



Department of Energy
Washington, DC 20585

B. J. Youngblood
Chief, Operations Branch
Division of High-Level Waste Management
Office of Nuclear Material Safety
and Safeguards
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Youngblood:

On April 14-15, 1987 DOE met with NRC in Las Vegas, Nevada to discuss changes which DOE planned to make in the exploratory shaft facility for the Nevada Nuclear Waste Storage Investigation (NNWSI). These DOE planned changes included adding 5,600 feet of exploratory drifts in place of previously planned core holes and enlarging the main test area from 1,500 feet of drifts to about 4,000 feet of drifts. In all the length of drifting was proposed by DOE to increase from 1,500 feet to about 9,600 feet. Based on the April 14-15, 1987 meeting record DOE has proceeded with design efforts with the understanding that NRC had generally agreed with the overall concept proposed by DOE as well as the specific changes presented. We have now received your letter of August 28, 1987 to Mr. Carl Gertz which with its attachment suggests that still more drifting might be required to allow adequate characterization of the site.

An enclosure to this letter provides a brief analysis of the concerns raised by your technical staff. (Enclosure 1) These staff comments appear to be based on the assumption that the NNWSI project repository outline shown in the Environmental Assessment (EA) corresponds to the more recent Site Characterization Plan (SCP) Conceptual Design Report. The EA conceptual design showed the repository extending into the highly faulted area to the south of the main repository block. The current placement of the perimeter drift for the underground facility specifically excludes the densely faulted area identified in the EA and earlier design bases. More detailed responses to the staff's specific concerns are in Enclosure 2. As you know, the DOE has recently completed a consultation draft of the Site Characterization Plan (SCP/CD) for the Yucca Mountain site which describes the plans to obtain information relevant to your concerns. Site characterization plans described in the EA and plans for drifting included

8803110141 880311
PDR WASTE
102 DCD

102
Wm-11
NH03

in the March 1987, background materials for the DOE/NRC meeting in April 1987, have been developed further in the SCP/CD. This draft includes programs intended to characterize those areas within and adjacent to the repository perimeter drifts to determine the distribution, characteristics and density of faults, fractures and bedding planes, the thermal and mechanical rock properties related to these features, and the potential hydrologic impact of these features should they extend into the proposed repository area. To facilitate reference to the SCP/CD, citations are provided in the enclosure to locations in the SCP where each concern is addressed. We anticipate that the clarifications contained in this response, combined with your review of the consultative draft of the SCP, will address the concerns raised in your letter and that you will find the site characterization program appropriate to satisfy statutory and regulatory requirements for site characterization.

If you have any questions concerning the comments offered in this letter, please contact me or Edward Regnier on 586-4959.

Sincerely,



Ralph Stein, Acting Director
Siting, Licensing and Quality
Assurance Division
Office of Civilian Radioactive
Waste Management

Enclosures (2)

RESPONSE TO TECHNICAL ITEMS REGARDING ADEQUACY OF SITE CHARACTERIZATION PLANS
FOR THE SOUTHERN PART OF THE YUCCA MOUNTAIN SITE

Overview

It is our understanding that the primary Nuclear Regulatory Commission (NRC) concern appears to be whether the Department of Energy (DOE) has a program for detailed characterization of the more highly faulted terrain at the southern end of the repository block. The NRC staff reviewers should be aware of two major changes in the DOE program that have occurred within the past year.

Firstly, a meeting between DOE, NRC and the State of Nevada on changes to the Exploratory Shaft Facility (ESF) was held on April 14-15, 1987 in Las Vegas, Nevada in which the five proposed changes to the ESF presented by the DOE during that meeting were agreed upon by signature to the meeting summary. The results of that meeting together with consideration of site data have led to the development of an SCP-Conceptual Design Report (CDR), summarized in Chapter 6 of the SCP, that includes a major change in the perimeter drift to specifically exclude the densely faulted southern area identified in the Nevada Nuclear Waste Site Investigations (NNWSI) Environmental Assessment (EA) and in earlier design bases. The repository area as shown in the EA (DOE, 1986, Figure 3-8) is attached as Figure 1. The current repository outline is shown on Figure 6-5 and Figure 8.3.1.4-12 from the draft SCP (Figures 2 and 3, attached).

