PDPlot Help

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PDPlot

Pressure v's Depth Analysis

by Petroleum Solutions Ltd

PDPlot Help

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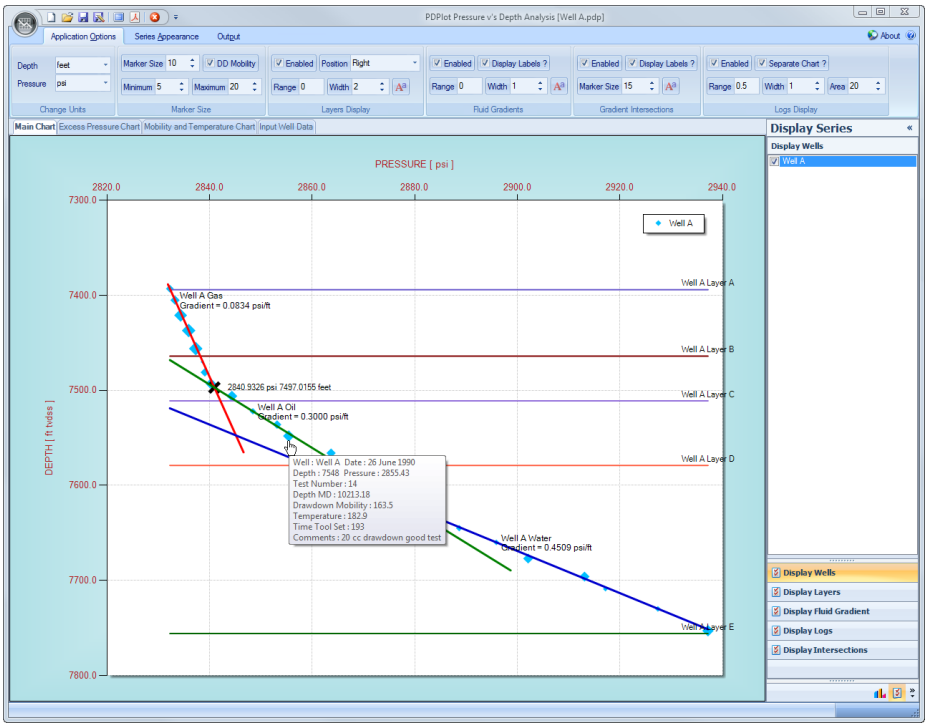
PDPlot

Pressure vs Depth Analysis

Part I

1 Introduction



PDPlot is an easy to use application developed for Petroleum Reservoir Pressure versus Depth Plotting and Analysis.

Though the use of ***PDPlot*** you will ultimately :

- Achieve better quality pressure versus depth analyses,
- Save a significant amount of time and shift the emphasis from ***preparation and presentation time*** to ***interpretation time***,
- Deliver presentation quality plots and graphics ***quickly***.

License.dat File

The "License.dat" file is located in the Application Startup folder (eg C:\Program Files\Petroleum Solutions\PDPlot\)

The contents of this ASCII license file needs to contain the following license information.

[License Settings]
LicensedTO =
Company =
ProductID =
LicenseID =

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If any of the above License key information is incorrect or absent, or if the License.dat file is missing then the application will fail to startup.

.NET Framework

This application requires the presence or installation of Microsoft .Net Framework version 2.

.NET Framework version 2 is a component of the Microsoft Windows® operating system used to build and run Windows-based applications.

Should .NET Framework version 2 not be installed on the destination PC then a link is provided below to download this system software. The user should download and install .NET Framework version 2 before attempting to install this application.

http://www.petroleumsolutions.co.uk/downloads.html

The installation of .Net Framework also requires a minimum software and hardware requirement. Details of which are shown below. Specifically, note that you cannot install the .NET Framework on a computer running the Microsoft Windows 95 operating system.

Minimum requirements

To install .NET Framework [Dotnetfx2.exe], you must have one of the following operating systems, with Microsoft Internet Explorer 5.01 or later installed on your computer:

- Microsoft® Windows® 98
- Microsoft® Windows® 98 Second Edition
- Microsoft® Windows® Millennium Edition (Windows Me)
- Microsoft® Windows NT® 4 (Workstation or Server) with Service Pack 6a
- Microsoft® Windows® 2000 (Professional, Server, or Advanced Server) with the latest Windows service pack and critical updates available from the Microsoft Security Web site (www.microsoft.com/security).
- Microsoft® Windows® XP (Home or Professional)

Recommended hardware

	CPU Recommended	RAM Recommended
Client	Pentium 90 MHz or faster	96 MB or higher

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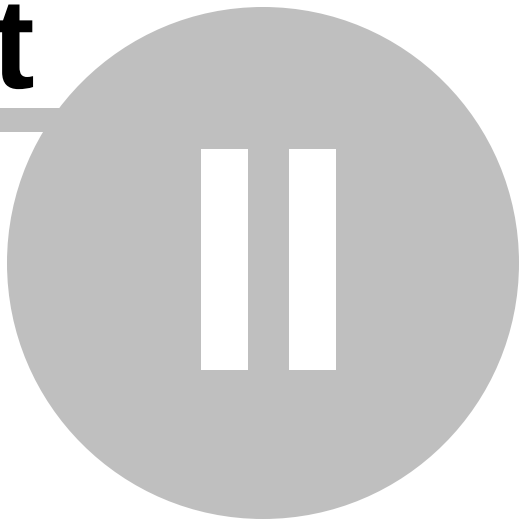
PDPlot

