

**Section 6.4 Assessment of Compliance:  
Undisturbed Performance**

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<b>Log #</b>	<b>Type of Information Needed</b>
INN 6.4-001	The EPA standard for the Yucca Mountain site.
INN 6.4-002	Documented results of the analyses of individual protection requirements.
INN 6.4-003	Documented results of the analyses of ground-water protection requirements.
INN 6.4-004	Documentation of the verification and validation of codes and models used in the analysis of individual and ground-water protection requirements.

## **6.4 ASSESSMENT OF COMPLIANCE: UNDISTURBED PERFORMANCE**

[The assessment of compliance with individual and ground-water protection requirements assuming undisturbed performance is presented in the following section (TBD-INN 6.4-001).]

### **6.4.1 Individual Protection Requirements**

[The assessment of the compliance of the repository with individual protection requirements considers all potential pathways for release of radionuclides to individuals. An analysis of each of the previously discussed scenarios was conducted for dose to an individual as well as evaluating the individual protection requirements for undisturbed conditions. The analyses include comparison of the calculated dose to individuals with the deterministic EPA Standards (TBD-INN 6.4-001). The results of the analyses are documented in \_\_\_\_\_(TBD-INN 6.4-002)] and the results will be used to complete Table 6.4A and this discussion.]

### **6.4.2 Ground-Water Protection Requirements**

[The assessment of the compliance (TBD-INN 6.4-001) of the repository with ground-water protection requirements was analyzed for each scenario as well as for undisturbed conditions. The results of these analyses are presented in Table 6.4B (TBD-INN 6.4-003). (These analyses will include comparison of the calculated ground-water concentrations of radionuclides with the deterministic EPA standards when these standards are available (40 CFR 141). Currently the analyses are being compared to the ground-water protection requirements of 40 CFR 191.)]

### **6.4.3 Code Verification and Model Validation**

[The codes and models that have been used in the undisturbed performance compliance analyses and those used to evaluate doses to an individual from the scenarios have undergone extensive verification and validation and the results have been discussed in \_\_\_\_\_(TBD-INN 6.4-004). (The

**SKELETON TEXT**

Date: 5/28/93

results of the verification and validation will be used to complete Table 6.4C and INN 6.4-004 will be used to complete this Section. The information in this Section will be cross referenced to Chapter 8 where applicable.}]

**REFERENCES**

Table 6.4A. Potential Pathways for Transport of Radionuclides to Members of the Public and Resulting Doses

<u>Scenario/Pathway</u>	<u>Projected Dose</u>
1. Scenario/Pathway	

Note: This Table will be completed using INN 6.4-002.

Table 6.4B. Concentrations of Radionuclides in Drinking Water and Resulting Doses

<u>Scenario</u>	<u>Concentration</u>	<u>Individual Exposure</u>
1. Scenario		

Note: This Table will be completed using INN 6.4-003.

Table 6.4C. Verification and Validation of Codes and Models Used for Analysis of Individual and Ground-Water Protection Requirements

Model	Analyses	QA Status	Verified	Validated	Source
GENII	Dose to man				PNL
DITTY	""				""

Note: This Table will be completed using INN 6.4-004.

**MGDS Annotated Outline Information Need Form**      Date: 5/28/93  
**Form A: Information Request**

1. Log number:                      **INN 6.4-001**
2. Section no. & title:            **6.4 ASSESSMENT OF COMPLIANCE:  
UNDISTURBED PERFORMANCE**
3. Lead author & phone no:      **Jim Duguid (703) 204-8851**
4. Information request date:      **2/03/93**
5. Work location:                  **Vienna, Virginia**
6. Type of information needed:  
**The EPA standard for the Yucca Mountain site.**
7. What is the information needed for?  
**To provide release/dose requirements for the high-level waste repository at Yucca Mountain. Currently 40 CFR 191 is being used until new standards are available.**
8. What group is the probable information supplier?  
**The Environmental Protection Agency.**
9. When is the information needed?  
**1995**
10. What kind of related information is already available in references, etc.?  
**40 CFR 191**

- 
11. Response by (name):
  12. Response date:
  13. Response:

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 6.4-002**
  2. Section no. & title: **6.4 ASSESSMENT OF COMPLIANCE:  
UNDISTURBED PERFORMANCE**
  3. Lead author & phone no: **Jim Duguid (703) 204-8851**
  4. Information request date: **2/03/93**
  5. Work location: **Vienna, Virginia**
  6. Type of information needed:  
**Documented results of the analyses of individual protection requirements.**
  7. What is the information needed for?  
**To complete Table 6.4A and related text.**
  8. What group is the probable information supplier?  
**Performance Assessment.**
  9. When is the information needed?  
**December 1994**
  10. What kind of related information is already available in references, etc.?  
**Iteration 1 of the Total System Performance Assessment (TSPA) and 40 CFR 191**
- 
11. Response by (name):
  12. Response date:
  13. Response:

**MGDS Annotated Outline Information Need Form**  
**Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 6.4-003**
  2. Section no. & title: **6.4 REASSESSMENT OF COMPLIANCE:  
UNDISTURBED PERFORMANCE**
  3. Lead author & phone no: **Jim Duguid (703) 204-8851**
  4. Information request date: **2/03/93**
  5. Work location: **Vienna, Virginia**
  6. Type of information needed:  
**Documented results of the analyses of ground-water protection requirements.**
  7. What is the information needed for?  
**To complete Table 6.4B and related text.**
  8. What group is the probable information supplier?  
**Performance Assessment.**
  9. When is the information needed?  
**December 1994**
  10. What kind of related information is already available in references, etc.?  
**Iteration 1 of the TSPA and 40 CFR 191**
- 

11. Response by (name):
12. Response date:
13. Response:

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 6.4-004**
2. Section no. & title: **6.4 ASSESSMENT OF COMPLIANCE:  
UNDISTURBED PERFORMANCE**
3. Lead author & phone no: **Jim Duguid (703) 204-8851**
4. Information request date: **2/03/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Documentation of the verification and validation of codes and models used in the analysis of individual and ground-water protection requirements.**
7. What is the information needed for?  
**To complete Table 6.4C and related text.**
8. What group is the probable information supplier?  
**Performance Assessment.**
9. When is the information needed?  
**1999**
10. What kind of related information is already available in references, etc.?  
**Iteration 1 of the TSPA and 40 CFR 191**

- 
11. Response by (name):
  12. Response date:
  13. Response:

# MGDS Annotated Outline

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## Section 6.5 10 CFR Part 60 Criteria

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**LIST OF INFORMATION REQUESTS**

<b>Log #</b>	<b>Type of Information Needed</b>
INN 6.5-001	Documentation of favorable conditions including justification of their presence and analyses of their effects on performance of a repository at Yucca Mountain.
INN 6.5-002	Documentation of potentially adverse conditions including justification of their presence and analyses of their effects on performance of a repository at Yucca Mountain.

## **6.5 10 CFR PART 60 CRITERIA**

[Compliance with the waste isolation performance objectives of 10 CFR 60.112 is discussed in this Section. The discussion includes both the favorable and potentially adverse conditions known to be present at the site or that could be present at the site due to unanticipated processes and events (TBD-INN 6.5-001 and INN 6.5-002).]

### **6.5.1 Favorable Conditions**

[Physical characteristics of the Yucca Mountain repository site provide conditions favorable to isolation of the waste. These characteristics contribute to containment of the waste in a variety of ways including retardation of radionuclides by the mineralized layers along the flow path to the accessible environment and control of radioactive gases by thin nearly saturated zones between the ground surface and the repository. These conditions are described in\_\_\_\_(TBD-INN 6.5-001).]

#### **6.5.1.1 Listing of Favorable Conditions**

[The favorable conditions at Yucca Mountain are summarized in Table 6.5A (TBD-INN 6.5-001). These conditions have been identified during site characterization and their presence has been factored into the performance assessment analyses as required by 10 CFR 60.122(b).]

#### **6.5.1.2 Justification of Presence of Favorable Conditions**

[The favorable conditions at Yucca Mountain which were previously defined are fully described in\_\_\_\_\_, and their presence is fully documented (TBD-INN 6.5-001).]

### **6.5.1.3 Incorporation of Favorable Conditions into Scenarios**

[The favorable conditions are included in the analyses conducted on the site as defined in \_\_\_\_\_(TBD-INN 6.5-001).]

### **6.5.2 Potentially Adverse Conditions**

Potentially adverse conditions at the repository include physical characteristics which contribute to larger quantities or faster release of radionuclides affecting waste isolation within the controlled area. [Definition of these characteristics, along with their analyses, is presented in \_\_\_\_\_, and is summarized in Table 6.5B (TBD-INN 6.5-002).]

