CHASE ENVIRONMENTAL GROUP, INC.
environmental engineering, remediation & consulting

FINAL STATUS SURVEY PLAN FOR PHASE III AREAS

for
Cimarron Corporation's Former
Nuclear Fuel Fabrication Facility
Crescent, Oklahoma

License Number: SNM-928

Prepared for:

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Oklahoma City, Oklahoma

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FINAL STATUS SURVEY PLAN FOR PHASE III AREAS

1.0 Purpose

This Phase III Plan is the third and final phase of the overall Final Status Survey Program being submitted by Cimarron Corporation (Cimarron) to the Nuclear Regulatory Commission (NRC). The purpose of this plan is to establish the requirements needed for the release of each area of the Cimarron site that has been previously remediated or surveyed and determined to be clean as part of the site decommissioning process. The results of the Phase III Final Status Survey will provide final survey data demonstrating that radiological parameters are satisfied for unrestricted release of all Cimarron site areas.

As described in the April 1995 Cimarron Decommissioning Plan, the Final Status Survey Plan for the Cimarron site was separated into three phases. The Phase I Plan titled "Final Status Survey Plan for Unaffected Areas" was submitted to and approved by the NRC. The Phase I Final Status Survey was completed and the Report submitted to the NRC on August 9, 1995. A license amendment, releasing this area from the site license (Amendment No. 13), was issued by the NRC on April 23, 1996. Phase I included only unaffected areas. This release reduced the acreage remaining under license from 840 acres to 152 acres.

The Phase II Final Status Survey Plan was submitted to the NRC in July 1995, and was approved by the NRC on March 14, 1997. The Phase II Plan included known affected and some contiguous unaffected areas of the Cimarron site. Cimarron has substantially completed the remediation of Phase II areas and has begun generating the final status survey data showing that requirements for unrestricted release of these areas from the license are met.

This Phase III Plan includes only affected areas, some of which have previously been released by the NRC. A description of those areas released is included with this Plan. Where required, this Phase III Plan provides a description of methodologies to be followed for additional surveying and sampling to be conducted on remediated Phase III areas. Existing characterization data and any new characterization data will be compiled into the Phase III Final Status Survey Report and submitted to the NRC. This Report will be submitted in support of a license amendment request for the unrestricted release of all Phase III areas from Cimarron License SNM-928. Upon submittal of this Phase III Report, final status surveys for the entire Cimarron site will have been completed.

2.0 Background

Cimarron Corporation, a subsidiary of Kerr-McGee Corporation, operated two plants near Crescent, Oklahoma, for the manufacture of enriched uranium and mixed oxide reactor fuels. The 840 acre Cimarron Facility site was originally licensed under two separate SNM Licenses. License SNM-928[1] was issued in 1965 for the Uranium Plant (U-Plant) and License SNM-1174[2] was issued in 1970 for the Mixed Oxide Fuel Fabrication (MOFF) Facility. Both facilities operated through 1975, at which time they were shut down and decommissioning initiated.

Decommissioning efforts at the MOFF Facility were completed in 1990 and Cimarron Corporation applied to the NRC on August 20, 1990[3], to terminate License SNM-1174. After confirmatory surveys by Oak Ridge Associated Universities (ORAU), the NRC terminated the MOFF Facility License, SNM-1174, on February 5, 1993[4]. The land surrounding the MOFF building remained under License SNM-928.

Decommissioning efforts involving characterization, decontamination, remediation, and surveying for the 840 acres licensed under SNM-928 were initiated in 1976 and are nearing completion. The goal of the decommissioning effort is to release the entire 840 acre site for unrestricted use. Kerr-McGee Chemical Corporation will continue to operate research and development activities at the site that do not require licensing by the NRC.

Based upon historic knowledge of site operations and characterization work completed, the Cimarron Radiological Characterization Report[5] was submitted in October 1994 to the NRC. As discussed in that report, the site was divided into affected and unaffected areas. Affected areas are areas in which residual radiological contamination has been identified or where historical information indicates the potential for radiological contamination. Unaffected areas are areas which are not expected to contain residual contamination. The affected and unaffected areas are shown on Drawing No. 95MOST-RF3. For the Final Survey Plan the entire 840 acre site has been divided into three major areas which contain both affected and unaffected areas. Each of these three major areas are also shown on Drawing No. 95MOST-RF3 and are designated by Roman Numerals I, II, and III (herein referenced as Phases I, II, and III). These three major areas were then further subdivided into smaller subsections (i.e. A, B, C, D, etc.).

In the Cimarron Decommissioning Plan[6], the Final Status Survey Plan (Phases I, II and III) was discussed in general terms, with the understanding that each of the three phases would be submitted to the NRC under separate cover for approval. The first of these three phases (Phase I[7]) was reviewed by the NRC

$$30 \text{ acres} \times \frac{4047 \text{ m}^2}{1 \text{ acre}} = 121,410 \text{ m}^2$$

and the NRC submitted their comments to Cimarron Corporation on February 24, 1995[8]. The NRC's comments were addressed and incorporated into both the Phase I plan and the Phase II plan as applicable. The Phase I plan was approved by the NRC via letter dated May 1, 1995[9]. The surveys and soil sample analyses for Phase I were completed and the Final Status Survey Report for Phase I was submitted to the NRC on August 9, 1995[10]. Cimarron Corporation responded to the NRC's comments[11] on the Phase I Report by letter dated November 13, 1995[12]. Confirmatory sampling for the Phase I areas were completed by the Oak Ridge Institute for Science and Education (ORISE). The ORISE report was submitted to the NRC, and a license amendment releasing this area from License SNM-928 was issued by the NRC and sent to Cimarron Corporation on April 23, 1996[13]. The Phase I area represents approximately 688 acres of the original licensed 840 acre site. Approximately 152 acres remain under license SNW-928 and are addressed in Phase II and III.

The area designated as Phase II on Drawing No. 95MOST-RF3 contains both affected and unaffected areas. The Phase II Area includes Burial Area #1, which had materials excavated and shipped off-site for disposal. This Phase II Area was released by the NRC per License Amendment #9[14] for backfilling with clean soil in 1992. Also included in Phase II are the East and West Sanitary Lagoons (also released for backfilling per License Amendment #9), the MOFF Plant yard area, the Emergency Building, the Warehouse Building (Building #4) and surrounding yard, and numerous stormwater drainage areas. The Final Status Survey Plan for Phase II was submitted to the NRC in July 1995[15]. The Phase II Final Status Survey Plan was approved by the NRC on March 14, 1997[16]. Final status surveying and soil sampling are currently being conducted for Phase II by Cimarron personnel. This area represents approximately 122 acres of the 152 acres remaining after release of Phase I.

The Phase III area survey is the last phase for completing the final status survey for the entire Cimarron site. This area is designated as Phase III on Drawing No. 95MOST-RF3 and consists of approximately 30 acres. The Phase III area includes the Uranium Processing buildings and yard area, Burial Areas #2 and #3, the New Sanitary Lagoon, the NRC approved BTP Option #2 On-Site Disposal Cell (Burial Area #4), and the Five Former Waste Water Ponds consisting of the Uranium Waste Ponds #1 and #2, the Plutonium Waste Pond, the Uranium Emergency Pond, and the Plutonium Emergency Pond.

3.0 Site Description

The Cimarron Facility is located in Logan County, Oklahoma, on the south side of the Cimarron River approximately 0.5 miles north of the intersection of

Oklahoma State Highways #33 and #74. Figure 3.1 shows the site location. The 840 acre site is located in an area of low, rolling hills and incised drainages. Local elevations range from about 940 feet along the river to 1,010 feet Mean Sea Level at the plant. The county is primarily rural with an economy primarily based upon agriculture and ranching. The entire site is owned by Cimarron Corporation, a wholly owned subsidiary of Kerr-McGee Corporation.

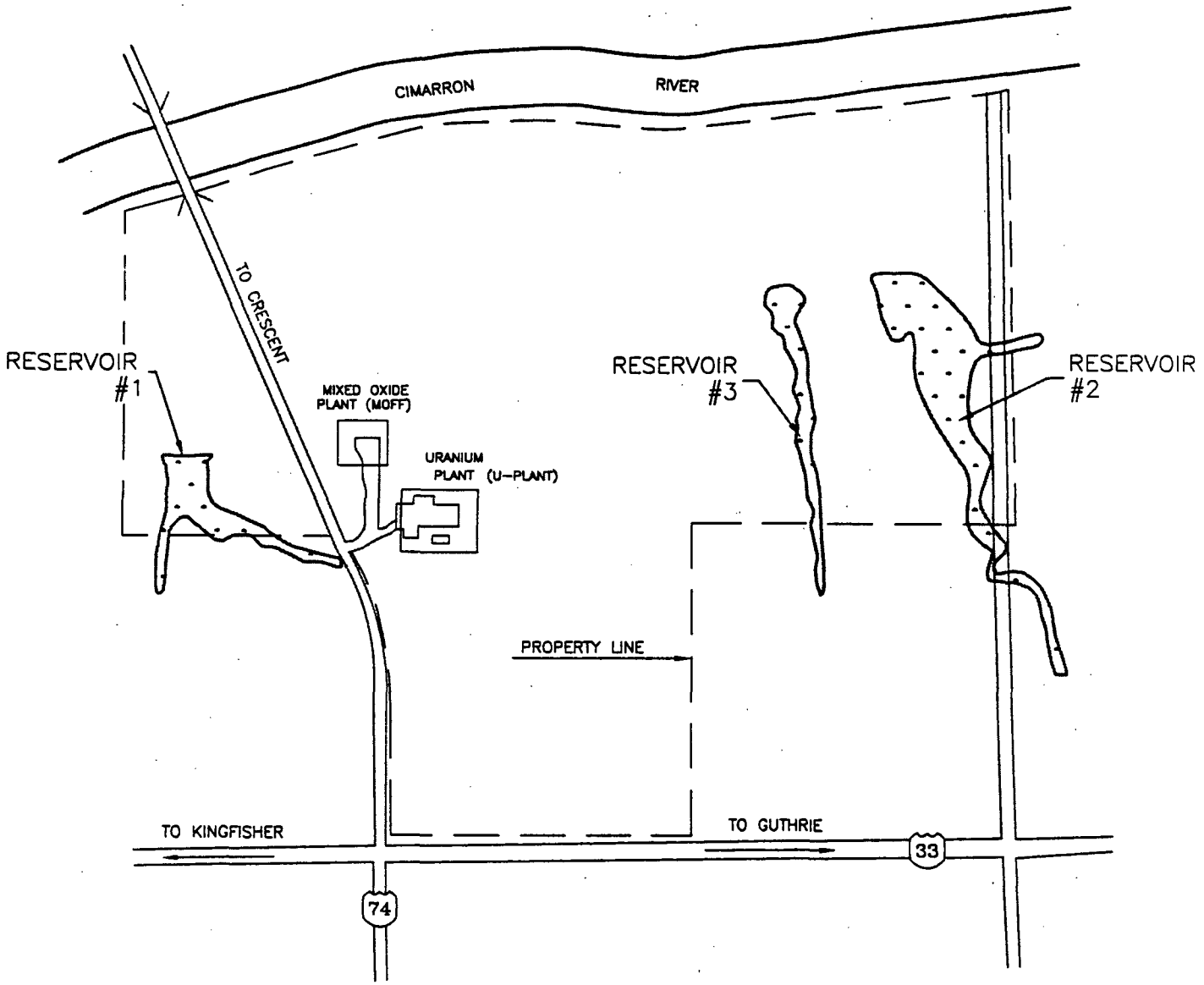
4.0 Facility Description

The U-Plant was constructed to be a complete nuclear fuel service facility. Operations provided for the production of UO_2, UF_4, uranium metal and the recovery of scrap materials. In 1968 the plant was expanded by increasing the UO_2 and Pellet facilities through the installation of another complete production line for the production of fuel pellets. In 1969 fabrication facilities were added for the production of fuel pins. In 1970 facilities were added for the production of the fuel elements. Equipment initially installed for the recovery of enriched scrap material was not used after work performed under a scrap recovery contract was completed in 1970. All equipment utilized in fuel production activities has been either decontaminated and removed from the site for salvage or packaged and transported off site for disposal at a commercial LLRW facility (Barnwell, S.C.).

The process facilities included several one-story sheet metal exterior buildings (U-Plant), five process related collection ponds, two original sanitary lagoons, a newer synthetic-lined sanitary lagoon, a waste incinerator, several uncovered storage areas, and three burial areas. As discussed in this Plan, these areas (herein referred to as "units") are currently at differing stages of completion with respect to decommissioning. The general site layout is shown on Drawing No. 96MOST-RF15. Included within the affected areas are several drainage ways and the site road to the old burial area (Burial Area #1). Cimarron's site decommissioning efforts are discussed at length in both the Characterization Report[5] and the Decommissioning Plan[6].

5.0 History of Site Operations

The Cimarron Facility was originally licensed under two separate licenses. License SNM-928 was issued for the U-Plant Facility and License SNM-1174 was issued for the MOFF Facility. License SNM-928 was originally issued in 1965 to Kerr-McGee Nuclear Corporation for the manufacture of enriched uranium reactor fuels. Both facilities terminated production operations in 1975.



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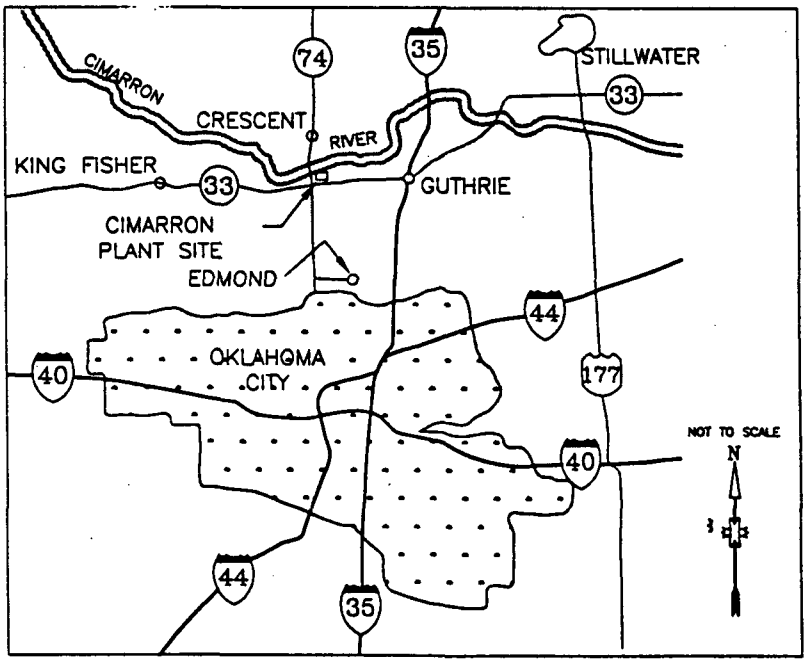

Cimarron Corporation
Crescent Oklahoma Facility
Location Map
Figure 3.1

Decontamination and decommissioning of the MOFF Facility was completed by 1990, and the license was terminated by the NRC in 1993[4]. The U-Plant Facility decommissioning is nearing completion with several remaining locations in the final stages of remediation.

6.0 Final Status Survey Overview

The purpose of this section is to discuss briefly the status of the substantially completed Phase III remediation effort and to present the radiological criteria and guideline values utilized throughout this phase of the decommissioning process. The radiological criteria and guideline values for Phase III areas are identical to those utilized for both the Phase I and Phase II areas, except for the recent NRC guidance on subsurface volumetric averaging to be applied to Uranium Waste Ponds #1 and #2. Phase III contains only the affected areas which are shown on Drawing No. 95MOST-RF15. The status of this area is discussed in this section along with the additional sampling and survey requirements required to complete the Final Status Survey. The Phase III area has been divided into five sub-areas which are designated as K, L, M, N, and O.

In general, for Phase III areas, Cimarron Corporation has committed to follow the methodology prescribed in NUREG/CR-5849 for performing the Final Status Survey. The Final Status Survey will be conducted after fairly comprehensive efforts have been made to identify, evaluate, and if necessary remove any areas of residual activity exceeding the guideline value. The Final Status Survey Reports for this area will include all necessary (and in many instances much more) data to support the Final Status Survey and will also include an evaluation of the data presented.

6.1 Identification of Contaminants

Based upon the knowledge of past site operations, the results of numerous characterization efforts to date, and other independent characterization efforts by regulatory agencies and their respective subcontractors, the radiological contaminants on the Cimarron site have been determined to consist of U-234, U-235 and U-238. The uranium is comprised of natural, depleted, and enriched forms, with an average enrichment above the naturally occurring level. The average U-235 enrichment at Cimarron has been previously established as approximately 2.7 weight percent.

Thorium contaminated materials from the Kerr-McGee Cushing Facility were disposed in Burial Area #1. Burial Area #1 is located within the Phase II area and is an affected area that was remediated between 1986 and 1988. ORAU[17] performed a confirmatory survey, and the NRC released this area for backfill in accordance with Amendment #9[14] to License SNM-928. Also, Burial Area #2, located within the Phase III Area contained slightly elevated thorium in a small amount of waste and soil. Although thorium (Th-232) is not considered to be a principle contaminant at the Cimarron site, samples collected from certain affected areas are analyzed for natural thorium to ensure complete and accurate characterization.

Cimarron notified the NRC on October 1996[18] that Tc-99 (Technetium-99) has been discovered at the Cimarron Site in several wells and seeps located downgradient from Uranium Waste Ponds #1 and #2. Cimarron Corporation discovered the presence of Tc-99 through an extensive investigation into a high gross beta to gross alpha ratio that was present in several of the 1996 environmental groundwater samples. On April 22, 1997[19], the NRC informed Cimarron that based on the information provided by the company regarding the origin and concentrations of Tc-99 at the Cimarron facility, there is no need to list Tc-99 on the license. However, Cimarron is continuing to perform annual environmental groundwater monitoring for Tc-99 for several wells with elevated gross beta to gross alpha ratios.

6.2 Site Background Levels

Natural background levels for uranium and thorium in soil have been established through numerous measurements by Cimarron personnel utilizing the on-site soil counter and through independent laboratory analysis. Analytical results from Cimarron Corporation's environmental sampling program are reported to the NRC in the annual Environmental Report. This report provides sample analysis results for soil samples collected from numerous off-site locations which are representative of background in surrounding soils.

Cimarron personnel collected and analyzed 30 surface soil samples from the perimeter of the Cimarron site during the first quarter of 1995 to further validate background levels. These results are discussed in Cimarron Corporation's response to the NRC dated June 21, 1995[20], which was related to the release of the South U-Yard Area for backfill. Total uranium ranged from 2.3 pCi/g to 6.6 pCi/g, with the average being 4.0 ± 2.6 (2σ) pCi/g. These values were obtained using the

NOT gamma

ALPHA 'S/ Act. Formula for U in 10CFR20 :

$A = U_{NAT}\ [0.4 + 0.38(0.72) + 0.0034(0.72)^2] \times 10^{-6}$ Ci/gm

$B = U_{2.7\,w/o}\ [0.4 + 0.38(2.7) + 0.0034(2.7)^2] \times 10^{-6}$ Ci/gm

natural U: 0.67×10^{-6}

enriched U: 1.45×10^{-6}

$$\frac{A}{B} = \frac{SA_{U_{NAT}}}{SA_{U_{2.7\,w/o}}} = \frac{\text{ratio of specific}}{\text{ALPHA ACTIVITY}} = \frac{0.67}{1.5}$$

$$\left[\frac{40\ pCi\ \text{total}\ U_{2.7\,w/o}}{g_{soil}}\left|\begin{array}{l}\text{soil NaI counts}\\ \text{c.i.g to 2.7 w\% U}\\ \\ \text{Avg Bcorg}\end{array}\right.\right] \cdot \left[\frac{0.67\ Ci\ U_{NAT}}{1.5\ Ci\ U_{2.7\,w/o}}\right] = 1.8\ \frac{pCi\ U_{NAT}}{g_{soil}}$$

If 2.7 w/o enrichment in U-235

o/o Gamma	o/o TOTAL	Isotope
	7.5 o/o	U-234
	22 o/o	U-238
	3 o/o	U-235

Cimarron on-site soil counter (Counter No. 1). This on-site soil counter is calibrated to assume an enrichment of 2.7 weight percent as this is the average enrichment of materials processed.

