The sampling and survey efforts completed to date meet the current requirements for a final release survey.

C. Environmental Data:

Groundwater in this area is monitored via wells #1332 and #1333. Gross alpha concentrations in both wells were less than the detection limit of 10 pCi/L. Gross beta was below the detection limit of 20 pCi/L in both wells during the monitored period. Total uranium concentrations were less than 0.005 mg/L at both wells. All isotopic concentrations for uranium, thorium, and radium were at levels characteristic of background.

11.2 New Sanitary Lagoon

The New Sanitary Lagoon (hypalon-lined) was installed by January, 1986. The New Sanitary Lagoon is located directly above the closed Plutonium Evaporation Pond and a portion of the closed Plutonium Emergency Pond. The location of the lagoon is shown on Drawing No. 93FISLUR-0. This lagoon was installed to replace the East and West Sanitary Lagoons that were being remediated and closed out. A french drain was installed under the New Sanitary Lagoon prior to construction to divert groundwater that may collect under this area. All liquids from the East and West Sanitary Lagoons were pumped to the New Sanitary Lagoon prior to the start of remediation on the East and West Sanitary Lagoons. Waste water from the ion exchange system and the Uranium Building drains was also released to the New Sanitary Lagoon. The New Sanitary Lagoon was utilized from early 1986 to October 22, 1992. This lagoon now is isolated and only rainwater is being collected.

A. Characterization Data

The NRC authorized the backfilling and closure of the retention ponds located below the New Sanitary Lagoon by letter dated July 10, 1978. Authorization was based upon NRC confirmatory sample analysis results. These retention ponds also had been sampled by Cimarron personnel prior to confirmatory sampling conducted by the NRC in 1978. The closure of the retention ponds, previously located below the New Sanitary Lagoon, is discussed in Section 12.0.

Sludge sample concentrations from the New Sanitary Lagoon range between 22 pCi/g and 26 pCi/g total uranium. The New Sanitary Lagoon will be characterized further prior to closure of this area.

B. Environmental Data

Well #1334 is located north of the sanitary lagoons. Gross alpha concentrations ranged from less than 10 pCi/L to 43 pCi/L during the 1989 to 1993 monitoring period. Gross beta concentrations all were less than 20 pCi/L from 1989 through 1993. Total uranium concentrations ranged from less than 0.005 mg/L (7 pCi/L) in June, 1993 to 0.25 mg/L (360 pCi/L) in June, 1991. Isotopic uranium concentrations reported in June 1991 were much lower (U-234: 14.3 pCi/L, U-235: 0.02 pCi/L, U-236: 0.02 pCi/L, and U-238: 17.8 pCi/L), indicating a possible error in reporting or measurement for the total uranium results. The total and isotopic uranium results for 1992 and 1993 are below the Table 2, Column 2 concentrations listed in 10 CFR 20, Appendix B.

Samples are collected weekly from the drain pipe located beneath the sanitary lagoon (sample location #1214) and analyzed for gross alpha.. Gross alpha concentrations ranged from less than 1.2 E-07 μCi/mL to 9.6 E-07 μCi/mL during 1993, and from 1.3 E-09 μCi/mL to 1.2 E-07 μCi/mL through May 4, 1994. The New Sanitary Lagoon has been isolated since October 22, 1992.

Weekly samples are collected also from the spring located east of the new sanitary lagoon. Gross alpha concentrations ranged from less than 1.2 E-07 μCi/mL to 1.3 E-06 μCi/mL in 1993. Sample results through May 4, 1994, ranged from 6.0 E-09 μCi/mL to 6.36 E-08 μCi/mL. Recent sample results are below the Table 2, Column 2 concentrations listed in 10 CFR 20, Appendix B.

12.0 Five Former Waste Water Ponds

The five former waste water ponds discussed in this section include the Uranium Waste Ponds #1 and #2, the Plutonium Evaporation and Emergency Ponds, and the Uranium Emergency Pond. The closure of the five Waste Ponds at the Cimarron facility started in March, 1976 with the construction and installation of a dike across the south half of Uranium Waste Pond #1. This dike consisted of a four-foot-tall plywood barrier wrapped with an EPDM liner which was weighted and staked to the Waste Pond #1 sides and bottom. This enabled Waste Pond #1 to be consolidated into a much smaller area. Excess water was decanted to Waste Pond #2. In March, 1976, Cimarron personnel fabricated and installed a filter system for decanting water from the Plutonium Evaporation Pond to Uranium Waste Pond #2. The water was pumped from the surface through the filtration system.

In April, 1976, water from the Plutonium Emergency Pond and the Uranium Emergency Pond was pumped to Uranium Waste Pond #1 with no visible sludge remaining in these two ponds. After being pumped dry and characterized, the Uranium Emergency Pond was left undisturbed (no additional remediation was performed) until written approval was received from the NRC to backfill all five ponds. The Plutonium Emergency Pond was left undisturbed until November 5, 1976 when it was used to treat water with radionuclide concentrations greater than 0.1 MPC that remained in the other ponds. This was done in order to keep the concentration of radionuclides in the water being pumped to Waste Pond #2 below 0.1 MPC. All water was pumped to Uranium Waste Pond #2 from the Plutonium Emergency Pond by December 10, 1976. All the waste precipitate residues were removed from the Plutonium Emergency Pond and the liquid was pumped to the Plutonium Evaporation Pond on December 10, 1976. Uranium Waste Pond #1 water was decanted to Uranium Waste Pond #2 beginning on April 13, 1976 and continuing through April 22, 1976. The Plutonium Evaporation Pond was decanted through a filtration system to Uranium Waste Pond #2 beginning on April 23, 1976 and continuing through June 21, 1976.

Sludge solidification at Uranium Waste Pond #1 started on July 30, 1976. This was accomplished by using a pump to fill 55-gallon drums with contaminated sludges which in turn were placed on conveyors adjacent to the mixing operation. After filling the barrels approximately 5/6 full with contaminated sludge, a mixer was inserted and cement was added gradually to produce a solidified waste form. Waste solidification operations were completed by October 27, 1976 for Uranium Waste Pond #1. A total of 865 drums of solidified waste containing 3,002 grams

of U-235 were shipped from Uranium Waste Pond #1 to a commercial LLRW disposal facility.

The decanted water remaining in the Plutonium Evaporation Pond was processed through a filtration system until approximately 70,000 gallons of water remained. The 70,000 gallons of water was not processed because the radionuclide concentration was greater than 0.1 MPC. The activity in this water was approximately 6E-5 uCi/ml alpha, with the radioactive particles in colloidal suspension. On November 5, 1976, treatment of the 70,000 gallons of water in the Plutonium Evaporation Pond was initiated with the water being decanted to the Plutonium Emergency Pond on a batch basis. The water from the Plutonium Emergency Pond then was decanted to Uranium Waste Pond #2. This batch process was repeated until all the excess water from the Plutonium Evaporation Pond was removed. The treatment was accomplished by adding ferric sulfate and NaOH to precipitate a $Fe(OH)_3$ floc. The $Fe(OH)_3$ heel was returned to the Plutonium Evaporation Pond from the Plutonium Emergency Pond on December 10, 1976. The sludge from the Plutonium Evaporation Pond and the Plutonium Emergency Pond was solidified with concrete. Waste solidification commenced on December 10, 1976 and was completed by March 1, 1977. A total of 491 drums of solidified waste containing less than 1 gram of Plutonium (total for all 491 drums) were shipped off site for disposal at a commercial LLRW disposal facility.

After completion of the water treatment project and subsequent sludge solidification in the Waste Ponds, Cimarron staff, the Oklahoma State Department of Health in October, 1977, and the NRC in November , 1977, sampled the five former waste water ponds and the resulting sample analyses were compared.[12] On March 2, 1978, Cimarron received written permission from the Oklahoma State Department of Health to cover the five former waste water ponds. On July 10, 1978[13], Cimarron received written permission from the NRC to backfill and cover the five former waste water ponds. These five ponds were backfilled and covered between August 3, 1978 and November 1, 1978. A December 14, 1978 NRC inspection report states that burial of the "five liquid effluent retention ponds was completed during the inspection". Initial seeding and fencing were performed between November 2, 1978 and March 20, 1979. Sprigging and fertilizing of these five former waste water ponds were performed from July 18, 1979 to October 30, 1979.

12.1 Uranium Emergency Pond, Plutonium Evaporation Pond, and Plutonium Emergency Pond

A. Uranium Emergency Pond (UEM Pond)

This unlined evaporation pond was irregular in shape. Axis measurements along the center line to the top of the dike were approximately 150 ft. x 180 ft.. The bottom area was approximately 5,000 ft^2 and the approximate capacity was 180,000 gal. at a maximum depth of 4.5 ft.

B. Plutonium Evaporation Pond (PEV Pond)

This hypalon-lined evaporation pond was irregular in shape. Axis measurements along the center line to the top of the dike were approximately 120 ft. x 180 ft. The bottom area was approximately 10,000 ft^2 and the approximate capacity was 700,000 gal. at a maximum depth of 7 ft. The Plutonium Evaporation Pond liner was surveyed for alpha contamination and then rolled up and left in place prior to backfilling. The liner was later removed in 1986 when the New Sanitary Lagoon was constructed.

C. Plutonium Emergency Pond (PEM Pond)

This hypalon-lined evaporation pond was irregular in shape. Axis measurements along the centerline to the top of the dike were approximately 100 ft. x 80 ft. The bottom area was approximately 4,500 ft^2 and the approximate capacity was 250,000 gal. at a maximum depth of 7 ft. The Plutonium Emergency Pond liner was surveyed for alpha contamination prior to being rolled up and left in place prior to backfilling.

D. Characterization Data:

These three ponds were sampled in 1977 by Cimarron personnel, Oklahoma State Department of Health, and the NRC prior to being backfilled. The sample locations and analytical results are included in Attachment 12.0.

Pre-remediation Micro-R and gamma surveys were conducted over the Plutonium Emergency Pond and the Uranium Emergency Pond areas. These data are contained

on Drawings No. 90PRUYUR-0, 90PRUYUR-1, and 90 PRUY3D-0, which are included as attachments to Section 9.0.

The UEM Pond and PEM Pond areas were partially cored down to four feet in 1990. The soil was composited in intervals of 0 to 6 in., 6 in. to 1 ft., 1 to 2 ft., 2 to 3 ft., and 3 to 4 ft.. The soil sample analysis results have been placed on Drawings No. 90PRPUSS-0 through 90PRPUSS-4. Only portions of the ponds could be cored due to the fact that part of the two ponds are located beneath the new lined sanitary lagoon. The majority of the soil sample results for this area were below the 30 pCi/g guideline value for total uranium (Option #1). As shown on the referenced drawings, several samples near the restricted area fence exceeded the 30 pCi/g guideline value for total uranium.

12.2 Uranium Waste Pond #1:

The closure of this pond was discussed in greater detail in Section 12.0. This asphalt pitch, felt and pea-gravel-lined evaporation pond was rectangular in shape. Axis measurements along the center line to the top of the dike were approximately 300 ft. x 110 ft.. The bottom area was approximately 23,000 ft^2 and the approximate capacity was 1,152,000 gal. at a maximum depth of 8 ft. Uranium Waste Pond #1 was closed by crushing the asphalt liner into the pond. The underlying clay dike material and clean soil was used to fill in the depression (a depth of approximately 4 ft.). This pond was backfilled in 1978 after being sampled by the NRC.

A. Characterization Data:

As discussed in Section 12.0, this Pond was sampled by Cimarron staff, Oklahoma State Department of Health, and the NRC prior to being backfilled. However, in January 1993, the NRC sent a letter to Kerr-McGee Corporation stating the following:

> "...the five former wastewater ponds that were closed in 1978 must be addressed in detail. A thorough characterization of these ponds must be included, and the Decommissioning Plan must describe how you plan to address any contamination in excess of levels acceptable for release for unrestricted use."

As a result of this letter from the NRC, Cimarron staff initiated an extensive characterization program for this area in an attempt to address NRC concerns. In March, 1993, a 10m x 10m grid was established for Waste Pond #1 by Cimarron personnel, and soil corings were taken to a depth of 6 ft.. Composite soil samples at one-foot intervals were obtained during this effort and analyzed for total uranium. These sample analysis results are shown on Drawings No. 93IVWPSS-1 through 93IVWPSS-6. The soil samples were analyzed at the Cimarron laboratory. Two grids showed soil concentrations exceeding the 30 pCi/g total uranium guideline value for Option #1 material at a depth of 6 ft.. The samples had uranium concentrations of 81 pCi/g and 167 pCi/g. A backhoe was utilized to collect additional soil samples at depths of 6 to 9 ft. in the same locations where the two soil samples exceeded the Option #1 limit. These sample analysis results are shown on Drawings No. 93IVWPSS-7 through-93IVWPSS-9. The highest concentration for this sampling phase with the backhoe was 133 pCi/g total uranium for contaminated soil collected at 8 to 9 feet in depth.

After reviewing the data from this first round of sampling (0 to 6 ft. and 6 to 9 ft.), Cimarron staff initiated a random sampling effort in the Waste Pond #1 area down to 12 ft. utilizing a drill rig. The results of this second round of sampling are shown on Drawings No. 93IVWPSS-R1 through 93IVWPSS-R12. A total of 138 samples were taken. As shown on the drawings, there were no soil samples with uranium concentrations above 30 pCi/g below 10 ft. There were several soil samples with uranium concentrations exceeding 100 pCi/g (maximum of 197 pCi/g total uranium) above 10 ft.

The very southern tip of Waste Pond #1 was not sampled due to large pieces of equipment being stored in this area at the time of sample collection. The southern tip of Waste Pond #1 is over the original diked area and it is unlikely that elevated concentrations of uranium would be found in this area.

A Micro-R survey of this area was conducted in 1993 and the results are listed on Drawings No. 93IVWPUR-0 and 93IVWPUR-1. The survey readings were in the range of 5

to 10 uR/hr. A gamma survey also was conducted in 1993 and the results are shown on Drawing No. 93IVWP3D-0.

B. Environmental Data

Monitoring wells #1311, #1312, and #1313 serve to monitor the area surrounding Uranium Waste Pond # 1. Well #1311 is southeast of the pond area and is probably not influenced by the pond, since any effluent from the pond should flow toward the Cimarron River to the north. Well #1312 is west of the pond, while well #1313 is north of the pond. These wells appear to be influenced by the pond, based upon the results of the environmental monitoring program. Figures 12.1 through 12.3 have been generated to show trends occurring in wells. "Less than" data are presented on graphs at the uppermost bound.

Concentrations of gross alpha activity in wells #1311, #1312, and #1313 ranged from less than detectable (< 10 pCi/L) to 2200 pCi/L (well #1312, June 21, 1985) during the monitoring period from 1985 through 1993. Sample results are presented in Figure 12.1. Gross alpha concentrations in well #1311 remained low throughout the 1985-1993 monitoring period, reaching a maximum of 32 pCi/L in 1990 and 1992. Concentrations in wells #1312 and #1313 decreased to near background levels during 1986 through 1988 and then increased to a maximum of 1510 pCi/L in well #1313 on June 12, 1992. Sample concentrations for wells #1312 and #1313 decreased in 1993 to 116 pCi/L and 647 pCi/L, respectively. Assuming that all alpha activity comes from uranium isotopes, the 10 CFR 20 Appendix B Table 2, Column 2 value for uranium (300 pCi/L) was exceeded in 1993 at well #1313. As the direction of the trend is downward for wells #1312 and #1313, it is likely that gross alpha concentrations will continue to decline.

Gross beta concentrations in wells #1311, #1312, and #1313 varied from less than 20 pCi/L to 11,800 pCi/L (well #1312, April 24, 1986). Data are plotted in Figure 12.2. Concentrations in well #1311 remained low, peaking at 49 pCi/L in 1992. As with gross alpha, activity in wells #1312 and #1313 trended lower through 1988, then increased.

