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A ROLE IN ENVIRONMENTAL COMPLIANCE FOR THE STATE OF NEVADA DURING SITE CHARACTERIZATION OF THE PROPOSED HIGH-LEVEL NUCLEAR WASTE REPOSITORY SITE AT YUCCA MOUNTAIN, NEVADA

State of Nevada
Agency for Nuclear Projects/
Nuclear Waste Project Office
Carson City, Nevada

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The Nevada Nuclear Waste project Office was created by the Nevada Legislature to oversee federal high-level nuclear waste activities in the State. Since 1985, it has dealt largely with the U.S. Department of Energy's siting of a high-level nuclear waste repository at Yucca Mountain in southern Nevada. As part of its oversight role, the Nuclear Waste Project Office has contracted for studies of various technical questions at Yucca Mountain.

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DISCLAIMER

FOREWORD

On May 26, 1986, Nevada was designated a potential host state for the nation's first geologic repository for high-level nuclear wastes. The action was taken in accord with the Nuclear Waste Policy Act of 1982 (NWPA) in which Section 111(a)(6) specifies that, "State and public participation in the planning and development of repositories is essential in order to promote public confidence in the safety of disposal of such (high-level nuclear) wastes and spent fuel." Section 116 of the Act provides the means for states to participate with the federal government in accomplishing the objectives of the repository program by exercising oversight with respect to potential adverse impacts.

In discharging its responsibility under the NWPA as the guardian of the public interest, the State of Nevada, through its Agency for Nuclear Projects/Nuclear Waste Project Office (NWPO), performs analyses and studies of the policies and practices needed relative to the repository project at the candidate site designated by the U.S. Department of Energy (DOE) at Yucca Mountain. Crucial in this regard is how the State can assure that regulatory requirements to protect the environment are complied with during site characterization. The compliance requirements that apply to the project were identified in a previous report (Environmental Program Planning for the Proposed High-Level Nuclear Waste Repository at Yucca Mountain, Nevada, NWPO-TR-001-87, August 1987).

The present report results from an analysis of the regulatory requirements in light of draft plans for site characterization and environmental compliance prepared by DOE and an evaluation of the past record of the Agency in matters of environmental protection. A perspective thereby was gained on how regulatory compliance is likely to be carried out by DOE for the Yucca Mountain project and the corresponding oversight role for the State of Nevada can provide oversight.

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1.0 INTRODUCTION

In accord with Sections 111 and 116 of the Nuclear Waste Policy Act of 1982 (NWPA) and the 1987 amendments to the NWPA the State of Nevada participates in the U.S. Department of Energy (DOE) program for finding a suitable site for a geologic repository for disposing of the nation's high-level nuclear wastes. The State's program is carried out by the Agency for Nuclear Projects/Nuclear Waste Project Office (NWPO) which receives federal grants mandated by NWPA to support its oversight role.

A major role of NWPO is to review and evaluate the DOE repository siting program with respect to the adequacy of environmental compliance as mandated by NWPA, the National Environmental Policy Act (NEPA), and federal and State regulations intended to protect natural resources and environmental quality. At issue is the adequacy of measures taken by DOE to meet the requirements of these laws as part of the site characterization program currently being planned.

A draft Site Characterization Plan (DOE, 1988a) and a draft Environmental Regulatory Compliance Plan (DOE, 1988b) have been prepared by DOE for the proposed repository site at Yucca Mountain adjacent to the Nevada Test Site (NTS). Later in 1988 DOE plans to issue detailed plans intended to describe individual site characterization studies and the corresponding environmental program. When the complete set of study plans, anticipated to number over 100, is available along with a more definitive regulatory compliance plan a thorough review of the adequacy of measures to be taken by DOE to fulfill environmental requirements can be conducted by the State.

Compliance with environmental regulations assumes major importance during repository siting because DOE largely views compliance as being equivalent with environmental protection. This results from the agency's policy that traditional environmental review requirements do not apply to site characterization. Instead, DOE is relying extensively on its environmental quality siting guideline, 10 CFR 960.5-2-5, to address environmental protection via accommodating regulatory compliance requirements.

Insight regarding how well DOE can be expected to protect the environment during site characterization can be gained by an analysis of the past compliance record for siting activities previously initiated at Yucca Mountain and NTS. This approach is valid because site characterization will consist largely of activities and procedures having environmental effect similar to those undertaken in the course of the DOE repository siting program in Nevada over the past decade. Additional insights to DOE environmental compliance policies and practices can be

obtained by evaluating the agency's performance at nuclear facilities across the nation.

2.0 BACKGROUND AND PURPOSE

The Atomic Energy Act of 1946 gave the Atomic Energy Commission (AEC) authority to operate federal nuclear facilities and provided for the AEC to be self-regulated with respect to nuclear safety and protection of public health and the environment. In response to the nation's growing involvement with nuclear energy the Energy Reorganization Act of 1974 was enacted to distinguish between government owned and commercial operations. From this step DOE evolved into an agency that continues to be responsible for managing federal nuclear facilities.

The self-regulatory nature of DOE has over the years been the subject of much debate. The defense mission of the agency and related matters of national security typically take priority over considerations of health, safety, and environmental protection. When NWPA was enacted to establish a national policy for disposal of civilian high-level radioactive wastes authority over safety, health, and environmental protection for construction and operation of a repository was given to the Nuclear Regulatory Commission (NRC). During siting, however, NRC has no role and DOE remains self-regulated until it applies for a repository construction license.

Coincident with setting the policy leading to NWPA Congress grew increasingly concerned with matters relative to environment, safety, and health at DOE nuclear facilities. This concern and the way in which DOE is carrying out the environmental mandates of NWPA have major implications for repository siting activities in Nevada and the role that must be played by the State government in representing the interests of its citizens regarding potential disposal of high-level nuclear wastes at Yucca Mountain.

2.1 Repository Siting Activities in Nevada

In 1977 the DOE Nevada Operations Office (NVO) established the Nevada Nuclear Waste Storage Investigations (NNWSI) project to evaluate the NTS and surrounding area for suitable repository sites. Limited siting activities had been initiated the preceding year and were expanded and intensified under NNWSI.

After January 7, 1983 when NWPA was enacted, NNWSI became a component of the DOE Office of Civilian Radioactive Waste Management (OCRWM) although it continued to be administered locally by NVO in Las Vegas. The advent of NWPA and OCRWM affected program management and schedules for the repository siting project but did not alter the basic strategy and nature of activities underway in NNWSI. In fact when NWPA was passed, Yucca Mountain already had been designated by NNWSI as its preferred site.

Among the requirements of NWPA was that DOE prepare guidelines for evaluating the suitability of sites for a repository. Additionally, DOE was to prepare a statutory environmental assessment (EA) for candidate repository sites that could be used for nominating sites for characterization. The guidelines were issued as 10 CFR 960 in late 1984 and on May 28, 1986, final EAs were released concurrent with the decision that three of the candidate sites, including the one at Yucca Mountain, would be characterized. Chapter 6 of the final EA for the Yucca Mountain site (DOE, 1986) contained an evaluation of the siting guidelines, a noteworthy feature of which was an environmental quality guideline, 10 CFR 960.5-2-5, which has the effect of equating a projected ability to comply with applicable environmental regulations with the potential for avoiding significant adverse impacts in the course of site characterization.

Another important requirement of NWPA was that DOE prepare a Mission Plan for the repository program that would, among other things, identify information needed in the course of selecting a repository site. The plan subsequently issued (DOE, 1985) used the siting guidelines as the basis for specifying four Key Issues for resolution during repository siting. The Key Issues were stated such that a hierarchial strategy for resolving them would lead to identification of information needs for judging a site acceptable for repository construction.

Key Issue 3 in the DOE Mission Plan addresses environmental protection. The issue of avoiding significant adverse environmental impacts is expressed in terms equivalent to complying with major regulations and standards for protecting components of the environment such as air, water, biota, critical habitats, and cultural resources. Key Issue 3 also is addressed in an issues hierarchy report (DOE, 1987a) but no insights greater than those in the Mission Plan are presented with respect to how environmental protection will be addressed. Instead, further consideration of Key Issue 3 is to be deferred by DOE until after completion of scoping hearings for the repository environmental impact statement (EIS) required by NWPA and the 1987 amendments.

How DOE will comply with environmental regulatory and related requirements should be addressed in detail in a systems engineering management plan (SEMP) to be prepared by NNWSI. In accord with the basic SEMP structure (DOE, 1985b) NNWSI should identify environmental requirements, document a strategy for their resolution, and ultimately lead to implementation plans for field studies and site investigations. The NNWSI SEMP should therefore provide additional details and insights to how Key Issue 3 and environmental compliance will be addressed for the Yucca

Mountain project. Also, DOE will present the State of Nevada with study plans for site characterization that should be sufficiently detailed to allow the State to perform a comprehensive regulatory analysis that identifies applicable environmental regulations in a definitive fashion.

An NWPA requirement to plan for site reclamation should the Yucca Mountain site be found unsuitable for a repository will be accommodated by a reclamation plan to be included in the DOE Site Characterization Plan. Finally, a NNWSI environmental program plan is to be presented to the State sometime in 1988 to describe how environmental studies and activities compliment the overall strategy for resolving Key Issue 3 thereby assuring that the environment at Yucca Mountain will be protected during the repository program.

The draft documents provided by DOE in January 1988 (DOE, 1988 a and b) are for purposes of consultation with affected parties in accord with NWPA mandates. These have been somewhat useful for understanding the extent of site characterization activities conducted by DOE in Nevada since 1976 and the nature of activities yet to be carried out at Yucca Mountain.

2.2 Health, Safety, and Environmental Protection at Nuclear Defense Facilities

Attachment A to this report discusses environmental, safety, and health (ES&H) programs for DOE nuclear facilities throughout the nation. The discussion was prepared by NWPO from reviews and evaluations undertaken by the U.S. General Accounting Office (GAO), the U.S. Congress, and others.

Over the past four decades numerous health and safety concerns have arisen with respect to nuclear defense facilities in the United States. National attention was called to the problems during the 1970s by public interest groups. As reports of occurrences of incidents jeopardizing public health and the environment increased Congress became concerned about DOE regulatory programs. In the early 1980s GAO began a series of investigations into DOE's activities that remains underway.

The GAO investigations have uncovered deficiencies and regulatory infractions at numerous nuclear defense facilities and have elicited promises from DOE to remedy the situation. However, despite reorganization of the agency's ES&H programs in 1985, recent GAO studies and Congressional hearings have found that little progress has been made in correcting DOE's performance. A number of explanations for this situation have been put forward but the most prevalent is the self-regulatory nature of ES&H responsibilities in DOE.

In the face of little effective change in DOE Congress is taking steps to relieve DOE of much of its authority for self-regulation. The nature of the Congressional action and the events leading to it are described in Attachment A.

2.3 Purpose and Intent of the Present Analysis

On the basis of the foregoing background the effort resulting in this report was undertaken to:

1. review statutory requirements placed upon DOE to protect the environment at Yucca Mountain during NNWSI site characterization;

2. analyze the likelihood of DOE compliance with the requirements in light of activities previously conducted at the site and the overall performance of DOE with respect to ES&H programs; and,

3. point to the extent to which the State of Nevada must become involved in oversight of the NNWSI environmental compliance program and to suggest the most effective manner by which the State can assure that proper measures to protect the environment and the interests of its citizens will be taken by DOE.

3.0 SCOPE AND APPROACH TO THE ANALYSIS

This analysis addresses the following issues related to repository siting activities previously undertaken by DOE in Nevada.

1. Whether or not a DOE siting activity triggered a federal or State regulation pertaining to environmental protection.

2. Whether or not a DOE activity was subject to both federal and internal agency requirements for environmental review.

3. Whether or not an activity, either field or procedural, was meant to comply with environmental requirements mandated by NWPA.

4. Whether or not a field activity was located on land within or outside of the jurisdiction of DOE.

Information needed for the compliance analysis consisted of descriptions of regulated activities and identification of applicable environmental requirements. Because different requirements have applied to DOE repository siting activities at various times, the analysis was facilitated by dividing the project into three periods as described in Section 3.3.

3.1 Activities Previously Undertaken

Site characterization as defined by NWPA consists of surface-based studies such as drilling and trenching and in-situ or underground testing for which an Exploratory Shaft Facility (ESF) must be constructed. To date NNWSI has involved only surface-based activities relative to geologic and hydrologic investigations. Construction of the ESF and associated testing will commence sometime in the future and is described in the draft Site Characterization Plan and accompanying DOE documents (DOE, 1988a, b, and c).

Environmental requirements that applied to activities previously undertaken by NNWSI are associated with drilling, trenching, seismic studies, installation of semi-permanent monitoring stations, and other activities that disturb the surface or risk degrading the quality of the environment. Future site characterization activities will have similar potential for impacting the environment and it follows that the same or similar regulations will apply as to previous activities.

Some activities involved in the DOE siting program are themselves the result of environmental requirements imposed by and unique to NWPA. These are discussed below.

3.2 Applicable Environmental Requirements

An earlier report (State of Nevada, 1987) identified the environmental statues and regulations that apply to NNWSI. These are listed here in Table 1 and Table 2. The requirements associated with statutory compliance also were described in the report.

Compliance with environmental statutory requirements that apply to DOE activities is addressed by DOE Order 5440, Implementation of the National Environmental Policy Act, and by DOE Order 5480 (General Environmental Protection). Compliance with environmental standards is required of all federal agencies by Executive Order 12088, Federal Compliance with Pollution Control Standards, enacted in October 1978. The intent of DOE to comply with all such applicable requirements is set forth under DOE Notice 5400, Environmental Policy Statement.

3.3 Phases of NNWSI with Different Environmental Requirements

The relevance of the issues stated at the onset of this section depends on whether a siting activity occurred before NWPA became law, after the final EA was issued, or during the period between enactment of NWPA and release of the EA. Focusing the analysis on these phases was important because the nature of environmental compliance requirements was influenced by NWPA and DOE's associated implementation policies. Correspondingly, compliance requirements tended to vary in accord with each different period.

During the initial phase, from 1976 to passage of NWPA in January 1983, DOE repository siting in Nevada was no different from any other DOE project and all customary requirements for environmental review and protection at both federal and State levels applied. Activities undertaken by NNWSI during this period consisted of geologic and hydrologic field studies on and off of NTS.

In the second period, from enactment of NWPA to issuance of the final EA in May 1986, siting activities in NNWSI and OCRWM were aimed at recommending candidate sites for characterization. This phase of the program was partially exempted by NWPA from NEPA environmental documentation and review requirements. Federal and State environmental protection regulations continued to apply to NNWSI and additionally NWPA imposed its own unique requirements upon the repository program. Activities undertaken by DOE during this period included geologic and hydrologic studies on and near NTS and measures to comply with NWPA.

