UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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FEBRUARY 25, 1993

TO: Charlotte Abrams, HLPD, Division of High-Level Waste Management
M/S 4 H 3 - FYI

FROM: Philip S. Justus, Sr. On-Site Licensing Representative

SUBJECT: PLANNING INFORMATION FOR SEISMIC REFLECTION PROGRAM ACTIVITY 8.3.1.4.2.1.2

Please find enclosed the above-referenced information.

PSJ:nan
Enclosure as stated

cc: A. K. Ibrahim w/enc. - M/S 4 H 3

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NH03

United States Department of the Interior
GEOLOGICAL SURVEY
BOX 25046 M.S. 425
DENVER FEDERAL CENTER
DENVER, COLORADO 80225

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:

January 28, 1993

WBS#: 1.2.3.2.2.1.1
QA : NA

Russ Dyer
U.S. Department of Energy
Yucca Mountain Site
Characterization Project Office
P.O. Box 98608
Las Vegas, Nevada 89193-8608

SUBJECT: Planning Information for Seismic Reflection Program
Activity 8.3.1.4.2.1.2

Dear Russ:

In response to the information requested (ref.: Jan. 7, 1993, letter, Dyer to Hayes) concerning the upcoming seismic reflection field study, Clay Hunter, principal investigator for this work, prepared the following information (cited in reference to numbered questions in that letter):

Phil
somewhat cloudy: we discussed this on phone
MC
2/24/93

1) The anticipated contract award date is currently estimated to be late February 1993. Negotiations with prospective vendors were held January 25 and 26, 1993, with best-and-final bids due February 16, 1993. This best-and-final date represents a two-week extension needed because of concerns raised in a fax to our COR and then given to the bidders. Headquarters approval and award is expected to follow quickly.

2) Pending award of the contract, discussions with the contractor and completion of technical procedures and software QA, the USGS can not, at this time, provide an accurate schedule for proposed field activities. The field work may take in the range of six to eight weeks to complete.

3) Summary of possible data quality checks and hold points being discussed by the USGS, subject to further discussion and adjustment:

i) Noise test and source test along Line 2 to the NE of hole VH-1. Noise test and source test near Shotpoint 510 along Line 5. Acquisition of Expanding Spread Profile (ESP) at VH-1. **HOLD POINT 1.** If ESP/VH-1 is successful, conduct Expanding Spread Profile at UE#25 P-1. If not, go to ii).

ii) Acquisition of Line 2 using a combination of vibrator and minihole sources. **HOLD POINT 2.** If the minihole data are successful in imaging reflections on the NE end of Line 2, go to iiia). If data at Yucca Crest are NOT promising but data from flanks of Yucca Mountain are better, go to iiib).

iiia) Acquisition of Line 3. Go to iv).

iiib) Acquisition only of eastern (alluvial cover) half of Line 3. Go to iv).

iv) **HOLD POINT 3.** If noise test data along Line 5 are satisfactory, go to v). If not, and if the vibrator data along Line 2 are successful, go to vii).

v) Acquisition of Line 4. **HOLD POINT 4.** If data quality either along Line 4 or from the noise test along Line 5 were satisfactory, go to vi). If not, and if vibrator data along the SW end of Line 2 are successful, go to vii). If none of the above conditions are true, stop. That is, if data quality from Line 4 and noise test along Line 5 is poor, do not acquire Line 5. If data from Line 2 are of poor quality, do not acquire Line 1. Stop.

vi) Acquisition of Line 5. **HOLD POINT 5.** Examination of field records and field-processed data. If Vibroseis data along Line 2 are successful, go to vii). If not, stop.

vii) Acquisition of Line 1. Stop/finish.

4) Until contract is awarded, and costs are agreed upon with the contractor, the USGS can not determine what revisions to the proposed program will be made. At this time we believe that only relatively minor changes to the proposed field program would be necessary due to budget limitations. In the unanticipated event that costs exceed the currently budgeted amounts, however, the USGS feels that Lines 2 and 3 have the highest priority, then Line 5, then Line 4, and lastly Line 1. The mobilization and demobilization of the shear-wave vibrator trucks is relatively expensive, and if technically feasible, it would be more cost-effective to use the land-airgun source as both a compressional and shear-wave source.

5) Shotpoint 303 is not absolutely required by the seismic reflection program, as long as it is possible to acquire Shotpoints 302 and 304. Shotpoint 209 is near Shotpoint 303 and can provide most if not all the needed information as to how effectively seismic sources on Yucca Mountain itself are coupled into the earth.

6) While this question can best be answered after contract negotiations, the USGS believes that seismic shothole drillers routinely dry drill in such conditions and the requirement to do so at Yucca Mountain for a few holes should not impose any hardship to the drilling aspect of the seismic reflection program. Potential contractors were advised of need to dry drill some 1200 feet in six holes to meet constraints of the drilling regulations.

