



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
611 RYAN PLAZA DRIVE, SUITE 400  
ARLINGTON, TEXAS 76011-8064**

November 26, 2001

Mr. Jeff Lux  
Cimarron Corporation  
Kerr-McGee Center  
P.O. Box 25861  
Oklahoma City, Oklahoma 73125

**SUBJECT: NRC INSPECTION REPORT 70-925/01-01 AND NOTICE OF VIOLATION**

Dear Mr. Lux:

An NRC inspection was conducted on July 30 through August 2, and September 5-6, 2001, at your Cimarron site near Crescent, Oklahoma, of activities authorized by NRC Special Nuclear Materials License SNM-928. On November 21, 2001, a telephonic exit interview was conducted, between the inspector and your radiation safety officer after the final results of sample analysis were available. The enclosed report presents the scope and results of this inspection.

The areas reviewed during this inspection included organization and management, radiation protection, solid radioactive waste management, transportation of radioactive materials, environmental protection, emergency preparedness, and fire protection. In addition, independent confirmatory surveys in Sub-Areas G and K were conducted by the inspectors. On September 5 and 6, groundwater samples were collected for analysis.

During the inspection, a violation of regulatory requirements was identified involving the failure to approve a radiation protection program change through the performance-based licensing process prior to implementing the change. This issue is of concern because it indicates that your ALARA Committee did not properly review and approve of this change as required.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, its enclosure(s), and your response will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Cimarron Corporation

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Should you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

**/RA/**

Dwight D. Chamberlain, Director  
Division of Nuclear Materials Safety

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

Enclosures:

1. Notice of Violation
2. NRC Inspection Report  
70-925/01-01

cc w/enclosures:  
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Cimarron Corporation

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## **ENCLOSURE 1**

### **NOTICE OF VIOLATION**

Cimarron Corporation  
Cimarron Site

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

During an NRC inspection conducted on July 30 - August 2, and September 5-6, 2001, one violation of NRC requirements was identified. In accordance with the General Statement of Policy and Procedure for NRC Enforcement Actions, NUREG-1600, the violation is listed below:

License Condition 27(e) states, in part, that the licensee may, without prior NRC approval and subject to the conditions specified in Part 3, make changes to the NRC approved Decommissioning Plan, Radiation Protection Plan, and associated procedures. All changes shall be approved by the Cimarron ALARA Committee.

The Radiation Protection Plan (Section 15.4 of the license application) states that thermoluminescent dosimeters (TLDs) are posted throughout the facility and at boundaries to monitor potential exposures to individuals in unrestricted areas.

Contrary to the above, during the second quarter of 2001, the licensee implemented a program change by eliminating the use of TLDs to monitor ambient radiation without NRC or ALARA committee approval.

This is a Severity Level IV violation (Supplement VI).

Pursuant to the provisions of 10 CFR 2.201, Cimarron Corporation, is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555, with a copy to the Regional Administrator, U.S. Nuclear Regulatory Commission, Region IV, 611 Ryan Plaza Drive, Suite 400, Arlington, Texas 76011, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. Your response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an order or a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

Because your response will be made available to the Public, to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.790(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

Dated at Arlington, Texas  
this 26<sup>th</sup> day of November 2001

**ENCLOSURE 2**

U. S. NUCLEAR REGULATORY COMMISSION

REGION IV

Docket No.: 70-925

License No.: SNM-928

Report No.: 70-925/01-01

Licensee: Cimarron Corporation  
Kerr-McGee Center  
Oklahoma City, Oklahoma 73125

Facility: Cimarron Site

Location: Crescent, Oklahoma

Dates: July 30 - August 2, and September 5-6, 2001

Inspectors: Emilio M. Garcia, Health Physicist  
Judith W. Walker, Health Physicist

Accompanied By: Kenneth M. Kalman, Project Manager, DWM NMSS  
Jon M. Peckenpaugh, Groundwater Hydrologist, DWM NMSS  
Rebecca Tadessee, Health Physicist, DWM NMSS

Approved By: D. Blair Spitzberg, Ph.D., Chief  
Fuel Cycle & Decommissioning Branch

Attachment: Supplemental Information

## **EXECUTIVE SUMMARY**

### **Cimarron Corporation NRC Inspection Report 70-925/01-01**

The Cimarron Corporation has been conducting site remediation activities in preparation for the termination of Special Nuclear Materials License SNM-928. Decommissioning inspections and radiological surveys had been conducted by the NRC at the Cimarron Site as part of the overall confirmatory survey process. This inspection was a continuation of that process. This inspection included reviewing organization and management, radiation protection, solid radioactive waste management, transportation of radioactive materials, environmental protection, emergency preparedness, and fire protection. It also involved performing exposure-rate and direct alpha and beta contamination measurements and collecting soil samples from Sub-Areas G and K, water samples from near surface groundwater wells and from a water seep. The sample results were compared with the release criteria listed in License Condition 27 of NRC License SNM-928. The water samples were also analyzed for technetium-99.

#### **Management Organization and Controls**

- The licensee's organization was consistent with the license requirements (Section 1) .
- The licensee was conducting periodic audits and surveillances (Section 1).

#### **Radiation Protection**

- Radiation survey instruments were operable and within their calibration interval (Section 2).
- No occupational exposures were detected in 2000 or the first half of 2001 (Section 2).
- Radioactive sources were stored in a locked and properly labeled cabinet (Section 2).
- The ALARA Committee had met quarterly in 1999, 2000, and the first half of 2001 except for the third quarter of 1999. The third quarter omission was licensee identified and corrected, an isolated occurrence, and therefore considered minor (Section 2).

#### **Radioactive Waste Management, Waste Generator Requirements, and Transportation Activities**

- The licensee had properly shipped radioactive waste material offsite to an authorized recipient for disposal (Section 3).
- Transportation survey results were well below the applicable NRC limits (Section 3).
- The licensee had effectively implemented the license requirements related to the management and shipment of radioactive waste (Section 3).



#### Environmental Protection

- The licensee had properly implemented the environmental protection program at the site with one exception. The one exception involved the licensee's failure to obtain as low as reasonably achievable (ALARA) committee approval prior to eliminating the use of TLDs to monitor ambient radiation. This failure was identified as a violation of License Condition 27(e) (Section 4).
- All environmental samples were taken as required (Section 4).
- The public dose assessment indicated that no individual exceeded the 100 millirem per year limit (Section 4).

#### Emergency Preparedness and Fire Protection

- The licensee is not required by NRC to have an emergency plan because a radiological emergency with significant offsite consequences is not considered credible. The licensee does maintain an emergency plan (Section 5).
- Training has been provided to onsite personnel on the emergency plan (Section 5).
- Personnel were trained in fire protection and response. Operational fire extinguishers were distributed throughout the facility (Section 5).

#### Decommissioning, Closeout Survey, and Site Status

- The confirmatory exposure-rate measurements, soil sample analysis results, and alpha and beta building measurements were all below the applicable NRC release criteria. These confirmatory measurements were consistent with the licensee's determination that Sub-Areas K and G of the Cimarron Site meets the criteria established in NRC License SNM-928 Condition 27 for unrestricted use (Section 6).
- Two groundwater analysis results for total uranium exceeded the applicable release criteria of 180 pCi/l. These samples were collected from wells that are located on a known plume.
- All measurement results for Tc-99 were below the release criteria. However, when the analysis results between the NRC contractor laboratory and the licensee contract laboratory are compared using the criteria in NRC Inspection Procedure 84525, "Quality Assurance and Confirmatory Measurements," four of the five analyses that were not in agreement. This disagreement in analysis results will be reviewed in a future inspection and will be tracked as an Inspection Follow-up Item.

