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High-Level Waste Technical Development Branch
Division of Waste Management
U. S. Nuclear Regulatory Commission
7915 Eastern Avenue
Mail Stop 623-SS
Silver Spring, MD 20910

Attention: Mr. Trueman Seamans, Mail Stop 623-SS

Subject: Contract No. NRC-02-82-030, Draft Letter Report in Response to Modification 1, Task Order 001

Ladies and Gentlemen:

Engineers International, Inc. (EI) has reviewed the document entitled "Request for Proposal Number DE-RP06-82RL10343 for Construction Manager/Construction Contractor for the Basalt Waste Isolation Project." The document review has been supplemented with the data obtained at the Basalt (BWIP) design workshop held in Richland, Washington, during October 5-6, 1982.

We have reviewed the document with the objective that the exploratory shaft being the first major subsurface penetration into the potential repository horizon, should be drilled and sealed to 10CFR60 requirements.

Our comments on the document are as follows:

- The document appears to be a non-technical program management guideline for the Construction Manager/ Contractor to maintain schedule and cost during exploratory shaft drilling and sealing, and subsequent phases of the BWIP. The roles of the contractor in smooth operation of the project, and with respect to safety, security, labor relations, and quality assurance are described. There is no detail on the drilling, lining and grouting of the shaft.

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- The shaft drilling, lining and grouting program, as presented by the BWIP during the October 5-6, 1982, design workshop, appears to utilize state-of-the-art technology. However, the compatibility of the cements and chemical grouts to the host rock environment has to be analyzed. In addition, the effect of varying geologic and hydrologic characteristics of strata to be intercepted by the shaft on the sealing requirements should be determined. The effectiveness of the seal should be documented by using a TV camera and applicable geophysical methods in all portholes.

- In Figure 4 of the Statement of Work section, a confirmatory borehole is shown at some distance from the shaft. This borehole should be logged in detail, both by visual and geophysical methods, so that the stratigraphy, extent of fracturing, and hydrologic characteristics of the horizons to be penetrated by the shaft are known in detail. In addition, hydrologic tests should be conducted to determine the hydraulic conductivity of strata from the surface to the shaft bottom.

- On page 2 of the Task Description section, quality assurance is mentioned, but the critical aspects concerning the water tightness of the shaft steel liner are not emphasized. Prequalification of all subcontractors and fabricators, and the welding of the steel liner segments and associated non-destructive testing of the liner should be emphasized. Futhermore, the plumbness of the liner in the hole is extremely important for subsequent sealing operations. Therefore, prequalification should be extended to outside licensed land surveyors.

- On page 4, the importance of quality assurance in the exploratory shaft construction should be emphasized since it has a direct bearing on licensability. The specifications for drilling, logging, steel lining, grouting, and inspection of the grout

should be detailed, and the mechanism that will be in place to implement the specifications should be required of the construction manager/contractor.

- On page 7, there is no mention of filing the geotechnical data derived from the confirmatory borehole or exploratory shaft. For instance, there is no mention of geophysical logs that should be run in the shaft. In blind boring, geophysical logs are effective in monitoring the in-hole conditions and should be utilized whenever applicable. The filing system should be expanded to include technical data as well as "Inspection reports" and "Samples."

- On page 8, quality assurance should be discussed in construction meetings to ensure that design specifications are properly reviewed and implemented. The design review team should consist of independent personnel who have extensive experience in blind hole drilling and shaft sealing.

- On page 10, the quality assurance program should emphasize the geoscience aspects of the project, and not just the construction and procurement aspects. As a minimum, the following geoscience areas should be addressed:

    - procedures to approve work plans and specifications
    - procedures to minimize damage to host rock
    - monitoring of excavation induced damage
    - selection of grouts compatible with the physical and chemical characteristics of the rock
    - installation and inspection of the steel casing

- installation and monitoring of the shaft seals

Our comments on the drilling, lining and grouting of the shaft based on the case history of the Piceance Creek Basin, Colorado, blindhole drilling project are as follows:

- The plumbness of the hole should be monitored at least once every 50 feet, using directional surveys. Deviation should be kept to less than 0°5' (five minutes). This will ensure that the grout and service lines welded to the outside of the casing are not damaged during lowering of the casing in the hole.

- The drill bit and cutters should be inspected before every run to ensure that they will not drop in the hole.

- Drill mud losses to fractures in the formation should be monitored and recorded each shift.

- Segments of the casing should be double joint welded according to the ASME Boiler and Pressure Vessel Codes, and all welds should be radiographically examined.

- Fluid levels in the casing and in the hole should be carefully monitored to ensure that the desired casing buoyancy is maintained. Fluid level fluctuations in the hole should be minimized.

- The first few stages of cement pour should be monitored to ensure that the casing does not float above its desired location in the hole.

- The caliper log provides an indication of cement volume required, however, provision for additional cement volume and the additional setting time required should be considered.

- Water temperature and its effect on cement set up time should be considered.

- The cement volume pumped should be carefully monitored at all times to ensure that the casing collapse pressure is not approached.

- The slurry weight, pumping pressure and pumping rate should be carefully recorded during each stage of cementing. A nuclear log should be run in the monitor lines to check the height of cement rise in the hole.

- Samples of cement should be obtained several times during each cementing stage and tested for quality control. A cement bond log should be run in the monitor lines to ensure that the number of voids in the annulus between the casing and the hole are kept as low as possible.

In closing, the exploratory shaft drilling, lining and grouting are critical items in the BWIP site characterization effort and should be performed with a major emphasis on quality assurance. The cements used for shaft grouting should be tested for their long-term (50 years or more) durability and compatibility to the host rock environment. Post-grouting tests should document the effectiveness of the exploratory shaft seal.

Sincerely,

ENGINEERS INTERNATIONAL, INC.

V. Rajaram
Project Manager

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