#### **6.5.2.1 Listing of Potentially Adverse Conditions**

[The potentially adverse conditions at Yucca Mountain are listed in Table 6.5B (TBD-INN 6.5-002) and a summary discussion of the effects of its presence is also provided.]

#### **6.5.2.2 Incorporation of Potentially Adverse Conditions into Processes and Events**

[The potentially adverse conditions were incorporated into appropriate processes and events\_\_\_\_(TBD-INN 6.5-002) and were modeled individually where possible or were incorporated into scenarios.]

#### **6.5.2.3 Incorporation of Potentially Adverse Conditions into Scenarios**

[The analyses which incorporate the potentially adverse conditions into scenarios are presented in\_\_\_\_(TBD-INN 6.6-002) and the results are presented in summary form in Table 6.5B (TBD-INN 6.5-002).]

**REFERENCES**

Table 6.5A. Summary of Favorable Conditions

Favorable Condition	Discussion--10 CFR 60.112
Low Permeability	
Geochemical Retardation	
Downward Hydraulic Gradient	

Note: This Table will be completed using INN 6.5-001.

Table 6.5B. Summary of Potentially Adverse Conditions

Potentially Adverse Condition	Discussion--10 CFR 60.112
Fracture Flow	
Volcanic Activity	
Tectonic Activity	

Note: This Table will be completed using INN 6.5-002.

**MGDS Annotated Outline Information Need Form**  
**Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 6.5-001**
  2. Section no. & title: **6.5 10 CFR PART 60 CRITERIA**
  3. Lead author & phone no: **Jim Duguid (703) 204-8851**
  4. Information request date: **2/03/93**
  5. Work location: **Vienna, Virginia**
  6. Type of information needed:  
**Documentation of favorable conditions including justification of their presence and analyses of their effects on performance of a repository at Yucca Mountain.**
  7. What is the information needed for?  
**To complete Table 6.5A and related text.**
  8. What group is the probable information supplier?  
**Performance Assessment**
  9. When is the information needed?  
**1995**
  10. What kind of related information is already available in references, etc.?  
**ESSE report**
- 
- 

11. Response by (name):
12. Response date:
13. Response:

**MGDS Annotated Outline Information Need Form**  
**Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 6.5-002**
2. Section no. & title: **6.5 10 CFR PART 60 CRITERIA**
3. Lead author & phone no: **Jim Duguid (703) 204-8851**
4. Information request date: **2/03/93**
5. Work location: **Vienna, Virginia**

6. Type of information needed:

**Documentation of potentially adverse conditions including justification of their presence and analyses of their effects on performance of a repository at Yucca Mountain.**

7. What is the information needed for?

**To complete Table 6.5B and related text.**

8. What group is the probable information supplier?

**Performance Assessment**

9. When is the information needed?

**1995**

10. What kind of related information is already available in references, etc.?

**ESSE report**

- 
11. Response by (name):

12. Response date:

13. Response:

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## Chapter 8.0 Performance Confirmation Program

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<b>Log #</b>	<b>Type of Information Needed</b>
INN 8.0-001	Plan for the Performance Confirmation Program

## 8.0 PERFORMANCE CONFIRMATION PROGRAM

The Performance Confirmation Program is organized as two major phases, the baseline phase and the confirmation phase. The baseline phase consists of information acquired and developed during the site characterization program. The submittal of the License Application marks the division between the phases of the testing; that is, the division between the baseline and confirmation phases of the Performance Confirmation Program (Figure 8.0A). Some testing initiated during site characterization will be ongoing at the time of submission of the License Application; however much of the confirmation phase of the testing will remain to be conducted during construction and operation of the repository. The confirmation phase, which begins with submittal of the License Application and ends with the approval of the license amendment for permanent closure, is divided into three periods: (1) the interim period which ends with issuance of the construction authorization, (2) the construction period which ends with the issuance of the license to accept waste, and (3) the operational period which ends with the license amendment for permanent closure.

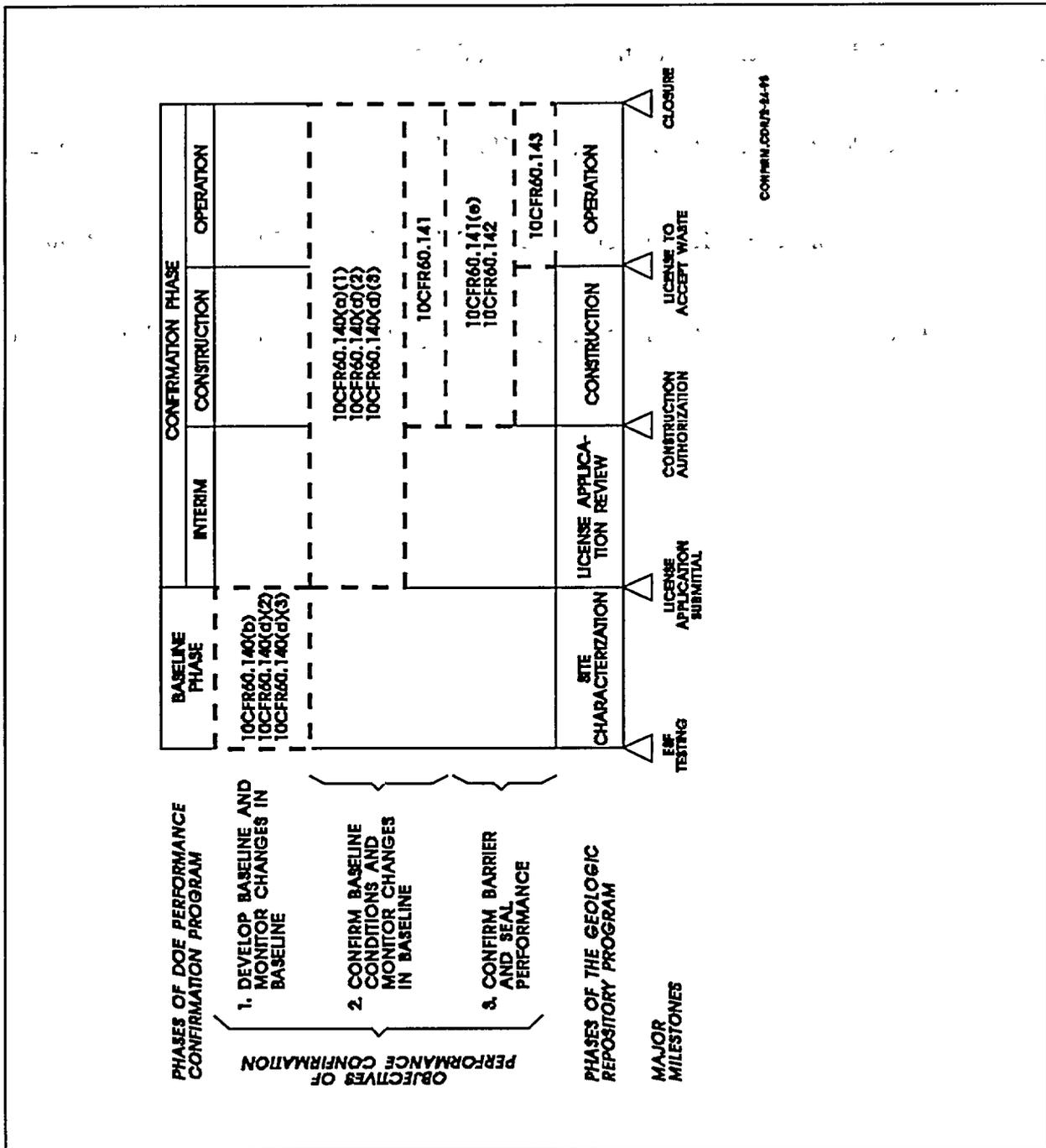
The Performance Confirmation Program is the program of testing, analysis, and monitoring activities required to confirm assumptions regarding the actual subsurface conditions at the site, and the functioning of the engineered and natural systems and components required for repository operation as predicted by the performance assessment calculations presented in the License Application. At the time of License Application submittal for a construction authorization, sufficient information must be provided to allow the Commission to determine, with reasonable assurance, that the types and amounts of radioactive materials described in the license application can be received, possessed, and disposed of in a geologic repository of the design proposed will not pose unreasonable risk to the health and safety of the public. Understanding of the site and engineered barriers will increase as the Performance Confirmation Program progresses. The purpose of the Performance Confirmation Program is to supply added confidence, beyond that supplied in the License Application, that the actual subsurface conditions are within the limits assumed for the geotechnical and design parameters, and that the engineered and natural systems

of the repository are functioning as anticipated to meet the long-term performance objectives for containment and isolation.