Pressure vs Depth Analysis

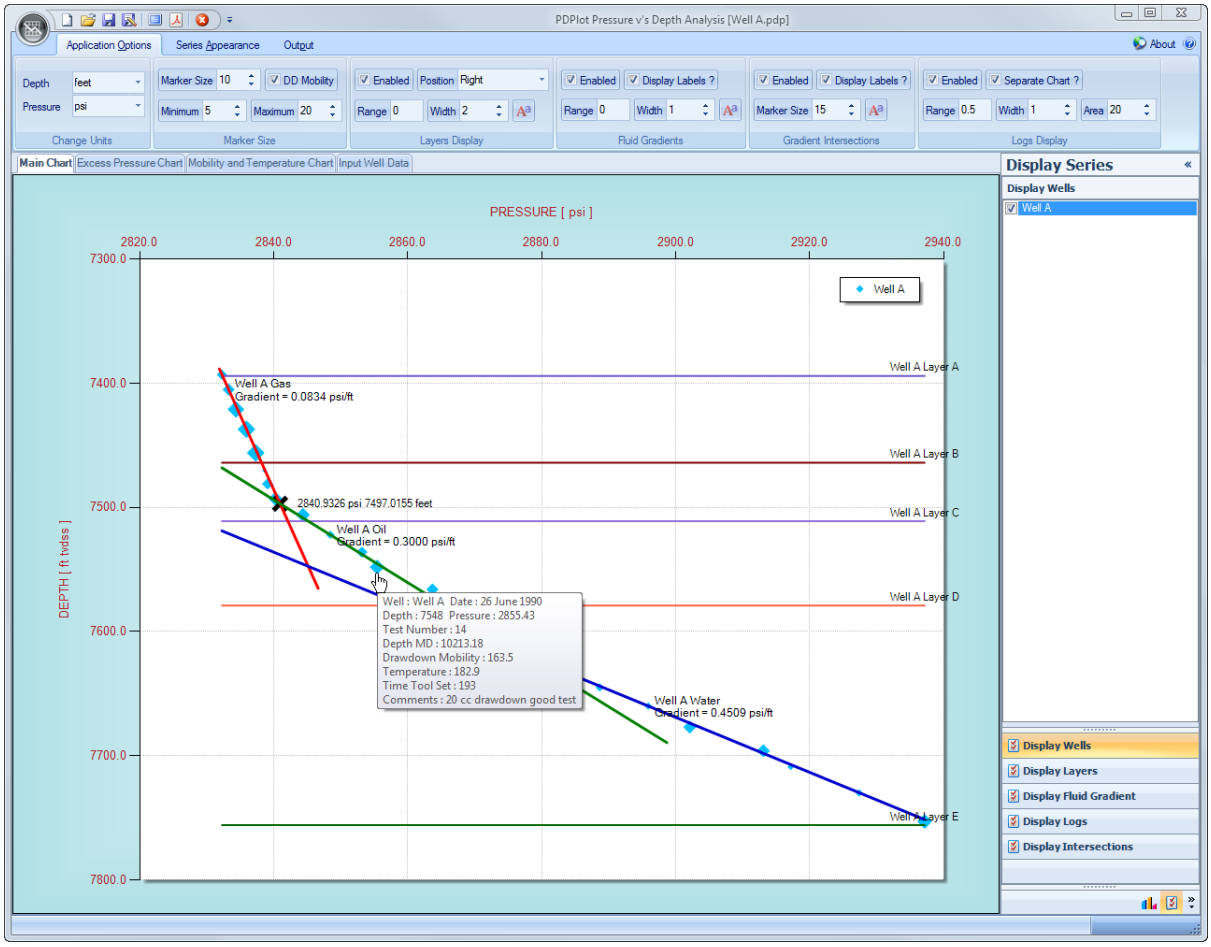
Part



2 Getting Started

The main application display is shown below.

All of the following help sections will lead you through how to get the most out of PDPlot, and hopefully demonstrate how you can save time, and achieve better pressure versus depth analyses, through the use of this very easy to use application.



2.1 Add Well

Before any well specific data can be input into PDPlot, the user must first add a well by pressing the "Add Well" button, located in the "Input Well Data" TAB.

To "Add Well" simply press the button as shown is the picture below.