Secondly, in the draft SCP the DOE has further developed the plans to characterize those areas within and adjacent to the repository perimeter drifts to determine: the distribution, characteristics, and density of faults, fractures and bedding planes; the thermal and mechanical rock properties related to these features; and the potential hydrologic impact of these features should they extend into the proposed repository area. The more densely faulted southern area, now outside the repository, will be characterized using a combination of surface-based exploration techniques and drilling. These and other activities are detailed in the NNWSI Project Draft Site Characterization Plan in Sections 8.3.1.2, 8.3.1.4, 8.3.1.15 and 8.3.1.16 for geohydrology, rock mass characteristics, thermal and mechanical rock properties, and preclosure hydrology, respectively. Section 8.3.1.1 describes the empirical and analytical techniques to be used to assess the rock mass thermomechanical response to excavation and repository operations. Draft SCP Sections 8.3.1.8 and 8.3.1.17 describe the post- and preclosure tectonics programs, respectively. These programs will address the potential effects of faults and faulting on repository performance and design. The spectrum of techniques to be applied to the area will be determined by data forthcoming from initial phases of site characterization activities.

Specific Responses to NRC Concerns

NRC Concern: Corehole and borehole data (renewed NRC concern from previous J.J. Linehan letter of November 13, 1985)

The NRC staff comment indicates that data from several boreholes and coreholes in the more highly faulted southern part of the site may not be suitable for use in the licensing process because these data may have been obtained prior to the initiation of an appropriate Quality Assurance (QA) program.

Although the southern area is no longer a part of the repository, the DOE has been evaluating the qualifications of presently existing data for use in a license application. The available data and locations of boreholes will be further evaluated after the first phase of drilling to decide on locations for additional boreholes to reduce uncertainty in the information used in the license application. Figures 3 and 4 (attached) from Section 8.3.1.4 of the August 17, 1987 draft of the SCP illustrate potential sequences of the phased systematic coring program.

NRC Concerns: The data should be adequate to characterize the more highly faulted southern zone, including details of: spacing of faults; increased offset along faults; age of faulting; increased rotation and dip on beds; and thinning of Topopah Springs Member. (First, second, third, fourth, and sixth NRC concerns in J.J. Linehan letter of August 28, 1987)

All of the comments grouped above are related to the premise that the repository block includes the more highly faulted southern area. As explained in the overview (enclosure 1) this is no longer the case. The repository outline is defined by the repository perimeter drift shown on attached figures 2, 3, and 4. Extensive surface-based and subsurface site characterization activities will be conducted in the repository block. The more highly faulted area to the south will also be characterized as part of the pre- and postclosure tectonics, rock characteristics, and hydrology programs.

NRC Concern: Low-angle faults (fifth NRC concern in J.J. Linehan letter of August 28, 1987)

Existing data on the distribution of natural seismicity is not sufficient to either confirm or deny the presence of low-angle fault planes under the repository at Yucca Mountain. The current understanding of ground-water flow paths indicates that the predominant flow paths extend vertically downward from the repository to the water table. Present data, however, are not able to quantify the impact of a potential low-angle fault or gouge zone beneath the repository on estimates of ground-water travel time.

Geological activities described in the draft SCP include geological mapping, geophysical surveys, paleomagnetic and stratigraphic correlations, faulting studies and fracture studies. These activities, described in Sections 8.3.1.4 and 8.3.1.17 (rock characteristics and tectonics, respectively) will provide input to a three-dimensional model of the site area. This model will provide input to mechanical and hydrogeologic analyses.

