



User's Guide

To

MEGS_Log

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Introduction

MEGS_Log is a Windows-based graphics application designed for use by exploration and mine geologists. It has been created to allow rapid manipulation and interpretation for correction of bore logs with associated downhole geophysical LAS data. Its main features include:

Interactive Borehole Visualisation

Bitmapped graphics and Window-based scrolling allow the user to scroll rapidly up and down a borehole. The application allows viewing of two boreholes side by side. You can change the scale of the bores, scroll up and down to align seams at different depths, or jump to a user-defined depth in the bores.

Interactive Geophysics Visualisation

MEGS_Log allows you to select multiple LAS files simultaneously. The LAS files may contain different tools and may have different sampling increments. Trace display attributes such as *colour*, *scale*, *screen location*, etc can be set up within a Windows dialog box. Alternatively, user-defined templates allow all attributes to be pre-specified, permitting expeditious loading and display of data.

Borehole data and geophysical data may be scrolled simultaneously. The origin of selected geophysical traces may be offset to correct for such errors as the inaccurate starting point of a geophysical tool.

Interactive Borehole Editing

Tools supplied with MEGS_Log allow you to adjust boreholes using a graphical interface. You can change the appearance of the graphic log by such functions as *Delete a Unit*, *Insert a Unit*, *Set the Rock Type*, *Shift a Rock Boundary*, etc.

Boreholes can be edited in *Overwrite Mode* or *Insert Mode*. These modes are used primarily to specify how a logged unit behaves when its base depth is dragged graphically. By dragging a unit downwards in *Insert Mode*, you are effectively increasing the thickness of that unit. As a result, all of the base depths of the units below will be automatically adjusted. *Overwrite Mode* adjusts only the thickness and base depth of the units above and below the dragged boundary.

All edits/corrections made in MEGS_Log are saved back to the original borehole data file to create a completely adjusted log. Other data that has been collected for the hole, for example, colour, grain size, weathering information etc., are retained in the original data file. An exception to this is, of course, if a unit is deleted, all data for that unit is removed from the original data file.

Seam Correlation and Sample Numbering

MEGS_Log allows the user to define Seam Correlations for a loaded borehole. The correlations are initially set up in a table from which the user can select a correlation to apply.

Once applied, the correlations are displayed alongside the borehole. You may allocate sample numbers to intervals/plies of each seam using the *Sample Numbers* View mode.

The Menus

The menus are listed on the menu bar at the top of the MEGS_Log screen.

Below, each menu has been opened and the list of commands displayed:

File	Edit	Options	Traces	Tools	Correlate	View	Setup	Help
New Ctrl+N	Undo Ctrl+Z	Settings All	Select LAS files	Create Boundaries F2	Correlate F8	Sample Numbers	Trace Defaults	Users Guide
Open Ctrl+O		Sample Numbers	Curve Setup / Load	Pick & Drag F3	Select Site	Filter Traces	Correlations	About MEGS2
Save Ctrl+S		Scale	Clear Traces	Set Rock F4			Bitmaps	
Save As		Set Depth	Filter	Merge F5			Rock Types	
Load Boreholes_		Ruler	Shift Trace	Insert F6				
Project Details		Fine Scroll Ctrl+F	Average	Set Base Depth F7				
Print Labels Ctrl+P				Delete F10				
Print Preview								
Print Setup								
Exit								

Getting Started in MEGS_Log

Note that all clicks are made with the left button unless otherwise stated.

Loading Up

1. *Make a new bore log:*

To make a new borehole, select *New* from the File menu. A dialog box will appear, prompting you to select the right or left borehole as the new hole. The new borehole should be created on the RH column to ensure its alignment with the LAS traces. To make either column active you can just click on the column you want active, and its name at the top of the column will appear magenta in colour.

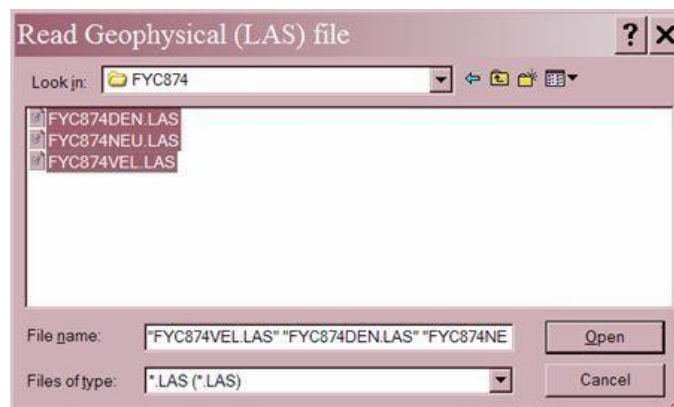
The *Project Details* can also be set from the File menu. A window appears asking for the Site Name to be entered, which is used for printing sample labels later on.

2. *Or load a started borehole:*

A started borehole can be loaded by selecting *Load Boreholes* or *Open* from the File menu.

This produces a dialog box listing all borehole files under their directories. Simply select the desired file by double clicking on it, or by one click and then OK, and the file will be loaded.

3. *Load the LAS data:*



- From the Traces menu, click on *Select LAS Files*. A window similar to the one shown above will appear. Select the correct directory path from the pull-down box and the list of LAS files will appear.
- Ctrl-Click or Shift-Click to highlight all the traces to load, then click on OK. The LAS traces will now appear on the screen. If the traces are excessively “noisy”, they can be filtered using the View – *Filter Traces* option.
- Select *Curve Setup/Load* from the Traces menu. This presents a window where trace attributes such as scale and colour can be modified. The appearance of traces from different LAS files can be selected by the pull down box at the top of the window.

4. *Adjusting a misaligned trace:*

If the traces are misaligned, click on the trace to be shifted, it will appear bold. From the Traces menu, select *Shift Trace*, a window will prompt for the distance by which the trace should be moved. Positive values move the trace downwards; negative values shift it upwards.

Usually a trace need only be shifted by an increment of about 0.02m. Try this initially, and increase the increment as necessary. The amounts entered are not cumulative; hence you would enter 0.02, then 0.04, etc. Trace shifts are not saved back to the data file, so if you reload the LAS at a later date, you will need to realign the traces.

Borehole Interpretation

You are now ready to interpret or modify the borehole. Some of the functions for which MEGS_Log is commonly used are listed below, and the way you use this program will depend on what kind of function you wish to perform.

1. Cored logged holes: modification using LAS traces.
2. Open holes: user interpretation from LAS data with the aid of field logs.
3. Old boreholes: entry of data from old logs to generate graphics for correlation purposes.

1) Cored logged holes: modification using LAS traces

A complete logged borehole graphic will have been imported into the RH column (see “Loading Up” 1 & 2, pg 4). In this situation, MEGS_Log is used to adjust lithological boundaries to coincide with the LAS data, correcting errors made through core loss and measuring, and providing an opportunity to interpret the rock types of lost core.

- i. From the Options menu, select *Settings All* and then the *Insert Mode* button. In this mode, dragging a boundary changes the thickness of the unit above it, and automatically readjusts **all boundaries below it**, hence adjusting for core loss as you progress down the column. (Use this mode with some caution).
- ii. Other useful Options settings are:
 - *Scale*. The default scale is 1:200, and can be changed as desired by setting the new scale in the dialog box.
 - *Ruler*. Clicking on this option produces a horizontal line which moves across the traces in unison with the cursor to aid in setting accurate stratigraphic boundaries.

Use items from the Tools menu to alter boundaries and rock types. The function keys provide a quicker alternative to picking from the menu. An *Undo* function is located under the Edit menu (short-cut *Ctrl+Z*), and can undo up to 10 edits.

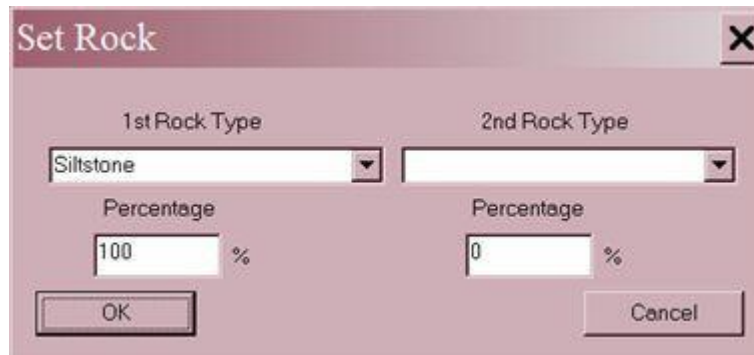
To create a boundary, select *Create Boundaries* from the menu, or press *F2*. When the cursor is positioned in the column, a hammer icon and crosshairs appear. Position the centre of the crosshairs where you pick the boundary to be, and click.

To drag a boundary, select *Pick and Drag* or press *F3*. An arrow icon will appear. Position the arrow above the boundary to be moved, and click. The boundary will turn red and a handle will appear at the RH side. Position the point of the arrow on the handle, click and drag.

To eliminate a boundary, select *Merge* or press *F5*. Position the crosshairs below the boundary to be deleted and click. A dialog box will appear to confirm the merge, after which, if *Yes* is selected, the rock type of the lower unit will merge upwards to replace that which was above the deleted boundary.

To set a boundary base depth, select *Set Base Depth* or press *F7*. Click within the unit for which the basal boundary is to be moved. A dialog box will appear with the existing boundary depth. Edit this depth as desired, and click OK.

To nominate or change a rock type, select *Set Rock* or press *F4*. A magnifying glass icon containing crosshairs appears. Click in the selected area of the column, which will bring up a Rock Type menu as shown below:



- (a) For a single rock type, click on the pull-down arrow on the LH side. This produces a rock type list in alphabetic order. Scroll through or short-cut by pressing the initial letter of the desired rock type (e.g. 's' for sandstone). Click on the selected name, then on OK or hit the Enter key. The allocated pattern for that rock type will appear in the borehole display column.
- (b) For a combination of rock types (e.g. 70% siltstone, 30% mudstone), select the first rock type from the LH box and change its percentage from 100 to the desired value. Select the second rock type from the RH box in the same way, and the program will already have calculated its corresponding percentage. Hit OK, or Enter.

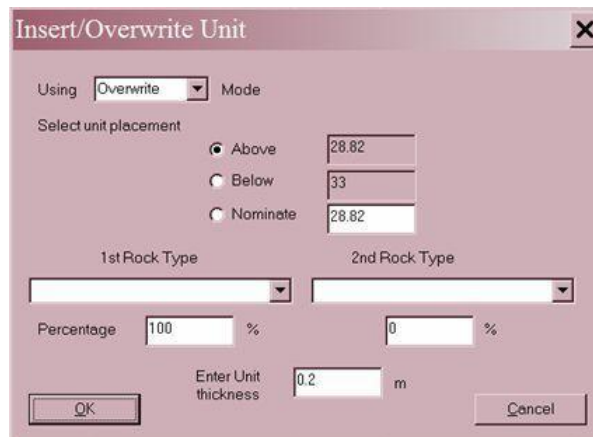
2) Open holes: user interpretation from LAS data with the aid of field logs

Interpretation from LAS data is possible only below the standing water level in the borehole. Traces above this level will appear abnormal, usually as straight lines.

From the Options menu, select *Settings All* and then the *Overwrite Mode* button. In this mode, dragging a boundary will have no effect on boundaries above or below it.

To set boundaries and rock types, see section 1. on page 5.

To insert a unit, select *Insert* or press *F6*. Click in the unit in which a new record is to be inserted. A dialog box will appear like the one below:



The mode, Insert or Overwrite, can be selected from this box to temporarily allow an over-ride to the default setting under Options Settings All. The unit placement determines where the record will be inserted:

- a) If *above* is chosen, the record will be inserted above the top of the unit that was originally clicked in.
- b) If *below* is chosen, the record will be inserted below the base of the unit that was originally clicked in.
- c) If *nominate* is chosen, the record will be inserted at exactly the depth nominated (i.e. the top of the unit inserted will occur at the depth entered). This depth must be within the range of the unit originally clicked in.

Choose the rock type(s) of the unit to be inserted, and enter the thickness of the record to be inserted. The default thickness is 0.2m. Click OK, or hit Enter and the new unit will appear as specified.

To delete a unit, select *Delete* or press *F10*. Click in the unit to be deleted and click Yes in the box that pops up to confirm the delete of the selected unit. All records below the unit deleted will then be shifted up the hole, regardless of the mode set (Insert or Overwrite).

3) Old boreholes: entry of data from old logs to generate graphics for correlation purposes

When only paper copies of geophysical logs are available, obvious lithological boundaries need to be hand-picked and entered in the stratigraphic column using the *Create Boundaries* tool (short-cut key *F2*).

A useful aid in this situation is the **depth indication figure** which appears at the bottom of the screen, below the borehole column. Simply run the cursor down the column until the depth indication figure reaches the desired value, and click to create the boundary. When using the **depth indication figure**, the *Depth Tolerance* can be set from the Options Settings All menu. This allows boundaries to be created or moved to the nearest 0.005m, 0.01m, 0.02m etc, as desired.

Once all possible boundaries have been established from the geophysical logs, remaining data such as rock types, can be entered from field logs or other available data (see section 1. on page 5).

Correlation and Sample Numbers

For correlation of bores in MEGS_Log, a customized menu listing of the stratigraphic units in your area of exploration can be created, enabling units to be labeled down the RH side of the display column. To create your list of seam names, see “Customizing MEGS_Log” on page 10.

Correlating in MEGS_Log:

1. To aid in correlation, a previously processed borehole can be loaded into the LH display column. Select the appropriate borehole file from the *Open* or *Load* options in the File menu.
2. The RH scroll bar moves both columns and traces while maintaining their alignment. The scroll bar between the two display columns moves the LH column only. To move in single increments, click on the up and down arrows. For larger shifts, click inside the bar near the arrows, pick and drag the handle along the bar, or simply scroll with the mouse wheel.
3. *Fine Scroll*, from the Options menu (or short-cut *Ctrl+F*), allows the user to move both columns together, or the LH column only, in finer increments for precise alignment of the two bores.
4. Using *Scale*, from the Options menu, boreholes can be compressed to compare entire bores on the screen for initial gross correlation, or blown up for detailed picks.
5. When first selecting the *Correlate* tool (*F8*) from the Correlate menu, MEGS_Log will prompt you to *Select Site*. Scroll through the names in the display box to select the correct site.
6. To label a single rock unit, press *F8* or select the *Correlate* tool, place the crosshairs within the unit and click. A “Correlate” box will appear. By scrolling through the list, select the desired seam name, and click on OK or hit the Enter key.
7. To apply the seam name to a sequence of units, place the crosshairs within the top unit and click and drag a box to within the lowest unit. The “Correlate” dialog box will appear, select the desired seam name, click OK or Enter. The chosen units will be assigned the seam name, labeled at the roof and floor of the sequence.

Sample number allocation:

1. Selecting *Sample Numbers* from the View menu toggles between displaying sample numbers and seam names against the RH side of the borehole. By activating the *Correlate* tool (*F8*) with the sample numbers displayed, numbers can be assigned to single or multiple units in the same way as seam codes. Sample numbers may be alphanumeric, and up to 10 characters in length.

2. When correlation and the allocation of sample numbers is complete, sample tags can be printed by selecting *Print Labels* under the File menu. A “Print” window appears, in which you can specify to which printer the labels should be sent.
3. *Print Preview* under the File menu shows the layout of the sample labels to be sent to the printer. This preview should be used as an example only, as it may not show the exact data that will be printed on the tags.

Useful User Tip:

By right-clicking on any unit within the borehole column, a window is opened that contains all the information for that unit, i.e. rock types, seam name, unit top and base depths, and the sample number. The *Previous* and *Next* buttons show the information for the units progressively up or down the hole, highlighting in green the unit for which the information is displayed.

Customizing MEGS_Log

The Setup menu allows the User to change the way the rock types and traces are displayed, as well as set up the seam correlations for different sites.

Seam names for correlation

```

#
Section Correlations
CurrentSite = "Bobbyjoe"
Table Sites
  "Bobbyjoe"
  "Maryjane"
  "Johnsmith"
EndTable
EndSection
#
Section "Bobbyjoe"
Table Seams
  BILL
  BOB
  JOE
EndTable
EndSection
#
Section "Maryjane"
Table Seams
  MARY
  JANE
  JILL
EndTable
EndSection
#
Section "Johnsmith"
Table Seams
  JOHN
  JACK
  SMITH
EndTable
EndSection
  
```

To create your list of seam names, from the Setup menu, select *Correlations*. Edit the text file that opens (as at left) by putting your site name in inverted commas as a new line in the **Section Correlations** part of the file, under the *Table Sites*. Then, at the bottom of the file, on a new line, insert a # and then enter a new **Section** "Your site name," and then list your seam codes under **Table Seams**, in stratigraphic order down-hole. Finish off by *End Table* and then *End Section*. Save and close the text file, and the new site and seam labels will be available within the program for correlations.

Geophysical trace displays

```

*DEN(SS)* 1.0 3.0 blue 1 Y
*DEN(L3)* 1.0 3.0 blue 1 Y
*GAMA* 0.0 200.0 green 2 Y
CALIFER 8.0 14.0 aqua 2 Y
*RES(SS)* 10.0 500.0 red 3 Y
DENSITY 0.0 4.2 blue 1 Y
COND 0.0 100.0 yellow 3 Y
DELTAT 250.0 1000.0 maroon 3 Y
RES 0.0 500.0 red 1 Y
NEUTRON 250.0 3000.0 yellow 3 Y
LSN 0.0 550.0 yellow 3 Y
SSN 1000.0 4500.0 red 3 Y
GRUS 0.0 275.0 green 2 Y
MCZF 150.0 500.0 red 1 Y
GRFS 0.0 275.0 green 2 Y
CRMS 90.0 200.0 aqua 2 Y
DENB 1.0 3.0 blue 1 Y
DENL 1.0 3.0 blue 1 Y
GRUS 0.0 200.0 green 2 Y
PIF 0.0 5000.0 red 1 Y
PIF 0.0 5000.0 red 1 Y
SSN 0.0 5000.0 maroon 2 Y
VLZF 1000.0 5000.0 red 2 Y
MSUS 0.0 3000.0 magenta 2 Y
FBI 0.0 200.0 magenta 3 Y
FBI 0.0 200.0 magenta 3 Y
FBI 0.0 200.0 magenta 3 Y
FBI 0.0 300.0 yellow 3 Y
FBI 0.0 300.0 yellow 3 Y
FBI 0.0 1000.0 yellow 3 Y
MSUS 0.0 3000.0 magenta 2 Y
F3 0.0 5000.0 red 1 Y
F1 0.0 5000.0 red 1 Y
*GAM(NAT)* 0.0 200.0 green 2 Y
*GAM(NAT)* 0.0 200.0 green 2 Y
RES 0.0 500.0 red 1 Y
VELOCITY 1000.0 5000.0 red 3 Y
  
```

To change the default settings for the scale or appearance of your LAS data, edit the text file that opens from the Setup Trace Defaults menu.

You will need to know the name of the curve in your LAS data that you want to change the trace display/scale for. The file is in free format and controls the following (in order, on each line).

Curve name

Minimum X axis value

Maximum X axis value

Trace display colour

Column number to display the trace on (numbered from left to right across the screen)

The axis to represent the curve value on (always Y).

Rock types and hatch patterns

If MEGS_Log does not recognize a rock type, the unit will be displayed blank, with red bars down the sides. To fix this, or to change which predefined hatch pattern is assigned to each rock type, edit the comma delimited file that opens when you choose Setup Rock types. Make sure you spell the rock type exactly as it is in your original bore log, but it's not case sensitive. You can have up to ten rock types matched to a particular bitmap pattern. Do not change the order of lines in this file (i.e. insert or delete rows), as they are mapped directly to their patterns within the program. When you've made your rock type edits, save the file (still in the comma delimited format) and the program will display the newly matched pattern for your rock type.

















MEGS_Log uses both Vector and Bitmap patterns to display different rock type hatches. Vector patterns are generally used to display the various categories of coal, which are represented in the graphics by some combination of horizontal lines that stretch vertically to fill the space allocated to them. These vector patterns are currently not customizable in MEGS_Log.

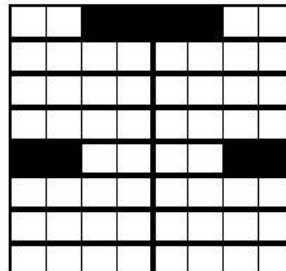
The majority of the hatch patterns in MEGS_Log are controlled by Bitmaps which use a pattern designed within a square, which is then repeated over the area designated to that particular lithology. The unit square is very small, and is divided into an 8 x 8 grid, giving 64 spaces which can either be filled or left blank to compose the symbol. The spaces in the grid are named using hex-decimal.

	1			2	
	3			4	
	5			6	
	7			8	
	9			10	
	11			12	
	13			14	
	15			16	

The 8 x 8 grid is divided into 16 rectangles, each of 4 horizontally-aligned spaces (see above). The unit therefore comprises 8 lines, each line being composed of 2 rectangles.

Every space which is left blank is designated by a 0, and every filled space is designated by a 1. The LH column on the right lists all the combinations of filled or blank spaces possible within one rectangle of 4 spaces. For simplification purposes, we represent each permutation by a single digit or letter, as listed in the RH column.

	0 0 0 0	0
	0 0 0 1	1
	0 0 1 0	2
	0 0 1 1	3
	0 1 0 0	4
	0 1 0 1	5
	0 1 1 0	6
	0 1 1 1	7
	1 0 0 0	8
	1 0 0 1	9
	1 0 1 0	A
	1 0 1 1	B
	1 1 0 0	C
	1 1 0 1	D
	1 1 1 0	E
	1 1 1 1	F

	C 3
	F F
	F F
	F F
	F F
	3 C
	F F
	F F
	F F

Above is the plot for the Claystone symbol. Offsets and overlap must be designed for continuity of the pattern as it is repeated. Each of the 8 lines of the unit has been reduced to 2 characters, representing its left and right hand sides.

To change the Bitmap patterns in MEGS_Log, select Setup Bitmaps and edit those already set up (keeping them in the same format, you need a "0" and a lower case "x" before each line pair). The facility to add more bitmap patterns to this file is currently not available in MEGS_Log.