

## **CIMARRON CORPORATION**

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S. JESS LARSEN  
VICE PRESIDENT

March 4, 1999

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

**Re: Docket No. 70-925; License No. SNM-928  
Cimarron Corporation**

Dear Mr. Kalman:

This letter is in response to NRC's January 19, 1999 comments pertaining to Cimarron's July 30, 1998, "Decommissioning Plan Groundwater Evaluation Report", herein referred to as the Groundwater Report. The purpose of the Groundwater Report was to provide information regarding groundwater at the Cimarron Facility as requested by NRC for inclusion in the Cimarron Decommissioning Plan. For clarity, we have included NRC's comments followed by Cimarron's response.

### **1. NRC Comment:**

In Section 10.0 of the Groundwater Evaluation Report, Cimarron noted that groundwater in the vicinity of Burial Area #1 does not meet the proposed groundwater criteria of 180 pCi/l for uranium and noted that Cimarron may characterize or remediate this area. In view of the high uranium concentrations reported for this area (in excess of 2,000 pCi/l), Cimarron should provide its plan for characterizing and remediating this area to demonstrate compliance with the proposed groundwater criteria.

### **Cimarron Response:**

The elevated uranium concentration (i.e., in excess of 2,000 pCi/l) referenced by NRC staff represents groundwater monitored by Well #1315 which is located downgradient from former Burial Area #1. Former Burial Area #1 has been extensively remediated with the removal of all solid waste and BTP Option #2 soil encountered during the area excavation. After remediation, final confirmatory soil sampling and surveys were performed by ORISE in December 1991 with a final report issued in July 1992. Based upon this confirmatory

report, the NRC issued Amendment #9 to Cimarron's SNM-928 License which authorized the backfilling of Burial Area #1. This license amendment was signed in December 1992.

As discussed in Section 10.0 of the Groundwater Report, Cimarron believes that, with the source removed, the concentration of uranium in groundwater downgradient from this former Burial Area as monitored by Well #1315 will continue to decrease. For this reason, Cimarron proposes to continue monitoring this groundwater and to rely upon natural attenuation to achieve the approved criteria of 180 pCi/l total uranium.

More recent groundwater analytical data generated after the Groundwater Report was submitted verifies that concentrations of radionuclide in groundwater have continued their decreasing trends. This decreasing trend can be seen by comparing the last quarter's analytical results which were presented in the Groundwater Report with the most recent quarterly data now available. The concentrations of total uranium in groundwater monitored at Well #1315 have decreased from 2,200 pCi/l as reported in March 1998 to 580 pCi/l as reported in December 1998. It should be noted that the previous quarterly result (i.e., September 1998) for Well #1315 was 511 pCi/l total uranium. For this same monitoring period, the concentration of total uranium in Well #1316 has decreased from 109 pCi/l to 66 pCi/l.

One data point does not necessarily mean that a trend has been established. For this reason the trending analysis included in the Groundwater Report for Well #1315 has been updated with the three additional quarters of data for 1998 that are now available. This entire data set with the three additional sample results has been analyzed using a computer generated linear fit method to illustrate the trend. This trend analysis, provided in Figure 1.0, shows the average decreasing trend to be approximately 36 pCi/l per month total uranium for the period 1988 through December 1998.

Since the NRC, at our January 11, 1999 meeting, expressed skepticism that the more recent monitoring data for Well #1315 truly shows a downward trend, a trending analysis was completed for the 1994 through December 1998 data set. This data set trend is included with this letter as Figure 2.0 and shows an 11.5 pCi/l per month decrease in total uranium concentration in the groundwater monitored by Well #1315. Although the slope of the trend has decreased for the more recent data (i.e., 11.5 versus 36 pCi/l per month), the trend is still noticeably downward.

As noted in the Groundwater Report, Cimarron will continue to monitor the groundwater downgradient from former Burial Area #1 and is now planning to perform further source investigations within the bounds of the former Burial Area. Based upon the most recent analytical data, Cimarron still believes that natural attenuation is an appropriate plan. However, Cimarron is proposing to perform additional localized characterization of the strata within the bounds of the former Burial Area beyond the non-intrusive testing that has already been performed.