NRC Concern: The impact of perched water on repository performance (last NRC concern in J.J. Linehan letter of August 28, 1987)

Analyses of the water recovered from seeps in bore holes USW H-3 and USW H-4 indicate that this water may have been drilling fluid. However, the DOE is sensitive to the potential implications of perched water on repository siting, design and operation. The potential impact of perched water, should it occur within or adjacent to the repository horizon, is a function of the location and quantity of water within the perched zone in relation to excavation. Activity 8.3.1.4.1.1.2 is designed to evaluate the effects of drilling boreholes in the unsaturated zone using water, mud, or air foam as a drilling circulation medium. Activity 8.3.1.4.1.1.2.3 is a review of alternative methods for dry drilling for core recovery below 500 ft. Activity 8.3.1.2.2.1.3 is designed to evaluate the development of perched water under controlled field conditions. Activity 8.3.1.2.2.6.1 is designed to develop a plan to determine conditions that lead to formation of a perched water zone. Activity 8.3.1.2.2.4.7 is designed to determine the occurrence of perched water zones and determine the implications of the existence of such zones on flux and flow paths. The NNWSI Project believes that the program outlined in the SCP will apply those techniques and generate that information required to identify, monitor and evaluate perched water zones within and adjacent to the repository horizon.

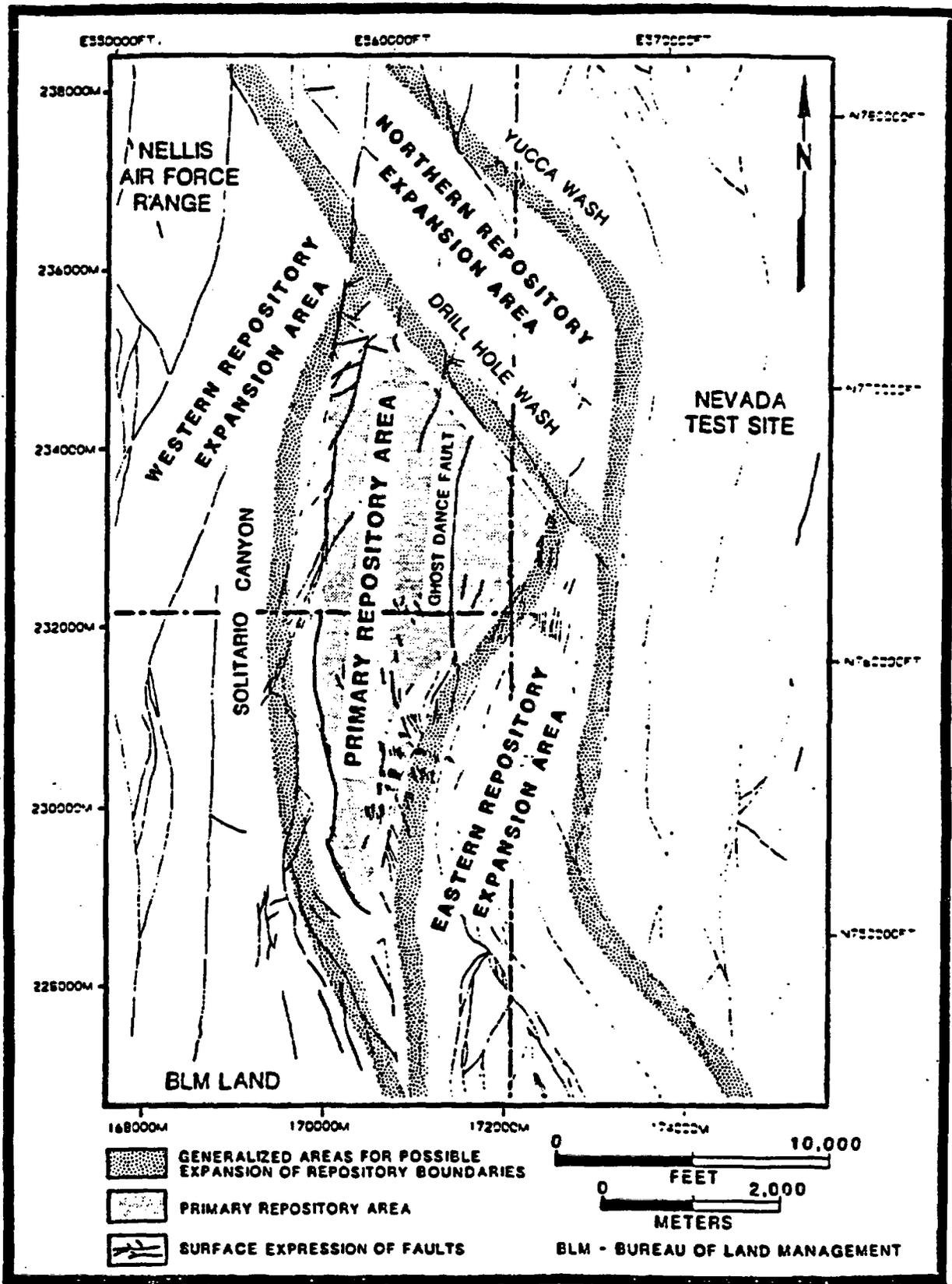


Figure 3-8. Generalized outlines of the primary repository and possible expansion areas. Modified from Mansure and Ortiz (1984).