The objectives of the Performance Confirmation Program are as follows:

1. **Develop baseline information:** Develop information on subsurface conditions and natural systems important to the performance assessment to be provided in the License Application and those aspects of design integral to the assessment (10 CFR 60.140 (d) (2)); monitor and analyze changes in this baseline information as a result of site characterization, and predict changes resulting from construction and operation (10 CFR 60.140 (d) (3)); begin collection of such information during site characterization (10 CFR 60.140 (b)).
2. **Confirm baseline information:** Confirm, to the extent practicable, that actual subsurface conditions and the changes in those conditions resulting from construction and operation are within the limits assumed in the License Application (10 CFR 60.140 (a) (1) and (d) (3); 10 CFR 60.141).
3. **Confirm barrier and seal performance:** Confirm, to the extent practicable, that natural and engineered systems and components that are designated or assumed to operate as barriers after permanent closure are functioning as intended and anticipated within the limits described in the License Application (10 CFR 60.140 (a) (2); 10 CFR 60.142, 143).

The objectives of the Performance Confirmation Program are shown schematically in Figure 8.0A. Here it should be noted that while site characterization will have been ongoing for a considerable amount of time prior to testing in the ESF, and that the ESF portion of site characterization will become part of the performance confirmation phase of the Performance Confirmation Program (Figure 8.0A). The plans for the confirmation program will mature as site characterization proceeds [TBD-INN 8.0-001].



CONFIRM.CONF-14-14

Figure 8.0A. Correlation Between the Phases and Objectives of the Performance Confirmation Program

**REFERENCES**

1. Title 10, Code of Federal Regulations, Part 60, Subpart F, 60.140 (U.S. Nuclear Regulatory Commission).
2. Title 10, Code of Federal Regulations, Part 60, Subpart F, 60.141 (U.S. Nuclear Regulatory Commission).
3. Title 10, Code of Federal Regulations, Part 60, Subpart F, 60.142 (U.S. Nuclear Regulatory Commission).
4. Title 10, Code of Federal Regulations, Part 60, Subpart F, 60.143 (U.S. Nuclear Regulatory Commission).

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.0-001**
  2. Section no. & title: **8.0 PERFORMANCE CONFIRMATION PROGRAM**
  3. Lead author & phone no: **Jim Duguid 703-204-8851**
  4. Information request date: **2/09/93**
  5. Work location: **Vienna, Virginia**
  6. Type of information needed:  
**Plan for the Performance Confirmation Program.**
  7. What is the information needed for?  
**For completion of Section 8.0 and remaining sections of Chapter 8.**
  8. What group is the probable information supplier?  
**Performance Assessment**
  9. When is the information needed?  
**1997**
  10. What kind of related information is already available in references, etc.?  
**Site Characterization Plan**
- 
- 

11. Response by (name):
12. Response date:
13. Response:

## **MGDS Annotated Outline**

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### **Section 8.1 Performance Confirmation for the Natural Systems of the Geologic Setting**

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**LIST OF INFORMATION REQUESTS**

<b>Log #</b>	<b>Type of Information Needed</b>
INN 8.1-001	Plan for the Performance Confirmation Program. Note that much of the planning for the ESF testing has already been completed in the Site Characterization Plan.
INN 8.1-002	Expected changes in the geologic system based on performance assessment analyses
INN 8.1-003	Results and analyses of the Baseline Phase of confirmation testing for the geologic system
INN 8.1-004	Expected changes in the hydrologic system based on performance assessment analyses
INN 8.1-005	Results and analyses of the Baseline Phase of confirmation testing for the hydrologic system
INN 8.1-006	Expected changes in the geochemical system based on performance assessment analyses
INN 8.1-007	Results and analyses of the Baseline Phase of confirmation testing for the geochemical system
INN 8.1-008	Expected changes in the climatological and meteorological systems based on performance assessment analyses
INN 8.1-009	Results and analyses of the Baseline Phase of confirmation testing for the climatological and meteorological systems

## 8.1 PERFORMANCE CONFIRMATION FOR THE NATURAL SYSTEMS OF THE GEOLOGIC SETTING

The Performance Confirmation Program for the natural systems of the geologic setting is focused on four major topics; the geologic system, the hydrologic system, the geochemical system, and the climatological and meteorological systems. [The interaction or coupling among these systems has been considered including the effects of natural thermal gradients and thermal loading (TBD) where it affects the performance of the repository and/or the design and implementation of the confirmation tests.]

The performance confirmation activities described below are required to confirm the findings discussed in Chapters 3, 5, and 6. [Note: The activities described in this Section will be periodically updated as additional information concerning the natural system is obtained during the characterization of Yucca Mountain.]

[The Performance Confirmation Program for the natural system clearly defines the tests that have been conducted and those that are planned to evaluate and confirm the geologic, hydrologic, geochemical, and climatological and meteorological systems as they respond to the effects of the repository (TBD-INN 8.1-001). These tests are initiated during site characterization and will be continued through construction and operation until permanent closure. The baseline characterization information and its compliance with 10 CFR 60.122 are presented in Chapter 3. The expected response of the natural systems to the repository is discussed in Chapter 6 as it relates to post-closure performance assessment. The expected response of the systems to the repository was defined and the expected levels of parameter changes were developed (TBD-INN 8.1-002). The confirmation tests that are conducted are designed to determine whether changes are within the ranges expected. Where results of testing fall outside the range expected, additional performance assessment evaluations of the total system will be conducted (Section 8.6).]

### 8.1.1 Geologic System

The geologic system confirmation program is intended to demonstrate that waste emplacement has no adverse effects on overall performance, to monitor and analyze changes from baseline conditions, and to confirm that the design assumptions and parameters are correct. [The baseline site characterization results (TBD) are described in Section 3.1.1 and are summarized in this Section. Performance confirmation activities for the geologic system are described in \_\_\_\_\_ (TBD-INN 8.1-001). The expected changes in the geologic system are described in Chapter 6 and are summarized in Table 8.1A (TBD-INN 8.1-002). Also included are the performance confirmation tests that remain to be conducted for confirmation of the behavior of the geologic system. (Note: The remaining text of this Section will be completed using the information needs cited above and INN 8.1-003 which will contain the results of monitoring confirmation activities during the baseline phase of performance confirmation.)]

### 8.1.2 Hydrologic System

An important part of the Performance Confirmation Program is the evaluation of the hydrologic system. [Like the geologic system, the hydrologic system confirmation program demonstrates that there are no adverse effects on overall performance from the waste emplacement, monitors and analyzes changes from baseline conditions, and confirms design assumptions and parameters. The baseline phase results of performance confirmation activities for the hydrologic system are presented in Table 8.1B and are described in this Section (TBD-INN 8.1-004 and INN 8.1-005). (Note: The site characterization information presented in Chapter 3, Chapter 6, INN 8.1-004, and INN 8.1-005 will be used to complete this Section.)]

### 8.1.3 Geochemical System

[The Performance Confirmation Program for the evaluation of the geochemical system is described below and a summary of baseline results and work to be completed is presented in Table 8.1C (TBD-INN 8.1-001, INN 8.1-006, and INN 8.1-007). Like the geologic and

hydrologic systems, the geochemical system performance confirmation program demonstrates that there are no adverse effects on overall performance from the waste emplacement, monitors/analyzes the changes from baseline conditions, and confirms the design assumptions and parameters.

Note: The site characterization information presented in Chapter 3, Chapter 6, INN 8.1-006, and INN 8.1-007 will be used to complete this Section.]

#### **8.1.4 Climatological and Meteorological Systems**

[The Performance Confirmation Program for the evaluation of the climatological and meteorological systems is described below and is summarized in Table 8.1D (TBD-INN 8.1-001, INN 8.1-008, and INN 8.1-009). Like the systems described above, the confirmation program for the climatological and meteorological systems monitors and analyzes changes from the baseline conditions, and confirms assumptions and parameters.

Note: The confirmation of these systems will rely heavily on site characterization data and interpretations, and on the performance assessment results that are described in Chapters 3 and 6.]

**REFERENCES**

Table 8.1A. Performance Confirmation Tests for the Geologic System

Confirmation Test (Location)	Purpose	Summary of Results and Expected Trends (changes)
Seismic network monitoring (Regional)	Regional Monitoring	
Geodetic leveling (Regional)	Regional Monitoring	
Drift stability monitoring (ESF)		
Heated room experiment (ESF)		
In situ testing of seal components (ESF)		

Note: This Table will be completed using INNs 8.1-001, 8.1-002, and 8.1-003, and Chapter 3 and Chapter 6.

