

DIGITAL MAPPING TECHNIQUES 2024

The following was presented at DMT'24
May 13 - 16, 2024

The contents of this document are provisional

See Presentations and Proceedings
from the DMT Meetings (1997-2024)

<http://ngmdb.usgs.gov/info/dmt/>

StraboSpot2 For Geologic Data Organization, Integration, and Collaboration

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ABSTRACT

StraboSpot2 is a Geographic Information System (GIS) platform engineered to support geologic mapping, primarily for mobile devices digitally. StraboSpot2 field app is built on the core concepts and successes of its predecessor, StraboSpot Mobile, with a revamped user interface (UI) and an expandable design, allowing for the addition of multiple disciplines and industries. The technical structure of StraboSpot2 utilizes the React Native framework, allowing more effective use of native sensors, native UI, and a philosophy of “write once run everywhere,” which can be written and used on multiple platforms (i.e., iOS, Android, web). The key to StraboSpot2's functionality is its backend infrastructure, community-driven lexicon, and workflows, enabling users to efficiently organize, manage, and analyze geospatial data. The platform's exporting functionality empowers users to export data in various formats, enhancing interoperability and facilitating collaboration.

The backend infrastructure of the StraboSpot data system is hosted at the JetStream2 supercomputer center at Indiana University. The JetStream2 cloud infrastructure ensures that the StraboSpot data system has the resources to maintain data integrity and network reliability. To complement this, the StraboSpot data system also employs a graph database (Neo4j) that allows data to be easily stored in a hierarchical fashion, maintaining complex parent-child relationships using nodes, edges, and properties. The StraboSpot data system uses a fully customizable API for transferring data, which has the added benefit of being source-agnostic, meaning anyone can write software to leverage the API to download and upload data to the StraboSpot data system.

The StraboSpot data system provides a mechanism called “StraboSpot My Maps,” which allows users to upload a spatially referenced GeoTIFF file and receive a unique code that can be entered into the StraboSpot2 field app to add a custom map to the field app interface. This functionality allows users to use their own custom-defined maps and means that they don't have to rely on the Strabo-provided map layers when collecting data.

StraboSpot's custom backend architecture can be easily transferred and hosted between other hosting systems using Docker containers. We currently provide a Docker container called "StraboSpot Offline" that allows users in the field to host their own offline backend with no internet connection required.

To enhance the workflow and collaboration efforts for the StraboSpot2 field app, we worked with discipline-specialized community teams to create lexicons used by StraboSpot for structural geology, rocks, minerals, and sedimentology. This information is organized into pages in the StraboSpot2 field app. Each page has its form and corresponding data input parameters. Some common fields for data input include basic text and numeric inputs, select boxes (pick lists for single or multiple choices), dates, timestamps, and sliders.

Customization of these forms is currently handled in two ways. The first is through the 'Other' option in most pick lists. This allows the user to input vocabulary that is not already defined in StraboSpot. The second way is by incorporating new forms during the development process. Community users found that the preset vocabulary didn't fulfill the needs for earthquakes, tephra, and site safety data, so their teams approached the StraboSpot team about creating custom pages with their lexicon. Their user teams met to formalize their vocabulary. Then, they created forms on the user-friendly form builder website, KoBoToolbox, which would capture the data they wanted. The StraboSpot development team could then incorporate the forms from KoBoToolbox into new pages in the app. Page visibility can be toggled independently on or off for each page so users can decide if specific pages are useful for their workflow.

Outside of forms, another powerful tool for customizing data in StraboSpot is the use of Tags. Tags can be applied to Spots and to specific features within Spots. Any number of Tags can be applied. There are a few predefined Tags, but users can also define their own Tags. Tags allow the user to group their data in ways that support their workflows.

Once user-generated field data has been uploaded to the StraboSpot data system, there are many download options available:

Shapefile: ESRI-compatible shapefile format suitable for use with many standard GIS software packages.

KMZ: The Google KMZ file format is suitable for use in Google Earth, Google Maps, and common GIS software packages.

XLS: Common spreadsheet format.

Stereonet Mobile: File format compatible with Rick Allmendinger's excellent Stereonet software.

Field Book: File format containing a summary of all data in a PDF file, suitable for sharing without special software.

In summary, StraboSpot2 represents a transformative leap forward in GIS technology, offering a powerful and versatile spatial analysis and mapping platform. By combining robust data management, advanced analytics, and intuitive visualization tools, StraboSpot2 empowers users to tackle complex spatial challenges and unlock insights that drive informed decision-making and innovation.



StraboSpot2



For Geologic
Data
Organization,
Integration,
and
Collaboration

What Is StraboSpot2?

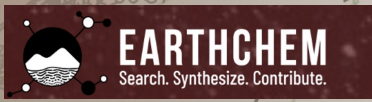
- GIS for Geologic Mapping
 - StraboSpot2 (2021)
 - StraboSpot Mobile (2018)
 - Tablets & Phones (iOS & Android)
 - Web (updated)
- Improvements over manual collection
 - Speed of entering observations & measurements
 - Data coalescing & processing
 - Sharing



Community Driven



DO GEOLOGY BETTER!!



