See ltr to Browning fm. Knight 10/28/87
109

HQO.871028.0003

SUMMARY OF THE OCTOBER 8 & 9, 1987 BRIEFING ON THE DOE ISSUE HIERARCHY AND ISSUE RESOLUTION STRATEGY

Background:

On March 3, 1987, the DOE presented the issues hierarchy and issue resolution strategy that will be included in the Site Characterization Plans (SCP's). At the request of the NRC and others, DOE agreed to repeat the presentations because the strategy is the key to understanding the site characterization program.

Objectives:

The primary objective of the briefing was to provide the NRC, States, Indian Tribes, and other participants, with an understanding of DOE's issues hierarchy and issue resolution strategy in order to facilitate the review of the SCP and to aid the NRC staff in developing the SCP review plans. The repeat briefing was enhanced using examples from Chapter 8 of the NNWSI SCP to show how the strategy is implemented. In addition, the briefing provided the opportunity for the participants to ask questions for clarification and to discuss sections of the SCP provided during the briefing.

Agenda and Participants:

The agenda is included as attachment 1. The list of participants is included as attachment 2.

DOE Presentation:

The viewgraphs used by DOE are included as attachment 3.

The SCPs are to be released concurrently for the three projects in January 1988 as consultation drafts, to allow interactions with the NRC, States and Indian Tribes prior to formal issuance of the SCPs. This process was briefly discussed.

The DOE presentation continued with :

- a brief summary of previous meetings on issues hierarchy and issue resolution strategy
- the overall structure of the SCPs
- the major sections of Part B (Chapter 8)
- the issues hierarchy as described in DOE/RW-0101, Issues Hierarchy for a Mined Geologig Disposal System (OGR/B-10)
- the 12-step issue resolution strategy and the use of the performance allocation process.

Three examples of the issue resolution strategy were taken from the NNWSI SCP (issues 1.1,1.5 and 4.4) and discussed in detail.

Following the DOE presentations, draft copies of the latest version of the NNWSI SCP were made available for the participants to study.

NRC Comments:

Based on the review of DOE's pre-briefing materials and the viewgraphs presented during the briefing, the NRC staff identified no fatal flaws in the issue hierarchy, issue resolution strategy and performance allocation approach at the broad level contained in those materials. The NRC staff has concerns in the following areas:

* Descriptions of the process and technical rational used in developing the licensing strategies especially as it is applied in going from the issues to the identification of performance measures. Specifically, the questions, the alternative conceptual models and the scenarios considered in identifying and determining performance measures and information needs.

* The process for revising the licensing strategy, including explicit identification of decision points for evaluating performance goals against test data.

* The identification in the SCP of the anticipated qualification of existing data relative to establishing the contribution that the existing data makes toward resolving issues.

The NRC does not expect feedback from DOE on the above concerns, but will be focusing on these and other areas in the SCP review. Before final conclusions can be made regarding the issues hierarchy, issue resolution strategy and performance allocation, the staff will need to evaluate the specific implementation at the site level during the SCP review.

The only action item resulting from this meeting was that DOE will provide NRC with a copy of the current draft Chapter 8 of the Yucca Mountain SCP. No other specific action or open items resulted from the briefing or the discussion of these topics. If, after further consideration of the pre-briefing materials and presentations and discussions that took place at the briefing, the NRC determines follow up action is needed in these or other areas, the NRC will send the DOE a letter expressing those concerns and proposing appropriate followup activities related to those concerns.

Acknowledgement:

The undersigned agree that this summary is a fair representation of the meeting. The signatures below do not necessarily indicate agreement with the comments or views expressed by other participants.

10/9/87

Donald H. Alexander, DOE

10/9/87

Robert L. Johnson, NRC

ATTACHMENT 1

HQO.871028.0004

Agenda
DOE Briefing, October 8-9, 1987
Issues Hierarchy/Performance Allocation/NNWSI Project SCP

Thursday, 10/8

8:30-8:45	Introduction, Statement of Purpose and Objectives, Review of Agenda	D. Alexander
8:45-9:00	Opening Remarks by NRC	R. Johnson
9:00-9:20	Statements by other participants (States, Indian Tribes, others)	Participants
9:20-9:30	Review of past DOE-NRC meetings	D. Alexander
9:30-10:00	Logic and structure of the SCP, Issues Hierarchy	C. Hanlon
10:00-10:15	Break	
10:15-10:45	Overview of the Issue Resolution Strategy	J. Nelson
10:45-12:00	Examples of performance allocation from the NNWSI Project SCP	T. Hunter/ J. Younker
12:00-1:00	Lunch	
1:00-2:00	Examples of performance allocation from the NNWSI Project SCP	T. Hunter/ J. Younker
2:00-4:30	Discussion of performance allocation and content of Chapter 8 of SCP (A complete draft of SCP will be available for viewing).	All
4:30-5:00	Preparation of briefing summary	All

Friday, 10/9

8:30-12:00	Completion of briefing summary. Open for continued discussion and questions, as needed. Draft SCP will be available for viewing.	All

SCP ISSUES HIERARCHY AND PERFORMANCE ALLOCATION

U.S. DEPARTMENT OF ENERGY

BRIEFING FOR THE U.S. NUCLEAR REGULATORY COMMISSION STAFF, STATES, AND INDIAN TRIBES

OCTOBER 8-9, 1987

ATTACHMENT 3
(87 pages)

HQO.871028.0006

DOE INTRODUCTION

REVISED APPROACH TO RELEASE OF SCPs

- RELEASE SCPs FOR ALL THREE CANDIDATE SITES SIMULTANEOUSLY AS CONSULTATION DRAFTS IN JANUARY 1988

- AT THE SAME TIME, RELEASE DRAFT MMPs FOR ALL THREE CANDIDATE SITES

- HOLD CONSULTATION WORKSHOPS WITH STATE, INDIAN TRIBE, AND NRC REPRESENTATIVES IN JANUARY, FEBRUARY, AND MARCH 1988

APPROACH FOR INTERACTIONS ON CONSULTATION DRAFTS

- TECHNICAL WORKSHOPS WILL BE PRIMARY FORUM FOR INTERACTIONS ON CONSULTATION DRAFTS. DOE SITE SPECIFIC TEAMS WILL CONSIST OF PROJECT OFFICE, HEADQUARTERS, AND CONTRACTOR REPRESENTATIVES

- PRIMARY DOE CONTACT WILL BE WASTE MANAGEMENT ORGANIZATION DESIGNATED BY EACH AFFECTED STATE AND INDIAN TRIBE

- REPRESENTATIVES OF THE STATE, ANY AFFECTED INDIAN TRIBE, AND THE NRC WILL BE INVITED TO PARTICIPATE IN WORKSHOPS

CONSULTATION DRAFT INTERACTIONS -- JANUARY - MARCH 1988 (Proposal)

- GENERAL BRIEFING AND PLENARY SESSION, CENTRAL LOCATION, DURING WEEK OF JANUARY 18, 1988
- FOLLOWING GENERAL BRIEFING AND PLENARY SESSION, SITE-SPECIFIC MEETINGS WILL BE SCHEDULED FOR EACH OF THE CANDIDATE SITES
- FIRST SITE-SPECIFIC MEETING TO BE HELD NEAR SITE WITH AGENDA CO-DEVELOPED WITH STATE AND AFFECTED INDIAN TRIBES
- LOCATION AND DATES FOR FOLLOW-ON TECHNICAL MEETINGS TO BE DETERMINED AT FIRST SITE-SPECIFIC MEETING

RW52472T.07

PURPOSE OF BRIEFING

BRIEFING IS INTENDED TO FACILITATE NRC, STATE AND INDIAN TRIBE REVIEW OF CONSULTATIVE DRAFT SCPs BY PRESENTING:

- LOGIC AND STRUCTURE OF THE SCP
- ISSUES HIERARCHY
- ISSUE RESOLUTION STRATEGY
- SPECIFIC EXAMPLES OF ISSUE RESOLUTION STRATEGIES FROM THE NNWSI PROJECT SCP

REVIEW OF PREVIOUS DOE-NRC MEETINGS

REVIEW OF PAST MEETING SUMMARIES WITH RESPECT TO ISSUES HIERARCHY AND PERFORMANCE ALLOCATION

- SEPTEMBER 26-27, 1985 PERFORMANCE ALLOCATION MEETING.

  NRC AND DOE AGREED THAT DOE WOULD DISCUSS TENTATIVE PERFORMANCE GOALS AND CONFIDENCE LEVELS WITH NRC STAFF

  DOE AGREED TO ARRANGE PROJECT-SPECIFIC PERFORMANCE ALLOCATION MEETINGS PRIOR TO SCP ISSUANCE.

- MAY 7-8, 1986, LEVEL OF DETAIL MEETING.

  DOE PROPOSED MEETING TO PRESENT THE DOE ISSUES HIERARCHY.

- MARCH 3-4, 1987, SCP ISSUES HIERARCHY AND PERFORMANCE ALLOCATION

  DOE AGREED TO REPEAT THIS BRIEFING FOR OTHER NRC STAFF, STATE AND INDIAN TRIBE REPRESENTATIVES

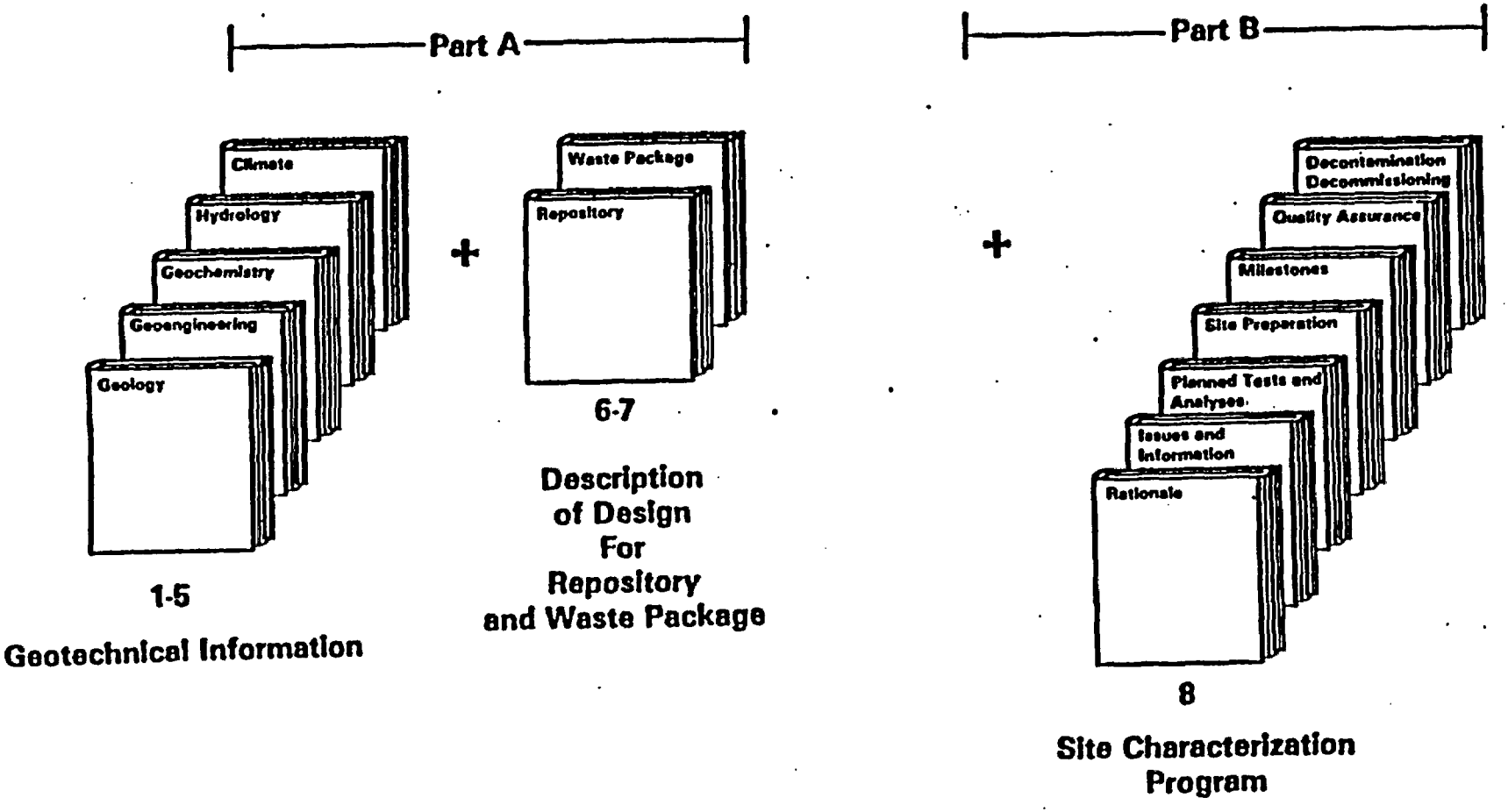
REVIEW OF PAST MEETING SUMMARIES (CONTINUED)

