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John J. Linehan, Section Leader
Salt Section
Repository Projects Branch
Division of Waste Management, MS 623-SS
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Linehan:

SUBJECT: NRC/DOE MEETING ON STRUCTURE AND TECTONICS OF THE PALO DURO BASIN, NOVEMBER 19-21, 1985, RESPONSE TO NRC COMMENTS

The DOE responses to NRC observations from the "Structure and Tectonics of the Palo Duro Basin" meeting are attached. DOE looks forward to receiving the NRC responses to DOE comments.

If there are any questions, please contact M. Ferrigan of my staff.

Sincerely,

J.O. Neff

J.O. Neff
Program Manager
Salt Repository Project Office

SRPO:PMF:max:1050C

Enclosure:
As Stated

cc: R. Wunderlich, SRPO
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SUMMARY OF NRC/DOE MEETING
ON THE
STRUCTURE AND TECTONICS OF THE PALO DURO BASIN

Observations

The NRC had the following observations:

1. A significant amount of data available for structural interpretations of the Palo Duro Basin consists of boring logs of oil exploration wells and seismic surveys conducted for oil exploration. As part of site screening activities of the entire basin, project specific seismic data were obtained utilizing acquisition parameters which emphasize resolution in the approximate 2000 to 6000 ft. depth range. As such, the inherent uncertainty and limitations of these data for detailed structural analysis are recognized particularly with respect to near-surface strata.

   Response: DOE recognizes the inherent limitations of existing seismic data. The regional database was intended to provide a basis for screening large land areas to define preferred study sites for detailed characterization and as such, are reconnaissance in nature. As indicated in DOE Observation 3, it is important, during site characterization, to obtain seismic data optimized for both basement structure and shallow structures (repository horizon and above). These considerations are currently being addressed in the planning of site characterization seismic data acquisition.

2. The nature and distribution of the seismic and boring data are such that some variations in interpretations are possible for both the data and the resultant structural features.

   Response: This point is raised as DOE's Observation 1. The issue of greatest importance is the impact of any reasonable alternative interpretation on expected site performance. Site Characterization studies of local and regional structural elements will be based on overall site performance considerations (to be discussed in the SCP), not on questions of strictly academic interest. It may well turn out that the differing interpretations of regional structure based upon screening data have no impact on demonstrated release rates (and probabilities) from the candidate site.

3. Some available seismic data and remote sensing imagery, such as landsat and aerial photographs, do not appear to have been fully utilized. Much seismic data are proprietary in nature, and when approached by DOE contractors, the oil companies have refused to release the data. Other seismic data are known by DOE to be available from brokers; however, the quality and usefulness of this data is not well known. DOE should consider evaluating the availability and usefulness of all seismic data to determine if they can be obtained and if they are worth obtaining to assist in structural interpretations. It should be recognized that NRC has defined procedures for dealing with proprietary data. DOE may also wish to consider obtaining and evaluating other available remote sensing data such as various types and scales of aerial photography and radar imagery.

Response:

a. Available Seismic Data - DOE has obtained representative, good quality seismic data of the site and region. It is recognized that additional brokered data exists and is desirable, particularly north of the site and over the Amarillo uplift. Further significant data at the site do not seem available through open channels with oil companies. Also, much of the available data is not of a quality (resolution at depths of interest) to be very useful to the program. Regarding seismic data owned by oil and gas exploration firms, it may be possible, on a case by case basis, to examine either the raw data or interpretations, but it is unclear how these proprietary lines can be used in an open, public program. DOE will continue to pursue this matter with NRC staff.

b. Remote Sensing Imagery - Some investigation of both satellite imagery and aerial photography of the Palo Duro Basin region has already occurred. The site has been flown at a detailed scale to permit construction of topographic maps for engineering design. DOE has recently received a subcontractor evaluation of landsat imagery of the Palo Duro region, and is performing a technical review of this study. As a result of this review, it is anticipated that additional remote sensing imagery analyses can be recommended which will be of use to the Salt Repository Project. A recent flyover was made of the Deaf Smith site using Side-Looking Airborne Radar (SLAR). This imagery, when available, will be evaluted to further utilize remote sensing within the Salt Repository Project.

4. In the development of their site characterization plans DOE should consider developing a comprehensive integration of the available data. The following data elements have been addressed to some degree; however, NRC considers the integration effort should include:

   a. Development of a conceptual regional tectonic model(s) to evaluate various structural interpretations.

   b. Evaluations of the possible effects of strick-slip faulting including both the ability to recognize such features and their effect on structural interpretations.

   c. Evaluations of the role of the Matador Arch and Oldham Nose in the regional tectonic setting.

   d. Evaluations of the relationship between fracture patterns observed in boreholes, outcrops, and remote sensing data including the limitations of the various methods in recognizing these features.

   e. Modelling of gravity and magnetic data.

   f. Evaluations of potential reactivation of structural features through geologic time including the upward change in structural expression such as progression from faulting to folding to fracturing which may be expected and variations in fracture density and orientations over areas of deep faults in comparison with unfaulted areas.

g. Providing more emphasis on evaluating the presence or absence of folds and their role in the tectonic history of the area.

h. Resolving difficulties in identifying basement.

i. Reevaluation of the boundaries and the resultant effect of the regional stress field between the approximately N 70° E maximum horizontal stress field of the mid continent to the approximately N-S stress field of the Rio Grande rift.

