



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

December 16, 2002

Mr. Russell H. Jones, Project Manager
Kerr-McGee Corporation
Kerr-McGee Center
P.O. Box 25861
Oklahoma City, Oklahoma 73125

SUBJECT: NRC INSPECTION REPORT 40-8006/02-01

Dear Mr. Jones:

On August 7 and September 16, 2002, the NRC completed an inspection of your Kerr-McGee Chemical, LLC, Technical Center site located in Oklahoma County, Oklahoma. The enclosed report presents the scope and results of this inspection.

The primary purpose of this inspection was to conduct a confirmatory sample in-process review of your decommissioning efforts and radiological surveys at the Technical Center. The inspection included the collection and analysis of neutralization pit sludge and soil radiological surveys of an area where building construction is being proposed. The inspection also included a tour of your onsite counting laboratory. No violations of NRC regulations were identified.

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

Should you have any questions concerning this inspection, please contact D. Blair Spitzberg, Ph.D. of my staff at (817) 860-8191.

Sincerely,

/RA/

Ken E. Brockman, Director
Division of Nuclear Materials Safety

Docket No.: 40-8006
License No.: SUB-986

Enclosure: As stated

cc: (see next page)

Kerr-McGee Corporation

-2-

cc w/enclosure:

Mike Broderick, Director

Oklahoma Department of Environmental Quality

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DOCUMENT NAME: Draft: s:\dnms\fcdb\rmunoz\20800601.wpd Final: R:_DNMS\

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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket No.: 40-8006

License No.: SUB-986

Report No.: 40-8006/02-01

Licensee: Kerr-McGee Company

Facility: Kerr-McGee Chemical, LLC, Technical Center

Location: Intersection of NW 150th Street and State Highway 74
Oklahoma County, OK

Dates: August 7 & September 16, 2002

Inspectors: R. Rick Muñoz, Health Physicist

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

Attachments: Supplemental Information

ADAMS Entry: IR 04008006-02-01; on August 7 & September 16, 2002;
Kerr-McGee Corporation; Technical Center. Decommissioning
Report. No violations were identified.

EXECUTIVE SUMMARY

Kerr-McGee Chemical, LLC, Technical Center
NRC Inspection Report 40-8006/02-01

Kerr-McGee Corporation has notified NRC of their desire to decommission their Technical Center located north of Oklahoma City, and terminate License SUB-986. At the Technical Center, the licensee uses radiological laboratories and possessed a series of calibration test pits containing uranium ores and its progeny. On July 11, 2000, Kerr-McGee Corporation submitted a decommissioning plan (DP) to the NRC. Based on the insufficient content of the DP as documented in the NRC's completeness review letter dated August 11, 2000, this plan was withdrawn on August 24, 2000, at which time the licensee stated their intent to revise their DP to include characterization and modeling of the pit area and to develop derived concentration guideline levels (DCGLs). The review of revised DP submitted to the NRC was not the subject of this inspection. The NRC determined, however, that the licensee was authorized under their license to begin certain decommissioning activities including excavation of the test pits and disposal of buried material prior to approval of their DP. In 2001, the licensee notified NRC Region IV that they had completed excavation of the test pits and confirmatory measurements were performed by the NRC.

During this inspection a split neutralization sludge pit sample was taken and radiological surveys were performed of an area where a proposed storage building is to be erected. The pit sludge sample was sent to Oak Ridge Institute for Science and Education (ORISE) for analysis. The licensee's counting methodology was reviewed.

The conclusion on each major area examined is listed below:

Soils Analytical Laboratory

The use of a spectrum fitting analytical method for soil sample analysis was found to be acceptable. Sample preparation and splitting was observed by the inspector and was found to be acceptable (Section 2).