- SEPTEMBER 26-27, 1985 PERFORMANCE ALLOCATION MEETING

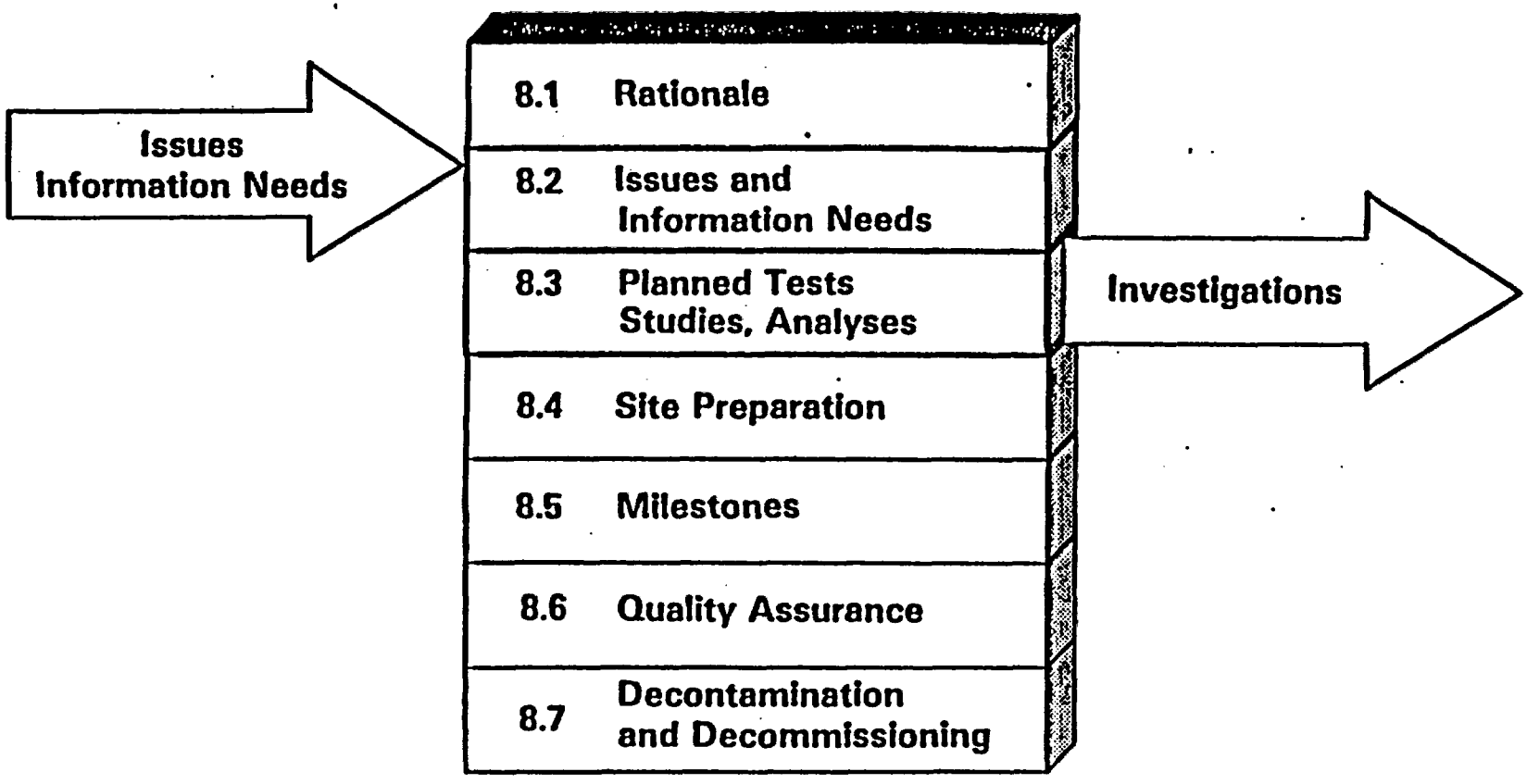
1. PERFORMANCE GOALS ARE NOT TO BE CONSTRUED AS PERFORMANCE CRITERIA
2. INITIAL PERFORMANCE GOALS AND CONFIDENCE LEVELS ARE SUBJECT TO CHANGE
3. DOE WILL USE BEST EFFORTS TO MAKE INITIAL ESTIMATES OF GOALS BASED ON SOUND TECHNICAL/MANAGEMENT JUDGEMENT.
4. EVERY EFFORT WILL BE MADE TO QUANTIFY GOALS AND CONFIDENCE LEVELS
5. PERFORMANCE GOALS WILL BE SET FOR EACH PERFORMANCE MEASURE TO GUIDE TESTING PROGRAM AND WILL BE IN THE SCP.
6. RATIONALE FOR TESTS WILL BE IN THE SCP, INCLUDING ANY RELATIONSHIP TO PERFORMANCE GOALS AND CONFIDENCE LEVELS.

LOGIC AND STRUCTURE OF THE SCP

Structure of the SCP



Chapter 8
Site Characterization Program



SCP SECTIONS 8.1, 8.2, 8.3

- SECTION 8.1 — PROVIDES GENERAL INTRODUCTION TO THE SITE CHARACTERIZATION PROCESS.
- SECTION 8.2 — DISCUSSES RATIONALE FOR CONDUCTING SITE CHARACTERIZATION.
- SECTION 8.3 — PRESENTS PROGRAM FOR SITE CHARACTERIZATION TESTING AND ANALYSIS.

SCP SECTION 8.1

- DISCUSSES THE ISSUES-BASED APPROACH TO PLANNING SITE CHARACTERIZATION.
- DISCUSSES AND EXPLAINS KEY ISSUES OF THE ISSUES HIERARCHY.
- DEFINES PERFORMANCE AND DESIGN ISSUES.
- DISCUSSES THE CONCEPT OF ISSUE RESOLUTION STRATEGY.
- DISCUSSES THE APPLICATION OF THE ISSUE RESOLUTION STRATEGY IN THE SCP.

SCP SECTION 8.2

- PRESENTS THE SITE-SPECIFIC ISSUES HIERARCHY THAT IS TO BE RESOLVED DURING SITE CHARACTERIZATION.
- PRESENTS A CORRELATION OF SITE-SPECIFIC ISSUES HIERARCHY WITH OTHER ISSUE LISTS SUCH AS MISSION PLAN, BWIP SCA, AND ISTPS.
- SUMMARIZES THE SITE-SPECIFIC STRATEGIES FOR RESOLUTION OF EACH OF THE PERFORMANCE AND DESIGN ISSUES.

SCP SECTION 8.3

- PRESENTS PLANS FOR COLLECTING AND ANALYZING INFORMATION.
- LEVEL OF DETAIL TO BE CONSISTENT WITH THE MAY 7-8, 1986, NRC/DOE SCP MEETING.
- SUPPORTED BY STUDY PLANS.

LEVEL OF DETAIL FOR PRESENTATION OF PLANNED TESTS, ANALYSES, AND STUDIES

- AS A RESULT OF THE NRC MEETING HELD OCTOBER 29-30, 1985 TO DISCUSS LEVEL OF DETAIL, PROGRAMMATIC TERMS DEFINED FOR TEST LEVELS

— PROGRAM:	A MAJOR ELEMENT OF THE REPOSITORY SYSTEM, INCLUDING THE SITE, THE REPOSITORY, THE SEAL SYSTEM, THE WASTE PACKAGE, AND PERFORMANCE ASSESSMENT. IT REPRESENTS AN AGGREGATION OF RELATED TECHNICAL INVESTIGATIONS	SCP
— INVESTIGATION:	THE FIRST MAJOR SUBDIVISIONOF A SPECIFIC PROGRAM IS COMPRISED OF TWO OR MORE RELATED STUDIES	
— STUDY:	A COMBINATION OF TESTS AND ANALYSES DEALING WITH A SINGLE OR SEVERAL RELATED STUDIES WITHIN A GIVEN INVESTIGATION	POST SCP
— TEST:	A COMBINATION OF PROCEDURES USED TO PRODUCE DATA OR INFORMATION THROUGH EXPERIMENTS	
— PROCEDURE:	A DESCRIPTION OF DETAILED STEPWISE PROCESS FOR CONDUCTING AN ACTUAL TEST (E.G. ASTM STANDARD)	

ISSUES HIERARCHY

- THE ISSUES HIERARCHY IS THE LIST OF QUESTIONS THAT MUST BE ANSWERED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE APPLICABLE FEDERAL REGULATIONS

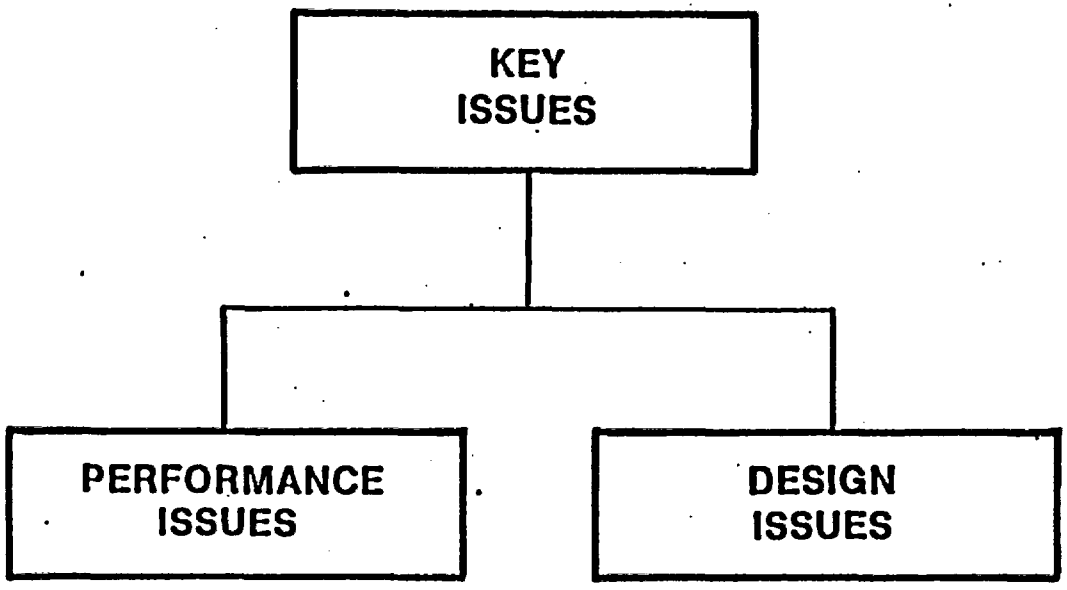
ISSUES HIERARCHY APPROACH TO SITE CHARACTERIZATION AND REGULATORY COMPLIANCE

- ISSUES HIERARCHY PROVIDES A FRAMEWORK FOR TRANSLATING APPLICABLE REGULATORY CRITERIA INTO A TESTING PROGRAM
- USES ISSUES HIERARCHY CONCEPT FROM MISSION PLAN
- PROVIDES MEANS TO DISTINGUISH BROAD QUESTIONS OF OVERALL SUITABILITY FROM SPECIFIC QUESTIONS ABOUT FEATURES OF THE DESIGN AND PERFORMANCE OF THE SYSTEM

ISSUES HIERARCHY STRUCTURE

KEY ISSUES:	BROAD-LEVEL REGULATORY REQUIREMENTS IN FOUR AREAS RELATING TO OVERALL PERFORMANCE OF THE SYSTEM, AS REFLECTED IN 10 CFR PART 960
ISSUES:	QUESTIONS THAT MUST BE ANSWERED IN ORDER FOR THE KEY ISSUE TO BE RESOLVED, DERIVED FROM SPECIFIC REQUIREMENTS OF 10 CFR PART 60, 40 CFR PART 191, AND 10 CFR PART 960
INFORMATION NEEDS:	INFORMATION IN SPECIFIC TECHNICAL AREAS THAT IS REQUIRED IN ORDER FOR THE ISSUE TO BE RESOLVED

TWO CATEGORIES OF ISSUES



- ADDRESS COMPLIANCE WITH REGULATORY REQUIREMENTS RELATED DIRECTLY TO PERFORMANCE OF THE SYSTEM
- IDENTIFY NEEDED INFORMATION RELATED TO DESIGN, SITE CHARACTERISTICS, AND PERFORMANCE ASSESSMENT

- ADDRESS DESIGN CRITERIA
- ADDRESS INFORMATION ABOUT DESIGN OF REPOSITORY AND WASTE PACKAGE NEEDED BY PERFORMANCE ISSUES
- IDENTIFY NEEDED INFORMATION RELATED TO SITE CHARACTERISTICS

ISSUE CATEGORIES

PERFORMANCE AND DESIGN ISSUES ESTABLISH REQUIREMENTS AND PRIORITIES FOR THE CHARACTERIZATION PROGRAM.

CHARACTERIZATION PROGRAM PRODUCES DATA FOR THE ANALYSES NEEDED TO ADDRESS DESIGN AND PERFORMANCE ISSUES.

KEY ISSUES

KEY ISSUE 1 — POSTCLOSURE PERFORMANCE

WILL THE MINED GEOLOGIC DISPOSAL SYSTEM AT [SITE NAME] ISOLATE THE RADIOACTIVE WASTE FROM THE ACCESSIBLE ENVIRONMENT AFTER CLOSURE IN ACCORDANCE WITH THE REQUIREMENTS SET FORTH IN 40 CFR PART 191, 10 CFR PART 60, AND 10 CFR PART 960?

EXAMPLE ISSUES

KEY ISSUE - POSTCLOSURE PERFORMANCE

PERFORMANCE ISSUE

1.5 WILL THE WASTE PACKAGE AND REPOSITORY ENGINEERED BARRIER SYSTEMS MEET THE PERFORMANCE OBJECTIVE FOR RADIONUCLIDE RELEASE RATES AS REQUIRED BY 10CFR 60.113?