7) The contractor will need to provide an exact statement of the type of drilling mud to be used for the drilling of the deep shotholes. Typically, a small amount of drilling mud (bentonite clay) is added to water to increase the density of the borehole fluid to resist collapse of the hole. The contractor will also need to provide an exact statement of the explosive used for both the deep and shallow drill holes. Very probably the contractor will use an explosive identical to the Atlas Petrogel, a high-velocity seismic explosive. Petrogel is a mixture of nitroglycerin, ethylene glycol dinitrate, ammonium nitrate, and sodium nitrate. As stated in a Performance Assessment Evaluation of Impacts of Proposed Surface Geophysical Surveys on Waste Isolation relayed in a memorandum from Laurence S. Costin to J. Russell Dyer, dated August 19, 1992, "no adverse effects are anticipated from the use of this explosive".

8) Details of scope and schedule for this study are described in the PACS submittals for FY1993. Approximately 35 miles of seismic reflection profiling is to be conducted across Yucca Mountain from Crater Flat to Jackass Flats and along a line following Yucca Wash. Interpretation of this line will provide direct information about the subsurface geometry of major structures at Yucca Mountain and in Crater Flat and further will identify mappable reflectors, providing fundamental data for structural modeling of Yucca Mountain and for development of tectonic and seismicity models. This work will be conducted under Study Plan 8.3.1.4.2.1.2, under WBS 1.2.3.2.2.1.1. Gravity and magnetic investigations along the seismic profiles in Yucca Wash and across Yucca Mountain are scheduled for completion at the end of FY93.

9) Seismic refraction profiling will be conducted simultaneously with the seismic reflection profiling, because the seismic refraction data will simply be obtained as the first arrivals on the seismic records. Thus, the acquisition of the seismic refraction data require no other independent and/or separate activities.

10) Potential contractors have been notified of requirement to submit safety and health plan. Provision of contract and safety plan to DOE is not possible until contract award.

11) The USGS has accepted the recommendation of the Civilian Radioactive Waste Management System Management and Operating Contractor (CRWMS M&O) for the standoff distance of the deep shotpoints only, and is currently in the process of relocating the deep shotholes identified in the CRWMS M&O test interference analysis as being located too close to existing wells. Consultation with the USGS principal scientists in charge of each of the existing wells indicates that almost all of these existing wells are cased down to competent rock and lack any instrumentation in the hole. In view of the fact that the holes are cased and uninstrumented, it is the USGS

position that the shallow holes can be located to no less than 75 feet from existing wells, much less than the 300 feet stated in the CRWMS M&O report. It is the personal experience of more than one USGS scientist who formerly worked for seismic contractors that 10 lb minihole shots did not damage nearby water wells. Acceptance of the 300 foot standoff distance by the USGS will result in numerous and large regions which will lack seismic source points and in serious degradation of the seismic reflection data precisely in those areas where high-quality data are most needed, near existing boreholes that will be used to relate the seismic reflections to the lithologies.

12) USGS field crews were in the field January 11, 1993 to complete staking of shothole locations for off-road line segments.

13) See response to Question 4.

14) The choice of method used to build fold at the ends of lines can be agreed upon during contract negotiations. In any case, USGS personnel are currently staking the off-end portions of each line which would require shallow explosion shotpoints in case the fold will be built using 50-m shotpoints off the ends of lines.

15) The current intent is to exclude alternate Line 2 from the field program. This alternative was proposed under severely constrained funding. With the additional funding obtained, our technical preference is to utilize the original alignment of Line 2, extending some 1.5 km NE of the UZ-16 location but not extending eastward to Line 4.

16) The USGS field personnel will inform YMP early should the decision be made to use exclusively minihole sources for the entire 25 miles of the 60-fold line. While this decision cannot be made prior to the source testing at the beginning of our field work, the USGS regards this possibility as very remote.

17) The USGS regards the need for a third or fourth noise test as a remote possibility and simply wished to alert potential contractors that this need may arise. A third or fourth test would, most likely, involve the intercomparison of vibrator, land-airgun, and shear-wave sources at a location of an existing planned deep shotpoint, using the production geophone array. Last-minute preactivity survey requirements would include, at the most, permitting only one other minihole shotpoint for each noise test.

Potential contractors have been advised of the need for a site visit after award to assure that field activities meet Site Office safety and health requirements.

If further information is needed, please contact W. Clay Hunter of the USGS at (303) 236-1123.

Sincerely,

Larry R. Hayes
for Technical Project Officer
Yucca Mountain Project Branch
U.S. Geological Survey

cc: R. Spengler, USGS, Denver
C. Hunter, USGS, Denver
T. Brocher, USGS, Menlo Park
R. Craig, USGS, Las Vegas