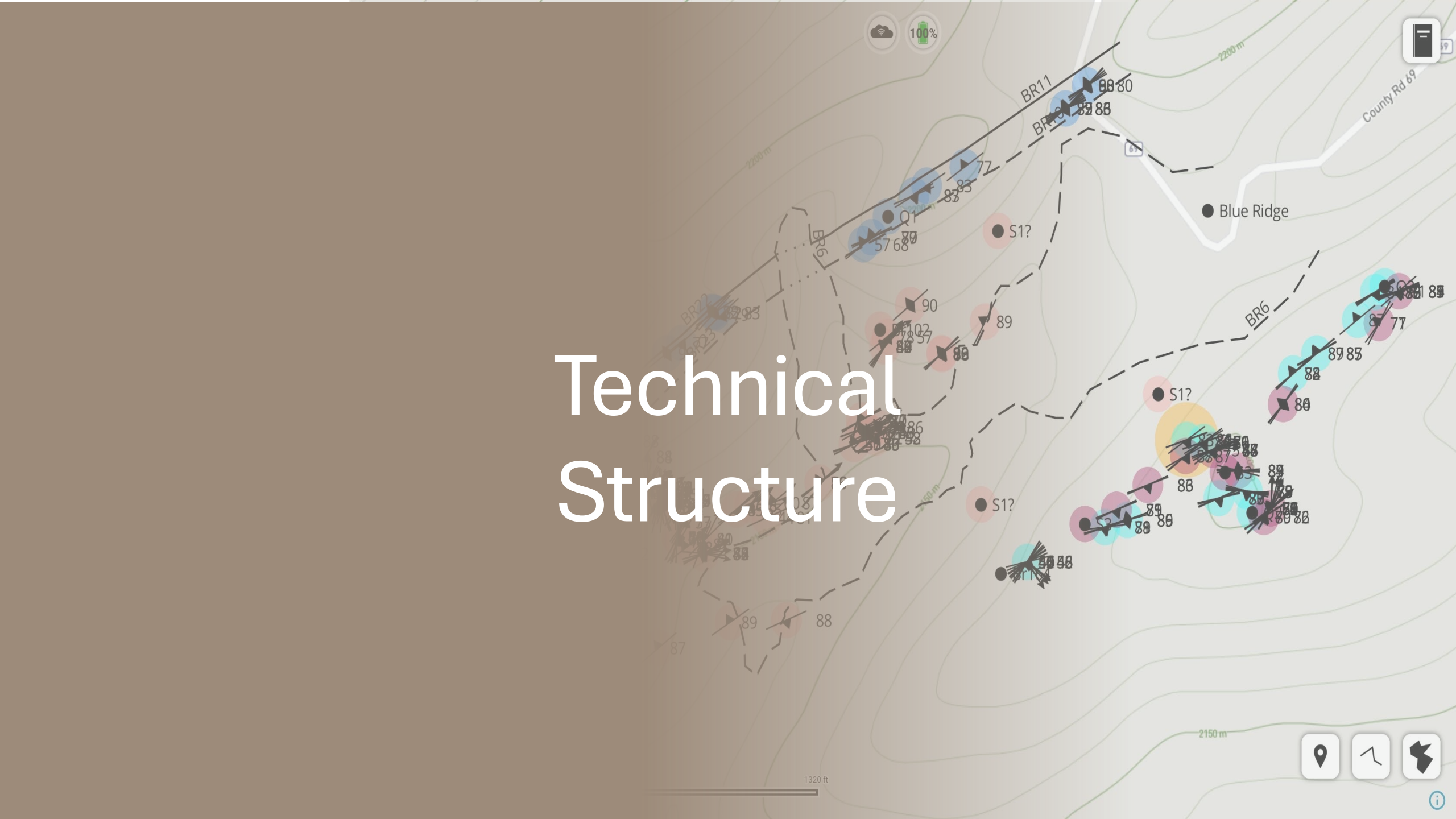
IEDA



Geochron

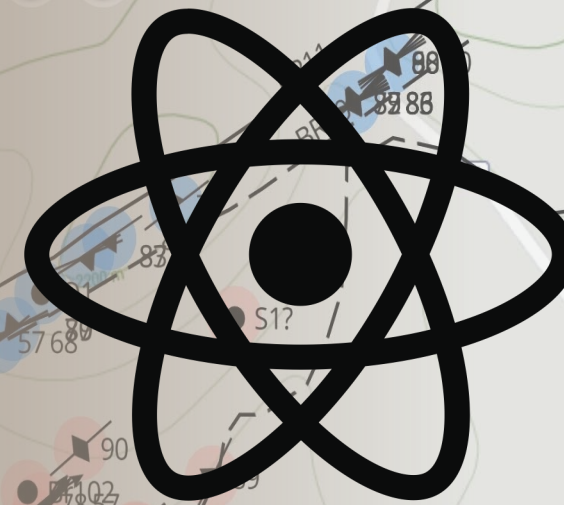


Technical Structure

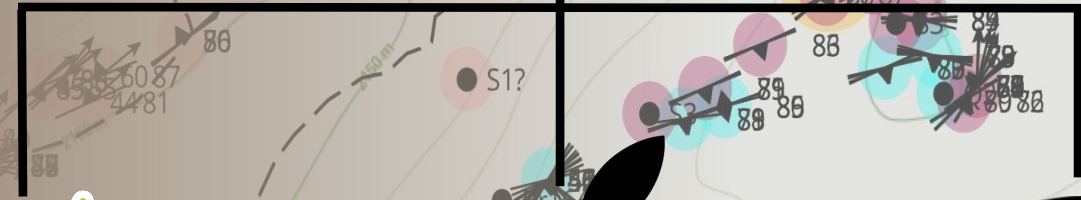


Technical Structure

- React Native framework
 - Cross-platform compatibility (iOS, Android, web)
 - Bridged to Java/Kotlin (Android) or Objective-C/Swift (iOS)
 - Better utilize native user interface (UI) themes and sensors
- Similar look and functionality on web



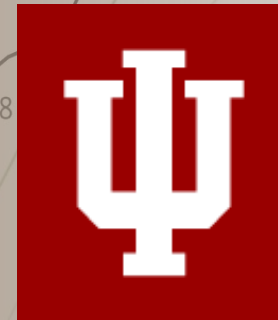
React Native



Backend Infrastructure

- JetStream2
 - University of Indiana
 - NSF Funded
 - StraboSpot has 20 terabytes reserved
 - Cloud infrastructure

JetStream2



Backend Infrastructure

- JetStream2
 - University of Indiana
 - NSF Funded
 - StraboSpot has 20 terabytes reserved
 - Cloud infrastructure
- Neo4j graph database
 - Hierarchical data storage
 - Fully customizable API
- Complex parent-child relationships
 - Nodes, Edges, and Properties
 - Complex multi-generational nested relationships



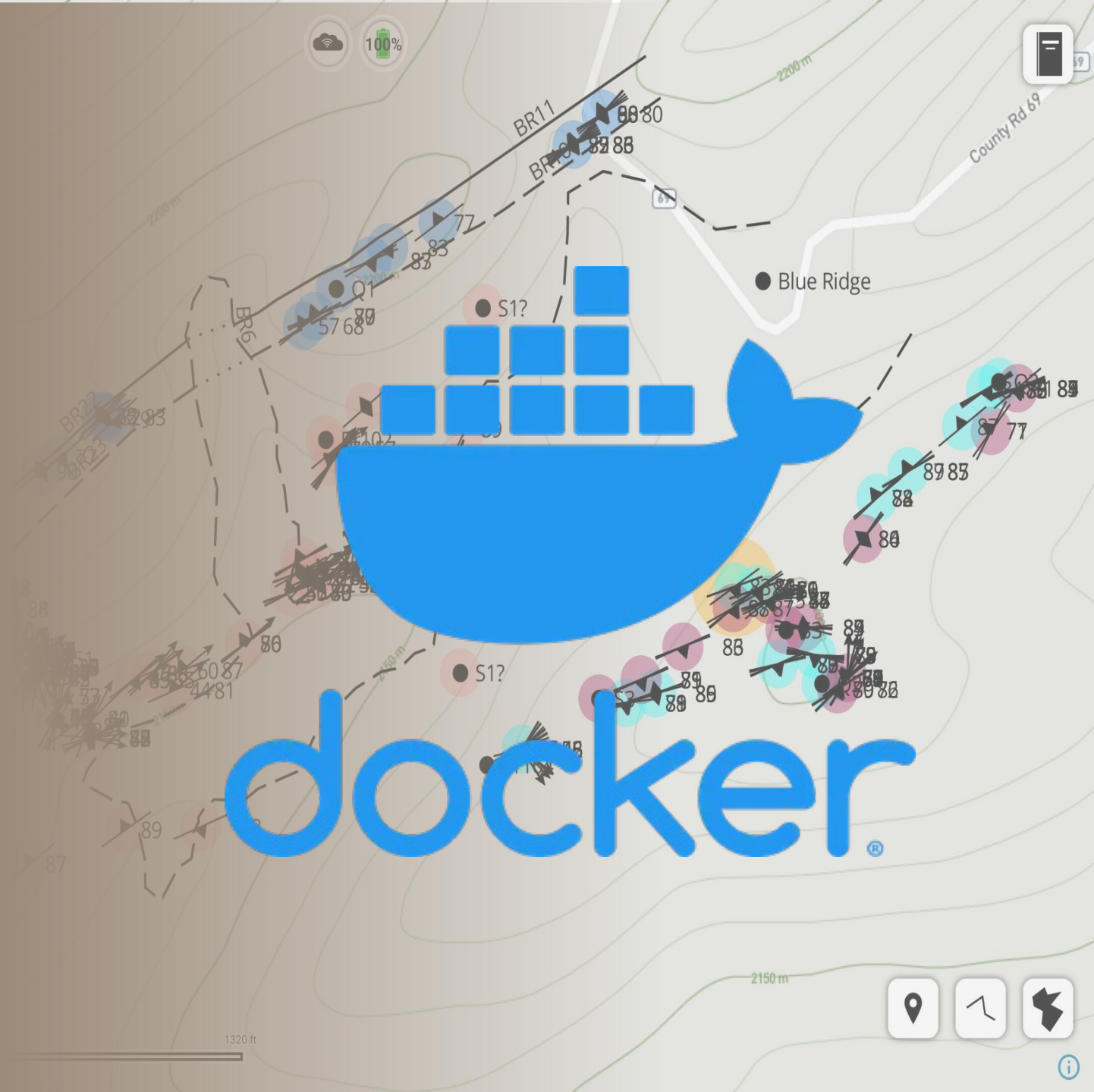
Jetstream2



neo4j

Docker Container

- What is a Docker Container?
 - An isolated environment for your code
- StraboSpot ecosystem can be transferred and hosted
- "StraboSpot Offline"
 - Enables offline backend hosting
 - No internet connection required
 - Custom backend for security



