

JOB 1013-1

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OCT 13 1989

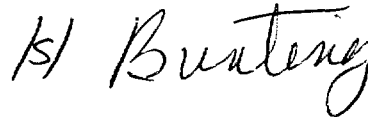
MEMORANDUM FOR: Robert E. Browning, Director
Division of High-Level Waste Management, NMSS

FROM: Joseph O. Bunting, Chief
Engineering Branch
Division of High-Level Waste Management

SUBJECT: SCOPING PAPER ON TECHNICAL FEASIBILITY ASSESSMENT OF AN
APPROACH TO PROVIDE QUANTITATIVE CRITERIA IN LIEU OF "SUB-
STANTIALLY COMPLETE CONTAINMENT"

On March 29, 1989, I circulated for review and comment a Scoping Paper, together with a Policy Options Paper, which recommended a Technical Feasibility Assessment of our concept to address the regulatory uncertainty associated with the requirement for "Substantially Complete Containment" before requesting approval to begin Rulemaking. In the Division Monthly Management Review on September 1, 1989, It was agreed that in view of the feasibility study underway, that a Final Scoping paper on the proposed rulemaking was not appropriate at this time. Instead, it was decided to produce a Scoping Paper which would describe the feasibility assessment that is under contract at the Center. Since this effort is entirely different from a rulemaking, it was agreed that the normal content and format for the routine scoping paper does not apply, and we had discretion as to the format and content. The Scoping Paper is provided at the enclosure.

Since you previously approved the effort now under contract, the Scoping Paper is forwarded for the purpose of documenting the previous decision, and for the information of others who may be interested. No specific action on your part is requested at this time. We are receptive to, and do solicit, substantive comments on the feasibility assessment itself from all those receiving a copy of the Scoping Paper.



Joseph O. Bunting, Chief
Engineering Branch
Division of High-Level Waste Management
Office of Nuclear Material Safety &
Safeguards

Enclosure: As stated

cc: C. Interrante, NIST

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PDR WASTE PDC
WM-11

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Central Files
RBrowning, HLWM
JLinehan, HLPD
MSilberberg

HLEN R/F
JYoungblod, HLWM
RWelller, HLEN
STreby, OGC

NMSS Director's R/F
RBallard, HLG
CPeterson, HLEN

See mem See mem

OFC	:HLEN	HLEN:	HLEN:	:	:	:	:
NAME	:CPeterson	RWelller:	JBunting:	:	:	:	:
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ENCLOSURE 1

APPROACH FOR TECHNICAL FEASIBILITY ASSESSMENT RELATED TO PROPOSED RULEMAKING TO MINIMIZE THE UNCERTAINTY REGARDING THE MEANING OF "SUBSTANTIALLY COMPLETE CONTAINMENT"

1. INTRODUCTION

The Commission's rules for the disposal of high-level wastes in geologic repositories include specific performance requirements (10 CFR 60.113) for the engineered barrier system following permanent repository closure. The objectives in 10 CFR 60.113 contain two distinctly separate but closely coupled requirements for the performance of the engineered barrier system. The requirements specify that "the engineered barrier system shall be designed, assuming anticipated processes and events, so that: (a) containment of HLW within the waste packages will be substantially complete for a period to be determined by the Commission taking into account the factors specified in §60.113(b) provided, that such period shall be not less than 300 years nor more than 1,000 years after permanent closure of the geologic repository; and (b) the release rate of any radionuclide from the engineered barrier system following the containment period shall not exceed one part in 100,000 per year of the inventory of that radionuclide calculated to be present at 1,000 years following permanent closure, ..."

While the requirement in the rule for limited release from the engineered barrier system in the post-containment period is clearly stated in precise engineering terms, the coupled requirement for "substantially complete containment" during the containment period is not considered a precise engineering term and its meaning and implementation are subject to interpretation. Interpretation of the "containment" requirement by the DOE has resulted in substantive comment by the NRC staff on both the CDSCP and the SCP as an area of disagreement. As such, there is regulatory uncertainty regarding the meaning of the "containment" requirement.

In an effort to deal with the regulatory uncertainty extant in the rule, the Engineering Branch circulated for internal review and comment on March 29, 1989, a Scoping Paper for Proposed Rulemaking to Minimize the Uncertainty Regarding the Meaning of "Substantially Complete Containment" (SCC) together with a Policy Options Paper. Written comments were provided by OGC, HLPD, HLGP, and RES (Waste Management Branch). That Scoping Paper proposed as a first effort to undertake a feasibility assessment of an approach to provide quantitative criteria in lieu of "substantially complete containment" has been discussed in various meetings with DHLWM management and representatives of HLPD and HLGP as well as OGC and RES. Therefore, since any recommendation to proceed with rulemaking is contingent upon the outcome of the feasibility assessment, Management has decided to postpone further development of the Scoping Paper and to focus on the scope of the feasibility assessment. The development of the rulemaking Scoping Paper will be resumed after the assessment is complete and will reflect the Staff recommendation.

