

**WBS: 1.2.5.2.4**

**QA: NA**

**Civilian Radioactive Waste Management System  
Management & Operating Contractor**

**License Application Annotated Outline Revision 3  
Feedback to Site Characterization Program**

**Revision 0**

**January 31, 1994**

Prepared for:

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## 1. INTRODUCTION

This report is the first in a series intended to summarize the insights and knowledge gained during each revision cycle of the License Application Annotated Outline (LA AO). The original intent of the report was to focus exclusively on information needs to ensure that the requested data would be obtained from site characterization activities in the time frame necessary to support submittal of a license application, if the site is found suitable. This intent is still valid. However, practical experience with the LA AO process has shown that this report is also a useful forum for identifying areas where the LA AO process can be improved. Therefore, the scope of the report has been expanded to cover not only information needs, but to also present and/or recommend actions necessary to improve the LA AO process.

A draft of this report was prepared for the U.S. Department of Energy (DOE)<sup>1</sup> along with a request to reissue it two months after the LA AO was transmitted to NRC. The Management and Operating Contractor (M&O) made this request because of the preliminary nature of the data contained in the draft. The DOE subsequently granted the request<sup>2</sup> thereby providing the time necessary to suggest solutions to the problems identified in the first draft.

Revision 3 of the LA AO represents the first major step in transforming the document from a planning tool to a practical tool for integrating and focusing the various Project elements on the ultimate goal of obtaining authorization to construct a repository. The knowledge and experience gained during this effort represents a major step in the evolution and refinement of the LA AO process.

## **2. LA AO INFORMATION NEEDS**

The LA AO is written in present tense to facilitate its conversion into a license application for submittal to the NRC, pending a site suitability determination. Information that is not available but is needed to complete a section is identified as an information need which is recorded on information request forms. The ultimate goal of each LA AO revision is to present the current "state of knowledge" for each section developed. This state of knowledge is embodied as text with supporting references and information needs.

LA AO information needs represent "voids" in the state of knowledge that must be filled prior to submitting a license application. Lead authors attempt to write complete sections of a potential license application with existing information. Information requests are developed to fill voids in the information needed to complete the section. The LA AO review process represents the opportunity for peer and cross-disciplinary reviews to ensure that a consensus on the present state of knowledge (including information needs) is reached. In theory, once all information needs are satisfied, the Project has enough information from site characterization to submit a license application if the site is suitable.

Information needs provide valuable feedback to the individuals responsible for planning and scheduling site characterization activities. This feedback will allow the planners to match the information needed in a license application with planned activities to ensure that the resulting products are consistent with the evolving needs of the Project. As an added benefit, the absence of information needs in a particular area suggests that sufficient information/data is already available and no additional study is considered necessary. These observations will be collected and included as an element of this report.

Many information needs were identified in Revision 3. The next step is to develop a process that will ensure LA AO feedback is incorporated into the annual and long range planning process. This topic will be discussed in Section 3 of this report.

### **2.1 OVERVIEW OF REVISION 3 INFORMATION NEEDS**

LA AO Revision 3 focussed on the development of Section 3.1, "Description of Individual Systems and Characteristics of the Site". This section, by definition, describes the geology of the site and the region surrounding the site. Because this text is generally descriptive in nature, it does not consider design and performance issues that will require substantial data from site characterization to demonstrate regulatory compliance. Nevertheless, the information needs identified during LA AO Revision 3 will assist in better defining the information need disposition process by providing real-time data to consider.

Information needs are generated at different levels of detail or granularity. For example, one information need might indicate a need for the nominal value of Young's Modulus for each thermo-mechanical unit. Another might request an evaluation of historical earthquakes. The latter information need is clearly less detailed than the former. These varying degrees of granularity complicate the task of matching information needs with deliverables, which is the ultimate linkage for all information needs. This task is further complicated by the fact that deliverables are not always clearly defined (the completion of an integrated long-range plan should help define these deliverables). These are difficulties which must be overcome to facilitate the linkage of information needs to concrete deliverables during future LA AO revisions. In the meantime, an attempt is made to match all Revision 3 information needs with the appropriate deliverables listed in the annual budget plan for site characterization<sup>3</sup>. This effort should ensure that Revision 3 information needs will prove useful in future budget and planning cycles.

A total of 120 information needs were generated during Revision 3. Each of these needs identifies one or more data sources that are believed to provide the data necessary to satisfy the information need. The predominant data source identified for these needs are study plans. Table 1 lists Revision 3 information needs as a function of study plans. The lowest common denominator currently available to relate information needs to study plan deliverables is the corresponding Work Breakdown Structure (WBS) number. Table 2 lists Revision 3 information needs as a function of the WBS number. Table 2 is a subset of Table 1 since WBS numbers cannot be related to all of the identified information needs.

Information needs that identify data sources other than study plans are listed in Table 3. These information needs generally refer to products that have been completed and are in review or are currently available for use. The majority of these information needs refer to the need for figures. Many of these figures were omitted from Revision 3 and included instead as information needs for future revisions because of time constraints and difficulties experienced in managing graphics in the LA AO document. It is expected that the majority of these information needs will be eliminated in the next revision of the corresponding section.

One final view of the information need data is shown in Table 4. This table lists "indirect" information needs - information needs that refer to other information needs. Because of the many interdependencies between the various LA AO sections, it is expected that the information needs of one section will require data that are needed in another section. Since the majority of LA AO text is still incomplete, indirect links are used as an indication that information presented in one section will be needed in another section. As sections are completed, indirect links will be eliminated by replacing the link with the actual information.

Based upon a review of all information needs and the exercise to match these needs with deliverables, the deliverables resulting from existing study plans should yield the information desired by the majority of Revision 3 information needs. This conclusion will be confirmed as the Revision 3 information needs are worked into the budget and planning cycle.

## 2.2 EROSION STUDY PLANS

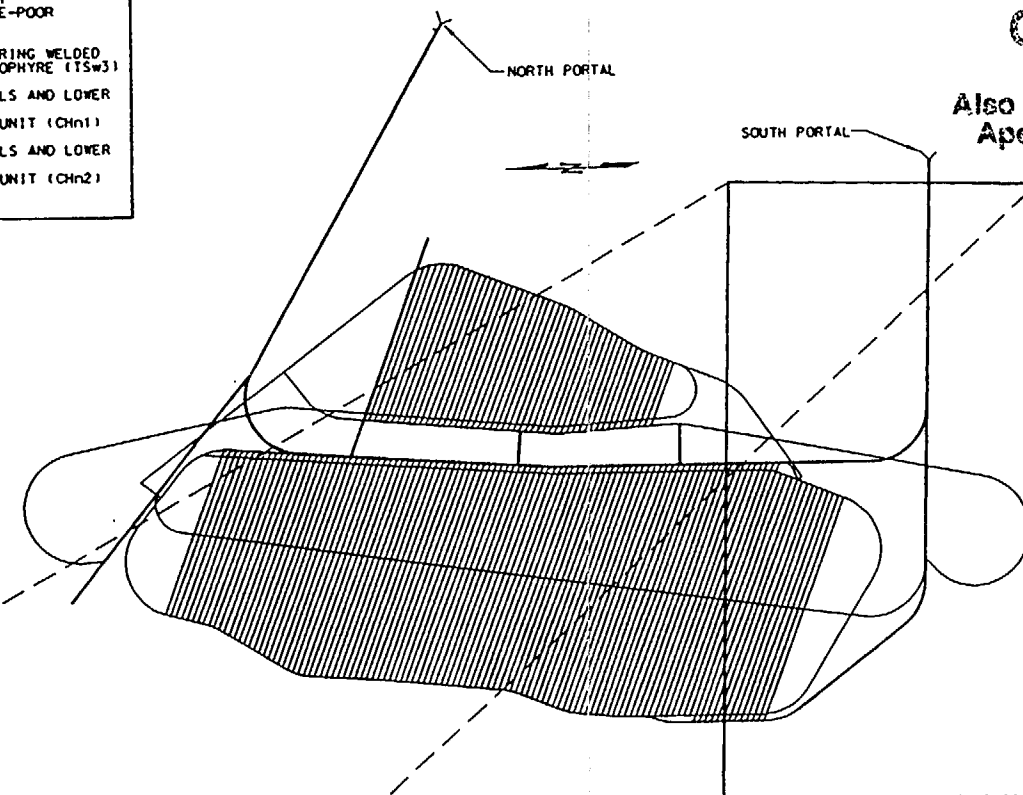
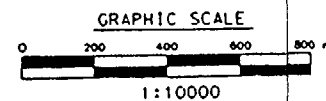
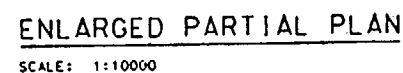
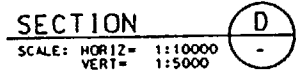
Section 3.3 of the LA AO includes discussions of potentially adverse conditions at the Yucca Mountain site including evidence of extreme erosion during the Quaternary Period. This condition was the subject of the Erosion Topical Report<sup>4</sup> that was completed and sent to the NRC in March 1993. The topical report is summarized and referenced in Section 3.3 of the LA AO as it would appear in the final license application. This report concluded that "there is no evidence of extreme erosion at Yucca Mountain during the Quaternary Period and that the potentially adverse condition of extreme erosion as identified at 10 CFR 60.122(c)(16) does not exist at Yucca Mountain".