Workflows and Features



► Organized in a hierarchy

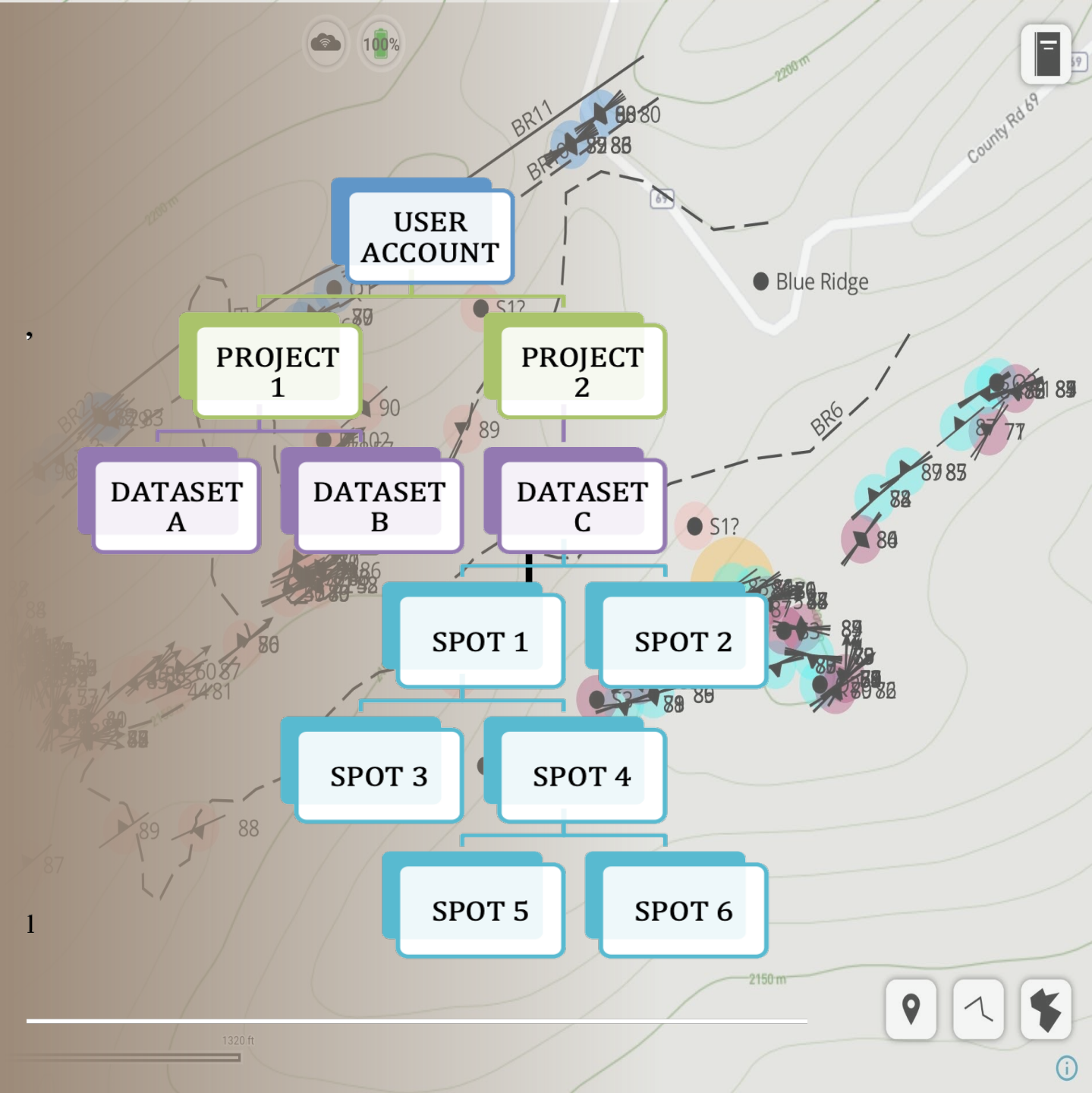
► Project

► Datasets

► Spots

• Spots

- Points
- Lines
- Polygons
- Contain the data
 - measurements,
 - photos,
 - sketches,
 - external links,
 - documents,
 - rocks units
 - and more.



- Virtual Field Notebook

- Pages

- Camera
 - Samples
 - Tags
 - Notes

- Slides in from right

- Doesn't obstruct the map view

- Maps

- Custom
 - Offline
 - Shortcuts

80%

EN5
-114.581161° W, 44.758305° N

GEOLOGIC UNITS

Unit A	Geologic Unit	>
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NOTES

Large outcrop of hornblende biotite tonalite consistent with Unit A. The fabric is mostly magmatic and poorly developed. Foliation is designed by aligned biotite and hornblende.

Fracture pattern is consistent with surrounding outcrops and foliation is consistent with regional patterns so we are confident of attachedness.

MEASUREMENTS

331/51 Foliation	>
315/64 Foliation	>
321/57 Foliation	>

PHOTOS & SKETCHES

Site EN5
[View as Image Basemap](#)
 Use as Image Basemap?

TAGS

Paleomag Site	Documentation	>
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SAMPLES