2. DESCRIPTION OF TECHNICAL FEASIBILITY ASSESSMENT (TFA)

In this alternative, prior to seeking the EDO's approval for rulemaking, the first step is to undertake an assessment of the feasibility of establishing quantitative criteria for SCC, e.g., a statement of probability that no more than N waste packages will fail during the containment period together with a statement of the limits of uncertainty regarding the probability. The TFA will also address related elements of proof and an understanding of the types and natures of the uncertainties regarding waste package performance.

Details of support from the CNWRA are provided in Attachment 1 (letter dated July 3, 1989 from J. Latz to M. Mace). The TFA approach will include workshops, the use of peer reviewers and the issuance of technical reports. The CNWRA itself will produce two technical reports. One will outline the technical elements of proof required for demonstrating long term waste package performance under anticipated conditions. It will detail information on mechanisms of field degradation of canister materials, controlling processes, prediction models, and design and fabrication parameters. The other will provide guidance for quantifying uncertainties and estimating confidence limits for the various parameters affecting the waste package performance. Following the issuance of the two reports, the CNWRA will make a recommendation regarding the feasibility of proceeding to rulemaking with the quantifying criteria, elements of proof, and methods of dealing with uncertainties.

While this approach requires a greater investment of time (62 weeks) before requesting the EDO's approval for the rulemaking effort, the required time to complete the rulemaking effort following the EDO's approval is anticipated to be less (71 weeks) than the time expected for a normal rulemaking (104 weeks).

3. HOW THE TECHNICAL ASSESSMENT WILL ADDRESS THE PROBLEM

The Division of High-Level Waste Management strategy for minimizing the regulatory uncertainty about the term "substantially complete containment" is to make a technical assessment of the feasibility of resolving the meaning of "substantially complete containment" with specific numerical criteria. Presuming success, this would be followed by a request to engage in a full rulemaking.

4. TECHNICAL ASSESSMENT SCHEDULE

Table 1 shows the projected schedule for achieving technical consensus as a basis for preparation of a scoping package requesting authorization of the EDO to commence rulemaking.

5. REQUIRED RESOURCES

The resources required for this technical assessment effort and subsequent rulemaking are estimated to be 6.8 FTE until the rule is published in February 1992, distributed as follows:

<u>Organization</u>	<u>FY89</u>	<u>FY90</u>	<u>FY91</u>	<u>Totals</u>
NMSS	0.7	1.5	1.5	3.7
RES	0.1	0.5	0.2	0.8
CNWRA	0.5	0.8	0.2	1.5
NIST	<u>0.3</u>	<u>0.3</u>	<u>0.2</u>	<u>0.8</u>
Totals	1.6	3.1	2.1	6.8

Contractor support (CNWRA, NIST) for this effort will be in the form of independent input that will be integrated with the in-house input.

TABLE 1. Technical Consensus Schedule

<u>Milestone</u>	<u>Elapsed Time, Wks.</u>	<u>Due Date</u>
1. Staff issues preliminary scoping package.	-	Jul 1989
2. Review by OGC, PM, BC's, and RES	8	Sep 1989
3. CNWRA issues draft report on technical basis for the Elements of Proof (EBS Subtask 4.1).	18	Jan 1990
4. Peer review of CNWRA report is completed.	Concurrent	Jan 1990
5. Consensus workshop is held on EOP and rational methods for assessing technical uncertainties.	2	Jan 1990
6. CNWRA issues EOP final report and draft report of technical uncertainties methods.	7	Mar 1990
7. CNWRA submits recommended wording for proposed rule and/or alternatives.	3	Apr 1990
8. Staff sends scoping package to HLWM Division Director for approval.	4	May 1990
9. Staff sends scoping package to RES for preparation for NMSS management approval.	Concurrent	May 1990
10. RES completes cost-benefit analysis and returns scoping package to HLWM Director.	4	Jun 1990
11. HLWM Director forwards package to NMSS Director for approval.	3	Jun 1990
12. NMSS Director grants approval.	4	Jul 1990
13. RES submits scoping package to EDO for final approval.	4	Aug 1990
14. EDO grants approval to undertake rulemaking	5	Sep 1990

