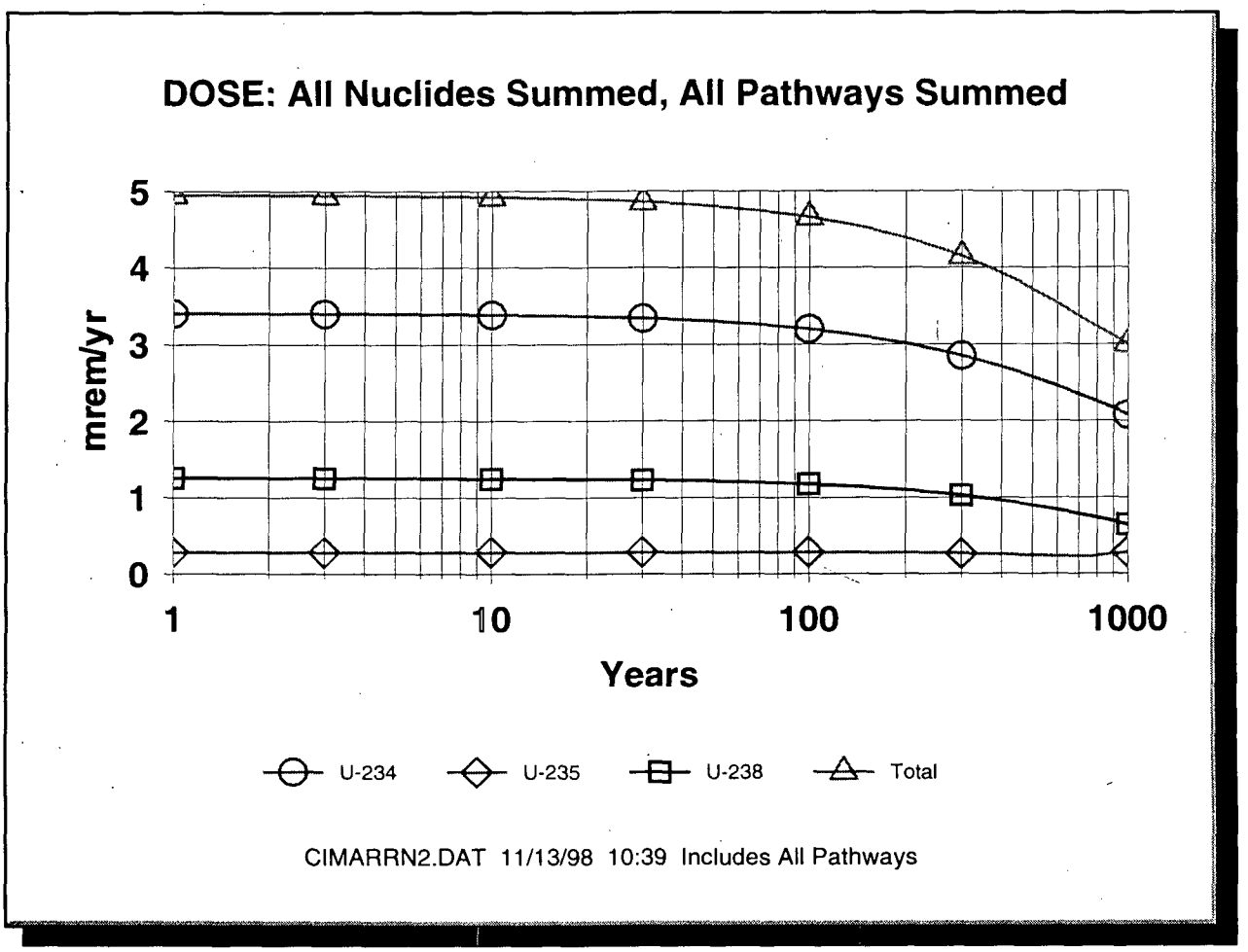

Figure 6.2: Resident-Farmer Scenario Doses for the Cimarron Disposal Cell With No Cover

In both the cover and no-cover cases, doses during the first 1000 years result from the groundwater independent pathways (inhalation, ingestion, and direct exposure). Figure 6.3 shows the water-independent and the water-dependent pathways for the no-cover, resident-farmer scenario.

NRC staff analyzed the dose to the resident farmer who ingests groundwater from a nearby well that pumps water from the shallow aquifer underneath the Cimarron site. This well is assumed to contain the concentration of uranium that the licensee requested as the release limit, 6.7 Bq/l (180 pCi/l).