Figure 12.1

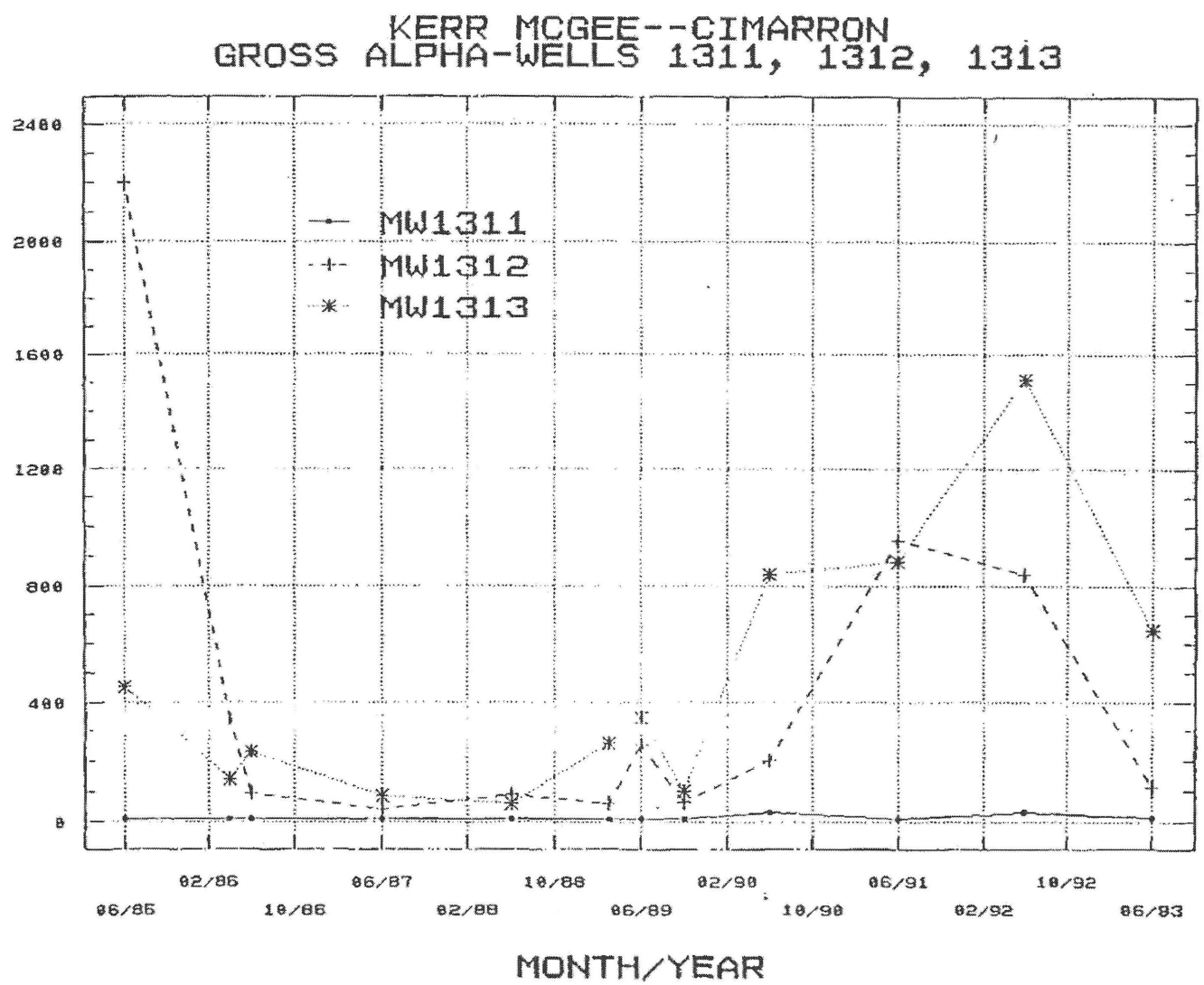

KERR MCGEE--CIMARRON
GROSS ALPHA-WELLS 1311, 1312, 1313
GROSS ALPHA (pCi/L)
2400
2000
1600
1200
800
400
0
MW1311
MW1312
MW1313
06/85
10/86
02/88
06/89
10/90
02/92
06/93
02/86
06/87
10/88
02/90
06/91
10/92
MONTH/YEAR

Figure 12.2

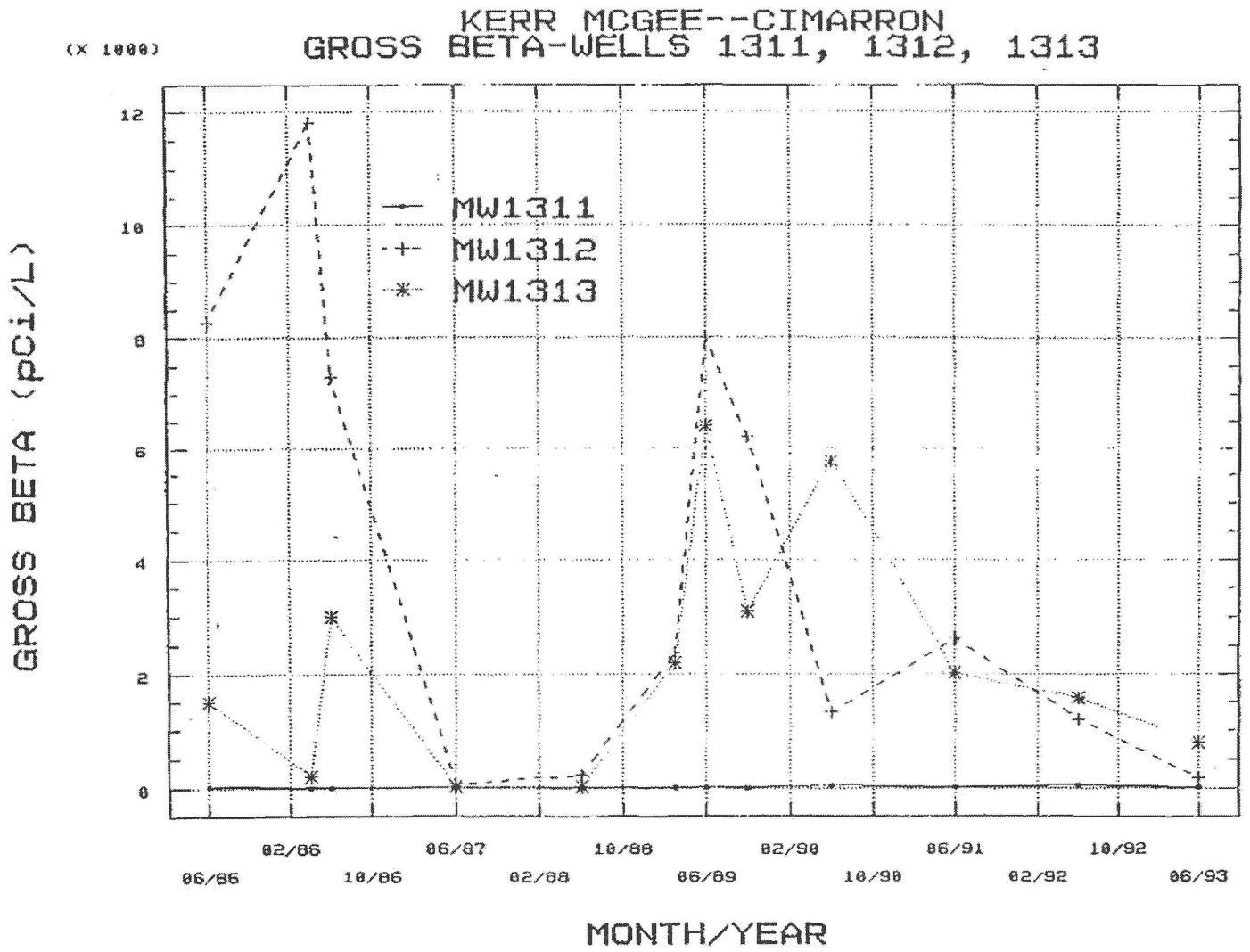
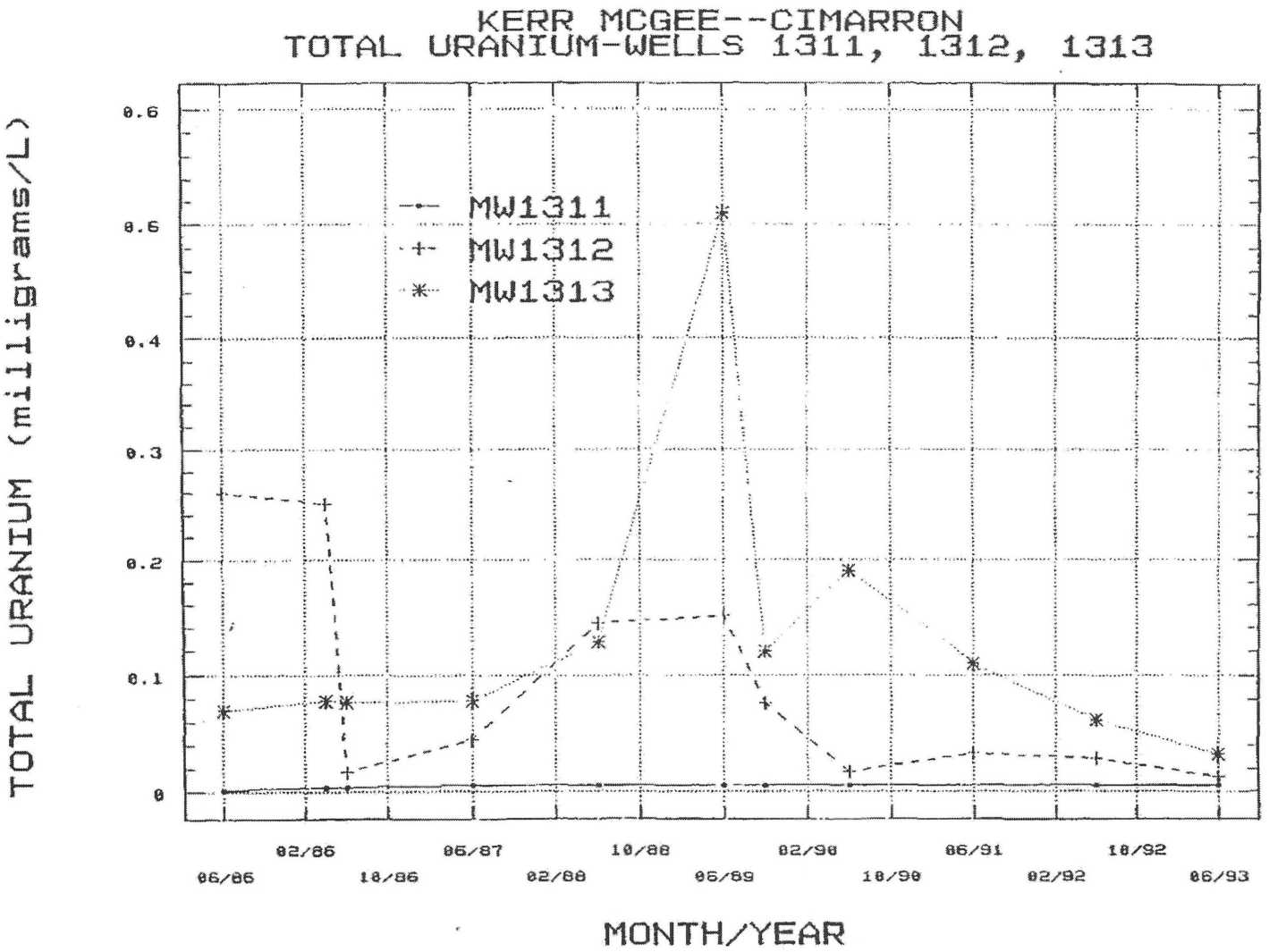

KERR MCGEE--CIMARRON
GROSS BETA-WELLS 1311, 1312, 1313
(X 1000)
GROSS BETA (pCi/L)
MW1311
MW1312
MW1313
12
10
8
6
4
2
0
06/86
02/86
10/86
06/87
02/88
10/88
06/89
02/90
10/90
06/91
02/92
10/92
06/93
MONTH/YEAR

Figure 12.3


KERR MCGEE--CIMARRON
TOTAL URANIUM-WELLS 1311, 1312, 1313
TOTAL URANIUM (milligrams/L)
MW1311
MW1312
MW1313
0.6
0.6
0.4
0.3
0.2
0.1
0
02/86
06/87
10/88
02/90
06/91
10/92
06/86
10/86
02/88
06/89
10/90
02/92
06/93
MONTH/YEAR

However, a peak in activity occurred in 1989 (8,000 pCi/L) at well #1312, followed by a downward trend through 1993. Concentrations in 1993 were trending lower in well #1312 (176 pCi/L) and well #1313 (791 pCi/L).

Total uranium concentrations in wells #1311, #1312, and #1313 followed essentially the same trend as the gross beta concentration. Figure 12.3 shows total uranium concentrations over time. Total uranium concentrations ranged from less than 0.002 milligrams per liter (mg/L) at well #1311 to 0.51 mg/L at well #1313 in 1989. Since 1989, concentrations have decreased to 0.012 mg/L in well #1312 and 0.032 mg/L in well #1313. Assuming a uranium enrichment of 2.7 weight percent, the specific activity is calculated as 1.5 E-06 Ci/g, using the equation from footnote 3 to Appendix B, 10 CFR 20. Using this conversion factor, the 1993 total uranium concentrations are estimated at 17 pCi/L and 46 pCi/L for wells #1312 and #1313, respectively. These values are well below the Table 2, Column 2 limit for mixtures of uranium isotopes.

Various isotopic analyses were performed on groundwater samples. Isotopic analyses show general agreement with total uranium results. Isotopic radium and thorium were characteristic of normal background levels.

12.3 Uranium Waste Pond #2:

The closure of Waste Pond #2 has been discussed in greater detail in Section 12.0. This pond had a compacted clay bottom liner with EPDM poly rubber sidewalls anchored at the bottom and top of the dike. The pond was rectangular in shape and axis measurements along the center line to the top of the dike were approximately 405 ft. x 270 ft. The bottom area was approximately 90,000 ft^2 and its capacity was 3,025,000 gal. at a maximum height of 4 ft. This pond was closed without the removal of sludge due to the fact that sludge was never generated in this pond.

A. Characterization Data:

As with Uranium Waste Pond #1, Cimarron personnel initiated an extensive characterization of this area by coring the original pond and the immediate area around the pond. The area was cored on a 10m x 10m grid in early 1993. Soil

samples were collected at one-foot intervals from 0 to 6 ft. in depth. Each one-foot soil interval was composited and analyzed at the Cimarron laboratory for total uranium. The sample analysis results are shown on Drawings No. 93IVWPSS-1 through 93IVWPSS-6. Soil sample concentrations ranged from less than 20 pCi/g to 243 pCi/g total uranium. At the 5 to 6 ft. depth interval, three samples exceeded the Option #1 guidelines.

After reviewing the data from the first round of sampling, Cimarron staff initiated additional sampling in the three areas where the samples exceeded the Option #1 limits. A drill rig was utilized to core to twelve feet in these three grid locations. The sample analysis results for this second round of sampling are shown on Drawings No. 93IVWPSS-R1 through 93IVWPSS-R12. Elevated concentrations of total uranium in the soil samples were not present below a depth of 9 ft. (One sample at the 8- to 9-foot depth was 39 pCi/g total uranium including background).

A Micro-R survey of this area was performed in 1993 and has been placed on Drawings No. 93IVWPUR-0 and 93IVWPUR-1. A gamma survey was also performed in 1993 for this area and the results are shown on Drawing No. 93IVWP3D-0.

B. Environmental Data:

Wells #1320 and #1321 are located near the southwest corner of the Waste Pond # 2 area. Gross alpha concentrations were low, ranging from less than 10 pCi/L to 22 pCi/L (well #1321, June, 1991). Gross beta concentrations were also low, ranging from less than 20 pCi/L to 26 pCi/L (well #1320, 1985). Total uranium was less than 0.005 mg/L from 1989 through 1993 in well #1320. Total uranium concentrations in well #1321 ranged from less than 0.005 mg/L to 0.021 mg/L (30 pCi/L). As these wells are located on the up gradient side of the waste pond unit, it is difficult to determine any groundwater impacts associated with the burial area.

Well #1336 was located north of Uranium Waste Pond #2. This well was sampled from 1989 through 1991 until the sample pump became stuck in the well casing. A new well has been installed recently (well #1336A) in the vicinity of

the original well and is being sampled in accordance with the environmental monitoring procedures.

Gross alpha concentrations in well #1336 ranged from 28 pCi/L in October, 1989, to 1,010 pCi/L in June, 1991. Gross beta concentrations peaked at 11,000 pCi/L in June, 1989, and trended downward to 2,082 pCi/L in June, 1991. Total uranium concentrations ranged from 0.015 mg/L (220 pCi/L) in June, 1989, and trended upward to 0.62 mg/L (900 pCi/L) in June, 1991. Samples collected in 1990 and 1991 exceeded the Table 2, Column 2 concentration limits of Appendix B to 10 CFR 20.

A surface water sample is collected annually from a stream north of Uranium Waste Pond #2 at sample location #1208. All samples collected during the 1977 through 1993 monitoring period ranged from less than 10 pCi/L to 296 pCi/L gross alpha concentration in June, 1993. Gross beta concentrations at sample location #1208 ranged from less than detectable to 600 pCi/L in 1986. The gross beta concentration in 1993 was 30 pCi/L. Total uranium ranged from less than 0.002 mg/L to 0.2 mg/L (290 pCi/L, based on 2.7 weight percent enriched U-235) in 1993. The 1993 surface water total uranium results are supported by isotopic analysis for U-235 (9.2 pCi/L), U-234 (217 pCi/L), and U-238 (77.1 pCi/L). Kerr-McGee will continue to monitor surface water at sample location #1208 during remedial activities.