## **Report Details**

### **1. Management Organization and Controls (88005, 88104)**

#### **1.1 Inspection Scope**

The inspectors interviewed cognizant licensee staff regarding the licensee organization, management, and audits. The inspectors reviewed a number of documents related to these activities.

#### **1.2 Observations and Findings**

##### **a. Organization**

The licensee organization was as described in licensee correspondence referenced in the license. The Cimarron Corporation is a subsidiary of the Kerr-McGee Corporation. The senior person directly responsible for the site was titled vice president and site manager. Three individuals reported directly to the site manager. These were the quality assurance coordinator, a contracted position; the decontamination supervisor; and the health physics and safety coordinator. These last two positions were direct Kerr-McGee employees. The health physics and safety coordinator was also the radiation safety officer (RSO). Contractors from Kelly Services reported to the quality assurance coordinator. Contractors from NEXTEP Environmental and Chase Environmental provide support to the decontamination supervisor and the health physics and safety coordinator.

The individual working as the RSO was as noted in the license.

##### **b. Audits and Surveillances**

Surveillances were performed by the onsite quality assurance coordinator. Audits were performed by the corporate quality and regulatory compliance department with the assistance of contractors. The inspectors interviewed the quality assurance coordinator, and reviewed records of recent surveillances and audits.

Surveillance S-00-053 was conducted on July 17, 2000, and dealt with disposal cell No. 3 Lift 5; removal of material greater than Option 2. The record of this surveillance indicated that the activities observed included non-radiological safety requirements, radiological safety and remediation of hot spots. The surveillance report was issued on July 24, 2000, and the final approval on August 19, 2000. There were no negative findings identified by this surveillance.

Surveillance S0-01-054 was conducted on May 10, 2001. This surveillance addressed disposal cell No. 3 density test of final lift, safety work Permit 940003, work plan Section 4, and onsite disposal. The surveillance report was issued on May 16, 2001,

and the final approval on May 21, 2001. There were no negative findings identified by this surveillance.

The inspectors selected for review the records of semi-annual corporate audits for the first halves of calendar years 2000 and 2001.

The audit for the first half of calendar year 2000, was conducted on May 17 and 18, 2000. The audit was conducted by an auditor from the corporate organization and a contractor from NEXTEP Environmental. The response to the audit findings was submitted on January 15, 2001. The audit identified internal program requirements that were not being performed. The licensee revised their radiation protection plan, many of the radiation protection procedures and the site health and safety plan to reflect the change in site conditions and decrease in risks that resulted from the removal of most of the radioactive materials onsite.

The audit for the first half of calendar year 2001, was conducted on June 4-5, 2001. The audit was conducted by two auditors from the corporate organization and a contractor from NEXTEP Environmental. The issues identified in the audit were addressed in the site manager's response to the audit dated July 11, 2001.

At this site, the radiation safety committee is called the ALARA Committee. Section 2 below discusses the ALARA Committee.

### 1.3 Conclusions

The licensee's organization was consistent with the license requirements. The licensee was conducting periodic audits and surveillances.

## 2. **Radiation Protection (83822, 88104)**

### 2.1 Inspection Scope

The inspectors interviewed cognizant individuals regarding the implementation of their health physics program, reviewed applicable records, and observed the storage of radioactive materials.

### 2.2 Observations and Findings

The licensee had submitted their revised radiation protection plan to NRC for review and approval. The NRC accepted the revised plan on April 17, 2000. The inspectors selected three portable radiation survey instruments used by the licensee to determine if they were operable and within their calibration frequency. All instruments were operable, had charged batteries, responded to radiation and were within the calibration interval. The licensee had their instruments on a 6-month calibration interval.

The inspectors reviewed the exposure reports for 2000 and 2001, submitted by the external dosimetry supplier, selected licensee reports and internal memorandums related to external dosimetry.

The external dosimetry supplier was United States Dosimetry Tech Inc. This company supplied thermoluminescence dosimeters (TLD) that the licensee used as the primary means of determining the dose of record. No occupational dose was reported as having been received for any of the quarters reviewed. A review of selected NRC Forms 4 and 5 for monitored individuals indicated that the forms were completed accurately.

The inspectors reviewed selected records of the radiation protection program. No problems were noted. The records appeared to be maintained in accordance with the requirements of 10 CFR 20.2102.

The licensee maintained all radioactive sources in a secured cabinet. The cabinet was observed to be locked and the appropriate posting was in place.

The minutes of the quarterly ALARA committee were reviewed for calendar years 1999, 2000, and the first two quarters of 2001. The ALARA committee failed to meet during the third quarter of 1999. This minor, isolated problem was identified by the licensee and corrective action was put in place to prevent recurrence. The corrective action was to arrange the meeting a year in advance so no other conflicts will exist. Records indicate and the RSO confirmed that all subsequent ALARA committee meetings have occurred each calendar quarter.

## 2.3 Conclusions

Radiation survey instruments were operable and within their calibration interval. No occupational exposure was received in 2000 or the first half of 2001. Radioactive sources were stored in a locked and properly labeled cabinet. The ALARA Committee had met quarterly in 1999, 2000, and the first half of 2001, except for the third quarter of 1999.

## 3 **Transportation Activities (86740)** **Radioactive Waste Management and Waste Generator Requirements (84850)**

### 3.1 Inspection Scope

The inspectors interviewed the cognizant licensee representatives, toured the site, and reviewed applicable records related to radioactive waste management to determine if the licensee had established and maintained an effective program, and to determine whether transportation of licensed materials was in compliance with the applicable NRC and DOT transportation regulations.

### 3.2 Observations and Findings

In October of 2000, the licensee had one shipment of radioactive waste to an offsite facility. The shipment consisted of ten 55-gallon drums of soil and debris. The shipment contained material that was characterized as waste greater than the BTP (Branch Technical Position) Option 2 concentration limit of 100 pCi/g uranium; therefore, requiring burial offsite.

The inspectors reviewed shipping papers and survey results associated with the radioactive waste shipment. NRC Forms 540 (uniform low-level radioactive waste manifest-shipping paper) and 541 (uniform low-level radioactive waste manifest-documentation associated with transportation) were reviewed for completeness. All required forms were completed and contained all relevant information. The transportation records also revealed that all external radiation and removable surface contamination surveys were within limits specified in 10 CFR 71.87(i) and (j).

At the time of the inspection, there was no radioactive waste being staged or stored at the facility. No decommissioning waste material had been free released offsite for disposal. The onsite disposal cell was completed and covered with clay.

### 3.3 Conclusions

The licensee had properly shipped radioactive waste material offsite for disposal. Transportation survey results were below the applicable NRC limits. The licensee had effectively implemented the license requirements related to the management and shipment of radioactive waste.

## **4 Environmental Protection (88045, 88104)**

### 4.1 Inspection Scope

The environmental protection program was reviewed to assess the effectiveness of the licensee's programs and to evaluate the impact, if any, of site activities on the local environment.

