

April 19, 1985

40-2061

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD



In the Matter of
KERR-MCGEE CHEMICAL CORPORATION
(West Chicago Rare Earths Facility)

Docket No. 40-2061-ML

ASLBP No. 83-495-01-ML

PDR
Return
to 39655

NRC STAFF ANSWERS TO PEOPLE OF THE STATE
OF ILLINOIS' SECOND SET OF INTERROGATORIES

The NRC staff hereby responds to the People of the State of Illinois' Second Set of Interrogatories, dated November 27, 1984. Although 10 C.F.R. § 2.720(b)(2)(ii) provides that interrogatory responses may not be required from the Staff unless the presiding officer makes the necessary finding under that provision, the Staff is voluntarily providing answers to the People's Second Set of Interrogatories. Affidavits of the persons providing responses are attached. Mr. Nixon was unavailable to execute his affidavit; his executed affidavit will be transmitted shortly. The undersigned counsel are responsible for the objections made.

The Staff objects to those interrogatories that would require it to perform studies or evaluations in addition to those already performed. See 10 C.F.R. § 2.740(c). This objection includes an objection to the instruction to provide cost figures in a prescribed manner. The Staff has responded to interrogatories regarding costs on the bases on which the Staff's cost analyses were performed. The Staff also objects to the instruction to identify all documents "pertinent" to each interrogatory as the Staff has already produced or will produce documents responsive to the document request and considers it unduly burdensome to identify those documents to

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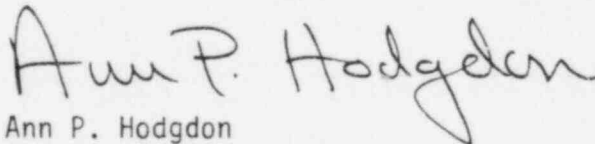
NRC Staff Answers
to People of the State
of Illinois Second
Set of Interrogatories

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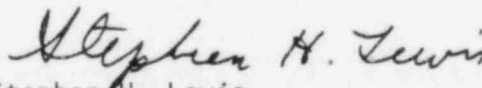
a particular response beyond identifying, as the Staff has done in every instance, the documents that provided the basis for the response.

The People's Request for Documents asked that production be made in Chicago unless otherwise agreed by the parties. The NRC staff filed a Response to Illinois Request for Documents on December 14, 1984. In that response, the Staff noted that the Commission's regulations in 10 C.F.R. §§ 2.744 and 2.790 governing discovery of Staff documents do not require such a production and that the Staff's documents would be made available in the places where they are normally kept. Subsequently, the People's counsel visited the Office of Nuclear Material Safety and Safeguards (NMSS) in Silver Spring, Maryland and identified documents from NMSS's files from which copies have been made and forwarded. A small number of documents were withheld pending review for a possible claim of privilege. Copies of documents that, after review, the Staff has decided to provide will be forwarded to the People's counsel shortly together with a list of the documents for which a privilege is claimed and a statement of the bases for the claims. As the People's counsel noted in a letter to Staff counsel dated April 15, 1984, arrangements for reviewing the Staff documents in Region III and at the Argonne National Laboratory are pending.

Respectfully submitted,



Ann P. Hodgdon
Counsel for NRC Staff



Stephen H. Lewis
Deputy Assistant Chief Hearing Counsel

Dated at Bethesda, Maryland
this 19th day of April, 1985.

RESPONSES TO INTERROGATORIES

INTERROGATORY 1

Identify all persons on and for the Staff who reviewed Kerr-McGee's alternative site evaluation, describe the work done by such person in reviewing the alternative site evaluation, and describe such person's educational background and field of expertise, if any.

RESPONSE

Kerr-McGee's alternative site evaluation was reviewed by the technical staff indicated in the List of Preparers on p. 8-1 of the FES. The review was performed in conjunction with preparation of the alternative site description and potential impacts in various areas, as indicated by the section numbers for each preparer. Statements of professional qualifications of certain of the preparers are appended to these responses. The Staff will supplement this response with whatever information it has as to the qualifications of the other preparers.

INTERROGATORY 2

Does the Staff agree with Kerr-McGee that abandoned strip mines in Illinois are not potentially suitable for land disposal of the Kerr-McGee wastes? If the answer is yes, explain why.

RESPONSE

No.

INTERROGATORY 3

Does the Staff disagree with any of the comments on the DES made by Dr. Thomas Johnson, Illinois State Geological Survey (see FES at H-240ff.)? If so, specify each comment with which the Staff disagrees, describe the disagreement, and explain the rationale for the disagreement.

RESPONSE

The FES at H-240ff indicates the Staff's general agreement with Dr. Johnson's comments and that the texts of sections of the DES on which Dr. Johnson commented were changed in the FES to reflect those comments.

INTERROGATORY 4

Describe the geologic, hydrologic, and hydrogeologic features the Staff deems appropriate to protect public health and the environment at sites where thorium mill tailings might be disposed of.

RESPONSE

Features that the Staff would deem appropriate are those satisfying the standards of 40 C.F.R. 192 as evaluated by the criteria of 10 C.F.R. Part 40, Appendix A. To the extent that these features are lacking or inadequate, engineering techniques may be used to compensate. Hydrogeologic considerations involved in evaluating sites for disposal of thorium mill tailings include:

1. Geotechnical hazard areas (such as those prone to slides and faults) as well as areas with underlying sinkholes or solution cavities should be avoided.
2. The soil should have low permeability and a high absorptive capability. Availability of sufficient clay material for use as a low-permeability liner is also important.
3. The disposal site should be located outside floodprone areas to reduce risk of inundation and should be generally well-drained.
4. The disposal site should not be located downstream of drainage areas whose run-off could erode or inundate the disposal site.

5. The water table at the disposal site should be deep enough to ensure that groundwater intrusion into the waste, perennial or otherwise, will not occur.

INTERROGATORY 5

Describe all other features the Staff deems appropriate to protect public health and the environment at sites where thorium mill tailings might be disposed of.

RESPONSE

Features that the Staff would deem appropriate are those satisfying the standards of 40 C.F.R. 192 as evaluated by the criteria of 10 C.F.R. Part 40, Appendix A.

Geologic and hydrologic features are discussed in the response to Interrogatory 4. Other features are primarily related to (1) the engineered cover system--with respect to reducing gaseous (thoron) emissions, gamma radiation, and dispersal of the thorium tailings, and (2) the institutional controls that will be necessary to ensure that the cover system remains intact. Such institutional controls include monitoring, periodic maintenance, land-use restrictions, and security to prevent human intrusion.

INTERROGATORY 6

(a) Do areas exist in Illinois having the geologic, hydrologic, and hydrogeologic features described in response to Interrogatory 4?

(b) If the answer to Interrogatory 6(a) is yes, where are such areas located?

(c) Describe the factual basis for your answers to Interrogatory 6(a) and (b).

RESPONSE

(a) Yes.

(b) The sites described in the FES for Alternatives I, III, and IV are located in areas of Illinois having the hydrogeologic features addressed in the response to Interrogatory 4.

(c) The factual bases for the responses to Interrogatory 6(a) and 6(b) are presented in the FES in Sections 4.7.1, 4.8.2, and 5.6.2.

INTERROGATORY 7

(a) Do areas exist in Indiana, Michigan, Wisconsin, Ohio, or Kentucky having the geologic, hydrologic, and hydrogeologic features described in response to Interrogatory 4?

(b) If the answer to Interrogatory 7(a) is yes, where are such areas located?

(c) Describe the factual basis for your answer to Interrogatory 7(a) and (b).

RESPONSE

(a) The Staff has not evaluated areas in these states with regard to the features identified in the response to Interrogatory 4.

(b) Not applicable.

(c) Not applicable.

INTERROGATORY 8

(a) Do areas exist in Illinois having the features described in response to Interrogatory 5?

(b) If the answer to Interrogatory 8(a) is yes, where are such areas located?

(c) Describe the factual basis for your answers to Interrogatory 8(a) and (b).

RESPONSE

(a) The features described in the Response to Interrogatory 5, relating to engineered and institutional controls, would be applicable to any site anywhere.

(b) See Response to Interrogatory 8(a).

(c) Engineered and institutional controls are not "features" of "areas".

INTERROGATORY 9

(a) Do areas exist in Indiana, Michigan, Wisconsin, Ohio, or Kentucky having the features described in response to Interrogatory 5?

(b) If the answer to Interrogatory 9(a) is yes, where are such areas located?

(c) Describe the factual basis for your answers to 9(a) and (b).

RESPONSE

(a) The Staff has not evaluated areas in states other than Illinois with regard to the features described in the Response to Interrogatory 5; however, the features described in the response to Interrogatory 5, relating to engineered and institutional controls, would be applicable to any site anywhere.

(b) See Response to Interrogatory 9(a).

(c) See Response to Interrogatory 8(c).

INTERROGATORY 10

(a) Does the Staff believe that the Kerr-McGee wastes should not be disposed of in any other State than Illinois? If so, why?

(b) Describe the factual basis, if any, for your answer to Interrogatory 10(a).

(c) Does the Staff believe that the Kerr-McGee wastes could not be disposed of in any other State than Illinois? If so, why?

(d) Describe the factual basis, if any, for your answer to Interrogatory 10(c).

RESPONSE

(a) The Staff has no belief regarding whether the Kerr-McGee wastes should be disposed of in any state other than Illinois.

(b) Not applicable.

(c) The Staff has not formed a belief regarding whether the Kerr-McGee wastes could be disposed of in any state other than Illinois, except that, for reasons stated in the FES, the Staff believes that the operating low level waste burial sites in Nevada, Washington and South Carolina are in all likelihood not feasible sites.

(d) See Response to Interrogatory 10(c). The FES states the basis for the Staff's belief regarding disposal at the operating low level waste burial sites in Nevada, Washington, and South Carolina.

INTERROGATORY 11

(a) Has the Staff at any time reviewed or evaluated any site or area as a potential location for disposal of the Kerr-McGee wastes other than a site or area identified by Kerr-McGee?

(b) If the answer to Interrogatory 11(a) is yes, describe the nature of the Staff's review or evaluation, the date(s) when it took place, the persons at the Staff involved, and the conclusion reached or findings made pursuant to such review or evaluation.

RESPONSE

(a) Yes.

(b) On October 3, 1980, Dr. Steve Y. Tsai visited Dr. Thomas Johnson at the Illinois State Geological Survey in Urbana, Illinois, and Mr. Ellis

Sanderson at the Illinois State Water Survey, also in Urbana, to discuss potential disposal sites for disposal of the Kerr-McGee wastes other than the sites identified by Kerr-McGee. Based on these discussions, Dr. Tsai concluded that although there may be other sites in Illinois that could be used for disposal of Kerr-McGee wastes, the hydrogeologic analysis of alternative sites conducted by Kerr-McGee and reviewed by the Staff was adequate.

INTERROGATORY 12

Identify by date and participants every conversation or communication between Kerr-McGee and the Staff concerning alternative disposal sites.

RESPONSE

To the best of the Staff's knowledge, every conversation or communication between Kerr-McGee and the Staff concerning alternative disposal sites is reflected in the following documents:

1. Meeting, Staff and Kerr-McGee Representatives, November 8, 1982. No attendance list available. See Nov. 16, 1982 memorandum.
2. Letter, J. L. Rainey, KM to R. E. Cunningham, October 11, 1982.
3. Letter, W. J. Shelley, KM to W. Nixon, February 1, 1982 - includes summary of KM meeting with Congressman Tom Cochren.
4. Meeting, Staff and Kerr-McGee Representatives, July 16, 1981. Attendee List attached. See Sept. 14, 1981 memorandum.
5. Letter J. L. Rainey, KM to R. E. Cunningham, July 20, 1981.
6. Letter W. J. Shelley, KM to W. Nixon, July 28, 1980.
7. Meeting, Staff and Kerr-McGee Representatives, June 18, 1980. Attendee List attached. See July 15, 1980 memorandum.