The non-intrusive investigation consisted of a subsurface magnetometer survey performed to evaluate whether other solid waste likely remains within the former Burial Area. This study

was performed even though Cimarron believes that the original remediation effort was successful in removing all solid waste. The magnetometer survey was conducted by Kerr-McGee's Hydrogeologic Department, which determined that there were four possible anomalies within the bounds of the former Burial Area. Their report is included as an attachment to this letter. These anomalies will be investigated as discussed herein. However, Cimarron still believes that the lingering groundwater contamination is a result of previously sorbed uranium on the subsurface soils being solubilized over time, and that uranium concentrations in groundwater will continue to decrease. To add further evidence to this belief, Cimarron will perform additional characterization of the subsurface hydrology and strata near former Burial Area #1. Cimarron is preparing a three phase intrusive investigation as outlined below.

The three phases are: (1) subsurface soil sampling within the bounds of the former Burial Area; (2) deeper coring and sampling into the underlying sandstone; and (3) groundwater analyses for samples collected from the deeper coring. The plan includes the following:

- Soil sampling – this phase includes the analysis of soil samples collected from three lines of corings running east and west at grid lines 860N, 830N and 810N. These corings are to be completed down to the top of the sandstone. Each line of corings will include as many as nine locations at 5 meter intervals within the bounds of the former Burial Area. Continuous sample corings will be collected for analysis for total uranium. These analytical results will show if residual concentrations of uranium in soils meet the BTP Option #1 guideline as previously confirmed by Cimarron and ORISE for the 1991 release surveys. Additionally, soil samples will be collected from the four anomalies addressed in the Kerr-McGee Hydrogeologic Department Report. Corings will be collected down to the top of the sandstone and inspected for the presence of solid waste. The approximate locations for the three lines of corings are shown on Figure 3.0. The locations of the four magnetometer study anomaly soil sample investigations are shown on the map included with the magnetometer study attached to this letter.
- Deeper Coring – three soil corings will be completed into the consolidation bedrock to the approximate top of the underlying first mudstone (or into the alluvium) at locations 860N-1240E, 830N-1240E and 810N-1240E. Additionally, three corings will be drilled north and east of Well #1315 at approximate locations 930N-1230E, 915N-1255E and 890N-1280E. Finally, one coring will be collected upgradient from Well #1314 as a background sample. Continuous sandstone corings will be collected for total uranium analysis assuming samples are recovered from the borings. These analyses will be used to profile the sandstone and to determine the residual concentrations of uranium within the sandstone strata. The approximate locations for these corings are shown on Figure 3.0.
- Groundwater Sampling – from the seven deep corings, if possible, water samples will be collected for on-site screening. Water elevations also will be collected from these corings, along with the four monitoring Wells #1314, #1315, #1316 and #1317. Based upon the on-site screening for total uranium, the corings may be completed as

piezometers or wells. The data collected will be used to further characterize the local groundwater near the former Burial Area and to model the mobility of the uranium in the subsurface. Cimarron has assumed that four locations will be completed as two inch monitoring wells for short-term (i.e., four to six months) sampling. With the completion of the data gathering activities, all corings not completed as wells will be grouted.

The information gathered from this additional characterization effort will be summarized in a report to the NRC. Should a discrete source be found during the investigation, then further evaluation may be required, possibly followed by source removal. Also, should this investigation and modeling effort determine that relying upon natural attenuation to achieve the 180 pCi/l total uranium concentration is not in the best interest of Cimarron for achieving its goal of expedient license termination, then other means of accelerating the clean up will be considered.

Although specific locations, sampling frequencies and general coring depths are specified with this plan, site conditions may require modifications in the field. Any required modifications will be discussed in the report submitted to the NRC.

**2. NRC Comment:**

Cimarron should provide a plan describing what it will do to investigate any areas where uranium concentrations in monitoring well levels exceed the proposed groundwater criteria.

**Cimarron Response:**

The most recent groundwater monitoring well environmental data are included as an attachment to this response (i.e., Table 1.0). This data represents the latest 1998 sampling event for all wells on site included under the Site's environmental monitoring program. This recent data was not available for inclusion in the Groundwater Report. As the NRC is aware, these wells are sampled annually with seven wells also included under a quarterly sampling program. The quarterly sampling represents those wells monitoring areas on site with the greater impact from prior site operations. This data set shows that only Well #1315 detects groundwater exceeding the approved total uranium concentration of 180 pCi/l. The proposed plan for addressing the groundwater monitored by Well #1315 is discussed in the response to the first NRC comment.

