U.S. Department of Energy
Office of Civilian Radioactive Waste Management

TSPA-SR Features, Events, and Processes (FEPs) Database: Current Status of Implementation

Presented to:
DOE/NRC Technical Exchange on Total System Performance Assessment (TSPA) for Yucca Mountain
San Antonio, TX

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YUCCA MOUNTAIN PROJECT

Outline

- Key Technical Issue (KTI) Subissues
- Yucca Mountain Project (YMP) FEPs Database Revisions
- Traceability
- Future Updates

Documentation for Site Recommendation

- **SRCR**
  - **Volume 1, Section 4.3**
  - **Volume 2, Section 3.3.1.1**
- **TSPA-SR**
  - **Section 1.6**
  - **Section 2.1**
  - **Appendix B**
- **FEP Analysis/Model Reports (AMRs)**
- **Database Rev 00 and Future Revisions**

Key Technical Issue Subissues

- **Relevant Total System Assessment and Integration (TSPAI) Issue Resolution Status Report (IRSR) Rev. 2 Acceptance Criteria include:**
  - **Section 4.1.1.2: FEPs Identification and Screening**
  - **Section 4.2.2: Classification of Processes and Events**
- **Resolution of TSPAI IRSR Open Issues described in Open Item Table**
- **Matrix of TSPAI IRSR acceptance criteria versus Process Model Reports (PMRs) provided**

FEPs Database Revisions

- Preliminary developmental versions (uncontrolled)
- Rev. 00A - July, 1999 (list to FEP Analysis/Model Report (AMR) Leads)
- Rev. 00B - September, 1999 (to NRC)
- Rev. 00C - November, 1999 (YAP-SV.1Q controlled)
- Rev. 00 - June 30, 2000 (from FEP AMRs Rev 00)
- Rev. 00 ICN 1 / Rev. 01- Future updates (no backfill, other updates)

FEPs Database Revisions
(continued)

- **Rev. 00A - July, 1999**
  - **Initial version of YMP FEPs Database:**
    - **General FEPs from international NEA database, Vers. 1.0**
    - **YMP-specific FEPs identified in YMP literature**
    - **YMP-specific FEPs identified in Site Recommendation planning workshops**
  - **Proposed Primary FEP/Secondary FEP relationships**
  - **Proposed assignments to PMRs and FEP AMRs**
    - **Many assigned to multiple PMRs**
  - **Preliminary placeholder screening decisions and text**
    - **not from subject matter experts**
  - **Distributed to FEP AMR Leads**

FEPs Database Revisions
(continued)

- **Rev. 00B - September, 1999**
  - **Same FEPs as Rev. 00A**
  - **Limited MS Access user functionality**
  - **Preliminary placeholder screening decisions and text converted to italics**
  - **Distributed to NRC at Appendix 7 Meeting on FEPs**

FEPs Database Revisions
(continued)