In-Process Confirmatory Survey

The confirmatory exposure-rate measurements and neutralization pit sludge sample analysis results were all below the applicable NRC release criteria. These confirmatory measurements were consistent with the licensee's determination that the proposed storage building site and the neutralization pit meet the criteria for unrestricted use in the proposed site decommissioning plan submitted by the licensee. Since the licensee does not have an approved decommissioning plan, the sample results will await comparison to specific radiological criteria for license termination once they are approved.

The neutralization pit sludge sample analytical results between the NRC contract laboratory and the licensee's laboratory were statistically not in agreement for total uranium. As for the one uranium result that was not in agreement, the respective values were well below the acceptance criteria. Therefore, in these cases the lack of analysis agreement between the

laboratories is not considered significant. Alpha spectroscopy results confirmed that the release criteria was not exceeded. If statistical disagreements between the licensee and NRC analytical results continues, this issue will be tracked as Inspection Follow-up Item (IFI) to assess whether future analytical comparisons result in similar disagreements (Section 3).

Close-out Inspection and Radiological Survey

The inspector performed radiological surveys of an area where the licensee is proposing to erect a new storage building. The soil radiological surveys and soil background levels measured by the NRC in this area were consistent with background levels previously collected and determined by the NRC and the licensee. NRC radiological survey results were consistent with the licensee's radiological measurements. The confirmatory exposure-rate measurements and licensee soil sample analysis results were all below the proposed release criteria. These confirmatory measurements were consistent with the licensee's determination that the proposed storage building site meets the criteria for unrestricted use in the proposed site decommissioning plan submitted by the licensee. Since the licensee does not have an approved decommissioning plan, the sample results will await comparison to specific radiological criteria for license termination once they are approved.

The highest laboratory results from soils collected by the licensee showed activities not exceeding one-half of the Fraction of the Maximum Permissible Concentrations (FMPC) proposed in the licensee's DP (Section 4).

Report Details

1. Facility Status (88104)

1.1 Scope

The site status and decommissioning activities were reviewed to determine if activities were being conducted in accordance with the regulatory requirements and the proposed Kerr-McGee Technical Center Site Decommissioning Plan (DP).

1.2 Observations and Findings

The Kerr-McGee Technical Center (KM) is located north of Oklahoma City, near the intersection of NW 150th Street and State Highway 74, Oklahoma County, Oklahoma. The Kerr-McGee Technical Center is a research facility with approximately 50 research laboratories on site. Approximately 25 of these laboratories presented a potential for a source of radioactive contamination. The facility, including the 25 laboratories no longer handle any radioactive material. The facility employs approximately 85 people who work primarily on titanium dioxide and electric batteries, and do not deal directly with radioactive substances. The site occupies approximately 160 acres. Although there are nearby agricultural operations, apartments and condominiums, and golf courses, the parcel of land is expected to remain commercial property.

Opened in 1965, KM was used for research and development involving chemical, nuclear, oil, gas and coal production. Radioactive contamination of the site mainly stemmed from outdoor test pits where probes for uranium exploration were tested and indoor laboratories where samples of ores were examined. The source materials tested at the Kerr-McGee Technical Center consisted of natural uranium and thorium daughters and purified natural uranium and depleted uranium without daughters. The materials which could be present in any form were typically ores containing uranium and thorium, yellowcake (U_3O_8), intermediate solid and liquid process streams from a uranium mill, conversion facility and a rare-earths facility, and UF_6 in gaseous or liquid form were typically provided in 2 kg cylinders. All of these materials came from licensed fuel cycle facilities. Uranium exploration geological core samples were also tested at this facility. At the Technical Center, the licensee had operated a series of calibration test pits containing uranium material, primarily ores and ore concentrates, that had been blended with natural sands to produce dilute known concentrations of uranium and its progeny. Kerr-McGee Chemical, LLC operations took over the site and uses all of its available laboratory space for non-licensed activities.

By letter dated January 7, 1999, Kerr-McGee Corporation notified NRC Region IV of the company's desire to decommission their Technical Center and terminate License SUB-986. The site has been largely decommissioned with the bulk of the radioactive ore removed and shipped offsite for disposal. Any residual radioactivity on the site is in areas which have been identified as survey units classified as Class 1 and Class 2. Much of the site is classified as unaffected.