DRAFT

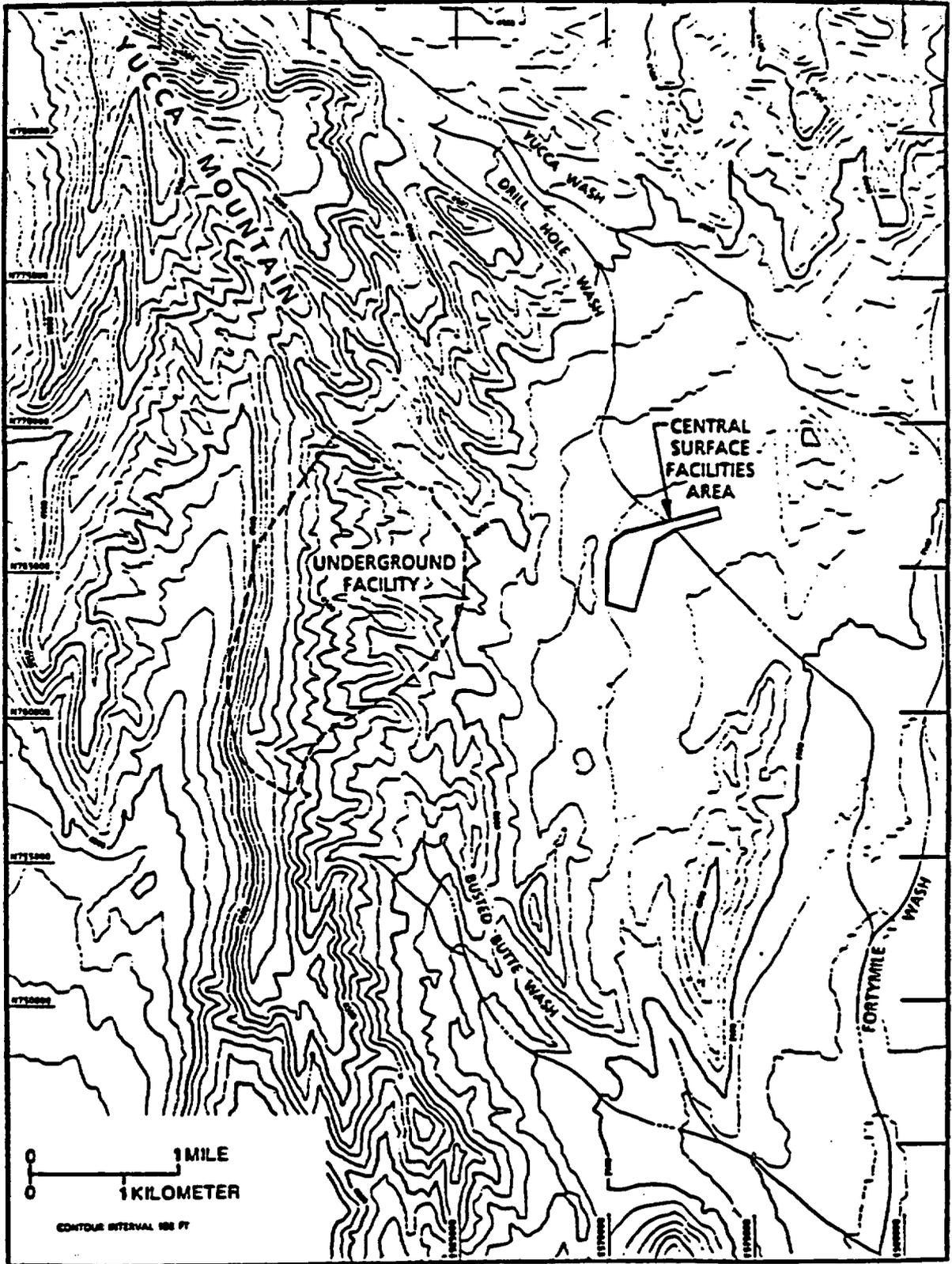


Figure 6-5. Site topographic map.