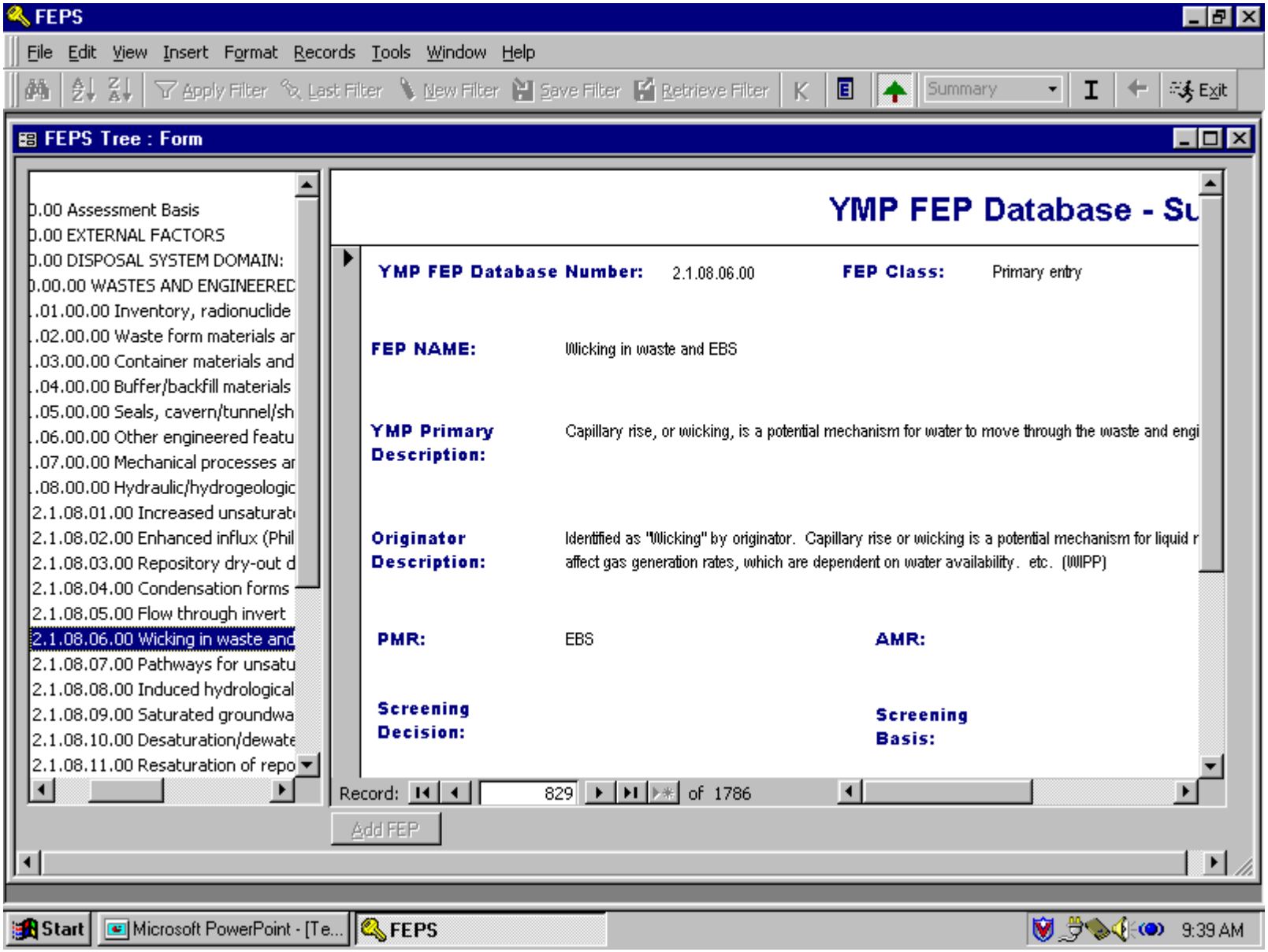
- **Rev. 00C - November, 1999**
  - **Same FEPs as Rev. 00A and Rev. 00B**
  - **Base controlled version**
    - **Preliminary placeholder screening decisions and text removed**
    - **Ready for input from FEP AMRs Rev. 00**