8. Meeting. KM, NRC and various government representatives, May 20, 1980 in St. Charles, Illinois. No record of meeting found.
9. Letter, I. L. Denny to W. Nixon, May 9, 1980, St. Charles, Illinois Meeting.
10. Letter, I. L. Denny to W. Nixon, April 30, 1980.
11. Letter, I. L. Denny to W. Nixon, March 17, 1980.
12. Letter, I. L. Denny to W. Nixon, February 25, 1980.
13. Letter, I. L. Denny to W. Nixon, February 20, 1980.
14. Meeting, February 14, 1980, St. Charles, Illinois. Attendee List attached to Feb. 20, 1980 letter.
15. Letter, J. L. Rainey to W. Nixon, January 14, 1980.
16. Letter, W. Nixon to I. L. Denny, December 13, 1979.
17. Meeting, Staff and Kerr-McGee, November 13, 1979. Attendees List attached. See Nov. 27, 1979 memorandum.
18. Letter, W. Nixon to I. L. Denny, November 21, 1979.
19. Letter, W. T. Crow, to J. L. Rainey, April 12, 1979.
20. Letter, R. E. Cunningham to J. L. Rainey, November 16, 1978.
21. Meeting, Staff and Kerr-McGee, February 16, 1978. Attendee List attached.
22. Meeting, Staff and Kerr-McGee, July 27, 1977. Attendee List attached.
23. Meeting, Staff and Kerr-McGee, December 12, 1977. Attendee List attached.
24. Meeting, Staff and Kerr-McGee, November 19, 1976. Attendee List attached.

25. Letter, R. H. Vreeland to W. T. Crow, October 21, 1975.

26. Letter, R. H. Vreeland to W. T. Crow, October 3, 1975.

INTERROGATORY 13

(a) Has the Staff evaluated or reevaluated potential alternative disposal sites since the receipt of comments on the DES?

(b) If the answer to Interrogatory 13(a) is no, explain why not.

(c) If the answer to Interrogatory 13(a) is yes, describe the evaluation, its methodology and findings, and the individual(s) who carried it out.

RESPONSE

(a) No.

(b) In the Staff's opinion, comments on the DES did not merit evaluation or reevaluation of potential alternative disposal sites.

(c) Not applicable.

INTERROGATORY 14

(a) Is risk of highway or train accident resulting in significant human exposure a serious concern if the Kerr-McGee wastes are transported

- (i) 200 miles?
- (ii) 400 miles?
- (iii) 750 miles?
- (iv) 1500 miles?

(b) If the answer to Interrogatory 14(a)(i), (ii), (iii), or (iv) is yes, explain why.

(c) Is there a distance beyond which transportation of the Kerr-McGee wastes poses a risk of highway or train accident resulting in significant human exposure? If so, what is that distance, and explain the rationale for your answer.

RESPONSE

(a) No. The radiological consequences of a truck accident are presented in Table 14-1. The estimates in this table were obtained as follows. Using a truck accident rate of 1.7×10^{-6} /mile (U.S. Nucl. Reg. Comm. 1977), with 8,640 trucks needed to transport the waste (FES), the number of truck accidents for different distances is obtained (Column 2). Assuming that half the material on a truck will be spilled in an accident, the amount of spilled material can be obtained as a fraction of the total amount shipped (Column 3). A rough estimate of the population dose (Column 4) can be obtained by assuming that the population dose is proportional to (1) the fraction of material spilled, (2) the total population dose for offsite disposal (80 person-rem), and (3) the ratio of the average population density along the route to the average population density within the 50-mile radius of the Kerr-McGee site. The population

Table 14-1. Radiological Risk Due to an Accident During the Transportation of Kerr-McGee Wastes

Distance Transported (mi)	No. of Truck Accidents ¹	Spilled Material as Fraction of Total ²	Estimated Population Dose (person-rem)	Estimated Cancer Deaths ³	Estimated Nonradiological Truck Accident Deaths ⁴
200	3	1.7×10^{-4}	5.8×10^{-3}	5.8×10^{-7}	8.3×10^{-2}
400	6	3.5×10^{-4}	1.2×10^{-2}	1.2×10^{-6}	1.7×10^{-1}
750	11	6.5×10^{-4}	1.3×10^{-2}	1.3×10^{-6}	3.1×10^{-1}
1,500	22	1.3×10^{-3}	1.7×10^{-2}	1.7×10^{-6}	6.2×10^{-1}
3,000	44	2.5×10^{-3}	2.0×10^{-2}	2.0×10^{-6}	1.2

¹ Based on a truck accident rate of 1.7×10^{-6} /mile (U.S. Nucl. Reg. Comm. 1977) and 8,640 truckloads.

² Assuming that half of the material will be spilled.

³ Using the conversion factor of 10^{-4} deaths per rem (Int. Comm. Radiol. Prot. 1977).

⁴ Based on truck accident fatalities of 4.8×10^{-8} /mile (Gay 1979).

density along the route is assumed to be $62.6/\text{mi}^2$ (the average population density in the United States in 1980) for distances beyond 400 miles, and about $400/\text{mi}^2$ up to 400 miles; the mean population density in the vicinity of Kerr-McGee is $960/\text{mi}^2$. The number of cancer deaths (Column 5) is obtained by multiplying the population dose by the conversion factor of 10^{-4} deaths per rem (Int. Comm. Radiol. Prot. 1977). The probability of nonradiological truck accident fatalities is presented for comparison (Column 6). The likelihood of a cancer fatality is extremely small, approximately one million times less than the likelihood of a fatal truck accident. This is true even for the longest possible distance that the waste might be transported.

Although the overall radiological risk due to train accidents has not been calculated it is expected to be similar to that due to a truck accident because the accident rates for trucks and trains are comparable (U.S. Nucl. Reg. Comm. 1977).

(b) Not applicable.

(c) No. See Response to Interrogatory 14(a).

INTERROGATORY 15

(a) What is the probability of a fatal cancer resulting from the transportation of the Kerr-McGee wastes from West Chicago.

- (i) 200 miles?
- (ii) 400 miles?
- (iii) 750 miles?
- (iv) 1500 miles?
- (v) the distance specified in your answer to Interrogatory 14(c), if any?

(b) Explain the calculations and reasoning supporting your answer to Interrogatory 15(a).

RESPONSE

(a) The probability of a fatal cancer resulting from transportation of Kerr-McGee wastes without accident is presented in Table 15-1. The truck accident fatalities due to nonradiological causes are presented for comparison. Cancer fatalities are about 100 times less likely than non-radiological truck accident deaths.

(b) The population dose in Table 15-1 was deduced from Table 5.7 in the FES, using the same population densities as presented in the response to Interrogatory 14. The estimate for cancer deaths was obtained from the population dose by multiplying by the conversion factor of 10^{-4} deaths per rem (Jmm. Radiol. Prot. 1977).

INTERROGATORY 16

(a) Has the Staff compared the costs of moving the Kerr-McGee wastes by rail with the costs of moving them by truck in the event they are disposed of elsewhere than onsite?

(b) If the answer to Interrogatory 16(a) is no, explain why not.

(c) If the answer to Interrogatory 16(a) is yes, describe the results of such comparison and identify the individual who carried it out.

Table 15-1. Cancer Fatalities Resulting from Transportation of Kerr-McGee Wastes Without Accident

Distance Transported (mi)	Estimated Population Dose ¹ (person-rem)	Estimated Cancer Deaths ²	Estimated Nonradiological Truck Accident Deaths ³
200	7.4	7.4×10^{-4}	8.3×10^{-2}
400	14.8	1.5×10^{-3}	1.7×10^{-1}
750	16.9	1.7×10^{-3}	3.1×10^{-1}
1,500	21.4	2.1×10^{-3}	6.2×10^{-1}
3,000	30.5	3.0×10^{-3}	1.2

¹ Source: FES, Table 5.7.

² Using the conversion factor of 10^{-4} deaths per rem (Int. Comm. Radiol. Prot. 1977).

³ Based on truck accident fatalities of 4.8×10^{-8} /mile (Gay 1979).

RESPONSE

To the extent that information regarding a comparison of train and truck transportation costs is available, it is provided in the Response to Interrogatory 63.

INTERROGATORY 17

Identify all individual(s) on or for the Staff who reviewed Kerr-McGee's analysis of costs associated with disposal of the Kerr-McGee wastes, describe the work done by each such individual in reviewing Kerr-McGee's cost analysis, and describe each such individual's educational background and field of expertise, if any.

RESPONSE

Kerr-McGee's analysis of costs associated with the disposal of the wastes was reviewed by two economists, Dr. Raghaw Prasad and Mr. Lee Busch, neither of whom is currently employed at Argonne National Laboratory. Dr. Prasad and Mr. Busch were collectively responsible for the sections identified on page 8-1 of the FES. The resumes of Dr. Prasad and Mr. Busch are enclosed with this document.

INTERROGATORY 18

(a) Does the Staff believe there is a ceiling on the costs Kerr-McGee should be required to incur in connection with disposing of the Kerr-McGee wastes?

(b) If the answer to Interrogatory 18(a) is yes, what is that ceiling?

(c) If the answer to Interrogatory 18(a) is yes, describe the rationale for that ceiling.

RESPONSE

(a) No; however, the Uranium Mill Tailings Radiation Control Act (UMTRCA) requires consideration of economic cost in agency decision-

making for the management of tailings. See Section 84(a)(1) of the Atomic Energy Act of 1954, as amended.

(b) Not applicable.

(c) Not applicable.

INTERROGATORY 19

(a) In the Staff's view, under what conditions, if any, should mill tailings be moved for disposal from the site where they were generated?

(b) Explain the rationale for your answer to Interrogatory 19(a).

(c) Are any conditions or factors which may be described in response to Interrogatory 19(b) present or involved at the Kerr-McGee site?

RESPONSE

(a) The Staff objects to the interrogatory on the basis that it asks for a legal conclusion. Without waiving its objection, the Staff states that, in general, mill tailings should be removed from the site of generation if the licensee's proposal for onsite disposal fails to meet the applicable Commission and EPA regulations for protection of the public health and safety or if a National Environmental Policy Act (NEPA) review shows that onsite disposal will result in significant unmitigable environmental impacts and an obviously superior alternative site is identified.

(b) The rationale is that there is no legal basis for requiring removal unless the circumstances set forth in the response to 19(a) are found to be present.

(c) Pending completion of the Staff's review against 10 C.F.R. Part 40, Appendix A and 40 C.F.R. 192 and completion of the Supplement

to the FES, the Staff cannot reach any conclusion responsive to Interrogatory 19(c).

INTERROGATORY 20

In the Staff's view, is there any reason why the Kerr-McGee wastes should not be moved for disposal elsewhere? If the answer is yes, explain the reason(s).

RESPONSE

As explained in the Response to Interrogatory 19, Kerr-McGee wastes should not be removed for disposal elsewhere unless Kerr-McGee's proposal fails to meet the applicable regulatory standards and an obviously superior alternative site is identified.

INTERROGATORY 21

In footnote 1 of the Staff's Answer To Board's Question, filed September 6, 1984, the Staff stated:

"In this case only the fact that the waste was produced at the factory site beginning in 1932 and still resides there gives any credence of acceptability to the site for disposal."

Explain why the fact that the waste was produced and is still present at the site gives credence of acceptability to the site for disposal.

RESPONSE

Similar statements made by the Staff on the subject of moving tailings piles explain and provide context for the statement addressed in Interrogatory 21. John B. Martin, then Director of the Division of Management, Office of Nuclear Material Safety and Safeguards (NMSS), testified before a Congressional Committee that "[tailings] should not be moved except as a last resort and even then they shouldn't be moved very

far." Carlton Kammerer, Director of the Commission's Congressional Affairs office, wrote the Congress: "Moving an entire tailings pile is an extreme worst case in that all other options would have to have been evaluated and found unsatisfactory." Uranium Ore Residues: Potential Hazards and Disposition, Hearings Before the Procurement and Military Nuclear Systems Subcommittee of the House Armed Services Committee, 97th Cong. 1st Session (June 1981) pp. 155-156, p. 543.

INTERROGATORY 22

(a) Does the Staff distinguish between "new" and "existing" mill tailings sites in determining the suitability of sites for thorium tailings disposal?