12.4 Industrial Waste Burial Area North of Uranium Waste Pond #1

There are two solid waste trenches located at the north end of Waste Pond #1 which were closed in 1985. The nonradioactive solid wastes (trash, glass, cans, paper, etc.) that were placed in these trenches came from the operation of equipment utilized in the Kerr-McGee Coal Liquification R&D Project.

ATTACHMENT

KERR-McGEE NUCLEAR CORPORATION

CIMARRON FACILITY

LICENSE SNM-1174, DOCKET 70-1193,
AND SNM-928, DOCKET 70-925

LIQUID WASTE CONTROL PONDS - PROPOSED DECOMMISSIONING

The Kerr-McGee Nuclear Corporation's Cimarron Facility suspended production operations in December 1975. During operations, five evaporation ponds served as a method of liquid waste control. By the summer of 1976, the ponds were essentially dry, and the sludge resulting from the evaporation of the water was removed, mixed with cement and buried in a licensed burial site. Since then, the ponds have been dry, except for occasional rainfall which subsequently evaporates. Samples were taken from the top six inches of soil in all the ponds, and analyzed for the isotopes possibly present in the particular pond in question. Each sampling point consisted of a 6 x 12 inch area with individual samples taken at the depths indicated on the attached. Equal weight composites were made as indicated and for two of the uranium ponds, secondary composites were made for all depths. Duplicate samples are held for further examination if desirable.

Analyses were made by varying methods and are reported here on a dry weight basis. The methods used and their detection limits are given below:

	Method	Detection Level
Uranium	fluorimetry	2 ± 1 µg/gm
Plutonium	alpha pulse height	.002 dpm/gm
U-235	gamma spectroscopy	.004 dpm/gm
Uranium α	liquid scintillation	1 ± .5 pCi/gm

It will be noted for Uranium ponds #1, #2, and the emergency pond, the Uranium-235 analysis is biased high when compared with the Uranium value determined by fluorimetry and α analysis. This bias is caused by the presence of

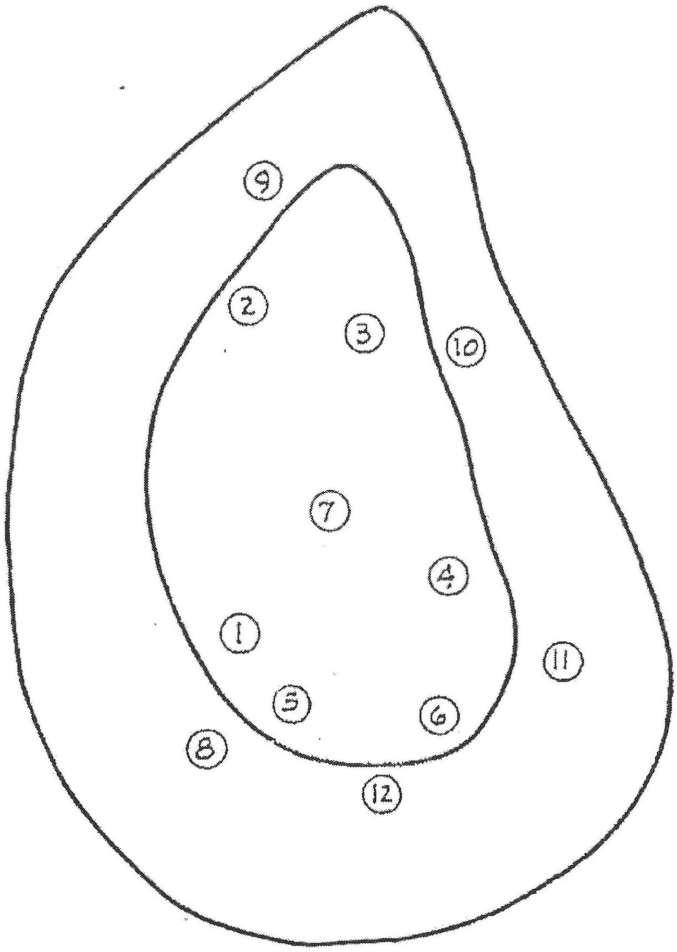
gamma activity from other isotopes contributing to the signal from U-235. This bias is not evident in the Plutonium ponds which received primarily depleted Uranium. Discrepancies in Uranium comparisons could also be expected due to compositing and aliquoting errors and analytical uncertainties at these low activity levels.

Kerr-McGee's examination of this data leads us to believe that the ponds can be buried in place without hazard to future use of the land or the public. We would propose that the lined ponds be disposed of by folding the lining into the bottom of the pond, then bulldozing the berm in on top of this, adding soil as necessary to bring the surface level into substantial agreement with the surrounding topography.

We would propose that the unlined ponds be disked in order to mix the contamination occurring in the top 6 to 10 inches, then the berms bulldozed over the center of the ponds and additional soil added to bring the surface to match the surrounding topography.

These areas would be seeded, initially with a quick growing cover such as rye grass, and sprigged with bermuda or seeded with fescue to provide pasture equal to the natural grass on the surrounding area. These seed beds would be watered and fertilized as necessary to ensure quick growth and sound vegetative cover. It is expected that within 2 growing seasons, the vegetative productivity from these areas would equal that of the natural grass surrounding the area.

KERR-McGEE NUCLEAR CORPORATION
CIMARRON FACILITY
Plutonium Evaporation Pond
(Lined)



Plutonium Evaporation Pond

Area	Depth	U,ug/g	U-alpha, pCi/g	Pu-238 pCi/g	Pu-239 pCi/g
I Composite of sampling pts. 2 & 3	0-1.5"	195	32	0.010	0.032
	1.5-3"	39	10	0.007	0.003
	3-6"	22	6	0.005	0.003
	6-10"	2.3	3.2	0.022	0.005
II Composite of sampling pts. 4 & 7	0-1.5"	22	7	0.009	0.016
	1.5-3"	10	5	0.010	0.001
	3-6"	12	5	0.012	0.002
III Composite of sampling pts. 1, 5, & 6	0-1.5"	37	1.8	0.026	0.231
	1.5-3"	38	42	0.003	0.010
	3-6"	134	29	0.006	0.005
IV Composite of sampling pts. 9 & 10	0-1.5"	37	11	0.035	0.246
	1.5-3"	78	23	0.574	5.34
	3-6"	48	12	0.012	0.004
V Composite of sampling pts. 1 & 4	6-10"	17	4.5	0.004	0.033
VI Composite of sampling pts. 8, 11, & 12	0-1.5"	5.9	3.6	0.002	0.021
	1.5-3"	1.4	2.7	0.004	0.020
	3-6"	3.1	6	0.002	0.002

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

JUL 10 1978

FCRR:WGB
Docket No. 70-1193
License No. SNM-1174, Amendment No. 2

Kerr-McGee Nuclear Corporation
ATTN: Mr. W. J. Shelley, Director
Regulation and Control
Kerr-McGee Center
Oklahoma City, Oklahoma 73125

Gentlemen:

In accordance with your application dated August 19, 1977 and the supplement dated March 3, 1978, and pursuant to Title 10, Code of Federal Regulations, Part 70, Special Nuclear Material License No. SNM-1174 is hereby amended (item 21c of the license) to authorize backfilling of the retention or settling ponds at the Cimarron Facility in the manner described in your license application, and the return of these areas to normal topography and usage.

All other conditions of this license shall remain the same.

FOR THE NUCLEAR REGULATORY COMMISSION

Richard W. Starostecki, Chief
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TABLE 1

Radioanalytical Results - Samples From Kerr-McGee
Cimarron Facility

Sample No.	Location	Type	Analytical Results (pCi/g dry) U-235	U-238	Pu-239
	Uranium Pond #1				
1-1	composite points 8, 10+12 @ 0.0-1.5" deep	soil	18	99	NA
1-2	composite points 2, 3+4 @ 0.0-1.5" deep	soil	2	11	NA
1-3	pond center-point 0.0-10.0" deep	soil	12	67	NA
	Uranium Pond #2				
2-1	composite points C-5, C-6, D-6 @ 1.5-3.0" deep	soil	11	61	NA
2-2	composite points B-1, B-2, C-1 @ 0.0-1.5" deep	soil	11	72	NA
2-3	pond center-point 0.0-6.0" deep	soil	.8	57	0.009±0.002
2-4	standing water	filtrate	NA	NA	0.032±0.013
		solids	7	64	0.150±0.010
3	Uranium Emergency Pond	soil	2	10	NA
	Plutonium Evaporation Pond				
4-1	composite points 5, 6 @ 1.5-3.0" deep	soil	0.4	16	0.006±0.002
4-2	composite points 9, 10, 11 @ 1.5-3.0 deep	soil	0.1	1.5	0.273±0.019
5	Plutonium Emergency Pond	soil	0.1	1.5	0.009±0.002

Uranium Waste Pond #2

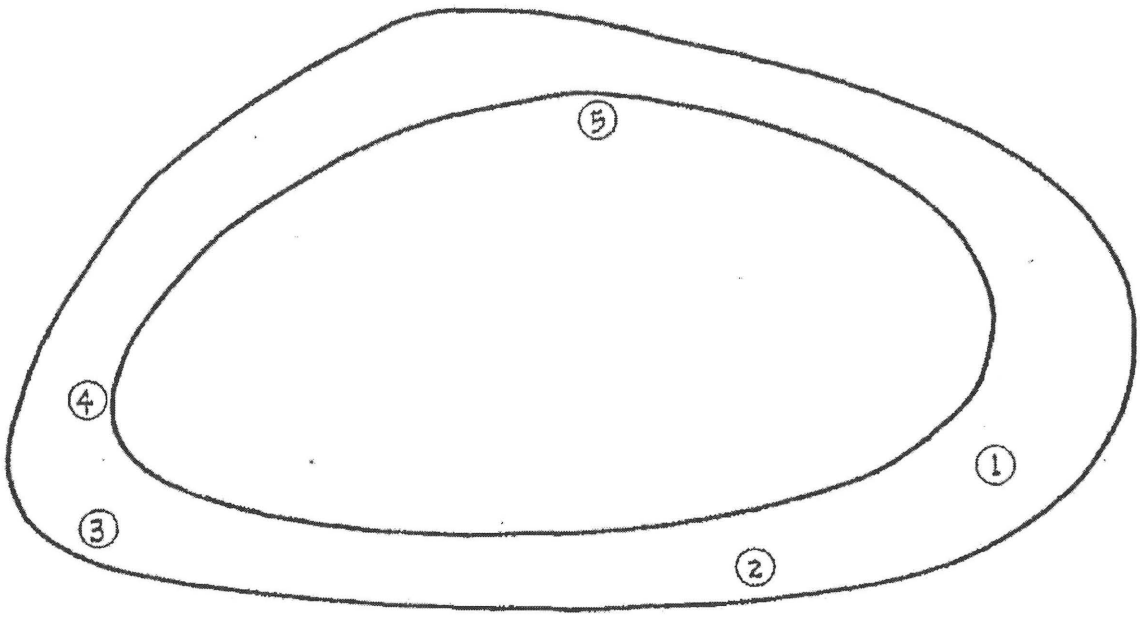
Area	Depth	*U, ug/g	Pu-239 pCi/g	Pu-238 pCi/g	U-alpha pCi/g	U-235 *pCi/g
I SW Grid Composite of A-1, A-2 B-1, B-2	0-0.5"	160	0.026	0.007	314	16.4
	0.5-1.5"		0.010	0.013	404	
	1.5-3"		0.003	0.006	145	
	3-6"		0.016	0.014	33	
II SE Grid Composite of C-1, C-2 D-1, D-2	0-0.5"	160	0.030	0.010	409	15.5
	0.5-1.5"		0.004	0.005	407	
	1.5-3"		0.001	0.008	114	
	3-6"		0.001	0.010	20	
III W Central Grid Composite of A-3, A-4, B-3, B-4	0-0.5"	160	0.064	0.024	223	16.9
	0.5-1.5"		0.004	0.003	391	
	1.5-3"		0.002	0.003	223	
	3-6"		0.014	0.016	50	
IV E Central Grid Composite of C-3, C-4, [illegible]3, D-4	0-0.5"	240	0.035	0.023	334	26.5
	0.5-1.5"		0.014	0.005	418	
	1.5-3"		0.001	0.006	432	
	3-6"		0.004	0.008	350	
V NW Grid Composite of A-5, A-6 B-5, B-6	0-0.5"	250	0.031	0.016	236	23.0
	0.5-1.5"		0.005	0.004	436	
	1.5-3"		0.001	0.018	486	
	3-6"		0.005	0.015	186	
VI NE Grid Composite of C-5, C-6 D-5, D-6	0-0.5"	250	0.023	0.019	236	24.4
	0.5-1.5"		0.005	0.007	341	
	1.5-3"		<0.001	0.004	564	
	3-6"		<0.001	0.012	318	
I Sw Grid	6-10"	21	0.004	0.021	37	3.56
VI NE Grid	6-10"	39	0.002	0.006	59	N.D.

*Analysis made on composite composed of all depths.

N.D. - Not Determined

KERR-McGEE NUCLEAR CORPORATION
CIMARRON FACILITY

Uranium Emergency Pond
(unlined)



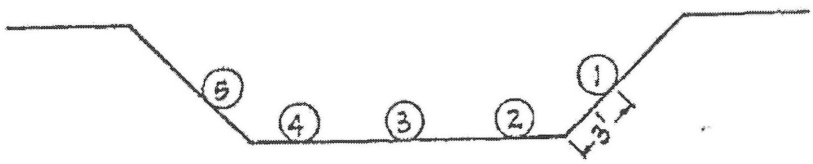
Uranium Emergency Pond

Area	Depth	*U, ug/g	U-alpha pCi/g	U-235 *pCi/g
Composite of sampling pts. 1 & 2	0-3"	15	21.9	Not detected
	3-6"		9.9	
	6-10"		44.7	
Sampling pt 3	0-3"	5	248	Not detected
	3-6"		33.5	
	6-10"		11.8	
Sampling pt. 4	0-3"	26	34.7	4.0
	3-6"		86	
	6-10"		33.4	
Sampling pt. 5	0-3"	131	9.0	18.6
	3-6"		32.8	
	6-10"		152	

*Analysis made on composite composed of all depths.

KERR-McGEE NUCLEAR CORPORATION
CIMARRON FACILITY

Plutonium Emergency Pond
(Lined)



Plutonium Emergency Pond

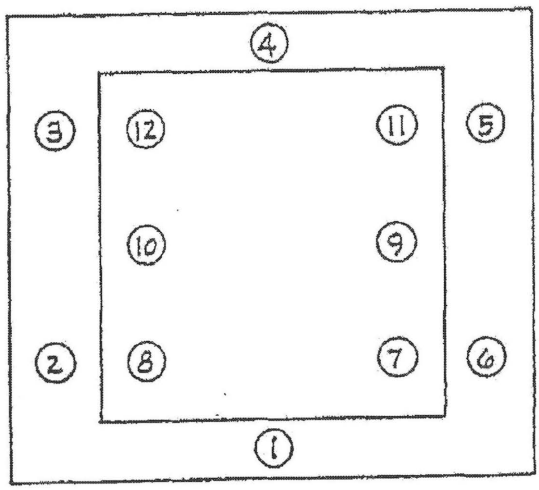
Area	Depth	U, ug/g	U-alpha, pCi/g	Pu-238 pCi/g	Pu-239 pCi/g
I. Composite of sampling pts. 1 & 5	0-1.5"	14	12	0.003	0.002
	1.5-3"	6.1	6	0.006	0.003
	3-6"	2.2	3.2	0.004	0.002
II Composite of sampling pts. 2 & 3	0-1.5"	97	17	0.010	0.050
	1.5-3"	7.8	3.6	0.006	0.002
IV Sampling pt. 4	0-1.5"	11	6	0.004	0.007
	1.5-4.5"	2.5	4.1	0.008	0.004

KERR-McGEE NUCLEAR CORPORATION

CIMARRON FACILITY

Uranium Waste Pond #1

(Lined)

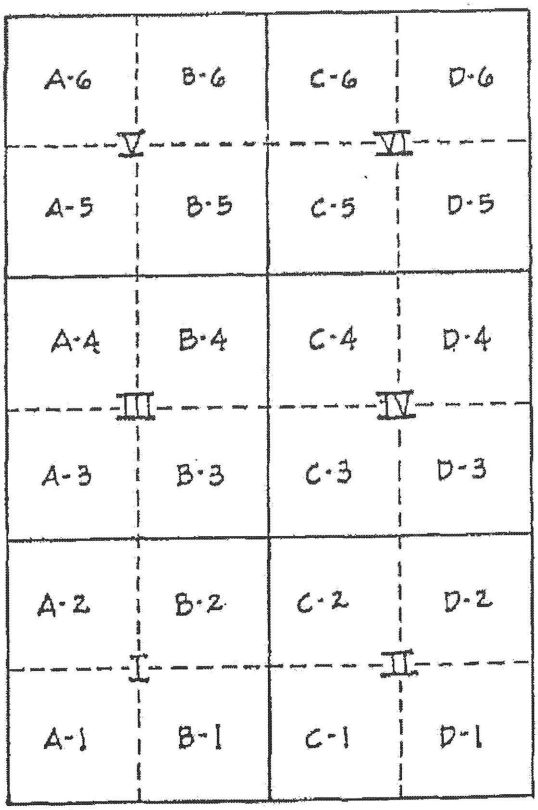


Uranium Waste Pond #1

Area	Depth	U-alpha pCi/g	U,ug/g
I Composite of sampling pts..1, 2, & 3	Tar & Gravel	97	64
	0-1.5"	33	32
	1.5-3"	32	35
	3-6"	20	8
II Composite of sampling pts. 4, 5 & 6	Tar & gravel	65	64
	0-1.5"	47	31
	1.5-3"	50	29
	3-6"	52	24
III Composite of sampling pts. 8, 10 & 11	Tar & gravel	1486	934
	0-1.5"	936	761
	1.5-3"	1309	828
	3-6"	469	283
IV Composite of sampling pts. 7, 9 & 11	Tar & gravel	776	452
	0-1.5"	85	56
	1.5-3"	160	93
	3-6"	102	52
V Composite of sampling pts. 8, 9 & 12	6-10"	220	127

KERR-McGEE NUCLEAR CORPORATION
CIMARRON FACILITY

Uranium Waste Pond #2
(Unlined)



13.0 Uranium Plant Yard

The restricted areas surrounding the Uranium Process Building (Building #1) and Warehouse Building (Building #4) have been extensively characterized and remediated. This area also contains a stockpile of Option #2 material awaiting approval from the NRC for on-site disposal. For this Characterization Report, the uranium plant yard has been segregated into four separate sections. They are the area north of Building #1 and surrounding Building #4, the area south of Building #1, the area east of Building #1, and the parking area west of Building #1. Stockpiles of Option #2 materials are contained in areas north and east of Building #1. The general layout of the uranium plant yard is shown on Figure 14.1 (included with Section 14.0).