A correction factor (0.67/1.5) was then applied to these results to convert the values from an assumed 2.7 weight percent enrichment to a natural enrichment. The converted results ranged from 1.0 pCi/g to 2.9 pCi/g with an average of 1.8 ± 1.0 (2σ) pCi/g total uranium.

It can therefore be stated that measurements of background soils will be less than or equal to 2.8 pCi/g total uranium 95 percent of the time after application of the correction factor (0.67/1.5 converts values from 2.7 weight percent enrichment to natural enrichment). The 2.8 pCi/g total uranium concentration (natural enrichment) represents the upper 95 percent confidence interval for total uranium found in Cimarron site soils. In like manner, the inverse of the subject correction factor multiplied times the analytical results reported in terms of natural enrichment produces results in terms of 2.7 weight percent enrichment. For example, this correction factor (1.5/0.67) when applied to the value of 1.8 pCi/g (average total uranium concentration; natural enrichment), produces a value of 4.0 pCi/g (average total uranium concentration; 2.7 weight percent enrichment). When using the Cimarron Corporation on-site soil counter, the average background value of 4.0 pCi/g total uranium is used. The NRC released the South U-Yard Area for backfill and approved these background values by letter dated July 7, 1995[21].

In addition to analyzing for total uranium, the 30 samples collected from the site perimeter were analyzed for natural thorium. The discussion on background for thorium is included in Cimarron Corporation's response to the NRC dated November 13, 1995[22]. The natural thorium background concentration was determined to range from 0.7 to 1.7 pCi/g.

B. Background exposure rate (μR/h) values

Background exposure rates have been established at the Cimarron site by taking micro-R readings at unaffected off-site sample locations and at Cimarron site areas which are unaffected by past operations. Site background exposure rates of approximately 7 μR/h have been observed in background areas by Cimarron personnel utilizing a Ludlum Micro-R survey meter. Site background exposure rates of approximately 7 μR/h have also been determined by ORISE personnel utilizing similar instrumentation. In addition, site background exposure rates have been determined by ORISE personnel utilizing a pressurized ion chamber (PIC)[23]. Based on the PIC measurements, the site background was determined to be approximately 10 μR/hr. Based upon these numerous

background assessments performed by both Cimarron and ORISE personnel, the background exposure rate at the Cimarron site has been determined to range from 7 to 10 μR/h. Cimarron conservatively uses 7 μR/h as a background exposure rate. This value will be utilized unless a different value is warranted due to changes in environmental variables (i.e., rock out-croppings).

6.3 Characterization Data

As discussed earlier, the Cimarron site has been subdivided into survey units. These units are naturally distinguishable or have a common history of characterization and decommissioning activities. Throughout most of the decommissioning process at the Cimarron site, a unit was characterized, remediated (if required), and resurveyed. The description of the decommissioning activities and final survey data were then submitted to the NRC for review and approval. After review of the submittal, the NRC either released the unit and/or contracted with ORISE (previously ORAU) to perform a confirmatory survey. Based upon the ORISE confirmatory survey (if requested by the NRC), the NRC would either release the unit or require additional remediation. The units which have been released by the NRC and are contained in this Phase III Plan are addressed in this section. Cimarron personnel have substantially completed the remediation and are in the final phases of surveying the remaining units on site utilizing the same NRC-approved procedures.

6.3.1 Areas Released by the NRC

As discussed in Section 2.0, the Phase III area comprises only affected areas including several areas which have been previously released for backfilling by the NRC. The affected areas, which have been released by the NRC and are included within this Phase III Plan, are discussed briefly below.

- Five Former Waste Water Ponds - The Five Former Waste Water Ponds, discussed in this section, provided a method of liquid waste control during facility operations. These five ponds included Uranium Waste Ponds #1 and #2, the Plutonium Evaporation and Emergency Ponds and the Uranium Emergency Pond. By early 1977, these ponds contained no free-standing liquid. The sludge remaining in four of these ponds was removed, mixed with cement, and

shipped off site for disposal at a licensed LLRW burial site. The other pond, Uranium Waste Pond #2, did not contain any sludge.

After the sludge was removed, Cimarron staff, the Oklahoma State Department of Health (October 1977), and the NRC (November 1977), sampled the soils/liner materials from each of the five ponds. Based upon the analysis results, Cimarron Corporation received written permission from the Oklahoma State Department of Health to backfill and cover these ponds on March 2, 1978[23]. Cimarron Corporation received written authorization from the NRC to backfill and cover these ponds on July 10, 1978[24]. These five ponds were backfilled and covered between August 3, 1978 and November 1, 1978. An October 30, 1978, NRC inspection, which was documented via letter dated December 14, 1978[25], states that closure of the "five liquid effluent retention ponds was completed during the inspection". Initial seeding as well as fencing of the areas was performed between November 2, 1978, and March 20, 1979. Sprigging and fertilizing of the cap soil was performed from July 18, 1979, to October 30, 1979. Even though closed in accordance with "current guidelines" as stated in the NRC letter dated January 8, 1993[26], the NRC informed Cimarron Corporation that "the five former waste water ponds that were closed in 1978 must be addressed in detail". In response to this issue, additional characterization work was conducted by Cimarron Corporation in these pond areas and is discussed in detail in Section 12.0 of the Characterization Report. Recently, additional soil sample data was collected from Waste Ponds #1 and #2 to support the volumetric averaging methodology to be employed to demonstrate that soils within these two pond areas meet BTP Option #1 criteria. This methodology is discussed in Section 6.4.4.

- Uranium Plant Yard Area - The restricted area south of Uranium Building #1, (containing the UF_6 Receiving Area (Vaporizer Room), the Tank Storage Building (Building #2), the Solvent Extraction Building (Building #3), the Liquid Storage Areas and the UF_6 Storage Area have been extensively remediated. All structures south of Building #1 (see Figure 6.1) have been removed and the subsurface soil has been remediated. Decontamination and decommissioning activities are further discussed in Section 13.0 of the

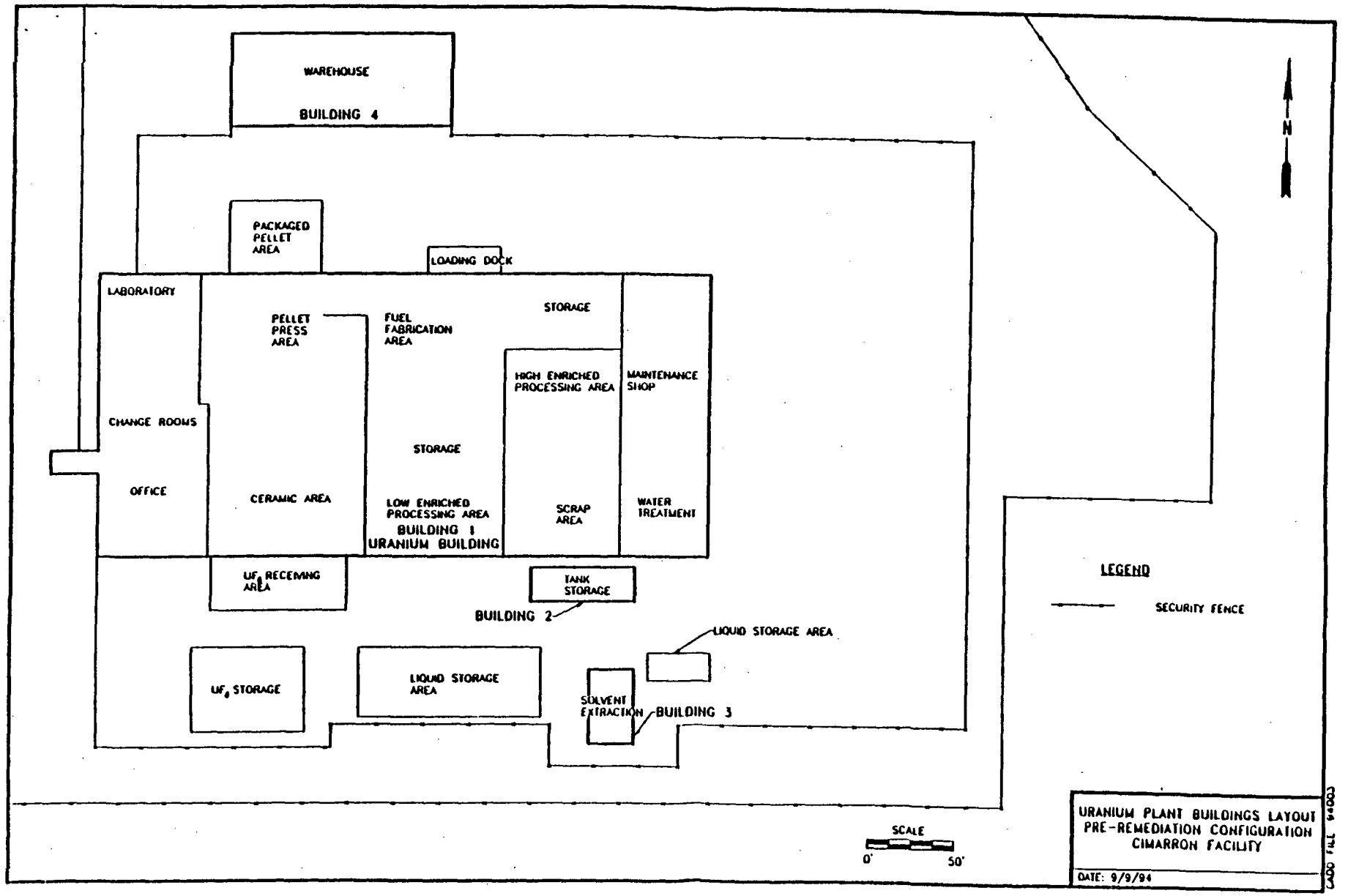
WAREHOUSE
BUILDING 4
PACKAGED PELLET AREA
LOADING DOCK
LABORATORY
PELLET PRESS AREA
FUEL FABRICATION AREA
STORAGE
HIGH ENRICHED PROCESSING AREA
MAINTENANCE SHOP
CHANGE ROOMS
STORAGE
OFFICE
CERAMIC AREA
LOW ENRICHED PROCESSING AREA
BUILDING 1
URANIUM BUILDING
SCRAP AREA
WATER TREATMENT
UF_6 RECEIVING AREA
TANK STORAGE
BUILDING 2
LIQUID STORAGE AREA
UF_6 STORAGE
LIQUID STORAGE AREA
SOLVENT EXTRACTION
BUILDING 3
N
LEGEND
SECURITY FENCE
SCALE
0'
50'
URANIUM PLANT BUILDINGS LAYOUT
PRE-REMEDIATION CONFIGURATION
CIMARRON FACILITY
DATE: 9/9/94

Figure 6.1

Characterization Report and also in the South U-Yard Remediation Report dated November 1994[28]. Based upon the results of the pre- and post-remediation characterization data presented in the South U-Yard Report and the November 1995 ORISE[29] confirmatory sampling results, the NRC released the area for backfilling and recontouring by letter dated July 7, 1995[30]. This area was backfilled, recontoured and seeded by December 15, 1995.

- Uranium Processing Building (Building #1) - In April 1977, Cimarron personnel initiated the characterization and decontamination of Building #1. The concrete floor in the Wet Ceramic Area has been removed. Option #4 soil located below the concrete floor was excavated and shipped off site for disposal. Option #2 soils were stockpiled on site waiting disposal in Burial Area #4. Follow-up soil sampling, completed in 1992, indicated that the soil remaining in this area met the BTP Option #1 guideline value for unrestricted release. At the request of the NRC, ORISE conducted an independent confirmatory survey on June 22, 1992[31]. Based upon this survey, the NRC released this area for backfill. The supporting data demonstrating that both the surface and subsurface areas meet the unrestricted release criteria along with the applicable ORISE references will be submitted as part of the Phase III Final Status Survey Report.

  The Scrap Recovery Area also required the removal of the concrete floor as well as contaminated soil located below the concrete. Confirmatory sampling was completed by Cimarron personnel in 1993, with sample results being submitted to the NRC that same year. Based upon a review of data by ORISE and the NRC, the NRC released this area for backfill in early 1994[32].

  The characterization and confirmatory sampling data, as well as a discussion of the decommissioning activities completed on Building #1, can be found in Section 14.0 of the Characterization Report[5].

- Burial Area #2 and North Field Drainage Area - Burial Area #2 was intended to be utilized in the 1970's for the disposal of on-site generated industrial solid waste. During an investigation of this area in 1990, it was discovered that radioactive waste materials were present in the buried waste. Remediation of this area was initiated in 1991. Both Option

#4 and Option #2 soils have been removed from this area and separated from the industrial waste (i.e. metal, piping, etc.). Option #2 soils were stockpiled for confirmatory analysis prior to being placed in the on-site disposal cell. Option #4 soil has been packaged for transportation and disposal off site. The industrial waste, presently stockpiled, is being packaged and transported off site for disposal at a LLRW facility.

A final survey of the excavated area has been completed on a 5 m x 5 m grid. The characterization data for this unit can be found in the Final Status Survey Report, Phase III, Subarea L[33]. The Phase III, Subarea L Final Status Survey Report was submitted prior to the submittal of this Phase III Plan due to the urgency of backfilling this area prior to significant erosion occurring. Based upon the Survey Report, and additional Cimarron clarification and sampling, the NRC approved the backfilling of Subarea L[34] on November 8, 1996. The Subarea L surface area is still included in the license and will be addressed in the final status survey for Phase III areas.

- New Sanitary Lagoon - This lagoon was Hypalon-lined and was constructed in January 1986 to replace the East and West Sanitary Lagoons. The New Sanitary Lagoon was utilized from early 1986 to October 1992. The decommissioning of this area was accomplished in accordance with Section 2.2 of the Decommissioning Plan[6]. This Lagoon was included in Subarea L and was backfilled and graded per NRC approval[34] (Subarea L Subsurface).

6.3.2 Other Areas Within Phase III

Cimarron personnel have substantially completed the remediation and/or survey of the remaining units (areas) on site. The remaining Phase III units that have been remediated or are in the final process of being remediated are discussed briefly below. The final status survey data for these units will be included in the Phase III final status survey report.

- Burial Area #3 - This area was intended to be utilized for the disposal of non-radioactive solid waste materials. In 1990 the soil sampling and gamma survey indicated that radioactive materials were present in the buried waste. An in-depth

characterization of this area, completed in 1992, resulted in the removal of approximately 100 ft^3 of waste. This waste was packaged and shipped to a commercial LLRW disposal facility.

To verify that only materials meeting the BTP Option #1 limit were present, Cimarron recently completed the excavation of all Burial Area #3 trenches. Industrial solid waste and soils were surveyed during the excavation and any radioactive materials/soils above the BTP Option #1 guideline were separated for either disposal in the On-Site Burial Cell or packaged for disposal off site. Initial characterization data for this area can be found in Section 9.0 of the Characterization Report. Remediation of this area is complete and its final status survey data will be included in the Phase III Final Survey Report.

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

- On-Site Roads - The road from the Uranium Plant to Burial Area #4 is being utilized for the transport of Option #2 waste materials. Therefore, this road has been included in the Phase III affected area and will be surveyed as such during the final status survey. The decontamination (if required) of this area and final survey will be performed when all Option #2 materials from other areas of the facility have been disposed.

- Burial Area #4 (Option #2 On-Site Disposal Cell) - On November 4, 1994, the NRC issued Amendment #10[35] to License SNM-928 which approved on-site disposal of up to 500,000 ft^3 of Option #2 waste materials at the location shown on Drawing No. 95MOST-RF15. The Option #2 stockpiles, which were located east and northeast of Building #1, have been placed in the on-site disposal cell. These materials were disposed with NRC approval after

characterization of the soil was completed by Cimarron and confirmed by ORISE. The on-site disposal cell is comprised of three pits (Pit #1, #2, and #3). Pits #1 and #2 have been filled and capped. Additional Option #2 materials are being placed in Pit #3 for final disposal. A final survey of this area will be completed in accordance with this plan once all Option #2 materials have been placed in Burial Area #4 and the cell is capped.

- Building #1 - The decontamination and decommissioning of this building is almost complete including the removal of walls, floors, and structural supports. As discussed in Section 6.3.1 of this plan and in Section 14.0 of the Characterization Report[5], two areas (i.e., scrap and ceramic areas) have been excavated, surveyed and released for backfill by the NRC.

  The office area, which is located at the west end of this building, will be surveyed for final release. Additionally, the western bay of the original process area will be surveyed and further decontaminated, if required for final release. These building spaces are to be retained throughout the final survey period or until replaced by portable offices, storage and maintenance trailers. All other walls, roof and structural support components are being removed, surveyed and decontaminated (if required) for free release. Approximately 80% of this building has been removed.

- Uranium Plant Yard Area - The restricted area east and northeast of Building #1 contained the Option #2 stockpiles prior to their disposal in the on-site disposal cell. Four of these stockpiles (DAP's #1, #2, #3 and #4) were characterized and placed in the on-site disposal cell. Option #4 soils and the industrial solid waste stockpiles are presently being placed in packages for transportation off-site to an approved LLRW disposal facility. The areas located beneath these stockpiles are being characterized and remediated (if required) in order to meet the Option #1 guideline value. A final survey of this area will be performed when all remediation has been completed. Excavated Option #2 materials are now being placed directly in the on-site disposal cell as approved by NRC on June 10, 1996[36].

- Drain Lines - The Phase III area includes several areas occupied by former drain lines to the Sanitary Lagoons, Evaporation Ponds and Uranium Waste Ponds. These drain

lines have been removed and the areas were surveyed at the time of line removal or during subsequent characterization and remediation efforts. One small section of an out of service sanitary drain line is still located beneath Building #1. A temporary change room and laboratory facility has been connected to the existing site sanitary drain line and septic drain field. The location of these drain lines and an explanation of remediation activities completed is included in Section 15.0 of the Characterization Report.

Bldg 41

6.3.3 Environmental Monitoring

Several of the areas addressed under Phase III include locations where environmental monitoring is performed. Environmental samples are collected from locations within the Phase III Areas in accordance with the Cimarron environmental sampling program and submitted to off-site laboratories for independent analysis. In addition to annual environmental reports which are submitted to the NRC by Cimarron Corporation, a description of the environmental monitoring program and summary of results were incorporated into the Characterization Report[5]. Additionally, the Groundwater Report[37] submitted to the NRC in December 1966, contained an evaluation of the 1996 annual environmental monitoring program results for groundwater and surface water and a summary of the previous annual data. A second document[38], which included a site recharge and groundwater quality study, was also submitted in December 1996.

The environmental monitoring locations within the Phase III area include 12 environmental monitoring wells, two surface water sampling locations, one soil sampling location and two vegetation sampling locations. Cimarron Corporation will continue to perform environmental sampling in accordance with the facility's environmental monitoring program and until such time as the Facility License SNM-928 is terminated or NRC approval is granted to suspend monitoring.

The Groundwater Report[37] discusses those areas onsite where groundwater has been impacted by past site operations. Cimarron recently responded[39] to the NRC's March 13[40] questions on the two December 1996 Groundwater Reports. As discussed in Cimarron's responses, the company believes that the groundwater onsite is not a viable source of drinking water due to

alternate sources of better water and site use control. Cimarron is working with the State Oklahoma Department of Water Quality (ODEQ) concerning aquifer classification. Cimarron believes that with source removal and low aquifer transmissivity, active restoration of the groundwater is not justified and reliance on natural process is appropriate.

Need HP to review all of Section 6.4

6.4 Survey Objective

The purpose of this section is to discuss the methodology to be utilized during the generation of additional survey and soil sampling data to supplement existing survey data for the Phase III area. The guidance promulgated in NUREG/CR-5849[41] will be utilized throughout the conduct of the Final Status Survey. The Final Status Survey Report for Phase III will present data necessary to demonstrate that all applicable radiological parameters are satisfied for unrestricted release. This report will be submitted to the NRC in conjunction with a license amendment request to terminate the Facility License SNM-928, due to the fact that this is the final phase of the overall Cimarron Facility Final Status Survey Plan.