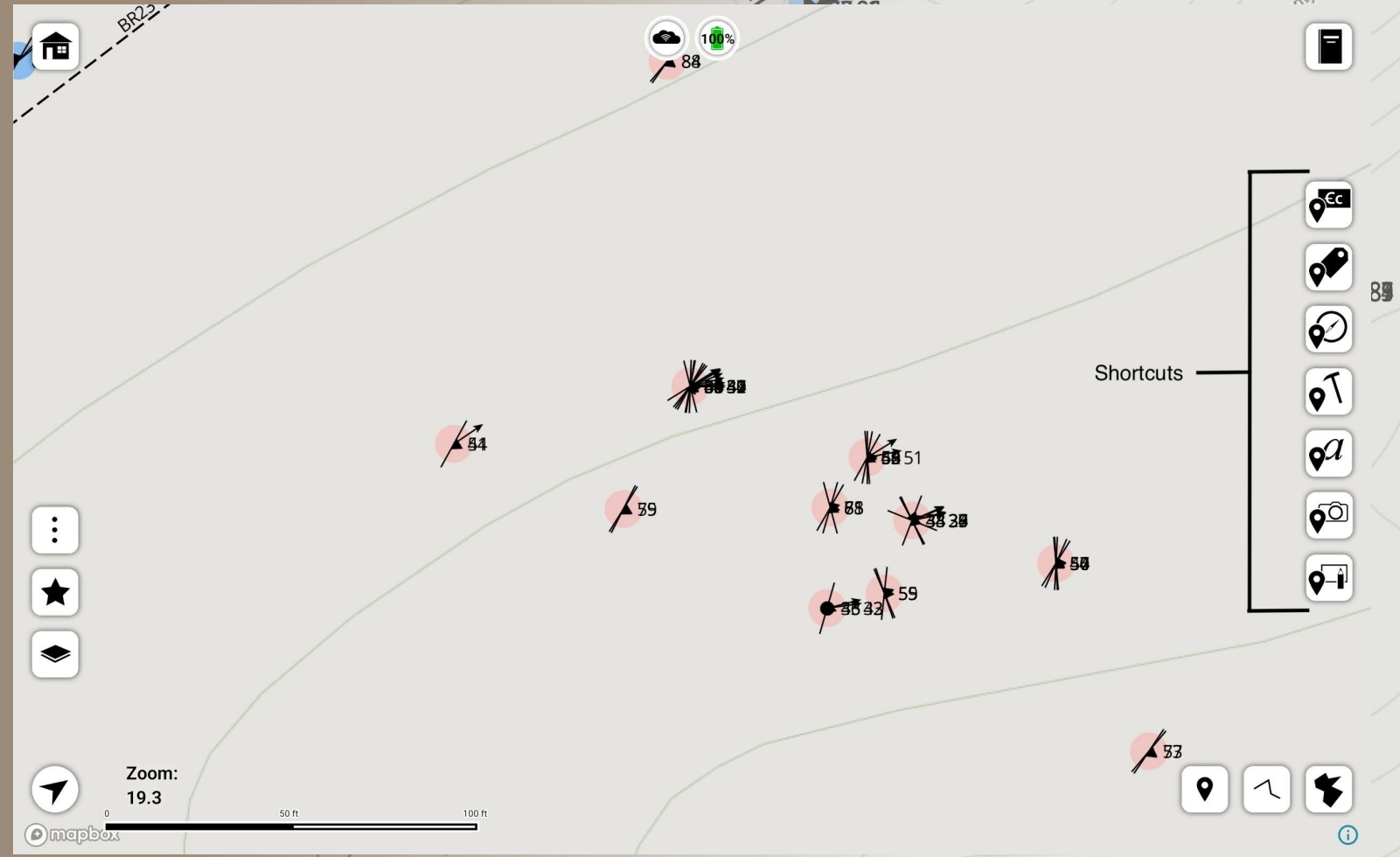
MORE

mapbox

1320 ft

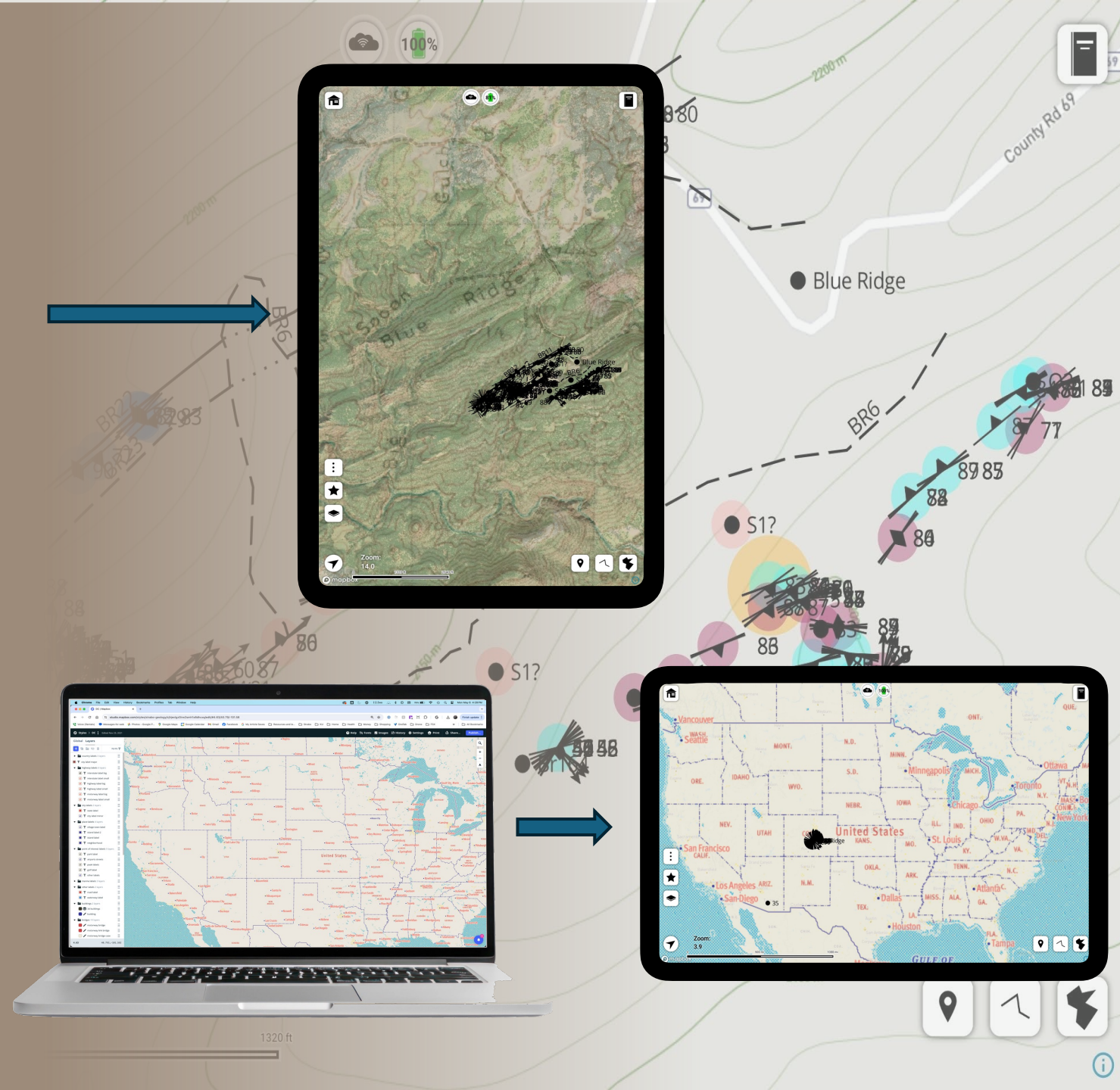
2150 m

- Projects
 - Datasets
- Spots (Stations)
 - Point, line, and polygons
- Notebook
 - Photos
 - Sketches
- Tags
- Maps
 - Custom
 - Offline
 - Shortcuts



Custom Map Integration

- StraboSpot MyMaps
 - Upload custom GeoTIFF files, enhancing mapping flexibility
 - Spatially referenced
 - Users can create and utilize their custom-defined maps
- Mapbox Styles Custom Maps
 - Copy and paste URL into Map Details when adding a custom map