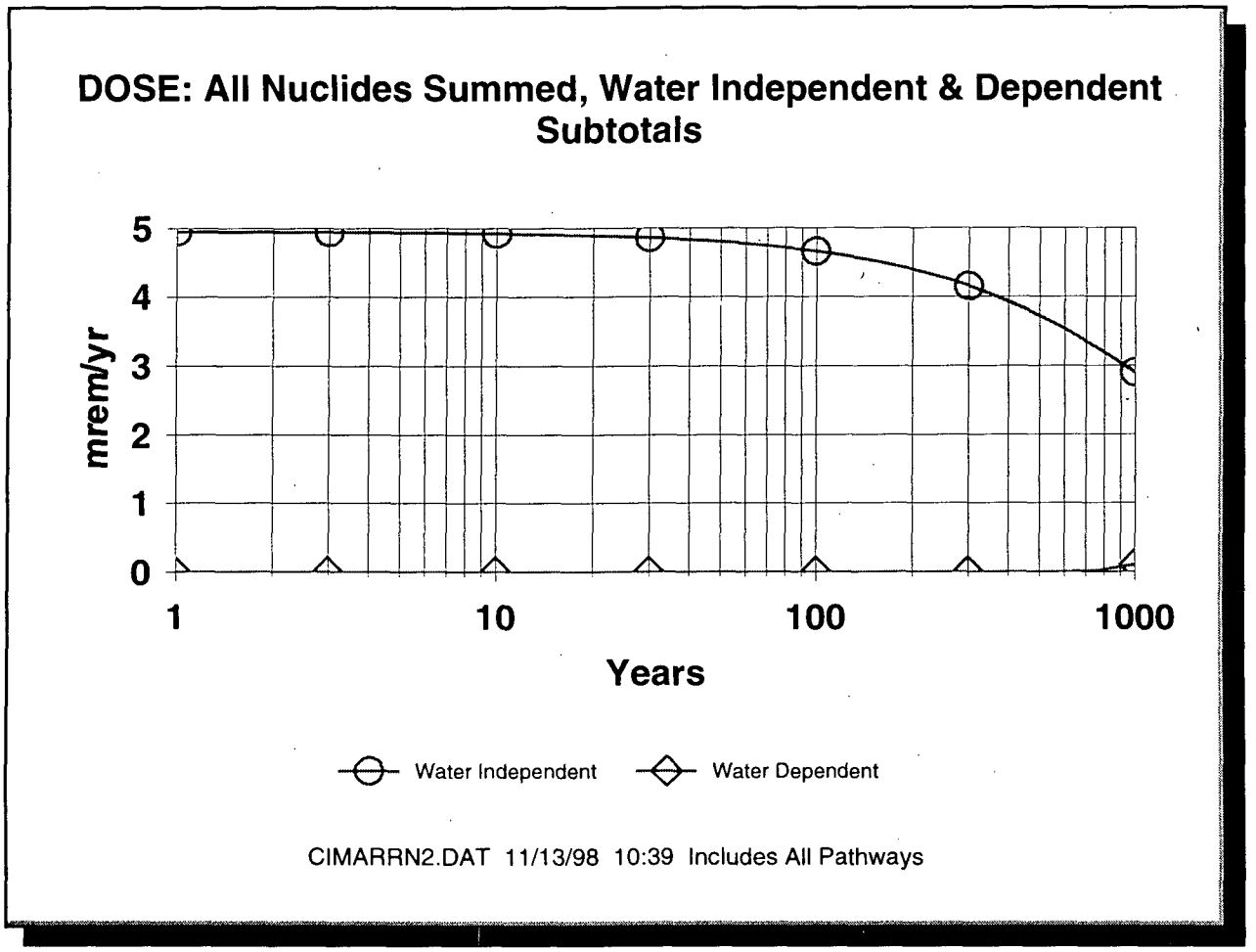

Figure 6.3: Doses from Water-Independent and Water-Dependent Pathways for the Cimarron Disposal Cell With No Cover

To calculate the potential ingestion dose to a resident farmer, DCFs were obtained from EPA's Federal Guidance No. 11 (Reference 9). The ingestion DCFs are 7.08 x 10^{6} Sv/Bq (2.62E-5 mrem/pCi), 7.22E-6 Sv/Bq (2.67E-5 mrem/pCi); and 6.43E-6 Sv/Bq (2.38E-5 mrem/pCi) for U-234, U-235, and U-238, respectively. The farmer is assumed to consume 730 l/yr (26 ft^3/yr) of water. This represents the 90th percentile daily drinking water ingestion rate as tap water, including uses in cooking and for beverages prepared using tap water. NRC staff computed the groundwater ingestion dose to be 0.032 mSv/yr (3.4 mrem/yr).

The dose from soil contamination to be a resident farmer, if no soil cover were over the contaminated material, would be about 0.05 mSv/yr (5 mrem/yr), as

shown by the RESRAD analysis. The dose from groundwater contamination to the same resident farmer is about 0.034 mSv/yr (3.4 mrem/yr). The sum of the doses is 0.084 mSv/yr (8.4 mrem/yr).

NRC staff has therefore determined that the total dose estimate for the combined dose from the onsite BTP Option 2 disposal cell and the licensee's proposed groundwater release limit are well below the 10 CFR Part 20 limit of 1 mSv/yr (100 mrem/yr) for doses to the public. Furthermore, based on the above evaluation, the licensee has demonstrated that the Cimarron site is well below the BTP Option 1 concentration limit (except for the onsite Option 2 disposal cell which meets the BTP Option 2 concentration limit) and, therefore, satisfies the requirements for unrestricted release.