The radiological parameters for surveys and soil sampling will be compared to the criteria described below:

6.4.1 Buildings and Equipment

OK Release limits for contamination on all buildings and equipment will comply with Facility License SNM-928 and are identical to the limits specified in Table 1 of the NRC's 1987 guidance[42] for decommissioning of facilities and equipment prior to release for unrestricted use. Those limits are reproduced in Table 6.1.

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

X Missing → Exposure rate - 5 uR/hr

6.4.2 Surface Soil Activity

For an affected area, the guideline value for residual concentrations of uranium which may remain in soil is specified

TABLE 6.1

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDES[a]	AVERAGE[b,c,f] = removable + fixed	MAXIMUM[b,d,f] 3X AVG	REMOVABLE[b,e,f] 20% AVG
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228,Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/cm^2	20 dpm/100 cm^2
Th-nat, Th-232m, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100 cm^2	3,000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 dpm βγ/100 cm^2	15,000 dpm βγ/100 cm^2	1,000 dpm βγ/100 cm^2

[a] Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

[b] As used in this table dpm (disintegration per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] The maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent level should be reduced proportionally and the entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber..

as Option #1 material (for enriched uranium, this is up to 30 pCi/g total uranium, excluding background) in Table 2 of the BTP[43]. Systematic soil sampling will be performed on each 100 m^2 grid area to determine the average value for residual activity. This systematic sampling will equate to four samples (5 m x 5 m grid) per 100 m^2 area. The average will then be compared to the guideline value. Hot-spot averaging will be performed for all locations, within 100 m^2 grid areas, which contain average soil concentrations in excess of 30 pCi/g total uranium (above background) as described in NUREG/CR-5849. Areas of elevated activity will be determined based upon discrete sampling within the grid or will be assumed to have a constant value (e.g., 25 m^2 based upon 5 m x 5 m grid sampling frequency). The maximum enriched uranium soil concentration within a 100 m^2 grid area may not exceed three times the BTP Option #1 limit (90 pCi/g total uranium above background).

6.4.3 Volumetric Activity for On-site Disposal

On-site disposal of BTP Option #2 material in a designated earthen cell was approved by the NRC through the issuance of Amendment #10 to License SNM-928[35]. Current authorization is for the burial of 500,000 ft^3 of Option #2 materials. The average concentration of radioactive material that may be buried on site (Burial Area #4) is 100 pCi/g total uranium above background (this assumes that the uranium is 100% soluble), and up to 250 pCi/g total uranium above background for insoluble uranium. The average concentrations of thorium and plutonium in the soil earmarked for disposal cannot exceed 10 pCi/g and 1 pCi/g, respectively. Hot-spot averaging can be applied to any location within a 100 m^2 grid area which contains soil concentrations in excess of the limits stated above. The maximum total uranium soil concentration for any "hot spot" location within a 100 m^2 grid area may not exceed three times the BTP Option #2 limit for 100% soluble or insoluble uranium.

6.4.4 Averaging Methodology for Subsurface Residual Activity

The NRC guidance[44] for volumetric averaging of subsurface soil containing residual contamination will be followed for demonstrating compliance with BTP Option #1 criteria. This guidance was prepared for a NRC licensee with thorium

contamination. Per the NRC, this guidance can be applied to a site containing residual uranium contamination as long as the methodology is similar. Based upon the NRC's methodology, the soil concentration guideline values to meet the Option #1 criteria will be determined for comparison to residual activity remaining below grade.

These guideline values will be applied to Uranium Waste Ponds #1 and #2 to demonstrate that subsurface soils meet the Option #1 average concentration guidelines and can be left in place.

6.4.5 Gamma Surface Survey (Open Land Areas)

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

The shielded or unshielded detector may be utilized during the initial survey for Phase III to identify elevated areas. When this type of detector is used, any survey instrument reading (in counts per minute) greater than twice background is used as an indication that an area requires additional investigation. As stated above, this instrument is only utilized for qualitative measurements. Quantitative measurement of residual contamination levels is performed with the Cimarron soil counter.

Paved and/or concrete surfaces will be scanned at the same frequency and for the stated limits discussed herein for open land areas. Surface contamination on an exterior surface which is greater than twice background is used as an indication that further investigation is required.

6.4.6 Exposure Rate Survey (Open Land Areas)

All open land areas contained within Phase III will be 100% scanned as part of the final status survey procedure. For affected areas, the average exposure rate may not exceed 10 μR/hr above background, at 1 meter above the surface. Exposure rates may be averaged over a 100 m^2 grid area as described in NUREG/CR-5849. The maximum exposure rate at any discrete location within a 100 m^2 grid area cannot exceed 20 μR/hr above

background.) Any areas with average exposure rates greater than 10 μR/hr above background (and any discrete locations within a 100 m^2 grid area with exposure rates greater than 20 μR/hr above background) will be delineated and remediated if required. As stated in Section 6.2, Cimarron conservatively uses 7 μR/hr as a background exposure rate.

Paved surfaces will be surveyed for exposure rates at the same frequency and for the stated limits discussed herein for open land areas.

7.0 Administration

The current organizational structure is expected to remain in place throughout the duration of the decommissioning process. Personnel may change but the structure will remain the same. The Cimarron site RSO/Health Physics Supervisor, QA/QC Manager, Project Manager and other support personnel report directly to the Site Manager. The Site Manager reports directly to the Vice President of Cimarron Corporation.

7.1 Organization

The final survey of the Phase III affected areas will be performed by a final survey team consisting of qualified personnel from the Cimarron site. Contractor assistance may be utilized if required. The final survey team will operate under the general direction of the Cimarron Site Manager who reports directly to the Vice President of Cimarron Corporation. The Vice President will have the authority to make appropriate changes to the final status survey plan as the survey progresses.

The selection of field measurement equipment and sample collection techniques will be under the direction of the RSO/Health Physics Supervisor who reports to the Cimarron Site Manager. Actual field measurements and sample collection will be under the direction of the Project Manager. Additionally, the Project Manager will also oversee the field activities of any contractor support personnel.

Cimarron site laboratory activities will be under the direction of the RSO/Health Physics Supervisor. The RSO/Health Physics Supervisor will provide oversight for any contract laboratory assistance. All

activities required under the Final Status Survey Plan will be performed in accordance with the Cimarron Radiation Protection Program.

7.2 Training

Cimarron Corporation provides continuing training for Cimarron personnel and any other personnel (i.e., contractors, visitors, etc.) who are allowed access to the site. All members of the final survey team will attend an in-house training session prior to commencement of work under the Phase III Final Status Survey Plan. All survey procedures and quality assurance requirements will be reviewed during this training session.

7.3 Radiation Protection Program

Cimarron Corporation maintains a radiation protection program which meets and/or exceeds all of the applicable regulatory requirements associated with activities conducted under Special Nuclear Materials License SNM-928[1] and By-Product License 35-12636-02[45]. The Cimarron Radiation Protection Program currently in place for all decommissioning activities is administered through the use of the following documents:

- License SNM-928 Amendment #13
- Cimarron Radiation Protection Procedures
- Cimarron Site Health and Safety Plan
- Cimarron Quality Assurance Plan and Procedures
- Cimarron Emergency Plan

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

Independent Kerr-McGee Corporate audits for regulatory and internal requirements are conducted on a periodic basis and include the review of the Cimarron Decommissioning Program and the associated elements. Assessments of program effectiveness are also performed and documented periodically by the Cimarron RSO/Health Physics Supervisor. Additionally, the program is inspected for compliance with

applicable rules and regulations by the Oklahoma Department of Health, NRC Region IV, ORISE and NRC Headquarters staff.

7.4 Cimarron Quality Assurance Program

The Cimarron Corporation Quality Assurance Plan and Procedures are an integral part of the Cimarron Radiation Protection Program. A principal component of this Program is the affirmation of the quality of project work performed during decommissioning by assuring that all tasks are performed in a quality manner by qualified personnel. The Program ensures that all characterization and final status survey samples are collected, controlled and analyzed in accordance with all applicable quality assurance requirements such that the resulting data accuracy and validity are verifiable. Such quality controls allows independent, third party review of analytical results.

The Cimarron Quality Assurance Program is implemented and maintained in accordance with written policies, procedures, and instructions. This Program is administered under the direction of the Quality Assurance Manager. Periodic audits and reviews are conducted to ensure that all aspects of the Program are addressed. The Cimarron Quality Assurance Program satisfies all of the applicable requirements of ASME NQA-1[46].

Written procedures, designated as Special Work Permits (SWP's), are prepared, reviewed and approved for activities involved in carrying out the decommissioning process. A SWP is a document or series of documents prepared by the Project Manager and the Health Physics Department to inform individuals of the conditions that exist in the work area and the radiological and non-radiological job safety requirements. Additionally, a work plan will be prepared when necessary to provide procedural guidance to workers. The work plan designates the type of surveys to be performed, samples to be collected, frequency of sample collection, number of samples to be split with an off-site independent laboratory and the type of field instrumentation required for the tasks required.

The facility performs its own radiological soil analysis in accordance with written procedures and QA/QC protocols. Field data are gathered and maintained in field logs for all samples in accordance with the Cimarron Quality Assurance Program. Necessary data are transferred to the on-site laboratory sample log when the sample is brought to the on-site laboratory for analysis. The sample logs provide a record of sample

collection and transport (chain of custody) and are incorporated into the facility quality assurance files.

In addition, off-site independent radiological analysis of split samples is an integral part of the Cimarron Quality Assurance Program. Samples sent to an off-site independent laboratory for analysis are accompanied by a chain of custody form in accordance with the Cimarron Quality Assurance Program. These forms provide documentation for all aspects of sample control and are maintained by the Quality Assurance Manager as permanent records.

Numerous confirmatory samplings by the NRC and ORISE have confirmed the precision of the Cimarron on-site counter. On May 4 and 5, 1995, ORISE, while on site, selected six soil samples from Cimarron's sample archives for confirmatory analysis. The basis for selection of the samples was to establish a broad range of activity concentrations for total uranium. Analytical results for these samples were compared to those reported by the licensee. The results of this comparison, as a whole, confirmed that ORISE[28] and Cimarron's analytical results are statistically identical. (1994)

Sample and survey data are reviewed by the Health Physics Department for accuracy, consistency, and for comparison to the guideline values. Reviews are performed on a regular basis. Investigation and correction of recognized deficiencies are performed immediately upon identification.

8.0 Phase III Final Status Survey

Existing characterization survey and soil sampling data will be utilized when available from past characterization efforts. This existing characterization data will be reviewed in light of the guidance contained in NUREG/CR-5849 to determine applicability. Existing characterization data utilized in the Final Status Survey Plan (Phase III) will either be sufficient to meet the criteria contained in NUREG/CR-5849 or will have a technical justification explaining why the data is determined to be adequate. Areas identified as not having adequate characterization data, based upon the review of the existing characterization data, will be characterized in accordance with NUREG/CR-5849. The following sections describe the general approach to be taken in completing the Final Survey for Phase III areas.

8.1 General

Cimarron Corporation has divided the entire 840 acre site into three major areas which contain both affected and unaffected areas. Each of these three areas are shown on Drawing No. 95MOST-RF15 and are designated by Roman Numerals I, II, and III (herein referenced as Phases I, II, and III). This plan is for the Phase III area only; and is the third and final phase which will complete the Final Status Survey for the entire Cimarron site.

8.2 Existing Characterization Data

The Phase III area contains only affected areas which consisted of the Uranium Processing Buildings and yard areas, Burial Areas #2 and #3, the On-Site Disposal Area (Burial Area #4), the New Sanitary Lagoon, the five former waste water ponds, and portions of the on-site road and pipeline runs. These areas are further discussed in Section 6.3 as well as in the Facility Characterization Report[5] and Decommissioning Plan[6].

As discussed in Section 6.3.1, Cimarron has gathered additional surface and subsurface soil data from Waste Ponds #1 and #2 areas. This data will be evaluated utilizing the recently issued NRC guidance[44] for averaging subsurface soil contamination. This guidance was prepared for a NRC licensee with thorium contamination. Per the NRC, this guidance can be applied to a site containing residual uranium contamination as long as the methodology is similar. Cimarron will follow this methodology for averaging concentrations of uranium in subsurface soils to demonstrate that the unrestricted use criteria is being met. Cimarron will develop average uranium activity concentrations for the scenarios evaluated in the NRC guidance and compare these values to the soil data available for the two Waste Ponds. Soils not meeting the guidelines will be remediated. Final characterization data, including the subsurface averaging data, will be included in a separate submittal to the NRC and only summarized in the Phase III Final Status Survey Report.

Need HP to check 8.3 - 8.7.4

8.3 Survey Plan Grid Areas

For purposes of identification, the Phase III area is shown on Drawing No. 95MOST-RF15. The Phase III area has been further divided into sub-areas for data tracking and are shown on this drawing as K, L, M, N, and O. The grid system shown on these drawings is utilized for locating soil sampling and survey points. Cimarron employs a Ground Positioning Survey (GPS) unit to check pre-established grid points and to

accurately locate sample collection and survey positions in the field. This unit is accurate to less than ± 1 m. The 0.0 grid point is located just south and slightly west of the main Uranium Building as shown on Drawing No. 95MOST-RF15. This grid point will be tied into a permanent marker for future reference.

8.4 Surveys (Open Land Areas)

In general, the affected areas will be 100% surveyed. The specific instruments to be used will be selected by the RSO/Health Physics Supervisor. The instrumentation available for use by site personnel and the minimum detectable activity (MDA) for those instruments available for use by Cimarron personnel are listed in Table 8.1. Where possible, in selecting an instrument for scanning, the MDA for the instrument should be ≤25% of the guideline value.

Where possible, 5 m x 5 m grids will be established and areas will be surveyed by traversing back and forth within the grid area. In some cases, areas to be surveyed may be less than five (5) meters in width. Each traverse performed by the technician covers an area of approximately 2 meters in width. For areas less than 5 meters, the technician may elect to survey the length of the grid area without traversing. The highest reading found within each approximate five (5) meter length or 5 m x 5 m grid area will be recorded. Survey performance, documentation, and record retention will be in accordance with the Cimarron Radiation Protection Program and Quality Assurance Program. In the event that any of these survey readings exceed the limits described in Section 6.4.3, their location will be flagged for additional surveys and/or soil sampling. The specific work to be performed in the Phase III areas will be specified in SWPs.

8.5 Soil Sample Locations

The systematic soil sampling frequency for each sub-area will be specified in the SWPs. Where practicable, soil samples will be collected at the 5 meter grid intersects throughout each of the five sub-areas contained in Phase III. The 5 m x 5 m grid sampling frequency is equivalent to the guidance in NUREG/CR-5849 which recommends four samples at locations equidistant between the center and each corner of a 10 m x 10 m grid. The actual soil sample locations may vary slightly

TABLE 8.1

RADIATION MONITORING INSTRUMENTS

INSTRUMENT TYPE	NUMBER AVAILABLE	RADIATION DETECTED	SCALE RANGE	BKG	TYPICAL MDA 95% CONFIDENCE LEVEL
Scintillation (Ludlum 2224) Scaler/Ratemeter	2	Alpha Beta	0-500,000 cpm	< 10 cpm < 300 cpm	100 dpm/100 cm² 500 dpm/100cm²
Micro-R Meter (Ludlum) 1" x 1" Nal Detector	1	Gamma	0 - 5,000 µR/h	7 µR/h	7 uR/h
Ion Chamber (Victoreen)	2	Gamma	0.1 - 300 mR/h	<.0 1 mR/h	<0.2 mR/h
3" x 1/2" Nal Scintillation Detector Digital Scaler	3 SCANNING	Gamma	0 - 500,000 cpm	3,000 cpm avg shielded 9,000 cpm avg unshielded	250 cpm 500 cpm
100 cm² gas flow (43-68) Digital Scaler	1	Alpha	0 - 500,000 cpm	<10 cpm	100 dpm/100 cm²
60 cm² gas flow (43-4) Digital Scaler	1	Alpha	0 - 500,000 cpm	<10 cpm	200 dpm/100 cm²
60 cm² Count Rate Meter (PRM-6)	6	Alpha	0 - 500,000 cpm	<100 cpm	350 dpm/100 cm²
50 cm² Personnel Room Monitor (Ludlum 177)	3	Alpha	0 - 500,000 cpm	<100 cpm	500 dpm/100 cm²
5" Slide-Drawer Counter	1	Alpha	0 - 500,000 cpm	<0.3 cpm	2 dpm
Eberline 2" GM Tube (Pancake)	1	Beta, Gamma	0 - 500,000 cpm 720 cpm = 0.2 mR/h	<200 cpm	70 cpm
Ludlum 2" GM Tube (Pancake)	2	Alpha, Beta, Gamma	0 - 500,000 cpm 720 cpm = 0.2 mR/h	<200 cpm	70 cpm
Tennelec LB5100 Computer Based Auto Sample Counter	1	Alpha Beta	0 - 99,999,999 cpm	<0.3 cpm 1.5 cpm	0.4 dpm 1.5 dpm
Soil Counter - Computer Linked 4" x 4" x16" Nal (T1) Detector	1 QUANTATIVE MEASURE	Gamma	---	4 pCi/g Total U 1.5 pCi/g Th (Nat)	10 pCi/g U (5 minute count) 4 pCi/g U (30 minute count) .25 pCi/g Th (Nat)
100 cm² Gas Flow Digital Scaler	2	Beta, Gamma	0 - 10,000 cpm	<300 cpm	600 dpm/100 cm²

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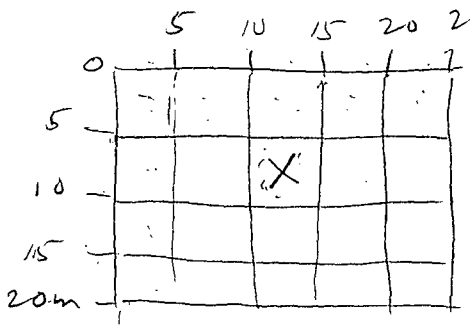
— Proposed location of subsurface Samples



$\frac{1 \text{ block}}{20 \text{ blocks}} = 5\%$ of the area sampled

X = one sample IN 20 grid blocks

Grid Block: $25m \times 20_M = 500 m^2$

∴ IF $10,000 m^2$ area ($100m \times 100m$)

1) $10,000 m^2 \times \frac{1 \text{ location}}{500 m^2} = 20 \text{ locations}$

2) Composite every Rod to 4FT at each location.

Note to: File - Docket No. 70-0925

From: Ken Kalman

Subject: 1/21/97 telephone conversation with Steve Marshall, Joe Kegin, Harry Newman, Will Rogers, Tim Johnson, Bobby Eid, and myself regarding Cimarron's preparation of a response to the NRC comments on Phase II Final Status Survey Plan(dated 10/31/96)

Cimarron agreed to use the methodology for subsurface sampling for the Phase II open land affected area that Tim Johnson proposed in a 12/12/96 telecon. Cimarron will use a 5 meter grid and sample every 20th grid. Samples will be taken at 1-foot intervals to a maximum depth of 4 feet or to bedrock (whichever comes first.

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from the designated 5 meter grid intersects due to obstructions located in the field. All soil samples collected will be analyzed for total uranium using the on-site soil counter. Additional soil sampling at various locations or depths may be required based upon previous sampling results or the surface soil sample analysis results generated under this plan.

Cimarron has collected surface and subsurface samples at numerous open land area locations within Phase III. 1) For those locations where subsurface sampling has been performed, Cimarron has collected and composited these subsurface samples, at one foot intervals, down to a maximum depth of 4 feet (or rock) prior to analyses. 2) For areas where there is no reason to believe that residual subsurface contamination is present, only surface sampling at the 5 m grid interval will be performed. However, 3) subsurface samples will be collected at a frequency of one out of every twenty (20) 5 m x 5 m grids located within these Phase III open land areas not previously sampled below grade. One sample location out of every twenty (20) 5 m x 5 m grid areas equates to one (1) sample location for every 500 square meters (to be located approximately in the mid-point of each 500 square meter area as some areas may not conform to this configuration). Therefore, a total of twenty (20) locations would be sampled for a 10,000 (100 m x 100 m) square meter open land area (i.e., 20 sample locations with 4, one foot composite soil samples per location), for a total of 80 soil samples.