Table 1.

FEDERAL ENVIRONMENTAL STATUTES, EXECUTIVE ORDERS, AND REGULATIONS APPLICABLE TO THE REPOSITORY SITING PROJECT AT YUCCA MOUNTAIN

Nuclear Waste Policy Act, 42 USC Section 10101 et seq. (10 CFR Part 960; 10 CFR Parts 51 and 60).

National Environmental Policy Act of 1969, 42 USC Sections 4321-4361 (40 CFR Parts 1501, 1505, and 1506).

Federal Land Policy and Management Act of 1976, 43 USC Section 1701-1784 (43 CFR Parts 2300 and 2800).

Organic Act of the National Park Service, 16 USC Section 1, and, National Park System Mining Regulation Act, 16 USC Sections 1901-1912 (36 CFR Part 9).

Materials Act of 1947, 30 USC Sections 601-604 (43 CFR Part 3600).

Floodplain Executive Order, E.O. 11988 (10 CFR Part 1022).

Endangered Species Act of 1973, 16 USC Sections 1531-1543 (50 CFR Sections 17.11, 17.12, 17.94, 17.95, and 17.96; 50 CFR Parts 222, 226, 227, 402, 424, 450, 451, 452, and 452; DOE/EP-0058).

National Historic Preservation Act of 1966, as amended, 16 USC Sections 470-470w-6; Archaeological and Historic Preservation Act, 16 USC Sections 469-469c; Archaeological Resources Protection Act of 1979, 16 USC Sections 470aa-47011; American Antiquities Act, 16 USC Sections 432 and 433 (36 CFR Parts 60, 62, 63, 65, 296, and 800; 43 CFR Parts 3 and 7, 25 CFR Part 261; DOE/EP-0098; E.O. 11503).

American Indian Religious Freedom Act, 42 USC Section 1996 (36 CFR Part 296; 43 CFR Part 7).

Noise Control Act of 1972, as amended by the Quiet Communities Act of 1978, 42 USC Sections 4901-4918 (E.O. 12088).

Clean Air Act, as amended, 42 USC Sections 7401-7642 (40 CFR Parts 50, 51, 52, 58, 60, 61, 124; Sections 81.300 and 81.400; DOE/EP- 0062 and 0065; E.O. 12088).

Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976 and the Hazardous and Solid Waste Amendments of 1984, 42 USC Sections 6901-6991 (40 CFR Parts 124, 240-247, 260-264, (266, 270-271 and 280; E.O. 12088; State regulations).

Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 and the Water Quality Control Act of 1987, 33 USC Sections

1251-1376; (33 CFR Parts 209, 320, 323-327, and 330; 40 CFR Parts 110, 116, 117, 121, 122, 123, 124, 125, 129, 133-136, 230, 233, 401, 403; DOE/EP-0060 and 0061; E.O. 12088).

Safe Drinking Water Act, 42 USC Sections 300f-300j-10 (40 CFR Parts 124, 141, 142, 143, 144, 145, 146, 147, and 149; E.O. 12088).

Table 2.

STATE AND LOCAL ENVIRONMENTAL STATUTES, CODES, AND ORDINANCES THAT APPLY TO SITE CHARACTERIZATION AND REPOSITORY CONSTRUCTION AT THE YUCCA MOUNTAIN SITE

Protection and Propagation of Native Fauna; Miscellaneous Protection Measures, NRS 503.590 to 503.660 (Collector's Permit for Taking Native Fauna Covered by Administrative Procedure).

Protection of Trees and Flora; Unlawful Removal or Destruction of Trees or Flora), NRS 527.050 (Permit Requirement for Removing Native Plants Covered by Administrative Procedure).

Preservation of Prehistoric and Historic Sites, NRS 381.195 to 381.227 (Permit Requirement for Field Studies Covered by Administrative Procedure).

Utility Environmental Protection Act, NRS 704.820 to 704.900 (Permit Requirements Proposed as Amendments to NAC 703.415 et seq.).

Appropriation of Public Waters, NRS 533.325 to 533.435 (Permit Requirements Covered by Administrative Procedure and "Regulations Concerning Preparation of Maps Under Application to Appropriate Water and Proofs of Appropriation", State Engineer, 1977).

Underground Water and Wells, NRS 534.010 et seq. (Regulations for Drilling Water Wells, NAC 534.010 ET SEQ.).

Air Pollution, NRS 445.401 to 445.710 (Permit Requirements, NAC 445.430 to 445.716).

Nevada Water Pollution Control Law, NRS 445.131 to 445.354 (Discharge Permit, NAC 445.140 to NAC 445.170; Treatment Works, NAC 445.170; Diffuse Sources and Permit to Construct or Grade, NAC 445.199 to 445.234; Temporary Underground Injection Control Regulations, NAC 445).

Public Water Systems, NRS 445.361 to 445.399 (Water Quality, NAC 445.244 to 445.262; Water Supply, NAC 445.370 to 445.420).

Collection and Disposal of Solid Waste, NRS 444.440 to 444.630 (Solid Waste Disposal, NAC 444.570 to 444.748).

Disposal of Hazardous Materials, NRS 459.400 to 459.600 (Hazardous Waste Disposal, NAC 444.8500 to 444.9335).

State Control of Radiation, NRS 459.010 to 459.290 (Licensing of Radioactive Material, NAC 459.180 to 459.314; Inspections, NAC 459.788).

Table 2. (cont'd)

Construction and Labor Camps, NRS 444.130 to 444.190 (Rules for Sanitary Conditions, NAC 444.550 to 444.566).

Food Establishments, NRS 446.870 to 446.945 (Food Establishments, NAC 446.010 et seq.).

Uniform Plumbing Code, NRS 444.340 to 444.430 (Uniform Plumbing Code, NAC 444.350).

Uniform Building Code and Fire Code, NRS 244.105, 244.3575, 278.023 and 477.010 to 477.250 (State Fire Marshall Regulations, NAC 477.010 et seq.

The third period began with release of the final EA for the Yucca Mountain site and extends to the present. This phase differs from the preceding one largely because geologic and hydrologic field activities ceased and work in NNWSI and OCRWM has focused on satisfying NWPA requirements regarding planning for site characterization studies. Attention by DOE also is being given to the investigations needed to provide information for approval of the Yucca Mountain site for a repository and for construction authorization. The partial exemption by NWPA from certain NEPA environmental review and documentation requirements applies to site characterization activities in this period as it did to activities in the previous period.

4.0 ANALYSIS AND RESULTS

This section of the report:

1. identifies both the activities previously undertaken by DOE and the environmental compliance requirements that applied to them;

2. describes measures taken or policies established by DOE for addressing the requirements; and,

3. evaluates the DOE environmental compliance record to date both for NNWSI repository siting activities in Nevada and for OCRWM planning in accord with NWPA.

The following discussion addresses periods of time corresponding to pre-NWPA, from passage of NWPA to issuance of the final EA, and post-EA.

4.1 Compliance Prior to NWPA

Repository siting investigations were initiated by DOE in Nevada in 1976 and one year later the NNWSI project was established. Between 1977 and enactment of NWPA in January 1983 siting activities were conducted at NTS and Yucca Mountain.

4.1.1 Activities Undertaken

The U.S. Geologic Survey (USGS) is responsible for geologic and hydrologic activities for NNWSI and by 1978 was involved in an array of studies in shale at Syncline Ridge, in alluvium at Jackass Flats, in granite at Quartzite Mountain and Calico Hills, and in tuff at Skull Mountain and Yucca Mountain. With the exception of Yucca Mountain, all locations were within the boundaries of NTS and thus on land controlled by DOE.

Prior to 1983 a total of 38 geologic and hydrologic test holes were drilled by USGS for NNWSI. The data presented in the draft Site Characterization Plan (DOE, 1988a) suggest that the drill holes were of the types that would have required drill pads, mud pits, and bladed access roads. Also undertaken by USGS prior to 1983 was construction of 19 geologic trenches. Seismic surveys and other investigations such as stream flow gaging also were performed by USGS. Contractors for DOE also installed meteorologic, seismologic, and other types of semi-permanent monitoring stations that disturbed small areas of the surface environment.

4.1.2 Environmental Requirements

Drill holes, trenches, and other surface disturbing activities performed prior to passage of NWPA were subject to the provisions of NEPA and corresponding regulations and DOE Orders. To accommodate compliance with internal requirements for environmental review DOE directed project offices to complete Environmental Checklists for drilling operations (DOE, 1981). The checklist procedure consists of answering "yes" or "no" to a series of eleven questions corresponding to major federal statutes for protecting the environment. Question No. 9 corresponds to NEPA and CEQ requirements for environmental assessment by asking if anticipated impacts will be sufficiently significant to necessitate documentation. In DOE these requirements are implemented by 10 CFR 1021 and by DOE Order 5440.1c.

An affirmative answer to a question on the checklist means that a particular compliance requirement applies and a negative answer means that it does not apply. The checklist calls for no information regarding the compliance steps to be taken when an affirmative answer indicates that certain requirements apply although in practice the DOE project office involved often describes compliance measures in footnotes on the checklist form.

Environmental Checklists prepared by a DOE contractor for the NNWSI drill holes (SAIC, 1984) addressed activities from 1979 to 1984. Checklists for holes drilled prior to NWPA showed that the Endangered Species Act applied to all drilling operations because of protected biota and habitat at Ash Meadows and that Floodplain Management Executive Order No. 11968 applied to 28 holes drilled in regulated floodplains. Compliance by DOE with the Endangered Species Act is addressed by Environmental Compliance Guidance Manual DOE/EP-0058/1 and regulatory requirements for activities in floodplains are covered by 10 CFR 1022.

Drilling activities off the NTS reservation and on land administered by other federal agencies required compliance with the Federal Land Policy Management Act (FLPMA) that was not addressed by the DOE Environmental Checklist. This requirement applied to 31 drill holes as well as to 13 of the trenches constructed outside the NTS boundary.

The DOE checklist procedure does not include State regulatory requirements. Of the NNWSI field activities undertaken prior to 1983 only the drill holes would have

involved compliance with significant State regulations not automatically covered by measures taken to meet federal requirements included on the checklists. Among the State regulations would have been NAC 534, Regulations for Drilling Water Wells, and where tracers were injected into ground water a review in accord with NAC 445, Temporary Underground Injection Control Regulations or NAC 459.180, Licensing of Radioactive Material, should have been performed. Well logging with radioactive sources also should have been reviewed under NAC 459.180.

Composite plans for drilling, trenching, access roads, and other activities that disturb the surface should have been reviewed by State regulators from the standpoint of air quality protection. This is a requirement where construction disturbs land surfaces totaling 20 acres or more in area. In such cases the activities must be registered under NAC 445.233, Permit to Construct or Grade. A permit also is required prior to destruction of flora associated with surface disturbance (NRS 527.050, Protection of Trees and Flora).

4.1.3 Compliance Measures Taken for NNWSI

Biological and archeological surveys were performed by DOE environmental contractors to address requirements of the Endangered Species Act and the National Historical Preservation Act (DOE, 1986a). Additionally, DOE (1987b) has stated that a draft EIS prepared for NTS in 1977 (ERDA, 1977) was meant to fill the NEPA review requirements for NNWSI prior to 1983. This position also is reflected in the NNWSI Environmental Checklists (SAIC, 1984) by a footnote to Question No. 9 (NEPA) stating that the draft EIS predicted that no significant impacts would result from repository siting activities.

The issue of Ash Meadows and the Endangered Species Act is puzzling because of its being raised in the checklists but not addressed in the draft EIS as a potential adverse impact. Biological surveys performed for NNWSI (DOE, 1986a) apparently did not include Ash Meadows adding further to the mystery of the issue having been raised in the context of the NNWSI Environmental Checklists (SAIC, 1984). The issue cannot be clarified because DOE has disposed of the files pertaining to the field surveys (DOE, 1987b and 1988d).

Measures that might have been taken by DOE to comply with floodplain protection requirements are unknown. DOE regulations (10 CFR 1022) require a notice

of proposed action and an environmental assessment to be published in the Federal Register. There is no record that these steps were taken in the 28 instances where holes were drilled in regulated floodplains for NNWSI.

Information provided to NWPO (DOE, 1987c) indicates that DOE obtained authorization from the U.S. Army Corps of Engineers for limited use of Nellis Air Force Range from 1979 to 1986. Agreement between DOE and BLM for limited use of the Yucca Mountain site was reached in April 1981. The cooperative agreement was accompanied by an EA prepared by BLM for the action that concluded with a Finding of No Significant Impact. A similar agreement was enacted in 1982. One well, USW-G1, apparently was drilled on BLM land prior to the initial cooperative agreement for DOE's use of the Yucca Mountain site. The agreements appear not to comprehensively cover all siting studies on public land prior to 1983 and some drilling and related activities probably were undertaken without proper BLM authorization. The agreements were not monitored or audited and there was no way to assure that drilling or other activities were carried out in accord with the agreements.

The BLM EA for the 1981 agreement reported the results of site specific biological and archeological surveys for areas to be disturbed. No other field studies were performed and discussion of air quality, water resources, and other environmental attributes were treated qualitatively without benefit of data or analysis. No references were given to other assessments or data bases such as the 1977 DOE draft EIS for NTS.

There is no record or indication that DOE considered complying with any of the applicable State regulations from 1976 through 1982. DOE apparently did not inform State regulators of geologic and hydrologic activities conducted on public lands at Yucca Mountain during this period.

4.2 Compliance After Passage of NWPA but Prior to Issuance of the Final EA

On January 7, 1983, NWPA became law and the DOE repository siting program embarked upon activities prescribed by the Act. Among these was preparation of EAs for sites to be nominated for characterization. During this period hydrologic and geologic field work at Yucca Mountain was accelerated by NNWSI. The notable difference between this period and the preceding one was that NWPA provided a partial

exemption from NEPA which applied to the siting program including field activities such as drilling and trenching.

4.2.1 Activities Undertaken

The draft Site Characterization Plan (DOE, 1988a) indicates that between January 1983 and May 1986 about 60 major holes were drilled by USGS for NNWSI that were outside the NTS boundary. Apparently 20 of the holes were drilled to or below the water table and another 40 holes were of sufficient depth or diameter to necessitate the use of drilling fluids. It is assumed that all 60 holes included construction of drilling pads, mud pits, and access roads although such details are not available to NWPO. Tests conducted included logging, pumping, and the use of ground-water tracers.