4.6.2 Radiological Impacts on Workers

During the remediation of the contaminated materials, workers will receive doses from direct exposure and from the inhalation of dusts containing uranium. For conservatism, it is assumed that the workers will receive doses from activities immediately above an uncovered BTP Option 2 disposal cell in Subarea N. According to the licensee, the concentration of uranium in the BTP Option 2 disposal cell ranges from 1.56 to 1.67 Bq/g (42 to 45 pCi/g) based on sampling results of materials disposed of there so far. The contributions of total uranium activity of the various uranium isotopes were estimated for U-234, U-235, U-238 to be about 79 percent, 1.7 percent and 20 percent, respectively (Reference 10). Assuming a total uranium concentration of 1.67 Bq/g (45 pCi/g), each radionuclide's concentration used in this analysis is 1.32 Bq/g (35.55 pCi/g) for U-234, is 0.03 Bq/g (0.765 pCi/g) for U-235, and is 0.33 Bq/g (9.0 pCi/g) for U-238.

To calculate the potential direct exposure dose to a worker, DCFs were obtained from EPA's Federal Guidance No. 11 (Reference 9). The external exposure DCFs for a uranium volume source with thickness of 15 cm (6 in) are 1.85E-16 Sv/d per Bq/m^3 (2.5E-7 r/yr/pCi/cm^3), 3.24E-13 Sv/d/Bq/m^3 (4.38E-4 r/yr/pCi/cm^3), and 4.76E-17 Sv/d/Bq/m^3 (6.43E-8 r/yr/pCi/cm^3) for U-234, U-235, and U-238, respectively. The soil density is assumed to be 1.625E6 g/m^3, (1.625 g/cm^3) and the worker is assumed to be performing decommissioning activity on the contaminated soil for 40 hours per week (hrs/wk), 50 wks/yr (2000 hr/yr). NRC staff computed the direct exposure dose to be 0.0013 mSv/yr (0.13 mrem/yr) for a working-year exposure.

To calculate the potential inhalation dose to a worker, DCFs were obtained from EPA's Federal Guidance No. 11 (Reference 9). The inhalation DCFs are 0.035 Sv/Bq (0.13 mrem/pCi), 0.032 Sv/Bq (0.12 mrem/pCi), and 0.032 Sv/Bq (0.12 mrem/pCi) for U-234, U-235, and U-238, respectively. A worker is assumed to be performing decommissioning activity on the contaminated soil for 40 hrs/wk, 50 wks/yr (2000 hr/yr). Also, a dust loading of 200 μg of soil per m^3 of air, and a respiratory rate of 1.2-m^3 (42.4 ft^3) of air/hr are assumed. NRC staff computed the inhalation dose to be 0.0278 mSv/yr (2.78 mrem/yr).

The sum of the doses from direct exposure and inhalation is 0.029 mSv/yr (2.9 mrem/yr). This dose is substantially below the 10 CFR Part 20 limit of 50 mSv/yr (5 rem/yr) for occupational exposure.

4.7 Environmental Specifications

Environmental specifications to be implemented include specifications limiting effluent releases to the environment and radiation exposure to workers and the public. An environmental monitoring program will be implemented as an additional safeguard. The environmental specifications are described in Cimarron's DP (Reference 1) and RPP, as supplemented (Reference 2). Cimarron has committed to perform environmental monitoring at the controlled area boundary and at various locations outside of the restricted area to ensure compliance with conditions of its license and all applicable regulations.

4.7.1 Effluent Release Specifications and Environmental Monitoring

Environmental air samples will be collected on a weekly basis at three locations and will be analyzed for gross alpha and gross beta activity. Releases will meet 10 CFR Part 20 Appendix B airborne effluent release limits. Environmental thermoluminescent dosimeters are placed at 14 locations throughout the facility and at the perimeters of the facility, and will be assayed on a quarterly basis. The action level per quarter is 0.2 mSv (20 mrem) above background.

Liquid effluents will meet 10 CFR Part 20 liquid effluent requirements before release. Surface-water and groundwater samples will be taken annually at the site. Cimarron will collect grab surface samples at seven places across the site and in the Cimarron River, and will collect groundwater samples from 24 sampling locations on the site. The licensee will measure for fluoride, nitrate, gross alpha, gross beta, and total uranium in each of the samples.

The action level for notifying the RSO, for the groundwater samples, is 50 percent of the limit of 10 CFR Part 20, Appendix B.

Cimarron will also collect soil samples and vegetation samples annually as part of its environmental monitoring program. The licensee will collect soil samples at 11 places and vegetation samples at three locations surrounding the site. The licensee will then measure for total uranium in each of the samples. The action level for total uranium in soils is 0.43 Bq/g (11.5 pCi/g) and the action level for total uranium in vegetation is 0.02 μg/μg vegetation.

NRC staff found the effluent release specifications to be adequate for the decommissioning activities at Cimarron.

4.7.2 Worker Radiological Control Specifications

The radiation protection program will be implemented by qualified staff under the direction of the RSO. The goal of the radiation protection program is to ensure that remediation activities are conducted in full compliance with all NRC regulations, and that all occupational radiation exposures are within the limits of 10 CFR Part 20 and are reduced to ALARA levels. The radiation protection program is described in the RPP, as supplemented.