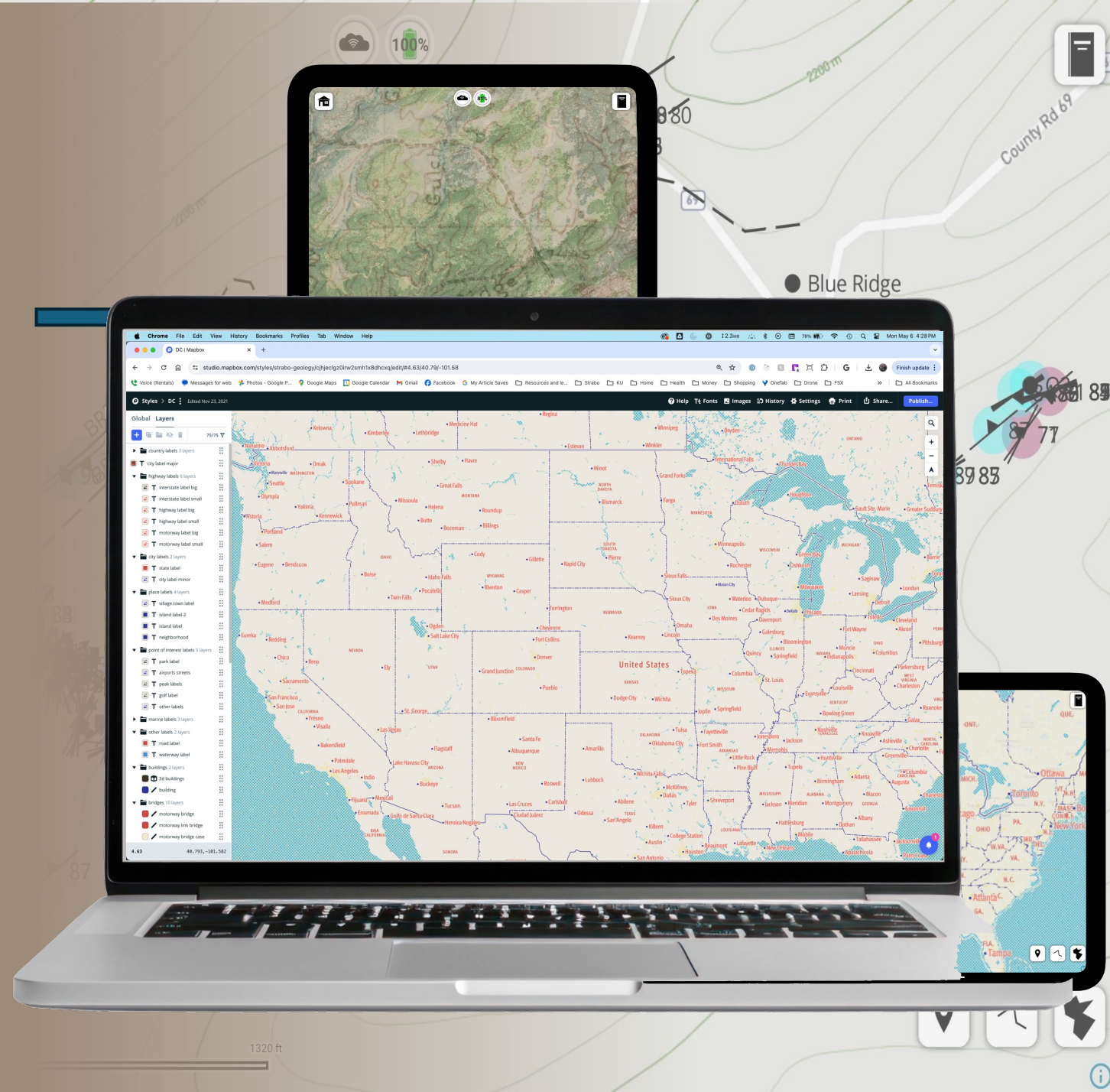
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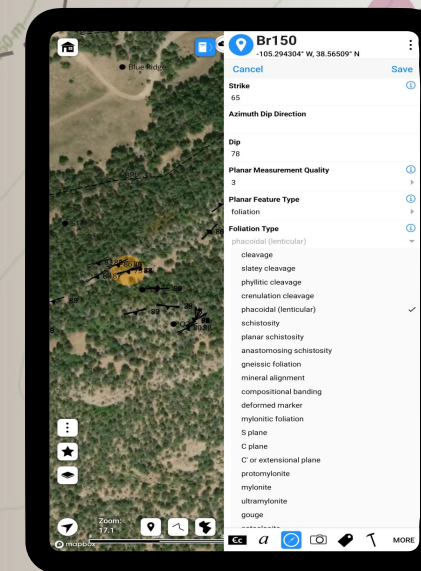
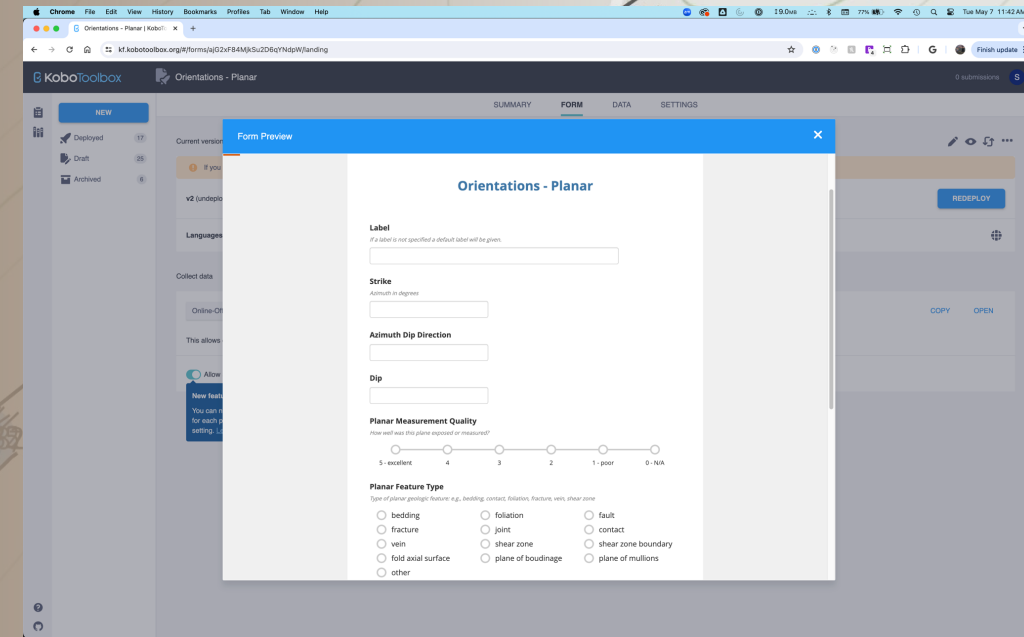
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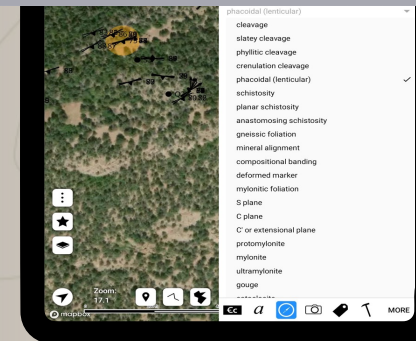
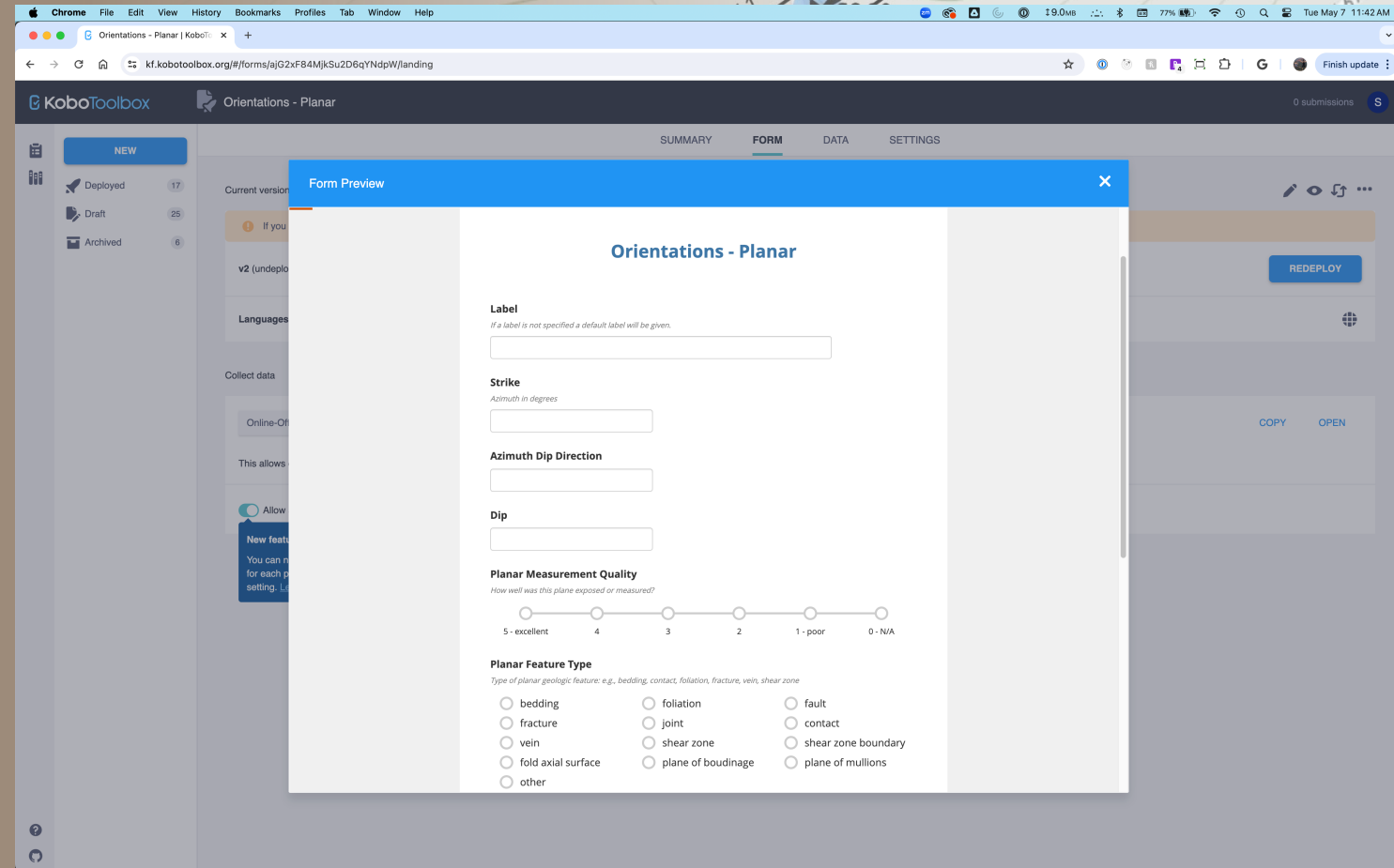
Forms

- Lexicon
 - Structural
 - Petrology
 - Sedimentology
- Data input
 - KoboToolbox => XLSForm
 - Basic text and numeric inputs, select boxes (pick lists for single or multiple choices), dates, timestamps, and sliders
 - Quick-Entry Modals