An open meeting between the licensee's staff, consultants and NRC representatives was held on January 22, 1999. The purpose of this meeting was to discuss issues associated with the decommissioning of the "test pits" and termination of the license. Subsequent to that meeting on July 11, 2000, the licensee submitted a DP. Based on the insufficient content of the DP as documented in the NRC's completeness review letter dated August 11, 2000, this plan was withdrawn on August 24, 2000. On August 24, 2000, another open meeting was held to discuss specific decommissioning and decontamination issues associated with the Technical Center. During that meeting, the licensee stated that it was their intent to revise the DP to include characterization and modeling of the pit area and to develop DCGLs. Also during that meeting, the NRC stated that the licensee was authorized under their license to begin certain decommissioning activities including excavation of the test pits and disposal of buried material prior to approval of their DP. In early 2001, the licensee notified NRC Region IV that they had completed excavation of the test pits and they were ready for any confirmatory measurements NRC intended to perform. The latest DP was revised in March 2001, and submitted by the licensee on April 5, 2001, which is currently under NRC review. NRC Region IV handled most of the review except for the DCGLs. The licensee has developed DCGLs for both contaminated soil and indoor building surfaces using the D and D code and also RESRAD-BUILD. The latest analyses used ICRP-72 methodology consistently except in one area: the licensee chose the adult to be the exposed critical group and did not elect to calculate the five age groups stipulated in ICRP-72. The application of ICRP-72 dose methodology to the calculation of the DCGLs is one of the few remaining issues for this site.

Region IV staff visited the site on June 26, 2002, and met with representatives of Kerr-McGee Corporation to discuss the use of ICRP-72 methodology in the determination of DCGLs for both soil and contaminated building surfaces at the Kerr-McGee Technical Center, Oklahoma City, OK.

The licensee met with NRC Headquarters staff on September 25, 2002, to discuss the outstanding issues. Kerr-McGee emphasized its interest in achieving quick resolution of the remaining issues because the State of Oklahoma is planning to widen a road that would come close to the excavated test pit location.

During this inspection, a sludge sample was collected from an active neutralization pit servicing 50 research laboratories onsite. Approximately 25 of these laboratories presented a potential for impacting the neutralization pit as a source of radioactive contamination. The neutralization pit undergoes routine maintenance by replacing the limestone filtration system to improve its effectiveness.

In addition, radiological surveys were performed in an area where the licensee is proposing to build a new storage building in a non-impacted area. This area is not affected nor impacted under the proposed decommissioning plan. This proposed building construction is adjacent to a buffer zone of a Class 2 area which is the closest impacted area.

1.3 Conclusions

Site decommissioning activities were found to have been conducted in accordance with the proposed decommissioning plan submitted to the NRC. Areas being decommissioned by the licensee will continue to be controlled pending approval of the decommissioning plan.

2 Analytical Laboratory (83890)

2.1 Scope

The inspector toured the licensee's onsite laboratory. Sample preparation and splitting of the pit sludge sample was observed. The analytical method used was discussed with licensee's contractors responsible for operating the laboratory.

2.2 Observations and Findings

The licensee used their in-house laboratory to analyze the neutralization pit sludge sample collected. This laboratory was operated by the licensee's contractor, NEXTEP Environmental. The inspector observed the licensee's contractors split the samples and run a wet sample analysis. The licensee used appropriate controls to prevent cross contamination and to maintain sample integrity.

The analytical method used at this laboratory is based on a total spectrum fitting and not photo peak identification. This method is described in PB 280 237, "Least-Square Resolution of Gamma-Ray Spectra in Environmental Samples," published by the Tennessee Valley Authority and the Environmental Protection Agency in August 1977. The licensee assumes that their samples only contain four constituents: natural uranium, radium-226, thorium and potassium-40. Therefore, any observed spectrum must be the sum of these four spectras corrected for concentration of each individual constituent. By using a reiterative process and finding the best least-square fit, the concentration of each constituent is determined. The licensee had used this method for many years and it has been previously examined during other NRC inspections.