Since site-wide source removal is essentially complete, Cimarron is confident that the average total uranium concentrations presently reflected by the environmental data will continue to trend downward. The next annual sampling event for all wells within the monitoring program is scheduled for June 1999. Once this analytical data is received and compared to the past environmental data, Cimarron intends to request removal of numerous wells from the monitoring program. The wells that will be included for removal from the monitoring program would represent only those areas where ongoing analyses have shown that within the last 3 years the groundwater criteria (i.e., 180 pCi/l total uranium) has not been exceeded. Presently, under this criteria only three wells would continue to be monitored; they are Wells #1315, #1317 and #1331. These three wells would continue to be

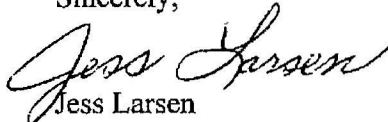


monitored on a quarterly basis until one year of subsequent data shows residual concentrations of total uranium are below the 180 pCi/l criteria for each sampling event. Individual wells would be removed as this goal is achieved. Cimarron believes that Well #1315 will be the only well remaining under this monitoring program after the third quarter of 1999.

In the unlikely event that another well beside Well #1315 exceeds the 180 pCi/l total uranium criteria, then Cimarron will implement a characterization plan that includes resampling of the well to verify the original result. Next, quarterly sampling will be continued for one year to determine whether or not the elevated concentration continues or is simply a one-time spike for that well. Should the elevated concentration continue as verified by the one year of quarterly sampling for total uranium, then Cimarron will implement a plan for potential source identification. The source identification program will include possible soil borings or well installations in the potential areas of concern. The source identification plan, and subsequent remediation if necessary, would be similar to that proposed for Well #1315 as discussed in the Response to NRC Comment #1.

Please advise if you have further questions or we can further clarify any matters for you. We trust that this response and its commitments will satisfy the needs of NRC to then expeditiously approve the Cimarron Decommissioning Plan.