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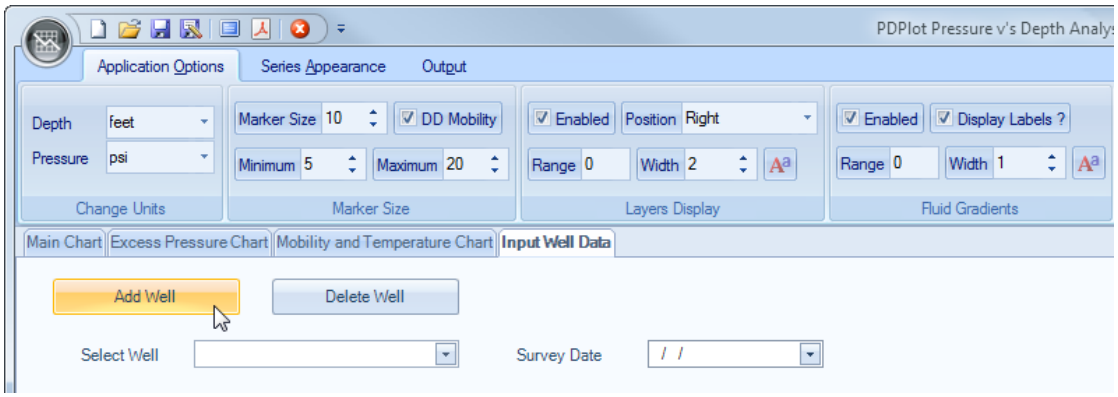
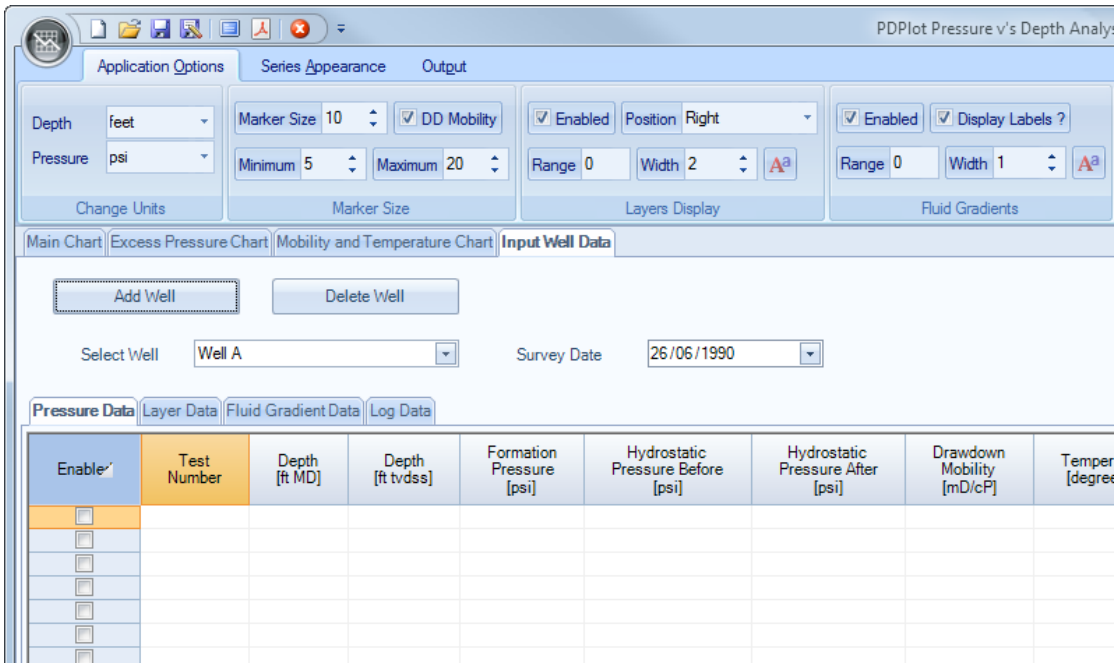


An input box will pop-up requesting a text name or description for the new well, followed by a further input box requesting the date that the pressure vs depth survey was taken.

Please use different names for well name or description, otherwise a warning message will be generated and the user will be asked to re-enter a unique well name.

Once the user has successfully input a well name, the remainder of the "Input Well Data" sub panels will become visible, allowing the user to input pressure, depth, layer, PVT, and display log data.



2.2 Input Depth and Pressure Data

The user can input data in a number of different ways :

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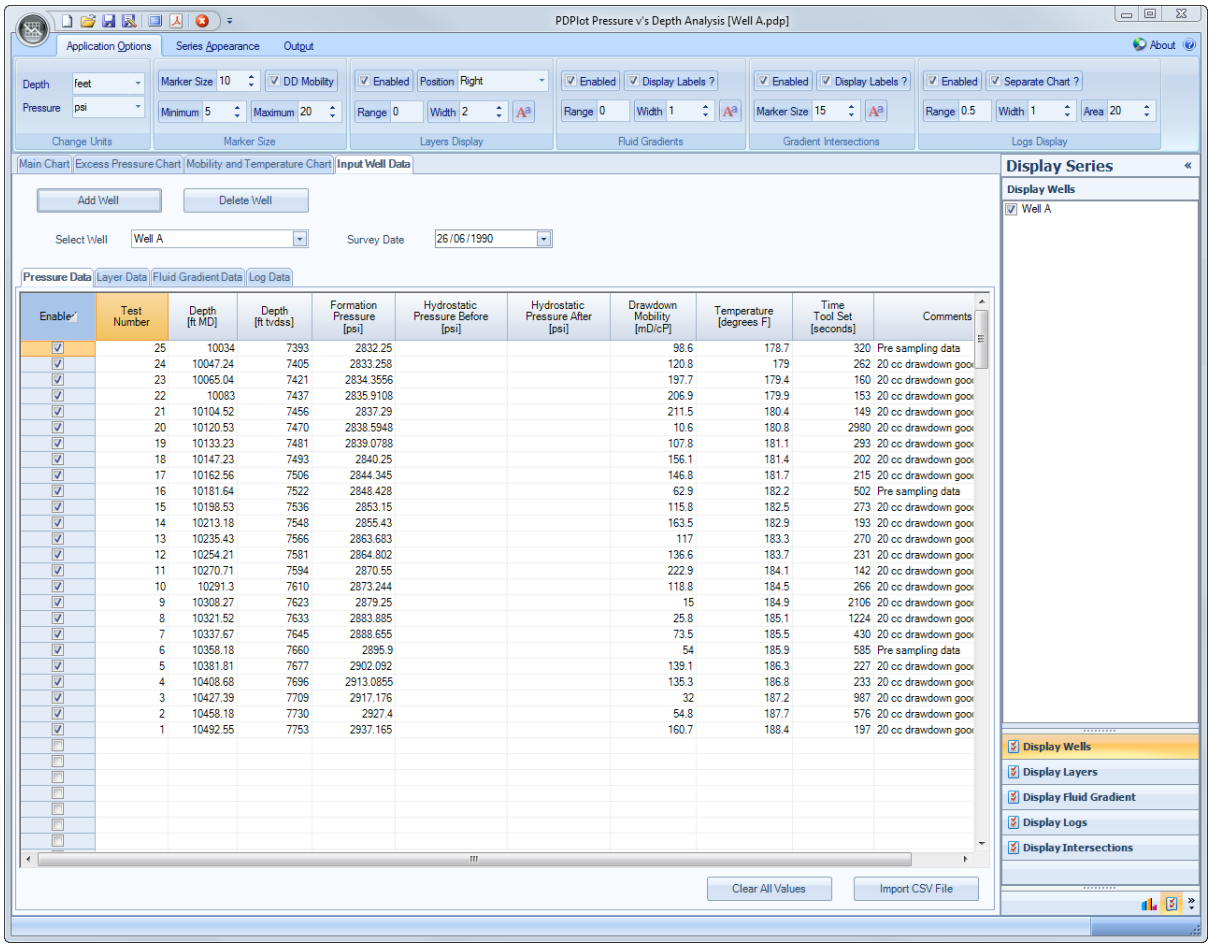

