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See Pocket 1 for enc.

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

JAN 1 8 1985

Those on Attached List

Gentlemen:

DOE/NRC MEETING MINUTES ON THE QUALITY ASSURANCE MEETING HELD IN RICHLAND, WASHINGTON, ON DECEMBER 10-11, 1984

For your information and files enclosed are the complete meeting minutes and respective notes and viewgraphs of the subject meeting. If there are questions regarding these minutes, please contact Mr. James E. Mecca of my staff on FTS 444-5038 or (509) 376-5038.

Very truly yours,

J. E. Mecca

for O. L. Olson, Project Manager
Basalt Waste Isolation Project Office

BWI:JEM

Enclosure

WM Record File 101.2
WM Project 10
Docket No.
PDR ✓
LPDR ✓

Distribution:

R Wright	Mellgate
J Kennedy	DRM
(Return to WM, 623-SS)	HJM C2

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Distribution list for letter, DOE/NRC Meeting Minutes on the Quality Assurance Meeting Held in Richland, Washington, on December 10-11, 1984, Olson to Distribution, January 18, 1985

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101.2

Encl. to memo to Mitchell Lieb from Olson 1/18/85

SUMMARY MEETING NOTES
DOE/NRC QUALITY ASSURANCE MEETING
BASALT WASTE ISOLATION PROJECT
RICHLAND, WASHINGTON
DECEMBER 10-11, 1984

ATTENDEES: Attachment 1

BACKGROUND

This meeting is the first of a series of visits to the BWIP Site to review and discuss the DOE QA program for the site characterization phase and later phases. The primary purposes of the first visit were for the staff to become familiar with the details of the DOE QA program, and to identify questions concerning implementation and interpretation of NRC QA requirements. The ultimate goal of the site visits is to achieve early agreement between DOE and NRC staffs on what constitutes an acceptable QA program for licensing.

The scope of review for the first visit was consistent with its overview nature. The DOE - Rockwell QA and Project Management systems and programs to be utilized before, during and after Site Characterization phase were presented. The DOE and NRC staffs discussed implementation of various QA program requirements as applicable to site characterization activities through examination of detailed technical procedures provided by Rockwell. J. Kennedy made a presentation on the NRC QA Review Plan and addressed subjects which are expected to be difficult to incorporate into the DOE program. In addition W. Altman discussed IE's involvement in the high level waste repository program and NRC policy and program development activities for QA.

The agenda for the visit is presented in Attachment 2.

DEVELOPMENTS

BWIP Comments - None.

NRC Comments - Attachment 3.

Comments from other participating parties - None.

OPEN ITEMS

Both NRC and DOE/BWIP follow-up actions are contained in Attachment 4.

NRC presentation material is contained in Attachment 5. DOE presentation material is contained in Attachment 6.

This report was agreed to by DOE and NRC prior to adjournment.

DOE O. L. Olson Date 12/12/84

NRC James C. Kennedy Date 12/12/84

ATTACHMENT 1 - ATTENDEES
December 10 & 11, 1984

NAME	AFFILIATION
E. B. Ash	Rockwell Hanford Operations
Ed Sulek	Weston
M. F. Nicol	Rockwell Hanford Operations
R. D. Hammond	Rockwell Hanford Operations
Alden McElrath	RKE/PB, Oakland, CA
Philip Gittings	RKE/PB, Oakland, CA
Harry Babad	Rockwell Hanford Operations
George Evans	Rockwell Hanford Operations
Carl Newton	DOE-HQ
O. L. Olson	DOE-RL
G. J. Bracken	DOE-RL
L. R. Fitch	Rockwell Hanford Operations
R. R. Hammond	Rockwell Hanford Operations
S. A. Wiegman	Rockwell Hanford Operations
R. L. Snow	Rockwell Hanford Operations
Ron Gerton	DOE-RL
R. M. Schwenk	Rockwell Hanford Operations
Michael Karol	DOE-RL
R. L. Shaub	PNL
Billie Neth	PNL/MCC
D. E. Ryder	PNL
D. G. Price	Rockwell Hanford Operations
W. J. Apley	PNL
Tom Woods	Rockwell Hanford Operations
GeorgeAnn Wood	Citizen
Roger Johnson	Rockwell Hanford Operations
Roy Pratt	Morrison-Knudsen
John Bores	Morrison-Knudsen
Wayne Delvin	WHC
Ted Petrie	DOE-RL
R. P. Saget	DOE-RL
R. E. May	Rockwell Hanford Operations
S. S. Biehorn	NRC
J. J. Fuquay	Battelle Northwest
C. Williams	Battelle Columbus
Vishnu Subrahmanyam	Rockwell Hanford Operations
M. E. Langston	U.S. DOE/OCRWM/HQ
B. G. Erlandson	Rockwell Hanford Operations
D. G. Farwick	WHC
John Graham	Rockwell Hanford Operations
Stan Echols	DOE
R. D. Kulchak	M-K
L. L. Caldwell	Hanford Oversight Committee
D. S. Ward	Geotrans for Yakima Indian Nation
S. Sutter	BNW
J. Mecca	Rockwell Hanford Operations
W. M. Bland	NRC
J. H. Levine	NASA
L. Connell	Rockwell Hanford Operations
J. Russell	Yakima Indian Nation
M. R. Kreiter	PNL

ATTACHMENT 1 - ATTENDEES
December 10 & 11, 1984

NAME	AFFILIATION
Richard Hudson	DOE-RL
Michael Karol	DOE-RL
Craig Walenga	NRC-IE
A. J. Bell	DOE-RL
J. Kennedy	NRC
W. Altman	NRC
B. Cook	NRC

ATTACHMENT 2

AGENDA

DOE/NRC QUALITY ASSURANCE MEETING
BASALT WASTE ISOLATION PROJECT
December 10-12, 1984

Location: Holiday Inn
1515 George Washington Way
Richland, Washington

December 10, 1984

8:15 a.m.	DOE INTRODUCTION AND WELCOME Introduce DOE/Contractor Staffs Discuss goals for meeting Highlight agenda for workshop	O. L. Olson
8:30 a.m.	NRC INTRODUCTION AND DISCUSSION Introduce Staff Discuss goals for meeting Present review plan background Discuss NRC QA organization and responsibilities	J. Kennedy W. Altman
9:30 a.m.	OVERVIEW - BWIP QUALITY ASSRUANCE Project QA Philosophy DOE Safety & QA System BWIP Quality Program Organization Responsibilities Project Management systems and controls QA program development QA program assessment Issues and major actions Implementation (15 minute break when appropriate)	O. L. Olson R. E. Gerton
12:00 Noon	LUNCH	
1:00 p.m.	OVERVIEW - ROCKWELL QUALITY ASSURANCE PROGRAM FOR BWIP Organization Rockwell Responsibilities as BWIP Technical Manager Current QA/Management Systems Issues and Major Actions QA/Management Systems Development Challenges Ahead	E. B. Ash

3:15 p.m.	BWIP MANAGEMENT SYSTEMS AND CONTROLS Mission Definition Data Requirements Identification Issue Correlation Work Definition Traceability Data Base Management Project Document Hierarchy (15 minute break when appropriate)	T. W. Woods
5:00 p.m.	ROCKWELL QA/MANAGEMENT SYSTEMS Implementation Key Actions Schedules	M. F. Nicol
6:00 p.m.	ADJOURN	
December 11, 1984	RECONVENE	
8:00 a.m.	PROJECT OFFICE QUALITY ASSURANCE PLAN Review and discuss major points, including design and test control graded quality assurance records management, etc. Identify implementation plans, schedules and procedures	G. J. Bracken
9:15 a.m.	BREAK	
9:30 a.m.	BWIP MANAGEMENT SYSTEMS AND CONTROLS Using examples, show how the developing management systems will control BWIP work from the initial definition of top level requirements to the eventual performance of data gathering and analysis activities.	E. B. Ash T. W. Woods
11:00 a.m.	QUESTIONS, ANSWERS, COMMENTS	All
12:00 Noon	LUNCH	
1:00 p.m.	EXIT MEETING PREPARATION Participants caucus to prepare for exit meeting	All

3:30 p.m.	EXIT MEETING (RECONVENE) Discuss meeting results and conclusions Prepare meeting minutes	All
5:00 p.m.	ADJOURN	

December 12, 1984

8:00 a.m.	FIELD TOUR DEPARTS FEDERAL BUILDING	
12:00 Noon	TOUR ENDS WITH RETURN TO FEDERAL BLDG. - MEETING OVER	

ATTACHMENT 3 - NRC COMMENTS

* As noted in the opening comments, this meeting was intended to be and has been primarily fact finding in nature and limited in scope. In our discussions we identified a number of areas where additional follow up and discussion between DOE and NRC staffs is needed. Examples noted in this meeting include procurement control, the role and interface of line QA activities versus independent QA activities, interface between project management program plans and QA activities, software QA, and records management.

* DOE is currently modifying their QA program to meet NRC licensing requirements. Many of the changes to the program are not scheduled to be completed until shortly before publication of the SCP. Because work is in progress now which may be referenced in licensing, DOE needs to implement at the earliest possible time the changes to the program which are now under way.

* Based on NRC staff findings in the Ford Amendment Study (NUREG-1055) and experience of the QA team members from NASA, the size of the DOE technical staff may not be sufficient to provide adequate oversight of such a large and complex project. In addition, heavy use of contractors to supplement DOE staff may not provide the continuity which is required for the program.

* The NASA consultant to NRC noted that one successful approach to verifying quality of technical work is to use separate technical design review teams to provide additional checks and balances over those obtained through use of line organization personnel.

* DOE should clarify the definitions of Conceptual, Title I, Title II, and Title III designs as applicable for BWIP, and the schedules for completion of each.

* DOE indicated that USGS has not accepted the project QA requirements. Follow up on this item is needed by DOE.

* Based on NASA experience, a central system for identification of failures, nonconformance reports and other problem areas is useful in helping to identify root causes of problems.

* DOE recognized that further development work is necessary to bring greater definition and refinement to their proposed trend analysis for QA.

* In follow up meetings, it will be important to develop a better understanding of how important design information and test procedures will be verified as having been implemented correctly. Additional information will also be needed on the organizations performing this verification (i.e., line or QA) and the extent performed by each. Verification steps should be specifically identified in the various test plans or procedures for collection of important data and should be identified in appropriate design documents.

ATTACHMENT 4 - OPEN ITEMS

* DOE will be developing an approach for three important and interrelated areas; the scope of items and activities covered by the QA program (that is those items important to safety and waste isolation); development of a graded QA approach for items and activities commensurate with their importance to safety and/or waste isolation; and qualification of existing data for licensing utilizing results of the first two investigations. NRC staff recognizes the ultimate importance of these activities to licensing and recommends DOE work closely with NRC in regard to development of these approaches.

* The DOE discussed use of Readiness Reviews during site characterization. In reactor licensing, some utilities believe it advantageous to have early NRC involvement in these readiness reviews so that NRC feedback and problem identification is obtained in a timely manner. DOE should consider the potential benefits of early involvement of NRC in this type of activity. NRC staff will forward to DOE additional background information on this approach and is prepared to discuss this matter further with DOE.

* Based on needs of licensing, some amount of verification and/or replication on data collected in the laboratory and the field is necessary. Additional detail in this area is required to be able to support licensing.

ATTACHMENT 5

NRC QUALITY ASSURANCE

SITE VISITS

DECEMBER 10-19, 1984

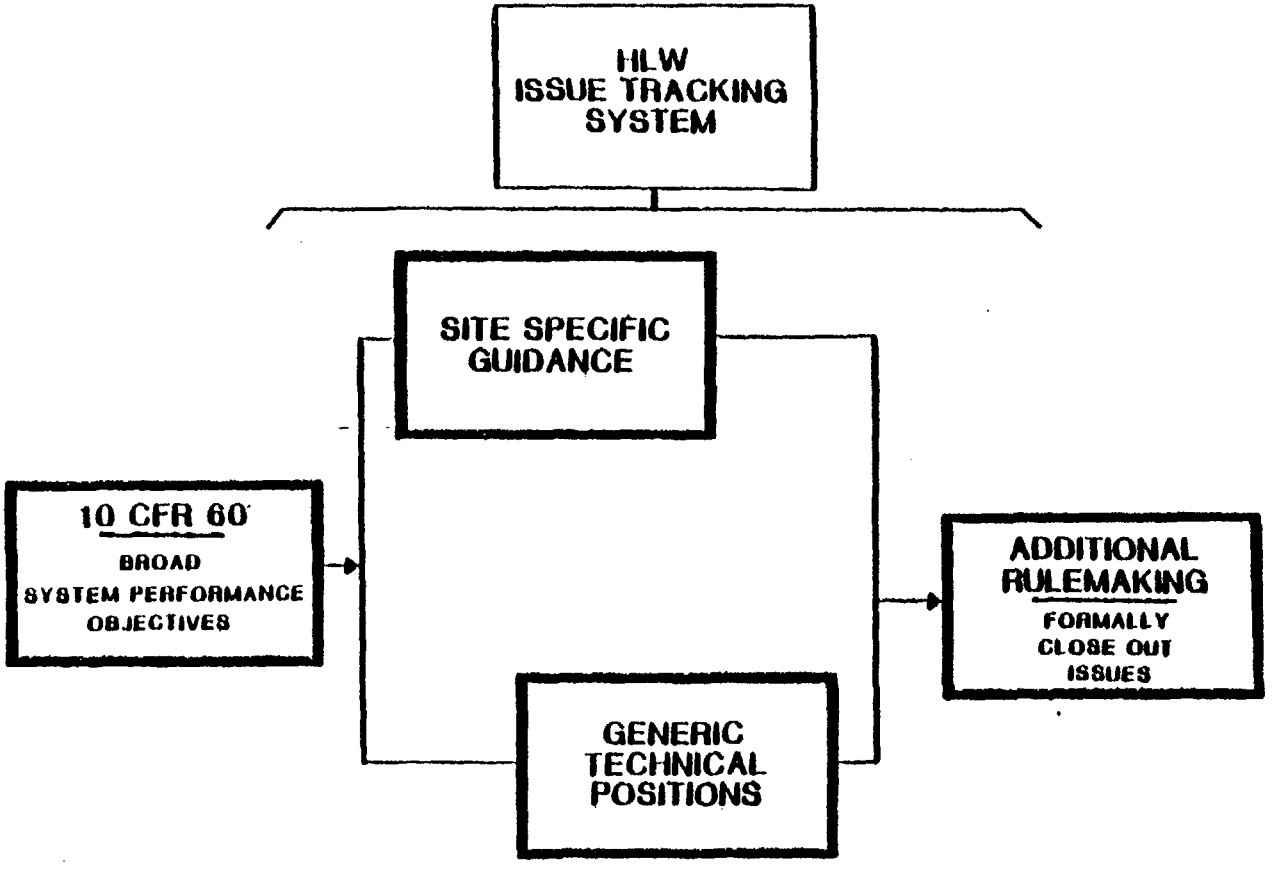
J. E. KENNEDY

- PRELICENSING CONSULTATION AND GUIDANCE PROGRAM
- GOALS FOR QA VISITS
- QA REVIEW PLAN

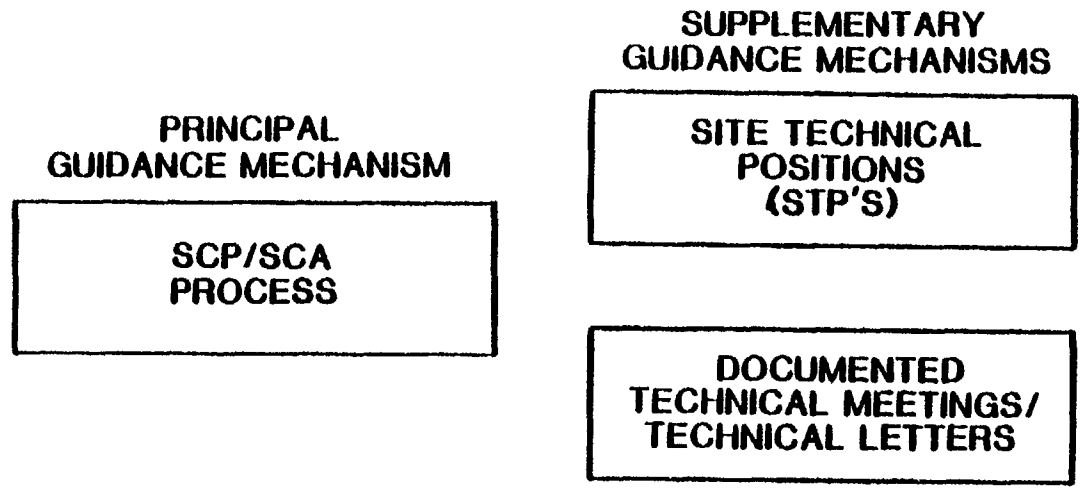
PRELICENSING CONSULTATION

AND GUIDANCE PROCESS

- 10 CFR 60 PROCEDURAL RULE
- NWPA
- EARLY IDENTIFICATION OF ISSUES AND TIMELY RESOLUTION



NRC HLW LICENSING GUIDANCE PROGRAM



SITE SPECIFIC
LICENSING GUIDANCE

TECHNICAL REVIEWS/WORKSHOPS
(FY 80-84)

	BWIP	NTS	SALT	GENERIC
OVERALL SITE/FIELD REVIEW	3	3	3	
GEOLOGY	2	1	1	
GEOCHEMISTRY	2	3	1	2
HYDROGEOLOGY	7	3	1	
WASTE PACKAGE	2	1	1	
DESIGN (UNDERGROUND TESTING)	5	1	2	1
PERFORMANCE ASSESSMENT	1		1	2
TOTAL	22	12	10	5

DECEMBER 1984

GOALS FOR QA VISITS

- FACT-FINDING AND FAMILIARIZATION WITH DOE PROGRAM
- EARLY IDENTIFICATION OF QUALITY ASSURANCE ISSUES
- DISCUSSION OF QA REVIEW PLAN
- ULTIMATELY, TO HAVE A DOE QA PROGRAM IN PLACE WHICH WILL ADEQUATELY ASSURE THE QUALITY OF SITE CHARACTERIZATION PHASE WORK

QUALITY ASSURANCE REVIEW PLAN

- REASONS FOR DEVELOPMENT
- PROCESS OF DEVELOPMENT
- CONTENT
- RELATIONSHIP TO OTHER QA GUIDANCE
- FUTURE PLANS

PURPOSES

- 10 CFR 60 SUBPART G - USE APPENDIX B, 10 CFR PART 50 "AS APPLICABLE AND APPROPRIATELY SUPPLEMENTED BY ADDITIONAL CRITERIA...."
- RECOGNIZES THAT REPOSITORY IS NOT A REACTOR
- DEFINE STAFF ACTIONS

PROCESS

- IE/NMSS JOINT EFFORT
- REACTOR SRP, CHAPTER 17
- DRAFT FOR PUBLIC COMMENT, JULY 1983 - MUCH INTEREST, FEW COMMENTS
- MEETINGS WITH DOE
- FORD AMENDMENT STUDY, APRIL 1984 - 60 NEW COMMENTS
- FINAL ISSUANCE, JUNE 29, 1984

CONTENTS

- DIFFERENT FROM REACTOR SRP WHICH ADDRESSES ONLY PROGRAM DESCRIPTION IN SAR
- GENERAL - INTRODUCTORY TEXT
  - DESCRIPTION OF ONGOING WORK
  - NRC REGULATIONS
  - APPLICATION OF QA TO GEOTECHNICAL WORK
  - DESCRIPTION OF NRC REVIEW PROCESS
  - FIGURES
- SPECIFIC - APPENDIX A
  - 18 CRITERIA TAILORED TO DOE, SC PHASE

IMPLEMENTATION ISSUES

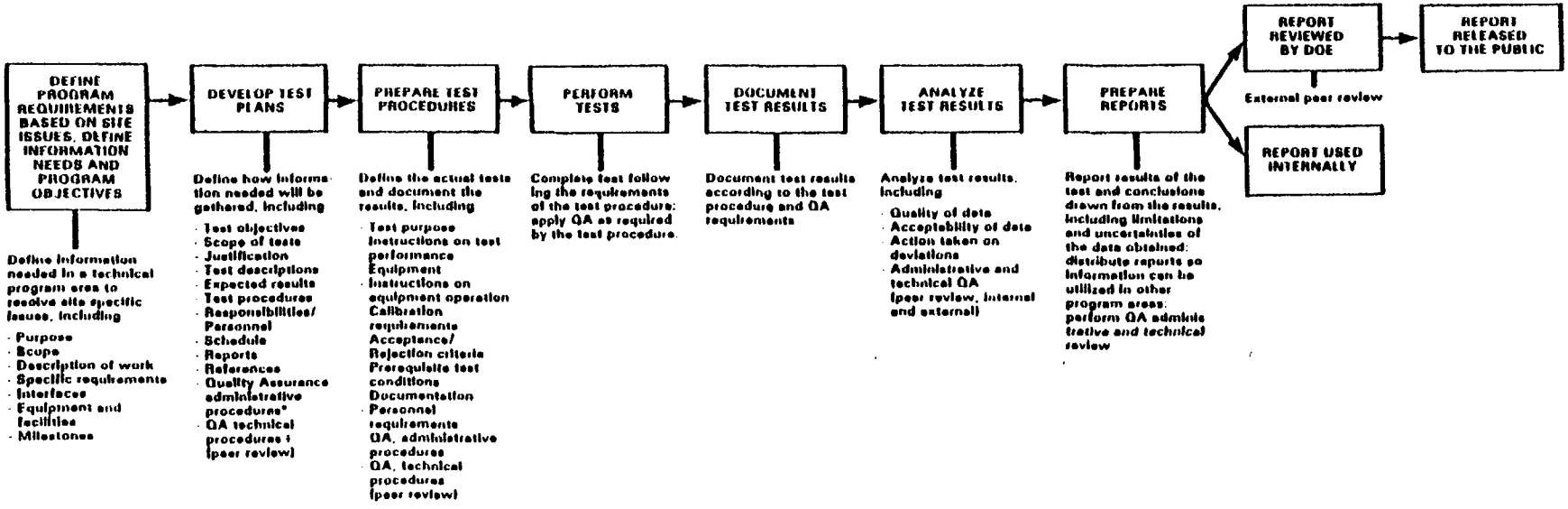
- HARDWARE QA VS DATA QA, E.G.
  - INSPECTIONS
  - NCR'S
- SCOPE OF ITEMS AND ACTIVITIES COVERED BY PROGRAM- THOSE IMPORTANT TO SAFETY AND WASTE ISOLATION
- QA OF EXISTING DATA
- LEVEL OF DETAIL IN PROCEDURES
- INDEPENDENCE OF QA ORGANIZATIONS
- RECORDS - PRELIMINARY VS FINAL
- DESIGN CONTROL - WHEN DOES IT START?
- GRADED QA
- REPLICATION

RELATIONSHIP TO NQA-1

- REVIEW PLAN - GREATER SPECIFICITY AND LEVEL OF DETAIL FOR DOE SITE CHARACTERIZATION PHASE
- NQA-1 REVISIONS REQUIRED

FUTURE PLANS

- NQA-1
- FORD AMENDMENT STUDY RECOMMENDATIONS
- WILLIAM BLAND STUDY RECOMMENDATIONS
- EXPERIENCE AT SITES
- CONSENSUS STANDARDS - ASME/ANSI 2.20, NQA-1 AND ANS-2.24
- CONFIGURATION CONTROL



*QA administrative procedures include procedures for: (1) document control; (2) documented instructions, procedures, and drawings; (3) control of materials, equipment, and services; (4) use of qualified personnel; (5) inspections; (6) documented test plans; (7) control of test equipment; (8) control of samples; (9) nonconformance reports; (10) corrective action; (11) peer review (both management and technical); (12) audits.

† QA technical procedures include the actual internal and external peer reviews (both management and technical).

SCOPE OF DIAGRAM:
To show chronology of events in development of a testing program

PURPOSE OF DIAGRAM:
(1) To show a breakdown sequence of development of plans to resolve problem of timely access to data by NRC (2) To show the involvement of QA, both administrative and technical, in each step of program

FIGURE 3

SUMMARY

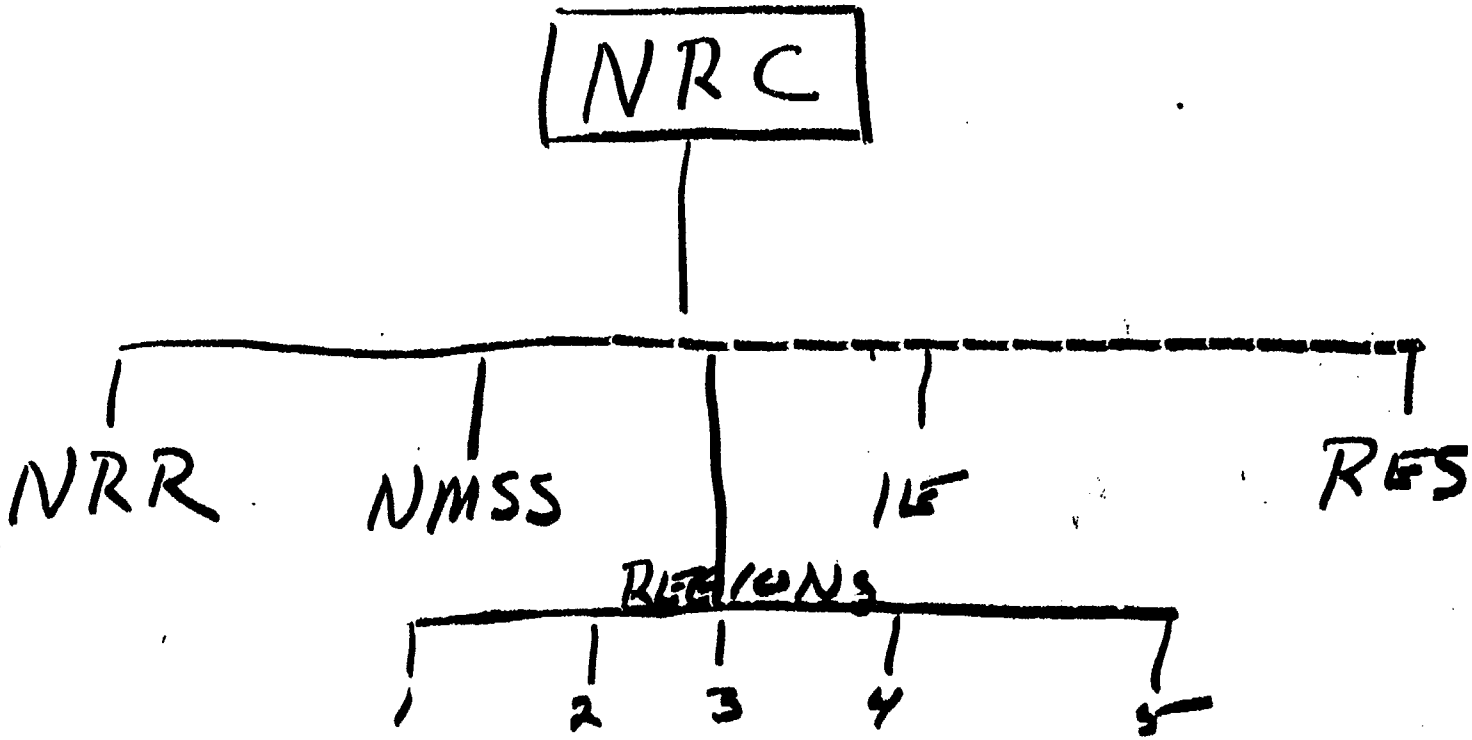
- CRITERIA FOR REVIEW NOW IN PLACE
- SITE VISITS WILL PROVIDE OPPORTUNITY FOR NRC STAFF TO BECOME FAMILIAR WITH DOE PROGRAM
- IMPLEMENTATION ISSUES WILL BE IDENTIFIED

ATTACHMENT 5

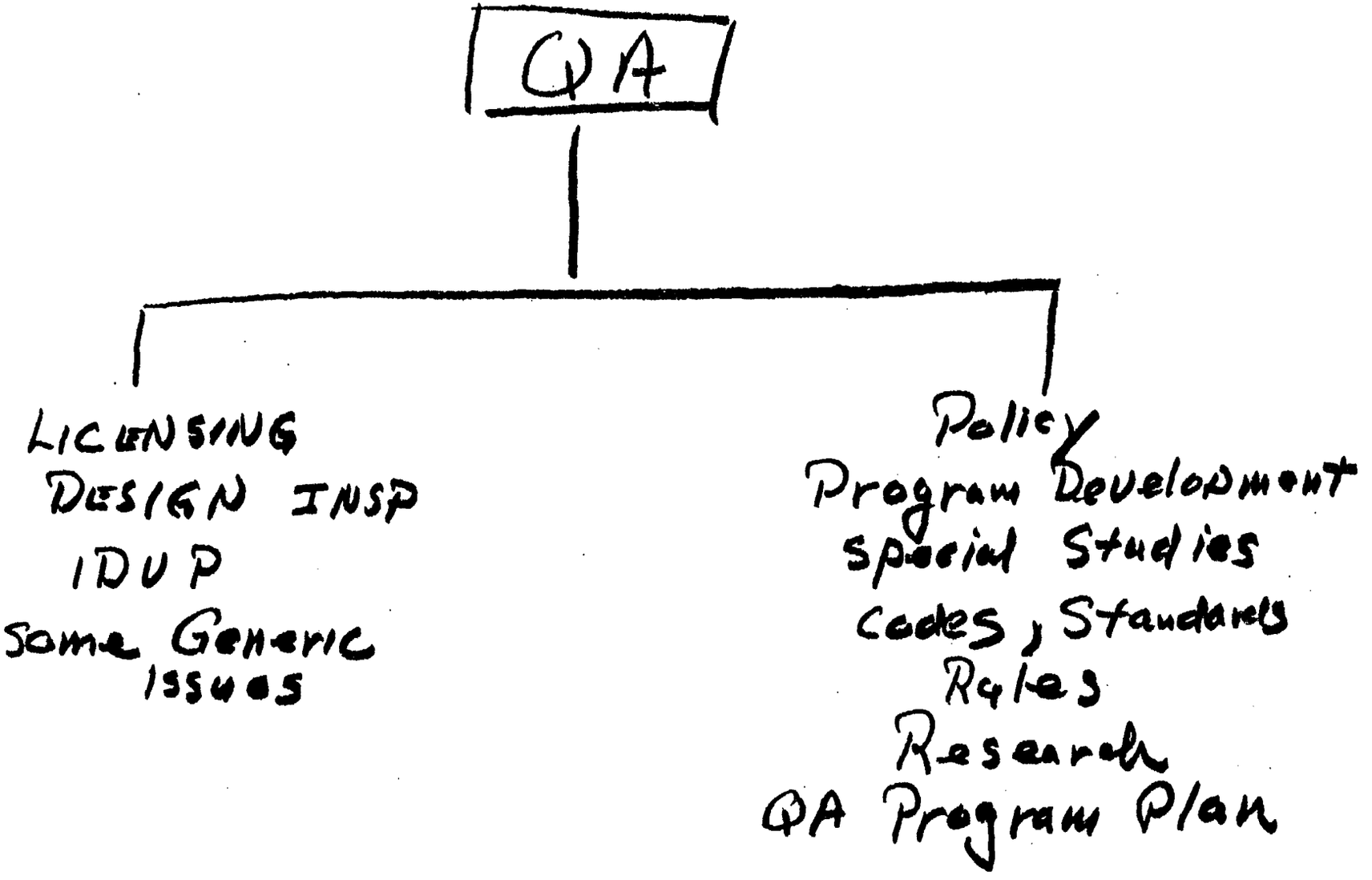
NRC - DOE

HLW SITE VISITS FOR QUALITY ASSURANCE

W. ALTMAN (I.E)



- NMSS resp for licensing HLW, MRS
- IE has policy lead for QA
- NMSS/IE interface on QA for HLW


QA
LICENSING
DESIGN INSP
IDVP
Some Generic
Issues
Policy
Program Development
Special Studies
Codes, Standards
Rules
Research
QA Program Plan

FORD AMENDMENT STUDY

ROOT CAUSES OF PROBLEMS

- INEXPERIENCE
  - LACK OF UNDERSTANDING OF PROJECT, OF REGULATORY REQUIREMENTS
  - FAILURE TO TREAT NUCLEAR DIFFERENT FROM PAST PROJECTS
  - INADEQUATE STAFFING
  - OVER RELIANCE ON CONTRACTORS
  - FAILURE TO RECOGNIZE SYMPTOMS
  - MANY INTERFACES, COMPLEX FIRST OF A KIND PROJECT
  - UNPREPARED FOR ACTIVE INTERVENTION
- MANAGEMENT
  - LACK OF INVOLVEMENT
  - DIFFUSION OF RESPONSIBILITY, DILUTED ACCOUNTABILITY
  - VIEW OF QA AS ANOTHER REGULATORY REQUIREMENT, NOT AS MANAGEMENT TOOL OR AS NECESSARY FOR LICENSING
  - "TEA KETTLE" SYNDROME
  - FALSE SENSE OF SECURITY
  - RELIANCE ON NRC TO DETECT PROBLEMS

FORD AMENDMENT STUDY

ROOT CAUSES OF PROBLEMS

- CHANGING ENVIRONMENT
  - CHANGING PUBLIC PERCEPTION OF NUCLEAR POWER
  - LONG CONSTRUCTION PERIOD
  - CHANGING STATE OF ART
  - CHANGING DESIGN REQUIREMENTS
  - MORE ACTIVE OPPOSITION: QA AN ISSUE
- NRC
  - FAILURE TO ADEQUATELY SCREEN FOR EXPERIENCE, MANAGEMENT CAPABILITY
  - ASSUMPTION OF UNIFORM LEVEL OF INDUSTRY COMPETENCE
  - FOCUS ON OPERATIONS AT EXPENSE OF DESIGN AND CONSTRUCTION
  - CHANGING REQUIREMENTS

PREMISES OF QA PROGRAM PLAN

- LICENSEES ARE PRIMARILY RESPONSIBLE FOR QUALITY. LICENSEE MANAGEMENT MUST ASSUME RESPONSIBILITY FOR QUALITY AND BE HELD ACCOUNTABLE FOR FAILURES.

- SUBSTANTIVE IMPROVEMENTS IN QUALITY MUST COME FROM THE INDUSTRY ITSELF. THEY CANNOT BE "INSPECTED IN."

- THE FOCUS OF NRC AND INDUSTRY QA PROGRAMS SHOULD BE ON PERFORMANCE, NOT PRESCRIPTIVENESS.

- NRC AND INDUSTRY QA PROGRAMS SHOULD BE ORIENTED TOWARD PREVENTION AND EARLY DETECTION.

- QA PROGRAMMATIC ACTIVITIES TO ASSURE QUALITY SHOULD NOT INTERFERE WITH THE ACHIEVEMENT OF QUALITY.

- QA IS A MANAGEMENT TOOL FOR MONITORING AND CONFIRMING WORK. IT IS NOT A SUBSTITUTE FOR MANAGEMENT.

- GREATER PREDICTABILITY SHOULD BE RESTORED TO THE LICENSING AND REGULATORY PROCESS. LACK OF PREDICTABILITY HAS AN ADVERSE EFFECT ON QUALITY.

NRC QA PROGRAM PLAN

- COMPUTER SOFTWARE
- MRS, ISFSI
- HLW
- NQA-1
- READINESS REVIEWS

NWPA

NRC

INDEPENDENCE OF QA ORGANIZATION

NRC REGULATOR

REACTOR LESSONS IN QA

NQA-1

DOE

LINE MANAGEMENT RESPONSIBLE

DOE RESPONSIBLE FOR PROJECT

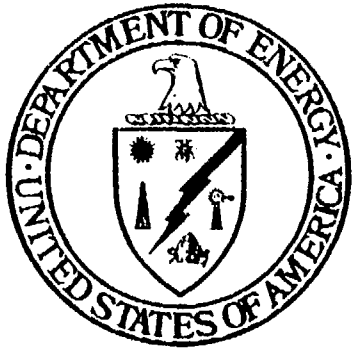
LESSONS APPLICABLE TO NON-REACTOR ACTIVITIES

NQA-1

NWPA

- REACTORS ARE DIFFERENT FROM HLW REPOSITORIES
- SOME QA MEASURES NOT APPLICABLE TO ALL ACTIVITES
- NRC NEEDS TO BECOME MORE FAMILIAR WITH DOE PROGRAMS
- DOE NEEDS TO BECOME MORE FAMILIAR WITH NRC POLICIES
- NRC APPROACH TO QA BEING MODIFIED AS A RESULT OF FORD STUDY
- SRP A BASELINE DOCUMENT TO BEGIN PROCESS
- UNIFIED NRC APPROACH
- EVOLUTION
- OPENNESS
- COMMUNICATION

ATTACHMENT 6



U.S. DEPARTMENT
OF ENERGY

BASALT WASTE ISOLATION PROJECT OFFICE

DEPARTMENT OF ENERGY
NUCLEAR REGULATORY COMMISSION

QUALITY ASSURANCE MEETING

DECEMBER 10-12, 1984

RICHLAND, WASHINGTON

AGENDA

DOE/NRC QUALITY ASSURANCE MEETING
BASALT WASTE ISOLATION PROJECT
DECEMBER 10-12, 1984
HOLIDAY INN
1515 GEORGE WASHINGTON WAY, RICHLAND, WASHINGTON

December 10, 1984

8:15 a.m.	DOE Introduction and Welcome	DOE
8:30	NRC Introduction and Discussion	NRC
9:30	Overview - BWIP Quality Assurance	DOE
12:00 noon	Lunch	
1:00 p.m.	Overview - Rockwell Quality Assurance Program for BWIP	Rockwell
2:00	BWIP Management Systems and Controls	Rockwell
4:00	Rockwell QA/Management Systems	Rockwell
5:00	Adjourn	

AGENDA

DOE/NRC QUALITY ASSURANCE MEETING
BASALT WASTE ISOLATION PROJECT
DECEMBER 10-12, 1984
HOLIDAY INN
1515 GEORGE WASHINGTON WAY, RICHLAND, WASHINGTON

December 11, 1984

8:15 a.m.	Review and Discuss Project Office Quality Assurance Plan	DOE
9:30	Review and Discuss Implementation of BWIP Management Systems and Controls	Rockwell
11:00	Questions, Answers, Comments	All
12:00 noon	Lunch	
1:00 p.m.	Exit Meeting Preparation	All
3:00	Exit Meeting (Reconvene)	All
4:30	Adjourn	

December 12, 1984

8:00 a.m.	Field Tour - Depart
12:00 noon	Return to Richland End of Meeting and Tour

PROJECT OFFICE QUALITY ASSURANCE PLAN

- REVIEW QA PLAN CONTENT
- DISCUSS ISSUES RELATIVE TO NRC REVIEW PLAN
- IDENTIFY IMPLEMENTATION ACTIONS

DECEMBER 11, 1984

QUALITY ASSURANCE MANUAL

SECTION I - QUALITY ASSURANCE PLAN

SECITON II - QUALITY ASSURANCE PLAN INDEX

SECTION III - PROJECT MANAGEMENT PROCEDURES

SECTION I - QUALITY ASSURANCE PLAN

TABLE OF CONTENTS

ORGANIZATION

- DELEGATIONS TO PROJECT PARTICIPANTS
- PROJECT OFFICE VS QUALITY ASSURANCE ORGANIZATION RESPONSIBILITIES
- REVIEW PLAN DISCUSSION
  - IDENTIFICATION OF ITEMS AND ACTIVITIES IMPORTANT TO SAFETY AND WASTE ISOLATION
  - LINE VERSUS STAFF RESPONSIBILITY FOR QUALITY ASSURANCE
  - PERSONNEL PERFORMING VERIFICATION ACTIVITIES
- IMPLEMENTING PROJECT MANAGEMENT PROCEDURES
  - 1.2 QA MANUAL PREPARATION AND MAINTENANCE
  - 6.2 STOP WORK

BWIP QA PROGRAM MATRIX

	DOE-RL	TECHNICAL MANAGER	CONST MANAGER	ARCHITECT ENGINEER
1. ORGANIZATION	X	X	X	X
2. QA PROGRAM	X	X	X	X
3. DESIGN CONTROL	X	X	X	X
4. PROCUREMENT DOCUMENT CONTROL	X	X	X	-
5. INSTRUCTIONS, PROCEDURES AND DRAWINGS	X	X	X	X
6. DOCUMENT CONTROL	X	X	X	X
7. CONTROL OF PURCHASED ITEMS & SERVICES	X	X	X	X
8. IDENTIFICATION AND CONTROL OF ITEMS	D	X	X	-
9. CONTROL OF PROCESSES	D	X	X	-
10. INSPECTION	D	X	X	-
11. TEST CONTROL	D	X	X	-
12. CONTROL OF MEASURING AND TEST EQUIPMENT	D	X	X	-
13. HANDLING, STORAGE AND SHIPPING	D	X	X	-
14. INSPECTION, TEST AND OPERATING STATUS	D	X	X	-
15. CONTROL OF NONCONFORMING ITEMS	X	X	X	-
16. CORRECTIVE ACTION	X	X	X	X
17. QUALITY ASSURANCE RECORDS	X	X	X	X
18. AUDITS	X	X	X	X

KEY TO IMPLEMENTATION RESPONSIBILITIES:

X = RESPONSIBLE D = DELEGATED - = NOT APPLICABLE

PROGRAM

- **REVIEW PLAN DISCUSSION**

  ITEMS AND ACTIVITIES IMPORTANT TO SAFETY OR WASTE ISOLATION

  GRADED QUALITY ASSURANCE

- **IMPLEMENTING PROJECT MANAGEMENT PROCEDURES**

  1.1 PROJECT MANAGEMENT PROCEDURE DEVELOPMENT

  1.2 QA MANUAL PREPARATION AND MAINTENANCE

  1.3 QA PROGRAM ASSESSMENT

  7.1 QUALITY ASSURANCE TRAINING

DESIGN CONTROL

- DISCIPLINED PROJECT MANAGEMENT SYSTEMS AND CONTROLS ARE A KEY TO DESIGN CONTROL
- REVIEW PLAN DISCUSSION

  PROCESS FOR CONTROL OF DESIGN SITE CHARACTERIZATION WILL BE IN PLACE PRIOR TO 10/85

  PEER REVIEWS IN USE

- IMPLEMENTING PROJECT MANAGEMENT PROCEDURES

  5.1 CHANGE CONTROL

  5.2 DOCUMENT CONTROL

  5.3 DESIGN REVIEWS

  5.4 DESIGN CONTROL - HARDWARE

  5.5 DESIGN CONTROL - SITE CHARACTERZATION

  3.1 DOCUMENT REVIEWS

  5.6 PEER REVIEWS

DESIGN AND SITE CHARACTERIZATION CONTROL

- OCRM PROGRAM TECHNICAL REQUIREMENTS BASELINED AND CONTROLLED BY DOE HQ - GRD
- SITE SPECIFIC TECHNICAL BASELINE WRITTEN FOR BWIP AND APPROVED BY DOE HQ
- FUNCTIONAL DESIGN CRITERIA/TECHNICAL PLANS BASIS FOR FACILITY EQUIPMENT DESIGNS
- DESIGN/PEER REVIEWS AT REGULAR INTERVALS
  - COMMENTS DOCUMENTED AND DISPOSITION OF COMMENTS AGREED TO PRIOR TO IMPLEMENTATION
- CHANGE CONTROL PROCEDURES ESTABLISHED
- QA AUDITS OF THE DESIGN/SITE CHARACTERIZATION PROCESS
- PROJECT MANAGEMENT PLAN - CLEARLY ESTABLISHES ROLES AND RESPONSIBILITIES OF ALL ORGANIZATIONS

PROCUREMENT DOCUMENT CONTROL

- **REVIEW PLAN DISCUSSION**

  NONE

- **IMPLEMENTING PROJECT MANAGEMENT PROCEDURE**

  4.1 PROCUREMENT DOCUMENT REVIEWS AND APPROVALS

INSTRUCTIONS, PROCEDURES AND DRAWINGS

- **REVIEW PLAN DISCUSSION**

  NONE

- **IMPLEMENTING PROJECT MANAGEMENT PROCEDURES**

  1.1 PROJECT MANAGEMENT PROCEDURE DEVELOPMENT

  1.2 QA MANUAL PREPARATION AND MAINTENANCE

DOCUMENT CONTROL

- **REVIEW PLAN DISCUSSION**

  NONE

- **IMPLEMENTING PROJECT MANAGEMENT PROCEDURES**

  1.2 QA MANUAL PREPARATION AND MAINTENANCE

  3.1 DOCUMENT REVIEWS

  3.2 CORRESPONDENCE CONTROL SYSTEM

  5.2 DOCUMENT CONTROL

CONTROL OF PURCHASED ITEMS AND SERVICES

- **REVIEW PLAN DISCUSSION**
  - DELEGATIONS
  - VERIFICATION OF SERVICES
- **IMPLEMENTING PROJECT MANAGEMENT PROCEDURES**
  - 2.1 - 2.4 AUDIT SERIES (4 PROCEDURES)
  - 2.5 SURVEILLANCE
  - 2.6 READINESS REVIEWS
  - 3.1 DOCUMENT REVIEWS

QA PROGRAM ELEMENTS DELEGATED TO OTHERS FOR IMPLEMENTATION

- SAMPLE AND HARDWARE IDENTIFICATION AND CONTROL
- SPECIAL PROCESSES
- INSPECTION
- TEST CONTROL
- MEASURING AND TEST EQUIPMENT
- SAMPLE HANDLING, STORAGE AND SHIPPING
- INSPECTION, TEST AND OPERATING STATUS