The Erosion Topical Report is the first in a series of issue resolution documents that are intended to resolve technical and regulatory issues. This report represents an instance where subject matter experts have examined existing data and reached the conclusion that enough information is currently available to make a confident projection of erosion at the site. Consequently, the topical report concludes that enough data have been gathered on erosion at the site and no further study is necessary.

The following table lists the studies currently included in the Site Characterization Program Baseline (SCPB) to provide additional information on erosion at Yucca Mountain.

Study Plan	Title	Stated Objective in SCPB
8.3.1.6.1.1	Distribution and Characteristics of Present and Past Erosion	...identify the erosional processes that have been operating in the Yucca Mountain area during the Quaternary, to identify the specific locations of past erosion, and to quantify the rates of the different processes and assess their relative importance.
8.3.1.6.2.1	Influence of Future Climatic Conditions on Locations and Rates of Erosion	...determine the effects of future climatic conditions on the locations and rates of erosion...
8.3.1.6.3.1	Evaluation of the Effects of Future Tectonic Activity on Erosion at Yucca Mountain	...identify the potential effects of tectonic activity on erosion at Yucca Mountain during the postclosure period...
8.3.1.6.4.1	Development of a Topical Report on the Effects of Erosion	...compile site specific data from other studies...to develop a topical report on how the processes and rates of erosion in the Yucca Mountain area bear upon the ability of the site to isolate waste.

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INTEGRATED CONCEPTUAL LAYOUT  
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PLAN  
  
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INFORMATION ONLY

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TO THE BASELINE ECF CONFIGURATION
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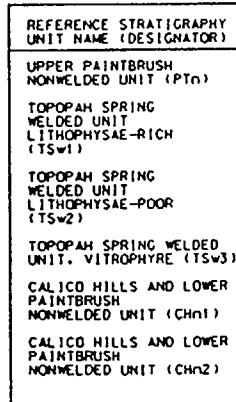
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NOTICE OF OPEN CHANGE DOCUMENTS

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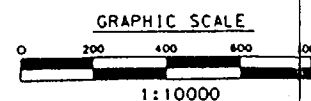
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**INFORMATION ONLY**



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U.S. DEPARTMENT OF ENERGY  
Yucca Mountain Site Characterization Project

**M&C** Civilian Radioactive Waste Management System  
MANAGEMENT & OPERATING CONTRACTOR

REPOSITORY ADVANCED CONCEPTUAL DESIGN

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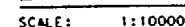
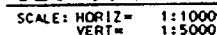
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Yucca Mountain Site Characterization Project