(b) If the answer to Interrogatory 22(a) is yes, explain why.

RESPONSE

(a) Yes, the Staff distinguishes between "new" and "existing" sites in determining the suitability of sites for thorium tailings disposal.

(b) The distinction is relevant to the optimization to the maximum extent reasonably achievable of the site features of Criterion I, 10 C.F.R. Part 40, Appendix A. New sites may present a greater opportunity for maximization of site features.

INTERROGATORY 23

(a) At page H-105 of the FES the Staff stated:

"The three existing licensed low-level disposal sites were indeed chosen, among other reasons, for the isolation of the sites relative to population centers. The NRC does not have the same freedom of choice for the existing Kerr-McGee site."

Explain why the NRC "does not have the same freedom of choice for the existing Kerr-McGee site."

(b) Does the Staff believe at the present time that it does not have the freedom of choice referred to in the above quotation? If so, explain why.

RESPONSE

(a) The three existing licensed low-level radioactive waste disposal sites were established to accept packaged radioactive waste from others. The applicants were not bound by a need to consider a large volume of waste already on hand. Secondly, the NRC does not select sites. It reviews sites submitted by applicants. Kerr-McGee has applied to dispose of its West Chicago wastes at its existing site in West Chicago. The NRC does not have the "freedom of choice" which was available to the Applicants in the initial siting decisions on the licensed low-level disposal in the sense that the Kerr-McGee application will be approved unless the circumstances discussed in Response 19 are found to be present.

(b) The NRC staff believes that it does not have the freedom of choice for the reasons stated above.

INTERROGATORY 24

Identify all existing NRC licenses for source or byproduct material issued or held under Title II of UMTRCA.

RESPONSE

Existing mills with NRC licenses for source or byproduct material issued or held under Title II of UMTRCA, in addition to the Kerr-McGee Rare Earths Facility, are listed in Table 24.

TABLE 24

URANIUM MILL STATUS Date: February 1985	Pre- licensing consultation	License application under review	License Issued	Operating Facility	Mill Shutdown	Mill decom- missioned	Tailings reclam- ation	DOE/ State Licensed
Mill								
Atlas Minerals (SUA-917) Moab, UT 40-3453					Shut down indefinitely in April 1984			
American Nuclear Corp. (American Nuclear) Gas Hills, WY (SUA-667) 40-4492					Shut down indefinitely in November 1981			
Bear Creek Uranium Co. Converse Co., WY (SUA-1310) 40-8452				X Renewal complete				
Exxon Minerals (Highland) Converse Co., WY (SUA-1139) 40-8102					June 1984 Final	X		
Minerals Expl. Corp. Sweetwater Co., WY (SUA-1350) 40-9584					Shut down indefinitely in April 1983			
Pathfinder Mines (Lucky MC) Gas Hills, WY (SUA-672) 40-2259				X	Shut down April 1985 for maintenance			

TABLE 24 (CONT.)

URANIUM MILL STATUS	Pre- licensing consultation	License application under review	License Issued	Operating Facility	Mill Shutdown	Mill decom- missioned	Tailings reclam- ation	DOE/ State Licensed
Date: <u>February 1985</u>								
Mill								
Pathfinder Mines Shirley Basin, WY (SUA-442) 40-6622				X				
Petrotomics Co. Shirley Basin, WY (SUA-551) 40-6659				X Renewal completed	Developing contingency plans for shutdown			
Plateau Resources Shootaring Canyon, Utah (SUA-1371) 40-8698					Shut down indefinitely in August 1982			
Rio Algom La Salle, UT (SUA-1119) 40-8084				X	Developing contingency plans for shutdown			
Silver King Mines (Morton Ranch) Converse Co., WY (SUA-1356) 40-8602			X (Not built)					
Tennessee Valley Authority Edgemont, S.D. (SUA-816) 40-1341						X		

TABLE 24 (CONT.)

URANIUM MILL STATUS	Pre- licensing consultation	License application under review	License Issued	Operating Facility	Mill Shutdown	Mill decom- missioned	Tailings reclam- ation	DOE/ State Licensed
Date: <u>February 1985</u>								
<u>Mill</u>								
Umetco Minerals Corp. (White Mesa) Blanding, UT (SUA-1358) 40-8681					Restart Summer 1985			
Umetco Minerals Corp. Gas Hills, WY (SUA-648) 40-0299					Shut down indefinitely in November 1984			
Western Nuclear, Inc. (Split Rock) Jeffrey City, WY (SUA-56) 40-1162					Shut down indefinitely in June 1981			
TOTALS	0	0	1	5	7	2		

With the exception of the TVA Edgemont facility, tailings reclamation plans for all MRC licensed mills call for reclamation in place. The reclamation plan for TVA involves relocating the tailings 3.2 kilometers SE of the existing mill site.

INTERROGATORY 25

Describe the location of each site or operation for which a license identified in response to Interrogatory 24 exists.

RESPONSE

The Staff objects to the interrogatory on the basis that the request for a description of the location of each licensed site is vague and unanswerable. Without waiving the objection, the Staff states that the location of each NRC licensed mill is given in Table 24.

INTERROGATORY 26

Are any of the sites or operations described in response to Interrogatory 25

- (i) no longer involved in milling operations?
- (ii) in the process of decommissioning?
- (iii) fully decommissioned?

RESPONSE

The status of each NRC licensed mill is given in Table 24.

INTERROGATORY 27

If the answer to Interrogatory 26(i), (ii), or (iii) is yes, have tailings generated at such site(s) been moved for disposal to another location, or are tailings generated at such site(s) likely to be moved for disposal to another location? If the answer is yes, identify the site(s) involved.

RESPONSE

As stated in the footnote to Table 24, the only tailings reclamation plan calling for relocating tailings is the plan for the TVA Edgemont mill. That plan calls for relocating the tailings 3.2 kilometers SE of the existing mill site.

INTERROGATORY 28

On the basis of the information about the New Douglas site presented in the FES, and without regard to engineering design for any disposal cell, does the New Douglas site have hydrologic, geologic, or hydrogeologic features which are better suited, equally well suited, or less well suited than those of the West Chicago site for long-term immobilization and isolation of contaminants from usable groundwater sources? Explain the rationale for your answer.

RESPONSE

Based on the relatively sparse hydrogeologic information available concerning the New Douglas site and without regard to engineering design for any disposal cell, the Staff is of the opinion that the New Douglas site might be slightly better suited than the West Chicago site for stabilization of the Kerr-McGee wastes. The New Douglas site is a pit-type quarry, and burial activities would be less likely to contaminate surface water runoff and nearby streamflow. In addition, no major aquifers have been identified near the New Douglas site and the groundwater supplies, which are not extensively utilized, are apparently small.

INTERROGATORY 29

At page A-4 of the FES the Staff stated that "no projection was made for possible future population growth [in the vicinity of the New Douglas site]." If such a projection were made, describe the methodology which would be used.

RESPONSE

The Staff knows of no valid method for projecting possible future population growth (or decline) over the 200 to 1,000 years for which EPA standards indicate that containment should last. In this regard it is appropriate to note that in the Preamble to the October 1983 amendments to 40 C.F.R. 192, the EPA stated, in response to comments on the issue of

whether the degree of control should depend on the size of the current local population, that "demographers have concluded that it is not possible to determine that a population at a specific location will remain low in the future." 48 Fed. Reg. 45935 (October 7, 1983).

INTERROGATORY 30

(a) Describe in detail all measures the Staff considers necessary or appropriate to maintain the site after closure in the event of onsite disposal.

(b) Over what time period should such measures be carried on?

(c) What is the projected total cost in 1984 dollars of each measure specified?

RESPONSE

The Staff objects to the interrogatory on the basis that it requires the Staff to perform research. However, without waiving the objection, the Staff states that some of the matters addressed in the interrogatory will be considered in the FES supplement.

INTERROGATORY 31

(a) Describe in detail all measures the Staff considers necessary or appropriate to exclude human beings from the site after closure in the event of onsite disposal.

(b) Over what time period should such measure be carried on?

(c) What is the projected total cost in 1984 dollars of each measure specified?

RESPONSE

See Response to Interrogatory 30.

INTERROGATORY 32

(a) Describe in detail all measures for post-closure groundwater monitoring the Staff considers necessary or appropriate in the event of onsite disposal. Among other things, describe the precise number and location of wells, their depths and screen lengths, the frequency of sampling, the time period over which such monitoring should be carried on, the parameters to be sampled for, the method for statistically analyzing sampling data.

(b) Describe in detail all measures for background groundwater monitoring the Staff considers necessary or appropriate in the event of onsite disposal, including the details set out in Interrogatory 32(a).

(c) What is the projected total cost in 1984 dollars of each measure specified in response to Interrogatory 32(a) and (b)?

RESPONSE

See Response to Interrogatory 30. In addition, the Staff's role with regard to groundwater monitoring will be to review for acceptability a proposed regime submitted by Kerr-McGee rather than to independently establish precise measures which must be taken by Kerr-McGee.

INTERROGATORY 33

(a) Describe in detail all post-closure radiological monitoring measures the Staff considers necessary or appropriate in the event of onsite disposal. Among other things, describe the precise number and location of monitoring points, the frequency of reading or sample collection, the type and model of instrumentation, the parameters to be monitored, and the time period after closure over which such monitoring should be carried out.

(b) What is the projected total cost in 1984 dollars of each measure specified in response to Interrogatory 33(a)?

RESPONSE

See Responses to Interrogatories 30 and 32.

INTERROGATORY 34

(a) Would the identical measures for post-closure (i) maintenance, (ii) use restrictions, (iii) groundwater monitoring, and (iv) radiological monitoring specified in response to Interrogatories 30-33, respectively,

be necessary or appropriate regardless where the Kerr-McGee wastes were disposed? -

(b) Explain the rationale for your answer to Interrogatory 34(a).

RESPONSE

See Responses to Interrogatories 30-33. In addition, the Staff notes that dissimilar sites would not be likely to require identical post-closure measures.

INTERROGATORY 35

(a) What measures will be necessary to maintain vegetative cover at the site over the long term in the event of onsite disposal?

(b) What conditions or events could damage or facilitate damage to the vegetative cover, and what are the probabilities of the occurrence of such conditions or events?

(c) Does growth of long-rooted vegetation pose any potential problems at the site in the event of onsite disposal, and if so, how can or should control of long-rooted vegetation be dealt with?

RESPONSE

(a) The most important measure that will be necessary to maintain vegetative cover in the long term is controlling use of the surface of the containment area so that erosive uses (such as farming or abuse by off-road vehicles) are prohibited. Other necessary measures include: (1) periodic inspections to detect areas with sparse vegetative cover and areas where deep-rooted plants are growing, (2) reseeding of any barren areas, and (3) removal or herbicide treatment of deep-rooted plants.

(b) Damage to the cover could occur if land-use controls are not effective or cease, if human intrusion occurs, or if certain severe events such as droughts or earthquakes occur. The probabilities of occurrence of these events have not been estimated.

(c) Yes. Control can be effected by physical destruction or herbicide treatment of deep-rooted plant species.

INTERROGATORY 36

(a) For how many years after closure can Kerr-McGee's proposed containment cell be reasonably expected to limit radon releases to 20/pCi/m²/sec?

(b) What is the basis for your answer to Interrogatory 36(a)?

(c) For how many years after closure can Kerr-McGee's proposed containment cell be reasonably expected to limit radon releases to 2.5 pCi/m²/sec?

(d) What is the basis for your answer to Interrogatory 36(c)?

(e) Would the answers to Interrogatory 36(a)-(d) differ if Kerr-McGee's proposed containment cell were modified in accordance with the Staff's recommendations in the FES, and if so, how and why would the answers differ?

RESPONSE

(a) For at least 1,000 years after closure, Kerr-McGee's proposed containment cell can be reasonably expected to limit radon releases to 20 pCi/m²/sec.