NONCONFORMANCES

- **REVIEW PLAN DISCUSSION**

  DELEGATIONS TO CONTRACTORS FOR CONTROL OF NONCONFORMING ITEMS

  SIGNIFICANT PROJECT NONCONFORMANCES REQUIRE DOE APPROVAL

- **IMPLEMENTING PROJECT MANAGEMENT PROCEDURE**

  8.1 NONCONFORMANCES

CORRECTIVE ACTION

- **REVIEW PLAN DISCUSSION**

  FOLLOWUP TO A CORRECTIVE ACTION PERFORMED BY LINE AND/OR QA ORGANIZATIONS

- **IMPLEMENTING PROJECT MANAGEMENT PROCEDURE**

  6.1 CORRECTIVE ACTION

QUALITY ASSURANCE RECORDS

- **REVIEW PLAN DISCUSSION**
  - DELEGATION TO ROCKWELL TO OPERATE BASALT RECORDS MANAGEMENT CENTER
  - DOE RECORDS
- **IMPLEMENTING PROJECT MANAGEMENT PROCEDURE**
  - 9.1 PROJECT QUALITY RECORDS

AUDITS

- **REVIEW PLAN DISCUSSION**

  NONE

- **IMPLEMENTING PROJECT MANAGEMENT PROCEDURES**

  2.1 VERIFICATION PLANNING

  2.2 AUDITOR QUALIFICATIONS

  2.3 INTERNAL AUDITS

  2.4 EXERNAL AUDITS

SUMMARY

QA PLAN PROJECT OFFICE APPROVED	AUGUST 1984
QA MANUAL ISSUED AS CONTROLLED DOCUMENT	FEBRUARY 1985
IMPLEMENTING PROCEDURES	JUNE 1985
PROJECT OFFICE QA PROGRAM FULLY IMPLEMENTED	OCTOBER 1985

PROJECT MANAGEMENT PROCEDURES

TABLE OF CONTENTS

0 = Issued for Implementation D = Drafted and Being Reviewed - = To be Drafted

PROJECT MANAGEMENT PROCEDURES

TABLE OF CONTENTS (CONT)

0 = Issued for Implementation D = Drafted and Being Reviewed - = To be Drafted

BASALT WASTE ISOLATION PROJECT

CONTENT and CONTROL

of

TECHNICAL WORK DEFINITION DOCUMENTATION

O U T L I N E

TECHNICAL WORK FLOW

- INFORMATION & DATA NEEDS ANALYSIS DOCUMENT
- REGULATORY CRITERIA & ISSUES CORRELATION DOCUMENT
- SCIENCE PLAN(S)
- TEST FACILITY OPERATING PLAN(S)
- DATA ACQUISITION RECORD REPORT
- DATA EVALUATION REPORT

EXAMPLE TECHNICAL PROCEDURES

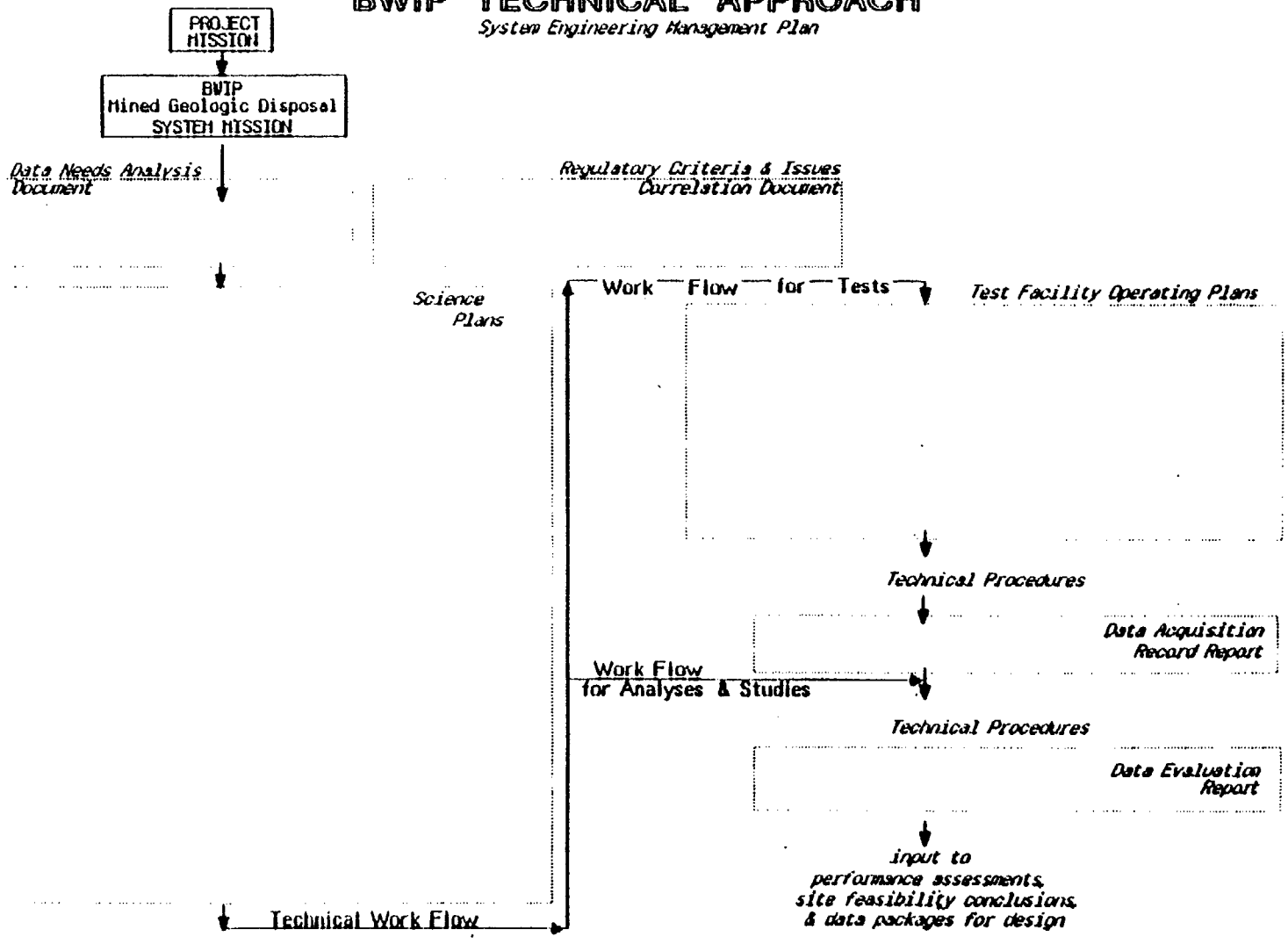
- FIELD TEST PROCEDURE
- LABORATORY TEST PROCEDURE

CONTROL POINTS

- WORK SHOPS
- PEER REVIEWS
- DESIGN & SAFETY REVIEWS
- TEST INSPECTION & HOLD POINTS
- READINESS REVIEWS

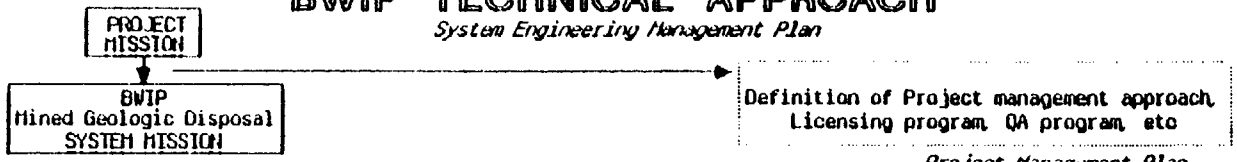
BWIP TECHNICAL APPROACH

System Engineering Management Plan



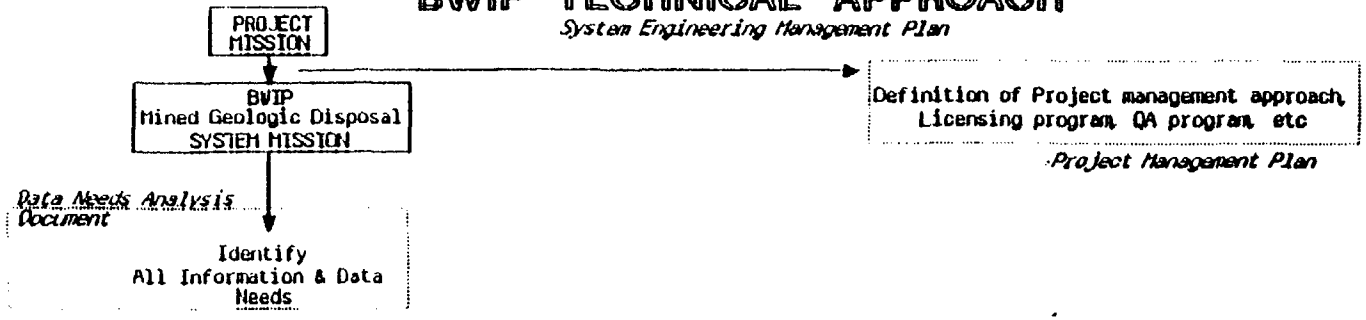
BWIP TECHNICAL APPROACH

System Engineering Management Plan

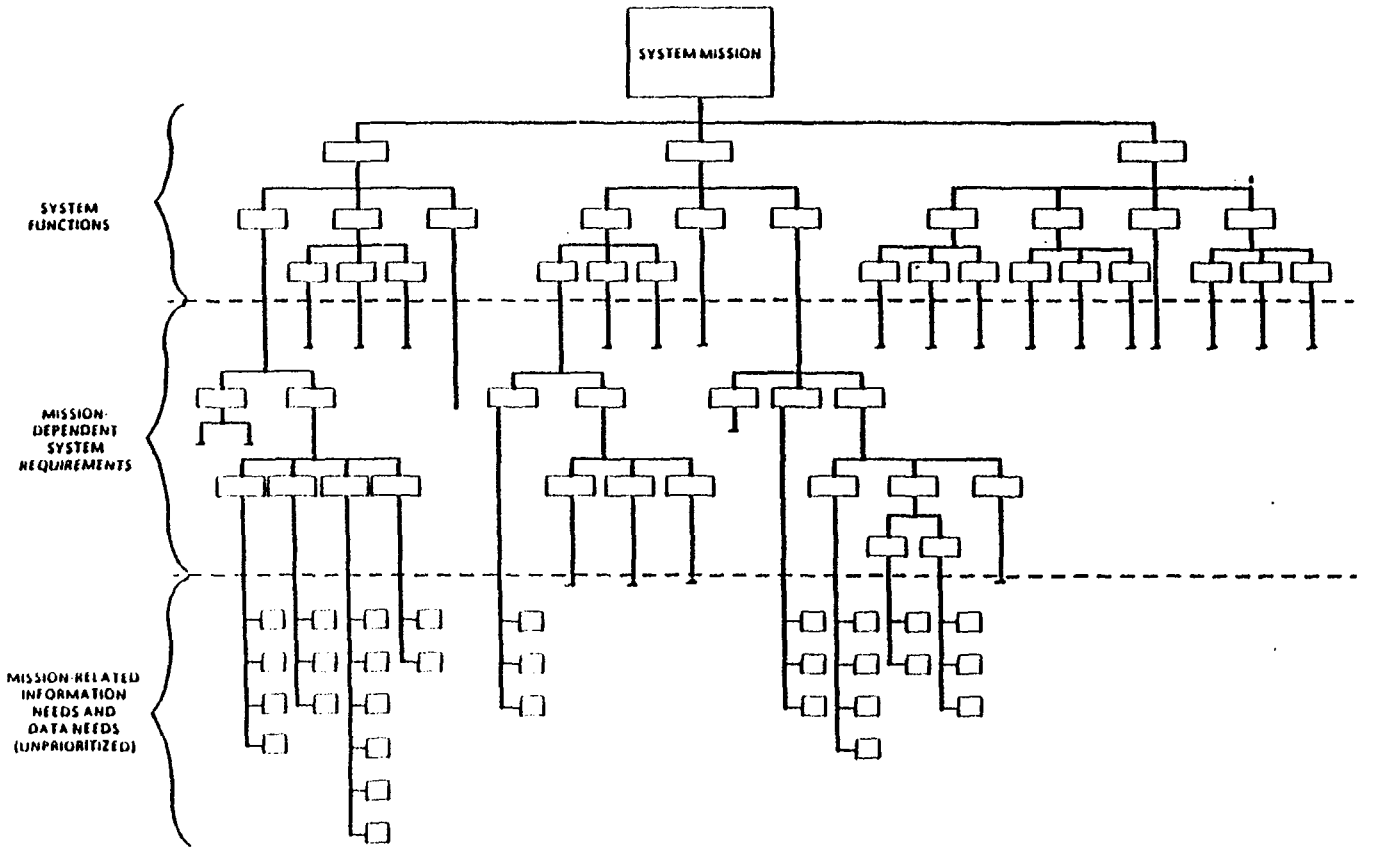


BWIP TECHNICAL APPROACH

System Engineering Management Plan

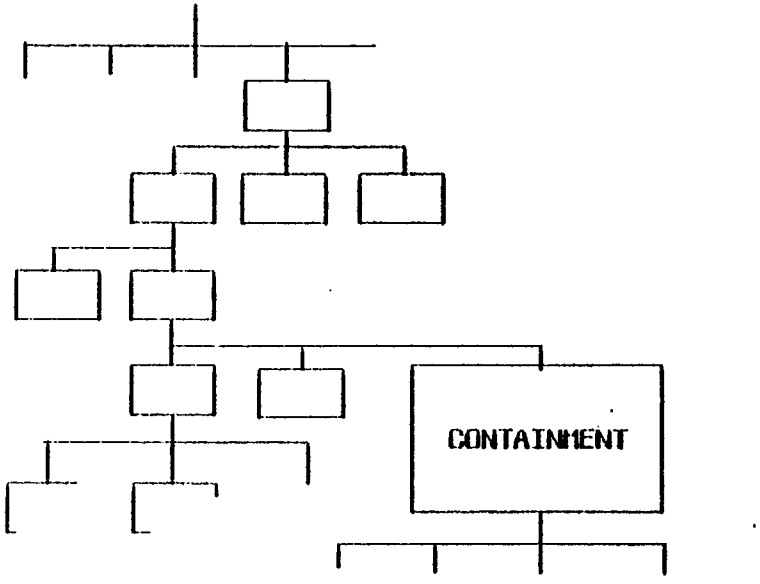


STRUCTURE OF SYSTEM REQUIREMENTS TREE



PS84 2005 8

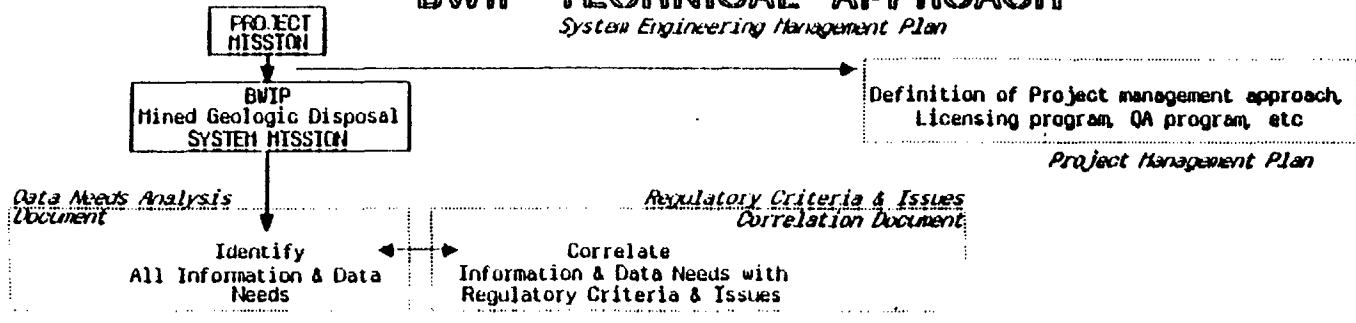
INFORMATION and DATA NEEDS IDENTIFICATION



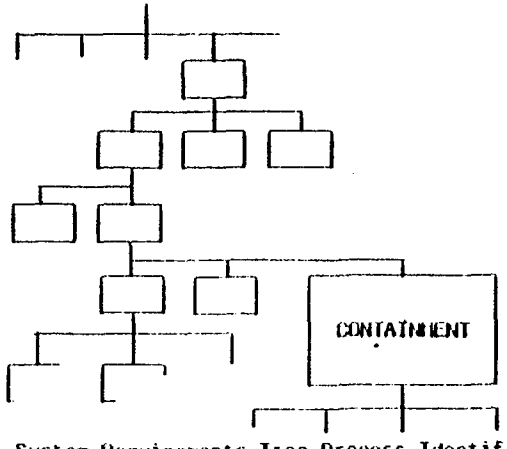
System Requirements Tree Process Identifies "Requirement" for the Mined Geologic Disposal System to Provide Containment

BWIP TECHNICAL APPROACH

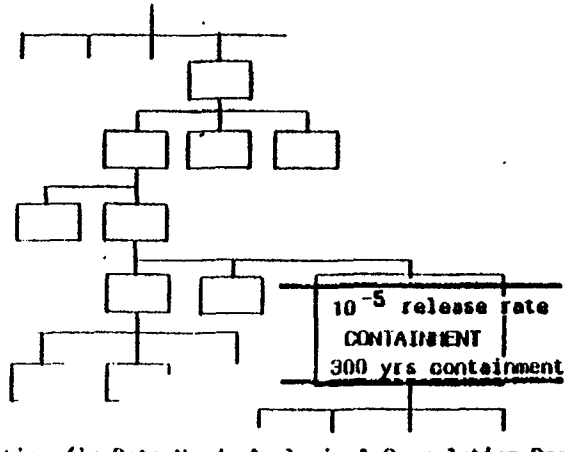
System Engineering Management Plan



INFORMATION & DATA NEEDS IDENTIFICATION
and
REGULATORY CRITERIA & ISSUES CORRELATION

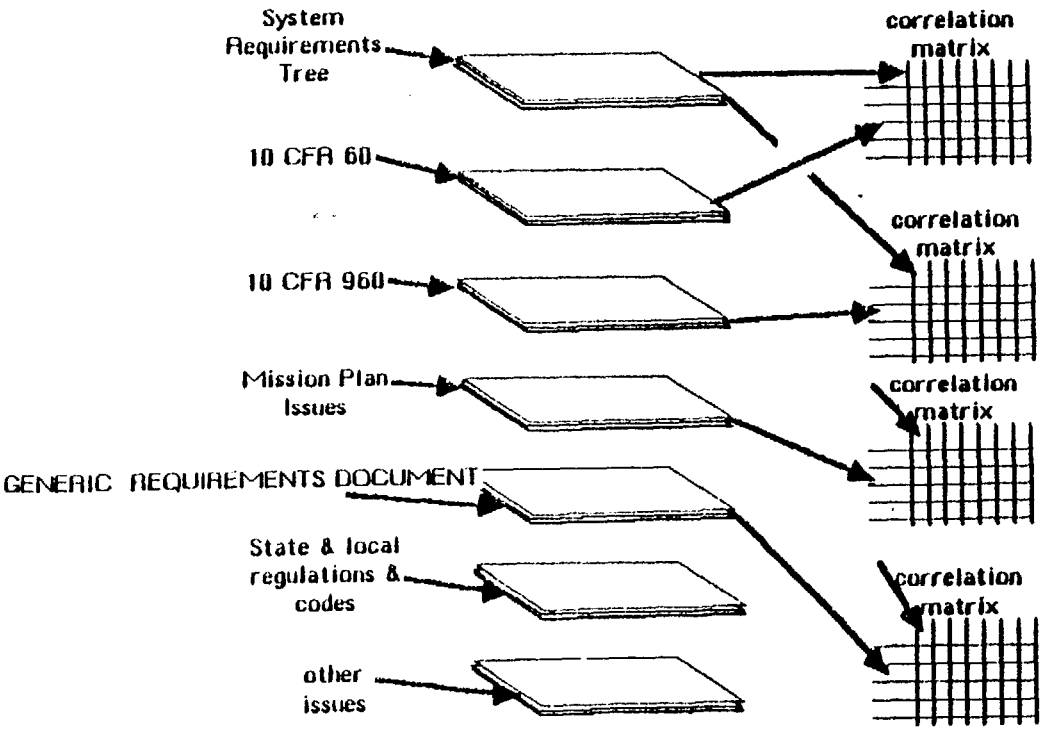


System Requirements Tree Process Identifies "Requirement" for the Mined Geologic Disposal System to Provide Containment



Correlation (in Data Needs Analysis & Correlation Document) with All Regulatory Criteria Establishes Most Stringent minima/maxima Constraints (floor and/or ceiling)

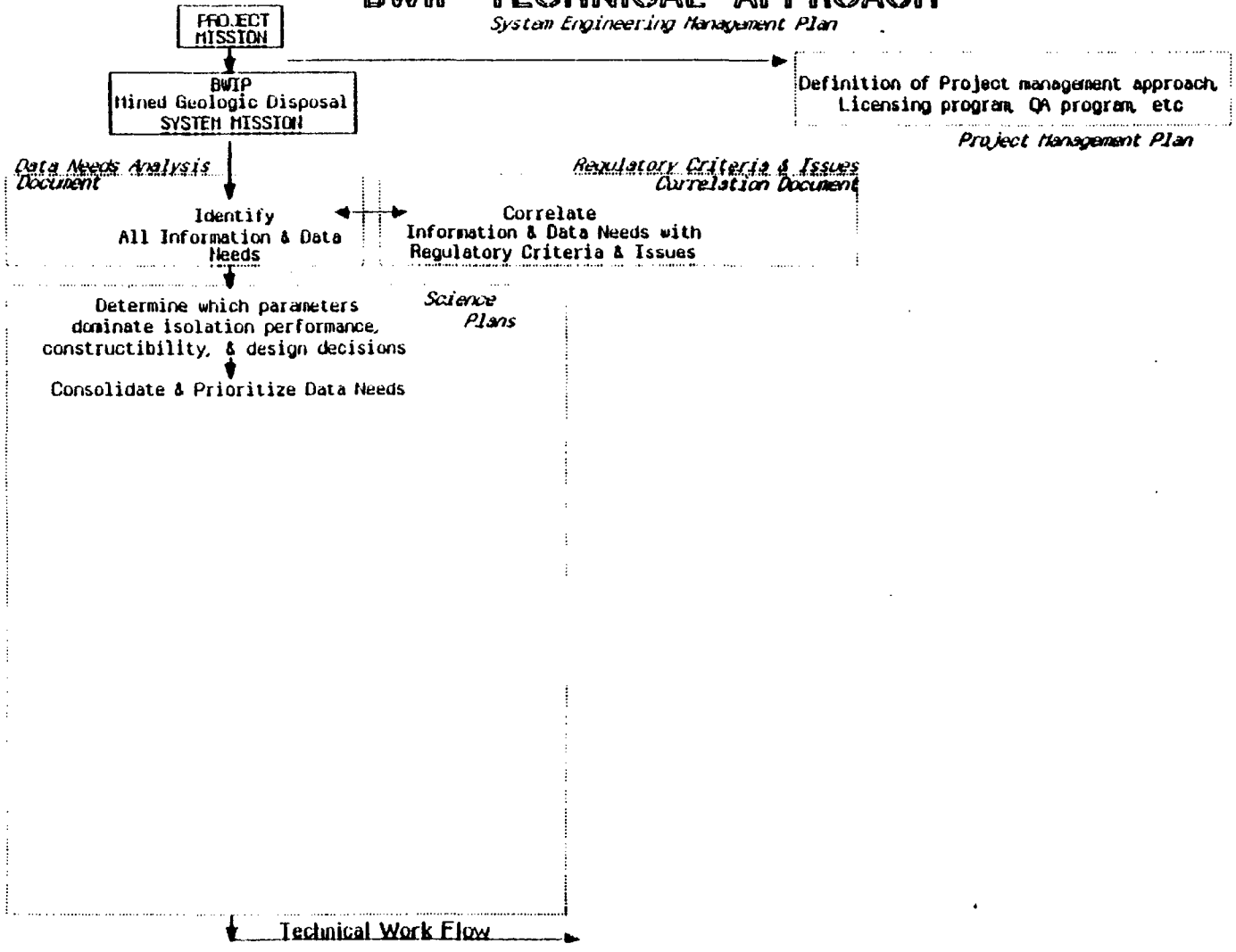
content of the REGULATORY CRITERIA & ISSUES CORRELATION DOCUMENT



THE SUBSECTION ADDRESSING EACH REGULATION CONTAINS:
- *SITE-SPECIFIC INTERPRETATIONS*
- *RESOLUTIONS OF CONFLICT*

BWIP TECHNICAL APPROACH

System Engineering Management Plan



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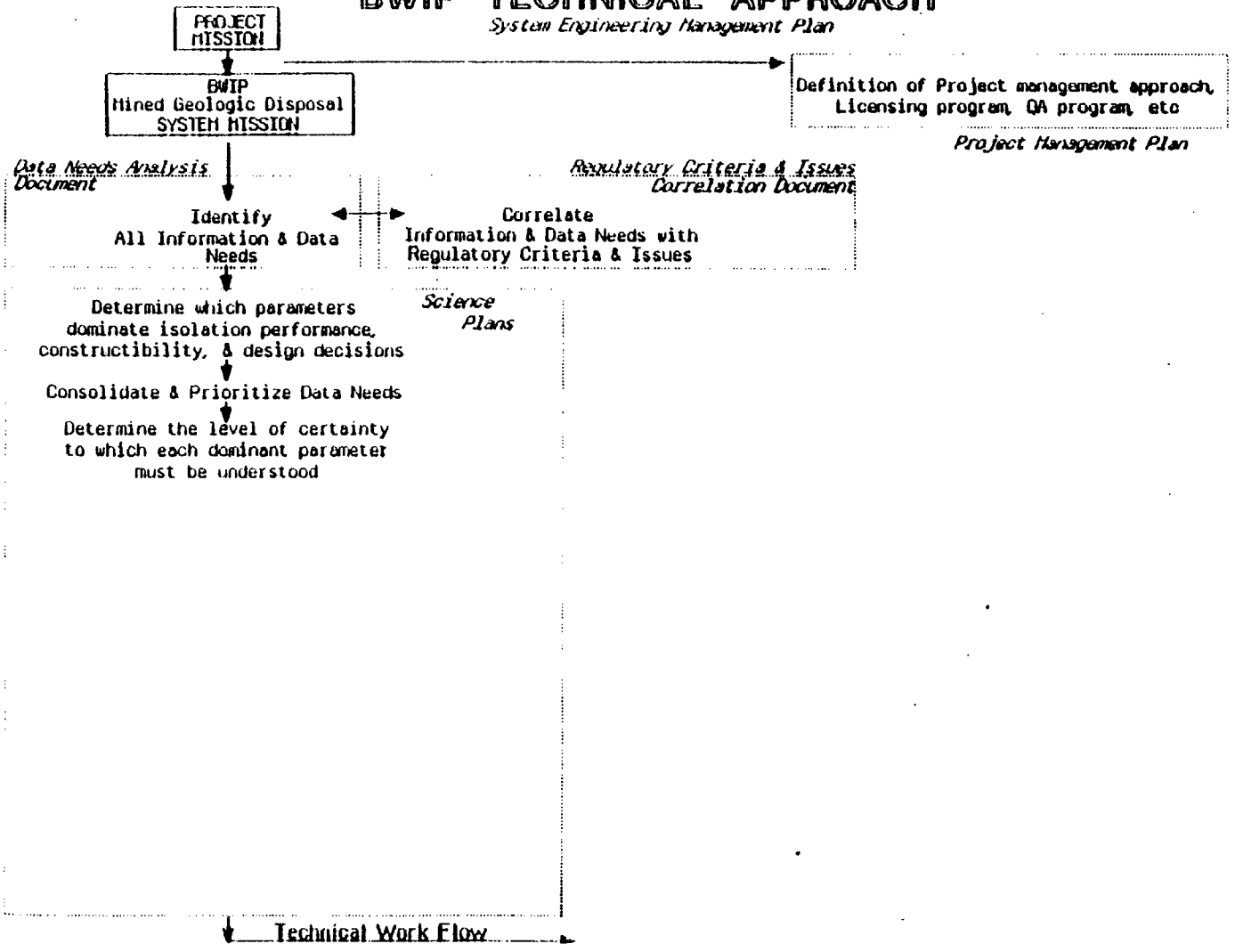
System Engineering Management Plan



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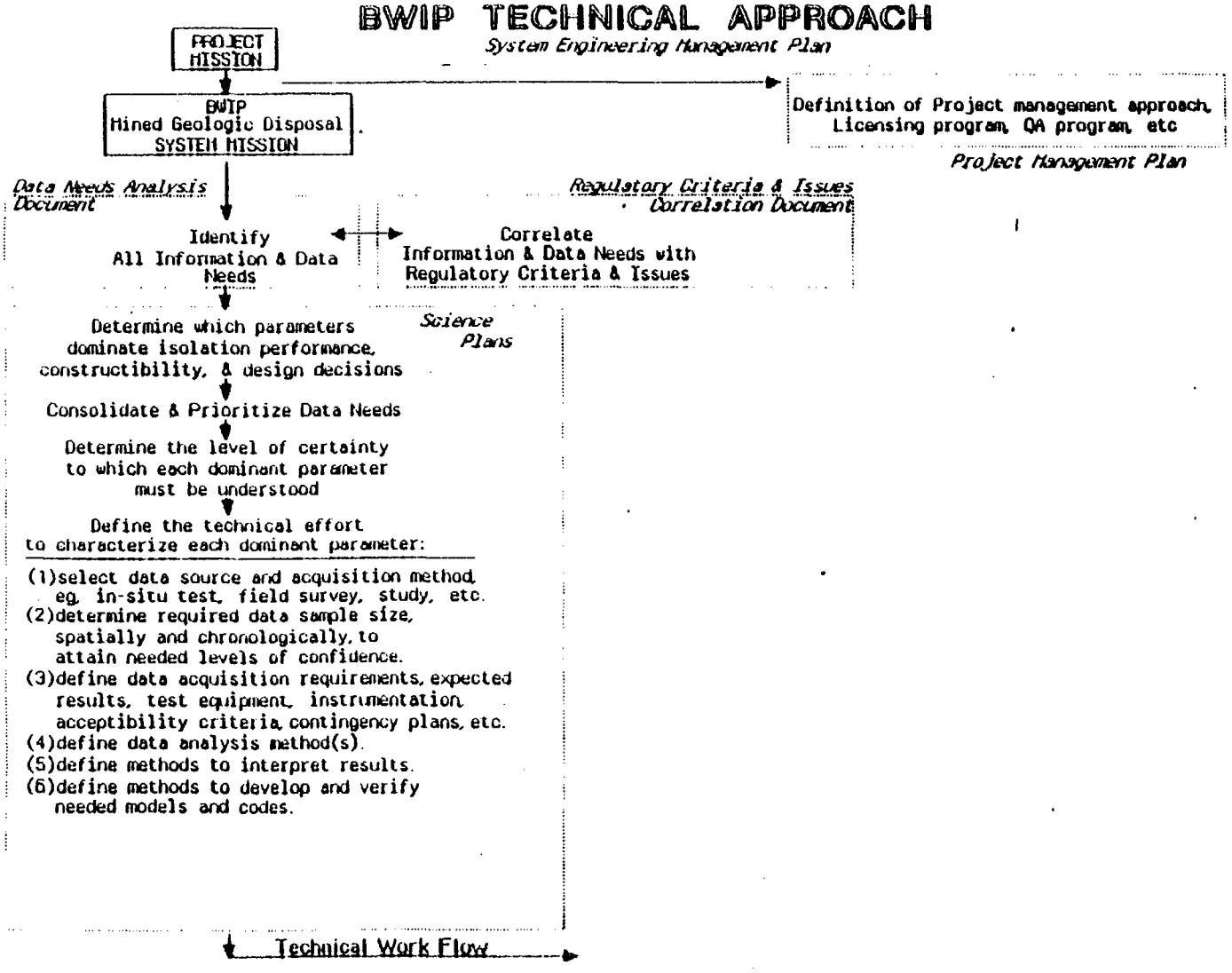

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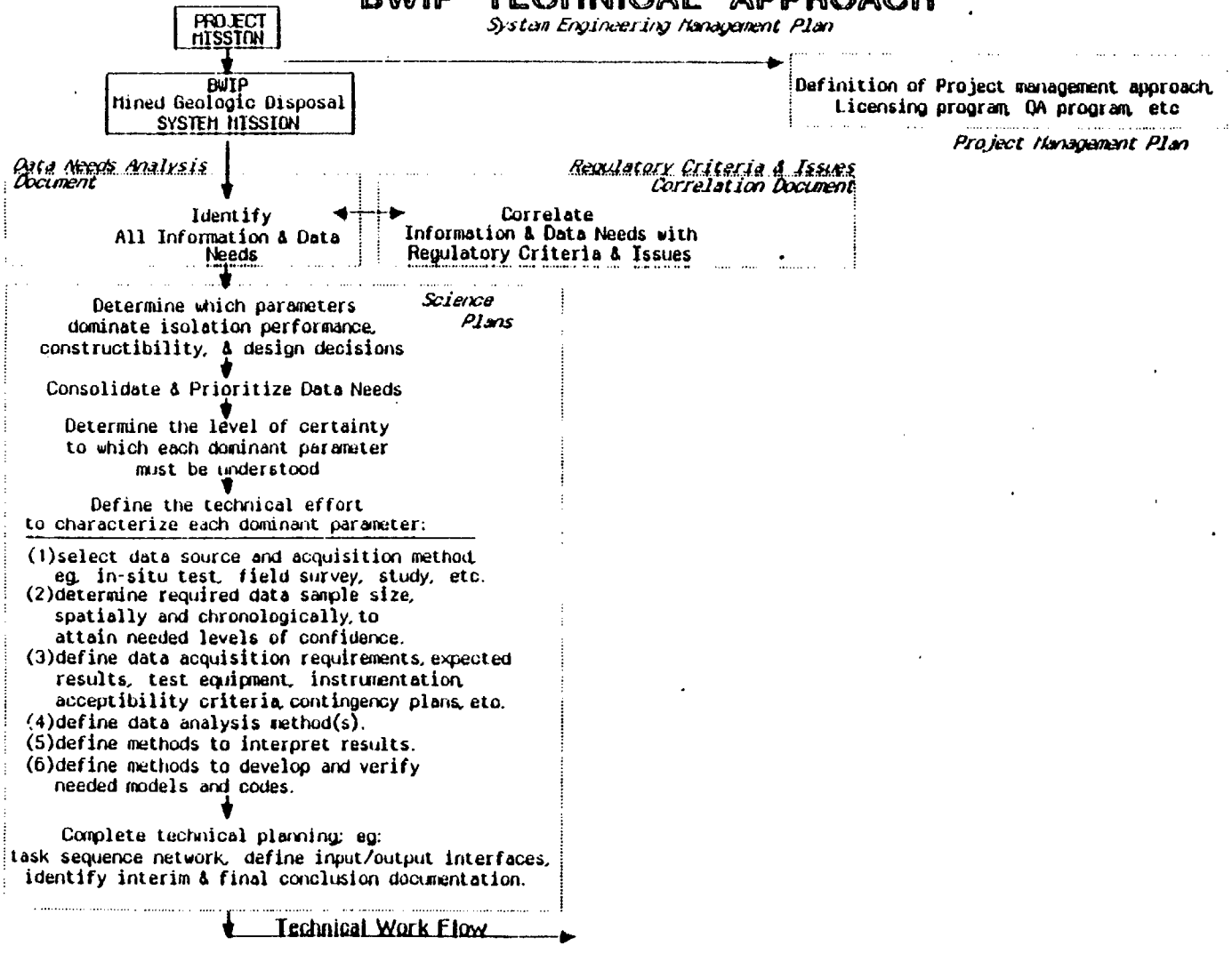

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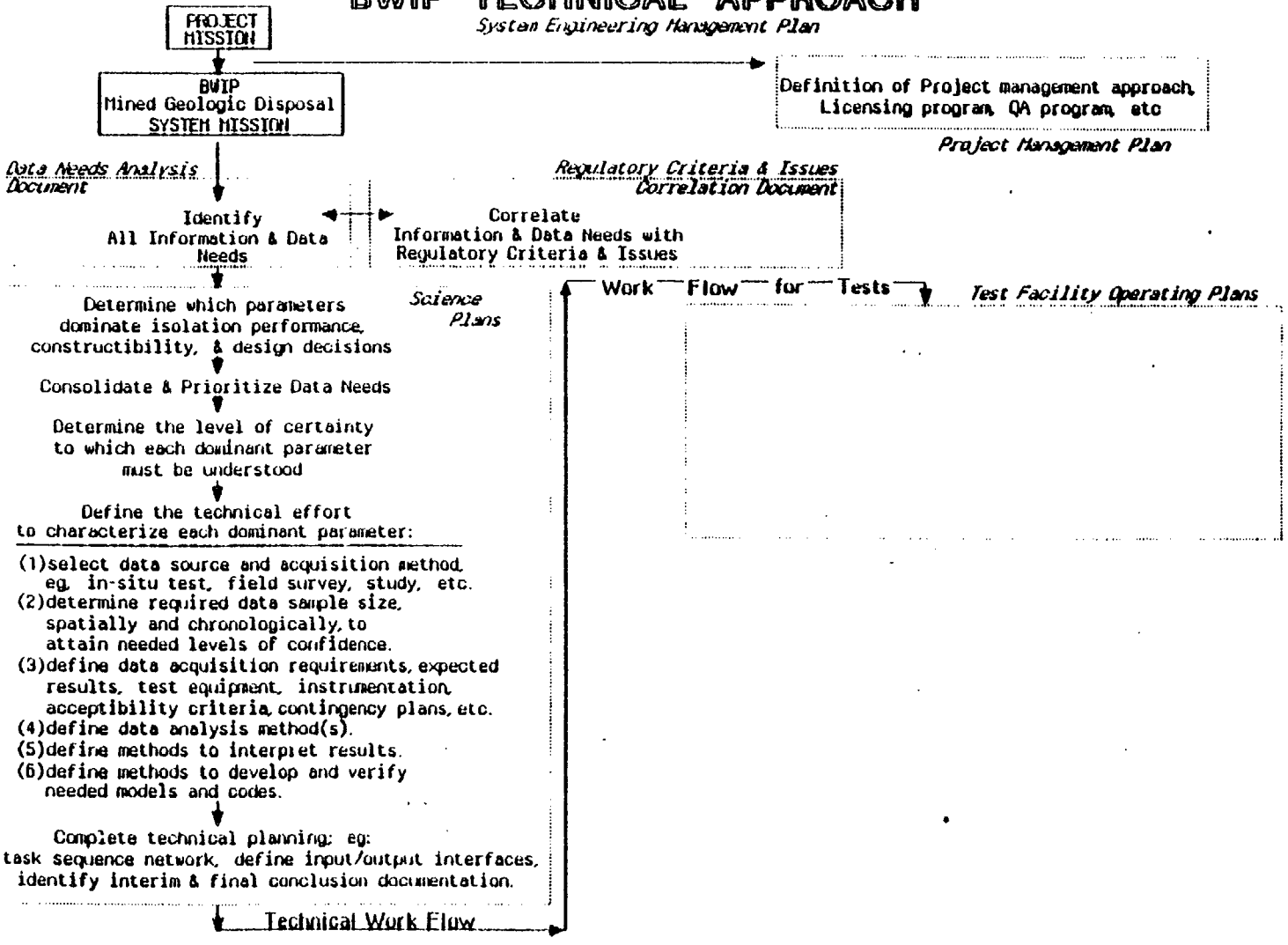

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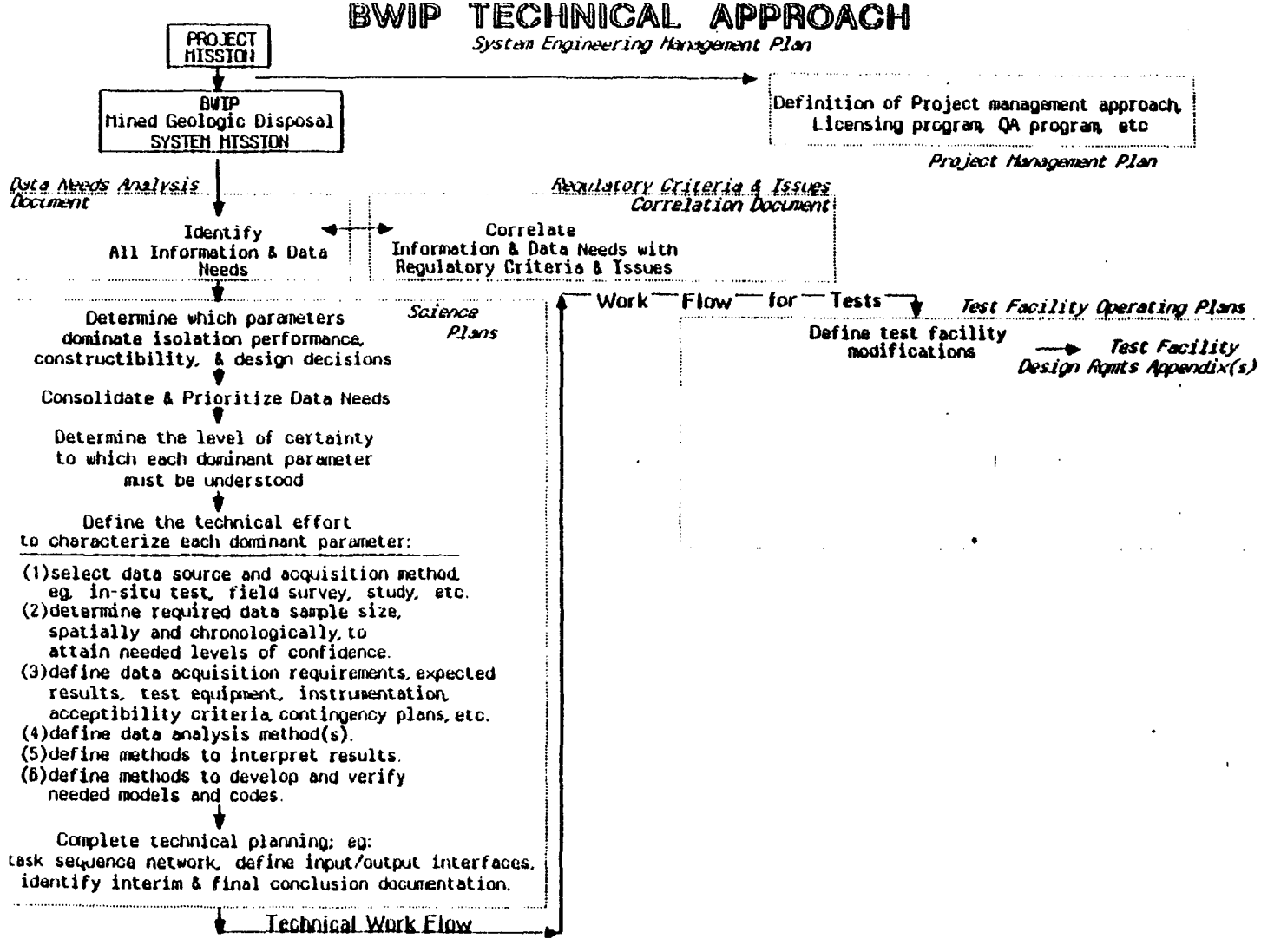

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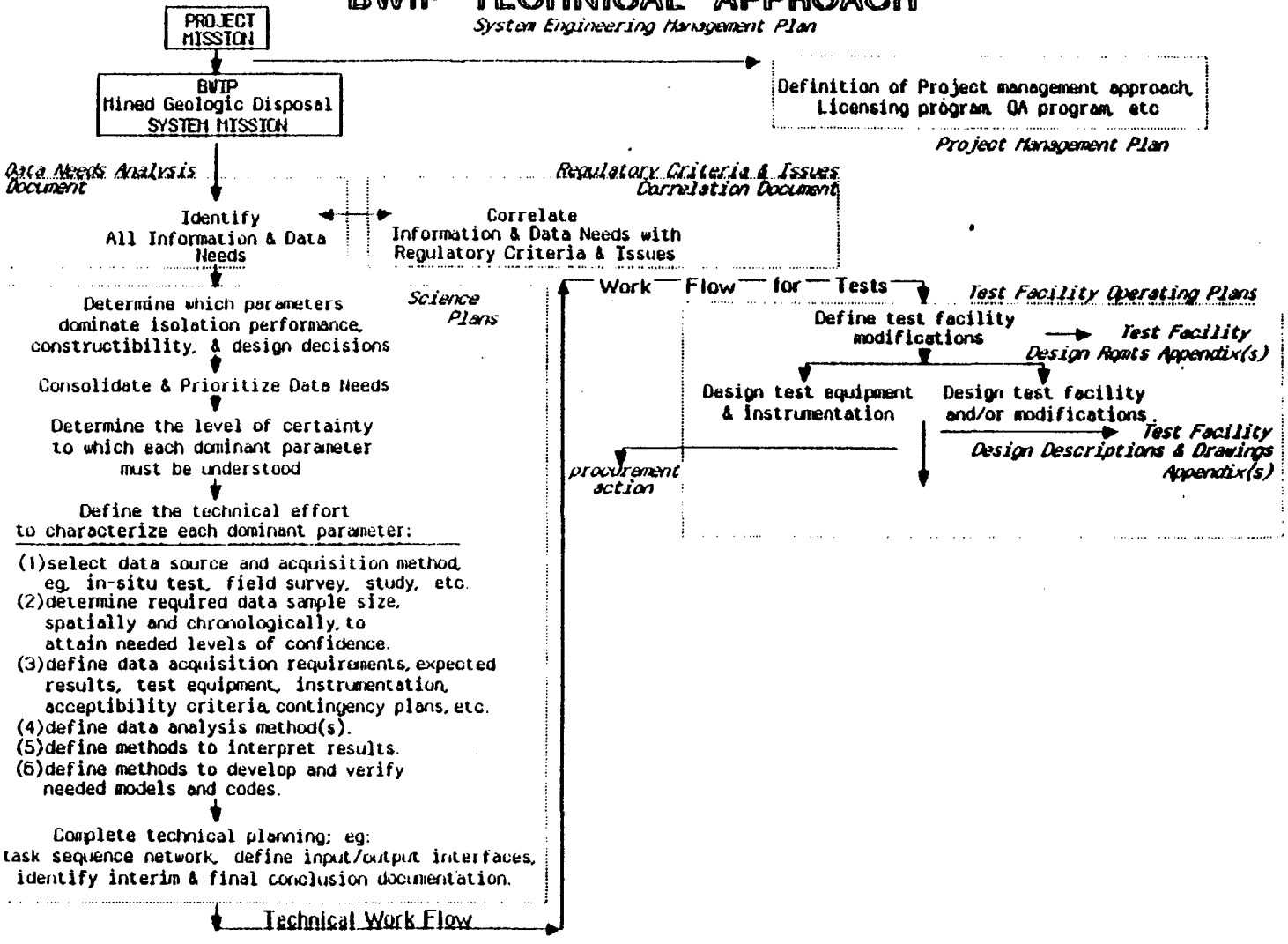

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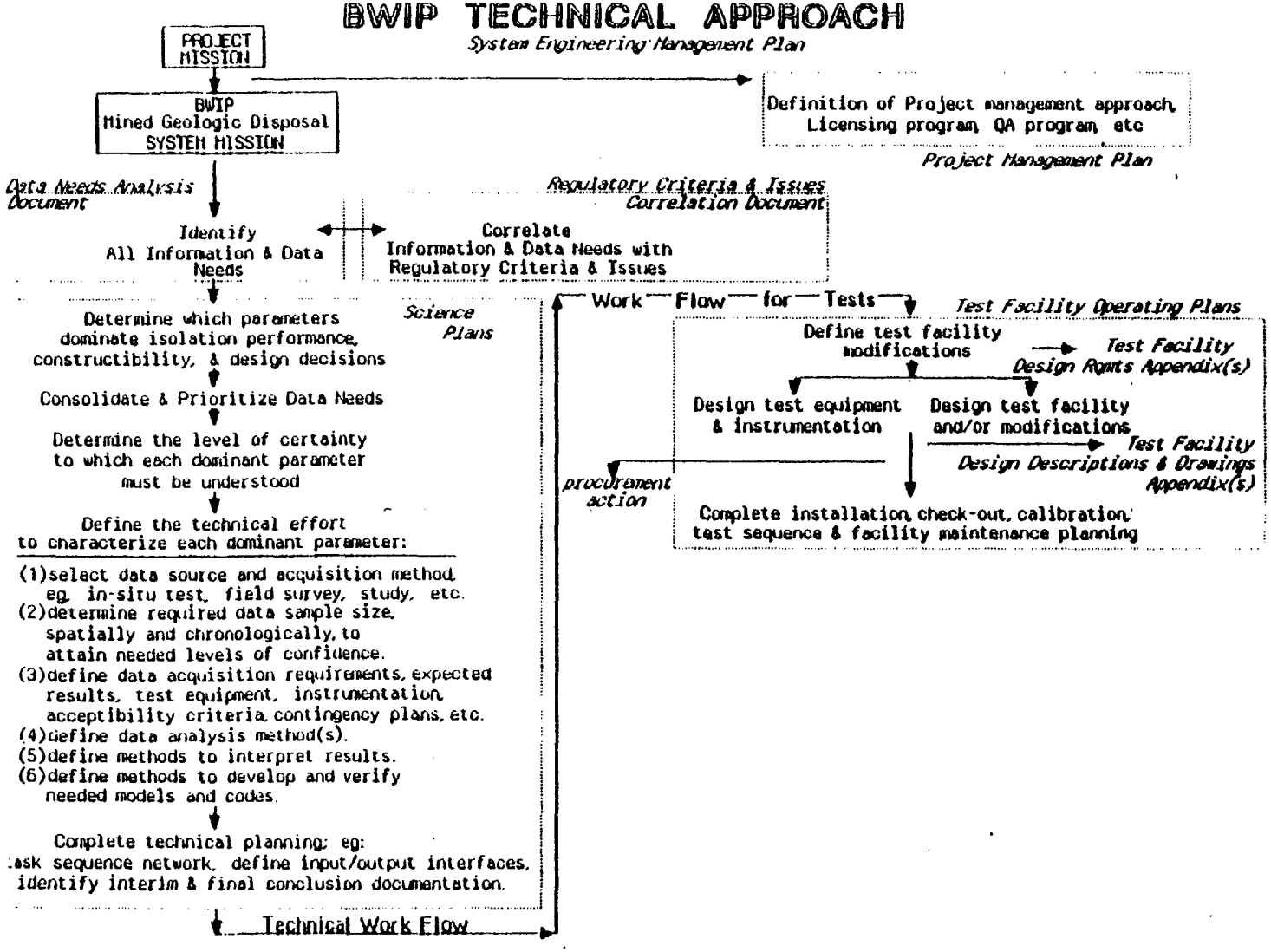


Rockwell International
Rockwell Hanford Operations
Energy Systems Group

RHO-BWI-MA-4
Change Notice No. 053
BOP No. C-4.13
Date 01/26/84
Page 1 of 1
Supersedes: N/A
Approved By:
M. F. Nicol, Manager
BWIP QA

BASALT OPERATING PROCEDURES CHANGE NOTICE

Subject	BOP C-4.13, SCANNING TRANSMISSION ELECTRON MICROSCOPE (STEM)

Make the following pen-and-ink changes to the subject procedure:

- Page 5 of 14, Section 6.1.3, Item (3) Lines 1 and 2, replace the first sentence with the following: "Using a commercially prepared TEM mesh grid bearing a carbon film, transfer..."
- Page 12 of 14, Section 8.0, Line 9, line out reference: "BOP C-4.20, Preparation of Carbon Films for TEM Grids"

FILE THIS CHANGE NOTICE IN FRONT OF BOP C-4.13 UNTIL NEXT REVISION.