FEPs Database Revisions

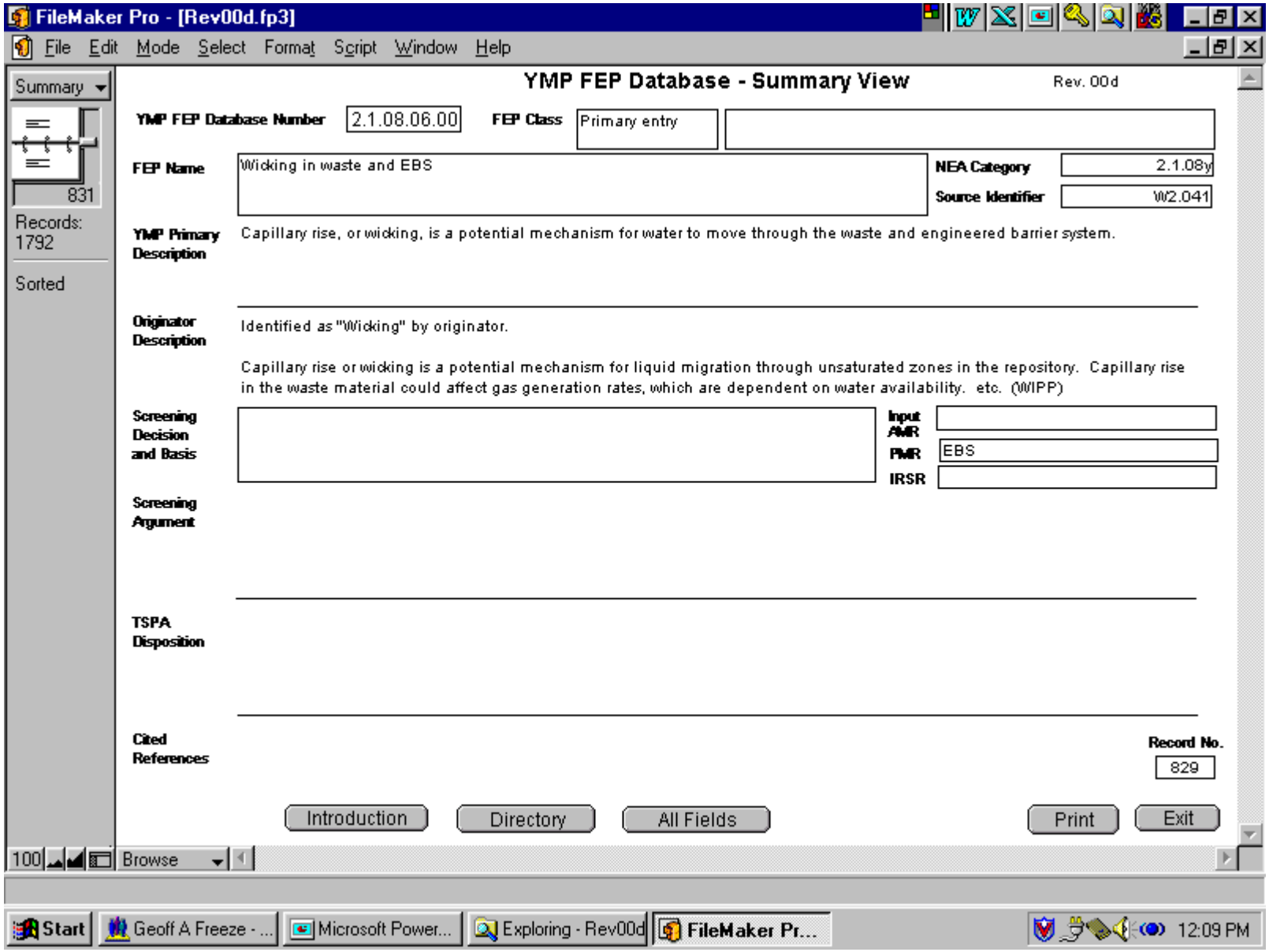
(continued)

- **Rev. 00 - June 30, 2000**
  - **Based on technical input from Rev. 00, ICN 0 of FEP AMRs (with backfill)**
    - **Screening decisions (include/exclude)**
    - **Screening text**
    - **Subject matter expert confirmation of Primary/Secondary relationships and PMR assignments**
    - **Identification of new FEPs**
  - **Enhanced user functionality**
    - **Directory tree-type organizational guidance**
    - **Keyword search capability (*)**
      - **(*) = possibly deferred to a later revision**