DESIGN ISSUE

1.11 HAVE THE CHARACTERISTICS AND CONFIGURATIONS OF THE WASTE PACKAGES BEEN ADEQUATELY ESTABLISHED TO (a) SHOW COMPLIANCE WITH THE POSTCLOSURE DESIGN CRITERIA OF 10CFR 60.135, AND (b) PROVIDE INFORMATION TO SUPPORT RESOLUTION OF THE PERFORMANCE ISSUES?

KEY ISSUES (Continued)

KEY ISSUE 2 — PRECLOSURE RADIOLOGICAL SAFETY

WILL PROJECTED RADIOLOGICAL EXPOSURES OF THE GENERAL PUBLIC AND WORKERS, AND RELEASES OF RADIOACTIVE MATERIALS TO RESTRICTED AND UNRESTRICTED AREAS DURING REPOSITORY OPERATION AND CLOSURE AT [SITE NAME], MEET APPLICABLE SAFETY REQUIREMENTS SET FORTH IN 10 CFR PART 20, 10 CFR PART 60, 10 CFR PART 960, AND 40 CFR PART 191?

KEY ISSUES (Continued)

* KEY ISSUE 3 — PRECLOSURE ENVIRONMENTAL, SOCIOECONOMIC, & TRANSPORTATION IMPACTS

CAN THE MINED GEOLOGIC DISPOSAL SYSTEM AT SITE NAME BE SITED, CONSTRUCTED, OPERATED, CLOSED, AND DECOMMISSIONED, AND CAN THE ASSOCIATED TRANSPORTATION SYSTEM BE SITED, CONSTRUCTED, AND OPERATED SO THAT THE QUALITY OF THE ENVIRONMENT WILL BE PROTECTED AND WASTE-TRANSPORTATION OPERATIONS CAN BE CONDUCTED WITHOUT CAUSING UNACCEPTABLE RISKS TO PUBLIC HEALTH OR SAFETY?

* KEY ISSUE 3 WILL NOT BE ADDRESSED IN THE SCP, BUT WILL BE ADDRESSED IN THE EIS

KEY ISSUES (Continued)

KEY ISSUE 4 — COST EFFECTIVE WITH REASONABLY AVAILABLE TECHNOLOGY

WILL MINED GEOLOGIC DISPOSAL SYSTEM CONSTRUCTION, OPERATION (INCLUDING RETRIEVAL), CLOSURE, AND DECOMMISSIONING BE FEASIBLE AT [SITE NAME] ON THE BASIS OF REASONABLY AVAILABLE TECHNOLOGY, AND WILL THE ASSOCIATED COSTS BE REASONABLE IN ACCORDANCE WITH THE REQUIREMENTS SET FORTH IN 10 CFR PART 960?

PART 60 CORRELATION WITH ISSUES HIERARCHY

10CFR 60		ISSUES
PERFORMANCE OBJECTIVES		
60.111 (a)	RADIATION PROTECTION	2.1, 2.2, 2.3
60.111(b)	RETRIEVABILITY	2.4
60.112	OVERALL SYSTEM	1.1, 1.2, 1.3
60.113(a)(1)	ENGINEERED BARRIER SYSTEM	1.4, 1.5
60.113(a)(2)	GEOLOGIC SETTING	1.6
SITING CRITERIA		
60.122	SITING CRITERIA	1.8
DESIGN CRITERIA FOR GROA		
60.131	GENERAL	2.7
60.132	SURFACE FACILITIES	2.7
60.133	UNDERGROUND FACILITIES	1.11, 2.7
60.134	SHAFT AND BOREHOLE SEALS	1.12
DESIGN CRITERIA FOR WASTE PKG		
60.135	WASTE PACKAGE	1.10, 2.6
PERFORMANCE CONFIRMATION		
60.137	GENERAL	1.7

ISSUE RESOLUTION STRATEGY

STEP-WISE PROCEDURE FOR (1) IDENTIFYING ISSUES, (2) PRIORITIZING, JUSTIFYING, AND PLANNING THE WORK NEEDED TO PROVIDE THE NECESSARY DATA AND THE ANALYSES TO RESOLVE THE QUESTION POSED BY THE ISSUE AND, (3) DOCUMENTING RESOLUTION.

ISSUE RESOLUTION STRATEGY

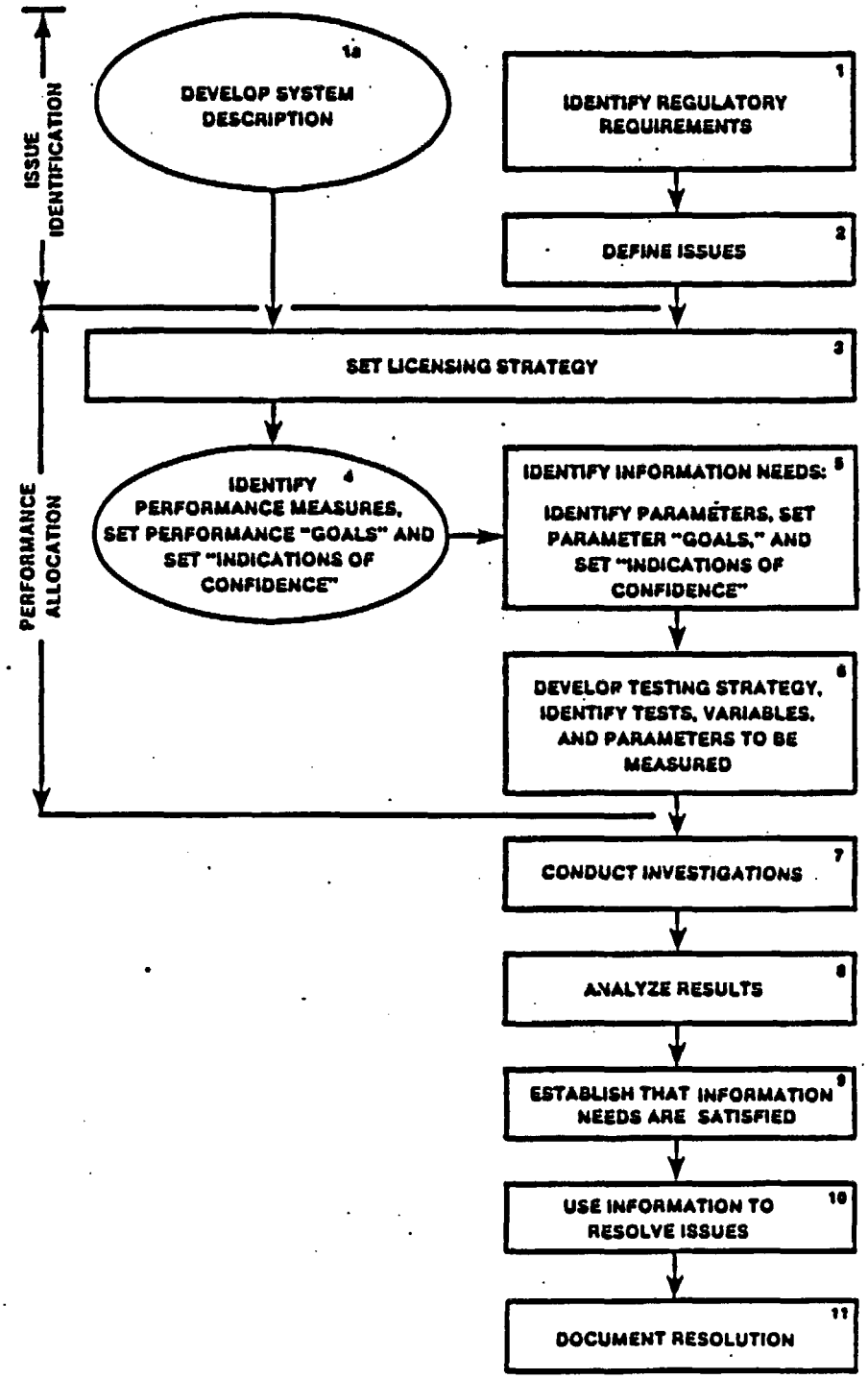
- INCLUDES THREE PARTS

  1. ISSUE IDENTIFICATION

  2. PERFORMANCE ALLOCATION PROCESS

  3. INFORMATION ACQUISITION, ANALYSIS, AND DOCUMENTATION

ISSUE RESOLUTION STRATEGY



PERFORMANCE ALLOCATION

- PROVIDES THE STEP-WISE PROCEDURE FOR IDENTIFYING AND PLANNING THE WORK NEEDED TO SUPPORT RESOLUTION OF ISSUES
- FOCUSES AND PROVIDES BASIS FOR PRIORITIZING SITE CHARACTERIZATION PROGRAM
- PROVIDES BASIS FOR ESTIMATING THE NATURE AND AMOUNT OF DATA, TESTING, AND ANALYSIS.
- PROVIDES A MEANS OF ASSESSING SUCCESS OF SITE CHARACTERIZATION PROGRAM TOWARD RESOLVING ISSUES AND MAKING NECESSARY MODIFICATIONS.

PERFORMANCE ALLOCATION

- SET LICENSING STRATEGY
- IDENTIFY PERFORMANCE MEASURES AND GOALS
- IDENTIFY PARAMETERS AND GOALS, CONSTRUCT INFORMATION NEEDS
- DEVELOP TESTING STRATEGY

LICENSING STRATEGY

- KEY ELEMENTS OF THE SYSTEM
- FUNCTIONS OF ELEMENTS
- IMPORTANT PROCESSES

PERFORMANCE MEASURES AND GOALS

- PERFORMANCE MEASURES

  VARIABLES THAT SPECIFY LEVEL OF PERFORMANCE OF SYSTEM ELEMENTS.

- TENTATIVE GOALS

  TENTATIVE VALUES FOR PERFORMANCE MEASURES CONSISTENT WITH MEETING REGULATORY REQUIREMENTS OF THE ISSUE.

- NEEDED CONFIDENCE

  DESIRED CONFIDENCE ASSOCIATED WITH THE TENTATIVE GOAL THAT IS CONSISTENT WITH MEETING THE REGULATORY REQUIREMENTS

PARAMETERS AND PARAMETER GOALS

- PERFORMANCE PARAMETERS

  VARIABLES NEEDED TO DETERMINE PERFORMANCE MEASURES.

- TENTATIVE GOALS

  TENTATIVE VALUES FOR PARAMETERS CONSISTENT WITH MEETING GOALS FOR PERFORMANCE MEASURES.

- NEEDED CONFIDENCE

  DESIRED CONFIDENCE ASSOCIATED WITH THE PARAMETER GOAL THAT IS CONSISTENT WITH MEETING THE GOAL FOR THE PERFORMANCE MEASURE.

- EXPECTED VALUES

  ESTIMATE OF THE VALUE OR RANGE OF VALUES FOR THE PARAMETER, BASED ON EXISTING INFORMATION.

- CURRENT CONFIDENCE

  CONFIDENCE THAT THE ACTUAL PARAMETER VALUES LIE WITHIN RANGE DEFINED BY THE TENTATIVE GOALS, USING ONLY CURRENTLY AVAILABLE INFORMATION, AND TAKING INTO ACCOUNT THE QUANTITY AND QUALITY OF THAT INFORMATION

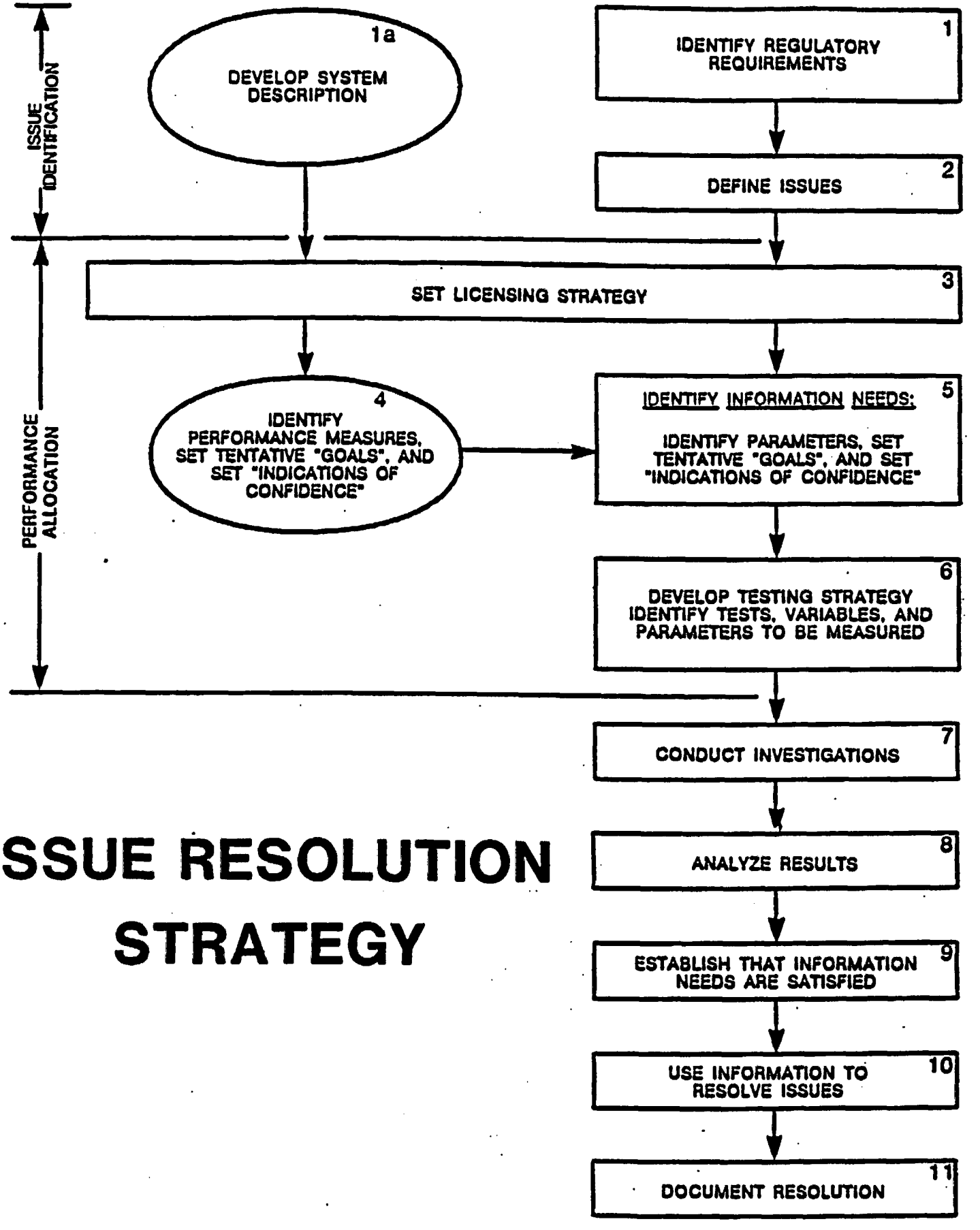
INFORMATION NEEDS

- THIRD LEVEL OF ISSUE HIERARCHY
- OBJECTIVES FOR INVESTIGATIONS TO BE CONDUCTED
- COLLECTIONS OF PARAMETERS AND ANALYTIC TOOLS

TESTING STRATEGY

- DEFINITION OF HOW WELL "CHARACTERIZATION" PARAMETERS NEED TO BE KNOWN
- TESTING BASIS DEVELOPED FOR CHARACTERIZATION PARAMETERS, MAY CONSIST OF
  - GOALS AND CONFIDENCES
  - ACCURACIES AND CONFIDENCES
  - EXPECTED VALUES AND CONFIDENCES
- BASIS FOR PLANNING THE INVESTIGATIONS

EXAMPLES OF PERFORMANCE ALLOCATION TAKEN FROM NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS PROJECT SITE CHARACTERIZATION PLAN



ISSUE RESOLUTION STRATEGY

STEP 2. DEFINE ISSUES

KEY ISSUE 1: POSTCLOSURE PERFORMANCE

1.1 TOTAL SYSTEM PERFORMANCE

⋮

1.5 EBS RELEASE LIMITS

⋮

1.12 SEALS CHARACTERISTICS

KEY ISSUE 2: PRECLOSURE RADIOLOGICAL SAFETY

2.1 PUBLIC RADIOLOGICAL EXPOSURE--NORMAL

⋮

2.7 RADIOLOGICAL DESIGN REQUIREMENTS

KEY ISSUE 4: PRECLOSURE PERFORMANCE

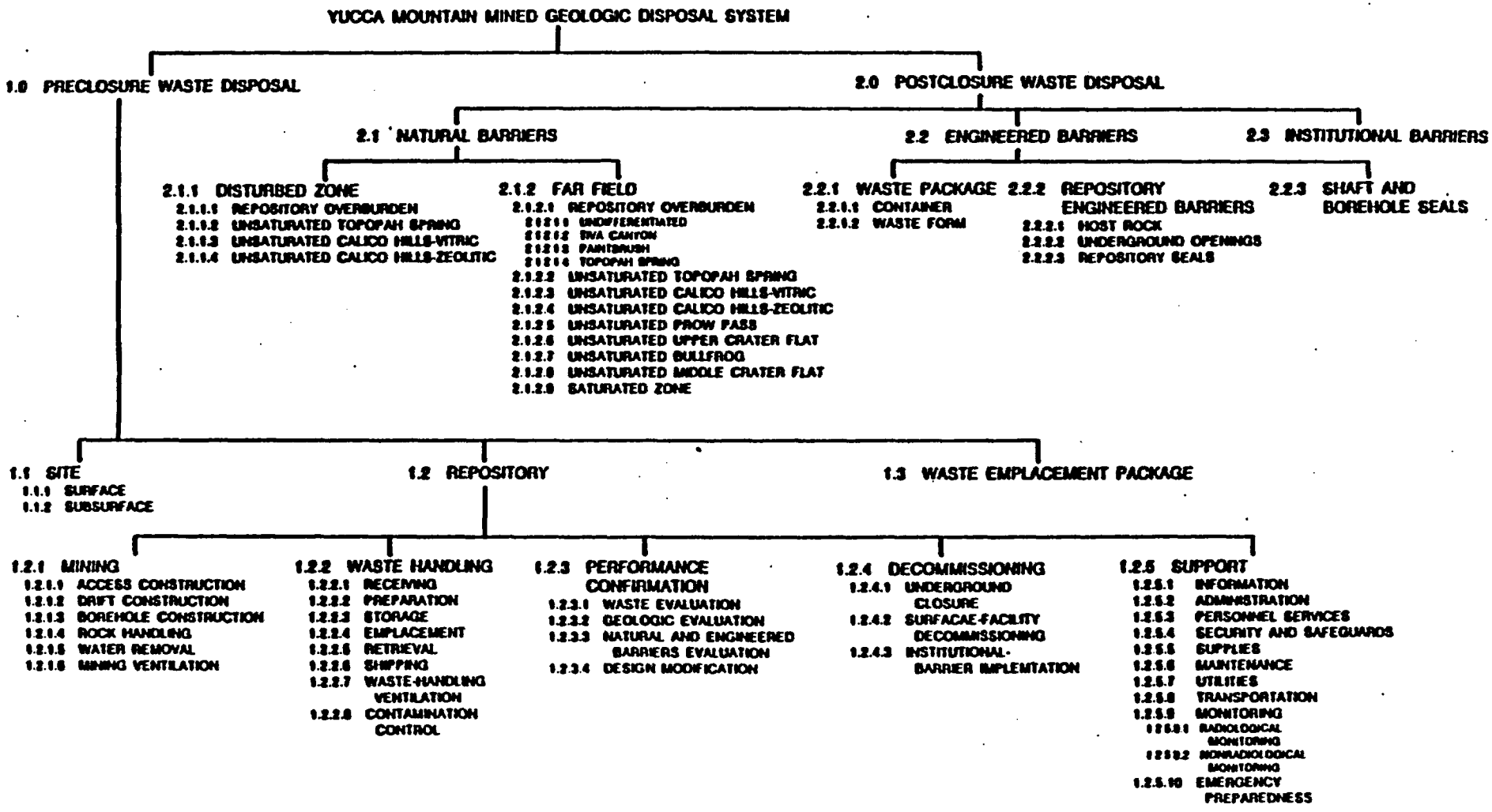
4.1 EASE AND COST-HIGHER LEVEL FINDINGS

⋮

4.4 DESIGN AND TECHNICAL FEASIBILITY

4.5 REPOSITORY COSTS

ELEMENTS OF YUCCA MOUNTAIN MINED GEOLOGIC DISPOSAL SYSTEM



STEPS IN PERFORMANCE ALLOCATION

IRS STEP 3. SET LICENSING STRATEGY FOR RESOLVING ISSUES
- SELECT SYSTEM ELEMENTS ON WHICH TO RELY
- IDENTIFY RELEVANT FUNCTIONS, PROCESSES, OR FEATURES

IRS STEP 4. IDENTIFY PERFORMANCE MEASURES
- SPECIFY PERFORMANCE MEASURES
- SET GOALS
- SET INDICATIONS OF NEEDED CONFIDENCE

IRS STEP 5. IDENTIFY INFORMATION NEEDS
- IDENTIFY PERFORMANCE/DESIGN PARAMETERS
- SET TENTATIVE GOALS
- SET INDICATIONS OF NEEDED CONFIDENCE

IRS STEP 6. DEVELOP TEST BASIS
- IDENTIFY CHARACTERIZATION PARAMETERS
- MAKE CURRENT ESTIMATES
- STATE CONFIDENCE IN ESTIMATES
- SET INDICATIONS OF NEEDED CONFIDENCE

GOALS AND OTHER ALLOCATED PARAMETERS

PURPOSE: TO GUIDE SITE CHARACTERIZATION PROGRAMS

BASES: PRIMARILY PROFESSIONAL JUDGEMENT

- REFINED BY SENSITIVITY STUDIES

CAVEATS: GOALS ARE TENTATIVE

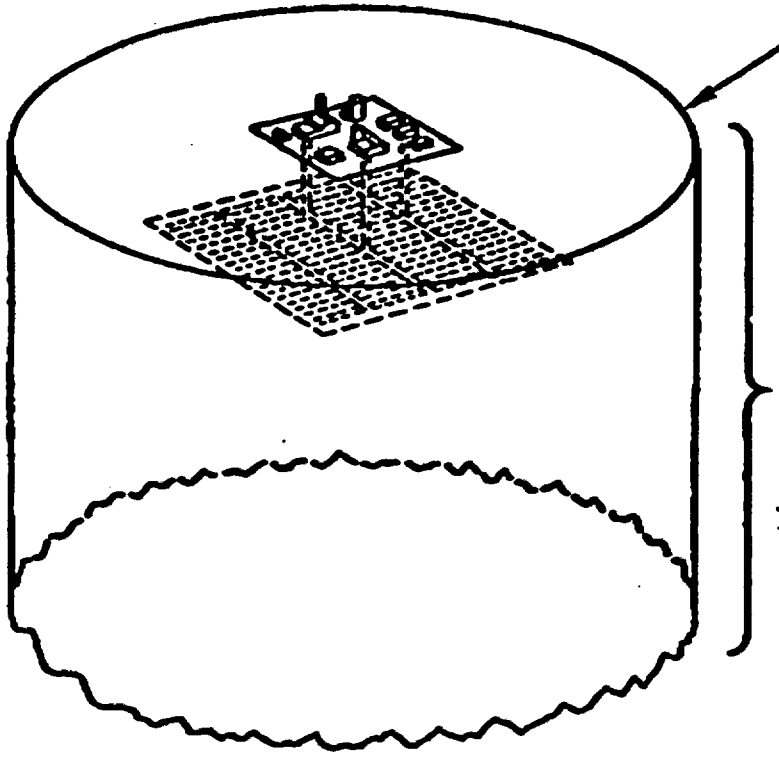
- GOALS COULD CHANGE AS NEW INFORMATION IS OBTAINED
- GOALS ARE NOT CRITERIA; FAILURE TO MEET A GOAL DOES NOT IMPLY UNSATISFACTORY SYSTEM PERFORMANCE

EXAMPLE #1

PERFORMANCE ALLOCATION FOR ISSUE 1.1

WILL THE MINED GEOLOGIC DISPOSAL SYSTEM MEET THE SYSTEM PERFORMANCE OBJECTIVE FOR LIMITING RADIONUCLIDE RELEASES TO THE ACCESSIBLE ENVIRONMENT AS REQUIRED BY 10 CFR 60.112 AND 40 CFR 191.13?

EPA STANDARD FOR RADIOACTIVE RELEASE TO THE ACCESSIBLE ENVIRONMENT



ACCESSIBLE ENVIRONMENT

I. RADIOACTIVE RELEASE

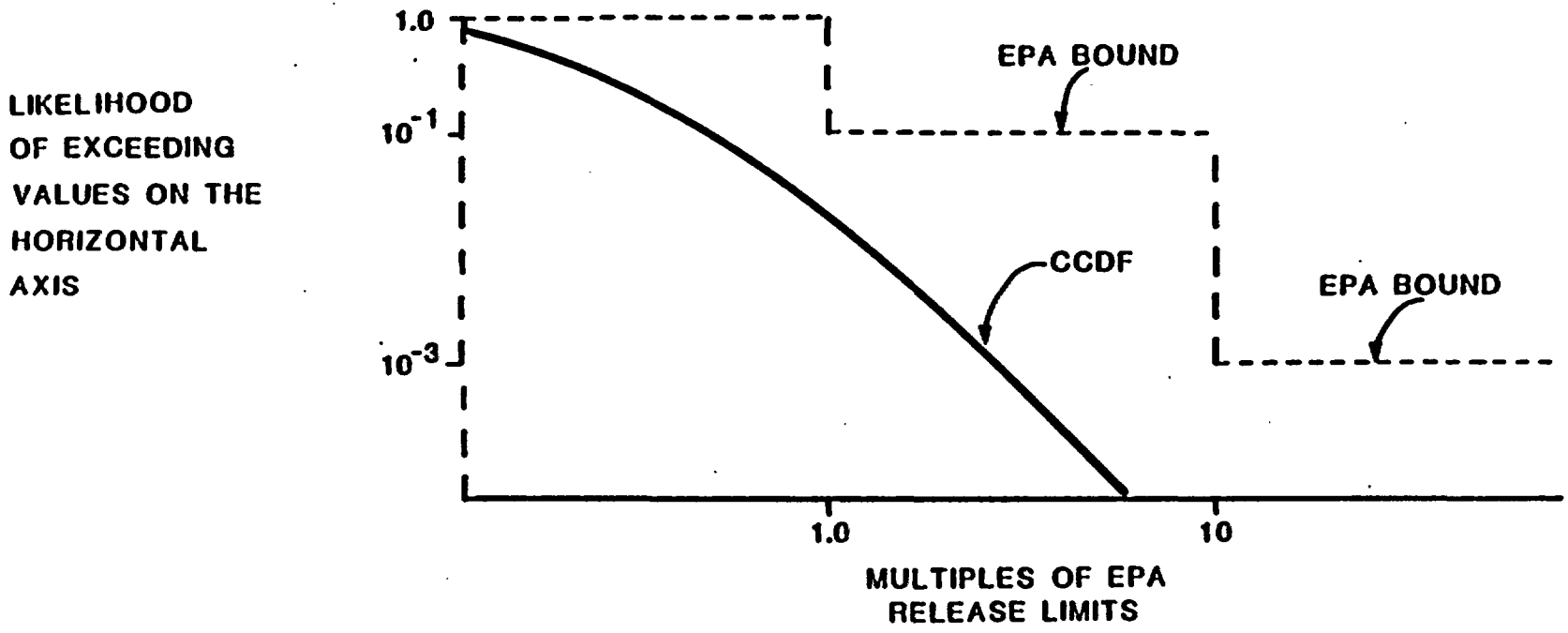
$\oint_{0}^{10,000} \dot{R}\, dt$ MUST BE LESS THAN THE SUM OF:

RADIONUCLIDE	CI/1000 MTHM

IRS STEP 3. SET LICENSING STRATEGY

- SELECT SYSTEM ELEMENTS
- IDENTIFY FUNCTIONS, PROCESSES, OR FEATURES

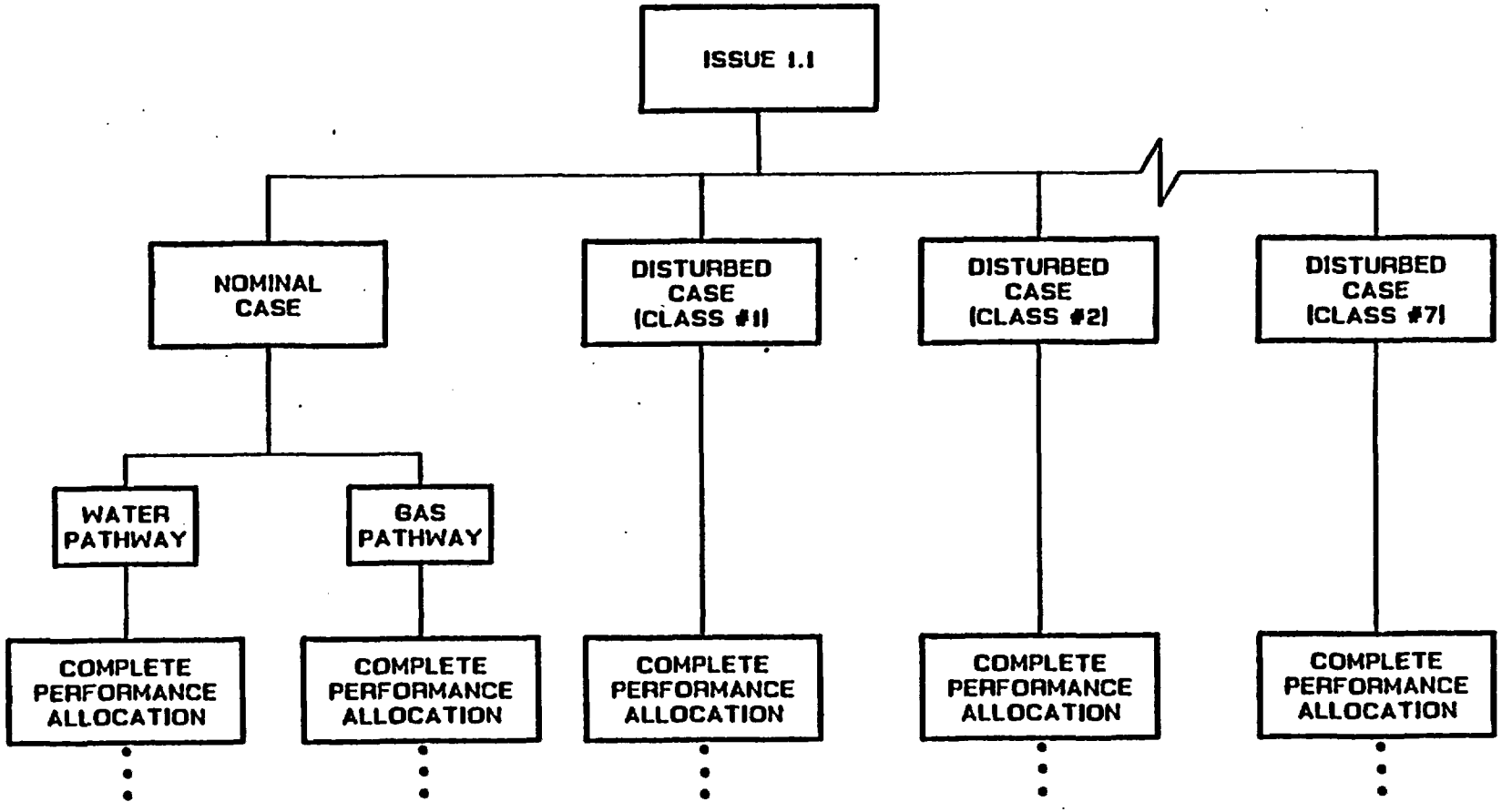
ILLUSTRATIVE COMPLEMENTARY CUMULATIVE DISTRIBUTION FUNCTION (CCDF)



ASSESSING POSTCLOSURE PERFORMANCE OF THE TOTAL SYSTEM (RELEASES TO ACCESSIBLE ENVIRONMENT)

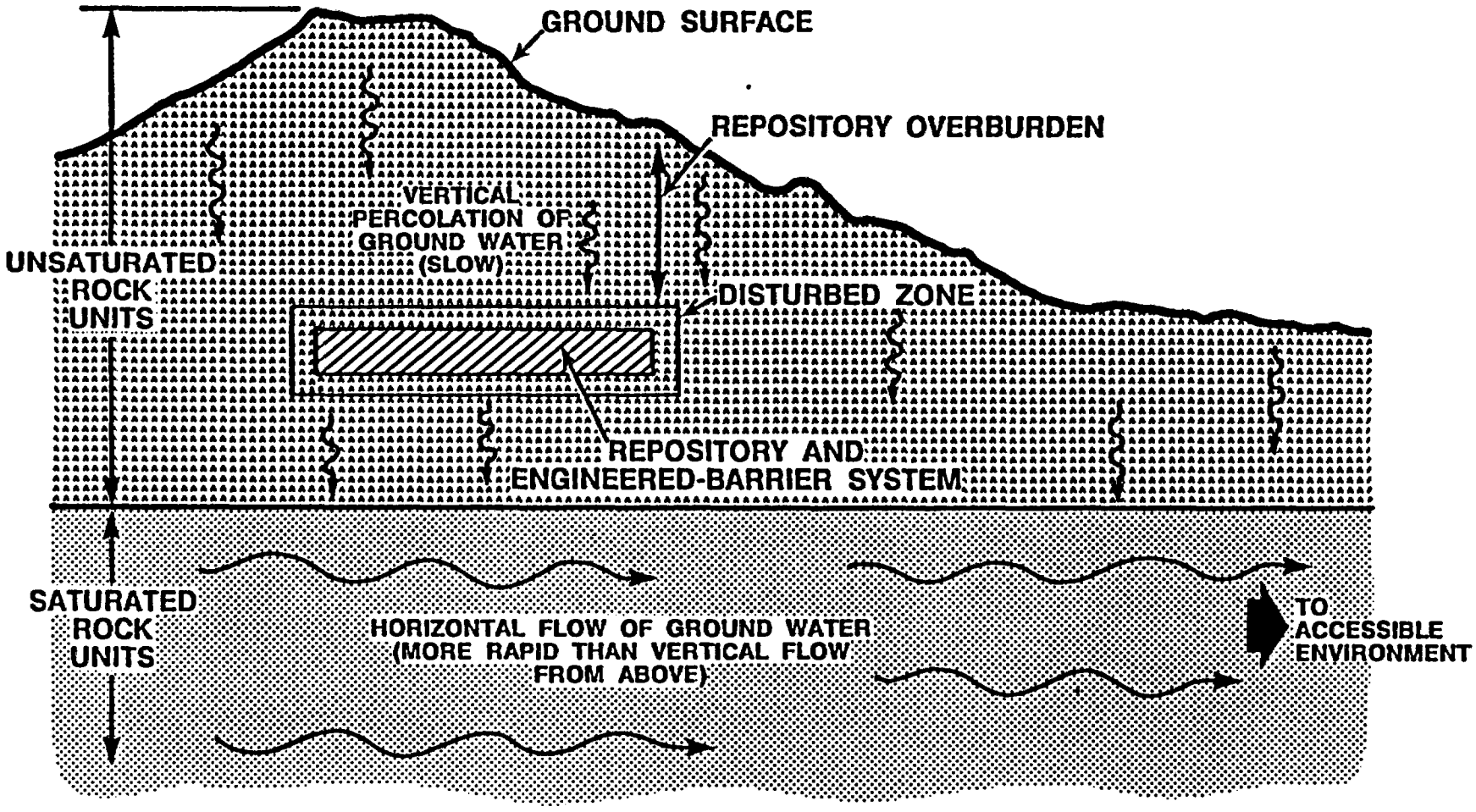
- CCDF WILL SHOW COMPLIANCE
- MAKING CCDF REQUIRES MODELING OF FUTURE PERFORMANCE
- FOR ALLOCATING PERFORMANCE, FUTURE EVENTS AND PROCESSES ARE GROUPED INTO
  - ONE "NOMINAL CASE"
  - SEVEN "DISTURBED CASES"
- PERFORMANCE IS ALLOCATED SEPARATELY FOR EACH CASE

PERFORMANCE ALLOCATION FOR "NOMINAL" AND "DISTURBED" CASES



PERALL-10/2/87-VA

ELEMENTS OF THE REPOSITORY SYSTEM THAT CAN BE RELIED ON FOR RESOLVING ISSUE 1.1



ELEMENTS AND FEATURES TO BE RELIED ON

ELEMENT	FEATURE TO BE RELIED ON
UNSATURATED ROCK UNITS	SMALL AMOUNT OF GROUND WATER
	LONG AVERAGE TRANSPORT TIME IN GROUND WATER
	CONFINEMENT OF WATER TO ROCK MATRIX
	GEOCHEMICAL RETARDATION
SATURATED ROCK UNITS (BACKUP BARRIER)	LONG FLOW TIME
	GEOCHEMICAL RETARDATION
ENGINEERED-BARRIER SYSTEM (BACKUP BARRIER)	LIMITED RATE OF RELEASE OF RADIONUCLIDES

IRS STEP 4. IDENTIFY PERFORMANCE MEASURES

- SPECIFY PERFORMANCE MEASURES
- SET "TENTATIVE" GOALS
- SET INDICATIONS OF NEEDED CONFIDENCE

EXAMPLE PERFORMANCE MEASURES FOR NOMINAL CASE

PATHWAY	SYSTEM ELEMENTS	FUNCTION/PROCESS	PERFORMANCE MEASURE	TENTATIVE GOAL	NEEDED CONFIDENCE
WATER	UNSATURATED ZONE ROCK UNITS	LIMIT RADIONUCLIDE TRANSPORT	CALCULATED RELEASE / EPA STANDARD	<.01	HIGH
	ENGINEERED BARRIER SYSTEM*				
	SATURATED ROCK UNITS*				
GAS	ENGINEERED BARRIER SYSTEM	LIMIT RELEASE OF CARBON-14	CALCULATED RELEASE / EPA STANDARD	<0.2	MEDIUM
	OVERBURDEN*				

* SECONDARY BARRIER

IRS STEP 5. IDENTIFY INFORMATION NEEDS

- IDENTIFY PERFORMANCE/DESIGN PARAMETERS
- SET "TENTATIVE" GOALS
- SET INDICATIONS OF NEEDED CONFIDENCE

EXAMPLE INFORMATION NEEDS FOR NOMINAL CASE (WATER PATHWAY)

SYSTEM ELEMENT	PERFORMANCE PARAMETER	TENTATIVE GOAL	NEEDED CONFIDENCE
UNSATURATED ZONE (UZ) (PRIMARY BARRIER)	AVERAGE FLUX	<0.5mm/YR	HIGH
	AVERAGE EFFECTIVE MATRIX POROSITY	>0.1	HIGH
	AVERAGE CHEMICAL RETARDATION FACTOR FOR I^{TH} SPECIES	≥1	HIGH
	AVERAGE THICKNESS BETWEEN REPOSITORY AND WATER TABLE	>100m	HIGH
SATURATED ZONE (SZ) (BACKUP BARRIER)	AVERAGE FLUX	<32mm/YR	MEDIUM
	AVERAGE LENGTH OF FLOW PATH	>5000m	MEDIUM
ENGINEERED-BARRIER SYSTEM (BACKUP BARRIER)	FRACTIONAL MASS RELEASE RATE FOR EACH SPECIES	$<10^{-4}$	MEDIUM