To control occupational exposures, restricted areas will be identified and posted, and access to them will be controlled. In addition, Cimarron uses administrative limits to control occupational exposures for the whole body, skin, eye lens, and extremities. They are established at 80 percent of the occupational dose limits of 10 CFR 20.1201. Specific annual administrative limits are, therefore, as follows:

Whole Body - The more limiting of the TEDE equal to 40 mSv (4 rem) or the sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue other than the eye lens being equal to 0.4 Sv (40 rem).

Skin - Shallow dose equivalent of 0.4 Sv (40 rem)

Eye lenses - Eye dose equivalent of 0.12 Sv (12 rem)

Extremities - Shallow dose equivalent of 0.4 Sv (40 rem)

Also to control occupational exposures, a special work permit (SWP) will be used to ensure workers understand: the tasks they are assigned; the equipment needed to perform the task; the task procedures; the radiation hazards in the work area; and the monitoring and personnel protection requirements for the task. The RSO or a designee will approve all SWPs before they are implemented.

Personnel external monitoring will be accomplished through the use of individual monitoring devices, film badges, and radiation surveys. The film badges will be processed for dose reading by a laboratory or vendor accredited under the National Voluntary Laboratory Accreditation Program. Personnel surveys will be performed before exiting radiologically controlled areas.

Personnel internal monitoring will be accomplished through the air monitoring program, and in-vivo or in-vitro bioassay sampling. Bioassay sampling will be performed at the direction of the RSO and whenever a calculated intake of 40 DAC-hours may have occurred in any one incident, based on air sampling data, accident conditions, equipment failure, external contamination, or other conditions.

Respiratory protection equipment will be available and will be used in compliance with Subpart H, "Respiratory Protection and Controls to Restrict Internal Exposure in Restricted Areas." Cimarron's Respiratory Protection Program plans to use elements from NUREG-0041, "Manual of Respiratory Protection against Airborne Radioactive Material" (Reference 7).

A contamination control program will be implemented to minimize the spread of contamination. The limit for the restricted areas of the facility is 5000 dpm/100 cm^2 (5000 dpm/15.5 in^2) removable alpha. The licensee will designate Contaminated Area Control for areas that exceed the 1000 dpm/100 cm^2 (1000 dpm/15.5 in^2) removable alpha limit. ALARA will be a consideration when selecting decontamination methods.

An ALARA program will be implemented to ensure that exposures are reduced to ALARA levels. This program will encompass work task preparation and planning, engineering controls, personnel, design, equipment, monitoring devices, controls, and training. The licensee will have an ALARA Committee that will ensure that ALARA policy, philosophy, commitments, and regulatory requirements are integrated into all appropriate work activities.

NRC staff found the dose limits stated in the RPP, along with additional clarification regarding these limits as provided in submittals dated May 16,

1997, and June 30, 1997, are in accordance with 10 CFR Part 20 and are acceptable.

4.7.3 Unrestricted-Use Specifications

The licensee proposed to use the unrestricted-use criteria listed in the 1987 NRC "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source or Special Nuclear Material" (Reference 5) for surfaces of buildings and equipment, and the BTP (Reference 3) for soils. Specific values are as follow:

Surfaces of buildings and equipment -

5000 dpm alpha/100 cm^2 (5000 dpm/15.5 in^2), averaged more than 1 m^2 (10.8 ft^2);
5000 dpm beta-gamma/100 cm^2 (5000 dpm/15.5 in^2), averaged more than 1 m^2 (10.8 ft^2);
15,000 dpm alpha/100 cm^2 (15,000 dpm/15.5 in^2), maximum 1 m^2 (10.8 ft^2);
15,000 dpm beta-gamma/100 cm^2 (15,000 dpm/15.5 in^2), maximum over 1 m^2 (10.8 ft^2);
1000 dpm alpha/100 cm^2 (1000 dpm/15.5 in^2), removable;
1000 dpm beta-gamma/100 cm^2 (1000 dpm/15.5 in^2), removable

Soils -

Natural uranium	0.37 Bq/g (10 pCi/g) total uranium
Enriched uranium	1.1 Bq/g (30 pCi/g) total uranium
Depleted uranium	1.3 Bq/g (35 pCi/g) total uranium
Natural thorium	0.37 Bq/g (10 pCi/g) total thorium

Exposure rates are as follow:

Surfaces of buildings and equipment -

1.3 pC/kg (5 μR/hr) above background at 1 m (3.3 ft)

Soils -

2.6 pC/kg (10 μR/hr) average above background at 1 m (3.3 ft)
5.2 pC/kg (20 μR/hr) maximum above background at 1 m (3.3 ft)

Section 13 of the RPP describes Cimarron's program for surveying materials for unconditional release as well as calibration of the survey equipment and radiological analysis and characterization to be used. Radiological surveys will be performed in accordance with NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination" (Reference 8). Final radiation surveys will be performed to ensure that radioactive material meets the averaging criteria in NUREG/CR-5849. The objective of these procedures is to demonstrate, with a 95 percent confidence level, that there are no radioactive hot spots having levels that exceed the averaging criteria in NUREG/CR-5849. These criteria address averaging concentrations over any 100-m^2 (1076-ft^2) area (A) using the $(100/A)^{½}$ elevated area criteria. Material that exceeds the averaging criteria in NUREG/CR-5849 will be removed and shipped offsite to a licensed LLW disposal site.