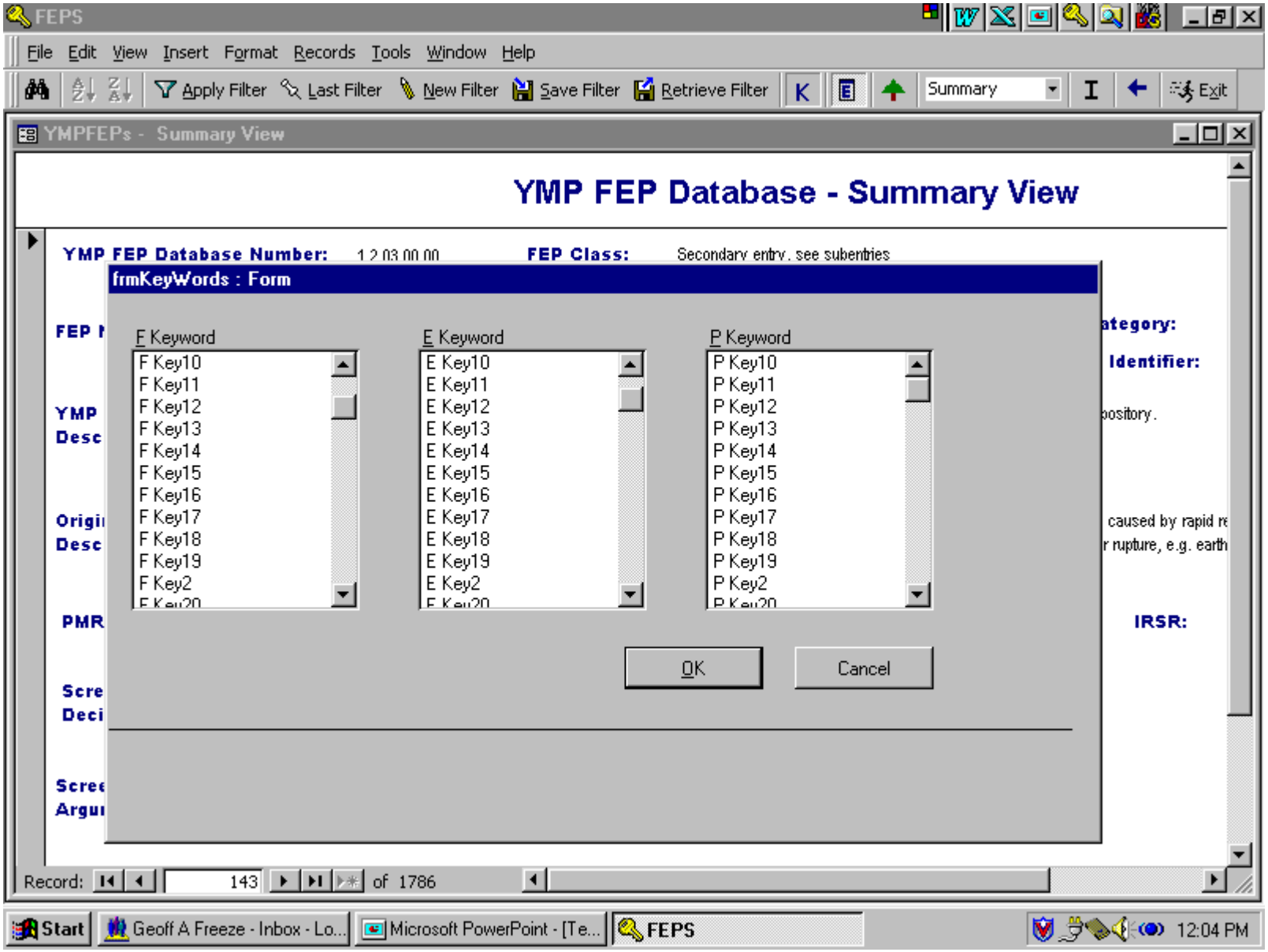
FEPs Database Rev. 00



FEPs Database Rev. 00



FEPs Database Rev. 00



Traceability

- **Sources/reviews contributing to Rev. 00**
  - **FEP AMRs**
  - **Documentation of FEP origins**
  - **Internal PMR reviews**
  - **Repository Safety Strategy 4 Workshops**
  - **NRC NFE Audit of Rev. 00B (*)**
  - **IRSR KTIs and Subissues (*)**
    - **(*) = possibly deferred to a later revision**