**M&C** Civilian Radioactive Waste Management System  
MANAGEMENT & OPERATING CONTRACTOR

REPOSITORY ADVANCED CONCEPTUAL DESIGN

SECTION "C" ALONG NORTH  
RAMP AND EXTENSION

ESF/GROA INTERFACE-4 OF 6

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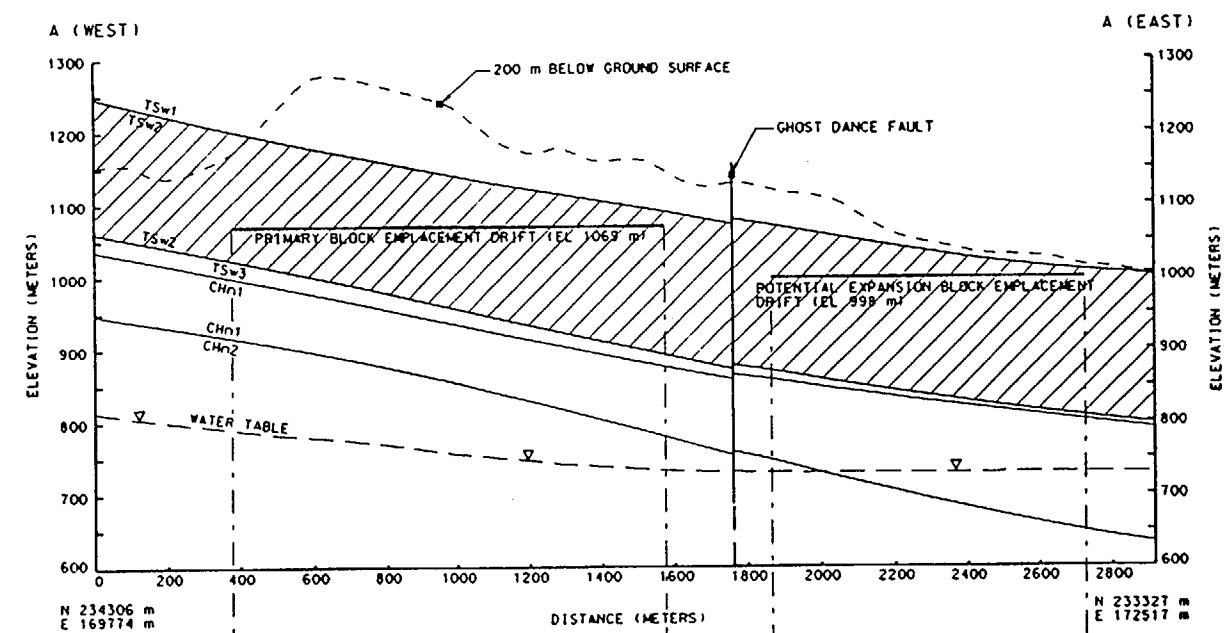
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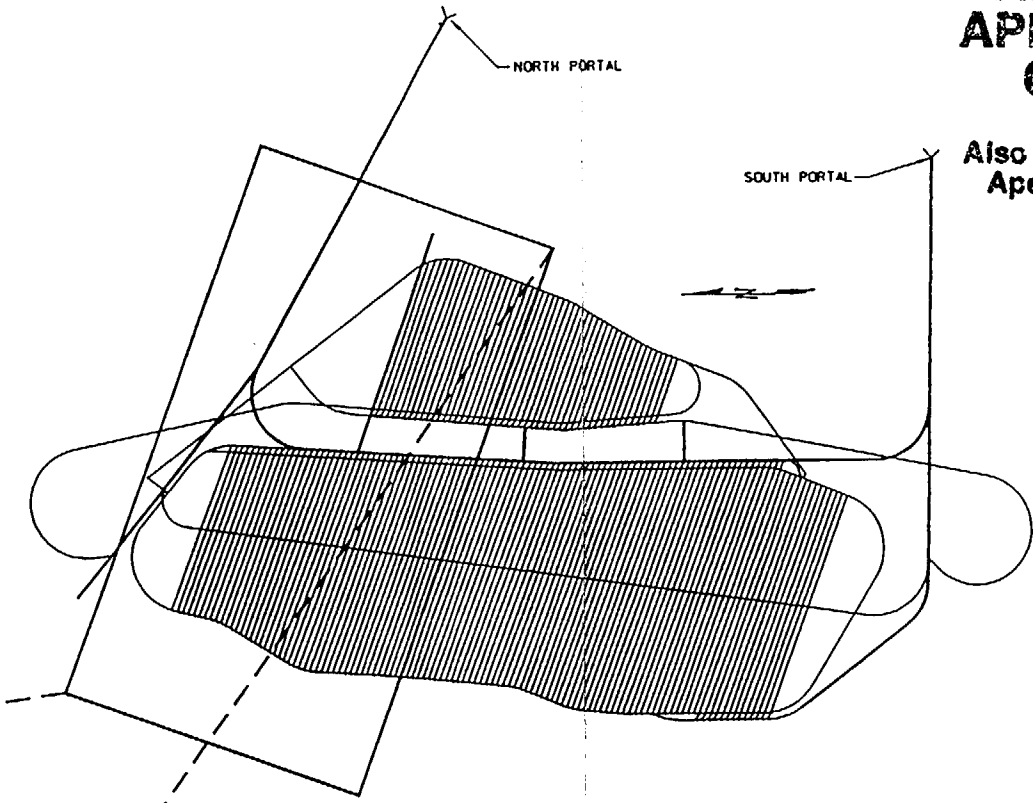
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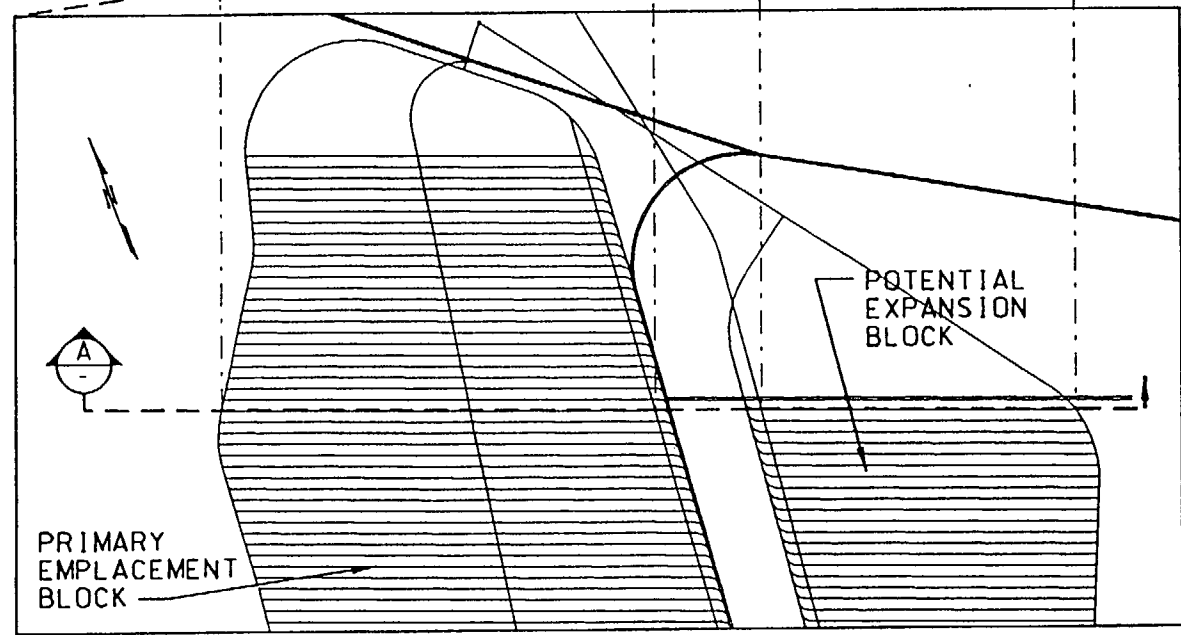
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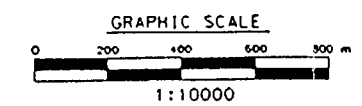
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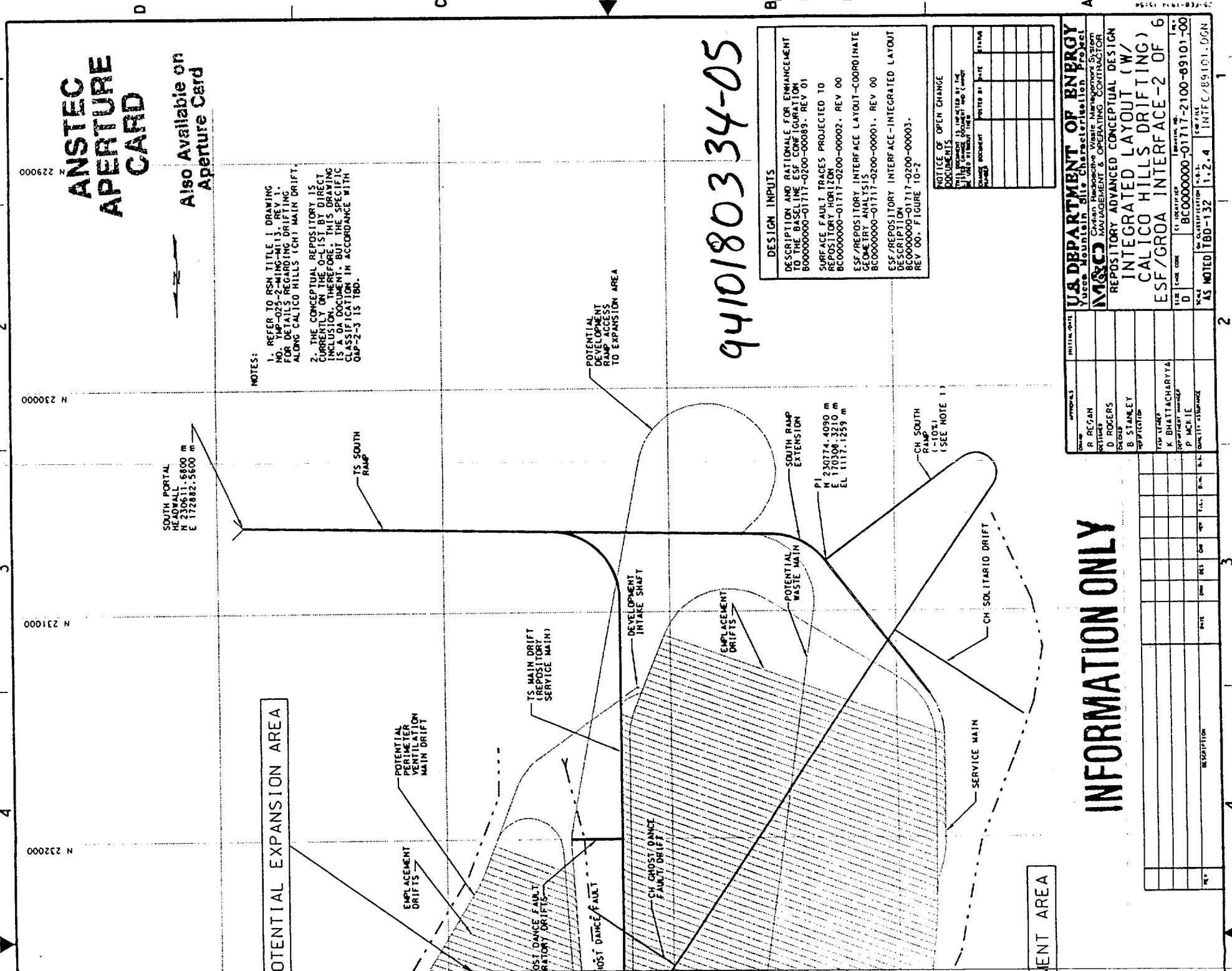
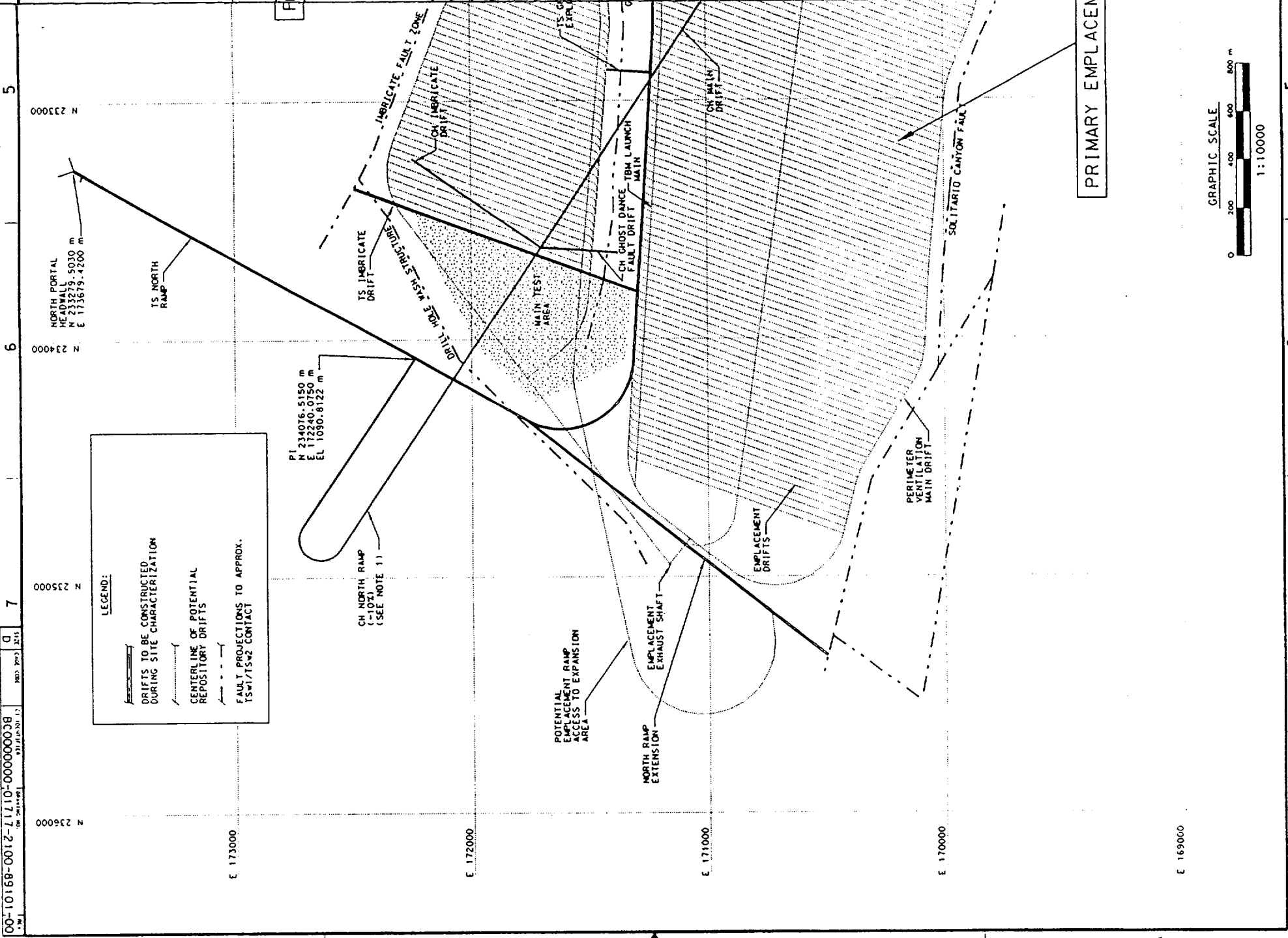
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VERIFIED P. MCKIE			BY QUALIFICATION 1.2.4	DATE 10-13-01
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DEPARTMENT MANAGER P. MCKIE			BY QUALIFICATION 1.2.4	DATE 10-13-01
QUALITY ASSURANCE			BY QUALIFICATION 1.2.4	DATE 10-13-01



CONCEPTUAL

**LEGEND:**

- DRIFTS TO BE CONSTRUCTED DURING SITE CHARACTERIZATION
- CENTERLINE OF POTENTIAL REPOSITORY DRIFTS
- FAULT PROJECTIONS TO APPROX. TS=1/TS=2 CONTACT



# ANSTEC APERTURE CARD

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- NOTES:**
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  2. THE CONCEPTUAL REPOSITORY IS CURRENTLY ON THE O-1 LIST BY DIRECT INCLUSION. THEREFORE, THIS DRAWING IS A CONCEPTUAL DESIGN AND IS NOT A FINAL DESIGN. IT IS SUBJECT TO CHANGE IN ACCORDANCE WITH GAP-2-3 IS TBD.