During this period at least 2 additional trenches were constructed, both of which were outside DOE controlled land. Geologic activities also included about 100 miles of seismic refraction and reflection lines at Yucca Mountain with associated site access and surface disturbance from shot holes and vibrator trucks. Almost all of this work occurred on public land outside the NTS. An unknown number of stream gages, meteorological monitoring stations, and seismic monitors were installed in the vicinity of Yucca Mountain, each associated with access and other surface disturbance related to their semi-permanent placement.

4.2.2 Environmental Requirements

Discussion of compliance requirements for NNWSI between January 1983 and May 1986 must include requirements stemming from NWPA as well as those that applied by virtue of the nature of field activities undertaken. The former category consisted primarily of preparation of the final EA required by NWPA for recommending sites for characterization.

As mentioned earlier, NWPA partially exempted siting activities from NEPA. However, Section 112 of the NWPA required preparation of statutory EAs in the course of selecting sites to be characterized. DOE was careful to note that the EAs were not associated with NEPA compliance and environmental review (Mussler, 1984 and Burton, 1984). The agency's actions implied that DOE considered siting activities to be free of all environmental review requirements associated with NEPA, including those promulgated by CEQ (40 CFR 1500-1508) and DOE's own internal review procedures (10 CFR 1021 and related DOE Orders).

In addition to the need to perform environmental review in accord with applicable CEQ regulations and internal DOE Orders, NNWSI was required to comply with federal and State regulations for protecting environmental quality and resources such as air, water, designated biota, and archeological sites. These requirements were the same as those described for this category in Section 4.1.

4.2.3 Compliance Measures Taken by DOE

Biological and archeological surveys were conducted by DOE environmental contractors at most prospective drill sites before operations were initiated (DOE, 1986a). Some sites apparently were overlooked but the number is not known. The Environmental Checklists prepared for NNWSI drill holes (SAIC, 1984) indicated that at least 53 holes were drilled in regulated 100-year floodplains. The checklists also indicated that all could potentially affect protected habitat and species at Ash Meadows but cited the 1977 draft EIS for NTS (ERDA, 1977) and the draft statutory EA (DOE, 1984) prepared for NWPA as evidence of environmental review showing no significant impact. Because DOE did not retain the files for the NNWSI field surveys it cannot be established whether or not the Ash Meadow environment was re-evaluated (DOE, 1987b and 1988d).

As with previously drilled holes there is no evidence known to NWPO of DOE having complied with its own floodplain protection regulations, 10 CFR 1022, nor is there evidence of compliance with State drilling and testing requirements, registration requirements for grading in excess of 20 acres, and permitting provisions where destruction of flora occurred.

Limited land use agreements between DOE and other federal agencies apparently were in place for some NNWSI activities prior to May 1986, including one reached with BLM (1983) in June 1983 to cover all future site characterization activities. This agreement is particularly significant because it addressed the ESF and other site characterization activities. However, descriptions of the proposed action are incomplete and it is difficult to determine the nature and locations of siting activities DOE sought permission to undertake. Nonetheless, BLM approved the DOE request to conduct site characterization at Yucca Mountain. The agreement apparently was not monitored and there is no way to determine if its terms were complied with by DOE.

Another EA also was prepared in this same time period, in this instance by USGS for the two geologic trenches constructed in 1983. The document is terse, limited to six pages, and carries with it no indication that a FLMPA right-of-way permit was secured for the activity which was to be cited near Beatty, Nevada. Nonetheless, the EA doubtlessly was meant to serve for USGS compliance with NEPA.

A major portion of the NNWSI environmental effort between 1983 and 1986 was devoted to preparing the final EA issued on May 26, 1986 (DOE, 1986a). During this time the draft EA (DOE, 1984) also was produced. This activity fulfilled the principal environmental requirement under NWPA for nominating a site such as Yucca Mountain for characterization. Because of the partial NEPA exemption granted under Section 112, the EA was not intended to be an environmental review document and DOE took steps to point this out (Mussler, 1984 and Burton, 1984). This raises the unresolved issue of how DOE performed comprehensive environmental review for activities undertaken prior to 1986.

The issue was discussed with NNWSI in September 1987 (DOE, 1987b) at which time DOE stated that environmental review was addressed by memoranda to the files that subsequently have been discarded and no longer exist. Thus, there is no firm evidence that DOE performed environmental review in accord with 40 CFR 1501, 1505, and 1506, 10 CFR 1021, and DOE Order 5440 between 1983 and 1986.

Content requirements for the statutory EA issued in May 1986 were set forth in NWPA and emphasized evaluation of site suitability in accord with DOE siting guidelines (10 CFR 960) and correspondingly an assessment of regional and local impacts of locating a repository at the proposed site. Because of the exemption from preparing a NEPA EIS and because NWPA failed to mandate a role for NRC at this stage of the program, traditional regulations and standards for environmental review of federal and civilian nuclear projects were set aside by DOE and replaced by the siting guidelines. This allowed DOE to evaluate the Yucca Mountain site largely on the basis of existing information rather than performing additional studies where environmental data were absent. Use of the siting guidelines instead of environmental assessment regulations for NEPA (40 CFR 1500-1508) allowed DOE basically to equate anticipated regulatory compliance with the predicted absence of significant adverse impacts.

Contrary to the situation at some candidate repository sites, DOE did have limited biological and archeological data for Yucca Mountain by virtue of having surveyed specific locations for resources protected by the Endangered Species Act and the National Historic Preservation Act. These data were on a par with what is done for a typical EA prepared in conjunction with NEPA compliance for minor projects.

The puzzling relationship of repository siting activities at Yucca Mountain and the Ash Meadows environment remains unresolved by the final statutory EA (DOE, 1986a). Existing information relative to Ash Meadows is cited and reviewed and the issue of potential impacts from repository activities at Yucca Mountain, raised in the Environmental Checklists for drillholes, is dismissed with the conclusion that the two groundwater systems are not connected. Supporting hydrogeological data for such a conclusion are meager and the issue remains one to be resolved during site characterization (DOE, 1988a).

These and other shortcomings are described in an NWPO review of the impact analyses reported in the final EA for the Yucca Mountain site. The review is included here as Attachment B and concludes as follows:

1. The EA does not provide adequate assurances that the environment will be protected;

2. Comments made by the State on the draft EA were not sufficiently addressed in the DOE Comment Response Document included with the final EA;

3. The EA did not assess or otherwise address impacts from site characterization activities previously carried out;

4. Existing environmental conditions and proposed actions were described in too little detail to allow credible assessment of potentially significant adverse impacts, to determine whether specific environmental regulations will or will not apply, to conclude that impacts can be adequately mitigated, and to assure that successful site reclamation and habitat restoration can be accomplished; and

5. The final EA did not uniformly meet commonly accepted professional standards for environmental documentation and review.

Aforementioned EAs prepared by BLM for land use agreements relied on the DOE environmental information base and therefore are also subject to the above criticisms. Of particular significance in this regard is the document prepared by BLM as its environmental review of DOE site characterization activities (BLM, 1983). The document falls far short of environmental reviews and resource management plans recently produced by BLM itself for land in southern Nevada (BLM, 1984 and 1985).

4.3 Compliance Subsequent to Issuance of the Final EA

DOE has conducted little field work for NNWSI since May 28, 1986, when the final EA was issued in conjunction with recommendation and selection of the Yucca Mountain site for characterization. Instead most activities have been focused on preparing for site characterization and meeting related NWPA requirements. During this time DOE has sought to keep almost all environmental activities distinct from planning for site characterization. The only exception has been consideration of reclamation in the event a site is not selected for characterization, which NWPA requires being addressed in plans for site characterization.

Unrelated to site characterization has been a limited amount of environmental planning for the repository EIS required by NWPA. However, NEPA scoping for the EIS has not been made part of the DOE process for developing its Site Characterization Plan for Yucca Mountain.

4.3.1 Activities Undertaken and Rationale

The inventory of NNWSI drilling activities presented in the preliminary draft Site Characterization Plan shows that drilling at Yucca Mountain requiring fluids or large rigs has not occurred since 1984. Additionally, there has been no drilling performed by USGS since early 1986 when a series of unsaturated zone neutron probe holes was completed and there has been no trenching or other surface-disturbing field work at the site since the EA was released in May 1986. Previously installed monitoring stations have been operated and a radiological monitoring program has been initiated but there are no significant compliance requirements relative to these activities.

Associated with site characterization are several environmental requirements stipulated by NWPA. These consist largely of planning and assessment, and the NNWSI environmental program has been concentrating on

these measures which in themselves are meant by DOE to constitute NWPA compliance and do not trigger independent requirements. Although plans for site characterization as mandated by NWPA in Section 113(a) is to embody environmental assessment DOE has not acknowledged the requirement. Instead, NNWSI continues to use the statutory EA as the environmental information base for site characterization planning (DOE, 1988b).

Also required by NWPA is preparation of a traditional NEPA EIS. Although this is not related specifically to site characterization's DOE plans to obtain information for the EIS while site characterization is underway. Plans to that effect are being developed in NNWSI but will not be completed until well after site characterization has been initiated and NEPA-related scoping procedures are carried out.

To date preparation of the Site Characterization Plan has involved only limited environmental reclamation planning. However, independent of the Site Characterization Plan NNWSI is developing a separate environmental plan to accommodate evaluating siting guidelines that DOE contends do not require site characterization for their evaluation. Additionally, NNWSI has prepared environmental monitoring and impact mitigation plans (DOE, 1988b) in place of the comprehensive assessment envisioned in NWPA Section 113(a). As previously noted, NNWSI does not consider reclamation to be mitigation even though NEPA regulations (40 CFR 1508.20) do include it as a means of mitigating adverse impacts.

4.3.2 Adequacy of Measures Taken by DOE to Comply with NWPA

Section 113 of NWPA concerns site characterization. The mandates contained therein provide the principal focus of the current NNWSI repository siting activities administered by DOE-NVO. The section contains two environmental requirements to be met in the course of planning for site characterization, one post-site characterization requirement, and a partial exemption from NEPA for site characterization activities.

4.3.2.1 Section 113(a)

Section 113(a) requires that environmental assessment be a part of site characterization planning in order to minimize significant adverse environmental impacts. Rather than performing a credible assessment of potential impacts based upon

comprehensive site specific environmental information and complete engineering design plans NNWSI has been directed by OCRWM to rely on the statutory EA prepared for the Yucca Mountain site. However, the EA was too premature in the planning cycle to bound the potential impacts from site characterization and it did not address how potentially significant adverse impacts would be detected and minimized. For these reasons DOE (1988b) has prepared an Environmental Monitoring and Mitigation Plan (EMMP) that tries to supplement the EA with more complete descriptions of proposed activities. This attempt at tiering (see 40 CFR 1508.28 and NEPA Scoping Guidance II. c. 3, April 30, 1981) fails because the EMMP still relies on the incomplete environmental baseline information and the preliminary impact analyses presented in the statutory EA for the Yucca Mountain site. Thus, the EMMP proposes monitoring only where potentially significant adverse impacts were predicted to occur and does not constitute a comprehensive reassessment environmental impact as is needed. Additionally, the only mitigation measure addressed by the EMMP is modification of the offending activity once an impact occurs. Reclamation is not considered in accord with standard practice and environmental review regulations (40 CFR 1508.20).

Satisfactory compliance with the Section 113(a) requirement should consist of a detailed reassessment of potential impacts based on comprehensive baseline environmental data specific to the Yucca Mountain site as opposed to the largely regional information used for the EA. The assessment for Section 113(a) should be performed on the basis of activities to be described in the Site Characterization Plan and accompanying work plans rather than on the basis of the preliminary and incomplete design plans presented in the EA. NWPO plans to undertake such an assessment in order to evaluate the efficacy of the DOE EMMP (State of Nevada, 1987).

4.3.2.2 Section 113(b)(1)(A)(iii)

Under subparagraph (1)(A)(iii) of Section 113(a) NWPA requires that plans be prepared for mitigating significant adverse environmental impacts caused by site characterization if a site is determined unsuitable for a repository. The DOE response to this requirement is to devote one page

discussing reclamation planning in Section 8.7 of the draft Site Characterization Plan (DOE, 1988a). No details are provided on the extent of reclamation anticipated, no maps are presented showing where reclamation may be undertaken, and no methods, procedures, or techniques for reclamation are discussed. There is no acknowledgment that sites at Yucca Mountain previously disturbed by geologic and hydrologic field activities remain unreclaimed and require attention.

4.3.2.3 Section 113(c)(4)

The reclamation plan called for in NWPA Section 113 would be implemented in accord with subparagraph (c)(4) if a site were found unsuited for a repository. Reclamation following site characterization would be accompanied by mitigation of any observed significant adverse impacts. Satisfactory compliance with these requirements can happen only if an effective and comprehensive impact detection effort is implemented accompanied by adequate plans for site reclamation and impact mitigation. Neither of these two prerequisites can be achieved under current DOE plans for NNWSI. The EMMP for NNWSI (DOE, 1988b) is flawed by being based on the statutory EA (DOE, 1986a) and the draft Site Characterization Plan (DOE, 1988a) fails to adequately address reclamation.

4.3.2.4 Section 113(d)

Section 113(d) of NWPA exempts all activities mandated by Section 113 from preparation of a NEPA EIS. This explicit exemption does not include NEPA requirements regarding agency environmental review and the corresponding implementing regulations. Despite this, DOE has assumed that site characterization is completely exempt from all NEPA related requirements (DOE, 1987d) and apparently NNWSI has not complied with environmental planning regulations (40 CFR 1501), decision-making regulations (40 CFR 1505), regulations governing agency responsibilities (40 CFR 1506) and corresponding DOE regulations and Orders since passage of NWPA.

4.3.2.5 The Repository EIS (Section 114)

Although not part of site characterization as defined by NWPA Section 113, DOE must prepare an EIS for the repository. The document is required

by Section 114 for NEPA compliance and for NRC licensing. DOE has been careful to distinguish between EIS related activities and compliance with environmental requirements in Section 113. This position apparently stems from the policy that environmental assessment is not required for site characterization and that the final EA is adequate for meeting the information base needed for complying with environmental requirements of Section 113.

It is contended by DOE that for the EIS it will be sufficient to use the condition of the Yucca Mountain environment after site characterization as the baseline for assessing potential repository impacts. Thus, DOE has no plans for describing the Yucca Mountain environment before it is altered by site characterization activities.