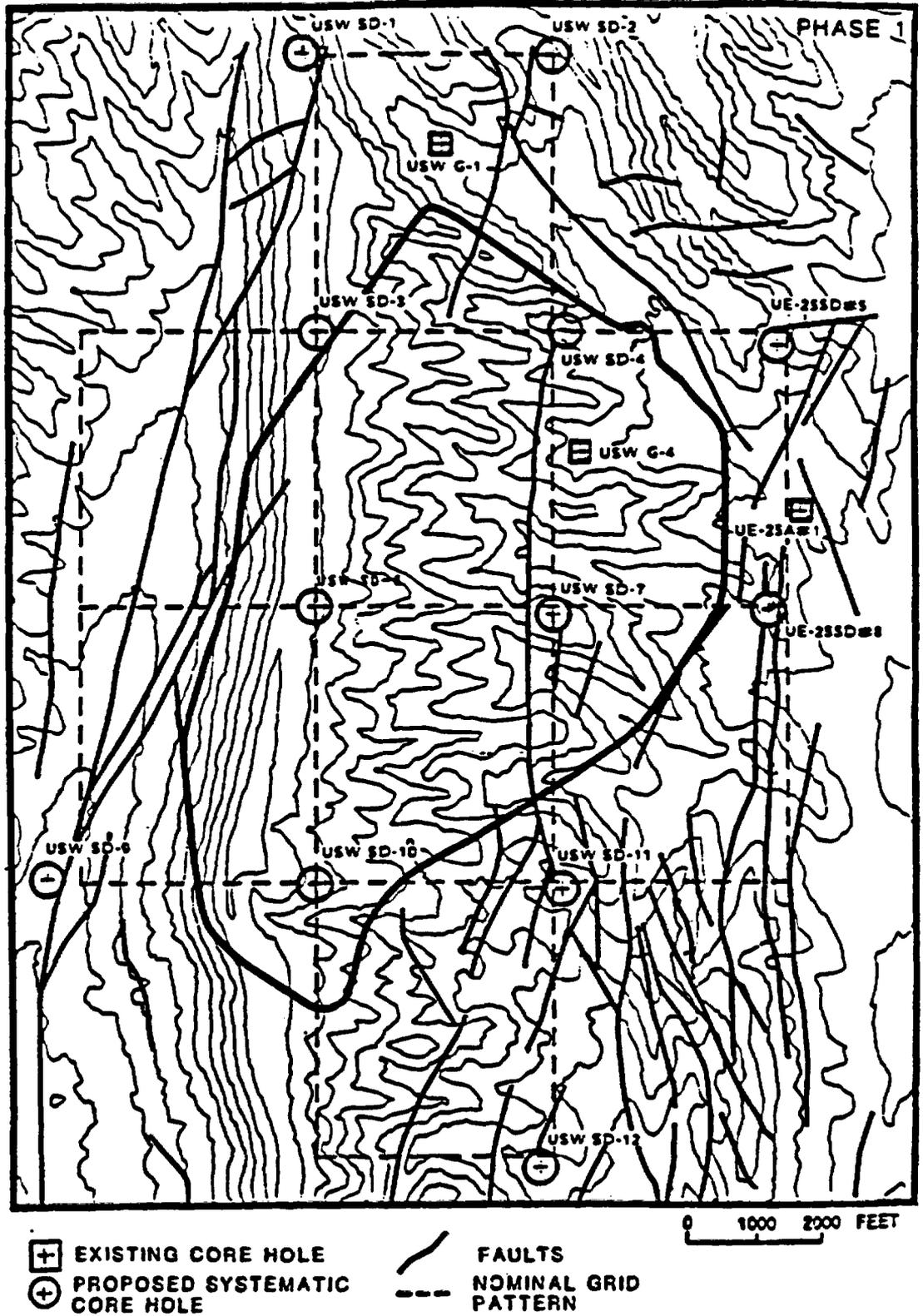
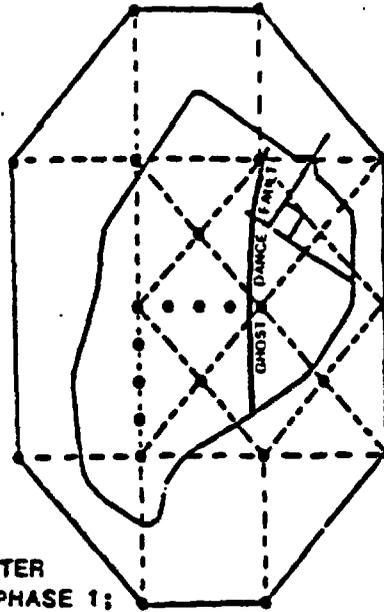
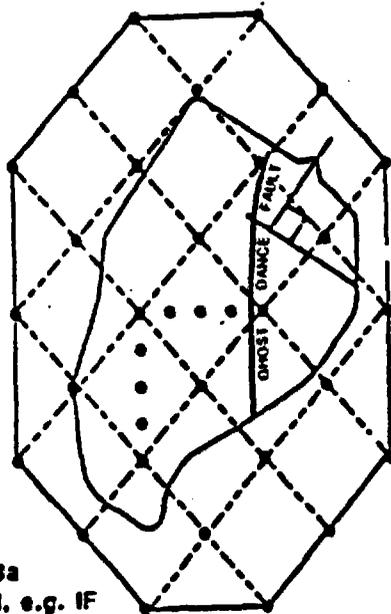