(b) The answer to Interrogatory 36(a) is based on (1) the U.S. Department of Agriculture's Universal Soil Loss Equation (USLE) to evaluate the average annual and long-term average seasonal erosion rates, and (2) the radon flux calculation methodology described in Appendix F of the FES to estimate the radon-222 flux in the multiple-layer soil system.

(c) Staff calculations show that Kerr-McGee's containment cell would limit radon releases to 2.5 pCi/m²/sec. However, because of the uncertainty surrounding the assumptions on which the calculations are

based, the Staff relies on them only for the showing that the releases will be below $20 \text{ pCi/m}^2/\text{sec}$.

(d) Not applicable.

(e) The Staff's recommendations (Alternative III) would probably not result in significant changes in radon releases.

INTERROGATORY 37

(a) Does the Staff foresee any possibility of gully erosion at the site in the event of onsite disposal?

(b) If so, what might be the causes of such erosion?

(c) If the answer to Interrogatory 37(a) is yes, how can gully erosion be prevented?

(d) If the answer to Interrogatory 37(a) is yes, what effect would gully erosion have on radon release over the long term?

RESPONSE

(a) Yes, there is a possibility of gully erosion at any near-surface disposal site.

(b) The causes of gully erosion could be: (1) slopes that are too steep, resulting in greater water erosion forces, (2) loss of protective cover (rocks, vegetation, etc.), (3) failure to establish vegetative cover, (4) loss of vegetative cover, (5) slope failure, and (6) nonconformities in surface topography.

(c) Although it may not be possible to prevent gully erosion, it can be minimized as long as control of the site is maintained. It can initially be minimized by proper design (shallow slopes, extra protection on the steeper slopes) and prompt establishment of vegetative cover. The control of land use and proper monitoring and maintenance of the cover

system can minimize the potential for gully erosion (see response to Interrogatory 35).

(d) Gully erosion, if uncorrected, might result in an increase in radon emissions.

INTERROGATORY 38

Has the Staff or any other person or entity conducted any studies of effects on health or the environment resulting from releases of contaminants from the site? If so,

- (i) Identify the person(s) or entity that conducted the study;
- (ii) Describe the nature of the study; and
- (iii) Identify all documents relating to the study.

RESPONSE

The Staff objects to the interrogatory on the basis that any such studies are equally as available to the People as to the Staff -- except, of course, for any studies the Staff may have conducted. The effects on health and the environment resulting from releases of contaminants from the site have been evaluated by the Staff, and the results are presented in the FES. See Section 5.9.

INTERROGATORY 39

Has the Staff or any other person or entity conducted any studies relating to the toxicity or mobility of rare earth compounds of the type, or chemically similar to the type, expected to be buried in the proposed containment cell? If so,

- (i) Identify the person(s) or entity that conducted the study; and
- (ii) Identify all documents relating to the study.

RESPONSE

The Staff objects to this interrogatory in that information on studies, except any studies conducted by the Staff, is equally as available to the People as to the Staff. The Staff has not carried out such studies. Without waiving its objection, the Staff provides the following response based on those studies of which it is aware.

Studies show that rare earth compounds are of low toxicity: lethal doses (LD_{50}) in rats and mice occur by oral ingestion of two or more grams per kilogram of body weight (U.S. Dept. Health Human Serv. 1983). Under the usual caveats concerning extrapolating data on rats and mice to humans, such data suggest that the rare earths are of low toxicity to humans.

Experimental data on the mobility of rare earths in soils and clays are limited. Measurements of the distribution coefficient (K_d) for the rare earth cerium gives values ranging from 58 to 6,000 mL/g, with a geometric mean of 1,100 mL/g (Baes and Sharp 1983). Crude estimates of distribution coefficients for other rare earths are 1,000 mL/g for all rare earths (Nucl. Saf. Assoc. 1980). These high values of K_d mean that the rare earths are strongly retained in the soil and clay and have low mobility.

INTERROGATORY 40

Explain the rationale for the Staff's assumption that for purposes of radiological dose calculation the individual at the residence nearest the site spends 10% of his time outdoors (see FES, Table 5.5--p. 5-28).

RESPONSE

The assumption that the individual at the nearest residence spends 10% of his time outdoors is based on a study by the U.S. Nuclear Regulatory Commission (1980b) and is considered to be a realistic assumption.

INTERROGATORY 41

(a) Has the Staff conducted any tests utilizing representative solutions of the Kerr-McGee wastes and representative samples of the clay to be used in the liner of the proposed containment cell in order to determine the effect of such solutions on the liner?

(b) If the answer to Interrogatory 41(a) is yes, identify the person(s) who conducted such tests and all documents relating to such tests.

(c) If the answer to Interrogatory 41(a) is no, explain why not.

(d) If the answer to Interrogatory 41(a) is no, does the Staff plan to conduct such tests, or to require Kerr-McGee to conduct such tests?

RESPONSE

(a) No.

(b) Not applicable.

(c) There is no a priori reason to expect leachate from the wastes to degrade the liner. This is supported by work done for the Kerr-McGee Stabilization Plan (Kerr-McGee Chem. Corp. 1980--Chap. 3) which shows low concentrations of metals and major ions in the leachate from neutralized waste. Also, the results of a study conducted at a uranium mill tailings site in Canonsburg, Pennsylvania (Dodson et al. 1984) indicate that clay liners will not degrade for at least several hundred years in the presence of tailings leachate.

(d) At present, the Staff has no plans to conduct such tests or to require Kerr-McGee to conduct such tests.

INTERROGATORY 42

Has the Staff ever communicated with Kerr-McGee on the subject of tests like those described in Interrogatory 41? If so, identify the persons involved in such communications, the approximate dates of such communications, and any documents relating to such communications.

RESPONSE

No.

INTERROGATORY 43

The FES states that Kerr-McGee will neutralize the wastes before disposing of them at the site (see FES at 3-11).

- (i) Describe in detail how such neutralization should be carried out.
- (ii) Describe in detail how such neutralization will be carried out.
- (iii) What is the projected cost in 1984 dollars of neutralizing the wastes?
- (iv) What is the purpose of neutralizing the wastes, and does the Staff believe that such purpose can be achieved by neutralizing the wastes in the manner described in answer to (A) Interrogatory 43(i) and (B) Interrogatory 43(ii)?

RESPONSE

The Staff objects to Interrogatory 43 on the basis that a response would require the Staff to prepare a detailed plan for neutralization. With regard to neutralization, the Staff's role is to review for suitability Kerr-McGee's proposed plan. Without waiving its objection, the Staff provides the following information.

Neutralization of the wastes with lime containing a minimal amount of radium, as outlined by the Kerr-McGee Stabilization Plan (Kerr-McGee Chem. Corp. 1980--Chap. 3), is an appropriate and suitable method. The

purpose of neutralizing the wastes is to greatly reduce the solubility and resultant mobility of chemical components of the waste. Studies carried out for the Stabilization Plan (Chap. 3) show that lime neutralization to pH 8 greatly reduced the concentrations of most chemicals in the leachate compared to the concentrations in leachate from unneutralized waste. Concentrations of arsenic and selenium were essentially unchanged by neutralization. Fluoride and radium concentrations in leachate samples were increased by neutralization. As noted in the Stabilization Plan (p. 3.42), concentrations of fluoride can be greatly reduced by increasing the amount of lime used. Also the lime itself may have been the source of fluoride and radium in the leachate samples. The use of lime containing as little radium and fluoride as practicable is advised.

The cost of lime neutralization, which involves purchase of the lime and mixing it with the wastes, is not expected to significantly increase the cost estimates given in the FES. The reason is that only one part lime to 100 parts (by weight) waste (or about 1900 tons of lime) is needed for neutralization (Kerr-McGee Chem. Corp. 1980--p. 3.28b). Also, lime is a common chemical produced in very large amounts, and the mixing process should be simple.

INTERROGATORY 44

Should Kerr-McGee neutralize the wastes regardless where or how they are disposed of? If not, describe the circumstances under which Kerr-McGee need not neutralize the wastes.

RESPONSE

Yes.

INTERROGATORY 45

(a) If the contaminated materials at Reed-Keppler Park, the West Chicago sewage treatment plant, Kress Creek and West Branch DuPage River, and the scattered "hot spots" which have been and will be exhumed by Kerr-McGee and the City, or any combination of these materials, were disposed of onsite, would that in any way change

- (i) the radon flux calculation presented in Appendix F of the FES?
- (ii) the radiation dose calculations presented in Table 5.5 of the FES?
- (iii) the leachate dispersion analysis presented in the Stabilization Plan?
- (iv) any of the costs associated with onsite disposal?
- (v) the size or configuration of the proposed containment cell, including its slope?
- (vi) the chemical composition of leachate generated in the proposed containment cell?
- (vii) post-closure groundwater monitoring measures?
- (viii) post-closure radiological monitoring measures?
- (ix) post-closure maintenance measures?

(b) If the answer to any of the parts of Interrogatory 43(a) is yes, describe the change expected to occur and explain why is expected to occur.

RESPONSE

The Staff objects to Interrogatory 45 on the basis that the Licensing Board's ruling on the admissibility of contentions that may implicate these matters has been deferred.

INTERROGATORY 46

What are the concentrations of U-238, U-234, Th-232, Th-230, Th-228, Ra-228, Ra-226, Ra-224, Pb-212, and Pb-210 in the material exhumed from

the Hartigan property at 736 Joliet Street, West Chicago, and what is the basis of your answer to this interrogatory?

RESPONSE

The Staff objects to Interrogatory 46 on the basis that the Licensing Board has deferred ruling on contentions regarding such matters. Without waiving its objection, the Staff notes that any information it might have regarding this property is contained in documents provided in response to the EPA's requests of February 1985, which have also been provided to the People.

INTERROGATORY 47

(a) Has the Staff considered or evaluated whether contaminated releases from Kerr-McGee's proposed containment cell might result in violations of Illinois groundwater standards, 35 Ill. Adm. Code, Subtitle C, Part 302?

(b) If the answer to Interrogatory 47(a) is yes, identify the individual(s) who conducted such evaluation, describe the results of such evaluation, and identify all documents used or generated in the course of such evaluation.

RESPONSE

(a) The Staff did not consider or evaluate in the FES whether releases from the containment cell might result in violations of Illinois groundwater standards. The Staff has since then conducted a preliminary evaluation on this matter.

(b) The Staff's preliminary evaluation against Illinois standards indicates that the validity of the evaluation in the FES is not affected by application of the Illinois standards.

INTERROGATORY 48

Does the Kerr-McGee waste differ with respect to its radiological hazards from the type(s) of waste whose disposal is governed by 10 CFR Part 61? If so, explain how.

RESPONSE

Yes. Part 61 Class B and Class C wastes are considerably more hazardous than the Kerr-McGee wastes, which are comparable to the Class A wastes of Part 61. Class A waste is subject to the least rigorous requirements of Part 61 regarding waste form to ensure stability after disposal.

INTERROGATORY 49

Does the Staff plan to meet or have discussions with any persons from any Illinois state agencies concerning the disposal of the Kerr-McGee wastes? If so, describe the purpose and expected date of such meeting(s) or discussion(s) and identify the persons from the Staff who will participate in such meeting(s) or discussion(s).

RESPONSE

Yes, the Staff plans to visit with the Illinois Attorney General and the Illinois State Geological Survey to review material on alternative sites. The dates for these meetings have not yet been established. The Staff may hold other meetings with State personnel, but specific plans regarding such meetings have not yet been made.

INTERROGATORY 50

(a) Has the Staff considered the views expressed by Dr. Terry R. Lash in his affidavit attached as Exhibit A to the People's Reply Brief filed August 7, 1984?

(b) Does the Staff intend to consider Dr. Lash's said views in preparing a supplemental environmental statement?

(c) Does the Staff disagree with any statement, other than interpretations of Illinois law, in ¶¶ 6-8 of said affidavit, and if so, explain the basis of the disagreement(s).

RESPONSE

(a) Yes.