- Either manually input depth and pressure data [typing and TABBING from cell to cell],
- Copy [CTRL+C] data from an external application and paste [CTRL+V] blocks of any data into the Pressure Data input table,
- Drag and drop data from an external application, that supports drag and drop operations, such as Microsoft Excel,
- or, choose to import a table of pre-formatted data via the "Import CSV File" button located at the bottom of the "Pressure Data" sub panel. CSV files are comma delimited text files that can be edited via Microsoft packages such as Notepad or Excel.

Two different formats are accepted as CSV input :

1. Two Columns of data; ***Depth, Pressure***

2. Ten Columns of data, in the following order ;

- ***Test Number,*** is the pressure depth survey test number.
- ***Depth MD,*** is the measured depth value of the pressure survey
- ***Depth tvdss,*** is the true vertical depth value of the pressure survey
- ***Pressure,*** is the actual measured pressure value
- ***Hydrostatic Pressure Before Test,***
- ***Hydrostatic Pressure After Test,***
- ***Drawdown Mobility,*** is the calculated Drawdown Mobility from the individual pressure survey, Drawdown mobility represents the permeability of the formation divided by the viscosity of the

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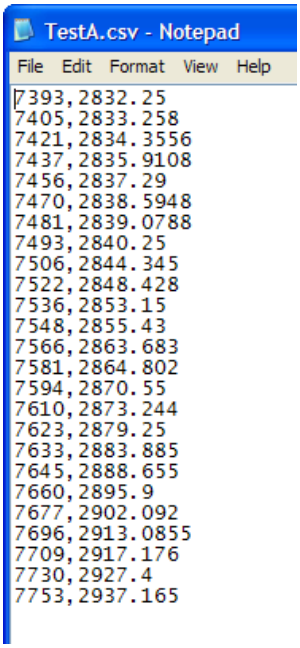
mobile fluid.

- ***Temperature,*** is the bottom hole temperature on station.
- ***Tool Time Set,*** is the time, in seconds, that the tool was on station determining the final stabilized pressure.
- ***Comments,*** can be any text string (although commas are not permitted, as commas are used to delimit strings in the ASCII file saving process) to describe or annotate that specific datapoint.

The *Test Number, Depth MD, Hydrostatic Pressure Before Test, Hydrostatic Pressure After Test, Drawdown Mobility, Temperature, Tool Time Set* and *Comments* are used to construct Mouse Chart Tips, in the main chart, in order to allow to user to better analyse good pressure points from suspect pressure points.

Examples of both of the above input CSV formats are shown below :



	A	B	C
1	7393	2832.25	
2	7405	2833.258	
3	7421	2834.356	
4	7437	2835.911	
5	7456	2837.29	
6	7470	2838.595	
7	7481	2839.079	
8	7493	2840.25	
9	7506	2844.345	
10	7522	2848.428	
11	7536	2853.15	
12	7548	2855.43	
13	7566	2863.683	
14	7581	2864.802	
15	7594	2870.55	
16	7610	2873.244	
17	7623	2879.25	
18	7633	2883.885	
19	7645	2888.655	
20	7660	2895.9	
21	7677	2902.092	
22	7696	2913.086	
23	7709	2917.176	
24	7730	2927.4	
25	7753	2937.165	
26			

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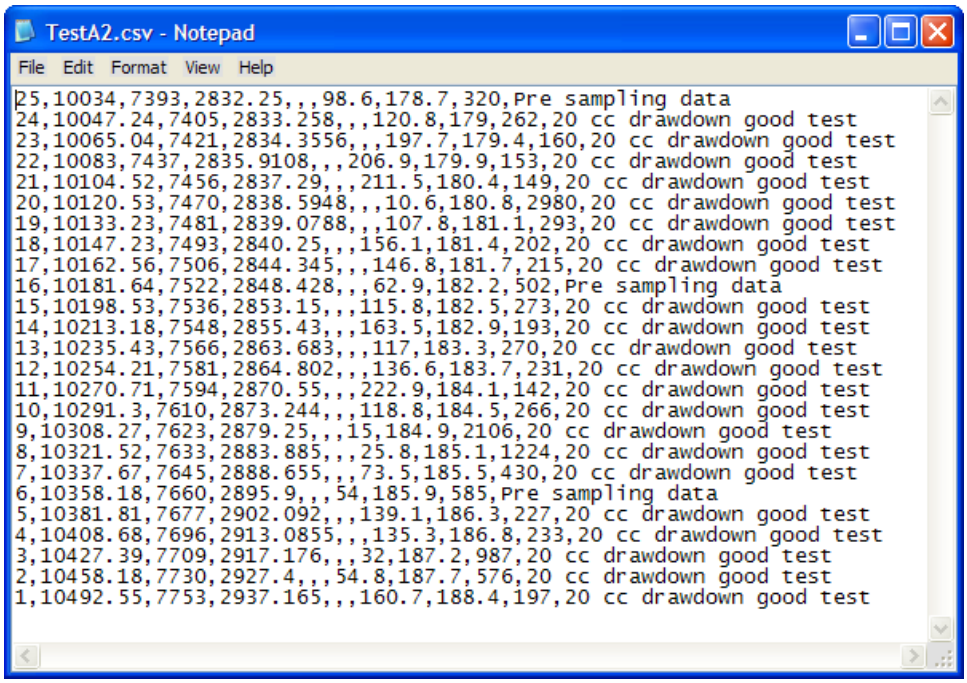

