GENISES a GIS Database for the Yucca Mountain Site Characterization Project
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ABSTRACT

This paper provides a general description of the Geographic Nodal Information Study and Evaluation System (GENISES) database design. The GENISES database is the Geographic Information System (GIS) component of the Yucca Mountain Site Characterization Project Technical Database (TDB). The GENISES database has been developed and is maintained by EG&G Energy Measurements, Inc., Las Vegas, NV (EG&G/EM). As part of the Yucca Mountain Project (YMP) Site Characterization Technical Data Management System, GENiSES provides a repository for geographically oriented technical data.

The primary objective of the GENISES database is to support the Yucca Mountain Site Characterization Project with an effective tool for describing, analyzing, and archiving geo-referenced data. The database design provides the maximum efficiency in input/output, data analysis, data management and information display. Participants may review the GENISES database on-screen through menu driven review of the data or base map products. It allows the Participants to select and review multiple data layers for analysis or product composition in-house or at a remote location.

This paper provides the systematic approach or plan for the GENISES database design and operation. The plan is based on five design process activities.

A. Needs assessment
b. Conceptual design
C. Physical design
D. Pilot study
E. Implementation

The paper also discusses the techniques used for data normalization or the decomposition of complex data structures as they apply to a GIS database. ARC/INFO and INGRES files are linked or joined by establishing "relate" fields through the common attribute names. Thus, through these keys, ARC can allow access to normalized INGRES files greatly reducing redundancy and the size of the database.

The ability to easily handle change is a key element of a well designed database. The physical structure of the GENISES database will change as program requirements change. However, the overall conceptual design will change very little over the life of the database. Therefore the original design will provide the foundation for the overall database structure for years to come.

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PROCEDURE

NEEDS ASSESSMENT

CONCEPTUAL DESIGN

PHYSICAL DESIGN

PILOT STUDY

IMPLEMENTATION

OPERATIONAL GIS

GIS DATA MODEL

ANALYZE DATA

MAP ANALYSIS TECHNIQUES

DETERMINE GIS DATABASE CONTENTS

DEVELOP DATABASE MODEL & COMPONENTS

DOCUMENTATION

PRESENTATION REVIEW & APPROVAL
DATA ANALYSIS

CARTOGRAPHIC CONSIDERATIONS

GIS DATA ANALYSIS

DATA CATEGORIZATION

DATA

POINT, LINE, POLY ANNOTATION

AUTOMATED/MANUAL

LAYERS & THEMES CATEGORIES

REDUNDANCY ELIMINATION

DATA SUBSET

DATA ORGANIZED BY PRIORITY

LAYERS ORGANIZED BY THEMES

CREATE LAYERS & THEMES

PRIORITIZE

EXPANDED ANALYSIS

LAYER ANALYSES
DATABASE DESIGN PROCEDURE

NEEDS ASSESSMENT

CONCEPTUAL DESIGN

PHYSICAL DESIGN

PILOT STUDY

IMPLEMENTATION

OPERATIONAL GIS

CONVERT CONCEPTUAL DATA MODEL INTO PHYSICAL DATA MODEL

DETAILED DESIGN OF MAINTENANCE & MANAGEMENT PROCEDURES

DETAILED DESIGN OF APPLICATION PROGRAMS (MACROS)

DOCUMENTATION

DETAILED DESIGN OF APPLICATION PROGRAMS (MACROS)
• ARC RELATE ALLOWS ACCESS TO NORMALIZED DATABASES.

CHAINED RELATES ARE NOT SUPPORTED (unless the last file in the chain is a symbol lookup table).

MULTIPLE RELATES ARE SUPPORTED.

ONE TO MANY RELATIONSHIPS NOT SUPPORTED. THE RETURNED VALUE OF Y MIGHT BE A, B, OR C. INFO WOULD RETURN THE FIRST OCCURRENCE - A.
DATABASE DESIGN PROCEDURE

Steps

1. NEEDS ASSESSMENT

2. CONCEPTUAL DESIGN

3. PHYSICAL DESIGN

4. PILOT STUDY

5. IMPLEMENTATION

Result: OPERATIONAL GIS
### CODE TYPE_ID | Definition
--- | ---
100 10 | Any not defined below
101 11 | Primary route:paved road
102 12 | Secondary route:paved road
103 13 | Two lane paved road
104 14 | Unpaved road
105 15 | Vehicle Trail
106 16 | Trail
107 17 | Right-of-way
108 18 | Disturbed area associated with road
109 19 | Pipeline
110 20 | transmission line
111 21 | Transmission line tower
112 22 | Transmission line pole
113 23 | Electrical substation
114 24 | Culverts/ditches
115 25 | Trench
116 26 | Materials Storage Area
117 27 | Drill pad
118 28 | Parking area
119 29 | Building
120 30 | Fence/wall
121 31 | Tower
122 32 | Tank
123 33 | Cleared area
124 34 | Spoil Pile
125 35 | Tracks
126 36 | Pile
127 37 | Pond
128 38 | Geologic Pavement
129 39 | Tracks associated with sampling

### CODE TYPE_ID | Definition
--- | ---
112112 103 | Two line paved road
112344 101 | Trail
122353 102 | Trail
112344 101 | Trail

### CODE TYPE_ID | Definition
--- | ---
123428 118 | Building
324529 119 | Building
299982 119 | Building
300933 120 | Building

### CODE TYPE_ID | Definition
--- | ---
1234188 108 | Building
2412123 114 | Building
3563538 125 | Building
3777365 127 | Building

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Figure 2-10. GENISES Lookup Table Relate Keys.

Page 14
Figure 2-2. GENISES Database Overview.
PROCEDURE

- NEEDS ASSESSMENT
- CONCEPTUAL DESIGN
- PHYSICAL DESIGN
- PILOT STUDY
- IMPLEMENTATION

- GIS SEMINAR
  - Interviews
  - Review of Operations
  - Sample Data Collection
  - Create Operational Scenarios
  - Documentation: Operations Report