Center for Nuclear Waste Regulatory Analyses

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*Gerry
Parrington*

July 3, 1989
NRC-02-88-005
Account No. 20-3301

U. S. NUCLEAR REGULATORY COMMISSION
ATTN: Ms. Mary H. Mace
Div. of Contracts and Property Management
7920 Norfolk Ave.
Bethesda, MD 20814

Subject: Revised EBS Operations Plan for Task 4

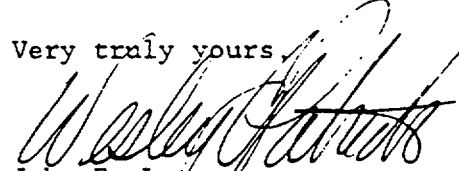
Reference: Letter M. H. Mace to J. E. Latz, "Draft Revised - EBS Operations
Plan for Task 4 Under Contract No. NRC-02-88-005", June 28, 1989

Dear Ms. Mace:

Enclosed please find a revised EBS Operations Plan for Task 4. The revised plan is in full compliance with the requirements identified in the referenced letter. Please note that because the base FY88-89 Operations Plan was not issued as a "controlled" document, this revision is not issued in "controlled" form. The "controlled" version will be issued with FY90-91 Operations Plan, in accordance with the CNWRA Quality Assurance Manual.

If you have any questions, regarding this submittal, please contact Dr. Prasad Nair at 512-522-5150.

Very truly yours,

for 
John E. Latz
President

JEL/PKN/wo

Enclosure

cc: J. Funches (4)
J. Bunting
CNWRA Directors
CNWRA Managers
S. Boyanowski

FULL TEXT ASCII SOON



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EBS (TASK 4) OPERATIONS PLAN ACTIVITIES AND COSTS

FOR

A STUDY TO DEVELOP THE TECHNICAL BACKGROUND FOR
INTERPRETING THE REGULATORY REQUIREMENT OF
SUBSTANTIALLY COMPLETE CONTAINMENT IN 10CFR60.113

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

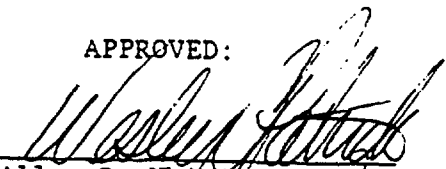
July 3, 1989

PREPARED BY:

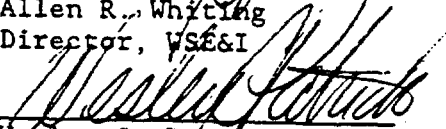



Prasad K. Nair
Manager, EBS

APPROVED:

for 

Allen R. Whiting
Director, WSE&I


Wesley C. Patrick
Technical Director


Bruce Mabrito
Director, QA

~~8907060065~~

1.0 TECHNICAL OBJECTIVES

10CFR60.113(a)(1)(i)(A) requires the waste package to provide substantially complete containment (SCC) of radionuclides for a period of 300 to 1000 years. The words "substantially complete containment" have been interpreted with a varying set of assumptions by DOE and other interested parties. While there is a general sense of what the words mean, ambiguity continues to exist in how a designer of waste packages will comply with the regulation. The description of the uncertainty in the rule and a potential strategy for the resolution of the uncertainty are described in the documents cited below.

1) Bunting, J. O., "Technical Policy Options to Minimize the Regulatory Uncertainty Regarding Substantially Complete Containment", Draft Report, March 20, 1989.

2) Bunting, J. O., Weller, R. A., Peterson, C., and Interrante, C., "Scoping Paper for Proposed Rulemaking to Minimize Uncertainty Regarding the Requirement for Substantially Complete Containment", Rev. 1, March 28, 1989.

3) CNWRA 10CFR60 Subpart E Regulatory Requirement Topic: E-4, "Containment Performance of the Engineered Barrier System to be Substantially Complete after Permanent Closure".

In developing a viable uncertainty reduction method, an understanding of the technical feasibility of the various options is required. The proposal presented here attempts to develop the necessary technical background as a precursor to the selection and exercise of any uncertainty reduction option. The objectives of this Operations Plan are:

- * To develop a report that outlines the technical Elements of Proof required for demonstrating long term waste package performance under anticipated conditions at the selected repository site,

- * To develop a reference report that classifies the type and nature of uncertainties and provides guidance for quantifying the uncertainties and estimating confidence limits for the various parameters affecting waste package performance, and

- * To develop a recommendation regarding a potential rulemaking on SSC to include a regulatory uncertainty reduction method and strategy based on the information generated in the technical reports described above.