	A	B	C	D	E	F	G	H	I	J	K	L
1	25	10034	7393	2832.25			98.6	178.7	320	Pre sampling data		
2	24	10047.24	7405	2833.258			120.8	179	262	20 cc drawdown good test		
3	23	10065.04	7421	2834.356			197.7	179.4	160	20 cc drawdown good test		
4	22	10083	7437	2835.911			206.9	179.9	153	20 cc drawdown good test		
5	21	10104.52	7456	2837.29			211.5	180.4	149	20 cc drawdown good test		
6	20	10120.53	7470	2838.595			10.6	180.8	2980	20 cc drawdown good test		
7	19	10133.23	7481	2839.079			107.8	181.1	293	20 cc drawdown good test		
8	18	10147.23	7493	2840.25			156.1	181.4	202	20 cc drawdown good test		
9	17	10162.56	7506	2844.345			146.8	181.7	215	20 cc drawdown good test		
10	16	10181.64	7522	2848.428			62.9	182.2	502	Pre sampling data		
11	15	10198.53	7536	2853.15			115.8	182.5	273	20 cc drawdown good test		
12	14	10213.18	7548	2855.43			163.5	182.9	193	20 cc drawdown good test		
13	13	10235.43	7566	2863.683			117	183.3	270	20 cc drawdown good test		
14	12	10254.21	7581	2864.802			136.6	183.7	231	20 cc drawdown good test		
15	11	10270.71	7594	2870.55			222.9	184.1	142	20 cc drawdown good test		
16	10	10291.3	7610	2873.244			118.8	184.5	266	20 cc drawdown good test		
17	9	10308.27	7623	2879.25			15	184.9	2106	20 cc drawdown good test		
18	8	10321.52	7633	2883.885			25.8	185.1	1224	20 cc drawdown good test		

Once the user has successfully input depth and pressure data, this data will be shown on the Main Chart.

2.3 Input Fluid Gradient Data

Fluid Gradient Data can be entered into the Main Display Chart via two different methods. The First Method explicitly calculates fluid density with the knowledge of other fluid properties. The Second Method is simple linear regression through selected chart data points.

Fluid gradients and PVT input have been deliberately left entirely in Oilfield imperial units; ie. "psi/ft", since it is very common industry practice to quote fluid density values in this manner. For example gas gradient of 0.08 psi/ft, oil gradient of 0.3 psi/ft and water gradient of 0.45 psi/ft.

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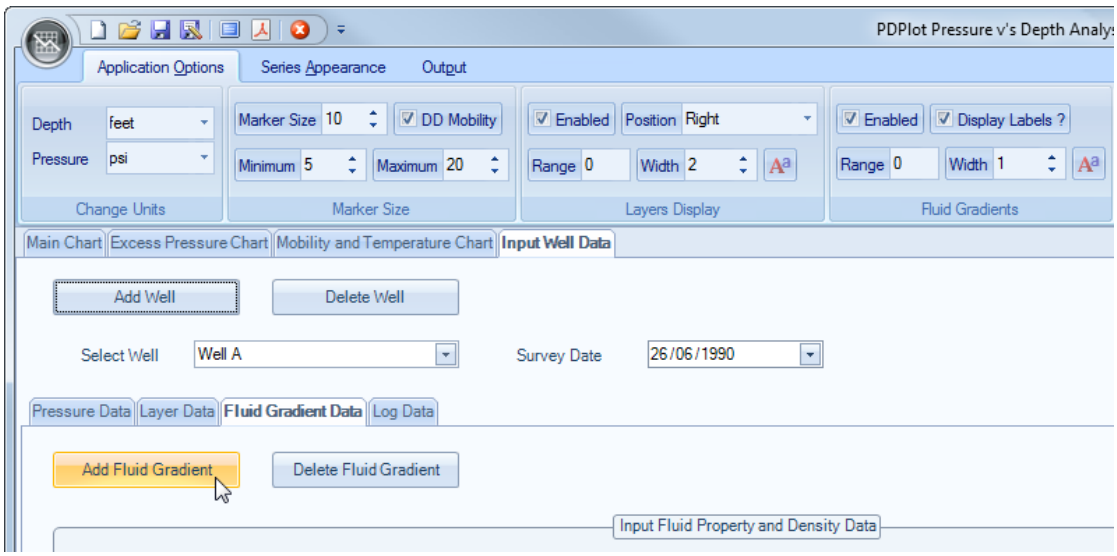
To explicitly calculate fluid density, the user must first press the "Add Fluid Gradient" button, as shown below.