Consequently, if DOE proceeds according to its current plan, it will not obtain pre-site characterization data on the Yucca Mountain environment and the environmental baseline survey for the EIS will be established only after site characterization impacts have occurred. Such a policy is contrary to sound environmental practice and implies that site reclamation for past and future characterization activities will be deferred until after closing of the repository or may never be addressed at all. Such concerns gave rise to the State of Nevada (1987) proposing to undertake an environmental oversight program that will:

1. establish a comprehensive site specific environmental data base prior to site characterization;

2. use detailed study plans for site characterization study plans to evaluate the preliminary environmental impact analyses presented by DOE in the statutory EA and the EMMP; and

3. provide the basis for reviewing the substance of monitoring, mitigation, reclamation, and regulatory compliance plans being prepared by DOE.

4.4 Compliance Summary

The foregoing discussion addressed the DOE record to date regarding compliance with environmental regulations, NEPA, and related NWPA requirements in the NNWSI project. Section 5 of the report will draw upon that record and the DOE plans evolving from it to evaluate implications to future compliance policies and actions to be expected in the course of site characterization. The following summary of DOE compliance with environmental requirements in the Yucca Mountain repository siting project since 1976 will facilitate the evaluation.

4.4.1 1976 Through 1982

Repository siting studies in Nevada commenced at NTS in 1976. Prior to passage of NWPA in 1983, however, the activities were modest involving onsite and offsite geologic and hydrologic exploration including:

- 38 drill holes with associated pads, pits, access roads, and testing;
- 19 trenches; and,
- installation of seismic and other monitoring stations.

Environmental requirements associated with the activities and corresponding compliance measures taken included the following:

- NEPA review and documentation was addressed by partial environmental surveys and by files that no longer exist;
- Endangered Species Act and National Historic Preservation Act surveys were performed for specific locations to be disturbed. The Ash Meadows ecosystem was mentioned but not assessed in the 1977 draft EIS for NTS;
- Regulations (10 CFR 1022) that applied to 11 drill holes located in the 100-year floodplain apparently were not complied with;
- Right-of-Way Authorizations by BLM and the Corps of Engineers were obtained for some activities located outside of NTS. A BLM EA prepared for the action was based on the same inadequate environmental information used by DOE for its final EA for the Yucca Mountain site;

- State of Nevada drilling regulations were not complied with;

- State of Nevada authorization to inject tracers and use radioactive well logging sources were not obtained; and,

- State of Nevada air emissions registrations were not applied for.

4.4.2 1983 to May 1986

Siting activities increased in NNWSI following passage of NWPA and were partially exempt from NEPA. Preparation of the Section 112 statutory EA was undertaken and field exploration ceased with issuance of the document. Actions associated with environmental compliance included:

- 20 major drill holes to or below the water table;

- another 40 major drill holes probably involving pads, pits, access roads, and testing;

- two trenches; and,

- installation of stream flow and meteorological monitoring stations.

Environmental requirements and compliance measures for the activities were as follows:

- Non-exempt provisions of NEPA were ignored or at best were covered by partial environmental surveys, the files for which no longer exist;

- The Endangered Species Act and the National Historic Preservation Act were addressed by site-specific surveys and reports except for the Ash Meadows environment;

- Floodplain protection requirements (10 CFR 1022) for 53 drill holes apparently were not complied with;

- The NWPA Section 112 EA for site nomination issued on May 26, 1986, was based on incomplete environmental information and plans for proposed site characterization actions; and,

- State of Nevada authorizations for drilling, use of tracers, radioactive logging and dust emissions were not obtained.

4.4.3 May 1986 to the Present

Since issuance of the final EA for the Yucca Mountain site the NNWSI environmental program has focused on preparing plans for monitoring, mitigation, and related activities to be carried out coincident with site characterization. Two of the plans, released with or part of the draft Site Characterization Plan, are meant to comply with specific NWPA environmental requirements as follows:

- The Environmental Monitoring and Mitigation Plan is meant by DOE to accomplish minimization of environmental impacts as required by NWPA Section 113(a); and,

- A reclamation plan required by NWPA Section 113(b)(1)(A)(iii) is included in the Site Characterization Plan as Section 8.7 of the plan.

A third plan, although not required by NWPA, also was issued with the draft Site Characterization Plan and addresses environmental regulatory compliance.

5.0 IMPLICATIONS FOR SITE CHARACTERIZATION

The analysis in the preceding section was to provide an understanding of the DOE compliance record relative to NNWSI repository siting activities and to give NWPO insight to how DOE can be expected to practice environmental compliance in the course of future site characterization activities. This section of the report describes the activities DOE proposes undertaking in order to characterization the Yucca Mountain site, identifies the corresponding environmental regulations that will apply, and reviews the measures that DOE is likely to take in complying with the requirements. Addressed are NWPA, NEPA, and relevant federal and State of Nevada environmental statutes and implementing regulations.

5.1 Proposed Activities for Site Characterization

Previous compliance evaluations conducted in the course of reviewing the statutory EA and DOE preliminary environmental protection plans (State of Nevada, 1985 and 1987) were of necessity based on preliminary and incomplete descriptions of proposed site characterization activities contained in the EA. Details available for the exploratory shaft surface facilities, access roads, and other surface-based aspects of site characterization were inadequate for a definitive analysis of applicable regulations and other environmental requirements.

While final engineering designs and study plans for individual activities such as drill holes or specific support facilities for the exploratory shaft remain unavailable, the draft Site Characterization Plan (DOE, 1988a) provides more detail than did the EA and thus merits the present compliance analysis. DOE anticipates preparing about 100 design and study plans which when made available will allow the State of Nevada to perform a more definitive review of environmental requirements to support regulatory decision making. In the interim this analysis based principally upon the Site Characterization Plan must suffice for insight to matters regarding applicable regulations and how they can be met.

The discussion that follows describes characteristics of proposed NNWSI activities that are relevant to environmental regulatory requirements. Addressed are surface-based as opposed to underground activities and included are geological and hydrological studies and construction of an ESF that will support two shafts and underground test drifts. Table 3 presents characteristics of the proposed activities that are relevant to regulatory compliance.

Table 3. NNWSI Proposed Site Characterization Activities at Yucca Mountain and Characteristics Relevant to Environmental Regulatory Compliance

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1. MAJOR DRILL HOLES

   Number: 70

   Depth: Several hundred feet to several thousand feet

   Disturbed Area: 2.5 acres each

   Other Characteristics:

   - bladed access road, average - 5 miles each
   - bladed, raised, and leveled dirt drill pad
   - 0.25 acre mud pit, unlined, for waste bentonitic mud, chemical foam, and drill cuttings
   - fill dirt obtained from near-by borrow area
   - water trucked in
   - diesel engine emissions and noise
   - logging with radioactive source
   - chemical tracers for aquifers (possibly some radioisotopes)
   - hydrofracturing with drilling mud
   - pumping tests, 500 gpm rate, 1-4 week duration, 500 gpm rate, discharged to dry drainage

2. OTHER DRILL HOLES

   Number: 280

   Depth: 5-350 feet

   Disturbed Area: 200-500 square feet per site

   Other Characteristics:

   - diesel engine emissions and noise
   - no drilling pads or waste pits

3. TRENCHING

Number: 20

Dimensions: 4-10 feet deep, 8-10 feet wide, 25-500 feet long

Other Features:

- constructed or reworked by diesel-powered bulldozer
- access road bladed to remote site

4. PAVEMENTS (sites cleared of regolith)

Number: 20

Disturbed Area: 8,600 square feet each

Other Features:

- pressurized water
- access road bladed to each site
- diesel emissions and noise

5. INFILTRATION TESTS

Number: 80 sites, 220 shallow (30') holes, 50 ponds

Disturbed Area: 225 square feet per site plus 5,000 square feet test area

Other Characteristics:

- blading and blasting
- excavations to 25 feet depth
- markers and chemical tracers used
- 1,000,000 gallons water
- access road bladed to each site

6. GEOPHYSICAL SURVEYS

Types: seismic reflection and refraction, gravity, magnetic

Number: 200-250 miles of lines

Disturbed Area: unspecified

Other Characteristics:

- vibrator trucks
- geophone stations
- 50-4,000 pound dynamite charges and shot holes
- diesel emissions and noise

7. EXPLORATORY SHAFT FACILITY (ESF) SITE PREPARATION

Area: 20 acres contiguous

Other Features:

- off-road vehicles
- shallow drilling and trenching with diesel-powered equipment, possibly some blasting

8. ESF ACCESS ROAD CONSTRUCTION

Area: 160 feet wide, 1,300 feet long for main road and 2 acres for miscellaneous roads

Other Features:

- fill material from borrow area
- dry washes modified
- topped with double layer of oil and chips
- diesel emissions and noise

9. ESF SURFACE, SUPPORT, AND UNDERGROUND FACILITIES

Types:

- 4 prefab metal buildings
- 12 trailers
- dormitories
- concrete batch plant
- 3 explosives magazines

- borrow area
- exhaust fans for shafts
- lined rock storage area with 160,000 cubic yards capacity
- lined mine waste water pond with 375,000 gallon capacity

Areas Occupied: (in addition to 20-acre contiguous area)

- 1 acre for cement batch plant
- 1 acre for magazines
- 2 acres for borrow area
- 0.5 acre for mine waste water pond
- 1.6 acres for rock storage area

Other Characteristics:

- blasting noise
- diesel emissions and noise
- dust, fumes, smoke from shaft exhaust
- emissions from concrete batch plant
- cement wash and batch waste water
- bentonitic mud, foam, water control agents from shaft
- solid wastes from construction and operation of ESF

10. ESF UTILITIES

Types:

- electric substation (69 kV overhead power line, 4.16 kV transformer)
- water supply (pipeline and 150,000 gallon storage tank)
- sewer system

Features:

- 1,300 foot extension of power line from NTS

- water pumped 6.2 miles from well J-13 at NTS in buried pipe
- water pumping station mid-way from NTS well site
- septic tank and leach field for municipal sewage (200 persons/24 hr.) and industrial (hazardous) wastes
- 2-acre leach field area

5.1.1 Drilling, Trenching, and Associated Testing

The draft Site Characterization Plan describes geologic and hydrologic studies yet to be undertaken for NNWSI. Information on the drill holes proposed in the Site Characterization Plan is summarized here in Table 3.

Up to 350 holes are planned, 230 of which are less than 100 feet deep. Of the remaining holes about 70 will be major operations involving construction of drilling pads, mud pits, and bladed access roads. The drilling sites for these holes will occupy about 2.5 acres each. All but 14 of the 350 drilling sites will be outside the NTS boundary.

The 178 existing holes and the 350 proposed new holes will be used for a variety of testing and monitoring purposes. Many of the shallow holes are for installation of neutron probes, for seismic monitoring, or for infiltration studies. The 30 existing and proposed hydrologic and water table holes will be used for long and short term pumping tests and for tracer injections. Other deep holes are for various types of geologic engineering, and performance assessment studies.

Some of the existing geologic trenches will be reworked for further studies and up to 20 additional trenches or test pits may be constructed. The draft Site Characterization Plan is unclear regarding the number and characteristics of these and other near-surface geologic studies that involve disturbance of the surface.

5.1.2 Other Surface-Based Studies

Various geologic and hydrologic studies will involve construction of ponds, plots, and removal of surface materials by hydraulic or pneumatic means (Table 3). Ponding tests, proposed around some neutron access holes, will involve excavations up to 25 feet deep. Other areas will be used for infiltration studies involving excavations and use of chemical tracers.

Surface disturbance also will result where seismic surveys are conducted. Refraction lines involving dynamite shots are proposed over an approximately 200-250 miles area from Death Valley, Beatty, and Crater Flat. Spreads of reflection lines using vibrator trucks are planned across Yucca Mountain to the Amargosa Valley.

Additional minor surface disturbance not included in Table 3 will result from access to and installation of proposed monitoring and gaging stations. Twenty-eight new precipitation and stream-flow stations are planned at washes throughout the study area. An undetermined number of meteorological and radiological monitoring stations also will be located around the site.

5.1.3 The Exploratory Shaft Facility (ESF)

Aspects of the ESF important to environmental compliance consist principally of surface facilities and operations that occur primarily at the surface. It is possible that some underground construction and testing could involve groundwater protection regulations and if so the regulatory requirements would be comparable to those associated with drilling and related testing. Emphasis here is focused on such facilities as pads, roads, buildings, utilities, and shaft support structures (Table 3).

Roads, power lines, and water lines have been constructed within NTS to the boundary adjacent to the Yucca Mountain site. The initial task related to ESF construction will be to extend the road and utilities to the site and to prepare surface areas there. These activities will occur on public land.

Surface preparation will involve drainage diversions and construction of leveled pads by grading and filling. Several areas will be involved with the largest being about 20 acres in size and various others totaling about 5-10 acres. The pads will accommodate prefabricated shops and a warehouse, trailers for change rooms and offices, three explosives magazines, equipment storage areas, a concrete batch plant, and a water tank, a mine waste water pond, a sewage system, and a mined-rock pile. Fill material for constructing pads will be obtained from nearby areas and runoff from the ESF area will be diverted into natural drainage.

A main roadway surfaced with oil-and-chip material will be constructed to the ESF. Additional roads will be constructed for access to the shaft site, magazines, water tank, and rock pile.

Utility systems will consist of an electrical substation supplied by an overhead power line, a 6-inch diameter underground pipe line from well J-13 on NTS to a 150,000 gallon storage tank at the ESF, a 200-person/24 hr. sewage system utilizing a septic tank and leach field, and a communications system.

Two shaft collars will be constructed by drilling, blasting, and preparing concrete foundations for hoists and headframes. A concrete batch plant will be located near the shafts. East of the shafts will be a mine waste water pond bermed and lined to hold 375,000 gallons of waste fluids. The rock pile, or muck-storage area, also will be situated east of the shafts and designed to hold mined material and associated wastes.

5.2 Applicable Regulations and Requirements

Environmental statutes and regulations associated with the DOE repository siting program and the NNWSI project in particular were discussed in Section 3.2 and listed in Tables 1 and 2. Additional details on the requirements can be found in an earlier report (State of Nevada, 1987).

Coupled with the information in the preceding section, particularly that given in Table 3, an evaluation was made of specific requirements likely to apply to DOE site characterization at Yucca Mountain. Results of the evaluation are summarized in Table 4 and discussed below.

