Instructions on How To Use Engauge to Digitize Well Logs

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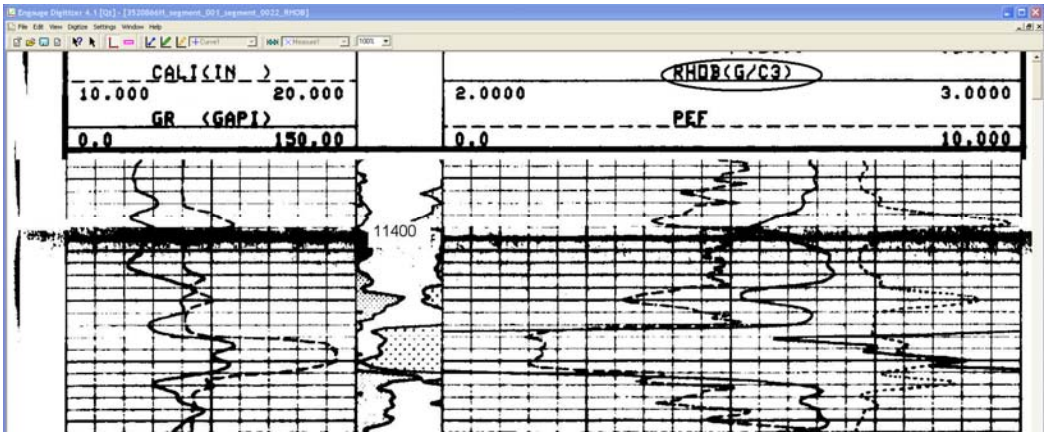
Notice: Only the marked curves need to be digitized. In each image file, there is only one curve that needs to be digitized. This curve is marked with an ellipse. For example, shown in figure beneath, there are 5 curves, but only the curve, RHOB, needs to be digitized. The legend underneath RHOB is a solid line, thus in the image log beneath, only the solid curve needs to be digitized.



Engauge Digitizer is free and can be downloaded at:
http://digitizer.sourceforge.net/
Go to the Download page.

1.Import file

a. Click on File button on main panel, Select Import Option. (Figure 1)

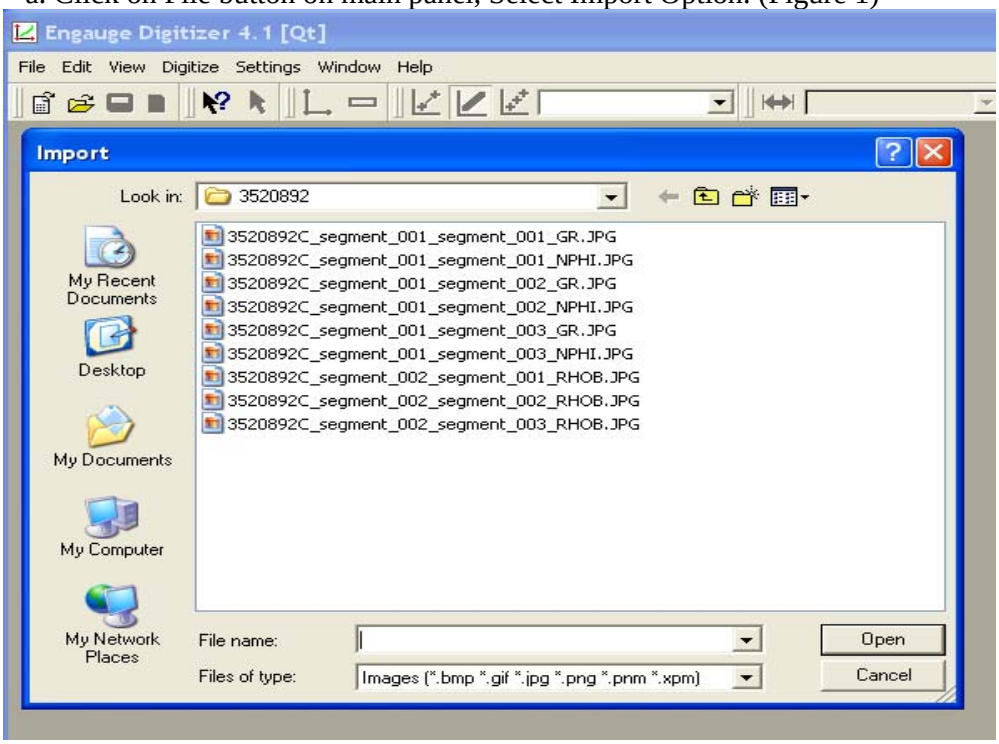


Figure 1, Import Panel

b. Find your file, and Click on Open button.(Figure 2)

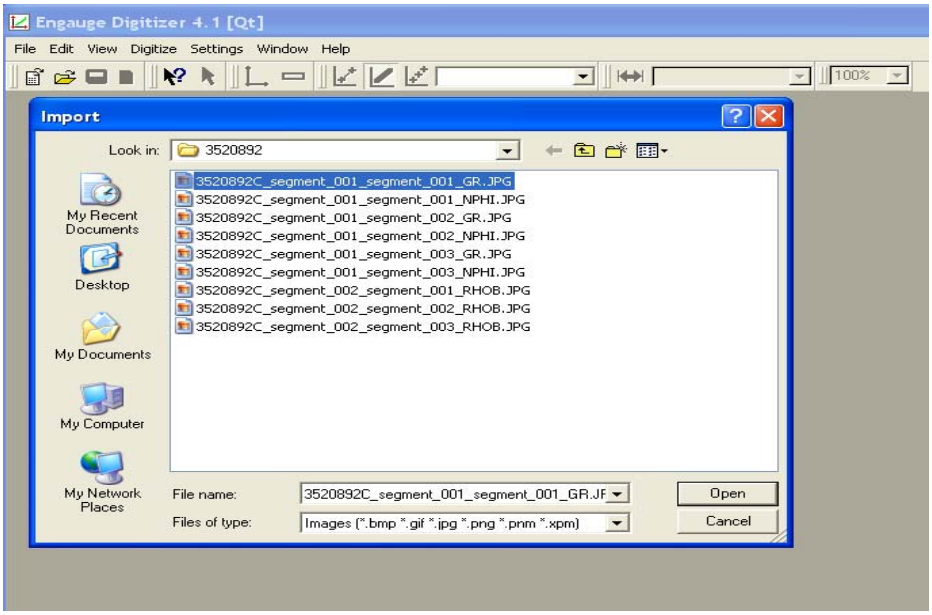


Figure 2, Find your file (ex:3520892C_segment_001_segment_001_GR.jpg) and click on Open button. The file will be imported.

c. When the file is importing, it will show Importing file… in the bottom left corner of the panel. And the Panel shows that the scanning of the image file is in the process.(Figure 3)