A confirmation box will pop-up in order to confirm that the fluid gradient will be associated with the currently selected well. To confirm press the "Yes" button, otherwise select the "No" button then select the Well required to add a fluid gradient to via the Well Name drop-down box, located under the Main "Add Well" and "Delete Well" buttons, then repeat the process.

A further input box will pop-up asking the user to input a name or description for the Fluid Gradient. This input box will automatically have the well name populated in the input box, but the user can delete/ modify/add any text they wish to best describe the Fluid Gradient.

Once the user has successfully input a description the remainder of the Fluid Gradient Data sub-panel will become visible.

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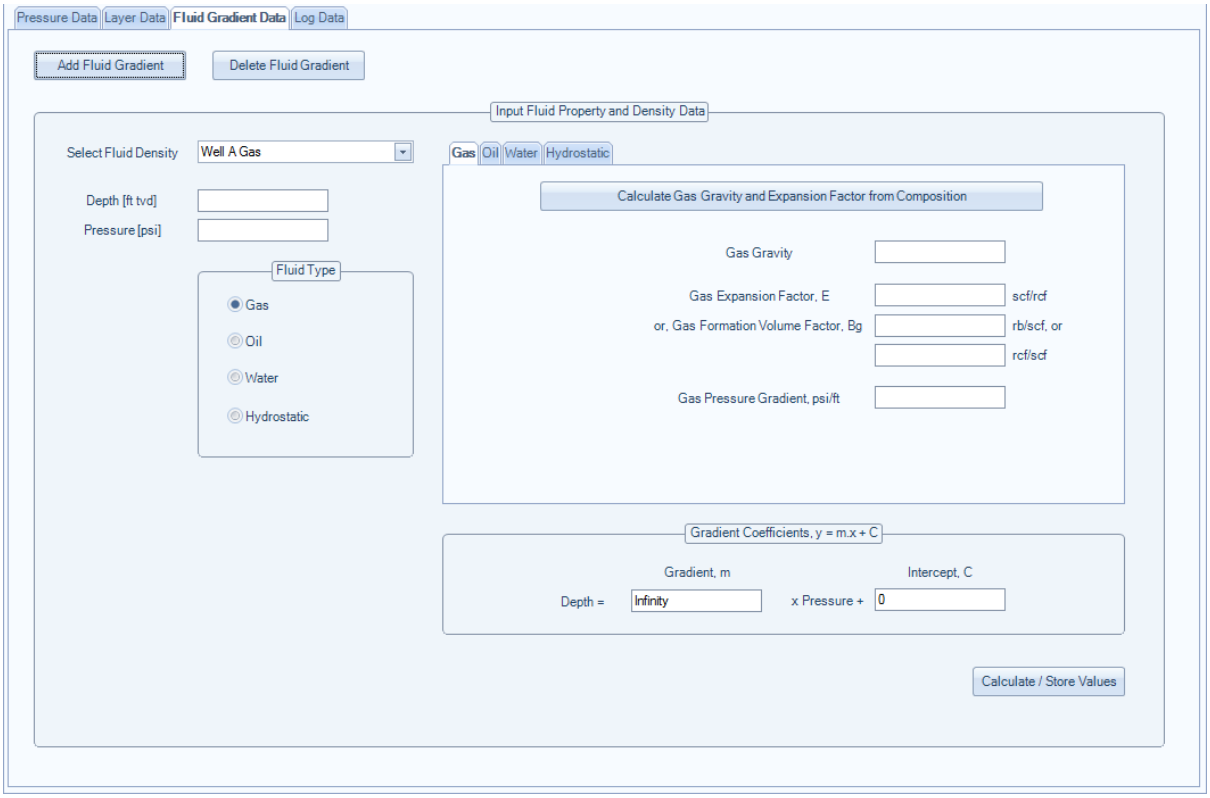

The user can then toggle between the Fluid Type radio buttons, which will automatically toggle the Fluid Type sub-panels to match the Fluid Type selection.

A Depth and Pressure data point must be entered into this Input PVT data Panel, since it determines where to anchor the pressure gradient.

The user can either choose to :

- Calculate the relevant fluid pressure gradient with a knowledge of the other PVT parameters
- Simply type in a value in the relevant Pressure Gradient input textbox

The above applies in all the Gas, Oil and Water input sections.

The pressure range that the pressure gradient is displayed is automatically chosen as the complete range of the individual well pressure Vs depth points. To modify this display gradient simply choose the "Stretch/Shrink PVT Gradients" menu item on the Main Chart Context Menu [accessed by right mouse click on the Main Chart Display]. See Stretch/Shrink PVT Gradients for more information.

2.3.1 Gas Example

For example, assuming the fluid gradient in the above example is gas, but the user does not know the gas gravity or expansion factor or gas pressure gradient, but does know the gas composition and reservoir temperature. Select the "Calculate Gas Gravity and Expansion Factor from Composition" and another input form will pop-up requesting the composition and reservoir temperature. See below.