The restricted yard area surrounding Building #1 was originally included in the Micro-R survey of the entire site which was conducted in 1979. The survey results have been placed on Drawing No. 79PRSBUR-0. This drawing is included as an attachment to Section 6.0. This survey showed numerous locations in the Uranium Plant Yard area with surface readings exceeding 30 uR/hr. Subsurface characterization and decommissioning work was initiated in this area and has continued up through the present.

A. Characterization Data (Restricted Area North of Uranium Building / Warehouse Building Yard):

A random soil sampling program was undertaken in late 1989, with analysis completed by February 1, 1990, by Cimarron personnel within the restricted area and around the three sanitary lagoons. The purpose of this sampling program was twofold: (1) to determine the extent of shallow surface soil contamination and (2) to determine the depth of soil contamination. The soil sampling program was completed with corings taken from 0 to 2 ft. and from 0 to 20 ft. and allowed Cimarron personnel to more accurately determine the volume of contaminated soil in this area. These sampling locations are shown on Figure 13.1. The soil data for the shallow sampling (0-2 ft.) and deep sampling (0-20 ft.) are shown in Tables 13.1 and 13.2, respectively. The 1990 soil sampling data indicates that, in general, contamination in the yard areas from uranium plant operations was limited to the upper 1 to 4 ft. of surface soils. Additionally, this sampling effort negated an earlier borehole gamma survey completed in 1988 that indicated contamination down to 20 ft. in depth. As a result of 1990 random soil sampling effort, it became obvious that the 1988[14] survey was producing false positives due to in-situ naturally occurring

Figure 13.1

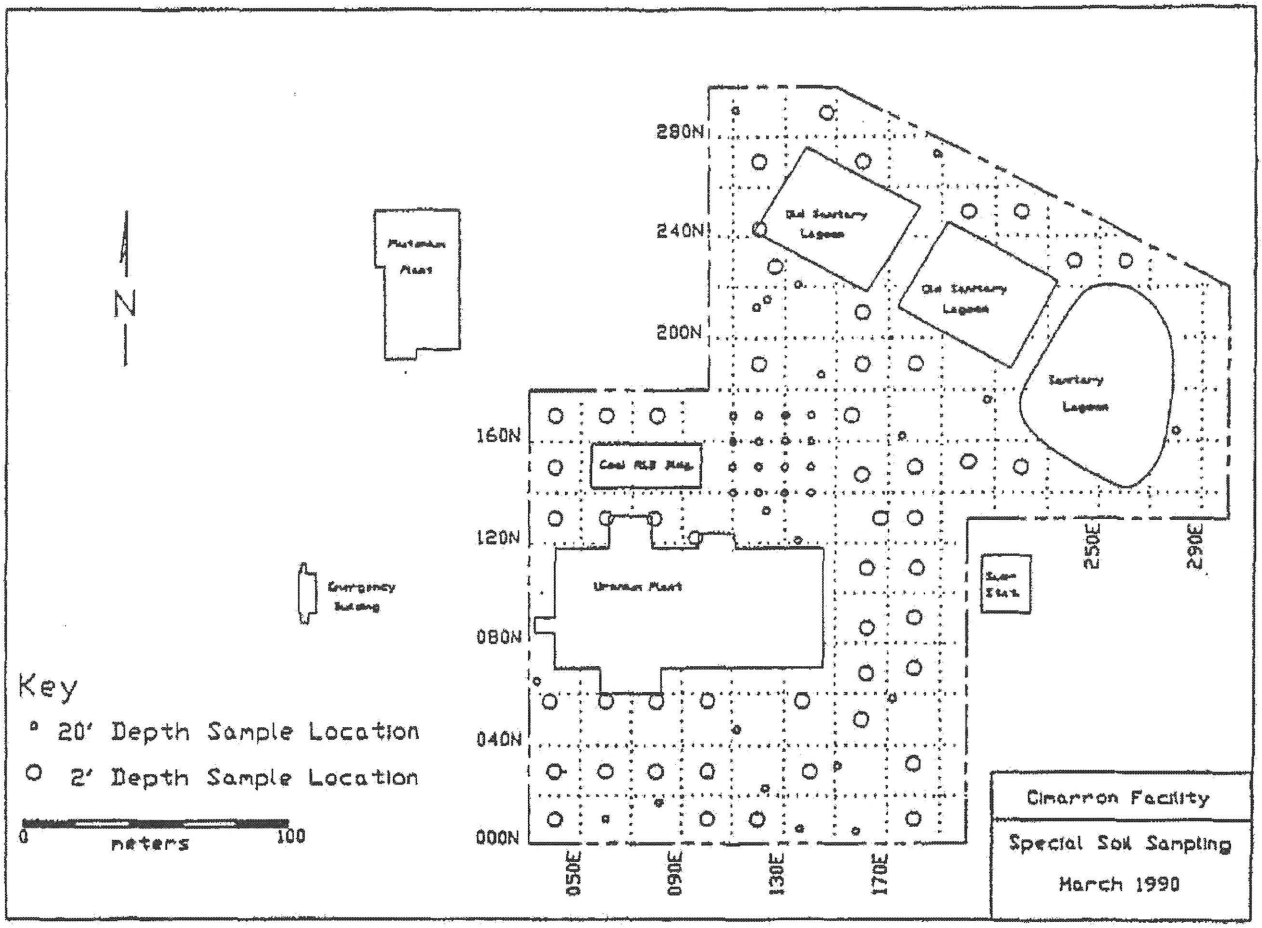

N
Old Sanitary Lagoon
Old Sanitary Lagoon
Sanitary Lagoon
Emergency Building
Uranium Plant
280N
240N
200N
160N
120N
080N
040N
000N
050E
090E
130E
170E
250E
290E
Key
20' Depth Sample Location
2' Depth Sample Location
0
meters
100
Cimarron Facility
Special Soil Sampling
March 1990

Table 13.1
Cimarron Facility
March 1990 Soil Sampling Events
Uranium Plant Yard Area
Page 1 of 2

Location	Sample Depth	Total Uranium pCi / gram
10N - 40E	0 - 1' 1 - 2'	17.97 17.40
10N - 100E	0 - 1' 1 - 2'	14.20 12.37
10N - 120E	0 - 1' 1 - 2'	12.65 8.67
10N - 180E	0 - 1' 1 - 2'	9.17 7.77
30N - 40E	0 - 1' 1 - 2'	12.77 10.76
30N - 60E	0 - 1' 1 - 2'	30.90 22.39
30N - 80E	0 - 1' 1 - 2'	42.61 12.10
30N - 100E	0 - 1' 1 - 2'	53.62 26.72
30N - 140E	0 - 1' 1 - 2'	21.36 7.46
33N - 180E	0 - 1' 1 - 2'	6.10 6.18
57N - 38E	0 - 1' 1 - 2'	14.69 12.33
57N - 60E	0 - 1' 1 - 2'	120.82 66.47
57N - 80E	0 - 1' 1 - 2'	94.19 95.86
57N - 100E	0 - 1' 1 - 2'	28.18 15.04
57N - 137E	0 - 1' 1 - 2'	25.12 12.53
50N - 160E	0 - 1' 1 - 2'	16.93 12.10
68N - 162E	0 - 1' 1 - 2'	20.16 16.19
70N - 180E	0 - 1' 1 - 2'	41.26 13.09
86N - 162e	0 - 1' 1 - 2'	25.34 14.21
90N - 180E	0 - 1' 1 - 2'	47.82 29.58
110N - 162E	0 - 1' 1 - 2'	39.07 24.76
110N - 181E	0 - 1' 1 - 2'	41.61 31.43
130N - 40E	0 - 1' 1 - 2'	23.91 15.80
130N - 60E	1 - 2' 2 - 3'	30.95 21.33

Table 13.1
Cimarron Facility
March 1990 Soil Sampling Events
Uranium Plant Yard Area
Page 2 of 2

Location	Sample Depth	Total Uranium pCi / gram
130N - 79E	1 - 2'	27.71
	2 - 3'	16.68
122N - 95E	1 - 2'	16.02
	2 - 3'	10.97
130N - 167E	0 - 1'	82.84
	1 - 2'	37.96
130N - 180E	0 - 1'	40.44
	1 - 2'	25.42
150N - 40E	0 - 1'	60.53
	1 - 2'	30.60
147N - 160E	0 - 1'	34.27
	1 - 2'	18.32
150N - 180E	0 - 1'	30.79
	1 - 2'	19.52
152N - 200E	0 - 1'	48.46
	1 - 2'	29.63
150N - 220E	0 - 1'	6.61
	1 - 2'	7.43
170N - 40E	0 - 1'	17.35
	1 - 2'	16.96
170N - 60E	0 - 1'	19.62
	1 - 2'	14.09
170N - 80E	0 - 1'	23.64
	1 - 2'	14.01
170N - 156E	0 - 1'	13.62
	1 - 2'	11.69
190N - 120E	0 - 1'	15.06
	1 - 2'	7.87
190N - 160E	0 - 1'	7.80
	1 - 2'	6.85
190N - 180E	0 - 1'	7.17
	1 - 2'	6.99
210N - 160E	0 - 1'	10.34
	1 - 2'	6.64
228N - 126E	0 - 1'	13.13
	1 - 2'	11.51
230N - 240E	0 - 1'	12.02
	1 - 2'	12.16
230N - 260E	0 - 1'	7.52
	1 - 2'	8.17
243N 120E	0 - 1'	11.74
	1 - 2'	8.23
250N - 200E	0 - 1'	12.18
	1 - 2'	10.47
250N - 220E	0 - 1'	11.21
	1 - 2'	12.54
270N - 120E	0 - 1'	11.37
	1 - 2'	10.60
270N - 160E	0 - 1'	16.13
	1 - 2'	10.37
290N - 146E	0 - 1'	13.43
	1 - 2'	11.15

table131

ble 13.2
Cimarron Facility - Gamma Spec. Analysis
Uranium Activity, pCi/g

GRID LOCATION	SAMPLING DEPTHS										
	0 - 1'	1 - 2'	3-4'	5-6'	7-8'	9-10'	11-12'	13-14'	15-16'	17-18'	19-20'
170N, 110E	25	51	13	18	20	22	7.4	16	12	13	13
160N, 110E	29	13	11	10	11	9	13	3	13	13	12
150N, 110E	81	13	11	8.2	11	10	14	12	-	-	14
140N, 110E	410	37	13	27	16	13	4	15	12	16	13
170N, 120E	28	20	20	9.4	12	15	14	25	12	5.2	11
160N, 120E	46	110	13	23	13	23	23	22	73	12	12
150N, 120E	39	17	11	5.6	9.1	11	12	16	14	11	12
140N, 120E	180	120	11	8.1	7.4	16	20	25	13	15	12
170N, 130E	12	17	14	10	13	11	13	11	15	26	13
160N, 130E	20	15	18	30	19	15	11	87	13	14	11
150N, 130E	27	18	12	5.6	8.0	16	21	-	13	14	12
140N, 130E	79	51	20	17	17	15	13	14	9.8	13	13
170N, 140E	21	61	5.3	18	21(10-11')	16	14	12	11	11	17(16-17')
160N, 140E	15	27	16	21	14	28	63	7.1	15	13	14
150N, 140E	51	7.1	13	14	16	26	22	13	13	11	6.4
140N, 140E	29	17	14	16	14	15	14	5.0	22	15	14
273N, 188E	11	17	15	23	12	7.4	12	18	11	8.3	7.1
133N, 123E	332	120	7.3	12	14	6.7	18	9.4	11	13	13
46N, 112E	60	15	11	8.4	12	9.3	9.8	8.1	14	-	-
17N, 81E	21	13	14	11	8.6	4	20	13	12	11	11
215N, 123E	23	15	12	15	13	13	14	16	15	9.2	10.4
23N, 123E	53	16	10	8.1	3.3	5.7	9.1	6.9	5.8	8.5	11
212N, 119E	9.9	33	10	11	17	13	12	12	15	15	13
176N, 207E	15	17	9.9	13	12	12	9.7	13	15	12	11
58N, 172E	134	36	19	16	12	14	16	4.4	20	12	9.3
65N, 33E	13	15	12	15	24	10	10	15	16	13	8.6
291N, 111E	24	22	16	15	6.8	9.2	3.1	6.9	9.2	9.2	13
32N, 151E	11	22	33	14	22	6.3	5.2	14	6.4	6.9	9.6
164N, 280E	16	16	11	11	13	11	9.8	20	19	11	6.7
6N, 136E	21	12	16	9.1	20	7.5	13	7.5	7.7	6.4	13
10N, 60E	7.5	14	13	7.2	10	33	16	14	8.3	10	15
221N, 135E	24	15	17	22	12	12	22	16	18	13	15
186N, 144E	18	37	8	14	12	22	12	12	19	18	15
162N, 175E	30	42	12	13	29	24	14	16	20	8.7	14
121N, 135E	15	23	12	15	13	12	13	13	7.5	8.9	9.8
5N, 158E	25	14	11	8.9	6.3	10	7.7	5.2	6.3	9.0	13

radionuclides. This data, presented in Table 13.2, was submitted to the NRC by letter from J. C. Stauter to Mr. Glen L. Sjoblom.[15]

Additionally, ORAU in 1988 collected soil samples from 19 boreholes around the site in potentially contaminated areas. As noted by the NRC[16], there appears to be little evidence of subsurface radioactive contamination." Maximum sample depth was 25 feet.

In order to further characterize this area, in 1993 an extensive soil sampling program was completed on a 5m x 5m grid at depths of 0 to 4 ft. The soil sampling data is shown on Drawings No. 93PRCWSS-1 through 93PRCWSS-4. Based upon this characterization, the uranium plant yard north of the Uranium Building (Building #1) was remediated. Both Option #2 and #4 soils were removed from this area. Option #2 soil was placed in the stockpile for on-site disposal. Option #4 soil was packaged and shipped off site for disposal.

Soil sampling was performed after remediation of this area. This sampling indicated several areas that required further remediation. Resampling of this area was completed after additional contaminated soil was removed. Soil sampling was performed at a depth of 0 to 6 in. on a 10m x 10m grid prior to backfill. These data have been placed on Drawing No. 93POCWSS-0. Also, a gamma survey was performed prior to backfill. These data were placed on Drawing No. 93POCW3D-0. Verbal permission was received by Cimarron personnel from the NRC to backfill the area around Building #4 in 1993. After backfilling, the surface soil was sampled and final surveys were completed. The data from the gamma survey performed after backfill are shown on Drawing No. 93FICW3D-0. The data from the Micro-R survey performed at the surface and at one meter are shown on Drawings No. 93FICWUR-0 and 93FICWUR-1. The data from the soil sampling are shown on Drawing No. 93FICWSS-0.

The soil samples taken prior to and during remediation were analyzed at the Cimarron facility laboratory. The Option #2 soil that was removed from this area was placed in the stockpile area.

B. Characterization Data (Restricted Area South of Uranium Building #1):

This area contained the UF_6 Receiving Area (Vaporizer Room), Tank Storage Building (#2), Solvent Extraction Building (#3), Liquid

Storage Area and UF_6 Storage Area. Cimarron License SNM-928, Amendment #8, was issued January 5, 1990 to allow Cimarron to remove a portion of the inner control fence south of the Uranium Building for remediation of this area. The outer fence is still in place.