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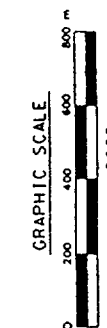
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NO.	DESCRIPTION	DATE	BY
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**U.S. DEPARTMENT OF ENERGY**  
**Yucca Mountain Site Characterization Project**  
**MS&C**  
**REPOSITORY ADVANCED CONCEPTUAL DESIGN**  
**INTEGRATED LAYOUT (W/ CALICO HILLS DRIFTING)**  
**ESF/GROA INTERFACE-2 OF 6**

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1	REVISION TO DRAWING NO. YAP-025-2-MING-1110-000000038	11/17/00	11/17/00

## INFORMATION ONLY



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CONCEPTUAL



It is recognized that these study plans are not currently funded or planned and additional erosion work may be necessary if NRC raises technical issues during their review that need supplementary erosion data. The M&O also acknowledges the DOE position that these study plans remain in the Site Characterization Program Baseline (SCPB) until a safety evaluation report (SER) is issued on the Erosion Topical Report. However, it is noted that the stated study plan objectives are already presented and discussed in the Erosion Topical Report. Therefore, these study plans are prime candidates for deletion from the SCPB.

### 3. DISPOSITION OF RECOMMENDATIONS INCLUDED IN DRAFT REPORT

This section presents the actions performed to date to address the recommendations presented in Section 4.0 of the draft feedback report. DOE specifically requested a complete description of these actions. Each recommendation is restated for completeness and the actions performed to address each recommendation are discussed.

#### Recommendations 1 and 3:

*Formalize the process for integrating recommendations resulting from the LA AO process with project management to ensure that suggested changes are reviewed and implemented in a timely manner* - The feedback to site characterization provided by the LA AO process will not be useful unless it is factored into the project scheduling and budgeting process. There is currently no process in place for incorporating this information into project management, although the feedback provided by this report is a beginning.

*Ensure that plans are in place to acquire information for those information needs that are not currently associated with a study plan* - This task will ensure that data acquisition activities are planned for all information needs identified in the LA AO revisions. This activity must become integral to the LA AO revision process.

#### Actions

These two recommendations identify the need for establishing a formal process to ensure that all information need requests and recommendations for site characterization streamlining are factored into budget and planning activities. Representatives of the M&O Regulatory and Licensing (R&L) and Strategic Planning and Technical Integration (SP&TI) Departments met to discuss the most effective way to disposition this feedback. This initial meeting did not resolve all details necessary to define the process. However, a working relationship has been established between the two departments with the agreement that work will continue on the disposition process until an optimized solution is found.

A plan discussed during the initial meeting considered attempting to incorporate information needs generated during Revision 3 into the long-range plan. It is believed that the process details can be best determined by attempting to factor actual information needs into the current planning process. Many practical questions or concerns that remain unanswered include:

- How are information needs best translated into a form that can be integrated into the tools and language of the SP&TI staff?
- Who should be responsible for making the translation? The LA AO authors, SP&TI staff, or both?
- Is it possible to specify information needs at different levels of granularity and still manage them?

- Can study plans be verified to supply the desired information when the deliverables associated with them are not clearly defined?

It was recognized that it might be prudent to synchronize LA AO revision cycles with the annual budget cycle so that feedback can be incorporated into the budget and planning process in a timely manner. It will be necessary to reexamine LA AO development schedules to see if this synchronization is possible.

These unanswered questions demonstrate that much work remains before the information need disposition process is finalized. However, efforts are well underway to begin developing the details of a workable process. Once these details have been finalized, R&L will present a description of the proposed process to DOE for concurrence. The formal process will be outlined in the forthcoming revision to the Regulatory Compliance Plan (RCP), scheduled for distribution to DOE in August 1994.

#### Recommendation 2:

*Consider deleting the study plans listed in Section 3.0 related to erosion from the SCPB document* - The SCPB currently represents the "official" plan recognized by the NRC for performing site characterization. Study plans that are listed in the SCPB, but are no longer planned, do not present a true representation of the site characterization activities and conflict with information provided to NRC during technical exchanges.

#### Actions:

This item is addressed in Section 2.2 of this report.

#### Recommendation 4:

*Issue the Feedback to Site Characterization report two months after each annual LA AO revision is distributed to NRC* - The current schedule for this report does not allow time for review of the LA AO by DOE prior to delivery. Consequently, the content of the current report does not necessarily represent a finalized product. It is further recommended that this report be revised once the LA AO has been finalized to incorporate DOE comments on LA AO Revision 3.

#### Actions

This report represents a final deliverable that reflects all comments made on Revision 3 of the LA AO during the CRG review. The deliverable date for this report is January 31, 1994 in the Planning and Control System (PACS). The delivery date for future LA AO feedback reports will be scheduled in PACS two months after the LA AO is distributed to NRC.

#### Recommendation 5:

*Provide seminars or briefings to discuss the role of the LA AO in site characterization and licensing* - Briefings that discuss the role of the LA AO in the licensing process and in site characterization should be provided to all personnel who write, comment, and review the LA AO prior to initiating work on each revision. These briefings would provide a chance for all involved in developing the LA AO to maximize the effectiveness of the document. Briefings were provided to the WBS managers and participants prior to LA AO Revision 3, however, these briefings should be expanded to include all reviewers at each site location.

#### Actions:

R&L held a kick-off meeting for all authors participating in development of Revision 4 on January 24, 1994. The R&L staff summarized the LA AO process (including the role of information needs) and announced planned changes to the process resulting from this report. Author handbooks were compiled and distributed to all present. The handbooks include a Revision 4 schedule, a newly compiled LA AO Writer's Guide, copies of the draft NRC Format and Content Regulatory Guide (FCRG), and copies of DOE comments on the FCRG.

R&L discussed the study plan coordinators' workshop concept with the workshop originator and agrees that this forum should provide a useful setting for information exchange on the LA AO process. R&L will host one of these workshops with review contacts prior to initiating a review of the Revision 4 document.

#### Recommendation 6:

*Ownership of the AO should be transferred to the DOE* - As a contractor document, the LA AO does not represent the official DOE position on any issue and it does not necessarily receive the attention that it deserves from all involved. Experience with the semi-annual Site Characterization Progress Report suggests that all organizations involved are more responsive when DOE formally requests a review.

#### Actions:

The M&O has aggressively pursued the implementation of this recommendation as directed by DOE<sup>2</sup>. The logistics involved with this transition have been discussed with the cognizant organizations and efforts are well underway to make the transition from an M&O to DOE document during the next LA AO revision (Revision 4).

The LA AO will become a DOE document once a Document Action Request (DAR) form is completed and signed by the Yucca Mountain Site Characterization Project Office (YMPO) Division Director (DD). From this point forward, the process used to produce the document is considerably different from that used in the past. A brief summary of the new process is presented below. The M&O intends to describe this process in the LA AO Management Plan.

The LA AO text is still prepared as it has been in the past. Lead authors will be assigned to various sections and support authors will assist the lead in preparing their sections. However, before the various subsections are assembled, the completed DAR form must be submitted to the Plans and Procedures Department (PPD). Once PPD receives the DAR, they assign a YMPO document number and the revision level is reset to zero. The DAR authorizes PPD to begin work on the LA AO document.

PPD will assume a large role in the preparation and management of the LA AO. They will perform the following services during the preparation of each draft:

- word processing/graphics production
- technical editing
- reproduction of document

Once PPD has completed preparation of the draft, the document is distributed for a peer and management review within the M&O and participant organizations. The current intent is for these reviews to be informal. Once the M&O and participant review is complete, a Document Review Information (DRI) form is completed to initiate a formal review of the draft. This form also requires the signature of the YMPO DD. PPD will then disseminate the review packages (PPD has strongly suggested that the DOE review be conducted under Quality Assurance Procedure (QAP) 6.2 although the LA AO is not a quality affecting document). Once the QAP 6.2 review is complete, PPD will transmit the LA AO as a controlled document and submit a records package to the Records Information System (RIS).

The implementation of this process is not complete and certain elements are subject to change and negotiation. The addition of a formal QAP 6.2 review could have a deleterious impact on the completion schedule and could complicate the task of the Concurrence Review Group (CRG). However, the M&O recommends that DOE move forward with this process with the knowledge that changes might be necessary to make the process work effectively and in a timely manner. A DAR form will be submitted to YMPO to initiate the transition when and if this recommendation is adopted.

