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In The Matter of)
Kerr-McGee Chemical Corporation) Docket No. 40-2061-ML
(West Chicago Rare Earths Facility)) ASLBP no. 83-495-01-ML
)

AFFIDAVIT

Gerald R. Thiers, being first duly sworn upon his oath, states and deposes as follows:

1. I am Gerald R. Thiers, a Principal Geotechnical Engineer with MK-Environmental Services, San Francisco. My academic credentials are BS (1956), MS (1959) and PhD (1965) all in Civil Engineering from the University of California, Berkeley. Emphasis for the BS degree was on construction engineering; emphasis for the MS and PhD degrees was on geotechnical engineering. I am a member of the American Society of Civil Engineers, a registered Civil Engineer in California, Pennsylvania and Washington, and a registered Geotechnical Engineer in California.

My work experience includes:

- o 1957 - 1959: Soils Engineer for U.S. Army Corps of Engineers, Seattle, Washington.
- o 1962 - 1965: Research Assistant, University of California, Berkeley, California.
- o 1965 - 1970: Assistant Professor, Carnegie-Mellon University, Pittsburgh, Pennsylvania.
- o 1980 - Present: Principal Geotechnical Engineer, MK-Environmental Services, San Francisco, California.

2. My involvement with reclamation of radioactive tailings includes:

- o **Union Carbide Uranium Tailings Reclamation Project** - Supervised consolidation, seepage and seismic analyses for 45-foot high major tailings deposit near Uravan, Colorado.
- o **Uranium Mill Tailings Remedial Action (UMTRA) Program** - Developed criteria and design and analysis procedures for design of Title I uranium tailings repositories at 24 locations in 10 states, repository volumes ranging from 40,000 to 2.3 million cubic yards, with land areas from 8 to 90 acres. Supervised

preparation of construction drawings and specifications for Canonsburg, Pennsylvania; Shiprock, New Mexico; and Slickrock, Colorado; sites, and managed engineering during construction for Canonsburg, Shiprock and Lakeview, Oregon sites.

3. I have reviewed the following documents:

A. Contentions filed by the State of Illinois regarding the proceeding before the NRC's Atomic Safety and Licensing Board.

B. Kerr-McGee Motion for Summary Disposition of the Remaining Contentions, dated December 22, 1989.

C. Affidavit of James L. Grant Concerning Contention 2(r).

D. Statement of Material Facts [Portions Concerning Contentions 2(h) and 2(r)].

4. I have formed the following opinions concerning Contentions 2(h) and 2(r):

5. Concerning Contention 2(h):

This contention provides:

"The decommissioning proposal does not include specific and adequate measures for excluding human beings from the site over the long-term. Given the 14-billion-year half-life of thorium, the NRC's acknowledgement that perpetual care of the site will be necessary, and the site's proximity to residences, commercial establishments, and public schools, discussion of such measures is crucial to evaluating the feasibility of onsite disposal."

A. The Motion for Disposition, Page 11, includes the statement, "The thickness of the cell cover, including the intrusion barrier, will make it unlikely that casual digging would proceed far enough to penetrate the wastes". There seems to be agreement that at least casual digging will not be excluded by the cell design. While "casual" digging alone may or may not expose and spread the tailings, either of two combinations of digging and precipitation could cause this unacceptable development:

1) Because the cover is not designed to resist the PMP (as required by the NRC), gullies will form, exposing first the cobbles underlying the topsoil, and, in turn, the sand, clay and tailings buried below. Any of these materials may be so attractive to a passer-by as to cause digging to proceed beyond the "casual" stage, the final depth depending on the needs, desires and persistence of the inevitable intruder.

2) Even "shallow" digging or rutting caused by dirt bikes will accelerate the formation of gullies by the rains and runoff of the West Chicago area.

Once initiated gullies will continue to grow toward an equilibrium condition, well below the upper surface of the tailings, unless each recurrence of gully formation is corrected by active maintenance.