This area was included in the random soil sampling program undertaken in March, 1990. Both shallow corings (0 to 2 ft.) and deep corings (0 to 20 ft.) were performed with composite soil samples collected at one-foot intervals. The analytical data are included in Table 13.1 and Table 13.2. Data indicated elevated concentrations of uranium in the upper two feet of the soil.

In 1993, additional soil sampling was performed on a 5m x 5m grid. Samples were collected down to 4 ft., composited and analyzed for total uranium. The results of this sampling program are shown on Drawings No. 93PRSUSS-0 through 93PRSUSS-4. The sample results showed numerous areas requiring remediation. Remediation of this area was completed in 1994 with final surface soil sampling analytical results plotted on Drawing No. 94POSUSS-0. Also, surface surveys were completed and are shown on Drawings No. 94POSU3D-0, 94POSUUR-0 and 94POSUUR-1.

With the removal of the concrete floor in the Vaporizer Room, extensive soil sampling of this area was undertaken by Cimarron between May and July, 1992. The sampling was performed on a 2m x 2m grid at depths of from 0 to 2 feet with several samples taken down to 8 feet. The soil samples were composited at one-foot intervals and analyzed for total Uranium in the facility laboratory. The analytical results for the 0-1 ft. and 1-2 ft. sample aliquot are shown on Drawings No. 92PRVRSS-1 and -2. A total of 200 samples were collected and analyzed. The samples varied from near-background levels to 364 pCi/g, with the average activity being 41.7 pCi/g.

In 1994, after remediation of the area beneath the vaporizer room, soil samples were collected and analyzed for total uranium to verify that sufficient soil had been removed (i.e. to within Option #1 limits). Also, during this same period, a survey was performed using a lead-shielded 3 inch x 0.5 inch NaI detector and a Micro-R meter. The soil sampling results, survey readings, and Micro-R readings are shown on Drawings No. 94POVRSS-0, 94POVR3D-0, 94POVRUR-0 and 94POVRUR-1.

The Uranium Tank Storage Building (Building #2) area experienced several spills during the operating history of the Uranium Plant. Tank overflows in the building caused two liquid releases for which the NRC was notified. Option #4 soil beneath Building #2 was excavated in 1990 to a depth of approximately 12 ft., with 80,000 ft^3 of material shipped off site for disposal. The Option #4 soil beneath the building that was excavated and shipped off site for disposal showed uranium concentrations up to 1,600 pCi/g. The average uranium concentration in the soil samples was 1,000 pCi/g. Soil sampling data at depths collected are shown on Drawing No. 94POB2FSS. Also, the survey data collected for this excavation are shown on Drawings No. 94POB2F3D-0, 94POB2FUR-0, and 94POB2FUR-1. Soil sample data for the side walls of the excavation, and for the wall surveys are shown on Drawings No. 94POB2WSS, 94POB2W3D-0, 94POB2WUR-0 and 94POB2WUR-1. This area has not been backfilled.

Option #4 soil was also removed from beneath the Solvent Extraction Building in 1989. The soil samples had a maximum concentration of 650 pCi/g uranium, with an average concentration of 300 pCi/g. This area has not been backfilled.

C. Characterization Data (Restricted Area East of Uranium Building #1):

This area was included in the random soil sampling program which was completed in March, 1990. The data for this area, the shallow coring data and the deep coring data are included in Tables 13.1 and 13.2. As noted in the tables, shallow soil contamination was detected in several of the corings.

This area contains both of the Option #2 stockpiles, and for this reason, the areas underneath the stockpiles have not been characterized since March, 1990. There is reason to believe that characterization of this area will identify elevated levels of uranium in soil at shallow depths. In addition, the area east of the Uranium Building (near the electrical distribution panel) was utilized for storage of Cushing equipment awaiting disposal in Burial Ground #1. Thorium-contaminated soil has been removed from this area and shipped off site for disposal.

The two stockpiles containing Option #2 materials are awaiting NRC approval for on-site disposal. The soil in the stockpiles has been characterized by surveys and soil sampling. The stockpiles were leveled to approximately 7 to 7-1/2 feet, a 5m x 5m grid was

established, and the soil was cored to a depth of 2 meters. The general location of the two stockpiles is shown on Drawing No. 94MOST-RF1. Samples were collected for every 0.5 meter depth interval, composited, and analyzed at the Cimarron facility laboratory. The soil sample analytical results for the East Stockpile corings are included on Drawings No. 94POEPSS-0.5 through 94POEPSS-2.0. Also, a summary of the analytical data is shown on Drawing No. 94MOEPSS.

Additionally, gamma surveys were taken in the boreholes from the stockpile surface down to 2 meters in depth. This data can be used to compare the gamma survey results in cpm to the soil uranium concentrations in pCi/g. The gamma survey results are shown on Drawings No. 94POEPDP-0.5 through 94 POEPDP-2.0.

The surface of the Eastern Stockpile was surveyed with a Ludlum Model 2220 with a lead-shielded 3 in. x 0.5 in. NaI detector. Background was established and readings were taken on the 5m x 5m grid intersects. These readings are shown on Drawing No. 94POEP3D-0 . A Micro-R survey was also performed at the surface and at one meter. These readings are shown on Drawings No. 94POEPUR-0 and 94POEPUR-1.

Similar surveys and soil sampling was performed on the North Stockpile. The soil sampling results are shown on Drawings No. 94PONPSS-0.5 through 94PONPSS-2.0; the soil summary data is shown on Drawing No. 94MONPSS; the bore hole gamma survey results are on Drawings No. 94PONPDP-0.5 through 94PONPDP-2.0; and the surface survey results are shown on Drawings No. 94PONP3D-0, 94PONPUR-0, and 94PONPUR-1.

D. Characterization Data (Restricted Area West of Uranium Building #1):

A gamma survey was completed in 1990 on the parking lot area using a Ludlum Model 2220 with a lead-shielded 3 in. x 0.5 in. NaI detector. This survey identified several areas of contamination as shown on Drawing No. 90PRUY3D-0. This drawing is included as an attachment to Section 8.0. With background established at 1,800 cpm, there were six grid locations that exceeded twice background. Soil sampling conducted in 1990 also included the parking lot. The results of this soil sampling effort are shown on Drawings No. 90PRUYSS-0 through 90PRUYSS-4. These drawings are included as attachments to Section 6.0. All sample

analysis results for the samples taken from the parking lot were within the guideline value for Option #1 material.

E. Characterization Data (South Drainage to Highway 74):

This area was included in the Micro-R survey completed in 1979. The survey results are included on Drawing No. 79PRSBUR-0 which is included as an attachment to Section 6.0. This area was affected by drainage from the Uranium Plant Yard. Additionally, this drainage area was included in the 1990 survey and soil sampling effort that included the area surrounding the Uranium Plant restricted area.

The soil sampling was conducted to a depth of 4 ft. The soil sample results are shown on Drawings No. 90PRSUSS-0 through 90PRSUSS-4. Several surface readings exceeded the Option #1 uranium guideline value (the maximum concentration was 119 pCi/g). The survey results for a gamma survey and two Micro-R surveys completed in 1990 are included on Drawings No. 90PRSU3D-0, 90PRSUUR-0 and 90PRSUUR-1.

F. Environmental Data:

Well sampling data in the vicinity of the Uranium Building (Building #1) are available for well #1319 and #1326 (east of the U Building), well #1327B (west), and wells #1328, #1329, and #1330 located to the south.

Well #1326 had measurable concentrations of gross alpha ranging from 14 pCi/L (March, 1989) to 175 pCi/L (June, 1989). Gross beta concentrations in this well ranged from less than 20 pCi/L to 9,640 pCi/L (June, 1989). Total uranium concentrations in well #1326 ranged from less than 0.005 mg/L to 0.014 mg/L (approximately 21 pCi/L based upon an enrichment of 2.7 weight percent). Neither the gross alpha or the gross beta concentrations in June, 18, 1989 appear to be attributable to the presence of uranium from on-site activities. Recent measurements performed in 1993 and 1994 for gross alpha, gross beta, and total uranium are at levels near the historical lows for this well. However, isotopic measurements for uranium in 1994 do indicate some low-level concentrations (U-234: 14.3 ± 2.1 pCi/L, U-235: 0.6 ± 0.3 pCi/L, U-238: 6.3 ± 1.1 pCi/L).

Gross alpha, gross beta, total uranium, and isotopic activities were less than detectable or near background levels in wells #1319, #1327B, #1329, and #1330 for the years 1989 through 1993.

Well #1328 had low levels of gross alpha ranging from 23 pCi/L to 35 pCi/L. The gross alpha in well #1328 is due to the presence of uranium as verified by isotopic analyses. Gross beta concentrations in this well were all less than detectable.

Soil samples are collected annually at sample location #1402, situated north of the uranium plant, and sample location #1403, south of the uranium plant. Surface soil concentrations of total uranium ranged from less than detectable up to 35 μg/g (approximately 50 pCi/g) at sample location #1402 in 1986. Concentrations in 1993 surface soil samples were less than 3 μg/g at location #1402 and 12 μg/g (17 pCi/g) at sample location #1403. The 1993 values are below the facility release criteria. Subsurface soil sample data were consistent with results obtained for the surface soil samples.

14.0 Uranium Process Buildings and Equipment

For the uranium process, uranium hexafluoride (UF_6) was received and converted into a fuel material such as uranium dioxide pellets. Within the continuous process line, gaseous UF_6 was converted to ammonium diuranate (ADU). The ADU was reduced in a calciner to UO_2 powder. The powder was ground, mixed and pelletized. These processes along with several ancillary lines, were housed within the Uranium Process Buildings and adjacent storage facilities. Because the process involved the storage and transport of liquid, gases and powders, spills resulted in the nonroutine release of licensed materials. In general, these releases were contained and to the extent practical, the affected area decontaminated. However, the several years of operation and the way the floors were engineered resulted in the spread of subsurface contamination. Additionally, positive controls were in place to limit effluent releases in the process and ventilation discharges. However, because of the large volume of air ventilated through the roof, even if the concentration were controlled below 10% of MPC, a sizable amount of uranium would be lost to the environment. For example, in 1970, Kerr-McGee estimated that from 40 Kg to 300 Kg/year could be lost through the roof ventilation system. This section will address the characterization of the process buildings within which these releases occurred.

The decontamination and decommissioning of the uranium processing equipment and buildings began in 1977. Equipment has either been decontaminated and/or removed, or is in the final process of being decontaminated and/or removed. A number of the interior walls and floor sections have been removed. Surfaces have been washed, scraped, chipped and/or scabbled to remove surface contamination. Subfloor drains and contaminated soils have been also excavated and removed. Some of these areas have been released by the NRC for backfilling. The Uranium Building (Building #1) is still in the process of being decontaminated. The Liquid Storage Building (Building #2) has been dismantled and removed. The Solvent Extraction Building (Building #3) and the Vaporizer Room concrete floor also have been dismantled and removed. The Uranium Warehouse building (Building #4), which was not used as part of the fuel cycle process, currently is being utilized by Kerr-McGee for nonnuclear process development.

14.1 Uranium Warehouse Building (Building #4):

The warehouse is a sheet-metal building (50 ft. x 160 ft.) which was never used to process radioactive materials. However, fuel assemblies were inspected and assembled for a short period of time within this building. Cimarron personnel requested permission

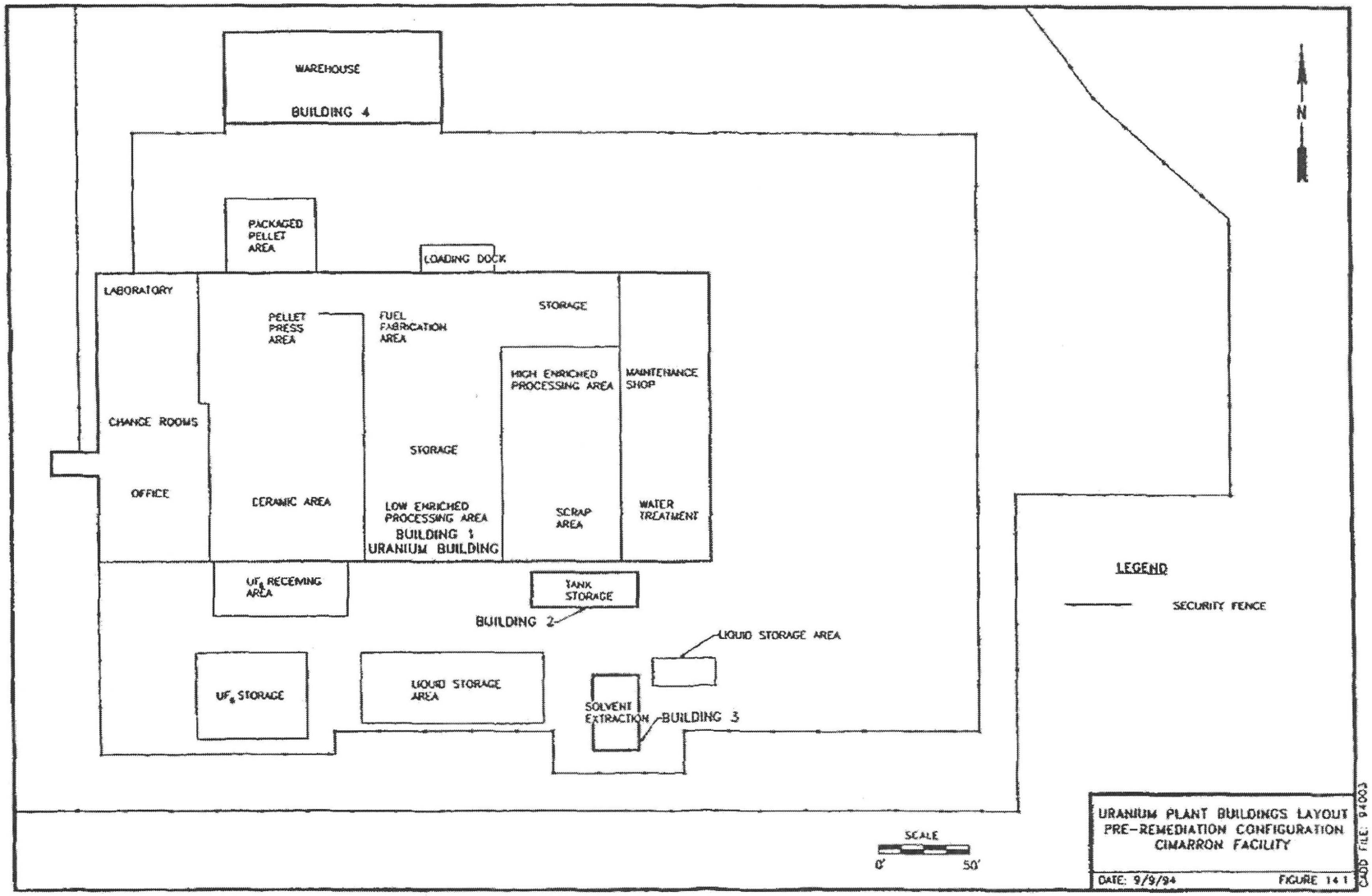
from the NRC on December 28, 1979 to decontaminate the warehouse and use the building for coal liquification processing. Approval was granted on December 28, 1979 by the NRC. However, a license amendment was not issued. This building is covered under Uranium License SNM-928. The NRC's December approval letter stated:

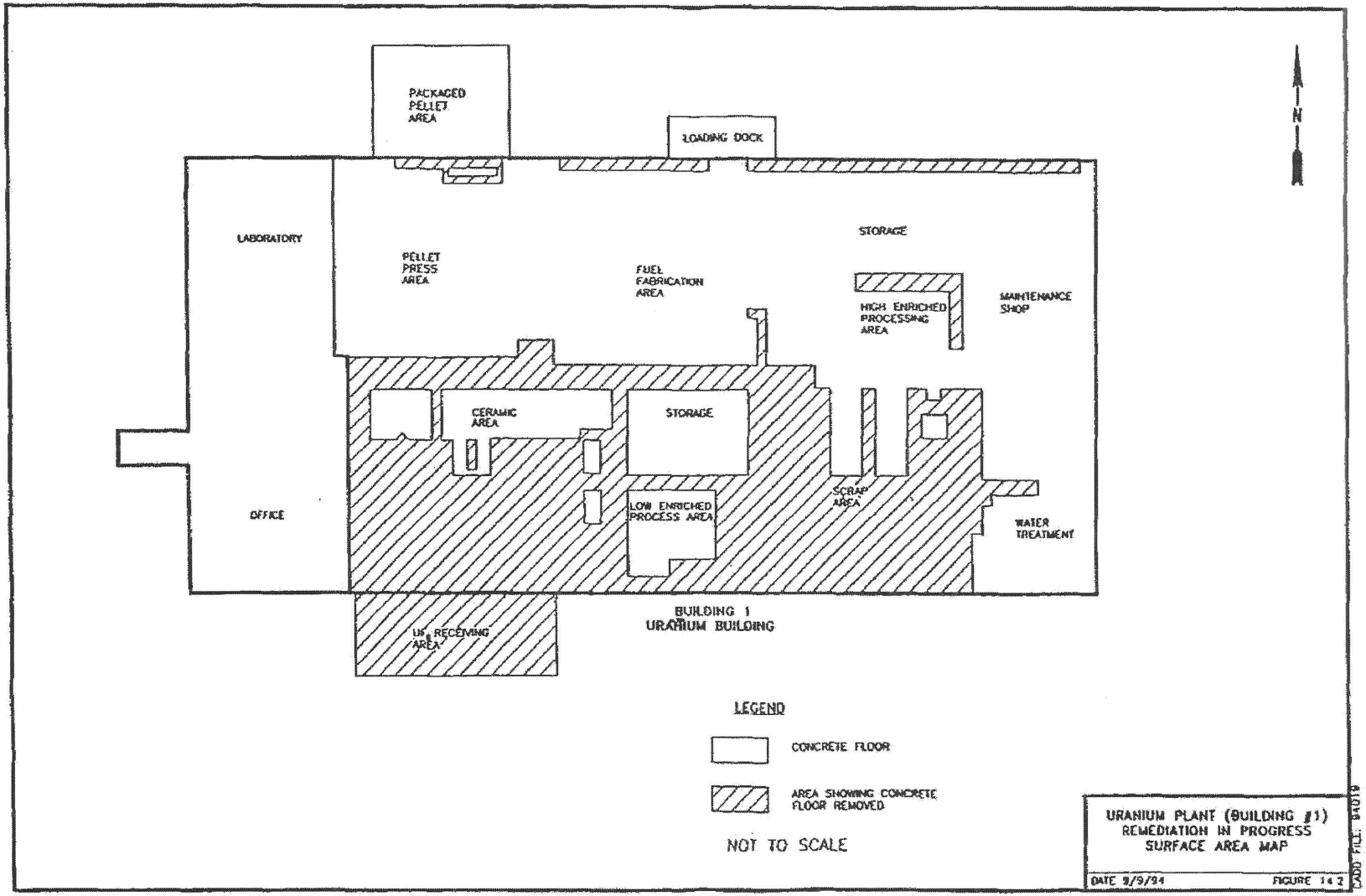
> "We agree with your proposal to decontaminate the building to below the NRC guidelines for release for unrestricted use prior to using it for non-nuclear activities; however, we will not eliminate this area as a place of use under your license since it is an integral part of the Cimarron facilities".

Final release surveys were completed on the inside and outside surface of this building in 1980. The results for the floor survey showed an average fixed activity of 500 dpm/100 cm^2 alpha with a maximum fixed activity of 2,254 dpm/100 cm^2 alpha. The walls, fixtures and other surfaces showed an average fixed activity of less than 500 dpm/100 cm^2 alpha with a maximum fixed activity of 2,500 dpm/100 cm^2 alpha. The NRC gave approval on March 28, 1980 to use the Coal Building for nonnuclear purposes based upon these surveys. The survey conducted in 1980 was for alpha only. Additional surveys were conducted in the Coal Building in 1993 for both alpha and beta/gamma. This survey revealed several small areas with elevated levels of beta activity in the concrete floor which required decontamination. An alpha survey performed at the same time showed a maximum fixed activity of 500 dpm/100 cm^2 and average of 200 dpm/100 cm^2.

14.2 Uranium Building (Building #1):

The Uranium Building is a one-story sheet metal building (160 ft. x 340 ft.) which contained the offices, laboratory, and change rooms, plus the majority of the equipment utilized for uranium fuel processing. The general layout of the building is shown on Figure 14.1. The process equipment was removed from the main processing area, surveyed, decontaminated, and/or shipped off site for disposal. The majority of the contaminated concrete has been surveyed, decontaminated, and removed, as required. The areas where concrete has been removed are shown on Figure 14.2. Contaminated soil under the concrete has been removed or is in the process of being removed. The floor drains and other drain lines also have been removed.


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
SCRAP AREA
WATER TREATMENT
BUILDING 1
URANIUM BUILDING
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 14 1
CADD FILE: 94003


PACKAGED PELLET AREA
LOADING DOCK
N
LABORATORY
PELLET PRESS AREA
FUEL FABRICATION AREA
STORAGE
HIGH ENRICHED PROCESSING AREA
MAINTENANCE SHOP
CERAMIC AREA
STORAGE
OFFICE
LOW ENRICHED PROCESS AREA
SCRAP AREA
WATER TREATMENT
BUILDING 1
URANIUM BUILDING
UF6 RECEIVING AREA
LEGEND
CONCRETE FLOOR
AREA SHOWING CONCRETE FLOOR REMOVED
NOT TO SCALE
URANIUM PLANT (BUILDING #1)
REMEDIATION IN PROGRESS
SURFACE AREA MAP
DATE 9/9/94
FIGURE 14.2
CADD FILE: 94019

The following discussions include greater detail on the status of the Uranium Building characterization and decontamination efforts. Final surveys are currently being performed.

A. Characterization Data (Roof and Exterior Walls):

A final alpha survey has been completed on the Uranium Building roof. A roof grid was set up for the different sections of the roof and direct and swipe surveys were taken at the grid intersect points. A summary of the readings by roof section are included in Table 14.1. The maximum direct reading by section varied from 496 dpm/100 cm^2 to 3,622 dpm/100 cm^2, with the average being 662 dpm/100 cm^2. A total of 6,496 readings were taken on the 55,000 ft^2 roof area.

From May through August, 1991, each outside wall panel around the north, south and east side of the Uranium Building was taken down, decontaminated and surveyed for alpha on both sides. This survey was conducted with an Eberline PRM-6 count rate meter. The concrete footings were decontaminated and surveyed and new foot plates were installed prior to replacement of individual wall panels. If wall panels were damaged or could not be decontaminated, replacement panels or panel sections from the Solvent Extraction Building were used. The final survey results for the panels are summarized below in Table 14.2:

TABLE 14.2

READINGS IN DPM/100 CM^2

Location	Number of Panels	Maximum Direct	Average Direct	Smearable
North Wall	136	6,000	760	<200
South Wall	280	6,000	1,059	<200
East Wall	150	5,000	998	<200

Table 14.1

U-PLANT ROOF FINAL ALPHA RELEASE SURVEY

Readings are DPM/100 cm^2

		DIRECT TOTAL			REMOVABLE TOTAL		
		Number Readings	Average DPM	Max DPM	Number Readings	Average DPM	Max DPM
U-PLANT ROOFTOP	Sections A1-F11	330	1,016.42	3,632	330	8.91	36.0
	Sections G1-L11	330	987.35	1,984	330	8.35	45.00
	Sections M1-R11	330	927.87	2,144	330	6.29	22.00
	Sections S1-X11	330	830.52	2,472	330	5.75	33.00
	Sections A12-F22	330	233.55	1,728	330	7.40	50.00
	Sections G12-L22	330	160.09	808	330	5.47	17.80
	Sections M12-R22	330	335.97	1,496	330	6.29	27.00
	Sections S12-X22	330	327.87	1,920	330	7.00	69.00
	Sections A23-F33	330	657.44	2,040	330	12.48	96.00
	Sections G23-L33	330	1,840.00	1,456	330	13.52	87.00
	Sections M23-R33	330	505.50	2,704	330	4.12	31.00
	Sections S23-X33	330	476.40	2,336	330	5.06	51.00
	Sections A34-F44	330	1,028.72	2,064	330	9.08	27.00
	Sections G34-L44	330	572.83	2,224	330	10.18	87.00
	Sections M34-R44	330	998.24	2,608	330	8.58	67.00
	Sections S34-X44	330	855.18	2,650	330	6.50	27.00
	Sections A45-F48	138	510.15	936	138	8.62	42.00
	Sections G45-L49	138	941.94	2,592	138	7.87	27.00
	Sections M45-R49	138	314.42	750	138	4.48	22.00
	Sections S45-X49	138	344.10	1,070	138	3.81	15.00
U-PLANT GUARD SHACK ROOF SOUTH CANOPY ROOF IN FRONT WEST CANOPY ROOF IN FRONT		110	618.91	3,100	110	7.42	49.00
U-PLANT ROOF DOCK		60	288.53	744	60	10.57	51.00
U-PLANT PELLET STORAGE ROOF		219	186.13	496	219	5.93	48.00
U-PLANT VAPORIZER ROOM ROOF		275	1,042.31	2,440	275	4.95	20.00
U-PLANT ROOF TOTALS		6,496	662.48	3,632	6,496	7.51	96

B. Characterization Data (Office and Lab Areas):

A preliminary alpha survey was performed on the Uranium Building office and laboratory areas. This preliminary survey was initiated in January, 1989. Later in the project the ceiling tiles were removed, vacuumed and surveyed with an Eberline PRM-6 meter with a Radeco alpha scintillation detector. This initial survey indicated a maximum of 10,000 dpm/100 cm^2 direct alpha and 2,000 dpm/cm^2 smearable alpha (approximately 1,000 dpm/100 cm^2 average direct alpha and 200 dpm/100 cm^2 average smearable alpha). Any ceiling tiles exceeding 2,000 dpm/100 cm^2 direct alpha and 500 dpm/100 cm^2 smearable alpha were disposed of off site. The ceiling, ceiling beams and rafters, conduit, piping and duct work were all surveyed with an Eberline PRM-6 meter with a Radeco alpha scintillation detector. This initial survey indicated a maximum of 27,000 dpm/100 cm^2 direct alpha and 10,000 dpm/100 cm^2 smearable alpha (approximately 4,000 dpm/100 cm^2 average direct alpha and approximately 2,000 dpm/100 cm^2 average smearable alpha).

The entire attic area was vacuumed and cleaned. A second survey of the attic was conducted with a Ludlum 2220 meter with a Ludlum 43-4 detector modified to use P-10 gas to increase detector sensitivity. Any areas identified as greater than 5,000 dpm/100 cm^2 alpha were acid washed and surveyed once more. Areas which could not be cleaned to less than 5,000 dpm/100 cm^2 alpha were resurveyed to ensure that they were less than 15,000 dpm/100 cm^2 alpha and that they would average less than 5,000 dpm/100 cm^2 alpha.

A survey was performed for this entire attic area using a Ludlum 2220 meter with a Ludlum 43-68 or 43-4 detector. This survey provided an average of 1,900 dpm/100 cm^2 direct alpha and 15 dpm/100 cm^2 smearable alpha. All permanent fixtures were surveyed with a Ludlum 2220 meter with a Ludlum 43-68 detector, using grids where possible. The survey was completed in March, 1990.

C. Characterization Data (Wet Ceramic Area):

In April, 1977, Cimarron personnel initiated a procedure for characterizing and decontaminating the Uranium Building walls, floors, and ceiling surfaces, including the Wet Ceramic Area. During initial characterization, all surfaces were

surveyed with an Eberline PRM-6 meter with a Radeco alpha scintillation probe or with a portable instrument (Ludlum 2220 or 2221) with a gas proportional alpha detector. All areas greater than 4,000 dpm/100 cm^2 alpha were marked. All floor surfaces and the bottom two meters of each wall were completely surveyed. All hot spots greater than or equal to 15,000 dpm/100 cm^2 direct and 1,000 dpm/100 cm^2 smearable were decontaminated. This general procedure was and is being utilized to characterize and remediate other areas within the Uranium Building.

The concrete floor in the West Ceramic area was surveyed and removed. Floor materials were decontaminated and were placed in drainage areas on site. Soil samples were collected and analyzed for total uranium on a 2m x 2m grid, at depths from 0 to 4 ft. The results of this sampling are shown on Drawings No. 90PRCPSS-1 through 90PRCPSS-4. These analyses indicated that soil contamination was deeper than 4 ft. Option #4 contaminated soil was excavated and shipped off site for disposal and Option #2 soil was stockpiled on site for future on-site disposal. Follow up soil sampling was completed in 1992 which indicated that the soil remaining in this area meets the guideline value for release. Soil samples were collected at the base of the excavation at 0 to 1 feet and 1 to 2 feet depths. The analytical results for the composited soil samples are shown on Drawings No. 92POCPSS-0 and 92POCPSS-1.

At the request of the NRC's Region III Office, the Environmental Survey and Site Assessment Program of ORISE conducted an independent confirmatory radiological survey of the Wet Ceramic Area. The objective of the confirmatory survey was to develop independent document reviews and radiological data for use by the NRC in evaluating the accuracy of the licensee's survey report. ORISE utilized a 2m x 2m grid system for surveys and soil sample collection.

The confirmatory survey was performed by ORISE on June 22 through 24, 1992[17]. ORISE found several areas that "indicated that soil contamination still existed in the Wet Ceramic Area which exceed the NRC guideline values". However, the ORISE confirmatory survey included an area outside of the Ceramic Area where Cimarron personnel were still decontaminating. When this issue was clarified, the NRC issued a verbal approval to Cimarron allowing the backfilling of

the Wet Ceramic area. This area has been backfilled with clean soil.

D. Characterization Data (Scrap Recovery Area):

The Scrap Recovery Area has been characterized and remediated. The concrete floor and contaminated soil below the concrete floor has been removed. A past gamma survey of this area on a 2m x 2m grid has been completed, with readings placed on Drawing No. 93POSP3D-0. Also a Micro-R survey of this area, taken at the soil surface and at one meter, has been completed. These readings are shown on Drawings No. 93POSPUR-0 and 93POSPUR-1. The final soil sample analytical data for this area has been placed on Drawing No. 93POSPSS-0. This drawing shows five areas where sample results were slightly above the guideline value of 30 pCi/g total uranium. However, with background subtracted, all sampling results are below the guideline value.

By letter dated November 15, 1993, Kerr-McGee requested approval from the NRC to backfill the Scrap Recovery Area in the Uranium Building. The NRC reviewed the sampling and survey results of the Scrap Recovery Area that were submitted in Kerr-McGee's July 8, 1993, and November 15, 1993 reports. Additionally, a confirmatory data review was completed by ORISE at the request of the NRC. Based upon the information submitted to ORISE and their report, the NRC approved the backfilling of the scrap recovery area by letter dated January 10, 1994[16].

E. Characterization Data (Pellet, Fabrication, and Maintenance Storage Areas):

These areas within the Uranium Building included portions of the process where liquids were not handled, thus the potential for spillage was minimal. For this reason, contamination migration into or below the concrete was substantially less than that found in other areas of the Uranium Building. However, due to the existence of process and drain lines at several locations beneath the Uranium Building, portions of the concrete floor had to be removed. Drain line removal is discussed in Section 15.0. Concrete floors in these areas have been surveyed and scabbled to remove surface contamination. The ceiling and wall support posts were also

scanned and decontaminated. The final surveys for these areas are not complete.

F. Characterization Data (Maintenance Shop and Water Treatment Areas):

Portions of these areas are still being used for survey and decontamination of building concrete rubble and asphalt and have not been final surveyed. However, as these areas did not contain any liquid fuel fabrication processes, only surface contamination is expected in this area.

G. Characterization Data (Status of Process Area Final Alpha Survey):

A substantial amount of the process area has been final surveyed for alpha. The surveys were completed utilizing a Ludlum 2220 with either a 43-68 probe (100 cm^2) or 43-4 probe (60 cm^2). The 43-4 probe was used when surveying pipes, hangers, supports and beams. The status of the individual areas, which are shown in Figure 14.1, are summarized below:

a) The Ceramic Area final alpha survey is approximately 98% complete. A summary on the survey results are as follows:

- Ceramic Walls

Alpha Max. Direct	3080 dpm/100 cm^2
Alpha Avg. Direct	<800 dpm/100 cm^2
Alpha Smearable	<10 dpm/100 cm^2

- Ceramic Support Beams & Ceiling

Alpha Max Direct	4805 dmp/100 cm^2
Alpha Avg. Direct	<2000 dpm/100 cm^2
Alpha Smearable	<25 dpm/100 cm^2

- Ceramic Area Floor

The Concrete within this area has been removed, surveyed, decontaminated as required and placed on site for erosion control.

b) The Pellet Area final alpha survey is approximately 98% complete. A summary of the survey results are as follows:

- Pellet Area Walls

Alpha Max Direct	4016 dpm/100cm²
Alpha Avg. Direct	<800 dpm/100cm²
Alpha Smearable	<20 dpm/100cm²

- Pellet Area Ceiling & Beams

Alpha Max Direct	4800 dpm/100cm²
Alpha Avg. Direct	<1500 dpm/100cm²
Alpha Smearable	<20 dpm/100cm²

- Pellet Area Floors

Alpha Max Direct	4990 dpm/100cm²
Alpha Avg. Direct	<300 dpm/100cm²
Alpha Smearable	<10 dpm/100cm²

c) The Fuel Fabrication Area final alpha survey is approximately 70% complete. A summary ofthe survey rsults completed to date are as follow:

- Storage Area Walls

Alpha Max Direct	4682 dpm/100cm²
Alpha Avg. Direct	<1000 dpm/100cm²
Alpha Smearable	<20 dpm/100cm²

- Storage Area Ceiling

Alpha Max Direct	4698 dpm/100 cm²
Alpha Avg. Direct	<2000 dpm/100cm²
Alpha Smearable	<20 dpm/100cm²

d) The Packaged Pellet Storage Area final survey is approximately 95% complete. A summary of the survey results completed to date are as follows:

- Packaged Pellet Area Floor

Alpha Max Direct	4840 dpm/100cm²
Alpha Avg. Direct	<1200 dpm/100cm²
Alpha Smearable	<20 dpm/100cm²

- Packaged Pellet Area Ceiling & Beams

Alpha Max Direct	4200 dpm/100cm²
Alpha Avg. Direct	<1000 dpm/100cm²
Alpha Smearable	<30 dpm/100cm²

- Packaged Pellet Area Walls

Alpha Max Direct	4340 dpm/100cm²
Alpha Avg. Direct	<1000 dpm/100cm²
AlphaSmearable	<50 dpm/100cm²

e) The Scrap Area final alpha survey is only approximately 10% complete. the concerete floor in this area has been removed.

f) The Storage Area final alpha survey is only approximately 10% complete.

g) The Maintenance Shop and Water Treatment final alpha survey has not been started at this time.