Table 4. SUMMARY OF ENVIRONMENTAL REQUIREMENTS THAT MAY APPLY TO NNWSI SITE CHARACTERIZATION ACTIVITIES

TYPE OF PROPOSED ACTIVITY	POTENTIAL COMPLIANCE REQUIREMENTS
Surface Disturbance	DOE Internal
- access roads - drill sites - trenching - seismic holes - sediment coring - exploratory shaft site preparation - drainage diversions - environmental monitoring stations	- environmental review - land management plan Other Federal - BLM users permit/land withdrawal - SCS review of soil resources - FWS review of biological resources and surveys - ACHP review of cultural resources surveys (and surveys) State - review of biological resources and protected species - habitat modification permit - permit to construct utility facilities - review of cultural resources
Actions in Floodplains	Federal
- diversion works - construction - drilling, coring, trenching - access roads - gauging stations	- floodplain notification and review - nationwide or special permit (dredge and fill) State - dam and water rights permit - non-point source control - water conservation districts
Buildings	State
- plumbing - electricity	- building codes - plumbing codes - electric codes

Work Camp	State
- sanitation facilities - food facilities	- State health inspections - county sanitary ordinances - county examination for food handlers
Municipal Solid Waste	Federal/State
	- review of facility and management plan
Hazardous Waste Management	Federal/State
	- materials registration - review of facility and management plan
Atmospheric Emissions	Federal/State
- fugitive dust - engines - concrete plant - shaft ventilation - rock storage pile - burning	- source registration - PSD review - permit to construct - permit to operate - burning permit
Sewage Treatment System	Federal/State
	- plan approval - discharge permit
Potable Water Supply System	Federal/State
	- water rights permit - plan approval - drinking water standards
Discharges to Rock Storage Pile or Seepage Field	Federal/State
- mining wastes - mine drainage	- NPDES and discharge permits - seepage monitoring system
Surface Runoff	State
- drainage diversion	- diffuse source controls - water wastage control - water conservation district review

Water Wells	State
- drilling - casing	- permit to appropriate water; also covers casing plan, sealing requirements, and licensed drillers
Radioactive Materials	Federal/State
- hydrologic testing - geophysical logging	- UIC permit - source registration - users license - disposal permit
Underground Storage Tanks	Federal/State
	- leak prevention practices - leak detection system

Because final engineering designs and study plans for all proposed activities are not completed the evaluation is a preliminary one. Once detailed plans are available for individual activities to be undertaken by DOE the regulatory analysis presented here can be updated to better provide guidance on how the environment should be protected.

5.2.1 Land Use and Environmental Protection

The exploratory shafts and most of the support facilities will be located on land controlled by BLM. Also, most of the proposed drilling will occur on public land outside the NTS boundary. Accordingly DOE must obtain authorization from BLM to utilize the Yucca Mountain site for purposes of characterization. This could involve a land withdrawal action under FLPMA.

All land surfaces to be disturbed must be evaluated for protected resources. Consultation by DOE with the U.S. Fish and Wildlife Service and with State agencies having jurisdiction over protected biota is necessary to determine whether field surveys and permits will be needed. Also, the provisions of the National Historic Preservation Act will apply with regards to archeological surveys, and under the terms of the American Indian Religious Freedom Act consultation with potentially affected Indian Tribes is required.

Floodplain protection regulations (10 CFR 1022) will apply where activities are to occur in regulated floodplains. Sufficiently detailed maps and information on exact locations of proposed activities are not available for determinations to be made at this time. Likewise, a determination cannot be made regarding whether drainage diversions and runoff associated with site preparation warrant regulation by State environmental and water resources agencies. Once study plans are available DOE should consult in these regards with the State Division of Environmental Protection and Division of Water Resources.

Because surface areas in excess of 20 acres will be disturbed DOE must register the site characterization program with the Nevada Division of Environmental Protection. A determination will be made by the State with regards to the need for permits under the Clean Air Act. Destruction of vegetation during surface clearing operations will require authorization by the Nevada Division of Forestry.

Drilling activities involving extensive pumping of potable water add wells supplying water for consumptive

use may require permitting by the Nevada Division of Water Resources. Where ground-water tracers are to be used a State water quality permit and approval by the U.S. Environmental Protection Agency (EPA) may be needed. Radioactive logging must be approved by the Nevada Health Division. The NWPA required that NRC permission be obtained for using radioactive materials during site characterization and that the materials be fully recoverable.

Buildings must comply with State codes, and plans for constructing utilities must be approved by the Nevada Public Services Commission. Water supplies and sewage disposal must be approved by the Nevada Health Division and the Division of Environmental Protection. Dormitories and food facilities associated with the ESF also must be approved by the State Health Division.

A State permit will be required for discharges to the mine waste water pond. This may involve monitoring beneath the pond for seepage and must be reviewed by the Nevada Division of Environmental Protection.

Facilities used for disposal of solid and hazardous wastes must be approved by the Nevada Division of Environmental Protection. Additionally, hazardous wastes generated during site characterization must be registered in accord with the Resources Conservation and Recovery Act (RCRA).

5.2.2 Environmental Review

Requirements under NWPA Section 113(a) for including environmental assessment as part of site characterization planning were discussed in Section 4.3.2.1. The partial NEPA exemption granted by NWPA Section 113(d) and the remaining environmental review requirements applying to site characterization were reviewed in Section 4.3.2.5.

Environmental review for DOE projects is covered in 10 CFR 1021 and implementation is addressed in DOE Order 5440.1C. Requirements for environmental planning (40 CFR 1501), environmental decision making (40 CFR 1505), and other agency environmental responsibilities (40 CFR 1506) apply to all aspects of DOE site characterization activities.

5.3 Anticipated DOE Compliance Measures and Their Consequences

Clear and comprehensive policies and strategies relative to environmental compliance with both federal and State statutes during site characterization has yet to be presented by DOE. A retrospective view of past compliance practices in NNWSI suggests that for upcoming site characterization activities measures will be taken by DOE to comply with federal statutes protecting biota and archeological resources. The past record indicates that DOE will take steps to obtain authorization from BLM to conduct studies on public land at Yucca Mountain. In each of these cases past DOE practice has been to take action to the minimum extent necessary to comply with applicable requirements. Infractions have occurred due to failure to include all activities that should have been addressed because of the apparent absence of an effective system for auditing both the completeness and sufficiency of compliance actions. Evaluation of potential environmental consequences have been based on preliminary information on proposed activities and incomplete descriptions of the site.

The DOE compliance record from 1976 to the present time suggests that most State environmental statutes, even those carrying delegated federal authority, are at risk of being ignored in the future. Thus, there is nothing to provide reasonable assurance that DOE will register sources of air emissions, obtain permits for construction and testing of wells, obtain water rights, or comply with other State regulations protecting the environment. From that perspective the view to the future is unfavorable regarding environmental compliance and interaction with State regulators.

Another view of future DOE compliance policy can be taken based on how DOE interprets its responsibilities under NWPA and NEPA. Ignoring the NWPA requirement to include environmental assessment in site characterization planning speaks somewhat to this perspective. How DOE has in the recent past responded to NWPA and NEPA is further revealing. The statutory EA is being used by DOE as the environmental data base for NNWSI site characterization planning. Thus, DOE does not intend to establish a comprehensive, site-specific baseline of information at Yucca Mountain until after the impacts from site characterization have occurred. This implies that any environmental data needed for regulatory compliance will be based on the historic regional information used for the statutory EA rather than being current and specific to the Yucca Mountain site. DOE also is using the EA to describe proposed activities even though the

plans discussed there are preliminary and differ from current planning presented in the draft Site Characterization Plan.

Additionally, to date DOE has taken the partial exemption to NEPA granted by NWPA to mean that it has no obligation to perform environmental review in connection with site characterization. This policy raises the question about how and when proper review of potential impacts from siting activities will be conducted.

Based on Section 8.7 of the draft Site Characterization Plan it is clear that DOE is unconcerned about site reclamation. Without a proper site specific environmental data base no serious or effective attempt at reclamation can be made and this is borne out by existing plans.

As discussed in Section 2.2 and Attachment A of this report DOE has an environmental, health, and safety record that leads to concern with respect to any project under the agency's own self-regulatory jurisdiction, as is the case for pre-construction repository siting activities like site characterization. The record shows that DOE cannot be relied on to uphold its responsibilities to protect the public and the environment. Over the years DOE has been repeatedly investigated and found short of complying with environmental, health, and safety laws and unable to meet commitments made in the wake of numerous inquiries and investigations.

With patience apparently at its limit, Congress currently is working on legislation to relieve DOE of its self-regulatory authority and to establish mechanisms for independent review and regulation. To that end the Nuclear Protections and Safety Act of 1987 (S. 1085) has been introduced in the U.S. Senate. The proposed legislation and events leading to it are described and documented in Attachment A.

Protection of the environment during site characterization will not be a responsibility of DOE alone. Because USGS, BLM, and NPS all are involved to varying degrees with either conducting studies for DOE or managing some of the public lands being characterized, these agencies have environmental obligations that must be addressed. In the past there has been a tendency on the part of other agencies to accept the incomplete information from the DOE statutory EA for purposes of environmental review. Additionally there has been no means of monitoring or auditing cooperative agreements with DOE to assure that the terms are being met. For these reasons it cannot be taken

for granted in future site characterization activities involving USGS, BLM, and NPS that those agencies will responsibly and credibly comply with environmental requirements.

6.0 NEED FOR STATE OVERSIGHT OF THE NNWSI COMPLIANCE PROGRAM

The history of DOE as an agency, the failure of NNWSI to recognize and comply with State environmental regulations, and the lack of appropriate environmental planning and review for site characterization at Yucca Mountain point to the need for a strong oversight function by the State. It cannot be assumed that DOE will on its own initiative properly comply with environmental requirements. A means must be provided not only for checking on the agency after an activity has been initiated to verify compliance but also for assuring beforehand that DOE is knowledgeable about the requirements it must meet prior to undertake an activity.

Clearly the State must be in a position to interdict an NNWSI activity that does not carry full environmental authorization and has not been reviewed in complete accord with all environmental requirements. To this end a procedure must be established to confirm that the environmental interests and responsibilities of the State are addressed in the course of DOE site characterization at Yucca Mountain. Within NNWSI there currently is no way of actively assuring that proper actions are taken for environmental compliance. In the past this shortcoming of the project has resulted in regulatory infractions that are bound to intensify if not remedied before site characterization resumes.

While the events documented in Attachment A did lead to initiation of a DOE-wide environmental survey and audit program (DOE, 1987e), the program has not lived up to expectations and appears to be in jeopardy of failing as evidenced by the recent resignation of top DOE administrators responsible for the program. Additionally, DOE (1987b) has stated that although the survey and audit program is being carried out at NTS it is not relevant to repository siting and will not be adopted for site characterization at Yucca Mountain. The failure of OCRWM to provide for assurances of compliance points to the need for the State of Nevada to assume that responsibility under the terms of NWPA that provide a role for affected parties in the repository program. Accordingly, the State will consult with DOE regarding the most effective means of:

1. reviewing all proposed actions for applicable regulatory requirements before activities are initiated;

2. coordinating DOE interactions with State regulatory agencies on matters concerning site characterization and related authorizations; and,

3. monitoring and auditing the efficacy of compliance measures taken to address regulatory requirements.

Developing such an oversight role is consistent with the intent of NWPA Section 116 and will assure that environmental protection is carried out in accord with the requirements of NWPA, NEPA, and federal and State environmental statutes.

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ATTACHMENT A

ENVIRONMENTAL, SAFETY, AND HEALTH ISSUES RELATED TO U.S. DEPARTMENT OF ENERGY NUCLEAR FACILITIES

ENVIRONMENTAL, SAFETY, AND HEALTH ISSUES RELATED TO U.S. DEPARTMENT OF ENERGY NUCLEAR FACILITIES

SUMMARY

The State of Nevada has been designated a participant in the nation's effort to dispose of high-level nuclear wastes in geologic repositories and is to provide oversight of the U.S. Department of Energy (DOE) repository siting project at Yucca Mountain. An important element of the State's program is to assure that the environment is adequately protected during DOE site characterization. To carry out this responsibility the State must determine the extent of independent oversight necessary for the DOE project.

Historically DOE has been a self-regulated agency and while the Nuclear Waste Policy Act and amendments (NWPA) mandates a role for the Nuclear Regulatory Commission (NRC) in licensing and constructing a repository neither the NRC nor any other regulatory body is directly involved in the repository siting project. Therefore, DOE will remain self-regulated while it selects a repository site. This implies that any independent oversight that should be exercised for the DOE Yucca Mountain project must be provided by the State. As a measure of the confidence the State and the public should place in the ability of DOE to protect the environment a review and evaluation was made of DOE environment, safety, and health (ES&H) programs outside Nevada. An abundance of literature exists on this issue as does an ample congressional record resulting from ongoing hearings and proposed legislation regarding how well DOE protects public interests.

The ES&H record established by DOE at its facilities across the nation clearly and consistently speaks for itself. Numerous investigations of DOE programs have shown the agency incapable of responsibly carrying out satisfactory environmental protection. Routinely DOE violates federal and State regulations as well as those it establishes for itself. Despite repeated commitments to improve its record in recent years DOE remains incapable of bringing about a change on its own initiative.

Concluding that DOE merits no further confidence in matters regarding public health, safety, and environmental protection Congress is taking steps to relieve the agency of its historic authority for self-regulation. The proposed Nuclear Protections and Safety Act of 1987 (S. 1085) would provide for outside oversight of many aspects of existing ES&H activities in DOE. However, there is no immediate prospect for legislative relief of the present situation in which DOE remains characteristically self-regulated.

By virtue of the poor record DOE has established in ES&H matters and the mandate given by NWPA to states participating in repository siting, it behooves the State of Nevada to establish a strong and authoritative oversite program with respect to environmental protection at Yucca Mountain. No less can be expected of the State if it is to fulfill its role as guardian of the public interest.

INTRODUCTION

In the United States there are 127 nuclear defense facilities operated by the U.S. Department of Energy (DOE). Regulation of public health, safety, and environmental protection at the facilities is under the exclusive jurisdiction of DOE and is not subject to independent oversight. This situation arose and has been perpetuated on the basis of national defense priorities established by the Atomic Energy Act of 1946.

In recent years concern has been growing over the ability of DOE to regulate itself without involving independent review and outside regulatory enforcement. Scrutiny of DOE's management of nuclear facilities and its health and safety record had intensified particularly in response to the Three-Mile Island and Chernobyl nuclear accidents. The agency's environmental programs also have received attention from the perspectives of compliance with the National Environmental Policy Act (NEPA), major federal programs to protect air quality and water resources, and national legislation addressing hazardous wastes. In particular, the Resources Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) have been instrumental in focusing national attention on mismanagement of hazardous wastes at DOE facilities.

In response to an increasing frequency of health, safety, and environmental incidents involving DOE a number of investigations have been undertaken both by federal institutions and public interest groups. In turn, DOE has attempted to take remedial steps to correct its environment, safety, and health (ES&H) programs. However, the attempts at self-correction have proven no better than the self-regulatory practices and policies that led to the existing adverse situation.

Finally, out of frustration with DOE's ability to correct its health and safety record and improve ES&H programs, Congress has taken steps to promulgate legislative solutions to the problems. This paper is a review of the major investigations conducted of DOE, the agency's attempt to respond to criticism, and the proposed legislation to improve health, safety, and environmental protection at the nation's nuclear defense facilities.

Numerical citations are used in the text to indicate notes and references pertinent to the topic discussed. The key to the citations is at the end of the paper.

PURPOSE AND BACKGROUND

This paper was prepared by the State of Nevada Agency for Nuclear Projects/Nuclear Waste Project Office (NWPO) as a means of providing insight to the recent record and trends in DOE ES&H programs. Interest in the ability of DOE to safely carry out its mandate and to adequately protect public health and the environment arises in Nevada by virtue of the state having been designated by DOE as a potential host for the nation's first, and possibly only, geologic repository for disposing of high-level nuclear wastes.

A role in the repository program was created by NWPA which provides for state participation with and oversight of DOE. Involvement of outside parties in the DOE program is a cornerstone of NWPA with the goal of achieving public confidence that the interests of a state and its citizens will receive foremost consideration in siting and developing a civilian nuclear waste repository.

While NWPA provides a role for the NRC during repository licensing and construction and requires DOE compliance with NRC health, safety, and environmental regulations for repository development, the Act does not require NRC regulation of the DOE siting program. Thus, the historic self-regulatory role and accompanying attributes will prevail in DOE prior to repository licensing with the exception of the independent oversight exercised by outside parties participating in the program. This places an extra burden of responsibility on states having a potential repository site within their boundary.

The DOE considers the potential repository site at Yucca Mountain, Nevada, as the preferred location for a geologic repository. As the guardian of the public interest the State of Nevada is meant by NWPA and the 1987 amendments to share with DOE the responsibility for assuring that health, safety, and environmental protection are achieved in the course of repository siting. This is not to be taken lightly and it behooves affected parties participating in the DOE program to comprehend the nature and extent of the responsibility relevant to how DOE can be anticipated to fulfill its own role as a self-regulated agency during site characterization. It was with this goal in mind that the present paper was prepared.

What follows is a review of investigations of DOE nuclear defense facilities from the perspective of public health, safety,

and environmental protection, the Congressional response to the DOE ES&H program, and a discussion of how these issues reflect on the role of the State of Nevada with respect to site characterization at Yucca Mountain.

PRACTICES AT DOE NUCLEAR FACILITIES

A series of investigations into health, safety, and environmental practices at DOE defense facilities was initiated by the U.S. General Accounting Office (GAO) in the early 1980s and has continued to the present time (1). Public interest groups also have become involved over the years in looking into DOE operations (2).

Initially the GAO investigations considered such issues as risks to workers from toxic chemicals, radioactive materials, and other industrial hazards at DOE nuclear reactors, production plants, and fabrication facilities. GAO found that oversight of DOE worker protection and emergency preparedness programs needed upgrading and that radiological monitoring programs should be improved. In mid-1980 a study of nine major nuclear defense facilities found a variety of significant environmental problems with water pollution, soil contamination, waste management, and regulatory non-compliance. For example, eight of the facilities had ground-water contamination with radioactive and/or hazardous substances at high levels exceeding regulatory standards up to 1,000 times. Additionally, six facilities had soil contamination in off-site locations and pollution in a creek bed at one site exceeded environmental guidelines over 150-fold. Four facilities were out of compliance with Clean Water Act permits, including two that consistently exceeded effluent discharge limits.

The generic pattern of findings made by GAO has been substantiated by detailed studies of individual DOE facilities. The major investigations undertaken by GAO and others of specific DOE defense operations are summarized below.

Ohio Defense Plants

One of the most extensive and detailed studies undertaken by GAO was of the Fernald, Portsmouth, and Mound nuclear facilities in Ohio (1). Together the three plants employ about 6,000 workers and are in communities with a combined population of over 2.25 million. The investigation stemmed from several incidents in 1984 resulting in the release of exceptionally large quantities of radioactive dust to the environment.

It was found that DOE's self-appraisal programs failed to discover deficiencies in environmental and worker protection,

leading in part to the radioactive releases that precipitated the GAO investigation. Contractors performing work for DOE did not uniformly establish worker exposure goals. Environmental monitoring programs were found to be inadequate and deficient and no coordination existed between DOE, the state, the contractors for independent verification of monitoring data. All three Ohio plans were out of compliance with hazardous waste laws and state permits and had problems with radioactive contamination of ground water, soil, and drinking water sources.

As a result of the Ohio investigation GAO recommended that DOE develop, in conjunction with the state, a system to exercise oversight of contractors, environmental monitoring, and regulatory compliance. Additionally, GAO pointed to the inherent conflict of interest allowing contractors to carry out environmental programs.

Savannah River Plant

No DOE facilities have been more frequently scrutinized than those at the Savannah River Plant (SRP) in South Carolina. Attention was called to SRP in the late 1970s when DOE moved to restart the L-Reactor for plutonium production (2). An attempt was made to avoid the environmental review requirements of NEPA and discharge radioactively polluted water into a stream that ultimately flowed into the Savannah River. The Natural Resources Defense Council (NRDC) intervened, took DOE to court, and forced the agency to comply with not only NEPA but with numerous other environmental laws that otherwise would have been ignored.

The NRDC case and others related or similar to it focused national attention on SRP operations (2, 3). Numerous cases of faulty management of hazardous and radioactive materials were found. For example, wastes such as nitrates, solvents, chromium, and mercury up to 200,000 gallons a day were disposed of in unlined pits at SRP as recent as mid-1987. The theory was that soils would retain much of the wastes and that polluted ground water would remain on the site. However, plant operators miscalculated soil retention capacity, direction and rate of ground-water movement, and the volume of waste to disposed of. A waste plume now is rapidly moving toward a nearby municipality and DOE is seeking a means of diverting it.

The Environmental Policy Institute (EPI) also became involved in waste disposal issues at SRP and found that DOE has over 150 abandoned sites on the reservation where hazardous and radioactive wastes were disposed of in unlined pits and trenches (2). Contamination from 51 underground waste storage tanks also has been found and EPI charges that despite commitments to the contrary DOE continues to violate RCRA and is making little

progress toward complying with CERCLA. DOE, on the other hand, contends that its seemingly unlawful practices are allowable under the Atomic Energy Act and that as a defense agency some federal environmental statutes do not apply to DOE. Contention over which provisions of RCRA apply to DOE nuclear defense facilities is one of the issues leading to congressional proposals to change who is accountable for health and environmental protection at DOE nuclear plants.

EPI also evaluated SRP worker protection and occupational risks programs. It was found that the radiation workers exposure incident record was sketchy and estimated to omit up to 1,000 incidents plus it contained no information on workers' time exposure as a result of ingesting or inhaling radioactive particles. Furthermore, inadequate records on equipment and failures between 1953 and 1982 rendered the data invalid for calculating future risks. The data bank for estimating occupational risks did not include hazards posed by the corroded and leaking high-level nuclear waste storage tanks and related risks posed by environmental contaminants originating from faulty waste management practices.

Hanford Operations

For over 40 years radioactive wastes have been disposed of in steel tanks, earthen ditches and trenches, ponds and swamps, and wells at the DOE Hanford site. Many of these management practices have resulted in extensive surface and ground-water contamination (3).

Animals burrowing into waste pits have spread radioactive materials over 2,500 acres of the site. Ground-water plumes from injection wells are migrating toward the site boundary at about 500 feet per year. Leaking tanks have lost over 200,000 gallons of liquid waste containing about 350,000 curies of radioactive cesium, strontium, and other fission products. The wastes are moving through the soil, into ground water, and discharging into the Columbia River.

Federal courts have ruled that DOE facilities must comply with RCRA and CERCLA regulations and in 1985 and 1986 GAO reviewed progress at Hanford in implementing the policy (1). The resulting report concluded that Hanford has been slow to implement RCRA and CERCLA, has not been forthcoming with identifying all the current hazardous waste sites that require permitting, and failed to include up to 700 former sites that require remedial action. Additionally, GAO found that ground-water monitoring systems were inadequate and violated regulations.

Hanford continues to use soil disposal for liquid low-level wastes without a proper permit. DOE justifies the practice by invoking exclusions provided by the Atomic Energy Act despite the conflicts with other federal statutes and the inconsistencies with the agency's own ES&H policies and directives.

Oak Ridge

At the DOE facilities near Oak Ridge, Tennessee, millions of pounds of toxic mercury wastes have been discharged into the Tennessee River system (3). For years the fact was denied and covered up by DOE until brought to light by independent investigation. When confronted with the issue DOE contended that it bore no responsibility for the act and did not have to comply with clean-up requirements because it is a self-regulating defense agency immune from other laws.

Consequently, NRDC sued DOE and won the case. This and related suits at SRP, Hanford, and other DOE facilities resulted in judgments that DOE must comply with federal and state hazardous waste regulations. However, recent reviews by GAO and others have shown that DOE remains recalcitrant, continues to illegally dispose of wastes at its major sites, and is making scant progress at complying with RCRA and CERCLA (1, 3).

DOE Nuclear Production Reactors

Since the Chernobyl accident the safety of nuclear production reactors at SRP and Hanford have received considerable attention (3). Studies being conducted by the National Academy of Sciences (NAS) found that between 1981 and 1987 production reactors at SRP were run at a high power level despite studies showing the practice to be unadvisable due to excessively high risks. In early 1987 an NAS panel advised DOE of serious concerns regarding the potential for core melt. DOE initially ignored the warning until it was made public.

Others also have been involved in reviewing reactor safety. GAO reported that cracked walls were detected in reactor tanks after having been missed by DOE's own inspectors (1). Numerous deficiencies reported earlier by GAO had been ignored leading GAO to note a "trend toward a gradual deterioration of safety." NRDC also has reached similar conclusions and has found that up-to-date risk analyses have not been performed by DOE for the SRP reactors (2).

All reviewers of the DOE nuclear reactor program concluded that realistic and practical safety goals are not characteristic of DOE, that effective safety orders and guidelines do not exist,

that contractor compliance with safety regulations is not verified, and that expert, independent safety analysis and review are needed (2).

RESPONSES MADE BY DOE TO THE INVESTIGATIONS

The investigations and evaluations described above point to numerous and repeated safety, health, and environmental violations at DOE nuclear facilities. When violations occur they are not followed by effective corrective action. As a result DOE programs for worker protection, safety assessment, emergency preparedness, and environmental compliance typically do not meet standards required of other federal agencies or set for nuclear facilities in the private sector.

The GAO in particular has made numerous recommendations that DOE should restructure its ES&H programs, implement independent reviews, and initiate audits in an effort to pursue attempts at corrective actions and regulatory compliance (1). GAO itself has on occasion evaluated DOE progress in implementing recommendations. For example, a 1983 study found that safety and health violations previously pointed out at DOE facilities were not uniformly handled to ensure comprehensive corrective action and follow-up. Emergency preparedness drills still were not uniformly conducted at all facilities and many facility safety analyses had not been completed. Environmental monitoring programs had not changed significantly and remained deficient. In total, few changes had been made in the safety and health oversight program, either in its organization and practices or its effectiveness.

Increasing national attention to problems led to a reorganization in DOE in 1985 and appointment of an Assistant Secretary of ES&H. Correspondingly, renewed commitments were made by DOE to improve programs at its nuclear facilities.

In 1987 GAO conducted another investigation to determine DOE progress in implementing the 1985 initiatives. On the positive side it was found that technical safety appraisals of DOE facilities previously recommended by GAO were being performed and that a comprehensive report on all facilities is planned for 1989. GAO also found initiative being taken to upgrade environmental protection and noted that some facilities were changing waste disposal practices to obtain a RCRA permit. Plans were being made to clean up contaminated ground waters at various locations.

DOE is issuing additional and clearer environmental guidance to field offices to assist with regulatory compliance. Included in the guidance are environmental policy statements, a general

environmental order, and revised orders and guidelines addressing regulation of air quality, water quality, hazardous waste management, radionuclide emissions, and radiation protection. An ES&H Office of Environmental Audit was established and is conducting surveys of approximately 40 major DOE facilities to identify specific environmental problems, to establish priorities for corrective action, and to critique regulatory compliance programs.

Despite this overall progress, GAO noted that authority and responsibility for execution of safety directives from headquarters through field operations to facilities and contractors remains less clear and effective than needed. Previous recommendations to enhance professional competence of ES&H staff have not been adequately addressed by DOE, although efforts have been made to hire additional staff with specialized skills and experience to fill vacancies in the ES&H program. Training and other professional development activities to enhance staff competence are lacking. Most significant of the GAO findings was that serious weaknesses remain in the DOE reactor safety program, a conclusion also reached by the recent NAS study.

There has been no progress made by DOE in increasing the extent of independent oversight long recommended by GAO and others. This move was called for again by the NAS regarding reactor safety and elicited another of the many pledges made by DOE to establish a means for outside review.

CONGRESSIONAL ACTION

In March and June 1987 the U.S. Senate Governmental Affairs Committee held hearings regarding safety, health, and environmental issues at DOE facilities. The consequent findings (4) confirm those made by GAO, i.e., that DOE facilities frequently operate without sufficient concern for health and safety and that many problems have developed during the agency's long history of self-regulation. This situation appears to result from a variety of reasons and characteristics common to DOE such as the low priority given to ES&H programs and budgets, lack of effective management from headquarters through field offices to facilities and contractors, slowness in implementing ES&H initiatives, conflicts between the Atomic Energy Act of 1946 and DOE's defense mission on the one hand with federal and state environmental statutes and regulations on the other, and a lack of adequate technical expertise among DOE's ES&H staff.

Senate hearings in October 1987 heard from top DOE officials that DOE has largely ignored mounting environmental and safety problems. The agency's ES&H record was characterized by a Senate

subcommittee as "a dismal one" (5). Additionally, the DOE Assistant Secretary for ES&H admitted to a U.S. House of Representatives subcommittee that DOE oversight has been poor and that nuclear safety standards have not been enforced (6). As on other occasions (7) commitments were made to redouble efforts to improve ES&H programs and to comply with regulatory standards. Shortly after these hearings at least four top ES&H administrators, including the Assistant Secretary, resigned and left DOE.

Both houses of Congress, having grown impatient with DOE's failure to keep promises, are developing legislation to relieve the agency of much of its self-regulatory authority. In the Senate S. 1085, the Nuclear Protections and Safety Act of 1987, was introduced and the House plans soon to follow suit (4-7). The proposed legislation has four major objectives and provisions as described below.

Nuclear Safety Oversight

The most pressing concern voiced by Congress is the excessive degree of risk that characterizes operation of production reactors by DOE. The report accompanying S. 1085 abundantly documents the failure of DOE to respond to national concerns over reactor safety. The lack of outside safety authority for defense production reactors is attributed to the problem and a lack of success that critics of DOE have had in bringing about a change in the DOE safety program.

As an ultimate solution to the issue, Congress proposes that an independent Nuclear Safety Board be established with membership appointed by the President with congressional consent. The board would review and evaluate existing health and safety standards and DOE Orders for their implementation. Accidents and unusual events would be investigated by the board and recommendations would be made as a consequence regarding procedures and standards to protect health and safety of both workers and the public. Another important function of the board would be review of design and construction standards for new DOE nuclear facilities and recommendations to make the DOE facilities comparable with those of the private sector.

Nuclear Safety and Health Standards

Another principal objective of S. 1085 is to give the Occupational Safety and Health Administration (OSHA) and the National Institute for Occupational Safety and Health (NIOSH) oversight responsibility for DOE nuclear facilities, something DOE has always objected to and resisted. Thus, DOE employees would in

the future be protected by the Occupational Safety and Health Act like other workers in the United States, a privilege currently denied them.

This provision of the proposed legislation would assure enforcement of health and safety standards at DOE facilities and would allow OSHA and NIOSH to conduct health, safety, and hazard assessment at DOE nuclear plants. Health and safety inspections of facilities would be required at least once yearly. The provision arose because it was determined that DOE was not adequately protecting, through monitoring and enforcement, the health and safety of its employees.

Exclusion of OSHA and NIOSH from DOE facilities conflicts with the DOE vested interest in production of nuclear materials and puts agency goals above the welfare of employees. All exemptions to health and safety standards now insisted upon by DOE in the interest of national defense would be eliminated by the proposed new legislation.

Regulation of Mixed Hazardous and Radioactive Wastes

Under the Atomic Energy Act DOE has always claimed exemption from regulation of wastes containing radioactive materials. The agency continued to insist on such exemptions, despite the fact that one purpose of RCRA was to regulate DOE mixed radioactive and hazardous wastes, until it lost legal challenges to the issue. Irrespective of court orders and expressed intentions by DOE to honor federal and state laws the agency has remained reluctant to bring its hazardous waste operations into compliance with national standards. Thus, large volumes of mixed wastes continue to be improperly disposed of and to constitute a threat to public health and safety.

In light of persistent recalcitrance on DOE's part to comply with RCRA Congress considers it necessary to clearly mandate in the proposed legislation that DOE must comply with existing hazardous waste regulations and any others promulgated to cover mixed wastes. The U.S. Environmental Protection Agency would be given clear and unilateral authority to regulate all such wastes generated by DOE nuclear facilities. Thus, the original intent of RCRA would be confirmed and there would be no grounds for DOE to continue resisting compliance on the basis of prior defense exclusions.

Oversight of DOE Radiation Health Studies

The fourth major objective of the proposed legislation is to establish an advisory oversight mechanism for DOE radiation health

research. Congressional hearings established that workers at DOE nuclear facilities have suffered effects from radiation. The fact that DOE studies health impacts on its own workers presents a conflict with the agency's goal of producing nuclear materials. As a result there is growing public concern about the integrity and credibility of the DOE health effects program. This is coupled with an increasing need to know the consequences of continued exposure to low levels of radiation associated with nuclear occupations, an issue researched for years by DOE but yet unresolved.

To foster future nuclear health research S. 1085 would create a Radiation Study Advisory Board with membership jointly appointed by the Secretaries of Energy, Health and Human Services, and Labor. The board would advise DOE on research program and would assure that proposed studies receive proper peer review. Among the board's goals would be developing a better understanding of nuclear health effects and their causes.

IMPLICATIONS FOR NEVADA AND THE DOE REPOSITORY SITING PROJECT

Past policies of being outside the jurisdiction of federal and state regulators and the legacy thus created have led to a situation in DOE that is not amendable to self-correction in the near future. The vast problems that exist in terms of extant environmental conditions at DOE sites, inventories of improperly managed wastes, aging and unsafe nuclear facilities, and a recalcitrant bureaucracy defy DOE's attempt to rectify past practices and turn itself around with respect to fulfilling its obligation to protect workers, the public, and the environment. Action being taken by Congress to relieve DOE if its historic justification for remaining self-regulated under the 1946 Atomic Energy Act promises to bring fundamental and long-needed change. Unfortunately the changes are not likely to be realized in sufficient time for the State of Nevada to benefit from improved DOE performance during site characterization at Yucca Mountain.

Having foreseen a lack of public confidence in DOE the framers of NWPA provided for affected states to participate in the DOE repository siting program. There is no clear alternative available to Nevada but to take full advantage of these provisions to exercise independent oversight of environmental protection during site characterization. Thus, the State must establish as strong a role as possible for assuring that adequate consideration of the environment is given by DOE in planning and carrying out its program. A means has to be found both for making DOE aware of regulatory obligations and for following up on the effectiveness of measures to comply with all requirements imposed by NWPA, NEPA, and other environmental regulations.

Prompt steps should be taken by the State to determine the extent of oversight that can be gleaned from NWPA as amended in 1987. If the resources thus provided appear deficient in light of what may be expected of DOE on the basis of its ES&H record the State will have to seek recourse otherwise. There is no justification for Nevada having any degree of confidence in DOE to conduct a responsible environmental program on behalf of the public. As the situation now stands the State must act as the sole guardian of the interests of its citizens. That conclusion is strikingly clear from the information and evaluation presented in this paper.

NOTES AND REFERENCES

(1) Reports of the U.S. General Accounting Office (GAO) relevant to the present paper include:

a. DOE Safety and Health Program for Enrichment Plant Workers Not Adequately Implemented (EMD 80-78; July 1980).

b. GAO's Analysis of Alleged Health and Safety Violations of the Navy's Power Training Unit at Windsor, Connecticut (EMD 81-19; Nov. 1980).

c. Better Oversight Needed for Safety and Health Activities at DOE's Nuclear Facilities 81-108; Aug. 1981).

d. Congress Should Increase Financial Protection to the Public From Accidents at DOE Nuclear Operations (EMD 81-111; Sept. 1981).

e. Cleaning Up Nuclear Facilities - An aggressive and Unified Federal Program is Needed (GAO/EMD 82-40; May 1982).

f. DOE's Safety and Health Oversight Program at Nuclear Facilities Could be Strengthened (GAO/RCED 84-50; Nov. 1983).

g. DOE Acting to Control Hazardous Wastes at SRP Nuclear Facilities (GAO/RCD 85-23; Nov. 1984).

h. Environment, Safety, and Health: Information on Three Ohio Defense Facilities (GAO/RCED 86-51FS; Nov. 1985).

i. Environment and Workers Could be Better Protected at Ohio Defense Plants (GAO/RCED 86-61; Dec. 1985).

j. Environment, Safety, and Health: Status of DOE Implementation 1985 Initiatives (GAO/RCED 86-68 FS; Mar. 1986).

k. Nuclear Safety: Safety Analysis Review for DOE's Defense Facilities Can be Improved (GAO/RCED 86-175; June 1986).

l. Nuclear Waste: Impact of SRP's Radioactive Waste Management Practices (GAO/RCED 86-143; July 1986).

m. Nuclear Safety: Comparison of DOE's Hanford N-Reactor

With the Chernobyl Reactor (GAO/RCED 86-213BR; Aug. 1986).

n. Nuclear Waste: Unresolved Issues Concerning Hanford's Waste Management Practices (GAO/RCED 87-30; Nov. 1986).

o. Nuclear Health and Safety: DOE's Progress in Implementing Its 1985 Initiatives (GAO/RCED-87-73 FS; March 1987).

(2) Public interest group studies of the DOE ES&H program are reflected in the following:

a. Environmental Policy Institute. 1986. Deadly Crop in the Tank Farm. EPI, July, Washington, D.C.

b. _____. 1987. Nuclear Hazards to Workers and Water Continue at DOE's SRP. Environmental Update, Oct./Nov., EPI, Washington, D.C.

c. National Resources Defense Council. 1986 and 1987. Congressional Statements and Testimony by D.W. Reicher and T.B. Cochran, 11 July 1986, 16 June 1987, and 17 July 1987, NRDC, Washington, D.C.

(3) Reports on DOE nuclear facilities written by Eliot Marshall frequently are included in Science. Drawn upon for the present paper were:

a. Science. 1983. The "Lost" Mercury at Oak Ridge. Sci. 221:130-132.

b. _____. 1986. The Buried Cost of the SRP. Sci. 233:613-615.

c. _____. 1987. Savannah River's $1 - Billion Glassmaker. Sci. 235. 1314-1317.

d. _____. 1987. How Safe Savannah River Reactors? Sci. 235:1563-1564.

e. _____. 1987. Hanford's Radioactive Tumbleweed. Sci. 236:1616-1620.

f. _____. 1987. Safety of DOE Reactors Questioned. Sci. 238:741.

(4) 100th Congress, 1st Session, S. 1085, Nuclear Protections and Safety Act of 1987 and Accompanying Report 100-1073 (Calendar No. 334).

(5) Nuclear Waste News. 1987. Vol. 7 No. 43: 307-308. (Report on Testimony of DOE Under-Secretary J.F. Salgado to the Senate Armed Forces Subcommittee on Strategic Forces and Nuclear Deterrence).

(6) _____. 1987. Vol. 7 No. 43: 310. (Report on Testimony of DOE Assistant Secretary for ES&H Mary L. Walker to the House Energy and Commerce Subcommittee on Oversight and Investigations).

(7) 100th Congress, 1st Session, 10 Feb. 1987, Serial No. 100-8, pg. 64-67, Statement of M.L. Walker.

ATTACHMENT B

COMMENTS ON IMPACT ANALYSES REPORTED IN THE FINAL ENVIRONMENTAL ASSESSMENT FOR THE YUCCA MOUNTAIN SITE

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COMMENTS ON IMPACT ANALYSES REPORTED IN THE FINAL ENVIRONMENTAL ASSESSMENT FOR THE YUCCA MOUNTAIN SITE

1.0 PURPOSE AND SCOPE

This paper reviews portions of Environmental Assessment: Yucca Mountain Site, Nevada Research and Development Area, Nevada (DOE/RW-0073), May 1986 that address potential impacts from site characterization and repository development. These issues are covered in sections of the EA that discuss environmental setting, the proposed actions, expected effects of site characterization on the environment, expected effects of a repository on the physical environment, evaluation of the environmental quality siting guideline, and DOE responses to comments on these subjects made in the course of reviews of the draft EA. Accordingly, the following sections of the three-volume final EA are addressed herein:

- Section 3.4, "Environmental setting", with the exception of "Land use" (3.4.1) which is a socioeconomic issue, "Archeological, cultural, and historical resources" (3.4.6) which was reviewed by Mifflin & Associates in a July 1987 report, and "Radiological background" (3.4.7), a subject outside the scope of this review

- Section 4.1, "Site Characterization Activities"

- Section 4.2.1, "Expected effects (of site characterization) on the environment", with the exception of subsections dealing with geology, hydrology, land use, and archaeological, cultural, and historic resources

- Section 5.1, "The Repository"

- Section 5.2, "Expected effects (of a repository) on the physical environment", with the exception of subsections on geologic and hydrologic impacts, land use, radiological effects, and archaeological, cultural, and historical resources

- Section 6.2.1.6, "Environmental quality (10 CFR 960.5-2-5)", with the exception of aspects dealing with socioeconomics, cultural resources, geohydrology, and radiology

- Appropriate aspects of section 6.2.2.2, "Preclosure system guideline: environment, socioeconomics, and transportation"

- Appropriate aspects of section 7.3.2, "Environment, socioeconomics, and transportation"

- Appendix C.3.4.2.2.1, "Environmental quality"

- Appendix C.7.2, "Environmental quality", except for subsections on land use, cultural resources, and background radiation

2.0 COMMENTS ON EA SECTION 3.4, "ENVIRONMENTAL SETTING"

This section of the EA is on pages 3-33 to 3-62, Vol. I. Excluded from the comments are subsections 3.4.1, 3.4.6, and 3.4.7, which are outside the scope of this review.

2.1 Terrestrial and Aquatic Ecosystems (EA Section 3.4.2)

Information and discussions in this section were based upon a literature review and ecological field studies initiated in 1982 at the site.

While the literature review for the site was thorough and adequate, the field studies were not. The study area did not cover all of the site and there have been a considerable number of site characterization activities conducted outside the study area. Additionally, only readily accessible areas were sampled and the ecological parameters measured were inadequate for predictive modeling and for conducting quantitative assessments of impacts based upon predictive models.

Emphasis in the EA discussion is placed upon "special-interest species" (Subsection 3.4.1.3), i.e., those listed or otherwise considered as threatened or endangered and therefore protected or potentially protected by law. An adequate job was done in this regard and nothing more could be added.

Perhaps the most significant oversight in the section involves "aquatic ecosystems" (subsection 3.4.2.4) where the statement is made that washes and drainages on the site contain a distinct array of species found only in washes. However, no information is given on the nature of those habitats, their locations, or the extent to which they occur on the site. Instead, the discussion shifts to and focuses on the Devil's Hole habitat which is reasonably well summarized from existing literature, and, according to the EA, is in a different hydrologic regime than Yucca Mountain (an issue not yet settled).

2.2 Air Quality and Weather Conditions (EA Section 3.4.3)

This section is based upon estimated air quality and meteorologic conditions because no site specific data were

available. Air quality is discussed in only one paragraph and is dismissed as being unimportant.

2.3 Noise (EA Section 3.4.4)

No noise data for the site are available and the one-half page discussion is based upon generalities taken from standard literature on the topic. No mention is made of the solitude characteristics of desert areas and the desirable benefits thereof, an issue typically addressed for desert environments.

2.4. Aesthetic Resources (EA Section 3.4.5)

This discussion consists of seven lines of qualitative site description aimed at dismissing aesthetics as a resource. There is no acknowledgment that an important aspect of desert environments is an uncompromised, pristine view of nature. As with noise, visual resources usually are addressed in assessments of desert areas.

2.5 Archaeological, Cultural, and Historic Resources (EA Section 3.4.6)

Field surveys for archeological resources were conducted at Yucca Mountain and this section is based upon a considerable base of site specific information. The section is adequate for purposes of the EA, although more work remains to be done before site characterization commences, to accommodate the State Historical Preservation Officer, i.e., the significant archaeological sites discovered must be appropriately entered in to the National Register of Historic Places.