B. Another statement in the Motion for Disposition, Page 11, is "The appearance of the cell, as well as the cover's artificial layering, would serve to alert any inadvertent intruder that the cell is not a natural formation." A person seeking topsoil, cobbles, sand or clay will be delighted to discover a uniformly thick layer of whichever of these he is seeking. And each disturbance must be corrected by active maintenance, or gully formation and exposure of the tailings will be accelerated, as noted in 2) above.

C. Finally the Motion (Page 11) includes the statement, "The fact that West Chicago is now a populated region should not be a significant factor in assessing the likelihood of intrusion over the long term." If this reasoning were applied elsewhere one might say, "The fact that there will be water in the reservoir should not be a significant factor in designing the dam". Of course the fact that West Chicago is a heavily populated area (compared to rural Illinois) will greatly increase the probability of intrusion. To reason otherwise flies in the face of all statistical analysis and reasoning. The greater the number of people passing the site and living near the site the greater the probability that intrusion will occur. I know of no other design which contends that a population center of the size of the Chicago area could change to the equivalent of a rural area.

D. In Summary: The Motion for Disposition agrees that the cell design does not prevent digging into the cell. In my opinion this increases the need for active maintenance, both for cases where the person digging discovers desirable materials, such as topsoil, cobbles, clay and sand, as well as for the cases where the digging combines with the inadequate erosion protection design (the cover is not designed to resist storms as required by the NRC) to enhance the growth of gullies which will lead to the spread of tailings. Furthermore I think ignoring the population density of West Chicago and proposing to base design decisions on the concept that the density could decrease to a negligible value is unreasonable. These issues raise serious questions about the feasibility of onsite disposal.

6. Concerning Contention 2(r):

This contention provides:

"The applicant did not conduct any tests utilizing representative tailings solutions and representative clay materials to determine whether significant deterioration of permeability or stability properties will occur in the proposed clay liner. Indeed, the applicant has not yet decided what type of clay to use at the site, thus making such tests impossible."

A. In the Affidavit of James L. Grant, Item 6, he states: "In each case, representative leachate solutions were prepared by stirring the waste samples in water while maintaining the pH of the slurry between 8 and 9 by the

addition of lime". This contrasts with the approach recommended in Engineering Report Volume VII, "Neutralization & Stabilization", which is to add 80 pounds of lime per ton of tailings. The lime added to the leachate solutions should have been limited to this concentration, instead of using the more open criteria cited by Grant.

B. The Motion for Disposition, Page 19, and 20, includes the statement, "The liner will provide protection of the groundwater during construction activities by capturing any excess water (principally rainwater that falls onto the wastes) before it can infiltrate to the groundwater". This implies that the liner is important for protection of the groundwater, and shows that the leachate which the liner must stop will be formed by water passing through tailings with only the lime present that has been added to the tailings, not with "whatever it takes to maintain the pH between 8 and 9" as was done in the tests. If the tests were run properly they could have shown that the liner will fail, allowing leachate to pass through to the groundwater. Or in the long term the clay permeability could decrease, causing a "bathtub" effect, once the leachate collection system is plugged, requiring continuous pumping and maintenance.

C. In Summary: The tests performed to check for deterioration of the clay liner were flawed, in that the pH was maintained in a certain range in a manner not corresponding to field conditions. Given the dependence on liner tightness for groundwater protection during construction this leaves unanswered the questions of whether the liner can prevent construction period infiltration from reaching the groundwater and whether or not a "bath tub effect" will be developed long term. Both are serious additional questions relating to the feasibility of the design for onsite disposal.

7. In Conclusion: The combination of potential intrusion by people digging for earth materials in a highly urban area and inadequate erosion protection design increases the need for active maintenance. The leachate tests were flawed, leaving unanswered serious questions about the feasibility of the onsite disposal proposed.

Further Affiant saith not.

Gerald R. Thiers
GERALD R. THIERS

Jan 16, 1990
DATE

SUBSCRIBED and SWORN to before me this 16 day of January, 1990.



Conchita C. Rocillo
Notary