Sincerely,

  
Jess Larsen  
Vice President  
Attachments

jl030499.1e1

**Figure 1.0--Well 1315 Total Uranium**

Linear Curve Fit

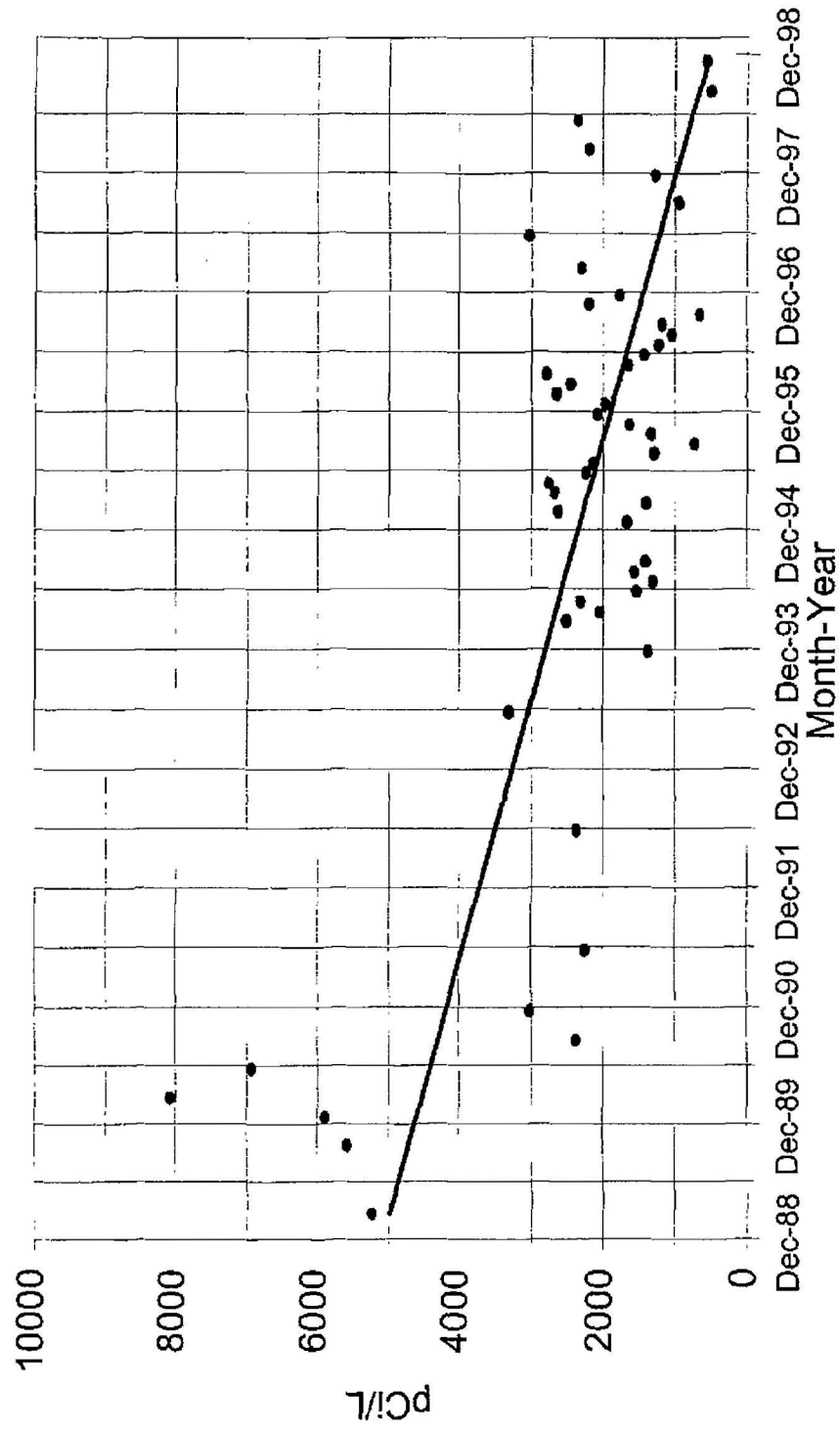
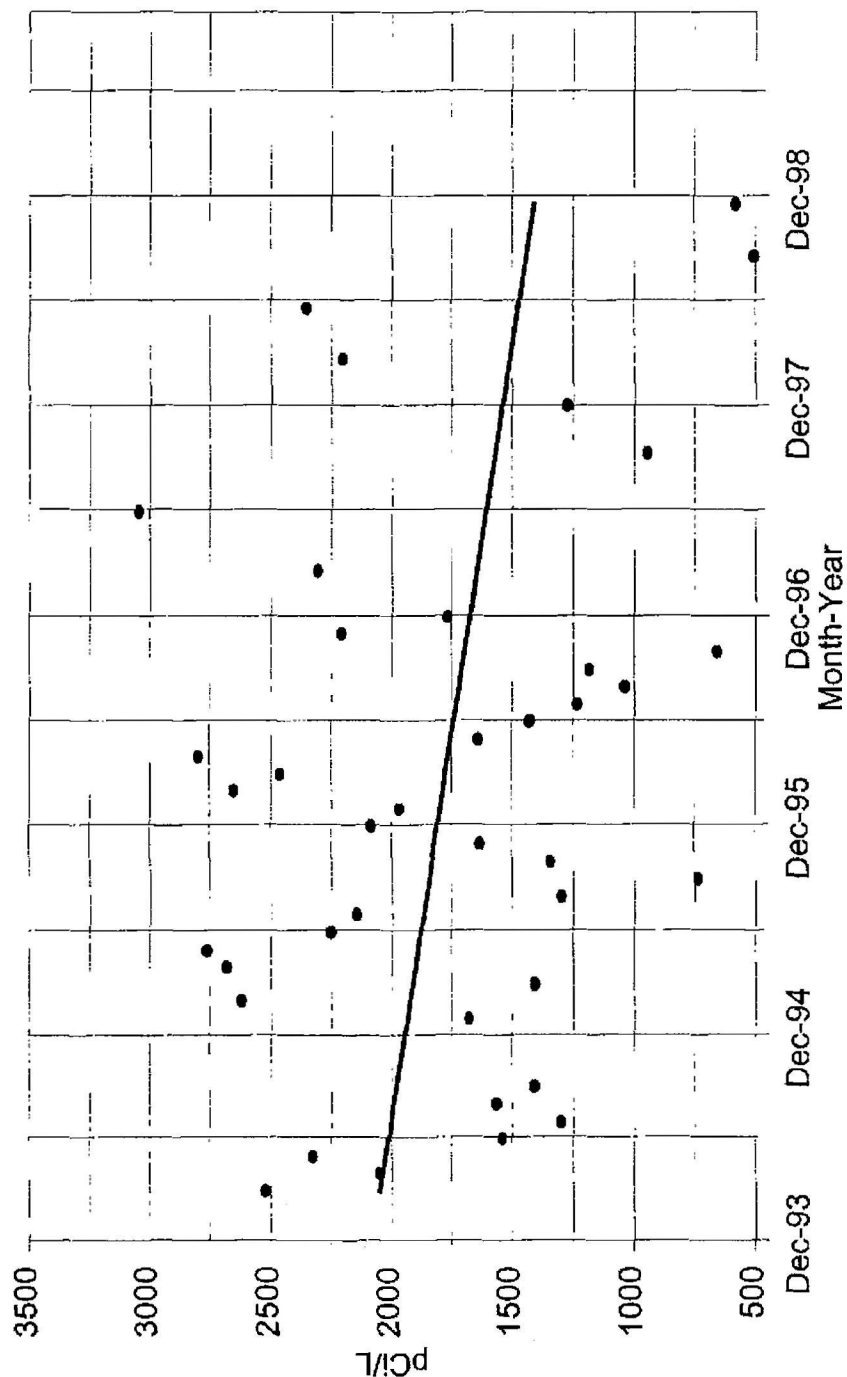
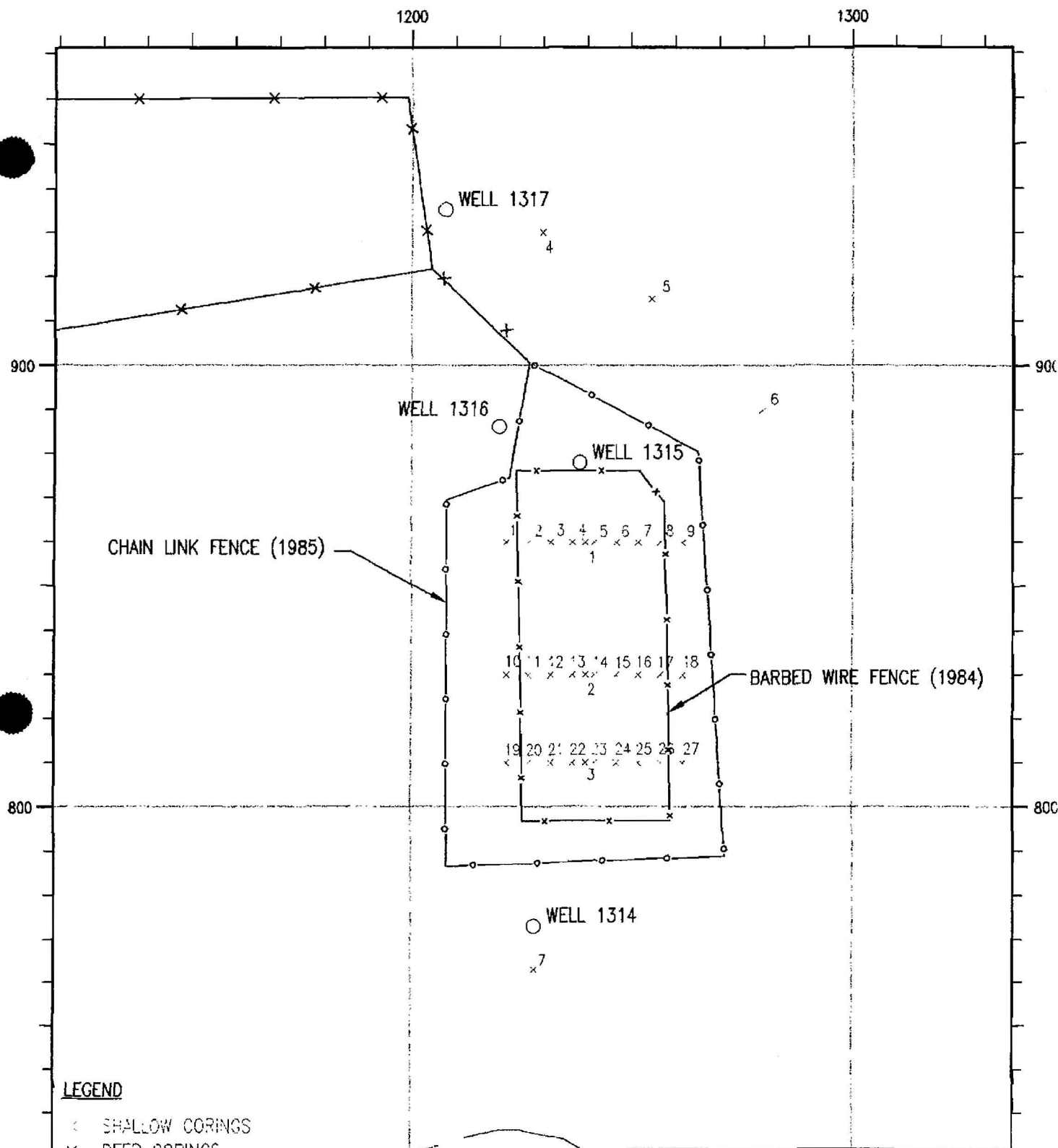


Figure 2.0--Well 1315 Total Uranium

Linear Curve Fit





# LEGEND

- x SHALLOW CORINGS
- x DEEP CORINGS

30 0 30  
SCALE IN METERS



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FIGURE 3.0  
BURIAL AREA #1  
DEEP AND SHALLOW CORING LOCATIONS

REV.	DESCRIPTION	DRWN BY:	CKD BY:	APP'D BY:	DATE	DRWN BY:	DATE	SCALE
0	DRAWING ISSUED.	JE	WR	JL	3/3/99	JE	2/27/99	AS SHOWN
						JOB NO.	DRAWING NO.	REV.
							99BG1	0

**TABLE 1.0**  
**ENVIRONMENTAL MONITORING DATA**

Well#	Sample Date	Gross Alpha pCi/l	238 U pCi/l	234 U pCi/l	235 U pCi/l	Total U pCi/l
1311	5/98	5.1	0.8	1.2	0.1	2.1
1312	12/98	19.5	4.2	18.3	0.5	23
1313	12/98	35.2	6.8	19.8	0.8	27.4
1314	6/98	0.3	0.8	1.8	0.1	2.7
1315	12/98	345	220	345	15.6	580.6
1316	12/98	42.6	21.4	42.3	2.6	66
1317	12/98	57.1	26.8	41.3	2.3	70.4
1320	6/98	19.6	1.4	1.7	ND	3.1
1321	6/98	3	3.7	8.6	0.2	12.5
1322	6/98	4.6	4.2	7.5	1.6	13.3
1323	5/98	7.1	8.3	15.9	1.4	25.6
1324	5/98	ND	0.8	0.7	0.3	1.8
1325	5/98	ND	0.5	0.9	ND	1.4
1326	5/98	2.2	2.2	5.8	0.5	8.5
1327	6/98	1.8	1.1	0.7	ND	1.8
1328	5/98	ND	8.0	22.1	2.0	32.1
1329	5/98	2.1	2	3	0.2	5.2
1330	5/98	8.9	4	11.9	0.5	16.4
1331	12/98	91.7	20.9	105	9.1	134.9
1332	6/98	17.9	12.0	22.6	0.8	35.4
1333	6/98	4.1	4.3	12.2	0.8	17.3
1334	5/98	1.1	4.9	8.0	0.8	13.7
1335	6/98	2.9	0.6	1.4	ND	2
1336	12/98	48.1	6.1	21.7	1.2	29
1337	6/98	20.5	4.9	12.1	0.8	17.8
1338	6/98	ND	0.5	0.05	0.1	0.65
1339	6/98	ND	4.2	13.5	0.3	18
1340	6/98	1.9	1.0	3.6	0.1	4.7
1341	6/98	6.9	0.7	1.3	0.3	2.3
1342(W)	6/98	4.8	2.6	5.0	0.2	7.8
1343(M)	9/98	7.6	6.2	6.9	0.2	13.3
1344(E)	6/98	7.7	3.1	4.4	0.4	7.9