(b) No. Dr. Lash's affidavit concerns two topics: (1) the State's intention to become an Agreement State only with reference to low-level radioactive waste subject to 10 C.F.R. Part 61, and (2) his position that low-level radioactive waste should not be disposed in an urban area. Neither concern is relevant to the disposal or storage of mill tailings. See, Criteria for Guidance of States and NRC Regulatory Authority and Assumption Thereof by States through Agreement, paragraphs 27, 29-32, 46 Fed. Reg. 7540 (January 23, 1981).

(c) The materials in paragraphs 6-8 of Dr. Lash's affidavit concern disposal of low-level radioactive waste and may be relevant to the State's responsibilities under the Low-Level Radioactive Waste Policy Act, Public Law 96-573, 94 Stat. 3347 (42 U.S.C. 2021b-2021d). The assumptions and conclusions in these paragraphs are not, however, necessarily pertinent to thorium mill tailings. Paragraph 7 is also factually wrong. The levels of radioactivity in the waste at West Chicago will remain constant for millenia. Releases of radioactive material into the air and water will not lead to greater exposures to any person than those that occurred during the operating life of the plant when no protective measures were taken.

INTERROGATORY 51

(a) Is there any possibility for a channelized flow of leachate from the proposed containment cell?

(b) Explain the rationale for your answer to Interrogative 51(a).

RESPONSE

(a)-(b) Well borings were taken in and around the disposal site by the Soil Testing Service, Northbrook, Illinois. According to the analyzed data, no evidence was found of nonhomogeneities that would permit horizontal channelization (Kerr-McGee Chem. Corp. 1983--p. 31). The plastic nature of the underlying formations is such that fracturing leading to vertical channelization is not possible.

It is noted in the FES that the subsurface geology is irregular and nonhomogeneous. However, the zone of high permeability is generally consistent across the site (FES, p. 4-52). This suggests that, if present, channelization of the leachate flow would be weak. Also, the isopleths of chloride and other ions (FES, pp. 4-64 to 4-90) show no evidence of channelization in groundwater flow in the deeper Silurian dolomite aquifer underlying the factory and storage site.

INTERROGATORY 52

(a) Has the Staff seen the electromagnetic survey referred to by Kerr-McGee in its response to Interrogatory 4(d) of the Staff's interrogatories filed September 14, 1984?

(b) If so, does that study demonstrate that a channelized flow of leachate from the proposed containment cell will not occur?

(c) Explain the rationale for your answer to Interrogatory 52(b).

RESPONSE

No.

INTERROGATORY 53

(a) Do the isopleths shown in the FES at pp. 4-70 to 4-89 indicate that a channelized flow of leachate from the site has not occurred or will not occur?

(b) Explain the rationale for your answer to Interrogatory 53(a).

RESPONSE

(a) As noted in the response to Interrogatory 51, the isopleths show no evidence of channelized flow of leachate from the site and give no evidence that channelized flow will occur.

(b) Channelized flow from the site would show up in the isopleths as long fingers of elevated concentrations of ions extending outward from the site. No such fingers are present in the isopleths. The isopleths represent data collected in the years 1964, 1977, and 1979; there is no evidence of irregularities in the contour shapes increasing as time passes. Consequently, it is not expected that channelization of leachate flow will occur.

INTERROGATORY 54

(a) Does the Staff agree with the statement in Kerr-McGee's "Compliance Memorandum" filed December 21, 1983, p. 14, that:

"[G]ully erosion, were it to occur, would be expected to occur in the first few years of the life of the disposal cell."

(b) Explain the rationale for your answer to Interrogatory 54(a).

RESPONSE

(a) No.

(b) Gully erosion can occur at any time throughout the life of the cover system. Initially, until vegetative cover is established, the potential for gully erosion will be higher. In the long term, should

the vegetative cover be disturbed or destroyed (e.g., by drought, fire, abuse by off-road vehicles, or erosive land uses resulting from loss of land-use controls--see Response to Interrogatory 5), there would be a potential for gully erosion.

INTERROGATORY 55

Are there any conditions or events which could precipitate or facilitate gully erosion or increased sheet erosion at the site at any time in the life of the proposed containment cell? If so, describe such conditions or events and the probability of their occurring.

RESPONSE

See Response to Interrogatories 5, 35, 37, and 54.

INTERROGATORY 56

(a) Does the Staff agree with Kerr-McGee's statement in said memorandum, p. 15, that:

"[Q]ualitative evidence from ancient ceremonial mounds that are found throughout the world, including the United States, [indicates] that the cell cover longevity for the West Chicago site will exceed 1000 years."

(b) Explain the rationale for your answer to Interrogatory 56(a).

RESPONSE

(a)-(b) Yes, the endurance of ancient ceremonial mounds does indicate that a properly designed cell and cover may last for at least 1,000 years. However, detailed studies of such mounds and comparison to the proposed cell would be needed before one could use ceremonial mound endurance as strong support for the long-term endurance of the proposed cell.

INTERROGATORY 57

(a) In the absence of a one-foot gravel layer beneath the bottom clay layer of Kerr-McGee's proposed containment cell, does the Staff foresee groundwater flow into the clay layer resulting from capillary action?

(b) Explain the rationale for your answer to Interrogatory 57(a).

(c) Why would the said one-foot gravel layer prevent such capillary inflow?

RESPONSE

(a) Yes, in certain areas beneath the containment cell.

(b) Based on available geologic data, the Staff has determined that the subsurface geology of the West Chicago site is irregular and non-homogeneous (FES, Section 4.7.1.2). The site has a clay soil sequence near the surface, underlain by a sand stratum of variable thickness. At those places where the clay stratum is thick (at least 1.8 m [6 ft]) and extends to the groundwater level, it is likely that groundwater would flow into the bottom clay layer of the proposed containment cell due to capillary action.

(c) The pore space in the gravel layer is generally much larger than that in the clay stratum. In this case, any capillary water that might be generated by surface tension forces would be overcome by gravitational force and thus prevented from rising.

INTERROGATORY 58

With respect to Table G.2 of the FES (p. G-7):

(i) What costs are included in the "Disposal Fee" (item 11) for the New Douglas site (column 4)?

- (ii) Why did the Staff derive the value for "Disposal Fee" for the New Douglas site in the manner described in footnote 9?
- (iii) What costs are included in "Overhead" as that term is used in items 7 and 14?
- (iv) How did the Staff derive the value for haulage (item 10) to the New Douglas site?
- (v) Describe what is meant or included in item 9--"Haul to landfill"--for the New Douglas site, and explain why such a cost is not applicable to Alternative I (column 1).
- (vi) How did the Staff derive the value for backfill and cover (item 5) at the New Douglas site?
- (vii) How did the Staff derive the values for labor (item 1) and supervision (item 2) for the New Douglas site?
- (viii) How did the Staff derive the value for equipment (item 4) for the New Douglas site?
- (ix) Identify the person(s) who prepared this Table.

RESPONSE

Based on information available to the Staff, the following responses are provided:

- (i) The disposal "fee" at the New Douglas site is the difference between site work costs of disposal onsite at West Chicago and disposal offsite at New Douglas (FES, Table G.2--footnote 9). Such a method of estimation of disposal fee does not indicate what specific costs are included in the disposal fee.
- (ii) Information is not available to the current Staff to answer this question.
- (iii) Overhead costs include such items as worker compensation, unemployment insurance, social security, general office expenses,

and contractor profit. More details are given in the cost data book of Robert Snow Means Co. (1984).

- (iv) The value for haulage to New Douglas of \$14,000,000 was calculated assuming that low-level wastes would have a Class 40 rate when shipped by rail. For haulage by Missouri Pacific, the shipping fee from West Chicago to New Douglas would be \$3.71/100 lb. (or 74.20/ton). The value of \$14,000,000 is obtained by multiplying the 191,000 tons of waste that need to be shipped by the shipping fee. Details are given by Meleski (1982).
- (v) This haulage cost refers to the short haul by truck from the rail head at New Douglas to the actual dumpsite. Waste is not dumped directly from rail cars into the disposal cell but is transferred to trucks, which then dump the materials into the cell. This cost does not apply for disposal at the West Chicago site because no transport is involved.
- (vi) The values are based on the amounts of material to be moved and the labor and equipment projected by the Applicant as necessary to carry out the relevant operations (FES, p. 3-23). Details of the derivations are not available. However, the value given--\$800,000 in 1982 dollars--can be derived by using the annual multiplier for local labor of 7.5% (FES, p. H-221) together with the Applicant's value of \$655,000 in 1979 dollars (Kerr-McGee Chem. Corp. 1980--Chap. 12).
- (vii) According to the FES (p. 3-23), the values are based on the amounts of labor projected by the Applicant as necessary to

carry out the relevant operations. Details of the derivations are not available. However, the value given for labor--\$1,800,000 in 1982 dollars--can be derived by using the annual multiplier for labor of 7.5% (FES, p. H-221) together with the Applicant's value of \$1,488,000 in 1979 dollars.

(viii) The values are based on the amounts of material to be moved as well as the amounts of labor and equipment necessary to carry out the relevant operations (FES, p. 3-23). Details of the derivation are not available.

(xi) Mr. Lee S. Busch and Dr. Raghaw Prasad.

INTERROGATORY 59

Describe the rationale for the 32% supervisory hours figure as shown on p. G-3 of the FES.

RESPONSE

The Staff does not have the details as to the source of this assumption.

INTERROGATORY 60

(a) If Kerr-McGee purchased land offsite to dispose of the wastes, would it be appropriate for Kerr-McGee to purchase buffer land around the area to be used for disposal? If so, how much buffer land should Kerr-McGee purchase?

(b) Explain the rationale for your answer to Interrogatory 60(a).

RESPONSE

(a)-(b) The Staff cannot respond as to what would be "appropriate" with respect to buffer land. However, neither 40 C.F.R. 192 nor 10 C.F.R. Part 40, Appendix A requires the purchase of buffer land.

INTERROGATORY 61

In evaluating the costs of offsite disposal, does the Staff assume that waste burial would be above-grade, and if so, why?

RESPONSE

No, the Staff does not assume above-grade burial offsite. Kerr-McGee considered below-grade burial at the New Douglas site where (quarry) excavation has already been done (Kerr-McGee Chem. Corp. 1980--p. 11-12). Also, burial at Hanford is below grade.

INTERROGATORY 62

In evaluating the costs of offsite disposal, does the Staff assume that the identical amount of clay would have to be imported to an offsite disposal site for use in a liner and cap as would have to be imported to the West Chicago site? If so, why?

RESPONSE

The individuals who performed this analysis are no longer employed at Argonne National Laboratory and the precise assumptions used by those persons are not known to the Staff. However, a review of the FES indicates that the analysis does not appear to be based on an assumption that the same amount of clay would be used in the offsite liner and cap as would be used in the onsite liner and cap.

INTERROGATORY 63

With respect to Table G.3 of the FES (p. G-8), explain the discrepancy between the Staff's and Kerr-McGee's values for "Burial Fee" and "transport costs" for Alternative IV.

RESPONSE

The Applicant's burial fee appears to be the original estimate of \$12,000,000 in 1979 \$ (Kerr-McGee Chem. Corp. 1980--Table 12.2) increased

by a multiplying factor to \$18,000,000 in 1982 \$ (DES, Table 3.2). The Staff's estimate assumes that burial costs at New Douglas are about the same as at West Chicago (FES, p. H-223). Further details are not available regarding derivation of the \$18,000,000 burial fee.

The Applicant's estimate of transport costs refers to truck transport from West Chicago to New Douglas (Kerr-McGee Chem. Corp. 1981--pp. 11.34 and 11.35). The resulting value of \$4,529,000 (Kerr-McGee Chem. Corp. 1980--Table 12.2) in 1979 dollars, increased by an annual multiplying factor of 9.5% (FES, p. H-221), gives \$6,000,000 (1982 \$). The Staff value of \$14,000,000 refers to Class 40 (the highest class) rail transport between West Chicago and New Douglas (Meleski 1982).

INTERROGATORY 64

Explain the discrepancy between the \$8,000,000 "Burial Fee" shown for Staff/Alternative IV in Table G.3 and the \$3,820,000 "Disposal Fee" shown for Alternative IV in Table G.2 of the FES.

