Walter (Terry) Cline
*tsaADVET – VP of Sales Support*

Scott Ryan-Hart
*ODOT – GIMS Specialist 1*

Integration of GIS and EDMS at Ohio DOT
Entered CADD arena in 1984
Computervision and Intergraph Mainframes

31 Years of experience working with numerous engineering applications

AGENDA

- **tsaADVET** (EDMS perspective)
  - Office of Geotechnical Engineering problems
  - System Goals & Cost Justification
  - Milestone accomplishments
  - Initial web based system (non GIS based)
  - Up to the current GEOMS implementation

- **Ohio DOT** (GIS perspective)
  - Issues with the current implementation
  - Plans and actions to address those issues
  - Integration with ODOT’s T.I.M.S. system
The Problem
Kirk Beach

- One stop shop, for Geotechnical information that might be relevant to Ohio DOT projects.
  - Data Source for both Internal and External users
    - ODNR, FHWA, Municipalities, etc.
  - Historical Project Data
    - Boring Logs
    - Profile Sheets, etc.
    - Lab Reports
  - Active Project Data
    - (Same stuff)
  - Geohazards Inventory data and much, more.
Office of Geotechnical Engineering

Geotechnical Data Management System
Situational Analysis
GeoDecisions

Assessment Report

Geotechnical Data Management System Assessment Report

February 4, 2004

Interviews Summary

Geotechnical Data Management System User Needs Interviews Summary

February 4, 2004
3.2. **Historical Archives**

ODOT has geotechnical project data dating back to the 1920s. This information is a valuable source for researching conditions around the state, particularly for new project investigations. However, the information is in hard copy only, and there is no backup copy.

The existing data archive is used by ODOT staff, consultants, ODNR staff, and others to investigate conditions. Consultants are required to do a prior information investigation for their project work. Currently, all users must travel to the archive site to research the information, which adds to project expense. There is also an opportunity for valuable information to be missed due to the current difficulties in data retrieval. ODOT staff can help users find information, particularly if the user is not familiar with the archive and/or changes that took place in the referencing system over time. Some users will call in to request information, and staff will then look for and retrieve the information, if available.

Project reference information is entered on a card file. The card file contains 37 fields of information, which include a reference to the hard copy folder containing the project materials, as well as a project reference number, and a county/route/section LRS reference for the project. However, the county/route/section references change as roads change or are re-numbered, making the LRS reference somewhat problematic for older data.

ODOT can usually get hard copy boring logs back to the requesting individual in about a day, depending on priority. The boring log information is relatively easy to find, but information describing found conditions are more difficult to identify and locate. Consultants are currently required to photocopy the originals and are sometimes permitted to take the originals with them. Both methods are cause for concern regarding the original documents, considering their condition and lack of other off-site, secure copies. In general, the information-finding process requires one to two days for two to three people to retrieve, with no current estimate at the proportion of data that might have been missed in the search.

OGE has initiated a project to scan all of this information, develop a database of selected project information that is tied to the scans, and provide information viewing tools. The project information and scans will be tied by the standard project number format (example: FRA–270–13.46). It is estimated there are 21,000 project files to be scanned. A pilot conversion study has been started and is estimated to produce 50,000 scans of 24x36 inch plan sheets and 1,500,000 8.5x11 inch records, in compressed TIFF format.

A database was established for the project information on the card files. Currently, 18 of the 37 fields are included in the database and available for query. The card is also included in the scanned information, so the full contents of the card can be viewed. Some of the 18 database
The following describes a typical workflow of a search for background info for a project. The process generally requires one to two days for two to three people. The search is initiated by a call from a consultant or internally within ODOT. The physical location of the information is first retrieved from the card file. The card files are physically in a different building from the files. The Department can usually get the information (hard copy bore logs, etc.) back to the requestor in a day or two, depending on priority. Consultants are required to make these background checks, but travel, time, and limits in current organization often increase the possibility that data is not found. Changes in project referencing and filing can occur. For example, changes made to the county/route referencing system over the years can cause projects to “move” along the road from their original location. A search of projects for an area may not turn up these records due to the referencing change. Access to electronic bore logs could save time and money, and provide valuable reference material for project pre-planning. Consultants are currently required to photocopy the originals, and are sometimes permitted to take the originals with them, which threatens the security of the originals. Both methods are cause for concern regarding the original documents.
“Most boring logs are maintained at the District Offices and are being purged after five to seven years.... The total amount of geotechnical information being lost is unknown.”
7.1. Direct Costs

Information from the assessment project interviews and survey indicate real and potential instances of losses of money and resources if current practices are continued.