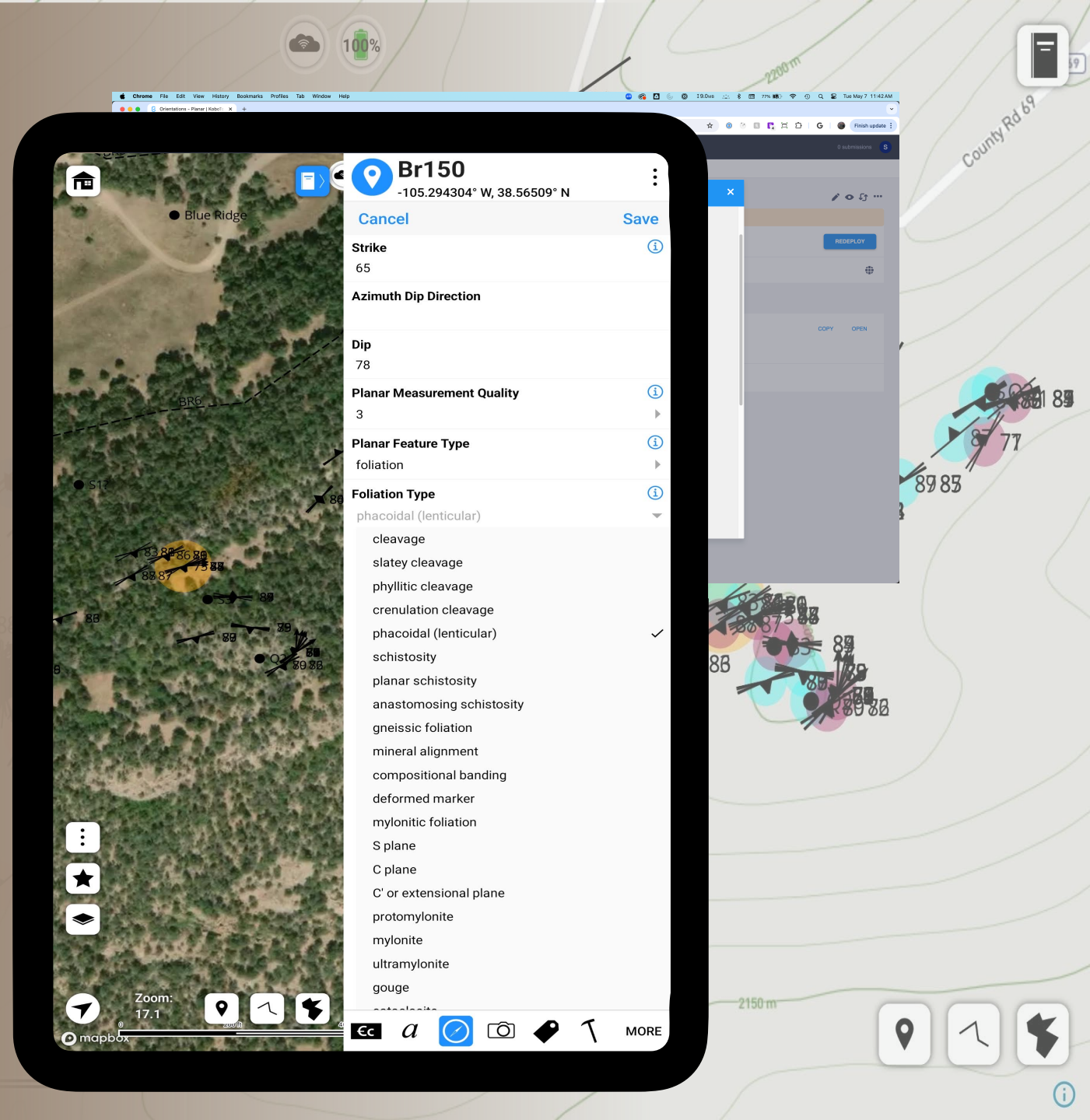
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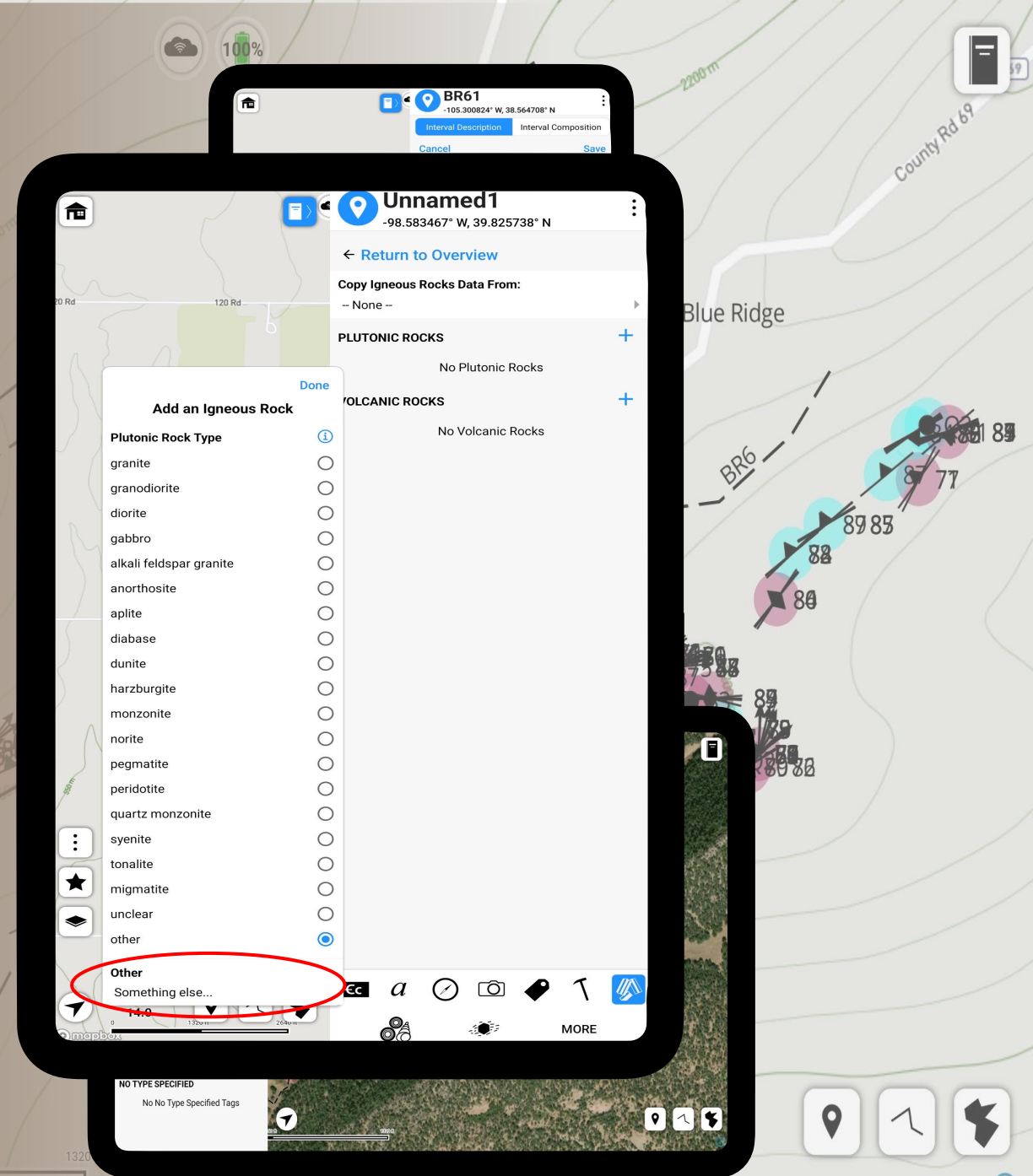
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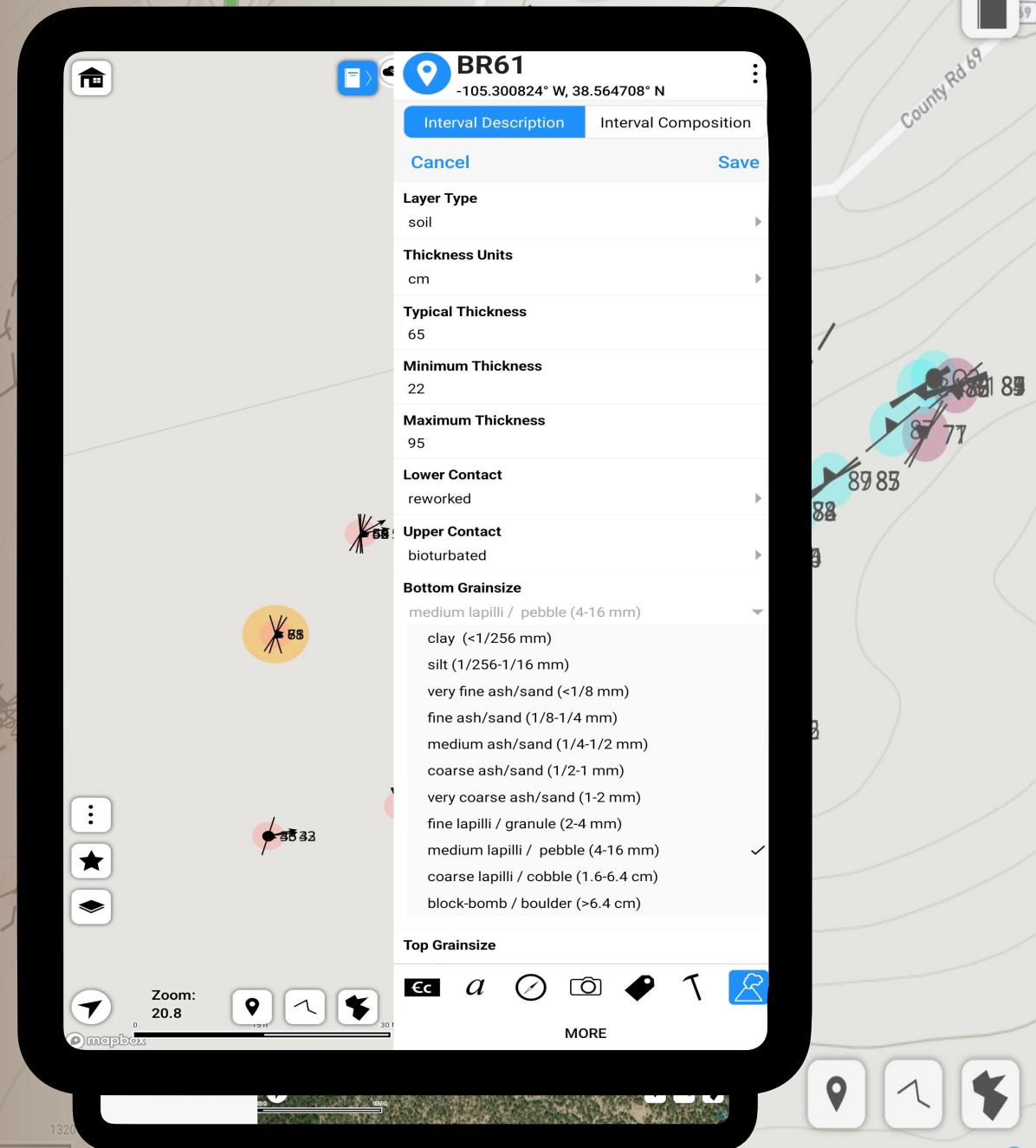
Data Entry Customization