Table 8.1B. Performance Confirmation Tests for the Hydrologic System

Confirmation Test (Location)	Purpose	Summary Results and Remaining Work
Surface water runoff monitoring (Site)		
Unsaturated zone monitoring (Site)		
Natural infiltration monitoring (Site)		
Intact fracture test (Laboratory)		
Percolation test (ESF)		
Bulk permeability test (ESF)		
Near-field thermally perturbed hydrologic properties (ESF)		
Site potentiometric level monitoring (Region/Site)		

Note: This Table will be completed using INNs 8.1-001, 8.1-004, and 8.1-005, and Chapter 3 and Chapter 6.

Table 8.1C. Performance Confirmation Tests for the Geochemical System

Confirmation Test (Location)	Purpose	Summary of Results and Remaining Work
Rock/water interaction tests (ESF)	To determine mineralogical changes	

Note: This Table will be completed using INNs 8.1-001, 8.1-006, and 8.1-007, and Chapter 3 and Chapter 6.

**Table 8.1D. Performance Confirmation Tests for the Climatological and Meteorological Systems**

<b>Confirmation Test (Location)</b>	<b>Purpose</b>	<b>Summary of Results and Remaining Work</b>
<b>Meteorological monitoring (Site)</b>		

**Note:** This Table will be completed using INNs 8.1-001, 8.1-008, and 8.1-009, and Chapter 3 and Chapter 6.

**MGDS Annotated Outline-Information Need Form**  
**Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.1-001**
2. Section no. & title: **8.1 PERFORMANCE CONFIRMATION FOR THE NATURAL SYSTEMS OF THE GEOLOGIC SETTING**
3. Lead author & phone no.: **Jim Duguid 703-204-8851**
4. Information request date: **2/08/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:

**Plan for the Performance Confirmation Program. Note that much of the planning for the ESF testing has already been completed in the Site Characterization Plan.**

7. What is the information needed for?

**Completion of Section 8.1 and remaining sections of Chapter 8**

8. What group is the probable information supplier?

**Performance Assessment**

9. When is the information needed?

**1997**

10. What kind of related information is already available in references, etc.?

**Site Characterization Plan**

- 
11. Response by (name):

12. Response date:

13. Response:

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.1-002**
  2. Section no. & title: **8.1 PERFORMANCE CONFIRMATION FOR THE  
NATURAL SYSTEMS OF THE GEOLOGIC  
SETTING**
  3. Lead author & phone no: **Jim Duguid 703-204-8851**
  4. Information request date: **02/08/93**
  5. Work location: **Vienna, Virginia**
  6. Type of information needed:  
**Expected changes in the geologic system based on performance assessment analyses**
  7. What is the information needed for?  
**For completion of Section 8.1.1 and Table 8.1A**
  8. What group is the probable information supplier?  
**Performance Assessment**
  9. When is the information needed?  
**1997**
  10. What kind of related information is already available in references, etc.?  
**First iteration of Total System Performance Assessment (TSPA)**
- 
- 

11. Response by (name):
12. Response date:
13. Response:

**MGDS Annotated Outline Information Need Form**

**Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.1-003**
2. Section no. & title: **8.1 PERFORMANCE CONFIRMATION FOR THE NATURAL SYSTEMS OF THE GEOLOGIC SETTING**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **02/08/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Results and analyses of the Baseline Phase of confirmation testing for the geologic system**
7. What is the information needed for?  
**For completion of Section 8.1.1 and Table 8.1A**
8. What group is the probable information supplier?  
**TBD**
9. When is the information needed?  
**TBD**
10. What kind of related information is already available in references, etc.?

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11. Response by (name):

12. Response date:

13. Response:

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.1-004**
  2. Section no. & title: **8.1 PERFORMANCE CONFIRMATION FOR THE  
NATURAL SYSTEMS OF THE GEOLOGIC  
SETTING**
  3. Lead author & phone no: **Jim Duguid 703-204-8851**
  4. Information request date: **02/08/93**
  5. Work location: **Vienna, Virginia**
  6. Type of information needed:  
**Expected changes in the hydrologic system based on performance assessment analyses**
  7. What is the information needed for?  
**For completion of Section 8.1.2 and Table 8.1B**
  8. What group is the probable information supplier?  
**Performance Assessment**
  9. When is the information needed?  
**1997**
  10. What kind of related information is already available in references, etc.?  
**First iteration of TSPA**
- 
- 

11. Response by (name):
12. Response date:
13. Response:

**MGDS Annotated Outline Information Need Form**  
**Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.1-005**
2. Section no. & title: **8.1 PERFORMANCE CONFIRMATION FOR THE NATURAL SYSTEMS OF THE GEOLOGIC SETTING**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **02/08/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Results and analyses of the Baseline Phase of confirmation testing for the hydrologic system**
7. What is the information needed for?  
**For completion of Section 8.1.2 and Table 8.1B**
8. What group is the probable information supplier?  
**Performance Assessment**
9. When is the information needed?  
**TBD**
10. What kind of related information is already available in references, etc.?

- 
11. Response by (name):
  12. Response date:
  13. Response:

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.1-006**
2. Section no. & title: **8.1 PERFORMANCE CONFIRMATION FOR THE  
NATURAL SYSTEMS OF THE GEOLOGIC  
SETTING**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **02/08/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Expected changes in the geochemical system based on performance assessment  
analyses**
7. What is the information needed for?  
**For completion of Section 8.1.3 and Table 8.1C**
8. What group is the probable information supplier?  
**Performance Assessment**
9. When is the information needed?  
**1997**
10. What kind of related information is already available in references, etc.?  
**First iteration of TSPA**

- 
11. Response by (name):
  12. Response date:
  13. Response:

**MGDS Annotated Outline Information Need Form**  
**Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.1-007**
2. Section no. & title: **8.1 PERFORMANCE CONFIRMATION FOR THE NATURAL SYSTEMS OF THE GEOLOGIC SETTING**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **02/08/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Results and analyses of the Baseline Phase of confirmation testing for the geochemical system**
7. What is the information needed for?  
**For completion of Section 8.1.3 and Table 8.1C**
8. What group is the probable information supplier?  
**Performance Assessment**
9. When is the information needed?  
**TBD**
10. What kind of related information is already available in references, etc.?

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11. Response by (name):

12. Response date:

13. Response:

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.1-008**
2. Section no. & title: **8.1 PERFORMANCE CONFIRMATION FOR THE  
NATURAL SYSTEMS OF THE GEOLOGIC  
SETTING**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **02/08/93**
5. Work location: **Vienna, Virginia**

6. Type of information needed:

**Expected changes in the climatological and meteorological systems based on  
performance assessment analyses**

7. What is the information needed for?

**For completion of Section 8.1.4 and Table 8.1D**

8. What group is the probable information supplier?

**Performance Assessment**

9. When is the information needed?

**1997**

10. What kind of related information is already available in references, etc.?

**First iteration of TSPA**

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11. Response by (name):

12. Response date:

13. Response:

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.1-009**
2. Section no. & title: **8.1 PERFORMANCE CONFIRMATION FOR THE  
NATURAL SYSTEMS OF THE GEOLOGIC  
SETTING**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **02/08/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Results and analyses of the Baseline Phase of confirmation testing for the  
climatological and meteorological systems**
7. What is the information needed for?  
**For completion of Section 8.1.4 and Table 8.1D**
8. What group is the probable information supplier?  
**Performance Assessment**
9. When is the information needed?  
**TBD**
10. What kind of related information is already available in references, etc.?

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11. Response by (name):
  12. Response date:
  13. Response:

## MGDS Annotated Outline

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Section 8.2 Performance Confirmation for the Structures,  
Systems, and Components of the Geologic  
Repository Operations Area

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**LIST OF INFORMATION REQUESTS**

<b>Log #</b>	<b>Type of Information Needed</b>
INN 8.2-001	Plan for the Performance Confirmation Program including shafts, ramps, and the underground facilities.
INN 8.2-002	Results of testing during the baseline phase of performance confirmation for shafts, ramps, and the underground facilities.
INN 8.2-003	Anticipated results of testing during performance confirmation for shafts, ramps, and the underground facilities (performance assessment analyses).

## 8.2 PERFORMANCE CONFIRMATION FOR THE STRUCTURES, SYSTEMS, AND COMPONENTS OF THE GEOLOGIC REPOSITORY OPERATIONS AREA

Performance confirmation tests to evaluate the structures, systems, and components of the geologic repository operations area (GROA) are required to confirm the findings presented in Chapter 6 of this License Application. These performance confirmation activities are designed to yield the data and information necessary to satisfy 10 CFR 60.140, 141, and 142 for structures, systems and components that have been classified as important to waste isolation. The structures include shafts and ramps, the systems include the underground facility, and the components include drains and seals. Surface facilities are included where confirmation activities affect their design or operation.

### 8.2.1 Surface Facilities

There are no specific requirements for performance confirmation of the surface facilities. [Note: A description of how performance confirmation testing for the repository affects the design or operation of the surface facilities will be included here if any effects are found to be present.]