## MAGNETOMETER SURVEY CIMARRON CORPORATION, BURIAL GROUND #1

### INTRODUCTION

A geophysical survey was conducted at the Cimarron Corporation's Former Nuclear Fuel Fabrication Facility in Crescent, Oklahoma during July 1998. The area of interest was former Burial Ground #1 (BG-1) and the purpose was to evaluate a cause for elevated concentrations of uranium in groundwater monitoring wells in that area. This burial ground was constructed during 1965 and opened in 1966 for disposal of radioactive waste material in accordance with 10 CFR 20. Burial Ground #1 was closed and capped in 1970. From 1986 to 1988, waste buried within BG-1 was exhumed and shipped off-site for disposal.

The geophysical equipment, designed to detect buried ferrous metals, was a G-858 Cesium magnetometer manufactured by Geometrics. The study was an attempt to verify the presence of any remaining drums which may have caused impact to the groundwater. Data compilation and processing was performed with Magmap, a computer program developed by Geometrics.

### DISCUSSION

The survey lines for the magnetometer study were spaced 1.5 meters apart in a north/south direction. Station locations were plotted by use of Global Positioning System (GPS) equipment.

The spatial gradient of the local magnetic field was obtained by using two magnetometers in tandem, one above the other separated by a few feet. The gradient is obtained by differencing two simultaneous measurements and dividing by the sensor separation.

The earth's natural magnetic field will tend to concentrate in iron objects. A higher magnetic field is noted in areas with a high iron concentration, such as steel drums or other iron-containing metal.

### DATA INTERPRETATION

Flat, or near flat, areas of the map are termed magnetically smooth and are not believed to contain buried ferrous metal (Figure 1). Magnetically smooth areas would be indicated by areas with background magnetization but could possibly include non-ferrous objects which would not exhibit a magnetic anomaly. Strong anomalies are typically indicated by steep contours or a steep gradient as evidenced by the monitor wells in Figure 1. The greater the difference between background magnetization and the magnetization of the anomaly, the more intense the gradient.



By using the vertical gradient magnetometer, the exact location of the buried metal should lie directly beneath the anomaly. Assuming the GPS positioning is accurate, the mapped presentation will accurately reflect the locations of the anomalies. However, the magnetometer and GPS equipment used for this survey were separate data collecting units rather than combined. A slight error in true station position may be noted by the map locations of the anomalies created by the steel monitor well protective casing. When compared to the mapped position of the monitor wells, the anomalies do not match exactly with the well locations.

Scattered fragments of metal wire and other metal debris were noted throughout the area of investigation. It is possible that other ferrous debris may have been just beneath the surface. As observed from the gradiometer map, the strongest magnetic anomalies are near the monitor well locations. Four smaller, weaker, anomalies, highlighted on Figure 1, are also noted in the surveyed area. Judging from the strong magnetic response exhibited by the steel well protector pipes, the response from the four anomalies appears to be less than would be expected from buried steel.