Roads located in open land affected areas will be surface sampled at 5 meter intervals along their length when the width of such affected areas are less than 5 meters. For areas greater than 5 m in width, a 5 m x 5 m grid will be established. Additionally, subsurface soil samples will be collected on a maximum frequency of 1 sample location per each 100 meters in length, and will include a total of 4 samples down to a maximum of 4 feet or rock for each 100 meter interval. As stated above, Cimarron does not intend to sample to depth all Phase III open land areas which have previously been sampled in accordance with NUREG/CR-5849.

For former pipeline locations, surface and subsurface soil samples will be collected at 5 meter intervals along their length. The subsurface samples will be collected to a depth of 4 feet or rock and include four one foot composite samples per sample location.

For each of the five designated sub-areas, four soil samples (for a total of twenty) will be split for submittal to an off-site independent laboratory for confirmatory analysis. Additionally, ten quarterly split samples will

be collected for soil counter quality assurance purposes and will include soil samples from the designated Phase III sub-areas where practicable.

Systematic exposure rates measurements using a Micro-R meter, will be recorded for each soil sample location at the surface and at 1 m above the surface. All areas with elevated exposure rates (greater than 10 μR/hr above background) will be investigated further.

8.6 Building/Surface Surveys

The survey measurements for surface activity will consist of a combination of surface scans, direct measurements and measurements of removable activity.

The maximum radioactive contamination on interior surfaces of buildings on the Cimarron site which may be released without restriction is based upon the NRC guidelines[42] for decontamination of facilities and equipment prior to release for unrestricted use which is discussed in Section 6.4.1. and listed in table 6.1.

The decontamination and decommissioning of the uranium processing equipment and buildings began in 1977. Almost all equipment has either been decontaminated and/or removed from the site. Building #1 is the only building still remaining within the Phase III area. A number of the exterior and interior walls, roof and floor sections have been removed. The walls, roof, and support steels are also being removed. Surfaces have been washed, scraped, chipped and/or scabbled to remove surface contamination as required. Subfloor drains and contaminated soils have also been excavated and removed. Two Building #1 subsurface areas have been released by the NRC for backfill. The western end of this building still houses the Cimarron Corporation Administrative Offices. The office areas, which have been remediated, may be retained or replaced with temporary building/offices.

The Liquid Storage Building (Building #2) has been dismantled and removed. The Solvent Extraction Building (Building #3) and the Vaporizer Room have also been dismantled and removed, including their concrete floors and foundations. The decommissioning of the process buildings is further discussed in Section 14.0 of the Characterization Report[5].

The remaining portions of Building #1 will be final surveyed, in general, per NUREG/CR-5849 and as discussed below. Where appropriate, a

reference grid will be established prior to conducting the initial survey. Scans of 100% of affected area floors and lower wall surfaces will be performed for alpha and beta/gamma. The surveys of the upper walls, ceilings, and support structures will be dependent upon the contamination potential for these surfaces. The survey coverage will be specified by the SWPs developed for this area.

Areas of elevated activity noted during the scan will be identified and direct measurements taken. The limit for activity on a building or structure surface for residual activity is three times the guideline value. Areas that exceed this limit will be remediated or removed and follow-up surveys will be performed. Areas of elevated activity between one and three times the guideline value will be tested to assure that the average surface activity level within any contiguous 1 m² area containing the elevated area is less than the guideline value. The guidelines for release of interior building surfaces are discussed in Section 6.4.1.

Direct measurements will be performed at a spacing of 2 m or less when practical for both floors and lower walls. Upper walls, ceilings and overhead surfaces will be surveyed at a frequency similar to floors and lower walls if operating history and the initial scan indicate the presence of residual activity. Different survey coverages may be specified for different overhead areas depending upon the potential for suspected residual activity. The guidelines and coverage will be specified by the SWPs developed for the area.

Removable contamination measurements (smears) will be taken at each location when direct surface activity measurements are obtained. The guidelines for removable activity are discussed in Section 6.4.1.

Exposure rate measurements will also be taken at 1 m from the floor and lower wall surfaces at each direct measurement location. The exposure rate guideline for internal building surfaces will be 5 μR/hr above background.

8.7 Instrumentation

The instrumentation to be utilized to generate the characterization and final status survey data discussed above are calibrated and maintained in accordance with the Radiation Protection Program procedures. These procedures utilize the guidance contained in ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration". Specific requirements for instrumentation include traceability of calibrations to

NIST standards, field checks for operability, background radioactivity checks, operation of instruments within established environmental bounds (i.e. temperature and pressure), training of individuals, scheduled performance checks, calibration with isotopes of energies similar to those to be measured, quality assurance tests, data review, and recordkeeping.

Portable survey instruments (micro-R survey meters, α/β survey meters, dose rate instruments, scalers/ratemeters, etc.,) are calibrated on a quarterly basis. All instrumentation is calibrated with NIST traceable standards. Where applicable, activities of sources utilized for calibration are corrected for decay. In addition to the quarterly calibration requirements, source checks are required on a daily basis for all instruments being utilized for characterization and final status surveys. A calibrated electronic pulse generator is utilized for instrument scale linearity checks.

which sources

All calibration and source check records are completed, reviewed, signed off and retained in accordance with Cimarron Quality Assurance Program requirements.

As required by the Cimarron Quality Assurance Program, a SWP is written and approved prior to commencement of field work covered under the Final Status Survey Plan. The SWP for this project will specify the type of instrumentation to be utilized in performing the site surveys. Several of the instrumentation utilized by site personnel are discussed below.

OK

The portable instrumentation available at Cimarron for use during this Final Status Survey are listed in Table 8.1 along with the detector sensitivities for the instrumentation (MDA).

Page 27

survey

8.7.1 Unshielded 3" x 0.5" NaI Gamma Detector – Label A, Table 8.1

used for SCAN SURVEYS?

The 3" x 0.5" detector is a sodium iodide (NaI) crystal gamma detector which is unshielded around the sides and socket end. The NaI detector is utilized with a portable scaler/ratemeter that has single channel analyzer capability. Americium-241, Uranium-235, and Natural Thorium sources are utilized to set the instrumentation window and threshold to detect gamma energies in the range of 50 to 250 keV. This energy range corresponds to the energies of interest when surveying for uranium and natural thorium contamination. The instrument is normally operated in

the window "out" mode, meaning that this instrument response is for the entire range of detectable energies.

8.7.2 Shielded 3" x 0.5" NaI Gamma Detector — Label A, table 8.1

The 3" x 0.5" detector is a NaI crystal gamma detector which is shielded with lead around the sides to improve the directional sensing capabilities of the equipment. Similar to the unshielded detector, the shielded detector is utilized with a portable scaler/rate meter that has single channel analyzer capacity. This instrument is normally utilized in areas where background may be elevated.

8.7.3 Micro-R Survey Meter (LUDLUM) — Label B, table 8.1

The 1" x 1" detector is a NaI/Tl crystal gamma detector which measures between 0 and 5,000 uR/hr. Background readings are obtained daily at a defined location prior to placing each instrument into service. This instrument is utilized, in general, for determination of exposure rates at both systematic and random locations, and at locations of elevated radiation, identified by area scans.

8.7.4 Soil Counter (Gamma Spectroscopy)

The Cimarron Soil Counter consists of a 4" x 4" x 16" sodium iodide crystal housed in a shielded chamber which is computer linked to a multi-channel analyzer (MCA). Data from the MCA is processed through an "analysis program" which, in turn, determines uranium and thorium concentrations in soil samples.

Calibration of this counting system is performed annually and is traceable to NIST standards through contractor laboratory evaluations of the on-site standards. ORISE has been used by the NRC for verification of a majority of the decommissioning work completed to date at the Cimarron site. ORISE has conducted an evaluation of the Cimarron Soil Counting system's ability to accurately measure total uranium concentrations in soil samples. This was done by comparing ORISE sample analysis results obtained by alpha pulse height analysis and gamma spectroscopy with the results obtained from the use of the Cimarron Soil

Counter. ORISE and Cimarron analysis results compared favorably at levels above background as demonstrated by the most recent confirmatory analysis performed for the DAP-3 stockpile (NRC approval letter dated May 31, 1995)[47]. Additionally, the confirmatory analysis performed on select soil samples collected during ORISE's site visit to investigate the South U-Yard,[28] verified previously that Cimarron's on-site counter results are statistically identical to ORISE's results.

Established quality assurance measures for the soil counter include Cesium-137 centroid checks, Chi-square tests, background determinations, and the counting of appropriate standards. All of these quality assurance controls are recorded on control charts and are trended on a continuing basis.

Standards used for calibration and quality assurance checks for the soil counter have been analyzed by outside laboratories and are NIST traceable through these analyses. Comparisons have been made between the standards as counted using the soil counter and two off-site laboratories. The assigned values for the standards are the average of the results obtained from the off-site laboratories, when the standards were analyzed by more than one laboratory. The standards range in concentration from 4.5 pCi/g total uranium to 292 pCi/g total uranium. This covers the entire range of interest for the Cimarron characterization and remediation activities.

Cimarron personnel determine uranium and thorium activities based upon the evaluation of net counts from the soil counter. Activities are calculated through the use of efficiency and correction factors obtained using appropriate standards. Soil concentrations are calculated by dividing the net activity by the soil mass. Soil masses are determined on a laboratory scale which is checked on a daily basis (when in use) utilizing NIST traceable standards.

9.0 Data Validation

The recorded survey data and soil sample activity concentrations for each affected area will be reviewed and compared to the criteria discussed in Section 6.4. Items to be reviewed during the data validation process to ensure consistency and acceptability of the data are also discussed below.

9.1 Field Survey Data (Portable Instrumentation)

Instrument calibration, data entry records, and data calculations shall be verified by the Project Manager or designee to ensure that:

- Field survey results have been recorded, signed and dated. Any changes will be crossed out with a single line and initialed by the individual making the change.
- Background and source check readings were obtained each day on which surveys were performed. Calibration sources are traceable to National Institute of Standards and Technology (NIST) standards or some other nationally recognized standard.
- MDA for appropriate instruments shall be recorded.
- Individuals performing the survey have been trained under the Cimarron QA program.
- Statistical analysis has been performed in accordance with NUREG/CR-5849 (or some other approved method) to demonstrate that the data for the survey unit (i.e. group of contiguous grids or regions with the same classification of contamination potential) satisfy the guideline values addressed in Section 6.4.
- Required conversions/calculations have been verified.
- All required signatures and dates are in place.
- Instrumentation calibration records are current.

9.2 Laboratory Analytical Data (On-Site Soil Counter)

Instrument calibration, data entry records, and data calculations shall be verified by the Project Manager or designee to ensure that:

- Instrumentation calibration records are current. Calibration sources are traceable to NIST standards.
- Sampling tracking documentation is complete and records have been filed in the project file.
- Laboratory results have been accurately recorded on laboratory data entry records, and where required, correctly converted to the appropriate units.
- Individuals operating the laboratory equipment are trained under the Cimarron QA program.
- Statistical analysis has been performed in accordance with NUREG/CR-5849 (or some other approved method) to demonstrate that the data for the survey unit (i.e. group of contiguous grids or regions with the same classification of contamination potential) satisfy the guideline values addressed in Section 6.4.

- Required conversions/calculations have been verified.
- Split samplings (i.e. two identical samples; one sent to an independent laboratory for analysis and the other analyzed on-site) have been performed as required by the applicable Special Work Permit.
- Split sample analysis results have been evaluated and meet acceptance criteria.
- All required signatures and dates are in place.
- Chain of Custody forms are used for all off-site analysis.
- Off-site laboratories have in place a Quality Assurance Program and as part of their program participate in an intercomparison (cross check) program. Participation in the program is to provide an objective measure of the accuracy of the analyses traceable to the National Institute of Science and Technology (NIST).

Any discrepancies discovered during the data validation process described above will be resolved and the disposition will be noted in the affected record(s). The discrepancy disposition may include additional surveys, sampling, sample analysis/re-analysis and/or remediation. All records generated as a result of the data validation process will be retained in accordance with the Cimarron QA Program. The data validation is administered under the direction of the site RSO/Health Physics Supervisor.

10.0 Report

A report (or reports) will be prepared which describes the results of the Phase III Final Status Survey and demonstrates that the Phase III area meets all applicable regulatory requirements for free release. This report will be submitted to the NRC in conjunction with a license amendment request to release the Phase III areas from License SNM-928 and to terminate the License.

DRAWINGS

REFERENCES

1. Cimarron Corporation Nuclear Materials License, SNM-928 Docket No. 070-00925, issued for possession only March 31, 1982; Amendment No. 13, issued April 23, 1996.

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

3. Cimarron Corporation Letter to USNRC, dated August 20, 1990.

4. USNRC Letter from Mr. Richard E. Cunningham, Director, Division of Industrial and Medical Nuclear Safety to Dr. John Stauter, Director of Environmental Services, Cimarron Corporation, dated February 5, 1993.

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

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

7. Chase Environmental Group, Inc. "Final Status Survey Plan for Unaffected Areas for Cimarron Corporation's Former Nuclear Fuel Fabrication Facility, Crescent, Oklahoma", October 1994.

8. USNRC Letter from Mr. Michael F. Weber, Acting Chief, Low-Level Waste and Decommissioning Projects Branch, Division of Waste Management, to Dr. John C. Stauter, Kerr-McGee Corporation, dated February 24, 1995.

9. USNRC Letter from Mr. Michael F. Weber, Chief, Low-Level Waste and Decommissioning Project Branch, Division of Waste Management, to Mr. Jess Larsen, Vice President, Kerr-McGee Corporation, dated May 1, 1995.

10. Cimarron Corporation, "Final Status Survey Report, Phase I Areas at the Cimarron Facility, License No. SNM-928", July 1995.

11. USNRC Letter from Mr. David N. Fauver, Sr. Project Manager, Low-Level Waste and Decommissioning Projects Branch, Division of Waste Management, to Mr. Jess Larsen, Vice President, Cimarron Corporation, dated September 5, 1995.

12. Cimarron Corporation Letter from Mr. Jess Larsen, Vice President, Cimarron Corporation, to Mr. Michael Weber, Chief, Low-Level Waste and Decommissioning Project Branch, Division of Waste Management, USNRC, dated November 13, 1995.

13. US NRC Letter from Mr. Michael F. Weber, Chief, Low-Level Waste and Decommissioning Project Branch, Division of Waste Management, to Mr. Jess Larsen, Vice President, Cimarron Corporation, dated April 23, 1996.

14. USNRC Region III, Letter from Mr. George M. McCann, Chief, Material Licensing Section, to Dr. John Stauter, Vice President, Kerr-McGee Corporation, dated December 30, 1992.

15. Chase Environmental Group, Inc., "Final Status Survey Plan for Phase II Areas for Cimarron Corporation's Former Nuclear Fuel Fabrication Facility", Crescent, Oklahoma, July 1995.

16. USNRC Letter from Mr. Kenneth L. Kalman, Project Manager, Low-Level Waste and Decommissioning Projects Branch, to Mr. Jess Larsen, Vice President, Cimarron Corporation, dated March 14, 1997.

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

18. Cimarron Letter from Mr. Jess Larsen, Vice President, Cimarron Corporation to Mr. Michael Weber, Chief, Low Level Waste and Decommission Project Branch, Division of Waste Management, USNRC, dated October 9, 1996.

19. USNRC Letter from Mr. Kenneth L. Kalman, Project Manager, Low Level Waste and Decommissioning Project Branch, Division of Waste Management, to Mr. Jess Larsen, Vice President, Cimarron Corporation, dated April 27, 1997.

20. Cimarron Letter from Mr. Jess Larsen, Vice President, Cimarron Corporation, to Mr. Michael Weber, Chief, Low Level Waste and Decommissioning Project Branch, Division of Waste Management, US NRC, dated June 21, 1995.

21. USNRC Letter from Mr. Michael F. Weber, Chief, Low-Level Waste and Decommissioning Project Branch, Division of Waste Management, to Mr. Jess Larsen, Vice President, Cimarron Corporation, dated July 7, 1995.

22. Cimarron Letter from Mr. Jess Larsen, Vice President, Cimarron Corporation to Mr. Michael Weber, Chief, Low-Level Waste and Decommissioning Project Branch, Division of Waste Management, USNRC, dated November 13, 1995.

23. ORAU Background Survey "Confirmatory Survey of Portions of the Sequoyah Fuels Corporation Cimarron Plant", completed in 1988.

24. State of Oklahoma Letter form Mr. Robert L. Craig, Director, Radiation Protection Division to Mr. W.J. Shelley. Director, Regulations and Control, Kerr-McGee Nuclear Corporation, dated March 2, 1978.

25. USNRC Letter from Mr. Richard W. Starostecki, Chief, Fuel Reprocessing and Recycle Branch to Mr. W.J. Shelley, Director, Regulation and Control, Kerr-McGee Nuclear Corporation, dated July 10, 1978.

26. USNRC Region III Letter from Mr. A. B. Davis, Chief, Fuel Facility and Materials Safety Branch to Mr. W.J. Shelley, Director, Regulation and Control, Kerr-McGee Corporation, dated December 14, 1978

27. USNRC Letter from Mr. Jerry J. Swift, Section Leader. Advanced Fuel and Special Facilities Section, Office of Nuclear Material Safety and Safeguards to Dr. Edwin T. Still, Vice President, Kerr-McGee Corporation, dated January 8, 1993.

28. Kerr-McGee Corporation, "Report on the South Uranium Yard Remediation at the Cimarron Facility, License #SNM-928, November 1994.

29. E. W. Abelquist, "Confirmatory Survey for the South Uranium Yard Remediation, Kerr-McGee Corporation, Cimarron Facility, Crescent, Oklahoma", Oak Ridge Institute for Science and Education, November 1995.

30. USNRC Letter from Mr. Michael F. Weber, Chief, Low-Level Waste and Decommissioning Project Branch, Division of Waste Management, to Mr. Jess Larsen, Vice President, Cimarron Corporation, dated July 7, 1995.

31. M.R. Landis, "Confirmatory Radiological Survey of the Wet Ceramic Area, Cimarron Corporation Facility, Crescent, Oklahoma", Oak Ridge Institute for Science and Education, July 1993.

32. USNRC Letter from Mr. David N. Fauver, Project Manager, Facilities Decommissioning Section, Office of Nuclear Material Safety and Safeguards to Dr. Edwin T Still, Kerr-McGee Corporation, dated January 10, 1994.

33. Cimarron Corporation's "Final Status Survey Report, Phase III, Subarea L (Subsurface)", dated May 1996.

34. USNRC Letter from Mr. Kenneth L. Kalman, Project Manager, Facilities Decommissioning Section, to Mr. Jess Larsen, Vice President, Cimarron Corporation, dated November 8, 1996.

35. USNRC Letter from Mr. John H. Austin, Chief, Low-Level Waste and Decommissioning Project Branch, Office of Nuclear Material Safety and Safeguards to Dr. John Stauter, Kerr-McGee Corporation, dated November 4, 1994.

36. USNRC Letter from Mr. Kenneth L. Kalman, Project Manager, Facility Decommission Section, to Mr. Jess Larsen, Vice President, Cimarron Corporation, dated June 10, 1996.

37. Chase Environmental Group, Inc. "Groundwater and Surface Water Assessment for Cimarron Corporation's Former Nuclear Fuel Fabrication Facility, Crescent, Oklahoma", dated December 1996.

38. Grant Environmental "Recharge and Groundwater Quality Study for Cimarron Corporation's Former Nuclear Fuel Fabrication Facility, Crescent, Oklahoma," dated December 1996.

39. Cimarron Letter from Mr. Jess Larsen, Vice President, Cimarron Corporation, to Mr. Kenneth L. Kalman, Project Manager, Low Level Waste and Decommission Branch, USNRC, dated May 12, 1997.

40. USNRC Letter from Mr. Kenneth L. Kalman, Project Manager, Low Level Waste and Decommissioning Branch to, Mr. Jess Larsen, Vice President, Cimarron Corporation, dated March 13, 1997.

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

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

43. USNRC, "Branch Technical Position on Disposal or On-Site Storage of Residual Thorium and Uranium from Past Operations", FR. Vol. 46, No. 205, Page 52061, October 23, 1981.

44. NRC Guidance "Method for Surveying and Averaging Concentrations of Thorium in Contaminated Subsurface Soil", transmitted by letter from Mr. Kenneth L. Kalman, Project Manager, Facilities Decommissioning Section, to Mr. Jess Larsen, Vice President, Cimarron Corporation, dated February 25, 1997.

45. Cimarron Corporation By-Product Materials License 35-12636-02, Amendment No. 13, November 22, 1993.

46. American Society of Mechanical Engineers, "Quality Assurance Requirements for Nuclear Facility Applications", ASME NQA-1, 1994.

47. USNRC Letter from Mr. Michael F. Weber, Chief, Low-Level Waste and Decommissioning Project Branch, Division of Waste Management to Mr. Jess Larsen, Vice President, Kerr-McGee Corporation, dated May 31, 1995.

August 11, 1998

NOTE TO: Ken Kalman, PM, LLDP, DWM

FROM: /S/ Pat Santiago, Senior HP, LLDP, DWM

SUBJECT: Docket No. 70-0925; SNM-928; Cimarron Responses to NRC Staff Comments Dated February 9, 1998 On the Phase III Final Status Survey Plan

I have reviewed the Cimarron responses dated 6/26/98, "Cimarron Corporation Response to NRC Staff 2/9/98 Comments on the Phase III Final Status Survey Plan", and the July 2, 1998 Cimarron letter, "Correction to Subarea J and Phase III FSSP Responses." These letters supplement the Cimarron letter dated 12/5/97 and respond adequately to the NRC letters dated October 3, 1997 and February 9, 1998. The FSSP should be approved to allow the licensee to continue to submit FSSRs for other Phase III areas. Information on calibration and training of individuals was submitted in the Cimarron response dated May 13, 1998, "Phase II - Subarea J". The licensee's responses contained in the Subarea J report were noted in my July 16, 1998 memorandum as acceptable and had been confirmed by the 5/18/98 NRC inspection report 70-925/97-03 results.

Attached for your use is a summary identifying what the Phase III areas will include and references to prior NRC authorizations for backfill of areas or release.

SUMMARY OF PHASE III AREAS

The Phase III areas will include:

1) five former waste water ponds (Uranium waste ponds 1 and 2; plutonium evaporation and emergency pond; and the uranium emergency pond). These ponds were backfilled as authorized by NRC letter July 10, 1978 and in accordance with current guidelines as stated in January 8, 1993 letter;

2) Uranium Plant Yard area remediated (sec 13 char.) (UF6 receiving area, tank storage building (2); solvent extraction building (3); liquid storage area; UF6 storage area). Backfilling in accordance with NRC letter July 7, 1995.

3) uranium Processing Building (1) and scrap recovery area released for backfill January 10, 1994. (Char sec 14);

4) Burial Area 2 and North Field drainage area (op 2 &4 removed/Op2 soils to onsite cell -- see subarea L report (May 1996) approved backfill Nov 8, 1996);

5) New sanitary lagoon (see sec 2.2 of DP and approval Nov 8, 1996);

6) Burial area 3 (Any > Op 1 left for cell disposal or sent offsite);

7) Trash incinerator dismantled 1992 and ash "if required" shipped offsite;

8) onsite roads - to be complete when op 2 waste done;

9) burial area 4 (op 2 cell - amendment 10-500,00 ft3) Cell=3 pits 1 &2 capped 3 will be capped when all Op 2 material buried); Building 1 {80% removed} (see 6.3.1/and sec 14 char.) released by NRC and backfilled///west end office area;

10) uranium plant yard area -disposing of stockpiles in cell or offsite; and

11) Drain areas removed except bldg 1 (????Bldg 4)

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

October 3, 1997

Mr. Jess Larsen, Vice President
Cimarron Corporation
P.O. Box 25861
Oklahoma City, OK 73125

Dear Mr. Larsen:

The U.S. Nuclear Regulatory Commission staff has completed its review of the "Final Status Survey Plan for Phase III Areas for Cimarron Corporation's Former Nuclear Fuel Facility at Crescent, Oklahoma," dated June 1997. The staff's comments are enclosed. Cimarron is requested to submit a response to the enclosed comments. If you have any questions about these comments, please contact me at (301) 415-6664.

Sincerely,

Kenneth Kalman, Project Manager
Facilities Decommissioning Section
Low-Level Waste and Decommissioning
Projects Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Docket No. 70-925
License No. SNM-928

Enclosure: As stated

cc: Cimarron distribution list

Comments on the Final Status Survey Plan for Phase III Areas of Cimarron Corporation's Former Nuclear Fuel Fabrication Facility Crescent, Oklahoma

General Comment

1. Based on its review of Sections 6.0, 6.4, 8.4 and 8.7, NRC staff is concerned that Cimarron may not have followed the procedures for fixed measurements of exposure rate as described in Section 5.3 in NUREG/CR-5849. The proposed Final Status Survey Plan (FSSP) does not describe how the sodium iodide survey meters proposed for the exposure-rate surveys will be cross-calibrated against a pressurized ion chamber (PIC) or calibrated for the low energy emissions expected from enriched uranium in soils. Also, as noted in Section 4 of NRC Inspection Report 70-925/97-02, dated July 31, 1997, Cimarron committed to use a PIC to support future exposure rate measurements. However, the FSSP does not appear to uphold that commitment. Please explain how your meters will be calibrated.

2. The FSSP should discuss what sources will be used for calibrating the instrumentation to be used.

3. The FSSP should discuss how previous data are of the same quality as data to be collected under this project.

4. The FSSP should discuss how additional samples will be taken at points having high scan levels.

5. The FSSP should discuss how building surface hot spots will be evaluated. NUREG/CR-5849, Section 8.5 needs to be referenced in this discussion.

Specific Comments

1. Section 6.0 notes that the radiological criteria and guideline values for Phase III will be the same as those utilized for Phases I and II. The Phase III FSSP should be revised to clearly state the criteria to be used.

2. Section 6.2 (last paragraph) discusses how Cimarron established its background rates. NRC staff requests that the data points and the statistical technique that was used to determine the average background exposure-rate be referenced in the FSSP and reported in the Phase III Final Status Survey Report (FSSR). It is not clear whether the average background exposure rate was characterized according to the procedures in Section 8.6 of NUREG/CR-5849. It is also not clear if the raw background data were measured with a properly-calibrated Ludlum micro-R meter (see general comment above). Furthermore, Section 6.2 should also be revised to address the background for soils and building and equipment surfaces.

Enclosure

3. Section 6.3.1 and Section 6.4.4 note that additional soil data will be gathered for Waste Ponds 1 and 2 to demonstrate that these soils meet the Branch Technical Position Option 1 criteria and can therefore be left in place. Likewise, Section 8.2 notes that final characterization data, including subsurface averaging data, will be included in a separate submittal to the NRC and only summarized in the Phase III FSSR. However, there is no specific mention of when these data will be presented. NRC staff encourages Cimarron to present these data for our review before it is incorporated into the Phase III FSSR. Failure to do so may delay our review of the Phase III FSSR.

4. Section 6.3.2 discusses remediation actions taken at the trash incinerator but does not mention whether this area will be included in the Phase III final status survey. Please specify whether it will be included in a final status survey. NRC staff suggests that Cimarron add a general direction that all Phase III areas be included in the final status survey.

5. Section 6.3.2 discusses on-site roads and the possible need for decontamination. How will these roads be surveyed? Is there any possibility that radioactive contaminants are trapped between layers of asphalt comprising these roads? How will this factor into the survey or sampling methodology? How will this road material be handled if it is above Option 1 criteria?

6. Section 6.3.3 notes Cimarron's belief that groundwater restoration is not justified. This is a matter that will not be brought to closure until after Cimarron and the Oklahoma Department of Environmental Quality have completed their risk assessment and NRC staff makes its decision. Such statements are premature and misleading, and should be qualified accordingly.

7. Section 6.4.4 should be revised to clearly state how the averaging criteria will be used for Burial Areas 1 and 2.

8. Section 6.4.2, first paragraph, fifth sentence. The reference to NUREG/CR-5849 should be clarified by adding the following words to the end of the sentence: "Section 8.5.2, for soils."

9. Section 7.3 references License Amendment No. 13. This should be changed to License Amendment No. 14, which is the amendment that actually incorporates the radiation protection plan. In addition, the text should be modified to explicitly reference the radiation protection program that was approved in License Amendment 14.

10. Section 8.5. NRC staff believes that Cimarron's procedures for the collection of surface soil samples and conduct of exposure rate measurements in open land areas are consistent with procedures in NUREG/CR-5849. However, the following information should be included in the FSSR:

a. For subsurface areas not previously sampled, Cimarron should present a written justification for its proposed sampling frequency of subsurface soil; one location for every twenty 5m X 5m grid areas.

b. NRC staff notes that the frequency and locations of subsurface soil samples, as presented in this paragraph, would be appropriate only if the subsurface soil areas were justified as unaffected areas.

c. Section 4.2.4 of NUREG/CR-5849 indicates that, "The number and locations of samples should follow the same pattern as described above in section 4.2.3 sampling depth of surface soil." For unaffected areas, this procedure requires 30 randomly-selected locations and a scan of a minimum of 10 percent of the soil to be scanned. Cimarron should also present the written procedure it will follow, if any of these subsurface samples exceed the averaging criteria for unrestricted release of areas contaminated with enriched uranium.

11. Section 8.5 discusses composites of samples taken at depth. Does this mean that one sample was analyzed to represent a 4 ft. depth? This is unacceptable unless the acceptance criteria was modified. Separate samples should be taken and analyzed to represent each depth level. Also, Cimarron should describe how it will determine when it has gone to an acceptable depth. Normally, NRC staff will accept data that shows the licensee is at background levels and that there is a consistent trend downward to background levels.

12. Section 8.6 should be revised to clearly specify what the measurement frequency will be for upper walls, ceilings, and overhead structures. Note that no specific information is provided. The frequencies should be consistent with NUREG/CR-5849, Section 4.2.3.

From: Robert B. Neel
To: KLK
Date: 9/4/97 1:12pm
Subject: COMMENTS ON FSSP FOR CIMARRON, CRESENT, OK

<WP Attachment Enclosed>

Ken,

The file is in WPW5.1/5.2 in case your WPW6.1 is not installed.

NOTE TO: K. L. Kalman, LLDP, DWM

FROM: R. B. Neel, Health Physicist, LLDP, DWM

SUBJECT: FINAL STATUS SURVEY PLAN FOR PHASE III AREAS FOR CIMARRON'S FORMER FUEL-FABRICATION FACILITY, CRESCENT, OK

I have reviewed those sections of the subject document that you requested, and have the following comments.

- GENERAL COMMENTS

My impression is that this FSSP has been carefully planned to conform to NRC procedures and guidelines.

Section 6.0, paragraph 2:
---Cimarron has committed to follow the methodology prescribed in NUREG/CR-5849.

Sections 6.0, 6.4, 8.4 and 8.7:
---Based on our phone conversation with Lou Carson, Region IV, it appears that Cimarron personnel have not followed the procedures for fixed measurements of exposure rate as described on page 5.15 of Section 5.3 in NUREG/CR-5849. The proposed FSSP does not describe how the sodium iodide survey meters proposed for the exposure-rate surveys will be cross-calibrated against a pressurized ion chamber or calibrated for the low energy emissions expected from enriched uranium in soils.

- SPECIFIC COMMENTS

Section 6.2, paragraphs 1-6 (refer also to Section 8.7.4) :
---Page 2 of the executive summary, NRC Inspection Report 70-925/97-02, indicates: "No significant bias or statistical error between the licensee's soil results and the NRC's results were identified." The justification for the use and calibration of the soil counter for gamma spectroscopy is given in Section 8.7.4

Section 6.2, last paragraph, page 8:
---I recommend that the data points and the statistical technique that was used to determine the average background exposure-rate be referenced in this FSSP and reported in the FSSR. It is not clear from the information in paragraph 5, page 8, if the average background exposure rate was characterized according to the procedures in Section 8.6 of NUREG/CR-5849. It is also not clear if the raw background data were measured with a properly-calibrated Ludlum micro-R meter (see general comment above).

Section 6.3.1:
---The affected and unaffected areas for Phase III are clearly defined.
---I assume that the FSSP for Phase III areas does not require evaluation of the concentrations of radionuclides in groundwater or in river water. (The area appears to be in close proximity to the Crescent River.) Paragraph 2, page 7, the FSSP indicates that voluntary environmental monitoring of groundwater is ongoing.

Section 6.4:
---Except for the omissions in Section 6.4.1 noted below, these survey objectives are consistent with NUREG/CR-5849 and the NRC-approved subsurface method for averaging concentrations as referenced in the FSSP.

Section 6.4.1 (refer to the discussion in Section 8.6).

Section 6.4.2, paragraph 1, line 5:
---Add the following words to the end of line 5: "...Section 8.5.2, for soils."

Section 8.3 - 8.4:
These sections describe the equipment and techniques that are consistent with NUREG/CR-5849 for surveys of open-land areas.
---The grid sizes (and method of their identification) on Drawing NO. 95MOST-R15 are consistent with those in Figure 4-5 of NUREG/CR-5849.
---The licensee intends to select survey instruments whose sensitivities should be <25% of guideline values. MDA values are listed for each instrument used in surveys of alpha, beta, and gamma radiations.

Section 8.5:
---Paragraph 1: The collection of surface soil samples is consistent with procedures in NUREG/CR-5849.
---Paragraph 2: The following information should be included in the Final Status Survey Report and the justification used to update the FSSP.
---For subsurface areas not previously sampled, Cimarron should present a written justification for their proposed sampling frequency of subsurface soil, one location for every twenty 5m X 5m grid areas. The frequency and locations of subsurface soil presented in this paragraph would be appropriate if the subsurface soil areas were justified as unaffected areas. Section 4.2.4 of NUREG/CR-5849 indicates that "The number and locations of samples should follow the same pattern as described above in section 4.2.3 sampling depth of surface soil." For unaffected areas, this procedure requires 30 randomly-selected locations and a scan of a minimum of 10% of the soil to be scanned. Cimarron should also present the written procedure they will follow if any of these subsurface samples exceed the averaging criteria for unrestricted release of areas contaminated with enriched uranium.
---Last paragraph: Exposure rate measurements on open land areas are consistent with procedures indicated in NUREG/CR-5849.

Section 8.6:
---The procedures described in this section for surveys of building/structure surfaces are consistent with those set out in NUREG/CR-5498.

Section 8.7:
---The procedures for selection and calibration of survey instruments are consistent with those in NUREG/CR-5489.

Section 10.0:
---The following information should be included in the Final Status Survey Report.

---For subsurface areas not previously sampled, Cimarron should present a written justification for their proposed sampling frequency of subsurface soil, one location for every twenty 5m X 5m grid areas. The frequency and locations of subsurface soil presented in this paragraph would be appropriate if the subsurface soil areas were justified as unaffected areas. Section 4.2.4 of NUREG/CR-5849 indicates that "The number and locations of samples should follow the same pattern as described above in section 4.2.3 sampling depth of surface soil." For unaffected areas, this procedure requires 30 randomly-selected locations and a scan of a minimum of 10% of the soil to be scanned. Cimarron should also present the written procedure they will follow if any of these subsurface samples exceed the averaging criteria for unrestricted release of areas contaminated with enriched uranium

CIMARRON CORPORATION LETTER OF TRANSMITTAL

DATE: 12/08/97

TO: **M r. Ken Kalman, Project Manager**
Low Level Waste & Decommissioning Project Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
MAIL DROP T2F27

FROM: **Mickey Hodo, Quality Assurance Manager**
Cimarron Corporation
P.O. Box 315
Crescent, OK 73028

☐ First Class Mail ☐ Internal ☐ Overnight--UPS
☐ Overnight--Fed Ex ☐ UniShippers ☐ Second Day Air--UPS
☐ Second Day--Fed Ex ■ Other **Certified Mail**

COPY NO.	DATE	DESCRIPTION
2	12/05/97	Docket no. 70-925; License No. SNM-928 Response to Comments on Phase III Final Status Survey Plan

These are transmitted as checked below:

☐ **For Approval** ☐ **Approved as submitted** ■ **For your use**
☐ **As requested** ☐ **Returned for corrections** ☐ **Return ____ corrected prints**
☐ **Disapproved** ☐ **For review and comment**

REMARKS **The above items are for your use. Please sign and return transmittal letter to me.**

NOTE:

SIGNATURE Mickey Hodo

ACKNOWLEDGEMENT OF RECEIPT **PLEASE RETURN ONE SIGNED COPY TO SENDER**

I HAVE RECEIVED THE DOCUMENTS IDENTIFIED ABOVE AND THE PRIOR REVISIONS OF THESE HAVE BEEN
- DESTROYED N/A **VOIDED** N/A

PRINTED NAME OF RECIPIENT: KEN KALMAN

SIGNATURE OF RECIPIENT: Ken Kalman

DATE RECEIVED: 12/15/97

If enclosures are not noted, kindly notify Cimarron Corporation

CIMARRON CORPORATION

P.O. BOX 25861 • OKLAHOMA CITY, OKLAHOMA 73125

S. JESS LARSEN
VICE PRESIDENT

December 5, 1997

Mr. Kenneth L. Kalman, Project Manager
Low-Level Waste and Decommissioning Projects Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: Docket No. 70-925; License No. SNM-928
Cimarron Corporation
Response to Comments on Phase III Final Status Survey Plan

Dear Mr. Kalman:

Please find enclosed Cimarron Corporation's response to your October 3, 1997, letter transmitting NRC staff's comments on the "Final Status Survey Plan for Phase III Areas for Cimarron Corporation's Former Nuclear Fuel Facility at Crescent, Oklahoma," dated June 1997.

We trust that these responses will resolve the questions raised by the NRC staff on this Phase III FSSP. Upon your advice that these responses and the proposed alterations to specific sections of the FSSP are acceptable to NRC, we will submit the amended pages and maps for placement in the FSSP.

Please contact me if we can clarify anything for you, or in any way help expedite the approval by NRC.

Sincerely,

Jess Larsen

Jess Larsen
Vice President
Enclosure

jl120597.le1

RESPONSE TO NRC'S COMMENTS ON THE FINAL STATUS SURVEY PLAN FOR PHASE III AREAS AT CIMARRON CORPORATION FACILITY
December 3, 1997

General Comment

1. NRC Comment:

Based on its review of Sections 6.0, 6.4, 8.4, and 8.7, NRC staff is concerned that Cimarron may not have followed the procedures for fixed measurements of exposure rates as described in Section 5.3 in NUREG/CR-5849. The proposed Final Status Survey Plan (FSSP) does not describe how the sodium iodide survey meters proposed for the exposure rate surveys will be cross-calibrated against a pressurized ion chamber (PIC) or calibrated for the low energy emissions expected from enriched uranium in soils. Also, as noted in Section 4 of NRC Inspection Report 70-925/97-02, dated July 31, 1997, Cimarron committed to use a PIC to support future exposure rate measurements. However, the FSSP does not appear to uphold that commitment. Please explain how your meters will be calibrated.

Cimarron Response:

As indicated in the NRC's comment, Cimarron committed to using a pressurized ion chamber to support its exposure rate measurements. Cross checks between the Micro-R and a Reuter-Stokes Pressurized Ion Chamber (PIC) are being performed as outlined in the recently submitted "Final Status Survey Report, Phase II, Subarea J". Also, as stated in the Phase III FSSP, instrumentation calibration is performed using the applicable guidance contained in ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration." The Micro-R meter used for exposure measurements are calibrated in accordance with written and approved procedures utilizing a traceable Cs-137 source.

To confirm that such calibration procedures produce accurate field results, Cimarron personnel performed exposure rate measurements at background

locations on the site boundary in 1995 using a Micro-R meter calibrated as noted. Confirmatory measurements also were obtained later at the same locations in 1997 using a Reuter-Stokes PIC. These two data sets are tabulated below in Table 1.0. The average background as measured using the Micro-R meter was 7.6 μR/h, and is about 15 percent less than the average for the PIC measurements of 9.0 μR/h indicating good agreement between the two measurement methods.

TABLE 1.0

Sample ID No.	Grid Location	Micro-R Reading (μR/h)	PIC Reading (μR/h)
UAF-BKG-1	819W-81N	9	9.8
UAF-BKG-7	1600E-120N	7	7.6
UAF-BKG-11	840W-700S	8	9.5
UAF-BKG-13	840W-288S	9	9.8
UAF-BKG-16	808W-282S	8	9.7
UAF-BKG-19	640W-700S	9	10.5
UAF-BKG-23	1610E-300S	5	7.8
UAF-BKG-25	1610E-69N	6	7.6
UAF-BKG-27	1610E-469N	7	7.8
UAF-BKG-28	1610E-634N	8	9.6
	AVERAGE	**7.6 ± 2.7 (2σ)**	**9.0 ± 2.3 (2σ)**

In addition, quarterly comparisons and/or confirmatory measurements for the Micro-R meter are obtained routinely to provide information concerning any significant measurement bias. These comparisons or confirmatory measurements are made using a PIC. As an example of these confirmatory measurements, Subarea J survey data is shown below. The quarterly confirmatory measurements included in Table 1.1 indicate good agreement between the Micro-R meter measurements and the PIC measurements. These quarterly comparisons will be continued during the gathering of the remaining decommissioning and final status survey data.

TABLE 1.1			
Sample ID No.	**Grid Location**	**Micro-R Reading (μR/h)**	**PIC Reading (μR/h)**
Phase II Affected Area J	150W-55N	8	8.9
Phase II Affected Area J	200W-80N	9	9.4
Phase II Affected Area J	140W-20S	9	9.8
Phase II Affected Area J	240W-30N	8	9.9
Phase II Affected Area J	370W-200S	8	8.9
Phase II Affected Area J	370W-30N	10	10.0
	AVERAGE	**8.7±1.6 (2σ)**	**9.5 ± 1.0(2σ)**

Site background exposure rates of approximately 7 μR/h have been recorded in background areas by Cimarron personnel utilizing a Ludlum Micro-R survey meter, and have been used in past reports and Plans submitted to the NRC. For example, the approved Phase II, FSSP[1] specified that 7 μR/h would be used for average background. Site background exposure rates of approximately 7 μR/h have also been determined by ORISE personnel utilizing similar instrumentation[2]. In addition, site background exposure rates were measured by ORAU (now ORISE) personnel in 1988 utilizing a PIC, and were determined to be 9 to 10 μR/h[3]. These values are similar to the values determined by Cimarron. Cimarron's background exposure rate measurements compare favorably to those determined by a third party utilizing both a Micro-R Survey Meter and the PIC.

In summary, NUREG/CR-5849, Section 5.3, "Instrumentation Selection and Use" states that for surveys, "The instrument must be able to detect the type of radiation of interest, and must, in relation to the survey or analytical techniques be capable of measuring levels which are less than the guideline values."

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1 US Nuclear Regulatory Commission Letter from Mr. Ken Kalman, Project Manager, Low-Level Waste and Decommissioning Branch to Mr. Jess Larsen, Vice President, Cimarron Corporation, dated March 14, 1997.

2 ORISE, "Confirmatory Survey for the South Uranium Yard Remediation, Kerr-McGee Corporation, Cimarron Facility, Crescent, Oklahoma," November 1995.

3 ORAU Background Survey, "Confirmatory Survey of Portion of Sequoyah Fuels Corporation Cimarron Plant," Completed in 1988.

Cimarron meets this requirement with fixed measurements for exposure rates in accordance with NUREG/CR-5849. Cimarron, also believes that the recent comparison surveys between the Micro-R and PIC indicates good agreement and verifies previous survey data by both the company and independent organizations.

Section 8.7.3 of the FSSP will be modified by adding the following paragraph:

> "Quarterly cross checks between the Micro-R meter and PIC will be performed during the gathering of all remaining final status survey data."

2. NRC Comment:

The FSSP should discuss what sources will be used for calibrating the instrumentation to be used.

Cimarron Response:

As stated in the Phase III FSSP, instrument calibration is performed using the applicable guidance contained in ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration." Specific requirements for instrumentation include traceability of calibrations to NIST standards, field checks for operability background radioactivity checks, operation of instruments within established environmental bounds (i.e., temperature and pressure), training of individuals, scheduled performance checks, calibration with isotopes of energies similar to those to be measured, quality assurance tests, data review, and recordkeeping. These requirements were incorporated into the written site calibration procedures and have been audited. The audits[4,5] found no discrepancies.

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[4] NRC Inspection Report 70-925/95-01, performed January 1 and February 28, 1995.

[5] NRC Inspection Report 70-925/94-01, performed November 17-18, 1994.

Calibration sources used are, to the extent practical, similar in energy and geometry to those which are to be measured in the field. Calibration of the onsite soil counter is performed using uranium and thorium standards in a soil matrix similar to those collected during field sampling. Micro-R meters are calibrated using Cs-137 and readings are compared to a PIC to ensure that any bias is identified. (See previous response comment #1.) Alpha/beta survey instruments are calibrated using alpha sources (Pu-239) or beta sources (Tc-99) in a dish geometry as appropriate for the instruments. The efficiency in regions of each probe are compared to ensure that the detection efficiency is reasonably consistent. In summary, these calibration procedures are written, followed, documented, and audited.

The above paragraph will be added to Section 8.7 of the FSSP, page 31, between the first and second paragraph.

3. **NRC. Comment:**

The FSSP should discuss how previous data are of the same quality as data to be collected under this project.

Cimarron Response:

Cimarron has been decommissioning the site, including the gathering of a great amount of data for over 20 years. A substantial amount of the data gathered was presented in the October 1994 Site Characterization Report. Additionally, numerous other survey reports have been submitted to the NRC for review and approval; which have resulted in areas being released by the NRC for backfilling or for soil placement into the on-site disposal cell. Typical of these reports are: "Final Status Survey Report, Phase I Areas", "Report on the South Uranium Yard Remediation" "Report on the Radiological Survey Results of Option #2 Stockpile No. 3", "Final Status Survey Report, Phase III-Subarea L (Subsurface)", and the "Sample Data for On-Site Disposal Cell, Pit No. 3, Lift No. 1". The survey data

included in the numerous reports submitted to the NRC and as noted above in responses #1 and #2 were generated in accordance with written calibration and quality assurance procedures. These procedures have been revised during the ensuing years as NRC guidances have changed (i.e., NUREG 2082 to NUREG/CR-5849) to assure accuracy and application of the latest guidance.

To assure data quality, the Cimarron Corporation Quality Assurance Plan and Procedures, which are an integral part of the Cimarron Radiation Protection Program, were upgraded in 1994. A principal component of this Program is the affirmation of the quality of project work performed during decommissioning by assuring that all tasks are performed in a quality manner by qualified personnel using properly calibrated instruments. The Program ensures that all characterization and final status survey samples are collected, controlled, and analyzed in accordance with applicable quality assurance requirements such that the resulting data accuracy and validity are verifiable. Such quality controls allow independent, third-party review of analytical results.

Historically, Cimarron's instrumentation, including both portable hand held field type equipment and the onsite soil counters have been calibrated against traceable standards and/or comparable cross checks. Portable survey instruments are calibrated at least semi-annually. All instrumentation is calibrated with NIST traceable standards. This program has been in place throughout the decommissioning phase, verifying that data collected during previous characterization and final status surveys will be of the same quality as that data collected during the Phase III Final Status Survey.

Similarly, the onsite soil counting system has in the past and is today calibrated to traceable NIST standards through contractor laboratory evaluations of the on-site standards. Recently, Counter #2 was installed to replace Counter #1, which is used as a back-up system. As referenced below, independent laboratory

analysis of split soil samples by both the NRC and ORISE and other Cimarron subcontract laboratories continue to verify that soil analytical data generated from Cimarron's counting systems are acceptably accurate and reproducible. Numerous quality assurance controls and cross-checks are further discussed in the Phase III Plan, Section 8.7.4.

Throughout the decommissioning period, NRC has performed numerous inspections and ORISE has performed extensive confirmatory analyses. These inspections and confirmatory surveys have consistently affirmed the quality of the work being performed by Cimarron. Several of these audits and confirmatory surveys are discussed below.

ORISE has been employed by the NRC for verification of a majority of the decommissioning work completed to date at the Cimarron site. ORISE has conducted an evaluation of the Cimarron Soil Counting system's ability to measure accurately total uranium concentrations in soil samples. This was done by comparing ORISE sample analysis results obtained by alpha pulse height analysis and gamma spectroscopy with the results obtained from the use of the Cimarron Soil Counter. ORISE and Cimarron analysis results compared favorably at levels above background as demonstrated by the most recent confirmatory analysis performed for the On-Site Disposal Cell, Pit #3 (NRC cover letter dated July 31, 1997)[6]. NRC Inspection Report #70-925/97-02, which accompanied this letter, states that "no significant bias or statistical error between the licensee's soil results and the NRC's results were identified." Additionally, the confirmatory analysis performed on select soil samples collected during ORISE's site visit to investigate the South U-Yard[7], and DAP-3 stockpile[8]

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[6] USNRC letter from Mr. Ross A Scarano, Director, Division of Nuclear Materials Safety to Mr. S. Jess Larsen, Vice President, Cimarron Corporation, dated July 31, 1997.

[7] E. W. Abelquist, "Confirmatory Survey for the South Uranium Yard Remediation, Kerr-McGee Corporation, Cimarron Facility, Crescent, Oklahoma," Oak Ridge Institute for Science and Education, November 1995.

[8] USNRC Letter from Mr. Michael F. Weber, Chief, Low-Level Waste and Decommissioning Project Branch, Division of Waste Management to Mr. Jess Larsen, Vice President, Kerr- McGee Corporation, dated May 31, 1995.

verified previously that Cimarron's onsite counter results are substantially identical to ORISE's results.

Throughout all phases of the Final Status Survey, Cimarron has operated in accordance with the facility's QA/QC program and has followed the methodology prescribed in NUREG/CR-5849. The Final Status Survey Reports for those areas which have been released have included the necessary data to support the survey and an evaluation of the data presented. Cimarron has committed to continue following this program.

Cimarron has reviewed its text related to this comment and feels no additions to the FSSP are considered necessary in response to this NRC comment.

4. NRC Comment:

The FSSP should discuss how additional samples will be taken at points having high scan levels.

Cimarron Response:

Cimarron believes the presence of elevated surface scan readings and the task to be undertaken subsequent to these measurements is discussed in the FSSP. Section 8.4, Surveys (Open Land Areas), second paragraph, states: "In the event that any of these survey readings exceed the limits described in Section 6.4.3., their location will be flagged for additional surveys and/or soil sampling." (We do note, however, the reference to Section 6.4.3 should be to Section 6.4.5.) Section 6.4.5 states that the guideline for scan surveys, using shielded or unshielded NaI detectors, is "twice background". For clarity, Section 8.4 of the FSSP will be modified to note this. The following sentence will be added to the second paragraph before the last sentence in this paragraph. "A reading greater than twice background requires an additional follow-up investigation. The additional investigation includes taking direct measurements to define the extent

and activity for locations exceeding twice background during the scanning survey. Also, a soil sample is collected to identify the radionuclide causing the elevated activity. Remediation would follow, if required, prior to beginning the systematic surveying."

A similar procedure is followed for buildings. Section 8.6 (Building/Surface Surveys) states, "Areas of elevated activity noted during the scan will be identified and direct measurements taken" to define the extent and activity for those locations exceeding the guideline values. Remediation would follow, if required, prior to beginning the systematic surveying. Building surface scans, "hot spot averaging" and systematic surveys are further discussed in the response to the next NRC comment and to NRC Specific Comment #12. Recommended changes to the FSSP are discussed in these responses.

5. NRC Comment:

The FSSP should discuss how building surface hot spots will be evaluated. NUREG/CR-5849, Section 8.5 needs to be referenced in this discussion.

Cimarron Response:

Section 8.6 of the Phase III FSSP discusses the procedure to be followed for surveying building surfaces and sets out the surface guideline values for buildings. This section emphasizes that surface surveys will consist of a combination of surface scans, direct measurements, and measurements of removable activity. As discussed in Section 8.6, areas of elevated activity noted during the scan will be identified and direct measurements taken.

To clarify how building surface hot spots have and will be evaluated, the second paragraph on Page 30, Section 8.6 will be modified by adding the following language prior to the last sentence in the paragraph.

"To evaluate whether this average condition is satisfied, additional measurements will be performed, and the activity level and areal extent of the elevated area will be determined. The average (weighted average) in the 1 m^2 area will be calculated, taking into consideration the relative fraction of the 1 m^2 occupied by the elevated area(s), using the relationship presented in Section 8.5.2 of NUREG/CR-5849."

Specific Comments

1. **NRC Comment:**

Section 6.0 notes that the radiological criteria and guideline values for Phase III will be the same as those utilized for Phases I and II. The Phase III FSSP should be revised to clearly state the criteria to be used.

Cimarron Response

The reference to Phase I and Phase II in Section 6.0 in the Phase III FSSP was intended to assure the NRC that Cimarron continues to decommission and survey the site in accordance with radiological criteria previously approved by the NRC. The radiological criteria listed in both the Phase I and Phase II FSSP's are similar to those criteria stated in Section 6.4 of the Phase III FSSP. The criteria to be used for continued site decommissioning as presented in Section 6.4, is summarized below:

- Section 6.4 - "Survey Objective" - Specifies that the guidance, including data evaluation, promulgated in NUREG/CR-5849 will be utilized throughout the conduct of the Final Status Survey.

- Section 6.4.1 - "Buildings and Equipment" - Specifies that release limits are those published in Table 1 of the NRC's 1987 guidance for decommissioning of facilities and equipment prior to release for

unrestricted use. The table is reproduced in the FSSP on Page 18. The average exposure rate guideline value as measured at 1 meter from the surface for internal building surfaces is 5 μR/h above background.

- Section 6.4.2 - "Surface Soil Activity" - The unrestricted release residual concentration of enriched uranium, which may remain in soil, is specified as BTP[9] Option #1 material. The BTP Option #1 guideline is up to an average of 30 pCi/g total uranium above background within a 10 m x 10 m grid. The average soil activity is to be determined from the analysis of a minimum of four locations per 100 m^2 area. The maximum enriched uranium soil concentrations within a 100 m^2 grid area may not exceed three times the Option #1 limit (i.e., 90 pCi/g total uranium). "Hot Spot: averaging is to be performed per the formula $(100/A)^{½}$ times the guideline value.

- Section 6.4.3 - "Volumetric Activity for Onsite Disposal" - Specifies that soil up to the BTP Option #2 upper limit for enriched uranium may be disposed on-site in the NRC approved on-site disposal cell. The average concentration of radioactive material that may be buried under a minimum four feet of soil cover is 100 pCi/g total uranium above background (100% soluble), and up to 250 pCi/g total uranium (insoluble). To date, Cimarron has decommissioned the facility using the conservative assumption that the residual uranium in soils is soluble. The maximum total uranium soil concentration for any "hot spot" location within a 100 m^2 grid may not exceed three times the Option #2 limit (i.e., 300 pCi/g total uranium).

[9] USNRC, "Branch Technical Position on Disposal or On-Site Storage of Residual Thorium and Uranium from Past Operations", FR. Vol. 46, No. 205, Page 52061, October 23, 1981.

- Section 6.4.4 - "Averaging Methodology for Subsurface Residual Activity" - Specifies that subsurface residual activity will meet the BTP Option #1 criteria when evaluated per the NRC guidance in "Method for Surveying and Averaging Concentrations of Thorium in Contaminated Subsurface Soil". This guidance was transmitted per NRC letter from Mr. Kenneth L. Kalman to Mr. Jess Larsen, dated February 25, 1997. In Cimarron's August 26, 1997 letter from Mr. Jess Larsen to Mr. Kenneth L. Kalman, the company committed to following this guidance. Cimarron presented its application of this guidance to the decommissioning for release of Waste Ponds #1 and #2 in a meeting with NRC staff on April 10, 1997 at NRC headquarters. At that time, NRC indicated that Cimarron appeared to have applied the guidance correctly in identifying Option #2 materials (as determined from the subsurface guidance document) to be removed and leaving behind residual Option #1 concentrations.

- Section 6.4.5 - "Gamma Surface Survey (Open Land Areas)" - This section specifies that when the NaI instrument is used for a gamma scan or systematic survey, any reading greater than twice background indicates an area requiring additional investigation.

- Section 6.4.6 - "Exposure Rate Survey (Open Land Areas)" - This section specifies that the average exposure rate, within a 100 m^2 area, may not exceed 10 μR/h above background at 1 meter above the surface. The maximum exposure rate for any discrete location within the unit area may not exceed 20 μR/h above background. Background has been established as 7 μR/h.

- Section 6.2 - "Site Background Levels" - The background exposure rate to be used for the site is 7.0 μR/h when surveying with a μR-

meter. When using the Cimarron on-site soil counter, the average background value for soils of 4.0 pCi/g total uranium is used. The derivation of this background soil value was discussed in the response to NRC Specific Comment No. 2 above.

As discussed above, the Phase III radiological criteria and guideline values summarized above (except Subsurface Residual Activity, Subsection 6.4.4) are the same as those used for all areas of Phase I and Phase II. Cimarron believes that no changes to the FSSP are required to respond to this NRC comment.

2. **NRC Comment:**

Section 6.2 (last paragraph) discusses how Cimarron established its background rates. NRC staff requests that the data points and the statistical technique that was used to determine the average background exposure-rate be referenced in the FSSP and reported in the Phase III Final Status Survey Report (FSSR). It is not clear whether the average background exposure rate was characterized according to the procedures in Section 8.6 of NUREG/CR-5849. It is also not clear if the raw background data were measured with a properly calibrated Ludlum Micro-R meter (see general comment above). Furthermore, Section 6.2 should also be revised to address the background for soils and building and equipment surfaces.

Cimarron Response:

Through numerous submittals and approvals, Cimarron and ORISE have established a background exposure rate of 7 μR/h when utilizing a Ludlum Micro-R Meter and 9 - 10 μR/h when surveying with a PIC. In response to NRC's General Comment #1 above, Cimarron presented the data and data comparisons developed by Cimarron for the Mirco-R meter which has been crossed checked with the PIC and discussed the fact that instrumentation is calibrated to NIST standards. The data utilized for these cross checks were

presented with that response. Additionally, the included calculation demonstrates that the ten Mirco-R survey locations were adequate for determining background exposure rates .

The total number of background measurements needed to satisfy the guidance in NUREG/CR-5849, Section 8.6 is as follows:

$$N_B = \left[\frac{t_{95.5} \bullet S_x}{0.2 \bullet \overline{X_B}} \right]^2$$

where

N_B = number of background measurements required
$\overline{X_b}$ = mean of initial background measurements
S_x = standard deviation of initial background measurements
$t_{95.5\%,\ diff}$ = t statistic for 95.5% confidence at df=n=1 degrees of freedom, where n is the number of initial background data points

The ten Micro-R survey readings listed in Table 1.0 were evaluated to determine if the number of background data points was acceptable.

The mean and standard deviation for this data (Table 1.0) were calculated to be 7.6 μR/h and 1.35 μR/h, respectively; the t statistic is 2.262 for 9 degrees of freedom. The total number of determinations required to establish an average background is:

$$N = \left[\frac{2.262 \bullet 1.35}{0.2 \bullet 7.6} \right]^2 = 4.0$$

Since the number is less than 10, no additional surveys to establish background are required.

Additionally, Phase III FSSP, Section 6.2, Page 8, third paragraph, addresses the residual activity for background uranium in soil. A value of 4.0 pCi/g total uranium has been established for background. The derivation of this value was presented in Cimarron's letter from Mr. Jess Larsen to Mr. Michael F. Weber, Chief, Low-Level Waste and Decommissioning Project Branch, US NRC, dated June 21, 1995 in response to questions on the "South Uranium Yard". The NRC accepted the derivation of background for "enriched" uranium with their approval to backfill the South Yard by letter dated July 7, 1995.[10]

At the NRC's request, Cimarron further performed a "Critical Value Determination" which recognized all significant contributions to the statistical variability for soil background. The "Critical Value Determination" was submitted to the NRC by letter dated July 23, 1996 from Mr. Jess Larsen to Mr. Ken Kalman. The observed variability in background concentrations is due to both counting variability as well as from spatial variability. The critical value determination resulted in total uranium background concentrations (at both the 95% and 99% confidence level) substantially greater than the 4.0 pCi/g total uranium value currently utilized by Cimarron. The critical value provides an upper bound for the normal distribution and could be used to determine when a single sample result in an unaffected area may require additional evaluation.