### 4.2 Observations and Findings

#### a. Environmental Monitoring

Section 15 of the Cimarron Radiation Protection Plan, requires the licensee to implement an environmental monitoring program. The licensee's environmental monitoring program consisted of surface water monitoring, groundwater well monitoring and ambient radiation monitoring. The licensee's program no longer requires the licensee to submit an annual environmental report to the NRC; however, the analytical data is retained on site.

b. Surface Water Monitoring

Surface water samples were collected annually at seven monitoring well locations and were analyzed for gross alpha, and beta concentrations. Additional analysis for isotopic uranium was performed if the gross alpha action level of 15 pCi/l or gross beta action level of 20 pCi/l was exceeded. The inspectors reviewed analytical results for 2000 for gross alpha and beta. Additional analysis for isotopic uranium was performed when necessary. All results for total uranium analysis were 39 percent or less of the applicable effluent concentration limit specified in 10 CFR Part 20, Appendix B, Table 2.

c. Groundwater Monitoring

Groundwater well samples were collected annually at 24 monitoring well locations and were analyzed for the same constituents as surface water. The inspectors reviewed the 2000 analytical data normally used to compile the annual environmental report. The highest sample measured  $1.44 \text{ E-}7 \text{ } \mu\text{Ci/ml}$  or 48 percent of 10 CFR Part 20, Appendix B, Table 2, effluent concentration limit ( $3.0\text{E-}7 \text{ } \mu\text{Ci/ml}$ ) for total uranium at monitoring well No. 1331.

The licensee was continuing to monitor the contaminated groundwater in burial Area 1. Groundwater monitoring wells in this area have reported total uranium concentrations greater than the 180 pCi/l total uranium release criteria specified in the license for groundwater. The licensee is continuing to monitor these wells on a quarterly basis as required. The licensee's investigation consists of monitoring the groundwater quality, hydrology and soil activity in the area of burial Ground 1. The licensee plans to submit a final investigation report and proposed groundwater remediation plan to the NRC upon completion of all field work.

d. Ambient Radiation Monitoring

The inspectors reviewed the licensee's public dose assessment to ensure that site activities did not result in a total effective dose equivalent in excess of 100 millirem per year to individual members of the public as specified in 10 CFR 20.1301(a). The licensee utilized TLDs throughout the facility and at boundaries to monitor potential exposures to individuals in unrestricted areas. Background at the site averaged  $7 \text{ } \mu\text{R/Hr}$ , or approximately 60 millirem per year. During 1999 and 2000, the exposure to the public resulting from site activities were less than 10 percent of the limit specified in 10 CFR 20.1301(a).

Section 15.4 of the Radiation Protection Plan states that TLDs are posted throughout the facility and at boundaries to monitor potential exposures to individuals in unrestricted areas. During 2001, the licensee only measured ambient radiation for the first quarter. The licensee eliminated the use of TLDs to monitor ambient radiation during the second quarter of 2000.

License Condition 27(e) states, in part, that the licensee may, without prior NRC approval and subject to the conditions specified in Part 3, make changes to the NRC approved Decommissioning Plan, Radiation Protection Plan, and associated procedures. All changes shall be approved by the Cimarron ALARA Committee. Contrary to the license condition, the licensee implemented a Radiation Protection Plan change by eliminating the use of TLDs to monitor ambient radiation without NRC or ALARA committee approval. This was identified as a violation of the NRC-approved performance based License Condition 27(e) (070-00925/0101-01).

#### 4.3 Conclusions

The licensee had procedures and practices in place to implement the environmental protection program at the site with one exception. A violation of License Condition 27(e) related to failure to obtain ALARA committee approval prior to eliminating the use of TLDs to monitor ambient radiation was identified.

All environmental samples were taken as required by the license. The public dose assessment indicated that no individual exceeded the 100 millirem per year limit.

### 5 **Emergency Preparedness and Fire Protection (88050, 88055, 88104)**

#### 5.1 Inspection Scope

The inspectors reviewed the licensee's emergency plan and fire protection program, interviewed the responsible personnel, toured the facility, and reviewed records of training.

#### 5.2 Observations and Findings

The inspectors interviewed the RSO. The NRC does not require the licensee to have an emergency plan because a radiological emergency with significant offsite consequences is not considered credible. However, the licensee did have a site emergency preparedness plan. This plan was last revised on December 21, 2000. Training to the licensee's staff and contractors was provided on April 13, 2000, and July 26, 2001. During the training, procedure changes were discussed.

Records reviewed indicated that the last fire protection and response training was provided on June 19, 2001. During a tour of the facility the inspectors observed that operational fire extinguishers were located throughout the facility buildings and were checked on a monthly basis. Other fire extinguishers that were not required and were considered to be out-of-service were observed throughout the building. These extinguishers were not tagged as out-of-service. The licensee's representative stated that these out-of-service fire extinguishers would either be tagged as such or removed from the building.

The licensee had not received a visit from the local fire marshal for several years. The prior fire marshal was very familiar with the facility. The licensee stated their intent to invite the various fire departments in the area for a site tour to become familiar with the site in case of a fire or other emergency. The licensee had not suffered any fires or other emergencies in the last 2 years, the period reviewed.

### 5.3 Conclusions

The licensee was not required by NRC to have an emergency plan because a radiological emergency with significant offsite consequences is not considered credible. However, the licensee did maintain an emergency plan. Training has been provided to onsite personnel on the emergency plan. Personnel was trained in fire protection and response. Operational fire extinguishers were distributed throughout the facility.

## 6. **Closeout Inspection and Survey (83890)**

### 6.1 Inspection Scope

The site status and decommissioning activities were reviewed to determine if activities were being conducted in accordance with the license, regulatory requirements, and the Cimarron decommissioning plan. The Cimarron decommissioning plan committed to the recommendations in NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination." Confirmatory measurements were conducted during this inspection and included exposure-rate measurements, direct measurements of total alpha and beta contamination, and soil samples in Sub-Areas G and K.

NRC License SNM-928 issued to Cimarron Corporation lists the release criteria in License Condition 27. The applicable values are:

#### a. Groundwater

6.7 Bq/l (180 pCi/l) total uranium

The attachment to a letter from the NRC Project Manager to the licensee's Jess Larsen dated March 13, 1997, states that the technetium-99 concentration in groundwater should not exceed the EPA's Interim Primary Drinking Water Regulations (40 CFR 141.16). This regulation requires that the average annual concentration in drinking water shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 mrem/yr. The NRC concludes that for Tc-99, the maximum contamination level that should be used for comparison and compliance is 3,790 pCi/l.



b. Surface of buildings and equipment

5,000 dpm alpha/100 cm<sup>2</sup>, average over 1 m<sup>2</sup>  
5,000 dpm beta-gamma/100 cm<sup>2</sup>, average over 1 m<sup>2</sup>  
15,000 dpm alpha/100 cm<sup>2</sup>, maximum over 1 m<sup>2</sup>  
15,000 dpm beta-gamma/100 cm<sup>2</sup>, maximum over 1 m<sup>2</sup>

c. Soils

|                  |                                    |
|------------------|------------------------------------|
| Enriched uranium | 1.1 Bq/g (30 pCi/g) total uranium  |
| Natural Thorium  | 0.37 Bq/g (10 pCi/g) total uranium |

d. Exposure Rates:

Surface of buildings and equipment

5 microRoentgen/hour (μR/hr) above background at 1 meter (3.3 feet)

Soils:

10 μR/hr average above background at 1 meter (3.3 feet).  
20 μR/hr maximum above background at 1 meter (3.3 feet).

