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ITASCA
Consulting Group, Inc.

18 April 1986

David Tiktinsky - SS623
U.S. Nuclear Regulatory Commission
Division of Waste Management
Washington, D.C. 20555

"NRC Technical Assistance
for Design Reviews"
Contract No. NRC-02-85-002
FIN D1016

Dear David:

Enclosed is our trip report for the meeting on Review Planning Activities for DOE FEA and SCP Submittals for a Geologic Repository in Salt, 2-3 April 1986, in Silver Spring. Please call me if you have any questions.

Sincerely,

Roger D. Hart
Program Manager

cc: J. Greeves, Engineering Branch
Office of the Director, NMSS
E. Wiggins, Division of Contracts
DWM Document Control Room

Encl.
rdh/ks

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P.O. Box 14806 • Minneapolis, Minnesota 55414 • (612) 623-9599

ITASCA TRIP REPORT

DATES: 2-3 April 1986

LOCATION: Nuclear Regulatory Commission
Silver Spring, Maryland

PURPOSE: Review Planning Activities for DOE FEA and SCP Submittals for a Geologic Repository in Salt

ITASCA ATTENDEES: J. Daemen (University of Arizona)
I. Farmer (University of Arizona
R. Hart (Itasca Consulting Group)
K. Wahi (consultant)

PREPARED BY: J. Daemen, I. Farmer, R. Hart, and K. Wahi

SUMMARY

The meeting was attended by NRC representatives and consultants from Itasca, Engineers International, and the Bureau of Mines. The meeting schedule was as described in the meeting notice.

The FEA Review Plan was presented by J. Pearring and NRC team members. FEA review tasks were outlined and discussed. In particular, these tasks involve:

(1) familiarization with and review of documents in preparation for FEA review

(2) tentative schedule of FEA review meetings

- week of 28 April 1986
- concluding meeting near the end of May 1986

(3) specific FEA review assignments

- focus on major comments
- Chapter 7 review

The SCP Design/Rock Mechanics Review items were presented by J. Pearring and discussed by NRC contractors. Major areas were identified for surface facilities, shafts, and underground facilities. Issues were identified and discussed, and preliminary plans outlined for SCP review preparation.

J. Pearring requested follow-up proposals from the NRC contractors on the scope of work and level of effort for the FEA review and preparation for the SCP review. A letter describing our understanding of Itasca's involvement was prepared by R. Hart and J. Daemen and sent to J. Pearring (with a copy to D. Tiktinsky) on 4 April 1986.

SPECIFIC COMMENTS BY I. FARMER

1. FEA Review

The following approach is suggested:

A. Compare, for each site, final EA with draft EA (look for changes, particularly from favorable to unfavorable conditions).

B. Examine, particularly, Chapter 7 to see if comments are justified.

C. Examine, particularly, how ratings in Chapter 7 are assessed and look at the use of discriminator schemes in data assessment and design

D. Look for areas of uncertainty and especially for DOE recognition of these areas. The draft EA was too optimistic.

E. See how major comments on the draft EA have been incorporated into the FEA. Look for incorporation of major new information into the FEA.

F. Prepare new major comments, if appropriate, on the basis of new and existing information. Comment on format, tone, approach, etc.

2. SCP Review

This is an area where a review philosophy has not been fully developed. The current need is for position papers or reviews in the goetechnical area to provide a basis for discussion of the SCP. Areas identified include:

(a) Surface Site Characterization Review Plan

(I Farmer provisionally to carry out.)

(b) Shaft Site Characterization Review Plan

A series of questions to identify data needs and design deficiencies is needed, with emphasis on shaft pillar, freezing methodology, groundwater inflows in grout, sealing of frozen zone, lining design in frozen zone, lining design in rock salt zone, inset and shaft bottom design, post-repository shaft seals, and shaft keys. There is room for a major review here.

(c) Underground Site Characterization Review Plan

The current state of knowledge of salt behavior—in the shaft and in the repository—is surprisingly weak (my emphasis), despite volumes of research published. German research, for example, which is comprehensive, appears to have been ignored. The underground review will depend on the correct questions being asked about rock salt. Presently, NRC does not have the background for this, and a review of much wider sources than those currently covered and carried out by someone with training in research and knowledge of engineering (rather than some DOE contractor) is needed to produce this information. Topics could include geology-geohydrology, mechanics, thermomechanics, constitutive models, design of openings, and pillars.

(d) In-Site Test Program

This was barely mentioned.

3. FLUOR Design

This appeared old-fashioned, naive and, in many places, bad engineering. It is important to obtain a copy for further study and comment.

4. Conclusions

While the FEA review process appeared under control and well planned, there appear to be serious deficiencies in planning and information for the SCP review. There is a need for position papers, reviews and possible research in several areas (outlined above).

SPECIFIC COMMENTS BY K. WAHI

1. QA Program Review

J. Kennedy's (NRC) presentation and handout emphasized the very important role that proper QA plays in the licensing process. He gave examples of costly mistakes made in the past in which a breakdown in QA implementation was responsible for project abandonment or major program changes. Consultants were advised on their indirect participation through technical information and data reviews.