### 8.2.2 Shafts and Ramps

Performance confirmation testing for shafts and ramps consists of an iterative process of planning and implementation. Planning [is documented in \_\_\_\_\_ (TBD-INN 8.2-001).] The results of implementation of the baseline phase of performance confirmation [is reported in \_\_\_\_\_ (TBD-INN 8.2-002), and the results anticipated for the confirmation testing of shafts and ramps during the performance confirmation phase are presented in \_\_\_\_\_ (TBD-INN 8.2-003).]

Planning and implementation of performance confirmation for shafts and ramps consist of the following activities: (1) collection of baseline data for the penetrated strata and the shaft and ramp engineered components, (2) initial performance assessments for the shaft or ramp,

(3) revising performance confirmation plans based on data collected during construction, (4) revising performance confirmation plans based on data collected during operation, (5) full-scale testing to evaluate the effectiveness of seals, grouts, plugs and backfill and to evaluate the effectiveness of drainage, and (6) performance assessments supporting permanent closure.

The computer codes used for determination of expected results from testing of components of shafts and ramps [are discussed in \_\_\_\_\_ (TBD-INN 8.2-003) and Chapters 4 and 6.] The geologic repository operations area is described in Chapter 4, and the structures, systems, and components important to safety and waste isolation are also included in that discussion. [The Performance Confirmation Plan (TBD-INN 8.2-002) includes] a discussion of each test that will be conducted (location, monitoring, if radioactive materials will be involved, and parameters to be measured), the duration of the test, and a summary of the expected results. [The expected results are described in detail in \_\_\_\_\_ (TBD-INN 8.2-003)] along with a discussion of the models used in the analysis. [It is expected that these codes and models will be the same as those discussed in Chapter 6.] The results of confirmation testing that has been completed, along with a comparison of actual and expected results [are presented in \_\_\_\_\_ (TBD-INN 8.2-002).]

### 8.2.3 Underground Facility

The performance confirmation testing for the underground facility consists of an iterative process of planning and implementation. Planning [is documented in \_\_\_\_\_ (TBD-INN 8.2-001).] The results of implementation of the baseline phase of performance confirmation [is reported in \_\_\_\_\_ (TBD-INN 8.2-002)], and the results anticipated for the confirmation phase of performance confirmation for the underground facility [are presented in \_\_\_\_\_ (TBD-INN 8.2-003).]

Planning and implementation of performance confirmation for the underground facility consist of the following activities: (1) collection of baseline data for the host rock and the engineered components, (2) initial performance assessments for the underground facility, (3) revising

performance confirmation plans based on data collected during construction, (4) revising performance confirmation plans based on data collected during operation, (5) continued performance confirmation to assess thermal and thermomechanical response of the natural and engineered components to construction and emplacement of waste, (6) full-scale testing to evaluate the effectiveness of seals, grouts, plugs and backfill and to evaluate the effectiveness of drainage, and (7) performance assessments supporting permanent closure.

The computer codes used for determination of expected results from testing of components of the underground facility [are discussed in \_\_\_\_\_ (TBD-INN 8.2-003)] and Chapters 4 and 6. The geologic repository operations area is described in Chapter 4; the discussion includes the structures, systems, and components important to safety and waste isolation. [The Performance Confirmation Plan (TBD-INN 8.2-002) includes] a discussion of each test that will be conducted (location, monitoring, if radioactive materials will be involved, and parameters to be measured), the duration of the test, and a summary of the expected results. The expected results are described in detail in \_\_\_\_\_ (TBD-INN 8.2-003)] along with a discussion of the models used in the analysis. [It is expected that these codes and models will be the same as those discussed in Chapter 6.] The results of confirmation testing that has been completed, along with a comparison of actual and expected results [are presented in \_\_\_\_\_ (TBD-INN 8.2-002).]

**REFERENCES**

1. Title 10, Code of Federal Regulations, Part 60, Subpart F, 60.140 (U.S. Nuclear Regulatory Commission).
2. Title 10, Code of Federal Regulations, Part 60, Subpart F, 60.141 (U.S. Nuclear Regulatory Commission).
3. Title 10, Code of Federal Regulations, Part 60, Subpart F, 60.142 (U.S. Nuclear Regulatory Commission).

Table 8.2A. Performance Confirmation Tests for Shafts and Ramps

Test Title and Description	Results (actual or anticipated) and Duration

Note: This Table will be completed using INNs 8.2-001, 8.2-002, and 8.2-003, and Chapter 4

Table 8.2B. Performance Confirmation Tests for the Underground Facility

Test Title and Description	Results (actual or anticipated) and Duration

Note: This Table will be completed using INNs 8.2-001, 8.2-002, and 8.2-003, and Chapter 4

**MGDS Annotated Outline Information Need Form**  
**Form A: Information Request** Date: 5/28/93

- 1. Log number: **INN 8.2-001**
- 2. Section no. & title: **8.2 PERFORMANCE CONFIRMATION FOR THE STRUCTURES, SYSTEMS, AND COMPONENTS OF THE GEOLOGIC REPOSITORY OPERATIONS AREA**
- 3. Lead author & phone no: **Jim Duguid 703-204-8851**
- 4. Information request date: **2/08/93**
- 5. Work location: **Vienna, Virginia**
- 6. Type of information needed:  
**Plan for the Performance Confirmation Program including shafts, ramps, and the underground facilities**
- 7. What is the information needed for?  
**Completion of Sections 8.2, 8.2.2, and 8.2.3**
- 8. What group is the probable information supplier?  
**Performance Assessment**
- 9. When is the information needed?  
**1997**
- 10. What kind of related information is already available in references, etc.?

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- 11. Response by (name):
  - 12. Response date:
  - 13. Response:

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.2-002**
2. Section no. & title: **8.2 PERFORMANCE CONFIRMATION FOR THE STRUCTURES, SYSTEMS, AND COMPONENTS OF THE GEOLOGIC REPOSITORY OPERATIONS AREA**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **2/08/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Results of testing during the baseline phase of performance confirmation for shafts, ramps, and the underground facilities.**
7. What is the information needed for?  
**Completion of Sections 8.2, 8.2.2, and 8.2.3**
8. What group is the probable information supplier?  
**Performance Assessment**
9. When is the information needed?  
**2000**
10. What kind of related information is already available in references, etc.?

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11. Response by (name):
  12. Response date:
  13. Response:

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.2-003**
2. Section no. & title: **8.2 PERFORMANCE CONFIRMATION FOR THE STRUCTURES, SYSTEMS, AND COMPONENTS OF THE GEOLOGIC REPOSITORY OPERATIONS AREA**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **2/08/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:

**Anticipated results of testing during performance confirmation for shafts, ramps, and the underground facilities (performance assessment analyses).**

7. What is the information needed for?  
**Completion of Sections 8.2, 8.2.2, and 8.2.3**
8. What group is the probable information supplier?  
**Performance Assessment**
9. When is the information needed?  
**1997**
10. What kind of related information is already available in references, etc.?

- 
11. Response by (name):
  12. Response date:
  13. Response:

## **MGDS Annotated Outline**

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### **Section 8.3 Performance Confirmation for the Engineered Barrier System**

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## **LIST OF INFORMATION REQUESTS**

<b>Log #</b>	<b>Type of Information Needed</b>
INN 8.3-001	Performance Confirmation Plan for the Engineered Barrier System (EBS)
INN 8.3-002	Analyses of expected results from EBS confirmation tests
INN 8.3-003	Analyses of expected results from EBS baseline confirmation tests compared with expected results
INN 8.3-004	Report on monitoring the components of the waste package during confirmation testing.
INN 8.3-005	Report on selection of representative waste packages for monitoring during confirmation testing.
INN 8.3-006	Report on results of degradation of waste packages during confirmation testing (includes a comparison of expected and actual results).
INN 8.3-007	Report on monitoring outside of the waste packages (in the near field) during confirmation testing.
INN 8.3-008	Plan for laboratory testing during the performance confirmation period. This Plan should include testing in hot cells both above ground and in the repository.
INN 8.3-009	Plan for compliance with the performance confirmation requirements of 10 CFR 60.
INN 8.3-010	Analyses of the effects of waste package failure modes and scenarios of failure modes on radionuclide release from the repository and to the accessible environment.
INN 8.3-011	Report on performance allocation to component of the EBS and justification of these allocations through supporting analyses.
INN 8.3-012	Drawing or schematic of the components of the EBS.
INN 8.3-013	Drawing or schematic of the components of the waste package.