The inspectors used a Ludlum Model 19, Micro-R Meter, NaI(Tl) Gamma Scintillator, Serial Number 33524, NRC Number 015534, to measure exposure rates at the locations where soil samples were collected. This instrument was last calibrated on December 1, 2000, and is due for recalibration on December 1, 2001.

The inspectors also used an Eberline Model 660E, Serial Number 790, NRC Number 063473, with a dual phosphor scintillator detector. This instrument was calibrated with this detector on December 12, 2000, and is due for recalibration on December 12, 2001. The detector used was an Eberline SHP 380 AB, Serial Number 00907, NRC Number 072358.

e. Results Comparisons

The criteria in NRC Inspection Procedure 84525, "Quality Assurance and Confirmatory Measurements," was used for comparison of licensee and NRC results. The table that follows lists the criteria.

**TABLE 1**  
**Acceptance Criteria<sup>1</sup>**

| <b>Resolution<sup>2</sup></b> | <b>Ratio<sup>3</sup></b> |
|-------------------------------|--------------------------|
| <4                            | 0.4 - 2.5                |
| 4 - 7                         | 0.5 - 2.0                |
| 8 - 15                        | 0.6 - 1.66               |
| 16 - 50                       | 0.75 - 1.33              |
| 51 - 200                      | 0.80 - 1.25              |
| >200                          | 0.85 - 1.18              |

<sup>1</sup> Criteria from Inspection Procedure 84525, Quality Assurance and Confirmatory Measurements for In-Plant Radiochemical Analysis

<sup>2</sup> Resolution is the NRC result divided by its associated 1 $\sigma$  uncertainty.

<sup>3</sup> Ratio is the licensee result divided by NRC result.

## 6.2 Observation and Findings

### a. Sub-Area K

On July 31-August 1, 2001, the inspectors conducted confirmatory surveys of Sub-Area K of the Cimarron Site. The inspectors selected 31 sample locations. The inspectors used the same grid system that had been established by the licensee for site remediation. The sample points were located using the licensee's global positioning system (GPS). The inspectors measured the exposure rate at 1 meter above the surface of each soil sampling location, and specified where the licensee staff was to collect the soil samples.

The 31 soil samples collected were split between the licensee and the NRC. The NRC splits were sent to the NRC's Region III laboratory. The samples were analyzed for uranium and thorium. The NRC splits were analyzed by the NRC Region III laboratory using a traditional peak identification gamma spectroscopy program. The licensee's contractor NEXSTEP analyzed the samples at their Kerr-McGee Technical Center laboratory using their least-square resolution method. Table 2 summarizes the sample results.

**TABLE 2**  
**Sub-Area K Soil Samples Exposure Rates and Gamma Analysis**

| Sample #                                 | Location <sup>a</sup> | Sample Depth | Exposure Rate at 1 meter (μR/hr) <sup>b</sup> | Total Uranium                    |                            | Total Thorium       |                            |
|--|-----------------------|--------------|---|----------------------------------|----------------------------|---------------------|----------------------------|
|  |                       |              |   | NRC Results (pCi/g) <sup>c</sup> | Kerr-McGee Results (pCi/g) | NRC Results (pCi/g) | Kerr-McGee Results (pCi/g) |
| 1  | 95N 105E              | 0 - 6 inches | 8.5   | < 9.20                           | 6.47 ± 0.65                | 1.25 ± 0.05         | 1.43 ± 0.01                |
| 2  | 100N 130E             | 0 - 6 inches | 9.0   | < 3.40                           | 4.10 ± 0.75                | 1.52 ± 0.05         | 1.97 ± 0.02                |
| 3  | 100N 130E             | 2-3 feet     | 9.0   | < 6.30                           | 1.62 ± 0.14                | 2.16 ± 0.11         | 2.18 ± 0.02                |
| 4  | 110N 145E             | 0 - 6 inches | 8.0   | < 9.50                           | 7.84 ± 0.79                | 1.38 ± 0.03         | 1.47 ± 0.02                |
| 5  | 85N 150E              | 0 - 6 inches | 9.0   | 19.92 ± 8.4                      | 3.62 ± 0.67                | 1.30 ± 0.16         | 1.47 ± 0.02                |
| 6  | 85N 150E              | 2-3 feet     | 9.0   | < 8.70                           | 2.32 ± 0.65                | 1.41 ± 0.16         | 1.22 ± 0.02                |
| 7  | 95N 160E              | 0 - 6 inches | 8.5   | < 26.50                          | 28.58 ± 0.99               | 1.36 ± 0.11         | 1.35 ± 0.02                |
| 8  | 95N 160E              | 2-3 feet     | 8.5   | 9.86 ± 4.4                       | 10.83 ± 0.75               | 0.84 ± 0.13         | 0.74 ± 0.01                |
| 9  | 108N 183E             | 0 - 6 inches | 7.5   | < 13.0                           | 7.77 ± 0.67                | 0.84 ± 0.13         | 0.87 ± 0.01                |
| 10                                       | 108N 183E             | 1-2 feet     | 7.5   | 12.33 ± 4.0                      | 5.95 ± 0.61                | 0.77 ± 0.12         | 0.58 ± 0.01                |
| 11                                       | 60N 150E              | 0 - 6 inches | 9.0   | < 9.20                           | 1.91 ± 0.60                | 1.39 ± 0.15         | 1.17 ± 0.01                |
| 12                                       | 31N 105E              | 0 - 6 inches | 11.0  | 13.41 ± 5.9                      | 3.58 ± 0.74                | 1.88 ± 0.17         | 1.72 ± 0.02                |
| 13                                       | 31N 105E              | 2-3 feet     | 11.0  | < 9.10                           | 2.65 ± 0.75                | 1.99 ± 0.14         | 1.68 ± 0.02                |
| 14                                       | 40N 95E               | 0 - 6 inches | 11.0  | < 8.20                           | 2.62 ± 0.79                | 1.90 ± 0.23         | 1.76 ± 0.02                |
| 15                                       | 68N 65E               | 0 - 6 inches | 8.5   | 2.95 ± 1.1                       | 2.47 ± 0.14                | 1.91 ± 0.06         | 2.01 ± 0.02                |
| 16                                       | 68N 65E               | 2-3 feet     | 8.5   | < 15.0                           | 7.75 ± 0.69                | 1.96 ± 0.16         | 1.44 ± 0.01                |
| 17                                       | 64N 48E               | 0 - 6 inches | 10.0  | < 15.10                          | 3.84 ± 0.73                | 1.78 ± 0.18         | 1.73 ± 0.02                |
| 18                                       | 64N 48E               | 2-3 feet     | 10.0  | < 12.50                          | 2.55 ± 0.14                | 2.46 ± 0.20         | 2.00 ± 0.02                |
| 19                                       | 50N 50E               | 0 - 6 inches | 10.0  | < 12.40                          | 1.42 ± 0.71                | 1.78 ± 0.18         | 1.77 ± 0.02                |
| 20                                       | 50N 50E               | 2-3 feet     | 10.0  | < 11.40                          | 4.85 ± 0.78                | 1.77 ± 0.18         | 1.62 ± 0.02                |
| 21                                       | 170N 120E             | 0 - 6 inches | 10.0  | < 13.20                          | 8.29 ± 0.92                | 2.29 ± 0.21         | 1.75 ± 0.02                |
| 22                                       | 170N 120E             | 2-3 feet     | 10.0  | < 8.30                           | 2.39 ± 0.73                | 1.60 ± 0.18         | 1.43 ± 0.02                |
| 23                                       | 160N 140E             | 0 - 6 inches | 10.0  | < 7.40                           | 7.32 ± 0.87                | 2.48 ± 0.07         | 2.32 ± 0.02                |
| 24                                       | 145N 160E             | 0 - 6 inches | 11.0  | < 9.65                           | 3.23 ± 0.14                | 1.84 ± 0.17         | 1.79 ± 0.02                |
| 25                                       | 120N 80E              | 0 - 6 inches | 10.0  | < 9.80                           | 3.47 ± 0.69                | 2.12 ± 0.19         | 1.51 ± 0.02                |
| 26                                       | 118N 64E              | 3-4 feet     | 6.5   | < 7.40                           | 3.02 ± 0.67                | 2.00 ± 0.16         | 1.78 ± 0.02                |
| 27                                       | 109N 49E              | 3-4 feet     | 7.0   | < 18.60                          | 2.32 ± 0.70                | 2.24 ± 0.20         | 1.81 ± 0.02                |
| 28                                       | 95N 54E               | 3-4 feet     | 6.5   | < 10.50                          | 1.94 ± 0.68                | 1.83 ± 0.16         | 1.75 ± 0.02                |
| 29                                       | 113N 60E              | 3-4 feet     | 6.0   | < 8.40                           | 2.24 ± 0.68                | 1.34 ± 0.15         | 1.70 ± 0.02                |
| 30                                       | 75N 63E               | 5-6 feet     | 10.0  | < 5.50                           | 2.73 ± 0.75                | 1.97 ± 0.18         | 1.96 ± 0.02                |
| 31                                       | 43N 59E               | 5-6 feet     | 8.0   | < 7.60                           | 2.88 ± 0.69                | 1.66 ± 0.18         | 1.65 ± 0.02                |
| <b>NRC release criteria <sup>d</sup></b> |                       |              | <b>10</b>                                     | <b>30</b>                        |                            | <b>10</b>           |                            |