BASALT OPERATING PROCEDURE

RESPONSIBLE ORGANIZATION: Engineered Barriers AUTHOR: C. C. Allen

Approved By	Subject	Classification
GB ok 12/9/83	SCANNING TRANSMISSION ELECTRON MICROSCOPE (STEM)	SCIENTIFIC TECHNOLOGIES

1.0 OBJECTIVE

This procedure describes methods, materials, equipment, and special conditions required to prepare samples and safely operate the JEOL 200 CX scanning transmission electron microscope (STEM) laboratory in support of the Basalt Waste Isolation Project (BWIP). This procedure provides the means for obtaining verifiable, reproducible, documented test data as required by ANSI/ASME NQA-1.

2.0 APPLICABILITY

This procedure applies to all employees trained and authorized to operate the equipment for the Materials Testing Group (MTG), Engineered Barrier Department (EBD). This equipment is located in Room 212 of the 2101-M Building, 200 East Area. This procedure does not qualify untrained personnel in the techniques of sampling, preparing, and testing of samples or calculating or interpreting results.

3.0 DEFINITIONS

3.1 TRANSMISSION ELECTRON MICROSCOPY (TEM)

The TEM describes a mode whereby a diffuse beam of electrons is allowed to impinge on a sample, with the image of the transmitted electrons formed on a fluorescent screen.

3.2 SCANNING TRANSMISSION ELECTRON MICROSCOPY (STEM)

The STEM describes a mode whereby the electron lens configuration permits scanning with a focused electron beam over the sample, with the transmitted electrons being used to form an image on a cathode ray tube (CRT).

NOTE: This procedure has been completely revised.

3.3 SCANNING ELECTRON MICROSCOPY (SEM)

The SEM describes a mode whereby a focused electron beam is scanned across the surface of the sample, with the resulting secondary electrons being used to form an image on a CRT.

3.4 SELECTED AREA ELECTRON DIFFRACTION (SAED)

The SAED describes a mode in which electron beams diffracted from a small area of the sample form a pattern on a fluorescent screen.

3.5 ENERGY DISPERSIVE SPECTROSCOPY (EDS)

The EDS describes a mode in which characteristic X-rays produced by interaction of the electron beam with the sample are sampled and processed to allow identification of the sample's major elements.

3.6 TEM GRID (MESH OR SLOTTED)

A TEM grid is a 3-mm-diameter disk of Cu, Ni, or Be, having a mesh insert in a square pattern or a single slot. Grids are used for sample support in the electron microscope.

4.0 RESPONSIBILITIES

4.1 MANAGER, ENGINEERED BARRIERS DEPARTMENT (EBD)

The Manager, EBD, is responsible for overall testing and experiments performed with the 200 CX. He is also responsible for approving this procedure.

4.2 MANAGER, MATERIALS TESTING GROUP (MTG)

The Manager, MTG, is responsible for maintenance of laboratory equipment and for the safety of personnel working in the laboratory. He is responsible for training of personnel in safety and emergency procedures and for evaluating the qualifications of persons to receive authorization to operate the 200 CX. The MTG Manager, under direction of the EBD Manager, is responsible for use and planning of tests performed with the 200 CX.

4.3 COGNIZANT SCIENTIST

Operators of the 200 CX are authorized by the Manager, MTG, upon demonstration of scientific education and specialized training that provide a thorough understanding of the uses and capabilities of the instrument and the ability to analyze the data obtained. The cognizant scientist is responsible for using the instrument in a safe and efficient manner, and for planning tests and experiments with the guidance and collaboration of the MTG Manager for the purpose of microcharacterization of solid materials. The cognizant scientist is further responsible to record the data and label and store samples in accordance with procedures in BOP C-4.3 for purposes of traceability. A minimum of 100 hours per year electron beam "hands-on" time is required in order to maintain proficiency on the 200 CX.

5.0 SAFETY

5.1 SAFETY COGNIZANCE

In the performance of work and in general conduct, laboratory personnel are to exhibit full cognizance of and respect for the safety hazards that exist with regard to laboratory equipment and materials. Safety regulations specified in RHO-MA-221 also apply and must be observed, in addition to Rockwell Master Safety Rules and specific safety regulations for this work posted in each laboratory. Entrance to the laboratory is strictly controlled, in accordance with posted visitor access signs. All work is to be completed in accordance with BOP C-4.2.

5.2 EMERGENCY SHUTDOWN

In case of emergency, the 200 CX can be immediately and safely shut down by pushing the red "Emergency Stop" button on the left side of the operator's console. Power to all instruments in the room can be turned off at the "S.T.E.M. Main Power Supply" circuit breaker on the wall to the operator's left (Figure 1).

5.3 FIRE

The 200 CX laboratory and the sample preparation laboratory are protected by automatic water sprinkler systems. Portable Halon and CO_2 fire extinguishers are located in the 200 CX laboratory to the right of

the operator's console (Figure 1). A multipurpose dry chemical fire extinguisher is located in the sample preparation laboratory next to the door into the 200 CX laboratory.

5.4 SPECIFIC SAFETY PRECAUTIONS

Precautions applying to specific portions of this procedure are detailed in Section 6.0 below.

6.0 PROCEDURE

6.1 SAMPLE PREPARATION

6.1.1 General Considerations

The 200 CX has the capability to analyze particles or deposits in sizes greater than a few tens of angstroms. Therefore, any dust or chemical residue is a potential contaminant. To preclude dust contamination, all samples should be prepared in the installed laminar flow clean bench, and kept covered in individual petri dishes whenever possible. All tools must be cleaned in a solvent prior to use. The only solvents acceptable for sample preparation are absolute ethanol, electron microscope (EM) grade acetone and ultrapure water. This water is produced by the Sybron/Barnstead filtration system and has a resistance exceeding 11 megohms/cm.

6.1.2 Preparation of Rock for TEM/STEM

(1) Samples are received as petrographic thin sections prepared according to BOP C-4.21. Sections for TEM/STEM should be prepared using Crystalbond cement.

(2) Examine the section in an optical microscope to define an area of interest approximately 3 x 3 mm.

(3) While observing the section in an optical microscope, separate the area of interest by carefully pressing at points around the periphery with a needle-tipped probe. A thin flake of the sample should be detachable from the section.

(4) Remove any adhering Crystalbond by agitating the flake in ethanol in an ultrasonic cleaner.

(5) Attach the sample flake to a TEM slotted grid, using a cement such as Eastman 910. Avoid letting cement flow into the grid slot.

(6) Thin the specimen for TEM/STEM examination using the Gatan Dual Ion Mill. Operating instructions are contained in Chapters 3-4 (pp. 8-15) of the Ion Mill Instruction Manual. Operating experience indicates that a tilt of 10-20°, gun current of 0.5 mAmp and a gun voltage of 5 kV are optimum for basalt samples. Milling time for a 30 um thick basalt sample is 4-8 hours.

NOTE: The ion mill employs two lasers in the autotermination system. Observe all safety precautions for laser use in the operating manual. In particular, do not look at the direct or reflected laser beam or eye damage could result.

(7) Apply a conductive coating of carbon or gold-palladium to the sample. Procedures for use of the Denton DV-502 carbon coater are found on pages 5-9 of the Denton Operating Instructions. A carbon rod with a 1 cm thinned tip produces an optimum coating. A gold-palladium coating can be applied using the Technics Hummer V coater, according to the procedures in the Technics Operating Manual. Coating should be done in the "Auto-Pulse" mode for 1 1/2 - 2 minutes.

NOTE: The carbon coater employs an extremely bright carbon arc. Avoid looking directly at this arc or eye damage could result.

(8) Store the grids in individual plastic petri dishes marked with sample identification codes. Sample identification and control is accomplished according to BOP C-4.3.2.

6.1.3 Preparation of Powdered Material for TEM/STEM

(1) Examine the sample under an optical microscope and select approximately 1 mm^3 of representative material.

(2) Suspend the material in approximately 1 cm^3 of ethanol. This may be done by ultrasonic agitation or, if required, following crushing in a boron carbide mortar and pestle.

CN #05B

(3) Using a commercially-prepared TEM mesh grid, bearing a carbon film, ~~Obtain a TEM mesh grid bearing a carbon film, prepared in accordance with BOP C-4.20.~~ Transfer several drops of the ethanol suspension to the grid using a micropipette, or dip the grid into the suspension. Allow the grid to dry in a horizontal position.

(4) Coat the grid with carbon or gold-palladium in accordance with Section 6.1.2.7 and store in accordance with Section 6.1.2.8.

6.1.4 Bulk Samples for SEM

(1) Using a razor blade, cut a <1 mm thick planchette from a pure graphite block, clean the planchette with ethanol, and attach it to a copper SEM mount using carbon paint.

(2) Apply a thin layer of carbon paint to the exposed planchette surface and transfer the sample to the tacky carbon paint.

(3) Coat the sample in accordance with Section 6.1.2(7) and store in accordance with Section 6.1.2(8).

6.1.5 Specimen Loading

(1) TEM Grid. Place the grid, coated side up, on the lower section of a JEOL EM-SR graphite specimen retainer. Carefully position the top section of the holder and engage the spring clips. Place the retainer into the JEOL EM-SCSH common specimen holder and gently release the catch. Load the holder into the 200 CX in accordance with Paragraph 1.5 (pp. 4-5) of Appendix SCSH of the JEOL 200 CX Instruction Manual.

(2) SEM Mount. Place the mount directly into the Large Specimen Holder and proceed in accordance with paragraph 6.1.5(1) above.

6.2 200 CX STARTUP AND ALIGNMENT

Startup and three methods of alignments are detailed in Chapter 5 (pp. 1-74) of the JEOL 200 CX Instruction Manual. Carry out a full column alignment procedure according to Method C (pp. 5-52 to 5-57) at the start of each day's analysis. At the same time, align the instrument for SEM operation in accordance with Chapter 5 (pp. 24-28) of the JEOL EM-ASID 3D Ultrahigh Resolution Scanning System Instruction Manual. Realignment during the course of the day is only required if the accelerating voltage is changed.

6.3 TRANSMISSION ELECTRON MICROSCOPY (TEM)

6.3.1 Illumination

The 200 CX in the TEM mode illuminates the sample with a diffuse beam of electrons accelerated by a voltage of 40-200 kV. The transmitted electron image may be viewed on a fluorescent screen or photographed using sheet film. Available magnifications range from 100X to 450,000X, with a maximum resolution of 3.5 Å.

6.3.2 Focusing and Photographing

Image observation and precision focusing in the TEM mode are described on pages 5-22 to 5-26 of the 200 CX Instruction Manual. Procedures for photography are detailed on pages 5-26 to 5-31 of the same manual. It should be noted that TEM photographs require darkroom processing.

6.4 SCANNING TRANSMISSION ELECTRON MICROSCOPY (STEM)

6.4.1 Forming the Image

The 200 CX in the STEM mode uses a finely-focused beam to scan an area of the sample in a raster pattern. The transmitted electron signal from each point in the raster is used to produce an image on a CRT. The STEM image can be photographed using either Polaroid film or sheet film. Available magnification ranges from 300X to 900,000X, with a maximum resolution of 40 Å. The STEM is complementary to TEM, in that STEM provides transmitted images with high resolution, a high degree of control over contrast and brightness, and the convenience of "instant" photography.

6.4.2 Controlling the Panel

The STEM mode is controlled from the EM-ASID 3D panel. Operation of this panel is described in Chapters 5-6 (pp. 24-40) of the EM-ASID 3D Instruction Manual. Detailed instructions for STEM observation are found in Section 6.3 (pp. 33-34) of this manual.

BASALT OPERATING PROCEDURE

6.5 SCANNING ELECTRON MICROSCOPY (SEM)

6.5.1 SEM Photography

The SEM mode uses a finely-focused electron beam to scan the sample surface in a raster pattern. Secondary electrons produced at each point in the scan are used to produce an image on a CRT. The SEM image can be photographed using either Polariod film or sheet film. Available magnification ranges from 10X to 800,000X, with a maximum resolution of 40Å. The SEM photographs show only the surface of a sample, since secondary electrons reach the detector from only the top few angstroms of the material.

6.5.2 Controlling the Panel

The SEM Mode is controlled from the EM-ASID 3D panel. Operation of this panel is described in Chapters 5-6 (pp. 24-40) of the EM-ASID 3D Instruction Manual. Detailed instructions for SEM Observations are found in Section 6.2 (pp. 31-33) of that manual.

6.6 SELECTED AREA ELECTRON DIFFRACTION (SAED)

6.6.1 Diffractograms

In the SAED mode, the diffuse electron beam is diffracted by the crystal planes within the specimen. The resulting pattern of dots or rings, known as a "diffractogram," can be observed on the fluorescent screen or photographed with sheet film. The spacing of the dots or rings can be translated into "d-spacing," the measure of interplanar distances within crystals. The d-spacings are equivalent to those measured by conventional X-ray diffraction (XRD), though the relative intensity data in XRD patterns are not available from SAED. However, since the scattering power of an electron beam is more than 10^6 times as great as that of an X-ray beam, much smaller samples (<1 um) can be studied with SAED than with XRD.

6.6.2 Photographing Diffractograms

The procedure for producing an SAED diffractogram is detailed in Section 5.7.1 (pp. 5-69 to 5-71) of the 200 CX Instructon Manual. Note that the film presently in use (Kodak 4489 Electron Microscope Film) allows the recording of SAED images in 2 to 8 seconds, rather than the 32 to 90 seconds called for in the manual.

6.6.3 Contact Prints

After processing in the darkroom, SAED diffractograms are reproduced as contact prints for measurement. Distances from the central spot to diffraction rings or spots are measured and related to crystal d-spacings by the following equation.

$$d = \frac{L\lambda}{r} \qquad (1)$$

where

d = crystal d-spacing (Å)

L = camera length (cm)

λ = electron beam wavelength (Å)

r = measured distance to ring or spot (cm)

The electron beam wavelength, λ in Å, is a function of accelerating potential, V in volts:

$$\lambda = \frac{12.26}{V^{1/2}\,(1 + 0.9788 \times 10^{-6}V)^{1/2}} \qquad (2)$$

The camera length (L) is selectable on the 200 CX.

6.6.4 Camera Calibration

The product L, known as the "camera constant" varies depending on the setting of the "camera length" dial and on fluctuations in lens currents. Accurate determinations of d-spacings requires that the camera constant be calibrated under normal operating conditions. A calibration standard, consisting of a TEM mesh grid coated with a thin layer of gold, is employed and the camera constant is derived from measurements of the ring spacings on the gold diffractogram. Calibration photos and results are saved in the "STEM Standardization" notebook. Operational experience indicates that recalibration should be performed every 2-3 months, and after each filament replacement.

6.6.5 Electron Diffractogram Measurements

The d-spacings derived from electron diffractograms are compared to lists tabulated in the Powder Diffraction File Data Books ("Minerals" and "Inorganic Phases"). Operational experience indicates that d-spacing measurements from the 200 CX are accurate to < ± 2%.

6.7. ENERGY DISPERSIVE SPECTOSCOPY (EDS)

6.7.1 Histograms

In the EDS mode, characteristic X-rays produced by interaction of the electron beam with the sample generate signals that are processed and displayed as histograms of X-ray counts versus energy. These histograms, known as EDS spectra, can be plotted, photographed on the display screen, or recorded on computer discs. Interactive computer software allows element identification and spectrum manipulation. The Princeton Gamma-Tech (PGT) 3000 EDS system on the 200 CX allows qualitative determination of the major element constituents of samples as small as 200 Å. The system is sensitive to all elements from Na to Cf in the periodic table, with detection limits in optimal cases of approximately 0.1 wt%.

6.7.2 EDS Calibration

Detailed procedures for calibrating the EDS system, as well as for obtaining, analyzing, and recording spectra, are contained in a two-volume set of PGT Instruction Manuals. The manuals reflect the most recent version of the computer operating system software, presently version 4.20. This software, contained on pre-recorded computer discs, is proprietary in nature. Calibration spectra are saved on computer data discs, under the spectrum title "Calib."

6.7.3 EDS Analysis

Operational experience with the 200 CX microscope and 3000 system EDS indicate several considerations relevant to EDS analysis. Samples are most commonly analyzed with the microscope in the SEM mode, with the scanned area or point defining the area analyzed. X-rays reach the detector from a volume of several cubic microns below the sample surface, so the effective spatial resolution of the EDS analysis is always much poorer than that of the SEM image.

The microscope and detector geometry dictate that flat-lying, initially horizontal, samples must be tilted approximately 30° counter-clockwise in order for X-rays to reach the detector in sufficient numbers.

An accelerating voltage of 200 kV is used routinely for thin samples on TEM grids. A voltage of 40 kV provides EDS spectra with less interferences for bulk samples on SEM mounts.

7.0 QUALITY ASSURANCE

7.1 INSTRUMENT CALIBRATION AND MAINTENANCE

Quality Assurance for this BOP is implemented in accordance with BOP C-1.3 for the calibration of applicable support, test, and repair instruments, as well as through the Maintenance Instrument Calibration System (MICS). Calibration of the 200 CX camera constant and the EDS system are described in this procedure in Sections 6.6.4 and 6.7.2, respectively. Routine maintenance of the 200 CX is conducted in accordance with Chapter 6 (pp. 6-1 to 6-42) of the 200 CX Instruction Manual. Periodic and emergency servicing of the 200 CX and EDS are provided by the manufacturers under the terms of service contracts.

7.2 DOCUMENT CONTROL

Data collected with these instruments are recorded in controlled laboratory notebooks in accordance with BOPs E-9 and C-4.3.2. Copies of all photos and contact prints of all SAED diffractograms are maintained in the notebooks, while negatives are filed separately. Plotter copies of EDS spectra are maintained in notebooks and duplicate copies of all spectra and operating software are preserved on computer discs. Peer review of notebooks and reports is in accordance with BOP A-22.

7.3 SAMPLE AND MEASUREMENT TRACEABILITY

Sample traceability is as specified in BOP C-4.3. Measurement techniques and data locations are recorded on a traveler card which accompanies each sample. When analysis is complete one copy of this card is filed in the "Solids Characterization Number Log" notebook, one copy is forwarded to the investigator who requested the analysis, and one copy is forwarded to the Materials Testing Group archives.

BASALT OPERATING PROCEDURE

8.0 APPLICABLE DOCUMENTS

RHO-MA-221, *Volumes 1 and 2*, "Accident Prevention Standards"
Industrial Hygiene and Safety
RHO-SWI-MA-4, Basalt Operating Procedures (BOPs)
A-22, "Peer Review"
C-1.3, "Instrument Calibration"
C-4.2, "MTG Safety Requirements"
C-4.3, "Test Specimen (Sample) Control System for the BMRL"
C-4.3.2, "Data and Sample Control for Basalt Solids Characterization"
CN #053 ~~C-4.20, "Preparation of Carbon Films for TEM Grids"~~
C-4.21, "Sample Preparation for Metallographic and Petrographic Examination"
E-9, "Engineering Notebooks and Laboratory Data Management"

ANSI/ASME NQA-1, Quality Assurance Program
Requirements for Nuclear Facilities

Denton Vacuum, Inc. Operating Instructions
DV-502, "High Vacuum Evaporator with Autocycle and 5 3/4 in. Pump"

Gatan, Inc. Instruction Manual
"Dual Ion Mill 600 Series"

JEOL, Ltd, Instruction Manuals
JEM 200 CX, "Electron Microscope"
EM-ASID 3D, "Ultrahigh Resolution Scanning System"

Power Diffraction File Data Books
"Minerals"
"Inorganic Phases"

Princeton Gamma-Tech Instruction Manuals
"System Instructions"
"Appendices"

Sybron/Barnstead Instruction Manuals
"ROpure System"
"NANOpure-A Systems"

Technics, Inc. Instruction Manual
"Hummer V"

BASALT OPERATING PROCEDURE

9.0 SUPPLEMENTAL APPROVALS

Prepared by — C. C. Allen, Senior Scientist, Materials Testing Group — 11/22/83 Date

Reviewed by — J. V. Mohatt, Program Representative, Health, Safety, and Environment — 11/27/83 Date

Approved by — R. C. Edwards, Manager, Materials Testing Group, Engineered Barriers Department — 11/30/83 Date

M. J. Smith, Manager, Engineered Barriers Department, Basalt Waste Isolation Project — 12/7/83 Date

QA Concurrence — M. F. Nicol, Manager, Quality Assurance, Basalt Waste Isolation Project — 12/9/83 Date

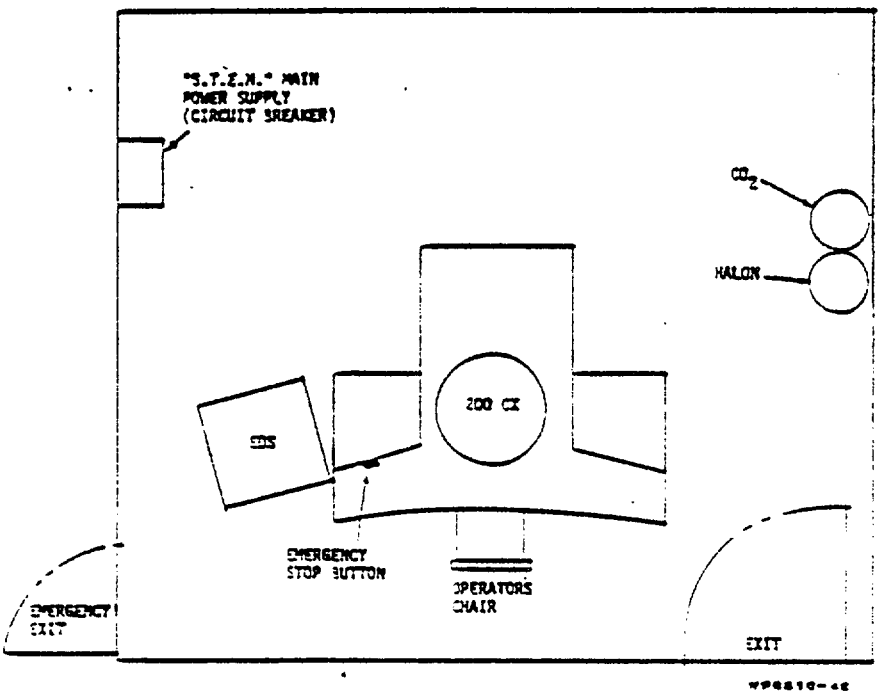


FIGURE 1. 200 CX Layout and Emergency Equipment.

BASALT OPERATING PROCEDURE

RESPONSIBLE ORGANIZATION: Site AUTHOR: S. R. Strait

Approved By	Subject	Classification
E B Ann 10/12/84	GEOPHYSICAL WELL LOGGING	SCIENTIFIC TECHNOLOGIES

1.0 OBJECTIVE

The objective of this procedure is to provide quidelines for geophysical well logging conducted for the Basalt Waste Isolation Project (BWIP) of Rockwell Hanford Operations (Rockwell).

2.0 APPLICABILITY

The procedure is primarily applicable to geophysical logging activities conducted by Pacific Northwest Laboratory (PNL) for Rockwell. The procedures are also applicable to commercial logging companies when specified in subcontract purchase/agreements.

3.0 DEFINITIONS

3.1 GEOPHYSICAL WELL LOGGING

Geophysical well logging consists of lowering probes (fluid temperature, spontaneous potential/resistivity, caliper, flowmeter, natural gamma, gamma-gamma, neutron-epithermal neutron, and sonic) down a well and recording at the ground surface a continuous instrumental response to a specific physical property of the rock material or fluid being logged.

Geophysical well logging can assist in interpreting the lithology, geometry, resistivity, bulk density, porosity, relative permeability, and moisture content of rock-mass in addition to defining the source and movement of water within the borehole.

3.2 DATUM

Datum refers to any point identified as the basis for calculating or measuring, such as a predetermined location point from which measurements are made.

(2) Gearhart-Owen Widco logger. Includes electronics, chart recorder, winch, and 10,000 ft of four conductor cable; adaptation for using a winch with 10,000 ft of seven conductor cable is also available.

(3) Well head sheave.

(4) IAC power sources.

(5) Radioactive sources (americium-beryllium and cesium 137).

6.2 EQUIPMENT SETUP

(1) In preparation for PNL geophysical logging, back the logging truck to approximately 75 ft from the well.

(2) Turn on the electronics, which run power produced from a generator in the logging truck.

(3) Turn on the chart recorder and check to ensure that the pens are clean and able to write.

(4) At the well head, place a sheave over the center of the casing in the well.

(5) Extend the cable, with an attached probe, from the winch to the sheave at the well such that the probe's zero point is at ground surface or a datum predetermined by the Rockwell representative. If the zero point cannot be placed at the datum, the distance from the zero point to the datum must be accounted for so all depth measurements are relative to the datum.

(6) Set the depth indicator on the equipment panel to zero relative to the probe's zero point. The equipment is now ready to run any desired probe.

6.3 EQUIPMENT OPERATION

Each of PNL's geophysical logging probes is run in accordance with detailed instructions set forth in the manuals listed below:

(1) Caliper, fluid temperature, flowmeter, natural gamma, neutron-epithermal neutron, and gamma-gamma probes

by: Instruction Manual - Pulse Logging Systems, Gearhart-Owen Industries, Inc., Fort Worth, Texas.

(2) Spontaneous potential resistivity probe

by: Instruction Manual - ELM 202 Electric Log Module, Gearhart-Owen Industries, Inc., Fort Worth, Texas.

(3) Sonic probe

by: Peretro, et al, Tech. Bull. with Operational Procedures Number 2 for Cement Bond Logs, Gearhart-Owen Industries, Inc., Fort Worth, Texas.

6.4 LOGGING COMPLETION

(1) When logging is completed, place the probes in the logging truck to avoid damage during transport.

(2) Store the radioactive sources in a lead-filled holder for a gamma source, and a paraffin wax-filled holder for the neutron source.

(3) Gather other equipment.

7.0 QUALITY ASSURANCE

7.1 ROCKWELL MONITORING

To ensure that quality assurance procedures are followed, a Rockwell representative must be present while the PNL logging crew is performing geophysical logging for Rockwell. Any deviation from the standard operating procedures is to be approved by the Rockwell representative by signing across each log. Each log must also be signed by the logging engineer that gathered the geophysical well log data.

7.2 LOG NOTATIONS

All pertinent information regarding well identification, depth, type of log, casing, and the dial settings on the logging panel is to be noted on the top of each log. If pertinent to the operation or analysis of the log, remarks are to be made as to the general condition of the well, any extraneous conditions (power lines, etc.) that might affect equipment response, and problems encountered during logging.

7.3 EQUIPMENT STANDARDIZATION

To standardize log responses, all geophysical logs run on the Hanford Site must also be run in reference to Well 399-5-2 (Figure 1). For PNL, geophysical logs must be run every three months to check for instrument drift. If tool malfunctions occur while logging, the tool is to be run in the reference well after being repaired to assure proper responses.

7.4 EQUIPMENT CALIBRATION

Calibrate all probes (e.g., counts/sec for the neutron log) in accordance with procedures set forth in the respective instruction manual (see Section 8.0). Calibrate each log before and after the log is produced. In the case of the sonic and spontaneous potential/resistivity logs where an after-calibration check is not available, perform a 50-ft overlap from a previous logging run is performed, if posssible, to check for consistency in the calibration. The before-and-after calibrations serve as double checks and account for any drift of tool responses due to borehole conditions. Perform a 50-ft repeat section or 50-ft overlap from a previous logging run for each log to ensure repeatability in the tool response.

7.5 GEOPHYSICAL LOG STORAGE

Geophysical logs are distributed to:

(1) The geophysical log files of the Drilling and Testing Group (BWIP)

(2) The Geosciences Group (BWIP)

(3) Basalt Records Management Center

(4) The Rockwell representative in charge of logging.

Original geophysical logs are kept on file at the subcontractor's facilities. Copies are available on request from the Rockwell representative in charge of logging. Copies are distributed in accordance with BOP E-6.

BASALT OPERATING PROCEDURE

8.0 APPLICABLE DOCUMENTS

RHO-MA-100. Policies Manual
Policy 8-04, "Control of Employee and Environmental Exposures"

RHO-MA-278, The ALARA Program

RHO-BWI-MA-4, Basalt Operating Procedure (BOP) Manaul
BOP C-1.2, "Field Work"
BOP C-2.8, "General Hydrologic Field Testing Procedures," Appendix F, "Instantenous Pulse Withdrawal/Injection Test"

Instruction Manual, Pulse Logging System, Gearhart-Owen Industries, Inc., Fort Worth, Texas

Instruction Manual, ELM 202 Electric Log Module, Gearhart-Owen Industries, Inc., Fort Worth, Texas

Peveto, F. H., et al, Tech. Bull: with Operational Procedures Number 2 for Cement Bond Logs, Gearhart-Owen Industries, Inc., Fort Worth, Texas

R. F. Ballard, Jr. and F. G, McLean, In Situ Measurement of Soil Properties/Schlumberger Ltd., Log Interpretations, Vol. 1 API, American Petroleum Institute, RP-33-74/J. O. Haun & L./W. Leroy - Subsurface Geology in Petroleum Exploration/R. L. Geyer & J. I. Myung, Proceedings of the 12th Symposium on Rock Mechanics, Rolla, Mississippi

9.0 SUPPLEMENTAL APPROVAL

QA Concurrence _____ 10/4/84
M. W. Nicol, Manager — Date
Quality Assurance
Basalt Waste Isolation Program

BASALT OPERATING PROCEDURE

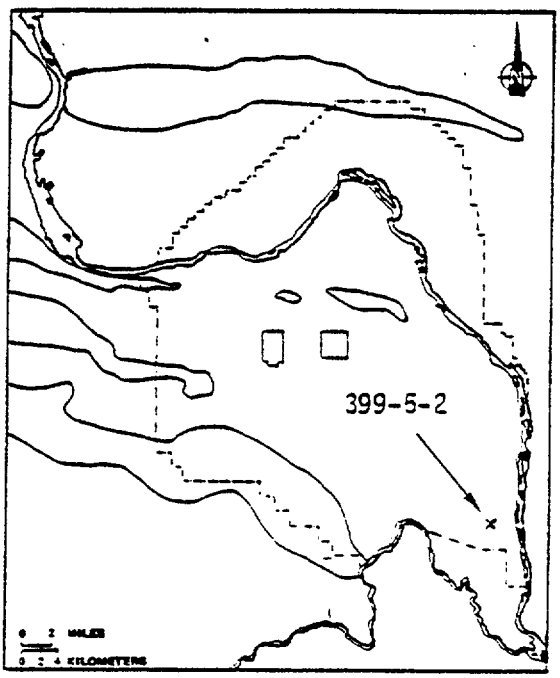


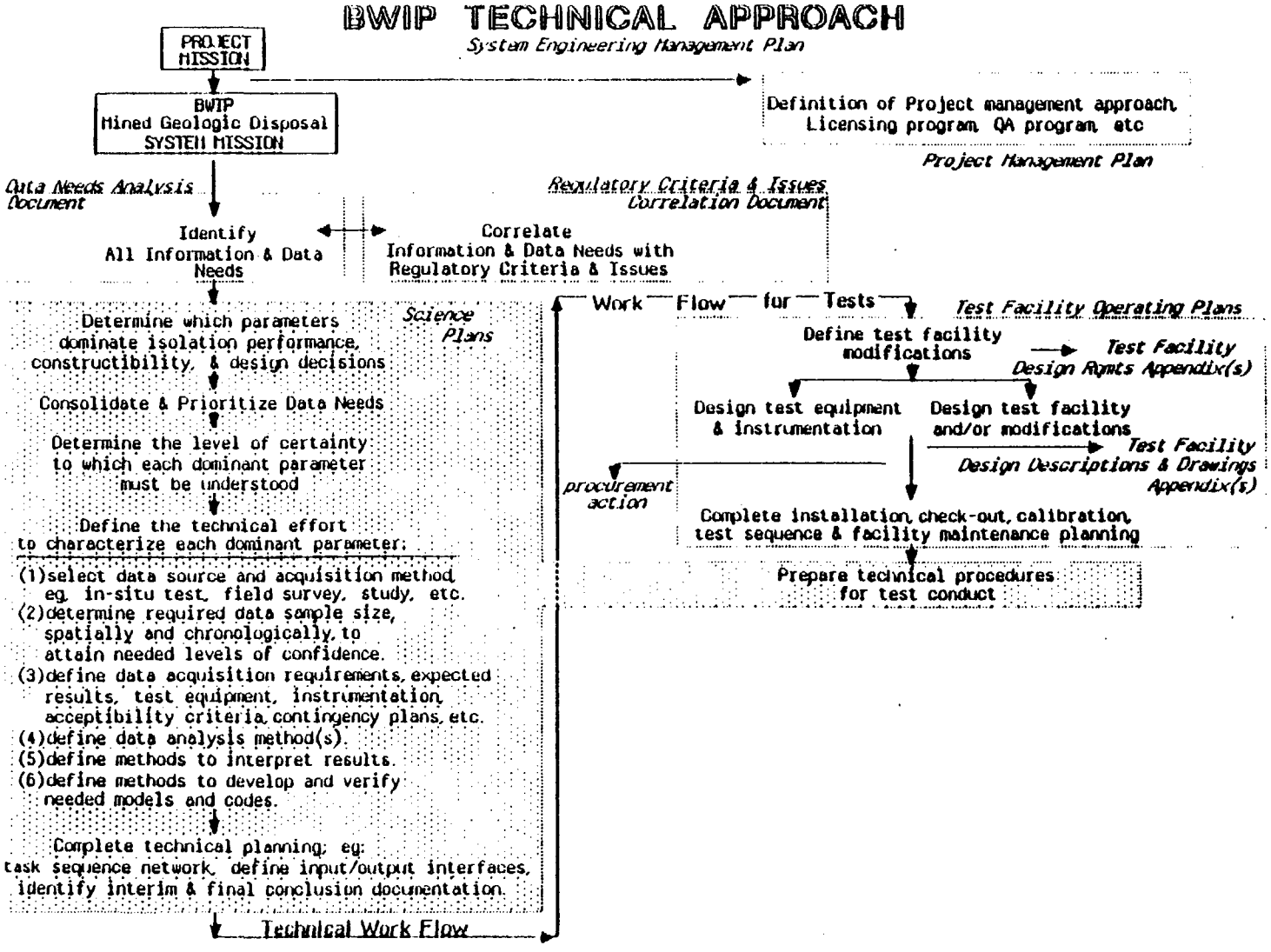
FIGURE 1. Location of Geophysical Logging Standard Well 399-5-2 (arrow).

TABLE 1. Basic Geophysical Functions and Selected Uses.

