DIGITAL MAPPING TECHNIQUES 2023

The following was presented at DMT’23
May 21 - 24, 2023

The contents of this document are provisional

See Presentations and Proceedings
from the DMT Meetings (1997-2023)
http://ngmdb.usgs.gov/info/dmt/
Geological mapping combining traditional with digital techniques

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Tasked to create 1:100,000 geological map of South-Central Indiana
Mapping Techniques

I. Data collection & sourcing legacy data
II. Amalgamating all data into one database
III. Map construction
I. Data collection & sourcing legacy data

A. Core sampling/core description
B. Field surveys of rock exposures
C. HVSR data collection
D. Sourcing archived data
   1. Legacy work maps
   2. Field guides
   3. Previous bore holes
      a) DOT
      b) Gas & oil wells
      c) Water wells
Core sampling

SDH 521
180-190’
Core diameter 2’’
Core description

Describing new & legacy core

• Entered in an in-house program, “Column”

• Data to be added to main data base used for surface creation
Field surveys of exposures
Field Notes

ArcGIS Field Collector Application

- Collector app combined with traditional field notes allows for quick data collection
- X, Y, and Z coordinates are contained within the collector application
- Detailed descriptions of rock units are written in the field notebook to be entered later back at the office
HVSR data collection

HVSR data is combined with well logs (water wells, oil & gas wells, gamma logs)

• Used for bedrock topography
Additional data sources

Legacy field maps from previous research

Quarry industrial mineral reports
Driller and geophysical logs from previous boreholes:
• DOT Geotech
• oil & gas exploration
• water wells
• gamma logs, etc.
II. Amalgamating all data into one database

A. Two primary methods

1. Synchronizing ArcGIS Field Collector App with database
   a) Data collected in the field

2. Data entry one point at a time taken from
   a) Field guides
   b) Geotech reports/DOT boreholes
   c) Gas, oil, water driller logs
   d) Gamma, induction logs
Method 1: Synchronize iPad/Android field collector application with main database

New data points will automatically populate in ArcGIS Pro
Details from field notes can be added after synchronization
Applicable location information entered in the various fields

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Each of these relationships represent rock formations observed at this data point.

Relationship for each rock formation located at this data point is created

Purpose is so that a definition query can be run on each individual formation top when creating formation surfaces.
Photos can be added using ArcGIS Field Map in the field or attached to the datapoint when adding details back at the office.
Method 2: Manual data entry

- Data types
  - Legacy borehole
  - Field guides
  - Industrial Mineral Reports
  - Water, oil and gas well records
  - Department of Transportation geotechnical reports
2. Use the “create” tool in the edit tool bar

Used primarily for adding legacy data from:

- Field notes/work maps
- Recent and old subsurface data
III. Map construction

A. Create bedrock topography map
   1. Using data sets containing depth to bedrock

B. Run geologic surface modelling tool using
   1. Database containing all data entries
   2. Inferred data points
A. Create bedrock topography map

Bedrock surface topography

Bedrock Surface topography map
Bedrock surface topography map

Bedrock Surface topography raster
- Clipped to area of interest
B. Create geological surface

Bedrock surface

Salem Limestone
Created geologic surface is intersected with bedrock topographic surface (BRS)

- Geologic surface – BRS = 0 (where intersect occurs)

Contours are created from intersected surface
- 5,000-foot interval used so that only “0” contours are created
Example of contacts created from where bedrock & geological surfaces intersect

Depending on the results, inferred data points and hand contouring is sometimes necessary
Polygons are created from finished surfaces

Topology tool used to QC
Questions