<sup>a</sup> These are the designated locations on the licensee's GPS grid system.

<sup>b</sup> Exposure rate background was determined by the Inspector for this instrument at the time of the inspection at the Cimarron site to range from 8 to 13 μR/hr outside buildings, and 6 to 10 μR/hr inside buildings. Background was not subtracted from these values.

<sup>c</sup> Total uranium concentration was determined by doubling the U-238 concentration to account for U-234, then summing the measured U-235.

<sup>d</sup> The NRC release criteria values noted are above background. Background was not subtracted from the analysis results.

b. Sub-Area K Building

The inspectors selected locations on the floor, interior and exterior walls, Z bars ceiling supports and roof of the building remaining in Sub-Area K to take alpha and beta contact measurements. Tables 3A and 3B summarize the statistics of the measurements for each of these sections of the building. None of the measurements taken by the inspectors exceeded the criteria in License Condition 27.

**Table 3A**  
**Summary of the Alpha Survey of the Surface of the Building in Sub-Area K**

| Area                        | # of Measurements | Mean dpm/100 cm <sup>2</sup> | Medium dpm/100 cm <sup>2</sup> | Low dpm/100 cm <sup>2</sup> | High dpm/100 cm <sup>2</sup> | Standard Deviation |
|-----------------------------|-------------------|------------------------------|--------------------------------|-----------------------------|------------------------------|--------------------|
| Floor                       | 15                | 1,148                        | 400                            | 112                         | 4,064                        | 1,376              |
| Interior Walls              | 16                | 487                          | 72                             | -16                         | 3,280                        | 909                |
| Exterior Walls              | 16                | 557                          | 256                            | 112                         | 2,848                        | 688                |
| Z bars Ceiling Supports     | 64                | 1,336                        | 864                            | 48                          | 6,528                        | 1,451              |
| Roof                        | 15                | 2,797                        | 2,496                          | 128                         | 5,984                        | 1,636              |
| <b>NRC Release Criteria</b> |                   | <b>5,000</b>                 |                                |                             | <b>15,000</b>                |                    |

**Table 3B**  
**Summary of the Beta Survey of the Surface of the Building in Sub-Area K**

| Area                        | # of Measurements | Mean dpm/100 cm <sup>2</sup> | Medium dpm/100 cm <sup>2</sup> | Low dpm/100 cm <sup>2</sup> | High          | Standard Deviation |
|-----------------------------|-------------------|------------------------------|--------------------------------|-----------------------------|---------------|--------------------|
| Floor                       | 15                | 3,568                        | 4,372                          | 963                         | 7,755         | 1,819              |
| Interior Walls              | 16                | 403                          | -553                           | -1,041                      | 6,805         | 2,417              |
| Exterior Walls              | 16                | -24                          | -299                           | -690                        | 1,874         | 744                |
| Z bars Ceiling Supports     | 64                | 1,200                        | 156                            | -1,444                      | 9,148         | 2,651              |
| Roof                        | 15                | 1,946                        | 1,705                          | -612                        | 5,296         | 1,430              |
| <b>NRC Release Criteria</b> |                   | <b>5,000</b>                 |                                |                             | <b>15,000</b> |                    |

c. Sub-Areas G

On August 1-2, 2001, the inspectors conducted confirmatory surveys of Sub-Area G of the Cimarron Site. The inspectors selected 43 sample locations. The inspectors used the same grid system that had been established by the licensee for site remediation. The sample points were located using the licensee's global positioning system (GPS). The inspectors measured the exposure rate at 1 meter above the surface of each soil sampling location, and specified where the licensee staff was to collect the soil samples.

The 43 soil samples collected were split between the licensee and the NRC. The NRC splits were sent to the NRC's Region III laboratory. The samples were analyzed for uranium and thorium. The NRC splits were analyzed by the NRC Region III laboratory using a traditional peak identification gamma spectroscopy program. The licensee's contractor NEXSTEP analyzed the samples at their Kerr-McGee Technical Center laboratory using their least-square resolution method. Table 4 summarizes the sample results.

**TABLE 4**  
**Sub-Area G Soil Samples Exposure Rates and Gamma Analysis**

| Sample # | Location <sup>a</sup> | Sample Depth | Exposure Rate at 1 meter (μR/hr) <sup>b</sup> | Total Uranium                    |                            | Total Thorium       |                            |
|----------|-----------------------|--------------|---|----------------------------------|----------------------------|---------------------|----------------------------|
|          |                       |              |   | NRC Results (pCi/g) <sup>c</sup> | Kerr-McGee Results (pCi/g) | NRC Results (pCi/g) | Kerr-McGee Results (pCi/g) |
| 1        | 962N 870E             | 0-6 inches   | 10  | < 10.60                          | 2.40 ± 0.13                | 2.00 ± 0.20         | 1.73 ± 0.02                |
| 2        | 993N 910E             | 0-6 inches   | 9.5   | < 1.60                           | 3.31 ± 0.13                | 1.68 ± 0.07         | 1.71 ± 0.02                |
| 3        | 993N 910E             | 2-3 feet     | 9.5   | < 9.90                           | 3.20 ± 0.72                | 1.91 ± 0.17         | 1.73 ± 0.02                |
| 4        | 1025N 818E            | 0-6 inches   | 10.5  | < 11.10                          | 3.14 ± 0.77                | 1.92 ± 0.17         | 1.84 ± 0.02                |
| 5        | 990N 800E             | 0-6 inches   | 9.5   | < 11.20                          | 2.28 ± 0.12                | 1.30 ± 0.16         | 1.19 ± 0.01                |
| 6        | 990N 800E             | 2-3 feet     | 9.5   | < 10.30                          | 1.94 ± 0.61                | 1.14 ± 0.14         | 0.90 ± 0.01                |
| 7        | 803N 715E             | 0-6 inches   | 10  | < 10.90                          | 1.96 ± 0.14                | 1.24 ± 0.16         | 1.41 ± 0.02                |
| 8        | 803N 715E             | 2-3 feet     | 10  | < 11.70                          | 2.30 ± 0.14                | 2.38 ± 0.19         | 1.77 ± 0.02                |
| 9        | 765N 510E             | 0-6 inches   | 12.5  | < 7.90                           | 5.21 ± 1.21                | 2.58 ± 0.13         | 2.68 ± 0.03                |
| 10       | 765N 510E             | 2-3 feet     | 12.5  | 9.69 ± 2.71                      | 1.66 ± 0.10                | 0.90 ± 0.13         | 0.45 ± 0.01                |
| 11       | 770N 524E             | 0-6 inches   | 13.5  | < 16.70                          | 6.12 ± 1.09                | 2.92 ± 0.23         | 2.37 ± 0.02                |
| 12       | 770N 524E             | 2-3 feet     | 13.5  | < 10.10                          | 1.37 ± 0.59                | 0.62 ± 0.12         | 0.69 ± 0.01                |
| 13       | 765N 491E             | 0-6 inches   | 12.5  | < 14.50                          | 3.80 ± 1.13                | 2.72 ± 0.22         | 2.71 ± 0.03                |
| 14       | 765N 491E             | 2-3 feet     | 12.5  | < 9.60                           | 1.97 ± 0.62                | 0.98 ± 0.12         | 1.07 ± 0.01                |
| 15       | 757N 430E             | 0-6 inches   | 13  | < 9.30                           | 9.60 ± 0.97                | 1.90 ± 0.06         | 1.91 ± 0.02                |
| 16       | 757N 430E             | 2-3 feet     | 13  | < 9.60                           | 2.26 ± 0.11                | 0.88 ± 0.11         | 0.87 ± 0.01                |
| 17       | 660N 380E             | 0-6 inches   | 11  | < 9.30                           | 3.94 ± 0.76                | 1.81 ± 0.16         | 1.60 ± 0.02                |
| 18       | 660N 380E             | 2-3 feet     | 11  | < 9.60                           | 1.17 ± 0.12                | 0.77 ± 0.12         | 0.50 ± 0.01                |
| 19       | 655N 385E             | 0-6 inches   | 11  | < 11.40                          | 3.81 ± 0.93                | 2.37 ± 0.21         | 2.16 ± 0.02                |
| 20       | 655N 385E             | 2-3 feet     | 11  | < 9.80                           | 2.12 ± 0.11                | 0.73 ± 0.11         | 0.66 ± 0.01                |
| 21       | 670N 455E             | 0-6 inches   | 12  | < 11.20                          | 2.48 ± 0.76                | 1.75 ± 0.18         | 1.91 ± 0.02                |
| 22       | 670N 455E             | 2-3 feet     | 12  | < 11.20                          | 1.98 ± 0.11                | 1.13 ± 0.15         | 0.97 ± 0.01                |
| 23       | 710N 530E             | 0-6 inches   | 14  | < 12.80                          | 4.18 ± 0.92                | 2.40 ± 0.19         | 2.38 ± 0.02                |
| 24       | 710N 530E             | 2-3 feet     | 14  | < 8.70                           | 2.14 ± 0.69                | 2.06 ± 0.16         | 1.95 ± 0.02                |
| 25       | 756N 414E             | 0-6 inches   | 13  | < 13.90                          | 11.14 ± 1.15               | 2.30 ± 0.07         | 2.12 ± 0.02                |
| 26       | 756N 414E             | 2-3 feet     | 13  | < 8.20                           | 2.74 ± 0.61                | 0.77 ± 0.15         | 0.60 ± 0.01                |
| 27       | 602N 893E             | 0-6 inches   | 6   | < 13.0                           | 1.78 ± 1.09                | 1.52 ± 0.17         | 1.17 ± 0.01                |
| 28       | 602N 893E             | 2-3 feet     | 6   | < 11.60                          | 2.48 ± 0.65                | 1.34 ± 0.04         | 1.35 ± 0.02                |

|   |           |            |           |           |             |             |             |
|---|-----------|------------|-----------|-----------|-------------|-------------|-------------|
| 29                                      | 796N 628E | 0-6 inches | 6.5       | < 10.30   | 2.49 ± 0.66 | 1.20 ± 0.13 | 1.11 ± 0.01 |
| 30                                      | 796N 628E | 2-3 feet   | 6.5       | < 17.50   | 1.63 ± 0.13 | 1.57 ± 0.17 | 1.36 ± 0.02 |
| 31                                      | 599N 509E | 0-6 inches | 7         | < 11.70   | 2.89 ± 0.75 | 1.39 ± 0.15 | 1.37 ± 0.02 |
| 32                                      | 599N 509E | 2-3 feet   | 7         | <10.30    | 1.72 ± 0.63 | 1.14 ± 0.14 | 0.99 ± 0.01 |
| 33                                      | 529N 458E | 0-6 inches | 10        | < 14.10   | 2.88 ± 0.78 | 1.88 ± 0.19 | 1.52 ± 0.02 |
| 34                                      | 529N 458E | 2-3 feet   | 10        | < 9.10    | 1.52 ± 0.11 | 0.79 ± 0.16 | 0.78 ± 0.01 |
| 35                                      | 500N 454E | 0-6 inches | 8         | < 7.60    | 3.40 ± 0.68 | 0.94 ± 0.11 | 1.22 ± 0.01 |
| 36                                      | 458N 445E | 0-6 inches | 9         | < 8.20    | 4.19 ± 0.86 | 2.06 ± 0.19 | 1.67 ± 0.02 |
| 37                                      | 458N 445E | 2-3 feet   | 9         | < 9.70    | 1.09 ± 0.64 | 0.88 ± 0.11 | 1.42 ± 0.02 |
| 38                                      | 595N 490E | 0-6 inches | 8.5       | < 10.00   | 3.50 ± 0.66 | 1.24 ± 0.14 | 0.96 ± 0.01 |
| 39                                      | 595N 490E | 2-3 feet   | 8.5       | < 18.20   | 3.86 ± 0.80 | 2.14 ± 0.19 | 1.47 ± 0.02 |
| 40                                      | 606N 490E | 0-6 inches | 10        | < 6.90    | 2.43 ± 0.74 | 1.38 ± 0.15 | 1.38 ± 0.02 |
| 41                                      | 606N 490E | 2-3 feet   | 10        | < 8.30    | 0.54 ± 0.49 | 0.56 ± 0.11 | 0.57 ± 0.01 |
| 42                                      | 502N 422E | 0-6 inches | 11        | < 6.90    | 2.88 ± 0.71 | 1.04 ± 0.11 | 1.22 ± 0.02 |
| 43                                      | 502N 422E | 2-3 feet   | 11        | < 10.40   | 0.95 ± 0.49 | 0.41 ± 0.05 | 0.50 ± 0.01 |
| <b>NRC release criteria<sup>a</sup></b> |           |            | <b>10</b> | <b>30</b> | <b>10</b>   |             |             |

<sup>a</sup> These are the designated locations on the licensee's GPS grid system.

<sup>b</sup> Exposure rate background was determined by the Inspector for this instrument at the time of the inspection at the Cimarron site to range from 8 to 13 µR/hr outside buildings, and 6 to 10 µR/hr inside buildings. Background was not subtracted from these values.

<sup>c</sup> Total uranium concentration was determined by doubling the U-238 concentration to account for U-234, then summing the measured U-235.

<sup>d</sup> The NRC release criteria values noted are above background. Background was not subtracted from the analysis results.

#### d. Ground Water Samples

On September 5-6, 2001, an inspector observed the collection of 12 groundwater samples from wells and 1 from a seep. The inspector observed that the samples were preserved by acidification on collection. The samples were split between the licensee and NRC. The NRC samples were sent to the NRC's contractor laboratory operated by Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science Education (ORISE). The NRC splits were analyzed for gross alpha and gross beta, by alpha spectroscopy for uranium, and by chemical separation and radiological analysis for technetium-99. The licensee used their local laboratory to conduct the gross alpha and gross beta analysis. Splits were sent to Severn Trent Laboratory (STL) of Richland, Washington, for alpha spectroscopy and technetium-99 analysis. There is no NRC groundwater release criteria for gross alpha or gross beta.

Table 5 summarizes the ESSAP and STL gross alpha and gross beta sample results. Table 6 summarizes the uranium alpha spectrum analysis results. All analysis results, with the exception of two for total uranium, were below the applicable release criteria. The two exceptions were wells 1315 and TMW-13. Both of these wells were located on a known plume.

Table 7 summarizes the technetium 99 analysis results. It should be noted that the licensee only analyzed for the presence of technetium 99 if the ratio of gross beta to gross alpha was greater than 3 and the total alpha exceed 30 pCi/l. All the results were below the concentration equivalent to the EPA drinking water standard of 4 mrem/yr. However, when the analysis results between the NRC contractor laboratory and the licensee contract laboratory are compared using the criteria in NRC Inspection

Procedure 84525, "Quality Assurance and Confirmatory Measurements," four of the five analysis were not in agreement. This disagreement in analysis results will be reviewed in a future inspection and will be tracked as an Inspection Follow-up Item (070-00925/0101-02).

**TABLE 5**  
**Groundwater Samples Gross Alpha and Gross Beta Analysis Results**

| Sample ID   | ALPHA ACTIVITY pCi/L |                          | BETA ACTIVITY pCi/L |                          | Beta/Alpha Ratio |       |
|-------------|----------------------|--------------------------|---------------------|--------------------------|------------------|-------|
|             | NRC (ESSAP) Results  | Kerr-McGee (STL) Results | NRC (ESSAP) Results | Kerr-McGee (STL) Results | NRC              | KM    |
| 1314-1282   | 0.2 ± 2.5            | 1.66 ± 1.10              | 0.15 ± 2.6          | 2.29 ± 1.50              | 0.81             | 1.38  |
| 1315-1283   | 360 ± 30             | 428.00 ± 92.00           | 90 ± 10             | 156.00 ± 22.00           | 0.26             | 0.36  |
| TMW-13-1284 | 2940 ± 230           | 2590.00 ± 560.00         | 630 ± 60            | 1010.00 ± 140.00         | 0.23             | 0.39  |
| 1316-1285   | 67.6 ± 9.1           | 46.40 ± 11.00            | 9.1 ± 3.1           | 11.60 ± 2.70             | 0.14             | 0.25  |
| 1344-1286   | 11.0 ± 4.7           | 18.40 ± 5.80             | 22.2 ± 6.2          | 22.70 ± 4.60             | 2.02             | 1.23  |
| 1336A-1287  | 52.6 ± 8.5           | 14.20 ± 4.50             | 630 ± 60            | 143.00 ± 20.00           | 11.98            | 10.07 |
| 1208-1288   | 200 ± 20             | 23.00 ± 9.40             | 2450 ± 250          | 575.00 ± 83.00           | 12.52            | 25.00 |
| 1311-1289   | 4.4 ± 1.5            | 3.04 ± 1.50              | 2.9 ± 1.2           | 4.36 ± 1.70              | 0.65             | 1.43  |
| 1206-1290   | 120 ± 10             | 74.20 ± 17.00            | 41.7 ± 4.3          | 35.70 ± 5.90             | 0.36             | 0.48  |
| 1312-1291   | 90 ± 10              | 28.20 ± 7.70             | 520 ± 40            | 557.00 ± 41.00           | 5.66             | 19.75 |
| 1330-1292   | 34.0 ± 6.4           | 12.70 ± 3.70             | 26.1 ± 4.2          | 12.00 ± 2.90             | 0.77             | 0.94  |
| 1328-1293   | 23 ± 13              | 30.10 ± 12.00            | 0 ± 10              | 18.50 ± 5.00             | -0.01            | 0.61  |
| 1329-1294   | 20.5 ± 4.7           | 31.30 ± 8.60             | 34.0 ± 4.8          | 34.00 ± 6.10             | 1.65             | 1.09  |

**TABLE 6**  
**Groundwater Samples Uranium Alpha Spectroscopy Analysis Results**

| Sample ID            | Radionuclide Concentration pCi/l |             |             |              |             |             |             |             |
|----------------------|----------------------------------|-------------|-------------|--------------|-------------|-------------|-------------|-------------|
|                      | U-234                            |             | U-235       |              | U-238       |             | Total U     |             |
|                      | NRC                              | KM          | NRC         | KM           | NRC         | KM          | NRC         | KM          |
| 1314                 | 1.17 ± 0.49                      | 0.83 ± 0.38 | 0.19 ± 0.24 | 0.07 ± 0.10  | 0.55 ± 0.29 | 0.62 ± 0.32 | 1.91 ± 0.62 | 1.51 ± 0.51 |
| 1315                 | 220 ± 20                         | 212 ± 43    | 11.8 ± 1.9  | 9.86 ± 2.40  | 160 ± 10    | 154 ± 31    | 390 ± 20    | 376 ± 53    |
| TMW-13               | 1830 ± 330                       | 1700 ± 350  | 90 ± 20     | 59.1 ± 50    | 1040 ± 190  | 985 ± 200   | 2960 ± 380  | 2685 ± 403  |
| 1316                 | 36.4 ± 3.8                       | 27.1 ± 5.7  | 1.90 ± 0.63 | 1.19 ± 0.48  | 17.4 ± 2.1  | 12.2 ± 2.7  | 55.7 ± 4.4  | 40.5 ± 6.3  |
| 1344                 | 1.32 ± 0.50                      | 1.29 ± 0.49 | 0.05 ± 0.17 | -0.01 ± 0.01 | 1.24 ± 0.46 | 0.98 ± 0.42 | 2.61 ± 0.70 | 2.27 ± 0.65 |
| 1336A                | 19.2 ± 2.3                       | 20.6 ± 4.6  | 0.79 ± 0.39 | 0.62 ± 0.45  | 6.2 ± 1.1   | 7.00 ± 1.9  | 26.2 ± 2.6  | 28.2 ± 5.0  |
| 1208                 | 27.8 ± 3.2                       | 30.0 ± 7.6  | 1.54 ± 0.55 | 1.15 ± 0.99  | 8.1 ± 1.3   | 8.89 ± 3.2  | 37.4 ± 3.5  | 40.0 ± 8.3  |
| 1311                 | 1.12 ± 0.47                      | 1.10 ± 0.48 | 0.28 ± 0.26 | 0.11 ± 0.14  | 1.44 ± 0.48 | 0.60 ± 0.33 | 2.84 ± 0.72 | 1.82 ± 0.60 |
| 1206                 | 80.0 ± 7.5                       | 75.7 ± 15   | 3.22 ± 0.86 | 3.11 ± 0.90  | 22.0 ± 2.6  | 20.3 ± 4.3  | 110 ± 10    | 99.1 ± 16   |
| 1312                 | 35.8 ± 3.7                       | 36.6 ± 7.6  | 1.33 ± 0.51 | 0.96 ± 0.44  | 11.7 ± 1.6  | 11.7 ± 2.7  | 48.8 ± 4.0  | 49.3 ± 8.1  |
| 1330                 | 10.4 ± 1.5                       | 11.8 ± 2.7  | 0.73 ± 0.39 | 0.41 ± 0.26  | 3.64 ± 0.79 | 3.87 ± 1.1  | 14.8 ± 1.8  | 16.1 ± 2.9  |
| 1328                 | 19.7 ± 2.4                       | 20.1 ± 4.5  | 0.47 ± 0.33 | 0.42 ± 0.30  | 10.2 ± 1.5  | 12.1 ± 2.8  | 30.4 ± 2.8  | 32.6 ± 5.3  |
| 1329                 | 4.33 ± 0.90                      | 4.4 ± 1.2   | 0.24 ± 0.22 | 0.04 ± 0.09  | 2.66 ± 0.68 | 1.59 ± 0.61 | 7.2 ± 1.1   | 6.03 ± 1.3  |
| NRC Release criteria |                                  |             |             |              |             |             | 180 pCi/l   |             |