### 8.3 PERFORMANCE CONFIRMATION FOR THE ENGINEERED BARRIER SYSTEM

The Engineered Barrier System (EBS) is described in Chapter 5. Performance confirmation activities for the EBS are required to confirm the expected behavior of the EBS thereby increasing confidence in the EBS design that is presented in Chapter 5. The components of the EBS [are shown in Figure 8.3A (TBD-INN 8.3-012)] and the components of the waste package [are shown in Figure 8.3B (TBD-INN 8.3-013).] This expected behavior serves as input to the total system analyses that are discussed in Chapter 6; thus performance confirmation testing of the EBS is required to confirm those analyses. The performance confirmation activities that are required for the EBS [are described in the Performance Confirmation Plan for the EBS (TBD-INN 8.3-001) and are summarized in Table 8.3A.] [The Performance Confirmation Plan for the EBS (TBD-INN 8.3-001) contains] a discussion of the laboratory and in situ confirmation tests that are required prior to closure of the repository.

[The Performance Confirmation Plan (TBD-INN 8.3-001) includes] those tests that will be conducted in both phases of confirmation: the baseline phase which ends with submission of this [potential] License Application and the confirmation phase consisting of an interim period which ends with the granting of the construction authorization, a construction period which ends with granting of the license to accept waste, and an operational period which ends with the amendment to the license for permanent closure. [The Plan (TBD-INN 8.3-001) includes] tests under expected repository conditions as well as those for anticipated (expected) processes and events, and identifies unanticipated processes and events that could lead to EBS failure. The effects of unanticipated processes are analyzed primarily through performance assessments which have been discussed in Chapter 5 (Engineered Barrier Systems) and Chapter 6 (Overall System Performance Assessment). Where tests can be devised to aid in these analyses they will be discussed in the Performance Confirmation Plan. The analyses to determine the expected results of each of the confirmation tests [are presented in \_\_\_\_\_ (TBD-INN 8.3-002) and are summarized in the Performance Confirmation Plan (TBD-INN 8.3-001).] The complete analyses of expected test

results [contained in \_\_\_\_\_(TBD-INN 8.3-002) include] the total system performance assessments necessary to demonstrate the effects under anticipated and unanticipated processes and events.

[The results of confirmation testing that has been completed prior to submission of the License Application are presented in \_\_\_\_\_ (TBD-INN 8.3-003). This document contains the results of confirmation testing and a comparison of the actual with the expected results (TBD-INN 8.3-003). These comparisons (TBD-INN 8.3-003) are made for both laboratory and in situ tests.]

### **8.3.1 Waste Package Monitoring**

The approach to monitoring conditions in the vicinity of the waste packages [is defined in \_\_\_\_\_, and a schematic of this approach is presented in Figure 8.3C (TBD-INN 8.3-004).] A discussion of waste package components is contained in Section 5.1. The discussion of the approach to monitoring the waste packages and associated engineered barrier components [provided in \_\_\_\_\_ (TBD-INN 8.3-004) includes:] the description of monitoring devices; their accuracy, calibration; and reliability; and their placement within the EBS. [This document (TBD-INN 8.3-004) also contains] a discussion of the environment that these devices will be subjected to, their expected life in that environment, and means of replacement during the specific tests.

#### **8.3.1.1 Waste Form**

[The performance confirmation of other EBS components that could effect the waste form will be discussed. However, no effects on the waste form are currently expected.]

#### **8.3.1.2 In Situ Waste Package Monitoring**

[The monitoring of waste packages (during repository operation) within each expected environment within the repository will be discussed.] The layout of these in situ tests within

representative panels of the repository [is presented in \_\_\_\_\_ (TBD-INN 8.3-005) and is presented schematically in Figure 8.3D.] The placement of individual monitoring devices [is shown in Figure 8.3C (TBD-INN 8.3-004).] These devices will monitor the intensity of gamma radiation, temperature, pressure, ion-specific geochemistry, moisture conditions, and gaseous and liquid effluents. [The results of monitoring are compared to predicted temperatures and fluid flow rates. The effects of the radiation and the geochemical environment on EBS components is determined by periodic retrieval and laboratory analysis of EBS components. This retrieval aids in confirmation of the waste retrieval option, allows for inspection of the wall rock in the vicinity of the package, provides access for sampling of the geochemical environment near the removed waste package, and provide package components for degradation testing. The results of the testing of package components are compared with expected results (TBD-INN 8.3-006).]

The validation of the methods of extrapolation proposed to evaluate post closure performance [is presented in \_\_\_\_\_ (TBD-INN 8.3-006) and the verification of computer codes and validation of models which were used in this evaluation are described in Chapters 5 and 6.]

### **8.3.1.3 External Waste Package Monitoring Environment**

The description of methods for monitoring the external environment of the waste packages (the rock in the vicinity of the repository, the rock in the vicinity of the waste packages, and the backfill) [is presented in \_\_\_\_\_ (TBD-INN 8.3-007), and a schematic of the monitoring approach is presented in Figure 8.3E.] This monitoring (which will be done during repository operation) will include the flow of gas and moisture, specific ions, temperature, rock stress and strain, and radiation. [The results are compared with the expected near field behavior which is presented in \_\_\_\_\_ (TBD-INN 8.3-002).]

### **8.3.1.4 Laboratory Waste Package Monitoring**

The description of the waste package laboratory testing program for demonstration of compliance with 10 CFR 60.143(c) [is presented in the laboratory testing plan \_\_\_\_\_ (TBD-INN 8.3-

008) and is summarized in Table 8.3B.] The laboratory experiments (some of which will be completed at the time of submission of the License Application) will duplicate the underground environment at Yucca Mountain as closely as possible. However, they will be conducted over a range of temperatures that are higher than expected in the repository in order to accelerate degradation of package components. The tests will largely be conducted in hot cells some of which are located within the underground facility, in order to more closely simulate the repository environment. During the tests the environmental conditions of pressure, temperature, specific ions in fluids, and gas generation will be monitored. Monitoring will be conducted both inside and outside the waste package (in the rock and the backfill).

#### **8.3.1.5 Duration of Post-Emplacement Waste Package Monitoring**

Monitoring of the waste packages will begin immediately after emplacement and will continue until the end of the retrieval period in accordance with 10 CFR 60.143(d). During this time some experiments will be completed, new tests will be initiated, and some tests initiated prior to emplacement will be continued. The last data from the testing will be collected and analyzed prior to permanent closure. These analyses, along with prior results, will be presented to the NRC to obtain the license amendment for permanent closure.

#### **8.3.1.6 Demonstration of Compliance**

The Performance Confirmation Program for the EBS has the following objectives in order to demonstrate compliance with 10 CFR 60.143:

- To demonstrate that the pre-emplacement waste package environment was accurately characterized (during site characterization and the baseline phase of performance confirmation)
- To evaluate the waste package components in a repository environment, both in the laboratory and in situ

- To evaluate environmental conditions near and around waste packages under repository conditions
- To confirm repository and EBS design parameters
- To develop a data set that can be used to bound the degradation of the waste packages and to predict their failure (TBD-INN 8.3-001).

[The Performance Confirmation Plan (TBD-INN 8.3-001) includes] a brief discussion of parameters to be monitored, location of monitoring devices, measurement sampling frequency, accuracy of measurements, quality control instrument calibration, and reliability and maintenance of the monitoring systems. More detailed discussions of these subjects [can be found in \_\_\_\_\_ (TBD-INN 8.3-004 and in \_\_\_\_\_ (TBD-INN 8.3-007). The discussions in INN 8.3-004 and INN 8.3-007 will be used to complete this section. A Waste Package Compliance Plan (TBD-INN 8.3-009) will also be developed to guide the activities and provide the approach to waste package compliance.]

### **8.3.2 Engineered Barrier and Waste Package Performance Objectives**

[The EBS and Waste Package performance objectives have been presented in detail in previous sections of this License Application ( TBD-INN 8.3-001, TBD-INN 8.3-004, and TBD-INN 8.3-007).] This section presents a detailed discussion of analyses to determine; the effects of waste package failure (TBD-INN 8.3-010), the expected environment for confirmation testing (TBD-INN 8.3-002), confirmatory test results (TBD-INN 8.3-002), and performance allocation to the EBS (TBD-INN 8.3-011).

#### **8.3.2.1 Failure Mode and Effects Analysis**

[A discussion of repository scenario screening for anticipated and unanticipated processes and events that could lead to EBS component failures is presented in Chapter 6 along with analyses

of the effects of these scenarios on the overall system performance. Analyses of the performance of the EBS is presented in Section 5.2.] This discussion serves as a basis for analysis of the effects of waste package failure [contained in \_\_\_\_\_ (TBD-INN 8.3-010) which are summarized in Table 8.3C. The discussion contained in (TBD-INN 8.3-010) will be used to complete this Section.]