3.0 COMMENTS ON EA SECTION 4.1, "SITE CHARACTERIZATION ACTIVITIES"

Descriptions of proposed actions for site characterization are contained in this section (pages 4-1 to 4-22, Vol. I). Two deficiencies detract from the section's usefulness.

First, there is no discussion of the impacts previously incurred from activities conducted at the site between 1978 and the time the EA was prepared. An assessment of potential impacts from proposed actions must build upon existing environmental conditions and prior impacts and thereby address cumulative impacts. This shortcoming of the EA is particularly significant with respect to drillholes of which between 30 and 40 have been drilled within the repository drift perimeter and another 100-150 outside the perimeter. Second, lack of detail regarding

proposed drilling operations. Locations, depths, and chemicals to be involved are not given in this section.

In the face of limited information on past and planned drilling, there is little that can be said about potential consequences of planned disruptive activities. It is bad enough to have only limited site specific environmental information available for Yucca Mountain. To add to the uncertainty by presenting no insights to past perturbations and offering so little in the way of descriptions for proposed operations renders pursuit of traditional impact assessment fruitless.

4.0 COMMENTS ON EA SECTION 4.2.1, "EXPECTED EFFECTS ON THE ENVIRONMENT" (pages 4-22 to 4-40, Vol. I)

4.1 Hydrology (EA Section 4.2.1.1.2)

This section is severely constrained by the lack of information on past and planned drilling operations. Potential impacts are not addressed and instead only a brief discussion of precautions that may be taken is presented. This contrasts with the known fact that thousands of barrels of drilling fluids already have been lost at the site as have radioactive materials used for well testing activities.

Although the section mentions a septic tank and drain field to be installed at the site, there is no information on the characteristics of wastes to be disposed of in that manner. Without estimates of effluent discharge rates and chemical composition of wastes no assessments can be performed. Also, without knowing whether industrial-type wastes will be put into the sewage system for disposal there is no way to anticipate the quality of effluent that might reach aquifers.

4.2 Ecosystems (EA System 4.2.1.2)

This section states that 705 acres of the site's surface will be disturbed but offers no insight to where the disturbance will occur. In the absence of that information, plus not having data on the extent of surface area already disrupted there is no way to evaluate the significance of habitat destruction associated with site characterization. Accordingly, the EA offers only general appraisals of the matter and presents no evidence that an analysis ever was performed.

An interesting aspect of EA Section 4.2.1.2 is that several categories of impacts to ecosystems are discussed in the future tense as possibilities that might occur when in

fact contractor reports prepared in advance of the EA state that such impacts already have resulted from past activities at the site. The wording used in the EA is the same as that in the contractor reports except that verb tenses have been altered. Clearly the authors of the EA were aware of existing impacts but chose not to mention them. This practice is consistent with failure to discuss past activities at Yucca Mountain and to ignore prior environmental impacts in the EA.

4.3 Air Quality (EA Section 4.2.1.3)

Emissions figures are presented in this section but an assessment of their impacts is not discussed, except in general, non-quantitative terms. The subject was dismissed in short order and apparently no modeling was conducted. It is characteristic of EAs that air quality modeling for preliminary regulatory purposes be performed as was the case for the repository (EA Section 5.2.5).

4.4 Noise (EA Section 4.2.1.4)

Noise resulting from equipment and blasting is discussed and dismissed as a potential source of impact. The basis for the conclusion is that no receptors of significance occur at the site. Because no information on the presences or the absence of potential receptors is given, exception to the DOE conclusion cannot be taken without obtaining site specific information on the ambient noise characteristics of the site and the surrounding environment.

4.5 Aesthetics (EA Section 4.2.1.5)

This section concludes that aesthetics are of no concern but no data are given. Without a proper viewshed analyses of the site a conclusion such as drawn by DOE has no basis.

4.6 Archeology (EA Section 4.2.1.6)

Except for the matter of determinations for the National Register, in accord with the State resource plan, there are no issues to be pursued regarding archeological resources.

4.7 Summary of Environmental Effects (EA Table 4-6)

Table 4-6 in the EA summarizes the kinds of impacts expected from site characterization, describes what DOE plans to do about them, and concludes that in every case no significance will be realized from the potential impact. The types of potential impacts identified is a good generic

accounting of what may have occurred or might yet occur at Yucca Mountain. Likewise, the practices and mitigation measures listed are good generic actions for all large construction projects. However, the conclusions drawn regarding occurrence and significance of impacts at the site are unfounded on the basis of the analyses and information presented in the EA. Insufficient detail on the proposed activities and the lack of insight to existing environmental conditions negate any conclusions reached by DOE regarding potentially significant adverse impacts. On the basis of what is presented in the EA, it would be as credible to reach conclusions contradictory to those summarized in Table 4-6.

5.0 COMMENTS ON EA SECTION 5.1, "THE REPOSITORY"

Because repository design is in such an early stage, the general descriptions used for reference purposes in this section (pages 5-4 to 5-35, Vol. I) probably are adequate. It will be in the future before more reliable detail on the nature of the proposed action is available.

6.0 COMMENTS ON EA SECTION 5.2, "EXPECTED EFFECTS ON THE PHYSICAL ENVIRONMENT"

This section (pages 5-35 to 5-65, Vol. I) addresses potential environmental impacts from the repository. In some instances where regulatory standards may be involved the impact analyses for the repository are more detailed than for site characterization. A larger degree of uncertainty is involved with all environmental parameters due to the lack of design detail on the proposed action. This perhaps is most evident where transportation impacts are concerned and may explain why environmental impacts in that area are not addressed at all.

6.1 Hydrology (EA Section 5.2.2)

Water quality impacts again are dismissed without any consideration of waste effluents, accidental spills, seepage or other aspects of the issue. Not only does DOE not assess these issues but it prevents others from doing so by providing no information on sources of pollution, such as the composition and quantity of sewage during repository development.

6.2 Ecosystems (EA Section 5.2.4)

Information presented and discussed in this section is no different than in the corresponding section for site characterization and suffers from the same deficiencies.

6.3 Air Quality (EA Section 5.2.5)

Emissions inventories are presented and the results of preliminary air quality modeling are discussed. However, DOE states that uncertainties exist due to modeling assumptions and estimates of emissions and that, as a consequence, all relevant issues were not addressed. The focus of what is presented relates to dust and analyses demonstrating that a permit will not be required. The uncertainties are so great, however, that no credence can be given to the information presented.

6.4 Noise (EA Section 5.2.6)

Noise is discussed from the occupational point principally which is outside the scope of this review. Environmental concerns would be the same as for site characterization.

6.5 Aesthetics (EA Section 5.2.7)

Aesthetics is discounted as an issue which may or may not be the case because too little is known at this point to properly address it.

6.6 Archeology (EA Section 5.2.8)

This issue is addressed to the same extent for the repository as it was for site characterization.

7.0 THE SITING GUIDELINES (EA Chapter 6, Vol. II)

7.1 Comments on EA Section 6.2.1.6, "Environmental Quality (10 CFR 960.5-2-5)" (pages 6-47 to 6-79, Vol. II)

This guideline for repository siting provides the principal consideration given to environmental protection, impacts, and mitigation. The weaknesses characteristic of the section are due to a lack of details about both the site and the proposed action and the fact that the guideline is composed primarily to equate environmental considerations with regulatory compliance, i.e., it is assumed that if compliance is achieved there will be no adverse impacts.

This is not a commonly accepted approach to environmental assessment and does not result in any standard expression or measure typically associated with traditional impact analysis. The approach detracts from the need for quantitative evaluation of comprehensive site specific data and thus constitutes a subterfuge.

While the adequacy of the environmental quality guideline for making siting decisions is not at issue here, it can be concluded that use of the guideline to assess impacts definitely is not a satisfactory technique because of the approach taken in EA Sections 6.2.1.6.3 and 6.2.1.6.4 to equate environmental protection with compliance issues. A weak attempt is made in little over one page to use impact mitigation as an analog of environmental protection but there is no basis for this approach here or elsewhere in the EA.

The rehash of inadequate information from EA Chapters 3, 4, and 5 is as unconvincing in Chapter 6 as it was earlier. Insufficient environmental data and insights to proposed actions are available for the compliance approach to work except in the most obvious cases where statutory provisions clearly do not apply.

7.2 Comments on EA Section 6.2.2.2, "Preclosure system guideline: environment, socioeconomics, and transportation (10 CFR 960.5-1(a)(2)" (pages 6-116 to 6-120, Vol. II)

This guideline attempts to use the failure of analyses in EA Chapters 4 and 5 to identify adverse impacts as a means of making an ultimate judgement that impacts either will not occur or can be adequately mitigated. The analysis of the guideline fails for all the reasons other portions of the EA are inadequate, i.e., too little is known of the proposed actions and the site's environment and this in turn negates the efficacy of attempts to carry out responsible and reliable environmental assessment.

8.0 COMPARATIVE EVALUATION (EA Chapter 7, Vol. II)

Chapter 7 reflects DOE's attempt at comparative evaluation of alternative sites based upon incomplete information and the subjective analyses reported in Chapters 4, 5, and 6 of the EA.

8.1 Comments on EA Section 7.3.2.1.1, "Environmental Quality" (pages 7-72 to 7-79, Vol. II)

This section of the EA uses 10 CFR 960.5-1(a)(2) and the lack of significant impacts at Yucca Mountain to compare the various sites. It points to the predicted ability to comply with regulations as evidence for the absence of adverse conditions despite the fact that engineering design plans were not complete, environmental baseline data were not available, and discussions with regulatory agencies were not held to determine what the requirements might be for meeting environmental standards. The logic adopted by DOE for such

an evaluation is faulty and the reasoning used is circular except where specific conditions such as protected resources clearly are absent from the site. There is no credible, objective basis presented in the EA for concluding that regulatory standards for clean air, clean water, and management of hazardous wastes will be complied with during site characterization and repository development.

There also is no convincing argument given for using abstract mitigation measures applied to unquantified impacts as a valid means for comparing sites. All the discussion of such considerations is subjective conjecture with no basis in fact supported by quantitative analysis and assessment. An adversary of the DOE position could just as readily reach and defend the opposed conclusion and defend it in a manner comparable to the approach taken in the DOE comparative evaluation.

8.2 Comments on EA Section 7.3.2.2, "Systems guideline on environment, socioeconomics, and transportation" (pages 7-100 to 7-106, Vol. II)

The discussion in this section of the EA constitutes a repetitive summary of the impacts or lack thereof presented and evaluated in Chapters 4, 5, 6 and earlier portions of 7. Again, there is no basis in fact for dismissing the potential at Yucca Mountain for significant adverse impacts to occur, particularly in light of the absence of information on past activities and their consequences and the inability of DOE to identify locations for proposed activities and to furnish other essential information on proposed actions. These deficiencies in the EA coupled with the lack of baseline environmental information reduce DOE's impact analysis and all related evaluations to subjective conjecture with no supporting foundation.

9.0 THE EA COMMENT - RESPONSE DOCUMENT (Volume III)

Volume III of the EA presents DOE responses to comments on the draft EA as follows:

9.1 EA Section C.3.4.2.2.1, ""Environmental quality" (pages CC. 3-5 to C. 3-61, Vol. III)

This section of the EA addresses comments relative to the environmental quality siting guideline. All the comments are dismissed with the circular reasoning that the evaluation of the guideline in Chapter 6 showed that no adverse condition existed and that therefore no question raised can have any validity. It is the DOE position that all questions about the environment are

moot because the guideline evaluation showed that no potential exists for incurring adverse impacts and for not complying with environmental regulations.

9.2 EA Section C.4.1.3, "Environmental conditions" (pages C. 4-16 to C. 4-24, Vol. III)

Discussed here are baseline conditions at the alternative sites and the adequacy of the information available to DOE for the EA. The position taken by DOE is that regional, generic information was adequate for the EA, that obtaining site specific, comprehensive field data was outside the scope of the EA, and that questions relative to real data will be addressed in the EIS for the repository. One comment response acknowledged that the environment at Yucca Mountain is highly variable and could not be reasonably represented by the information available for the EA.

9.3 EA Section C.7.1, "Expected Effects of Site Characterization (pages C. 7-1 to C. 7-5, Vol. III)

Under "effects on the physical environment" DOE acknowledges that before site characterization begins it must conduct analyses of emissions and air quality for Yucca Mountain to assure that significant deterioration of air quality will be prevented. DOE also acknowledges that archeological sites have yet to be evaluated with respect to eligibility for the National Register and this issue must be resolved with the State.

9.4 EA Section C.7.2, "Environmental Quality" (pages C. 7-10 to C. 7-22)

This section of the EA represents responses to seemingly random comments regarding protection of natural resources and environmental quality. DOE dismisses "potential contamination of water resources" simply by stating that the mined waste pond will be lined and that sewage systems will comply with regulations or be designed to avoid ground-water infiltration. No technical, quantitative, verifiable information to support the supposition is presented.

In response to comments regarding ecological impacts, DOE repeats its intent to mitigate impacts and to undertake habitat reclamation and restoration measures. At the same time, the potential for significant impact is diminished by DOE's stating that the area to be disturbed is small compared to the overall extent of desert environment surrounding the site. There still is no evidence that DOE comprehends the

nature of the ecosystems to be destroyed and the kinds of consequences to anticipate. This is acknowledged by the admission that studies must be carried out to determine suitable reclamation and mitigation measures for disturbed sites.

Regarding air quality, DOE acknowledges its lack of adequate information for dispersion modeling and states that reliable modeling and analyses must be performed when more is known about project design and emissions inventories. The discussion clearly is such that all information on air quality in the EA is discredited. The same results from the discussion of aesthetic conditions and noise. Additionally, an admission is made that potential environmental impacts from transportation routes have not been addressed in the EA.

10.0 CONCLUSIONS FROM REVIEWING THE EA

The final EA is not up to the commonly accepted standards of environmental assessment and is inadequate in terms of addressing environmental protection. Too little is known about the proposed action, existing environmental conditions, and impacts caused by past activities for DOE to credibly assess the potential for site characterization and repository development to result in adverse impacts.

On the basis of the information in the EA, DOE has no support for its contention that various environmental regulations either will not apply or can be met. Likewise, there is no basis for statements that adverse impacts can be adequately mitigated and that successful reclamation and habitat restoration can be accomplished. A careful review of the EA would document contradictory statements and positions taken by DOE in these regards and could be used to discredit many of the conclusions and findings used by DOE for making siting decisions.