#### CONCLUSIONS

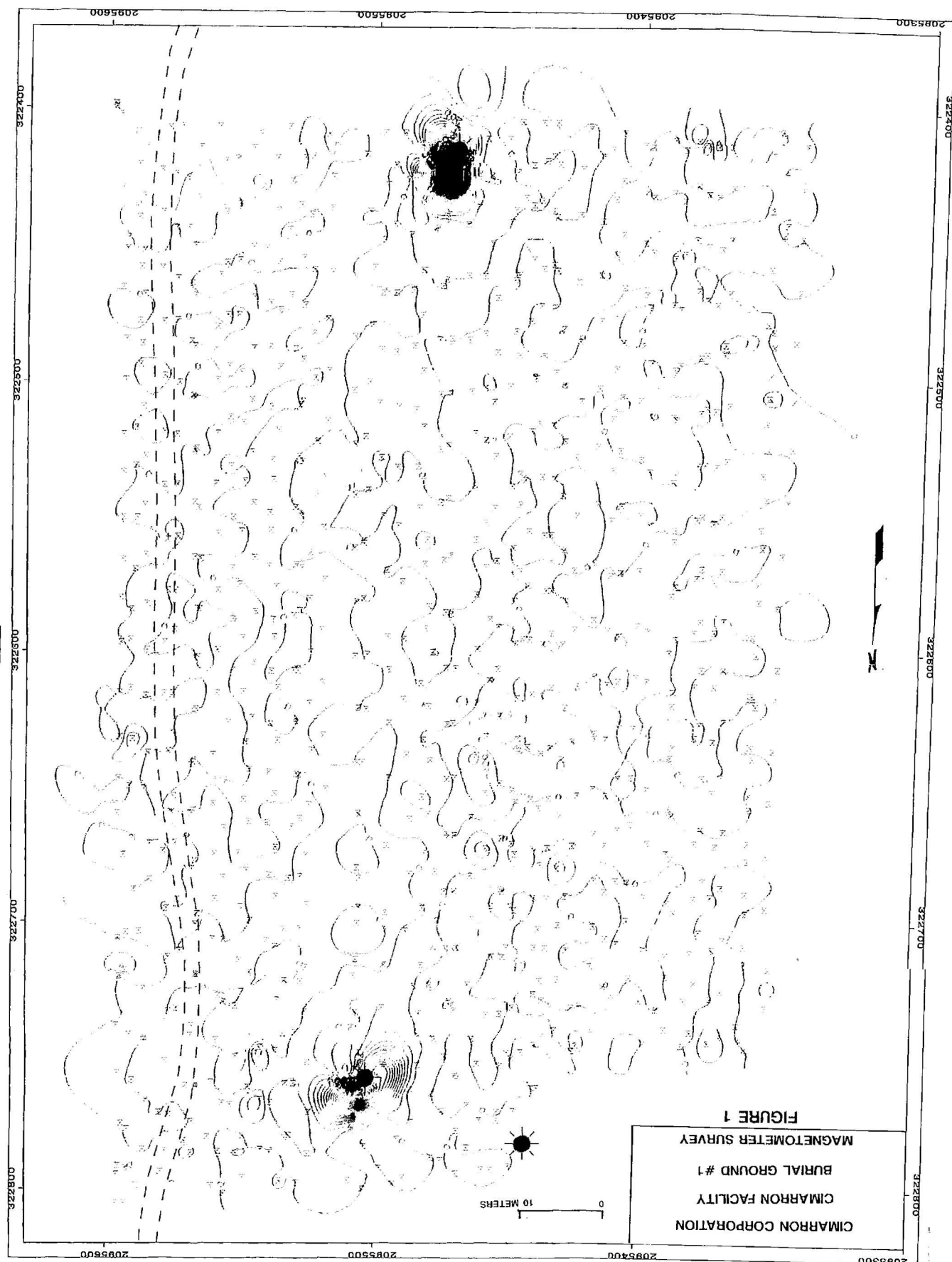
Based on these observations, the likelihood of drums remaining at the burial site are remote. The evidence from the geophysical survey tends to discount the presence of drums missed during the initial excavation and removal thirteen years ago. While there are other mild magnetic responses in the survey area, none of them bears the more intense signature of a buried steel drum.

## REFERENCES

Barrows, L. and Rocchio, J., 1990, Magnetic surveying for buried metallic objects. *Groundwater Monitoring Review*, v.10, no.3, pp. 204-211.

Martinek, B.C., 1988, Ground based magnetometer survey of abandoned wells at the Rocky Mountain Arsenal – a case history in *Proceedings of the Symposium of the Application of Geophysics to Engineering and Environmental Problems*, Golden, Colorado, March 1988.

Schlenger, C.M., circa 1989, Magnetometer and Gradiometer Surveys for Detection of Underground Storage Tanks: *Bulletin of the Association of Engineering Geologists*.



CIMARRON CORPORATION  
BURIAL GROUND #1  
MAGNETOMETER SURVEY  
FIGURE 1