Geophysical Function	Basic Use	Remarks
Spontaneous potential	Identification of interbed characteristics Zone thicknesses and depths	
Resistivity	Stratigraphic correlations Zone thicknesses and depths Mud infiltrate zones	
Fluid temperature	Locate sources of ground water contribution into borehole Identify direction of ground-water circulation in borehole Pressure corrections for head measurements Geothermal gradient	
Flowmeter	Fluid flow velocity in borehole Location of fluid gain and loss zones	
Caliper	Locating borehole breakouts and changes in borehole diameter Identifying liner sections Locating large rock fractures	
Natural gamma	Indicators of lithology Stragraphic correlations	Neutron source (Am-Be)
Neutron-epithermal neutron	Moisture Content Bulk Porosity Stratigraphic correlations	
Gamma-gamma	Bulk density	Gamma Source (Cs-137)
Sonic	Cement bonding between rock and casing Bulk porosity Fracture detection	

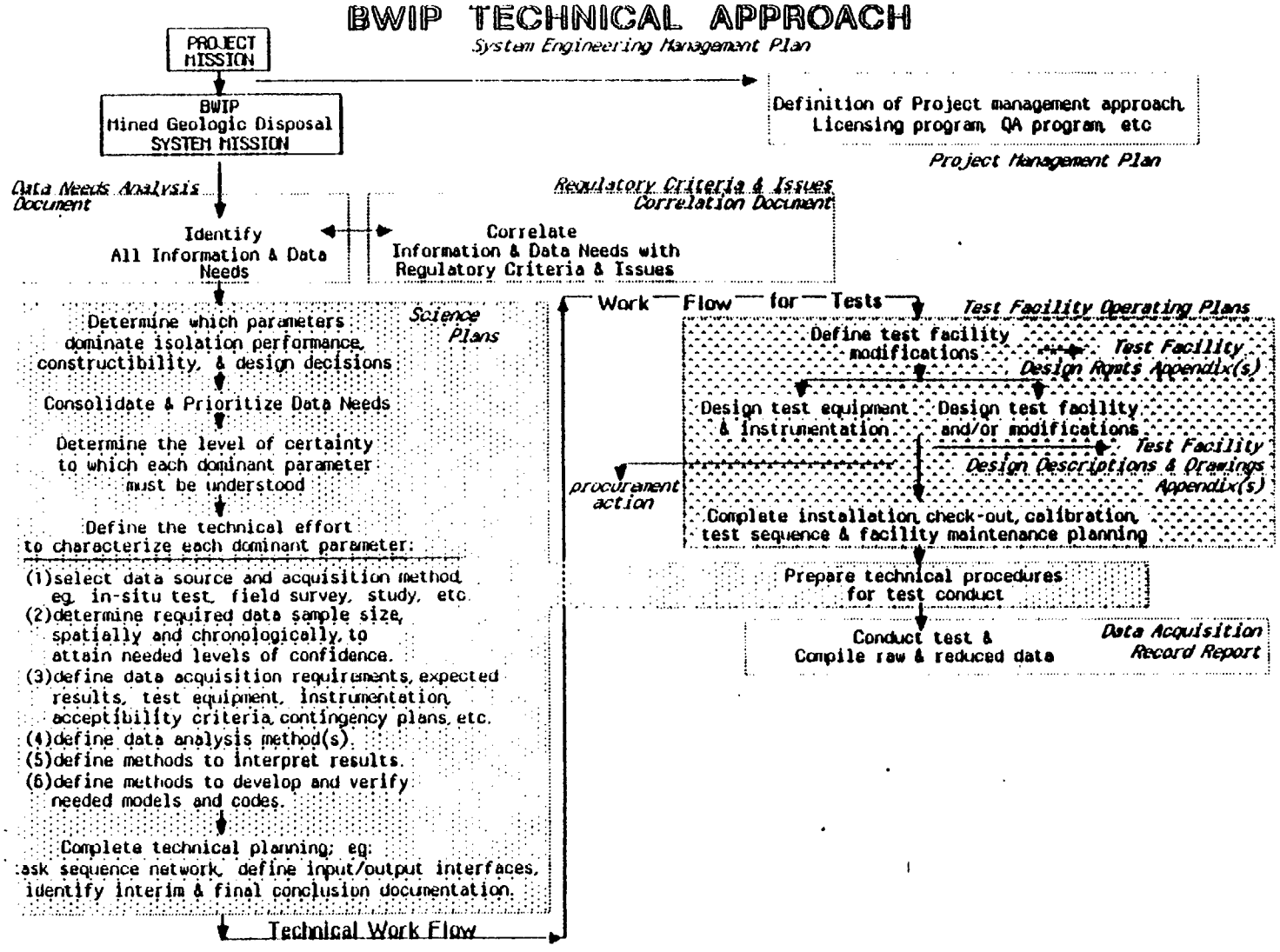
BWIP TECHNICAL APPROACH

System Engineering Management Plan



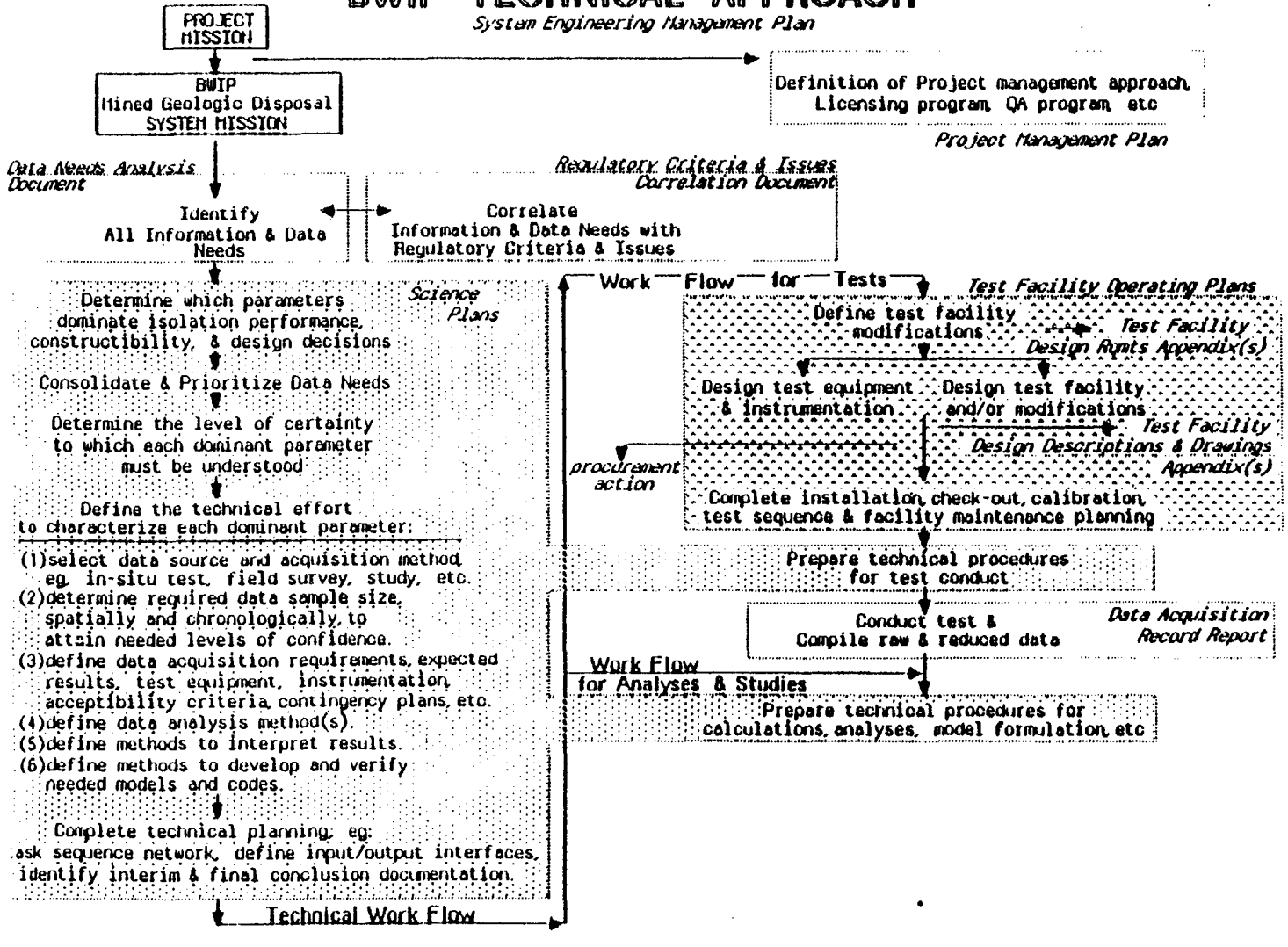
BWIP TECHNICAL APPROACH

System Engineering Management Plan



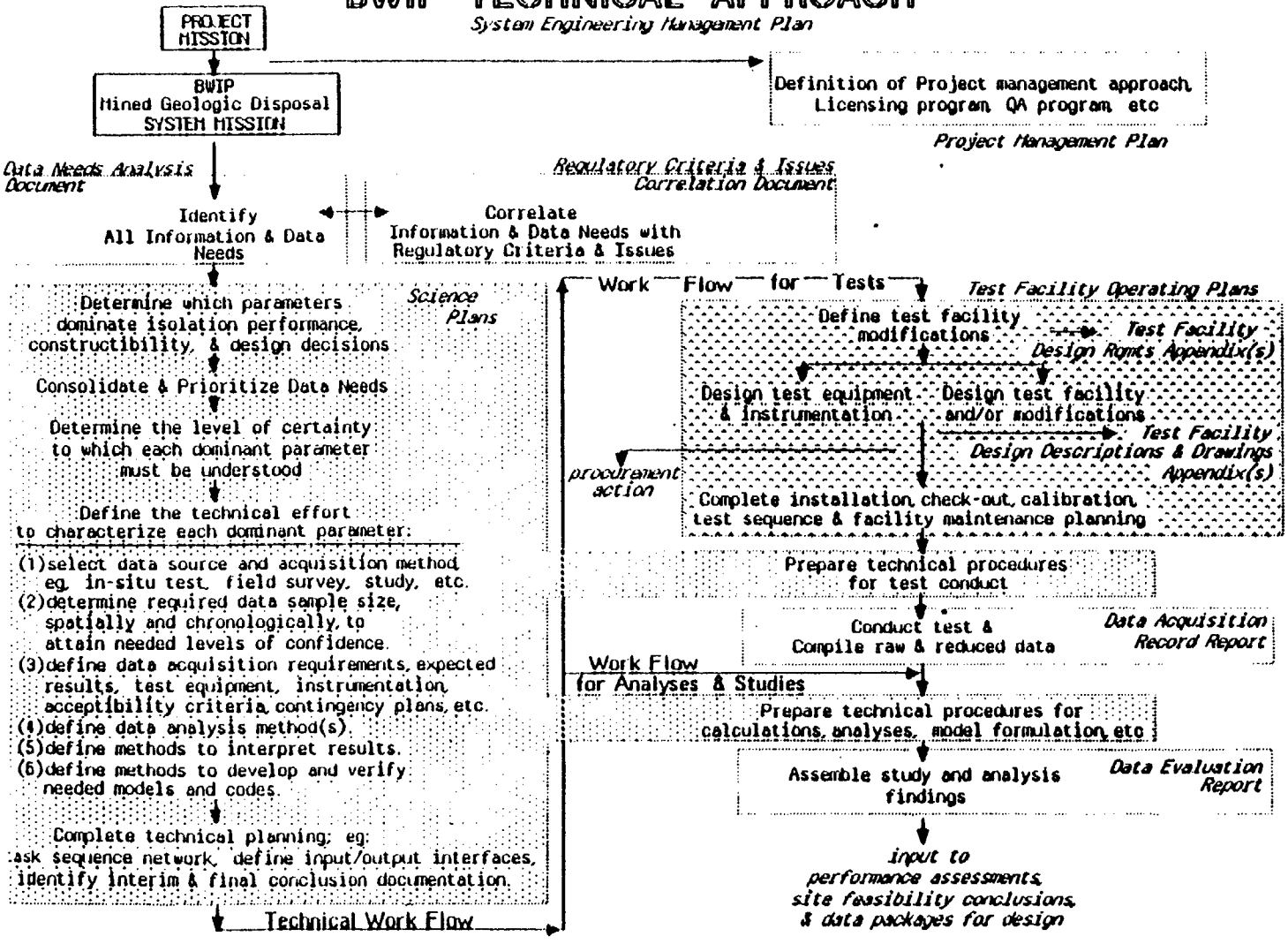
BWIP TECHNICAL APPROACH

System Engineering Management Plan



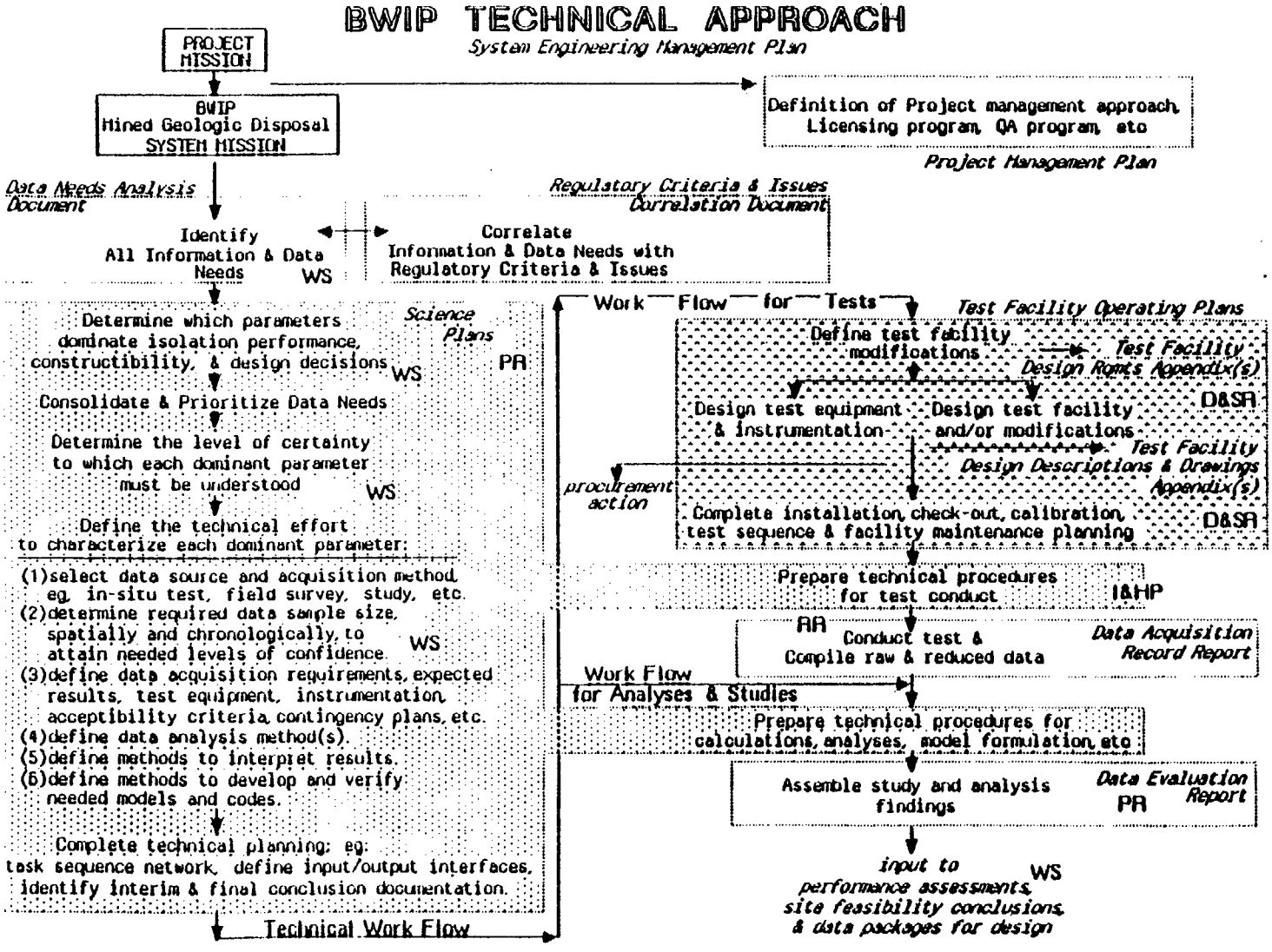
BWIP TECHNICAL APPROACH

System Engineering Management Plan

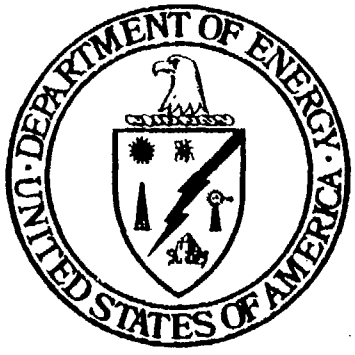


BWIP TECHNICAL APPROACH

System Engineering Management Plan



ATTACHMENT 6



U.S. DEPARTMENT
OF ENERGY

BASALT WASTE ISOLATION PROJECT OFFICE

DEPARTMENT OF ENERGY
NUCLEAR REGULATORY COMMISSION

QUALITY ASSURANCE MEETING

DECEMBER 10-12, 1984

RICHLAND, WASHINGTON

AGENDA

DOE/NRC QUALITY ASSURANCE MEETING
BASALT WASTE ISOLATION PROJECT
DECEMBER 10-12, 1984
HOLIDAY INN
1515 GEORGE WASHINGTON WAY, RICHLAND, WASHINGTON

December 10, 1984

8:15 a.m.	DOE Introduction and Welcome	DOE
8:30	NRC Introduction and Discussion	NRC
9:30	Overview - BWIP Quality Assurance	DOE
12:00 noon	Lunch	
1:00 p.m.	Overview - Rockwell Quality Assurance Program for BWIP	Rockwell
2:00	BWIP Management Systems and Controls	Rockwell
4:00	Rockwell QA/Management Systems	Rockwell
5:00	Adjourn	

AGENDA

DOE/NRC QUALITY ASSURANCE MEETING
BASALT WASTE ISOLATION PROJECT
DECEMBER 10-12, 1984
HOLIDAY INN
1515 GEORGE WASHINGTON WAY, RICHLAND, WASHINGTON

December 11, 1984

8:15 a.m.	Review and Discuss Project Office Quality Assurance Plan	DOE
9:30	Review and Discuss Implementation of BWIP Management Systems and Controls	Rockwell
11:00	Questions, Answers, Comments	All
12:00 noon	Lunch	
1:00 p.m.	Exit Meeting Preparation	All
3:00	Exit Meeting (Reconvene)	All
4:30	Adjourn	

December 12, 1984

8:00 a.m.	Field Tour - Depart
12:00 noon	Return to Richland End of Meeting and Tour

BASALT WASTE ISOLATION PROJECT

OVERVIEW

- PROJECT QUALITY ASSURANCE PHILOSOPHY
- DOE SAFETY AND QUALITY ASSURANCE SYSTEM
- BWIP QUALITY PROGRAM
  - ORGANIZATION
  - RESPONSIBILITIES
- MANAGEMENT SYSTEMS AND CONTROLS
- PROGRAM DEVELOPMENT
- PROGRAM ASSESSMENT
- ISSUES
- IMPLEMENTATION

BASALT WASTE ISOLATION PROJECT

QUALITY ASSURANCE PHILOSOPHY

- QUALITY PERFORMANCE - DO IT RIGHT THE FIRST TIME
- PROJECT MANAGEMENT SYSTEMS AND QUALITY ASSURANCE ARE INSEPARABLE
- BWIP IS DEVELOPING DISCIPLINED PROJECT MANAGEMENT SYSTEMS AND CONTROLS
- DOE AND NRC QUALITY ASSURANCE REQUIREMENTS ARE MINIMUMS
- LINE RESPONSIBILITY FOR QUALITY ASSURANCE
  - ACCOUNTABILITY RESTS WITH PROJECT OFFICE
  - INDEPENDENT REVIEW BY SEPARATE QUALITY ASSURANCE ORGANIZATION
- DOE EXPERIENCE

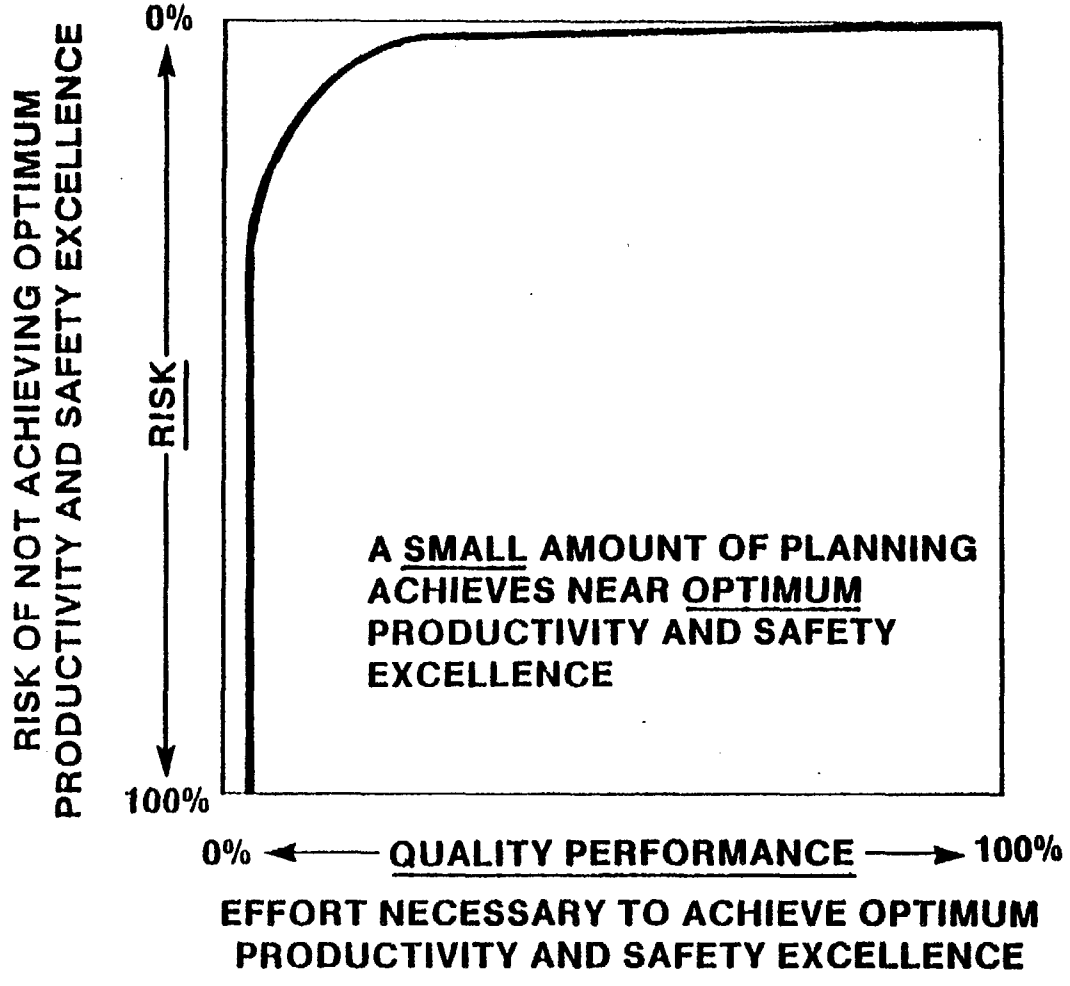
DOE SAFETY AND QA SYSTEM

QUALITY PERFORMANCE

- PLAN WHAT YOU DO
- DO WHAT YOU PLAN
- DOCUMENT WHAT YOU DID
- EVALUATE YOUR PERFORMANCE
- IMPROVE YOUR PLANS AND PERFORMANCE

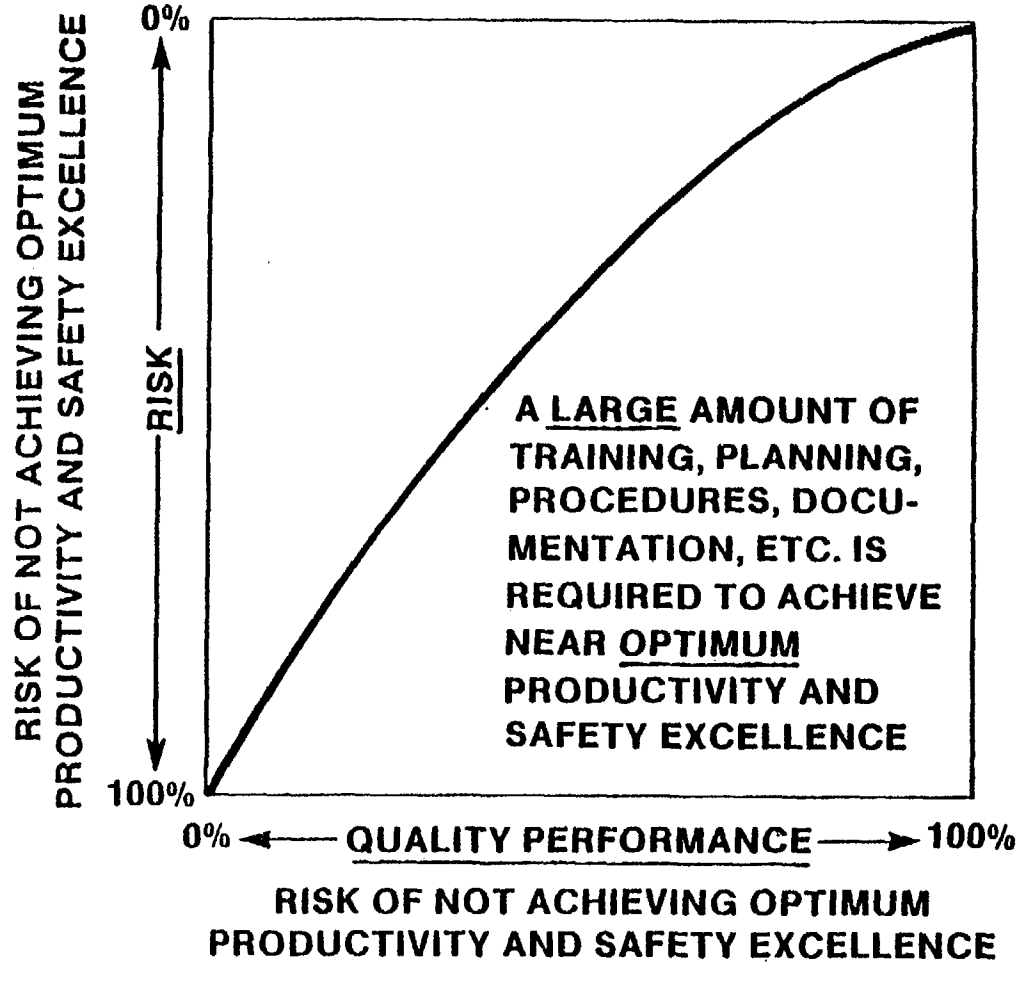
DOE SAFETY AND QA SYSTEM

SIMPLE JOB



DOE SAFETY AND QA SYSTEM

COMPLEX JOB



DOE SAFETY AND QA SYSTEM

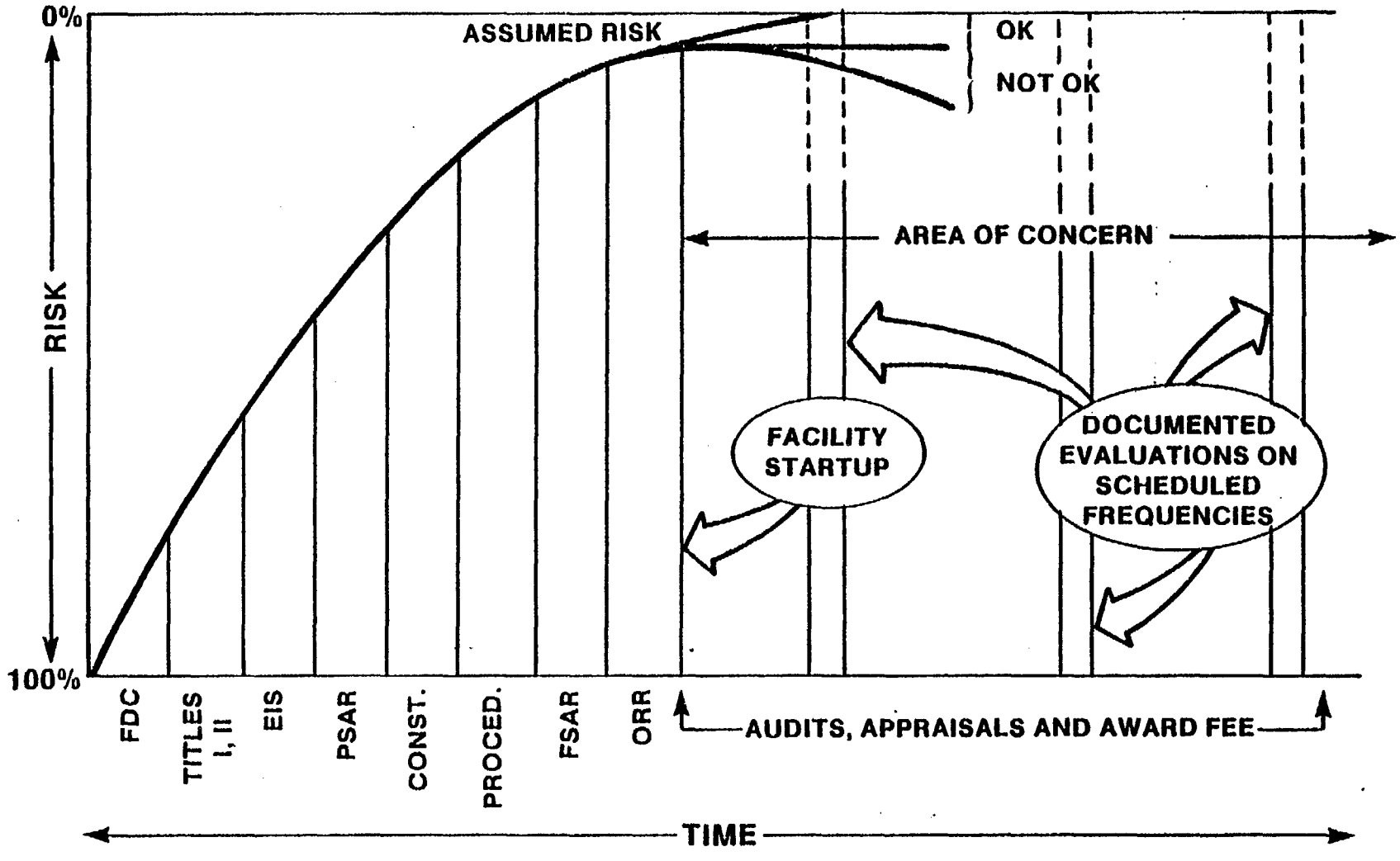
ELEMENTS FOR ACHIEVING OPTIMUM PRODUCTIVITY AND SAFETY EXCELLENCE

(QUALITY PERFORMANCE)

- EVERYTHING WITHIN THE CONTRACTORS' MANAGEMENT SYSTEM:
  - CONCEPTUAL DESIGN
  - FUNCTIONAL DESIGN CRITERIA
  - SAR
  - EIS
  - CONSTRUCTION
  - ACCEPTANCE INSPECTION
  - PROCEDURES
  - ACCEPTANCE/OPERATIONAL TESTING
  - TRAINING
  - ADMINISTRATIVE CONTROLS
  - APPRAISALS
  - AUDITS
  - ORR
  - ETC.

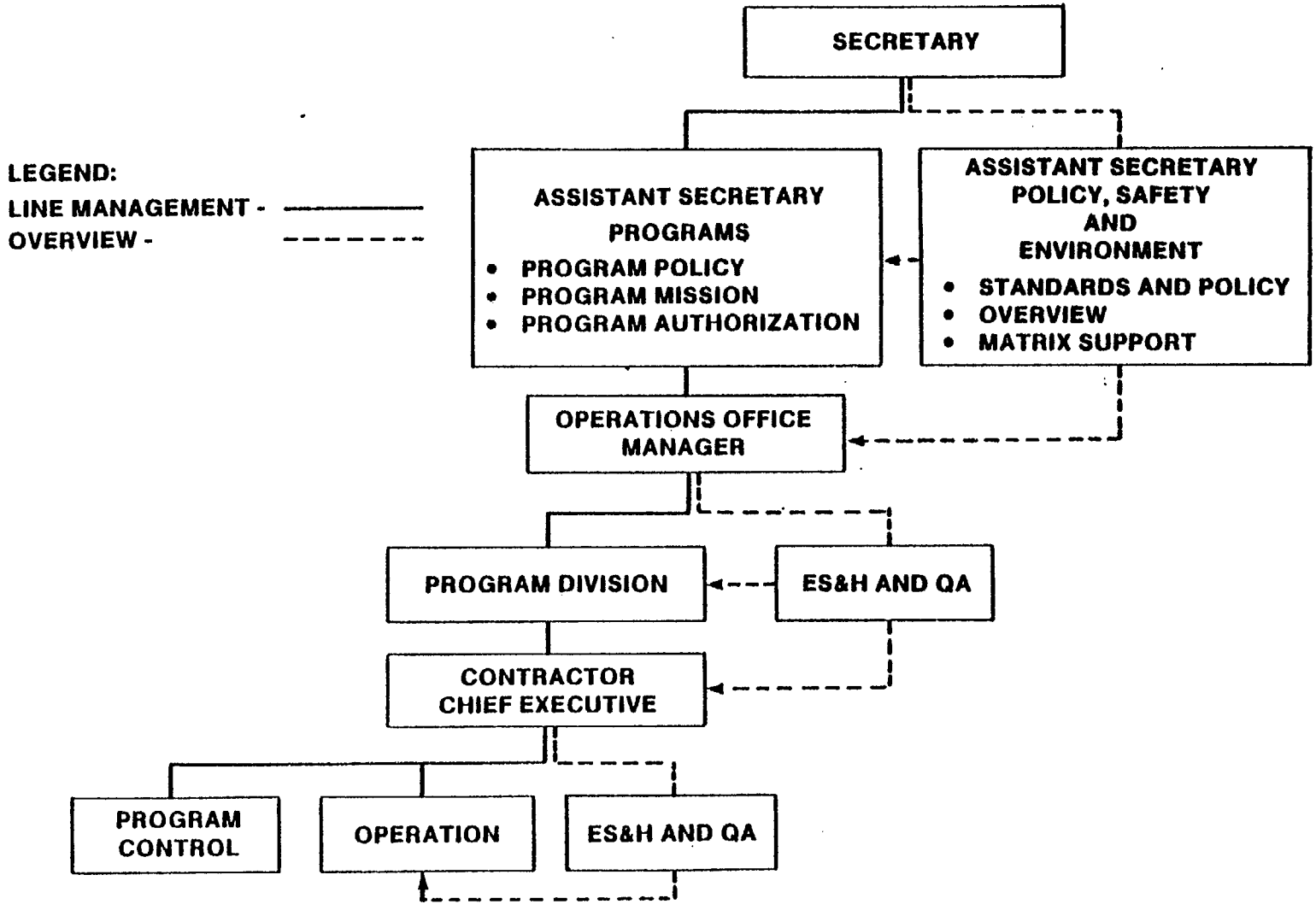
DOE SAFETY AND QA SYSTEM

COMPLEX TECHNICAL OPERATION



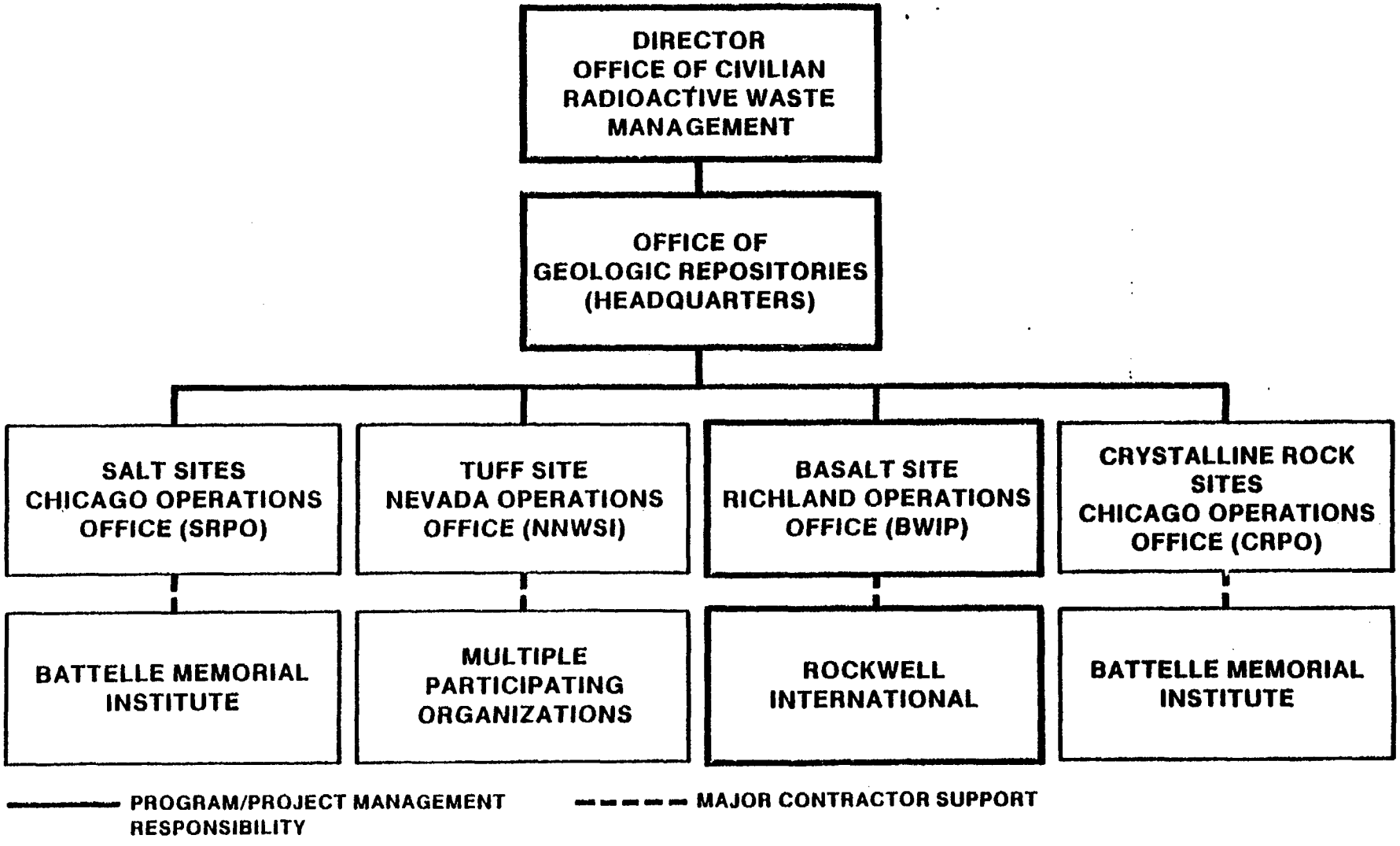
DOE SAFETY AND QA SYSTEM

USDOE ENVIRONMENT, SAFETY, HEALTH AND QUALITY ASSURANCE PROGRAM IMPLEMENTATION



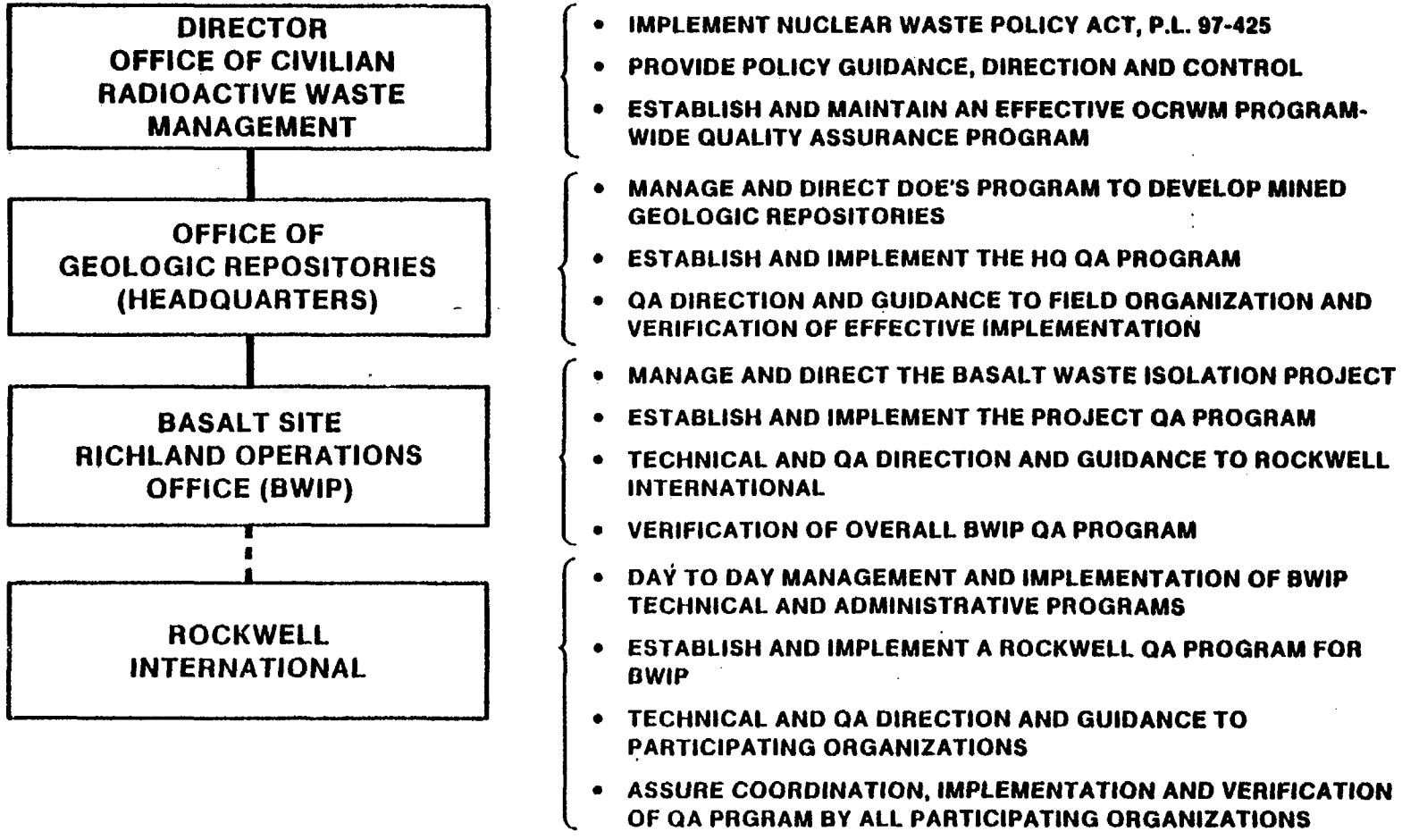
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

FIELD OFFICE AND CONTRACTOR MANAGEMENT RESPONSIBILITY FOR OGR PROJECTS

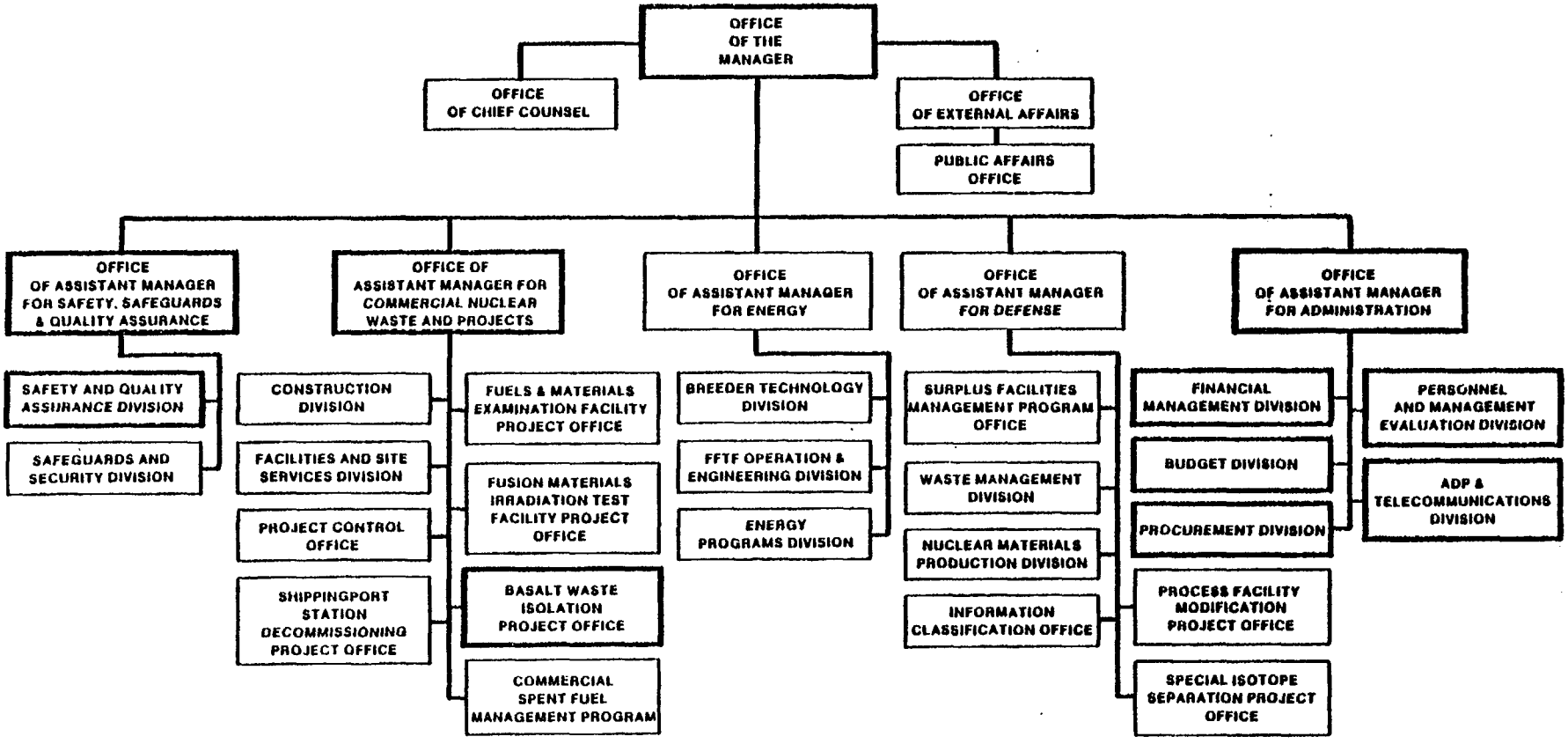


OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

FIELD OFFICE AND CONTRACTOR MANAGEMENT RESPONSIBILITY FOR OGR PROJECTS



BASALT WASTE ISOLATION PROJECT
U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE



BASALT WASTE ISOLATION PROJECT
U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE

- ULTIMATE RESPONSIBILITY FOR ALL FIELD OFFICE ACTIVITIES
- MAINTAIN EFFECTIVE QUALITY ASSURANCE IN COMPLIANCE WITH REQUIREMENTS

MANAGER DOE-RL

- MANAGER DELEGATES DAY TO DAY MANAGEMENT AND IMPLEMENTATION OF FIELD OFFICE RESPONSIBILITIES THROUGH THE ASSISTANT MANAGERS

ASSISTANT MANAGER FOR ADMINISTRATION

PROCUREMENT DIVISION

- MANAGE AND IMPLEMENT THE PROCUREMENT PROCESS
- OBTAIN REQUIRED TECHNICAL AND QA REVIEWS AND APPROVALS

ASSISTANT MANAGER FOR COMMERCIAL NUCLEAR WASTE AND PROJECTS

BASALT WASTE ISOLATION PROJECT OFFICE

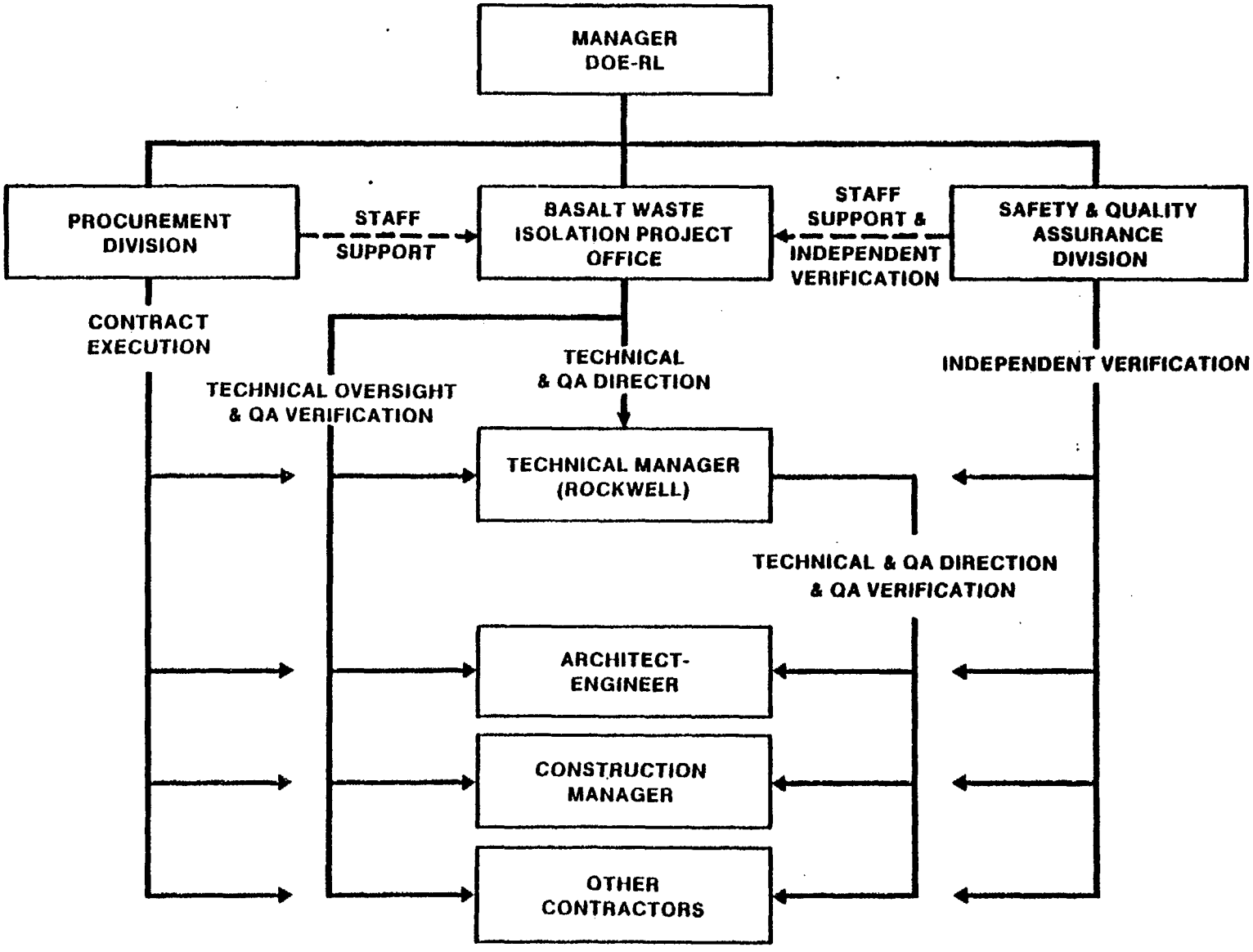
- PROVIDE OVERALL MANAGEMENT AND DIRECTION OF THE BWIP
- ESTABLISH, IMPLEMENT AND VERIFY THE OVERALL BWIP QA PROGRAM
- RETAIN RESPONSIBILITY AND ACCOUNTABILITY FOR BWIP QA PROGRAM
- TECHNICAL AND QA DIRECTION AND GUIDANCE TO ROCKWELL INTERNATIONAL
- PERFORM REQUIRED PROCUREMENT REVIEWS AND APPROVALS

