STRABOSPOT
TEPHRA

USER GUIDE

v.1.3

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STRABOSPOT
TEPHRA

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INTRODUCTION

What is StraboSpot Tephra?

The StraboSpot Tephra collection is a set of templates developed to aid researchers in data collection, analysis and identification of tephra layers from the volcano to the ultradistal. These templates are intended to be comprehensive -- not all boxes need to be filled in, although adhering as closely as possible to the template is, of course, ideal. Although not all the information recorded may get published, it is important to record as much as possible so the data, analysis and interpretation workflow can be revisited later when other questions about the deposits may arise.

Why StraboSpot?

There is no uniform mechanism to post or search digitally for SG&T data. Such data form perhaps the most basic dataset about the solid Earth, insofar as it captures that part of the Earth exposed to direct observation and is the fundamental ground truth against which all models of Earth development must be compared.   In particular, in the past:

- There has been no digital Data System (acquisition and database) for SG&T data. Further, there is no widely accessible way to archive structure data digitally, with the result that structural data cannot be discovered or easily reused.
- A community effort to standardize data collection would result in a tremendous saving of time and provide a focus for the community to improve data collection and quality.
- The ability to make data available for download to all other interested researchers across disciplines would facilitate an improvement in the quality of science.
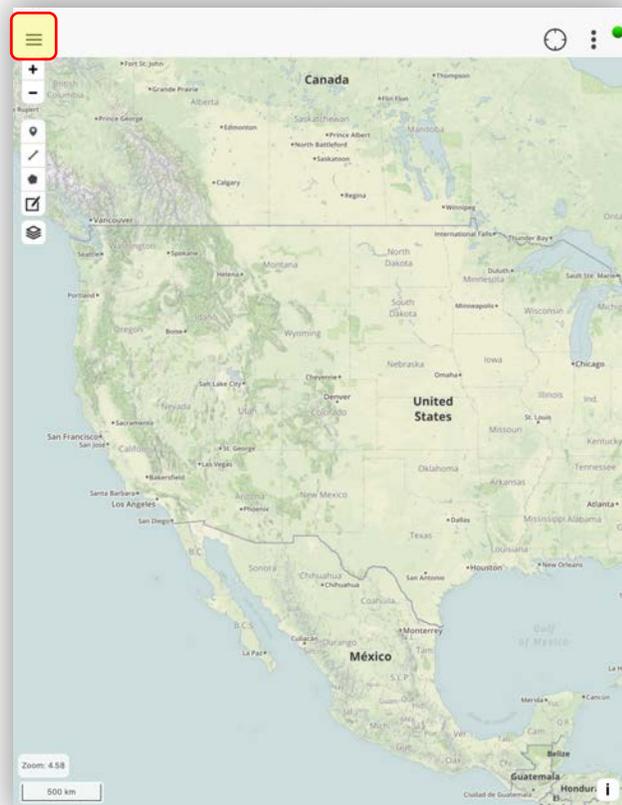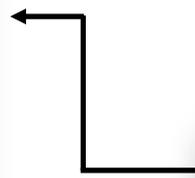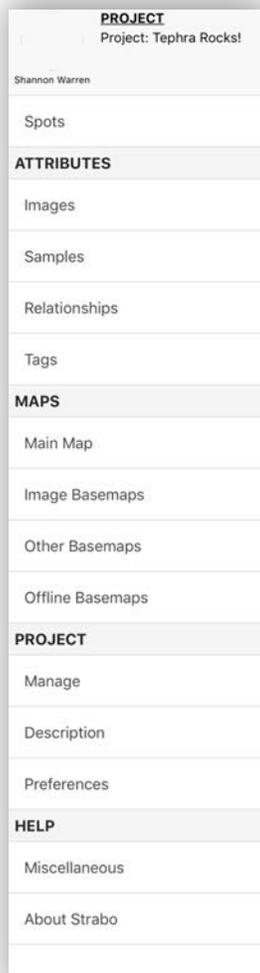- Other fields of the Earth Sciences are at the similar stages of development for digital data.

StraboSpot is being developed as an open source mobile app and web application to address these needs for the Earth Sciences. It is developed using NSF funding from the EAR and EarthCube programs.

GETTING STARTED

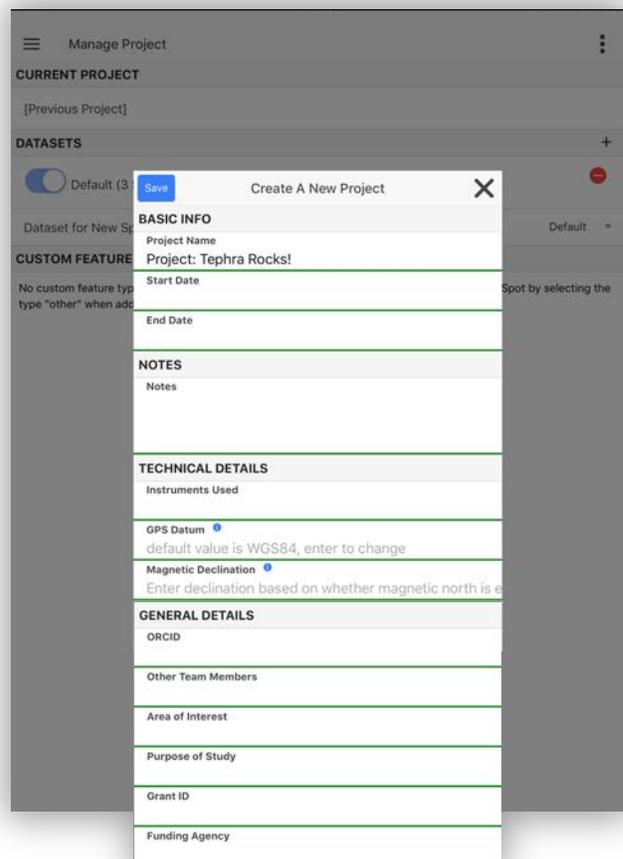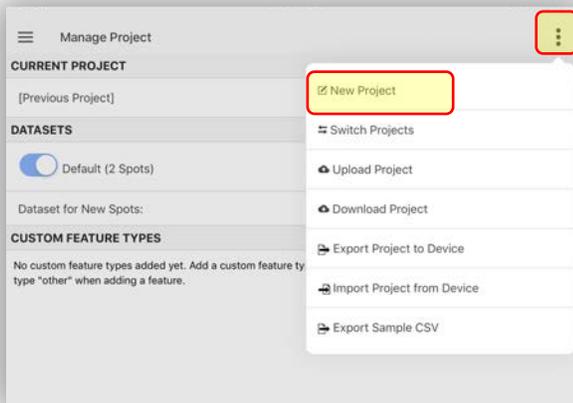## Logging In and the 3-Line Menu

Open the StraboSpot application on your mobile device and sign in to your StraboSpot account (or create a new account).