Response: DOE agrees that it is desirable to provide an integrated geological analysis with the site description in the Chapters 1 through 4 of the Site Characterization Plan (SCP). The points raised in this observation will be considered to the extent possible in the SCP.

5. It appears that DOE's contractors have made significant progress in developing and implementing a viable QA program; however, NRC questions if traceability of information from study to study can yet be demonstrated. From the meeting presentations, it is NRC's impression that each study is providing some checks and documentation; however, there appears to be little to no effort to cross-check from one study to another. Examples that arose during the meeting include: criteria used to identify faults on seismic lines, criteria used to eliminate or modify faults presented in the published literature and subcontractor reports and criteria to select stratigraphic "picks" from borehole logs. DOE may wish to have its QA personnel consider this concern.

Response: DOE has expended considerable effort over the past serveral years to develop a consistent and coordinated Quality Assurance (QA) program which meets the requirements of NQA-1 and 10 CFR 50, Appendix B. QA provides the means of documenting how an activity was conducted, i.e., the steps taken in each analysis leading to a specific interpretation. The key is to understand how varying the data reduction method changes the overall interpretation. It is recognized that as the program enters the site characterization phase to collect licensing information, it will be necessary to focus on a single approach to data interpretation (e.g., defined criteria for selecting formation tops from E-logs) by all contract research groups. Appropriate procedures will be developed for site characterization analytical work. However, some flexibility will still need to be provided to allow alternative approaches to be considered.

6. When planning for seismic surveys NRC believes that:

a. Expanded coverage with seismic refraction profiling may provide much useful information concerning lateral and vertical variations of velocity values. Such information could be useful for 1) drill hole location optimization, 2) geohydrology characterization, and 3) planning of seismic reflections lines and evaluation of shallow reflection anomalies.

b. Dual programs may be desirable in certain areas to provide both shallow and deep structural data.

c. Shallow (less than 2000 feet) surveys should be considered in selected areas where the Alibates Fm is known to be faulted.

Response:

a. Cost-benefit considerations are a mandated part of the repository program. Both reflection and refraction programs are planned to address either specific issues or to provide needed support for other studies.

(1) Lateral and vertical variations of seismic velocity are probably insufficient to have any influence on optimizing the siting of drill holes. Sites will be selected to optimize the intended purpose for each hole, such as stratigraphic or hydrologic studies. Limited seismic work will be used to indicate that anamolous conditions are not present. Targeting an anomaly would be an exception.

(2) Hydrologists have indicated that the upper aquifer studies will require: elevations for the water table (available from existing water wells), the Ogallala-Dockum contact, and the base of the Dockum on about a 1/8-mile, or larger, grid. Variations in seismic velocity within the aquifer are not readily correlated with hydrologic parameters. The means to provide the desired data points will be considered in preparing the SCP.

(3) The reflection work will desire datum statics from refraction arrivals as an integral part of the reflection program, or will use a specialized refraction program to address datum statics only.

b. Agree with NRC.

c. Agree with NRC.

Plans and rationale will be provided in the SCP and subject to NRC review.

7. DOE should consider the usefulness and applicability of electrical and electromagnetic surveys in resolving structural and geohydrologic concerns.

Response: The type of investigations to be conducted during site characterization will be matched to the issues to be resolved and overall site performance objectives. The SRP Issue Resolution Strategy, which will be presented in Section 8.2 of the SCP, will describe the type of information necessary to address questions of site performance. Associated field study plans will present the approach to collecting that information. All available geophysical survey techniques will be considered, as appropriate.

8. Based on the DOE presentations of general types of planned site characterization studies, it appears to the NRC that current planning is focusing on developing site specific studies. It is not as apparent that the same attention has been given to also developing regional investigations important to understanding site performance. During future meetings in which proposed studies are discussed this subject needs additional clarification. This subject should be evaluated in light of the performance objectives of 10 CFR 60.

   Response: SRP agrees with the need to evaluate site performance within a regional geologic context. However, the necessary level of detail for regional understanding is not well defined at this time. The SCP for the candidate salt site will describe what is known of the regional geology and important alternative interpretations. Chapter 8 of the SCP will define site performance objectives, and list the issues to be resolved through site characterization studies in order to demonstrate a level of site performance. Additionally, Chapter 8 will present what is believed to be a reasonable set of activities, including regional studies, to assure issue resolution. We look forward to further interactions with the NRC on this subject to assure that all substantive concerns and recommendations are accomodated.

9. The NRC staff appreciates that effort of DOE in making available at this meeting the key personnel involved in the structural evaluation of the Palo Duro Basin. The knowledge and candor of the presentors helped assure the success of the meeting in accomplishing its objectives. The NRC staff wishes to thank all DOE participants for their effort.

   Response: SRPO concurs with the observation on the usefulness of this type of working meeting where all participants have an opportunity to discuss ideas in an open, professional environment. We would like to maintain this format for future discussions.

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NRC/DOE Mtg on Structure and Tectonics of the Palo Duro Basin

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ENCLOSURES

Closed out 2/13 telephone call to A. Noel SRPO. NRC is preparing its response and anticipates sending late next week.

R Johnson

REMARKS

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