The laboratory uses a 5-inch NaI(Tl) well detector that allows for very short sample count time of 2 minutes. Appropriate minimum detectable concentrations (MDCs) are achieved, because, unlike in traditional spectrum analysis where only the photons detected in the region of interest of the photo peak are considered, all detected photons are considered.

This analytical method is normally performed on a dry sample, although a wet sample was analyzed for preliminary data information and comparison by the licensee. The inspector did not remain in the laboratory for the drying operation and analysis of the sample. Sample results were presented and reported on September 16, 2002.

2.3 Conclusions

The licensee's use of a spectrum fitting analytical method for the pit sludge sample analysis was found to be acceptable. Sample preparation and splitting was observed by the inspector and was found to be acceptable. The drying technique and analysis of the sample was not observed.

3 In-Process Confirmatory Survey (83890)

3.1 Scope

The inspector requested and observed licensee contractor staff collect a sludge sample from the neutralization pit for independent and confirmatory analysis. One sludge sample was collected for this evaluation. No background reference was possible other than background reference area soil data from previous sampling events. The NRC analysis results and their comparison to the licensee's results are listed below. Note that the licensee does not have an approved decommissioning plan.

3.2 Observations and Findings

a. Pit Sludge samples

On August 7, 2002, the inspector observed the licensee's contractor staff collect one split sludge sample from the neutralization limestone pit. This sample was prepared, split, and analyzed by the licensee. The NRC split was sent to Oak Ridge Institute for Science and Research (ORISE) laboratory for analysis.

b. Results Comparisons

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

TABLE 1
Acceptance Criteria¹

Resolution²	Ratio³
<4	0.4 - 2.5
4 - 7	0.5 - 2.0
8 - 15	0.6 - 1.66
16 - 50	0.75 - 1.33
51 - 200	0.80 - 1.25
>200	0.85 - 1.18

¹ Criteria from Inspection Procedure 84525

² Resolution is the NRC result divided by its associated 1 σ uncertainty.

³ Ratio is the licensee result divided by NRC **result**.

TABLE 2
Sample Analysis Comparison of Sludge Samples
from the Neutralization Pit
Collected on August 7, 2002

Sample # /Isotope	KM Analysis pCi/g ¹	NRC Analysis pCi/g ¹	Resolution ²	Ratio ²	Agreement Status ²
#1	Pit Sludge Sample				
Ra-226	0.77 ± 0.036	0.86 ± 0.07	12	.89	Agreement
U-238	0.6 ± 0.04	1.29 ± 0.24	5	.46	Agreement
Th-228	Not Measured	0.62 ± 0.05			
Th-232	Not Measured	0.66 ± 0.08			
U-Total(234,235,238)	1.30 ± 0.455	3.29 ± 0.33	9	.39	Disagree
Total Thorium	1.37 ± 0.116	1.28 ± 0.09	14	1.07	Agreement

¹ Kerr-McGee reported their uncertainties as two sigmas. ORISE laboratory reported their uncertainty as one sigma.

² Resolution, ratio and agreement status were determined from Acceptance Criteria Table above.

The gamma emission of thorium-234 was used to quantify the uranium-238 present. Total uranium was determined from the relative radiological abundance of U-234 and U-235 to U-238. The results are presented in Table 2.

The samples were analyzed for uranium, thorium and radium. The NRC splits were analyzed by the ORISE laboratory using a traditional peak identification gamma spectroscopy program. The licensee's contractor NEXTEP analyzed the samples at their Kerr-McGee Technical Center laboratory using their least-square resolution method. Table 2 summarizes the exposure rates and gamma spectroscopy analysis sample results. The NRC sample was further analyzed by alpha spectroscopy.