From the main interface in Strabo, pressing the 3-Line Menu ☰ opens a menu of main header options: **ATTRIBUTES**, **MAPS**, **PROJECT**, and **HELP**. The subheadings under each main header under this menu will be used to record data and access various features in the StraboSpot app.

PROJECT
Project: Tephra Rocks!

Shannon Warren

Spots

ATTRIBUTES

Images

Samples

Relationships

Tags

MAPS

Main Map

Image Basemaps

Other Basemaps

Offline Basemaps

PROJECT

Manage

Description

Preferences

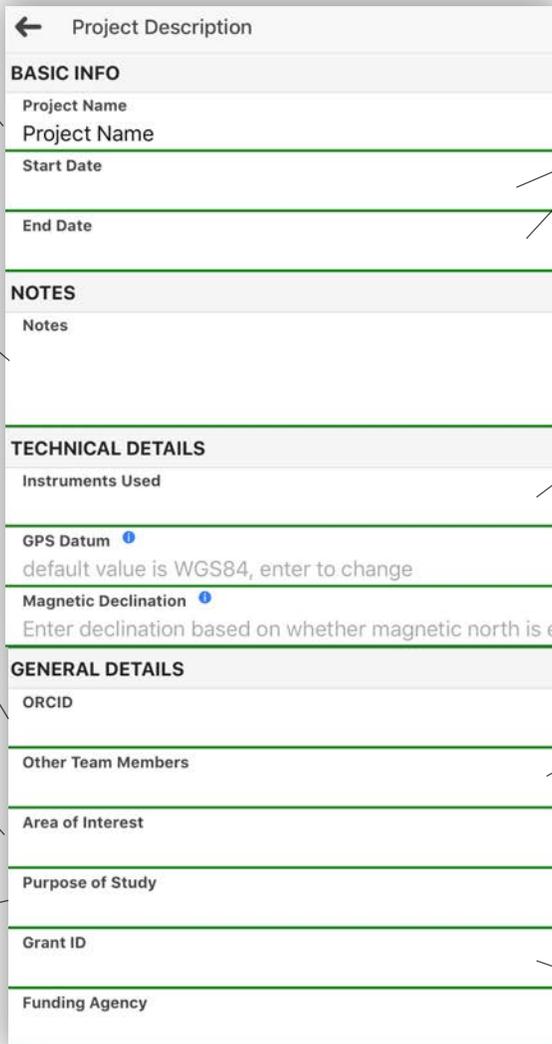**HELP**

Miscellaneous

About Strabo

Creating a New Project

Under the **PROJECT** header under the 3-line menu ☰ , click on 'Manage', where a window of your current project details appears (if applicable). To create a new project, click on the 3-dot menu ⋮ in the top right corner of the screen interface; next, click on 'New Project'. A new window will appear which allows you to record your project details (refer to page 4 for further details on recording project information).

Setting Up and Recording General Project Information

The 'Create a New Project' window provides fields which allows you to record your general project details and information, such as your Project Name (required), start/ end date, ORCID, Purpose of Study, Grant ID, Funding Agency, Notes, etc. TIP: it is recommended to record as much information about your project as deemed possible—this will help you in the future post-field work! Next, click the blue 'Save' button.

Project Name
Record a unique name for your project. *This field is required.*

Notes
Record any additional notes deemed necessary that are not recorded in other available fields

ORCID
Enter project's ORCID, if applicable

Area of Interest
Describe geographic location of project

Purpose of Study
Provide a short description of the purpose of your project/ study

Funding Agency
List funding agency names of your project/ study

Start/ End Date
Start and end date of data collection for your project

Instruments Used
Describe the instruments used for your project

Other Team Members
List project leader's name, as well as other team members on your project

Grant ID
List grant identification numbers

← Project Description

BASIC INFO

Project Name
Project Name

Start Date

End Date

NOTES

Notes

TECHNICAL DETAILS

Instruments Used

GPS Datum ⓘ
default value is WGS84, enter to change

Magnetic Declination ⓘ
Enter declination based on whether magnetic north is e

GENERAL DETAILS

ORCID

Other Team Members

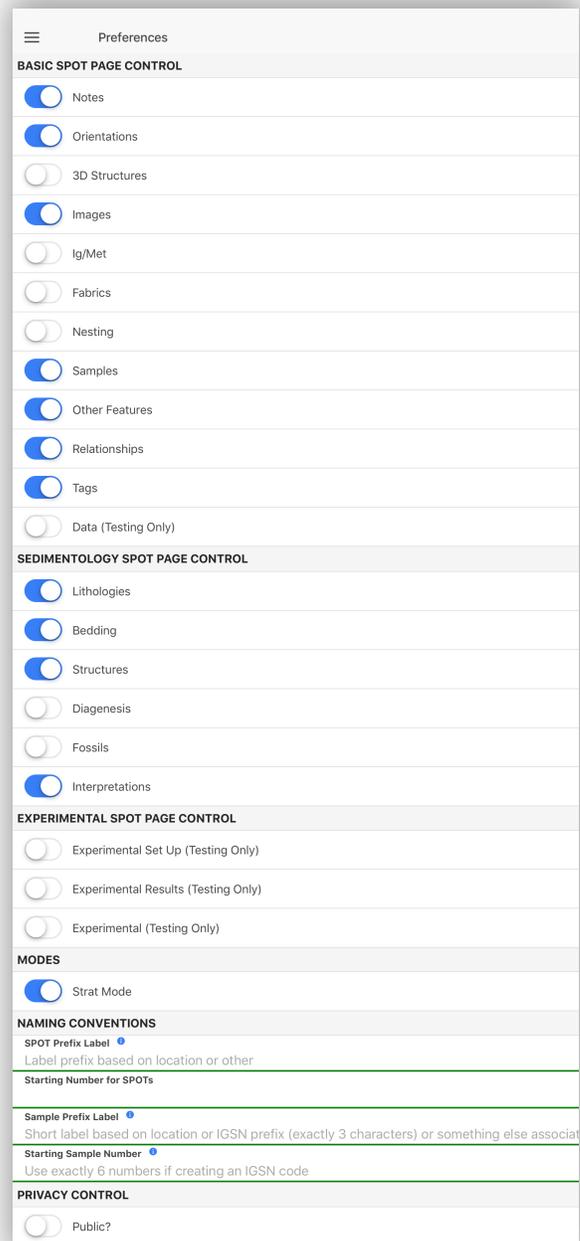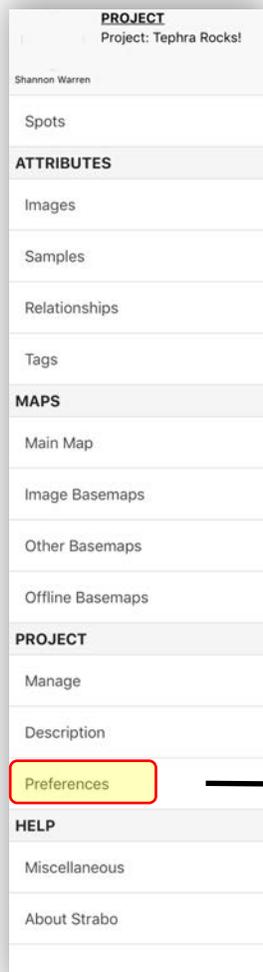Area of Interest

Purpose of Study

Grant ID

Funding Agency

Turning on Tabs in 'Preferences' for Page Control

After creating a new project, open the 'Preferences' tab under the **PROJECT** header under the 3-line menu ☰ . Here, you have the opportunity to customize your page control interface for data collection. Turn on tabs that you want access to while collecting data.

IMPORTANT:
For tephra work, Notes, Samples, Strat Mode, Lithologies, Bedding, Structures, and Interpretations *must* be turned on.

ADDING 'SPOTS'

Spots allow you to add and record data to a specific location. Examples for creating a 'Spot' include eruption response sampling, tephra sampling and data collection, and setting up a subaerial or core station section.

To create a spot, first access the main map interface by clicking on 'Main Map' under the **MAPS** heading from the the 3-line menu ≡ button located at the top left of the screen). On the main map interface, a series of options are on the left side of the screen. To add a Spot, click on the 'Point' ◉ tool button, then click on the map at the desired location. TIP: pressing the 'GPS' ◯ tool located at the top right of the screen will locate your position on the map. After pinning a Spot to the map, a new window will appear that allows you to start adding data to this Spot location.

SETTING UP A STATION

To set up a station site for describing and collecting tephra data in a stratigraphic interval/ stratum or eruption response sampling at a specific location, add a Spot at your exact field location on your main map interface (refer to Page 5 for instructions on how to add Spots). TIP: For each section you describe, you will need to create a new section at that location, including if you move along a section to a new location. After a Spot is created, you will be prompted to record general information for your station site (a 'Spot' in Strabo).

Station ID/ name of Sampling Station
Create a unique station name. Best practices include the year and sampler's initials

Notes
Purpose of visiting station (e.g. proximal site, looking for a particular deposit, eruption response, tephra study); Permitting/ permissions to work at this site; collect name/ contact info, including PI's; explanation of how station is named; other station notes

Latitude/ Longitude
Exact location of station. Automatically recorded where Spot is located on the Main Map; can be manually recorded, if preferred or needed.

Date/ Time
StraboSpot automatically records this; however, you can manually input it if needed
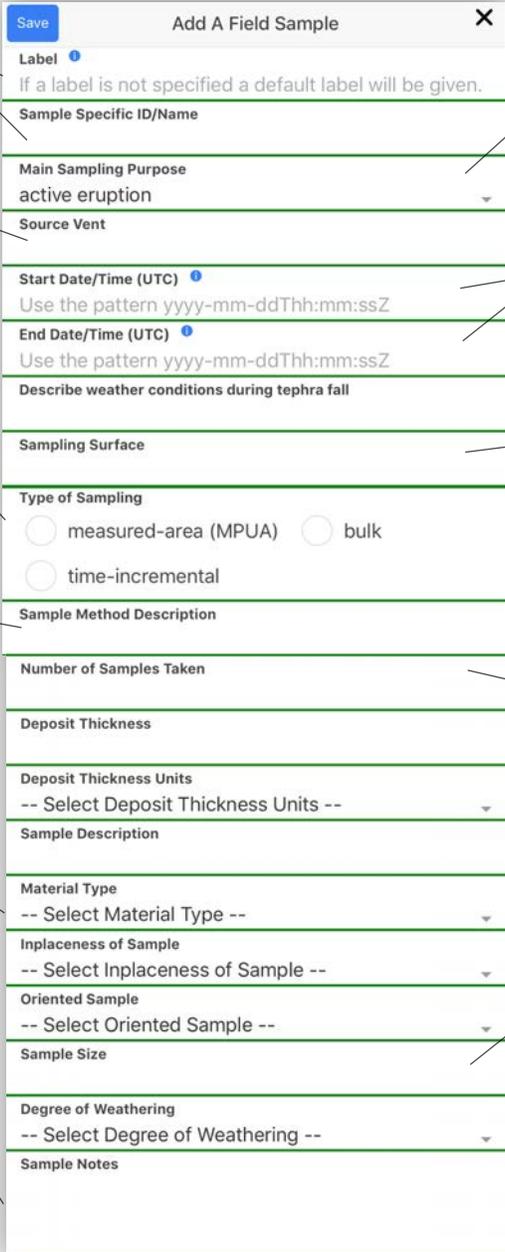
7

ERUPTION RESPONSE SAMPLING

To record tephra data for Eruption Response Sampling, first create a Spot at your Station Site (refer to page 6 for directions on how to add a Station Site). Click on the 'Samples' heading option located at the top of the Spot window. Here, you can choose from a variety of different sample types. Click on your desired Sample type to open a Sample data window. From here, name Sample under the 'Label' text field, as well as a 'Sample Specific ID/Name'. Under the 'Main Sampling Purpose' drop menu, choose 'active eruption'. This will provide a series of text fields to record your tephra sample data, such as Source Vent, start/end date/time, description of weather conditions during tephra fall, Sampling Surface, Type of Sampling (MPUA, bulk, time-incremental), additional Sample Notes, etc. (see page 7).

Recording Data for Eruption Response Sampling

Record as much data as deemed possible here for each sample collected! After you have recorded your data for a sample, press the blue 'Save' button. TIP: if needed, you can always go back and edit a Sample. Continue recording additional Samples to this site location or go back to the Main Map to create a new Spot/ Station Site.

Label and Sample Specific ID/ Name
Record a label for your sample as well as the specific ID or name associated with your collected sample

Source Vent
Give volcano name of associated vent

Type of Sampling
Select from list; if MPUA, area of surface sampled (m^2) and mass (g) of sample fields will be recorded in new available fields

Sample Method Description
Describe details of your sampling method

Material Type
Select sample material type from available options from, or select describe if 'other'

Sample Notes
Add any additional notes and descriptions of sample collected.

Main Sampling Purpose
For Eruption Response Sampling, 'active eruption' must be selected in this field

Start/ End Date/ Time
Record the start and end time of eruption event. This must be manually recorded. Example: 2020-03-20 13:10:54

Sampling Surface
Describe the surface upon which sampling is taken from (e.g. clean tarp, vehicle windshield, snow, stairs, etc.)

Number of Samples Taken
Describe how many individual samples you collected under this sample ID/ Name

Sample Size
Qualitative or quantitative description of size of sample(s) collected

---

Add A Field Sample

Save ✕

Label ⓘ
If a label is not specified a default label will be given.

Sample Specific ID/Name

Main Sampling Purpose
active eruption ▾

Source Vent

Start Date/Time (UTC) ⓘ
Use the pattern yyyy-mm-ddThh:mm:ssZ

End Date/Time (UTC) ⓘ
Use the pattern yyyy-mm-ddThh:mm:ssZ

Describe weather conditions during tephra fall

Sampling Surface

Type of Sampling
◯ measured-area (MPUA)   ◯ bulk
◯ time-incremental

Sample Method Description

Number of Samples Taken

Deposit Thickness

Deposit Thickness Units
-- Select Deposit Thickness Units -- ▾

Sample Description

Material Type
-- Select Material Type -- ▾

Inplaceness of Sample
-- Select Inplaceness of Sample -- ▾

Oriented Sample
-- Select Oriented Sample -- ▾

Sample Size

Degree of Weathering
-- Select Degree of Weathering -- ▾

Sample Notes

TEPHRA FIELD SAMPLING AND DATA COLLECTION

Once you create a 'Spot' to collect field samples at a specific location (refer to Pages 6 and 7), you can start collecting samples and recording sample data in StraboSpot. The following screen examples highlight key components in StraboSpot to record tephra-related data for field collection and/ or describing tephra strata within a stratigraphic section. As always, record as much information as deemed necessary and possible for each location and sample collected. Do this by navigating through the tabs and going through each field and record associated necessary data. To add more tephra collection sites at new locations, add another 'Spot' (explained on Page 6 and 7). Refer to Pages 16-21 for directions on how to create a stratigraphic section in Strabo and record collected samples in an interval or specific location in a section.

SED LITHOLOGIES – Lithology

Volcaniclastic Type
Select the volcaniclastic type of deposit

Componentry
Select main components, particle/ clast types within deposit

Evidence of deposit alteration
Describe evidence of strata alteration (e.g. soft easily crushed pumice; coatings, strong alteration colors – e.g. carbonate or amorphous silica in soils – these can compromise attempts at bulk geochemistry

Color
Describe fresh and weathered color of deposit and note whether it is wet/ dry/ both

Report presence of particle aggregates
Text explanation describing aggregates (e.g. accretionary lapilli, ash coated pumice, lithics, etc.) including average size range and units

Approximate relative abundances of clasts
Estimate and explanation of percentage of clasts in deposit

Evidence of clast alteration
Describe evidence of clast alteration (e.g. soft easily crushed pumice; coatings; etc.)

SED LITHOLOGIES – Texture

Min./ Max./ Average Clast Size
Note and record the minimum, maximum, and average size of clasts (cm)

Sorting
Select observed sorting character of the deposit

Clast Shapes Within Strata
Select observed clast shapes; if other, describe in the following given field.

Matrix- or Clast-Supported
Select whether the deposit is matrix- or clast- supported

Angularity of Clasts
Select the type of angularity of clasts; further detail can be reported in 'Notes' below

SED LITHOLOGIES – Composition

Discrete/ Disseminated/ Crypto
Select from list volcaniclastic type, including whether the deposit is discrete, disseminated, or cryptotephra

SED BEDDING

Bed Geometry
Select from list that describes the physical continuity of the stratigraphic interval along the outcrop; can add further detail in 'Notes' below (e.g. pinches in/ out, pinches from 1-6 cm, etc.)

LOWER CONTACT
Enter and record the shape and character of the stratigraphic interval's lower contact; further text description may be recorded in 'Notes' below

UPPER CONTACT
Enter and record the shape and character of the stratigraphic interval's upper contact; further text description may be recorded in 'Notes' below

← V1

HER FEATURES RELATIONSHIPS TAGS SED INTERVAL SED LITHOLOGIES SED BEDDING SED STRUCTURES SED I

Lithology 1   Lithology 2

Bed Geometry
- discontinuous ⚪ tabular/parallel ⚪ lenticular
- wedge ⚪ channel-like

LOWER CONTACT
Shape of lower contact (if variable, select more than one)
- flat ⚪ undulatory ⚪ curved
- concave up ⚪ concave down ⚪ irregular
- covered

Character of lower contact(s) (if variable, select more than one)
- sharp ⚪ gradational ⚪ well-defined
- poorly-defined

Lower contact relief

UPPER CONTACT
Shape of upper contact (if variable, select more than one)
- flat ⚪ undulatory ⚪ curved
- concave up ⚪ concave down ⚪ irregular
- covered

Character of upper contact (if variable, select more than one)
- sharp ⚪ gradational ⚪ well-defined
- poorly-defined

Upper Contact Relief

INTERBED THICKNESS
Average Thickness

Maximum Thickness

Minimum Thickness

Interbed Thickness Units
m

Notes

SED STRUCTURES – Physical

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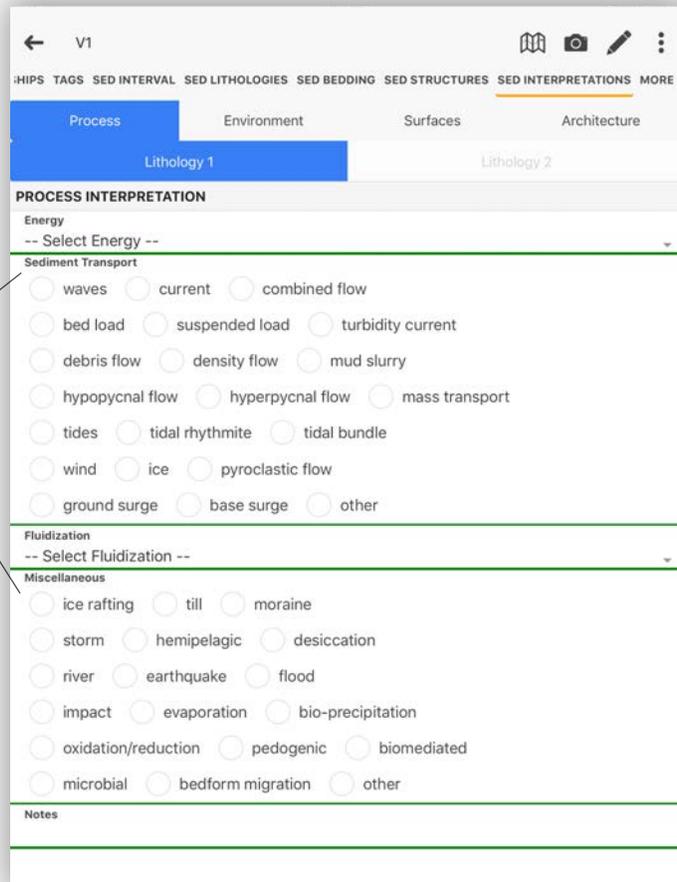**Internal Bedding**
Select, note, and describe any internal bedding features of interval

Graded Bedding
Select type of grading present in the deposit; further text description should be added in 'Notes' below

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SED INTERPRETATIONS – Process

Evidence of Reworking
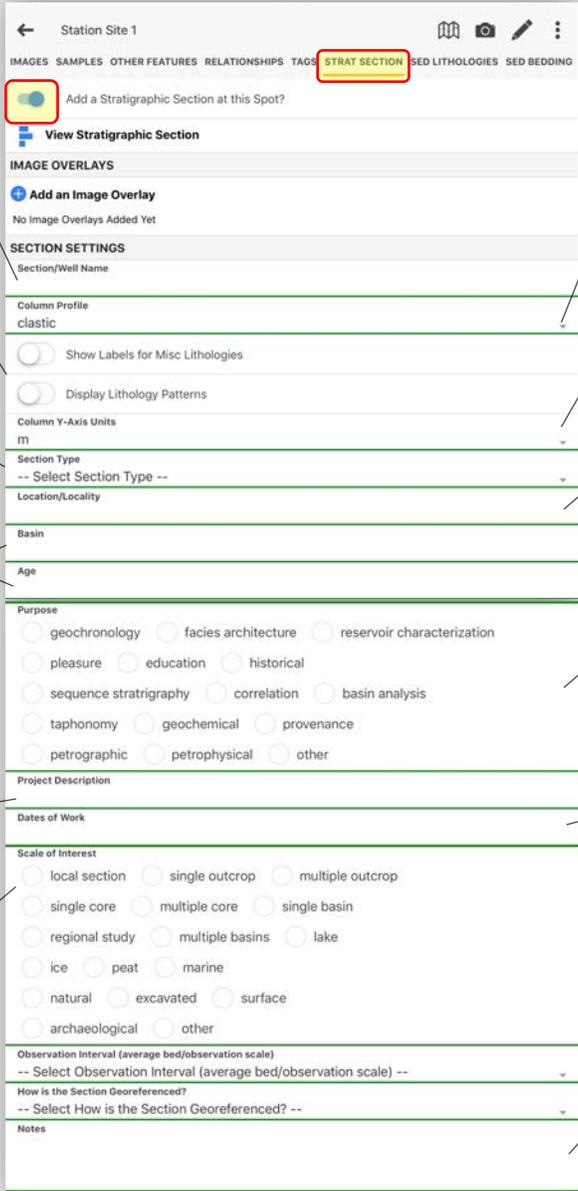Note and select any evidence of reworking. Further text description can be recorded in 'Notes' below.

SETTING UP A STRATIGRAPHIC SECTION

The StraboSpot application also features utilizing creating a stratigraphic section and recording data through each stratum or stratigraphic interval described. The following describes how to create and set up a subaerial and core station section.

Setting Up a Subaerial Station Section

After creating a 'Spot' instructed on Page 6 and 7, click on the 'Strat Section' heading option located at the top of the Spot window. Next, switch the toggle 'On' next to 'Add a Stratigraphic Section at this Spot?' A series of fields will appear to record some general information about the section you are describing at this particular Station Site/ 'Spot'.

Section Name
Name of your section at this Station Site.

Lithology Labels/ Patterns
Toggle on/off, depending on preference

Section Type
Select section type from drop menu; select 'outcrop' for a subaerial section

Basin and Age
List the basin associated with the deposits at your section and the age

Project Description
Give short description of your project

Scale of Interest
Select from list of the type of subaerial station site

Column Profile
Select from list of section profile options

Column Y-Axis Units
Select units used for section from drop menu

Location/ Locality
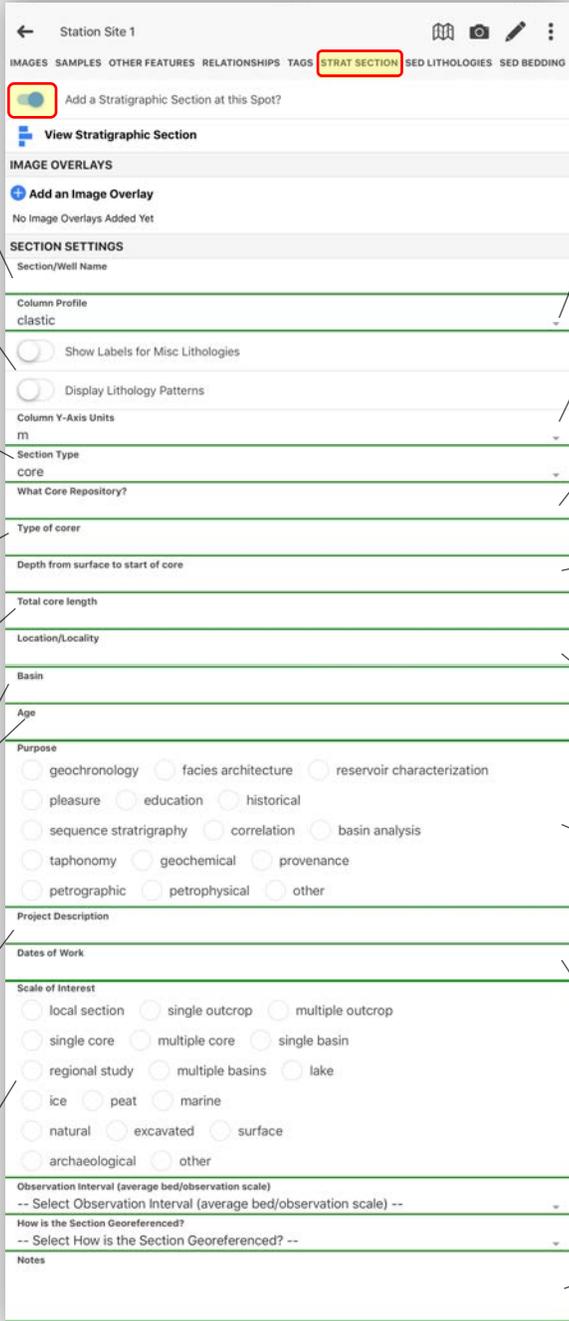Describe location of stratigraphic section

Purpose
Choose from options for purpose of recording data at this section, or select other and describe in the next field

Dates of Work
List the dates you work at this section

Notes
Record any further initial remarks and observations

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Setting Up a Core Station Section

After creating a Station Site instructed on Page 7, click on the 'Strat Section' heading option located at the top of the Spot window. Next, switch the toggle 'On' next to 'Add a Stratigraphic Section at this Spot?' A series of fields will appear to record some general information about the section you are describing at this particular Station Site/ 'Spot'. TIP: record as much information as possible or deemed necessary.

Section Name
Name of your section at this Station Site.

Lithology Labels/ Patterns
Toggle on/off, depending on preference

Section Type
Select section type from drop menu; select 'core' for a core section

Type of Corer
Describe type of corer/ instrumentation used

Total Core Length
Record composite length of core including all sections/ drives

Basin and Age
List the basin associated with the deposits at your section and the age

Project Description
Record short description of your project

Scale of Interest
Select from list of the type of subaerial station site

Column Profile
Select from list of section profile options

Column Y-Axis Units
Select units used for section from drop menu

What Core Repository
Describe where samples are stored/ archived

Depth From Surface
Enter the depth between the reference surface (lake/ glacier surface) and where the core material begins

Location/ Locality
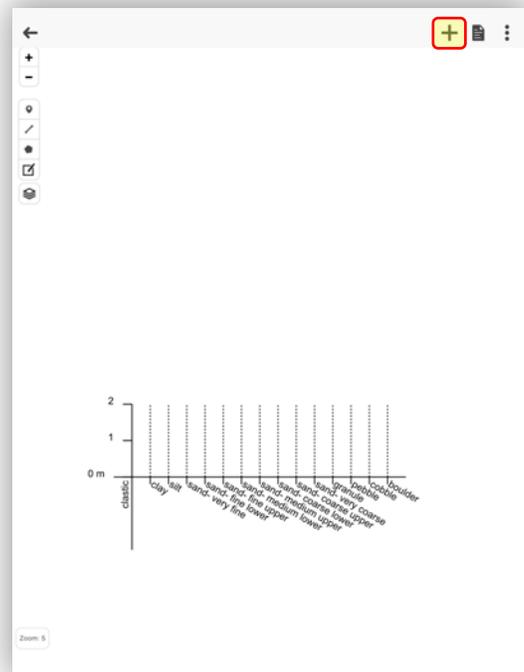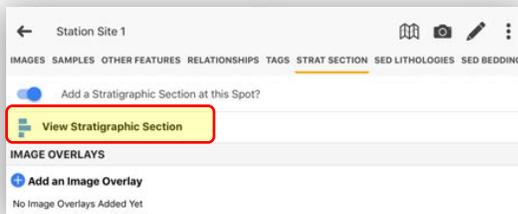Describe location of stratigraphic section

Purpose
Choose from options for purpose of recording data at this section, or select other and describe

Dates of Work
List the dates you work at this section

Notes
Record any further initial remarks and observations

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Accessing Your Section and Adding Strat Intervals

After setting up your station section and recording general information for your section (refer to page 10 and 11), you are ready to record data and observations through your section. First, click on 'View Stratigraphic Section'. This will bring you to a new interface that will allow you to start measuring your section, recording data, collecting samples, etc. 'Add an Image Overlay' is a feature that allows you to take a photo of your section to use as an overlay for your section. This may be useful if collecting samples at specific locations throughout your section so you can add a 'Spot' to the exact location on the outcrop you sampled from. After you are at the screen with a section, click the '+' sign located at the top right corner to add a stratigraphic interval.

Interval Name/ Thickness/ Units
Enter a name your your strat level, thickness of deposit, and measured units

Select Primary Lithology
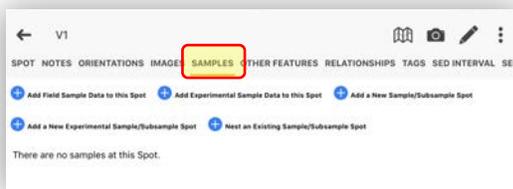Select 'volcaniclastic' for Tephra-related deposits and collections

Add More Detail
Click here after recording data in the above fields to add more data on this particular interval (see Page 13).

RECORDING FIELD SAMPLES IN STRAT INTERVALS

There are two methods to collecting a sample and pinning and saving it to a specific stratigraphic interval or location in a created stratigraphic section in StraboSpot. These two methods are described below.

General Sample from a Stratigraphic Interval

This method allows you to collect samples throughout an entire stratigraphic interval. Any samples saved in this method will be corresponded with a specific stratigraphic interval in your section. Click on the name of the stratigraphic interval you are collecting a sample from to navigate to the 'Samples' tab. Click on 'Add a Field Sample' and navigate through the following fields to record information on your collected sample (refer to Page 21 for further field details).
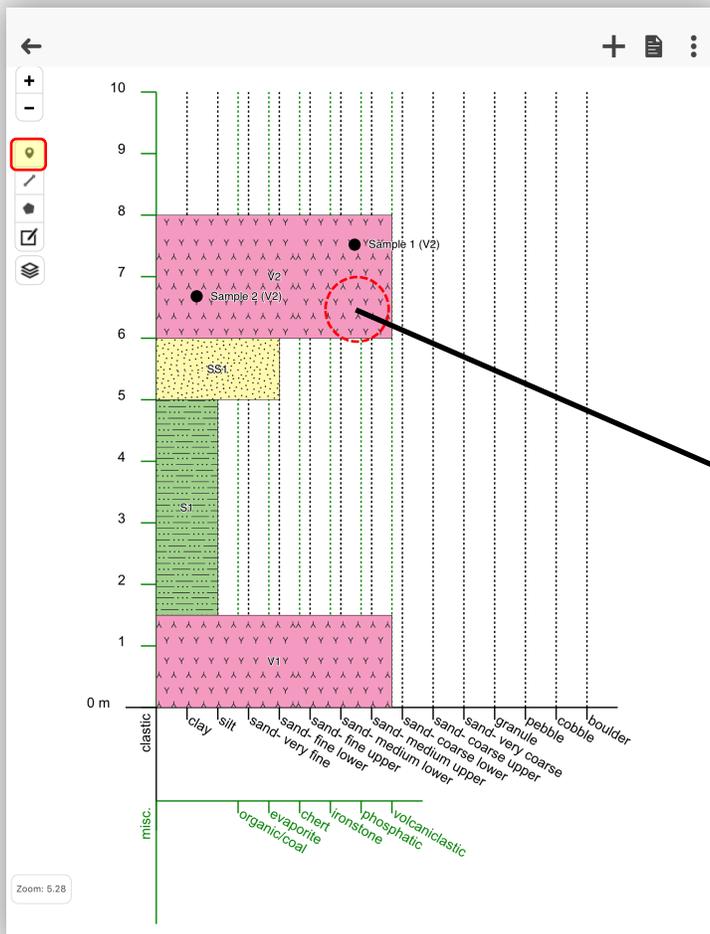
Sample from a Specific Location ('Spot') within a Section

Similar to how you add a 'Spot' or 'Station Site' to a map, you can add a Spot to your stratigraphic section to record the locations of samples collected. From the Strat Section interface, click on the 'Point' tool 📍 located on the left side of the screen. Next click on the location on your stratigraphic section that you are sampling from. This will create a 'Spot' where you can add, name, and record sample information under the 'Samples' tab.

Recording Data and Information for Section Field Samples

After getting to the 'Add a Field Sample' window (discussed on Pages 19 and 21), you will be given a list of fields to record information on your collected sample. The following describes each field.

Label and Sample Specific ID/ Name
Record a label for your sample as well as the specific ID or name associated with your collected sample

Sample Description
Short description of sample and why sampled (not analysis type)

What is sampled?
Select from Sample Type 1 and 2 from list of what is being sampled

Color
Describe color of collected sample; include whether fresh/ weather and wet/ dry

Sample Notes
Add any additional notes and descriptions of sample collected. This may include an explanation of how your sample was named/ labeled, description of your sampling container, number of samples taken, etc.

Main Sampling Purpose
Select from drop menu the main sampling purpose

Deposit Thickness
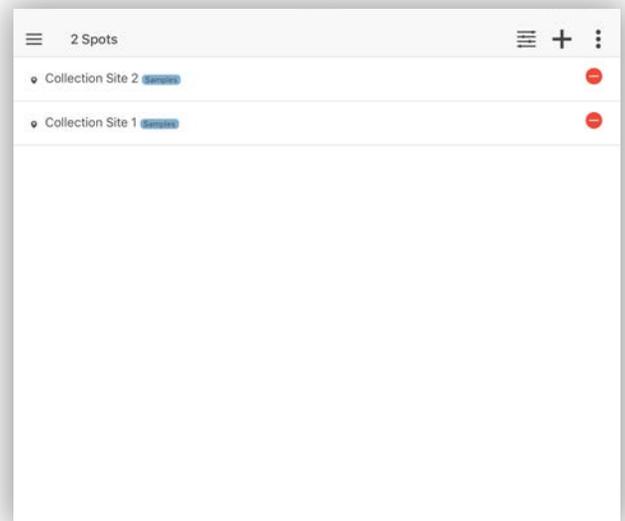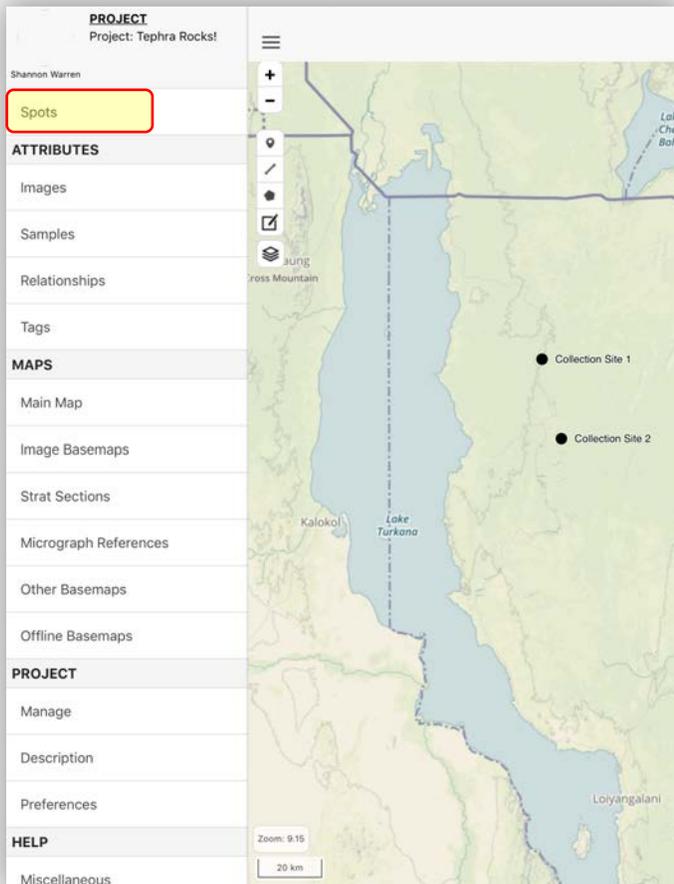Numerical thickness of deposit being sampled from and units

Material Type
Select from options; for tephra sample, select 'tephra'

Density
Record the in-situ deposit density (kg/m^3) and describe method used to determine this value

Sample Size
Qualitative or quantitative description of size of sample(s) collected

Add A Field Sample

Save   Add A Field Sample   ✕

Label ⓘ
If a label is not specified a default label will be given.

Sample Specific ID/Name

Main Sampling Purpose
-- Select Main Sampling Purpose --

Deposit Thickness

Sample Description

Material Type
tephra

Sample Type 1
- debris flow   - tephra fall
- pyroclastic flow   - pyroclastic surge
- lava   - gas
- intrusion   - regolith
- diamict   - other

Sample Type 2
- bulk   - juvenile
- matrix   - pumice
- scoria   - lithic
- block or bomb   - channel
- other

Density

Color

Lithology

Sample Unit

Inplaceness of Sample
-- Select Inplaceness of Sample --

Oriented Sample
-- Select Oriented Sample --

Sample Size

Degree of Weathering
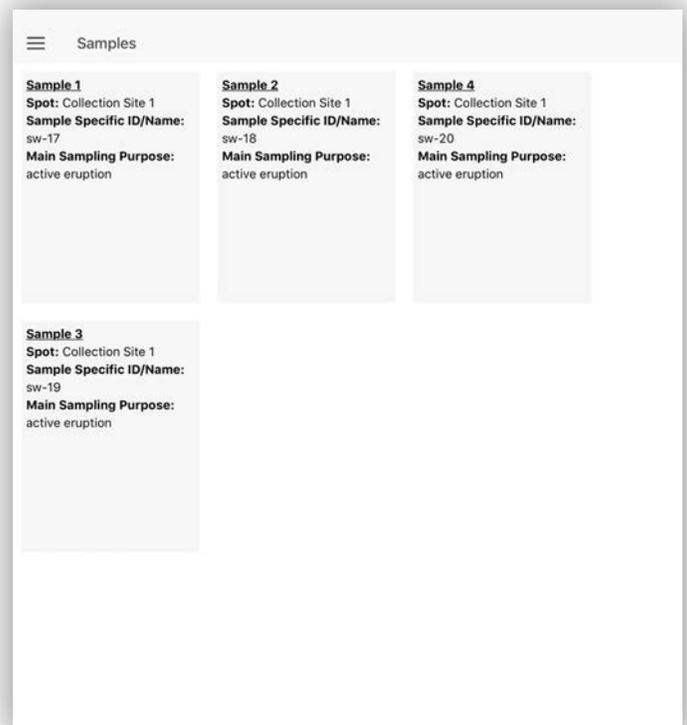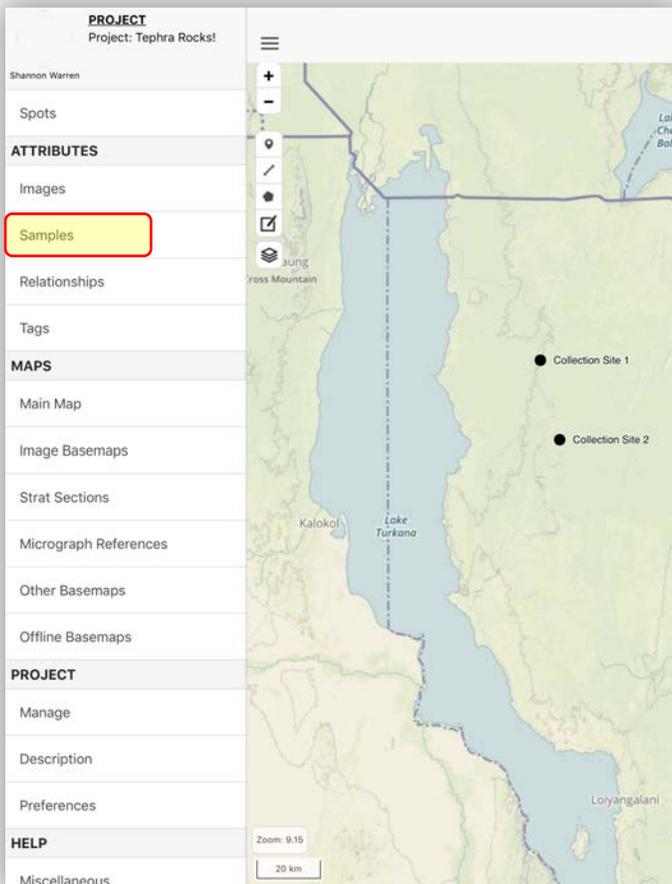-- Select Degree of Weathering --

Sample Notes

QUICK ACCESS TO SPOTS

From the 3-line menu ≡ button, click on 'Spots'. Here, you will find a list of your recorded Spots. Clicking on a Spot will bring you back to the data recorded and saved under that Spot name and location; here, you can edit or add information and data for any Spot.

QUICK ACCESS TO SAMPLE DATA

From the 3-line menu ≡ button under the **ATTRIBUTES** heading, click on 'Samples'. Here, you will find a list of all recorded Samples in your project. You can look at your recorded data by clicking on any sample, as well as add, edit, or delete any necessary information.

SAVING AND UPLOADING YOUR PROJECT

To save, upload, switch, or create a new project, click on the 3-line menu ≡ button. Under the **PROJECT** header, click on 'Manage', where a window of your current project details appears. Click on the 3-dot menu ⋮ button located in the top right corner. Here, you can choose to create a New Project, Switch Projects, Upload Project, Download Project, Export Project to Device, Import Project from Device, or Export Sample CSV.