Cimarron proposed the use of alternative methodologies for volumetric averaging of waste ponds 1 and 2 in Phase III Subarea O, and concrete rubble in Phase II Subarea F.

By letter of July 1, 1997, NRC staff noted its concern with high levels of uranium in waste ponds 1 and 2. In response, by letter of August 26, 1997, Cimarron agreed to re-enter and decommission the two waste ponds in accordance with the BTP Option 1 criteria, using the approach that was identified in NRC's February 25, 1997, letter, "Method for Surveying and Averaging Concentrations of Thorium and Subsurface Soil," for evaluating soil concentrations. This method applies an averaging protocol to volumetrically contaminated material to minimize overall doses to an intruder. Although this guidance focused on thorium, the NRC letter noted that it could be applied to uranium.

Similarly, Cimarron proposed the use of alternative methodology for volumetric concentration averaging of the concrete rubble in Subarea F. Surveys that were conducted at Subarea F used criteria that differed from those in NUREG/CR-5849 and indicated values that exceed the surface contamination criteria listed above. To demonstrate that this concrete rubble meets the BTP Option 1 criteria for free release (1.1 Bq/g (30 pCi/g) total uranium), Cimarron proposed the use of a risk-based dose assessment.

To determine the acceptability of the residual radioactivity on the concrete, the licensee evaluated the levels of surface contamination on the concrete and converted the surface contamination to an effective volumetric concentration. The resulting effective volumetric concentration ranged from 0.03 to 0.27 Bq/g (0.8 to 7.4 pCi/g) total uranium. This is below the BTP Option 1 limit of 1.1 Bq/g (30 pCi/g) total uranium. The total inventory of uranium in the concrete

was calculated to be 1.7E-08 Bq (4.7E-03 Ci). In addition to the direct comparison to the 1.1 Bq/g (30 pCi/g) limit, the licensee performed dose assessments using the RESRAD pathway analysis/dose assessment code and the resident farmer scenario. The maximum dose was estimated to be approximately 0.01 mSv/yr (1 mrem/yr) after 900 years.

The overall average exposure rate at 1 m (3.3 ft) from the concrete surface was 1.8 pC/kg (7 μR/hr), with a maximum exposure rate of 2.6 pC/kg (10 μR/hr). A background exposure rate was not subtracted from these values. The exposure rates are well below the SDMP Action Plan criteria of 2.6 pC/kg (10 μR/hr), above background at 1 meter (3.3 ft). In addition, the sediment downstream of the concrete was sampled and no contamination above background was identified.

As the average surface contamination levels exceed values of "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source or Special Nuclear Material" (Reference 5), the NRC staff requested an additional assessment to evaluate the potential dose from the resuspension of the surface contamination. The licensee performed dose calculations using two scenarios: 1) a resident farmer scenario, and 2) a trespasser dose assessment. The dose assessments were performed using conservative assumptions as to the amount of resuspended contamination. The resulting doses from the two scenarios were 0.002 mSv/yr (0.2 mrem/yr) and 0.0002 mSv/yr (0.02 mrem/yr), respectively.

NRC staff has reviewed the alternative methods that Cimarron proposed for the waste ponds in Subarea O and the concrete rubble in Subarea F and found them to be acceptable. Cimarron is following the NRC guidance provided for volumetric averaging in the waste ponds and volumetric concentration averaging for the concrete rubble.

Another area of concern was in regard to high concentrations of uranium in the groundwater. As previously noted, the EPA proposed groundwater standard for total uranium is 1.1 Bq/l (30 pCi/l) for community drinking water or individual household use. However, Cimarron maintains, and ODEQ agrees, that the naturally poor quality of groundwater and surface water at the Cimarron site, as well as the availability of other sources of water in the area, make it unlikely that the groundwater will ever be used for domestic or agricultural purposes.

Cimarron has proposed a groundwater standard of 6.7 Bq/l (180 pCi/l) for total uranium which it has demonstrated to equate to the allowable 0.25 mSv/yr (25 mrem/year) TEDE to the hypothetical individual drinking the water. NRC staff

found the proposed groundwater standard of 6.7 Bq/l (180 pCi/l) for total uranium to be acceptable because the 0.025 mSv/yr (25 mrem/yr) dose associated with that standard, when added to the negligible dose from all other pathways, is well below the 0.1 mSv/yr (100 mrem/yr) limit of 10 CFR 20.1301, for individual members of the public. In addition, the likelihood of this groundwater ever being used for domestic or agricultural purposes is low.

Cimarron has proposed to take quarterly samples from the wells that currently exceed the proposed groundwater standard of 6.7 Bq/l (180 pCi/l) for total uranium until eight successive samples are below the standard. In addition, Cimarron's March 4, 1999, submittal included a contingency plan for dealing with wells, that may unexpectedly exceed the proposed standard for a period of 1 year or more. It should be noted that in consideration of past variability in groundwater monitoring results, NRC will not terminate Cimarron's license until it has been demonstrated that the concentrations in all wells have been below the proposed standard for eight consecutive samples (the past 2 years). Also, ODEQ may require continued groundwater monitoring of non-radioactive components under its authority.