- Pick List 'other' option



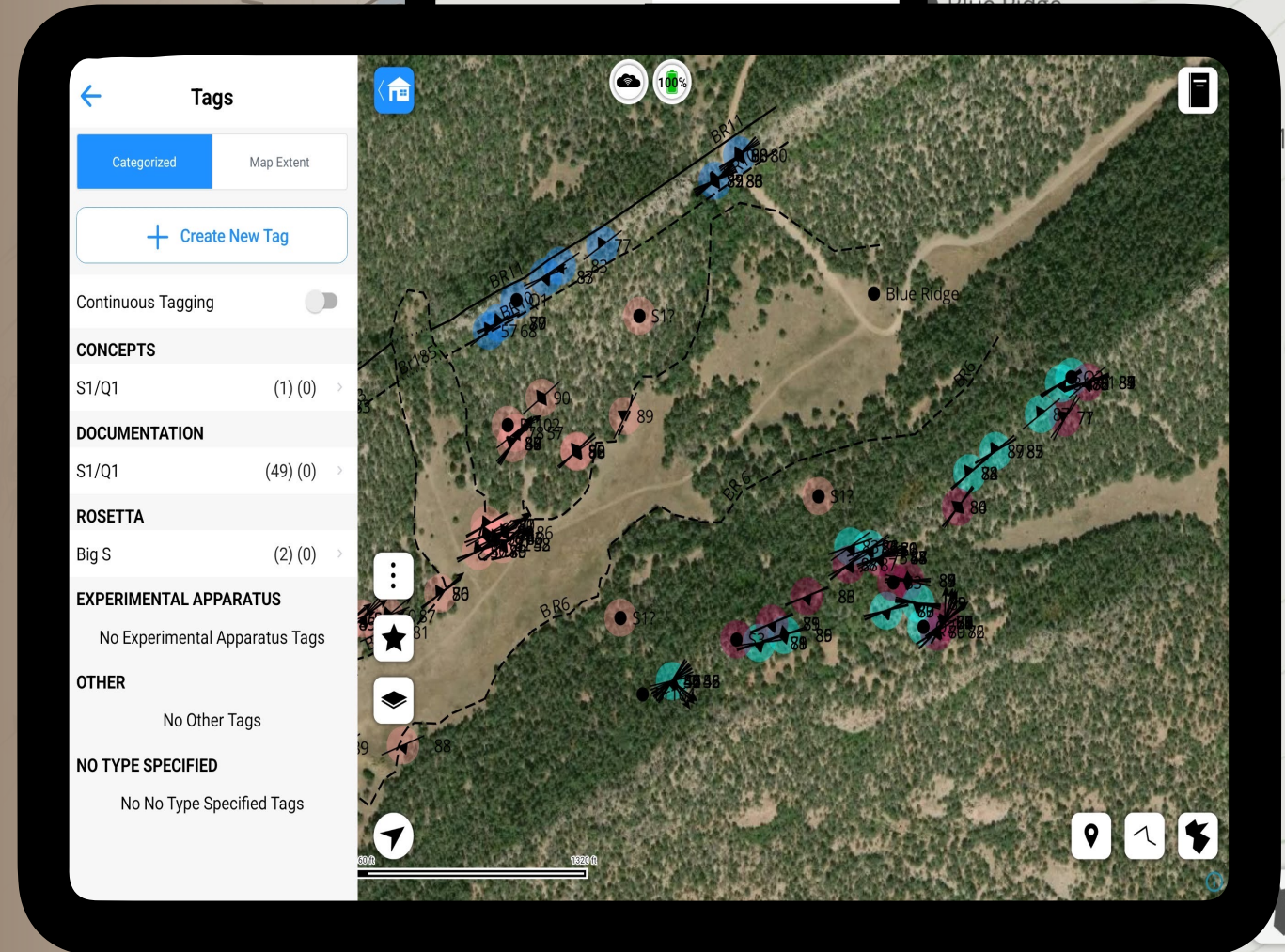
Data Entry Customization

- Pick List 'other' option
- Custom Pages
 - Tephra, Earthquakes, Site Safety
 - Created in conjunction with development team
 - Page visibility can be toggled

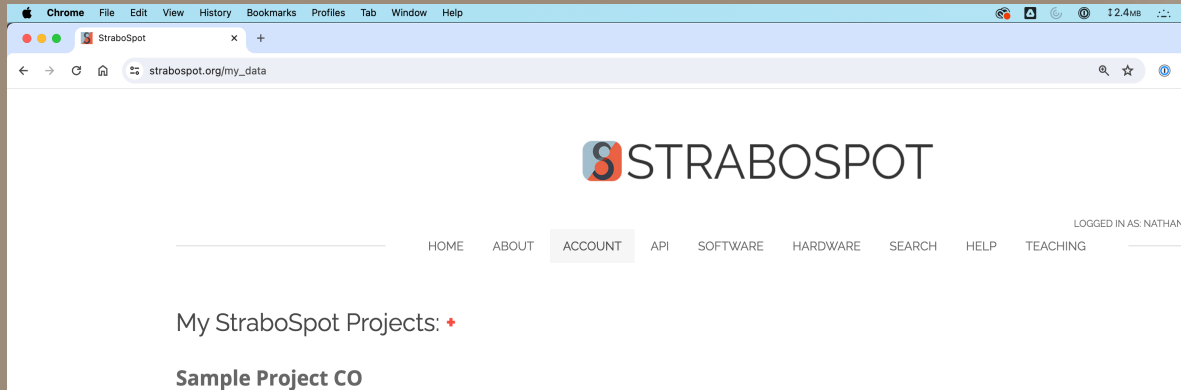


Data Entry Customization

- Pick List 'other' option
- Custom Pages
 - Tephra, Earthquakes, Site Safety
 - Created in conjunction with development team
 - Page visibility can be toggled
- Tags
 - Spots and features
 - Assigned Color
 - Predefined and user generated