RESPONSE

The Staff is unable to explain the discrepancy between the \$8,000,000 burial fee and the \$3,820,000 disposal fee.

INTERROGATORY 65

Identify by date and participants every conversation or communication between the Staff and Kerr-McGee concerning the costs of disposing of the Kerr-McGee wastes.

RESPONSE

To the best of the Staff's knowledge every conversation or communication between the Staff and Kerr-McGee regarding disposal costs for the West Chicago wastes is reflected in the following documents:

1. Letter, W. J. Shelly to W. Nixon, February 1, 1982.
2. Letter, J. C. Stauter to W. Nixon (Amendment to Stabilization Plan), December 11, 1981.
3. Letter, W. J. Shelly to W. Nixon (Amendment to Stabilization Plan), July 28, 1980.
4. Meeting, Staff & Kerr-McGee, February 28, 1978, Attendee List attached.
5. Letter, R. J. Wreeland to W. T. Crow, October 21, 1975.

INTERROGATORY 66

(a) Has the Staff or any other person or entity conducted any studies or inquiries to determine the price of land at the New Douglas site?

(b) Has the Staff or any other person or entity conducted any studies or inquiries to determine the price of land at any abandoned surface coal mines in Illinois?

(c) Has the Staff or any other person or entity conducted any studies or inquiries to determine the price of land at any other location where the Kerr-McGee wastes might be disposed of?

(d) If the answer to Interrogatory 66(a), (b), or (c) is yes, describe the results of such studies or inquiries, identify the person(s) who conducted them, and identify all documents relating to them.

RESPONSE

The Staff objects to this interrogatory on the basis that information regarding any such studies, except any studies that the Staff may have conducted, is equally as available to the People as to the Staff. The Staff has not conducted any such studies.

INTERROGATORY 67

(a) How much clay (in cubic yards) will Kerr-McGee need to import to the site for use in the liner if the proposed containment cell is constructed?

(b) How much clay (in cubic yards) will Kerr-McGee need to import to the site for use in the cover if the proposed containment cell is constructed?

(c) How much will the said clay for the liner and cap cost per cubic yard?

(d) How much will it cost to transport the said clay for cap and liner to the site?

(e) Would the answers to Interrogatory 67(a)-(d) differ if the proposed containment cell were modified in accordance with the Staff's recommendation in the FES, and if so, how and why would the answers differ?

RESPONSE

(a)-(b) The volume of clay in the bottom liner and cap in the containment cell can be determined from data in a report of the Law Engineering Testing Company (1981). They are (to two significant figures): clay volume in liner = 63,000 yd³; clay volume in cap = 63,000 yd³.

(c)-(d) All of this clay will be brought in from offsite. The cost of buying the clay, hauling it onsite, placing it and spreading it (without compaction) is \$8.65/yd³ (1984 \$). This value assumes that there is a 2-mile haul and that the price of clay is the same as that for select, structural fill and includes subcontractor overhead and profit. For longer haul distances, the price would increase. For example, for a 5-mile haul, the cost would increase to \$10.10/yd³ (Robert Snow Means Co. 1984).

These values give total costs for 2-mile and 5-mile hauls, respectively, of \$545,000 and \$636,000 for the liner and \$545,000 and \$636,000 for the cap.

(e) The volumes of clay described in the FES for Alternative III would remain the same. This is based on the assumption that the extra 1-ft layer of low-permeability soil above the sand-and-gravel drain is not clay (FES, p. 3-19). If the layer were constructed of clay, then the volume of clay in the cap would increase to 94,000 yd³ and the cost would increase to \$813,000 (2-mile haul) or \$949,000 (5-mile haul) for the cap.

INTERROGATORY 68

Has the Staff or any other person or entity conducted any studies or inquiries to determine the value of the site at its highest use? If so, describe the results of such studies or inquiries, identify the person(s) who conducted them, and identify all documents relating to them.

RESPONSE

The Staff objects to the interrogatory on the basis that the People have not defined the term "highest use." Without waiving this objection and assuming that the term refers to different economic and societal uses to which the property could be put, the Staff states that it is not aware of any studies made to determine the value of the site at its highest use.

INTERROGATORY 69

(a) Identify the underlying elements of each cost and each benefit associated with disposal of the Kerr-McGee wastes, and (b) project a monetary value or assign some other quantitative values to each such cost and benefit. Each projected monetary value should be described in nominal dollars for each year of occurrence. If you do not or cannot assign a monetary or other quantitative value to some cost or benefit, explain why.

RESPONSE

The Staff objects to this interrogatory for the following reasons:

- (1) it is vague in that the term "underlying elements" is not defined

and (2) a response would require, in part, cost projections not already performed by the Staff. Without waiving this objection, the Staff states that the costs and benefits which it has identified associated with the disposal of the Kerr-McGee wastes are set forth in the FES. These matters will be further addressed in the Supplement to the FES.

INTERROGATORY 70

(a) In the event of onsite disposal, could the site be released for unrestricted use at any time following stabilization of the wastes? If so, when?

(b) Explain the rationale for your answer to Interrogatory 70(a).

(c) In the event of onsite disposal, could the site be released for any use whatsoever at any time following stabilization of the wastes?

(d) If the answer to Interrogatory 70(c) is yes, describe in detail the use for which the site could be released.

(e) Explain the rationale for your answer to Interrogatory 70(c) and (d).

RESPONSE

(a) No. Section 83 of the Atomic Energy Act requires Government ownership in perpetuity and continual surveillance.

(b) See Response to Interrogatory 70(a).

(c) It is possible that limited use could be made of the surface, consistent with maintaining the integrity of the cover against damage and erosion.

(d) The NRC staff cannot anticipate the uses that the custodial agency might wish to permit. In any case, any use of the surface would require a review by the NRC and a determination that the use would not endanger the public health, safety, welfare, or the environment. Section 82

of the Atomic Energy Act also imposes protective responsibilities on the State should it become the custodial agency.

(e) See Response to Interrogatory 70(c) and (d).

INTERROGATORY 71

In the Staff's opinion, has Kerr-McGee provided sufficient engineering detail on the proposed leachate collection system to allow a determination whether that system will properly perform its intended function? If not, what details should be provided to make such a determination?

RESPONSE

In the Staff's opinion, sufficient details on the conceptual design of the leachate monitoring system are provided by Law Engineering Testing Company (1981), the subcontractor to Kerr-McGee, with the possible exception of information regarding the diameters of the risers and the route of the risers through the cover. The risers should be of sufficient diameter to allow pumping out of the sumps in the unlikely event that excessive fluid collected. Also, the route through the cover should be such as to prevent water leaking around the risers into the waste. They must also be protected against displacement or breaking resulting from possible settling movements of material in the closed cell.

INTERROGATORY 72

(a) Has the Staff or any other person or entity performed any studies of the chemical composition of the contaminated materials (i) located at Kress Creek and West Branch DuPage River; (ii) in the scattered "hot spots" which have been and will be exhumed by Kerr-McGee and the City; (iii) at the West Chicago sewage treatment plant; and (iv) at Reed-Keppler Park?

(b) If the answer to Interrogatory 72(i), (ii), (iii), or (iv) is yes, describe the nature of the studies, when they were conducted and by whom, and the studies' findings or conclusions.

RESPONSE

The Staff objects to the interrogatory on the basis that the Licensing Board has deferred ruling on the admissibility of contentions regarding the subject matter addressed in the interrogatory.

INTERROGATORY 73

Identify all persons who participated in preparation of Appendix F of the FES.

RESPONSE

Appendix F of the FES was prepared by Dr. Ping C. Chee, who is no longer associated with Argonne National Laboratory. His current address is 1101-1B Harbor Avenue, S.W., Seattle, Washington 98116.

INTERROGATORY 74

Identify all expert witnesses the Staff plans to call at hearing with respect to post-closure radiological impacts, including radon flux and radiation doses, and describe the subject matter on which each is expected to testify, the substance of the facts and opinions to which each expert is expected to testify, a summary of the grounds for each opinion, and all documents on which each such opinion is based.

RESPONSE

In a letter of September 17, 1984, from Staff counsel to Applicant's counsel, the Staff identified Dr. Thomas L. Gilbert as a possible witness with regard to these matters. The Staff has made no further decisions regarding expert witnesses since that time.

INTERROGATORY 75

State the total amount, volume, and categories of material which will be stabilized onsite in the event of onsite disposal.

RESPONSE

The Staff objects to Interrogatory 75 on the basis that a determination regarding precisely what will be disposed has not been made. Without waiving its objection, the Staff states that Table 75-1 lists the onsite wastes presently proposed to be included in the disposal cell, as well as the Reed-Keppler Park material which may be buried in the disposal cell.

INTERROGATORY 76

State the total concentrations of the following radionuclides contained in (a) the wastes presently onsite, and (b) the total material which will be stabilized onsite in the event of onsite disposal: U-238, U-234, Th-232, Th-230, Th-228, Ra-228, Ra-226, Ra-224, Pb-212, Pb-210.

RESPONSE

(a) The concentrations of the enumerated radiouclides in the ore residue and in the sludge (waste site sediment) are given in Table 76-1. The concentrations of Ra-226 in all wastes are given in Table 76-2. The concentrations of Pb-210 in wastes other than sludge and ore residue are

Table 75-1. Materials to be Stabilized Onsite
Under Alternative I or III

Type of Material	Source	Volume (m3)
Various process equipment and contaminated material	Factory site	700
Contaminated earth	Factory site	31,130
Contaminated earth	Waste site	42,450
Reed-Keppler material	Reed-Keppler	14,150
Sediment	Factory site	2,264
Sediment	Waste site	17,970
Ore residue	Waste site	18,000
Building rubble	Factory site	6,310
Building rubble	Waste site	2,320
Rare earth chemicals	Waste site	311
Metals	Factory site	2,632
Incinerator ash	Factory/ Waste site	118
General cleanup materials	Miscellaneous	707
TOTAL		138,360

Source: FES (Table G.1).

Table 76-1. Estimated Radioactivity Concentrations
of Uranium-238 and Thorium-232 Series Nuclides
in Sludge and Ore Residue

Nuclide	Concentration (pCi/g)	
	Sludge	Ore Residue
U-238 and U-234	280	15
U-238 series ¹ other than U-238 and U-234	280	800
Th-232	6,800	500
Th-232 series ¹ other than Th-232	6,800	2,200

¹ For the purposes of calculation, U-238 series nuclides included U-238, U-234, Th-230, Ra-226, Pb-210, Po-210, and Rn-222 and short-lived daughters; Th-232 series nuclides included Th-232, Ra-228, Th-228, Ra-224, Pb-212, Bi-212, and Rn-220 and short-lived daughters.

Source: FES (Table 5.3).

Table 76-2. Composition of the Waste Material in the Disposal Cell at the Disposal/Storage Site

Material ¹	Ra-226 Concentration (pCi/g)	Density (g/cm ³)	Volume (m ³)	Mass (Mg)	Fraction Weighted of Total Concentration ² Mass	Ra-226 Concentration ² (pCi/g)
Incineration ash	<50	0.7	118	83	0.001	0.1
Rare earth chemicals	<50	1.6	311	500	0.003	0.2
Building rubble (factory)	<50	1.7	6,310	10,730	0.054	2.7
Building rubble (waste)	<50	1.7	2,320	3,940	0.020	1.0
General cleanup	<50	2.1	707	1,485	0.007	0.4
Metals	<50	4.8	2,632	12,600	0.063	3.2
Contaminated earth ³	100	1.5	31,130	46,700	0.235	23.5
Contaminated earth ⁴	100	1.5	42,450	63,680	0.321	32.1
Sediment (factory site)	280	0.9	2,264	2,040	0.010	2.8
Sediment (waste site)	280	0.9	17,970	16,170	0.081	22.7
Reed-Keppler material ⁵	280	1.6	14,150	22,640	0.114	31.9
Ore residue	800	1.0	18,000	18,000	0.091	72.8
TOTALS		1.4 (average)	138,362	198,568	1.000	193.4 (average conc.)

¹ Ordered by concentration of Ra-226 and density.

² Actual concentration multiplied by fraction of total mass.