ASSISTANT MANAGER FOR SAFETY, SAFEGUARDS & QUALITY ASSURANCE

SAFETY AND QUALITY ASSURANCE DIVISION

- MANAGE AND DIRECT HANFORD SITEWIDE QA PROGRAM
- ASSIST IN DEVELOPMENT OF BWIP QA PROGRAM
- PROVIDE INDEPENDENT REVIEW AND APPROVAL OF KEY BWIP QA ACTIONS
- PROVIDE INDEPENDENT VERIFICATION AND ASSESSMENT OF BWIP QA PROGRAM
- PERFORM REQUIRED PROCUREMENT REVIEWS AND APPROVALS

BASALT WASTE ISOLATION PROJECT
ORGANIZATION



BASALT WASTE ISOLATION PROJECT

PROJECT MANAGEMENT SYSTEMS AND CONTROLS

- BWIP MANAGEMENT SYSTEMS DEVELOPED IN ACCORDANCE WITH DOE ORDERS
- HIERARCHY OF WORK REQUIREMENTS AND CONTROLS ESTABLISHED
- BASELINE REQUIREMENTS ESTABLISHED BY DOE HQ
  - MISSION PLAN
  - GENERIC REQUIREMENTS DOCUMENT
  - BWIP PROJECT CHARTER
- BASELINE REQUIREMENTS ESTABLISHED BY PROJECT OFFICE
  - BWIP PROJECT PLAN
  - BWIP PROJECT MANAGEMENT PLAN
  - BWIP SYSTEMS ENGINEERING MANAGEMENT PLAN
  - BWIP SITE SPECIFIC FUNCTIONS AND REQUIREMENTS DOCUMENT

BASALT WASTE ISOLATION PROJECT
PROJECT MANAGEMENT SYSTEMS AND CONTROLS

SYSTEMS ENGINEERING MANAGEMENT PLAN

- STRUCTURES THE CONTENT AND CHARTS THE COURSE FOR THE TECHNICAL PROGRAM
- ASSURES WORK REQUIREMENTS ARE MISSION DERIVED
  - SITE CHARACTERIZATION PROGRAM
  - WASTE DISPOSAL SYSTEM DESIGN AND DEVELOPMENT PROGRAM
- SYSTEMATIC DEVELOPMENT OF DATA REQUIREMENTS
- PRESENTS A HIERARCHY OF PROJECT ACTIVITIES AND DOCUMENTATION
- SUPPORTS AND INTEGRATES QA ACCOUNTABILITY AND TRACEABILITY WITHIN ITS FRAMEWORK

BASALT WASTE ISOLATION PROJECT
PROJECT MANAGEMENT SYSTEMS AND CONTROLS

KEY MANAGEMENT CONTROL DOCUMENTS

- QUALITY ASSURANCE PLANS
- RECORDS MANAGEMENT PLAN
- CONFIGURATION MANAGEMENT PLAN
- PROCUREMENT PLAN

BASALT WASTE ISOLATION PROJECT

QUALITY ASSURANCE PROGRAM DEVELOPMENT

- **PREVIOUSLY** FORMAL QA PROGRAMS DEVELOPED AND DOCUMENTED IN DOE HQ AND FIELD OFFICE ORDERS AND GUIDANCE

  DOE ROLE ONE OF QA DIRECTION AND VERIFICATON

  CONTRACTOR ROLE ONE OF DEVELOPMENT AND IMPLEMENTATION OF PROJECT SPECIFIC QA PLANS

- **CURRENTLY** FOCUS ON DEVELOPING MORE EXTENSIVE PROJECT SPECIFIC QA PLANS AND PROCEDURES

  INCLUDES DOE AS WELL AS CONTRACTORS AND OTHER PARTICIPANTS

  RESPONSIVE TO CHANGING NEEDS OF PROJECT

  RELIES UPON DEVELOPMENT OF DISCIPLINED PROJECT MANAGEMENT SYSTEM AND CONTROLS

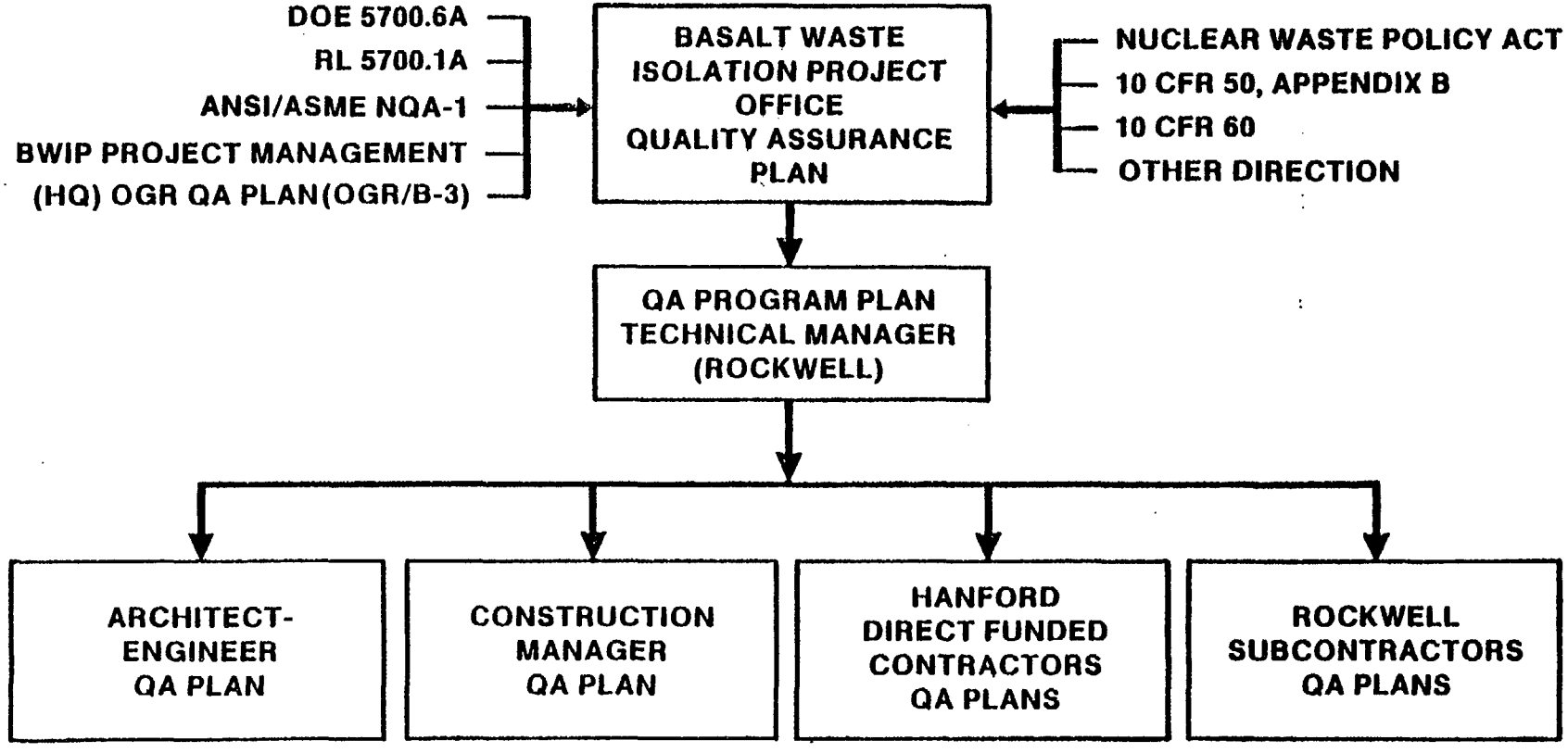
  PROJECT OFFICE QA PLAN ISSUED AND PROCEDURES BEING PREPARED

- **FUTURE** FOCUS ON IMPLEMENTATION AND DEBUGGING PRIOR TO ISSUANCE OF SITE CHARACTERIZATION PLAN

  COMPLETE PREPARATION OF IDENTIFIED PROCEDURES

BASALT WASTE ISOLATION PROJECT

ORGANIZATIONAL POLICIES AND REQUIREMENTS



BASALT WASTE ISOLATION PROJECT

QUALITY ASSURANCE PROGRAM ASSESSMENT

PROJECT OFFICE

- **QA PROGRAM DEVELOPMENT**

  PROGRESS HAS BEEN SUBSTANTIAL

  QA PLAN PREPARED AND ISSUED TO HQ FOR REVIEW AND APPROVAL

  REQUIRED IMPLEMENTING PROCEDURES HAVE BEEN IDENTIFIED

  OUTSTANDING PROGRAM DEVELOPMENT REQUIREMENTS IDENTIFIED FOR RESOLUTION

- **QA PROGRAM IMPLEMENTATION**

  PREPARATION OF IMPLEMENTING PROCEDURES INITIATED AND SCHEDULE FOR COMPLETION ESTABLISHED

  CHALLENGES AHEAD TO COMPLETE IMPLEMENTATION OF PROGRAM PRIOR TO SUBMISSION OF SITE CHARACTERIZATION PLAN

  VERIFICATION EFFORTS INTENSIFIED, RESULTING IN IDENTIFICATION OF AREAS FOR IMPROVEMENT IN ROCKWELL QA PROGRAM

ROCKWELL (TECHNICAL MANAGER)

- **QA PROGRAM DEVELOPMENT AND IMPLEMENTATION**

  OUTSTANDING PROGRAM DEVELOPMENT AND IMPLEMENTATION REQUIREMENTS IDENTIFIED FOR RESOLUTION

  ACTION PLANS BEING DEVELOPED TO ASSURE RESOLUTION PRIOR TO ISSUANCE OF SITE CHARACTERIZATION PLAN

BASALT WASTE ISOLATION PROJECT OFFICE

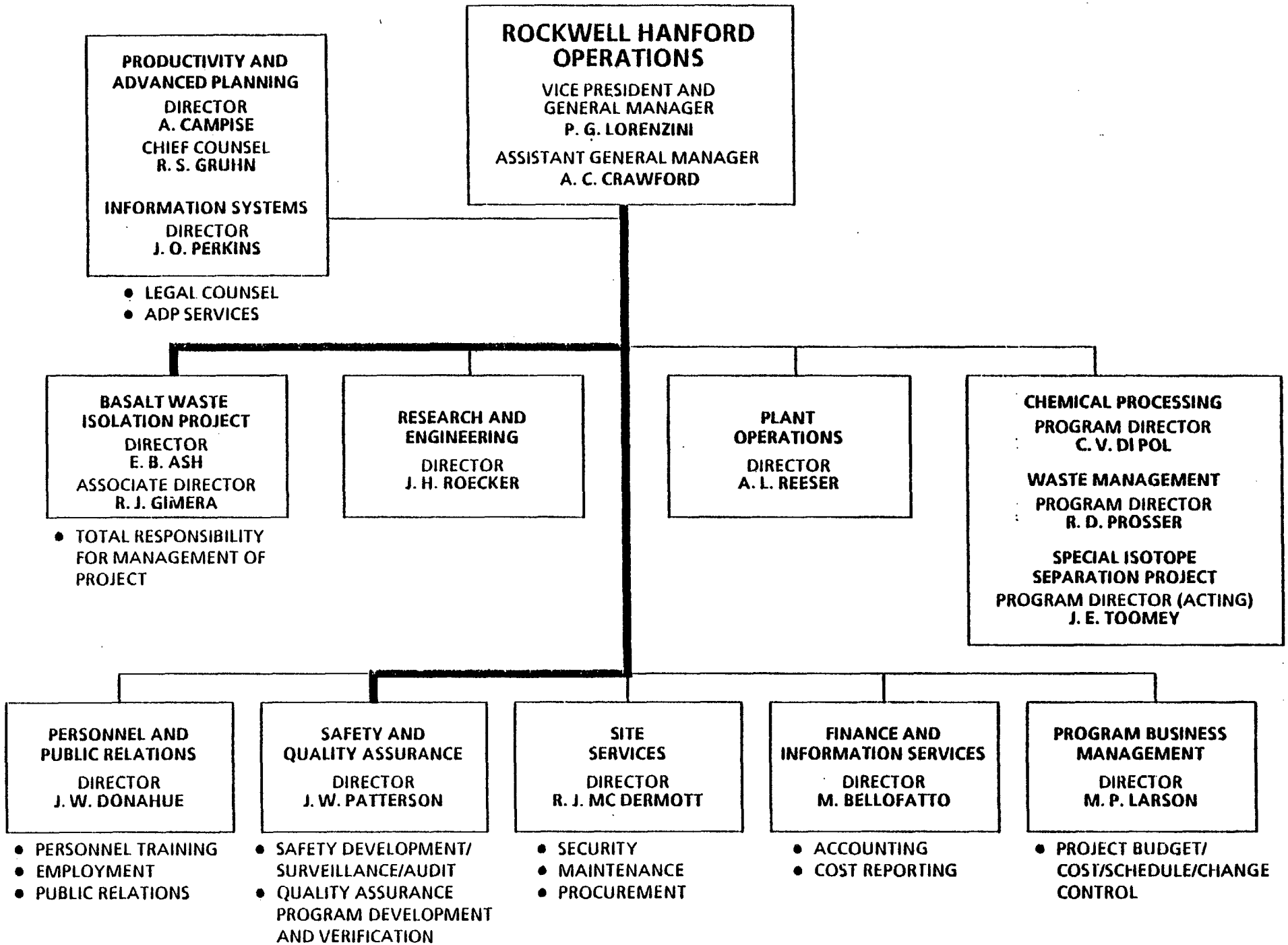
QUALITY ASSURANCE PROGRAM KEY ISSUES AND ACTIONS

ISSUE	ACTION
• DEVELOP AND IMPLEMENT PROJECT MANAGEMENT SYSTEMS AND CONTROLS	• REVIEW AND APPROVE SYSTEM ENGINEERING MANAGEMENT PLAN (4/85) REVIEW AND APPROVE PROJECT MANAGEMENT PLAN (6/85)
• HQ APPROVAL OF PROJECT OFFICE QA PLAN	• RECEIVE AND RESOLVE COMMENTS AND ISSUE QA PLAN (1/85)
• ADDITIONAL IMPLEMENTING PROCEDURE REQUIRED	• COMPLETE PREPARATION OF IDENTIFIED PROCEDURES (6/85)
• AVAILABILITY OF RESOURCES NECESSARY TO IMPLEMENT THE QA PROGRAM	• IDENTIFY COURSE OF ACTION TO RESOLVE THIS (2/85)
• DETERMINATION OF ITEMS AND ACTIVITIES IMPORTANT TO SAFETY OR WASTE ISOLATION	• CURRENTLY EVALUATED ON A CASE BY CASE BASIS. ADDITIONAL DEVELOPMENT REQUIRED TO RESOLVE THIS AREA (10/85)
• ESTABLISH FORMALIZED APPROACH TO DETERMINING GRADED QA	• POTENTIALLY IMPLEMENTED THROUGH VERIFICATION PLANNING. CLOSELY TIED TO ABOVE (10/85)
• DESIGN CONTROL AS APPLIED TO HARDWARE AND SITE CHARACTERIZATION	• REVIEW AND APPROVE SYSTEM ENGINEERING MANAGEMENT PLAN, PROJECT MANAGEMENT PLAN, AND PREPARE IMPLEMENTING PROCEDURES (6/85)
• ACCEPTANCE OF PAST ACTIVITIES CONDUCTED UNDER PREVIOUS QA PROGRAM CONTROLS	• ESTABLISH A FORMAL PROCESS FOR REVIEW ON A CASE BY CASE BASIS TO DETERMINE ACCEPTANCE (10/85)

ROCKWELL HANFORD OPERATIONS

QUALITY ASSURANCE PROGRAM OVERVIEW

E.B. ASH


ROCKWELL HANFORD OPERATIONS
VICE PRESIDENT AND GENERAL MANAGER
P. G. LORENZINI
ASSISTANT GENERAL MANAGER
A. C. CRAWFORD
PRODUCTIVITY AND ADVANCED PLANNING
DIRECTOR
A. CAMPISE
CHIEF COUNSEL
R. S. GRUHN
INFORMATION SYSTEMS
DIRECTOR
J. O. PERKINS
• LEGAL COUNSEL
• ADP SERVICES
BASALT WASTE ISOLATION PROJECT
DIRECTOR
E. B. ASH
ASSOCIATE DIRECTOR
R. J. GIMERA
• TOTAL RESPONSIBILITY FOR MANAGEMENT OF PROJECT
RESEARCH AND ENGINEERING
DIRECTOR
J. H. ROECKER
PLANT OPERATIONS
DIRECTOR
A. L. REESER
CHEMICAL PROCESSING
PROGRAM DIRECTOR
C. V. DI POL
WASTE MANAGEMENT
PROGRAM DIRECTOR
R. D. PROSSER
SPECIAL ISOTOPE SEPARATION PROJECT
PROGRAM DIRECTOR (ACTING)
J. E. TOOMEY
PERSONNEL AND PUBLIC RELATIONS
DIRECTOR
J. W. DONAHUE
• PERSONNEL TRAINING
• EMPLOYMENT
• PUBLIC RELATIONS
SAFETY AND QUALITY ASSURANCE
DIRECTOR
J. W. PATTERSON
• SAFETY DEVELOPMENT/ SURVEILLANCE/AUDIT
• QUALITY ASSURANCE PROGRAM DEVELOPMENT AND VERIFICATION
SITE SERVICES
DIRECTOR
R. J. MC DERMOTT
• SECURITY
• MAINTENANCE
• PROCUREMENT
FINANCE AND INFORMATION SERVICES
DIRECTOR
M. BELLOFATTO
• ACCOUNTING
• COST REPORTING
PROGRAM BUSINESS MANAGEMENT
DIRECTOR
M. P. LARSON
• PROJECT BUDGET/ COST/SCHEDULE/CHANGE CONTROL

BASALT WASTE ISOLATION PROJECT
ROCKWELL ORGANIZATION

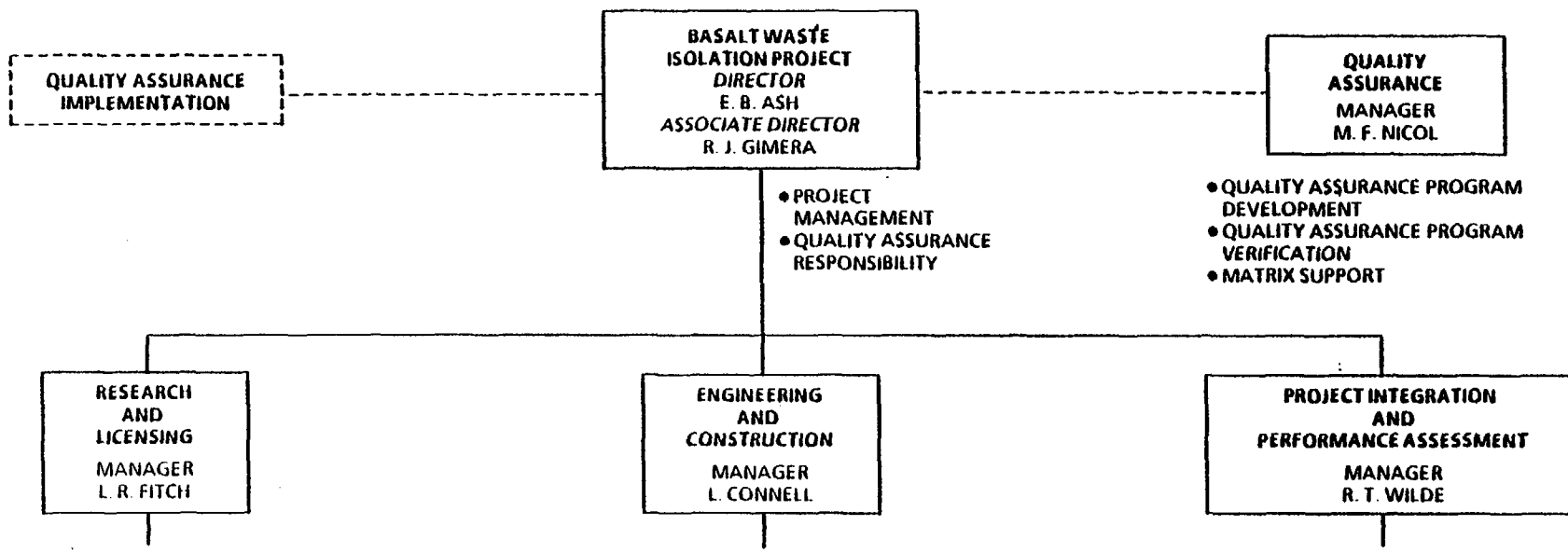


Chart 1

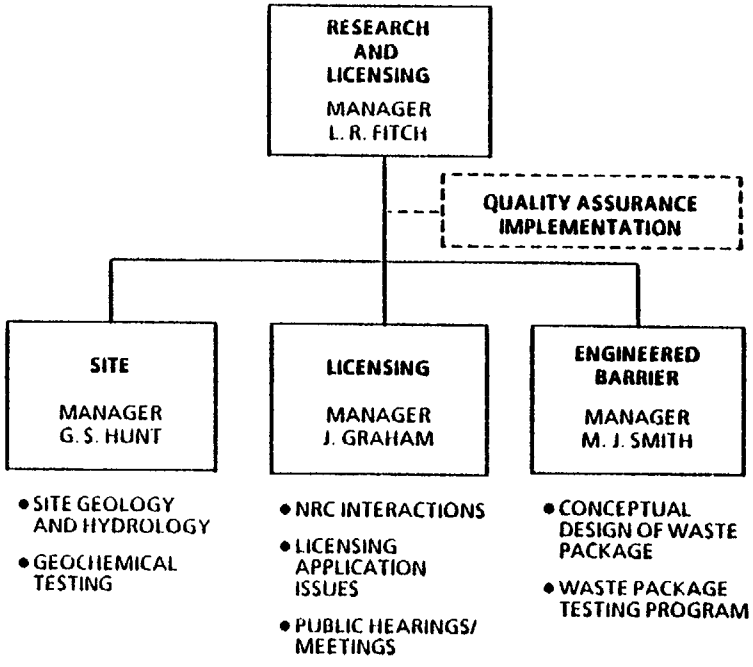

RESEARCH AND LICENSING
MANAGER
L. R. FITCH
QUALITY ASSURANCE IMPLEMENTATION
SITE
MANAGER
G. S. HUNT
LICENSING
MANAGER
J. GRAHAM
ENGINEERED BARRIER
MANAGER
M. J. SMITH
• SITE GEOLOGY AND HYDROLOGY
• GEOCHEMICAL TESTING
• NRC INTERACTIONS
• LICENSING APPLICATION ISSUES
• PUBLIC HEARINGS/ MEETINGS
• CONCEPTUAL DESIGN OF WASTE PACKAGE
• WASTE PACKAGE TESTING PROGRAM

Chart 2

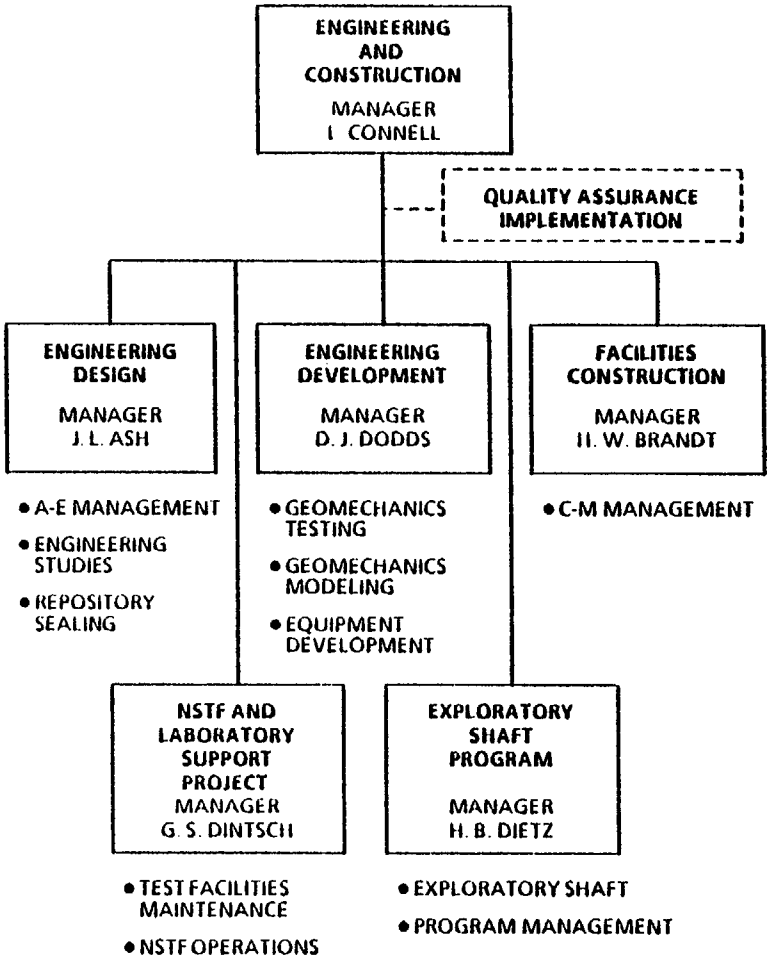

ENGINEERING AND CONSTRUCTION
MANAGER
I. CONNELL
QUALITY ASSURANCE IMPLEMENTATION
ENGINEERING DESIGN
MANAGER
J. L. ASH
ENGINEERING DEVELOPMENT
MANAGER
D. J. DODDS
FACILITIES CONSTRUCTION
MANAGER
H. W. BRANDT
• A-E MANAGEMENT
• ENGINEERING STUDIES
• REPOSITORY SEALING
• GEOMECHANICS TESTING
• GEOMECHANICS MODELING
• EQUIPMENT DEVELOPMENT
• C-M MANAGEMENT
NSTF AND LABORATORY SUPPORT PROJECT
MANAGER
G. S. DINTSCH
EXPLORATORY SHAFT PROGRAM
MANAGER
H. B. DIETZ
• TEST FACILITIES MAINTENANCE
• NSTF OPERATIONS
• EXPLORATORY SHAFT
• PROGRAM MANAGEMENT

Chart 3

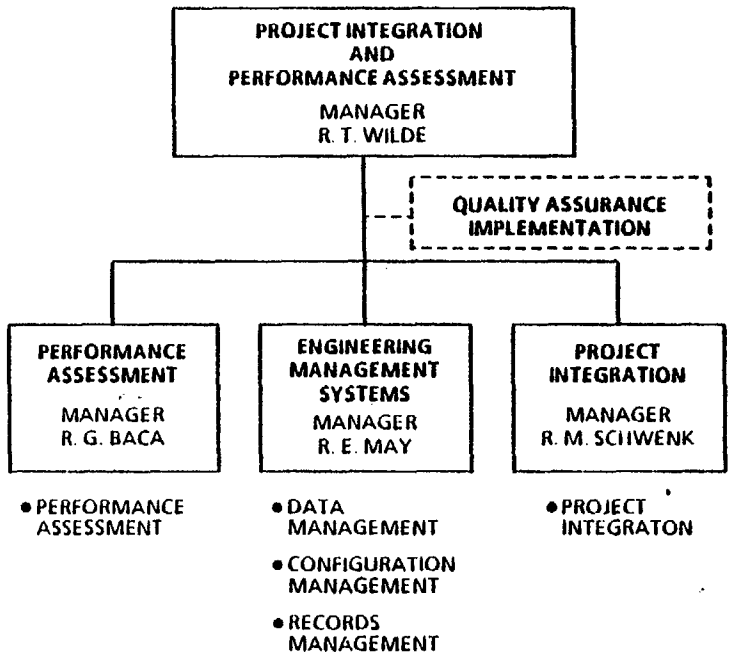
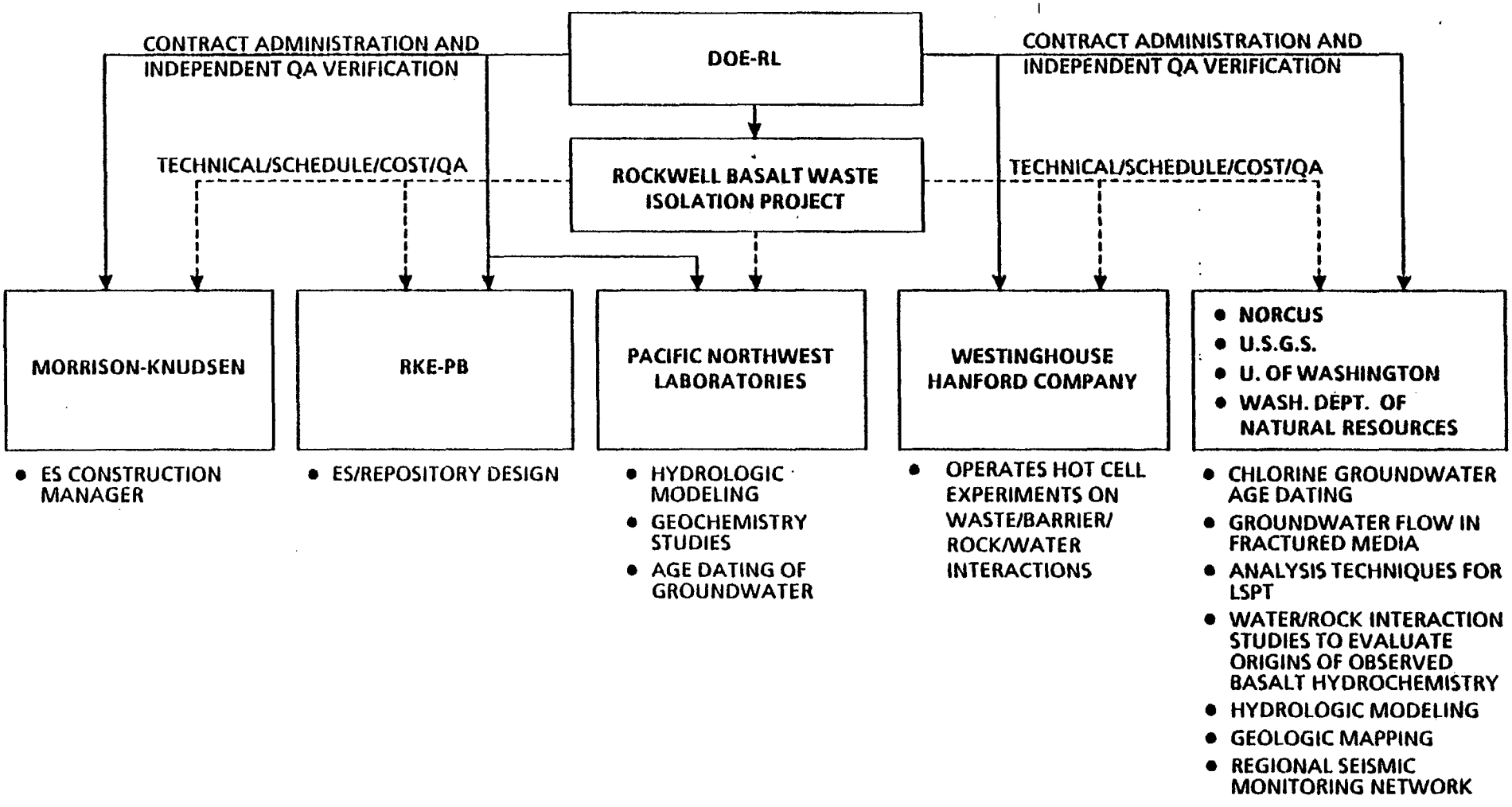
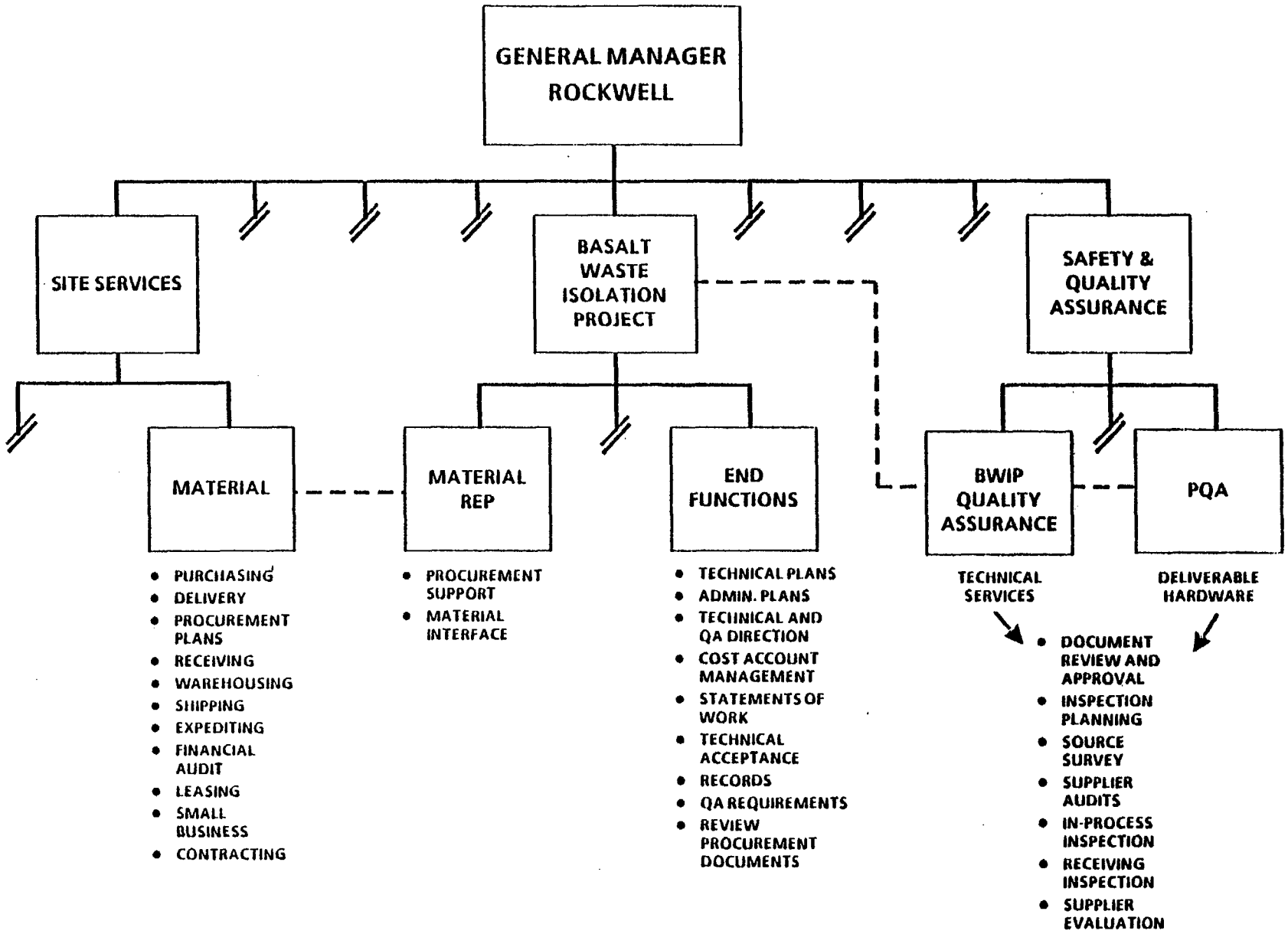

PROJECT INTEGRATION
AND
PERFORMANCE ASSESSMENT
MANAGER
R. T. WILDE
QUALITY ASSURANCE
IMPLEMENTATION
PERFORMANCE
ASSESSMENT
MANAGER
R. G. BACA
ENGINEERING
MANAGEMENT
SYSTEMS
MANAGER
R. E. MAY
PROJECT
INTEGRATION
MANAGER
R. M. SCHWENK
• PERFORMANCE ASSESSMENT
• DATA MANAGEMENT
• CONFIGURATION MANAGEMENT
• RECORDS MANAGEMENT
• PROJECT INTEGRATON

Chart 4

BASALT WASTE ISOLATION PROJECT
DIRECT FUNDED CONTRACTORS



ROCKWELL SUBCONTRACTOR MANAGEMENT SYSTEM



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WORK SCOPE - ROCKWELL SUBCONTRACTORS

QA REQUIREMENTS APPLIED:

LABORATORY ANALYSIS
- BETA ANALYTICAL
- JFT AGAPITO
- LANL (MODELING)
- DYNATECH
- ROCKWELL SCIENCE CENTER
- HYDRO GEO-CHEM
- KRUEGER
- OREGON STATE UNIVERSITY
- TEMPLE UNIVERSITY
- UNION CARBIDE
- PITTSBURGH TESTING LABS.
- UNIVERSITY OF ARIZONA
- UNIVERSITY OF MIAMI
- UNIVERSITY OF MISSOURI

EARTHSCIENCES (Seismic, Geophysics)
- ANALYTICAL SERVICES
- DRESSER
- WASHINGTON STATE UNIVERSITY
- EMERALD EXPLORATION
- WESTON
- SIERRA GEOPHYSICS

TECHNICAL SERVICES
- APPLIED MECHANICS
- LANL
- GOLDER
- ANALYTICAL AND COMP. RESEARCH
- IN SITU INC.
- FENNIX & SCISSION
- WOODWARD-CLYDE
- WASHINGTON STATE UNIVERSITY

ENGINEERING AND TEST
- RE/SPEC
- GILBERT-COMMONWEALTH
- WESTINGHOUSE ELECTRIC
- COLORADO SCHOOL OF MINES
- HYDROTECHNIQUE

PEER REVIEW
- IT CORPORATION
- D'APPOLONIA

NO QA REQUIREMENTS APPLICABLE
- TYPICAL SERVICES INCLUDE: GRAPHICS, LEASES, MAINTENANCE, SUPPLIES, REPAIR (NON-CRITICAL ITEMS)
- VARIES FROM 60 TO 90 CONTRACTS IN PLACE AT ANY ONE TIME

TYPICAL QUALITY ASSURANCE REQUIREMENTS
BY CONTRACT TYPE

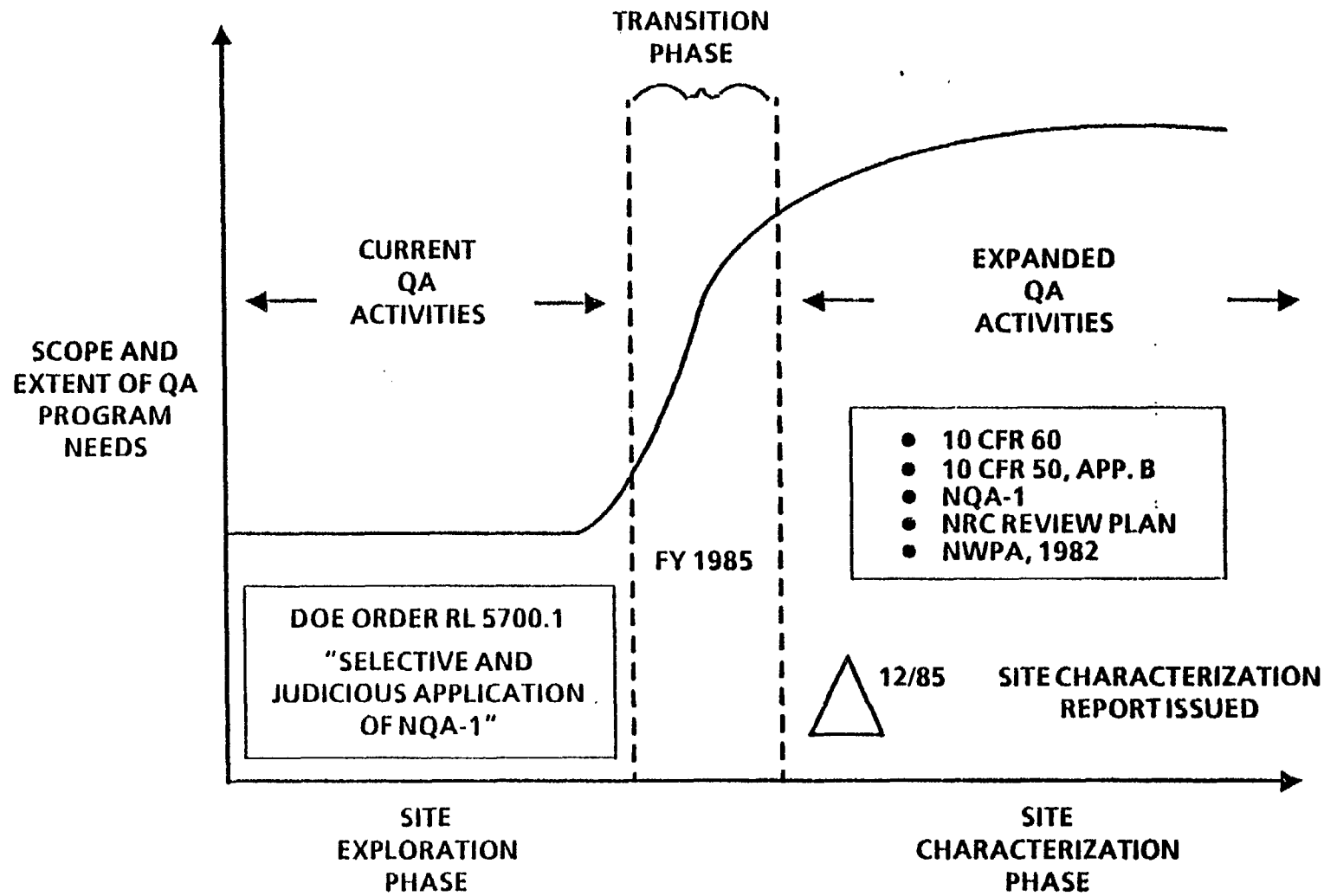
LABORATORY ANALYSIS, SEISMIC, GEOPHYSICS, ENGINEERING, AND ENGINEERING TEST

- FORMAL QUALITY ASSURANCE PROGRAM/PLAN TO NQA–1 CRITERIA
- DESIGN CONTROL (ENGINEERING AND TEST)
- SUBTIER QUALITY ASSURANCE CONTROLS
- WRITTEN PROCEDURES/DRAWINGS
- DOCUMENT CONTROL
- CALIBRATION
- NONCONFORMANCE REPORTING
- CORRECTIVE ACTION
- QUALITY ASSURANCE RECORDS
- SOURCE VERIFICATION (BY ROCKWELL)

TECHNICAL SERVICES AND PEER REVIEW

- DEFINED RESPONSIBILITIES
- PROCEDURES (AS APPLICABLE)
- QUALITY ASSURANCE RECORDS

GROWTH IN QA NEEDS



CURRENT QA PROJECT DOCUMENTS
(INCLUDES MATRIX SUPPORT ORGANIZATIONS)

- BWIP QA PROGRAM PLAN (RHO-QA-PL-3)
  - REQUIREMENTS DEFINITION
  - QA PROGRAM INDEX
  - PREPARED BY QA ORGANIZATION/DOE-RL APPROVAL
  - ADDRESS 18 CRITERIA
- BWIP QA PROGRAM MANUAL (RHO-BWI-MA-14)
  - ADDRESS IMPLEMENTATION OF PROGRAM PLAN
  - ORGANIZED BY 18 CRITERIA
  - QA PROGRAM PROCEDURES (40 RELEASED)
  - ADMINISTRATIVE PROCEDURES (6 RELEASED)
  - PREPARED BY IMPLEMENTING ORGANIZATIONS/APPROVED BY QA
  - CONTROLLED BY QA ORGANIZATION
- BASALT OPERATING PROCEDURES MANUAL (RHO-BWI-MA-4)
  - TECHNICAL PROCEDURES (88 PROCEDURES)
  - PREPARED BY TECHNICAL STAFF/APPROVED BY QA
  - CONTROLLED BY ENGINEERING MANAGEMENT SYSTEMS

CURRENT QA PROJECT DOCUMENTS (CONT.)