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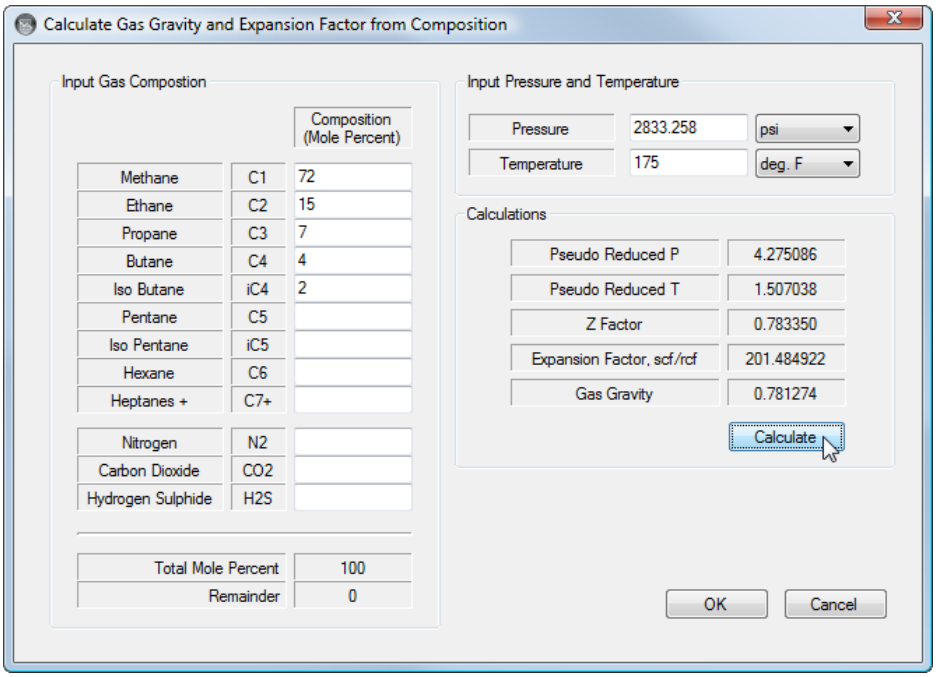
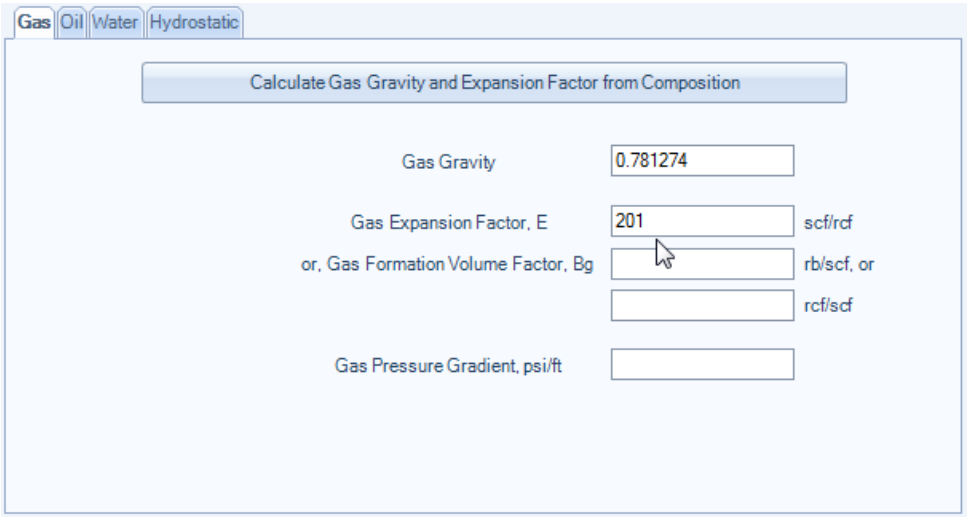


Once the input composition and reservoir temperature are input [Pressure was copied from the main input panel previously, assuming a value was entered], the user should press the "Calculate" button. This will calculate the relevant Z factor, Expansion Factor and Gas Gravity. Once this calculation has been performed the user can press the "OK" button to return these values to the Main application or the "Cancel" button to return to the main application without the calculated values.

Once these values are returned by the user pressing the "OK" button, the application calculates the Gas pressure gradient with a knowledge of Gas gravity and Expansion factor.

A simpler approach to the above can be achieved if the user knows the Gas gravity and Expansion factor. If this is the case then simply TAB down or mouse select the Gas Gravity input textbox and type in the value, then TAB across or mouse select the Gas Expansion Factor input textbox.



Once these two values have been input the user can press the "Calculate/Store" button, and the Gas

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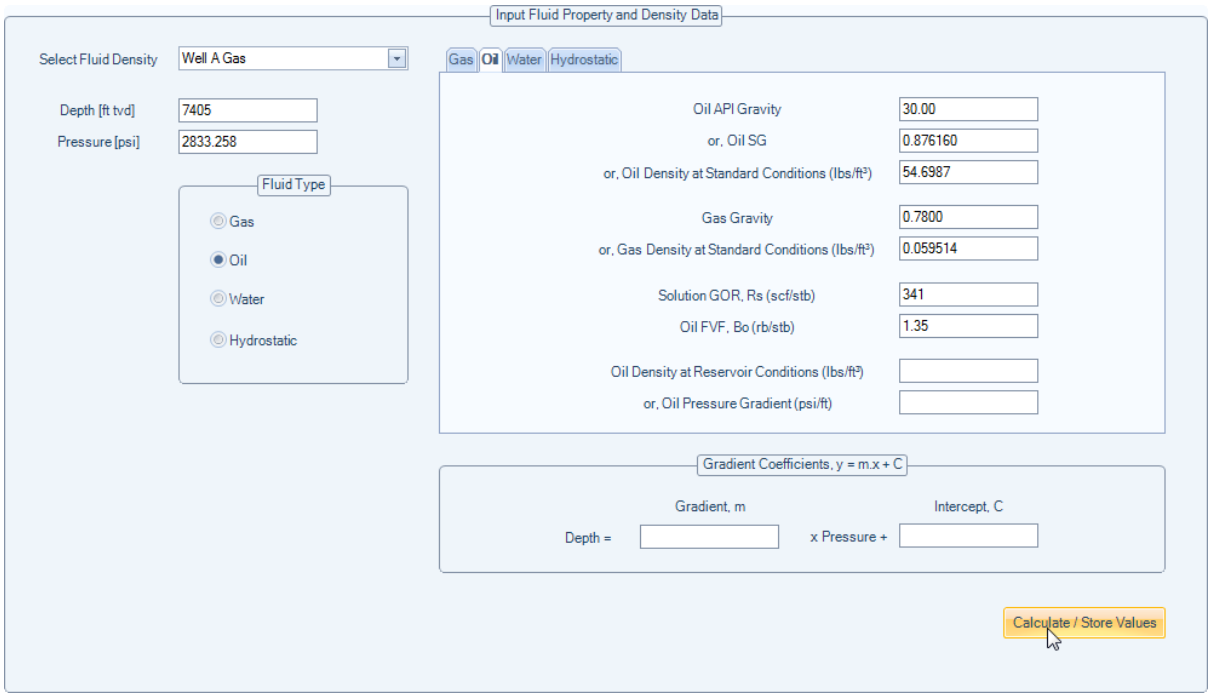
Pressure gradient will be calculated and displayed in the Main display chart.