The criteria in NRC Inspection Procedure 84525, "Quality Assurance and Confirmatory Measurements," was used for comparison of licensee and NRC results. All but one of the results were in agreement between the laboratories. With respect to the one uranium result that was not in agreement, the respective values were well below the proposed release criteria of 170 pCi/g. In addition, the measured levels were consistent with previously measured soil background. Therefore, in these cases the lack of analysis agreement between the laboratories is not considered significant. Alpha spectroscopy results confirmed that the proposed release criteria was not exceeded.

3.3 Conclusions

The confirmatory exposure-rate measurements and neutralization pit sludge sample analysis results were all below the proposed release criteria. Sample results will await comparison to specific radiological criteria for license termination once they are approved.

The neutralization pit sludge sample analytical results between the NRC contract laboratory and the licensee's laboratory were statistically not in agreement for total uranium. As for the one uranium result that was not in agreement, the respective values were well below the proposed release criteria. Therefore, in these cases the lack of analysis agreement between the laboratories is not considered significant. Alpha spectroscopy results confirmed that the release criteria was not exceeded. If statistical disagreements between the licensee and NRC analytical results continues, this issue will be tracked as an Inspection Follow-up Item (IFI) to assess whether future analytical comparisons result in similar disagreements.

4 Closeout Inspection and Radiological Surveys (83890)

4.1 Inspection Scope

The site status and decommissioning activities were reviewed to determine if activities were being conducted in accordance with the license, regulatory requirements, and the Kerr-McGee Chemical, LLC, proposed decommissioning plan. Confirmatory soil exposure-rate measurements were conducted in an area where the licensee proposes to erect a new storage building. The area surveyed is located in a non-impacted zone adjacent to Survey Unit 4 which has been classified as a Class 2 area.

The inspector used a Ludlum Model 19, Micro-R Meter, NaI(Tl) Gamma Scintillator, Serial Number 33537, NRC Number 015540, to measure exposure rates. This instrument was last calibrated on December 10, 2001, and is due for recalibration on December 10, 2002.

4.2 Observation and Findings

a. Background Measurements

To determine applicable background values for ambient exposure monitoring, the inspector obtained gamma measurements from the fence line at the entrance to the property and at the front parking lot located in front of the main entrance to the facility. Background levels were established at 12 micro Roentgens per hour.

b. Proposed building site area

On September 16, the inspector conducted confirmatory surveys of an area where the licensee is proposing to erect a new storage building. The area is located in the northwest part of the property and measures 17 x 18 meters and is located in a non-impacted zone adjacent to Survey Unit 4 which has been classified as a Class 2 area. The proposed building 18 x 42 feet will set on a foundation measuring 28 x 50 feet. The proposed site is located north of the Technical Sales & Service Labs (TSSL) between an existing storage building and sample storage building. The inspector used the same 5 x 5 meter grid system that had been established by the licensee for area surveys. The inspector measured the exposure rate at 1-foot above the surface of the soil.

c. NRC Collected Background Soil Samples

During a previous inspection on February 6, 2001, with the aid of the licensee's staff, the inspector collected soil samples in areas outside the licensee's controlled area that were not likely to have been impacted by licensed operations. These samples were split, prepared and analyzed by the licensee and the other half of the split was sent for analysis by NRC's Region III Laboratory. Where NRC results were reported as less than the respective value, no direct comparison was made with the corresponding licensee result. The results of these analyses are listed below.