(INCLUDES MATRIX SUPPORT ORGANIZATIONS)

- RECORDS MANAGEMENT PLAN (SD-BWI-AP-001)
  - BASALT RECORDS MANAGEMENT CENTER
  - MICROFILMING
  - PREPARED BY PROJECT MANAGEMENT STAFF/APPROVED BY QA
- SOFTWARE MANAGEMENT PLAN (DRAFT)
  - CONTROL OF COMPUTER CODES/PROGRAMS
  - SOFTWARE CONFIGURATION MANAGEMENT
  - PREPARED BY PROJECT MANAGEMENT STAFF/APPROVED BY QA

CURRENT QA PROGRAM KEY FEATURES

- DESIGN CONTROL (11 PROCEDURES)
  - BASELINE IDENTIFICATION
  - VERIFICATION/BENCHMARKING
  - PEER REVIEW
  - DESIGN REVIEW
  - CHANGE CONTROL
  - INTERFACE CONTROL
- SURVEILLANCE AND INSPECTION (7 PROCEDURES)

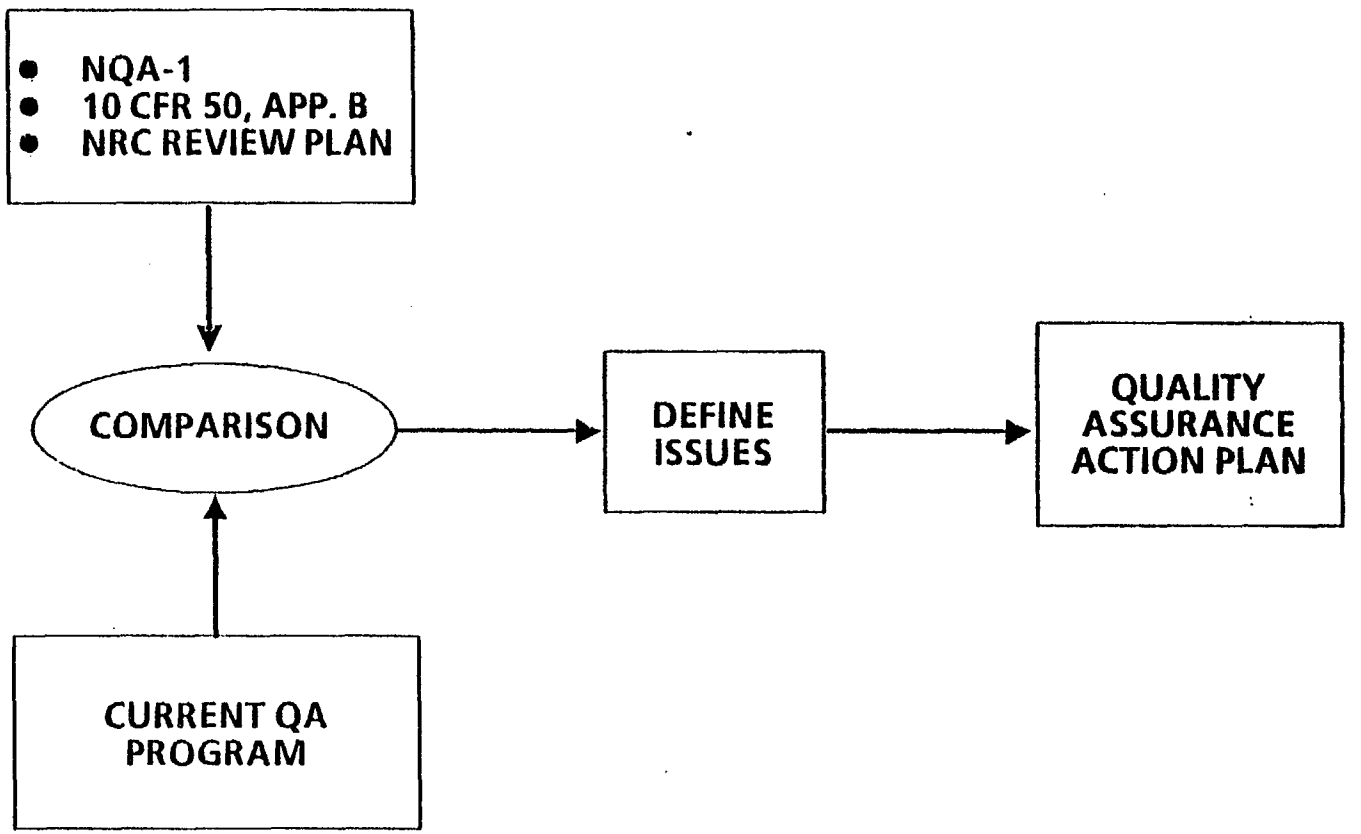
  FY 1984 ACTIVITIES - HARDWARE SUBCONTRACTORS
  - 10 SUPPLIER SOURCE INSPECTIONS
  - 3 SUPPLIER SURVEILLANCES
  - 4 PRE-AWARD SURVEYS
  - 2 RESIDENT INSPECTORS

  FY 1984 ACTIVITIES - ROCKWELL, BWIP CONTRACTORS, AND SERVICE SUBCONTRACTORS
  - 215 SURVEILLANCE REPORTS
  - 6 SUPPLIER SOURCE SURVEYS
- AUDITS (3 PROCEDURES) FY 1984 ACTIVITIES
  - 1 INTERNAL AUDIT
  - 5 SUPPLIER AUDITS
  - 4 VERIFICATION AUDITS (INTERNAL)
- 51 QA PROGRAM MANUAL PROCEDURES IN DEVELOPMENT

CURRENT QA PROGRAM KEY FEATURES (CONT.)

- PROCUREMENT PLANNING AND CONTROL (10 PROCEDURES)
  - QA PLANNING
  - DOCUMENT REVIEW
  - CHANGE CONTROL
- DOCUMENT CONTROL (10 PROCEDURES)
  - QA PROGRAM MANUAL
  - FIELD AND FACILITY PROCEDURES
  - SUPPORTING DOCUMENTS
  - ENGINEERING RELEASE
  - PUBLIC CLEARANCE
- FIELD AND LABORATORY TEST CONTROL (88 PROCEDURES)
  - GEOSCIENCES
  - HYDROLOGY
  - MATERIALS TESTING
- QA RECORDS (6 PROCEDURES)
  - RECORDS MANAGEMENT SYSTEM
  - DATA RECORDING
  - TEST DATA
- QA STAFF
  - BWIP QA (21 PERSONS)

FORMULATION OF FY 1985 QUALITY ASSURANCE ACTION PLAN



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ISSUES IDENTIFIED WITH CURRENT QA PROGRAM

- 51 NEW PROCEDURES (MINIMUM) ARE REQUIRED - EXAMPLES:
  - "Q" LIST - ITEMS AND ACTIVITIES AFFECTING QUALITY
  - MANAGEMENT APPROVAL AUTHORITY
  - TREND REPORTING/SUPPLIER SELECTION/CONTROL OF SUPPLIER DOCUMENTS
  - QA PERSONNEL QUALIFICATION
- EXISTING PROCEDURES REQUIRE UPDATE - EXAMPLES:
  - PEER REVIEW
  - ORGANIZATION CHARTERS
  - DESIGN REVIEW
  - INTERFACE CONTROL
  - RECORDS MANAGEMENT
- TRAINING PROGRAM NEEDS AUGMENTATION
- OVERALL PROGRAM MANAGEMENT DISCIPLINE NEEDS IMPROVEMENT
- MANAGEMENT AND EMPLOYEE QA AWARENESS NEEDS INTENSIFICATION
- AUDIT/SURVEILLANCE ACTIVITY NEED ACCELERATION
- ROCKWELL INTERNAL CHARTER ISSUES NEED RESOLUTION

ISSUES IDENTIFIED WITH CURRENT QA PROGRAM

- ROLES OF PROGRAM PARTICIPANTS NEED FURTHER CLARIFICATION
- INCREASE QA STAFFING NEEDED
- QA TREND ANALYSIS NEEDED TO AID MANAGEMENT IN CONTROLLING GENERIC PROBLEMS
- EXTERNAL PROFESSIONAL REVIEW OF PROGRAM REQUIRED
- LARGE MICROFILMING BACKLOG NEEDS REDUCTION
- BASELINED TEST PLANS ARE REQUIRED FOR ALL ONGOING ACTIVITIES
- USGS LACK OF CONCURRENCE WITH QA REQUIREMENTS

KEY FEATURES OF ADDITIONAL PROGRAM MANAGEMENT ACTIVITIES

MAJOR AUGMENTATION OF THE CURRENT OVERALL PROJECT MANAGEMENT APPROACH

UTILIZES A DISCIPLINED PROJECT MANAGEMENT METHODOLOGY SUCCESSJULLY UTILIZED ON OTHER COMPLEX MAJOR SYSTEM PROGRAMS

TO BE FULLY IMPLEMENTED BY END OF FY 1985

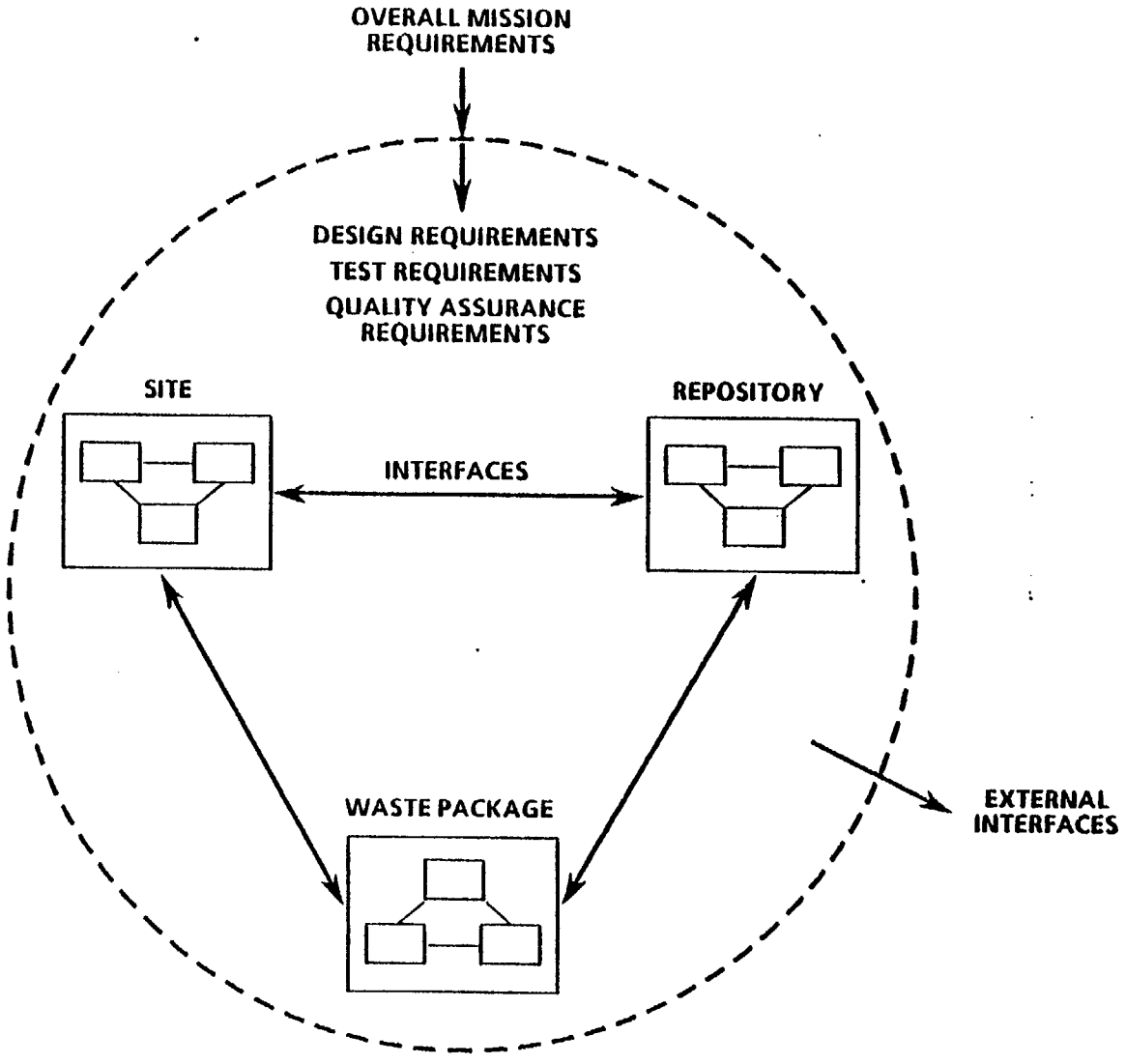
COMPATIBLE WITH SITE CHARACTERIZATION QUALITY ASSURANCE REQUIREMENTS

QUALITY ASSURANCE IMPLEMENTATION RESPONSIBILITIES INTEGRATED INTO LINE ORGANIZATIONS

ELEMENTS OF THE DISCIPLINED MANAGEMENT APPROACH

- IDENTIFICATION AND ALLOCATION OF MISSION REQUIREMENTS TO INDIVIDUAL SYSTEM ELEMENTS
- OVERALL SYSTEM ANALYSIS USING ESTABLISHED METHODOLOGIES
- ESTABLISHMENT OF QUALITY AS AN INTEGRAL PART OF PROGRAM MANAGEMENT
- UNIFORM DOCUMENTATION SYSTEM
- TRACEABILITY OF REQUIREMENTS
- UNIFORM DECISION METHODOLOGY
- CONFIGURATION AND CHANGE CONTROL
- LOGICAL DEFINITION OF INTERRELATED WORK ELEMENTS
- TREATMENT AS AN INTERACTING SYSTEM
- DEFINITION AND CONTROL OF INTERFACES
- CLEAR FOCUS OF RESPONSIBILITIES/CHARTERS

THE "SYSTEM"



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RECENT ROCKWELL ACCOMPLISHMENTS AND STATUS

- SYSTEM ENGINEERING MANAGEMENT PLAN COMPLETE (10/84 DRAFT)
- PROJECT PLAN IN WORK (12/84 DRAFT MILESTONE)
- PROJECT MANAGEMENT PLAN IN PREPARATION (4/85 DRAFT MILESTONE)
- MANY NEW PROCEDURES/PLANS IN DRAFT FORM - EXAMPLES:
  - SCIENCE AND ENGINEERING PLAN IMPLEMENTATION
  - PEER REVIEW PROCEDURE
  - CONFIGURATION MANAGEMENT PLAN
  - EXPLORATORY SHAFT TEST PLAN
  - PERFORMANCE ASSESSMENT PLAN
  - SOFTWARE MANAGEMENT PLAN
  - GEOSCIENCE PROGRAM PLAN
- DOCUMENT HIERARCHY DRAFT COMPLETED (5/84)
- DETAILED FY 1985 IMPLEMENTATION PLANNING UNDER WAY
- QUALITY ASSURANCE ACTION PLAN IN PREPARATION (12/84 DRAFT MILESTONE)

RECENT ROCKWELL ACCOMPLISHMENTS AND STATUS (CONT.)

- BUDGET AUGMENTATION DEFINED ($1.6M) AND PROPOSED TO DOE
- RHO-BW-MA-14 (QA PROGRAM MANUAL) RELEASED
  - CONSOLIDATES QA PROCEDURES WITHIN PROJECT
- RECENT DOE AUDITS DEFINED SEVERAL GENERIC DEFICIENCIES NOW BEING CORRECTED
- ALL LABS WERE SHUT DOWN FOR 3-5 MONTHS TO UPGRADE PROCEDURES AND DOCUMENT CORRECTION OF QUALITY DEFICIENCIES
- BWIP-ROCKWELL PROJECT MANAGEMENT STAFF AUGMENTED
- ORGANIZATIONAL CHANGES MADE TO CLARIFY RESPONSIBILITY
  - RECORDS MANAGEMENT
  - CONFIGURATION MANAGEMENT
- NEW PROCEDURE ISSUED FOR CONTROL OF DIRECT FUNDED CONTRACTORS
- INTERCONTRACTOR QA COORDINATION GROUP ESTABLISHED

RECENT ROCKWELL ACCOMPLISHMENTS AND STATUS (CONT.)

- DISCIPLINED METHODOLOGY FOR DETERMINING SITE CHARACTERIZATION NEEDS ESTABLISHED
- INTEGRATED QA PLAN IN PREPARATION
- QA TRAINING COMMITTEE ESTABLISHED
- MANAGEMENT CONTROL SYSTEM (MCS) IMPLEMENTED

BASALT WASTE ISOLATION PROJECT

OVERVIEW
of the
STRUCTURE of the PROJECT
for
SITE CHARACTERIZATION

STRUCTURE:

- WHAT ARE THE CONSTITUENT PARTS ?
- HOW ARE THE PARTS RELATED ?
- HOW IS THIS STRUCTURE RESPONSIVE TO SOUND PROJECT MANAGEMENT AND QUALITY ASSURANCE PRINCIPLES ?

SITE CHARACTERIZATION

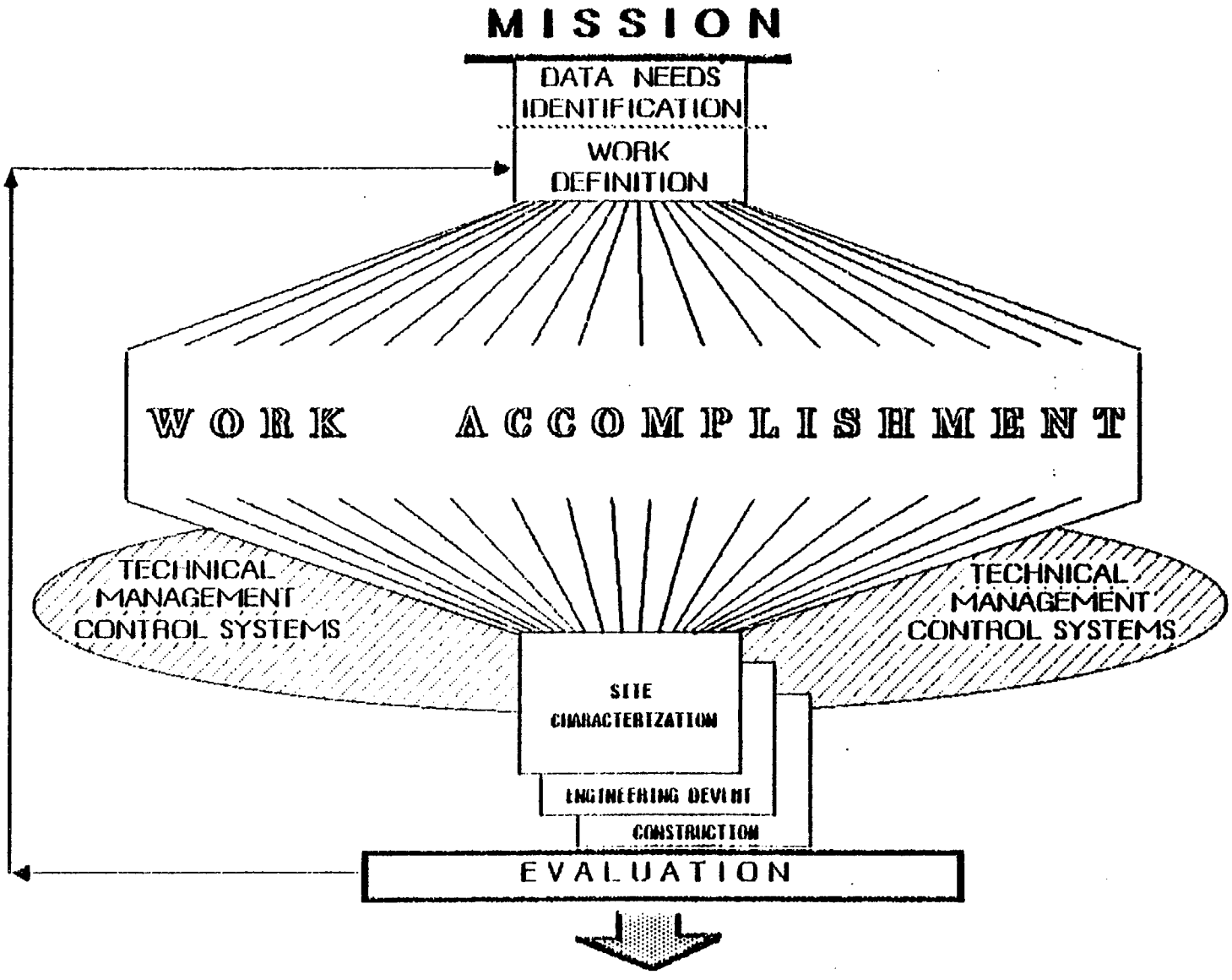
- ***SITE EXPLORATION***
  - Candidate Site Identification,
  - Environmental Assessment,
  - Presidential Selection.
- ***SITE CHARACTERIZATION***
  - Natural Sciences Investigations,
  - Conceptual & Preliminary Design,
  - Assessment of Isolation Performance,
  - Site Recommendation Data,
  - Presidential Site Recommendation.
- ***ENGINEERING DEVELOPMENT***
  - Apply for Construction Authorization
  - Definitive Design
  - Follow-On Testing
- ***CONSTRUCTION***
- ***OPERATIONS***
- ***MONITORING***
- ***DECOMMISSIONING***

"THE MANAGEMENT CONTROL PROGRAM REQUIRED BY NRC
IS CALLED THE QUALITY ASSURANCE PROGRAM"

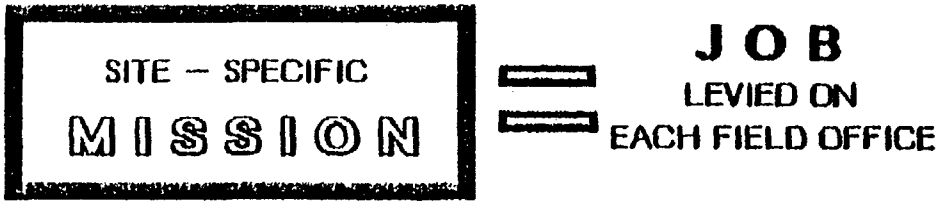
OUTLINE

- Mission - The Job To Be Done
- Identification of Data Needs and
  Correlation with Regulatory Criteria and Issues
- Work Definition - The Science and Engineering Programs
- Test Facility Management
- Conduct of the Technical Work
- The Technical Management Control Systems

PROJECT MODEL

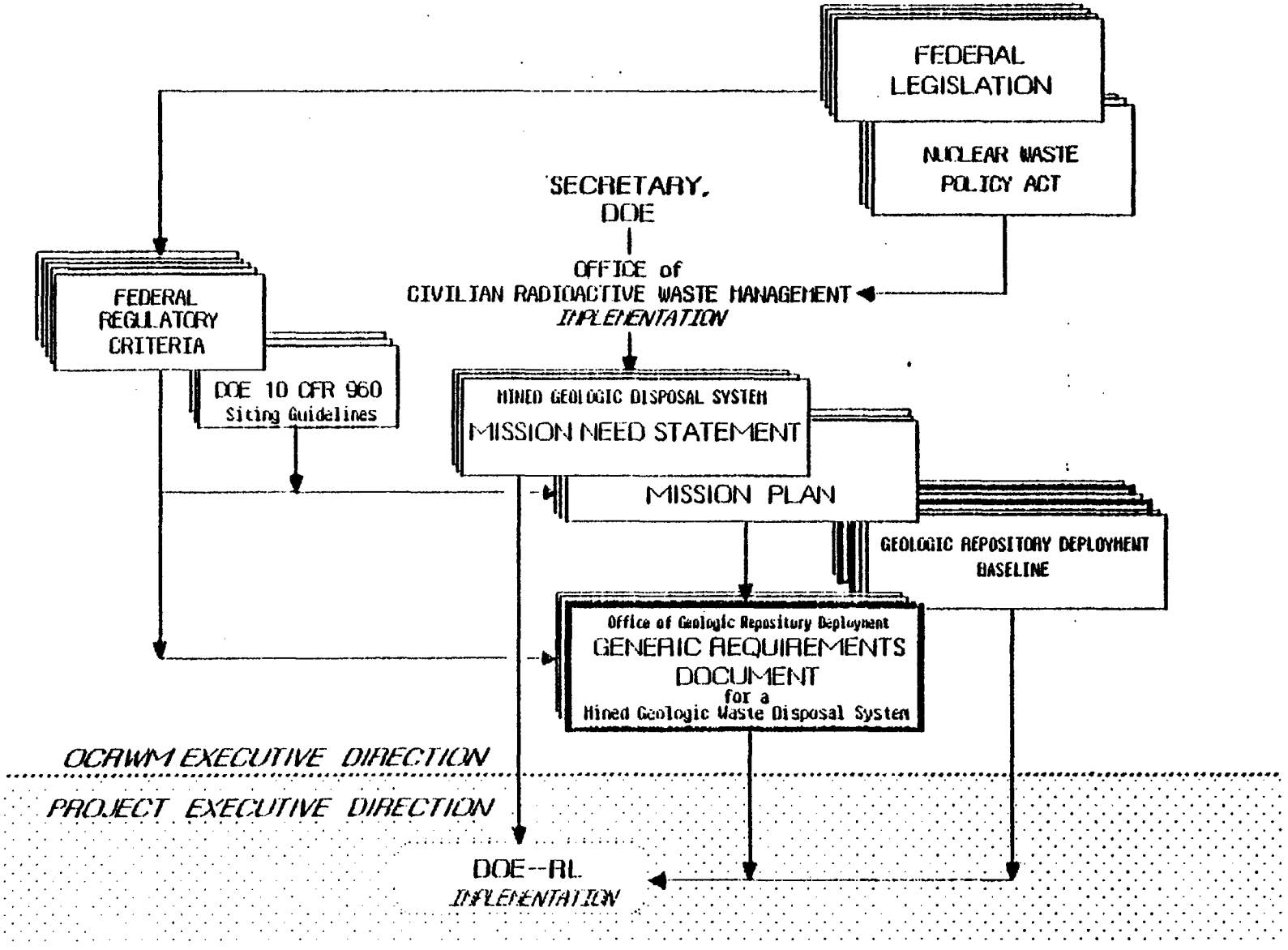


THE ASSIGNED MISSION



"It is the mission of the Basalt Waste Isolation Project to determine the feasibility of repository sites in the Columbia River Basalts and to provide the technology and facilities compatible with those sites for the permanent disposal of commercially generated high level radioactive wastes."

THE ASSIGNED MISSION



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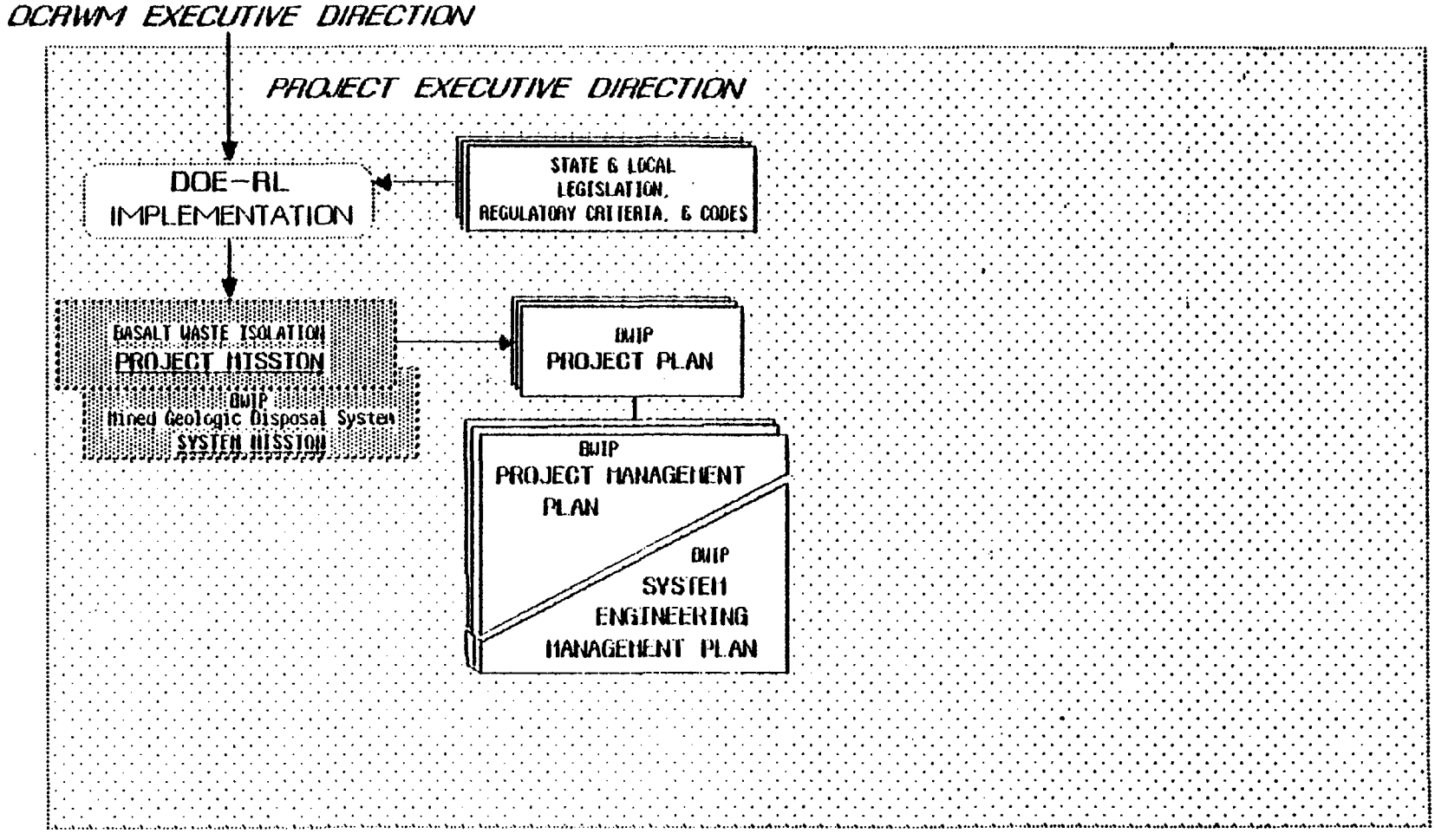

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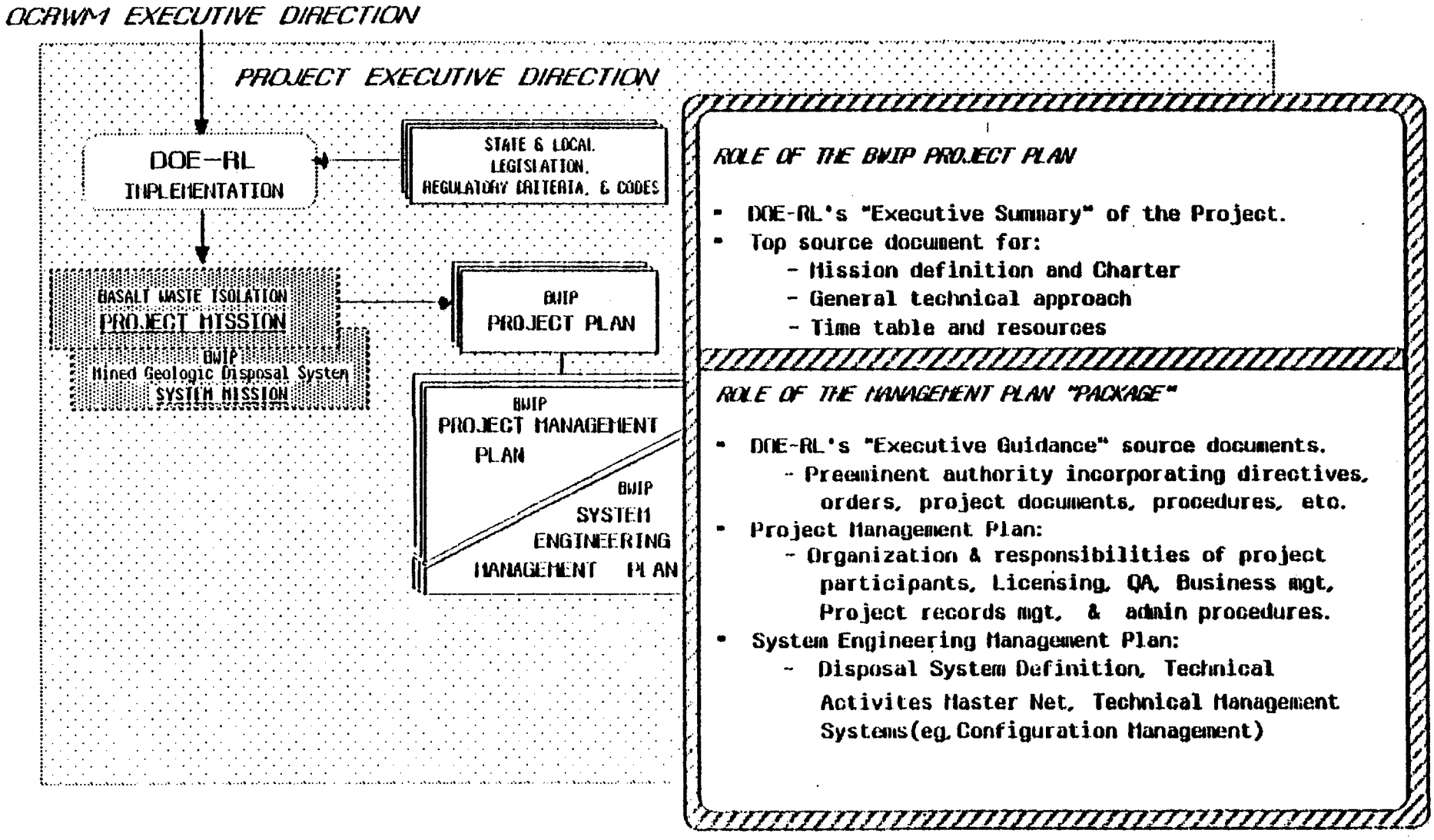
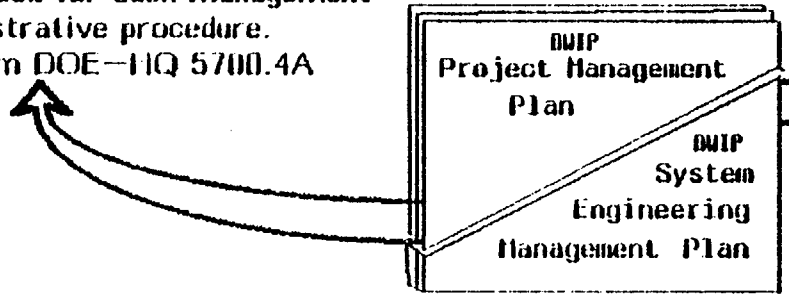


ROLE OF BWIP's MANAGEMENT PLAN "PACKAGE"

DOE–RL's "EXECUTIVE GUIDANCE" SOURCE DOCUMENT(S):
Designates all Project applicable directives, orders,
BWIP documents, procedures, etc.

PROJECT MANAGEMENT PLAN

- Role & responsibilities of each participant.
- Establishes licensing approach.
- Establishes quality assurance program.
- Establishes Project's business management needs for all participants.
- Establishes Project Directive System.
- Establishes Records Mangement Program.
- Establishes need for each management and administrative procedure.
- Prepared from DOE–HQ 5700.4A

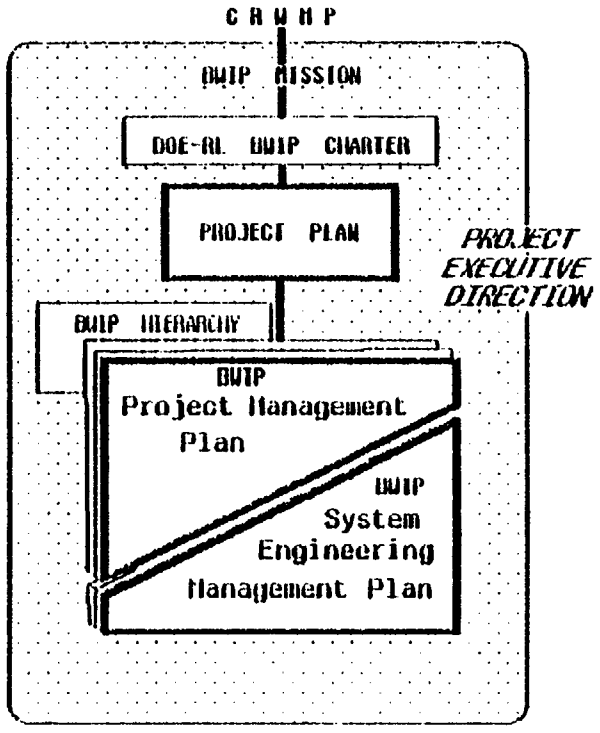


SYSTEM ENGINEERING MANAGEMENT PLAN

- Establishes the System Mission.
- Establishes the technical approach.
- Establishes Project-wide Activities Master Net
- Defines the need, role and characteristics of technical management systems; eg:
  - Data Needs Identification
  - Work Definition and Integration
  - Defines role and minimum characteristics of Project-wide Change Management Sys.
  - Traceability System
  - Data Base Management
  - Technology Risk Assessment
  - Design Control

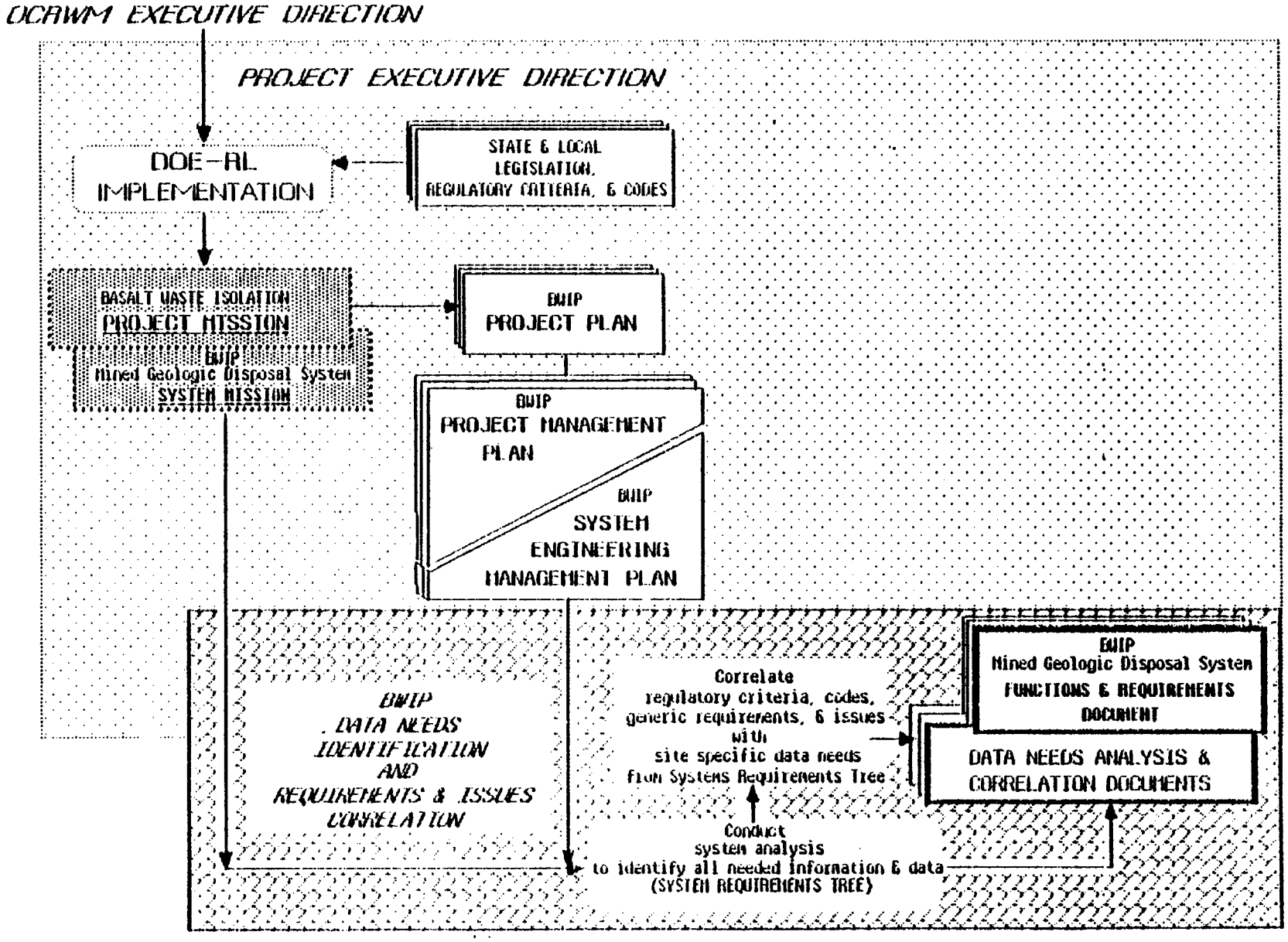
REVIEW PLAN CORRELATION

PROJECT MANAGEMENT PLAN (PMP)	SYSTEM ENGINEERING MANAGEMENT PLAN (SEMP)
1. ORGANIZATION 2. QUALITY ASSURANCE PROGRAM (MANAGEMENT ISSUES) 4. PROCUREMENT DOCUMENT CONTROL 5. INSTRUCTIONS, PROCEDURES, DRAWINGS 6. DOCUMENT CONTROL 7. CONTROL OF PURCHASED ITEMS AND SERVICES 10. INSPECTION 15. CONTROL OF NONCONFORMING ITEMS 16. CORRECTIVE ACTION 17. QUALITY ASSURANCE RECORDS 18. AUDITS	2. QUALITY ASSURANCE PROGRAM (TECHNICAL ISSUES) 3. DESIGN CONTROL 8. IDENTIFICATION AND CONTROL OF ITEMS 9. CONTROL OF PROCESSES 11. TEST CONTROL 12. CONTROL OF MEASURING AND TEST EQUIPMENT 13. HANDLING, STORAGE, AND SHIPPING 14. INSPECTION, TEST, AND OPERATING STATUS