14.3 Uranium Tank Storage Building (Building #2):

This steel clad building (20 ft. x 57 ft.) was located just south of the Uranium Building. Building #2 was used to house 44 tanks that were 10 inches in diameter and 20 feet tall. The tanks were used to store uranium nitrate scrap solutions of less than 5% enrichment. This solution was held for subsequent reclamation by processing through the solvent extraction building. The tanks were separated by concrete isolation barriers.

The concrete contained in the isolation barriers and the floor was contaminated because of the tank overflows, pipe leaks and pump leakage that had occurred within this building. Additionally, the soils under and surrounding the building were contaminated.

The piping, tanks, and pumps were removed from the north side of Building #2 between January 9, 1987 and February 24, 1987. The piping, tanks, and pumps were removed from the south side of Building #2 from June 1, 1988 through July 19, 1988. This equipment either was shipped off site as LSA radioactive waste or was decontaminated, surveyed and released. The building was surveyed, dismantled, and/or disposed of as required based upon alpha survey results from September 12, 1988 through November 18, 1988. The concrete divider in Building #2 was decontaminated by wet blasting and vacu-blasting from May 4, 1989 through July 3, 1989. The concrete divider then was surveyed with a pancake probe for both alpha and beta/gamma. When the concrete divider was released and removed from the restricted area, it was hauled to on-site drainage areas as rip-rap for erosion control.

The building concrete floor and footings also were decontaminated and removed from the restricted area. The concrete that could be released was placed in on-site drainage areas for erosion control from July 12, 1989 through August 4, 1989. Contaminated soils from beneath Building #2 initially were removed from August 24, 1989 through October 19, 1989. Option #2 and Option #4 soils were removed down to four feet in the Building #2 area from January 11, 1990 through November 17, 1990. Additional Option #4 soils were removed down to approximately 12 feet. A total of 19,500 ft^3 of soil and concrete were shipped off site for disposal at a licensed LLRW facility. The Building #2 area was backfilled with Option #2 material up to four feet below grade on February 26, 1990. The removal of this Option #2 soil and placement in the Option #2 stockpile was initiated on February 1, 1994 and is still and has been completed.

All survey and soil sampling data for this area is addressed under the Uranium Plant yard area.

14.4 Solvent Extraction Building (Building # 3):

This metal building (25 ft. x 40 ft.) was dismantled completely in 1986. After surveys were conducted, parts of the building siding were shipped off-site as radioactive waste and other parts were decontaminated and used as replacement siding for the Uranium

Building. Some of the equipment from this building was shipped off-site as waste and other pieces of equipment were decontaminated. The concrete flooring from this building was surveyed for alpha only, decontaminated and then released from the restricted area and used for on-site erosion control. Contaminated soil located in areas below the previous location of the Solvent Extraction Building has been excavated and segregated as required to meet the Option #1 or Option #2 limits. All survey and soil sampling data for this area is addressed under the Uranium Plant yard area.

14.5 UF_6 Receiving (Vaporizer Building):

This metal building (30 ft. x 75 ft.) was located adjacent to the south wall of the Uranium Building. It was within this building that the cylinders of UF_6 , received from the AEC diffusion plants, were heated with steam to vaporize the UF_6 for processing into fuel. Decontamination and decommissioning activities were initiated for the Vaporizer Building on August 1, 1991. The Vaporizer Building inner wall was removed, surveyed, decontaminated as required, and replaced. The interiors of the south and west walls have been surveyed and decontaminated as required. Additionally, the east wall, which has been 40 percent removed, has been surveyed on the inside. The roof for this building, which is still in place, has been surveyed and the results summarized on Table 14.1. The concrete floor has been surveyed, decontaminated and removed. The concrete from this area also was used for on-site erosion control. Contaminated soil from under this building has been excavated and stockpiled in the on-site Option-2 material stockpile awaiting on-site disposal. Final survey data for this area are discussed under the Uranium Plant yard area. Decommissioning activities for the Vaporizer Building floor were completed on December 18, 1991.

14.6 Emergency Building:

This building, during facility operations, housed medical personnel, records, and emergency decontamination showers. The building is now being used for records storage. This building will be surveyed prior to final release.

15.0 Drain Lines

The process drain lines that were located at the Cimarron facility are shown on Drawing No. 85PRUT. This drawing shows the drain lines located under the Uranium Building and also throughout the Cimarron facility. In most cases, these process effluent drain lines have been removed and only sanitary drain lines have been replaced. Drain lines from the Uranium Building to the Waste Ponds and Sanitary Lagoons, and from the Waste Ponds to the Cimarron River have been removed. All three Sanitary Lagoons are no longer in service. Specific drain lines are discussed in greater detail in the following sections.

A. Characterization Data (Main Drain Lines from the Uranium Building to Waste Pond #1):

Portions of this four-inch PVC discharge line were removed in 1985 (from the fence of the restricted area to Waste Pond #1) and in 1992 (Uranium Building to the Option #2 stockpile). The section of this drain line under the Option #2 eastern stockpile is still in place and will be excavated when the Option #2 stockpile is moved from this area.

Survey data are available for a portion of the excavated discharge line trench from the restricted area fence to Uranium Waste Pond #1. These data have been placed on Drawing No. 85POSTUR-0. The survey was conducted in the bottom, on the surface, and at one meter above the surface of the excavated area. Soil data are available for the pipeline run for the area within the restricted area. This data showed the presence of soil beneath the Eastern Option #2 stockpile requiring excavation. Four results varied from 3 pCi/g to 3,301 pCi/g total uranium.

The 1990 soil sampling that was conducted on a 10m x 10m grid, at depths from 0 to 4 ft., included the area where this drainage line was located. One soil sample showed a concentration of 65 pCi/g uranium. All other soil sample concentrations were less than 30 pCi/g uranium. The results of this sampling effort are shown on Drawings No. 90PRUYSS-0 through 90PRUYSS-4 which are included in the attachments to Section 6.0.

This drain line had several leaks during the Cimarron facility operational period. Approximately 150 drums of contaminated soil were excavated and shipped off-site for disposal from a leak located just south and east of Uranium Waste Pond #1. The

excavated area was surveyed and the trench was released for backfilling.

B. Characterization Data (Liquid Waste Line from Uranium Building to the two Emergency Ponds:

This drain line was used for liquid effluents discharged from the Uranium Building to these two evaporation ponds. The four-inch PVC line was excavated and removed in July, 1985. A gamma survey was conducted after the pipe was removed. Several areas had elevated concentrations of uranium in the soil which were remediated prior to backfilling. The original documentation for the soil survey and soil sample data is not available. However, the 1990 soil sample data that are shown on Drawings No. 90PRUYSS-0 through 90PRUYSS-4 included the area where this liquid waste line was previously located. These drawings are included as attachments to Section 6.0.

C. Characterization Data (Drain Line from Closed Sanitary Lagoons to Cimarron River):

This four-inch steel drain line was used for liquid effluent discharges from the Sanitary Lagoons to the Cimarron River during Cimarron Facility operations. The effluent was sampled prior to discharge to ensure that the effluent would meet Cimarron license limits. A weir box with a continuous sampler was used to collect a 24-hour sample which was analyzed daily.

This drain line was excavated and removed in June, 1985. A gamma survey was conducted after this drain line was removed. The surveys were taken at the bottom, at the surface and at one meter above the surface of the excavated trench. These survey results are shown on Drawing No. 85POSTUR-0.

Additionally, Cimarron personnel have surveyed, cored, and sampled the length of the area previously traversed by this drain line. The surveys and soil sampling were completed in late June, 1994, and were taken at 10m intervals for the length of the excavated and backfilled piperun. Soil samples were collected at depths from 0 to 4 ft., with the first two samples taken at six-inch intervals. The soil samples were analyzed for total uranium and thorium. The soil sampling results are shown on Drawings No. 94POERSS-0 through 94POERSS-4. The radiation surveys were taken with an unshielded 3 in. NaI detector and a Micro-R meter.

Background was 4,000 cpm for the 3 in. detector and 7 μR/hr for the Micro-R meter. The gamma surveys and Micro-R survey results are shown on Drawings No. 94POER3D-0, 94POERUR-0 and 94POERUR-1. A total of 98 locations were surveyed and sampled with the following results:

- Three-inch. NaI detector - The survey reading varied from a high of 4,970 cpm at 455N-105E, to a low of 1,920 at 385N-106E with the average for the 98 survey points being 3,419 cpm.

- Micro-R survey meter - The exposure reading varied from a high of 10 μR/hr to a low of 4 μR/hr at one meter and from 11 μR/hr to 5 μR/hr at ground surface. The average readings were 7.0 μR/hr at 1 meter and 7.6 μR/hr at ground surface.

- Soil Total Uranium Analytical Results - Soil samples were collected at 10m intervals at depths down to 4 ft. A total of 480 soil samples were collected and analyzed for total uranium. The average activity for all samples was 8.7 pCi/g total uranium. Four samples exceeded the 30 pCi/g Option No. 1 limit; they were:

Location	Depth Interval	Activity (pCi/g)
395N-105E	1' - 2'	37
425N-105E	1' - 2'	52
455N-105E	1' - 2'	52
835N-105E	3' - 4'	59

  The analytical results discussed above include background which has not been subtracted. Also, the three samples collected at the 1- to 2-foot depth between 395N and 455N are located in the drainage way just north of the Sanitary Lagoons.

- Soil Total Thorium Analytical Results - The 480 soil samples also were analyzed for total thorium. All results were in the 0 to 2 pCi/g range except one reading at 835N-105E (3' - 4' depth) being 3 pCi/g.

D. Characterization Data (Drain Line from Uranium Waste Pond #1 to the Cimarron River, including the Siphon Line):

This 6-inch PVC drain line was installed for liquid effluent discharges from Waste Pond #1 to the Cimarron River. This drain line was utilized for only two discharges from Waste Pond #1 to the Cimarron River.

A review of the records for these two discharges to the Cimarron River from Waste Pond #1 indicate that no liquids with concentrations greater than 1.0 MPC were released to the Cimarron River. One release consisted of 1,600 gallons of water with a concentration of 0.9 MPC and the other release consisted of 775 gallons of water with a concentration of 0.68 MPC.

Excavation and removal of this drain line was completed in June, 1985 along with the associated 1-inch siphon drain line. A gamma survey was conducted after the drain line was removed. The survey was taken at the bottom, at the surface and at one meter above the surface of the excavated area. No contaminated soil was identified in this area. These survey results are shown on Drawing No. 85POSTUR-0.

To verify 1985 survey data, additional sampling was undertaken. The survey and soil sampling were completed June, 1994, and were taken at 10m intervals for the length of the excavated and backfilled drain pipe run. Soil samples were collected at depth from 0 to 4 ft. The radiation surveys were taken with an unshielded 3-inch NaI detector (cpm) and a Micro-R meter. Background was 4,000 for the 3-inch detector cpm and 7 μR/hr for the Micro-R meter. A total of 74 locations were surveyed and 355 soil samples were collected and analyzed for total uranium and thorium. The soil samples all were less than 30 pCi/g total uranium, with the average being 8.4 pCi/g. The volumes for total thorium were all within the range of 0 to 2 pCi/g. The soil sampling results are shown on Drawings No. 94POERSS-0 through 94POERSS-4.

The Micro-R survey reading both for the surface and at one meter above grade were in the range of 7 μR/hr to 10 μR/hr. The 3-inch NaI detector readings varied form 2,650 to 5,180 cpm. The gamma survey and Micro-R survey results are shown on Drawings No. 94POER3D-0, 94POERUR-0 and 94POERUR-1.

E. Characterization Data (Drain Line connecting Uranium Waste Pond #1 to Waste Pond #2):

This 4-inch PVC drain line was used for liquid effluent discharges from Waste Pond #1 to Waste Pond #2. Liquid effluent discharges from Waste Pond #1 to Waste Pond #2 involved only slightly contaminated water. Waste Pond #2 was used for evaporation purposes only.

Excavation and removal of this drain line were conducted in June, 1985. A gamma survey was conducted after the pipe was removed. The surveys were taken at the bottom, at the surface and at one meter above the surface of the excavated area. No contaminated soil was identified in this area.

F. Characterization Data (4-inch Potable Water Treatment Line from east end of the Uranium Building to Sanitary Lagoons):

This potable water line was utilized to backwash the potable water treatment system, including the sand filter, ion exchange, and water softener. The line was connected to the outfall of the Sanitary Lagoon weir box. Radioactive materials were not discharged through this line. This water line was removed in 1985.

G. Characterization Data (Other Drain Lines):

This section addresses drain lines under the Uranium Building, from the west side of the Uranium Building to the Sanitary Lagoons (Uranium Building lab and restroom/change room), from the dock area on the north side of the Uranium Building to the Sanitary Lagoons; and from the east end of the Uranium Building to the Sanitary Lagoons. The drain lines discussed in this section are shown on Drawing No. 85PRUT.

The following is a brief history of when specific drain lines were excavated and removed. All drain lines that were removed were surveyed and either released or disposed of off site at a commercial LLRW disposal facility. The soil surrounding the drain lines was surveyed to determine if the soil was contaminated. Additionally, soil samples were collected and analyzed on site for total uranium. All process drain lines have been removed except for a section of the lab/change room sanitary drain (West drain) under the Building #4. This section of the sanitary drain line has been decontaminated and surveyed for free release. This survey was completed in March, 1993 with no survey results exceeding

Ludlum 2220
Serial# 37807
43-45 probe

3-11-93

Bkg : 3
Source #9756 – 570,575,
Source #7272 – 94,89,95

Survey of 6" Clay Pipe Under Cool Bldg
.5 min Count

West END Entrance

1. 113 bottom = 1808 dpm /100cm²
2. 4 = 64 DPM
3. 6 = 96 DPM

2 Ft.

1. 52 bottom = 832 DPM
2. 6 = 96 DPM
3. 28 = 448 DPM

4 Ft

1. 73 bottom = 1168 DPM
2. 13 = 208 DPM
3. 6 = 96 DPM

East END Entrance

1. 94 bottom = 1504
2. 24 = 384 DPM
3. 25 = 400 DPM

2 Ft

1. 13 bottom = 208 DP
2. 5 = 80 DPM
3. 17 = 272 DPM

4 Ft

1. 49 bottom = 784 D
2. 8 = 128 D
3. 14 = 224 D

ALL Readings in DPM /100cm²

Mike Kiesnit

2,000 dpm/100 cm^2 alpha (background was 1,800 dpm/100 cm^2 alpha). Soil along the sanitary drain line excavation was sampled for total uranium. A total of 68 samples were collected and analyzed in the site laboratory. Samples ranged from 7 pCi/g to 25 pCi/g total uranium, with the average being 9.3 pCi/g. The drain line excavation from the east end of the Uranium Building and from the dock area to the Sanitary Lagoons was sampled. Four soil samples from locations adjacent to the outer wall of the building exceeded the 30 pCi/g Option #1 limit.

As mentioned previously, a portion of the drain line from the Uranium Building to Uranium Waste Pond #1 located under the eastern Option #2 stockpile is still in place. This section of drain line will be excavated once the Option #2 stockpile is moved. The status of the drain lines under the Uranium Building are:

- Drain lines under the laboratory were removed between January and February, 1990.

- Drain lines under the Wet Ceramic area were removed in April, 1990 and January, 1991. This area was included in the 1991 confirmatory survey performed by ORISE prior to backfilling.

- Drain lines under the Scrap Area Floor were removed from September, 1990 through February, 1991. This area was included in an ORISE confirmatory review.

- Drain lines along the North wall of the Uranium Building were removed from March, 1991 through May, 1991.

