

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TRIP REPORT

SUBJECT: Professional Development Training; Dynamic Graphics, Inc.
Introduction of EarthVision and the WorkFlow Manager 1
20.01402.158

DATE/PLACE: August 28–31, 2000
Alameda, California

AUTHOR: James D. Prikryl

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PERSONS PRESENT:

Robert S. McFaul (DGI course instructor), James D. Prikryl (CNWRA), and 4 other students.

BACKGROUND AND PURPOSE OF TRIP:

This trip was part of the CNWRA program for professional staff development. The Dynamic Graphics, Inc. *EarthVision* product family provides analysis and visualization of highly complex geologic environments. With *EarthVision*, geoscientists can analyze data, surfaces, geologic structures, and property volumes (e.g., porosity, temperature, and contaminant concentration) in their true three-dimensional (3D) spatial context. This disparate data can then be combined in an integrated 3D model that provides insights into the complex relationships in the data and eliminates the inconsistent results that have confounded scientists in the past when analyzing a series of independent models. In addition to producing 3D graphics, *EarthVision* can also generate highly accurate base and contour maps, cross sections, and fence diagrams.

The purpose of this trip was to become familiar with the operation and capabilities of *EarthVision* to support CNWRA reviews of the U.S. Department of Energy (DOE) Integrated Site Model (ISM) of Yucca Mountain and other CNWRA activities. The purpose of the ISM is to provide a common framework of stratigraphy, rock properties, and mineralogy for subsequent process and performance assessment modeling. *EarthVision* is important in evaluating the ISM because it is used to construct and model site geology and to create 3D portrayals of site geologic, rock property, and mineralogic characteristics and their spatial variabilities.

EarthVision 5.0, released in 1998, offers a geologically oriented process flow module called the WorkFlow Manager™, which makes 3D model building easier and faster than in previous *EarthVision* releases. The interface design of the WorkFlow Manager guides users through all aspects necessary to create a 3D structure or property model. All the tools for creating 3D models are laid out in a straight-forward pattern, so that users can easily follow the correct path.

SUMMARY OF PERTINENT POINTS:

The course focused primarily on the WorkFlow Manager and 3D Viewer modules of *EarthVision*. The WorkFlow Manager steps the user through the process of creating a 3D model of faults, fault blocks, faulted and unfaulted zones, and property models within those zones. Structural and property models were calculated, with various output generated including sorted fault data, 2D grid surfaces, 3D models (or faces

files), contour maps, and cross-sections. The 3D Viewer was used for visualizing previously created faces files, grid files, or data files for verification.

The course also covered several capabilities that are not yet available directly in the WorkFlow Manager, but are available elsewhere in *EarthVision*. These capabilities included volumetrics, property cross-sections and color-filled cross sections, contour maps beyond the default and isochore maps, and time-to-depth conversion. These capabilities are generally accessible by using one of the outputs from the WorkFlow Manager.

SUMMARY OF ACTIVITIES:

The instructor for this course was Robert S. McFaul, a technical support specialist with Dynamic Graphics, Inc. The course consisted of instructor-led discussions followed by laboratory exercises.

The course began with a brief introductory discussion of *EarthVision* which focused on input data file types and field specifications, data file editing, and directory structure. This discussion was followed by a lab exercise on the capabilities of the *EarthVision* 3D Viewer module. The 3D Viewer allows the user to view, manipulate, and edit data in 3D space as the model is being built.

The remainder of the course focused on the three types of geologic characteristics that can be represented within the *EarthVision* 3D model: (i) faults, (ii) horizons, and (iii) properties. Data on these geologic characteristics are used as input to the WorkFlow Manager to progressively build a structural or property model. Topics covered during discussion of each geologic characteristic are listed below:

Faults

- Entering and editing fault data
- Defining dying fault boundary polygons
- Verifying fault surfaces and fault boundary polygons using the 3D Viewer
- Modeling techniques (2D minimum tension or 2D trend gridding)
- Fault preview outputs
- Fault tree building

Horizons

- Rules of geologic operations (depositional, unconformity, channel erosion)
- Zone definition (reference or intermediate)
- Horizon input data (scattered, 2D grid, constant)
- Horizon gridding and parameter specification
- Local vertical and nonvertical faults

Properties

- Property definition
- Input data type (scattered, 3D grid, constant)
- Parameter specification
- Modeling methods (3D minimum tension or 3D trend)

Laboratory exercises emphasizing data input, selection of modeling methods and parameters, and modeling concepts covered during discussions were conducted using Silicon Graphics hardware with UNIX operating

systems. In addition to laboratory exercises related to aspects of the WorkFlow Manager, a series of lab exercises introducing capabilities in the *EarthVision* Toolkit that have not been incorporated as yet into the WorkFlow Manager were conducted. A listing of the exercises is shown below:

WorkFlow Manager Exercises

- Automatically built polygons for dying faults
- Manually built polygons for dying faults
- Fault modeling methods
- Automatic and manual fault tree building
- Analyzing fault intersections
- Geologic rules for defining a sequence stratigraphy
- Horizon gridding
- Property modeling basics
- Final project

***EarthVision* Toolkit**

- Volumetrics
- Formula Processor
- Maps, cross sections, graphic editor

IMPRESSION/CONCLUSIONS

This course provided an excellent introduction to the capabilities of *EarthVision* software. The WorkFlow Manager offers an easily understood and streamlined interface for creating 3D structural and property models. As the WorkFlow Manager steps the user through the process of building the model, output can be easily viewed, manipulated, and verified using the 3D Viewer. For example, fault surfaces can be displayed and verified using the 3D Viewer before horizon data is entered into the model.

PROBLEMS ENCOUNTERED:

None

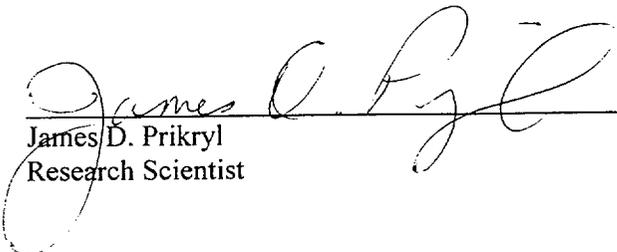
PENDING ACTIONS:

None

RECOMMENDATIONS:

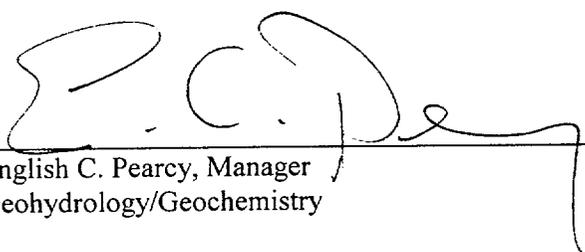
This course is highly recommended for scientists and engineers involved in reviewing documents related to site geology and geologic characteristics of the proposed Yucca Mountain, Nevada high-level nuclear waste repository. In addition, earth scientists involved in other licensing activities for the NRC (e.g., uranium recovery and site decommissioning) would benefit from this course.

SIGNATURES:

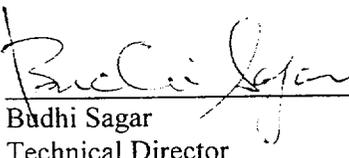

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