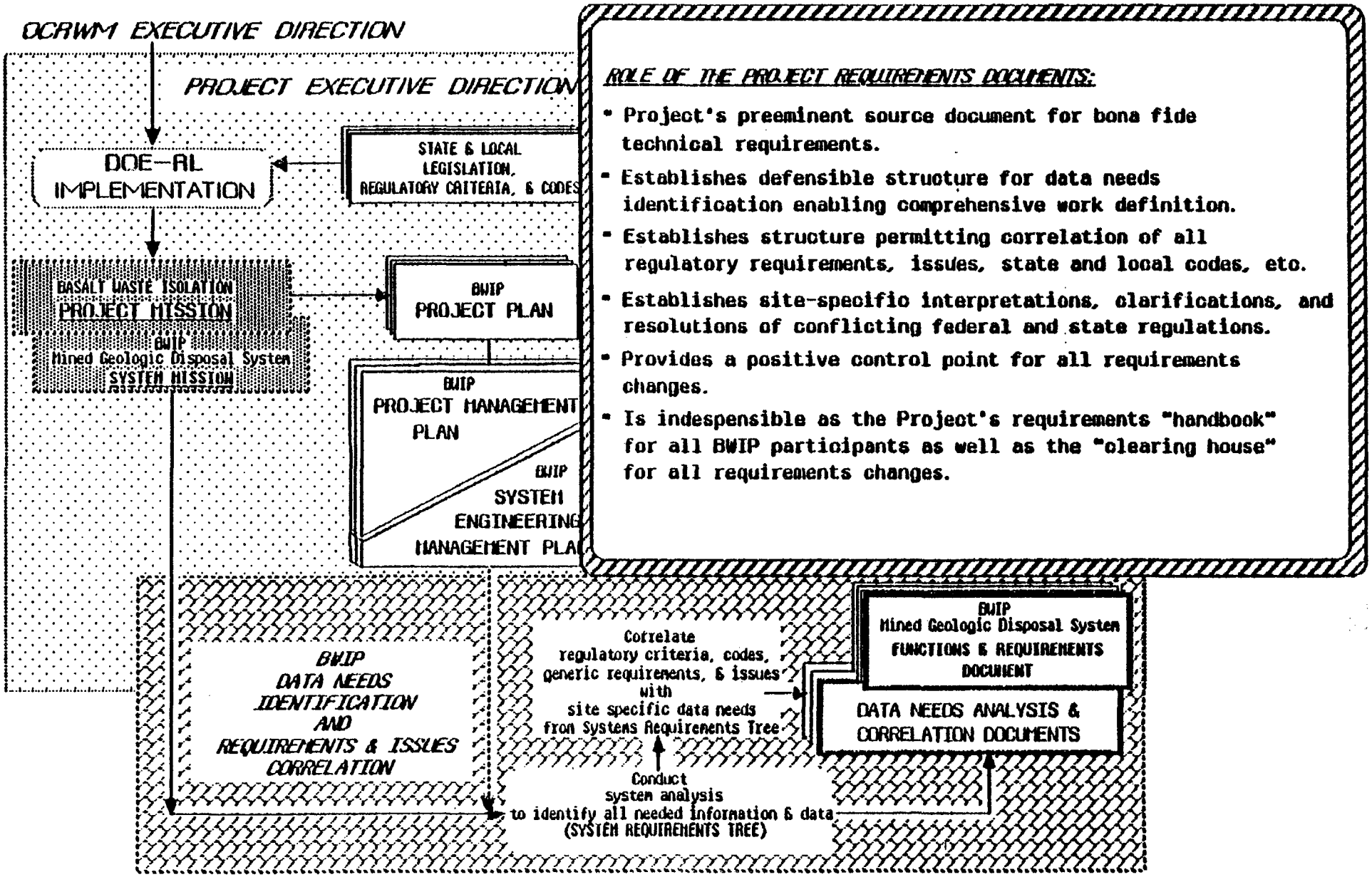


BWIP HIERARCHY OF PROJECT ACTIVITIES AND DOCUMENTATION

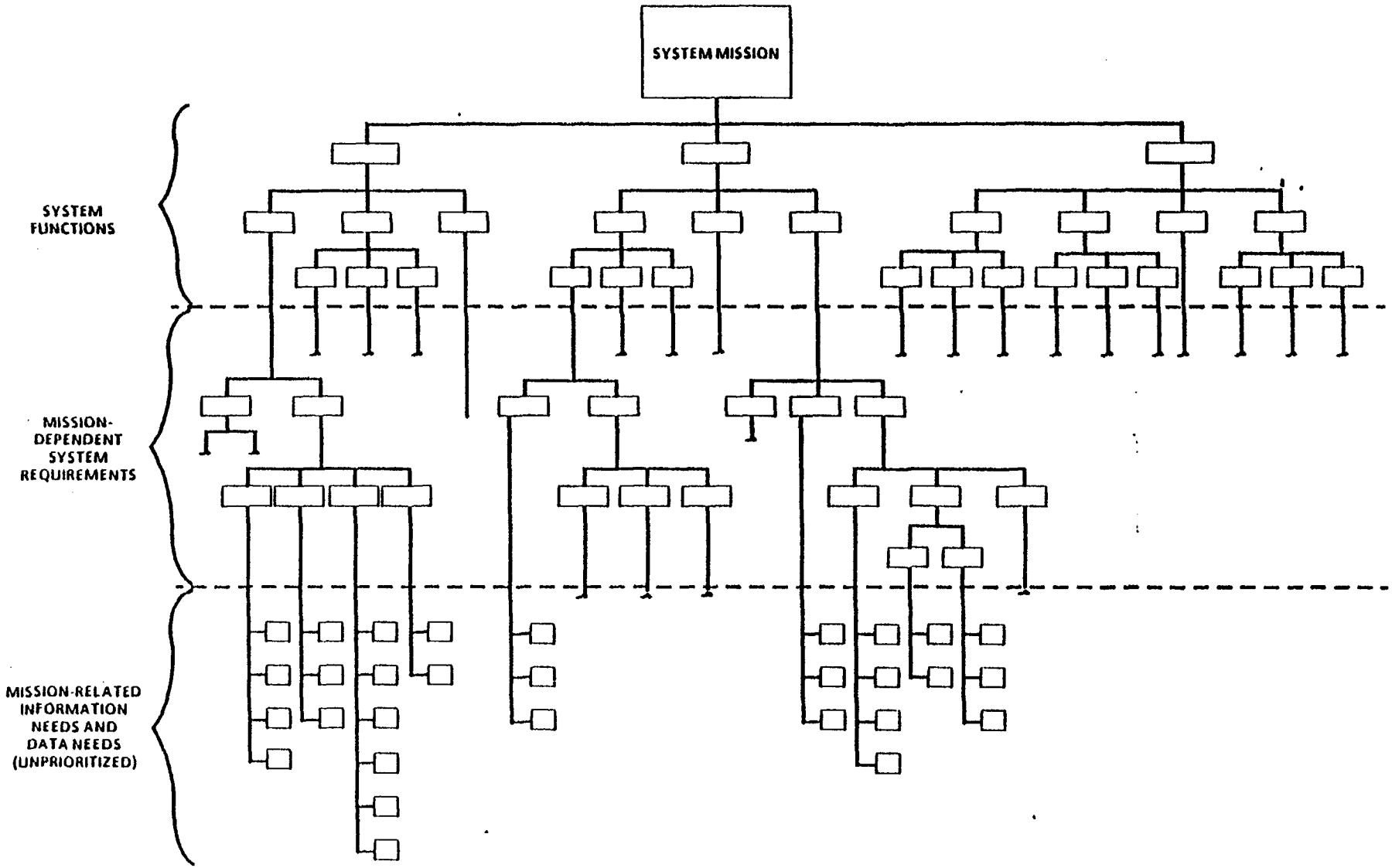
IDENTIFICATION OF DATA NEEDS



IDENTIFICATION OF DATA NEEDS

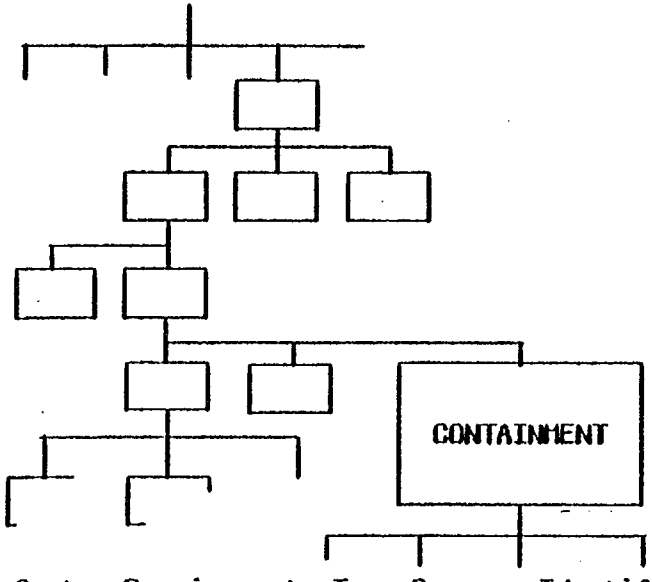


STRUCTURE OF SYSTEM REQUIREMENTS TREE

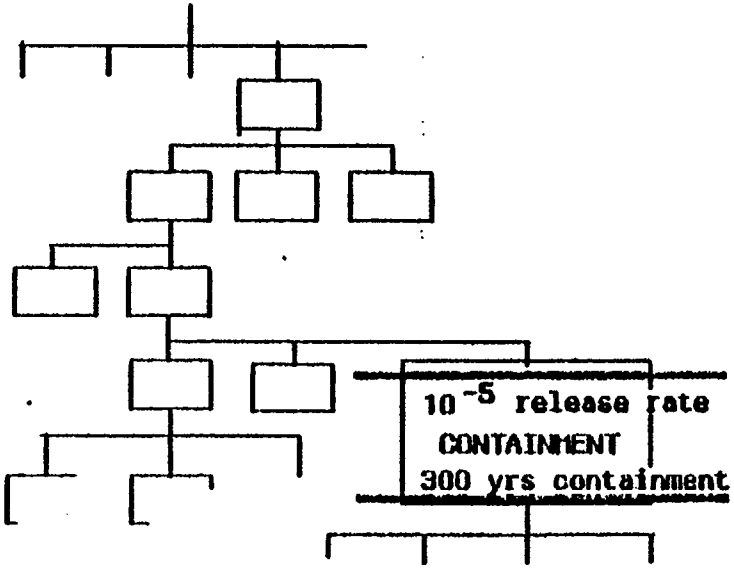


PSB4-2005-8

DATA NEEDS IDENTIFICATION
and
CORRELATION

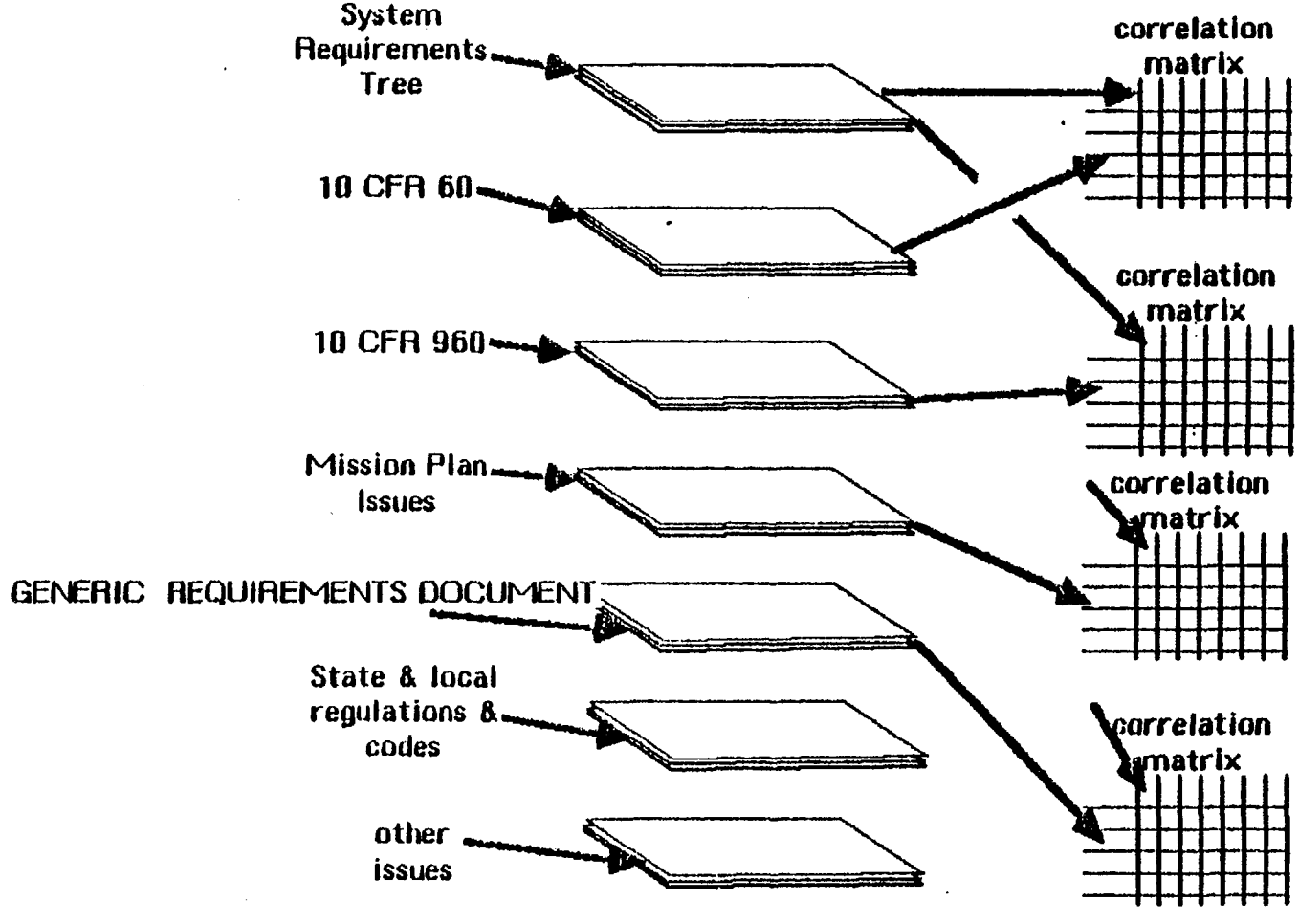


System Requirements Tree Process Identifies "Requirement" for the Mined Geologic Disposal System to Provide Containment



Correlation (in Data Needs Analysis & Correlation Document) with All Regulatory Criteria Establishes Most Stringent minima/maxima Constraints (floor and/or ceiling)

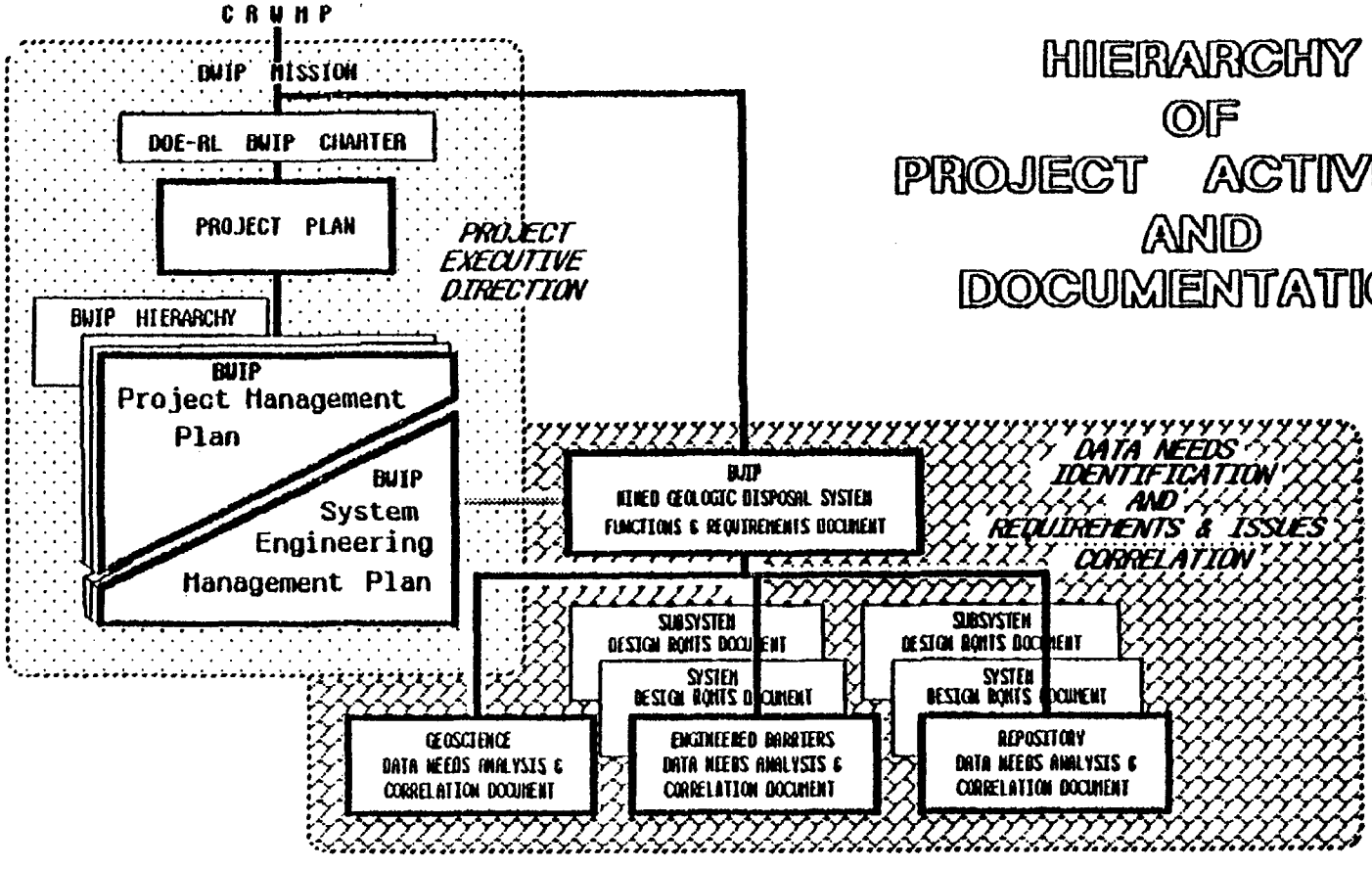
content of the
BWIP MGDS DATA NEEDS ANALYSIS
and
CORRELATION DOCUMENT



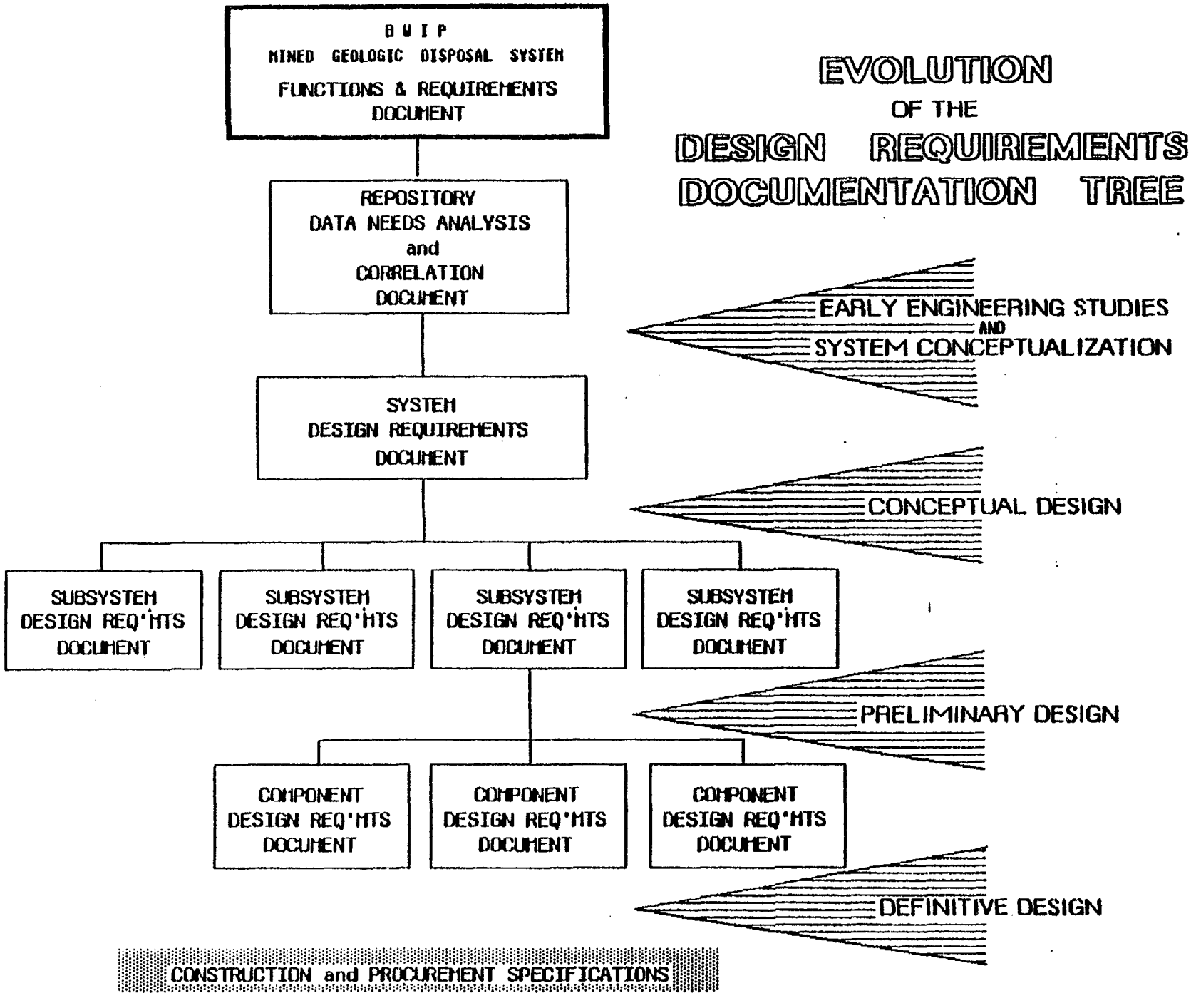
THE SUBSECTION ADDRESSING EACH REGULATION CONTAINS :

- *SITE–SPECIFIC INTERPRETATIONS*
- *RESOLUTIONS OF CONFLICT*

HIERARCHY OF PROJECT ACTIVITIES AND DOCUMENTATION



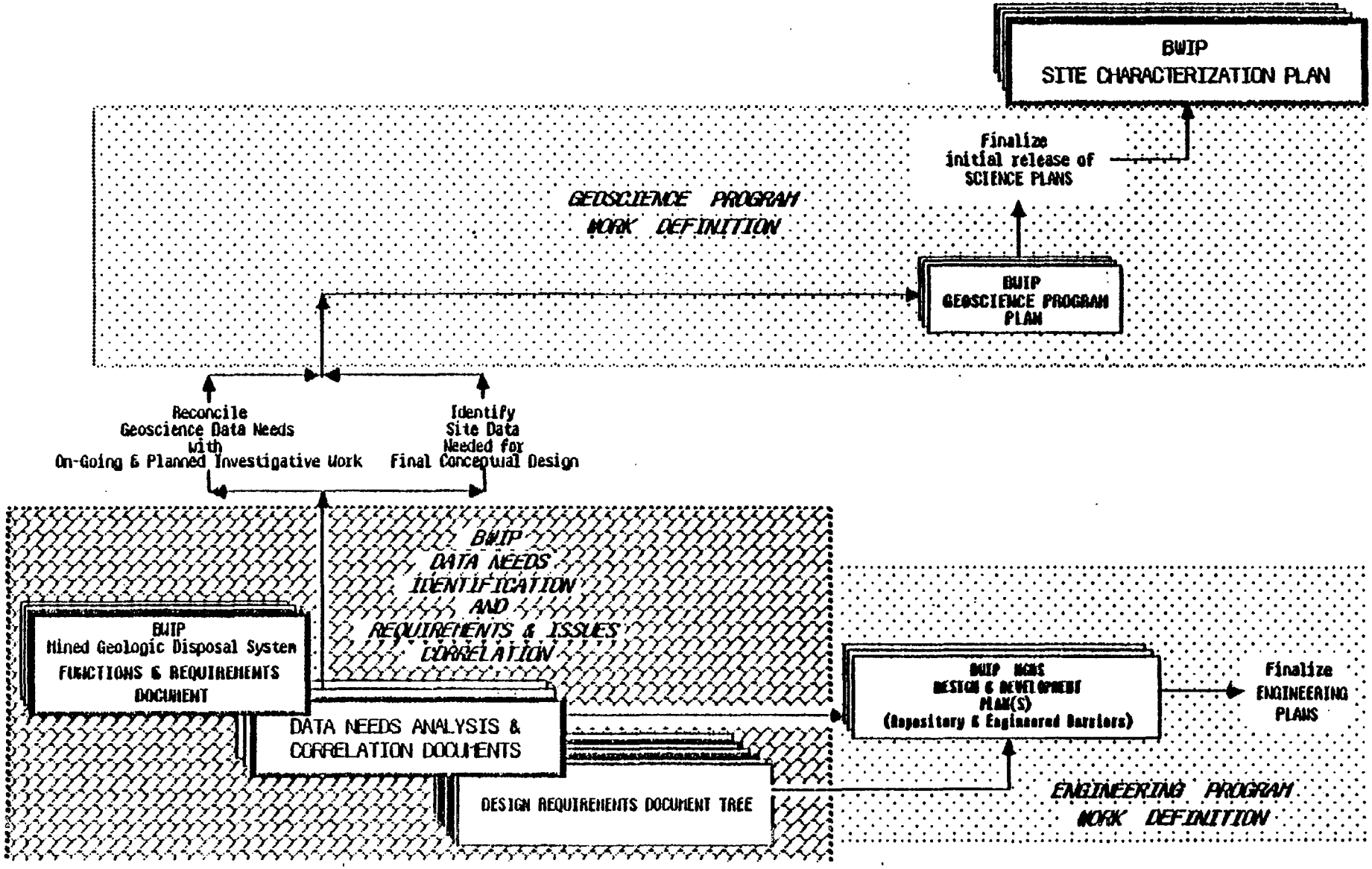
EVOLUTION OF THE DESIGN REQUIREMENTS DOCUMENTATION TREE



WORK DEFINITION :

THE

SCIENCE AND ENGINEERING PROGRAMS



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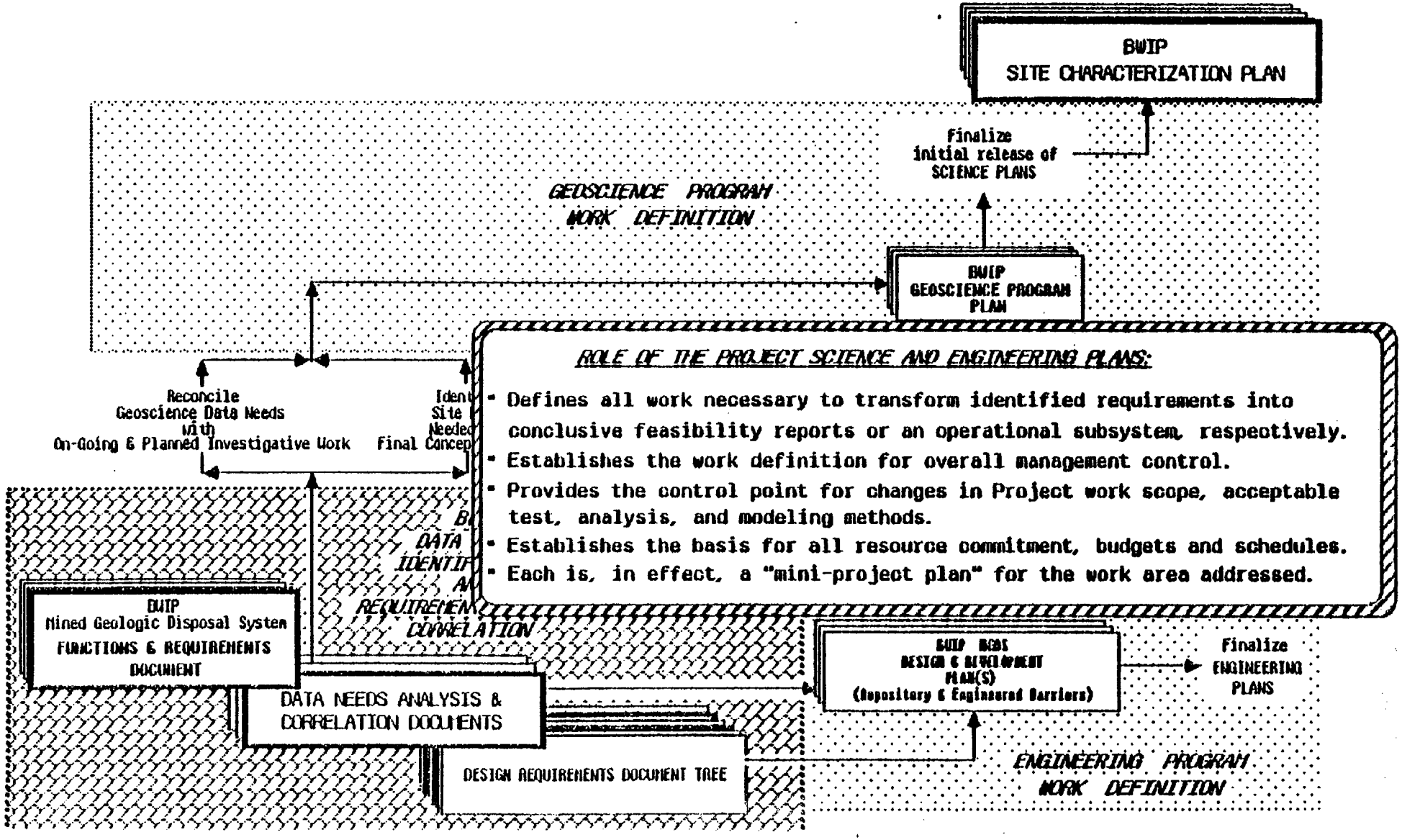
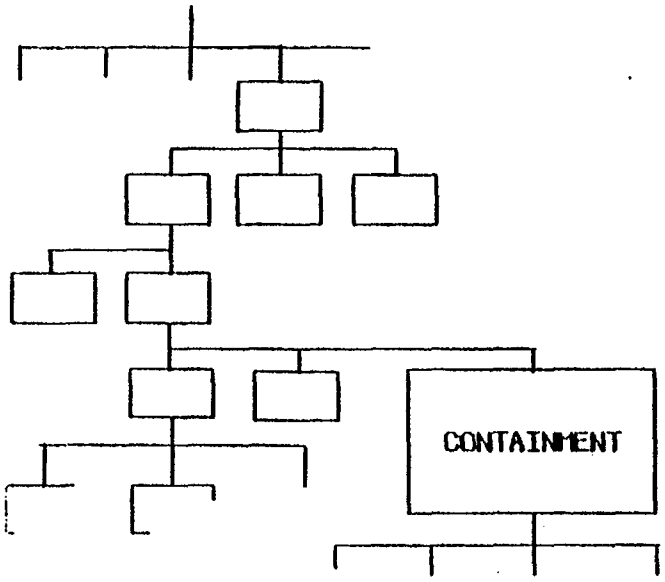


WORK DEFINITION



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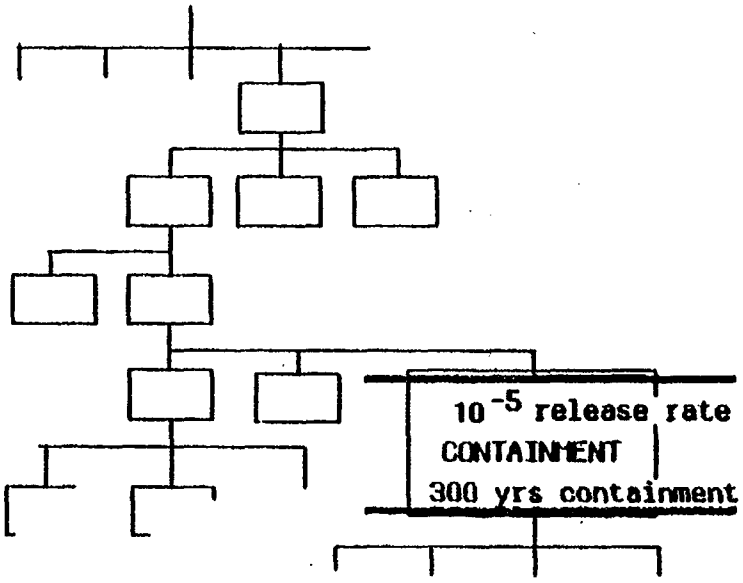
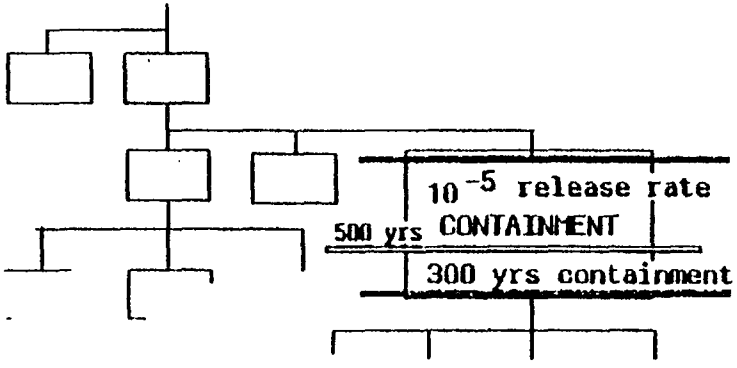
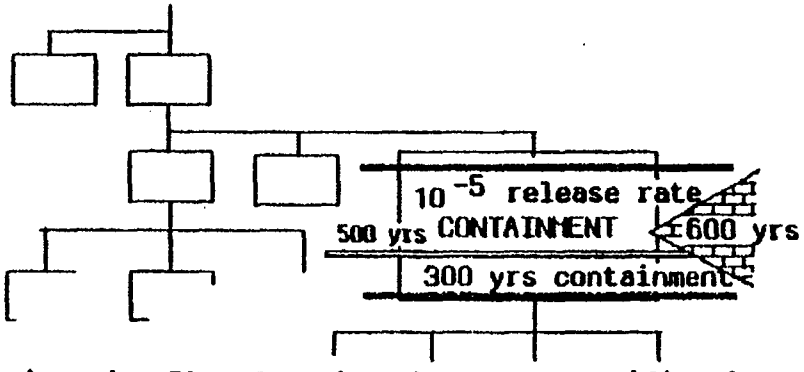


Correlation (in BWIP MGDS Requirements Document) with All Regulatory Criteria Establishes Most Stringent minima/maxima Constraints (floor and/or ceiling)

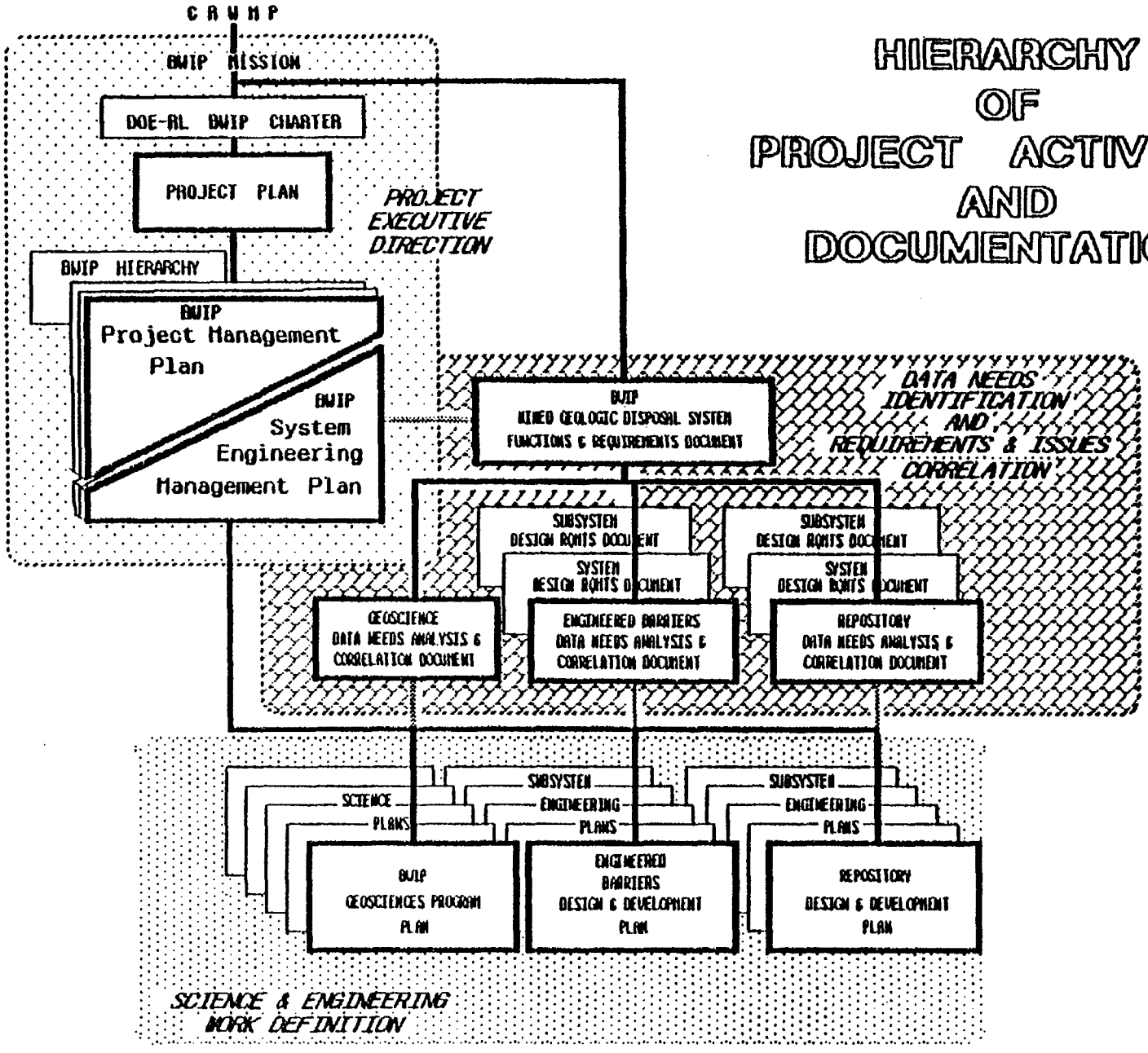


Engineering Plan Prescribes Analyses Methods That Derive Subsystem Containment Design "Target" from Performance Allocation

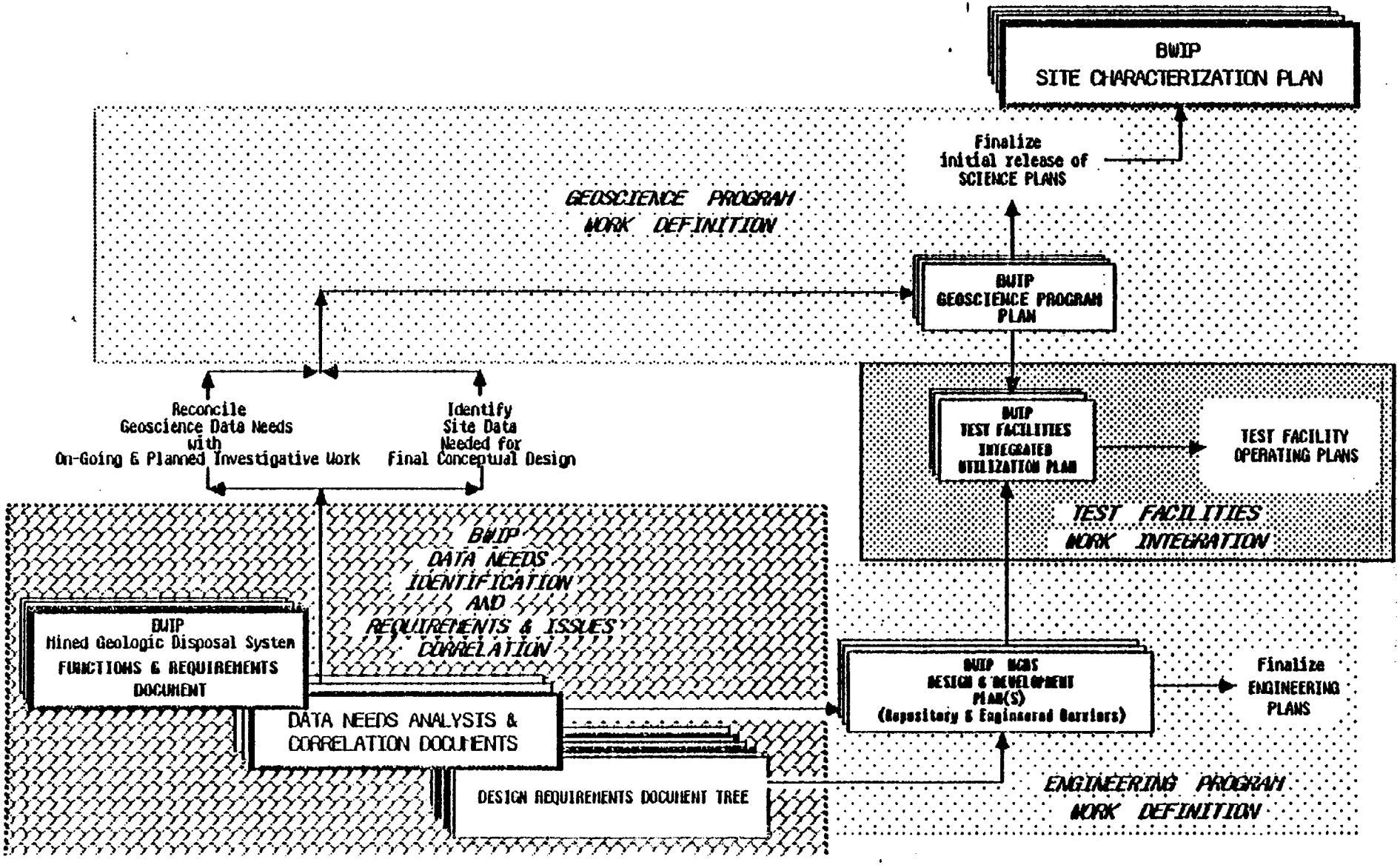


Engineering Plan Presribes Tests and Verification Work that Yeilds Substantiated Estimate of Achieved Isolation Containment Time.

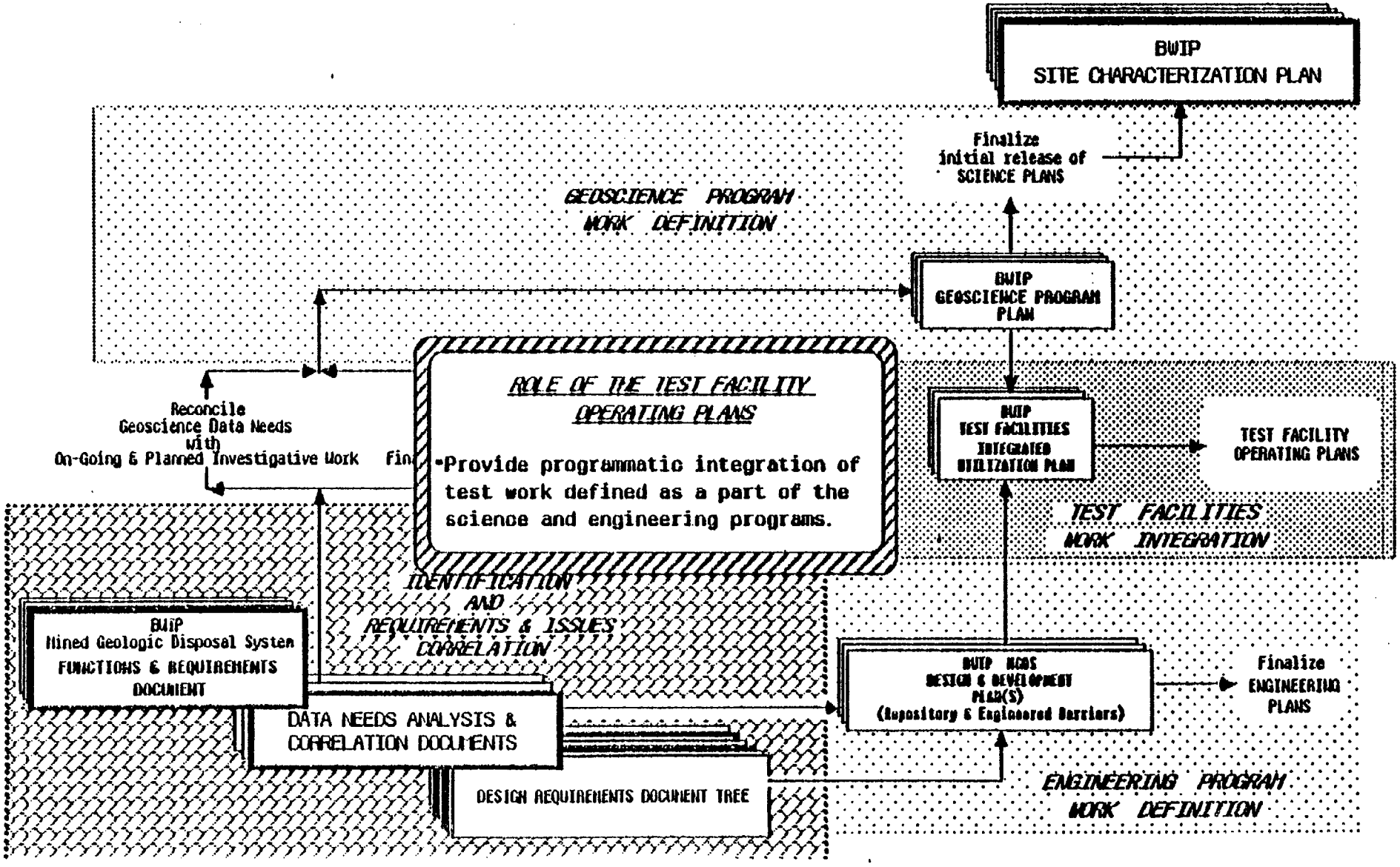
HIERARCHY OF PROJECT ACTIVITIES AND DOCUMENTATION