EXAMPLE INFORMATION NEEDS FROM ALLOCATIONS FOR DISTURBED CASES

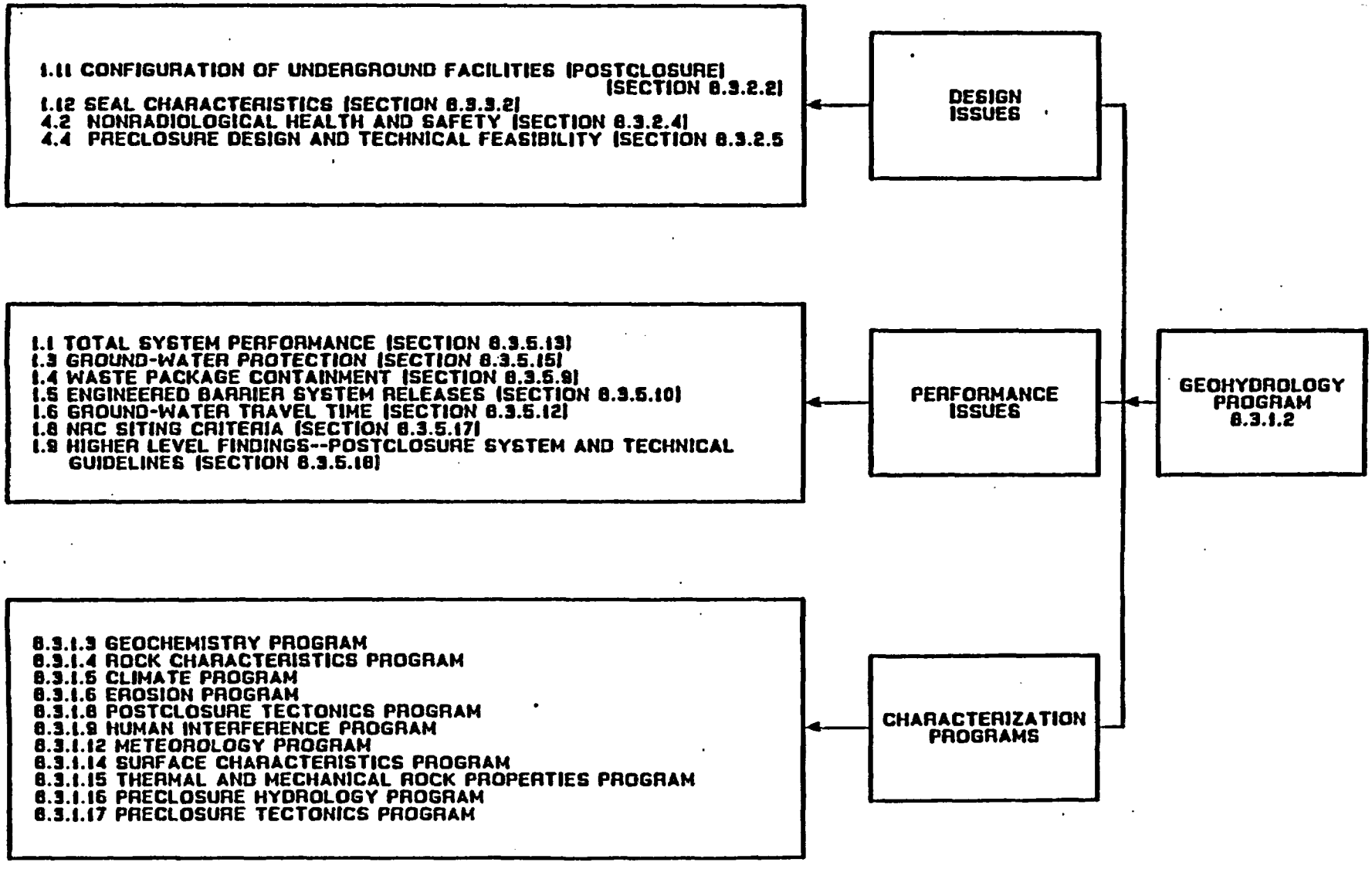
INITIATING EVENT OR PROCESS	PERFORMANCE PARAMETER	TENTATIVE PERFORMANCE GOAL	NEEDED CONFIDENCE
IGNEOUS INTRUSION CAUSES WATER-TABLE RISE (FROM CASE C-2, "FORESHORTENING OF THE UZ")	PROBABILITY OF INTRUSION WITHIN AREA	$<10^{-5}$/YR	MEDIUM
OFFSET ON FAULT CAUSES WATER-TABLE RISE (FROM CASE C-2)	PROBABILITY OF OFFSET >1m	$<10^{-1}$ IN 10,000 YR	MEDIUM
VOLCANIC ERUPTION PENETRATES REPOSITORY (FROM CASE A-1, "EXTRUSIVE MAGMATIC EVENTS")	PROBABILITY FOR SUCH ERUPTION	$<10^{-6}$/YR	HIGH
	DISRUPTED AREA	<0.1% OF REPOSITORY AT CONDITIONAL PROBABILITY <0.1 IN 10,000 YR	

EXAMPLE FROM GEOHYDROLOGY SITE PROGRAM

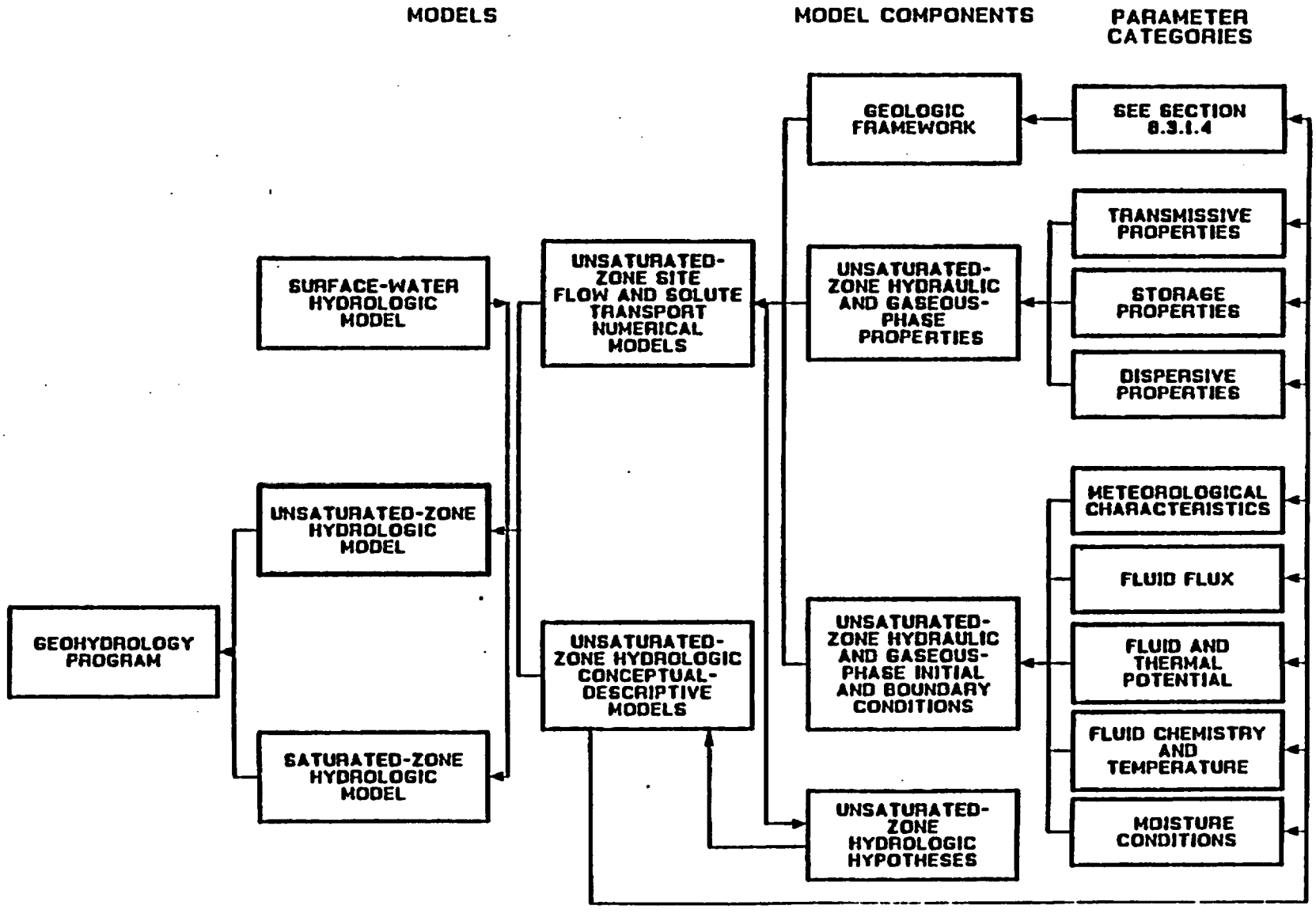
IRS STEP 6. DEVELOP TEST BASIS

- IDENTIFY CHARACTERIZATION PARAMETERS
- MAKE CURRENT ESTIMATE
- STATE CONFIDENCE IN ESTIMATE
- SET INDICATIONS OF NEEDED CONFIDENCE

ISSUES AND SITE PROGRAMS REQUESTING GEOHYDROLOGY DATA



UNSATURATED-ZONE HYDROLOGY COMPONENT OF THE GEOHYDROLOGY PROGRAM



8.3.1.2-3

EXAMPLE OF TEST BASIS DEVELOPMENT

- DEFINITION OF PARAMETER CATEGORIES
- DEFINITION OF ACTIVITY PARAMETERS

UNSATURATED ZONE - TEST BASIS

PARAMETER CATEGORIES

- TRANSMISSIVE
- STORAGE
- DISPERSIVE
- FLUID CHEMISTRY AND TEMPERATURE
- FLUID FLOW
- FLUID AND THERMAL POTENTIAL
- MOISTURE CONDITIONS
- SYNTHESIS CHARACTERISTICS

ACTIVITY PARAMETERS PROVIDED BY THE UNSATURATED ZONE GEOHYDROLOGY PROGRAM

CALLS BY PERFORMANCE AND DESIGN ISSUES		PARAMETER	RESPONSE BY GEOHYDROLOGY CHARACTERIZATION PROGRAM	
ISSUE	SCP SECTION	CATEGORY	ACTIVITY PARAMETER	SCP ACTIVITY
1.1, 1.5, 1.6, 1.12	8.3.5.13, 8.3.5.10, 8.3.5.12, 8.3.3.2	FLUID FLOW	FLUX, LIQUID AND GASEOUS PHASE, GHOST DANCE FAULT ZONE	8.3.1.2.2.6.1
			FLUX, VOLUMETRIC, THROUGH FRACTURE/ MATRIX NETWORKS	8.3.1.2.2.4.2
			FLUX, VOLUMETRIC, THROUGH THE TOPOPAH SPRING WELDED UNIT	8.3.1.2.2.4.3
1.1, 1.4 1.6, 4.4 1.8, 1.9 1.5, 4.2	8.3.5.13 8.3.5.9, 8.3.5.12, 8.3.2.5, 8.3.5.17, 8.3.5.18, 8.3.5.10, 8.3.2.4,	SYNTHESIS CHARACTERISTICS	FLOW PATHS, MOISTURE IN UNSATURATED ZONE	8.3.1.2.2.10.3
			GROUND-WATER TRAVEL TIME, FRACTURE/MATRIX NETWORKS	8.3.1.2.2.4.2
			MOISTURE FLUXES, FLOW PATHS, AND TRAVEL TIMES WITHIN THE UNSATURATED ZONE	9.3.1.2.2.10.1

ACTIVITY PARAMETER TRACKED INTO APPROPRIATE STUDY

8.3.1.2.2.4 STUDY: CHARACTERIZATION OF YUCCA MOUNTAIN PERCOLATION IN THE UNSATURATED ZONE--EXPLORATORY SHAFT FACILITY STUDY

8.3.1.2.2.4.1 ACTIVITY: INTACT FRACTURE TEST IN THE ESF

8.3.1.2.2.4.2 ACTIVITY: INFILTRATION TESTS IN THE ESF

ACTIVITY PARAMETER	SCP ACTIVITY
FLUX, VOLUMETRIC THROUGH FRACTURE/MATRIX NETWORKS	8.3.1.2.2.4.2

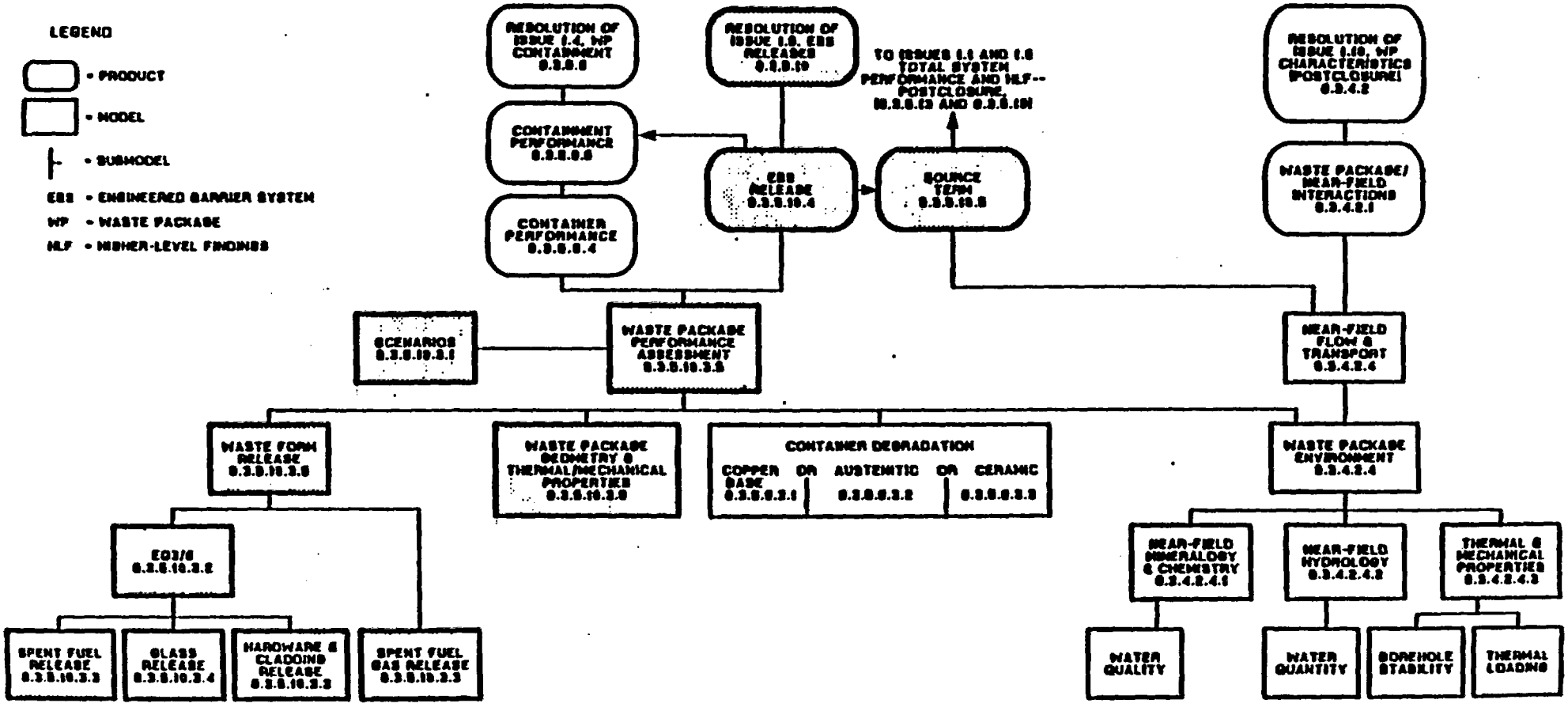
⋮

EXAMPLE #2

PERFORMANCE ALLOCATION FOR ISSUE 1.5

WILL THE WASTE PACKAGE AND REPOSITORY ENGINEERED BARRIER SYSTEMS MEET THE PERFORMANCE OBJECTIVE FOR RADIONUCLIDE RELEASE RATES AS REQUIRED BY 10 CFR 60.113?

LOGIC DIAGRAM FOR ISSUE 1.5 - EBS RELEASE



IRS STEP 3. SET LICENSING STRATEGY

- SELECT SYSTEM ELEMENTS
- IDENTIFY FUNCTIONS, PROCESSES, OR FEATURES

SYSTEM ELEMENTS FOR ISSUE 1.5

2.2 ENGINEERED BARRIERS

2.2.1 WASTE PACKAGE

- 2.2.1.1 CONTAINER
- 2.2.1.2 WASTE FORM

2.2.2 REPOSITORY ENGINEERED BARRIERS

- 2.2.2.1 HOST ROCK
- 2.2.2.2 UNDERGROUND OPENINGS
- 2.2.2.3 REPOSITORY SEALS

IRS STEP 4. IDENTIFY PERFORMANCE MEASURES

- SPECIFY PERFORMANCE MEASURES
- SET "TENTATIVE" GOALS
- SET INDICATIONS OF NEEDED CONFIDENCE

IRS STEP 5. IDENTIFY INFORMATION NEEDS

- IDENTIFY PERFORMANCE/DESIGN PARAMETERS
- SET "TENTATIVE" GOALS
- SET INDICATIONS OF NEEDED CONFIDENCE

EXAMPLES OF PERFORMANCE MEASURES FOR ISSUE 1.5 - EBS RELEASE

SYSTEM ELEMENT	PERFORMANCE/DESIGN MEASURE	TENTATIVE GOAL	NEEDED CONFIDENCE
HOST ROCK (ENGINEERED ENVIRON-MENT)	QUANTITY OF LIQUID WATER THAT CAN CONTACT THE CONTAINER	< 20 L PER PACKAGE PER YEAR	HIGH
	WATER QUALITY	CONSTRAIN WATER CHEMISTRY TO ACCEPTABLE LEVELS FOR WASTE FORM PERFORMANCE	HIGH

INFORMATION NEEDS

PERFORMANCE/DESIGN PARAMETER	TENTATIVE GOAL	NEEDED CONFIDENCE
pH	5.5 - 9	HIGH
Cl^-	< 20 PPM	HIGH
F^-	< 6 PPM	HIGH
⋮	⋮	⋮

TEST BASIS CONTINUED ON NEXT FIGURE

IRS STEP 6. DEVELOP TEST BASIS

- IDENTIFY CHARACTERIZATION PARAMETERS
- MAKE CURRENT ESTIMATE
- STATE CONFIDENCE IN ESTIMATE
- SET INDICATIONS OF NEEDED CONFIDENCE

EXAMPLES OF CHARACTERIZATION PARAMETERS CORRESPONDING TO PERFORMANCE MEASURES FOR ISSUE 1.5 - EBS RELEASE

TEST BASIS FOR INVESTIGATIONS

CHARACTERIZATION PARAMETER	CURRENT ESTIMATED RANGE	CONFIDENCE IN CURRENT ESTIMATE	NEEDED CONFIDENCE
pH	6.1 - 7.7	MEDIUM	HIGH
Cl^-	< 10 PPM	MEDIUM	HIGH
F^-	< 6 PPM	MEDIUM	HIGH
⋮	⋮	⋮	⋮

EXAMPLE #3

PERFORMANCE ALLOCATION FOR ISSUE 4.4

ARE THE TECHNOLOGIES OF REPOSITORY CONSTRUCTION, OPERATION, CLOSURE AND DECOMMISSIONING ADEQUATELY ESTABLISHED FOR THE RESOLUTION OF THE PERFORMANCE ISSUES?

IRS STEP 3. SET LICENSING STRATEGY

- SELECT SYSTEM ELEMENTS
- IDENTIFY FUNCTIONS, PROCESSES, OR FEATURES

SYSTEM ELEMENTS FOR ISSUE 4.4

1.1 SITE

- 1.1.1 SITE SURFACE
- 1.1.2 SITE SUBSURFACE

1.2.1 MINING

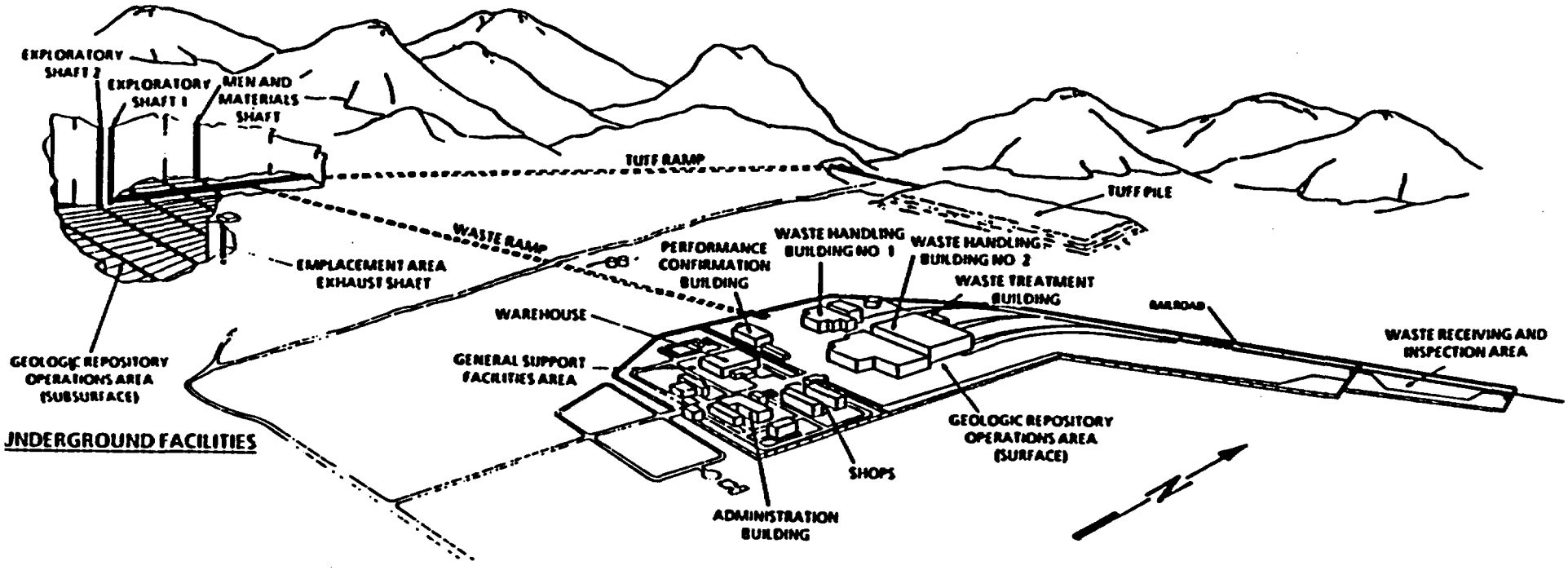
- 1.2.1.1 ACCESS CONSTRUCTION
- 1.2.1.2 DRIFT CONSTRUCTION
- 1.2.1.3 BOREHOLE CONSTRUCTION
- 1.2.1.4 ROCK HANDLING
- 1.2.1.5 WATER REMOVAL
- 1.2.1.6 MINING VENTILATION

1.2.2 WASTE HANDLING

- 1.2.2.1 RECEIVING
- 1.2.2.2 PREPARATION
- 1.2.2.3 STORAGE
- 1.2.2.4 EMPLACEMENT
- 1.2.2.5 RETRIEVAL
- 1.2.2.6 SHIPPING
- 1.2.2.7 WASTE-HANDLING VENTILATION
- 1.2.2.8 CONTAMINATION CONTROL

⋮

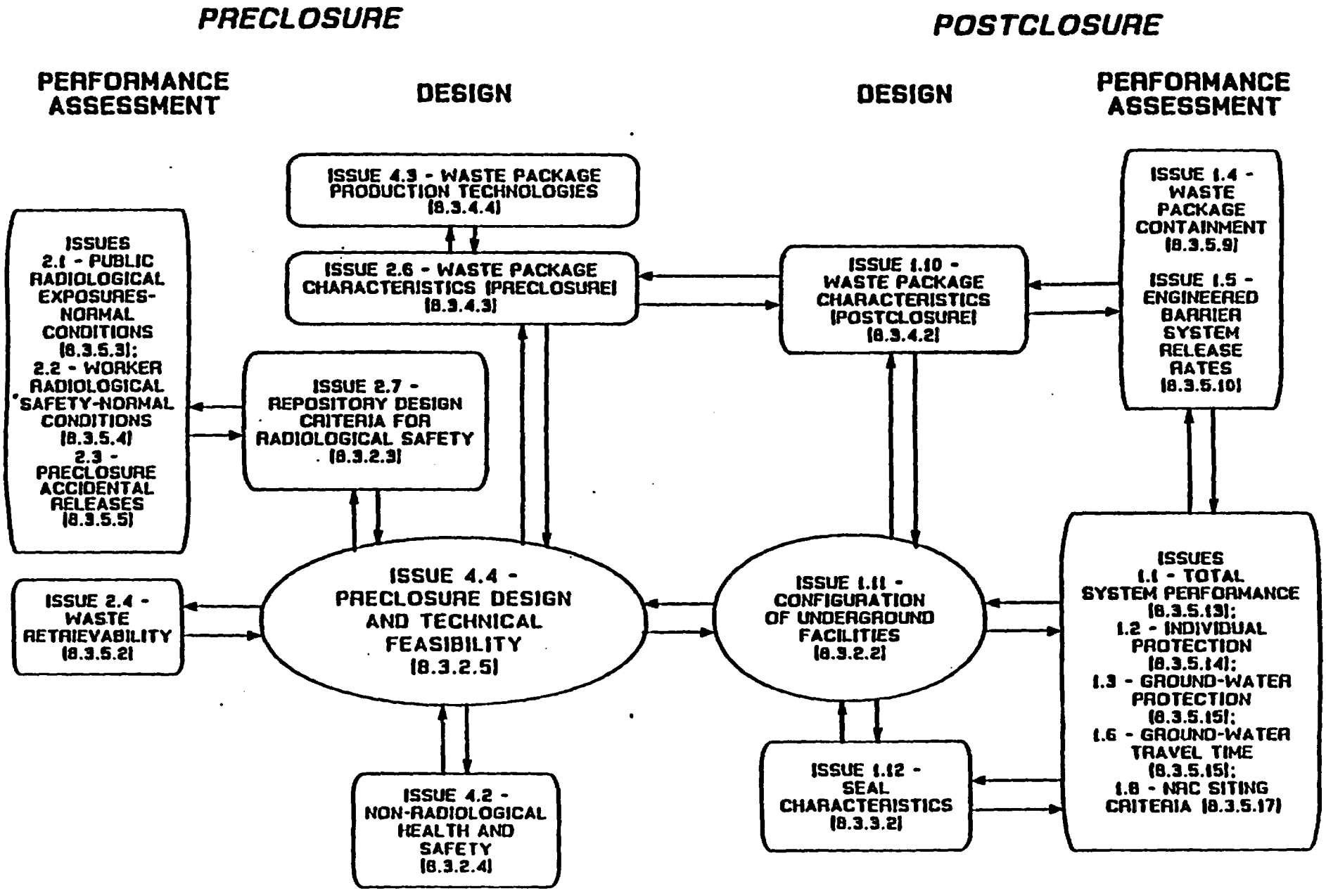
CONCEPTUAL REPOSITORY DESIGN



UNDERGROUND FACILITIES

CENTRAL SURFACE FACILITIES

ISSUES INTERACTIONS



IRS STEP 4. IDENTIFY PERFORMANCE MEASURES

- SPECIFY PERFORMANCE MEASURES
- SET "TENTATIVE" GOALS
- SET INDICATIONS OF NEEDED CONFIDENCE

EXAMPLE PERFORMANCE MEASURES

PRECLOSURE DESIGN OF SURFACE FACILITIES IMPORTANT TO SAFETY (FITS)