#### **8.3.2.2 Environmental Conditions for Confirmatory Tests and Analyses**

The analysis of expected test results and near field waste package and repository environmental conditions [is presented in \_\_\_\_\_ (TBD-INN 8.3-002). These expected conditions were used to develop the expected confirmation test results that are also presented in \_\_\_\_\_ (TBD-INN 8.3-002).]

#### **8.3.2.3 Confirmatory Tests and Analysis**

The analyses of expected confirmation test results for the waste package along with the criteria for determining whether confirmation has been achieved [are presented in \_\_\_\_\_ (TBD-INN 8.3-002).]

#### **8.3.2.4 EBS Performance Allocation**

The design performance allocated to different parts of the EBS [ is described in Section 5.2.2 and is summarized here in Table 8.3D (TBD-INN 8.3-011). The results presented in (TBD-INN 8.3-011) will be used to complete this Section. ]

#### **8.3.2.5 Results of EBS Performance Confirmation**

The results of the baseline confirmation testing [have been compared to the analyses of expected results in \_\_\_\_\_ (TBD-INN 8.3-003).]

**REFERENCES**

1. Waste Acceptance Specifications
2. 10 CFR 60
3. EPA Regulations
4. Waste Form Compliance Plans
5. Waste Qualification Tests
6. Waste Package Test Reports
7. Site Characterization
8. Waste Form Test Reports
9. Performance Acceptance

Table 8.3A. Performance Confirmation Tests for the Engineered Barrier System

Confirmation Test (Location)	Purpose and Description	Summary of Results Obtained or Expected

Note: This Table will be completed using INNs 8.3-001, 8.3-002, and 8.3-003.

Table 8.3B. Summary of the Laboratory Confirmation Tests for the Waste Package

Confirmation Test (Location)	Purpose and Description	Summary of Results Obtained or Expected

Note: This Table will be completed using INN 8.3-008.

Table 8.3C. - Summary of Analyses of the Effects of Waste Package Failure

Failure Mode or Scenario of Failure Modes	Failure Rate	Summary of Effects Anticipated at Repository Boundary and Accessible Environment

Note: This Table will be completed using INN 8.3-010.

Table 8.3D. Summary of Performance Allocated to Components of the EBS

EBS Component	Performance Allocation	Justification
Seals		

Note: This Table will be completed using INN 8.3-011.

Figure 8.3A. Components of the Engineered Barrier System (TBD-INN 8.3-012)

**Figure 8.3B. Components of the Waste Package (TBD-INN 8.3-013)**

Figure 8.3C. Waste Package Monitoring Locations (TBD-INN 8.3-004)

**Figure 8.3D. Layout of Representative Waste Packages to be Monitored**  
(TBD-INN 8.3-005)

Figure 8.3E. Monitoring of Locations Outside the Waste Package (TBD-INN 8.3-007)

**MGDS Annotated Outline Information Need Form**  
**Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.3-001**
  2. Section no. & title: **8.3 : PERFORMANCE CONFIRMATION FOR  
THE ENGINEERED BARRIER SYSTEM**
  3. Lead author & phone no: **Jim Duguid 703-204-8851**
  4. Information request date: **2/09/93**
  5. Work location: **Vienna, Virginia**
  6. Type of information needed:  
**Performance Confirmation Plan for the Engineered Barrier System (EBS)**
  7. What is the information needed for?  
**For completion of Section 8.3 and Table 8.3A.**
  8. What group is the probable information supplier?  
**Performance Assessment**
  9. When is the information needed?  
**1997**
  10. What kind of related information is already available in references, etc.?  
**SCP**
- 
- 

11. Response by (name):
12. Response date:
13. Response:

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.3-002**
2. Section no. & title: **8.3 PERFORMANCE CONFIRMATION FOR  
THE ENGINEERED BARRIER SYSTEM**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **2/09/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Analyses of expected results from EBS confirmation tests.**
7. What is the information needed for?  
**For completion of Section 8.3 and Table 8.3A.**
8. What group is the probable information supplier?  
**Performance Assessment**
9. When is the information needed?  
**1997**
10. What kind of related information is already available in references, etc.?

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11. Response by (name):

12. Response date:

13. Response:

**MGDS Annotated Outline Information Need Form**  
**Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.3-003**
2. Section no. & title: **8.3 PERFORMANCE CONFIRMATION FOR THE ENGINEERED BARRIER SYSTEM**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **2/09/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Analyses of expected results from EBS baseline confirmation tests compared with expected results.**
7. What is the information needed for?  
**For completion of Section 8.3 and Table 8.3A.**
8. What group is the probable information supplier?  
**Performance Assessment**
9. When is the information needed?  
**1997**
10. What kind of related information is already available in references, etc.?

---

11. Response by (name):

12. Response date:

13. Response:

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.3-004**
2. Section no. & title: **8.3 PERFORMANCE CONFIRMATION FOR  
THE ENGINEERED BARRIER SYSTEM**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **2/09/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Report on monitoring the components of the waste package during confirmation testing.**
7. What is the information needed for?  
**For completion of Section 8.3.1, Section 8.3.1.2, and Figure 8.3D.**
8. What group is the probable information supplier?  
**Waste package testing group at LLNL.**
9. When is the information needed?  
**1997**
10. What kind of related information is already available in references, etc.?

- 
11. Response by (name):
  12. Response date:
  13. Response:

**MGDS Annotated Outline Information Need Form**

**Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.3-005**
2. Section no. & title: **8.3 PERFORMANCE CONFIRMATION FOR THE ENGINEERED BARRIER SYSTEM**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **2/09/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Report on selection of representative waste packages for monitoring during confirmation testing.**
7. What is the information needed for?  
**For completion of Section 8.3.1.2 and Figure 8.3C.**
8. What group is the probable information supplier?  
**Waste package testing at LLNL, M&O Waste Package Design Group, and Performance Assessment.**
9. When is the information needed?  
**1997**
10. What kind of related information is already available in references, etc.?

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11. Response by (name):

12. Response date:

13. Response:

**MGDS Annotated Outline Information Need Form**  
**Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.3-006**
  2. Section no. & title: **8.3 PERFORMANCE CONFIRMATION FOR THE ENGINEERED BARRIER SYSTEM**
  3. Lead author & phone no: **Jim Duguid 703-204-8851**
  4. Information request date: **2/09/93**
  5. Work location: **Vienna, Virginia**
  6. Type of information needed:  
**Report on results of degradation of waste packages during confirmation testing (includes a comparison of expected and actual results).**
  7. What is the information needed for?  
**For completion of Section 8.3.1.2.**
  8. What group is the probable information supplier?  
**Waste package testing at LLNL, M&O Waste Package Design Group, and Performance Assessment.**
  9. When is the information needed?  
**TBD**
  10. What kind of related information is already available in references, etc.?
- 
- 

11. Response by (name):
12. Response date:
13. Response:

**MGDS Annotated Outline Information Need Form**

**Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.3-007**
2. Section no. & title: **8.3 PERFORMANCE CONFIRMATION FOR THE ENGINEERED BARRIER SYSTEM**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **2/09/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Report on monitoring outside of the waste packages (in the near field) during confirmation testing.**
7. What is the information needed for?  
**For completion of Section 8.3.1.3 and Figure 8.3E.**
8. What group is the probable information supplier?  
**Waste package testing at LLNL and M&O Waste Package Design Group.**
9. When is the information needed?  
**1997**
10. What kind of related information is already available in references, etc.?

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11. Response by (name):

12. Response date:

13. Response:

**MGDS Annotated Outline Information Need Form**  
**Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.3-008**
2. Section no. & title: **8.3 PERFORMANCE CONFIRMATION FOR THE ENGINEERED BARRIER SYSTEM**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **2/09/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Plan for laboratory testing during the performance confirmation period. This Plan should include testing in hot cells both above ground and in the repository.**
7. What is the information needed for?  
**For completion of Section 8.3.1.4 and Table 8.3B.**
8. What group is the probable information supplier?  
**Waste package testing at LLNL and M&O Waste Package Design Group.**
9. When is the information needed?  
**1997**
10. What kind of related information is already available in references, etc.?