  Soil samples were collected from the drain lines under the Uranium Building that discharges from the east end of the building to the Sanitary Lagoons. These drains included the Wet Ceramic area and Scrap area. A total of 101 samples were collected with the highest being 32 pCi/g total uranium. The average was 13.5 pCi/g.

16.0 Site Reservoirs and Drainage Areas

16.1 Reservoir #1 and Drainage Area (West of HWY #74)

Reservoir #1 and the drainage area from Highway #74 to Reservoir #1 are located west of the Uranium Building. This reservoir collects drainage generally from areas south of the Uranium Building. This reservoir is shown on Drawing No. 94MOST-RF4. Reservoir #1 is located west of the Uranium Building.

A. Characterization Data:

Cimarron personnel conducted an investigation of the drainage area west of Highway #74 to determine if runoff from the southern portion of the Uranium Building yard had affected this area. This preliminary investigation showed soil concentrations up to 70 pCi/g uranium in the drainage area leading to Reservoir #1. This drainage area was characterized and remediated. All contaminated soil with total uranium concentrations above 30 pCi/g was removed and stockpiled in the on-site Option #2 stockpile. At the completion of this remediation effort, this drainage area was characterized again along with the banks and the bottom of Reservoir #1. Soil samples around Reservoir #1 and within this drainage area to Reservoir #1 were collected in 1991. The soil sampling was conducted on a 10m x 10m grid at depths of 0 to 4 ft. in the drainage area. The soil samples were collected on an approximate 10m x 10m linear grid at a depth of 0 to 6 inches around the perimeter of Reservoir #1. In addition, random sludge samples were taken from the bottom of Reservoir #1. The soil and sludge samples were analyzed at the Cimarron facility laboratory for total uranium. These soil sample data have been placed on Drawings No. 91PORISS-0 through 91PORISS-4. The sludge sample analysis data are shown on Drawing No. 91PORISS-5. All soil and sludge sample concentrations were below 30 pCi/g total uranium.

B. Environmental Data:

An annual surface water sample is taken as part of the Cimarron facility environmental monitoring program at sample location #1204. Surface water sampling conducted prior to 1976 indicated elevated levels of uranium. Typical

sample analysis results from the pre-1976 annual environmental sampling program were 8.28 dpm/L plutonium and 160 dpm/L total uranium. Data from 1977 through 1993 indicates levels characteristic of background. Concentrations of gross alpha, gross beta, and total uranium in 1992 and 1993 were less than detection limits.

16.2 Drainage Area from Reservoir #1 to the Cimarron River

This drainage area is not included in the annual environmental sampling program. However, Reservoir #1 is included in the annual environmental sampling program and water sample results from the last two years show that concentrations of total uranium were less than detection limits. The 1979 Micro-R survey for the 1,100-acre Cimarron site included this drainage area west of Highway #74. The survey results are shown on Drawing No. 79PRSAUR-0, and were at background levels (This drawing is included as an attachment to Section 6.0.). A scoping survey was also conducted on this drainage area in 1994. A Ludlum Model 2220 with a 3 in. x 0.5 in. NaI detector was used to perform the scoping survey. Soil samples were taken at locations where the highest readings were recorded for this drainage area. All soil samples had uranium concentrations within background levels. This area is not considered an affected area.

16.3 Reservoir #2 (East Reservoir)

Reservoir #2 was constructed to provide process water to the Cimarron facility during operations. A surface water sample is taken as part of the annual environmental monitoring program and the historic data indicates gross alpha, gross beta, and total uranium concentrations at background levels. This reservoir is shown on Drawing No. 94MOST-RF4. Reservoir #2 is located at the eastern edge of the 1,100-acre site. This Reservoir is not considered an affected area.

16.4 Drainage Area from Reservoir #2 to the Flood Plain (catch basin)

The 1979 Micro-R survey for the 1,100 acre Cimarron site included this drainage area. The survey results are shown on Drawing No. 79PRSAUR-0 and were at background levels. Concrete released from the decommissioning of the Uranium Facility was placed in this drainage area for erosion control. The concrete released prior to 1989 was surveyed for alpha only. A survey utilizing a gas proportional beta/gamma detector was utilized in 1993 to survey

concrete in this drainage area. This survey identified several pieces of concrete in this drainage area exceeding 15,000 dpm/100 cm^2 fixed beta/gamma[19]. This drainage area may contain concrete rubble which exceeds the free release limit for beta/gamma. Averaging of survey results in accordance with NUREG/CR-5849 will be performed during the final release survey of this area.

16.5 Reservoir #3 (Middle Reservoir)

Reservoir #3 was constructed to provide backup process water to Cimarron during operations. A surface water sample is taken as part of the annual environmental monitoring program and the historic data indicates gross alpha, gross beta, and total uranium concentrations at background levels. This reservoir is shown on Drawing No. 94MOST-RF4. Reservoir #3 is located just east of Uranium Waste Pond #2. This Reservoir is not considered an affected area.

16.6 Drainage Area from Reservoir #3 to the Flood Plain (catch basin)

The 1979 Micro-R survey for the 1,100-acre Cimarron site included this drainage area. The survey results are shown on Drawing No. 79PRSAUR-0 and were at background levels. Concrete released from the decommissioning of the Uranium Process was placed in this drainage area for erosion control. The concrete released prior to 1989 was surveyed for alpha only. A survey utilizing a gas proportional beta/gamma detector was utilized in 1993 to survey concrete in this drainage area. This survey identified several pieces of concrete in this drainage area exceeding 15,000 dpm/100 cm^2 fixed beta/gamma. This drainage area may contain concrete rubble which exceeds the free release limit for beta/gamma. Averaging of survey results in accordance with NUREG/CR-5849 will be performed during the final release survey of this area.

16.7 Drainage Area/River Flood Plain Area east of Highway #74

This area was included in the 1979 site-wide random Micro-R survey. The results are shown on Drawing No. 79PRSAUR-0. The readings taken were at background levels. A portion of the drainage area is considered an affected area.

16.8 Concrete Released from the Restricted Area

Cimarron personnel initiated decontamination and removal of concrete rubble from pads, building floors, and support tiers within the restricted area in 1986. Concrete which was released from the restricted area was surveyed for alpha prior to 1989. Concrete that was released from the restricted area subsequent to 1989 was surveyed for both alpha and beta/gamma. Cimarron personnel conducted a survey in 1993 utilizing a gas proportional survey instrument to perform beta/gamma surveys of concrete released from the restricted area prior to 1989. This survey identified several pieces of concrete in this drainage area exceeding 15,000 dpm/100 cm^2 fixed beta/gamma. A follow-up survey was conducted in May, 1994 on concrete placed in several drainage areas.

Numerous large pieces of concrete were surveyed in the drainage area northeast of Burial Ground #1. The concrete was surveyed with a Ludlum 2220 with a 43-68 probe. Of the forty-one pieces of concrete surveyed, six showed readings exceeding 15,000 dpm/100cm^2 fixed beta/gamma, the maximum reading being 24,000 dpm/100cm^2. Also, concrete located in the east side of Reservoir #2 spillway was surveyed. Forty-nine large pieces of concrete were surveyed, with eleven readings exceeding the 15,000 dpm/100cm^2 fixed beta/gamma limit. The maximum reading was being 40,000 dpm/100cm^2. The concrete located in Reservoir #1 was released with both alpha and beta surveys in 1994.

The following areas on site contain concrete rubble that may exceed the free release limit for beta/gamma. Averaging of survey results for each of these areas in accordance with NUREG/CR-5849 will be performed during the final release survey of these areas.

- Concrete in Drainage Area next to the Uranium Emergency Pond:
- Concrete in Drainage Area between Waste Ponds #1 & #2:
- Concrete in the spillway from Reservoir #3:
- Concrete northeast of Burial Ground #1:
- Concrete in the Spillway North of Reservoir #2:

- Concrete in Drainage Area between the New Lined Sanitary Lagoon and the Incinerator / Burial Area #3:

17.0 Plutonium Building and Plant Yard

Cimarron submitted a license termination request to the NRC to terminate the MOFF Plant License SNM-1174 on August 20, 1990. The MOFF Plant license covers the facility itself, the fenced area (security fence) which surrounds the facility, the drain line to the evaporation ponds, the former plutonium evaporation and emergency ponds, the east and west sanitary lagoons, the septic tank, and some underground tanks). The NRC terminated License SNM-1174 by letter dated February 5, 1993[3]. In this letter, the NRC stated the following:

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

However, the MOFF Plant was not released from the Uranium Facility License SNM-928. The Uranium Facility License SNM-928 covers the entire 1,100-acre site (which includes the area licensed under SNM-1174). The NRC stated the following in the same letter of February 5, 1993:

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

As discussed above, Cimarron submitted a license termination request to the NRC for License SNM-1174. This request included a complete characterization and final survey for the MOFF Plant. A Final Confirmatory Survey of the MOFF Plant was conducted by ORAU at the request of the NRC[20]. The survey report was submitted to the NRC in 1991 and was titled "Confirmatory Survey of the Cimarron Corporation Mixed Oxide Fuel Fabrication Plant, Crescent, Oklahoma". In this report, ORAU stated:

> "The documentation developed by the licensee was thorough and adequately described the post decontamination status of the

facility. Radiological data demonstrated that the residual activity levels satisfied the established decommissioning guidelines".

The ORAU Confirmatory Survey Report also was referenced in the "Environmental Assessment For License Termination At The Cimarron Corporation Mixed Oxide Fuel Fabrication Plant" which was issued by the NRC (NMSS) in February of 1993[2]. In this Environmental Assessment, the NRC stated that "...Cimarron Corporation has decontaminated and decommissioned the Mixed Oxide Facility and associated grounds to below guidelines required for unrestricted use by the NRC. It is NRC's judgement that the applied guidelines adequately protect the public health and safety, and the environment. Therefore, the NRC finds that termination of the Mixed Oxide Facility Licenses (License No. SNM-1174) and conversion of the related facility to unrestricted use will pose no significant impact to the environment or the health and safety of the public."

During the conduct of the final confirmatory survey of the Cimarron facility, ORAU investigated the sources of all contamination at the Plutonium Facility and yard area. During this investigation, ORAU discovered uranium contamination on the exterior surface of the Plutonium Building and also in several soil samples from the yard area. However, the concentrations of uranium in the soil samples and the surface contamination levels were all within NRC guideline values. The following excerpt from the 1991 ORAU Final Confirmatory Survey Report explains these issues in more detail:

"Because the activity was suspected to be windblown uranium from the adjacent Uranium Plant, several samples of surfaces with elevated direct measurements were analyzed for uranium and plutonium content... .

Plutonium has been identified as the major potential contaminant on building interior surfaces, the guidelines applicable to plutonium are:

100 alpha dpm/100 cm^2, averaged over 1 m^2 area
300 alpha dpm/100 cm^2, maximum in a 100 cm^2 area
20 alpha dpm/100 cm^2, removable

All individual final measurements were below the 300 dpm/100 cm^2 maximum level and there was no removable activity in excess of 20 dpm/100cm^2 . Several single measurements were noted to have activity levels between 100 and 300 dpm/100 cm^2 ; however, the surface areas of these locations were small and averaging

throughout the contiguous 1 m^2 results in activity levels below the 100 dpm/100cm^2 guideline.

Contamination levels on some exterior surfaces exceeded the plutonium guideline levels. Further analyses indicated that the contaminant was predominantly uranium - likely windblown from the adjacent Uranium Plant. The NRC guidelines for uranium are:

5,000 dpm/100 cm^2, averaged over 1 m^2 area
15,000 dpm/100 cm^2, maximum in a 100 cm^2 area
1,000 dpm/100 cm^2, removable

Activity levels on exterior surfaces satisfied these guidelines.

Exposure rates throughout the site were typically in the range of background levels. The highest exposure rate measured at one meter above the surface was 13 μR/h, which is 3 μR/h above the range (9 to 10 μR/h) in background rates. Exposure rates are therefore well within the guideline value of 10 μR/h above background (see Appendix C).

Residual soil activity guidelines for this site are:

Total uranium	30 pCi/g
Total plutonium	25 pCi/g
Total Americium-241	30 pCi/g

One drum of excavated soil (#124-5) contained total plutonium and Am-241 concentrations in excess of these guideline values; however, samples of residual subfloor soil were well below the guideline values. Outside the building, one sample from the piping excavation contained residual total plutonium activity of approximately 110 pCi/g. A nearby sample from that same excavation and samples from 10 m grid intersections and random boreholes were well within the guideline plutonium value, thus averaging would result in meeting the guideline. Assuming an activity ratio for U-234/U-235 of 21 (typical for low enrichment uranium) a U-235 concentration above 1.36 pCi/g would indicate that the total uranium exceeds the 30 pCi/g guideline. Samples from grid locations 20E, 212N (2) and 30E, 220N (1) contained U-235 concentrations above 1.0 pCi/g (1.5 pCi/g and 1.3 pCi/g, respectively). Using the activity ratio of 21, the total uranium (U-234, U-235, and U-238) in samples from these locations is estimated as:

20E, 212N (surface)	37.3 pCi/g
" " (30-45 cm)	37.6 pCi/g
30E, 220N	36.3 pCi/g

Although these levels are slightly above the guideline value, other samples from the adjacent areas contain much lower concentrations, and the average levels are therefore expected to be well within the guideline".

This report summarized the authors findings as follows:

"At the request of the U.S. Nuclear Regulatory Commission, Region III, Environmental Survey and Site Assessment Program of Oak Ridge Associated Universities conducted an independent radiological survey of the Mixed Oxide Facility at the Cimarron Corporation Plant. The survey included surface alpha, beta-gamma, and gamma scans, measurement of direct and removable contamination levels, exposure rate measurements, and determination of radionuclide concentrations in soil, concrete, and paint samples.

Initial measurements identified several areas of residual surface activity exceeding guideline levels. These areas were addressed by the licensee, and resurveys indicated that the additional cleanup was effective in meeting the established limits. Based on the results of the confirmatory survey it is ORAU's opinion that the decontamination efforts have been successful in satisfying the guideline levels and that the licensee's documentation adequately and accurately describes the final radiological status of the site".

This area has not been released from Uranium License SNM-928. In this letter, the NRC also stated that "The termination of License SNM-1174 does not alter your Special Nuclear Material License SNM-928 in any way. Because the land formerly licensed under License SNM-1174 is contained within the bounds of License SNM-928, a second confirmatory survey of the former Mixed-Oxide Facility and associated grounds may be made at the termination of the Uranium Facility License".

Also included with the decommissioning of the MOFF Plant and termination of the SNM License were the plutonium evaporation and emergency ponds. These ponds were sampled by Cimarrron and the NRC prior to closure. As stated in the NRC's February 1993 Environmental Assessment for License Termination, "NRC and the

Oklahoma State Department of Health verified Kerr-McGee's soil sample data by independently sampling the pond bottoms... . The NRC results were generally less conservative than the Kerr-McGee results... .

Because of the close proximity to the Uranium plant, Cimarron performed a release survey on the exterior of the MOFF plant building and yard. The purpose of the survey was to detect the presence of enriched uranium. The building survey indicated no elevated levels of contamination on the south, west or north walls, but contamination was found on the east wall in the vicinity of the air supply fanroom stairs. A previously installed addition to the stair landing, a deck plate, was found to be reading approximately 100,000 dpm/100 cm^2. An alpha pulse height analysis on a smear taken from this plate indicated enriched uranium. The deck plate was removed for disposal as LSA material. The area beneath the deck plate on the east wall of the building was decontaminated to meet release limits and resurveyed.

The restricted area surrounding the Plutonium Building, which was part of the Plutonium License was released by the NRC with the release of SNM License 1174. Uranium contamination discovered in the Plutonium Plant Yard during the confirmatory survey is below the release limits for the Cimarron facility License SNM-928.

18.0 Septic Tank, Lines and Drain Field

As part of the overall site decommissioning effort, the sanitary sewer and laundry drains were diverted from the New Sanitary Lagoon to the old MOFF Plant uncontaminated septic tank in 1992. New drain lines have been installed from the Uranium plant to the septic tank that had previously served the plutonium building, and a new drain field (laterals) has been installed for this septic tank. This new drain line is a 4-inch PVC pipe which runs from the Uranium plant change rooms to the septic tank. This will be used as the septic tank for the Uranium plant during the remaining site decommissioning activities. The laundry water for the Uranium plant drains into 55-gallon drums where it is sampled and analyzed prior to being released. The sample analysis results for the laundry water and the volume of water are logged by Health Physics personnel prior to being released to track the amount of uranium discharged to the septic tank and drain field. If laundry water samples are above the effluent concentration limit, the water is recycled through a filter to remove the radioactivity before it is discharged to the septic tank.

19.0 All On-site Roads outside Restricted Area

The roads outside of the restricted area are shown on Drawing No. 94MOST-RF5. The road from the restricted area to Reservoir #2 will require final surveys be performed once all on-site remediation and on-site disposal has been completed.