Reference was made to a "Ford Study" (NUREG-1055) on QA and to the fact that the results of that study will be transferred for application in the waste management programs. With respect to EA reviews, it was pointed out that QA (or lack of it) would not be a determinant in site rankings. However, any data used in support of a license application would have to meet appropriate QA requirements and provisions. Any NRC decision following the SCP reviews could be questioned on the basis of how such decisions were reached; such a situation has QA-related (i.e., QA on the NRC side) implications. This issue needs more attention due to its potentially serious impacts.

2. FEA Review

Only design and rock mechanics issues are to be considered by the participants of this meeting as far as FEA reviews are concerned. Apparently, the FEA Review Plan document is essentially the same as the Draft EA Review Plan.

J. Pearring assigned various people to the different salt sites and gave instructions on the timing and procedures for their reviews. The scope of FEA reviews is to focus on the Draft EA major comments—in other words, identify if, and to what extent, NRC's concerns have been addressed in the new document(s). Three of the 11 or 12 major comments on each salt site were contributed by the design/rock mechanics review team. These comments are on the issues of rock mass heterogeneity, retrievability, and shaft sealing. New reference documents for individual sites, as well as those common to all sites, were identified. A number of these may require some degree of review prior to performing FEA reviews. Dr. Hart will coordinate the review assignments for the Itasca team members.

J. Pearring stated that, in addition to FEA Chapters 3, 4, 5 and 6, we need to check the contents of Chapter 7 for consistency. This is necessary in order to ascertain that the rock mechanics evaluations as presented in Chapter 7 are consistent with the findings presented in Chapters 3-6. It is unclear, at this time, whether an evaluation of the site rankings is to be performed by this group or another. A request was made that a copy of the comments from the "Affected States" be made available to us.

John Linehan presented the management's overview of the review plans. His remarks are paraphrased in the following statements. There are two audiences for the reviews performed by the staff and consultants: (1) The (NRC) Commission, and (2) the DOE, Affected States and Tribes. The reviews should stay out of rankings and the debate on site suitability. Issues resolution is not the goal at this stage, but DOE should give appropriate recognition of uncertainties. However, mere recognition of uncertainties is not sufficient. The impact of those uncertainties needs to be carried through in the analyses presented. The reviewers should feel free to consider data and program changes of which they are aware, regardless of whether or not the DOE FEAs reference such information.

The remainder of the Wednesday (2 April 1986) meeting and all of Thursday (3 April 1986) were spent on discussing SCP Review Planning. J. Pearring presented material on DOE's latest thoughts on design of surface and underground facilities. The design bases for surface facilities were stated. An interesting note is that for the Deaf Smith site (and perhaps others), the design calls for raising the final

grade to be above maximum flood level. Site characterization information needs, as they are relate to surface facilities, are identified as geomechanical and thermomechanical aspects and thermal loading. EI will look into retrieval considerations for surface facilities. With respect to maintaining separate piles of excavated material to be used later as backfill, the question was raised whether the material would be chemically compatible after decades of exposure at the surface. The 35° angle of draw criterion for the shaft location in relation to underground facilities was questioned. It was pointed out that surface heave (and not just subsidence) should be considered in planning the relative locations of the shafts, surface facilities, and underground facilities. K. Wahi (Itasca) suggested that one-dimensional thermal analyses be performed to quantify or bound the effects of a detailed stratigraphy. Monitoring the performance of seals, their chemical deterioration, and the conditions in adjacent native rock were recommended. I. Farmer (Itasca) feels that alternatives to freezing (during shaft construction) should be considered because it causes problems that may not be manageable (e.g., rock/ground response upon thawing).

A description of the current, conceptual design of underground facilities was given by J. Pearring. The key design parameters pertain to elimination of the cross-cuts at 100-ft. intervals (MSHA regulations for gassy mines), thermal loads (areal and per package), and retrievability considerations. The design calls for maintaining rock surfaces of un-backfilled areas to a maximum of 70°C. Concern was expressed over the closeness of adjacent holes for certain waste types. DOE's assumptions regarding conditions at retrieval time and the ease of retrieval were considered as too optimistic by the entire group.

Respectfully submitted,

Roger D. Hart
Itasca Consulting Group, Inc.

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rdh/ks

COST BREAK-OUT

Labor

J. Daemen	24 hrs @ $57.75/hr	$ 1,386.00
I. Farmer	20 hrs @ $57.75/hr	1,155.00
R. Hart	30 hrs @ $22.12/hr	663.60
K. Wahi	28 hrs @ $55.00/hr	1,540.00
	TOTAL LABOR	$ 4744.60

Actual Expenses

Travel

Airfare (to WDC)

Daemen	$ 860.00
Farmer	312.00
Hart	420.00
Wahi	336.00

Miscellaneous Travel Expenses (car rental, gas, mileage, parking taxis) 164.19

Motel

Daemen	(3 nights @ $37.40/night)	$ 112.20
Farmer	(2 nights @ $42.35/night)	84.70
Hart	(3 nights @ $40.65/night)	121.95
Wahi	(3 nights @ $36.58/night)	109.74

Meals

Daemen	$ 76.16
Farmer	52.00
Hart	40.50
Wahi	99.00

Miscellaneous Expenses

Hart	(phone)	$ 0.30
Wahi	(phone)	12.45

TOTAL EXPENSES: $ 2,801.19