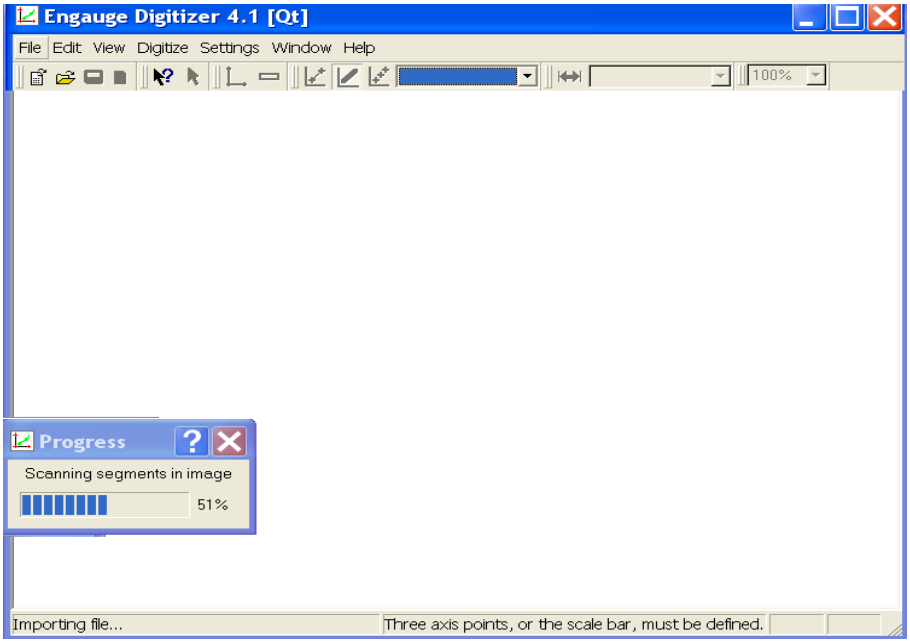


Figure 3, Importing File

d. After importing the file, It looks like the one shown below (Figure 4a). Click on View/Original Image option(Figure 4b). Note: If the size of the imported file is too big, you can see nothing. In this case the file needed to be truncated multiple files with smaller sizes and be handled one by one. Because the size of the file that the Engauge Digitizer can handle depends on your computer memory. Please contact Dr. Li in GE315 if this happens and he can show you how to do the truncation.

Figure 4a, A file is imported

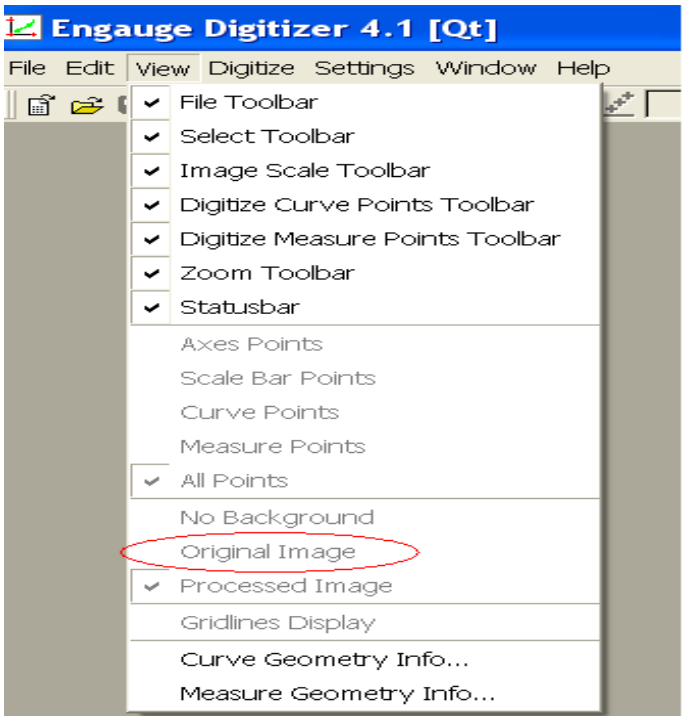


Figure 4b, The Original Image Option

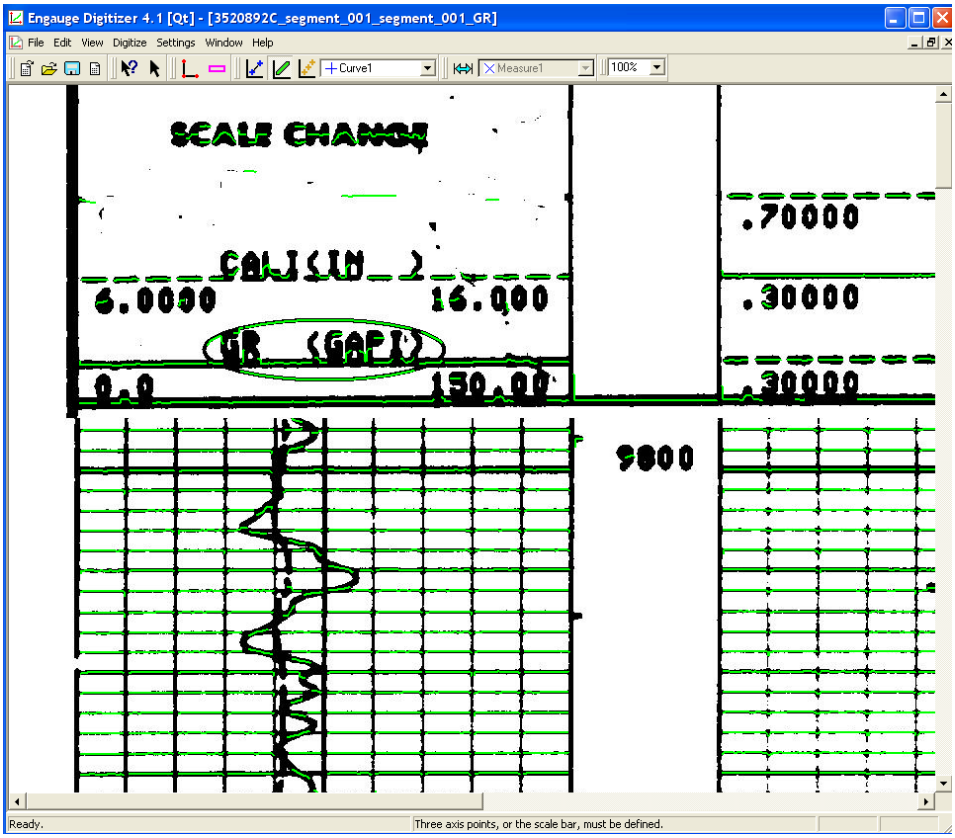


Figure 4c, Panel shows the imported file after clicking Original Image button

2. After importing the file, you can start the digitization of the file.

a. Click on the Axis Point button (Figure 5) before entering axis points, this will define the coordinate system with three points. Notice that it does not matter where the three points are as long as each should have different locations corresponding to the 3 points shown by this icon. Alternatively, the top "dot" in this icon can point downwards. But for the sake of precision, these three points should be located as far apart from one another as possible.

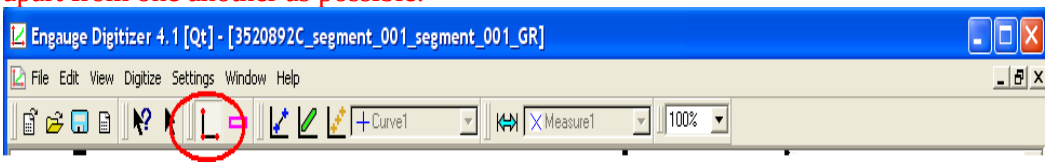


Figure 5, Axis Point button

b. Click on one of the axes to add the <u>first</u> axes point, then enter its graph coordinates. (Figure 6). X=9800 (X meaning ft along the downward depth; Y=0 (Y meaning the value of GR along the horizontal axis).