TABLE 3
Background Soil Samples

Location	KM Detector 1 Total U pCi/g	KM Detector 2 Total U pCi/g	NRC U-238 pCi/g	NRC Total U pCi/g
South of North Section SW Pond	1.8 ±1.10	3.1 ±0.60	<1.96	<4.01
East of Tech Center Outside Property	2.4 ±1.07	2.2 ±0.51	<2.59	<5.31
Creek North of Esperanza Development	3.5 ±1.41	1.2 ±0.56	<3.34	<6.85
Southwest of South Bridge Access Road	1.6 ±0.97	2.3 ±0.49	<2.67	<5.47
South of Technical Center near Hwy. 74 & NW 150 th	1.7 ±1.08	2.2 ±0.44	<3.54	<7.25

TABLE 4
Soil Samples at Proposed Building Site
Collected on September 16, 2002 by Kerr-McGee

Location	Total U pCi/g	Natural Th pCi/g	Ra-226 pCi/g	Net FMPC	NRC Survey µR/Hr
223E-712N 0-.15M	4.81 ± 0.451	1.80 ± 0.110	0.95 ± 0.033	0.03	10
224E-711N 0-.15M	3.37 ± 0.387	1.41 ± 0.095	0.83 ± 0.030	-0.09	10
224E-712N 0-.15M	13.08 ± 0.679	1.55 ± 0.138	2.90 ± 0.071	0.58	18
224E-712N .15-.5M	5.79 ± 0.538	1.89 ± 0.128	1.31 ± 0.044	0.15	12
224E-712N .5-1M	2.58 ± 0.470	2.07 ± 0.122	0.86 ± 0.031	0.04	10
224E-713N 0-.15M	2.99 ± 0.451	1.86 ± 0.117	0.62 ± 0.026	-0.07	10
225E-712N 0-.15M	5.83 ± 0.520	1.69 ± 0.117	2.10 ± 0.051	0.34	12

d. Radiological Surveys

The results of radiological survey measurements, performed within the proposed storage building area by the inspector, were all at or below the background levels established by the licensee (3520 cpm) and NRC (12 microR/hr). There was one small area less than 1-square foot where survey readings were just below twice the established background levels. The licensee collected seven soil samples from zero to

1-meter depth within a 1-square meter area to isolate and define the area showing the slightly elevated readings.

4.3 Conclusions

The soil radiological surveys and soil background levels measured by the NRC in this area were consistent with background levels previously collected and determined by the NRC and the licensee. The confirmatory exposure-rate measurements and licensee soil sample analysis results were all below the proposed DP release criteria. These confirmatory measurements were consistent with the licensee's determination that the proposed storage building site meets the criteria for unrestricted use established in the proposed site decommissioning plan submitted by the licensee. Since the licensee does not have an approved decommissioning plan, the sample results will await comparison to specific radiological criteria for license termination once they are approved.

The highest laboratory results from soils collected by the licensee showed activities not exceeding one-half of the FMPC proposed in the licensee's DP.

5 **Exit Meeting Summary**

On December 2, 2002, after the results of laboratory analysis of the neutralization sludge pit sample collected by the inspector were received and analyzed, a final telephonic exit briefing was conducted with the program manager. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspector. There were no violations noted.

ATTACHMENT 1

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee

R. Jones, Program Manager
M. Logan, Vice President
K. Morgan, Corporate Radiation Safety Officer
H. Gay, Decommissioning Supervisor (Technical Center)
L. Smith, QA Coordinator
J. Johnson, Radiation Safety Officer

NEXTEP Environmental (Licensee Contractor)

S. Marshall, Contractor
R. Callahan, Contractor
W. A. Rogers, Contractor
H. J. Newman, Health Physicist
L. Morgan, HP Technician

INSPECTION PROCEDURES USED

IP 88104 Decommissioning Inspection Procedure for Fuel Cycle Facilities
IP 83890 Closeout Inspection and Survey

ITEMS OPENED, CLOSED AND DISCUSSED

None

LIST OF ACRONYMS

FMPC	Fraction of the Maximum Permissible Concentrations
DCGLs	Derived Concentration Guideline Levels
DP	Decommissioning Plan
MDC	Minimum Detectable Concentration
NRC	Nuclear Regulatory Commission
pCi/g	Pico-Curies per gram
pCi/l	Pico-Curies per liter
IFI	Inspection Follow-up Item