³ Assumed to be 0.9 m (3 ft) under all buildings (approximately 2.4 ha [6 acres]) and 0.3 m (1 ft) from balance (approximately 0.8 ha [2 acres]) at the factory site.

⁴ Assumed to be 0.3 m (1 ft) under wastes; 1.5 m (5 ft) below bottoms and from sides of Ponds 1, 2, and 3; and 0.46 m (1.5 ft) from top of Pond 1 on the disposal/storage site.

⁵ Material from Reed-Keppler Park believed to be a mixture of gypsum and tailings.

Source: FES, Table F.1.

expected to be approximately the same as the concentration of Ra-226. The concentrations of U-238/U-234 and Th-230 in wastes other than sludge and ore residue are not known but may conservatively be assumed to be the same as the concentration of Ra-226. The concentrations of Th-232, Ra-228, Th-228, Ra-224, and Pb-212 in wastes other than sludge and ore residue are not known. One may reasonably infer that (1) the concentrations of these radionuclides in incineration ash, rare earth chemicals, building rubble, general cleanup materials, metals, and contaminated earth under buildings are less than the corresponding concentrations in ore residue; (2) the concentrations in contaminated earth under the waste site sediment (sludge) are less than the concentrations in the sludge; and (3) the concentrations in the factory site sediments do not exceed the concentrations in the waste site sediments.

(b) The Staff has no basis for making predictions at this time regarding the total material to be stabilized onsite in the event of onsite disposal.

INTERROGATORY 77

State the total amount and volume of contaminated material at (a) at Kress Creek and West Branch DuPage River; (b) the scattered "hot spots" which have been and will be exhumed by Kerr-McGee and the City; (c) the West Chicago sewage treatment plant; and (d) Reed-Keppler Plant.

RESPONSE

The Staff objects to the interrogatory on the basis that it relates to contentions on which the Licensing Board has deferred ruling. Without waiving its objection, the Staff states that in response to the Licensing Board's request, the Staff will consult with Kerr-McGee and

will attempt to estimate the volume of material at Reed-Keppler Park, the sewage treatment plant and in Kress Creek.

INTERROGATORY 78

State the concentrations of the radionuclides listed in Interrogatory 76 contained in the contaminated materials at (a) Kress Creek and West Branch DuPage River, (b) the scattered "hot spots" which have been and will be exhumed by Kerr-McGee and the City, (c) the West Chicago sewage treatment plant, and (d) Reed-Keppler Park.

RESPONSE

The Staff objects to the interrogatory on the basis that it relates to contentions on which the Licensing Board has deferred ruling.

INTERROGATORY 79

Specify the diffusion coefficients used in the radon flux calculations in Appendix F of the FES, and specify the assumptions supporting the selection of these coefficients.

RESPONSE

The diffusion coefficients (D/P) are as follows. For cell cover, D/P is 0.0021 cm²/s; for source layer and cell cap, D/P is 0.0171 cm²/s. These values are based on: (1) estimates of moisture content in the cover layers given in Brady (1974--p. 192), and (2) the empirical relationship between the cover moisture and diffusion coefficient given in a report of the U.S. Nuclear Regulatory Commission (1980a--Vol. III, Appendix F--p. P-8).

INTERROGATORY 80

Describe the (a) density (g/cm³) and (b) concentrations of radionuclides (as listed in Interrogatory 76) in each layer of waste material to be

encapsulated in Kerr-McGee's proposed containment cell in the event of onsite disposal, and specify the order of layers in the said cell.

RESPONSE

All information currently available to the Staff regarding the character of the waste and its placement in the containment cell is in the FES.

INTERROGATORY 81

(a) Describe in detail the source of materials to be utilized in the cap of Kerr-McGee's proposed containment cell.

(b) Describe in detail the moisture content of (a) the materials to be utilized in the cap of the said containment cell, and (b) the wastes to be encapsulated in the said containment cell.

(c) Describe all tests, studies, or other data upon which the answers to Interrogatory 81(a) and (b) are based.

(d) Identify the person(s) from whom all materials to be utilized in the cap of the said containment cell will be purchased or obtained.

RESPONSE

All information currently available to the Staff regarding the character of the materials to be used in the cap of the containment cell is in the FES.

INTERROGATORY 82

(a) How many persons reside within 1/2 mile of the site of Kerr-McGee's proposed containment cell?

(b) How many residences are located within 1/2 mile of the site of the said containment cell?

(c) How many persons reside in each such residence?

(d) How far is each such residence from the site of the said containment cell?

(e) Describe the direction of each such residence from the site of the said containment cell?

(f) Identify all documents, including but not limited to aerial photographs, tabulations, and diagrams, on which the answers to Interrogatory 82(a)-(e) are based.

RESPONSE

The Staff objects to Interrogatory 82 as not being reasonably calculated to lead to the discovery of admissible evidence. 10 C.F.R. § 2.740(b)(1). Without waiving this objection, the Staff submits that it has no information on which to base an answer to the interrogatory.

INTERROGATORY 83

Describe in detail how population data and/or assumptions about population data were utilized in the dose calculations of Table 5.5 of the FES.

RESPONSE

The region within the 80-km (50-mile) radius of the site was divided into sectors and the population within each sector was estimated from demographic data as shown in Table 83-1. The population dose commitment was calculated as follows. First, the population dose commitment was calculated for each radionuclide and pathway from the average radionuclide concentration and the exposure rate for each sector. All the sector data were then summed to obtain the result for the whole region. The total population dose commitment was obtained by summing over all the radionuclides and over all the pathways.

INTERROGATORY 84

Describe in detail the atmospheric dispersion model utilized in the dose calculations of Table 5.5 of the FES.

RESPONSE

The atmospheric dispersion techniques used in the dose calculations employ a gaussian plume dispersion model modified to include ground deposition, resuspension, and radioactive decay and daughter ingrowth (FES, Sec. 5.9.1). The model is designed to predict ground-level air concentrations resulting from continuous release of U-238 or Th-232 and their decay products from multiple area sources. The exposure pathways considered include inhalation, direct radiation from ground deposition of

Table 83-1. Population Distribution

Kilometers	N 0.0	NNE 22.5	NE 45.0	ENE 67.5	E 90.0	ESE 112.5	SE 135.0	SSE 157.5	
0.0- 0.1	0	0	0	0	0	0	0	0	
0.1- 0.5	551	1,945	1,841	1,185	568	1,085	2,285	305	
0.5- 1.0	0	0	0	0	0	0	0	0	
1.0- 2.0	0	0	0	0	0	0	0	0	
2.0- 3.0	729	3,205	1,136	497	442	204	847	104	
3.0- 4.0	0	0	150	1,627	2,055	15	0	1,142	
4.0- 5.0	0	0	150	1,627	2,055	15	0	1,142	
5.0-10.0	4,494	0	4,612	1,775	10,190	2,834	300	6,881	
10.0-20.0	10,822	20,353	8,427	27,796	57,389	26,256	13,579	30,711	
20.0-30.0	53,422	160,144	207,028	158,054	290,147	151,218	72,665	35,251	
30.0-40.0	24,252	38,845	120,493	435,296	683,294	329,659	50,101	66,399	
40.0-50.0	24,252	38,845	120,492	435,295	683,293	329,659	50,100	66,398	
50.0-60.0	53,752	13,136	37,060	17,662	261,457	840,738	248,909	5,083	
60.0-70.0	17,025	34,396	0	0	0	166,329	36,645	6,970	
70.0-80.0	17,024	34,396	0	0	0	166,329	36,645	6,970	
0.0-80.0	206,323	345,265	501,389	1,080,814	1,990,890	2,014,341	512,076	227,356	

Kilometers	S 180.0	SSW 202.5	SW 225.0	WSW 247.5	W 270.0	WNW 292.5	NW 315.0	NNW 337.5	Row Sum† ¹
0.0- 0.1	0	0	0	0	0	0	0	0	0
0.1- 0.5	197	11	62	23	346	517	802	957	12,680
0.5- 1.0	0	0	0	0	0	0	0	0	0
1.0- 2.0	0	0	0	0	0	0	0	0	0
2.0- 3.0	27	86	16	18	12	63	65	111	7,562
3.0- 4.0	0	18	74	0	0	42	0	0	5,123
4.0- 5.0	0	17	74	0	0	41	0	0	5,121
5.0-10.0	0	0	0	1,598	1,138	4,752	1,446	0	40,020
10.0-20.0	3,483	29,385	32,451	9,858	3,912	18,477	8,742	6,711	308,352
20.0-30.0	11,778	26,588	30,434	7,430	5,275	1,351	2,070	73,973	1,286,828
30.0-40.0	18,153	1,702	14,321	1,666	17,484	8,361	2,876	17,026	1,829,928
40.0-50.0	18,152	1,702	14,320	1,665	17,483	8,360	2,875	17,025	1,829,916
50.0-60.0	11,986	14,774	3,650	4,205	2,803	4,576	8,539	18,907	1,547,237
60.0-70.0	9,232	3,443	12,529	2,345	6,680	16,319	16,269	8,103	336,285
70.0-80.0	9,231	3,443	12,529	2,345	6,679	16,318	16,269	8,102	336,280
0.0-80.0	82,239	81,169	120,460	31,153	61,812	79,177	59,953	150,915	7,545,332

†¹ Row sum includes corresponding rows from upper and lower parts of the table.

windborne particulates, and direct radiation from submersion within a cloud of windborne particulates.

The models pertinent to Interrogatories 83 and 84 are described in greater detail in reports of the U.S. Nuclear Regulatory Commission (1980a) and Momeni et al. (1979).

INTERROGATORY 85

At page H-251 of the FES, the Staff stated:
"Health effects can only be given on a statistical basis and, for the no-action Kerr-McGee situation, can be calculated to be less than 0.019 increased cancer deaths per year in the entire 80-km radius area around West Chicago."

(a) Describe in detail (i) all monitoring data on which the above calculation was made, including but not limited to the time periods over which such data was gathered and the conditions under which it was gathered; and (ii) how the above calculation was made.

(b) Would the above calculation be affected, and if so how, by the data contained in USEPA Region V's study dated May 1982 and entitled "Ambient Monitoring of Airborne Radioactivity Associated with Thorium Wastes Near the Kerr-McGee West Chicago, Illinois Facility?"

RESPONSE

(a) (i) Dose calculations were not based on any short-term monitoring data. They are based on a five-year average of summertime meteorological conditions (summer chosen because it is expected that the stabilization work will be carried out in summer). Details of the dose calculations are given in the FES (Section 5.9.1--p. 5-20; Section 4.3.2 -- p. 4-19).

(ii) The population doses for specific organs were calculated using the dispersion model described in the Response to Interrogatory 84. The health risk was calculated from the effective dose equivalent, which

was based on the concepts in Publication 26 of the International Commission on Radiological Protection (1977).

(b) The health risk calculation will not be affected by the USEPA Region V's study because the dose calculations were not based on any short-term monitoring data.

INTERROGATORY 86

(a) Does the Staff believe that the design of Kerr-McGee's proposed containment cell is adequate and appropriate for disposal of the Kerr-McGee wastes?

(b) Does the Staff believe that the design for Kerr-McGee's proposed containment cell as modified by the Staff's recommendations in the FES is adequate and appropriate for disposal of the Kerr-McGee wastes?

RESPONSE

The Staff will deem the design adequate and appropriate if it satisfies the standards of 40 C.F.R. Part 192 as evaluated by the criteria of 10 C.F.R. Part 40, Appendix A. That determination has not yet been made.

INTERROGATORY 87

Do the documents produced in response to the following Request for Documents constitute all documents responsive to that request?

RESPONSE

See Response to Request for Documents.

INTERROGATORY 88

Identify (a) the person(s) who provided the answers to these interrogatories, designated by interrogatory number, and (b) the custodian(s) of documents produced and person(s) who participated in preparing or assembling said documents.