In regard to the onsite disposal of BTP Option 2 material, Cimarron will comply with License Condition 23. Likewise, Cimarron will comply with License Condition 18 and dispose of radioactive material that exceeds BTP Option 2 criteria at a licensed LLW disposal facility. Consequently, NRC staff found the proposed criteria are consistent with the 0.1 mSv/yr (100 mrem/yr) dose limit of 10 CFR 20.1301, for individual members of the public.

4.8 QA/Quality Control Plan

Cimarron's QA program is described in Section 3.2 of the DP. Cimarron's QA program was reviewed in the NRC staff's approval of Cimarron's RPP (Amendment 14). Cimarron's radiation protection program conforms with Cimarron's QA plan. Cimarron's QA plan is designed to implement the applicable requirements of the "Quality Assurance Requirements for Nuclear Facility Applications (ASME/NQA-1)." Section 5 of the RPP describes the audits and surveillances Cimarron has in place to assure that its radiation protection program activities comply with the license and regulatory requirements and are performed within established policies and recognized good practices.

The NRC staff found Cimarron's QA program to be acceptable.

4.9 Emergency Planning

Emergency procedures are provided in Cimarron's HASP. These procedures address specific actions to be taken by Cimarron staff in case of an emergency. Potential emergencies include accidents, accidental releases, fires, explosion, and natural disasters. Emergency procedure training is also addressed in Cimarron's HASP.

Offsite assistance can be provided, if necessary, by the Logan County Sheriff Department and fire departments in Guthrie or Crescent, Oklahoma, and from local hospitals. The Program Manager will ensure that local fire, police, and medical emergency units are aware of the decommissioning activities and emergency procedures. A list of personnel to be contacted in case of an emergency will be provided to Cimarron remediation staff and security officers.

The NRC staff has determined that Cimarron's Emergency Planning Program is adequate for decommissioning activities at the Cimarron site.

4.10 Physical Security

Physical security and material control are discussed in Section 6.0 of the DP. NRC staff previously reviewed this part of Cimarron's program in approval of Cimarron's RPP (Amendment 14). Access control at Cimarron, as described in Section 8 of the RPP, is based on a three-fold program: (1) fences and security guards are stationed to control physical access to restricted and radiologically controlled areas; (2) radiologically controlled area boundaries are defined by posting barriers, ropes, etc; and (3) personnel, individuals, and visitors at the site are given the appropriate levels of access, training, and dosimetry commensurate with their activity at the site. Figure 2.2 illustrates the boundaries of the Controlled, Restricted, and Unrestricted areas. Areas containing radioactivity will be posted in accordance with 10 CFR Part 20 requirements."

In addition, by letter of October 26, 1998, Cimarron noted its plans to discontinue security guard coverage. NRC staff reviewed this proposal and determined that there is no special nuclear material onsite and all known material exceeding BTP Option 2 criteria has been removed from the site. Fencing and lockable gates are in place to control access to the site. By letter of December 11, 1998, Cimarron provided revisions to sections of the RPP where the use of security guards is described. NRC reviewed this submittal and found the elimination of security guards at the site is acceptable provided that access gates to the facility are locked and secured when no personnel are

onsite. NRC staff concludes that the access control program is acceptable for ensuring that workers and individuals at the site will be trained and authorized for access to controlled areas, as appropriate.

5. AGENCIES AND INDIVIDUALS CONSULTED, AND SOURCES USED

This SER was prepared entirely by NRC staff in consultation with the U.S. Fish and Wildlife Service (FWS) and the ODEQ. Input from the FWS is discussed in Section 6.2.5 of the EA. Based on its review of a draft copy of the EA, by letter of June 24, 1999, ODEQ stated that if NRC releases the site for unrestricted use, ODEQ reserves the right to require Kerr-McGee to continue monitoring the site for non-radiological components. NRC incorporated this comment into Section 5.2.3 of the EA.

ODEQ also commented that it would like to continue to review the final remediation work plans and other items addressing the decommissioning and decontamination of the Cimarron facility. NRC staff agrees and will continue to coordinate with ODEQ staff.

No other sources were used beyond those referenced in this SER.

6. CONCLUSION

NRC staff has reviewed:

(1) Cimarron's proposed DP, including the "Groundwater Evaluation Report" and supplements.

(2) Cimarron's proposed revisions to License SNM-928.

(3) Cimarron's proposed revisions to the RPP.

(4) Cimarron's proposed revisions to its organizational structure.

Based on this review, NRC staff concluded that Cimarron's DP (including the "Groundwater Evaluation Report") and proposed revisions, as supplemented, are necessary and acceptable for Cimarron to complete the remainder of the decommissioning activities at the Cimarron site while protecting public health and safety. License termination is a separate action that requires an NRC finding that the premises are suitable for release.