Average background for buildings and equipment has not been presented, nor is Cimarron using it during decommissioning. Acceptable surface contamination levels for releases of buildings and equipment are presented by Table 6.1 on page 18 in the FSSP. These values are absolute values, recorded by properly calibrated portable survey equipment. Ambient background has not been subtracted from these values.

[10] USNRC letter from Mr. Michael F., Weber, Chief, Low-Level Waste and Decommissioning Project Branch, Division of Waste Management, to Mr. Jess Larsen, Vice President, Cimarron Corporation, dated July 7, 1995.

Cimarron believes that no change to the FSSP are required to respond to this NRC comment. However, this discussion will be included and cited in the Final Status Survey Report.

3. **NRC Comment:**

Section 6.3.1 and Section 6.4.4 note that additional soil data will be gathered for Waste Ponds 1 and 2 to demonstrate that these soils meet the Branch Technical Position Option 1 criteria and can therefore be left in place. Likewise, Section 8.2 notes that final characterization data, including subsurface averaging data, will be included in a separate submittal to the NRC and only summarized in the Phase III FSSR. However, there is no specific mention of when these data will be presented. NRC staff encourages Cimarron to present these data for our review before it is incorporated into the Phase III FSSR. Failure to do so may delay our review of the Phase III FSSR.

Cimarron Response:

As stated in Section 6.4.4, Cimarron will apply the NRC's BTP Option #1 guidance to Uranium Waste Ponds #1 and #2 for volumetric averaging of subsurface soils containing residual contamination. During a meeting with the NRC on October 2 - 3, 1996, the NRC staff recommended that Cimarron consider applying the subsurface averaging methodology for residual activity being developed by the NRC for other licensees. The NRC guidance document that provides this method for averaging elevated areas of subsurface soil concentrations was sent to Cimarron by cover letter from Mr. Ken Kalman to Mr. Jess Larsen dated February 25, 1997. This document titled "Method for Surveying and Averaging Concentrations of Thorium in Contaminated Subsurface Soil", describes a set of decommissioning performance objectives for subsurface soils that the NRC has found acceptable at other sites. As stated in Mr. Kalman's letter, "Although the methodology was written for thorium it can be applied to uranium as well."

This NRC guidance assumes that soils containing residual contamination are excavated and brought to the surface where surface exposure pathways, and the surface averaging method apply. The surface averaging method used for excavated subsurface soils is consistent (although modified by the new guidance) with that used in NUREG/CR-5849. The acceptable concentrations (guideline values) which have been calculated by Cimarron for comparison to the final status survey data for the two Uranium Waste Ponds are a function of the excavated soil volumes. The calculated guideline values result in projected exposures similar to those representative of BTP Option #1 soils (30 pCi/g total uranium) with widespread surface contamination.

The methodology, the guidance values derived, and the preliminary data evaluation completed by Cimarron for both waste ponds were discussed with the NRC in Washington on April 10, 1997. The NRC representatives at that meeting included Mr. Dave Fauver, Mr. Ken Kalman, Mr. Tim Johnson, and Mr. John Hickey. At that meeting Cimarron discussed the preliminary soil survey data based upon one foot soil samples increments and committed to removing several soil areas within both waste ponds that exceeded the guideline values. Also, Cimarron discussed the fact that the final survey data would be evaluated and presented in one meter (i.e., 3 to 4 foot) increments per the methodology contained in the NRC's subsurface averaging guidance. NRC representatives at that meeting indicated that this method of data presentation met the guidance criteria.

In Cimarron's August 26, 1997 response to NRC's questions pertaining to the Decommissioning Plan, the company formally committed to follow the subsurface volumetric averaging guidance. The methodology's performance objectives put forth in the NRC guidance document are being followed in determining the Option #1 guideline values for subsurface soils. Presently these guidelines are being applied to the final status survey soil data for the two

Uranium Waste Ponds. Soil remediation of both waste ponds and the placement of 3 feet of clean fill (i.e., cap material) over Waste Pond #2 has been completed. The survey data compilation, data comparisons, drawings, and guideline value deviations are being assembled into the Subarea O, (i.e., Uranium Waste Ponds #1 and #2) Final Status Survey (i.e., subsurface only) Report for submittal. Cimarron anticipates submitting the "Subsurface" Subarea O FSSR by mid-January. The final status survey data for the Subarea O surface soils will be forwarded as a separate report at a later date, once all surface contouring and grading is completed and the survey data has been assembled and analyzed. Uranium Waste Ponds #1 and #2 both have been combined into Subarea O (Uranium Waste Pond #1 was moved from Subarea M to O) as noted on the revised Drawing No. 95 MOST-RF3, included with this response.

The revised Drawing 95MOST-RF3 will be included with the revision to the FSSP. Cimarron believes that no other changes to the FSSP are required to respond to this NRC comment.

4. NRC Comment:

Section 6.3.2 discusses remediation actions taken at the trash incinerator but does not mention whether this area will be included in the Phase III final status survey. Please specify whether it will be included in a final status survey. NRC staff suggests that Cimarron add a general direction that all Phase III areas be included in the final status survey.

Cimarron Response:

The trash incinerator location is included in Phase III, Subarea M. This subarea, along with all other Phase III Subareas, will be included in the Phase III Final Status Survey. The incinerator location will be included in the Final Status Survey Report for Phase III, Subarea M. The final status survey for this subarea is in progress, but has not been completed.

Section 8.0 of the FSSP will be modified by adding to the beginning of the first paragraph the following sentence:

> "All Phase III Subareas will be included in the Phase III Final Status Survey."

5. NRC Comment:

Section 6.3.2 discusses onsite roads and the possible need for decontamination. How will these roads be surveyed? Is there any possibility that radioactive contaminants are trapped between layers of asphalt comprising these roads? How will this factor into the survey or sampling methodology? How will this road material be handled if it is above Option 1 criteria?

Cimarron Response:

The issue of how "paved surfaces" are to be surveyed was discussed in Cimarron's response to NRC's comments on the Phase II FSSP. That response was:

> For exterior paved surfaces, the August 1987 surface contamination criteria from NRC's "Guidelines for Decontamination of Facilities and Equipment Prior to Release form Unrestricted Use" are being utilized by Cimarron Corporation. However, the activity is averaged over 100 m^2 as opposed to 1 m^2. NUREG/CR-5849 treats paved surfaces as open land areas (See "Open Land Surveys", NUREG/CR-5849, Section 4.2.3, page 4.16). Systematic grid surveys for open land areas are performed on a 10 m x 10 m grid as noted in Figure 4-4 (page 4.17) in NUREG/CR-5849. This treatment of paved surfaces as "Grounds" is also discussed in Section 4.3.7, page C-25 of NUREG/CR-5849.

The NRC agreed with this response, and approved the Phase II FSSP by letter March 14, 1997. **However, no asphalt roads presently exist within Phase III areas.**

Phase III FSSP will be modified to better define the disposition of roads (and parking areas) presently located within the Phase III area. These roads are gravel or dirt type roads some of which previously were covered with asphalt. Roads and parking areas in close proximity to the Uranium Plant operation area were asphalt. Other roads onsite were, in general, gravel. The asphalt from Phase III area roads and parking areas were removed beginning in the late 80's and stockpiled as part of the on-going decommissioning process. The asphalt was removed to facilitate subsurface soil characterization and remediation as required. All asphalt including that which was discovered to have residual activity between the layers has been removed and stockpiled. This asphalt has subsequently been crushed and characterized. The status of this asphalt stockpile was addressed by Cimarron in its October 17, 1997 letter to the NRC from Mr. Jess Larsen to Mr. Ken Kalman. The NRC forwarded several comments to Cimarron pertaining to Cimarron's October 17 response by letter dated November 7, 1997. Cimarron will forward its responses to the NRC as soon as they are completed.

The existing gravel/dirt roads will be surveyed as open land areas receiving a 100% surface scan prior to soil sampling. As discussed in Section 8.5, page 28, roads will be sampled at 5 m intervals along the length with 1 sample location per each 100 meters in length sampled down to 4 feet or rock. This procedure for surveying gravel/dirt roads was also included in the Phase II FSSP submitted on January 28, 1997 in response to NRC questions. As discussed above, this Phase II Plan was approved by the NRC by letter dated March 14, 1997 from Mr. Kenneth L. Kalman to Mr. Jess Larsen.

Any materials found during the surveys above the Option #1 criteria, will be handled as Option #2 material or greater as appropriate. Option #2 material will be placed into the on-site disposal cell, and Option #4 material will be packaged for off-site disposal.

Section 6.3.2 of the FSSP, page 14, under "On-Site Roads" will be modified with the addition of the following paragraph as the beginning paragraph.

> "No asphalt roads or parking lots exist within Phase III areas. The asphalt from area roads and parking lots were removed beginning in the late 80's and stockpiled as part of the on-going decommissioning process. The asphalt was removed to facilitate subsurface soil characterization and remediation as required. Existing gravel roads will be surveyed as open land areas per NUREG/CR-5849.

6. NRC Comment:

Section 6.3.3 notes Cimarron's belief that groundwater restoration is not justified. This is a matter that will not be brought to closure until after Cimarron and the Oklahoma Department of Environmental Quality have completed their risk assessment and NRC staff makes its decision. Such statements are premature and misleading, and should be qualified accordingly.

Cimarron Response:

Cimarron Corporation understands and agrees that the groundwater issues have not been brought to closure. The areas of groundwater impacts are associated with past disposal/operational activities and those areas have been excavated and materials removed and shipped off-site. The aquifers are "tight" and in some instances unsaturated in the impacted areas making a pump and treat system impractical. Cimarron is also working with the State of Oklahoma DEQ regarding this groundwater issue.

7. **NRC Comment:**

Section 6.4.4 should be revised to clearly state how the averaging criteria will be used for Burial Areas 1 and 2.

Cimarron Response:

By this comment, the NRC may be confusing Burial Areas #1 and #2 with Uranium Waste Ponds #1 and #2. Section 6.4.4 addresses the soil averaging criteria to be applied to Uranium Waste Ponds #1 and #2. This criteria was not applied to Burial Areas #1 and #2, as they were remediated and released by the NRC prior to the issuance of the new guidance as discussed in the response to NRC Specific Comment No. 3. Burial Area #1 which is located in Phase II Subarea F, was remediated, surveyed, and released per NRC License Amendment #9 issued by letter from Mr. George M. McCann, US NRC to Dr. John Stauter, dated December 29, 1992. A surface survey of this area will be included as part of the final status survey for Phase II, Subarea F.

Burial Area #2 is located in Phase III, Subarea L. This Burial Area has been remediated, final surveyed and backfilled per NRC authorization letter dated November 8, 1996 from Mr. Ken Kalman to Mr. Jess Larsen. In this letter the NRC states, "Based upon its review of these submittals and the additional subsurface sampling data, the NRC staff is satisfied that the criteria for unrestricted release have been met". Based upon this release, the area has been backfilled and graded. The surface area survey will be included in the final status survey for Subarea L.

Cimarron's response to NRC's Specific Comment #3, discusses the Option #1 subsurface averaging methodology to be applied to Uranium Waste Ponds #1 and #2 and the guideline values derived.

Cimarron believes that no changes to the FSSP are required to respond to this NRC comment.

8. NRC Comment:

Section 6.4.2, first paragraph, fifth sentence. The reference to NUREG/CR-5849 should be clarified by adding the following words to the end of the sentence: "Section 8.5.2. for soils."

Cimarron Response:

Cimarron will add to the end of the fifth sentence in Section 6.4.2 the phase, "Section 8.5.2 for soils."

9. NRC Comment:

Section 7.3 references License Amendment No. 13. This should be changed to License Amendment No. 14, which, is the amendment that actually incorporates the radiation protection plan. In addition, the text should be modified to explicitly reference the radiation protection program that was approved in License Amendment 14.

Cimarron Response:

Section 7.3 will be modified by revising the second sentence and the first bulleted item to read as follows:

"The Cimarron Radiation Protection Program currently in place for all decommissioning activities which was recently modified and updated per SNM-928 Amendment No. 14, is administered through the use of the following documents:

- License SNM-928 Amendment #14"

10. NRC Comment:

Section 8.5. NRC staff believes that Cimarron's procedures for the collection of surface soil samples and conduct of exposure rate measurements in open land areas are consistent with procedures in NUREG/CR-5849. However. the following information should be included in the FSSR:

a. For subsurface areas not previously sampled, Cimarron should present a written justification for its proposed sampling frequency of subsurface soil; one location for every twenty 5m X 5m grid areas.

Cimarron Response:

Cimarron was pleased to hear that the NRC staff believes that Cimarron's procedures for collection of surface soil samples and for conducting exposure rate measurements are consistent with the procedures in NUREG/CR-5849. Cimarron also believes that their procedures for subsurface sample collection are consistent with NUREG/CR-5849.

Cimarron was conservative in its designation of affected versus unaffected areas of the site. Numerous locations designated as affected areas onsite have subsurface soils that are unaffected by past site operations. It is these areas that are to be sampled per the frequency discussed in the response above. Cimarron has completed extensive subsurface sampling throughout the site as part of the overall characterization process for site decommissioning. These results are documented in numerous reports previously submitted to the NRC, including the October 1994 Characterization Report. Where it was determined by Cimarron that there was a potential for residual activity below the surface, these areas were investigated with subsurface borings, and if required those areas were remediated. The subsurface sampling data was utilized in planning the remediation. Any other affected areas onsite, not believed to contain residual below grade activity, were scheduled for subsurface sampling at the

frequency presented in Section 8.5 (i.e., one location for every twenty 5 m x 5 m grid areas). These subsurface soils can be treated as an unaffected subsurface area even though the surface is being surveyed as an affected area.

This soil sample frequency (i.e., one location for every twenty 5 m x 5 m grid areas) was agreed to per discussions with Mr. Tim Johnson, Mr. Boby Eid and Mr. Ken Kalman from the NRC, and Mr. Joe Kegin, site manager for Cimarron, in a conference call on December 12, 1996 at which the NRC's comments on the Phase II Final Status Survey Plan were being discussed. This agreed sample frequency was formalized in Cimarron's January 28, 1997 letter from Mr. Jess Larsen to Mr. Ken Kalman responding to NRC's October 31, 1996 Phase II Plan comments. Based upon this response the NRC approved the Phase II Plan by letter dated March 14, 1997. As agreed, this sample frequency only applies to affected areas that have not been previously cored to depth, and where there is little reason to believe that subsurface residual contamination is present. Unaffected areas do not require subsurface sampling. It should be clarified, Phase III contains only areas of the site designated "affected" per NUREG/CR-5849.

Cimarron believes that no changes to the FSSP are required to respond to this NRC comment.

10.b. NRC Comment:

NRC staff notes that the frequency and locations of subsurface soil samples, as presented in this paragraph, would be appropriate only if the subsurface soil areas were justified as unaffected areas.

Cimarron Response:

See Response to 10. a.

10.c. NRC Comment:

Section 4.2.4 of NUREG/CR-5849 indicates that "The number and locations of samples should follow the same pattern as described above in section 4.2.3 sampling depth of surface soil." For unaffected areas, this procedure requires 30 randomly-selected locations and a scan of a minimum of 10 percent of the soil to be scanned. Cimarron should also present the written procedure it will follow, if any of these subsurface samples exceed the averaging criteria for unrestricted release of areas contaminated with enriched uranium.

Cimarron Response:

The reference quoted from Section 4.2.4 of NUREG/CR-5849 applies to areas onsite where "there is [a] potential for residual activity below the surface layer." This position also is stated in Section 6.5.5 of NUREG/CR-5849, third paragraph, which states, "Location of known or suspected subsurface activity are sampled using the same grid block spacing and systematic pattern as used for surface areas of high contamination potential." As discussed in 10.a., Cimarron has cored those areas onsite where there was reason to believe that below grade residual activity was present. NUREG/CR-5849 does not suggest that other areas onsite, even affected areas, where there is no reason to suspect subsurface contamination, be cored during the final status survey. The sample frequency discussed in the FSSP, Section 8.5 applies to affected areas onsite that have not been previously cored and when there is no reason to believe that subsurface residual activity exists. Cimarron would also like to clarify that unaffected areas do not require subsurface sampling per the guidance in NUREG/CR5849.

Should any of the subsurface samples collected per Section 8.5 of the Phase III FSSP exceed the Option #1 guideline, then off-set samples will be collected to determine the extent of the elevated activity, and to provide additional data for performing subsurface soil averaging and/or excavation.

Cimarron believes that no changes to the FSSP are required to respond to this NRC comment.

11. NRC Comment:

Section 8.5 discusses composites of samples taken at depth. Does this mean that one sample was analyzed to represent a 4 ft depth? This is unacceptable unless the acceptance criteria was modified. Separate samples should be taken and analyzed to represent each depth level. Also. Cimarron should describe how it will determine when it has gone to an acceptable depth. Normally, NRC staff will accept data that shows the licensee is at background levels and that there is a consistent trend downward to background levels.

Cimarron Response:

Section 8.5, page 28, first complete paragraph states, "Cimarron has collected and composited these subsurface samples, at one foot intervals, down to a maximum depth of 4 feet." For clarity, the following sentence will be added after this sentence: "What this means is that Cimarron collects individual soil samples at depth from 0-1', 1'-2', 2'-3' and 3'-4'; thus four samples per location." This sampling frequency is very conservative in that NUREG/CR-5849 recommends samples be collected at 1 m intervals. It should be noted that a portion of the final status survey data for Uranium Waste Pond #1 was collected on a 3 foot interval for comparison to the subsurface guideline values.

To clarify how Cimarron determine that it has sampled to an acceptable depth, the following paragraph will be added prior to the first complete paragraph on Page 29. "In general, once the soil data has been recorded, it is reviewed by the Project Manager and RSO (or RSO designee) to determine if further characterization or remediation is required or if the data is acceptable. The data review process is to verify that approved QA/QC procedures have been followed,

the Option #1 guideline values have been met, and that no further characterization, remediation or sampling is required."

12. NRC Comment:

Section 8.6 should be revised to clearly specify what the measurement frequency will be for upper walls, ceilings, and overhead structures. Note that no specific information is provided. The frequencies should be consistent with NUREG/CR-5849, Section 4.2.3.

Cimarron Response:

As discussed in Section 8.6, the survey frequency for upper walls, ceilings and overhead structures is to be performed per the guidance in NUREG/CR-5849. NUREG/CR-5849 specifies that survey coverage of these areas is dependent upon the contamination potential of the surfaces. Section 8.6 of the FSSP states that, upper walls, ceilings and overhead structures will be surveyed at a frequency similar to floors and lower walls if operating history and the initial scans indicate the presence of residual activity. In general, based upon the initial characterization surveys, flat surfaces of the upper walls and roof and exterior surfaces were found to contain residual activity at levels below 25% of the guideline value. For this reason, upper walls, ceilings and exterior surfaces for the buildings within Phase III areas may be surveyed at a frequency different from the lower walls and floors. Structural members, including those with horizontal surfaces will be surveyed at a frequency similar to lower walls and floors. Locations of areas of elevated activity which are identified during the scan or survey will then be further surveyed with direct measurements to define the extent and activity levels. Remediation will be performed as necessary.

For clarity, the recommended survey frequency for all surfaces associated with buildings within the Phase III area is being presented herein and will be added to

the FSSP, Section 8.6. The proposed survey methodology for Phase III building surfaces is presented below with the addition of new Section 8.6.1:

"8.6.1 Survey Methodology

The specific procedures to be followed in scanning and surveying the buildings and structures within Phase III areas are as follows:

a) Interior Floors:

The surfaces will be 100% scanned for alpha and beta/gamma. Areas of elevated activity which are identified during the scan will then be further surveyed with direct measurements to define the extent and activity levels. Remediation will be performed if guidelines values (Table 1 of NRC's 1987 guidance) are exceeded; areas will be resurveyed as necessary.