#### Recommendation 7:

*Streamline the process for entering new data into the RIB and ensure that controls are in place to revise outdated data in a timely manner* - If the Reference Information Base (RIB) cannot be updated in a timely manner, then individuals who need the data cannot perform their job adequately. Resourceful individuals will and have developed "work arounds" to allow them to acquire the data they need when they need it. These work arounds are clearly in violation of the institutional protocol for acquiring such information. However, if this protocol encumbers or prohibits the use of a database tool like the RIB, then perhaps the protocol should be reconsidered. If the RIB is to be used as envisioned, it must be responsive to user needs maintaining only complete, current, and correct data. Corrective actions are currently being implemented to address this recommendation.



## Actions

The corrective actions to address the RIB problems are as follows:

1. The M&O's Technical Data Management group is in the process of identifying the data to be incorporated in the RIB by establishing a data hierarchy through the use of the Parameter Dictionary.
2. Once identified, these data items will be scheduled for delivery from the Principle Investigators (PIs) and incorporated in the RIB according to the needs of end users (i.e. design group, performance assessment group, licensing group).
3. The RIB procedure is currently being modified to streamline the submission process and define the format and content of the scheduled data item subdivisions.
4. Per agreement with the YMPO Quality Assurance Department (QA), a team is being established to try to qualify all current RIB data. This team will attempt to demonstrate that participant pre-QA program procedures were adequate thereby facilitating a blanket approval of activities and data over a period of time.

#### **4. REFERENCES**

1. Letter from M.A. Lugo to A.V. Gil dated September 30, 1993
2. Letter from J. R. Dyer to L. D. Foust dated December 6, 1993.
3. "FY 1994 Annual Technical Implementation Plan for WBS 1.2.3 Site Investigations Yucca Mountain Site Characterization Project", Final Draft, TRW Environmental Safety Systems, Inc., December 1993.
4. "Evaluation of the Potentially Adverse Condition 'Evidence of Extreme Erosion During the Quaternary Period' at Yucca Mountain, Nevada", March 1993, Department of Energy, YMP/92-41-TPR.

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**Table 1 - INNs versus Study Plans**

<b>Study Plan Number</b>	<b>Study Plan Description</b>	<b>Information Need Number</b>
<b>8.3.1.12.2.1</b>	<b>Meteorological Data Collection at Yucca Mountain</b>	3.1.4.1.1- 1
		3.1.4.1.1- 2
		3.1.4.1.1.2.2- 1
		3.1.4.1.1.2.2- 2
		3.1.4.1.1.2.3- 1
		3.1.4.1.1.2.3- 2
		3.1.4.1.1.2.4- 1
		3.1.4.1.1.2.4- 2
		3.1.4.1.1.2.5.1- 1
		3.1.4.1.1.2.5.1- 2
		3.1.4.1.1.2.5.1- 3
		3.1.4.1.1.2.5.1- 4
		3.1.4.1.1.2.5.2- 1
		3.1.4.1.1.2.6- 1
		3.1.4.1.1.2.7- 1
		3.1.4.1.1.2.8- 1
		3.1.4.1.1.2.8- 2
		3.1.4.1.1.2.8- 3
		3.1.4.1.1.2.8- 4
		3.1.4.1.1.2.8- 5
		3.1.4.1.1.2.8- 6
		3.1.4.1.1.2.8- 7
		3.1.4.1.1.2.9- 1
		3.1.4.1.1.2.9- 2
		3.1.4.1.1.2.9- 3
		3.1.4.1.2- 1
		3.1.4.1.3- 1
		3.1.4.1.3- 2
<b>8.3.1.14.2</b>	<b>NGR and SRG Drill Hole Data</b>	

<b>Study Plan Number</b>	<b>Study Plan Description</b>	<b>Information Need Number</b>
		3.1.1.2.7.1.1- 1
<b>8.3.1.15.1.3</b>	<b>Laboratory Determination of the Mechanical Properties of Intact Rock</b>	3.1.1.2.7.3.1- 1 3.1.1.2.7.3.1- 2 3.1.1.2.7.3.1- 3 3.1.1.2.7.3.2- 1 3.1.1.2.7.3.2- 2 3.1.1.2.7.3.2- 3 3.1.1.2.7.3.2- 4 3.1.1.2.7.3.2- 6 3.1.1.2.7.3.3- 1 3.1.1.2.7.3.4- 1 3.1.1.2.7.3.5- 1
<b>8.3.1.15.1.4</b>	<b>Laboratory Determination of the Mechanical Properties of Fractures</b>	3.1.1.2.7.4.1- 1 3.1.1.2.7.4.2- 1 3.1.1.2.7.4.3- 1 3.1.1.2.7.4.5- 1 3.1.1.2.7.4.6- 1
<b>8.3.1.16.1.1</b>	<b>Characterization of Flood Potential of the Yucca Mountain Site</b>	3.1.2.1.5- 1
<b>8.3.1.17.3.1</b>	<b>Relevant Earthquake Sources</b>	3.3.2.11- 1 3.3.2.12- 1
<b>8.3.1.17.3.3</b>	<b>Ground Motion from Regional Earthquakes and UNEs</b>	3.3.2.11- 1 3.3.2.12- 1
<b>8.3.1.17.3.4</b>	<b>Effect of Local Site Geology on Surface and Subsurface Motions</b>	3.3.2.11- 1

<b>Study Plan Number</b>	<b>Study Plan Description</b>	<b>Information Need Number</b>
		3.3.2.12- 1
8.3.1.17.3.5	Ground Motion from Controlling Seismic Events	3.3.2.11- 1 3.3.2.12- 1
8.3.1.17.3.6	Probabilistic Seismic Hazard	3.3.2.11- 1 3.3.2.12- 1
8.3.1.17.4.1	Historic and Current Seismicity	3.3.2.11- 1 3.3.2.12- 1
8.3.1.17.4.12	Tectonic Models and Synthesis	3.3.2.11- 1 3.3.2.15- 1 3.3.2.3- 1
8.3.1.17.4.2	Location and Recency of Faulting Near Prospective Surface Facilities	3.1.1.2.2.5- 1
8.3.1.17.4.6	Quaternary Faulting Within the Site Area	3.3.2.11- 1 3.3.2.3- 1
8.3.1.17.4.7	Subsurface Geometry and Concealed Extension of Quaternary Faults	3.3.2.3- 1
8.3.1.17.4.8	Stress Field Within and Proximal to the Site	3.3.2.11- 1
8.3.1.17.4.9	Tectonic Geomorphology	3.3.2.11- 1
8.3.1.2.1.1	Characterization of Meteorology for Regional Hydrology	3.1.4.1.1- 1 3.1.4.1.1- 2 3.1.4.1.1.1.2- 1 3.1.4.1.1.1.2- 2

<b>Study Plan Number</b>	<b>Study Plan Description</b>	<b>Information Need Number</b>
		3.1.4.1.1.1.2- 3
		3.1.4.1.1.1.3- 1
		3.1.4.1.1.1.3- 2
		3.1.4.1.1.1.3- 3
		3.1.4.1.1.2.1- 1
		3.1.4.1.1.2.2- 1
<b>8.3.1.2.1.2</b>	<b>Characterization of Streamflow and Runoff</b>	
		3.1.2.1.1- 1
		3.3.2.3- 1
<b>8.3.1.2.1.3</b>	<b>Regional Ground-Water Flow System</b>	
		3.1.2.1.1- 4
		3.1.2.2.2- 1
<b>8.3.1.2.2.1</b>	<b>Characterization of Unsaturated Zone Infiltration</b>	
		3.3.1.7- 1
		3.3.1.8- 1
		3.3.2.20- 1
		3.3.2.23- 1
<b>8.3.1.2.2.2</b>	<b>Water Movement Test</b>	
		3.3.1.7- 1
		3.3.1.8- 1
		3.3.2.23- 1
<b>8.3.1.2.2.3</b>	<b>Characteristic Percolation in UZ-Surface Based Study</b>	
		3.1.1.2.7.1.1- 1
		3.3.1.7- 1
		3.3.1.8- 1
		3.3.2.20- 1
		3.3.2.23- 1
<b>8.3.1.2.2.4</b>	<b>Characterization of the Unsaturated Zone- Exploratory Studies Facility</b>	
		3.3.1.7- 1
		3.3.1.8- 1

<b>Study Plan Number</b>	<b>Study Plan Description</b>	<b>Information Need Number</b>
		3.3.2.20- 1
		3.3.2.23- 1
<b>8.3.1.2.2.5</b>	<b>Diffusion</b>	3.3.1.7- 1
<b>8.3.1.2.2.6</b>	<b>Characterization of Gaseous-Phase Movement</b>	3.3.1.7- 1
<b>8.3.1.2.2.7</b>	<b>Hydrochemical Characterization of the Unsaturated Zone</b>	3.3.2.8- 1
		3.3.2.9- 1
<b>8.3.1.2.2.8</b>	<b>Fluid Flow in Unsaturated Zone</b>	3.3.1.7- 1
		3.3.2.23- 1
<b>8.3.1.2.2.9</b>	<b>Site Saturated Zone Synthesis and Modeling</b>	3.3.1.7- 1
		3.3.2.22- 1
		3.3.2.23- 1
<b>8.3.1.3.1.1</b>	<b>Ground-water Geochemistry Model</b>	3.3.1.4- 1
		3.3.2.7- 1
<b>8.3.1.3.2.1</b>	<b>Mineralogy, Petrology, and Chemistry along Transport Pathways</b>	3.1.3.2.1- 1
		3.3.2.7- 1
<b>8.3.1.3.2.2</b>	<b>Alteration History</b>	3.1.3.2.1.1- 1
		3.3.1.4- 1
		3.3.1.8- 1
		3.3.2.7- 1
<b>8.3.1.3.3.1</b>	<b>Natural Analogs of Hydrothermal Systems in Tuff</b>	3.3.1.4- 1