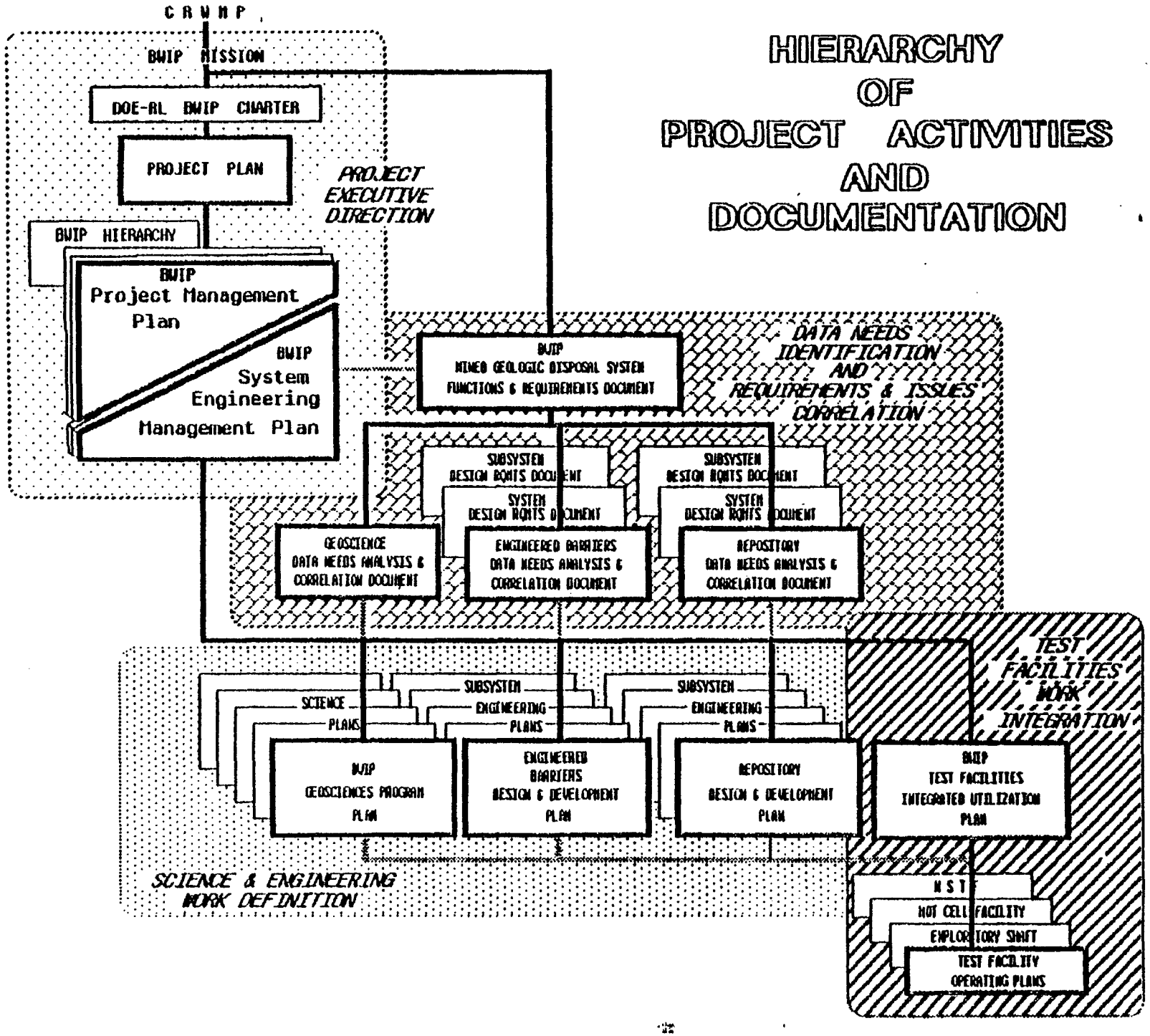


TEST FACILITY MANAGEMENT

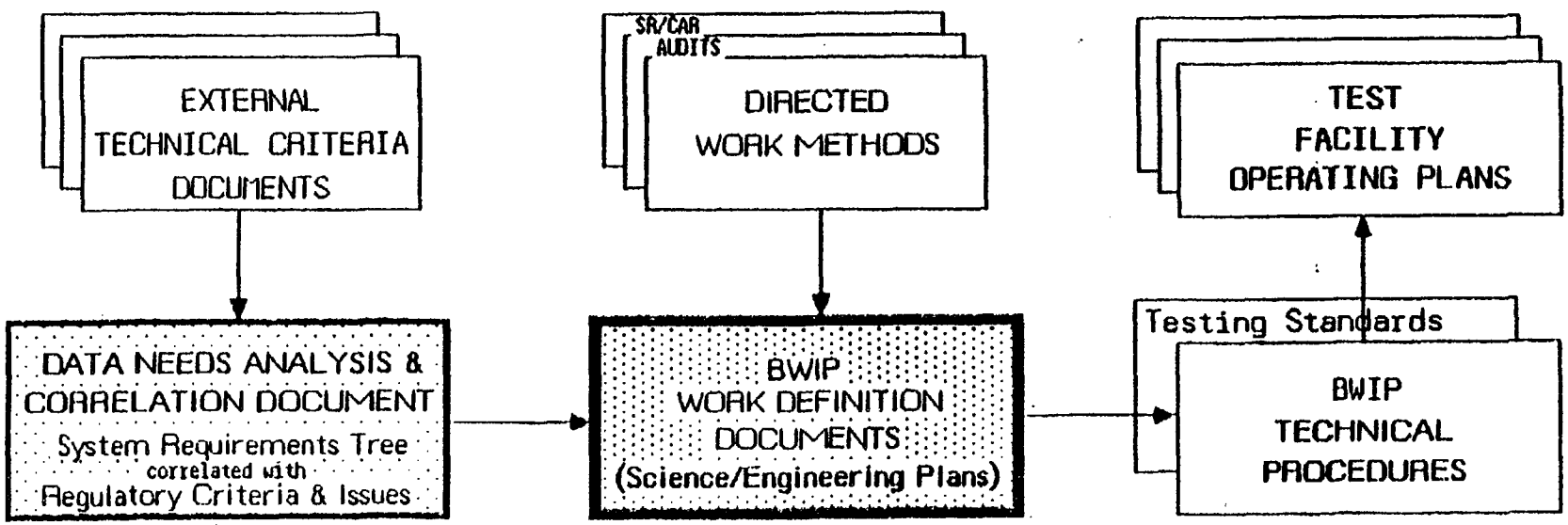


TEST FACILITY MANAGEMENT

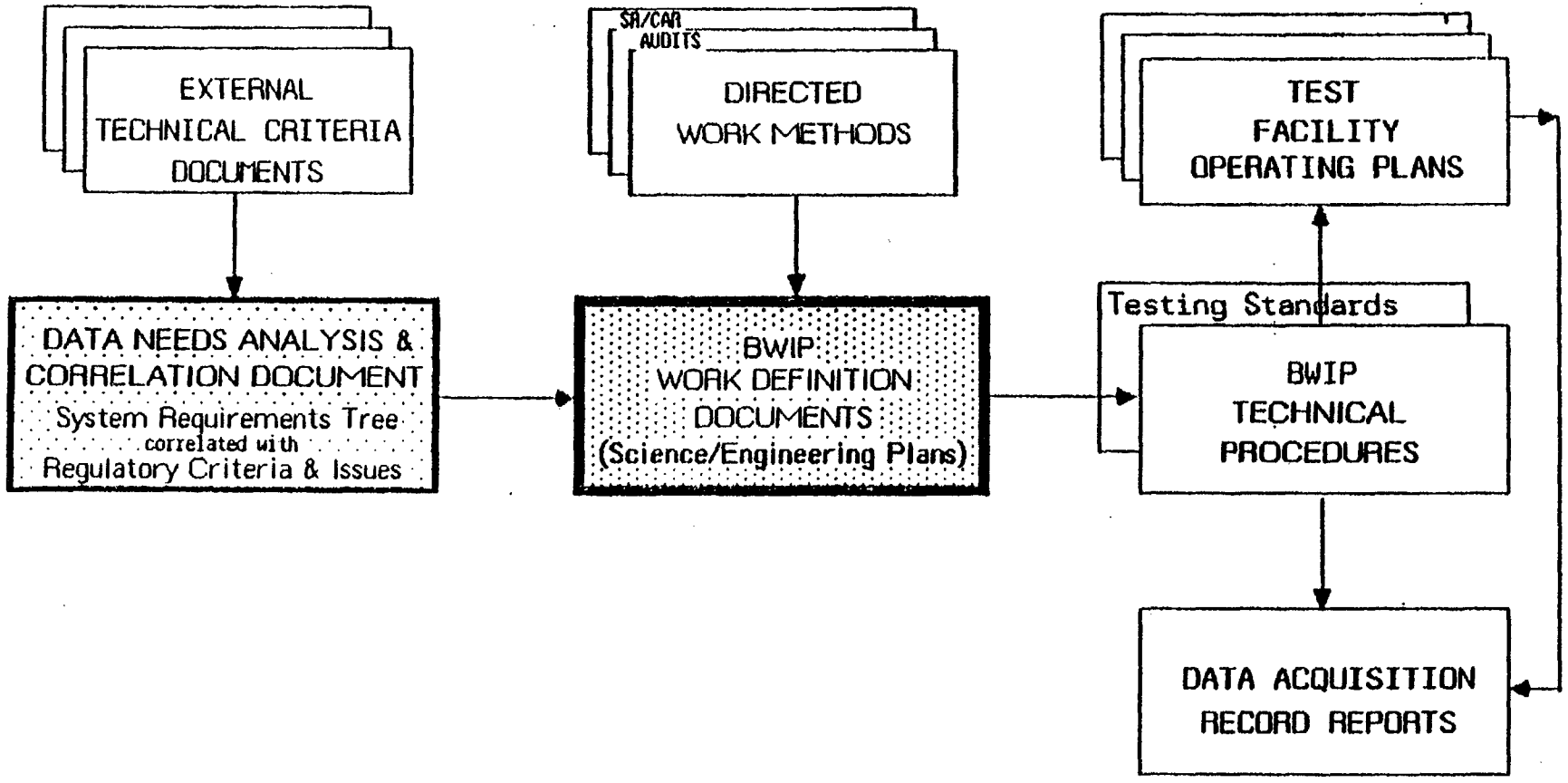



CRWMP
BWIP MISSION
DOE-RL BWIP CHARTER
PROJECT PLAN
PROJECT EXECUTIVE DIRECTION
BWIP HIERARCHY
BWIP Project Management Plan
BWIP System Engineering Management Plan
HIERARCHY OF PROJECT ACTIVITIES AND DOCUMENTATION
BWIP MINED GEOLOGIC DISPOSAL SYSTEM FUNCTIONS & REQUIREMENTS DOCUMENT
DATA NEEDS IDENTIFICATION AND REQUIREMENTS & ISSUES CORRELATION
SUBSYSTEM DESIGN REQTS DOCUMENT
SYSTEM DESIGN REQTS DOCUMENT
GEOSCIENCE DATA NEEDS ANALYSIS & CORRELATION DOCUMENT
ENGINEERED BARRIERS DATA NEEDS ANALYSIS & CORRELATION DOCUMENT
REPOSITORY DATA NEEDS ANALYSIS & CORRELATION DOCUMENT
TEST FACILITIES WORK INTEGRATION
SCIENCE PLANS
SUBSYSTEM ENGINEERING PLANS
BWIP GEOSCIENCES PROGRAM PLAN
ENGINEERED BARRIERS DESIGN & DEVELOPMENT PLAN
REPOSITORY DESIGN & DEVELOPMENT PLAN
BWIP TEST FACILITIES INTEGRATED UTILIZATION PLAN
NST
HOT CELL FACILITY
EXPLORATORY SHAFT
TEST FACILITY OPERATING PLANS
SCIENCE & ENGINEERING WORK DEFINITION

WORK DEFINITION
AND
TEST FACILITY MANAGEMENT



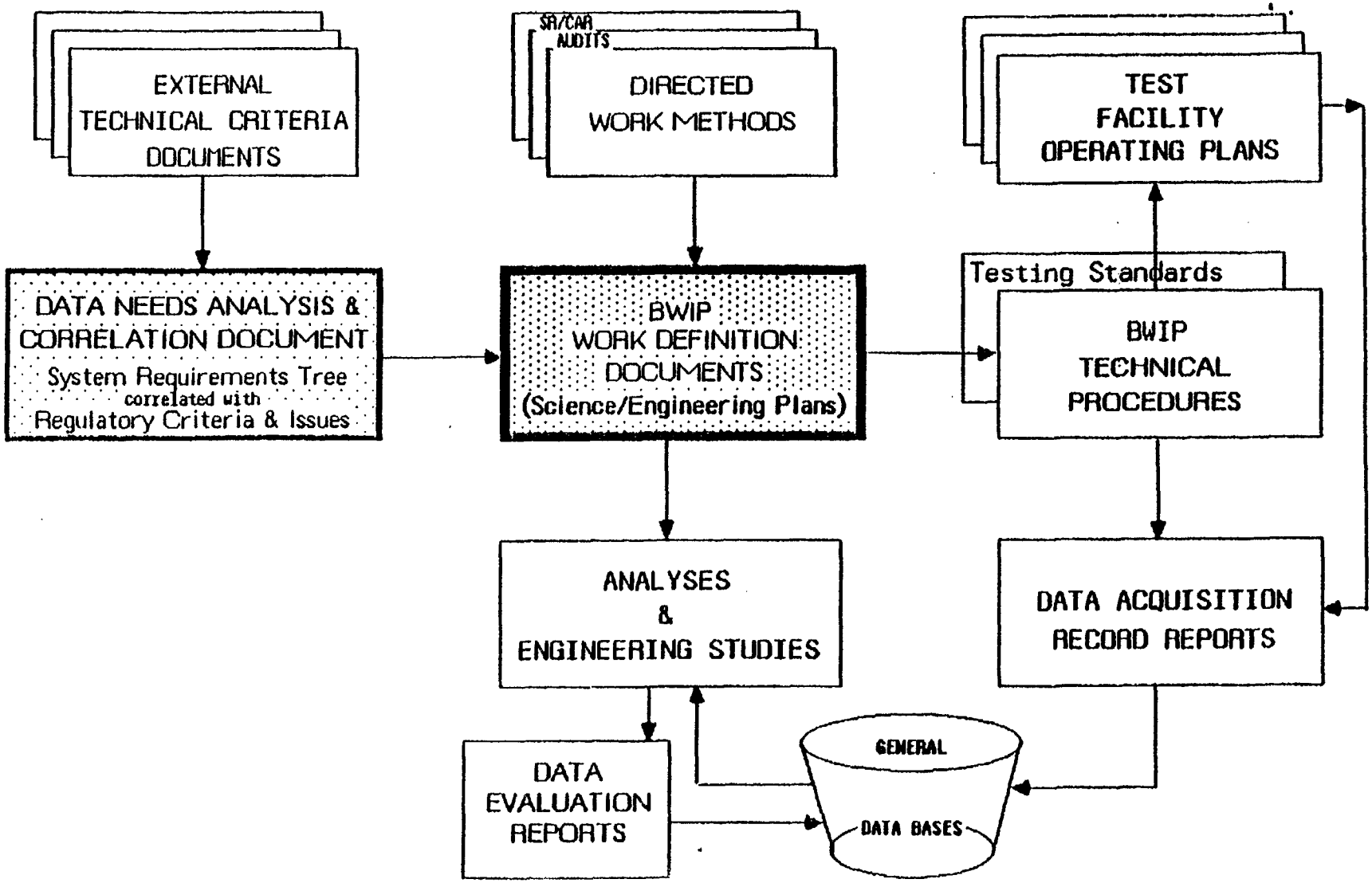
CONDUCT OF TECHNICAL WORK



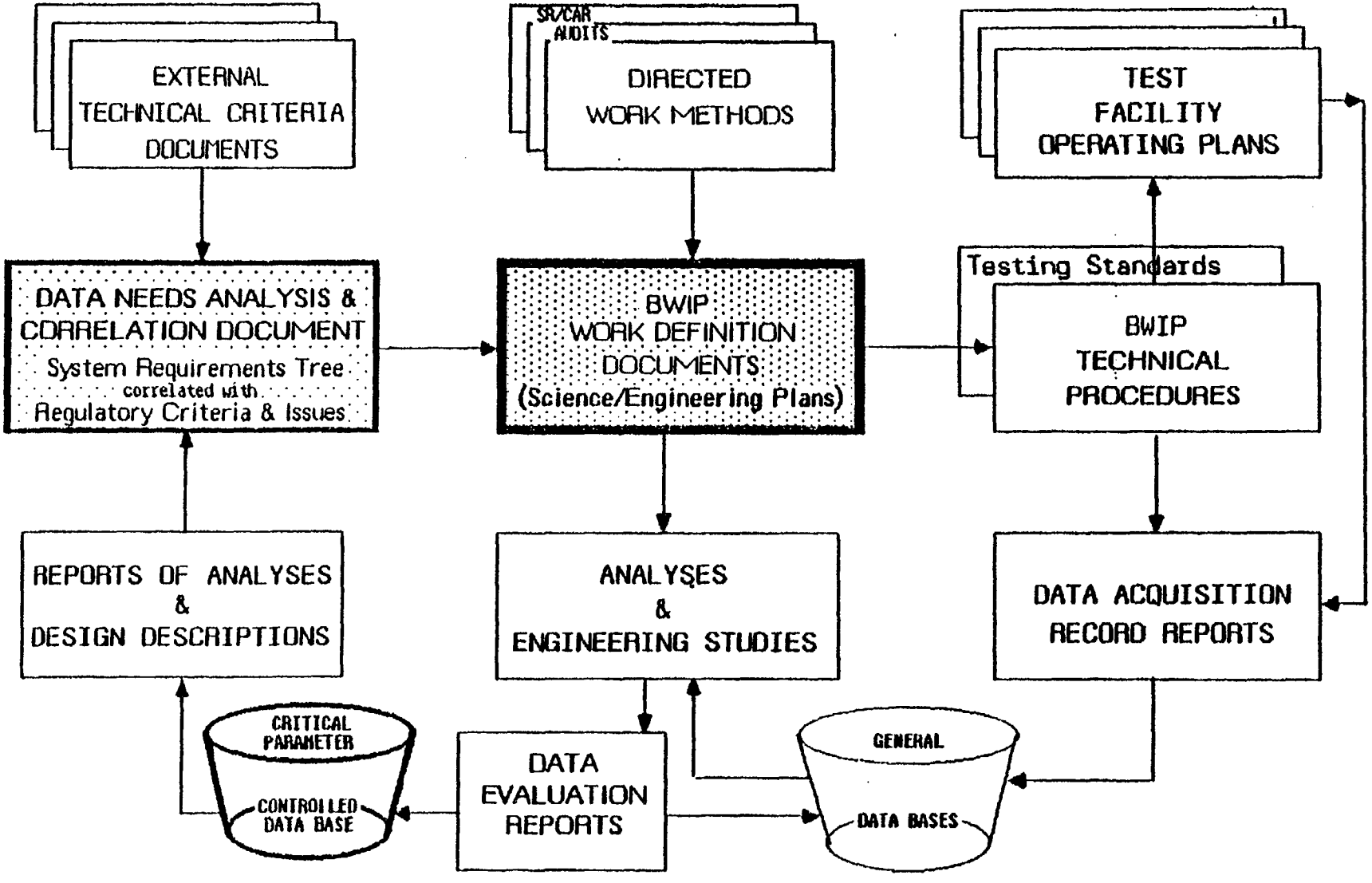
ROLE OF THE DATA ACQUISITION RECORD REPORT

- Provide a formal, traceable record of raw data prior to any analytical modification.

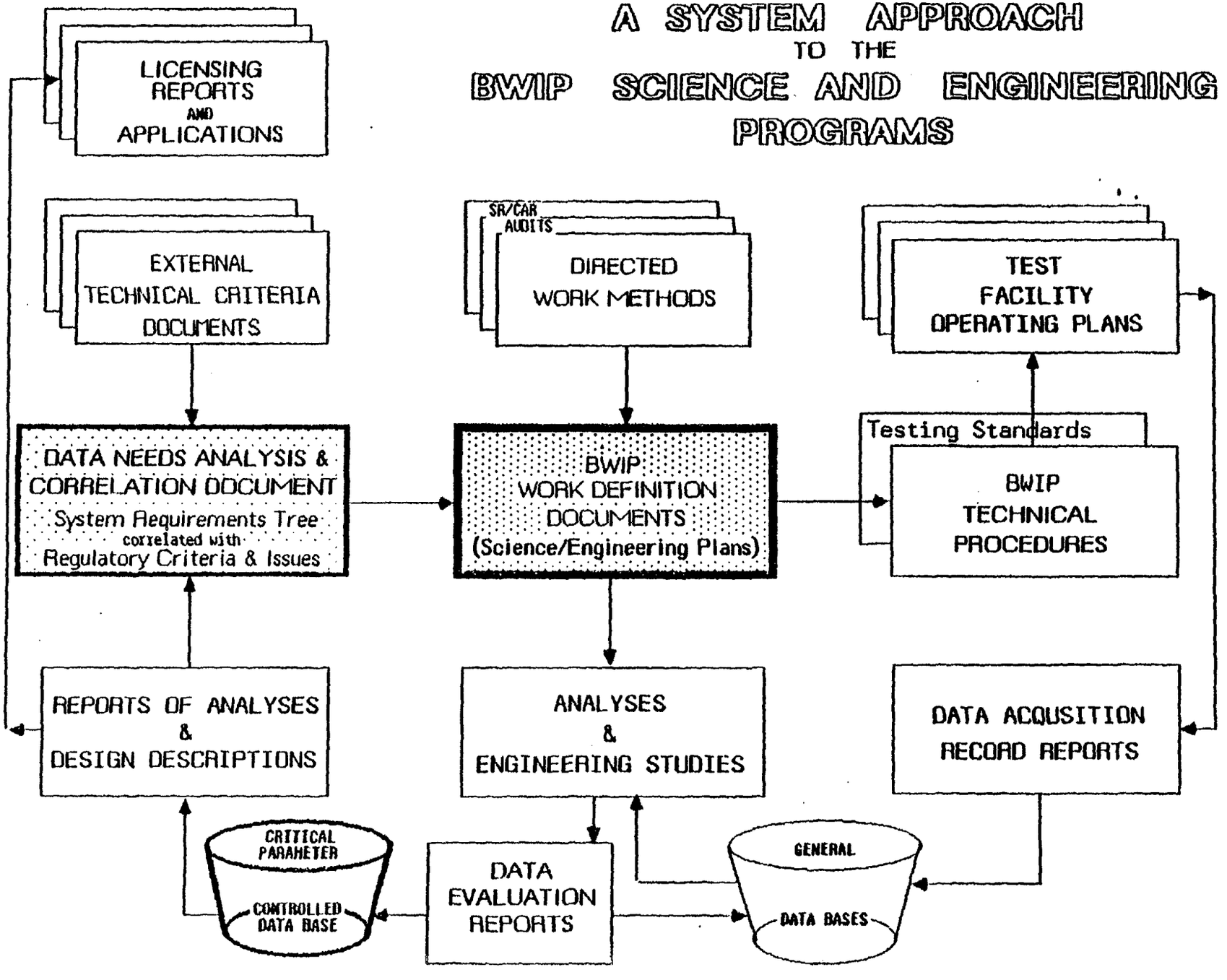
CONDUCT OF TECHNICAL WORK



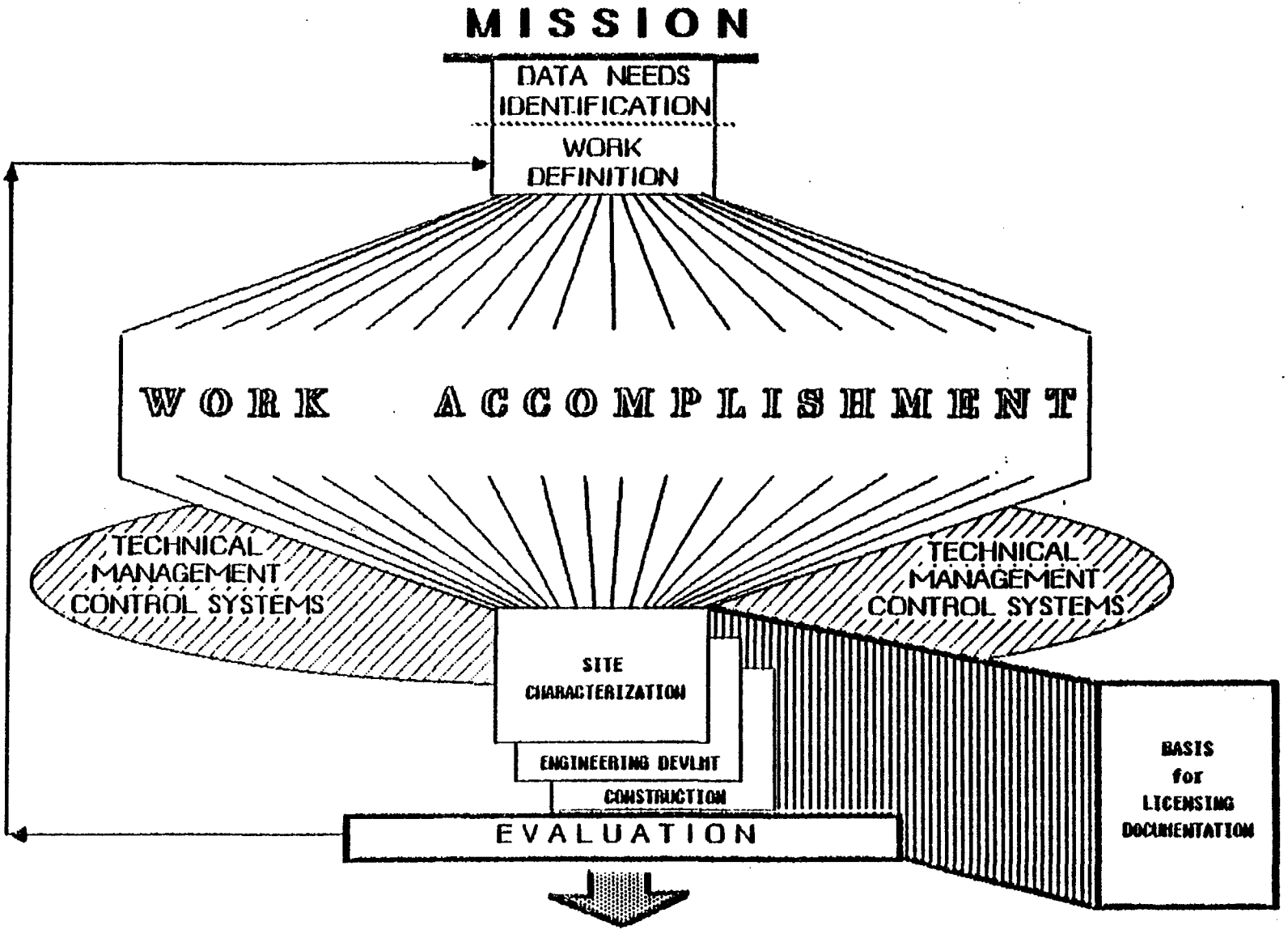
CONDUCT OF TECHNICAL WORK



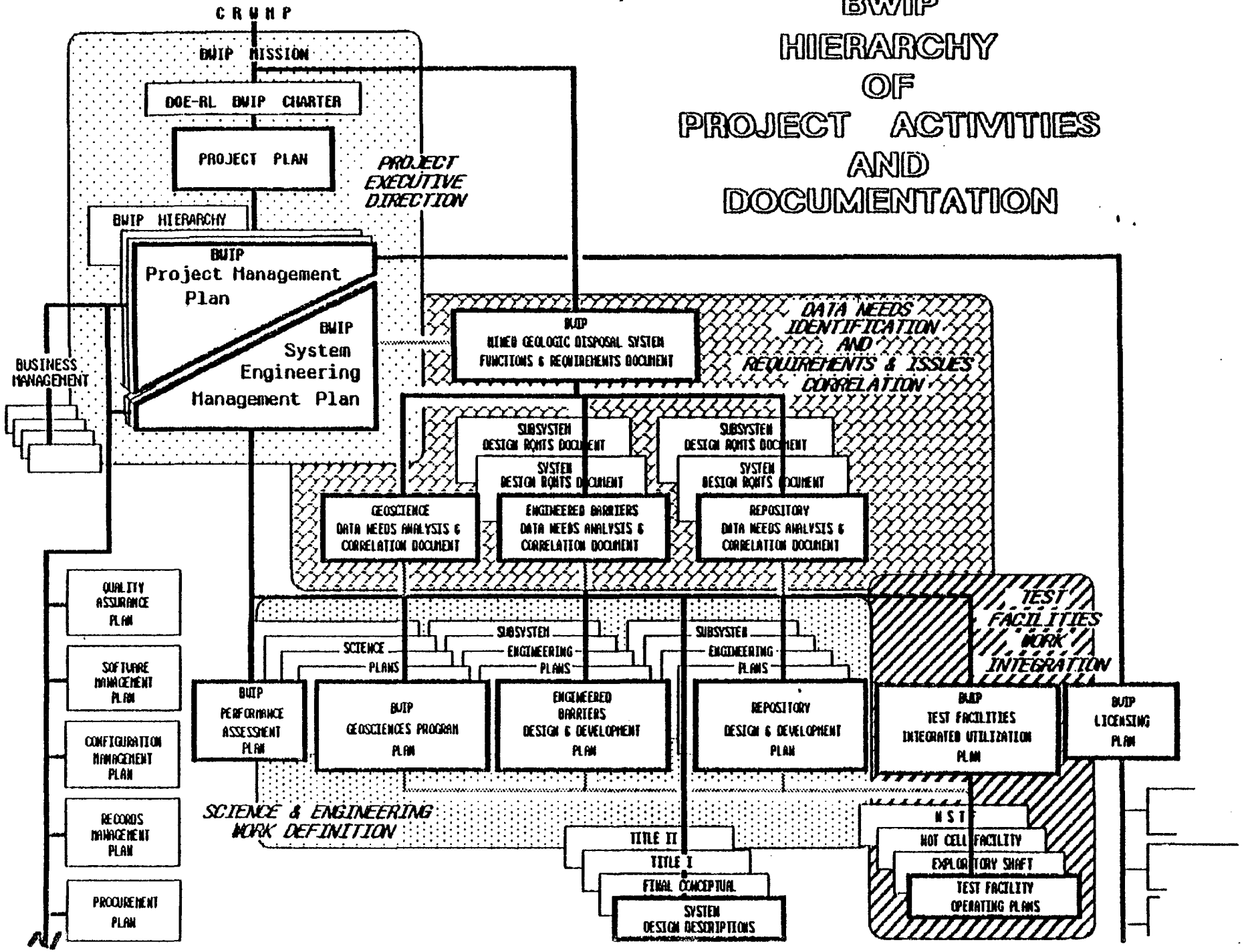
A SYSTEM APPROACH TO THE BWIP SCIENCE AND ENGINEERING PROGRAMS



PROJECT MODEL



BWIP HIERARCHY OF PROJECT ACTIVITIES AND DOCUMENTATION



SCIENCE & ENGINEERING PROGRAM(S) MANAGEMENT SYSTEMS

PROJECT MANAGEMENT SYSTEMS

and

ORGANIZATION MANAGEMENT SYSTEMS

MANAGEMENT SYSTEMS

- PROJECT UNIQUE
- PROJECT COMPATIBLE
- ORGANIZATIONAL UNIQUE

MANAGEMENT SYSTEMS

PROJECT UNIQUE

- Critical Parameter Controlled Data Base
- Life Cycle Cost
- Assessment of System Performance
- Technical Status Review Process

PROJECT COMPATIBLE

- Change Management
- Project Directive System
- Software Management
- Traceability
- Data Base Management
- Trade Study Methodology
- Decision-Making Methodology
- Technology Risk Assessment & Contingency Management
- Managing Technical Uncertainty
- Design Verification & Performance Confirmation Program
- Technical Procedures

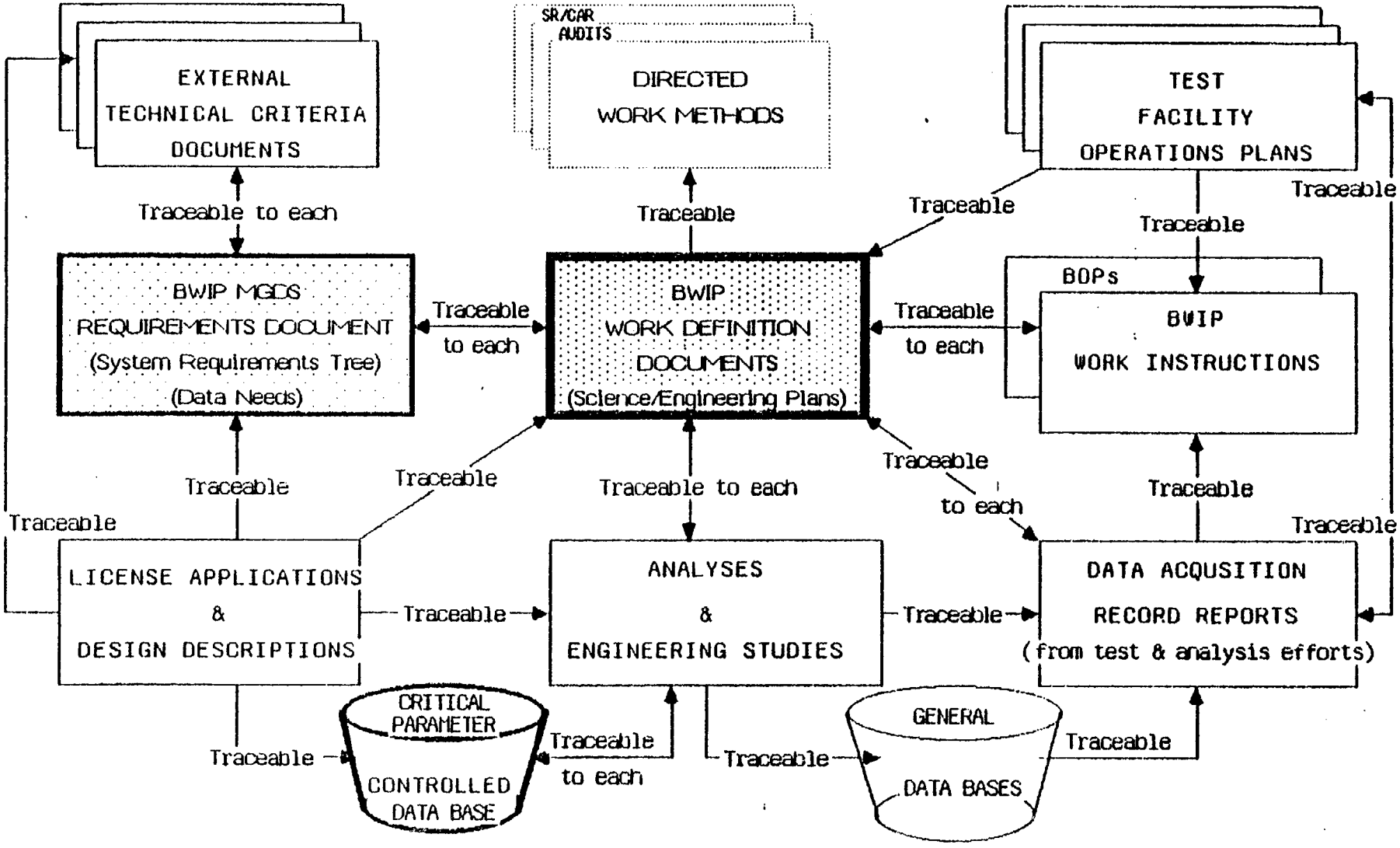
ORGANIZATIONAL UNIQUE

- Engineering & Technical Standards
- Administrative Procedures
- ADP Equipment

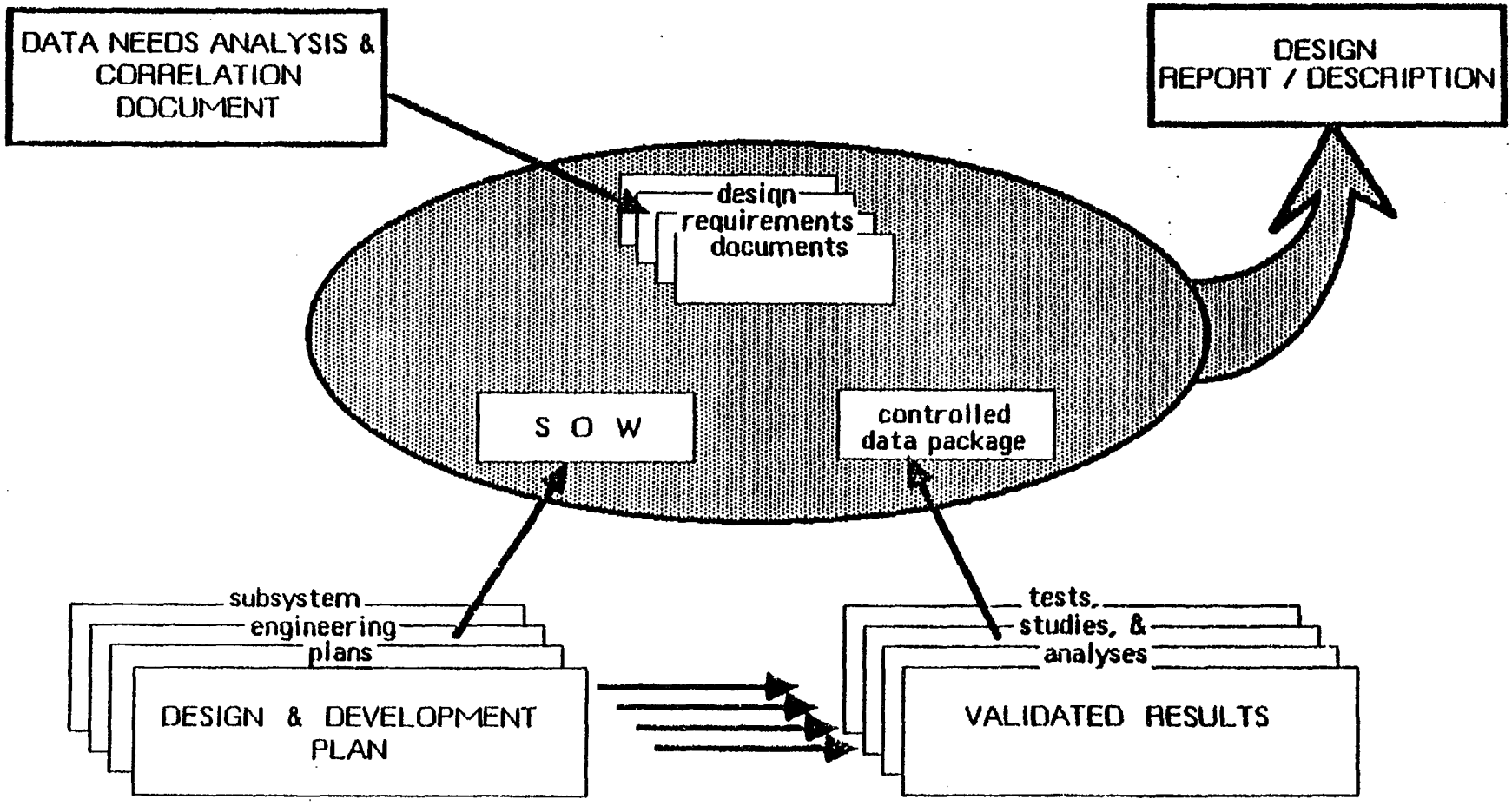
BWIP TRACEABILITY RELATIONSHIPS

PURPOSE: TO ESTABLISH THOSE AUDIT TRAIL RELATIONSHIPS REQUISITE TO LICENSING

- o Document traceability to the requirement for the content of the document
- o Document traceability to all references made to the document, and vice versa
- o Data traceability to the document containing the requirement for the data
- o Data traceability to other significantly related data



the CONTRACT WORK PACKAGE



QUALITY ASSURANCE ACTION PLAN

M. F. NICOL

BWIP PA841204-1

QUALITY ASSURANCE ACTION PLAN FOR FY 1985

PURPOSE

- ENSURE THE QUALITY ASSURANCE PROGRAM NEEDED FOR SITE CHARACTERIZATION IS IN PLACE PRIOR TO OCTOBER5 1985 (SHOULD SITE BE NOMINATED)

- ENSURE ALL PROJECT QUALITY ASSURANCE PROGRAM REQUIREMENTS ARE DEFINED AND DOCUMENTED IN A SINGLE SOURCE

  - BWIP QUALITY ASSURANCE REQUIREMENTS DOCUMENT (BQARD)

- ENSURE ALL PROJECT PARTICIPANTS IMPLEMENTING QUALITY ASSURANCE PROGRAMS ADDRESS APPLICABLE PROJECT QUALITY ASSURANCE PROGRAM REQUIREMENTS

- ENSURE ALL QUALITY ASSURANCE PROGRAM REQUIREMENTS ARE INTEGRATED IN THE PMP/SEMP

QUALITY ASSURANCE REQUIREMENTS MATRIX

PROJECT MANAGEMENT PLAN (PMP)	SYSTEMS ENGINEERING MANAGEMENT PLAN (SEMP)
1. ORGANIZATION	2. QUALITY ASSURANCE PROGRAM (TECHNICAL ASPECTS)
2. QUALITY ASSURANCE PROGRAM (MANAGEMENT ASPECTS)	3. DESIGN CONTROL
4. PROCUREMENT DOCUMENT CONTROL	8. IDENTIFICATION AND CONTROL OF ITEMS
5. INSTRUCTIONS, PROCEDURES, DRAWINGS	9. CONTROL OF PROCESSES
6. DOCUMENT CONTROL	11. TEST CONTROL
7. CONTROL OF PURCHASED ITEMS AND SERVICES	12. CONTROL OF MEASURING AND TEST EQUIPMENT
10. INSPECTION	13. HANDLING, STORAGE, AND SHIPPING
15. CONTROL OF NONCONFORMING ITEMS	14. INSPECTION, TEST, AND OPERATING STATUS
16. CORRECTIVE ACTION	
17. QUALITY ASSURANCE RECORDS	
18. AUDITS	

QUALITY ASSURANCE ACTION PLAN APPROACH

- EVALUATE EXISTING QUALITY ASSURANCE PROGRAM AGAINST NEEDS FOR SITE CHARACTERIZATION (10 CFR 50 APPENDIX B, REVIEW PLAN, NQA–1)
- EVALUATE RESULTS OF U.S. DEPARTMENT OF ENERGY AND ROCKWELL AUDITS
- DOCUMENT NEEDED ACTION ITEMS
- ASSIGN ACTION AND SCHEDULE COMPLETION
- THIRD PARTY ASSESSMENT OF PLAN
- ISSUE ACTION PLAN
- TRACK STATUS
- THIRD PARTY ASSESSMENT OF IMPLEMENTATION

QUALITY ASSURANCE ACTION PLAN

KEY ACTIVITIES

QUALITY ASSURANCE ACTION PLAN

KEY ACTIVITIES

1. DEFINE PROJECT QUALITY ASSURANCE REQUIREMENTS IN A SINGLE SOURCE DOCUMENT (BQARD)

   - ENSURE INCORPORATION OF ALL FEDERAL AND REGULATORY REQUIREMENTS (10 CFR 50 APPENDIX B, NRC REVIEW PLAN, NQA–1)
   - PROVIDE A BASIS FOR ASSIGNMENT OF RESPONSIBILITIES IN PMP/SEMP
   - PROVIDE A BASIS FOR REVIEW AND APPROVAL OF PROJECT PARTICIPANTS IMPLEMENTING QUALITY ASSURANCE PROGRAMS

QUALITY ASSURANCE ACTION PLAN

KEY ACTIVITIES

2. INTEGRATE PROJECT QUALITY ASSURANCE REQUIREMENTS INTO PROJECT MANAGEMENT SYSTEM

   - ENSURE PROJECT QUALITY ASSURANCE REQUIREMENTS ARE ADDRESSED IN THE PMP/SEMP
   - ASSIGN IMPLEMENTATION RESPONSIBILITIES FOR THE PROJECT QUALITY ASSURANCE PROGRAM AMONG PROJECT PARTICIPANTS

QUALITY ASSURANCE ACTION PLAN

KEY ACTIVITIES

3. IDENTIFY ITEMS AND ACTIVITIES IMPORTANT TO SAFETY OR WASTE ISOLATION

- ESTABLISH LOGIC FOR DETERMINATION
- COORDINATE APPROACH WITH OTHER OFFICE OF GEOLOGIC REPOSITORIES (OGR) PROJECTS
- INTEGRATE INTO PMP/SEMP
- PROVIDE BASIS FOR GRADED APPROACH TOWARD QUALITY ASSURANCE PROGRAM IMPLEMENTATION
- PROVIDE BASIS TO EVALUATE USE OF PAST DATA

QUALITY ASSURANCE ACTION PLAN

KEY ACTIVITIES

4. CONDUCT INDEPENDENT ASSESSMENTS OF PROJECT QUALITY ASSURANCE PROGRAM APPROACH AND IMPLEMENTATION

   - CONDUCT INDEPENDENT THIRD PARTY ASSESSMENT AT QUALITY ASSURANCE REQUIREMENTS/IMPLEMENTATION/PLANNING STAGE
   - CONDUCT FOLLOW UP ASSESSMENT TO VERIFY IMPLEMENTATION

QUALITY ASSURANCE ACTION PLAN

KEY ACTIVITIES

5. CONTINUE THE QUALITY ASSURANCE COORDINATION GROUP AMONG PROJECT PARTICIPANTS

   - INITIAL MEETINGS HELD/MEMBERSHIP ESTABLISHED/CHARTER DRAFTED
   - MUTUAL UNDERSTANDING OF PROCUREMENT DOCUMENT QUALITY ASSURANCE PROGRAM REQUIREMENTS AND INTERNAL CONTRACTOR QUALITY ASSURANCE PROGRAMS
   - PMP/SEMP APPROACH PRESENTED
   - INCLUDES INVOLVEMENT OF LINE MANAGEMENT WHEN APPROPRIATE
   - PROVIDES FORUM TO RESOLVE COMMON PROJECT QUALITY ASSURANCE ISSUES
   - DISSEMINATES INFORMATION FROM OGR QUALITY ASSURANCE COORDINATION GROUP AND NQA WASTE MANAGEMENT SUBCOMMITTE

QUALITY ASSURANCE ACTION PLAN

KEY ACTIVITIES

6. COORDINATE, REVISE, AND ISSUE PROJECT PARTICIPANT QUALITY ASSURANCE DOCUMENTS (QUALITY ASSURANCE PROGRAM AND TECHNICAL)

   A. ROCKWELL

      - COORDINATE REVIEW AND APPROVE (WHERE RESPONSIBLE) ALL PROJECT PARTICIPANTS QUALITY ASSURANCE PROGRAM AND TECHNICAL DOCUMENTS AS INTEGRATING CONTRACTOR
      - ENSURE INCORPORATION OF PROJECT QUALITY ASSURANCE REQUIREMENTS/ PMP/SEMP IN CONTRACTOR DOCUMENTS
      - ISSUE ADDITIONAL QUALITY ASSURANCE PROGRAM PROCEDURES IDENTIFIED IN RHO-BWI-MA-14

   B. ALL PROJECT PARTICIPANTS

      - ENSURE INTERNAL PROCEDURES ADDRESS PROJECT QUALITY ASSURANCE REQUIREMENTS/PMP/SEMP IMPLEMENTATION
      - IDENTIFY AND ISSUE PLANS AND PROCEDURES WHICH REQUIRE PREPARATION OR REVISION

QUALITY ASSURANCE ACTION PLAN

KEY ACTIVITIES

7. QUALITY ASSURANCE INDOCTRINATION AND JOB SPECIFIC TRAINING

A. ROCKWELL

- ESTABLISH INDOCTRINATION AND TRAINING ON PROJECT QUALITY ASSURANCE REQUIREMENTS/PMP/SEMP FOR ALL PROJECT PARTICIPANTS
- EXPAND ESTABLISHED JOB SPECIFIC TRAINING PROGRAM
- ISSUE TRAINING PLAN AND MANUAL
- EMPHASIZE QUALITY ASSURANCE PERFORMANCE IN ANNUAL APPRAISALS – IDENTIFY ADDITIONAL TRAINING NEEDS/NEED FOR REPLACEMENT
- ESTABLISH QUALITY AWARENESS PROGRAM
- ENSURE PROJECT PARTICIPANTS ESTABLISH JOB SPECIFIC TRAINING

QUALITY ASSURANCE ACTION PLAN

KEY ACTIVITIES

7. QUALITY ASSURANCE INDOCTRINATION AND JOB SPECIFIC TRAINING

B. ALL PROJECT PARTICIPANTS

- ESTABLISH TRAINING NEEDS
- PROVIDE JOB SPECIFIC TRAINING PROGRAMS
- EMPHASIZE TECHNICAL ASPECTS FOR QUALITY ASSURANCE PERSONNEL/QUALITY ASSURANCE ASPECTS FOR TECHNICAL/PROJECT MANAGEMENT PERSONNEL
- DOCUMENT INDOCTRINATION AND TRAINING

QUALITY ASSURANCE ACTION PLAN

KEY ACTIVITIES

8. ORGANIZATIONAL UPGRADES

A. ROCKWELL

- REVIEW CHARTERS, CLARIFY ORGANIZATIONAL RESPONSIBILITIES
- PROVIDE NEEDED STAFFING LEVELS IN LINE AND QUALITY ASSURANCE ORGANIZATIONS (DETAILED STAFF PLANNING PERFORMED DURING FY 1985 PLANNING)

B. PROJECT

- CLARIFY PROJECT PARTICIPANT RESPONSIBILITIES AND AUTHORITIES IN PMP

QUALITY ASSURANCE ACTION PLAN

KEY ACTIVITIES

9. ENSURE APPROPRIATE LEVEL OF QUALITY ASSURANCE VERIFICATION

- ESTABLISH APPROPRIATE VERIFICATION LEVELS AS PART OF GRADED QUALITY ASSURANCE APPROACH
- ADJUST ESTABLISHED AUDIT AND SURVEILLANCE SCHEDULES ACCORDINGLY
- ESTABLISH INSPECTION NEEDS OF THE PROJECT (TEST FACILITIES, LABORATORIES, AND FIELD)

QUALITY ASSURANCE ACTION PLAN

KEY ACTIVITIES

10. NONCONFORMANCE AND CORRECTIVE ACTION REPORTING PROCESS

- PROVIDE ADDITIONAL VISIBILITY TO U.S. DEPARTMENT OF ENERGY AND ROCKWELL SENIOR MANAGEMENT THROUGH REGULAR ASSESSMENT MEETINGS (END FUNCTION AND PROJECT SUMMARY LEVELS)
- DEFINE AND IMPLEMENT QUALITY TRENDING SYSTEM AND REPORT AT ASSESSMENT MEETINGS
- PROVIDE APPROPRIATE LEVEL OF DISPOSITIONAL AUTHORITY (INCLUDING THE U.S. DEPARTMENT OF ENERGY)
- EXERCISE STOP WORK AUTHORITY SHOULD CONDITIONS SO WARRANT

QUALITY ASSURANCE ACTION PLAN

KEY ACTIVITIES

11. EXPAND APPLICATION OF READINESS REVIEW PROCESS

- SUCCESSFUL APPLICATION FOR NEAR-SURFACE TEST FACILITY START UP
- PLANNED APPLICATION FOR EXPLORATORY SHAFT CONSTRUCTION READINESS AND OPERATIONAL READINESS
- INCREMENTAL APPROACH