SYSTEM ELEMENT	FUNCTION/ PROCESS	PERFORMANCE/DESIGN MEASURE	TENTATIVE GOAL	NEEDED CONFIDENCE
SITE – SURFACE	PROVIDE FACILITY LOCATION NOT JEOPARDIZED BY NATURAL OR MAN-MADE PHENOMENA	ACCEPTABILITY OF LOCATION OF SURFACE FACILITIES ⋮	FITS NOT LOCATED OVER HAZARDOUS FAULT ACCEPTABLE POTENTIAL FOR GROUND SHAKING ⋮	HIGH HIGH ⋮

IRS STEP 5. IDENTIFY INFORMATION NEEDS

- IDENTIFY PERFORMANCE/DESIGN PARAMETERS
- SET "TENTATIVE" GOALS
- SET INDICATIONS OF NEEDED CONFIDENCE

EXAMPLE INFORMATION NEEDS CORRESPONDING TO PERFORMANCE MEASURES

PRECLOSURE DESIGN OF SURFACE FACILITIES IMPORTANT TO SAFETY (FITS)

SYSTEM ELEMENT	FUNCTION/ PROCESS	PERFORMANCE/DESIGN MEASURE	TENTATIVE GOAL	NEEDED CONFIDENCE
SITE-SURFACE	PROVIDE FACILITY LOCATION NOT JEOPARDIZED BY NATURAL OR MAN-MADE PHENOMENA	ACCEPTABILITY OF LOCATION OF SURFACE FACILITIES ⋮	FITS NOT LOCATED OVER HAZARDOUS FAULT	HIGH
			ACCEPTABLE POTENTIAL FOR GROUND SHAKING ⋮	HIGH ⋮

INFORMATION NEEDS

PERFORMANCE/DESIGN PARAMETER	TENTATIVE GOAL	NEEDED CONFIDENCE	
PROBABILITY OF EXCEEDING 5 cm OF DISPLACEMENT UNDER FITS	< 0.01 PER 100 YEARS	HIGH	
⋮	⋮	⋮	
PROBABILITY OF EXCEEDING DESIGN BASIS GROUND MOTIONS AT FITS	< 0.1 PER 100 YEARS	MEDIUM TO HIGH	TEST BASIS FROM-CHARACTERIZATION PROGRAM CONTINUED

IRS STEP 6. DEVELOP TEST BASIS

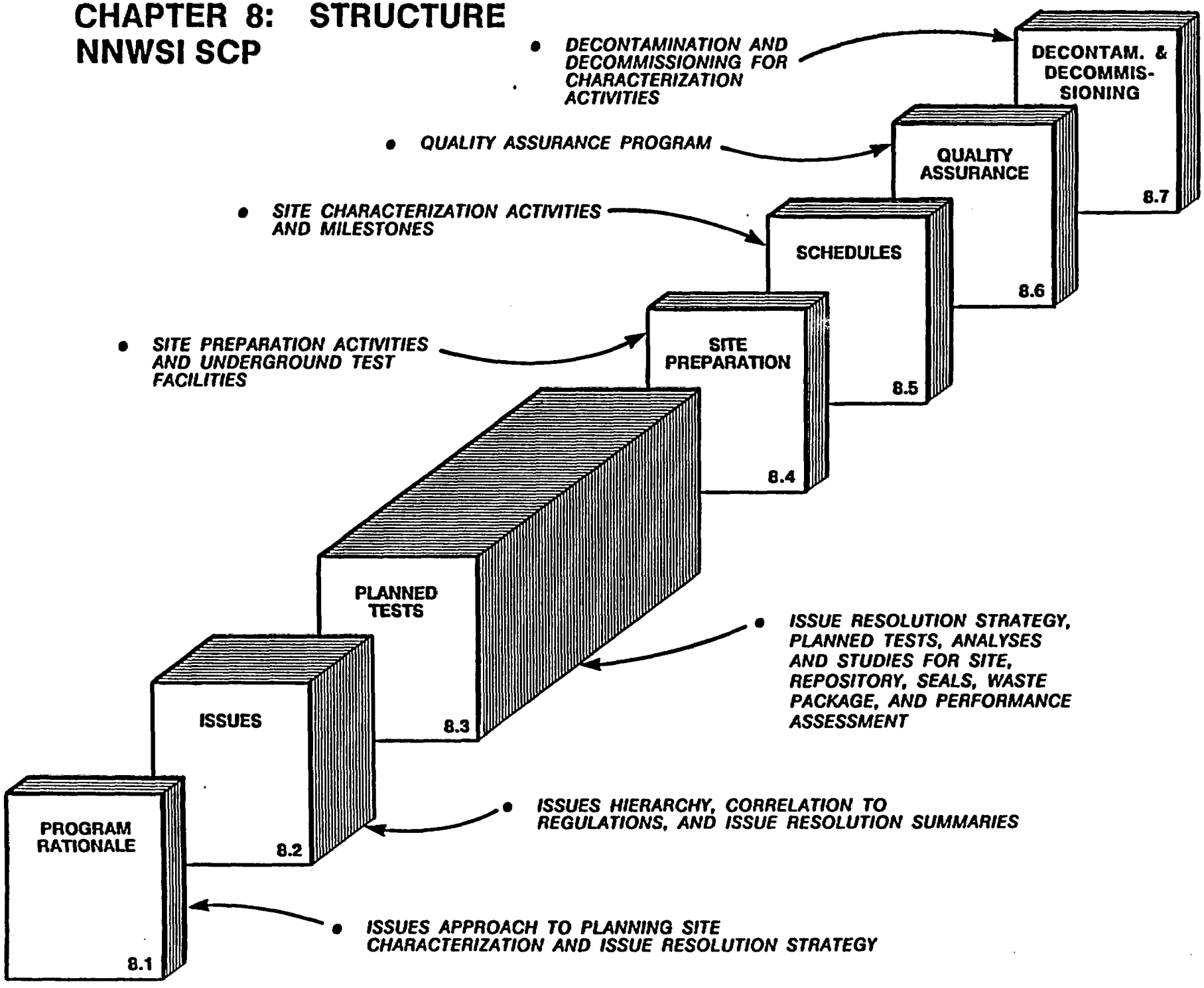
- IDENTIFY CHARACTERIZATION PARAMETERS
- MAKE CURRENT ESTIMATE
- STATE CONFIDENCE IN ESTIMATE
- SET INDICATIONS OF NEEDED CONFIDENCE

EXAMPLE OF TEST BASIS CORRESPONDING TO INFORMATION NEED

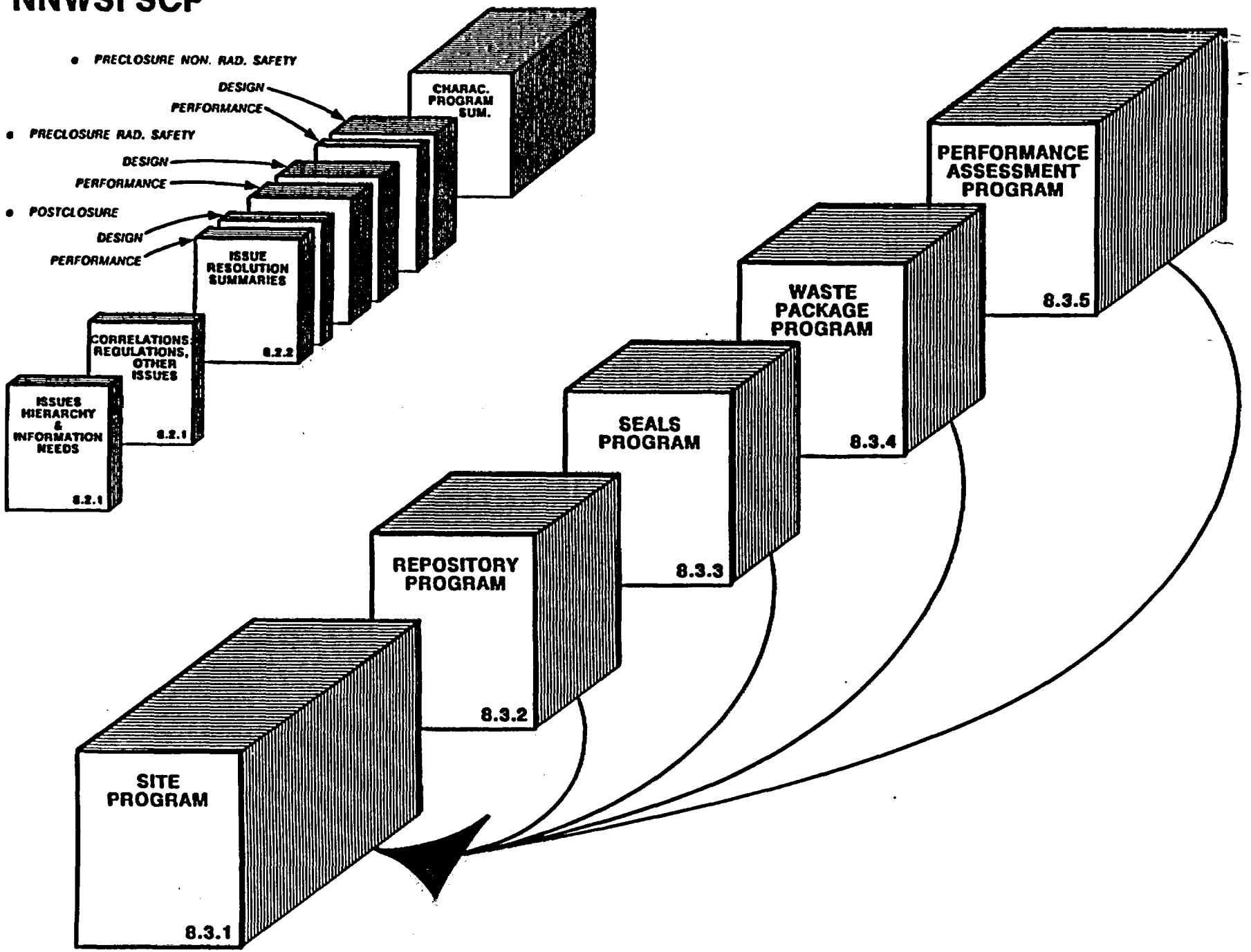
PERFORMANCE/DESIGN PARAMETER: PROBABILITY OF EXCEEDING DESIGN BASIS GROUND MOTION AT FITS

CHARACTERIZATION PARAMETER	CURRENT ESTIMATE	CONFIDENCE IN CURRENT ESTIMATE	NEEDED CONFIDENCE
POTENTIAL SOURCES FOR LOCAL EARTHQUAKES	PAINTBRUSH CANYON BOW RIDGE SOLITARIO CANYON	MEDIUM	MEDIUM TO HIGH
⋮	⋮	⋮	⋮
GROUND MOTION ATTENUATION WITH DISTANCE	PUBLISHED FOR CA. & W.U.S.	LOW TO MEDIUM	MEDIUM TO HIGH
⋮	⋮	⋮	
TIME HISTORIES FOR CONTROLLING EVENT(S)	PGA 0.4 - 0.6G	LOW TO MEDIUM	MEDIUM TO HIGH
MOTION RECURRENCE	0.4G @ 1000+ YEARS	LOW TO MEDIUM	MEDIUM

CHAPTER 8: STRUCTURE
NNWSI SCP



NNWSI SCP


• PRECLOSURE NON. RAD. SAFETY
DESIGN
PERFORMANCE
• PRECLOSURE RAD. SAFETY
DESIGN
PERFORMANCE
• POSTCLOSURE
DESIGN
PERFORMANCE
CHARAC. PROGRAM SUM.
ISSUE RESOLUTION SUMMARIES
8.2.2
CORRELATIONS: REGULATIONS, OTHER ISSUES
8.2.1
ISSUES HIERARCHY & INFORMATION NEEDS
8.2.1
PERFORMANCE ASSESSMENT PROGRAM
8.3.5
WASTE PACKAGE PROGRAM
8.3.4
SEALS PROGRAM
8.3.3
REPOSITORY PROGRAM
8.3.2
SITE PROGRAM
8.3.1

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