Figure 8.3.1.4-12. Distribution of proposed coreholes for the first phase of systematic coring.

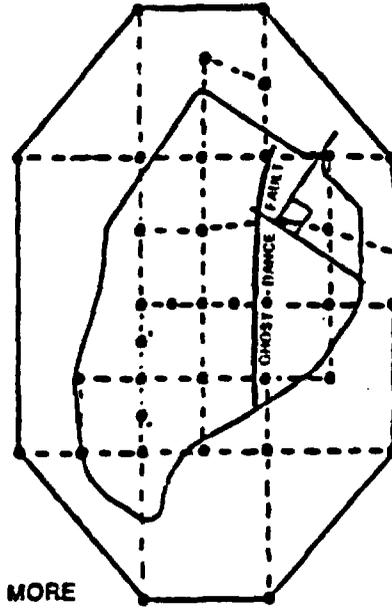
DRAFT



PHASE 2
(DESIGNED AFTER
ANALYSIS OF PHASE 1;
e.g. THIS OPTION YIELDS
SMALLER-SCALE VARIABILITY
IN FACILITY AREA)



PHASE 3a
(OPTION, e.g. IF
FACILITY EXPANSION
IS REQUIRED)



PHASE 3b
(OPTION, e.g. MORE
DETAIL REQUIRED ALONG
UNSATURATED ZONE
FLOWPATH OR IN HOST ROCK)

Figure 8.3.1.4-13. Conceptual example of additional phased systematic coring.