<sup>a</sup> Uncertainties are total propagated uncertainties at the 95% confidence level.



**TABLE 7**  
**Groundwater Samples Technetium-99 Analysis Results**

| Sample ID  | NRC<br>(ESSAP)<br>Results pCi/l | Kerr-McGee<br>(STL)<br>Results pCi/l | Kerr-McGee<br>Beta/Alpha<br>Ratio | Resolution | Ratio <sup>1</sup> | Status <sup>1</sup> |
|--|---------------------------------|--------------------------------------|-----------------------------------|------------|--------------------|---------------------|
| 1314-1282  | 1.6 ± 9.1                       |                                      | 1.38                              |            |                    |                     |
| 1315-1283  | 7.8 ± 9.3                       |                                      | 0.36                              |            |                    |                     |
| TMW-13-1284  | 458 ± 66                        | -4.25 ± 7.5                          | 0.39                              | 14         | -0.01              | Non-agreement       |
| TMW-13-1284  | 458 ± 66                        | 5.12 ± 7.9                           | 0.39                              | 14         | 0.01               | Non-agreement       |
| 1316-1285  | 5.6 ± 9.3                       |                                      | 0.25                              |            |                    |                     |
| 1344-1286  | 3.0 ± 9.2                       |                                      | 1.23                              |            |                    |                     |
| 1336A-1287   | 1050 ± 80                       | 571 ± 42                             | 10.07                             | 26         | 0.54               | Non-agreement       |
| 1208-1288 <sup>2</sup>   | 2572 ± 189                      | 2280 ± 150                           | 25.00                             | 27         | 0.89               | Agreement           |
| 1311-1289  | 0.9 ± 9.1                       |                                      | 1.43                              |            |                    |                     |
| 1206-1290  | 101 ± 16                        |                                      | 0.48                              |            |                    |                     |
| 1312-1291  | 1026 ± 79                       | 557 ± 41                             | 19.75                             | 26         | 0.54               | Non-agreement       |
| 1330-1292  | 35 ± 10                         |                                      | 0.94                              |            |                    |                     |
| 1328-1293  | 2.5 ± 9.2                       |                                      | 0.61                              |            |                    |                     |
| 1329-1294  | -6.2 ± 8.9                      |                                      | 1.09                              |            |                    |                     |
| Equivalent to EPA<br>drinking water<br>standard of<br>4 mREM/year<br>criterion | 3,790 pCi/L                     |                                      |                                   |            |                    |                     |

<sup>1</sup> Resolution, ratio and agreement status determined from Table 1 Acceptance Criteria above.

<sup>2</sup> 1208 is a seep. Therefore the 60,000 pCi/l surface water criteria applies.

### 6.3 Conclusions

The confirmatory exposure-rate measurements, soil sample analysis results, and alpha and beta building measurements were all below the applicable NRC release criteria. These confirmatory measurements were consistent with the licensee's determination that Sub-Areas K and G of the Cimarron Site meets the criteria established in NRC License SNM-928, License Condition 27 for unrestricted use.

Two groundwater analysis results for total uranium exceeded the applicable release criteria of 180 pCi/l. These samples were collected from wells that are located on a known plume.

All measurement results for Tc-99 were below the release criteria. However, when the analysis results between the NRC contractor laboratory and the licensee contract laboratory are compared using the criteria in NRC Inspection Procedure 84525, "Quality Assurance and Confirmatory Measurements," four of the five analyses that were not in agreement. This disagreement in analysis results will be reviewed in a future inspection and will be tracked as an Inspection Follow-up item.

## **7 Exit Meeting Summary**

The inspectors presented the preliminary results of the inspection to licensee representatives at the conclusion of the site visit. On November 21, 2001, after receipt and analysis of the last set of sample results a telephonic exit meeting was conducted between the lead inspector and the radiation safety officer. The licensee representatives acknowledged the findings as presented. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.

## **ATTACHMENT**

### **PARTIAL LIST OF PERSONS CONTACTED**

#### Licensee Cimarron Corporation

J. Larsen, Former Site Manager and Vice President, Cimarron  
K. Morgan, Radiation Safety Officer  
L. Smith, Quality Assurance Coordinator  
H. Gay, Operations

#### NEXTEP Environmental (contractor)

S. Marshall, Nextep Environmental  
H. Newman, Health Physics Laboratory Consultant  
R. Callahan, Technician

W. Rogers, Technical Consultant

### **INSPECTION PROCEDURES USED**

IP 88104 Decommissioning Inspection Procedure for Fuel Cycle Facilities  
IP 88045 Environmental Protection  
IP 83890 Closeout Inspection and Survey  
IP 86740 Transportation Activities

### **ITEMS OPENED, CLOSED AND DISCUSSED**

#### Closed

None

#### Opened

070-00925/0101-01 VIO Change to Radiation Protection Plan without prior ALARA Committee Approval. License Condition 27(e).

070-00925/0101-02 IFI Lack of Agreement between NRC and Licensee analysis for Tc-99.

#### Discussed

None

### **LIST OF ACRONYMS**

|                         |  |
|-------------------------|--|
| ALARA                   | As Low As is Reasonably Achievable                 |
| ANSI                    | American National Standards Institute              |
| BTP                     | Branch Technical Position                          |
| CFR                     | Code of Federal Regulations                        |
| dpm/100 cm <sup>2</sup> | disintegrations per minute/100 centimeters squared |
| μR/hr                   | microRoentgen/hour                                 |
| pCi/g                   | picocuries/gram                                    |
| PDR                     | public document room                               |
| QA                      | quality assurance                                  |
| SNM                     | special nuclear material                           |