The current geotechnical archive is a collection of 21,000 hard copy report files that represents approximately 75 years of information collection. There are no backup copies of this information; the archive consists of single originals only. This is a very valuable, and irreplaceable, resource for ODOT. It represents the only store of geotechnical knowledge for ODOT. It is estimated to cost $20,000 to $25,000 per project if this data needed to be collected again for future projects. Thus, without the GDMS to provide a digital copy of all of this information (preserving it for future use), ODOT is risking an approximate $500 million loss of important data. The majority of geotechnical data does not change over time. Therefore, the data will remain a valuable asset for ODOT.

Structures represent significant expenditures in money and resources for ODOT. A structural failure, as evidenced elsewhere, can be catastrophic to human life. It is imperative that structures be thoroughly and safely planned, designed, built, and inspected. Structural tests such as load tests or dynamic monitoring of pile driving are a primary component of this process. However, all of the materials comprising a structure cannot be individually tested; ODOT must rely on representative tests. The tests themselves are expensive, depending on the structure, and can run into hundreds of thousands of dollars or more. Test results must be interpreted and interpolated for regional conditions and across the state. The geotechnical information associated with the tests is an essential component of the test, and must also be interpreted and interpolated consistently.

Terminology, data structures and values, and analysis methods can vary from area to area, making it difficult to successfully apply interpretation and spatially analyze data. Conversely, a structural test can be only partially reliable if geotechnical information is not available for the test, or for where the tested design will be applied. Thus, ODOT has spent, and will continue to spend, many dollars on structural tests that could be replaced by accurate and meaningful interpretations. Information about structural tests needs to be captured and disseminated. Major structural tests are rarely conducted; the expense for these tests is great. For example, ODOT spent about $1 million on a test of two shafts. One shaft passed all tests, but the second shaft did not pass one of the tests. Information about similar configurations and tests could be available in the GDMS, and provide information that might cause ODOT to change or improve a design prior to testing.
The Plan
GDMS Comments

Don Kiel - GeoDecisions

1) No “one-stop” solution already exists
2) Standardization is one key to success
3) Cooperation and communication is another
4) GDMS must incorporate many modules
5) GDMS has four MAJOR components
GDMS Major Parts

Don Kiel - GeoDecisions

1) DBMS
2) GIS
3) APPS
4) EDMS
Input
(Examples)
- Borings and Lab Data
- Structure Information
- Historic Data
- Geohazard Inventories
- Field Data Collection
- Construction and Maintenance Notes
- Cities, Counties, Other States
- Consultant Data

Core GDMS
- Database (Drilling Data, GIS Data, Historic Data, etc.)
- Server(s) (Database, Web, File/Image, Authentication, Application)

Use
(Examples)
- Desktop Software Analysis
- Intranet Web Portal (Research, Query, Analysis)
- Archive (View, Research)
- Research and Information (Consultants, Cities, Counties, Colleges, Federal, Public)

Firewall
Internet
Summary of GDMS Benefits

- Reduces costs associated with project design
- Requires the establishment of electronic standards for geotechnical data (soil, rock, water, ...)
- Provides the foundation for data sharing
- Protects $500 million dollar asset of existing information
Document Capture
Dayton Imaging

- Commenced on August 15, 2005 upon issuing a purchase order to Dayton Imaging
Dayton Imaging

All boxes and drawing tubes were inventoried and labeled with barcodes indicating a control number for quality control.
Dayton Imaging
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**DO NOT WRITE IN THIS SPACE**

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Data Capture
Data Entry and Importing

ArcPad integration with handheld device for incorporation of GPS collected data
Data Entry and Importing

Intelligent Forms:

- Data checked on entry
- Can be reproduced upon paper
- Automatically creates EDDs
Metadata Structure

- Dayton Imaging indexed over 40 metadata fields. (per document type)
- Over 40 document types.
- Over 100 sub-document types.
- To date, approximately 1.65 million documents have been scanned and indexed into Falcon/DMS as the EDMS engine, and are accessible via Falcon/SVP or through the ESRI graphical interface (Falcon/API)
Flow of GDMS Information

Geotechnical Data Management System

Manages versions of all INCOMING DATA

Manages versions of all OUTGOING DATA
Data Entry and Integration

Industry collaboration

Each year, UA conducts research on behalf of more than 100 companies of all sizes. UA works creatively to solve industry problems, creating graduate student internship opportunities and workforce development through many of its colleges, institutes and centers. UA’s recent successes include:

- UA is participating in a multi-million dollar international initiative to set up training facilities and educate faculty for a technology manufacturing facility overseas
- During the past year, UA has explored collaborative sessions with such large multinational corporations as American Greetings, Avery Dennison, BASF, Bridgestone, ExxonMobil, Gojo, Goodyear, Kration Polymers, Lockheed Martin, Lubrizol, NASA’s Glenn Research Center, Omnova Solutions, Parker Hannifin, PolyOne, RPM, Saint-Gobain, Steris and Shawnee-Williams, Sumitomo and Timken
- Licensing process that can be customized to your unique needs and speed up licensing deals
- Join the 120 companies currently taking advantage of UA sponsored research

UA research services:

- *Research expertise* in polymers and advanced materials, biomaterials and medical devices, advanced energy, computational science, and nanotechnology
- *Laboratory services*, including a magnetic resonance lab, characterization and testing of polymer materials, and a nanofiber filtration center
- *Licensable technologies*, including a silver-based drug candidate, polymer coatings for medical devices and a clean, efficient coal fuel cell
- *Licensing process* enhanced by an independent research foundation that can speed up licensing deals
- Join the 115 companies currently taking advantage of UA sponsored research

Resources for partnership:
Original System
### Search Results: 1-10 (13 matches)

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<th>Road Name</th>
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- **Options**: Select all, View PDF, Search, Help, Logout
- **Filename**: You can click on any filename to view the document.
- **County**: BEL
- **Route**: 470
- **Section**: 1.26
- **Road Name**: structures, structure, bridge, structural foundation invest. sheets
- **Project Type**: structure, bridge
- **Project Sub type**: bridge, structural foundation invest. sheets, general info.
- **Document Type**: cordfile, structural foundation invest. sheets, general info.
Integration with GIS
Separation of Responsibilities

The map, the objects icons, what is visible and when, etc.

The managed project documents, and authorized access to them, etc.
Falcon/API Packaged Solution

FalconWebAPI.aspx?cmd=search&app=ODOT_GDMS&env=GDMS&structure_no=43056
GDMS website URL

http://equis.odotgeoms.org

- Username: guest
- Password: guest
Current System
Datasets

• 2 primary Datasets
  – Geohazard Inventory
  – Historical Datasets
Datasets

• 2 primary Datasets
  – Geohazard Inventory
    • Landslide
    • Rockfall
    • UVIRA
  – Historical Datasets
Datasets

• 2 primary Datasets
  – Geohazard Inventory
  – Historical Datasets
    • Borehole Locations
    • Project Facility Limits
    • Geohazard Remediation Limits
We aren’t going into the Geohazards today

- Separate System
- Continuously Updated
Current Mapping Service

- Hosted through Earthsoft’s EQuIS Pro 6.1 platform
- Requires login credentials
- Data is view only
- Mapping services are related to Falcon v7 but not directly connected
Current Mapping Service

General Statistics

• 250,000+ Borehole Location Points
• 21,000+ Project Lines
• 2200+ Geohazard Polygons
Current Mapping System (Login)
Current Mapping System (Login)

Issues

• Confusing
• Username “guest” with password “guest” is a workaround
Mapping User Data Considerations

• Project Limits
  – Project Data
  – DOT Confidence

• Borehole Locations
  – Project Data
  – Boring Log
  – Plan view
  – Profile
  – Confidence

• Geohazard Remediation Limits
  – Project Data
  – Plan view
  – Confidence
Confidence?

- Rating of 1 through 4
  - 1 is lowest and 4 is highest confidence interval
  - Ordinal ranking system
  - Determined by GIS Operator entering data
  - Only entities with confidence levels 3 and 4 shown on map
Current Mapping System
Current Mapping System (ToC)
Current Mapping System (Example)
Current Mapping System (Example)
Current Mapping System (Example)
Current Mapping System (Example)
## Identify Results

### Project Information

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### Individual Element (Boring Logs, Plans, or Profiles)

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Issues

• Login issues
• Mapping application does not always load correctly
• Visibility toggles are “clunky”
• Limited to the data available
• No export capability
• Walled garden
Next Steps
TIMS Integration

- More user friendly
- Brings OGE Data within the ODOT Mapping Platform
- Can incorporate other ODOT Datasets
- Can select multiple entities
- Exportable data
Next Steps

- TIMs Integration
Next Steps

- TIMs Integration
Next Steps

- DATA Download