Based on its review of Cimarrons proposals, NRC staff will incorporate the following conditions into a revised license:

1. The following license condition will be added to tie Cimarron to commitments made in the DP, "Groundwater Evaluation Report", and supplements to these submittals:

> The licensee is authorized to remediate the Cimarron facility in accordance with the "Decommissioning Plan for Cimarron Corporation's Former Nuclear Fuel Fabrication Facility at Crescent, Oklahoma" dated April 19, 1995, with supplemental correspondence dated September 10, 1996; May 6; 1997, August 26, 1997; March 10, 1998; March 12, 1998; June 15, 1998; October 6, 1998; and March 4, 1999.

2. In its "Groundwater Evaluation Report" dated July 30, 1998, and supplemented by letter of March 4, 1999, Cimarron proposed a groundwater standard of 6.7 Bq/l (180 pCi/l) total uranium and committed to continue to monitor groundwater in burial area 1. Cimarron also committed to retain control of the property licensed under NRC Radioactive Material License SNM-928 until the proposed criteria are met. In consideration of past variability in groundwater monitoring results, NRC will not terminate Cimarron's license until it has been demonstrated that the concentrations in all wells have been below the proposed standard for eight consecutive samples (the past 2 years). Therefore NRC will add the following license condition:

> The release criteria for groundwater at the Cimarron site is 6.7 Bq/l (180 pCi/l) total uranium. NRC will not terminate Radioactive Material License SNM-928 until Cimarron demonstrates that the total uranium concentrations in all wells have been below the groundwater release criteria for eight consecutive quarterly samples (the past 2 years). Cimarron will retain control of the property licensed under NRC Radioactive Material License SNM-928 until the groundwater release criteria are met.

3. NRC staff reviewed Cimarron's submittals dated June 30, 1997, and April 3, 1998, requesting revision of licensee submittals referenced in License Condition 10. NRC staff revised License Condition 10 as follows:

> For use in accordance with statements, representations, and conditions contained in letters dated April 12, 1995, July 5, 1995, April 25, 1996, August 28, 1996, and November 20, 1996, letters dated November 19, 1985, March 3, 1986, and November 2, 1989; letter dated June 24, 1992;

letters dated September 4, 1987, February 25, 1993, April 19, 1994, May 31, 1994, July 20, 1994, September 21, 1994, and November 3, 1994; letters dated December 16, 1994, and June 5, 1995; letter dated January 23, 1996; letters dated August 9, 1995, and November 13, 1995; letters dated November 15, 1994, September 20, 1996, January 12, 1997, and May 16, 1997; letter dated May 6, 1997; letters dated August 22, 1990, and September 14, 1990; letters dated April 25, 1996, and June 10, 1996; and letters dated July 25, 1995; January 8, 1997; February 10, 1998; December 5, 1997; June 26, 1998; and July 2, 1998.

4. By letter of April 30, 1997, Cimarron requested an amendment to its license to add a new license condition specifically establishing BTP Option 1 unrestricted-use residual contamination criteria as the cleanup standard for the Cimarron site. In addition to this revision, NRC staff will make the following revision to the license to include all releasable materials:

> Cimarron shall use the unrestricted use criteria listed in the August 1997 "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source or Special Nuclear Material" for surfaces of buildings and equipment, and the Branch Technical Position, "Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations," for soils or soil-like material. Specific values are as follow:
>
> Surfaces of buildings and equipment -
>
> 5,000 dpm alpha/100 cm^2 (15.5 in^2), averaged over 1 m^2 (10.8 ft^2);
> 5,000 dpm beta-gamma/100 cm^2 (15.5 in^2), averaged over 1 m^2 (10.8 ft^2);
> 15,000 dpm alpha/100 cm^2 (15.5 in^2), maximum over 1 m^2 (10.8 ft^2);
> 15,000 dpm beta-gamma/100 cm^2 (15.5 in^2), maximum over 1 m^2 (10.8 ft^2);
> 1,000 dpm alpha/100 cm^2 (15.5 in^2), removable;
> 1,000 dpm beta-gamma/100 cm^2 (15.5 in^2), removable
>
> Soils -
>
> | | |
> |---|---|
> | Natural uranium | 0.37 Bq/g (10 pCi/g) total uranium |
> | Enriched uranium | 1.1 Bq/g (30 pCi/g) total uranium |
> | Depleted uranium | 1.3 Bq/g (35 pCi/g) total uranium |
> | Natural thorium | 0.37 Bq/g (10 pCi/g) total thorium |

Exposure rates are as follow:

Surfaces of buildings and equipment -

1.3 pC/kg (5 μR/hr) above background at 1 m (3.3 ft)

Soils -

2.6 pC/kg (10 μR/hr) average above background at 1 m (3.3 ft)
5.2 pC/kg (20 μR/hr) maximum above background at 1 m (3.3 ft)

Soils and soil-like material with concentration exceeding the BTP Option 1 limits, but less than the Option 2 Limits may be disposed of in the onsite disposal cell, in accordance with License Condition 23.

The licensee shall conduct a final survey and sampling program to ensure that residual contamination meets the unrestricted use criteria in this license. Buildings, equipment, and outdoor areas shall be surveyed in accordance with NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination." Radioactivity levels shall not exceed the averaging criteria in NUREG/CR-5849.

For areas surveyed before the issuance of NUREG/CR-5849, in the applicable final survey report, the licensee shall describe the survey methods used and provide the applicable references.