2.0 TECHNICAL PROGRAM DESCRIPTION

2.1 Technical Approach

The activities described in this proposed plan are part of Task 4 in the EBS Program Element Operations Plan. The approach presented in this section will, when implemented, be consistent with the intent of the Commission to provide for independent barriers for the isolation of radionuclides in a repository. In this respect, NUREG-0804 and other NRC documents and Memoranda of Understandings will provide guidance to the process of determining uncertainty reduction methods.

The proposed work effort will consist of three subtasks. The first two subtasks will provide the technical basis for establishing the nature of considerations that are required in defining "substantially complete containment". These two subtasks will be performed by teams of technical experts. It is the intent to use the special talents from the CNWRA, NRC, and NIST staff in conducting these subtasks. The major effort and responsibility for the completion of the subtasks, as outlined, will be that of the CNWRA. The third subtask will identify a method for reducing the uncertainty on Substantially Complete Containment, based on information developed in the first two subtasks. The CNWRA will maintain overall management for all subtasks.

2.2 Task Description

The various activities are described under EBS Task 4, Substantially Complete Containment Evaluation.

2.2.1 Subtask 4.1 Technical Basis for the Elements of Proof for Evaluating Substantially Complete Containment

In this subtask a report will be prepared to include Elements of Proof (EOP) and associated technical review components. This report will detail the technical considerations required for evaluating waste package performance under anticipated conditions at the repository. Information on service environments, mechanisms of field degradation of canister materials, controlling processes with time, available data, prediction models, and design and fabrication related parameters will be reviewed and assessed for identifying their relative importance to long-term performance.

A preliminary draft of the EOP report will be completed in three months. The draft report will be reviewed for adequacy and completeness by a minimum of five technical peers in the relevant areas. The peer review will take place at the Center. These reviews will take place during the fourth and fifth month after the start of this subtask. Based on the review, the EOP report will be updated and made ready for a workshop session to be held at the end of the sixth month. The workshop participants will include technical experts in the various disciplines identified by the report. The purpose of the workshop will be to provide a peer consensus of the content and hierarchy of the elements of proof and technical review components presented in the report. A draft final

report will be prepared and submitted to the NRC by the end of the seventh month.

2.2.2 Subtask 4.2 Develop Guidelines for Uncertainty Evaluations

The state-of-information on the technology required to demonstrate compliance with the containment regulatory requirement will have varying degrees of uncertainty. Evaluation of these uncertainties on a qualitative basis will be difficult both for a designer and for a regulator. In support of a rational approach for assessing the various technical uncertainties, guidelines based on quantitative methods will be developed. A guideline report will be prepared and will include statistical techniques and probabilistic methods.

The draft report is expected to be completed in a period of four months after the start of this Subtask. A peer review will be conducted. At least three technical experts with appropriate backgrounds will participate in the peer review. A draft report will be updated and presented at the workshop associated with the workshop in Task 4.1. A draft final report will be submitted to NRC at the end of seven months. It is expected that a potential consultant will participate in this subtask.

2.2.3 Subtask 4.3 Develop Recommendations for Substantially Complete Containment Uncertainty Resolution

Historic background on the rule in 10CFR60.113, its intent, the comments on the rule from the interested parties, and Memoranda of Understandings between NRC and DOE will be collected and evaluated. Based on the evaluation and preliminary information from Subtasks 4.1 and 4.2, an analysis of the nature and the impact of the Substantially Complete Containment uncertainty will be presented.

Based on the assessment, recommended wording for a proposed rule or other alternatives will be prepared. Recommendations will be developed for identifying a Substantially Complete Containment uncertainty reduction method. The feasibility of implementing the method will be evaluated. The uncertainty reduction method will include statements of a potential regulatory position with accompanying technical specifications on the expected performance of waste packages. Appropriate recommendation will be presented in a letter report and submitted to NRC for review.

This subtask will be initiated one month after the start of the project and is expected to be completed in an eight month period.

2.3 Schedules, Milestones, and Deliverables

Figure 1 presents the planned schedule for the Substantially Complete Containment project. For the purpose of developing a schedule it is assumed that the project will be initiated on or about June 22, 1989. The milestones and deliverables are outlined below.

SCHEMILES AND MILESTONES AND DELIVERABLES	SPONSOR: NRC													CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES SOUTHWEST RESEARCH INSTITUTE													
	PERFORMANCE PERIOD: FY 1989 - FY 1990													BASIC DATE: 6/5/89						REVISION DATE:							PAGE NO
TASK/MILESTONES	FY 89													FY 90													
	1	2	3	4	5	6	7	8	9	10	11	12	13	1	2	3	4	5	6	7	8	9	10	11	12	13	
Subtask 4.1 Tech Basis EOP																											
• Draft EOP Report												1	2														
• EOP Workshop																											
• Draft Final Report																											
Subtask 4.2 Develop Guidelines																											
Subtask 4.3 Develop Recommendations for S.C.C.																											
▽ Milestone Completion																											

Figure 1. Schedule/Milestones for E.B.S. Task 4

<u>Milestone/ Deliverable</u>	<u>Description</u>	<u>Date</u>
1	Draft Preliminary EOP Report	9/20/89
2	EOP Workshop	12/12/89
3	Draft Final EOP Report	1/20/90
4	Draft Final Uncertainty Evaluation Methodology Report	1/20/90
5	Substantially Complete Containment Recommendations Letter Report	2/20/90

2.4 Required Interface with Other Organizations

Subtask 4.1 will involve CNWRA and NIST staff. Subtask 4.2 will be accomplished by CNWRA, NRC, and a Consultant (TBD). Subtask 4.3 participants will primarily include CNWRA and NRC staff.

3.0 PROGRAM MANAGEMENT

The Substantially Complete Containment project will be conducted under the Task 4 activity of the Centers' EBS Program Element Operations Plan. The Quality Assurance requirements for this project will be conducted according to the approved CNWRA QA Program. Dr. Prasad Nair will be the Project Manager for the overall Substantially Complete Containment effort at the Center. Figure 2 identifies the project organization with the assigned Subtask Leaders for each subtask. General resources needed are mainly library facilities to conduct literature searches and to obtain specific technical and regulatory documents.

This project will involve travel. Following is breakdown of the potential travel requirements for the Center staff.

<u>Destination</u>	<u>Subtask 4.1</u>	<u>Subtask 4.2</u>	<u>Subtask 4.3</u>
	<u>Trips/Staff</u>	<u>Trips/Staff</u>	<u>Trips/Staff</u>
	<u>Days</u>	<u>Days</u>	<u>Days</u>
Washington DC	4 / 12	2 / 6	6 / 18
Totals	4 / 12	2 / 6	6 / 18

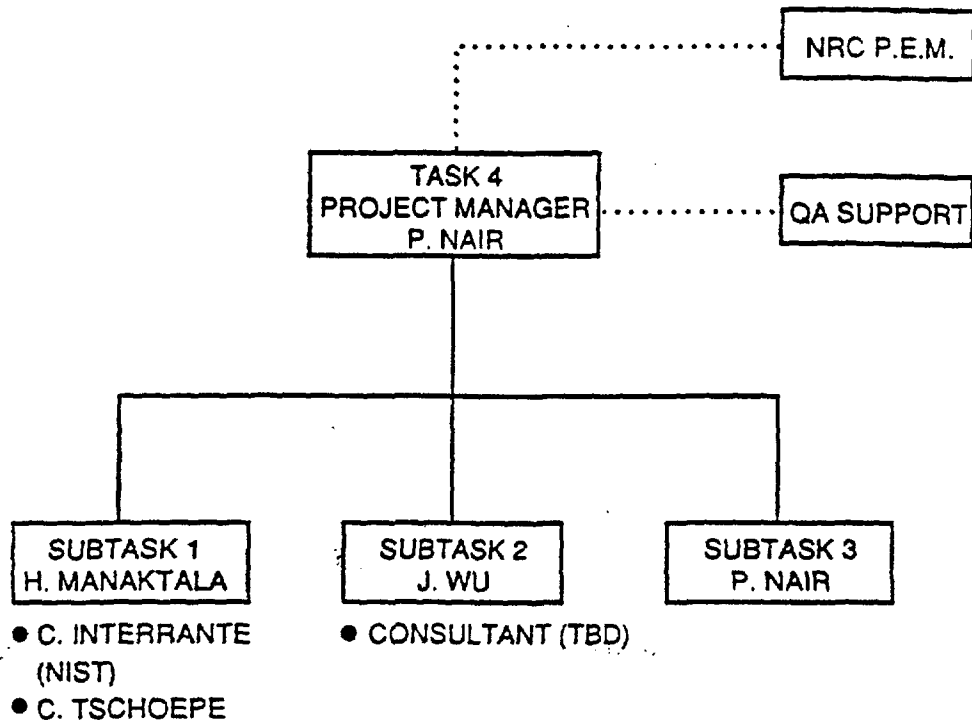


FIGURE 2. PROJECT ORGANIZATION

4.0 ESTIMATED COSTS

The estimated costs for the project are presented in Tables 1 and 2. The Management and Technical Support costs represented in these tables are fully burdened. The Senior Technical Support for FY89 represents the use of a summer student for conducting literature search activities. The spending plan is presented in Figures 3 and 4. The costs identified are those for the Center and one consultant to support Subtask 4.2 activities. In addition the following uncosted support is assumed for the project.

C. Interrante (NIST) 0.3 FTE for a period of 7 months

Table 1 - EBS Task 4 Spending Plan, Year 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	
CENTER DIRECT LABOR (TECH)														
PL-4	0	0	0	0	0	0	0	0	0	295	295	295	295	1,180
PL-3	0	0	0	0	0	0	0	0	0	932	932	1,088	1,088	4,040
PL-2	0	0	0	0	0	0	0	0	0	1,645	1,645	1,645	1,645	6,581
PL-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SR. TECH.	0	0	0	0	0	0	0	0	0	784	784	784	784	3,137
CLERICAL	0	0	0	0	0	0	0	0	0	94	94	94	94	376
MGT & TECHNICAL SUPPORT	0	0	0	0	0	0	0	0	0	3,166	3,454	3,528	3,528	13,676
SWRI DIRECT LABOR	0	0	0	0	0	0	0	0	0	1,684	1,684	1,684	1,684	6,734
CENTER FRINGE	0	0	0	0	0	0	0	0	0	1,538	1,538	1,601	1,601	6,278
CENTER OVERHEAD	0	0	0	0	0	0	0	0	0	4,336	4,336	4,516	4,516	17,705
SWRI FRINGE	0	0	0	0	0	0	0	0	0	690	690	690	690	2,761
SWRI OVERHEAD	0	0	0	0	0	0	0	0	0	2,754	2,754	2,754	2,754	11,014
SWRI ADP SUPPORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SWRI REPORT SERVICES	0	0	0	0	0	0	0	0	0	100	100	100	100	400
SWRI OTHER SERVICES	0	0	0	0	0	0	0	0	0	150	150	150	150	600
SUBCONTRACTORS														
PEER REVIEW/WORKSHOP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CONSULTANTS	0	0	0	0	0	0	0	0	0	2,000	2,000	2,000	2,000	8,000
TRAVEL	0	0	0	0	0	0	0	0	0	0	1,600	1,600	1,600	4,800
EQUIPMENT & MATERIALS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COST OF FACILITY CAPITAL	0	0	0	0	0	0	0	0	0	536	536	545	545	2,161
TOTAL ESTIMATED COST	0	0	0	0	0	0	0	0	0	20,703	22,592	23,074	23,074	89,443
FEE (8%)	0	0	0	0	0	0	0	0	0	1,613	1,765	1,802	1,802	6,983
TOTAL COST INCLUDING FEE	0	0	0	0	0	0	0	0	0	22,317	24,357	24,876	24,876	96,426
% COMPLETION	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	23.1%	25.3%	25.8%	25.8%	
CUMULATIVE COST	0	0	0	0	0	0	0	0	0	22,317	46,673	71,550	96,426	
CUMULATIVE % COMPLETION	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	23.1%	48.4%	74.2%	100.0%	

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EBS - Year 2, Task 4 (Spending Plan)

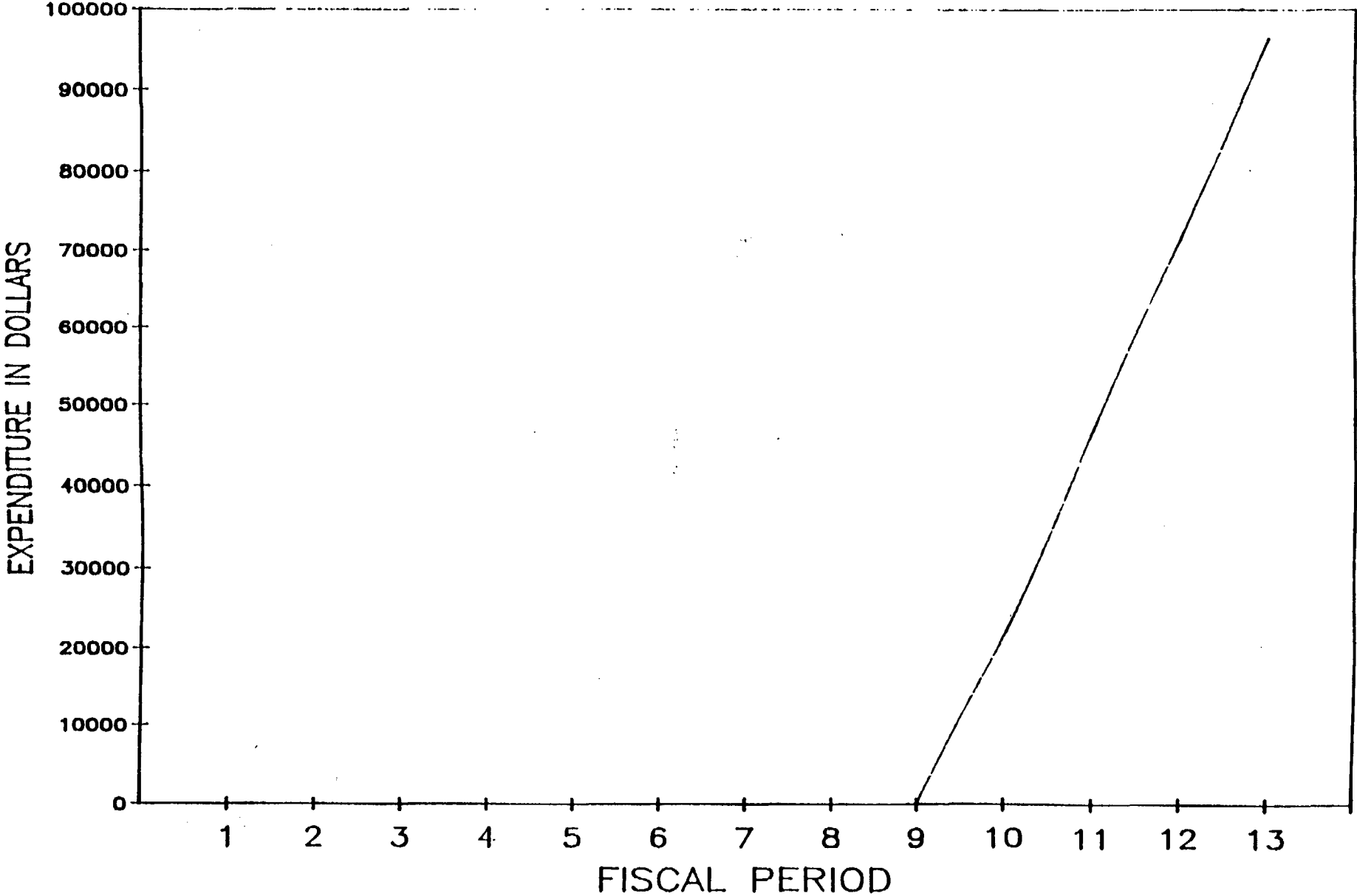


Figure 3 - Task 4 Spending Plan, Year 2

Table 2 - EBS Task 4 Spending Plan, Year 3

	1	2	3	4	5	6	7	8	9	10	11	12	13	
CENTER DIRECT LABOR (TECH)														
PL-4	223	223	223	223	223	223	0	0	0	0	0	0	0	1,339
PL-3	1,152	1,152	1,152	1,152	1,152	1,152	0	0	0	0	0	0	0	6,913
PL-2	1,609	1,609	1,609	670	670	670	0	0	0	0	0	0	0	6,837
PL-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SR. TECH.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CLERICAL	99	99	99	99	99	99	0	0	0	0	0	0	0	593
MGT & TECHNICAL SUPPORT	6,331	3,155	7,414	1,891	1,710	1,855	0	0	0	0	0	0	0	22,356
SWRI DIRECT LABOR	1,531	1,531	1,531	1,028	1,028	1,028	0	0	0	0	0	0	0	7,676
CENTER FRINGE	1,264	1,264	1,264	879	879	879	0	0	0	0	0	0	0	6,429
CENTER OVERHEAD	3,564	3,564	3,564	2,479	2,479	2,479	0	0	0	0	0	0	0	18,131
SWRI FRINGE	628	628	628	421	421	421	0	0	0	0	0	0	0	3,147
SWRI OVERHEAD	2,504	2,504	2,504	1,681	1,681	1,681	0	0	0	0	0	0	0	12,554
SWRI ADP SUPPORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SWRI REPORT SERVICES	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SWRI OTHER SERVICES	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUBCONTRACTORS														
PEER REVIEW/WORKSHOP	20,000	0	25,000	0	0	0	0	0	0	0	0	0	0	45,000
CONSULTANTS	2,000	2,000	2,000	500	500	500	0	0	0	0	0	0	0	7,500
TRAVEL	0	2,400	1,000	1,000	0	800	0	0	0	0	0	0	0	5,200
EQUIPMENT & MATERIALS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COST OF FACILITY CAPITAL	504	504	504	343	343	343	0	0	0	0	0	0	0	2,541
TOTAL ESTIMATED COST	41,409	20,632	48,492	12,367	11,186	12,131	0	0	0	0	0	0	0	146,215
FEE (8%)	3,272	1,610	3,839	962	867	943	0	0	0	0	0	0	0	11,494
TOTAL COST INCLUDING FEE	44,681	22,242	52,331	13,328	12,054	13,073	0	0	0	0	0	0	0	157,709
% COMPLETION	28.3%	14.1%	33.2%	8.5%	7.6%	8.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
CUMULATIVE COST	44,681	66,923	119,253	132,582	144,635	157,709	157,709	157,709	157,709	157,709	157,709	157,709	157,709	
CUMULATIVE % COMPLETION	28.3%	42.4%	75.6%	84.1%	91.7%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	

EBS - Year 3, Task 4 (Spending Plan)

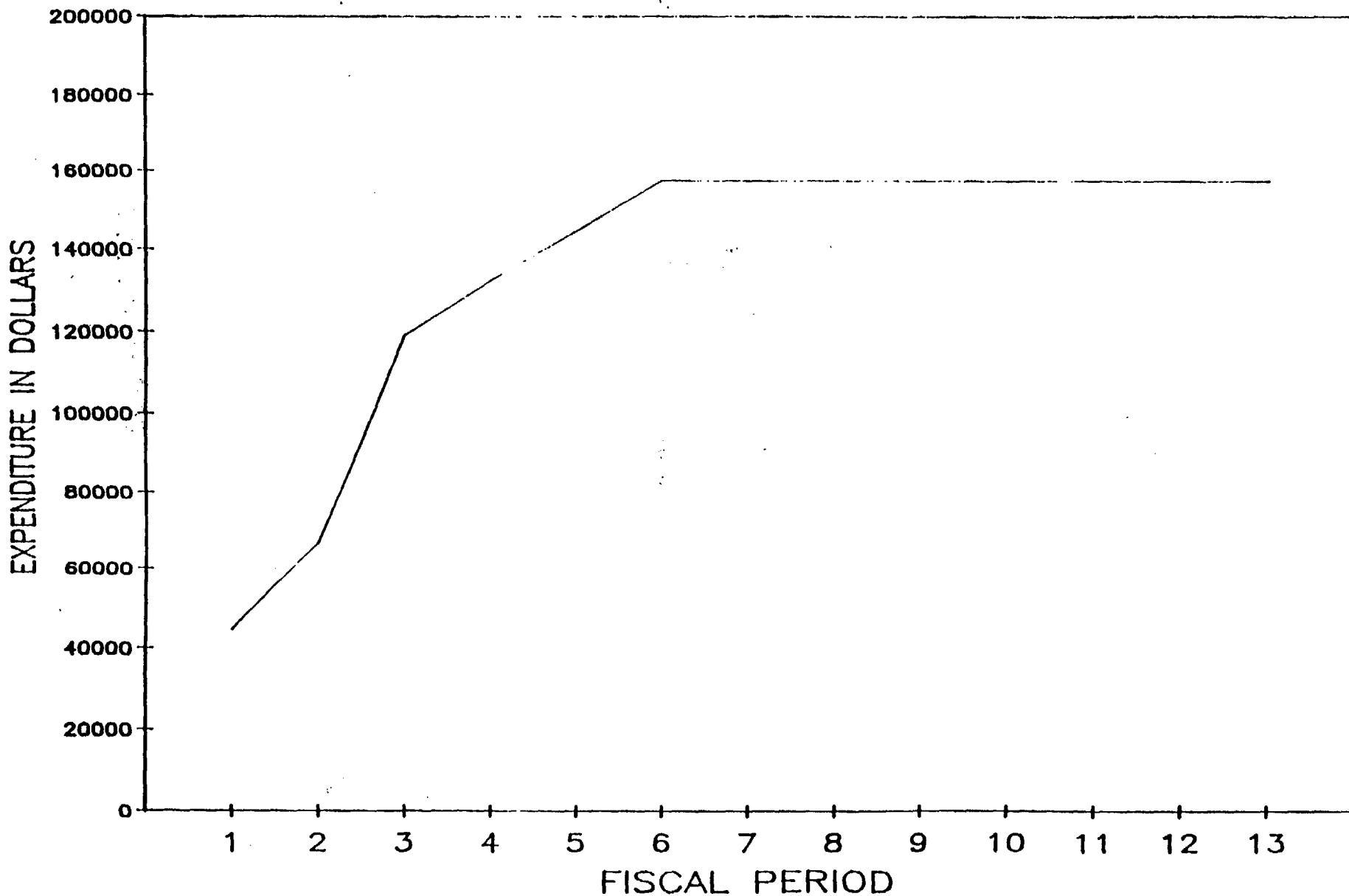


Figure 4 - Task 4 Spending Plan, Year 3