

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/>

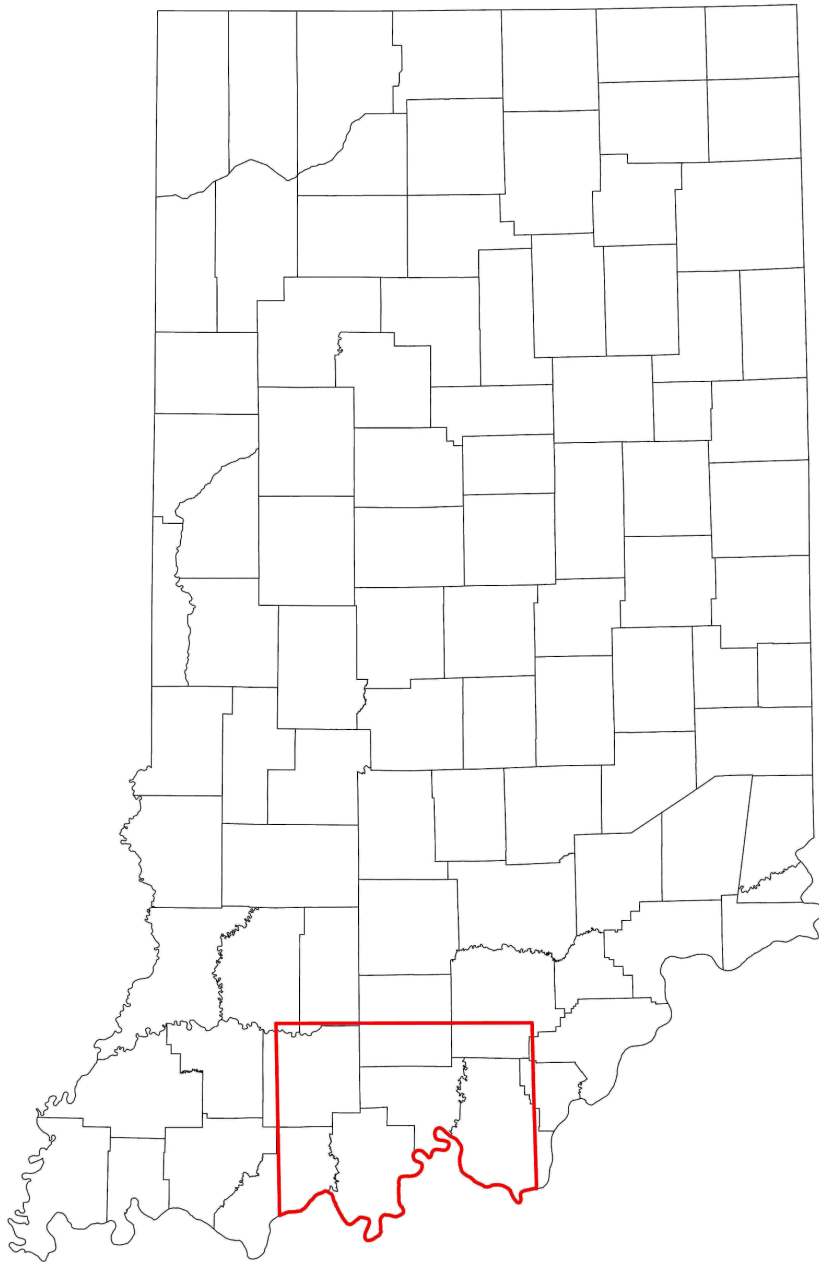


**INDIANA GEOLOGICAL
& WATER SURVEY**
INDIANA UNIVERSITY

Geological mapping combining traditional with digital techniques

Don Tripp, Robin Rupp, Valerie Beckham-Feller, Ben Romlein





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

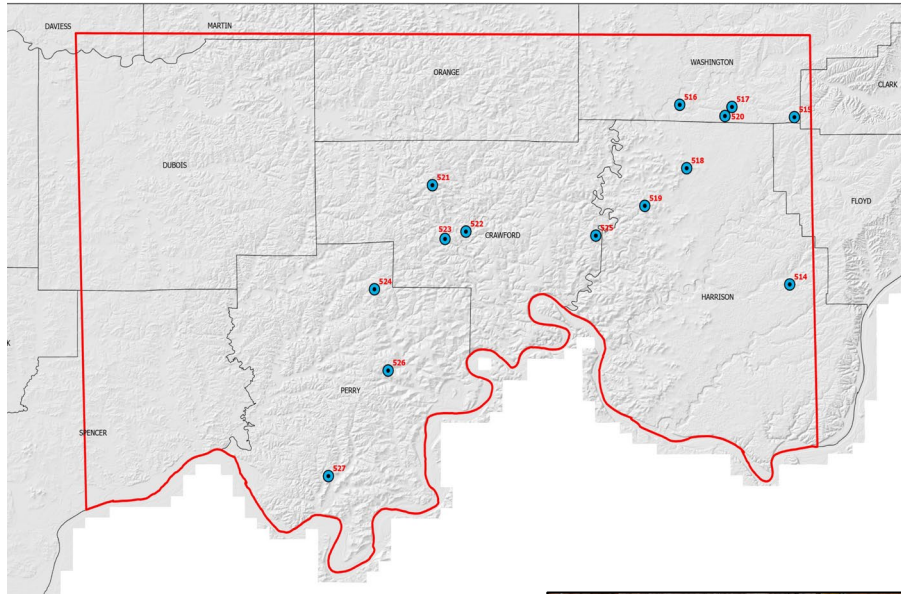
Mapping Techniques

- 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"

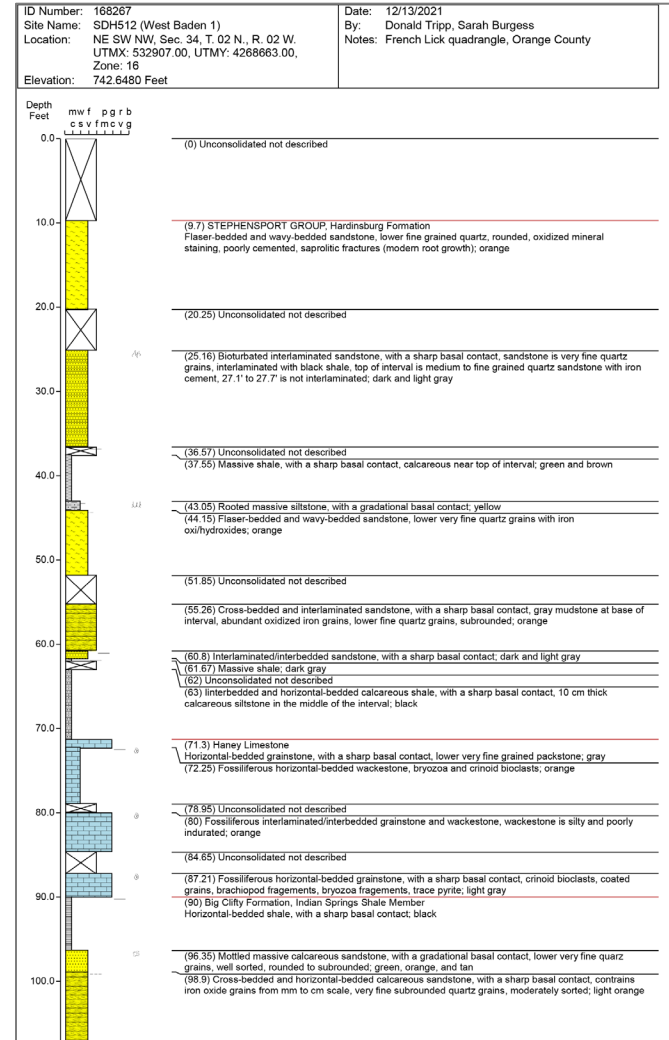


Core description



Describing new & legacy core

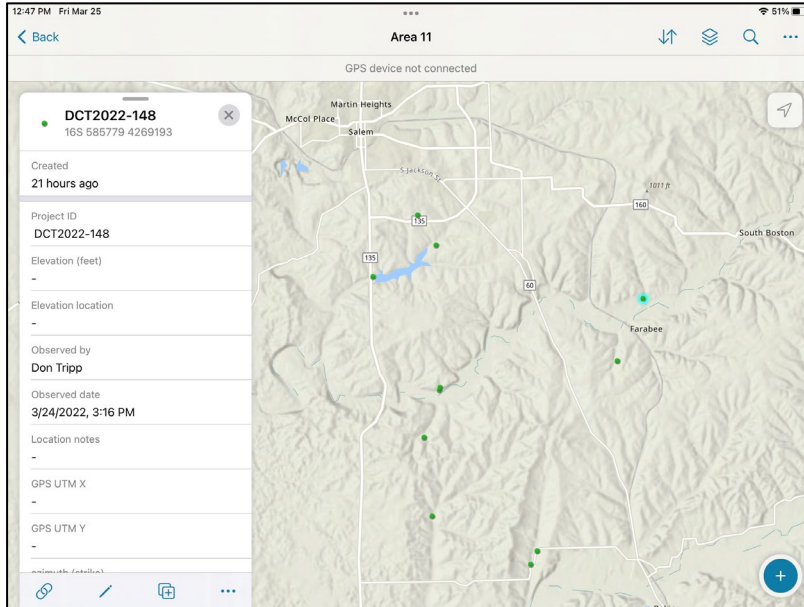
- Entered in an in-house program, “Column”
- Data to be added to main data base used for surface creation



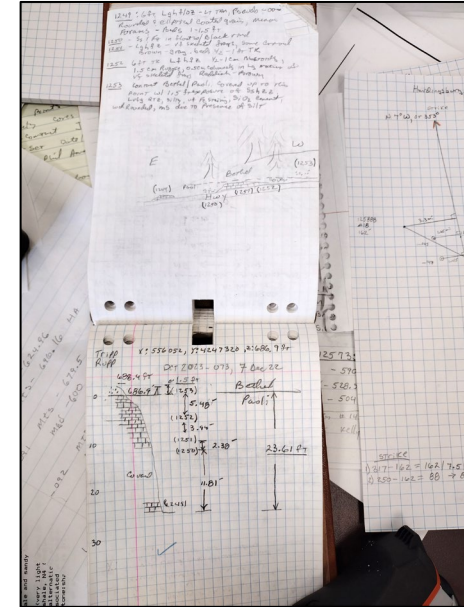
Field surveys of exposures



Field Notes



ArcGIS Field Collector Application



Field notebook

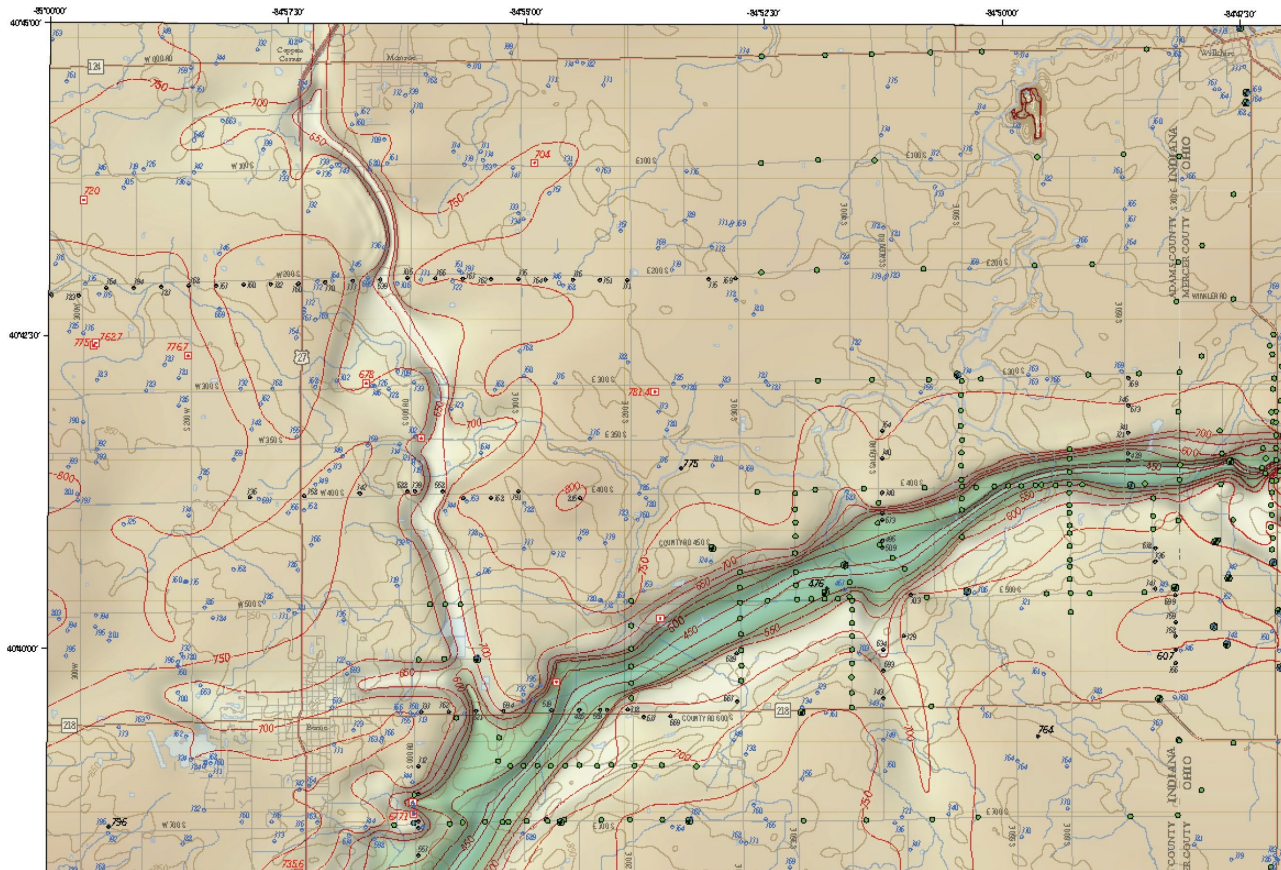
- Collector app combined with traditional field notes allows for quick data collection
- X, Y, and Z coordinates are contained within the collector application
- Detailed descriptions of rock units are written in the field notebook to be entered later back at the office



HVSR data collection

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

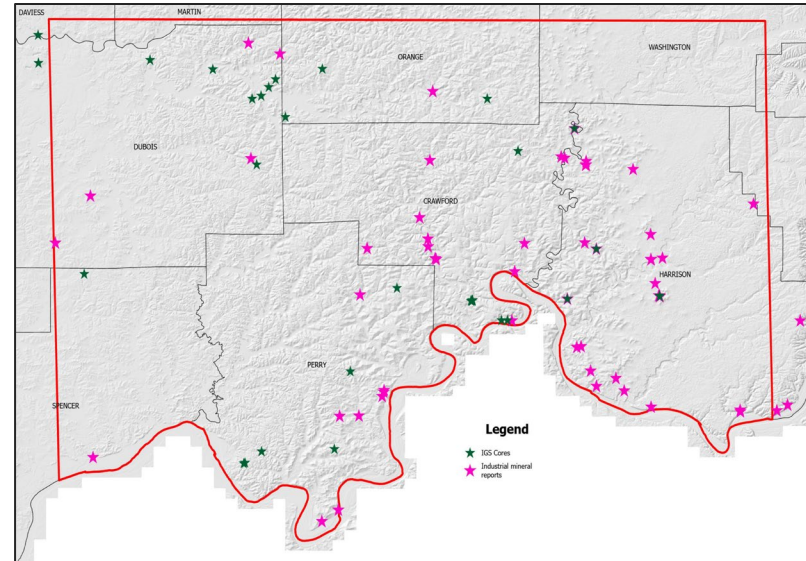
- Used for bedrock topography



Additional data sources



Legacy field maps from previous research



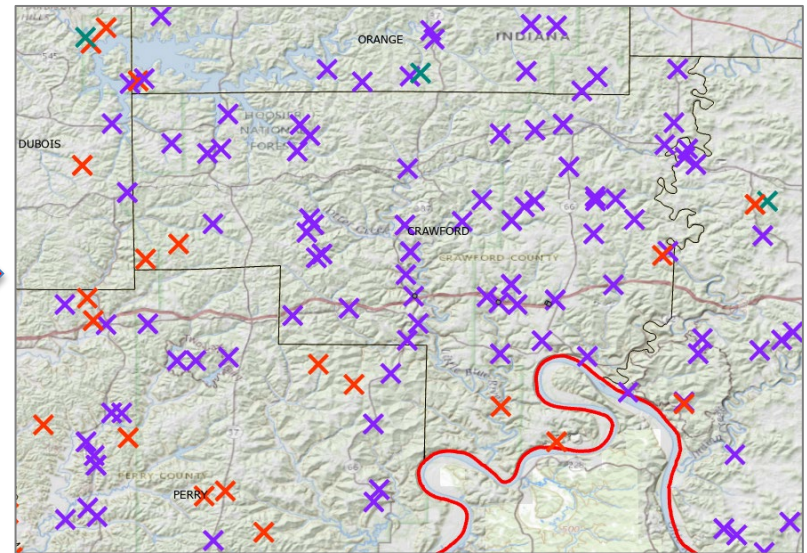
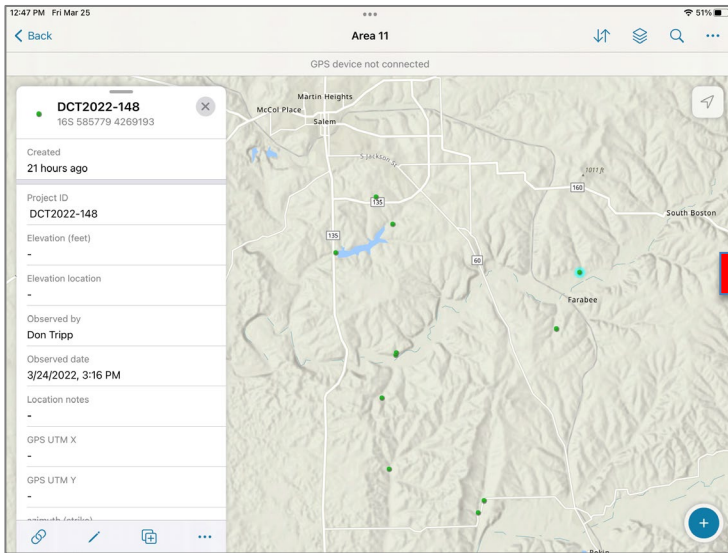
- Quarry industrial mineral reports
Driller and geophysical logs from previous boreholes:
- DOT Geotech
 - oil & gas exploration
 - water wells
 - gamma logs, etc.

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

The screenshot displays the ArcGIS Desktop interface. The main map shows a topographic view of a region with several location points marked with 'X' symbols. The points are labeled DCT2023_145, DCT2023_146, DCT2023_147, and P-125941. The map includes labels for roads like SAINT ISIDORE RD and CO RD, and rivers like Middle Fork Anderson River. The scale is 1:34,429.

The Attributes window on the right shows the details for the selected point (OBJECTID 241). The attributes include:

Attribute	Value
OBJECTID	241
originalID	DCT2023_147
surfaceElevationFt	450.71
surfaceElevationSource	exposure
surfaceElevationConfidence	High
totalDepthFt	<Null>
dataSource_ID	<Null>
notes	SR 145, 250 meters south of CR 160 intersection
locationType	outcrop
locationConfidence	Medium
siteRank	<Null>
locationName	<Null>
observedBy	Tripp, Feller
verifiedBy	<Null>
verifiedDate	<Null>
Confidential	no
GlobalID	{67E506AB-7FDB-4AD1-9D7E-6925CC7934F3}
ObservedDate	2/22/2023

The bottom table shows a list of location points with their attributes:

OBJECTID	originalID	surfaceElevationFt	surfaceElevationSource	surfaceElevationConfidence	totalDepthFt	dataSource_ID
183	215	597.88	exposure	High	<Null>	<Null>
184	173	570.99	exposure	<Null>	<Null>	<Null>
185	175	500.58	exposure	<Null>	<Null>	<Null>
186	239	553.78	exposure	High	<Null>	<Null>
187	240	508.61	exposure	High	<Null>	<Null>
188	241	450.71	exposure	High	<Null>	<Null>
189	216	<Null>	<Null>	<Null>	<Null>	<Null>



Attributes

Selection Layers

Change the selection.

- StratPicksLegacy_FieldCollection : Location points (1)
 - 241
 - StratPicksLegacy_FieldCollection

Attributes Geometry Attachments (0)

OBJECTID	241
originalID	DCT2023_147
surfaceElevationFt	450.71
surfaceElevationSource	exposure
surfaceElevationConfidence	High
totalDepthFt	<Null>
dataSource_ID	<Null>
notes	SR 145, 250 meters south of CR 160 intersection
locationType	outcrop
locationConfidence	Medium
siteRank	<Null>
locationName	<Null>
observedBy	Tripp, Feller
verifiedBy	<Null>
verifiedDate	<Null>
Confidential	no
GlobalID	{67E506AB-7FDB-4AD1-9D7E-6925CC7934F3}
ObservedDate	2/22/2023

Auto Apply

Apply Cancel

Applicable location information entered in the various fields



Attributes

Selection Layers

Change the selection.

- StratPicksLegacy_FieldCollection : Location points (1)
 - Skyline well # 1
 - StratPicksLegacy_FieldCollection
 - P-125941
 - P-125941
 - P-125941
 - P-125941
 - P-125941
 - P-125941
 - P-125941
 - P-125941
 - P-125941

Attributes Attachments (0)

OBJECTID	691
originalID	P-125941
topDepthFt	477
topElevationFt	190
bottomDepthFt	535
bottomElevationFt	132
horizonLocation	horizon (contact)
unitLocationConfidence	High
dataSource_ID	<Null>
thicknessFt	58
geologicSystem	Mississippian
geologicGroup	Stephensport Group
geologicFormation	Big Clifty Formation
geologicMember	<Null>
geologicBed	<Null>
mapUnitAbbreviation	Mbcy
TopSource	geophysical log
TopRank	<Null>

Auto Apply

Apply Cancel

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

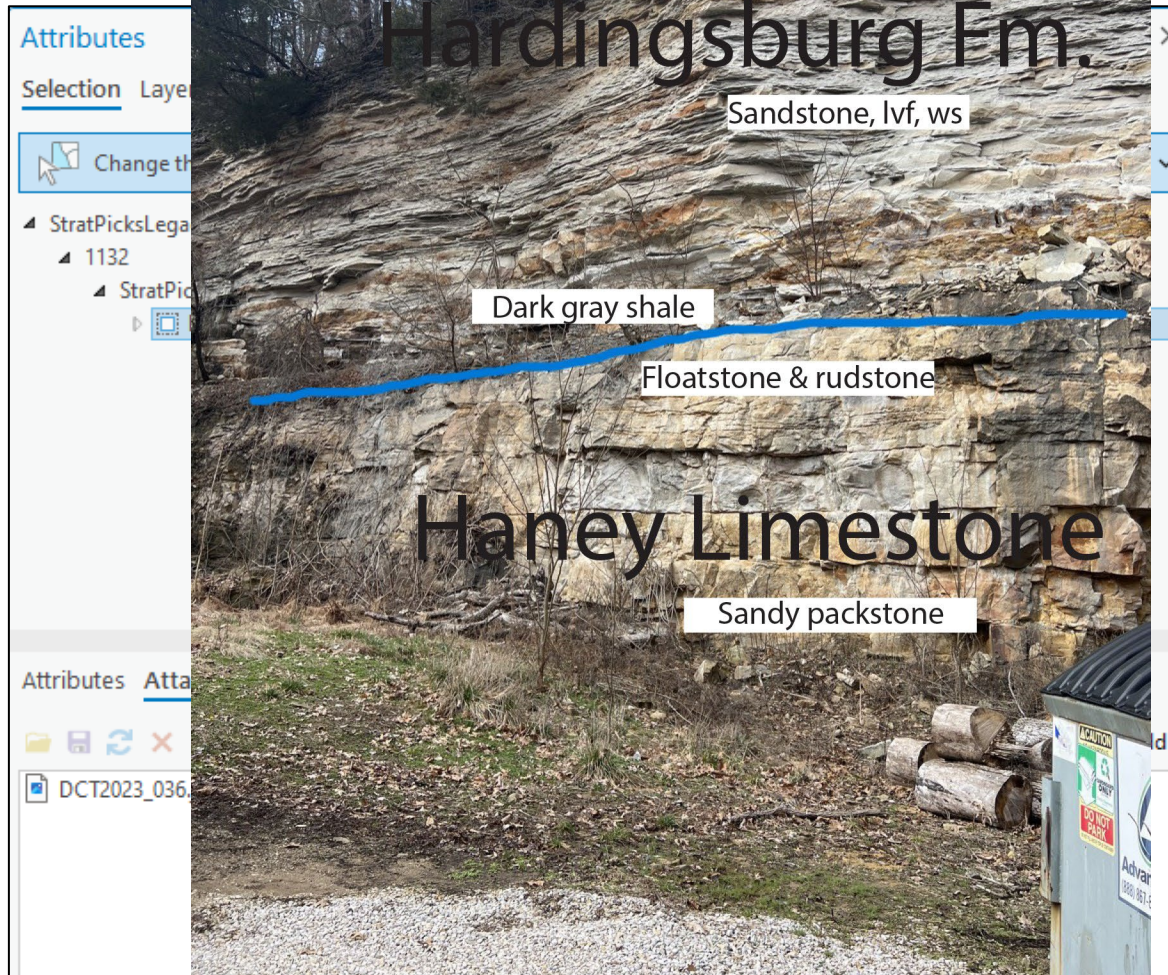
Relationship for each rock formation located at this data point is created

Purpose is so that a definition query can be run on each individual formation top when creating formation surfaces



Photos can be taken in the field or at the back at the

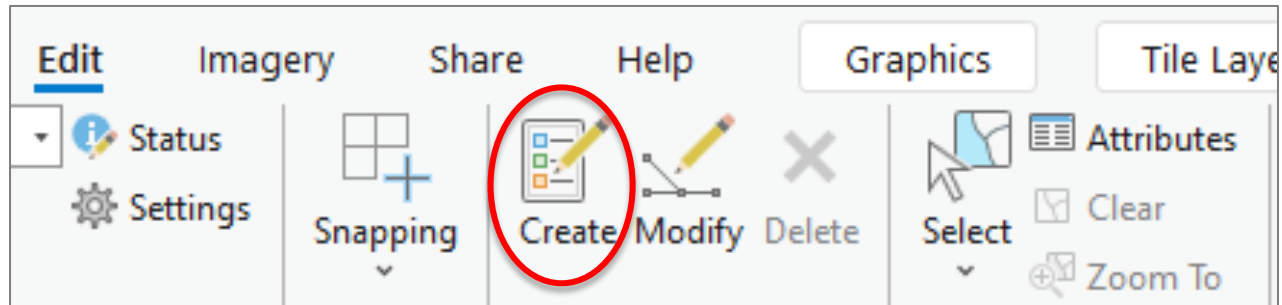
map in the field or at the back at the



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:

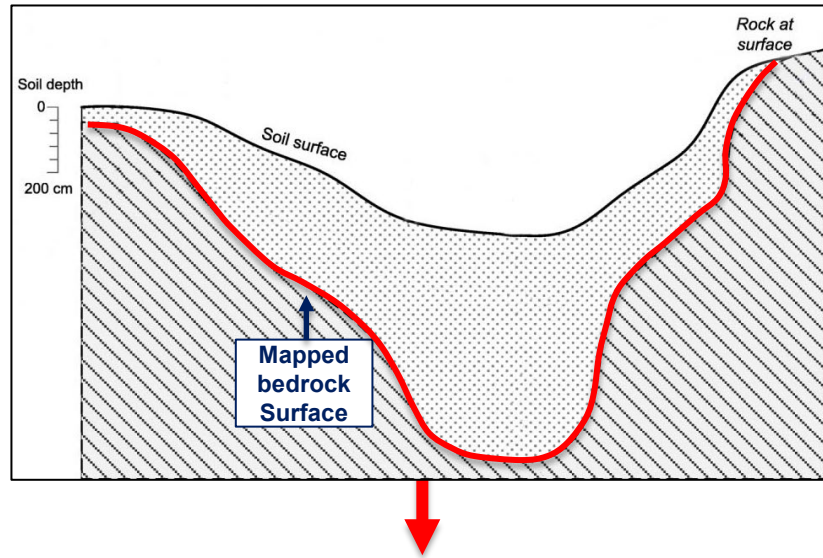
- Field notes/work maps
- Recent and old subsurface data

III. Map construction

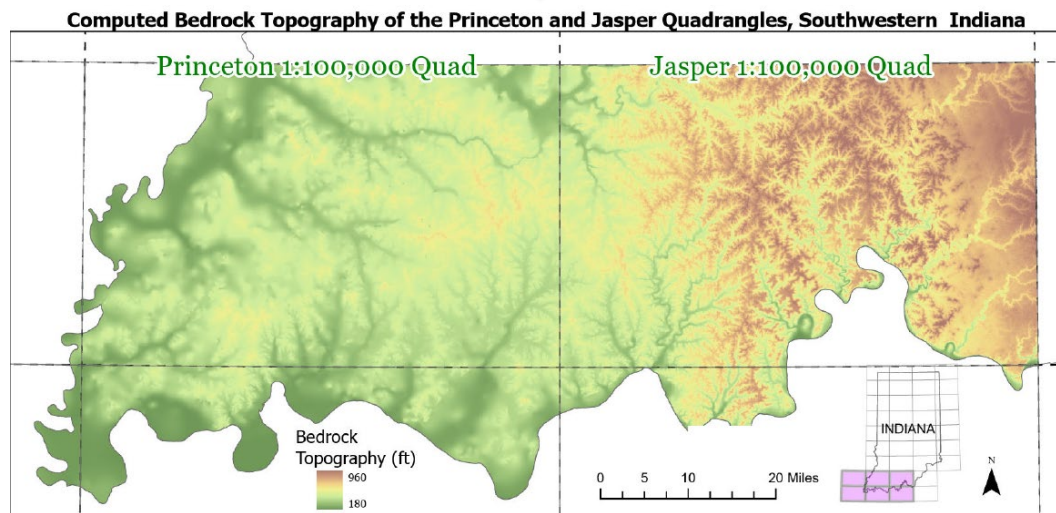
- A. Create bedrock topography map
 - 1. Using data sets containing depth to bedrock

- B. Run geologic surface modelling tool using
 - 1. Database containing all data entries
 - 2. Inferred data points

A. Create bedrock topography map

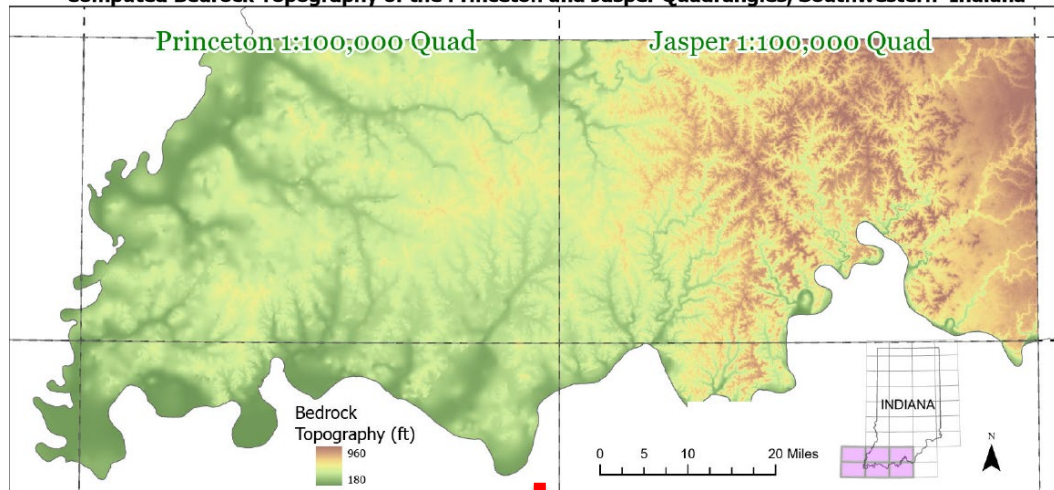


Bedrock surface topography



Bedrock Surface topography map

Computed Bedrock Topography of the Princeton and Jasper Quadrangles, Southwestern Indiana



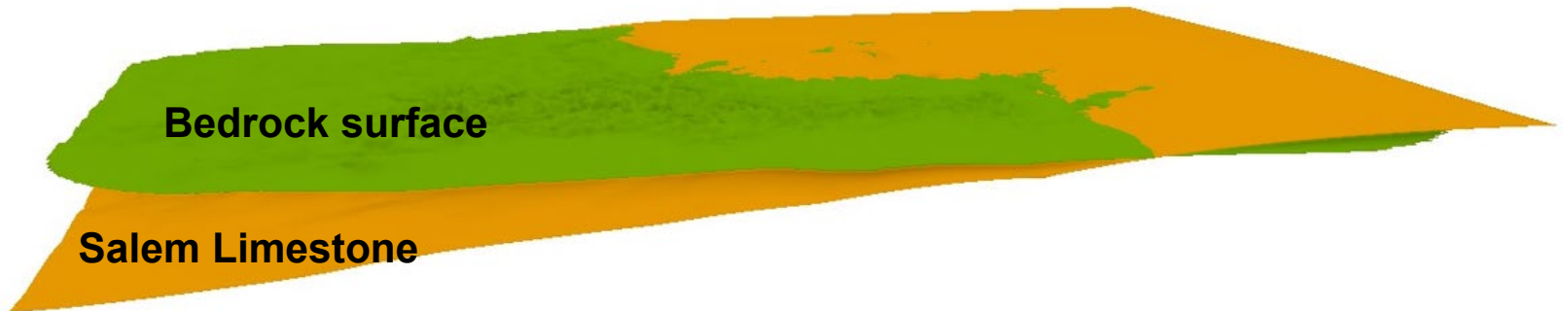
Bedrock surface topography map



Bedrock Surface topography raster

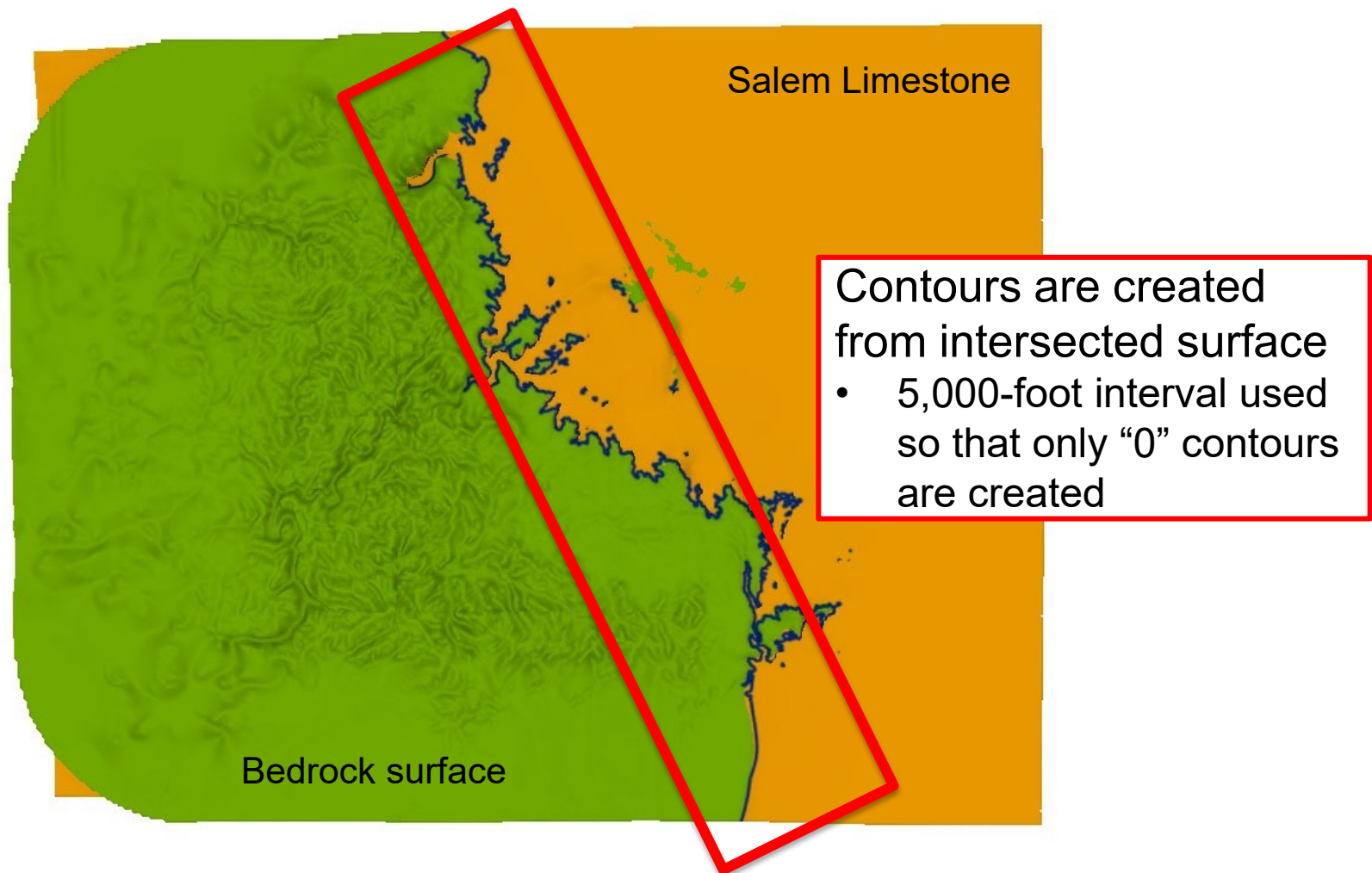
- Clipped to area of interest

B. Create geological surface

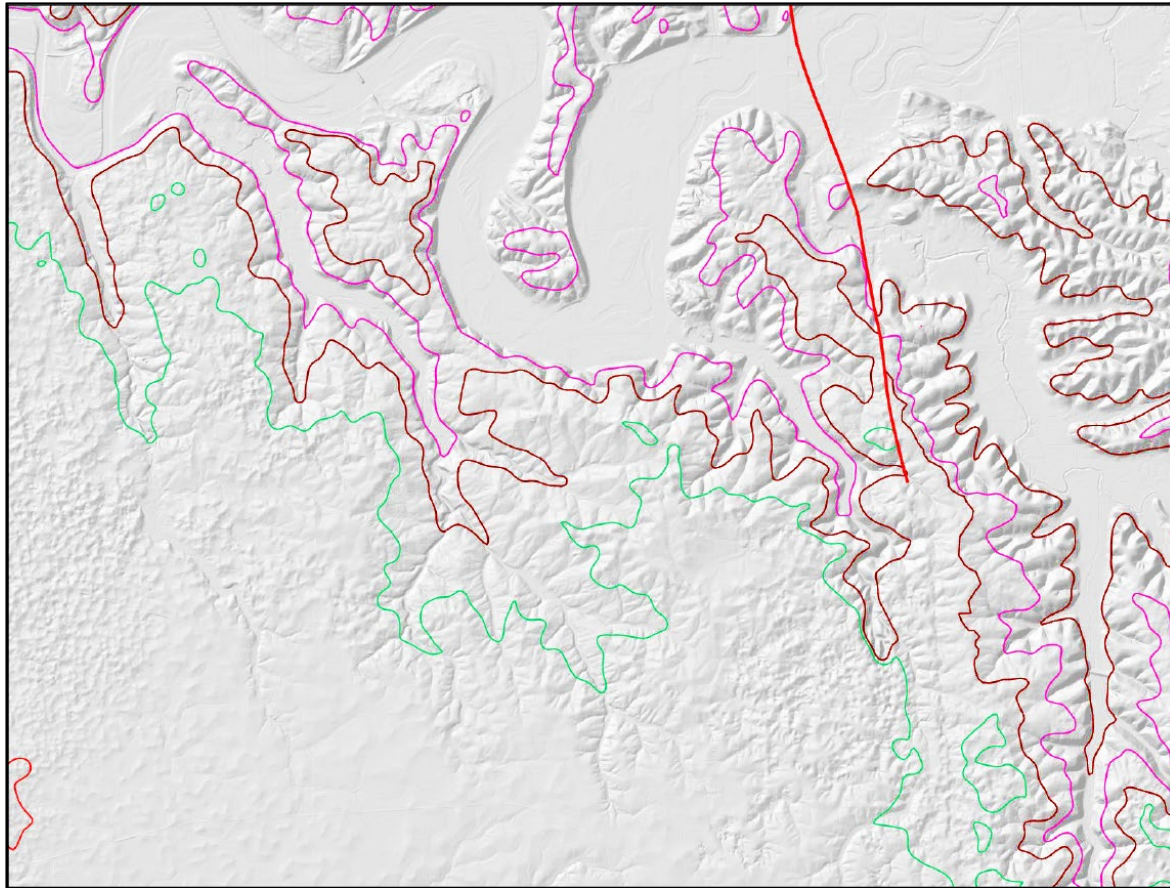


Created geologic surface is intersected with bedrock topographic surface (BRS)

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

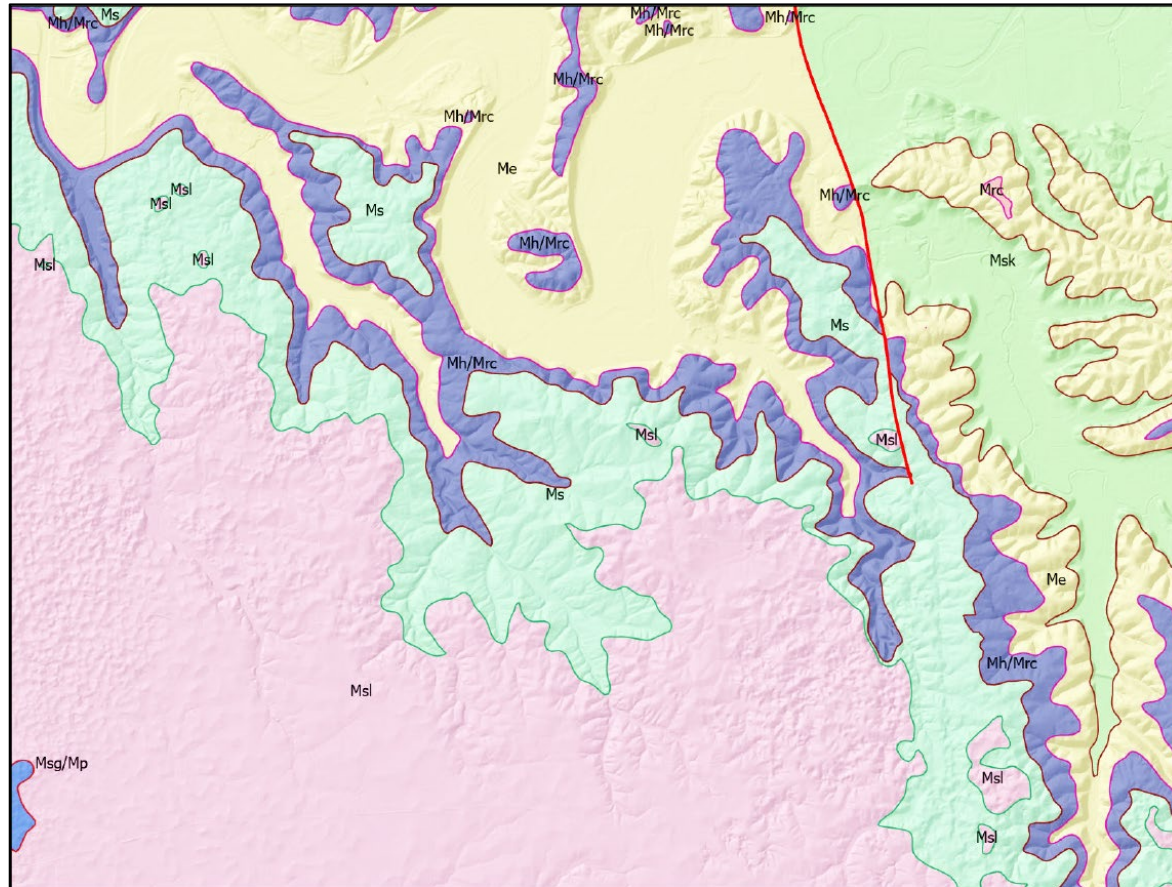


Example of contacts created from where bedrock & geological surfaces intersect



Depending on the results, inferred data points and hand contouring is sometimes necessary

Polygons are created from finished surfaces

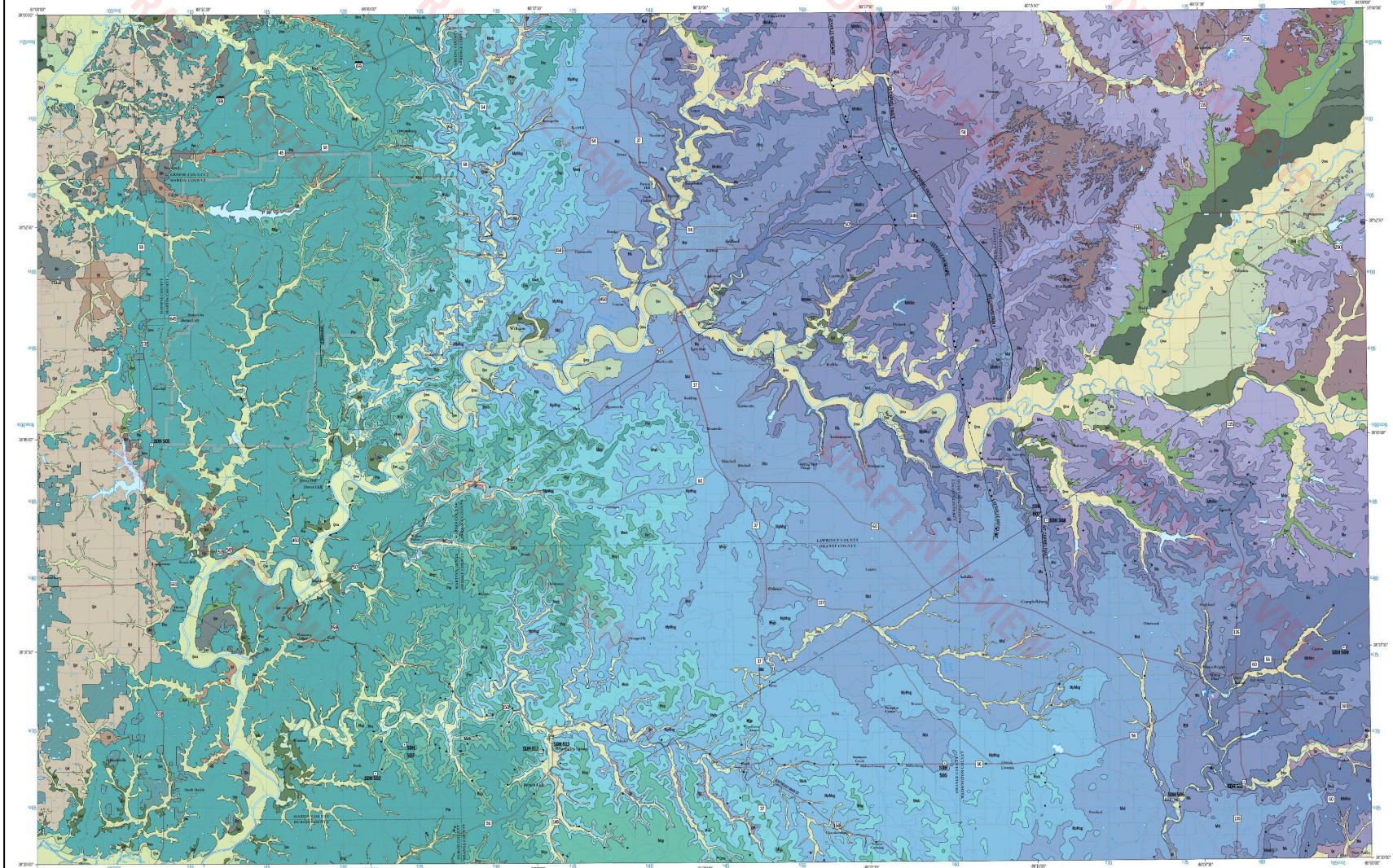


Topology tool used to QC



Preliminary Map of the Bedrock Geology of the Bedford 30- X 60-Minute Quadrangle, Indiana

By
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Bloomington, Indiana
2022



Questions