Soils and soil-like materials with elevated activities exceeding the unrestricted use criteria shall be investigated to determine compliance with the averaging criteria in NUREG/CR-5849. These criteria address averaging concentrations over any 100 m^2 (1070 ft^2) area and use the $(100/A)^{½}$ elevated area method.

For waste ponds 1 and 2 in Phase III Subarea 0, the licensee may use the "Method for Surveying and Averaging Concentrations of Thorium in Contaminated Subsurface Soils" (reference NRC letter dated February 25, 1997) for volumetric concentration averaging of enriched uranium in soils.

For concrete rubble located in Phase II and Phase III Subareas, the licensee may use the concentration averaging for concrete rubble as described in submittals dated March 10, 1998, June 15, 1998, and October 6, 1998.

Material that exceeds the above averaging criteria shall be removed and shipped offsite to a licensed low-level radioactive waste disposal site.

5. NRC staff has reviewed the proposed revisions to the Radiation Protection Plan (including organizational changes) dated January 23, 1998, June 29, 1998, October 26, 1998, and December 11, 1998 and will revise License Condition 26 to read as follows:

Cimarron shall conduct a radiation protection program in accordance with Annex A "Radiation Protection Plan," dated September 20, 1996, and supplements dated January 12 1997, May 16, 1997, June 30, 1997, January 23, 1998, June 29, 1998, October 26, 1998, and December 11, 1998.

During remediation operations, liquid and airborne effluents shall be sampled and analyzed to ensure that releases meet the requirements of 10 CFR Part 20, Appendix B.

6. By letters of October 26, 1998 and December 11, 1998, Cimarron noted its plans to discontinue the use of security guards at the Cimarron site. NRC staff reviewed this submittal and found the elimination of security guards at the site is acceptable provided that access gates to the facility are locked and secured when no personnel are onsite and fences and locks will be maintained. NRC staff will therefore add the following license condition:

Access gates the Cimarron facility shall be locked and secured when no personnel are onsite and fences and locks will be maintained.

7. In view of the previous request to amend the license to incorporate changes to Cimarron's organizational structure, NRC staff will add the following new condition to allow minor changes without prior NRC approval:

The licensee is authorized to make certain changes to the NRC-approved Decommissioning Plan (DP), Radiation Protection Plan (RPP), and associated procedures without NRC's approval, if these changes are consistent with the as-low-as-reasonably-achievable (ALARA) principle and the decommissioning process. All changes shall be approved by the Cimarron ALARA Committee, subject to the following:

1. The licensee may, without prior NRC approval, and subject to the requirements specified in Parts 2 and 3 of this condition:

   a. Make changes in the facility or process, as presented in the NRC-approved DP and RPP;

b. Make changes in the procedures presented in the NRC-approved DP, RPP, or applicable license conditions; and

c. Conduct tests or experiments not present in the NRC-approved DP or applicable license conditions.

2. The licensee shall not be required to file an application for an amendment to the license when the following conditions are satisfied;

a. The change, test, or experiment does not conflict with requirements specifically stated in the license (excluding those aspects addressed in Part 1 of this condition), or impair the licensee's ability to meet all applicable NRC regulations;

b. There is no degradation in safety or environmental commitments addressed in the NRC-approved DP or RPP, or have a significant adverse effect on the quality of the work, the remediation objectives, or health and safety; and

c. The change, test, or experiment is consistent with the conclusions of actions analyzed in the Environmental Assessment (dated July 29,1999) and Safety Evaluation Report (dated August 20, 1999).

3. If any of these conditions are not met for the change, test, or experiment under consideration, the licensee is required to submit a license amendment application for NRC review and approval. The licensee's determinations as to whether the above conditions are met will be made by the facility's ALARA committee. All such determinations shall be documented. The licensee shall provide in an annual report to NRC, a description of all changes, tests, and experiments made or conducted pursuant to this condition, including a summary of the safety and environmental evaluation of each such action. As part of this annual report, the licensee shall include any DP or RPP pages revised pursuant to this condition. The records shall be retained until license termination. The retained records shall include written safety and environmental evaluations, made by the ALARA committee, that provide the basis for determining whether or not the conditions are met.

The ALARA Committee shall consist of a minimum of three individuals employed by the licensee, and one of these shall be designated as the

ALARA Committee chairman. One member of the ALARA Committee shall have expertise in management and shall be responsible for approval of managerial and financial changes; one member shall have expertise in decommissioning and shall have responsibility for implementing any decommissioning changes; and one member shall be the site Corporate Radiation Safety Officer or equivalent, with the responsibility for assuring changes conform to radiation safety and environmental requirements. Additional members may be included in the ALARA Committee as appropriate, to address technical aspects such as health physics, groundwater hydrology, surface-water hydrology, specific earth sciences, and other technical disciplines. Temporary members or permanent members, other than the three above-specified individuals, may be consultants.

7. REFERENCES

1. Chase Environmental Group, Inc., "Decommissioning Plan for Cimarron Corporation's Former Nuclear Fuel Fabrication Facility, Crescent, Oklahoma," April 1995.

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ENCLOSURE 3