RESPONSE

(a) The persons who provided the responses to these interrogatories, designated by interrogatory number, are:

I. Argonne National Laboratory Staff

Dr. Paul Benioff: 16, 39, 41, 43-44, 51, 53, 56, 58-64, 66-68
71, and 75

Dr. Thomas Gilbert: 74, and 76

Ms. Pamela Merry-Libby: 5, 29, 35, 37, and 54-55

Dr. Natalia Meshkov: 14-15, and 83-84

Dr. Steve Tsai: 1-4, 6, 8, 11, 13, 17, 28, 38, 42, 47, 52,
57, 73, and 87-88

Dr. Charley Yu: 36, 40, 76, 79, and 85

II. William A. Nixon: 7, 9-10, 12, 18-27, 30-34, 46, 48-50, 65,
69-70, 72, 77, 80-82, 86, and 88-89

(b) The Staff objects to subpart (b) insofar as it requires identification of anyone other than the author(s) of the documents identified, on the basis that the identification of preparers and assemblers of documents (other than authors) is not reasonably likely to lead to the discovery of admissible evidence. 10 C.F.R. § 2.740(b)(1). As regards custody, the documents are in the possession of either Argonne National Laboratory or the NRC staff.

REQUEST FOR DOCUMENTS

The Staff objects to the Request for Documents to the extent that it asks for documents other than those relied upon as the basis for responses. It would be an undue burden on the Staff, which would entail

research beyond that already conducted by the Staff, to identify all documents "related" to each interrogatory response. A list of documents identified in the responses is provided below. Should the People require copies of any of these documents, appropriate arrangements will be made following the People's identification of such a need.

Baes, C.F., III, and R.D. Sharp. 1983. A proposal for estimation of soil leaching and leaching constants for use in assessment models. *Journal of Environmental Quality* 12(1):17-28.

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Dodson, M.E., A.W. Gee, and R.J. Serne. 1984. Interaction of Tailings Leachate with Local Liner Materials Found at Canonsburg, Pennsylvania. PNL-5046. Pacific Northwest Laboratory, Richland, WA. April 1984.

Frame, P.W. 1984. Comprehensive Radiological Survey of Kress Creek, West Chicago Area, Illinois. Prepared by Oak Ridge Associated Universities for the U.S. Nuclear Regulatory Commission. Final Report, February 1984.

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International Commission on Radiological Protection. 1977. Recommendations of the International Commission on Radiological Protection. ICRP Publ. 26. Pergamon Press, Elmsford, NY.

Kerr-McGee Chemical Corporation. 1980. Stabilization Plan. License Station 583, West Chicago, Illinois.

Kerr-McGee Chemical Corporation. 1981. The Applicant's Preferred Remedial Action Plan. Supplement to Stabilization Plan: License STA-583. December 11, 1981.

Kerr-McGee Chemical Corporation. 1983. Memorandum. Compliance of the Kerr-McKee Stabilization Plan with EPA Standards. December 20, 1983.

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Momeni, M.H., Y. Yuan, and A.J. Zielen. 1979. The Uranium Dispersion and Dosimetry (UDAD) Code. NUREG/CR-0553; ANL/ES-72. Prepared for the U.S. Nuclear Regulatory Commission by Argonne National Laboratory. May 1979.

Nuclear Safety Associates. 1980. Comparison of Alternatives for Long-Term Management of High-Level Radioactive Waste at the Western New York Nuclear Services Center. Appendix IIIC. September 1980.

Robert Snow Means Co. 1984. Building Construction Cost Data. Kingston, MA.

Stehney, A.F., A.P. Polednak, J. Rundo, A.M. Brues, H.F. Lucas, Jr., B.C. Patten, and R.E. Rowland. 1980. Health Status and Body Radioactivity of Former Thorium Workers, Interim Report. NUREG/CR-1420; ANL-80-37. Prepared for the U.S. Department of Energy and the U.S. Nuclear Regulatory Commission by the Center for Human Radiobiology, Argonne National Laboratory, Argonne, IL. January 1980.

U.S. Department of Health and Human Services. 1983. Registry of Toxic Effects of Chemical Substances, 1981-1982. Edited by R.L. Tatken and R.J. Lewis, Sr. DHHS (NIOSH) Publ. No. 83-107. Public Health Services, National Institute for Occupational Safety and Health, Cincinnati, OH. June 1983.

U.S. Environmental Protection Agency. 1983a. Standards for Remedial Actions at Inactive Uranium Processing Sites; Final Rule (40 CFR Part 192). Fed. Regist. 48(3):590-606 (January 5, 1983).

U.S. Environmental Protection Agency. 1983b. Environmental Standards for Uranium and Thorium Mill Tailings at Licensed Commercial Processing Sites; Final Rule (40 CFR Part 192). Fed. Regist. 48(196):45926-45947 (October 7, 1983).

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U.S. Nuclear Regulatory Commission. 1980b. A Methodology for Calculating Residual Radioactivity Levels Following Decommissioning. NUREG-0707. October 1980.

U.S. Nuclear Regulatory Commission. 1982. Licensing Requirements for Land Disposal of Radioactive Waste; Final Rule. 10 CFR Parts 2, 19, 20, 21, 30, 40, 51, 61, 70, 73 and 170. Fed. Regist. 47(248):57446-57449 (December 27, 1982).

INTERROGATORY 89

Identify all expert witnesses whom the Staff plans to call at hearing, the subject on which each is expected to testify, a summary of the grounds for each opinion, and all documents on which each opinion is based.

RESPONSE

Other than the three potential witnesses identified in the letter of September 17, 1984, from Robert Fonner to Peter Nickles, the Staff has not at this time identified further witnesses.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
KERR-MCGEE CHEMICAL CORPORATION)
(West Chicago Rare Earths Facility))

Docket No. 40-2061-ML

ASLBP No. 83-495-01-ML

AFFIDAVIT OF DR. PAUL BENIOFF

I, Paul Benioff, being duly sworn, state as follows:

1. I ~~am~~ employed by Argonne National Laboratory.

2. I ~~am~~ duly authorized to answer Interrogatories 16, 39, 41, 43-44, 51, 53, 56, 58-64, 66-68, 71 and 75.

I hereby certify that the answers are true and correct to the best of my knowledge.

Paul Benioff
Dr. Paul Benioff

Subscribed and sworn to before
me this 19 day of April, 1985

Margaret A. Zurek
Notary Public

My commission expires: FEBRUARY 13, 1987

NOT COMMISSION EXPIRES

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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 OF DR. THOMAS GILBERT

I, Thomas Gilbert, being duly sworn, state as follows:

1. I am employed by Argonne National Laboratory.
2. I am duly authorized to answer Interrogatories 74 and 76.

I hereby certify that the answers are true and correct to the best of my knowledge.

Thomas S. Gilbert
Dr. Thomas Gilbert

Subscribed and sworn to before
me this 19 day of April 1985

Margaret A. Zurek
Notary Public

My commission expires: FEBRUARY 13, 1987

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

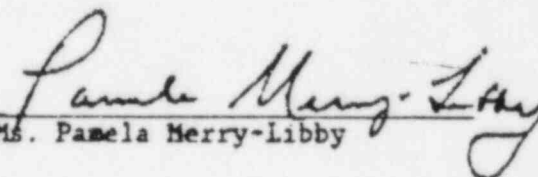
In the Matter of)	
KERR-MCGEE CHEMICAL CORPORATION	)	Docket No. 40-2061-ML
(West Chicago Rare Earths Facility)	)	ASLBP No. 83-495-01-ML

AFFIDAVIT OF MS. PAMELA MERRY-LIBBY

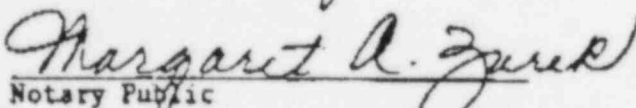
I, Pamela Merry-Libby, being duly sworn, state as follows:

1. I am employed by Argonne National Laboratory.
2. I am duly authorized to answer Interrogatories 5, 29, 35, 37 and 54-55.

I hereby certify that the answers are true and correct to the best of my knowledge.


Ms. Pamela Merry-Libby

Subscribed and sworn to before
me this 18 day of April, 1985


Notary Public

My commission expires: FEBRUARY 13, 1987

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)

KERR-MCGEE CHEMICAL CORPORATION)

(West Chicago Rare Earths Facility))

Docket No. 40-2061-ML

ASLEP No. 83-495-01-ML

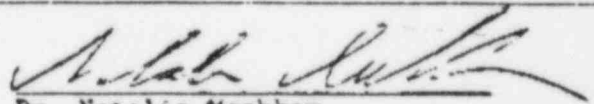
AFFIDAVIT OF DR. NATALIA MESHKOV

I, Natalia Meshkov, being duly sworn, state as follows:

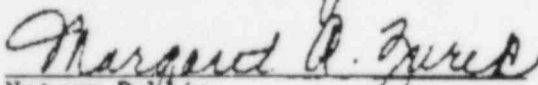
1. I am ~~employed~~ by Argonne National Laboratory.

2. I am duly authorized to answer Interrogatories 14-15, and
83-84.

I hereby certify that the answers are true and correct to the best of my
knowledge.


Dr. Natalia Meshkov

Subscribed and sworn to before
me this 18 day of April 1985


Notary Public

My commission expires: MY COMMISSION EXPIRES
FEBRUARY 12, 1987

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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 OF DR. STEVE TSAI

I, Steve Tsai, being duly sworn, state as follows:

1. I am employed by Argonne National Laboratory.
2. I am duly authorized to answer Interrogatories 1-4, 6, 8, 11, 13, 17, 28, 38, 42, 47, 52, 57, 73, and 87-88.

I hereby certify that the answers are true and correct to the best of my knowledge.

Steve Tsai
Dr. Steve Tsai

Subscribed and sworn to before
me this 19 day of April, 1985

Margaret A. Zurek
Notary Public

MY COMMISSION EXPIRES
FEBRUARY 13, 1987

My commission expires: _____

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

KERR-MCGEE CHEMICAL CORPORATION

(West Chicago Rare Earths Facility)

)
)
)
)
)

Docket No. 40-2061-ML

ASLBP No. 83-495-01-ML

AFFIDAVIT OF DR. CHARLEY YU

I, Charley Yu, being duly sworn, state as follows:

1. I am employed by Argonne National Laboratory.
2. I am duly authorized to answer Interrogatories 36, 40, 76, 79, and 85.

I hereby certify that the answers are true and correct to the best of my knowledge.

Charley Yu
Dr. Charley Yu

Subscribed and sworn to before
me this 19 day of April, 1985

Margaret A. Zurek
Notary Public

MY COMMISSION EXPIRES

My commission expires: FEBRUARY 12, 1987

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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 OF WILLIAM A. NIXON

I, William A. Nixon, being duly sworn, state as follows:

1. I am employed by the U.S. Nuclear Regulatory Commission as a Senior Chemical Engineer, Uranium Fuel Licensing Branch.

2. I am duly authorized to answer Interrogatories 7, 9-10, 12, 18-27, 30-34, 38, 46, 48, 49-50, 65, 69-70, 77, 80-82, 86, and 88-89.

I hereby certify that the answers are true and correct to the best of my knowledge.

William A. Nixon

Subscribed and sworn to before
me this day of , 1985

Notary Public

My commission expires:_____

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
)	
KERR-MCGEE CHEMICAL CORPORATION	)	Docket No. 40-2061-ML
)	
(West Chicago Rare Earths Facility)	)	ASLBP No. 83-495-01-ML

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF ANSWERS TO PEOPLE OF THE STATE OF ILLINOIS' SECOND SET OF INTERROGATORIES" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class, or as indicated by an asterisk through deposit in the Nuclear Regulatory Commission's internal mail system, this 19th day of April, 1985:

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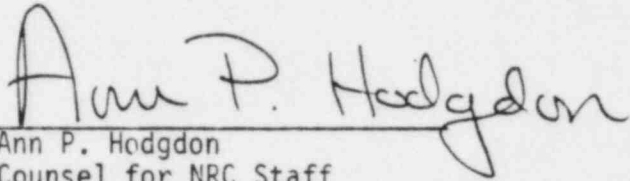
Atomic Safety and Licensing
Appeal Board Panel*
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Washington, D.C. 20555

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