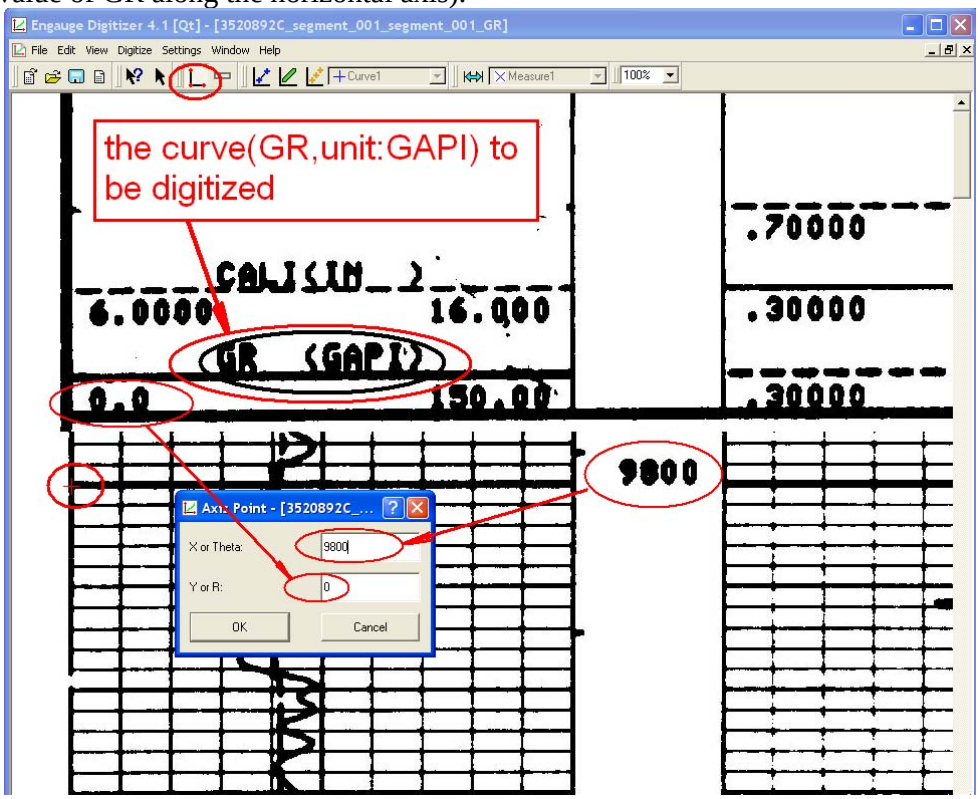


Figure 6, the <u>first</u> axis point (red cross)and its graph coordinates

c. Click on one of the graph axes to add the <u>second</u> axis point, then enter its graph coordinates. (Figure 7). X=9800 (X meaning ft along the downward depth);Y=150.0 (Y meaning the value of GR along the horizontal axis at this position).

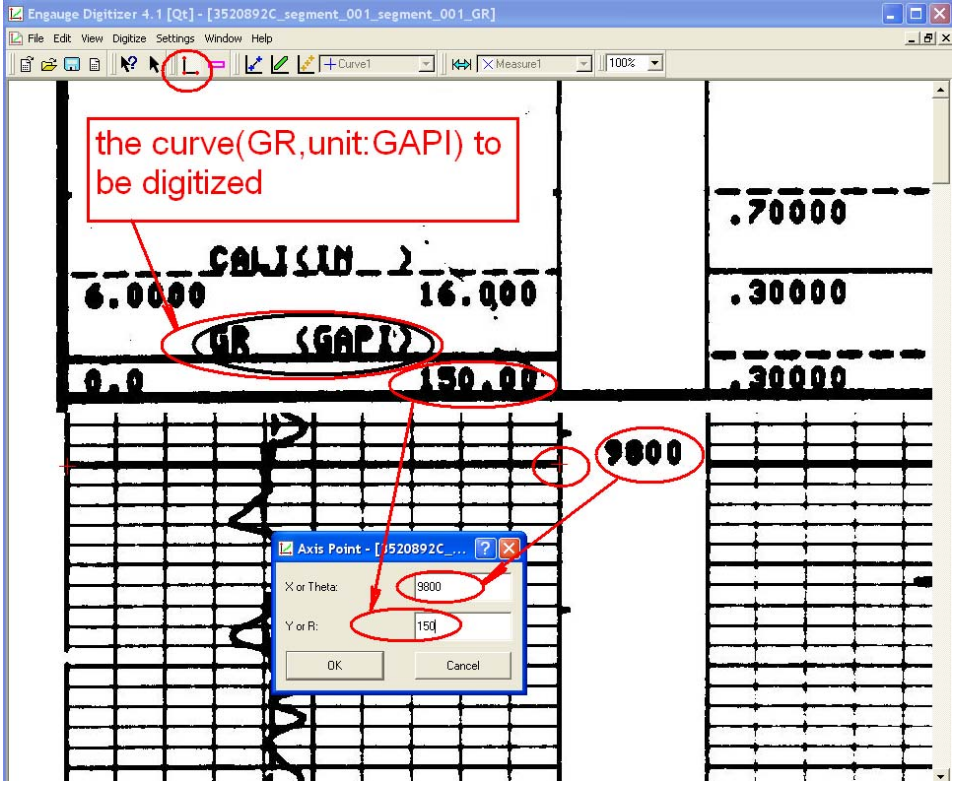


Figure 7, the <u>second</u> axis point (red cross) and its graph coordinates

d. Click on one of the axes to add the <u>third</u> axis point, enter its graph coordinates. (Figure 8). X=10100(X meaning ft along the downward depth); Y=150.0 (Y meaning the value of GR along the horizontal axis). You may need to scroll down the image to find a major tick mark (in this case, 10100 feet).

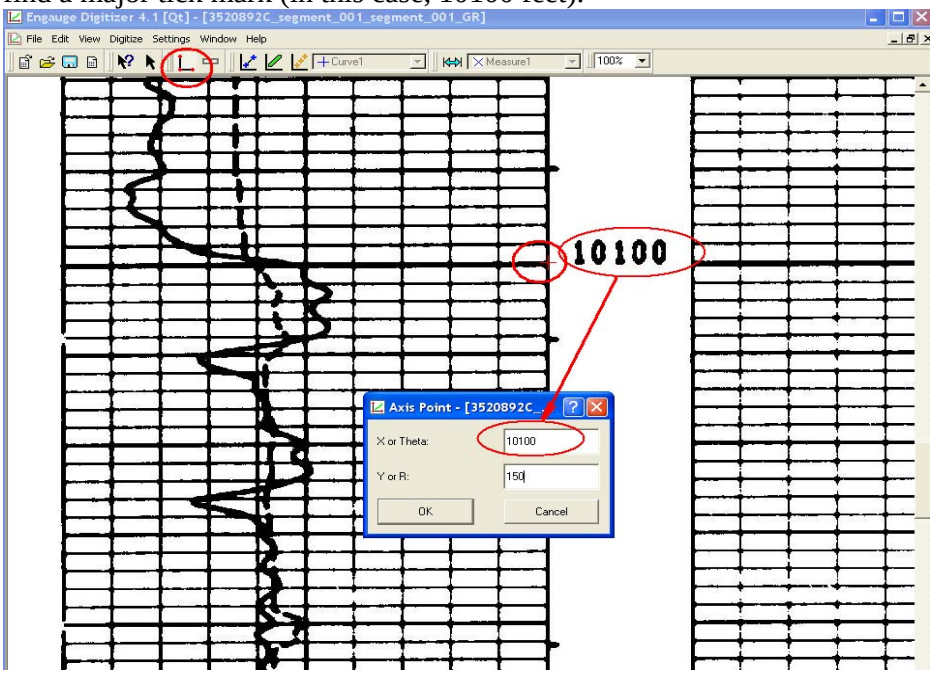


Figure 8, the <u>third</u> axes point (red cross) and its graph coordinates

e. For an imported image file, below figure (Figure 9) shows the Legend for the log (curve name, unit, scales, and line model ---here a solid curve is associated with RHDB)

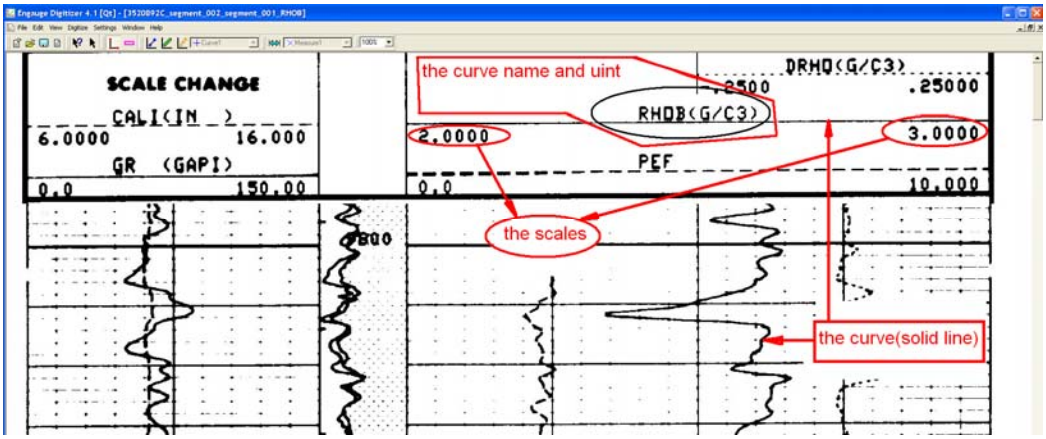


Figure 9, the Legend example

So far, you have defined the three points with "real" coordinates which you read off from the graph, Engauge will figure out the correct coordinate values for the subsequent digitized data points along the well log curve.

3. After defining the coordinate system, start picking up points:
   a. Click on the Measure Point button before entering curve points. These will contain the digitized graph data.(Figure 10)

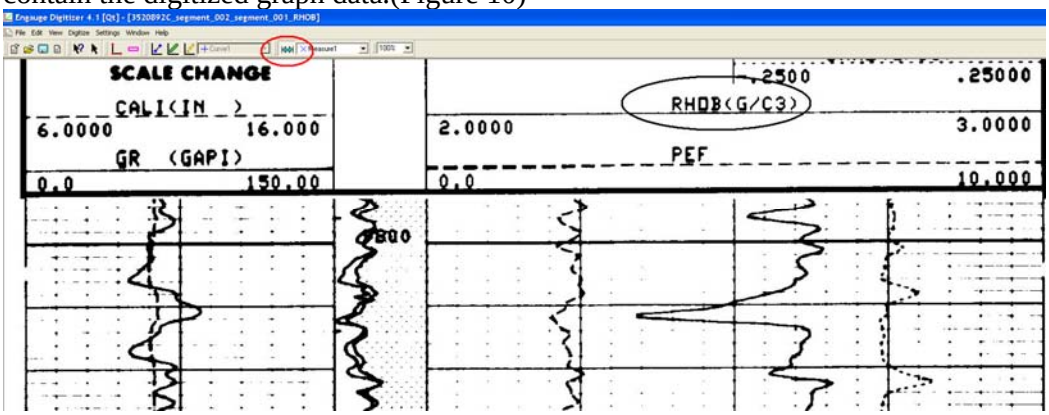


Figure 10, Measure Point button as shown by the red ellipse

Click on the curve to add a curve point. Repeat until all of the points in the original image are digitized. (Figure 11). The marked curve is drawn with solid line. **As you digitize, don't forget to save the Engauge file (*.dig) you're working on.**

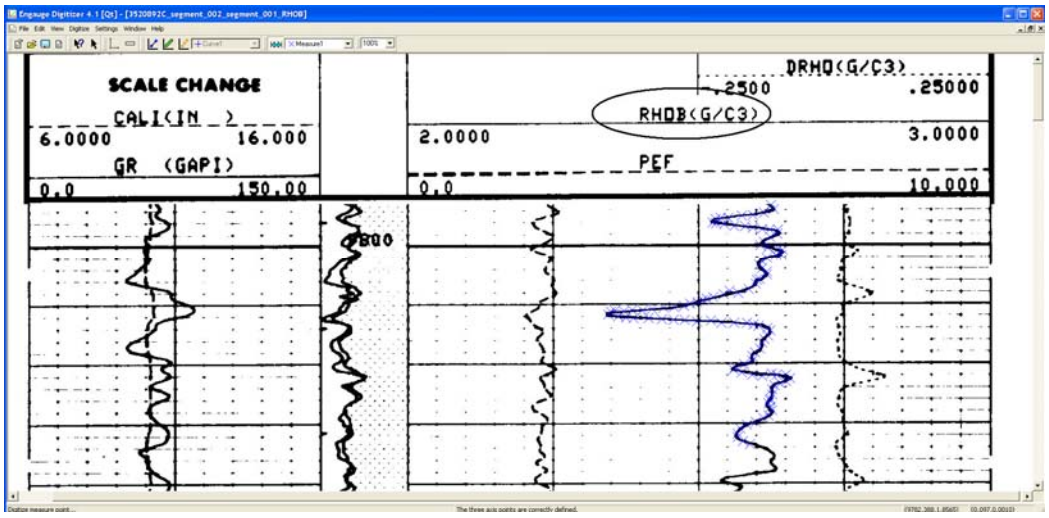


Figure 11, digitizing points

b. If you Click on View/Measure Geometry Info…(Figure 12a), The digitized data are shown in the Measure Geometry Panel. The first Column and the second Column are the data points.(Figure 12b)

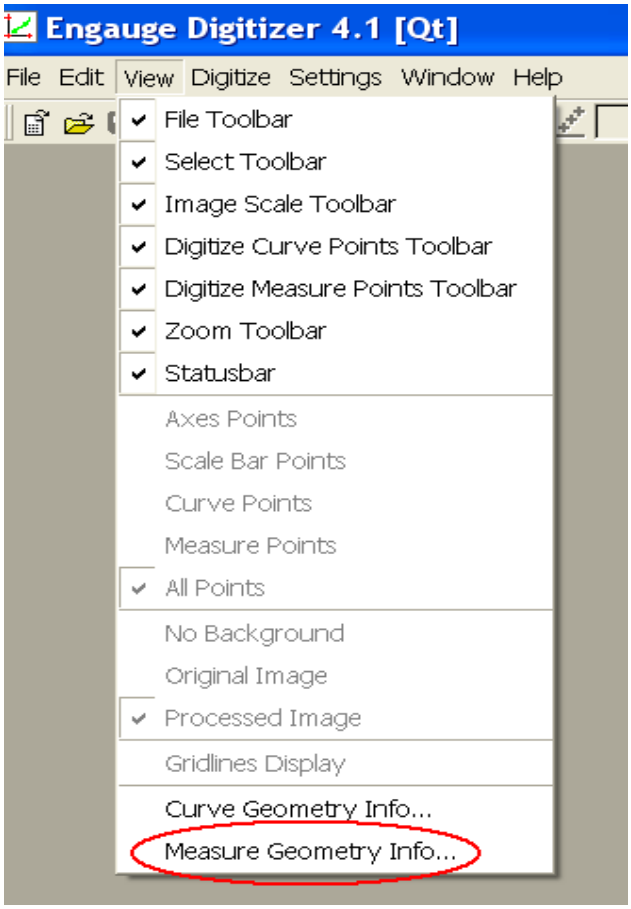


Figure 12a, the Measure Geometry Info…option

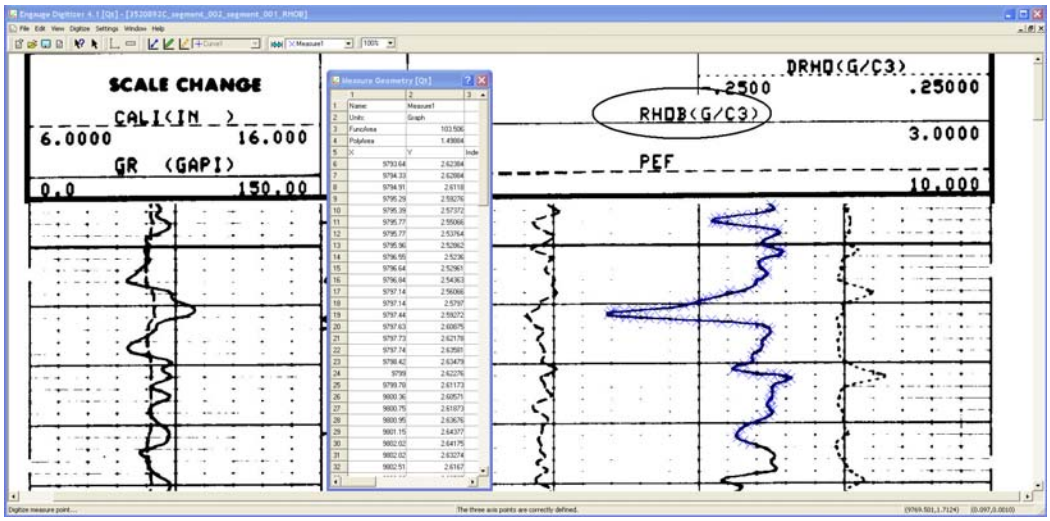


Figure 12b, digitized data are shown in a separate Measure Geometry window: the X value is increasing downwards representing vertical depth (from surface); the Y value reflects the lateral variation in RHOB (ranging between 2.0 and 3.0 in this case). Note that Engauge has correctly figured out the "real" coordinates for X and Y.

c. Output the data points. Select the first two columns, and Press both Ctrl and c buttons (Ctrl+c) at the same to copy them to Clipboard. (Figure 13)

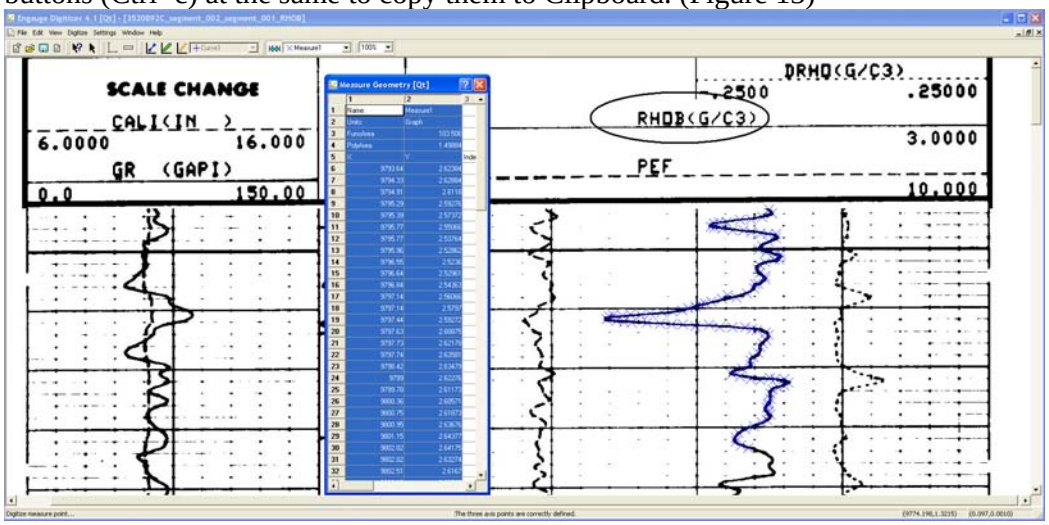
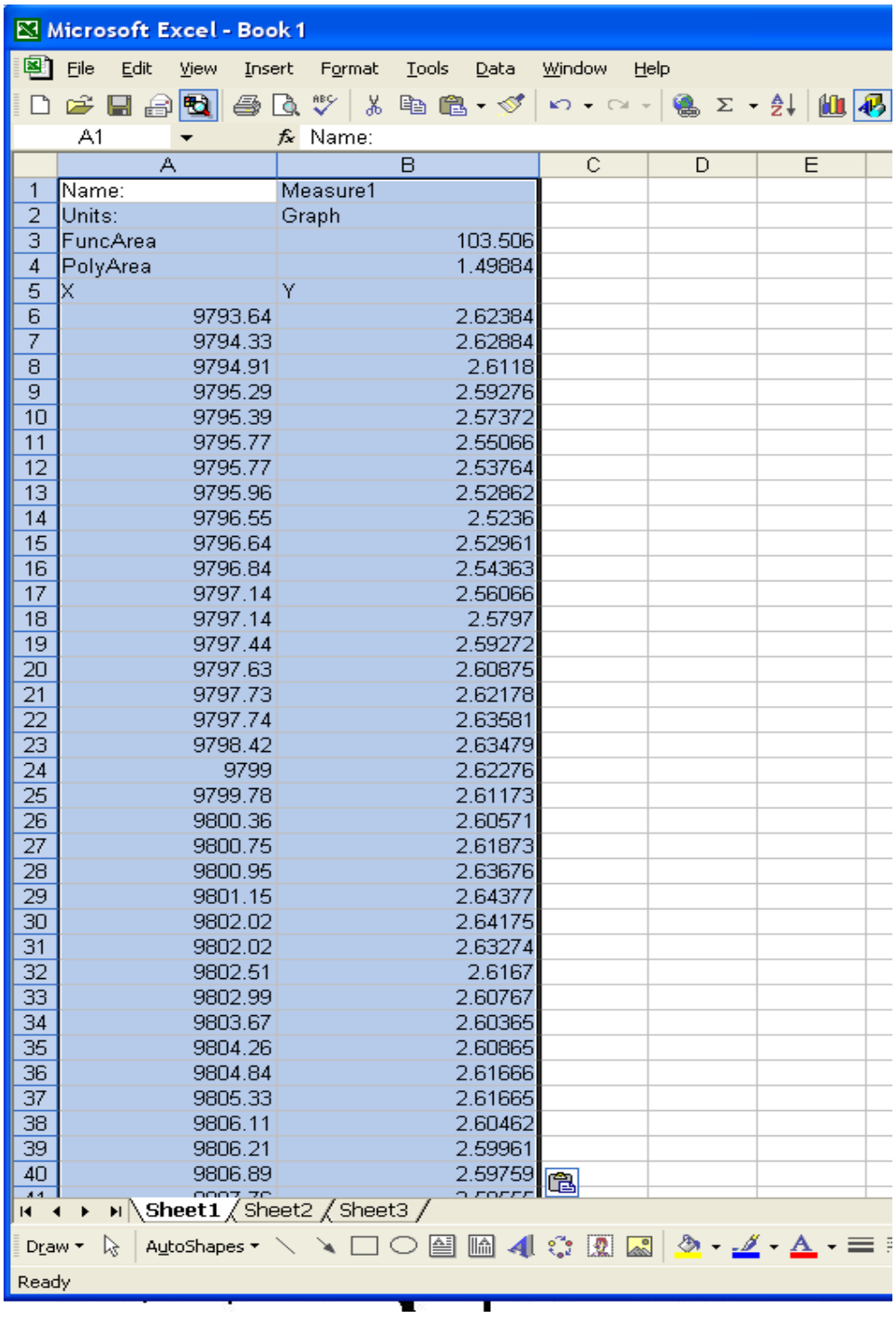


Figure 13, Select the columns and Copy the data

d. Paste the data you just copied to a spreadsheet of Excel.(Figure 14)



	A	B	C	D	E
1	Name:	Measure1			
2	Units:	Graph			
3	FuncArea	103.506			
4	PolyArea	1.49884			
5	X	Y			
6	9793.64	2.62384			
7	9794.33	2.62884			
8	9794.91	2.6118			
9	9795.29	2.59276			
10	9795.39	2.57372			
11	9795.77	2.55066			
12	9795.77	2.53764			
13	9795.96	2.52862			
14	9796.55	2.5236			
15	9796.64	2.52961			
16	9796.84	2.54363			
17	9797.14	2.56066			
18	9797.14	2.5797			
19	9797.44	2.59272			
20	9797.63	2.60875			
21	9797.73	2.62178			
22	9797.74	2.63581			
23	9798.42	2.63479			
24	9799	2.62276			
25	9799.78	2.61173			
26	9800.36	2.60571			
27	9800.75	2.61873			
28	9800.95	2.63676			
29	9801.15	2.64377			
30	9802.02	2.64175			
31	9802.02	2.63274			
32	9802.51	2.6167			
33	9802.99	2.60767			
34	9803.67	2.60365			
35	9804.26	2.60865			
36	9804.84	2.61666			
37	9805.33	2.61665			
38	9806.11	2.60462			
39	9806.21	2.59961			
40	9806.89	2.59759			

Figure 14, Paste the data into a spreadsheet within Excel

e. Delete the unwanted rows in Figure 14 (from the 1st row to the 4th row). Change "X" and "Y" to appropriate names and use the appropriate units --- these info can be found from the legend of the log you just digitized. In this case, "X" is replaced by " Depth_RHOB(FT)"; "Y" is replaced by "RHOB(G/c3)". Change the spreadsheet name from "Sheet1" to a number which is the first part of the imported file's name (that is, the unique well ID as shown in Figure 15). For example, in this case, the "Sheet1" is replaced by "**3520892**". The original imported file name is:
3520892C_segment_002_segment_001_RHOB.JPG.

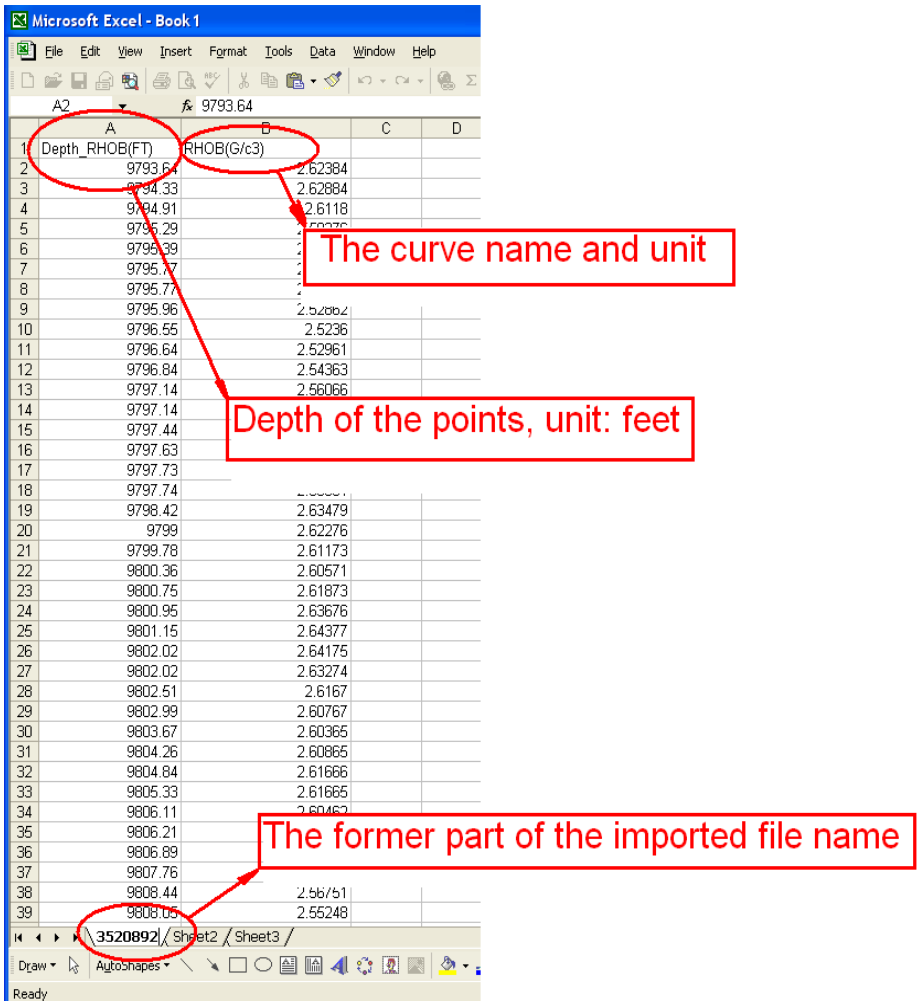


Figure 15, modify the column name and change the sheet's name

g.. Save this Excel spreadsheet as a file with the same name as the imported file except the Excel suffix (Figure 16). Please save the Excel file in the same folder as where the imported file is located. In this case, the imported file name is:
3520892C_segment_002_segment_001_RHOB.JPG;
The Excel file's name is:
3520892C_segment_002_segment_001_RHOB.xls.

This way, the data digitized for each curve is saved as an independent Excel file.

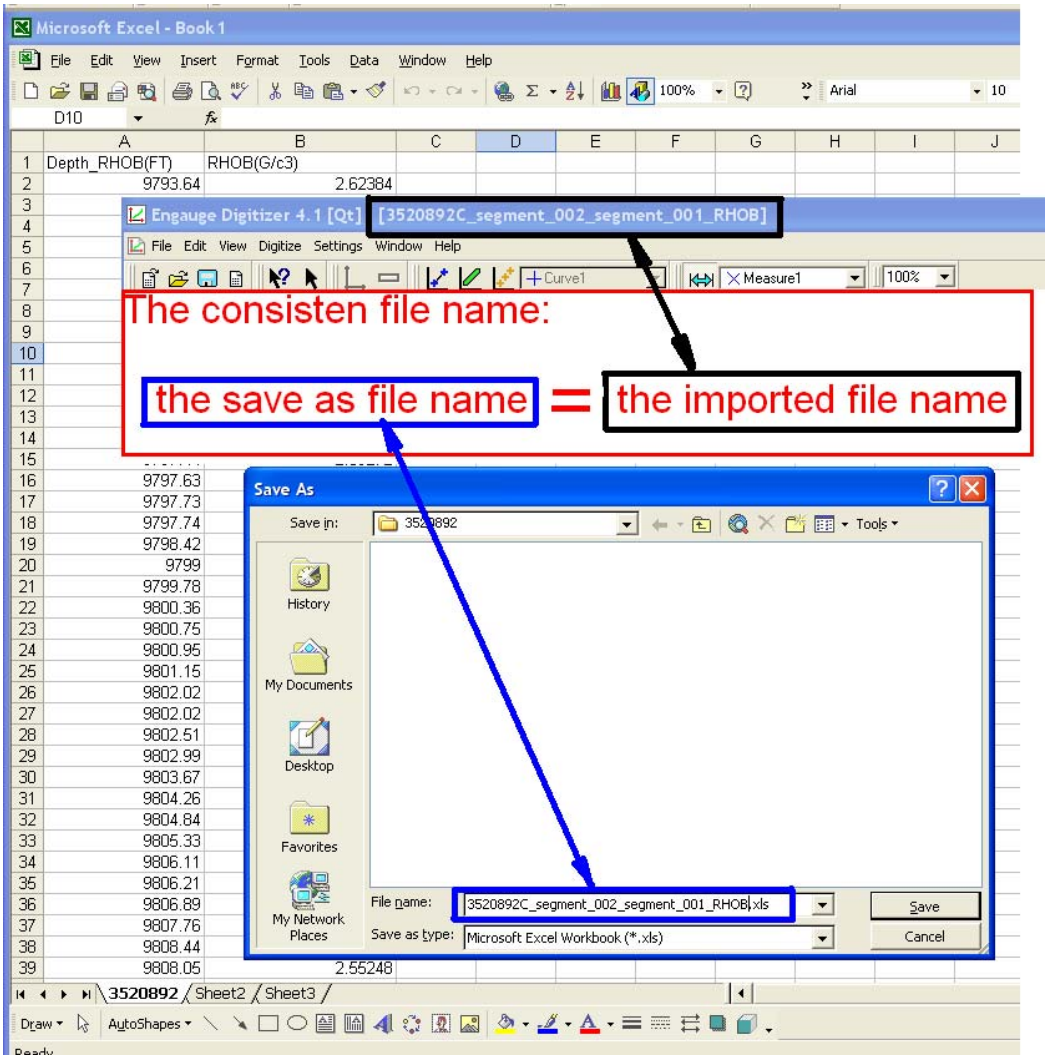


Figure 16, Save the sheet as the file whose name is the same as the imported file's name except the suffix and in the same folder where the imported file is located in. In the case , the imported file's name is : 3520892C_segment_002_segment_001_RHOB.JPG, the Excel file's name saved as: 3520892C_segment_002_segment_001_RHOB.xls.

f. **Save the Engauge file**. Click on File button in the main panel of Engauge Digitizer and then Click on Save as button. Save the file in *.dig format. The file name is the same as the imported file's except the suffix and in the same folder where the imported file is located (Figure 17). In this case, the imported file name is:
3520892C_segment_002_segment_001_RHOB.JPG,
And the Engauge Digitizer file name (*.dig) is:
3520892C_segment_002_segment_001_RHOB.dig.

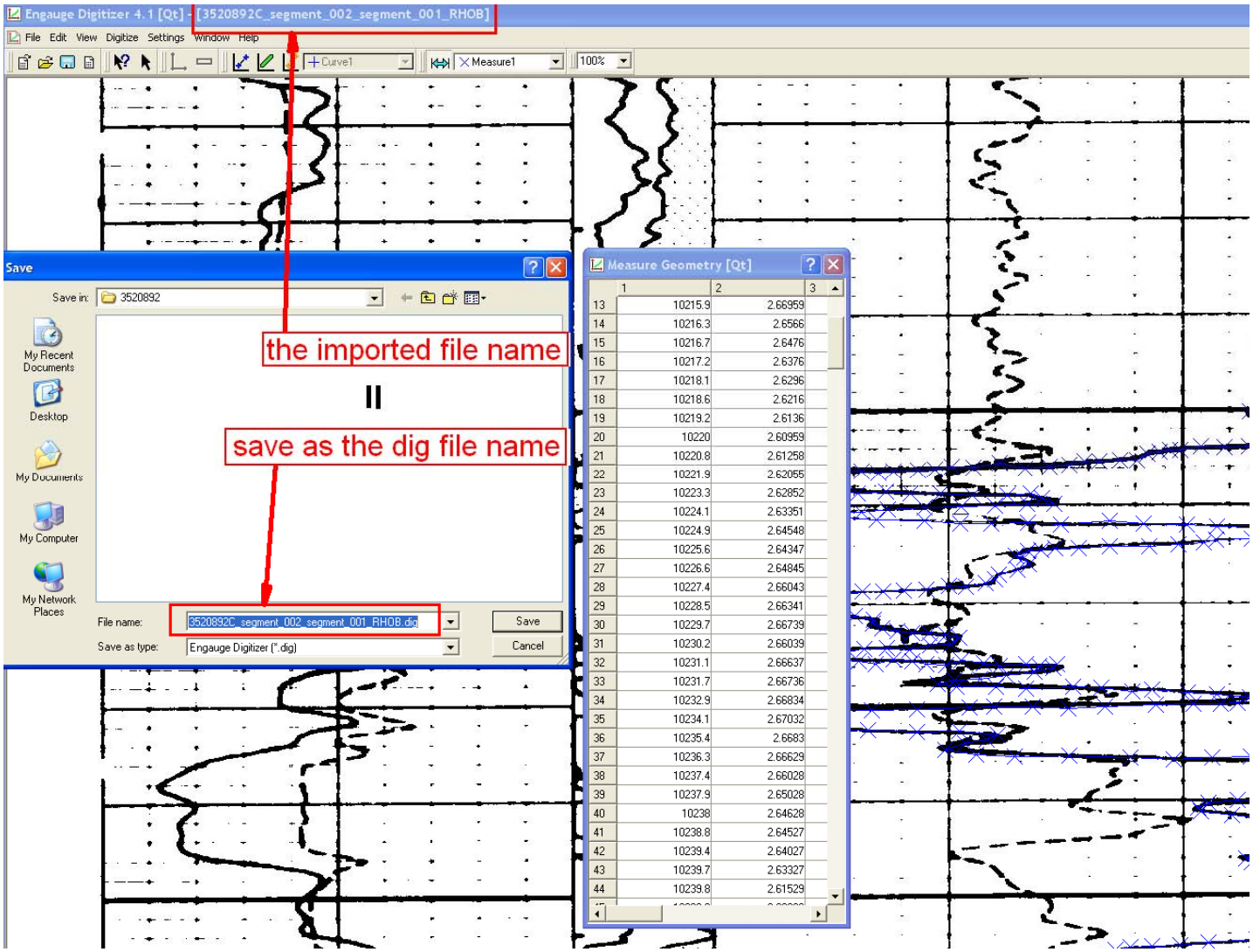


*Figure 17, Save as the *.dig file. The file name is the same as the imported file's name except the suffix (*.dig , *.jpg). In this case, the imported file name is: 3520892C_segment_002_segment_001_RHOB.jpg, And the filename saved as is : 3520892C_segment_002_segment_001_RHOB.dig.*

i.. If out-of- range behavior exists in the graph and only a few segments are out-of-rang (see example, Figure 18), mentally move the out-of-range data (usually plotted on the other side of the graph) to the correct side and digitize the points approximately. Earlier on the 3 coordinate points have defined the proportions (both vertical and lateral), thus Engauge can find the correct "out-of-range" values for Y. You can open up "Measure Geometry" and check for yourselves at these points. For this examples, the Y value can go up to 130 for the first out-of-range interval, while it goes down to 40 for the second out-of-range interval. (Figure 18). This procedure can be done only if a few points are out of range.

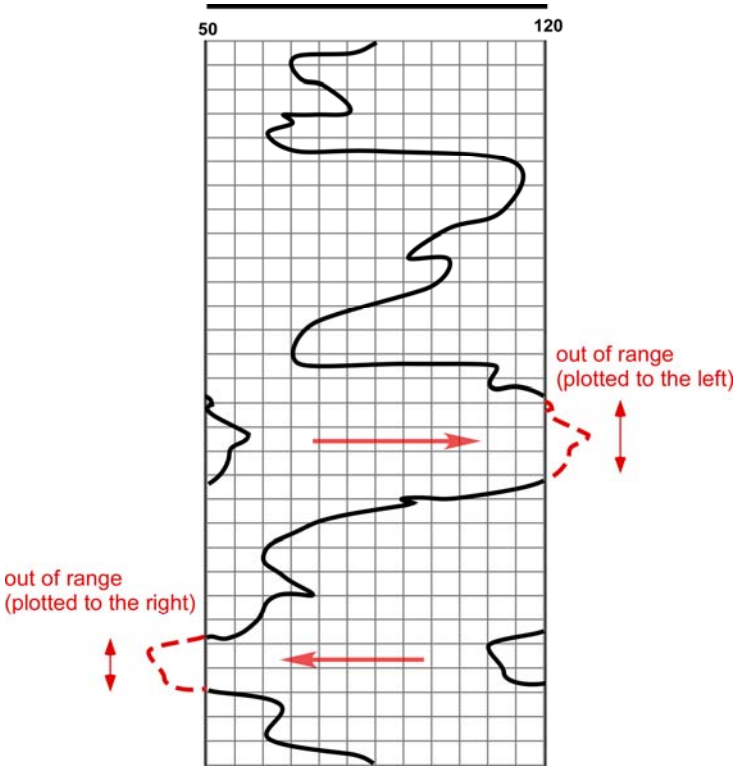


Figure 18, a schematic log with a few points out of range.

j. If there are a lot of points out of range, for example, NPHI is out of range quite a lot (Figure 19). According to the Legend in the header portion of the image, there are 2 scales: one is from 0.3 to -0.1 with short dash line; another from 0.7 to 0.3 with long dash line. The values of NPHI in the upper part are mostly displayed with long dash lines: the values range from 0.7 to 0.3. The values of NPHI in the lower part are displayed with short dash lines: the values range from 0.3 to -0.1. In this case you have to digitize them separately just like ***2 different curves***.

Since different Y scale is used for each NPHI, the coordinate definition (*that is, the 3 points selected to define the scales of the axis, **before** you digitize the curve*) must be done for the lower curve a second time. That is, before you digitize the lower curve, the 3 points must again be selected and their coordinates entered with different Y values (as read off from the header with the scale for the lower curve). If in doubt, please contact Dr. Li.

Finally combine the two series of digitized data (in this example, both refer to NPHI at different depth intervals) into the same Excel spreadsheet. According to their depth intervals, you need to paste them appropriately. If in double, please contact Dr. Li.

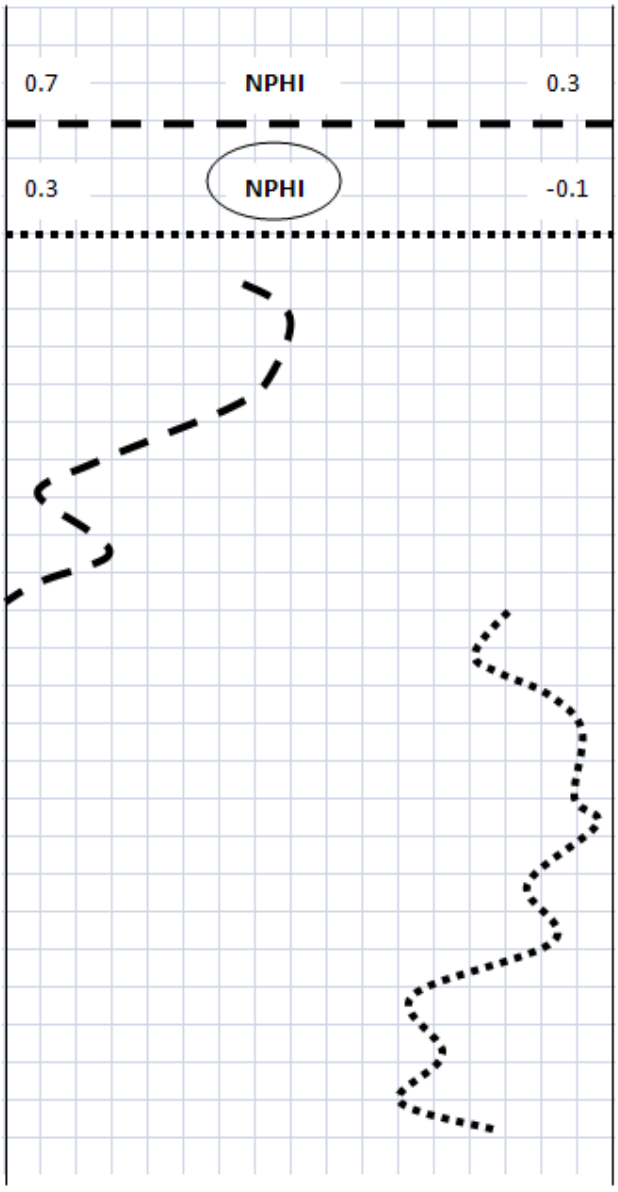


Figure 19, Different scales are used to digitize the different part of NPHI curve separately. In this case, first, digitize the upper part of the NPHI curve, and then digitize the lower part of the NPHI, separately. Combine the two data and put them into the Excel file according to their depth interval.