



**Department of Energy**  
Office of Civilian Radioactive Waste Management  
Yucca Mountain Site Characterization Office  
P.O. Box 98608  
Las Vegas, NV 89193-8608

DEC 29 1994

L. Dale Foust  
Technical Project Officer  
for Yucca Mountain  
Site Characterization Project  
TRW Environmental Safety Systems, Inc.  
Bank of America Center, Suite P-110  
101 Convention Center Drive  
Las Vegas, NV 89109

EVALUATION OF AMENDED RESPONSE TO CORRECTIVE ACTION REQUEST  
(CAR) YM-94-073 RESULTING FROM YUCCA MOUNTAIN QUALITY ASSURANCE  
DIVISION (YMQAD) AUDIT YMP-94-01 OF THE CIVILIAN RADIOACTIVE  
WASTE MANAGEMENT SYSTEM MANAGEMENT AND OPERATING CONTRACTOR  
(SCPB: N/A)

The YMQAD staff has evaluated the amended response to CAR  
YM-94-073. The response has been determined to be satisfactory.  
Verification of completion of the corrective action will be  
performed after the effective date provided. Any extension to  
this date must be requested in writing, with appropriate  
justification, prior to the date. Please send a copy of  
extension requests to Deborah Sult, YMQAD/QATSS, 101 Convention  
Center Drive, Suite 640, Las Vegas, Nevada 89109.

If you have any questions, please contact either Robert B.  
Constable at 794-7945 or Richard E. Powe at 794-7749.

Richard E. Spence, Director  
Yucca Mountain Quality Assurance Division

YMQAD:RBC-1528

Enclosure:  
CAR YM-94-073

cc w/encl:  
T. A. Wood, HQ (RW-14) FORS  
~~J. G. Spraul~~, NRC, Washington, DC  
S. W. Zimmerman, NWPO, Carson City, NV  
R. L. Robertson, M&O/TRW, Vienna, VA  
Richard Jiu, M&O/Duke, Las Vegas, NV  
R. P. Ruth, M&O/TRW, Las Vegas, NV  
D. G. Horton, OQA (RW-3) NV  
R. M. Nelson, Jr., YMSCO, NV

cc w/o encl:  
W. L. Belke, NRC, Las Vegas, NV  
D. G. Sult, YMQAD/QATSS, Las Vegas, NV

YMP-5

9501120101 941229  
PDR WASTE  
WM-11 PDR

102.7  
LW-11  
HAD3/1

**OFFICE OF CIVILIAN  
RADIOACTIVE WASTE MANAGEMENT  
U.S. DEPARTMENT OF ENERGY  
WASHINGTON, D.C.**

8 CAR NO.: YM-94-073  
PAGE: 1 OF 2  
QA

**CORRECTIVE ACTION REQUEST**

1 Controlling Document OCRWM QARD, DOE/RW-0333P, Revision 01		2 Related Report No. YMP-94-01	
3 Responsible Organization M&O		4 Discussed With J. Pye/S. Bonabien/J. Naaf	
5 Requirement: 1) QARD, DOE/RW-0333P, Revision 0, Section 3.2.1.A states: "Design inputs shall be identified and documented, and their selection reviewed and approved by those responsible for the design."  Section 3.2.2.F states: "Applicable information derived from experience, (Continued on next page)"			
6 Adverse Condition:  Design validation was not performed on the Starter Tunnel and used as input to the design of the North Ramp Package 2C. It was also determined that presently there is not a plan to use design validation data for making real time design modifications to the ground support.  Discussion:  10CFR60.141(a), (b), and (d) requires that the design validation activity be performed as part of the performance confirmation process. It specifically states that the geotechnical in-situ conditions found should be compared with the original design bases and assumptions. Further, the design validation process should be a real time activity that will provide the justification and documentation for ground support changes as the excavation is advancing.			
9 Does a Significant Condition Adverse to Quality exist? Yes <u>X</u> No <u>    </u> If Yes, Check One: <input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input checked="" type="checkbox"/> D <input type="checkbox"/> E		10 Does a stop work condition exist? Yes <u>    </u> No <u>X</u> ; If Yes - Attach copy of SWO If Yes, Check One: <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	
3 Response Due Date: 20 Working Days From Issuance			
11 Required Actions: <input checked="" type="checkbox"/> Remedial <input checked="" type="checkbox"/> Extent of Deficiency <input checked="" type="checkbox"/> Preclude Recurrence <input checked="" type="checkbox"/> Root Cause Determination			
12 Recommended Actions: Complete the design validation for the starter tunnel. This will include classifying the starter tunnel rock mass and comparing this in-situ classification with the rock mass classification assumptions used in the Package 1A "Starter Tunnel" design. In addition, all convergence measurements and (Continued on next page)			
7 Initiator William R. Sublette <i>WR Sublette</i>		14 Issuance Approved by: QADD <i>RC Lawrence</i> Date <u>8/5/94</u>	
15 Response Accepted QAR <i>R. Powe</i> Date <u>12/21/94</u>		16 Response Accepted QADD <i>RC Lawrence</i> Date <u>    </u>	
17 Amended Response Accepted QAR <i>C.C. WARREN for R.E. POWE</i> Date <u>12-21-94</u>		18 Amended Response Accepted QADD <i>RC Lawrence</i> Date <u>12/24/94</u>	
19 Corrective Actions Verified QAR <u>    </u> Date <u>    </u>		20 Closure Approved by: QADD <u>    </u> Date <u>    </u>	