Systematic surveys (fixed surveys and smear surveys) for alpha and beta/gamma will be performed at a spacing equivalent to a 1 m x 1 m grid on the floors. Systematic Micro-R measurements will be taken at one meter from the floor at a frequency equivalent to one measurement per every 4 m^2 (i.e., 2 m x 2 m grid) of surface area.

b) Interior Walls:

Characterization surveys have shown that upper interior flat surfaces are not expected to contain residual activity that exceeds 25% of the guideline value. However, Cimarron has elected to survey all of these surfaces similar to a lower wall survey. The surface will be 100% scanned for alpha and beta/gamma. Areas of elevated activity which are identified during the scan will be addressed as discussed in a) above. Cimarron will perform systematic surveys for alpha and beta/gamma, including direct and

removable activity surveys, at 1 m x 1 m grid spacing. Exposure rate measurements will be taken with a Micro-R meter at 1 m from the surface at a frequency of one measurement per every 4 m^2 of surface area along the lower walls (i.e., 2 m in height).

c) Roof Support Beams:

Support beams and, in general, horizontal surfaces will be 100% scanned for alpha and beta/gamma. Areas of elevated activity will be addressed as discussed in a) above. Systematic measurements for alpha and beta/gamma will be taken at one meter intervals on all accessible sides along beams and supports.

d) Interior Ceiling:

The surfaces will be 100% scanned for alpha and beta/gamma. Areas of elevated activity will be addressed as discussed in a) above. Systematic survey measurements for alpha and beta/gamma will be taken at a frequency equivalent to a 1 m x 1 m grid or less.

e) Exterior Side Walls:

Surfaces will be 100% scanned for alpha and beta/gamma. Areas of elevated activity will be addressed as discussed in a) above. Systematic measurements will be taken on all walls at a frequency of one location per every 2 m x 2 m grid intersect. Surveys will be taken for both alpha and beta/gamma. Exposure rate measurements will be taken with a Micro-R meter at 1 meter from the wall surface at a frequency equivalent to one measurement per every 4 m^2 of surface area along the lower wall (i.e., 2 m in height).

f) Roof Exterior:

All surfaces will be 100% scanned for alpha and beta/gamma. Areas of elevated activity will be addressed as discussed in a) above. Systematic surveys for alpha and beta/gamma will be taken at locations equivalent to a 1 m x 1 m grid.

g) Hot Spot Averaging

Residual activity exceeding 15,000 dpm/100 cm^2 shall be remediated and follow-up surveys performed. Areas of elevated activity between 5,000 and 15,000 dpm/100 cm^2 will be tested in accordance with NUREG-5849, Section 8.5.2, to assure that the average surface activity level within a contiguous 1 m^2 area containing the elevated area is less than 5,000 dpm/100 cm^2."

As noted, this language which includes the survey frequency will be added to Section 8.6 of the FSSP.

Mr. Jess Larsen, Vice President
Cimarron Corporation
P.O. Box 25861
Oklahoma City, OK 73125

February 9, 1998

Dear Mr. Larsen:

The U.S. Nuclear Regulatory Commission staff has completed its review of the "Response to Comments on Phase III Final Status Survey Plan," dated December 5, 1997. NRC staff was generally satisfied with the responses you provided. However, there are a few areas where additional information is needed. Cimarron is, therefore, requested to submit a response to the enclosed comments. If you have any questions about these comments, please contact me at (301) 415-6664.

Sincerely,

[ORIGINAL SIGNED BY:]

Kenneth Kalman, Project Manager
Facilities Decommissioning Section
Low-Level Waste and Decommissioning
Projects Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Docket No. 70-925
License No. SNM-928

Enclosure: As stated

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UNITED STATES
NUCLEAR REGULATO. ' COMMISSION
WASHINGTON, D.C. 20555-0001

February 9, 1998

Mr. Jess Larsen, Vice President
Cimarron Corporation
P.O. Box 25861
Oklahoma City, OK 73125

Dear Mr. Larsen:

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Sincerely,

Kenneth Kalman

Kenneth Kalman, Project Manager
Facilities Decommissioning Section
Low-Level Waste and Decommissioning
Projects Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Docket No. 70-925
License No. SNM-928

Enclosure: As stated

cc: Cimarron distribution list

Comments on
The Response to Comments on Phase III Final Status Survey Plan
for
Cimarron Corporation's Former Nuclear Fuel Fabrication Facility
Crescent, Oklahoma

1. Your response to General Comments 1 and 2 provided much greater insight into your calibration procedures. However, Cimarron did not address all of the detailed information identified in Section 5.4 of NUREG/CR-5849. In the last sentence on page 4, Cimarron indicates that "...(calibration) requirements (ANSI N232-1978) are incorporated into the written site calibration procedures...," but the Final Status Survey Plan (FSSP) does not contain a detailed summary of these procedures or the training of those persons who perform the calibrations. Based on the January 27, 1998, meeting between NRC and Cimarron, NRC anticipates that Cimarron will provide this information. Providing all this information in a single place will facilitate the NRC staff's review.

2. In responding to General Comment 3, Cimarron cited a number of references (on page 7 of the subject document) to illustrate how well the ORISE and contractor data confirm the accuracy of the soil counter measurements. Please provide measurement data to verify this claim.

3. In responding to General Comment 3, Cimarron mentioned the use of "independent, third-party review of analytical results." What documents does Cimarron have in place that spell out when independent, third-party reviews of analytical results will be conducted?

4. In responding to General Comment 4, Cimarron stated that it intends to identify elevated areas based on a response of "twice background" as indicated in Sections 6.4.5 and 8.4. of the FSSP. How does Cimarron justify this scan sensitivity? Does Cimarron have any performance correlation data for NaI count rate instrument surveys to justify the "twice background" limit?

Enclosure

Docket No. 70-925
License No. SNM-928

Joe Kegin
Cimarron Corporation
PO Box 315
Crescent OK 73028

Mike Broderick
Radiation Management Section
Waste Management Division
Department of Environmental Quality
1000 NE Tenth
Oklahoma City, OK 73117-1212

From: Charles Cain
To: TWD2.TWP7(KLK)
Date: 2/6/98 12:08pm
Subject: please review and concur on letter to Cimarron re. response to comments on Phase 3 fssp -Reply

i concur

From: Robert Fonner
To: TWD2.TWP7(KLK)
Date: 2/5/98 11:26am
Subject: please review and concur on letter to Cimarron re. response to comments on Phase 3 fssp -Reply

I have no legal objection to your letter to Cimaron re response to comments.

FAX TRANSMITTAL COVER SHEET
FAX NUMBER: (405) 270-6039
KERR-McGEE CORPORATION
SAFETY & ENVIRONMENTAL AFFAIRS
McGee Tower 20th Floor

DATE :	June 26, 1998	NUMBER OF PAGES (INCLUDING COVER SHEET)	6
To :	Ken Kalman		
Company :	US Nuclear Regulatory Commission		
Subject :	Response to NRC Comments on Phase III FSSP		
FAX. No. :	301-415-5397		
FROM :	Jess Larsen		
OF :	Cimarron Corporation		

MESSAGE:

Ken,

Please find attached a copy of the Cimarron response to NRC comments on the Phase III Final Status Survey Plan.

The original and other distribution copies are being sent through the normal channels.

I hope that you have a good weekend.

Regards,

Jess Larsen

Jess Larsen
Attachment

need section inspection report

J1062698.fx1

CIMARRON CORPORATION
P.O. BOX 25861 • OKLAHOMA CITY, OKLAHOMA 73125

S. JESS LARSEN
VICE PRESIDENT

June 26, 1998

Mr. Ken Kalman, Project Manager
Facilities Decommissioning Section
Low-Level Waste & Decommissioning Projects Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: Docket No. 70-0925; License No. SNM-928
Cimarron Corporation Response to NRC Staff Comments Dated February 9, 1998
On the Phase III Final Status Survey Plan

Dear Mr. Kalman:

Cimarron Corporation submits herewith responses to NRC staff comments dated February 9, 1998 on the Phase III Final Status Survey Plan.

We believe that we have addressed the questions raised and clarifications requested. We are hopeful that the Phase III FSSP can now be approved in an expedient manner and that we can begin submitting the Phase III Final Status Survey Reports in the near future. We have the Sub-area "L" FSSR virtually ready for submission at this time.

Please advise if you have any further questions.

Sincerely,

Jess Larsen

Jess Larsen
Vice President
Enclosure

JI062698.le1

Cimarron Responses
NRC Staff Comments Dated February 9, 1998
On the Phase III Final Status Survey Plan

1. **NRC Comment:**

Your response to General Comments 1 and 2 provided much greater insight into your calibration procedures. However, Cimarron did not address all of the detailed information identified in Section 5.4 of NUREG/CR-5849. In the last sentence on page 4, Cimarron indicated that "...(calibration) requirements (ANSI N323-1978) are incorporated into the written site calibration procedures...," but the Final Status Survey Plan (FSSP) does not contain a detailed summary of these procedures or the training of those persons who perform the calibrations. Based on the January 27, 1998, meeting between NRC and Cimarron, NRC anticipated that Cimarron will provide this information. Providing all this information in a single place will facilitate the NRC staff's review.

Cimarron Response:

Cimarron has responded to this comment in detail in its Sub-Area J responses forwarded to the NRC on May 13, 1998 by letter from Mr. Jess Larsen, Vice President, Cimarron Corporation to Mr. Ken Kalman. Please refer to the May 13 submittal, specifically Cimarron's response to NRC General Comment a. and b.

Selection, calibration and use of radiation detection instrumentation, used for final status survey release at Cimarron are directed by the facility's Radiation Safety Officer (RSO). The RSO is responsible for the calibration performed by Cimarron Health Physics staff, or by contract services. In addition to the equipment calibration records, the RSO maintains a file for each technician on staff as to their qualifications and training.

2. **NRC Comment:**

In responding to General Comment 3, Cimarron cited a number of references (on page 7 of the subject document) to illustrate how well the ORISE and contractor data confirm the accuracy of the soil counter measurements. Please provide measurement data to verify this claim.

Cimarron Response:

ORISE and other independent laboratories have split sampled and performed duplicate analyses on selected Cimarron soil samples. The ORISE report titled "Confirmatory Survey of South U-Yard Remediation, Kerr-McGee Corporation, Crescent, Oklahoma" dated November 13, 1995, and NRC Inspection Report #70-825/97-02, dated July 31, 1997, provide confirmation of the Cimarron Soil Counter accuracy and traceability. These data comparisons are included with Attachment A.

The most recent confirmatory sample results from NRC Region IV (March 18, 1998 NRC Inspection Report 70-925/97-03) continues to show excellent agreement. The comparison between Cimarron's results and the NRC's results are also included in Attachment A. The nine samples were sent to the NRC Region III laboratory for analysis, after first being analyzed by the on-site counter.

Numerous soil samples were collected from Subarea O for comparative analysis. These soil samples were counted first on-site and then sent to Core Laboratory for analysis. This data comparison is also included in Attachment A.

3. **NRC Comment:**

In responding to General Comment 3, Cimarron mentioned the use of "independent third-party review of analytical results." What documentation does Cimarron have in place that spells out when independent third-party reviews of analytical results will be conducted?

Cimarron Response:

In response to the referenced General Comment 3, Cimarron stated the following, "such quality controls allow independent, third-party review of analytical results." By this statement Cimarron did not intend to imply that it routinely schedules independent third-party reviews of analytical results. However, Cimarron's QA/QC program is structured to generate data that can be verified by a third-party (i.e., NRC, Kerr-McGee Corporation, or State of Oklahoma) should they desire to perform an audit of the data or obtain such review.

Kerr-McGee Corporation performs quarterly audits of Cimarron's Quality Assurance/Radiation Protection Program. Each audit emphasizes specific areas of the Program. Audit results are documented by the auditing personnel and Cimarron management reviews audit findings and

responses to verify that corrective action (if required) is scheduled and completed.

4. **NRC Comment:**

In responding to General Comment 4, Cimarron stated that it intends to identify elevated areas based on a response of "twice background" as indicated in Sections 6.4.5 and 8.4 of the FSSP. How does Cimarron justify this scan sensitivity? Does Cimarron have any performance correlation data for NaI count rate instrument surveys to justify the "twice background" limit?

Cimarron Response

Prior to the commencement of site-wide remediation, Cimarron evaluated several portable survey instruments for performing scan surveys including the 2" x 2" NaI detector. Based upon phone discussions and ensuing recommendations from Ludlum Instruments, Inc, Cimarron decided to use the 3" x 0.5" NaI detector for general area scans. This system was one of the more sensitive detection systems available to Cimarron. For the isotopes of interest at the Cimarron site the 3" x 0.5" NaI detector is approximately 1.5 times more efficient than the 2" x 2" detector. Cimarron has employed the 3" x 0.5" NaI detector for performing gamma scan surveys in both affected and unaffected open land areas for qualitative evaluations in identifying regions or areas of slightly elevated activity.

The twice background guideline has been used for scan surveys utilizing the 3" x 0.5" NaI detector since the inception of Cimarron site decommissioning. This guideline has been utilized as a standard in the nuclear industry for many years; and is discussed in Section 6.4.2 of NUREG/CR-5849 as quoted below. This qualitative guideline was included in the Phase I Final Status Survey Plan, Phase I Final Status Survey Report, and the Phase II Final Status Survey Plan just to name a few of the documents where this guideline was addressed and approved by NRC for this site.

As discussed in Section 6.4.2 "Scanning" of NUREG/CR-5849:

> "For optimum detection sensitivity, changes in the instrument response are monitored via the audible output (use of headphones is recommended), rather than by observing fluctuations in the analog meter reading. This use of an audible signal negates concern for the time constant related to the meter response. Locations of direct radiation, discernable above the ambient level

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(typically 2 to 3 times the ambient count rate), are marked on facility maps and identified for further measurements and/or sampling."

Cimarron technicians utilize the audible output during scanning as an indication of changes in residual activity, and twice background is the guideline for recording of data and for future investigations of an area. This twice background (as noted by NUREG/CR-5849) is the low end of the range discernable for scanning instrumentation. During the scan survey the technician upon noting a "discernable" difference in the audio output from the meter will stop and attempt to locate the elevated area.

It is difficult to discriminate low levels of residual uranium contamination when other naturally occurring radionuclides are present which affect the gross count rate of the scan instrument. This twice guideline value seems to provide a sufficient margin for technicians when conducting a scan to conclude that residual contamination may be present when a signal exceeds the twice background level (i.e., a discernable audible increases above background). This discernable audible response alerts the surveyor to momentarily stop moving the probe (i.e., 2 to 3 seconds) and to investigate the response. The survey instruments utilized at Cimarron indicate increases in radioactivity levels via a higher or lower pitch. These changes in pitch are easier to detect than changes in the count rate.

In practice, surveyors **do not** make decisions on the basis of a single indication. Rather, upon noting an increased number of counts (i.e., change in pitch), they pause briefly and then decide whether to move on or take further measurements. Thus, this preliminary surveying consists of two components, i.e., continuous monitoring and stationary sampling. In the first component, characterized by continuous movement of the probe the surveyor has only a brief "look" at potential sources. The surveyor's criterion (i.e., willingness to decide that a signal is present) at this stage is likely to be liberal, in that the surveyor will respond positively on scant evidence, since the only "cost" of a false positive is a little added time. The second component occurs only after a positive response was made at the first stage. It is marked by the surveyor interrupting his scanning and holding the probe stationary for a period of time, while comparing the instrument output signal during that time to the background counting rate. For this decision, the criterion is more strict, since the cost of a "yes" decision is to spend considerably more time evaluating the location.

FAX TRANSMITTAL COVER SHEET
FAX NUMBER: (405) 270-6039
KERR-McGEE CORPORATION
SAFETY & ENVIRONMENTAL AFFAIRS
McGee Tower 20th Floor

DATE :	July 2, 1998	NUMBER OF PAGES (INCLUDING COVER SHEET)	3
To :	Ken Kalman		
Company :	US Nuclear Regulatory Commission		
Subject :	Corrections to Sub-area "J" and Phase III FSSP Responses		
FAX. No. :	301-415-5397		
FROM :	Jess Larsen		
OF :	Cimarron Corporation		

MESSAGE:

Ken,

Please find attached copy of my letter this date proposing to correct the areas we discussed yesterday in the conference call. We also noted another typo in a date and have corrected that also.

The original and controlled distribution copies will come out next week.

Have a great Independence Day weekend.

Regards,

Jess Larsen

Jess Larsen
Attachment

JI070298.fx1

TC34

CIMARRON CORPORATION

P.O. BOX 25861 • OKLAHOMA CITY, OKLAHOMA 73125

S. JESS LARSEN
VICE PRESIDENT

July 2, 1998

Mr. Ken Kalman, Project Manager
Facilities Decommissioning Section
Low-Level Waste & Decommissioning Projects Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: Docket No. 70-0925; License SNM-928
Cimarron Responses to two NRC Staff Comments during the July 1, 1998 Conference Call.

Dear Mr. Kalman:

As requested during the conference call with NRC staff on July 1, 1998, Cimarron is providing the following in response to two NRC staff comments.

The first NRC staff comment involved Cimarron's response to NRC staff comment "a." (dated January 9, 1998 on the "Final Status Survey Report for Phase II – Sub-Area "J") and to NRC staff comment #2 (dated February 9, 1998 on the Phase III FSSP). NRC staff indicated that these responses were not appropriate due to the fact that Cimarron stated that NRC Inspection Report #70-925/97-02 confirmed the "traceability" of the Cimarron Soil Counter. The second NRC staff comment involved a typographical error (i.e. NRC Inspection Report #70-925/97-02 was incorrectly referred to as "#70-825/97-02") in the June 26, 1998 Cimarron Response.

The following was provided in the May 13, 1998 Cimarron response to NRC Comment "a.":

> "The most recent confirmatory sample results from NRC Region IV (3/16/98 NRC Inspection Report) continue to show excellent agreement. In addition, the ORISE Report titled "Confirmatory Survey of South U-Yard Remediation, Kerr-McGee Corporation, Crescent, Oklahoma" dated 11/13/95, and NRC Inspection Report #70-925/97-02, dated July 31, 1991 provide confirmation of the Cimarron Soil Counter accuracy and traceability."

Cimarron Corporation proposes that the words "and traceability" be removed from this paragraph and that the NRC Inspection Report date (to correct a typographical error on the year) be revised as follows:

> "The most recent confirmatory sample results from NRC Region IV (3/16/98 NRC Inspection Report) continue to show excellent agreement. In addition, the ORISE Report titled "Confirmatory Survey of South U-Yard Remediation, Kerr-McGee Corporation, Crescent, Oklahoma" dated 11/13/95, and NRC Inspection Report #70-925/97-02, dated July 31, 1997 provide confirmation of the Cimarron Soil Counter accuracy."

The June 26, 1998 Cimarron response to NRC Comment "2" stated:

> "ORISE and other independent laboratories have split sampled and performed duplicate analyses on selected Cimarron soil samples. The ORISE Report titled "Confirmatory Survey of South U-Yard Remediation, Kerr-McGee Corporation, Crescent, Oklahoma" dated November 13, 1995, and NRC Inspection Report #70-825/97-02, dated July 31, 1997 provide confirmation of the Cimarron Soil Counter accuracy and traceability. These data comparisons are included with Attachment A."

Cimarron Corporation proposes that the words "and traceability" be removed from this paragraph and that the NRC Inspection Report number be revised as follows:

> "ORISE and other independent laboratories have split sampled and performed duplicate analyses on selected Cimarron soil samples. The ORISE Report titled "Confirmatory Survey of South U-Yard Remediation, Kerr-McGee Corporation, Crescent, Oklahoma" dated November 13, 1995, and NRC Inspection Report #70-925/97-02, dated July 31, 1997 provide confirmation of the Cimarron Soil Counter accuracy. These data comparisons are included with Attachment A."

Please feel free to contact me if there are any additional questions or concerns.

Sincerely,

Jess Larsen

Jess Larsen
Vice President

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