Downloading and Importing



Sample Project CO

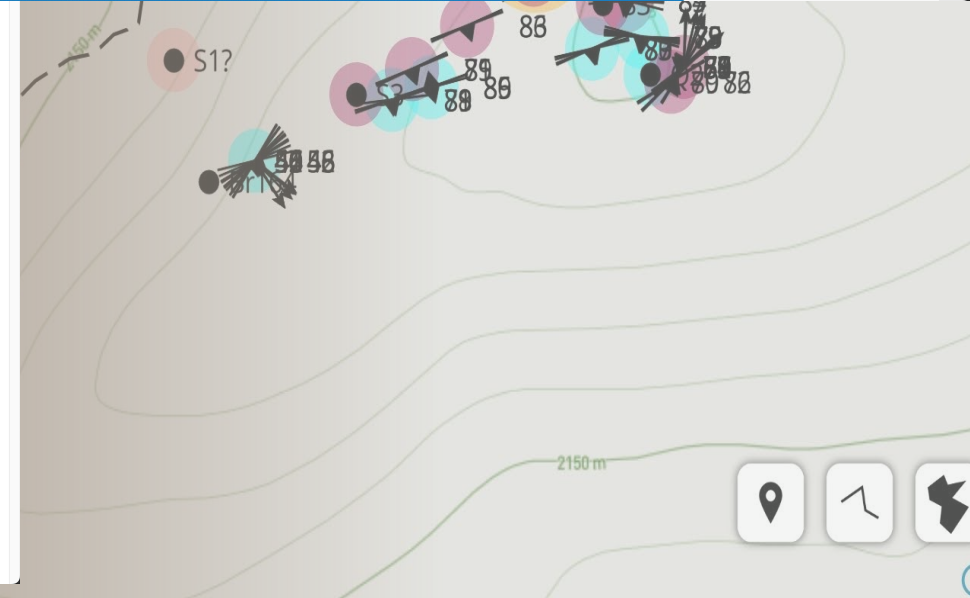
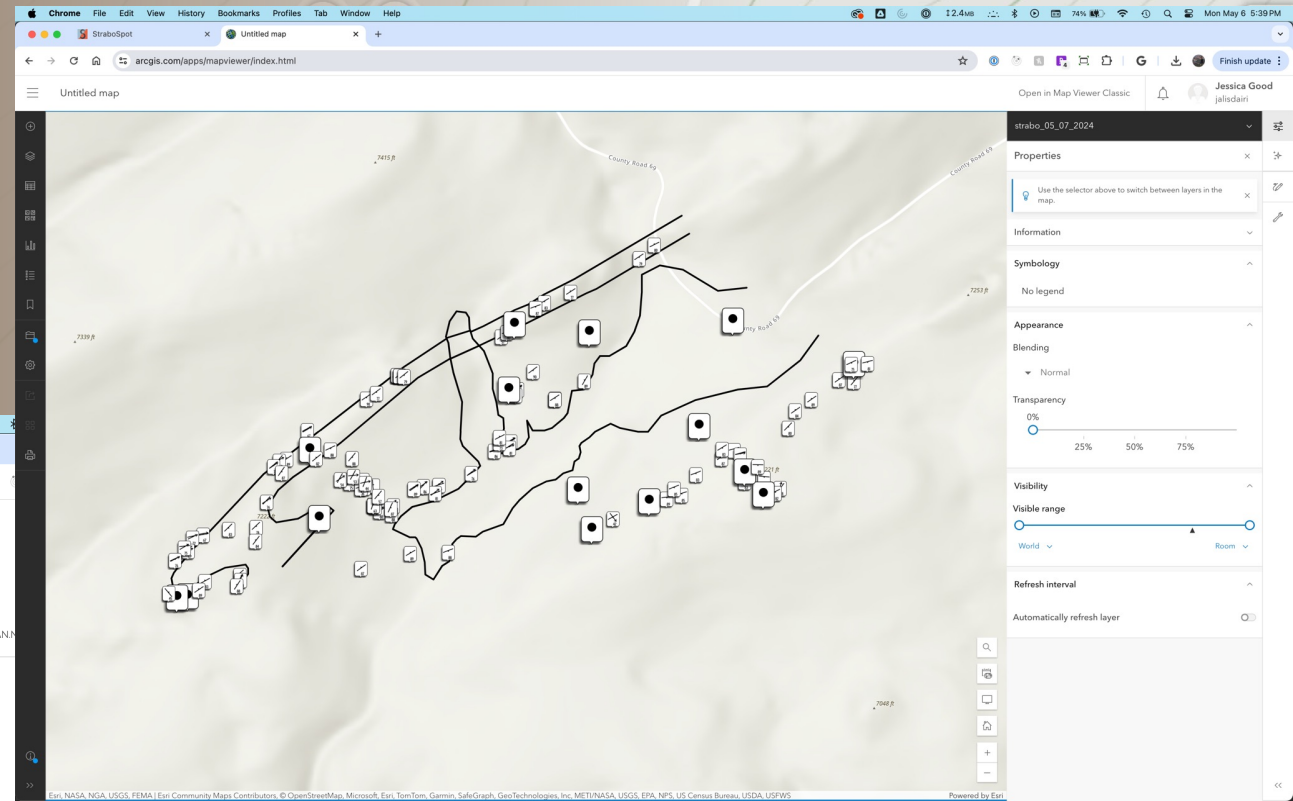
Last Uploaded: May 7, 2024, 12:18 am UTC +00:00 [Open with Strabo1 Web](#) | [Open with Strabo2 Web](#) | [Delete](#) | [JSON](#) | [Public?](#)

	Download	Dataset Name	Num Features		Last Modified
Delete Edit	Download: <input type="text" value="Select..."/>	Default	3	<input type="text" value="Move to..."/>	April 1, 2024, 10:02 pm UTC +00:00
Delete Edit	Download: <input type="text" value="Select..."/> <ul style="list-style-type: none"> Shapefile KMZ XLS Stereonet Mobile Field Book Strat Section(s) Download Photos Landing Page Sample List 	lines.shp	17	<input type="text" value="Move to..."/>	April 26, 2024, 5:35 pm UTC +00:00
Delete Edit	Download: <input type="text" value="Select..."/>	points.shp	319	<input type="text" value="Move to..."/>	April 26, 2024, 5:35 pm UTC +00:00
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Field Camp CO

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	Download	Dataset Name	Num Features		Last Modified
Delete Edit	No Spots.	North Twin	0	<input type="text" value="Move to..."/>	March 8, 2022, 4:58 pm UTC +00:00
Delete Edit	Download: <input type="text" value="Select..."/>	Default	2	<input type="text" value="Move to..."/>	November 15, 2022, 11:23 pm UTC +00:00
Delete Edit	Download: <input type="text" value="Select..."/>	Blue Ridge	132	<input type="text" value="Move to..."/>	November 15, 2022, 11:23 pm UTC +00:00
Delete Edit	Download: <input type="text" value="Select..."/>	Temple Canyon	167	<input type="text" value="Move to..."/>	March 23, 2024, 4:17 pm UTC +00:00
Delete Edit	No Spots.	Twin Mountain	0	<input type="text" value="Move to..."/>	March 8, 2022, 4:58 pm UTC +00:00



Downloading and Importing

Chrome | File | Edit | View | History | Bookmarks | Profiles | Tab | Window | Help

StraboSpot

strabospot.org/my_data

HOME ABO

My StraboSpot Projects: +

Sample Project CO
Last Uploaded: May 7, 2024, 12:18 am UTC +00:00

	Download	
Delete Edit	Download: Select...	
Delete Edit	Download: Select...	
Delete Edit	Download: Select...	
Delete Edit	Download: Select...	

✓ Select...

- Shapefile
- KMZ
- XLS
- Stereonet Mobile
- Field Book
- Strat Section(s)
- Download Photos
- Landing Page
- Sample List

Field Camp CO
Last Uploaded: May 7, 2024, 12:18 am UTC +00:00

	Download					Last Modified	
Delete Edit	No Spots.	North Twin	0	Move to...		March 8, 2022, 4:58 pm UTC +00:00	
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Chrome | File | Edit | View | History | Bookmarks | Profiles | Tab | Window | Help

StraboSpot

arcgis.com/apps/mapviewer/index.html

Untitled map

Open in Map Viewer Classic

Jessica Good jalodan

strabo_05_07_2024

Properties

Use the selector above to switch between layers in the map.

Information

Symbology

No legend

Appearance

Blending

Normal

Transparency

0%

25% 50% 75%

Visibility

Visible range

World Room

Refresh interval

Automatically refresh layer

Powered by Esri

Public?

Last Modified	
	April 1, 2024, 10:02 pm UTC +00:00
	April 26, 2024, 5:35 pm UTC +00:00
	April 26, 2024, 5:35 pm UTC +00:00
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	March 8, 2022, 4:58 pm UTC +00:00

Ongoing Development

- QAQC
 - User-defined constraints
 - Rules to check datasets
- Group Workflows
 - Multiples users contributing to same project simultaneously
 - Contributions acknowledgement





Questions?

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nnovak@ku.edu
strabospot@gmail.com
www.strabospot.org