- 
11. Response by (name):
  12. Response date:
  13. Response:

**MGDS Annotated Outline Information Need Form**  
**Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.3-009**
2. Section no. & title: **8.3 PERFORMANCE CONFIRMATION FOR THE ENGINEERED BARRIER SYSTEM**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **2/09/93**
5. Work location: **Vienna, Virginia**

6. Type of information needed:  
**Plan for compliance with the performance confirmation requirements of 10 CFR 60.**

7. What is the information needed for?

**For completion of Section 8.3.1.6.**

8. What group is the probable information supplier?

**M&O Licensing Group**

9. When is the information needed?

**1997**

10. What kind of related information is already available in references, etc.?

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11. Response by (name):

12. Response date:

13. Response:

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.3-010**
2. Section no. & title: **8.3 PERFORMANCE CONFIRMATION FOR  
THE ENGINEERED BARRIER SYSTEM**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **2/09/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Analyses of the effects of waste package failure modes and scenarios of failure  
modes on radionuclide release from the repository and to the accessible  
environment.**
7. What is the information needed for?  
**For completion of Section 8.3.2.1 and Table 8.3C.**
8. What group is the probable information supplier?  
**Waste Package Testing Group and Performance Assessment**
9. When is the information needed?  
**1997**
10. What kind of related information is already available in references, etc.?

- 
11. Response by (name):
  12. Response date:
  13. Response:

**MGDS Annotated Outline Information Need Form**  
**Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.3-011**
2. Section no. & title: **8.3 PERFORMANCE CONFIRMATION FOR THE ENGINEERED BARRIER SYSTEM**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **2/09/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Report on performance allocation to component of the EBS and justification of these allocations through supporting analyses.**
7. What is the information needed for?  
**For completion of Section 8.3.2.4 and Table 8.3D.**
8. What group is the probable information supplier?  
**Performance Assessment**
9. When is the information needed?  
**1999**
10. What kind of related information is already available in references, etc.?

- 
11. Response by (name):
  12. Response date:
  13. Response:

**MGDS Annotated Outline Information Need Form**  
**Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.3-012**
2. Section no. & title: **8.3 PERFORMANCE CONFIRMATION FOR  
THE ENGINEERED BARRIER SYSTEM**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **2/09/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Drawing or schematic of the components of the EBS.**
7. What is the information needed for?  
**For completion of Section 8.3 and Figure 8.3A.**
8. What group is the probable information supplier?  
**EBS Design**
9. When is the information needed?  
**1996**
10. What kind of related information is already available in references, etc.?

- 
11. Response by (name):
  12. Response date:
  13. Response:

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.3-013**
2. Section no. & title: **8.3 PERFORMANCE CONFIRMATION FOR  
THE ENGINEERED BARRIER SYSTEM**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **2/09/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Drawing or schematic of the components of the waste package.**
7. What is the information needed for?  
**For completion of Section 8.3 and Figure 8.3B.**
8. What group is the probable information supplier?  
**EBS Design**
9. When is the information needed?  
**1996**
10. What kind of related information is already available in references, etc.?

- 
11. Response by (name):
  12. Response date:
  13. Response:

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## Section 8.4 Radiation Protection

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**LIST OF INFORMATION REQUESTS**

<b>Log #</b>	<b>Type of Information Needed</b>
INN 8.4-001	Document describing the plans to monitor and control internal and external radiological exposure to workers and to members of the public from the testing described in the Performance Confirmation Plan.

## 8.4 RADIATION PROTECTION

[The description of the plans to monitor and control internal and external radiological exposure to workers and to members of the public is presented in \_\_\_\_\_ (TBD-INN 8.4-001). This Section lays out the radiation protection design features of the underground facility and discusses how these features are intended to meet the standards of 10 CFR 20 and 40 CFR 191, Subpart A. The Section includes (where performance confirmation activities differ from the operations included in Section 4.4.1): a discussion of the layout of radiological areas and facilities; ALARA design considerations; characterization of shielding; radiological monitoring instrumentation; and the interface of structures, systems, and components that are important to safety. The Section also includes an assessment of compliance with 10 CFR 20 where confirmation testing activities differ from the operations described in Chapter 4 (Sections 4.2 and 4.5.1). The assessment follows the same format as presented in Sections 4.2 for restricted areas and 4.5.1 for unrestricted areas.]

**REFERENCES**

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.4-001**
2. Section no. & title: **8.4 RADIATION PROTECTION**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **2/10/93**
5. Work location: **Vienna, Virginia**

6. Type of information needed:

**Document describing the plans to monitor and control internal and external radiological exposure to workers and to members of the public from the testing described in the Performance Confirmation Plan.**

7. What is the information needed for?

**For completion of Section 8.4 and associated Tables and Figures.**

8. What group is the probable information supplier?

**Waste Package and Repository Design Groups.**

9. When is the information needed?

**1999**

10. What kind of related information is already available in references, etc.?

- 
11. Response by (name):

12. Response date:

13. Response:

# MGDS Annotated Outline

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## Section 8.5 Analysis of Changes from Performance Confirmation Baseline

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**LIST OF INFORMATION REQUESTS**

<b>Log #</b>	<b>Type of Information Needed</b>
INN 8.5-001	Document containing a detailed approach to dealing with parameter changes found during confirmation that effect baseline parameters used in analysis and design.

## 8.5 ANALYSIS OF CHANGES FROM PERFORMANCE CONFIRMATION BASELINE

A description of the monitoring system used to determine changes in parameters that were used in repository design, engineered barrier design (EBS), and performance analyses of the tests and overall system [is presented in \_\_\_\_\_ (TBD-INN 8.5-001).] A summary description of the parameters to be monitored and the methods of monitoring [is presented in Table 8.5A (TBD-INN 8.5-001).] The analyses associated with any change in baseline parameters, the methods of feedback of data and analyses to appropriate decision makers within the DOE and to the NRC, and the approach to implementation of appropriate action [are also described in \_\_\_\_\_ (TBD-INN 8.5-001).] A schematic of the flow of information and analyses (based on parameter changes) to the decision makers for potential implementation of changes [is presented in Figure 8.5A (TBD-INN 8.5-001).] The approach used for reaching decisions, and the criteria for determination of whether a change is necessary [ (e.g., whether the deviation between expected and observed behavior is large enough to effect health and safety) are also described in \_\_\_\_\_ (TBD-INN 8.5-001).]

**REFERENCES**

Table 8.5A. Methods of Monitoring Baseline Parameters During Performance Confirmation

Baseline Parameter	Method of Monitoring
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

Note: This Table will be completed using INN 8.5-001.

Figure 8.5A. Flow of Data, Analyses, and Information from Tests to Implementation of Changes (TBD-INN 8.5-001)

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.5-001**
2. Section no. & title: **8.5 ANALYSIS OF CHANGES FROM  
PERFORMANCE CONFIRMATION  
BASELINE**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **2/10/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:  
**Document containing a detailed approach to dealing with parameter changes found  
during confirmation that effect baseline parameters used in analysis and design.**
7. What is the information needed for?  
**Completion of Section 8.5, Table 8.5A, and Figure 8.5A.**
8. What group is the probable information supplier?  
**TBD**
9. When is the information needed?  
**1997**
10. What kind of related information is already available in references, etc.?

- 
11. Response by (name):
  12. Response date:
  13. Response:

## MGDS Annotated Outline

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### Section 8.6 Unresolved Safety Questions

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**LIST OF INFORMATION REQUESTS**

<b>Log #</b>	<b>Type of Information Needed</b>
INN 8.6-001	Discussion of remaining unresolved safety questions expected at the time of submission of the SAR should be presented in a system safety hazard analysis report. Description of the question, its expected severity, and the expected date of resolution.

## **8.6 UNRESOLVED SAFETY QUESTIONS**

[Safety questions that remain unresolved at the time of submission of this SAR are presented below, and are described in more detail in the system safety hazard analysis report \_\_\_\_\_ (TBD-INN 8.6-001). The discussion includes the level of severity of the safety question and a description of its potential effect. These questions are summarized in Table 8.6A along with the expected dates of their resolution (TBD-INN 8.6-001).]

**REFERENCES**

Table 8.6A. Summary of Unresolved Safety Questions

Safety Question	Probability of Occurrence	System Effectuated and Location	Description and Level of Severity	Expected Date of Resolution
1.			Potential risk to ---	6/30/02
2.				
3.				
4.				

Note: This Table will be completed using the system safety hazard analysis report INN 8.6-001.

**MGDS Annotated Outline Information Need Form  
Form A: Information Request**

Date: 5/28/93

1. Log number: **INN 8.6-001**
2. Section no. & title: **8.6 UNRESOLVED SAFETY QUESTIONS**
3. Lead author & phone no: **Jim Duguid 703-204-8851**
4. Information request date: **2/10/93**
5. Work location: **Vienna, Virginia**
6. Type of information needed:

**Discussion of remaining unresolved safety questions expected at the time of submission of the SAR should be presented in a system safety hazard analysis report. Description of the question, its expected severity, and the expected date of resolution.**

7. What is the information needed for?  
**For completion of Section 8.6 and Table 8.6A.**
8. What group is the probable information supplier?  
**TBD**
9. When is the information needed?  
**January 2000**
10. What kind of related information is already available in references, etc.?

- 
11. Response by (name):
  12. Response date:
  13. Response: