British Geological Survey

NATURAL ENVIRONMENT RESEARCH COUNCIL

BGS•SIGMA 2012
Open Source User Guide

Spatial Geoscience and Technologies Programme

Open Report OR/13/021

Σigma • MOBILE
System for integrated Geoscience Mapping

BGS•SIGMA 2012
Open Source User Guide

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BRITISH GEOLOGICAL SURVEY

The full range of our publications is available from BGS shops at Nottingham, Edinburgh, London and Cardiff (Welsh publications only) see contact details below or shop online at www.geologyshop.com

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The British Geological Survey carries out the geological survey of Great Britain and Northern Ireland (the latter as an agency service for the government of Northern Ireland), and of the surrounding continental shelf, as well as basic research projects. It also undertakes programmes of technical aid in geology in developing countries.

The British Geological Survey is a component body of the Natural Environment Research Council.

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Foreword

The British Geological Survey began developing digital field mapping systems in 1989. However, it was apparent that the commercially available hardware was not suitable at that time. In 2001, we revisited the topic under the System for Integrated Geoscience Mapping (SIGMA) programme. By 2003, BGS had developed a PDA (personal digital assistant) field system, which was superseded in 2005, when we began deploying a beta system on rugged Tablet PCs. The Tablet PC system, which we called BGS•SIGMA*mobile* was used by BGS in mapping projects across the UK as well as overseas. It first became available in Open Source form, in June 2009 via the BGS website, www.bgs.ac.uk, under an agreement which stipulates that updates and modifications must be supplied to BGS in order to stimulate further developments. In 2011/2012, BGS•SIGMA*mobile* was rewritten in .NET and combined with our office based mapping software BGS•SIGMA*desktop* within ArcGIS 10.x to create BGS•SIGMA 2012.

It is envisaged that future releases will be made available from the BGS website incorporating new modules, modifications and upgrades supplied by BGS and external users of the system.

This document has been written to guide users through the installation and use of BGS•SIGMA 2012 (*mobile and desktop*), which is the third free release.

We are happy to receive feedback and modifications emailed to sigma@bgs.ac.uk.

Acknowledgements

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Thank you also for the continued support from our Survey Geologists and 'Field Testers'; most influentially: C. Auton, L. Hughes, M. Krabbendam, G Leslie, and R. Thomas.

Thank you to K Goodenough for your comments contributing to the writing of this manual.

Contents

Introduction

This report serves as an installation and introductory user guide to BGS•SIGMA 2012 which is an application for digital geoscience field data collection and office based mapping developed within the British Geological Survey's SIGMA (System for Integrated Geoscience Mapping) programme within the Earth & Planetary Observation & Mapping Team. This document provides installation instructions, followed by a brief guide to using the application. In BGS we provide our field staff with a two-day training course, and while this guide does not replace that, it is hoped that these instructions will provide a basis for successful use of BGS•SIGMA 2012 in your organisation.

BGS•SIGMA 2012 is designed to run in the field on rugged Tablet PCs and in the office on desktop PCs. The system is a heavily customised ArcGIS 10.x and MS Access application. The user must have, at minimum, a licensed copy of ESRI ArcGIS ArcEditor and MS Access 2007, BGS does not supply these. The system is fully tested on the Windows 7 operating system.

The BGS currently use the *mobile* application on the GETAC V100 and Panasonic CF-19 Toughbook Tablet PCs. This guide does not provide instructions to its use on specific hardware platforms.

BGS staff have used the system for mapping in locations including the UK, Ghana, Madagascar, Tajikistan, the Antarctic and the U.S.A. We use it as part of a workflow of other customised BGS-developed systems that enables us to:

1. automatically collate spatial information from our databases,
2. interpret new data from satellite imagery and digital photogrammetry,
3. take our baseline and interpreted data to the field,
4. populate corporate databases with our field data,
5. build 3D digital models and visualisations,
6. output our data in formats such as maps.

Further information on these steps is available from the BGS website at http://www.bgs.ac.uk/research/technologies_epo.html.

1   Getting Started with BGS•SIGMA 2012

1.1   SOFTWARE REQUIRED FOR BGS•SIGMA 2012:

- ArcGIS 10.x – for creating and using a GIS project (*.mxd)
- Access 2007 – for creating and using a database (DFDC.mdb)

1.2   HARDWARE

- SIGMA 2012 can be set-up on any PC or Tablet with appropriate hardware/software
- BGS is currently using the following tablets:
  - GETAC V100
  - Panasonic CF-19 Toughbooks

## 1.3   SET-UP ON YOUR MACHINE OR TABLET:

- If you haven't already done so, go to: http://bgs.ac.uk/research/sigma/download.html
  - Press the DOWNLOAD BGS•SIGMAmobile2012 link
  - Fill in and submit the form
  - You will then save a zip file to your computer containing:
    - A SIGMA 2012 installation file
    - Brief installation guide
    - What's new guide
    - This manual
- Uninstall all previous version's components of BGS•SIGMA*mobile* and *desktop*, such as the: Bearing Tool, BGS GPS Tool, BGS Object Class Extension, BGS Sketch Tool, Capture By Symbol, Précis Tool, and the Structure Contour Tool
  - Do this by going to Start – Control Panel – Programs – Uninstall a Program – Select the Program and press the Uninstall Button
- Set Access Macro Security Settings to Low
  - Open Access 2007 - Office Button – Access Options – Trust Centre – Trust Centre Settings – Macro Settings - Enable all Macros – ok – ok
- Set your tablet/PC date settings to the format dd/mm/yyyy (this may or may not be necessary, it needs testing)
- Install BGS•SIGMA 2012 (There will be slightly different install files for different versions of ArcGIS – choose the one that matches your PC or tablet)
  - Unzip your files
  - Go to: \SIGMA_2012_INSTALL\v1.0x
  - Run: Setup.exe
  - Next
  - Select folder: default or a folder of your choosing
  - Next
  - Close
- You will find the required BGS•SIGMA data files on your computer in the folder you specified above in a sub-folder called BGS; for example: C:\Program Files\BGS\BGS SIGMA 2012 - v1.0x
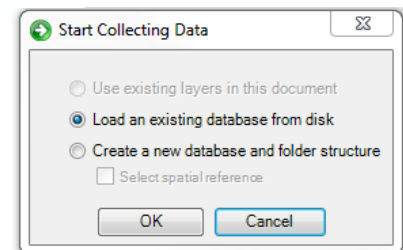
1.4   ARCMAP 10 – BGS•SIGMA SET-UP

- Open ArcMap 10
- On the main ArcMap toolbar, select: Customize – Toolbars – BGS SIGMA Mobile and/or BGS SIGMA Desktop
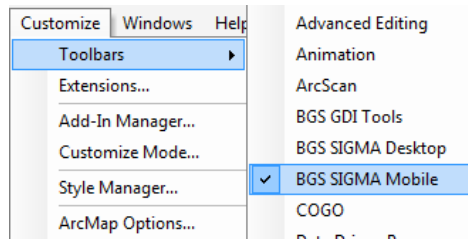
- Depending on which part of the process you are using in the BGS•SIGMA workflow the following steps are the same but located on different toolbars
    - For Field Work select Start Collecting from the BGS SIGMA Mobile drop down menu
    - For Office Work select Start Collecting from the BGS SIGMA Desktop drop down menu
        - It should be noted that you can use the tools on either toolbar regardless of where you started collecting from
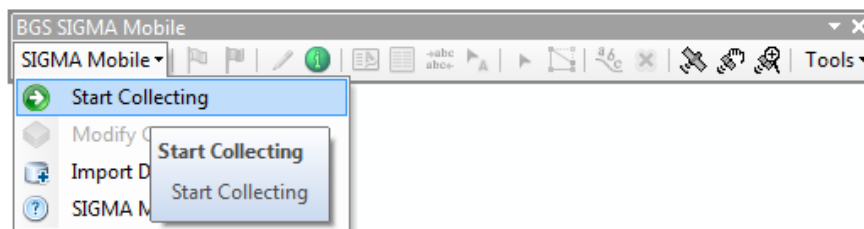

- From the Start Collecting Data dialog box select one of three options:
    - **Use existing layers in this document**
        - Select this option to continue working on an existing project
        - The database to use is: DFDC.mdb
        - This option is only available if DFDC layers are already loaded within your project
    - **Load an existing database from disk**
        - Select this option to load a DFDC that has been created but whose layers have not yet been added to your Project
        - Navigate to the DFDC you wish to add
    - **Create a new database and folder structure**
        - Select this option to create a new BGS•SIGMA Project and database
        - Navigate to where you wish to store your Project and database and save to your Project folder or 'Make New Folder'
            - It may be useful to create your New Project Folder within Windows first before starting ArcMap
        - Select Spatial Reference: leave unchecked if working in the UK with British National Grid

- If working outside the UK see : Setting up Projects Overseas (page 46)
  - o Please, WAIT ... there may be a small delay while SIGMA loads ...

- **Select Datasets**
  - o Select from the list or Select All/Select None – OK
  - o Greyed-out options are integral to BGS•SIGMA operations and cannot be unselected
- Please, WAIT ... there may be a small delay while SIGMA loads ...
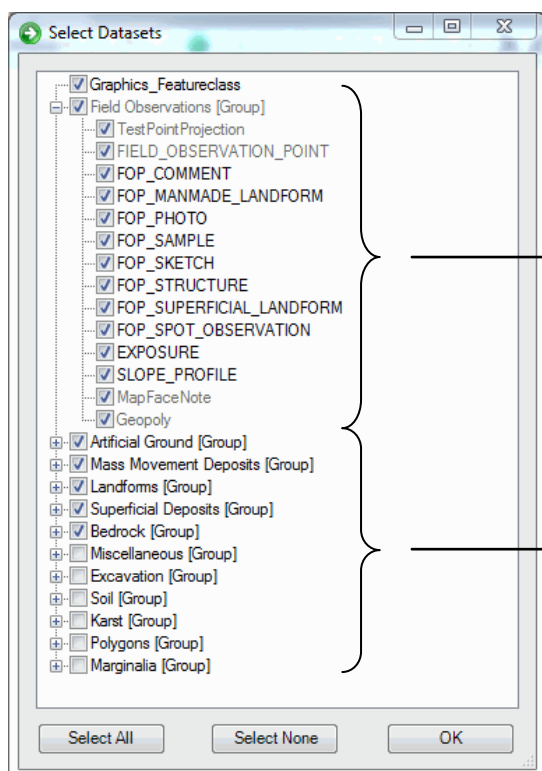
Point Datasets
- Observations are collected and stored in the DFDC Access Database
- Similar to data collection by the original SIGMA Mobile

Line, Seed, and Polygon Datasets
- Observations are collected and stored within ArcMap
- Line styles creation and display similar to the original SIGMA Desktop (GSD)
- Seed and Polygon creation similar to the original SIGMA Desktop (GSD)
- Marginalia layer for Cartographic purposes

- **User/Project Details Form**
  - o Start typing your name into the field and your name will appear in a drop down list. Select your name from the list and your BGS ID will be added automatically to the ID field. If your name is not included in the list then type in your full name and ID.
  - o Enter Map Scale – optional.
  - o It is advisable to enter your next sample number. If you are adding to a project with previous samples already added then enter the next valid Sample Number.
  - o You must enter your next Locality

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Number - you will not be able to continue to the next step without it. If you are adding to a project enter the next valid Locality Number.

- When continuing on with an existing project both the Sample and Locality numbers will automatically be updated
- Location
  - UK
  - Other – See Section 6: Setting up Projects Overseas (page 46).
- Check Field or Desktop as your location
  - For metadata purposes this populate fields in the database tables to show where observations and changes are taking place; i.e. Field or Desktop
- Please, WAIT ... there may be a small delay while SIGMA loads ...
- BGS•SIGMA*mobile*/*desktop* is now active and ready for use

1.5 SAVING YOUR BGS•SIGMA PROJECT

Save and name your ArcMap Project to your Project Folder.

1.6 BASELINE DATA

Add all relevant Baseline data that will be required while in the field into your Project Folder and subsequently into your Project GIS/SIGMA. Some UK examples are: OS Topography, Digital Surface Models (DSMs) and Hillshaded images, Aerial Photography, OS Contours, Historic Maps and Fieldslips, Historic OS Maps. Baseline data for use in the office can be used from your corporate drives.

NOTE: Wherever possible raster data should be in an optimised file format and stored as an image catalog to reduce the file size and number of rasters displayed at once, therefore reducing the amount of system resources needed to refresh the data within BGS•SIGMA*mobile*. One example of an optimized file format is ECW which can be generated through the ERMapper software or FME.

1.7 DIGITIZING AND EDITING FEATURES

See Section 2: Digitizing and Editing in SIGMA 2012 (page 8).

1.8   THE BGS SIGMA MOBILE TOOLBAR
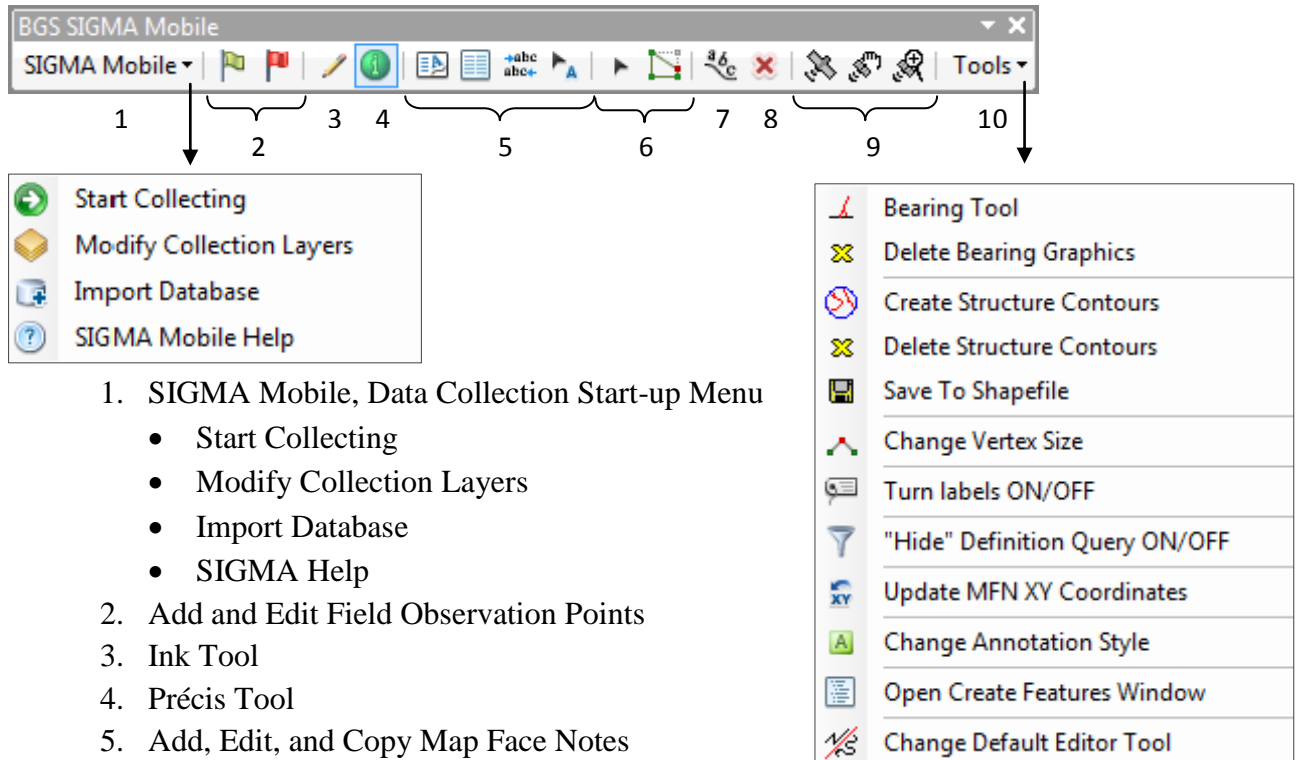
1. SIGMA Mobile, Data Collection Start-up Menu
    - Start Collecting
    - Modify Collection Layers
    - Import Database
    - SIGMA Help
2. Add and Edit Field Observation Points
3. Ink Tool
4. Précis Tool
5. Add, Edit, and Copy Map Face Notes
6. Edit Tool and Edit Vertices Tool
7. Label Geofeature
8. Delete SIGMA Mobile Features
9. BGS GPS Tools
10. SIGMA Mobile, Tools Menu
    - Bearing Tools
    - Structure Contour Tools
    - Change Vertex Size
    - Turn Labels ON/OFF
    - Hide Definition Query (in newer versions, called: Show Hidden Features)
    - Change Map Face Note Style
    - Open Create Feature Window
    - Change Default Editor Tool

See

1.9   THE DFDC DATABASE

See Section 4: The DFDC Database, for a detailed look at how to use the DFDC database forms and functions (page 25).

1.10 THE BGS SIGMA DESKTOP TOOLBAR
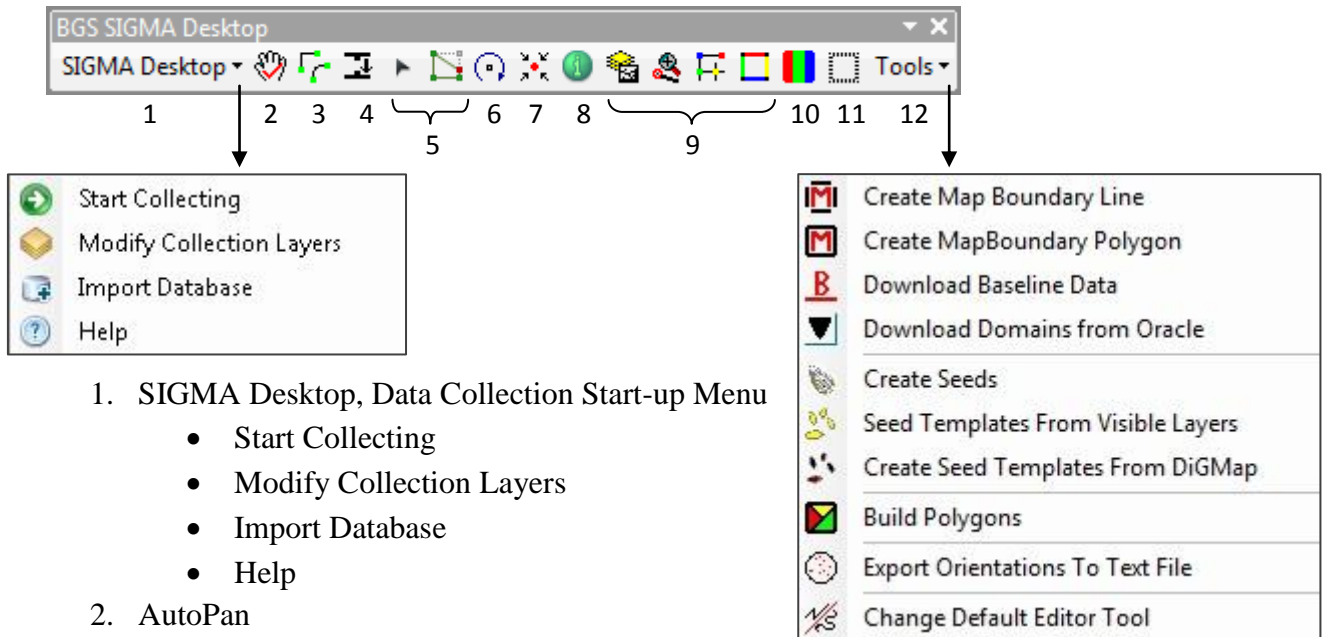
1. SIGMA Desktop, Data Collection Start-up Menu
   - Start Collecting
   - Modify Collection Layers
   - Import Database
   - Help
2. AutoPan
3. BGS Smooth Tool
4. Flip Line Tool
5. Edit Tool and Edit Vertices Tools
6. Rotate Marker Tool
7. Pan Zoom to Mouse
8. Précis Tool
9. Set Map Topology and resulting error checking buttons for nodes and dangles
10. BGS Renderer
11. Hide Features Tool
12. SIGMA Desktop, Tools Menu
    - o Create Map Boundary Line
    - o Create Map Boundary Polygon
    - o Download Baseline Data
    - o Download Domains from Oracle
    - o Create Seeds
    - o Seed Templates from Visible Layers
    - o Create Seed Template from DiGMap
    - o Build Polygons
   - o Export Orientations to Text File
    - o Change Default Editor Tool

See : BGS•SIGMA*desktop* (page 37).

2 Digitizing and Editing in BGS•SIGMA2012

One of the major differences in this version of ArcMap/SIGMA is the way features (points, lines, and polygons) are selected and used. You should automatically be in Editing mode once SIGMA has loaded from the Start Collecting function and the Create Features Window should be loaded and docked on the right side of the screen. Any layer and its editable features will be listed in the Create Features window. The layers in the Table of Contents and the Create Features window are linked to hide and show available feature styles for selection. For example: If the Artificial Boundary, Bedrock Boundary, and Fault or Fracture Trace Layers are selected in the Table of Contents then the Line Styles attributed to those layers are available for selection in the Create Features Window.

- Select the layers within the Table of Contents that you are currently working on
- To digitize a point, line or polygon select the required feature in the Create Features Window and begin digitizing by clicking/tapping onto the map window to place or draw that feature (double-click/tap to finish your line/polygon using Standard Editing)
- If the Create Features Window is accidentally closed, it can be reopened by two methods:
  - BGS SIGMA Mobile Toolbar – Tools – Open Create Features Window
  - ArcMap – Editor Toolbar – Create Features Button
- If you have stopped Editing and closed the Create Features dialog box you can reopen them and the Editor toolbar quickly by:
  - Table of Contents – Select any Layer – right-click – Edit Features – Start Editing
- To Hide the Create Features Window, press the push pin in the corner of the blue ribbon and it will tack to the far right margin (to Close press the x)
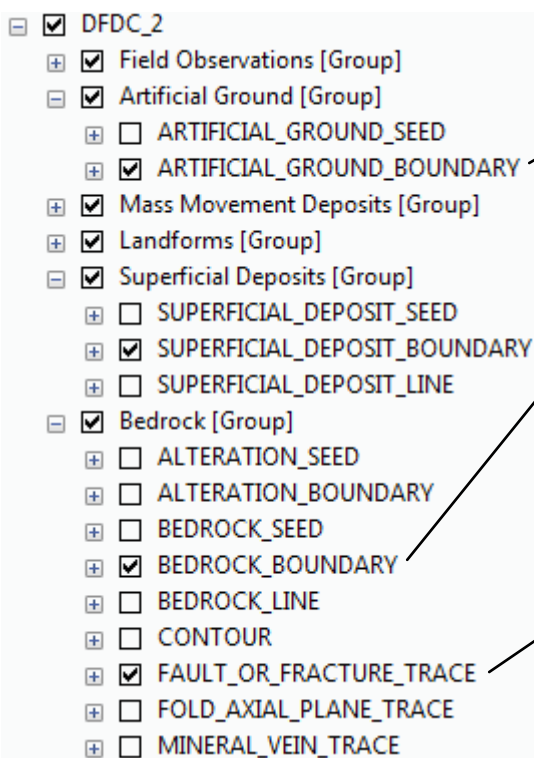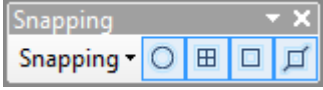
Table of Contents   **Create Features Window (partial selection)**
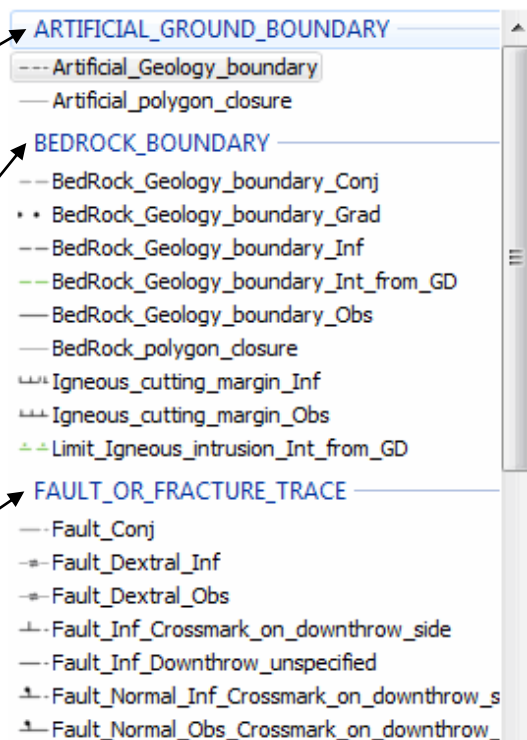
2.1 SET SNAPPING

Setting the Snapping Environment is an absolute must when digitizing. Snapping reduces many common digitizing errors by snapping lines and polygons together. In BGS•SIGMA*desktop* the final outcomes are geological polygon layers created from clean and seeded line work, thus the need for cleanly snapped lines.

- Set the **Snapping Tolerances** – allowing lines to snap to themselves
  - On the Main ArcMap Toolbar select: Customize – Toolbars – Snapping
  - On the Snapping Toolbar select: Snap to Sketch
- Double check that Use Snapping is checked from the drop-down menu of the Snapping Toolbar and that all 4 buttons on the Toolbar itself are selected initially. You can turn these snapping tools on and off to suit your preference.
  - Point Snapping – snaps to point features
  - End Snapping – snaps to the first or last node of lines
  - Vertex Snapping – snaps to any vertex on a line or polygon
  - Edge Snapping – snaps anywhere on a line or polygon
- To suspend snapping temporarily, hold down the spacebar while digitizing
- You can also use **Classic Snapping**, which allows you to snap to specific layers
  - Editor Toolbar – Editor drop-down list – Options
  - General Tab – check on, Use classic snapping - OK
  - Editor Toolbar – Editor drop-down list – Snapping – Snapping Window
  - The Window appears in the same location as the Create Features Window and you are now able to check on or off the layers you wish to snap to and check on or off the type of snapping (vertex, edge, or end)
    - Toggle between the Create Features and Snapping Windows using the tabs at the very bottom of the menu just above the cursor location

2.2 SELECT THE EDITING ENVIRONMENT

- Choose your Editing Preference, Standard or Sketch from the BGS SIGMA Mobile or Desktop Toolbars – Tools drop down list – Change Default Editor Tool
  - **Standard Editing** (is the recommended digitizing method)
    - Is the default editor where you click/tap on screen to add nodes/vertices to your line
  - **Sketch Editing**
    - Allows you to draw a continuous line and nodes/vertices are added automatically
      - In this version of the Sketch Editor nodes/vertices are added at reasonably spaced intervals to allow for easy editing of the line
  - Switching between Editors can be done at any time by selecting the Change Default Editor Tool from the BGS SIGMA Mobile or Desktop Toolbars – Tools drop down list
- Select your working layers from the Table of Contents
- Select the Line Style from the Create Features Window
- Draw your line in the ArcMap Window (double tapping/clicking to end your line/polygon using Standard Editing)

2.3   EDITING LINES

Editing is the same as previous ArcMap/SIGMA versions; either select the Edit Tool and Edit Vertices Tool from the ArcMap Editor Toolbar or from the BGS SIGMA Mobile or Desktop Toolbars:

- Use the **Edit Tool** ▶ to select, move, duplicate, and delete features
    - o Delete lines and features using the Delete button on the Main ArcMap Toolbar (beside paste)
    - o **DO NOT** delete Field Observation Points using this delete button (use the Delete SIGMA Mobile features button ✖ located on the BGS SIGMA Mobile toolbar – page 14/18)
- Use the **Edit Vertices Tool** ⬚ to move, insert, delete, and change vertices of a point, line or polygon
    - o See Section 3.10.3: Change Vertex Size to change the size of the vertex (page 22)

2.4   BGS•SIGMA*DESKTOP* EDITING TOOLS

A number of Editing Tools are available on the BGS SIGMA Desktop Toolbar that may be helpful whilst using BGS•SIGMA*mobile*. These include: AutoPan, BGS Smooth, Flip Line Tool, and Pan Zoom to Mouse. These are all discussed in Section 5.7: BGS SIGMA Desktop Toolbar – Partial (page 38-40).

2.5   EDITING SHORT-CUT KEYS

Z key   Zoom in (you can also use the mouse scroll-wheel)

X key   Zoom out (you can also use the mouse scroll-wheel)

C key   Pan (or hold the mouse scroll wheel down to pan)

V key   Show vertices

Esc   Cancel

Ctrl + Z   Undo

Ctrl + Y   Redo

Spacebar   Temporarily Suspend Snapping

2.6   CHANGING LINE ATTRIBUTION

On the Editor Toolbar is a button called: Attributes ▦ . When you press this button a dialog box appears which describes the attributes of the line you have just digitized or have selected with the editor tool.

- To change the Feature, for example from Bedrock Boundary Inferred to Bedrock Boundary Observed, press the Feature name and then the small box with 3 dots in it. This will bring up the Choose Symbol dialog box where you will choose your new line style
- Feel free to add names, labels, and comments if necessary

2.7   SAVING AND SAVING EDITS

As always, it is good practice to frequently Save 💾 your Project and to Save any Edits that you have made. To Save Edits, Open the Editor Toolbar (Customize – Toolbars - Editor) and Edit – Save Edits.

2.8   LAYER SELECTABILITY

It can be useful when editing to alter a layer's selectability. Some examples are: layers that can become accidentally moved, such as your Boundary line/polygon or when editing Superficial Lines, it might be good practice to turn off the selectability of Bedrock and Artificial Line Styles.

- To alter a layer's selectability – Table of Contents – List by Selection
- Press the 'click to toggle selectable' by the Layer name and the layer will move to the Not Selectable List and vice versa

2.9   CREATING TAGS TO SUBSET THE CREATE FEATURES WINDOW TO YOUR FAVOURITE LINE STYLES:

- Select the Organize Templates Button 🗔 under the Create Features Header
- Select a Layer from the Layers Menu on the left – the line styles will appear in the window on the right
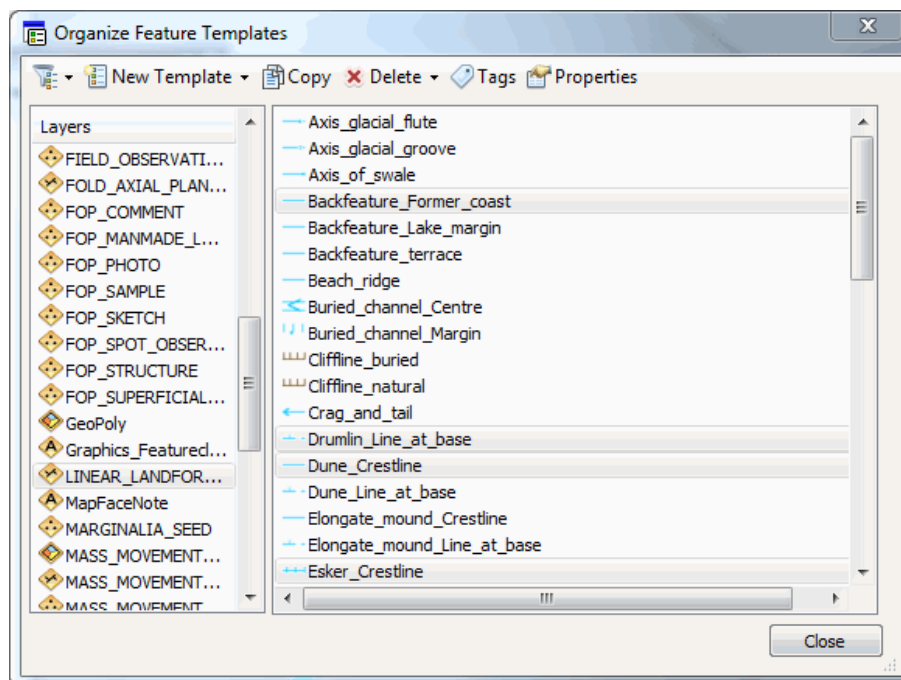

- Holding the Ctrl key on the keyboard (or the Shift key for blocks of line styles), select the line styles to be in your subset, and the Tags Button 🏷Tags
- In Tag: Enter a memorable name, such as a short Project Title or your initials, Press Add and OK
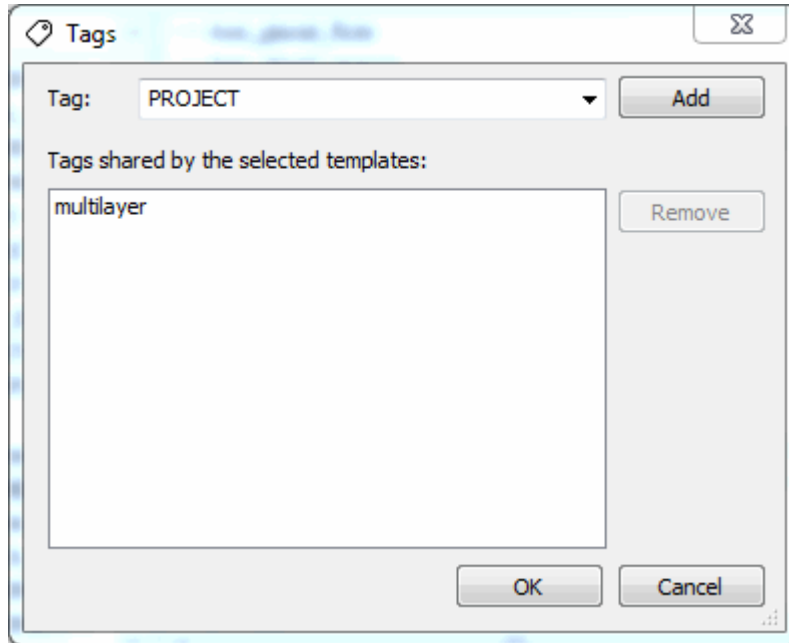
- Continue this process for all of the layers/line styles you wish to have in your subset
  - Using the same tag name to continue adding to the subset
  - Or a different tag name to have multiple subsets
- Close the Organize Features Template Window
- In the **Filter Templates Box** (to the right of the Organize Templates Button) type in the name of your Subset and the list will contain only your chosen tags
  - **Note:** you can also search the entire template using this box, for example typing in backfeature will bring up all Landform line styles with this name

3 BGS•SIGMA*mobile*

The way to think about your BGS•SIGMA*mobile* project is as a digital fieldslip. This should be treated in much the same way as a paper field slip where geologists draw lines and polygons, make map face comments, and draws points with labels to reference their geological notebook observations. Any geological lines or landforms created using BGS•SIGMA*mobile* should be "inked in" using BGS•SIGMA*desktop* on return to the office in much the same way a paper field slip is inked in and a Map created.
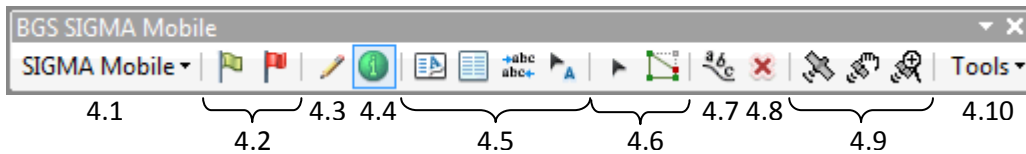
3.1 BGS SIGMA MOBILE, DATA COLLECTION START-UP MENU

This is where it all starts with BGS•SIGMA*mobile*.

3.1.1 Start Collecting
- Select this option to set-up a new BGS•SIGMA*mobile* project or to continue with an existing project
- Details of how to do this are outlined in <u>Section 1.3</u>: ArcMap 10 - BGS•SIGMA Set-up (page 2)

3.1.2 Modify Collection Layers
- After you have set-up a project you can use this function to modify the layers you chose in the 'Select Datasets' dialog box and within your project

3.1.3 Import Database
- A function to allow you to import previous fieldwork databases or colleagues' databases for collating
- Pre-2012 databases are currently viewable by the précis tool

3.1.4 SIGMA Mobile Help
- A link to the BGS•SIGMA manual

3.2 ADD AND EDIT FIELD OBSERVATION POINTS

Observation Points are key for digital field data capture. These Tools are the gateways to the DFDC Database which allow you to store numerous types of data for each point of observation.

3.2.1 To Add a Field Observation Point
- Select the Add Field Observation Point Button from the BGS SIGMA Mobile Toolbar and click within the ArcMap Window where you would like your point to be placed
- Wait for the DFDC database form to load and enter your observed information
- Close the DFDC database by using the Close Form Button instead of the Red X in the corner*

3.2.2 To Edit a Field Observation Point
- Select the Edit Field Observation Button from the BGS SIGMA Mobile Toolbar and select the point you wish to Edit

- Wait for the DFDC database to load and change, update, or add more information to the specified observation point
- Close the DFDC database by using the Close Form Button instead of the Red X in the corner*

3.2.3 To Delete a Field Observation Point

- Using the Select Tool on the ArcMap Tools Toolbar ⬚, select the observation to be deleted within the ArcMap Window, and press the Delete SIGMA Mobile Features Tool ✖ located on the BGS SIGMA Mobile Toolbar
- **DO NOT** press the ArcMap Delete button as information stored within the database will not be deleted

3.2.4 To Move a Field Observation Point

- Using the Edit Tool ➤ on the BGS SIGMA Mobile Toolbar or the ArcMap Tools Toolbar, Select the Field Observation Point to be moved and drag it to its new location – all of the auxiliary information will be moved and updated automatically

*Note: Closing the Access DFDC Database using the Red X saves and closes Access completely and will need to be reloaded during the next Field Observation. Closing the Access DFDC Database using the Close Form Button refreshes and updates both Access and ArcMap and the Database is minimized until the next Field Observation, thus saving time.

See Section 4: The DFDC Access Database for a detailed look at how to use the DFDC database forms and functions (page 25)

3.3   INK GRAPHICS TOOL

The Ink Graphics Tool is an easy way to 'ink' in sketches within your Project. The Graphics are stored within the Project DFDC Access Database for future reference. In this version you are no longer able to convert your sketches to digital (vector) lines and thus, it is not recommended for drawing geological linework.

Draw Ink   Reactivate Ink

Erase Ink   Commit to Graphic

Delete
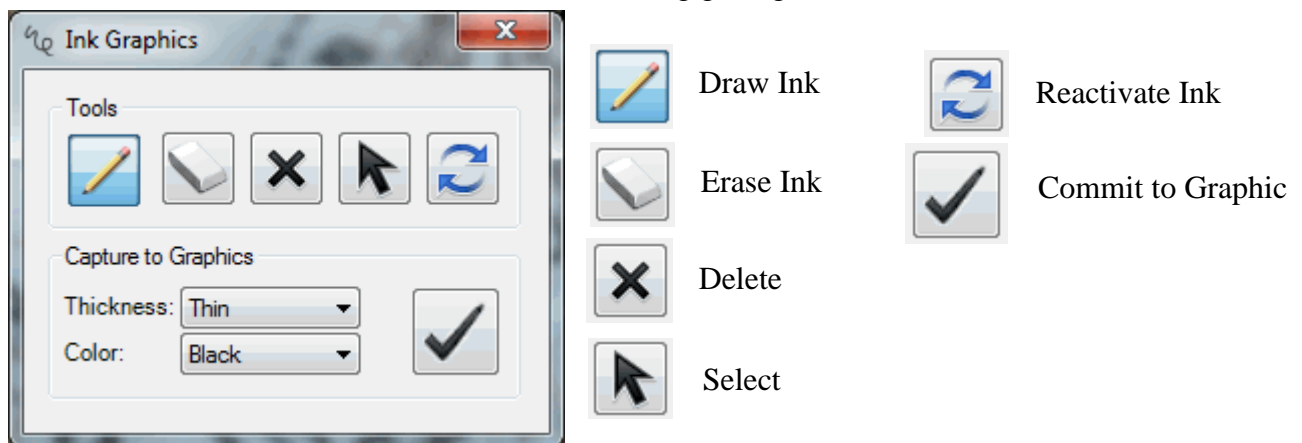
Select

3.3.1 To draw a sketch

- Press the Draw Ink button
- Select the desired Thickness and Colour from the drop down lists
- Sketch within the ArcMap window:
  - Directly with the pen stylus or by
  - Holding the left mouse button down and moving the mouse
- Press the Commit to Graphic button when finished

3.3.2 To erase part of a sketch

- For an active sketch:
    - Press the Erase Ink button and either:
        - Erase the mistake by following the sketch with the pen stylus, or
        - Hold the left mouse button down and erase the mistake
- For an inactive sketch/graphic:
    - Press the Select Ink/Graphic Tool
    - Select the inactive sketch graphic in the ArcMap window
    - Press the Reactivate Ink button
    - Proceed as above
    - Press the Commit to Graphic button when finished

3.3.3 To delete a sketch/graphic

- For an active sketch:
    - Press the delete button
- For an inactive graphic:
    - Press the Select Ink/Graphic Tool
    - Select the graphic in the ArcMap window
    - Press the Delete Ink/Graphic Button

3.3.4 To reactivate a sketch

- Press the Select Ink/Graphic Tool
- Select the inactive sketch graphic in the ArcMap window
- Press the Reactivate Ink button

3.3.5 To change the pen thickness and colour of an existing graphic

- Press the Select Ink/Graphic Tool
- Select the graphic in the ArcMap window
- Press the Reactivate Ink button
- Choose the desired Thickness and Colour from the drop down list
- Press the Commit to Graphic button when finished

3.4 PRÉCIS TOOL

The Précis Tool gives an overview screen shot of a Field Observation point including, Comments, Sketches, Photos, Samples, and Observations. It can be accessed from the BGS SIGMA Mobile Toolbar and also from the Access DFDC Database itself.

3.4.1 To use the précis tool from ArcMap:

- Press the Précis button from the BGS SIGMA Mobile Toolbar and select the desired Field Observation Point (FOP)

3.4.2 To use the précis tool from the Access DFDC Database:

- Press the PRECIS Button within the Access DFDC database
    - You can open the DFDC Database for the desired Field Observation Point (FOP) by selecting the Edit Field Observation Button from the BGS SIGMA Mobile Toolbar and then pressing the PRECIS Button within the database

3.5 ADD, EDIT, AND COPY MAP FACE NOTES

Map Face Notes allow you to quickly add a visible comment or note directly to the ArcMap window. The Map Face Note is also stored within the DFDC database along with its Geographical Coordinates for future reference.

3.5.1 Setting the Map Face Note Colour Scheme
- BGS SIGMA Mobile – Tools – Change Map Face Note Style
- Select the desired arrow and text colour and Close the form
  - The colour scheme can be changed at any time but will only be applied to new Map Face Notes and not existing Map Face Notes

3.5.2 Adding Map Face Notes
- Press the Add Map Face Note Button from the BGS SIGMA Mobile Toolbar
- Within the ArcMap Window, you will need to click twice with your pen or mouse, once to place the arrow and the other to place your comment
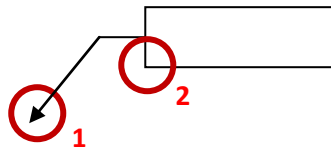

- Enter your note or comment (Press Enter to make a new line) and press the Enter Comment button
- Your note will appear on the ArcMap Window

3.5.3 Editing Map Face Notes - Text
- To Edit a Map Face Note, press the Edit Annotation Button on the BGS SIGMA Mobile Toolbar, select the Map Face Note to be edited within the ArcMap Window, followed by the Edit Map Face Note Button located on the BGS SIGMA Mobile Toolbar
- The Edit Map Face Note Form will appear allowing you to make what ever changes you need to your comment
- To submit your changes press the Enter Comment button at the bottom of the Form or close to cancel

3.5.4 Editing Map Face Notes – Size
- To edit the size of one comment, press the Edit Annotation Button on the BGS SIGMA Mobile Toolbar, select the Map Face Note to be edited within the ArcMap Window, hover over the red triangle until you see a white arrow, and then click, hold and drag the comment to be bigger or smaller in size
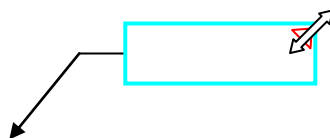
3.5.5 Copying Map Face Notes
- To copy a comment, press the Edit Annotation Button on the BGS SIGMA Mobile Toolbar, select the Map Face Note to be copied within the ArcMap Window, and press the Copy Map Face Note button on the BGS SIGMA Mobile Toolbar

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- Press OK
- Drag the new Comment Box (by clicking, holding, and dragging the mouse anywhere within the comment box) and Arrow (by the small green box at the arrow tip) to a new location
- You may have to refresh the screen for the new location to be updated

3.5.6 Deleting Map Face Notes

- Select the Map Face Note with the Edit Tool ▸ and either press the Delete Geofeatures button ✖ on the BGS SIGMA Mobile Toolbar or the general delete button ✖ on the ArcMap Main Toolbar

3.5.7 Saving Map Face Notes

- Map Face Notes are Saved automatically every time you add a Field Observation Point and the Close Form button is pressed
- However, it is good practice to Save all of your Edits (Edit Toolbar, Save Edits) and your Project regularly

3.6   EDIT TOOL AND EDIT VERTICES TOOL

These tools are the same as the ArcMap Editing Tools, just placed on this toolbar for ease of access. Choose from either location to edit features.

3.6.1 Edit Tool ▸

- Allows you to select, move, duplicate, and delete features

3.6.2 Edit Vertices Tool ⬚

- Allows you to move, insert, delete, and change vertices of a point, line or polygon
- See Section 3.10.3: Change Vertex Size to change the size of the vertex (page 22)

3.7   LABEL GEOFEATURE

The Label Geofeature button ᵃᵇᵪ allows you to type a caption or note onto the line style itself.

3.7.1 To Add a label

- Select the line you wish to label with the Edit Tool ▸ (from either toolbar), press the Label Geofeature button ᵃᵇᵪ on the BGS SIGMA Mobile Toolbar, type in your text, and press Add/Remove Label

3.7.2 To Edit your label's text

- Select a labelled line with the Edit Tool ▸, press the Label Geofeature button ᵃᵇᵪ on the BGS SIGMA Mobile Toolbar, edit your text, and press Add/Remove Label

3.7.3 To Delete your label

- Select a labelled line with the Edit Tool ▸, press the Label Geofeature button ᵃᵇᵪ on the BGS SIGMA Mobile Toolbar, delete your text, and press Add/Remove Label

3.8   DELETE SIGMA MOBILE FEATURES

This currently deletes any Field Observation Points and Map Face Notes plus GeoLines and GeoPolys if you have chosen to use these historic linestyles. Deleting a Field Observation Point is described in Section 3.2 (page 14).

3.9   BGS GPS TOOLS

The Global Positioning System (GPS) uses a satellite based system to determine your position anywhere in the world. The BGS GPS Tools takes the location information and offers various tools to help navigate within your BGS•SIGMA Project.

3.9.1 The Basics

- Press the Start GPS Button 🛰 on the BGS SIGMA Mobile Toolbar and the BGS GPS 1.06 Form will appear
- Press Start GPS
    - o The Satellites bar will fill as available satellites work together to determine your position
    - o The Status bar will advise you of: GPS Fix, No Fix, or GPS OFF
    - o When a fix has been determined the Latitude and Longitude boxes will be updated
- Two shapefiles will appear at the top of your Project Table of Contents
    - o GPS – Your current GPS Location
        - ▪ The colour of the GPS symbol will change depending on satellite strength: Red = No Signal, Yellow = Low Signal, and Green = Good Signal
    - o GPS_YYMMDD_HHMMSS – GPS Log for the current session
        - ▪ These files can be found in your Project Folder under GPS
        - ▪ You can delete previous GPS Logs from the Project Table of Contents but errors may occur if the GPS Location and current GPS Log are deleted
- Adjust the Update Interval slider for your preferred refresh/update interval, in seconds, of your GPS location
- Close the BGS GPS 1.06 Form by using the X in the corner
    - o The GPS will continue to run in the background
- Use the Pan to GPS 🖐 and 🔍 Zoom to GPS buttons on the BGS SIGMA Mobile Toolbar to Pan and Zoom to your current position
- To Stop using the GPS, press the Start GPS Button 🛰 on the BGS SIGMA Mobile Toolbar to see the BGS GPS 1.06 Form again and press Stop GPS

3.9.2 A Bit More Detail

The tablet PC's GPS System collects location information using WGS 1984. SIGMA projects this information into British National Grid, OSGB 1936 using the layer TestPointProjection.

For information on how to use BGS•SIGMA outside of the UK, See Section 6: Setting up Projects Overseas (page 46)
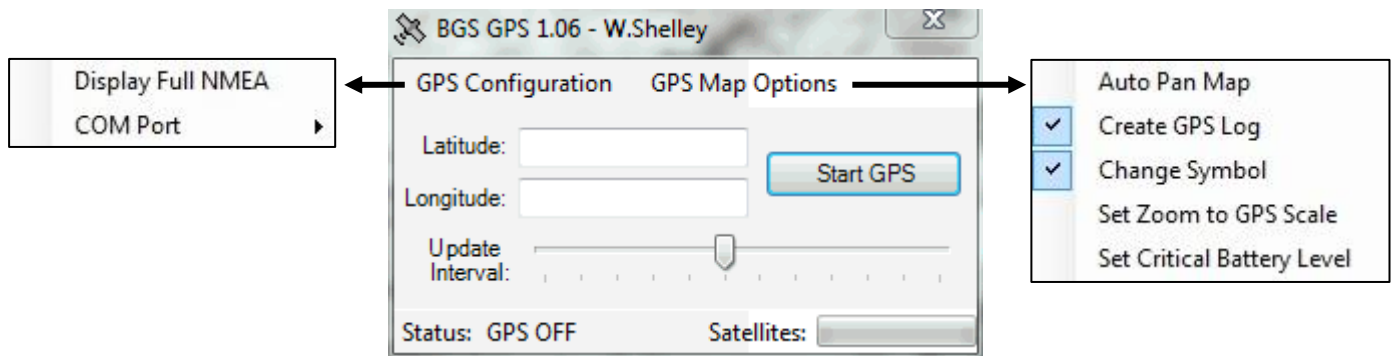
- **BGS GPS 1.06 Form**
  - **Start/Stop GPS** – Starts and Stops the acquisition of your GPS location
  - **Latitude** – When a satellite fix is found, your current latitude
  - **Longitude** – When a satellite fix is found, your current longitude
  - **Update Interval** – Slider to control the Map Panning, GPS Log, and GPS Symbolizing frequency in seconds
  - **Status** – A status indicator specifying one of: GPS OFF, No Fix, or GPS Fix
  - **Satellites** – Satellite acquisition progress
- **GPS Configuration Drop Down List**
  - **Display Full NMEA** – Displays the Tablet PC's Satellite Acquisition Screen and Settings
  - **COM Port** – COM Port 2 will automatically be selected, if a different COM Port is required you can select it from the drop down list
- **GPS Map Options Drop Down List**
  - **Auto Pan Map** – A setting to automatically pan to the current GPS location
  - **Create GPS Log** – A GPS log will be created within your Project Folder based on the interval specified on the Update Interval Slider (on by default)
  - **Change Symbol** – When this function is ticked on the symbol changes with satellite strength: Red = No Signal, Yellow = Low Signal, and Green = Good Signal (on by default)
  - **Set Zoom to GPS Scale** – Allows the user to set the amount of zoom required for the Zoom to GPS button on the BGS SIGMA Mobile toolbar
  - **Set Critical Battery Level** – This should be automatically set above the Tablet PC's critical battery level to avoid a GPS error

3.9.3 ARC GPS Tools

Sometimes, various platforms work better with one GPS Tool than another. For instance, our Getac V100 tablets work better with the BGS GPS Tools but our Panasonic CF-19 Toughbooks only work with the ArcGPS Tools. If you are having difficulty with one GPS tool then it is worth trying the other. Instructions for the ArcGPS tools are found in Appendix A, (page 48).

3.10 BGS SIGMA MOBILE, DROP DOWN TOOLS MENU

3.10.1 Bearing Tool

This tool allows the user to quickly derive and draw their compass bearings (lines of sight and backsight) within ArcMap.

- Select the Bearing Tool ⏚ from the BGS SIGMA Mobile Toolbar, Tools drop down list (you will notice the pointer will change to ⊕)
- Click/tap on the screen where you would like to start your bearing from. As you hover and swivel the cursor around that point you will see a dashed red line in the ArcMap Window and the compass bearing appearing in the bottom left hand corner of the screen (underneath the ArcMap Table of Contents)

56.3

56.3

- Double click to create a graphic of your bearing
    - You can create as many bearing graphics as you wish
- **To Delete** all bearing graphics, select the Delete Bearing Graphics Tool ✖ from the BGS SIGMA Mobile Toolbars, Tools drop down list
- **To Turn Off** the Bearing Tool, select a different function or tool
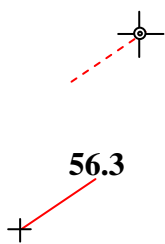
3.10.2 Structure Contour Tools

The Structure Contour Tool allows the user to estimate where a geological bed will outcrop. Generally, it uses the angle and dip from one field observation point or three observed outcrop points to calculate the plane of bed and bed elevation and compares this to the digital terrain model to predict where the bed will next outcrop.

- From the BGS SIGMA Mobile Tools drop-down list, select Create Structure Contours and the following dialog box will appear

- Using the drop-down arrow, select your **Digital Terrain Model (DTM)** from the list, such as nextmap_dtm
  - Use the multiple layers as DTM button if your search area covers more than one DTM (check appropriate layers)
    - The drop-down list contains all the raster images contained within your project including topographic maps – only select a layer or layers which contains elevation information
- Choose either the Single Observation Point or the Three Points Calculation Method

  Single Observation Point
  - Choose one of three data entry options: click on the map at your observation to automatically derive eastings and northings, enter them manually, or use the switch to small inputs form to click on the map at your observation and press Back to Main Form
  - Enter the observed Dip (from 0-90) and Azimuth (from 0-360) manually into the box or use the sliders to the right of the box to enter
  - Enter the Elevation in metres manually or choose Get Elevation from DTM

  Three Observed Outcrop Points
  - Point 1 Tab - Choose one of three data entry options: click on the map at your observation to automatically derive eastings and northings, enter them manually, or use the switch to small inputs form to click on the map at your observation and press Back to Main Form
  - Enter the Elevation in metres manually or choose Get Elevation from DTM
  - Select the Point 2 Tab and repeat steps 1 and 2
  - Select the Point 3 Tab and repeat steps 1 and 2
- Choose your **Tool Parameters**
  These three input values are parameters that affect how the tool calculates and displays structure contours. Each input is initially given a default value.

    - **Tolerance**: At various points in the search area the tool calculates the predicted elevation of the bed and compares it with the ground elevation value from the DTM to see if they are the same. The tolerance value defines how close (in metres) these two values need to be to be declared 'the same'. This value can be typed in manually or populated using the slider to the right of the Tolerance text box. To move the slider small amounts click just to the left or just to the right of the slider's pointer and it will move 1 metre in that direction. A non-integer value (e.g. 0.5) can be entered as the tolerance, but this must be entered manually.
    - **Sample Resolution**: Large search areas can take a long time to process as calculations are made every 5 metres (the resolution of NEXTMap). The speed of the tool can be improved by increasing the distance between the calculations. A sample resolution of 2 means calculations will be made every 10 metres, whilst a sample resolution

of 3 means calculations will be made every 15 metres and so on. Obviously increasing the sample resolution may decrease the number of resulting points. Values can be typed in manually or populated using the slider to the right of the Sample Resolution text box.

- o **Point Colour:** Select one of four colours from the drop-down list for the display results. By choosing different colours it is possible to display the results from several structural contour calculations on the map at the same time.

- Enter in your **Search Area Parameters** to define a circular search area
  - o Either manually enter in the Eastings and Northings of the centre point or press the Use Observation Point or Centre of Three Points Button
  - o Select your Radius in metres from the drop-down list or enter manually
- Press **Calculate**
- The Results
  - o The blue circle is the extent of your Search Area
  - o The blue crosses are your observation points or observed point
  - o The red crosses are your estimated outcrop locations (or more formally, where the estimated bed elevation is within the tolerance value of the ground elevation – forming a structure contour)
  - o The results are displayed as a graphic on screen

- To **Save** the Structure Contour Display Graphic as a Shapefile go to the BGS SIGMA Mobile Tools drop-down list and select Save to Shapefile
  - o Browse to the folder location, name, and press Save
  - o The shapefile will automatically be added to your Project as a point file
- To **Delete All** the Structure Contour Display Graphics go to the BGS SIGMA Mobile Tools drop-down list and select Delete Structure Contours
- Create another Structural Contour Display by going to the BGS SIGMA Mobile Tools drop-down list, select Create Structure Contours, and enter in the required information
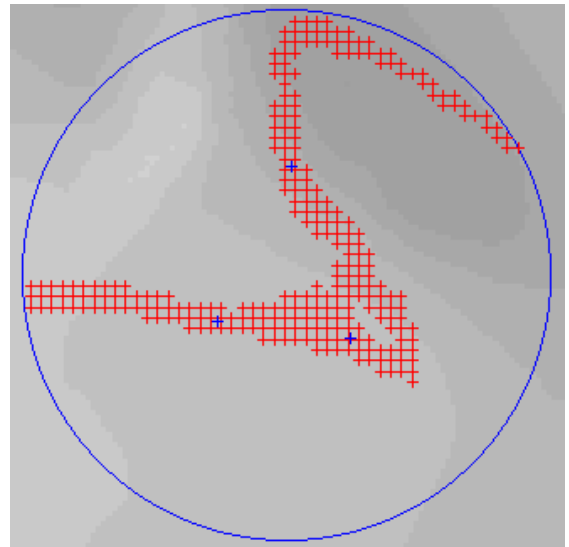
3.10.3 Change Vertex Size

This tool lets the user determine the size of the editor node/vertex using a sliding scale from 4 to 20.

3.10.4 Turn Labels ON/OFF

Allows the user to turn on and off labels by selecting them in the dialog box

- Check layers you want to view or hide (check mark shows labels/unmarked box hides labels), Select All Layers (shows all labels), or Select None (hides all labels) and press OK
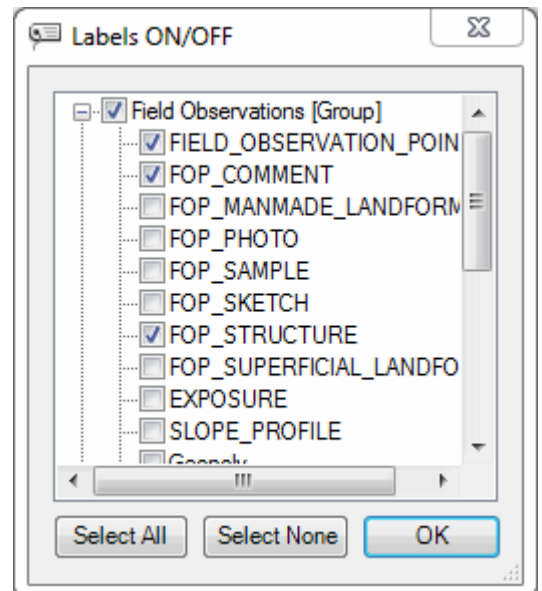
3.10.5 Hide Definition Query (called Show Hidden Features in newer versions)

Allows the User to Hide or Show certain features within the ArcMap Window by changing the visibility within the database tables, for example, to only show bedding measurements within the FOP_STRUCTURE layer

Alter the database tables within ArcMap

- On the BGS SIGMA Mobile Toolbar, Tools drop down list, Select "Hide" Definition Query ON/OFF and turn off any layers you wish to modify
    - This will show any previously hidden database rows
- Within the ArcMap Table of Contents Select the layer you wish to modify, right-click, and select Open Attribute Table
- Scroll to the Hide column (0=visible/1=invisible), sort the column if you wish, and enter 1 into each item in the column you wish to hide
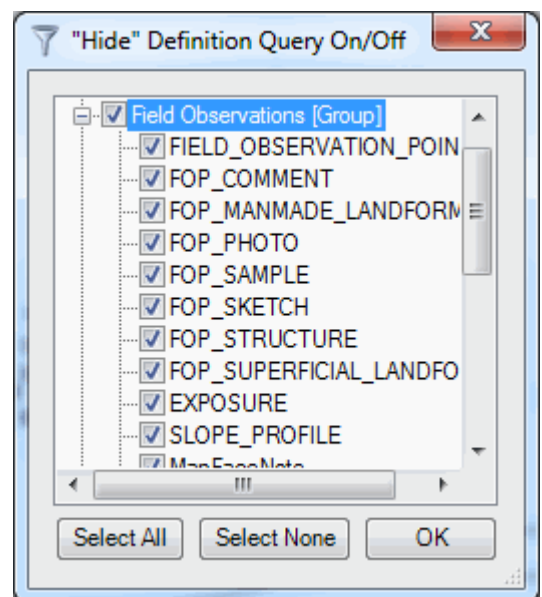
To Hide database items in the ArcMap Window

- On the BGS SIGMA Mobile Toolbar, Tools drop down list, Select "Hide" Definition Query ON/OFF and turn on any layers you have modified

To Show all database items in the ArcMap Window

- On the BGS SIGMA Mobile Toolbar, Tools drop down list, Select "Hide" Definition Query ON/OFF and turn off any layers you have modified

3.10.6 Change Map Face Note Style

See

3.10.7 Open Create Feature Window

Opens the Create Features Window for line-type selection.

3.10.8   Change Default Editor Tool

This tool allows you to change from Standard to Sketch Editing.

Standard Editing

- Is the default editor where you click/tap on screen to add nodes/vertices for your line

Sketch Editing

- Allows you to draw a continuous line and nodes/vertices are added automatically
    - In this version of the Sketch Editor nodes/vertices are added at reasonably spaced intervals to allow for easy editing of the line

3.11 BACKING UP DATA IN THE FIELD

It is good practice to back up your data EVERY EVENING of field data collection.

- Using Windows, create a New Folder in your Project Area, called Back_Up (or equivalent)
- Copy the Project .mxd and DFDC.mdb to the New Folder and rename with an _ and the date
- If something was to happen to your Project – copy the most recent back-up back to your Project Folder and rename them to their original format

4   The DFDC Access Database

The DFDC Access Database is the hub of all Field Observation Information. The place to enter, edit, compile, store, and view Field Observation Information.

4.1   HOUSEKEEPING

Locality Number
- Each Locality is automatically given a Locality Number
- If you wish to view or modify another Field Observation while the database is open, then Select the Field Observation (Locality Number) from the Drop-down list

Locality Description and Summary Label
- **Locality Description** – Enter in a description of your location
- **Summary Label on Map** – Enter in a short summary or code that you wish to see beside your Field Observation Point within the ArcMap Window

Project Scale Field Slip
- Displays general information about the Project
- You can change the Data Source Field here from: Field to Desktop

Geologist Information
- Displays general information about the Collector ID and Next Sample Number

Housekeeping
- **Edit Collector/Sample Number** – Pressing the button allows you to update your Project Code, Project Name, Collector ID, and next available sample number
- **View/Manipulate Dictionaries** – The place to order and subset dictionary items, if necessary
- **Show/Hide Ribbon** – Displays or Hides the DFDC Tables within the database

Management Fields
- Displays general information about the Field Observation

Close
- Minimizes the form and updates both Access and ArcMap until the next Field Observation is added

4.2   MAKE QUICK OBSERVATIONS

Make a Quick Comment
- A compact comment form to enter comments
- Press the Comments Button within the Make General Comments Section of the Form to Delete and Hide Comments

Repeat Last Comment Made
- Repeats the Last Comment

Photo
- A compact photo form which allows you to enter in the Photo Facing and Description
- Press the Photos Button within the Make General Comments Section of the Form to Delete, Copy, Link and View the Photos

Shaft
- Adds a Shaft Observation

Adit
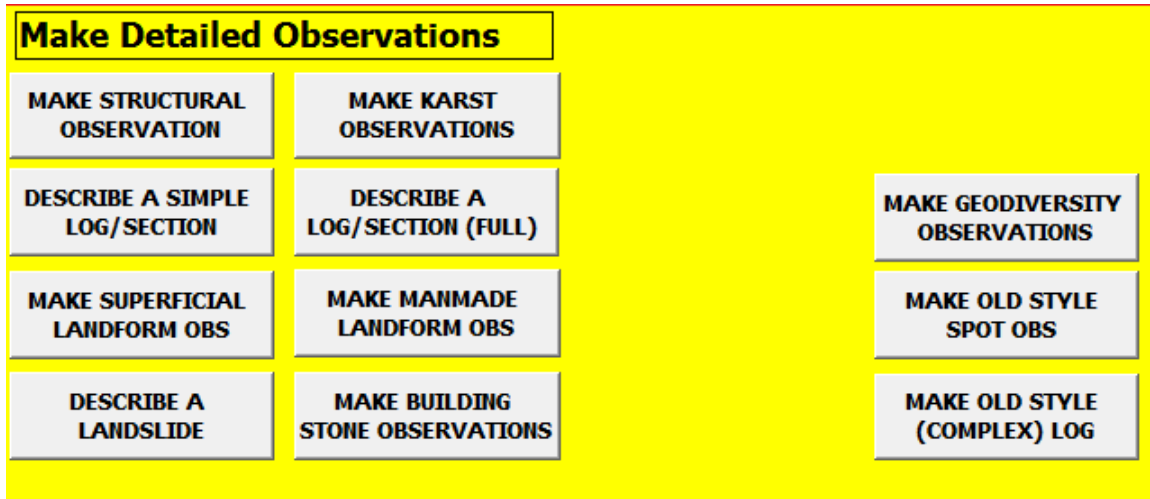- Enter in an Azimuth and an Adit Observation is created

Sink
- Adds a Sink Observation

Exposure
- Type in an Exposure Comment and an Exposure Observation is created

4.3 MAKE DETAILED OBSERVATIONS

Make Structural Observations

- This form has been significantly modified from previous versions and is almost completely button orientated
- Choose from the 'button types' menu (Bedding, Foliation, Axial Pln, and Etc.) to bring up the sub category below
- Click on a sub-category button (for example in Bedding, Inclined Normal) will add the symbol/measurement to the map face and populate the Measurement box
- Add in the Strike/Dip and Dip Direction or the Dip-Azimuth/Dip
- Type in any comments and Younging Evidence if required
- More than one observation can be entered by clicking within the sub-categories (you can view each observation by scrolling through the Record dialog)

  Record: I◀ ◀ 1 of 2 ▶ ▶I
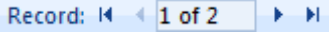
- Delete observations by pressing the Delete button

Describe a Simple Log/Section

- You must first press the 'New' button and then select your section/log type from the 'Section/Log Type' drop-down dialog box
- Enter in the Direction you wish to code your log(down/up)
- You can select up to 3 Lithologies by pressing the 'First Lith' Button
- Search for lithologies by either code or text, by pressing the Code/Text button:
  - To the right of the 'Search for Lith >' box enter in your search term (for example, B for Boulders if in Code mode or boulders if in text mode)
  - The filtered results will then appear in the 'Full Lithology' drop-down list
- Enter as much or as little information as required

Make Superficial Landform Observations

- Similar to Structural Observations, this form is now also completely button orientated
- Choose from the 'button types' menu (Glacial, Periglacial, Glaciotectonic, and Etc.) to bring up the sub category below – clicking on the sub-category button will add the symbol/measurement to the map face and populate the Feature box
  - The Erratic button does not contain a sub-category and will add the symbol directly to your map face

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- Type in any comments, if required
- More than one observation can be entered (you can view each observation by scrolling through the Record dialog) Record: ⊮ ◁ 1 of 2 ▷ ⊯
- Delete observations by pressing the Delete button

Describe a Landslide

- This form was originally made for the Landslides Team but is available for anyone in the organization to use
- Choose from the Landslides, Type and Style of Movement, Landslide Detail and Causal Factors, and Landslide Damage and Human Effect tabs
    - The last tab is a Landslide Guidance
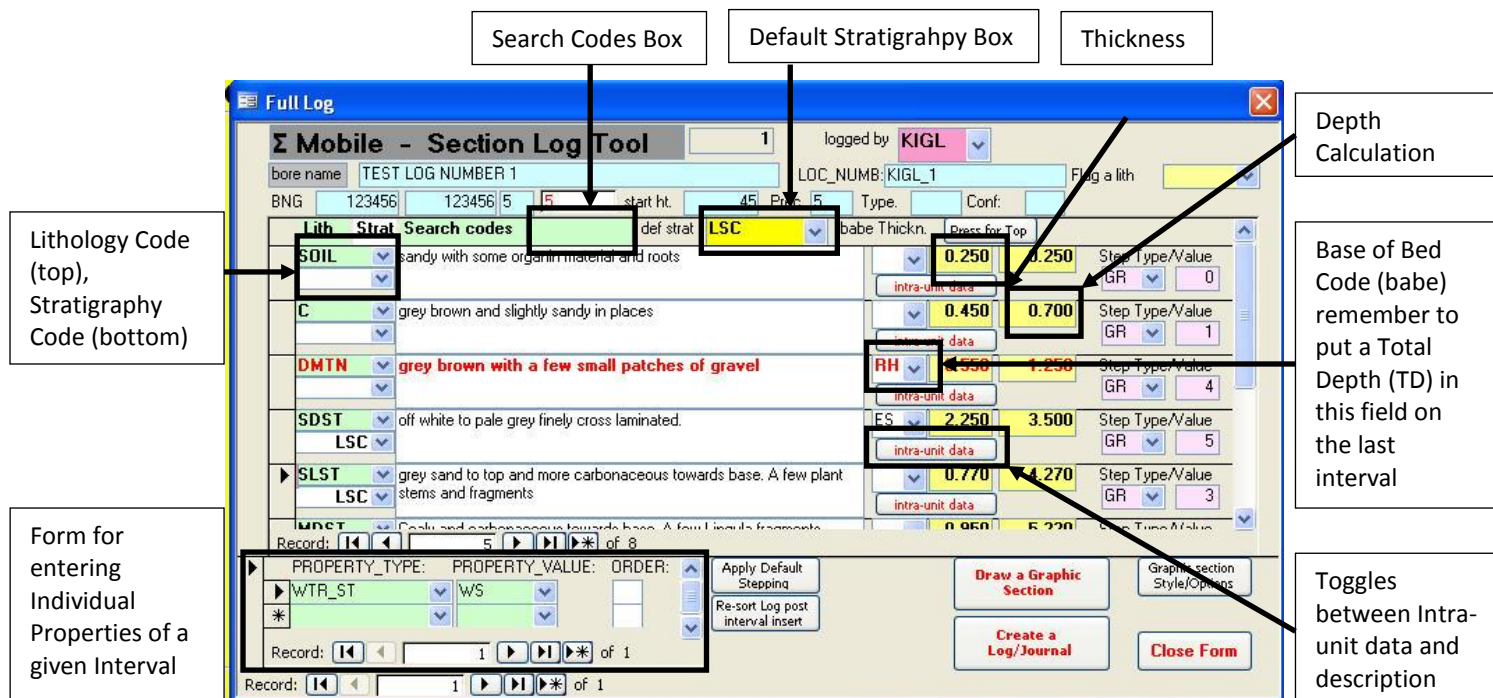- Enter as much or as little information as required

Make Karst Observations

- Enter as much or as little information as required choosing from the Sinkhole, Cavity, Stream Sink, Spring, and Building Damage tabs
    - A Building Damage Descriptions table is available on the last tab
- To make a simple Karst observation you will find a button in the Make Superficial Landforms Observations Section

Describe a Log/Section (Full)

This tool mimics the current Borehole entry system in BGS (BOGE).

- Enter a bore name

- The Search codes box is a search engine. Typing a word or phrase into the Search codes box will filter the results in the drop down list boxes for Lith (green) and Strat (white). For example: 'Sand' in the Search codes box will return descriptions containing the string "sand" in the Lith drop down list while 'Lothian' will return numerous results in the Strat drop down list.
    - It is possible to set project control in the dictionaries so that the stratigraphy and the lithology that you are looking for will be at the top of the list
        - Housekeeping Tab – View Manipulate Dictionaries - BGS_DIC_ROCK_ALL and BGS_LEX_LITHOSTRAT_UNIT_V3 respectively

- Selecting a record, such as West Lothian Oil Shale Formation in the def strat box will now set the default entry for the Stratigraphy field to WLS, this is a convenience measure, and individual Stratigraphy entries can still be changed.

- Once the Lithology values have been set, then a description, base of bed (babe field), and thickness can be entered, this order is not essential but is desirable. If you enter a thickness then a depth will be calculated and vice versa, this will display correctly on leaving the field or row.

- Each log must have a TD (Total Depth) in the babe field against the last record in the section for the report elements of the tool to work correctly.

Screenshot labels: Search Codes Box; Default Stratigrahpy Box; Thickness; Depth Calculation; Lithology Code (top), Stratigraphy Code (bottom); Base of Bed Code (babe) remember to put a Total Depth (TD) in this field on the last interval; Form for entering Individual Properties of a given Interval; Toggles between Intra-unit data and description

- You can toggle between entering a description and putting in intra-unit data
    - Intra-unit data allows you to enter individual parameters (up to 6 per interval)
        - This is for graphic display
- To enter an intra-unit description, select a character from the drop down box and enter a depth that is within the interval (for accurate display of your 'drawn' graphic)
    - Information entered will automatically be entered into the description box – so that no information is lost

### Drawing Graphics and Creating Printable logs

The Draw a Graphic Section button will create a scaled graphic of the section and the Create a BGS Log/Journal will create a fully translated journal or log of the section. The Graphic Section/Styles button will open up a separate form which allows you to play with the various settings and assign ornaments to Lithologies.

- It should be noted that this tool is still in the development stage, for example not all Lithologies are ornamented.

GSSPLOT Setup Forms

Tab 1 – Main options – Graphic Type, Header Scale bar and Ticks

- When selecting an option (from any of the option groups) the picture will alter to display the form your graphic will take
- The Stepping key option is not yet implemented
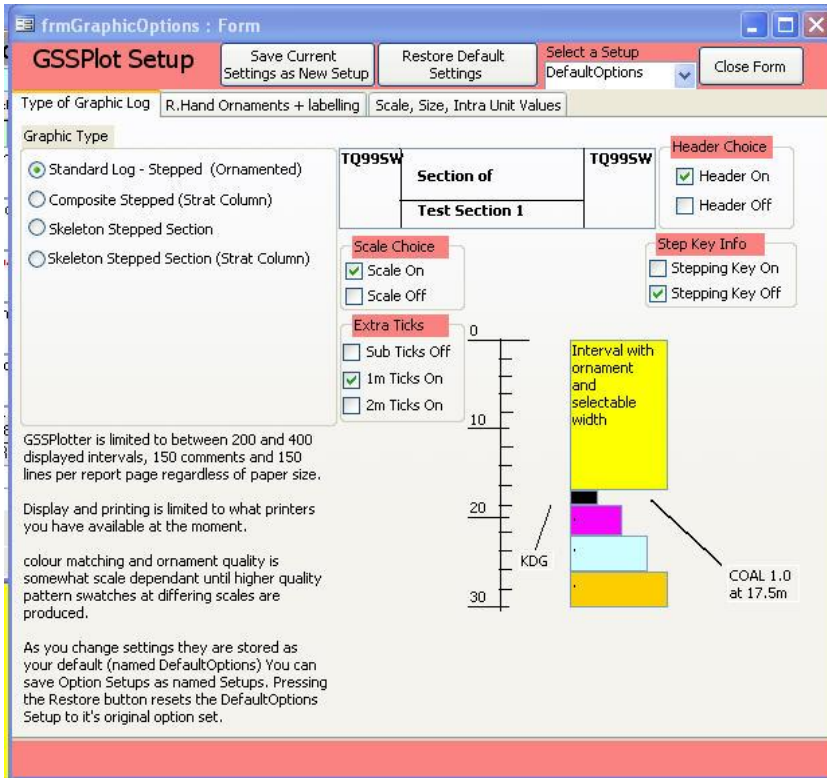
Tab 2 – Ornament Selection and Stepping Width and Amount

- This is controlled by choosing a Lithology (either an existing one or by entering a new one) and then choosing an ornament from the right hand side

- Press the ← LINK→ button and that ornament will be associated with that lithology

- Default step is a multiplier and will step the interval out to the right of the drawn section by that number multiplied by the Step Size (bottom Right)
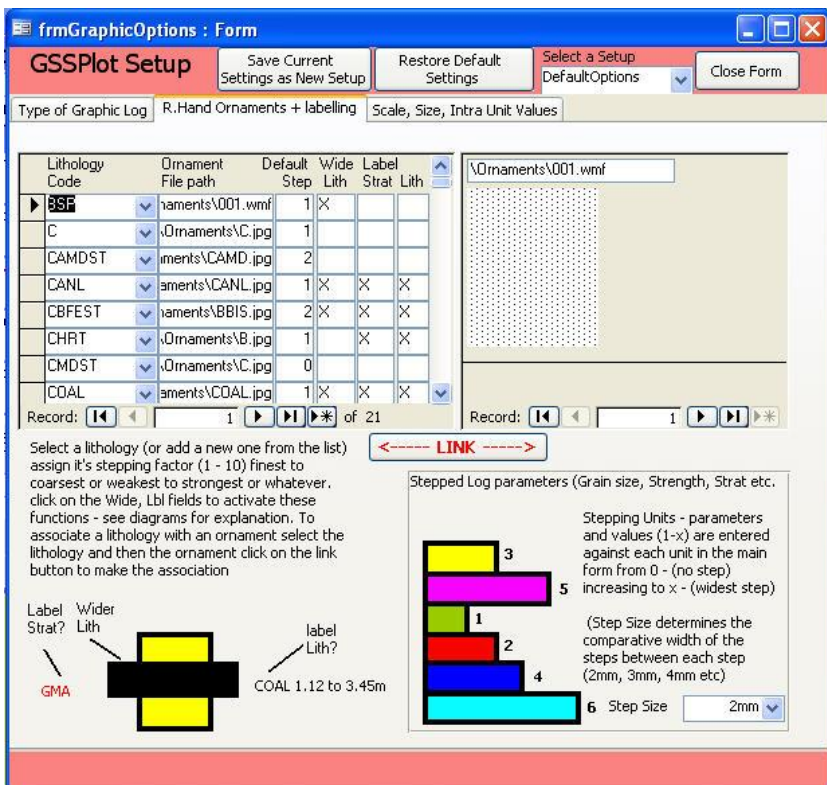
Tab 3 – Graphic Scale and Intra Unit tags

- This screen allows for the scale to be set – any value may be entered (Standard BGS Graphic scale is 500)
    - Please remember that you are limited to whatever can be 'drawn' onto a A3 Sheet of paper
- Creation of Intra Unit tags – on the main entry form it is possible to enter up to 6 intra-unit properties per interval.
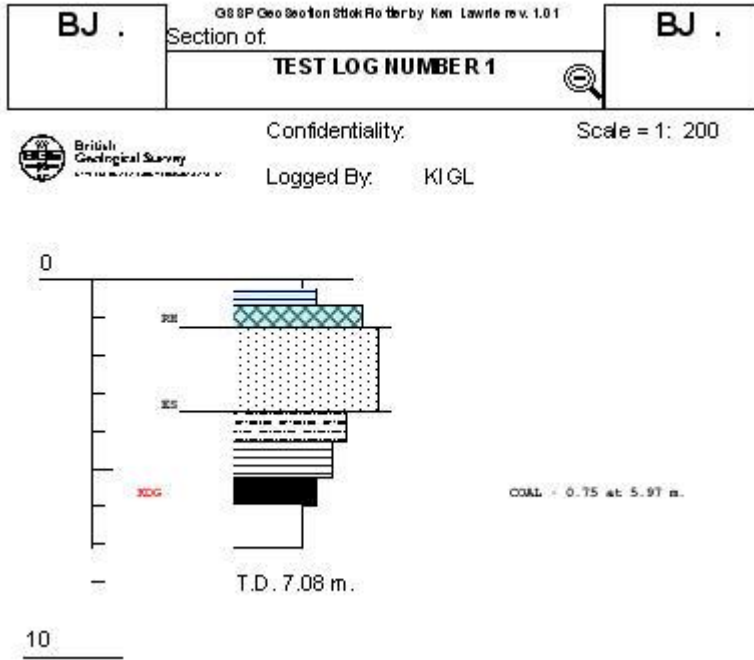   - This form allows you to create a symbol (from a font) to display at a precise depth within an interval

- The buttons at the top of the main form allow you to create and save your settings for future use.

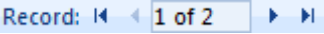**Example of a Graphic Section Stick (press the Draw a Graphic Section button)**

Example of a BGS Log/Journal (press the Create a Log/Journal Button)

					Thick	Depth m
Soil sandy with some organin material and roots---					0.25	0.25
Clay grey brown and slightly sandy in places---					0.45	0.70
Diamicton grey brown with a few small patches of gravel--- ROCKHEAD					0.55	1.25
Sandstone off white to pale grey finely cross laminated.--- EROSION SURFACE					2.25	3.50
Siltstone grey sand to top and more carbonaceous towards base. A few plant stems and fragments---					0.77	4.27
Mudstone Coaly and carbonaceous towards base. A few Lingula fragments---					0.95	5.22
Coal Cannely in bands. A few rusty markings and well fractured possible stoop---					0.75	5.97
Seatearth Seatrock Silt grade abundant roots---TOTAL DEPTH					1.11	7.08

End of Borehole

Make Manmade Landform Observations

- Similar to Structural Observations and Superficial Landforms, this form is now also completely button orientated
- Select the man-made landform button and the symbol will be automatically added to the map
- Some of the buttons allow you to enter in more information, such as azimuth or depth
- Enter in any comments as required
- More than one observation can be entered (you can view each observation by scrolling through the Record dialog) Record: ◄ ◄ 1 of 2 ► ►
- Delete observations by pressing the Delete button

Make Building Stone Observations

- This is a specialty form made specifically for a Building Stone Study

Make Geodiversity Observations

- This is a specialty form made specifically for a Geodiversity Study

Make Old Style Spot Observations

- Enter in as much or as little information as required

Make Old Style (Complex) Log

- Currently not recommended for use

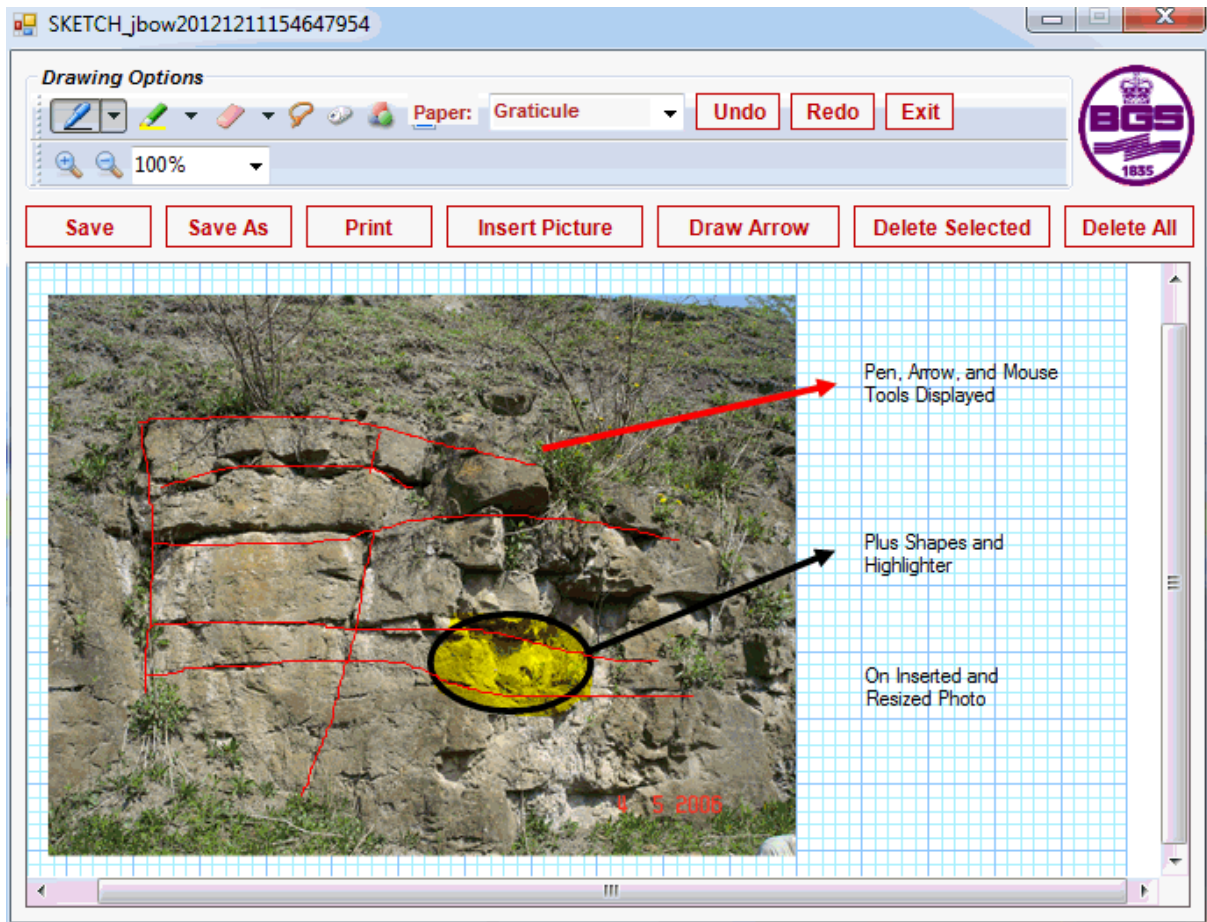## 4.4 MAKE GENERAL COMMENTS AND DESCRIBE SAMPLES, SKETCHES, AND PHOTOS

Comments
- Create (by pressing New) and Delete Comments plus Toggle the Hide Field

Sketches
- Press New Sketch and a Sketch 'Pad' opens

- **Pen** ✏️ - Choose the Pen Style or Settings from the drop-down menu and start drawing by holding the left mouse button or draw directly with the stylus
- **Highlighter** ✏️ - Choose the Highlighter Style or Settings from the drop-down menu and start highlighting by holding the left mouse button or draw directly with the stylus
- **Eraser** - Choose the Eraser size or Settings from the drop-down menu hold the left mouse button or erase directly with the stylus
- **Lasso** - Hold the left mouse button down or select directly with the stylus
- **Mouse** - Tap on screen, after selecting this button, to type text
  - Edit text by clicking within the text box
- **Shapes** - Use this tool to create a common shape based on your sketch, such as circles, ovals, squares, rectangles, triangles, and stars
- **Paper** – Different paper styles are available from the drop-down list
- **Undo/Redo** – Undoes or Redoes the last action
- **Exit** – Exits the Sketch Pad
- **Save/Save As/Print** – Saves, Saves with a new name, or prints the sketch
- **Insert Picture** – Inserts pictures/photos from file, this gives the user the ability to sketch their notes directly on to the media
- **Draw Arrow** – click or tap on the screen and swivel the arrow to the desired direction and click or tap to commit
  - Choosing the pen colour will create the arrow in that colour
- **Delete Selected/Delete All** – Delete Selected or Delete All

- Enter a Comment into the Comment Field of the Sketches Form upon closing the Sketch Pad, is advised, and close the Sketches Form

Photos
- Press NEW to create a new Photo Entry, enter the Photo Facing and a Description of the photo
  - Link the photo to the database by selecting the Link Photo button
  - View the photo after it has been linked by pressing the View Photo button
  - Copy the Current information into a new entry by pressing the Copy Current button
  - Delete the current entry by pressing Delete
- To link all of the photos in the database at the end of each day, use the Photo Transfer Tool within the Field Tools Section of the Form – see Section 4.5, below, for details

Samples
- Press New to create a new sample entry, choose a sample type from the drop-down list, enter a description, and close the form
  - Or choose to delete the current sample

4.5   FIELD TOOLS

Show Observation Selector
- Allows the user to customize the Form View by showing or hiding buttons on the Main Form
  - These can be turned on or off at any time

Photo Transfer
- Allows the user to quickly associate/match their photo's to the database based on the locality description and photo description
  - Choose Associate Photo and browse to the photo on your hard drive (Transferred from the camera into the Project/Baseline_data/Photographs Folder is ideal)

Word Field Report
- Gives a detailed report of required Field Observation Points as a Word Document

4.6   DESKTOP TOOLS

Photo Spreadsheet
- Creates a Photo Summary Spreadsheet in the Project/Photograph Folder containing all fields required for BGS Photo submission

Sample Spreadsheet
- Creates a Sample Summary Spreadsheet in the Project Folder containing all the fields required for BGS Sample submission

Field Observation Spreadsheet
- Creates a Field Observation Summary Spreadsheet in the Project Folder
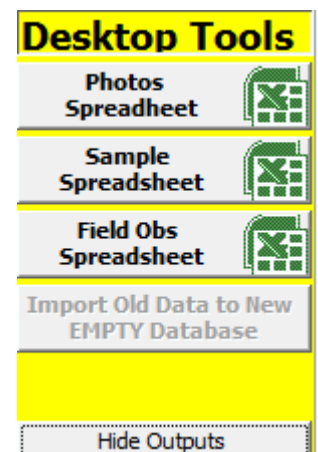
- o A dialog box appears called: Enter Parameter Value
- o Enter the Spatial Reference System of your Project, such as BNG (British National Grid)
  - This will populate a column in the excel spreadsheet with your Spatial Reference (which can easily be changed in Excel if you have made a mistake)

Import Old Data to New Empty Database

- Not Currently Possible

Hide/Show Outputs
- Shows or Hides all Desktop Tools

4.7 PRÉCIS TOOL

The Précis Tool gives an overview screen shot of a Field Observation point including, Comments, Sketches, Photos, Samples, and Observations. The Precis Tool can also be accessed from the BGS SIGMA Mobile Toolbar by pressing the 🛈 button. See Section 3.4: Précis Tool (page 15).

5   BGS•SIGMA*desktop*

BGS•SIGMA*desktop* is used to compile all field data to create seeded geological linework and polygons.

5.1   SETTING UP BGS•SIGMA*DESKTOP*

If you are going to use your Field data, from BGS•SIGMA*mobile*, then it is recommended that you keep an 'untouched' copy of your fieldwork in a safe location. Take a copy of your DFDC and paste it into your BGS•SIGMA*desktop* Folder before starting BGS•SIGMA*desktop* and only link to this copied dataset.

5.1.1 Start Collecting
- Select this option to set-up a new BGS•SIGMA*desktop* project or to continue with an existing project
- Details of how to do this are outlined in the Section 1.3: ArcMap 10 - BGS•SIGMA Set-up (page 2)

5.1.2 Modify Collection Layers
- After you have set-up a project you can use this function to modify the layers you chose in the 'Select Datasets' dialog box and within your project

5.1.3 Import Database
- A function to allow you to import previous fieldwork databases or colleagues' databases for collating
- Pre-2012 databases are currently viewable by the précis tool

5.1.4 Help
- A link to the BGS•SIGMA 2012 manual

5.2   CREATING BOUNDARIES

5.2.1 Create a Map Boundary Line
You will need to create a Map Boundary Line for your project. This boundary will be used for snapping lines at the edge of your project and thus for the creation of polygons.

- For square/rectangular shaped project areas:
    - On the BGS SIGMA Desktop Toolbar select Tools and Create Map Boundary Line
    - Enter in a map sheet, such as NT26NE or Grid References in the format xmin, ymin, xmax, ymax and press OK (the map sheet function will only work in the UK)
- For irregular shaped project areas:
    - Make sure the Boundary Line Layer is visible in the ArcMap Table of Contents
    - Select the Boundary Line from the Create Features Window and draw your Boundary
    - Edit by using the Edit Tools, if necessary

5.2.2 Create a Map Boundary Polygon

A Map Boundary Polygon is useful for clipping layers to the Project Area.

- For square/rectangular shaped project areas:
    - On the BGS SIGMA Desktop Toolbar select Tools and Create Map Boundary
    - Enter in a map sheet, such as NT26NE or Grid References in the format xmin, ymin, xmax, ymax and press OK (the map sheet function will only work in the UK)
- For irregular shaped project areas:
    - Make sure the Boundary Layer is visible in the ArcMap Table of Contents
    - Select Boundary from the Create Features Window and draw your Boundary
    - Edit by using the Edit Tools, if necessary, found on the BGS SIGMA Mobile and Desktop Toolbars and on the ArcMap Editor Toolbar

5.3   DOWNLOAD BASELINE DATA

Useful baseline data should be added to your project to help you make decisions about Geological Linework. Some UK examples are: OS Topography and Contours, Historic Maps and Fieldslips, and NextMap Terrain Models.

While using BGS•SIGMA*desktop* in the office, data can be linked to your ArcMap Project directly from your corporate data drives.

There is a Download Baseline Data function within the BGS Desktop Tools drop-down menu, which allows BGS staff to download common corporate datasets to the Baseline Data Folder automatically from the corporate storage drive. This function will not work outside of BGS but could be coded to work with your own corporate datasets.

5.4   DOWNLOAD DOMAINS FROM ORACLE

This is a BGS specific function that updates BGS corporate dictionaries and will therefore not work in the OpenSource Version.

5.5   DIGITIZING AND EDITING GEOLOGICAL BOUNDARIES, SETTING SNAPPING, LAYER SELECTABILITY, AND CREATING TAGS

Digitize Geological Boundaries by firstly making sure the Layer is selected in the Table of Contents, choosing the line style from the Create Features Window, and digitizing your line. Edit your lines using the Edit and Edit Vertices Tools located on the BGS SIGMA Desktop/Mobile or Editor Toolbars. This and other important information are discussed in detail in Section 2: Digitizing and Editing in BGS•SIGMA 2012 (page 8).

5.6   SAVING AND SAVING EDITS

As always, it is good practice to frequently Save 🖫 your Project and to Save any Edits that you have made. To Save Edits, Open the Editor Toolbar (Customize – Toolbars - Editor) and Edit – Save Edits.

5.7   BGS SIGMA DESKTOP TOOLBAR – PARTIAL

A portion of the BGS• SIGMA*desktop* Tools are explained in brief in this section. You will find the Topology Tools explained in the Checking for Errors Section (5.8), the Seed Tools explained in the Creating Seeds Section (5.9), and the Build Polygons Tool explained in the Building Polygons Section (5.10).
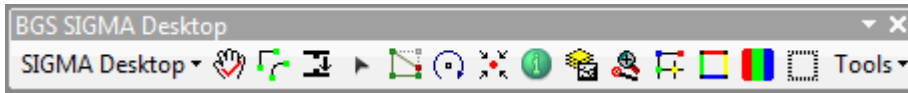
5.7.1 AutoPan

When this tool is ON, the screen will automatically pan in the direction you are digitizing when you near an edge.

- Check mark – ON, Red X - OFF

5.7.2 BGS Smooth

This tool will smooth jagged lines.

- Select the tool and smooth any required lines (if a line is selected when the tool is pressed, this line will also be smoothed)
  - Please note that this tool has the potential to move your original line nodes and will then affect other lines that are snapped to it so it is best practice to draw your line, smooth it, and then snap other lines on to it (smoothing a group of lines could cause all the snapping to be lost)

5.7.3 Flip Line Tool

This tool is useful for directional lines such as: faults, meltwater channels, drumlins and eskers.

- Select the tool and change the direction of any required lines (if a line is selected when the tool is pressed, this line will also change direction)

5.7.4 Edit Tool

This tool allows you to select, move, duplicate, and delete features.

- Also available from the ArcMap Editing Tools Toolbar and BGS SIGMA Mobile Toolbar

5.7.5 Edit Vertices Tool

This tool allows you to move, insert, delete, and change vertices of a point, line or polygon.

- Also available from the ArcMap Editing Tools Toolbar and BGS SIGMA Mobile Toolbar

5.7.6 Rotate Marker Tool

This tool allows you to rotate a symbol on screen (primarily for cartographic use)

5.7.7 Pan Zoom to Mouse

This button pans or zooms to the area you have clicked on screen and is set to an appropriate scale for digitizing

5.7.8 Précis Tool

The Précis Tool gives an overview screen shot of a Field Observation point including, Comments, Sketches, Photos, Samples, and Observations within the DFDC

- Press the Précis button 🛈 from the BGS SIGMA Desktop Toolbar and select the desired Field Observation Point (FOP)

5.7.9 Define Renderer using BGSRef ▮▮▮

This tool colours up BGS DiGMap data as well as the Polygons Layer within your Project's DFDC.

- Select the Layer you wish to colour in the ArcMap Table of Contents and press the Define Renderer using BGSRef Button ▮▮▮ on the BGS SIGMA Desktop Toolbar
- Select Classification Field: either LEX_ROCK or LEX_RCS depending on your preference
- Select Label Field: LEX_ROCK or LEX_RCS
- Select Colouring Field: BGSREF
- Select Description Field: LEX_ROCK or LEX_RCS
- OK, OK

5.7.10   Hide Features Tool ⬚

This tool is used to hide features. Use this tool with caution, as you can only hide but not unhide easily. To unhide any currently hidden features you will need to temporarily delete the Definition Query from the Table Properties and change any items in the Hide Field in the Attribute Table from 1 to 0. See also, the Hide Definition Query Tool located on the BGS SIGMA Mobile Tools Drop Down list (page 23).

5.7.11   Tools – Change Default Editor Tool

This tool allows you to change from Standard to Sketch Editing.

Standard Editing

- Is the default editor where you click/tap on screen to add nodes/vertices for your line

Sketch Editing

- Allows you to draw a continuous line and nodes/vertices are added automatically
   - In this version of the Sketch Editor nodes/vertices are added at reasonably spaced intervals to allow for easy editing of the line

5.8   CHECKING FOR ERRORS

It is a good idea to check for line connectivity errors before building polygons. Lines that have not been snapped together properly will not create polygons. Where the line hasn't snapped together or overhangs the line is called a dangle.

- To check for dangle errors select the Set Map Topology button 🗺 from the BGS SIGMA Desktop Toolbar
- From the dialog box select the layers you require for your topology, normally this will just

Map Topology

Map topology lets you use the Topology Edit tool and the Modify Edge and Reshape Edge edit tasks on shapefiles and feature classes.

Layers

Select the data to participate in the map topology:

☑ Bedrock boundary
☐ Bedrock polygon
☐ Linear Bedrock Unit
☐ Contour
☐ Chronostratigraphical Unit Seed
☐ Chronostratigraphical Unit polygon
☑ Fault or fracture trace
☐ Fold Axial Plane Trace

Select All

Clear All

Cluster Tolerance: 0.0041558552 meters

OK   Cancel

be the layer you want to check and the Map Boundary Line layer called (Boundary Line)

- o   In the case of Bedrock you may also need to use the Fault or fracture trace layer
- Click ok and your topology will be built
- You can now use the Zoom to First Dangle button to find and edit your errors
  - o   Continue to press this button until no more errors are found
  - o   It should be noted that this button will not go to the next error until the current error is fixed
- If you are finding quite a lot of errors, then double check that snapping is set - see Section 2.1 (page 9)
- If you would just like to look at the nodes in a specific section of the screen then press the Display nodes with visible extent button
  - o   Red nodes are errors
  - o   As soon as you zoom or pan the node errors will disappear – press the button again to show errors if necessary.
- The Display edges with visible extent button can be useful for finding obscure errors in the data by highlighting the number of lines connecting to one another

5.9   CREATING SEED TEMPLATES

Seeds are point features with LEX-RCS attributes. You use seeds to attribute and colour the layer's polygons.

The SIGMA Desktop Toolbar provides three ways to create Seed Templates to enable you to seed your polygons. The template commands are found on the BGS SIGMA Desktop – Tools drop-down list.

The template commands are as follows:

- Create Seeds
- Seed Templates From Visible Layers
- Create Seed Templates from DigMap (this function will not work outside of BGS)

The first step in any of the template creation commands is to turn on the Seed Layer you wish to create the template for in the ArcMap Table of Contents. For example if you wish to capture Bedrock Seeds the "BEDROCK_SEED" layer needs to be checked on.

5.9.1 Create Seeds Command

The "Create Seeds" command uses an on-screen dialog box to interactively create seed templates using LEX-RCS.
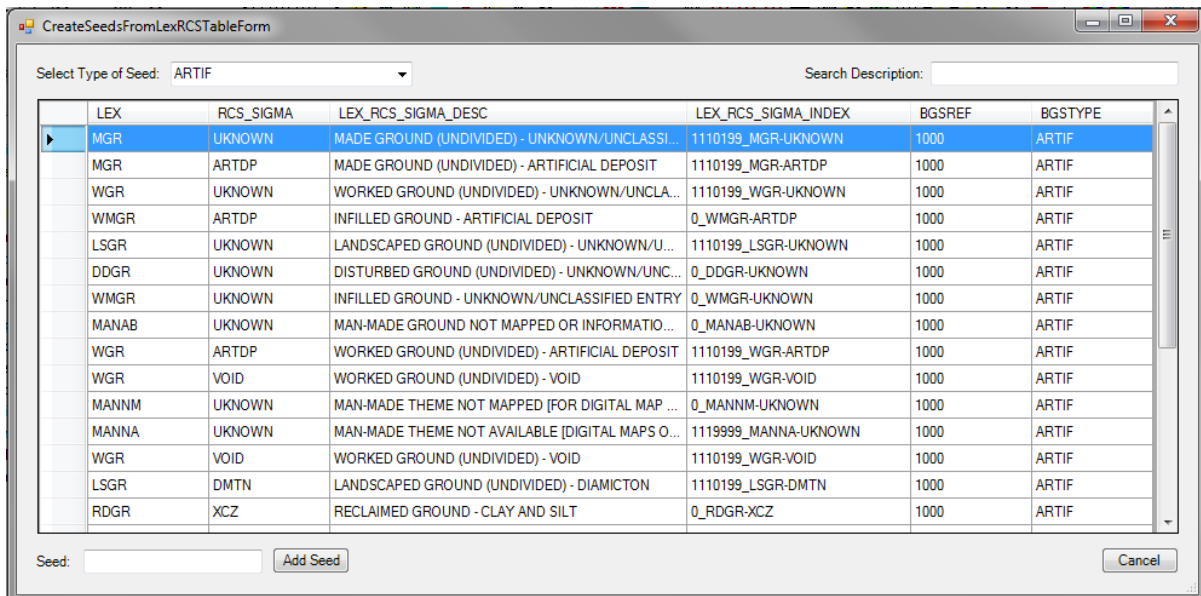
- Select the Seed Type you wish to make the template for from the 'Select Type of Seed' drop-down list on the top left of the dialog box (Artificial, Bedrock, Fossil Horizon, Mass Movement, or Superficial)
  - The appropriate seeds for that seed type will be displayed in the table
- The table can be sorted, filtered, and adjusted
  - The seeds and seed details can be ordered by clicking on any of the field headings
  - Rows can be filtered by entering a search term into the 'Search Description' box
  - Column widths can be adjusted to be larger or smaller
- Click to the left of a row (in the column beginning with the blue box and arrow)
  - This will select your record and add it to the Seed box
  - Press the 'Add Seed' button to add the Seed to the Create Features dialog box and automatically be returned to the main form
- Repeat these steps for as many LEX-RCS codes as required
- When you have finished creating your template press the cancel button or exit from the form
- SAVE your ArcMap Project as this will save your template!

You can also:

- Enter the LEX-RCS code directly into the 'Seed:' box on the bottom left of the form
  - (If you type in just the LEX, then all items starting with that LEX will be filtered and the seed can be selected as above)
  - LEX-RCS codes should be entered with the hyphen in between them
  - If you wish to use a temporary code or combinations of LEX-RCS codes that are not valid you can still add them to your Create Features dialog box
- If a valid LEX-RCS code is entered into the Seed box it will turn green, invalid entries or combinations will turn the box red
- Press the 'Add Seed' button to add the Seed to the Create Features dialog box and automatically be returned to the main form

5.9.2 Seed Templates From Visible Layers

The create Seed Templates From Visible Layers command is a more specialised way of creating templates. It is essentially used to create Seed templates from LEX-RCS codes present in an existing GIS layer.

- The command checks the ArcMap Table of Contents for suitable layers containing LEX-RCS codes
  - o Your GIS Layer must contain a field called LEX_RCS and their layer name must contain one of the following keywords (bedrock, superficial, artificial, and mass)
- A template is then created in your Create Features dialog box based on this layer

5.9.3 Create Seed Templates from DigMap

This is a BGS specific function and will only work when connected to the BGS corporate data drives.

5.9.4 Sharing Templates

Templates are stored as part of the layer so if members of a team wish to share templates it is possible to create a layer file (.lyr) and use it as a mechanism to move templates between different instances of SIGMA.

5.9.5 Seeding Polygons

Once created, the Seed templates are standard ArcMap Edit Templates and are used in the standard way. Select a seed from the Create Features dialog and click on the map where you want to place it. Click as many times as required, to place multiple seeds of the same type. Select a different seed from the Create Features dialog as required.

5.10 BUILDING POLYGONS

Once you have checked for errors and seeded your polygons you can then build them. Select Build Polygons from the BGS SIGMA Desktop Tools drop down list, select the type of polygon you wish to build, and press ok. You can build polygons as many times as required. It should be noted that this currently cannot be done in the Field using an ArcEditor Licence.

5.11 PLOTTING ORIENTATION DATA ON A STEREOGRAM

Orientation data collected in SIGMA can be exported and displayed on a stereogram using the freely available, free Open Source "Open Stereo" application http://www.igc.usp.br/index.php?id=openstereo.

5.11.1 Installing Open Stereo on your PC or Windows Laptop

To install Open Stereo, copy the folder S:\SIGMAToolkit\openstereo_0.1.2f_win32 to the local hard drive on your computer. Then create a shortcut to OpenStereo.exe located in the folder you have copied to your hard drive. For use in the office you do not even need to copy the folder you can just create a shortcut to OpenStereo.exe from the S: drive.

5.11.2 Exporting Orientation data to a Text File suitable for use in Open Stereo

The Export Orientations To Text File command under the SIGMA Desktop Tools menu allows the Export of orientation data from a layer such as FOP_STRUCTURE to a simple text format suitable for loading into Open Stereo. The export command will honour any selections that have been applied to the layer and will only export the orientations of selected features. Selection may be spatial or by any attribute.

The Process is as follows:

- Select the orientations required using standard ArcMap selection tools
- Click the command and select the layer and fields to be exported
  - The layer will normally be FOP_STRUCTURE (the tool has been written to be generic so that it can potentially be used with other GIS layers containing orientation data)
  - Azimuth field and dip field will normally be called AZIMUTH and DIP respectively
- Then select the output location of the export file (.txt extension)
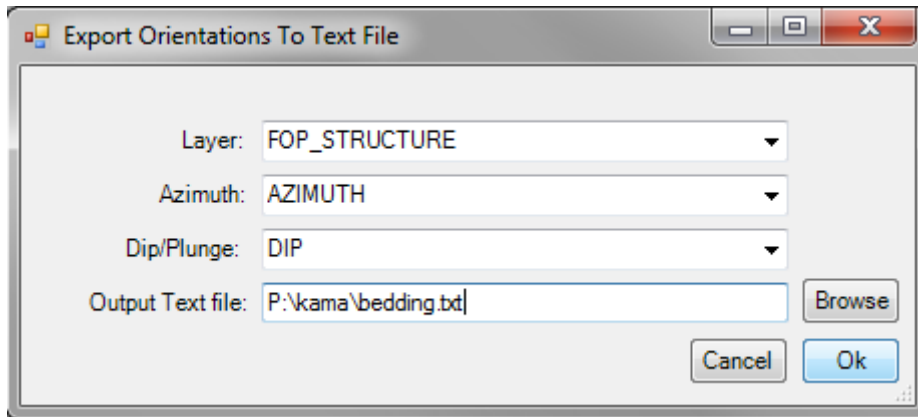
- Click ok to export the orientation data

5.11.3   Plotting your exported orientations in Open Stereo
- Start Open Stereo
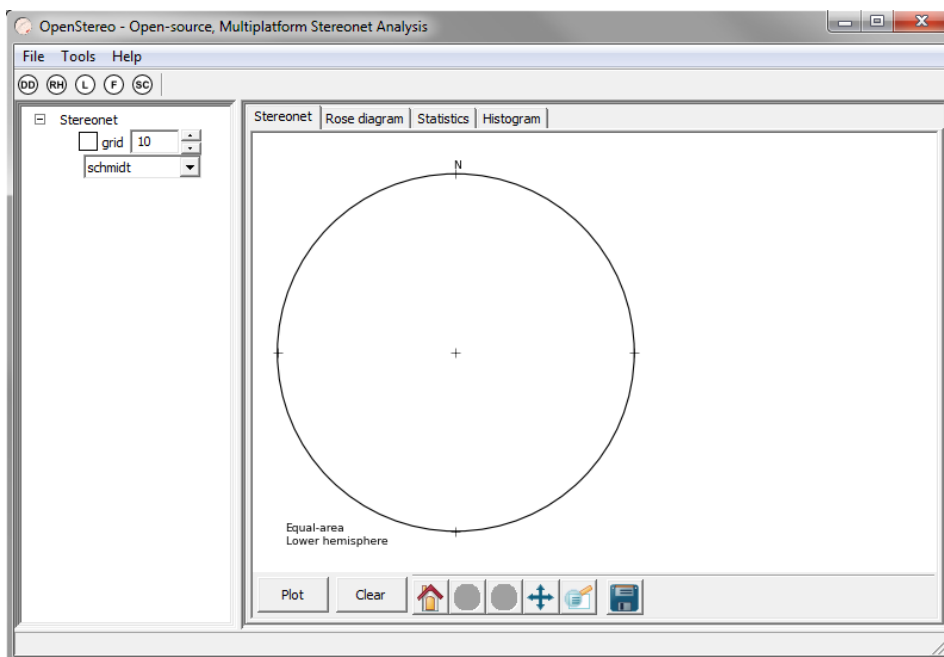
- Click File and choose the type of data you want to load
  - For example if you want to load bedding measurements select: Open Planar Data (Dipdir/Dip)
- Navigate to the location of your orientations data file (.txt)
- Click Plot - for a simple plot
- Select options in Open Stereo as required and click plot again to refresh the display
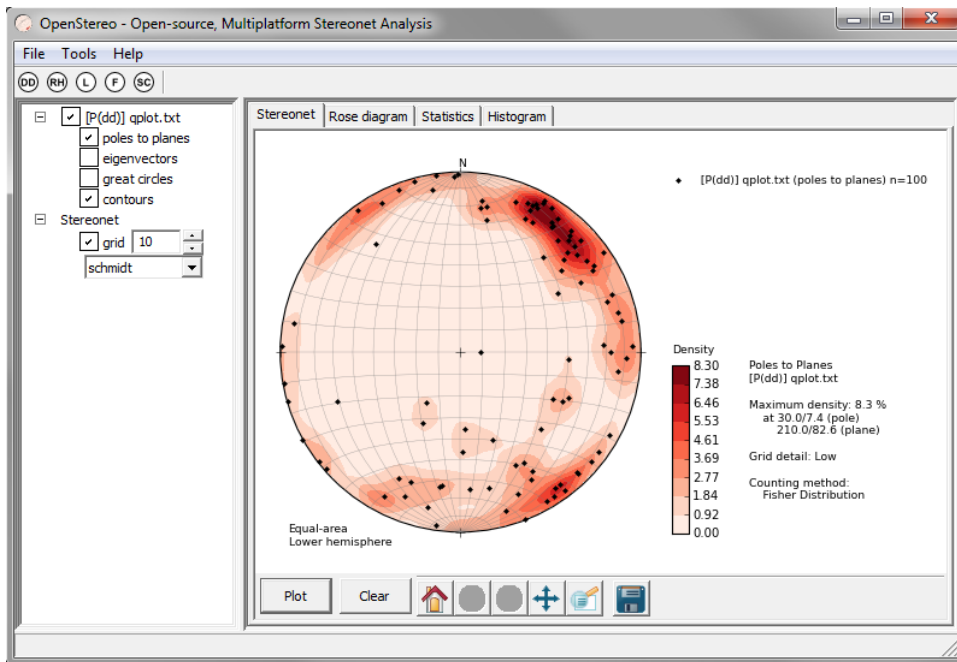
There are many options in Open Stereo for displaying and analyzing orientation data such as Stereonets, Rose Diagrams, Statistics and Histograms. Description of the functions available in Open Stereo is beyond the scope of this document. However the options should be fairly intuitive.

6   Setting up Projects Overseas

This process has been significantly improved from previous versions of BGS•SIGMA*mobile*.

6.1   STEPS TO SETTING UP PROJECTS OVERSEAS
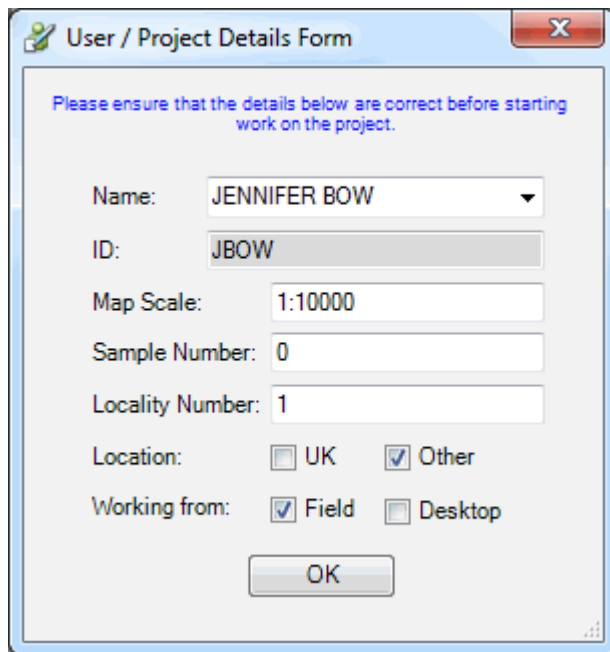
- From the Start Collecting Data dialog box, select Create a new database and folder structure and check Select spatial reference
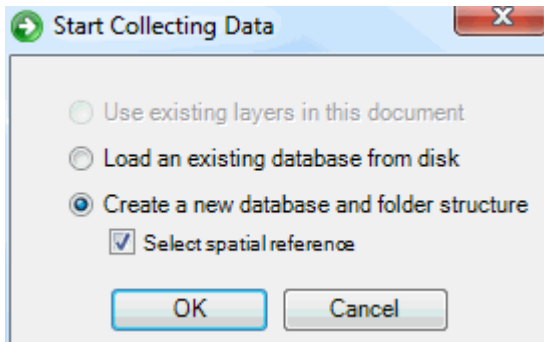
- Browse to your Project Folder and press OK
- You will then be asked to select the Projection you wish to use from either the list contained within the Geographic or Projected Coordinate Systems Folders
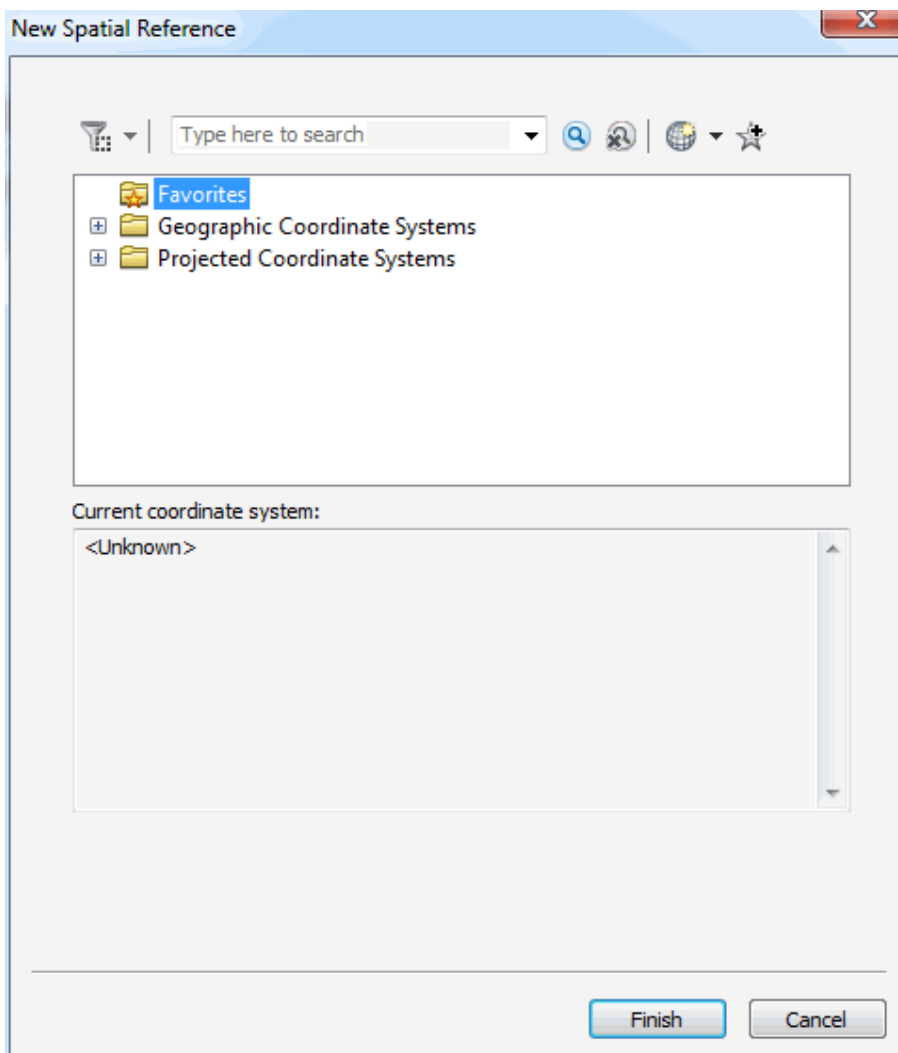
- Select your datasets as outlined in Select Datasets (page 3)
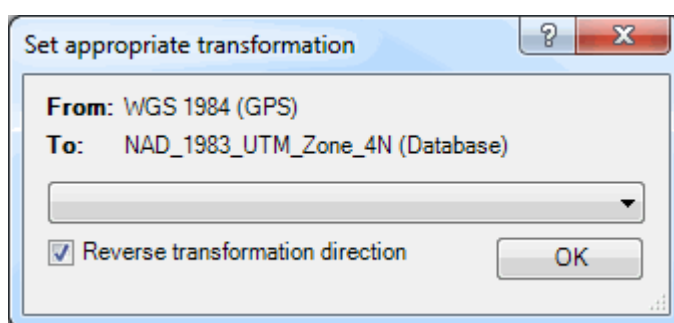
- On the User/Project Details Form, check Other in the Location Field to bring up the Transformation dialog box
- Select your transformation
- Check or Uncheck the Reverse transformation button based on the wording in the dialog box
  - For example: If you have the transformation set as below from WGS 1984 to NAD 1983 then
    - If you used a similar transformation to this: `WGS_1984_To_NAD_1983` then uncheck the box (as the wording is in the same direction as the transformation)
    - If you used a similar transformation to this: `NAD_1983_To_WGS_1984` then tick the box (as the wording is reversed to the transformation)

- Save your Project

6.2   HOW TO CHOOSE THE APPROPRIATE TRANSFORMATION

Please see the following documents:

http://webhelp.esri.com/arcgisdesktop/9.3/index.cfm?TopicName=Geographic_transformation_methods

http://blogs.esri.com/esri/arcgis/2009/05/06/about-geographic-transformations-and-how-to-choose-the-right-one/

http://support.esri.com/en/knowledgebase/techarticles/detail/21327

Appendix A – Using the ArcMap GPS Toolbar within SIGMA

It is recommended to use the BGS GPS Tool within SIGMA as it is generally more stable than the ArcMap GPS Tool. However, in certain hardware circumstances the ArcMap GPS Tool may be your only answer. This section explains how to use the ArcMap GPS to capture GPS points to a log.

On the main ArcMap toolbar, select: Customize – Toolbars - GPS

GPS Toolbar Functions:

1 2   3   4   5   6   7   8
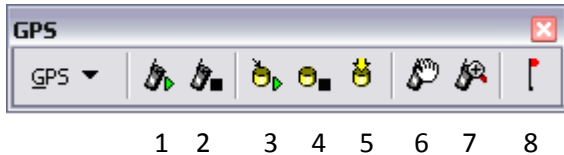
1. **Open Connection**
   - Opens a GPS connection for updates from the GPS port
2. **Close Connection**
   - Closes the GPS connection to stop updates from the GPS port
3. **Start Streaming to Log**
   - Starts streaming GPS data into the selected log
4. **Stop Streaming to Log**
   - Stops streaming GPS data into the selected log
5. **Stamp Current Position to Log**
   - Stamps the current position to the log
6. **Pan to GPS Position**
   - Pans the active view to display the current GPS position
7. **Zoom to GPS Position**
   - Zooms to the current GPS position
8. **Add Destination**
   - Sets the clicked point on the screen as the destination

Set the COM Port

The first step in this process is to set the communications (COM) port connection:

- From the ArcMap GPS drop-down menu select GPS - GPS Connection Setup
- Toggle on the Connect to GPS Receiver option
- Set Communication Port to the required COM port
- Click Detect GPS Port. Wait for the conformation window
- Click OK
- Close window
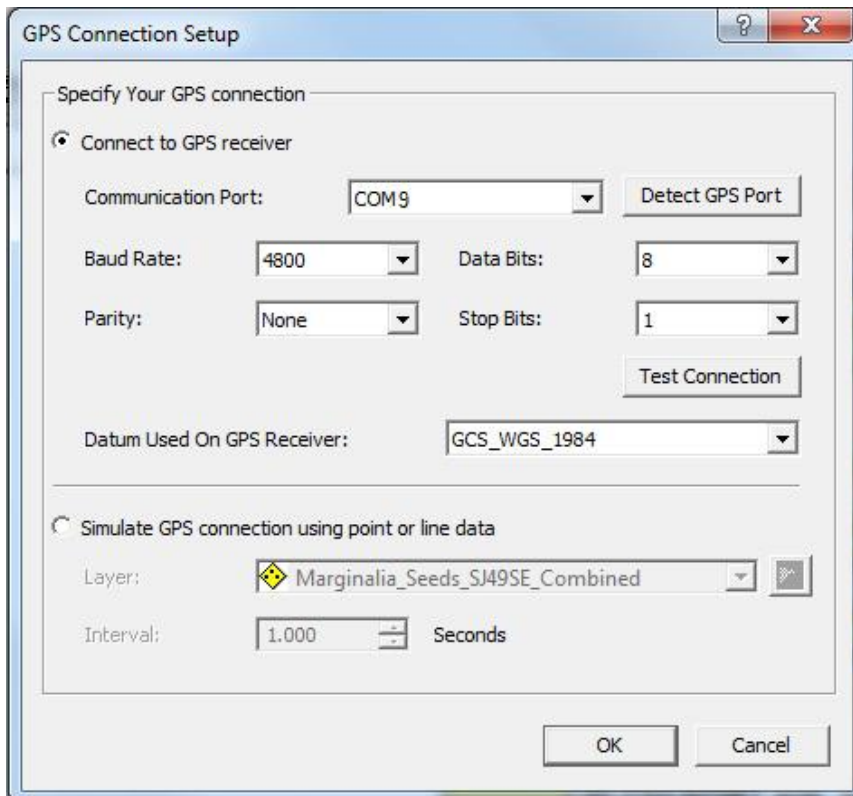
Create a New Log

When the GPS is active a log file can be created. This shapefile can then be loaded into your project to show where you have been tracking.

- On the *ArcMap GPS* toolbar drop-down list click GPS - Log Setup
- Click the New button
- Choose the type of features that you want
  - Click Points if you want the log to contain points (default setting) or Lines
- A GPS folder needs to be created to store GPS logs
  - Click the Browse button 📂 and navigate to the folder where you want to store your log; this should be your SIGMA project folder
  - Create a GPS folder to store the log file
- Check the fields you want to store in the log.
  - Use the Select All and Clear All buttons to quickly change the selection set
- Click OK

Start Collecting

- Add the GPS shapefile to the project
- Click Open Connection 🧭 on the GPS toolbar, to start the GPS device on your tablet
- Click on Start Streaming 🗂 to log your position into the log file
  - The log file will collect GPS points and display them in the project
- To stop streaming click on Stop Streaming To Log 🗄
- Click on Close Connection 🧭 to stop the GPS device

Appendix B – Trouble Shooting

1. Trouble with the Edit FOP (Field Observation Point) Button (Red Flag) on the BGS SIGMA Mobile Toolbar?
    a. Make sure that all of the data in the Table of Contents are linked (no red exclamation marks) as this can interfere with the code
2. Bringing in older SIGMA data causes an error regarding the BGS Object Class Extension
    a. The BGS Object Class Extension has been replaced by the Audit Extension code within SIGMA 2012. For older databases it is best to remove the extension reference from the database rather than install the old BGS Object Class Extension.
        i. Open the .mdb file using Microsoft Access
        ii. F11 to show the Objects panel if it is hidden
        iii. Open the Table GDB_ObjectClasses
        iv. Locate the field EXTCLSID
        v. Search and Replace all instances of the ID: {F4390CCD-4520-4B55-803D-8A889A1AAE33} in the EXTCLSID with blank
        vi. Save the changes to the .mdb and exit Access
    b. The .mdb will no longer need the BGSObjectClassExtension and you can bring in data as normal
3. An older database comes up with this error: Your Microsoft Office Access database or project contains a missing or broken reference to the file 'BGSPrecisTool.tlb' version 1.0. To ensure that your database or project works properly, you must fix this reference
    a. Close out of SIGMA and/or Access
    b. Open Access from the Start menu and create a new database
    c. Go to the Database Tools tab and press the Visual Basic button
    d. Go to Tools, References, and press the Browse button
    e. Browse to where your Précis Tool is installed – .../BGS/BGSPrecisTool/BGSPrecisTool.tlb
    f. OK and Close Access
    g. Your older databases should now work
4. Can't see the Create Features Dialog Box? Try one of these:
    a. Have you pressed the Start Collecting button on the either the Mobile or Desktop Toolbars?
    b. Go to: BGS SIGMA Mobile Toolbar – Tools – Open Create Features or press the last icon on the Editor Toolbar
    c. Right-click on the layer you wish to edit in the Table of Contents and select Edit Features – Start Editing
5. Can't find the line style in the Create Features Dialog Box?
    a. Make sure the layer is selected in the Table of Contents
    b. Search for line styles in the Filter Templates Box <Search>
6. Want to Hide the Create Features Dialog Box?
    a. Press the push pin in the corner of the Create Features Dialog Box and it will tack to the far right margin
7. Having problems with your UUID field?
    a. It may be necessary to change the date format of your tablet/PC to dd/mm/yyyy
8. Want to set-up Sleep mode on the Panasonic Toughbooks?
    a. Go to Control Panel, Power Options, System Settings, and toggle Don't Require a Password

Glossary