<b>Study Plan Number</b>	<b>Study Plan Description</b>	<b>Information Need Number</b>
<b>8.3.1.3.3.2</b>	<b>Kinetics and Thermodynamic of Mineral Evolution</b>	3.3.1.4- 1
<b>8.3.1.3.3.3</b>	<b>Conceptual Model of Mineral Evolution</b>	3.3.1.4- 1
<b>8.3.1.3.4.1</b>	<b>Batch Sorption</b>	3.3.1.3- 1 3.3.2.7- 1
<b>8.3.1.3.4.2</b>	<b>Biological Sorption and Transport</b>	3.3.1.3- 1 3.3.2.7- 1
<b>8.3.1.3.4.3</b>	<b>Development of Sorption Models</b>	3.3.1.3- 1 3.3.2.7- 1
<b>8.3.1.3.5.1</b>	<b>Dissolved Species Concentration Limits</b>	3.3.1.3- 1 3.3.2.7- 1
<b>8.3.1.3.5.2</b>	<b>Colloid Behavior</b>	3.3.1.3- 1 3.3.2.7- 1
<b>8.3.1.3.6.1</b>	<b>Diffusion</b>	3.3.1.3- 1 3.3.2.7- 1
<b>8.3.1.3.6.2</b>	<b>Diffusion</b>	3.3.2.7- 1
<b>8.3.1.3.7.1</b>	<b>Retardation Sensitivity Analysis</b>	3.3.1.3- 1 3.3.2.7- 1
<b>8.3.1.4.2.1.</b>	<b>Data from Boreholes USW G-5-7</b>	3.1.1.2.2.2- 1 3.1.1.2.2.3- 2
<b>8.3.1.4.2.2</b>	<b>Activity of Geologic Mapping of the ESF</b>	



<b>Study Plan Number</b>	<b>Study Plan Description</b>	<b>Information Need Number</b>
		3.1.1.2.7.3.2- 5
		3.3.2.20- 1
		3.3.2.21- 1
<b>8.3.1.4.3.1</b>	<b>Systematic Drilling Program</b>	
		3.1.1.2.7.1.1- 1
<b>8.3.1.5.1.1</b>	<b>Characterization of Modern Regional Climate</b>	
		3.3.1.8- 1
<b>8.3.1.5.1.2</b>	<b>Paleoclimate Study: Lake, Playa, Marsh Deposits</b>	
		3.1.1.2.2.5- 1
<b>8.3.1.5.1.6</b>	<b>Characterization of Future Regional Climate and Environments</b>	
		3.3.2.6- 1
<b>8.3.1.5.2.1</b>	<b>Characterization of the Quaternary Regional Hydrology</b>	
		3.1.2.1.4- 1
<b>8.3.1.5.2.2</b>	<b>Characterization of Future Regional Hydrology Due to Climate Change</b>	
		3.3.2.3- 1
		3.3.2.5- 1
		3.3.2.6- 1
<b>8.3.1.8.1.1</b>	<b>Probability of Magmatic Eruption Penetrating the Repository</b>	
		3.3.2.15- 1
		3.3.2.3- 1
<b>8.3.1.8.1.2</b>	<b>Physical Processes of Magmatism and Effects</b>	
		3.3.2.15- 1
		3.3.2.3- 1
<b>8.3.1.8.3.1</b>	<b>Analysis of the Effects of Tectonic Processes and Events on Average Percolation Flux Rates Over the Repository</b>	
		3.3.2.4- 1
<b>8.3.1.8.3.2</b>	<b>Analysis of the Effects of Tectonic Processes and Events on Changes in the Water Table Elevation</b>	
		3.3.2.4- 1

<b>Study Plan Number</b>	<b>Study Plan Description</b>	<b>Information Need Number</b>
8.3.1.8.3.3	<b>Analysis of the Effects of Tectonic Processes and Events on Local Fracture Permeability</b>	3.3.2.4- 1
8.3.1.8.5.1	<b>Characterization of Volcanic Feature</b>	3.3.2.15- 1
8.3.1.8.5.2	<b>Characterization of Igneous Intrusive Features</b>	3.3.2.15- 1
8.3.1.9.2.1	<b>Natural Resource Assessment at the Yucca Mountain Site</b>	3.3.2.17- 1
8.3.1.9.2.2	<b>Water Resource Assessment at the Yucca Mountain Site</b>	3.3.2.17- 1
8.3.1.9.3.1	<b>Data Needed to Support the Assessment of the Likelihood of Future Inadvertent Human Intrusion for Exploration/Extraction of Natural Resources</b>	3.3.2.17- 1
8.3.1.9.3.2	<b>Evaluation of Potential Effects of the Exploitation of Natural Resources on the Hydrologic Characteristics of Yucca Mountain</b>	3.3.2.17- 1 3.3.2.5- 1
8.3.4.2.4.5	<b>Effects of Man-Made Materials on Ground-Water Chemistry</b>	3.3.2.8- 1

**Table 2 - Information Needs by WBS**

WBS Number			Data Source	Data Source Description
1.2.2.3.2.1			Study Plan 8.3.1.16.1.1	Characterization of Flood Potential of the Yucca Mountain Site
	INN	3.1.2.1.5 - 1		
1.2.3.1			Borehole Catalog	
	INN	3.3.2.19 - 1		
1.2.3.2			Investigation 8.3.1.17	Tectonics
	INN	3.3.1.1 - 1		
1.2.3.2.1.1.1			Study Plan 8.3.1.3.2.1	Mineralogy, Petrology, and Chemistry along Transport Pathways
	INN	3.1.3.2.1 - 1		
	INN	3.3.2.7 - 1		
1.2.3.2.1.1.2			Study Plan 8.3.1.3.2.2	Alteration History
	INN	3.1.3.2.1.1 - 1		
	INN	3.3.1.4 - 1		
	INN	3.3.1.8 - 1		
	INN	3.3.2.7 - 1		
1.2.3.2.1.2.1			Study Plan 8.3.1.3.3.1	Natural Analogs of Hydrothermal Systems in Tuff
	INN	3.3.1.4 - 1		
1.2.3.2.1.2.2			Study Plan 8.3.1.3.3.2	Kinetics and Thermodynamic of Mineral Evolution
	INN	3.3.1.4 - 1		
1.2.3.2.1.2.3			Study Plan 8.3.1.3.3.3	Conceptual Model of Mineral Evolution
	INN	3.3.1.4 - 1		
1.2.3.2.2.1.1			Study Plan 8.3.1.4.2.1.	Data from Boreholes USW G-5-7
	INN	3.1.1.2.2.2 - 1		
	INN	3.1.1.2.2.3 - 2		
1.2.3.2.2.1.2			Study Plan 8.3.1.4.2.2	Activity of Geologic Mapping of the ESF
	INN	3.1.1.2.4.2.1 - 1		
	INN	3.1.1.2.7.3.2 - 5		
	INN	3.3.2.20 - 1		

WBS Number	Data Source		Data Source Description	
1.2.3.2.2.1.3	INN	3.3.2.21 - 1	ESF	Results from Surface and ESF Based Testing Programs (all Drilling, Field Mapping, and Geophysical Studies.)
1.2.3.2.2.2.1	INN	3.1.1.2.2.3 - 1	Study Plan 8.3.1.4.3.1	Systematic Drilling Program
1.2.3.2.5.1.1	INN	3.1.1.2.7.1.1 - 1	Study Plan 8.3.1.8.1.1	Probability of Magmatic Eruption Penetrating the Repository
1.2.3.2.5.1.2	INN	3.3.2.15 - 1	Study Plan 8.3.1.8.1.2	Physical Processes of Magmatism and Effects
	INN	3.3.2.3 - 1		
1.2.3.2.5.3.1	INN	3.3.2.15 - 1	Study Plan 8.3.1.8.3.1	Analysis of the Effects of Tectonic Processes and Events on Average Percolation Flux Rates Over the Repository
	INN	3.3.2.3 - 1		
1.2.3.2.5.3.2	INN	3.3.2.4 - 1	Study Plan 8.3.1.8.3.2	Analysis of the Effects of Tectonic Processes and Events on Changes in the Water Table Elevation
1.2.3.2.5.3.3	INN	3.3.2.4 - 1	Study Plan 8.3.1.8.3.3	Analysis of the Effects of Tectonic Processes and Events on Local Fracture Permeability
1.2.3.2.5.5.1	INN	3.3.2.4 - 1	Study Plan 8.3.1.8.5.1	Characterization of Volcanic Feature
1.2.3.2.5.5.2	INN	3.3.2.15 - 1	Study Plan 8.3.1.8.5.2	Characterization of Igneous Intrusive Features
1.2.3.2.6.2.1	INN	3.3.2.15 - 1	Study Plan 8.3.1.2.2.3	Characteristic Percolation in UZ-Surface Based Study
1.2.3.2.7	INN	3.1.1.2.7.1.1 - 1	Investigation 8.3.1.15	Thermal and Mechanical Properties

WBS Number			Data Source	Data Source Description
	INN	3.3.2.20 - 1		
	INN	3.3.2.21 - 1		
1.2.3.2.7.1.3			Study Plan 8.3.1.15.1.3	Laboratory Determination of the Mechanical Properties of Intact Rock
	INN	3.1.1.2.7.3.1 - 1		
	INN	3.1.1.2.7.3.1 - 2		
	INN	3.1.1.2.7.3.1 - 3		
	INN	3.1.1.2.7.3.2 - 1		
	INN	3.1.1.2.7.3.2 - 2		
	INN	3.1.1.2.7.3.2 - 3		
	INN	3.1.1.2.7.3.2 - 4		
	INN	3.1.1.2.7.3.2 - 6		
	INN	3.1.1.2.7.3.3 - 1		
	INN	3.1.1.2.7.3.4 - 1		
	INN	3.1.1.2.7.3.5 - 1		
1.2.3.2.7.1.4			Study Plan 8.3.1.15.1.4	Laboratory Determination of the Mechanical Properties of Fractures
	INN	3.1.1.2.7.4.1 - 1		
	INN	3.1.1.2.7.4.2 - 1		
	INN	3.1.1.2.7.4.3 - 1		
	INN	3.1.1.2.7.4.5 - 1		
	INN	3.1.1.2.7.4.6 - 1		
1.2.3.2.8.3.1			Technical Report 3GSS114M	Piety et al. (1993)
	INN	3.1.1.2.4.4 - 1		
	INN	3.3.2.11 - 1		
	INN	3.3.2.12 - 1		
1.2.3.2.8.3.3			Study Plan 8.3.1.17.3.3	Ground Motion from Regional Earthquakes and UNEs
	INN	3.3.2.11 - 1		
	INN	3.3.2.12 - 1		
1.2.3.2.8.3.4			Study Plan 8.3.1.17.3.4	Effect of Local Site Geology on Surface and Subsurface Motions
	INN	3.3.2.11 - 1		
	INN	3.3.2.12 - 1		

WBS Number			Data Source		Data Source Description
1.2.3.2.8.3.5			Study Plan	8.3.1.17.3.5	Ground Motion from Controlling Seismic Events
	INN	3.3.2.11 - 1			
	INN	3.3.2.12 - 1			
1.2.3.2.8.3.6			Study Plan	8.3.1.17.3.6	Probabilistic Seismic Hazard
	INN	3.3.2.11 - 1			
	INN	3.3.2.12 - 1			
1.2.3.2.8.4.1			Catalog		Southern Great Basin Seismic Network Catalog
	INN	3.1.1.1.4.2.1 - 1			
	INN	3.3.2.11 - 1			
	INN	3.3.2.12 - 1			
1.2.3.2.8.4.12			Study Plan	8.3.1.17.4.12	Tectonic Models and Synthesis
	INN	3.3.2.11 - 1			
	INN	3.3.2.15 - 1			
	INN	3.3.2.3 - 1			
1.2.3.2.8.4.2			Study Plan	8.3.1.17.4.2	Location and Recency of Faulting Near Prospective Surface Facilities
	INN	3.1.1.2.2.5 - 1			
	INN	3.1.1.2.4.1 - 1			
1.2.3.2.8.4.3			Technical Report		USGS Open-File Report on Quaternary Faulting Catalog
	INN	3.1.1.2.4.1 - 1			
1.2.3.2.8.4.4			Technical Report		USGS Open-File Report on Quaternary Faulting Catalog
	INN	3.1.1.2.4.1 - 1			
1.2.3.2.8.4.6			Catalog		UNR Northern Nevada and Southern Great Basin Networks
	INN	3.1.1.2.4.1 - 1			
	INN	3.3.2.11 - 1			
	INN	3.3.2.3 - 1			
1.2.3.2.8.4.7			Study Plan	8.3.1.17.4.7	Subsurface Geometry and Concealed Extension of Quaternary Faults
	INN	3.3.2.3 - 1			
1.2.3.2.8.4.8			Study Plan	8.3.1.17.4.8	Stress Field Within and Proximal to the Site

WBS Number			Data Source	Data Source Description	
1.2.3.2.8.4.9	INN	3.3.2.11 - 1	Study Plan	8.3.1.17.4.9	Tectonic Geomorphology
1.2.3.3	INN	3.3.2.11 - 1	Investigation	8.3.1.2	Geohydrology
1.2.3.3.1.1.1	INN	3.3.1.1 - 1	Study Plan	8.3.1.2.1.1	Characterization of Meteorology for Regional Hydrology
	INN	3.1.4.1.1 - 1			
	INN	3.1.4.1.1 - 2			
	INN	3.1.4.1.1.1.2 - 1			
	INN	3.1.4.1.1.1.2 - 2			
	INN	3.1.4.1.1.1.2 - 3			
	INN	3.1.4.1.1.1.3 - 1			
	INN	3.1.4.1.1.1.3 - 2			
	INN	3.1.4.1.1.1.3 - 3			
	INN	3.1.4.1.1.2.1 - 1			
	INN	3.1.4.1.1.2.2 - 1			
1.2.3.3.1.1.2			Study Plan	8.3.1.2.1.2	Characterization of Streamflow and Runoff
	INN	3.1.2.1.1 - 1			
	INN	3.3.2.3 - 1			
1.2.3.3.1.1.3			Activity	8.3.1.2.1.3.4	Evapotranspiration Studies
	INN	3.1.2.1.1 - 2			
	INN	3.1.2.1.1 - 4			
	INN	3.1.2.2.2 - 1			
	INN	3.1.2.2.3 - 1			
1.2.3.3.1.2.1			Study Plan	8.3.1.2.2.1	Characterization of Unsaturated Zone Infiltration
	INN	3.3.1.7 - 1			
	INN	3.3.1.8 - 1			
	INN	3.3.2.20 - 1			
	INN	3.3.2.23 - 1			
1.2.3.3.1.2.2			Study Plan	8.3.1.2.2.2	Water Movement Test
	INN	3.3.1.7 - 1			
	INN	3.3.1.8 - 1			

WBS Number			Data Source		Data Source Description
1.2.3.3.1.2.3	INN	3.3.2.23 - 1	Study Plan	8.3.1.14.2	NGR and SRG Drill Hole Data
	INN	3.1.1.2.7.1.1 - 1			
	INN	3.3.1.7 - 1			
	INN	3.3.1.8 - 1			
	INN	3.3.2.20 - 1			
	INN	3.3.2.23 - 1			
1.2.3.3.1.2.4			Study Plan	8.3.1.2.2.4	Characterization of the Unsaturated Zone-Exploratory Studies Facility
	INN	3.3.1.7 - 1			
	INN	3.3.1.8 - 1			
	INN	3.3.2.20 - 1			
	INN	3.3.2.23 - 1			
1.2.3.3.1.2.5			Study Plan	8.3.1.2.2.5	Diffusion
	INN	3.3.1.7 - 1			
1.2.3.3.1.2.6			Study Plan	8.3.1.2.2.6	Characterization of Gaseous-Phase Movement
1.2.3.3.1.2.7	INN	3.3.1.7 - 1	Study Plan	8.3.4.2.4.5	Effects of Man-Made Materials on Ground-Water Chemistry
	INN	3.3.2.8 - 1			
	INN	3.3.2.9 - 1			
1.2.3.3.1.2.8			Study Plan	8.3.1.2.2.8	Fluid Flow in Unsaturated Zone
	INN	3.3.1.7 - 1			
	INN	3.3.2.23 - 1			
1.2.3.3.1.2.9			Study Plan	8.3.1.2.2.9	Site Unsaturated Zone Modeling and Synthesis
	INN	3.3.2.22 - 1			
	INN	3.3.2.23 - 1			
1.2.3.3.1.3.1			USGS		
	INN	3.1.2.2.3 - 3			
1.2.3.3.1.3.3			Study Plan	8.3.1.2.2.9	Site Saturated Zone Synthesis and Modeling
1.2.3.4	INN	3.3.1.7 - 1	Investigation	8.3.1.3	Geochemistry



WBS Number			Data Source		Data Source Description
1.2.3.4.1.1	INN	3.3.1.1 - 1	Study Plan	8.3.1.3.1.1	Ground-water Geochemistry Model
	INN	3.3.1.4 - 1			
1.2.3.4.1.2.1	INN	3.3.2.7 - 1	Study Plan	8.3.1.3.4.1	Batch Sorption
	INN	3.3.1.3 - 1			
1.2.3.4.1.2.2	INN	3.3.2.7 - 1	Study Plan	8.3.1.3.4.2	Biological Sorption and Transport
	INN	3.3.1.3 - 1			
1.2.3.4.1.2.3	INN	3.3.2.7 - 1	Study Plan	8.3.1.3.4.3	Development of Sorption Models
	INN	3.3.1.3 - 1			
1.2.3.4.1.3.1	INN	3.3.2.7 - 1	Study Plan	8.3.1.3.5.1	Dissolved Species Concentration Limits
	INN	3.3.1.3 - 1			
1.2.3.4.1.3.2	INN	3.3.2.7 - 1	Study Plan	8.3.1.3.5.2	Colloid Behavior
	INN	3.3.1.3 - 1			
1.2.3.4.1.4.1	INN	3.3.2.7 - 1	Study Plan	8.3.1.3.6.1	Dynamic Transport Column Experiments
	INN	3.3.1.3 - 1			
1.2.3.4.1.4.2	INN	3.3.2.7 - 1	Study Plan	8.3.1.3.6.1	Diffusion
	INN	3.3.1.3 - 1			
1.2.3.4.1.5.1	INN	3.3.2.7 - 1	Study Plan	8.3.1.3.7.1	Retardation Sensitivity Analysis
	INN	3.3.1.3 - 1			
1.2.3.6	INN	3.3.1.1 - 1	Investigation	8.3.1.6	Geomorphology
	INN	3.3.1.1 - 1			
	INN	3.3.1.1 - 1			
	INN	3.3.1.1 - 1			

WBS Number			Data Source		Data Source Description
1.2.3.6.2.1.1			Study Plan	8.3.1.5.1.1	Characterization of Modern Regional Climate
	INN	3.3.1.8 - 1			
1.2.3.6.2.1.2			Study Plan	8.3.1.5.1.2	Paleoclimate Study: Lake, Playa, Marsh Deposits
	INN	3.1.1.2.2.5 - 1			
1.2.3.6.2.1.6			Study Plan	8.3.1.5.1.6	Characterization of Future Regional Climate and Environments
	INN	3.3.2.6 - 1			
1.2.3.6.2.2.1			Study Plan	8.3.1.5.2.1	Characterization of the Quaternary Regional Hydrology
	INN	3.1.2.1.4 - 1			
1.2.3.6.2.2.2			Study Plan	8.3.1.5.2.2	Characterization of Future Regional Hydrology Due to Climate Change
	INN	3.3.2.3 - 1			
	INN	3.3.2.5 - 1			
	INN	3.3.2.6 - 1			
1.2.3.7			Study Plan	8.3.1.9.3.2	Evaluation of Potential Effects of the Exploitation of Natural Resources on the Hydrologic Characteristics of Yucca Mountain
	INN	3.3.2.17 - 1			
	INN	3.3.2.17 - 1			
	INN	3.3.2.17 - 1			
	INN	3.3.2.5 - 1			
1.2.3.7.2.1			Study Plan	8.3.1.9.2.1	Natural Resource Assessment at the Yucca Mountain Site
	INN	3.3.2.17 - 1			
1.2.5			Topical Report		Seismic Hazards Topical Report
	INN	3.1.1.1.4.1 - 1			
	INN	3.1.4.1.1 - 1			
	INN	3.1.4.1.1 - 2			
	INN	3.1.4.1.1.2.2 - 1			
	INN	3.1.4.1.1.2.2 - 2			
	INN	3.1.4.1.1.2.3 - 1			

WBS Number	Data Source	Data Source Description
INN 3.1.4.1.1.2.3 - 2		
INN 3.1.4.1.1.2.4 - 1		
INN 3.1.4.1.1.2.4 - 2		
INN .1.4.1.1.2.5.1 - 1		
INN .1.4.1.1.2.5.1 - 2		
INN .1.4.1.1.2.5.1 - 3		
INN .1.4.1.1.2.5.1 - 4		
INN .1.4.1.1.2.5.2 - 1		
INN 3.1.4.1.1.2.6 - 1		
INN 3.1.4.1.1.2.7 - 1		
INN 3.1.4.1.1.2.8 - 1		
INN 3.1.4.1.1.2.8 - 2		
INN 3.1.4.1.1.2.8 - 3		
INN 3.1.4.1.1.2.8 - 4		
INN 3.1.4.1.1.2.8 - 5		
INN 3.1.4.1.1.2.8 - 6		
INN 3.1.4.1.1.2.8 - 7		
INN 3.1.4.1.1.2.9 - 1		
INN 3.1.4.1.1.2.9 - 2		
INN 3.1.4.1.1.2.9 - 3		
INN 3.1.4.1.2 - 1		
INN 3.1.4.1.3 - 1		
INN 3.1.4.1.3 - 2		
INN 3.3.1.6 - 1		

**Table 3 - Data Sources other than Study Plans and INNs**

<b>Data Source</b>	<b>Number</b>	<b>Document Description</b>	<b>INN</b>	<b>INN Type</b>
<b>Activity</b>				
	<b>8.3.1.2.1.3.4</b>	<b>Evapotranspiration Studies</b>	3.1.2.1.1 - 2	
<b>Borehole Catalog</b>			3.3.2.19 - 1	
<b>Catalog</b>		<b>Southern Great Basin Seismic Network Catalog</b>	3.1.1.1.4.2.1 - 1	Table
			3.1.1.2.4.1 - 1	Figure
<b>EG&amp;G</b>		<b>Source Documents Have Been Provided to EG&amp;G.</b>	3.1.2.1.1 - 3	Figure
<b>EIS</b>			3.3.1.6 - 1	
<b>ESF</b>		<b>Results from Surface and ESF Based Testing Programs (all Drilling, Field Mapping, and Geophysical Studies.)</b>	3.1.1.2.2.3 - 1	
<b>Investigation</b>				
	<b>8.3.1.15</b>	<b>Thermal and Mechanical Properties</b>	3.3.2.20 - 1	
			3.3.2.21 - 1	
	<b>8.3.1.17</b>	<b>Geomorphology</b>	3.3.1.1 - 1	
	<b>8.3.1.2</b>	<b>Geohydrology</b>	3.3.1.1 - 1	

<b>Data Source</b>	<b>Number</b>	<b>Document Description</b>	<b>INN</b>	<b>INN Type</b>
	<b>8.3.1.3</b>	<b>Geochemistry</b>	3.3.1.1 - 1	
	<b>8.3.1.5</b>	<b>Geomorphology</b>	3.3.1.1 - 1	
	<b>8.3.1.6</b>	<b>Geomorphology</b>	3.3.1.1 - 1	
<b>Literature</b>				
			3.1.1.1.3.1.2 - 1	Figure
			3.1.1.1.4.1 - 2	Figure
			3.1.2.2.8 - 1	
<b>Repository LAD</b>				
			3.3.1.4 - 1	
			3.3.2.8 - 1	
<b>Technical Data Base</b>				
		<b>Sheehan et al. (1993)</b>	3.1.1.2.4.2.2 - 1	Figure
<b>Technical Report</b>				
		<b>U.S. Geological Survey Open-File Reports (L.W. Anderson and others; W.F. Simonds and J.W. Whitney)</b>	3.1.1.2.3.2 - 1	Figure
			3.1.1.2.4.1 - 1	Figure
			3.1.1.2.4.2.1 - 1	
			3.1.1.2.4.2.2 - 2	Figure
			3.1.2.1.5 - 3	
			3.1.2.2.3 - 1	Table

<b>Data Source</b>	<b>Number</b>	<b>Document Description</b>	<b>INN</b>	<b>INN Type</b>
			3.3.2.1 - 1	
	<b>3GSS114M</b>	<b>Piety et al. (1993)</b>	3.1.1.2.4.4 - 1	Table
	<b>NVO-1163-TM-22</b>	<b>Weetman et al. (1970)</b>	3.1.1.2.4.2.2 - 12	Figure
	<b>SAND82-0174</b>	<b>Vortman and Long (1982)</b>	3.1.1.2.4.3.4 - 1	Figure
	<b>SAND88-3032UC-814</b>	<b>Phillips (1991)</b>	3.1.1.2.4.2.2 - 10	Figure
			3.1.1.2.4.3.4 - 2	Figure
	<b>SAND88-3032UC84</b>	<b>Phillips (1991)</b>	3.1.1.2.4.2.2 - 8	Figure
	<b>SAND88-3033UC-814</b>	<b>Walck and Phillips (1990).</b>	3.1.1.2.4.2.2 - 7	Figure
<b>Topical Report</b>		<b>Seismic Hazards Topical Report</b>	3.1.1.1.4.1 - 1	
<b>USGS</b>			3.1.2.2.3 - 2	Table

**Table 4 - Indirect Information Need Data Sources**

Information Need	Description	Indirect Information Need
3.3.1.1 - 1	Results of the site characterization programs for tectonics, geohydrology, geochemistry, and geomorphology. In particular, data, interpretations of data, figures, and tables supporting the interpretations.	6.5-001
3.3.1.3 - 1	Results of studies of radionuclide sorption and solubility.	6.5-001
3.3.1.7 - 1	Estimates of ground-water travel time.	6.5-001
3.3.2.11 - 1	Structural deformation during the Quaternary.	6.5-002
3.3.2.11 - 1	Structural deformation during the Quaternary.	3.3.2-5
3.3.2.11 - 1	Structural deformation during the Quaternary.	3.3.2-4
3.3.2.12 - 1	Evaluation of historical earthquakes.	6.5-002
3.3.2.15 - 1	Probability and consequences of an igneous intrusion penetrating the repository history of igneous activity during the Quaternary.	6.5-002
3.3.2.19 - 1	Evidence of drilling.	6.5-002
3.3.2.24 - 1	Potential for movement of radionuclides in a gaseous state through the unsaturated zone.	6.5-002
3.3.2.4 - 1	Structural deformation that could affect the regional ground-water system.	6.5-001
3.3.2.5 - 1	Effects of tectonic processes, climate change, and human activities on hydrologic conditions.	6.5-002
3.3.2.5 - 1	Effects of tectonic processes, climate change, and human activities on hydrologic conditions.	3.3.2.4-1
3.3.2.6 - 1	Effects of future climate change on hydrologic conditions	6.5-002
3.3.2.8 - 1	Anticipated thermal load and tectonic processes and human activities that significantly change the ground-water composition.	3.3.2.7-1