Traceability
(continued)

- **NRC Criteria (TSPA&I IRSR Rev. 2, Sec. 4.1.1.2)**
  - **Criterion T1: The screening process by which FEPs were included or excluded from TSPA is fully described**
- **DOE Implementation of NRC Criteria**
  - **Screening criteria and rationale for include/exclude decision are documented in the FEP AMRs and in the database**

Traceability
(continued)

- **NRC Criteria (TSPA&I IRSR Rev. 2, Sec. 4.1.1.2)**
  - **Criterion T2: Relationships between relevant FEPs are fully described.**
- **DOE Implementation of NRC Criteria**
  - **Related FEPs are grouped within the NEA-based hierarchical numbering scheme. Tree directory allows user to graphically view and identify these groupings**
  - **Related FEPs are grouped by relevant PMR(s)**
  - **All primary FEPs are assigned F, E, and P keywords. Related FEPs can be identified through pull-down menu keyword search**

Traceability
(continued)

- **NRC Criteria (TSPAI IRSR Rev. 2, Sec. 4.2.2)**
  - **Criterion T1: Provide adequate documentation how initial list of processes and events has been grouped into categories**
- **DOE Implementation of NRC Criteria**
  - **Proposed categorization (Rev. 00A) based on:**
    - **Primary FEPs identified at a level where they can be evaluated with a "single" screening argument or TSPA disposition**
    - **Secondary FEPs are duplicate or redundant to a Primary FEP**
    - **Secondary FEPs are subsumed in broader Primary FEP screening arguments or TSPA dispositions**
    - **Primary FEP Description is YMP specific and encompasses all aspects of Primary FEP and associated Secondary FEPs**
  - **Categorization reviewed and confirmed (with appropriate changes made where necessary) by subject matter experts in FEP AMRs (for Rev. 00)**

Future Updates

- **Rev. 00 ICN 1 / Rev. 01**
  - **Will reflect ICN 1 or Rev. 01 changes to FEP AMRs**
    - **No backfill (ICN 1)**
  - **Will include other enhancements:**
    - **New FEPs, if identified**
    - **Enhancements required to better satisfy NRC Criteria (e.g., interaction matrix)**
    - **Proposed enhancements not included in Rev. 00**
  - **Will satisfy Site Recommendation sufficiency review**
  - **Expected date is Spring/Summer 2001**

Backup

FEP AMRs

- BIO: Evaluation of the Applicability of Biosphere-Related Features, Events, and Processes (FEP)
- DE: Disruptive Events FEPs
- EBS: EBS FEPs/Degradation Modes Abstraction
- NFE: Features, Events, and Processes in Thermal Hydrology and Coupled Processes
- SYS: Analyses to Support Screening of System-Level Features, Events, and Processes for the Yucca Mountain Total System Performance Assessment -Site Recommendation
- SZ: Features, Events, and Processes in SZ Flow and Transport
- UZ: Features, Events, and Processes in UZ Flow and Transport
- WF:
  - Miscellaneous Waste-Form FEPs
  - Clad Degradation – FEPs Screening Arguments
  - Waste Form Colloid-Associated Concentrations Limits: Abstraction And Summary
- WP: FEPs Screening of Processes and Issues in Drip Shield and Waste Package Degradation

Database Audit Deficiency Summary

- Database is not comprehensive
- Inadequate documentation on the categorization of secondary entries into individual primary entries
- Poor correspondence between primary and secondary entries
- Inadequate technical basis for many of the preliminary screening arguments
- Inadequate representation of FEP coupling