OFFICE OF CIVILIAN  
RADIOACTIVE WASTE MANAGEMENT  
U.S. DEPARTMENT OF ENERGY  
WASHINGTON, D.C.

8 CAR NO.: YM-94-073  
PAGE: 2 OF 2  
QA

**CORRECTIVE ACTION REQUEST (CONTINUATION PAGE)**

5 Requirements (continued)

as set forth in reports or other documentation, shall be made available to cognizant design personnel."

Section 3.2.3.A "Design analyses shall be planned, controlled, and documented."

- 2) 10CFR60.141(d) "Confirmation of geotechnical and design parameters. These measurements and observations shall be compared with the original design bases and assumptions. If significant differences exist between the measurements and observations and the original design bases and assumptions, the need for modifications to the design or in construction methods shall be determined and these differences and the recommended changes reported to the Commission."

13 Recommended Action(s) (continued)

rockbolt load cell data should be evaluated and documented to validate that the engineered opening (starter tunnel) is performing as intended or as defined by a quantitative performance criteria (design criteria).

**Amended Response to CAR YM-94-073**

**The M&O will propose in the FY95 Engineering Plan a design validation plan to develop technical data and information for possible use in performance confirmation. The plan will be developed upon DOE approval of the Engineering Plan.**

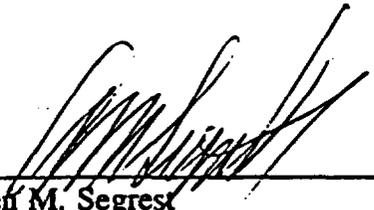
**Expected completion date for the FY95 Engineering Plan, November 18, 1994, and the design validation plan, January 2, 1995.**

**Responsible Individual - Robert S. Saunders**

10/12/94 LVESB. GH. 10/94-168

Amended Response To CAR YM-94-073

The M&O will propose in the FY95 Engineering Plan that a plan and procedures be developed for implementing a portion of Performance Confirmation activities. The plan and procedures will be developed upon DOE approval of the Engineering Plan. The A/E does not agree about the arbitrary time frame (procedure should be in place prior to Phase 3 TBM Operations) contained in the recommendation section of the CAR. An amended response will be submitted for the implementation date of the plans and procedures after consideration and approval/disapproval by the DOE.

  
\_\_\_\_\_  
Alden M. Segrest  
MGDS Development Manager

  
\_\_\_\_\_  
Date

9/16/94  
V. ESSB. GH. 9/94-776

OFFICE OF CIVILIAN  
RADIOACTIVE WASTE MANAGEMENT  
U.S. DEPARTMENT OF ENERGY  
WASHINGTON, D.C.

8. CAR NO. YM-94-073  
PAGE 1 OF 1  
QA

CORRECTIVE ACTION REQUEST (CONTINUATION PAGE)

EVALUATION OF AMENDED RESPONSE TO CAR YM-94-073

The DOE agrees that the M&O did consider information from construction of design package 1A in the development of design package 2C; however, the M&O has not developed a plan/procedure for verifying the 2C design by collection of scientific data during construction of the ESF. In other words, the portion of this CAR that states "Design Validation was not performed on the Starter Tunnel and used as input to the design of the North Ramp Package 2C." is no longer an issue; however, the second part of the Adverse Condition requires a new response.

The response is unacceptable for the following reason:

The M&O has not committed to development of a plan/procedure that addresses implementing a portion of Performance Confirmation activities during ESF construction. The scientific community has documented their activities in Study Plans and the design organization has communicated their needs to the scientific community via letters; however, the design organization has no procedure that describes how they intend to use the data collected by the scientific community. The QARD, DOE/RW-0333P, Revision 1, Section 5 requires that work be prescribed by, and performed in accordance with, written implementing documents. OQA cannot find an M&O implementing document that describes the process of evaluating data from the scientific community to determine that the Geotechnical design is valid, e.g. when the M&O obtains data from the scientific investigation what M&O implementing document describes how they document that they have evaluated that data and determined that no changes to the Geotechnical design are needed? How often is this evaluation done? Daily? Weekly?

RECOMMENDATIONS:

1. The response should commit to development of an appropriate implementing document.
2. This implementing document (plan/procedure) needs to be in place within a reasonable time after start of tunnel boring, i.e. tunnel boring operations can begin prior to development of this procedure; however, this procedure should be in place prior to Phase 3: Operation of the TBM and conduct of scientific investigations following installation of the mapping platform.
3. The M&O should consider use of the attached terms when developing the implementing document.

R Spone, QAR

9/8/94

*There is no ref. in  
This analysis to  
any of the  
design validation  
efforts in the  
Starter Tunnel.*

OFFICE OF CIVILIAN  
RADIOACTIVE WASTE MANAGEMENT  
U.S. DEPARTMENT OF ENERGY  
WASHINGTON, D.C.

<sup>B</sup> CAR NO. YM-94-073  
PAGE 1 OF 1  
QA

**CORRECTIVE ACTION REQUEST (CONTINUATION PAGE)**

**ATTACHMENT TO EVALUATION OF RESPONSE TO CAR YM-94-073**

Recommended Terms for Consideration

Design Verification - Design verification shall be performed using one or a combination of the following methods:

**Design Review** - A documented evaluation of design output during the design process to determine design adequacy and conformance to specified acceptance criteria

**Alternate Calculations** - Calculations that are made with alternate methods to verify correctness of the original calculation

**Qualification Testing** - A test that is intended to provide a desired level of confidence that an item meets specified criteria

SOURCE: DOE/RW-0333P, Revision 1 OCRWM Quality Assurance Requirements and Description (QARD)

Performance Confirmation - The program of tests, experiments and analyses which is conducted to evaluate the accuracy and adequacy of the information used to determine with reasonable assurance that the performance objectives for the period after permanent closure will be met. (SOURCE: QARD)

Design Validation - That portion of Performance Confirmation that is used to ensure that geotechnical and design parameters used for the design of the ESF/Repository are confirmed (i.e. valid) and the engineered system is performing such that it meets the intended objectives of the performance or design criteria. The process of real time comparison during construction of in-situ subsurface conditions with design basis and assumptions to evaluate the need for design changes. This process also includes the real time monitoring of the engineered systems to determine if their performance satisfies the objectives of the performance or design criteria.\* (SOURCE: Proposed definition by R. Powe and W. Sublette)

- \* Changes needed in design of the Repository to accommodate actual field conditions encountered will need to be reported to the Nuclear Regulatory Commission (SOURCE: 10CFR60 Subpart F)

Amended Response to Corrective Action Report YM-94-073

**Discussion**

10 CFR 60.141.(a), (b) and (d) and the ESFDR 3.2.1.J9 requires that the design validation activity be performed as part of the performance confirmation process. It specifically states that the geotechnical in situ conditions found should be compared with the original bases and assumptions. Further, the design validation process should be a real time activity that will provide the justification and documentation for ground support as the excavation is advancing. It did not happen in the Starter Tunnel, and the question is whether it will happen in the North Ramp.

**Investigative Action**

The adverse condition statement uses the term "validation" which is not used in 10 CFR 60.141.(a), (b) and (d) ESFDR Section 3.2.1.J9 or the QARD Glossary. It is therefore assumed that the auditor is discussing performance confirmation.

The initial statements made by the auditor concern the starter tunnel and design package 1A. To address the ESFDR requirement 3.2.1.J the following were initiated as to develop a geotechnical baseline in support of performance confirmation:

- Geological mapping - USGS/USBR
- As-builtting to record the type and location of ground support
- Deformation monitoring using extensometers
- Support load monitoring of selected rockbolts

It should be noted that additional analyses will be performed on the existing box cut and starter tunnel for the purpose of completing the headwall design at the portal. The final phase of design verification of the 1A design package will be initiated during the construction of the portal headwall, internal concrete liner and invert for the starter tunnel.

8/29/94 L.V. ESSB.GH.8/94-237

↑  
There is no discussion here of performing Rock Mass Classification on ~~the~~ the Starter Tunnel

*do not agree with this*

The tunneling conditions and the methods of excavation and ground support have limited bearing on the construction of the North Ramp which will utilize a TBM mining system. When appropriate, relevant information derived from package 1A has been considered in the Ground Support Scoping Analysis BABEA0000-01717-0200-00008 Rev 01 as indicated on page 54 of 83:

"The limited information obtained from NRG boreholes, and mapping in the Starter Tunnel and Test Alcove 1, indicates that many of the joints are discontinuous ...."

The second part of the auditor's comment concerns relate to design validation for the Design package 2C. Plans for construction monitoring and design verification\*\* have been discussed with the WBS 1.2.6 Manager and include for FY 95 the following:

- Geological Mapping (USGS/USBR)
- Production of geotechnical as-builts (USGS/USBR)
- Construction as-builts Title III A/E
- Geotechnical instrumentation SNL ( Deformation monitoring, seismic monitoring, blast vibration monitoring, Rock mass classification)
- Verification analyses A/E

Note: The term "design verification " as used in this context is not to be confused with the QARD definition of design verification.

A summary of description of these design verification, construction monitoring and mapping activities are discussed in the TS North Ramp Ground Support Analyses BABEA00000-01717-0200-00008 Section 10.12.8 page 74 of 84.



Complete details, can be obtained in the current revisions of:

- Study Plan 8.3.15.1.5 Excavation Investigations Studies
- Study Plan 8.3.15.1.8 In situ Design Verification Studies
- Study Plan 8.3.1.4.2.2 Site Characterization Mapping

*New;* to be implemented through Work Plans

*↑  
They are not doing what they said they would do in the TBM. (since it started)*

These activities will be performed for the A/E and coordinated by the TCO as indicated in the referenced correspondence. The data and information needs to complete design analyses have been identified in a series of letters:

"Meeting Notes For the Meeting Held June 16, 1994, On Sandia National Laboratories Support For Exploratory Studies Facility 1.2.6 (SCPB:N/A) LA-EES-13-LV-06-94-028. H.Kalia/L.Costin to Distribution."

"Ground Support Design Verification Data Needs LV.ESSB.JHP.6/94-674 Sandifer to Elkins."

"Request for Technical Support to provide Geological/Geotechnical data Collection, Mapping and Reporting During Construction of the Exploratory Studies, Facility (ESF) (SCP/NA) .LV.ESSB.JHP.3/94-595."

The testing organizations have in response to the A/E's request for data and information developed work plans which identify the tests and test activities to be performed during the construction of the ESF. These plans can be seen to support the acquisition of baseline geotechnical data and information for performance confirmation (Ref. 10 CFR 60 140 (d)(2))

The process of ground support selection based on geotechnical criteria which is subject to verification\*\* by SNL under the Construction Monitoring and Design Verification work plans, will provide the A/E with the basis to adjust and/or substitute the ground support categories identified in Drawings BABEAB000-01717-2100-40151 through 40161. The real time adjustment of ground support is described in Ground Support Scoping Analysis BABEA0000-01717-0200-00008 Rev 01 as indicated on page 74 of 83:

"To meet the data needs of the A/E, technical activities are to be developed to include:

- Evaluations of rock mass quality and other empirical geo-engineering parameters will be made near the face continuously during TBM operations. The evaluations will be made to support the M & O field change decisions to modify ground support at the face during construction."

*↑  
This is a  
key point.  
(the above  
paragraph)*

**Remedial Action**

See investigative action

**Root Cause**

See investigative action

**Corrective Action.**

See investigative action



MGOS DEVELOPEMENT



DATE

RESPONSE TO CAR NO. YM-94-073

**DISCUSSION:**

The Yucca Mountain Project" Review Record Memorandum for the ESF Title I Design Acceptability Analysis and Comparative Evaluation of Alternative ESF Locations" document was prepared to determine what 10 CFR 60 requirements apply to ESF construction during site characterization.

This document was prepared in consultation with the NRC. Volume 2 contains an appendix titled "Correlation of Criteria Derived for ESF Physical Elements with 10 CFR Part 60 Applicable Requirements". This appendix (pg I.3-72) indicates that criteria 60.140(b), 60.141(a), 60.141(b), and 60.141(d) do not apply to the ESF.

**Remedial Action:**

Based on our review and investigative action below, no remedial action is necessary.

**Investigative Action:**

The adverse condition statement uses the term "validation" which is not used in 10 CFR 60.141. (a), (b) and (d) ESFDR Section 3.2.1.J9 or the QARD Glossary (except for software validation). It is therefore assumed that the auditor is discussing performance confirmation.

Subpart F of 10 CFR 60 states in 60.140(b) under General Requirements, that the performance confirmation program "...shall have been started during site characterization and it will continue until permanent closure."

In 60.141(a) under Confirmation of Geotechnical and Design Parameters, it is further stated that "During repository construction and operation, a continuing program of surveillance, measurement, testing, and.....to ensure that geotechnical and design parameters are confirmed to ensure that appropriate action is taken to inform the Commission of changes....."

The example given in the Adverse Condition for this CAR is in 10 CFR 60.141(d), which falls under the section describing the "continuing performance confirmation program" that is to be conducted during construction and operation, and therefore does not apply to ESF design and testing.

The initial statements made by the auditor concern the starter tunnel and design package 1A. To address the ESFDR requirement 3.2.1.J, the following were initiated:

8/12/94 LV. ESSB. GH. 8/94-737

- Geological mapping - USGS/USBR
- As-builting to record the type and location of ground support
- Deformation monitoring using extensometers
- Support load monitoring of selected rockbolts

It should be noted that additional analyses will be performed on the existing box cut and starter tunnel for the purpose of completing the headwall design at the portal. The final phase of design verification of the 1A design package will be initiated during the construction of the portal headwall, internal concrete liner and invert for the starter tunnel.

There is no specific requirement to apply the results of design verification from Design Package 1A and apply them to Design Package 2C. Clearly the tunneling conditions and the methods of excavation and ground support have limited bearing on the construction of the North Ramp which will utilize a TBM mining system. What limited, relevant information derived from package 1A has been considered in the Ground Support Scoping Analysis BABEEA0000-0171700200-00008.

The second part of the auditor's comment concern relates to design validation for the Design package 2C. Plans for construction monitoring and design verification have been discussed with the WBS 1.2.6 Manager and include for FY 95 the following:

- Geological Mapping (USGS/USBR)
- Production of geotechnical as-builts (USGS/USBR)
- Construction as-builts Title III A/E
- Geotechnical instrumentation SNL (Deformation monitoring, seismic monitoring, blast vibration monitoring, Rock mass classification)
- Design verification analyses A/E

A summary of these design verification, construction monitoring and mapping are discussed in the TS North Ramp Ground Support Analyses BABEEA00000-01717-0200-00008 Section 10.12.8 page 74 of 84.

Complete details can be obtained in the current revisions of:

- Study Plan 8.3.15.1.5 Excavation Investigations Studies
- Study Plan 8.3.15.1.8 In situ Design Verification Studies
- Study Plan. 8.3.1.4.2.2 Site Characterization Mapping

These activities will be performed for the A/E and coordinated by the Test Coordination Organization.

The process of ground support selection based on geotechnical criteria and subject verification by SNL under the Construction Monitoring and Design Verification will provide the A/E with the basis to adjust and/or substitute ground support categories.

The five ground support categories are identified in the ground support in Drawings BABEAB000-01717-2100-40151 through 40161.

Root Cause:

Investigative action has determined that no procedural violation has occurred.

Corrective Action:

Investigative action has determined that no procedural violation has occurred.

# MEMO

## Construction Management Organization (CMO)

### Construction Control Group (CCG)

**TO:** Distribution

**FROM:** Robert Adams (Phone 702/295-7322)

**DATE:** 27 December 94

**SUBJECT:** FY95 Construction Schedule Up-date

The attached ESF construction schedule has a data date of 4 December 94, and a plot date of 23 December 94. If you have specific questions related to this schedule, please give me a call.

If you wish to be added or removed from distribution, contact William Blair at 5-4324.

Distribution:

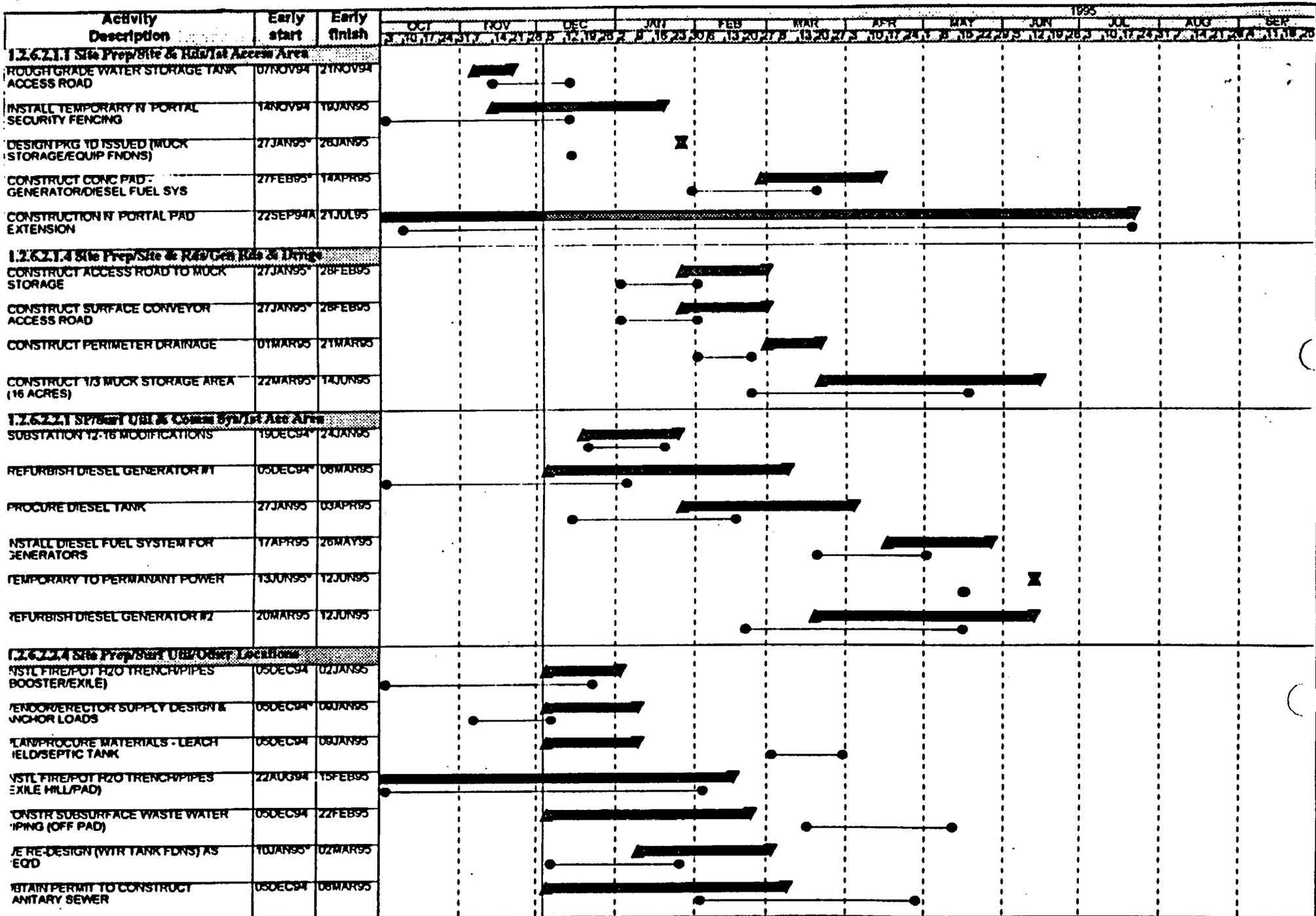
See attached List

C:\SCHDIST1  
REV. 1.0  
12/01/94

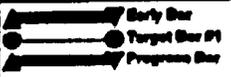
**Robert Adams**

**Distribution Mail Stop 523**

**W. Boyle  
M. Brodsky  
R. Craun  
W. Dixon  
J. Dyer  
V. Iorii  
J. Replogle  
R. Spence  
B Verna**



Project Start: 01JAN93  
 Project Finish: 08AUG97  
 Issue Date: 09/20/94  
 Int Date: 23DEC94



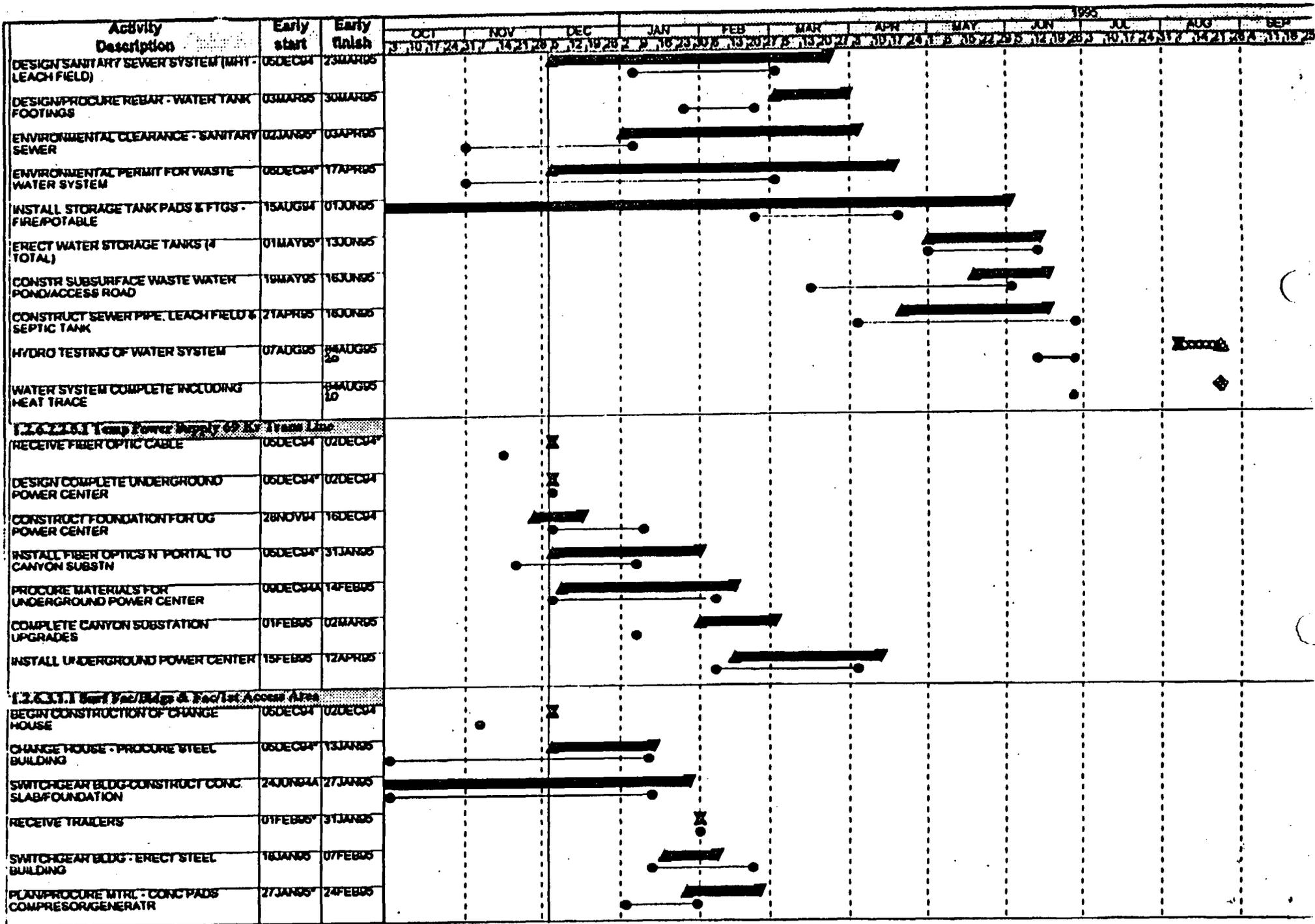
YSPF

### Yucca Mountain Project Target Versus Actuals Level 2 Schedule

Sheet 1 of 4

Revised 12/22/94

DATE	REVISION	DESIGNED	APPROVED



Project Start 01JAN02  
 Project Finish 08AUG07  
 Date Date 04DEC04  
 Plot Date 23DEC04

Legend:  
 — Early Bar  
 - - - Target Bar #1  
 - - - Progress Bar

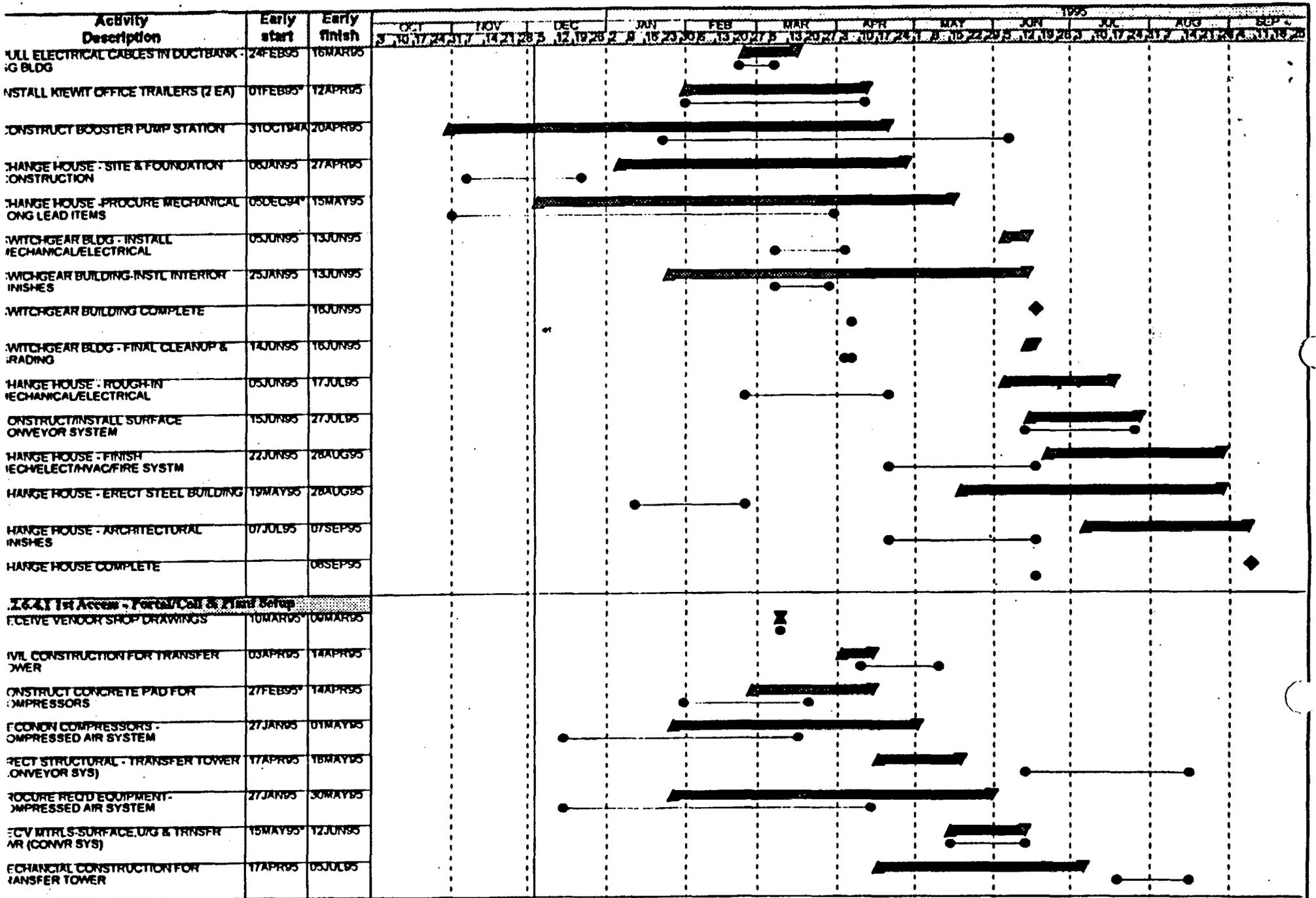
VSEP

**Yucca Mountain Project  
 Target Versus Actuals  
 Level 2 Schedule**

Sheet 2 of 4

Revised 12/04/04

Date	Revised	Checked/Approved



Legend:  
 Start Date: 01JAN92  
 End Date: 08AUG97  
 Start Date: 04DEC94  
 End Date: 23DEC94

Legend:  
 [Solid Bar] Early Bar  
 [Bar with dots] Target Bar (P)  
 [Dashed Bar] Progress Bar

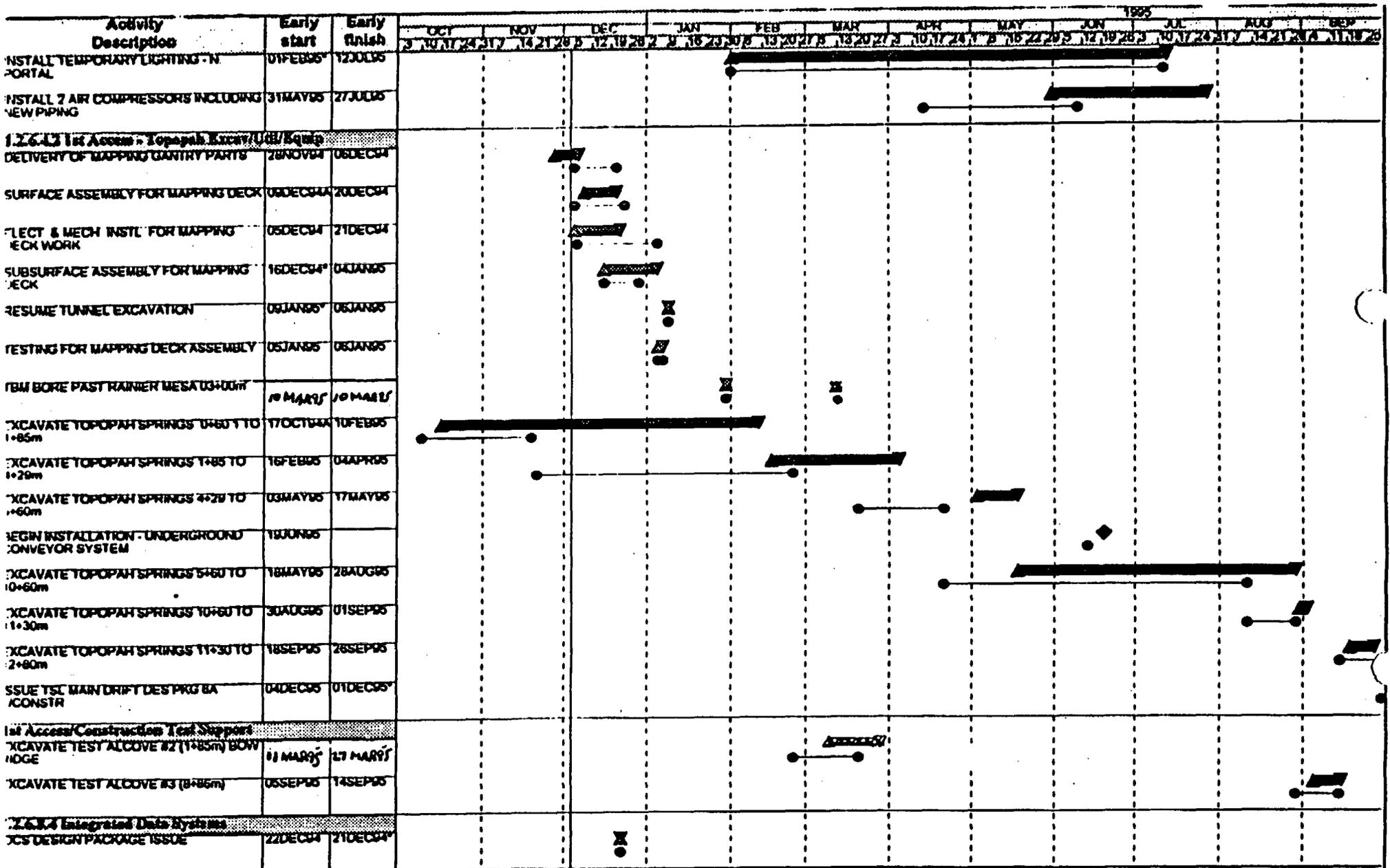
YMP

### Yucca Mountain Project Target Versus Actuals Level 2 Schedule

Sheet 3 of 4

Revised 12/04/94

DATE	REVISION	CREATED	APPROVED



Report Start: 01JAN93  
 Report Finish: 08AUG97  
 Issue Date: 04DEC94  
 Print Date: 23DEC94

Legend:  
 - Early Bar  
 - Target Bar (T)  
 - Progress Bar

**Yucca Mountain Project**  
**Target Versus Actuals**  
**Level 2 Schedule**

Sheet 6 of 6

Revised 12/04/94

DATE	REVISION	CREATED	APPROVED