Assuming any two of the three variables are input the "Calculate/Store" button calculates for the unknown variable.

2.3.2 Oil Example

The oil pressure gradient is calculated in a similar fashion. An example is provided below :



Assuming the user knows Oil API gravity, gas gravity, Solution GOR and Oil Formation Volume Factor and their values are typed into the relevant input textboxes, the user can press the "Calculate/Store" button and the Oil Pressure gradient will be calculated and displayed in the Main display chart.

Back-calculation also works here with the "Calculate/Store" button, ie. Assuming any four of the five variables are input into the relevant input textboxes, the "Calculate/Store" button will calculate the unknown variable.

2.3.3 Water Example

Again, the water pressure gradient is calculated in a similar fashion to Gas and Oil examples.

An example is provided below :

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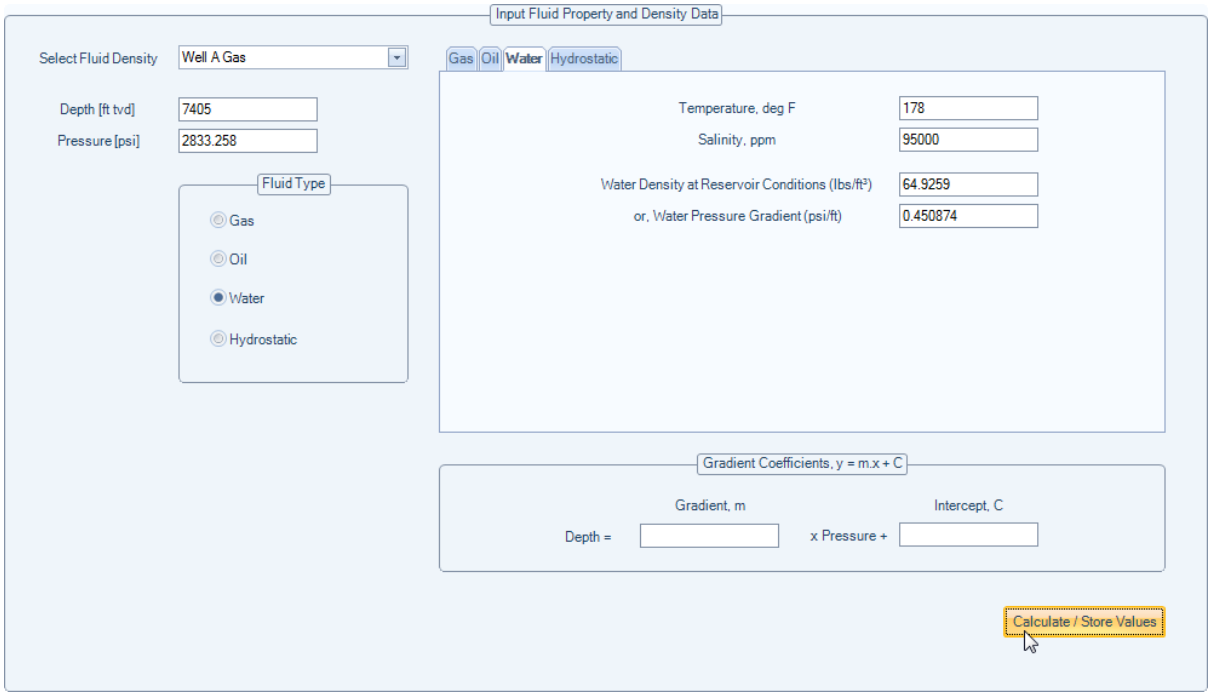

Assuming the user knows Reservoir Temperature and Aquifer Water Salinity and their values are typed into the relevant input textboxes, the user can press the "Calculate/Store" button and the Water Pressure gradient will be calculated and displayed in the Main display chart.

Water salinity should be in the range of 0 to 300,000 ppm [fully saturated]. If the input value of salinity exceeds 300,000ppm a warning message will be displayed.

Back-calculation does not apply in this section.

2.4 Input Layer Data

The intention with Layer Data is to display layer depth values on the Main Display Chart alongside the Depth v's Pressure data. Layer depth data is associated with a specific Well, but the Layer Name is intended to be common to all Wells within a project.

To add a Layer Name simply press the "Add Layer" button located on the "Layer Data" sub panel, as shown below.

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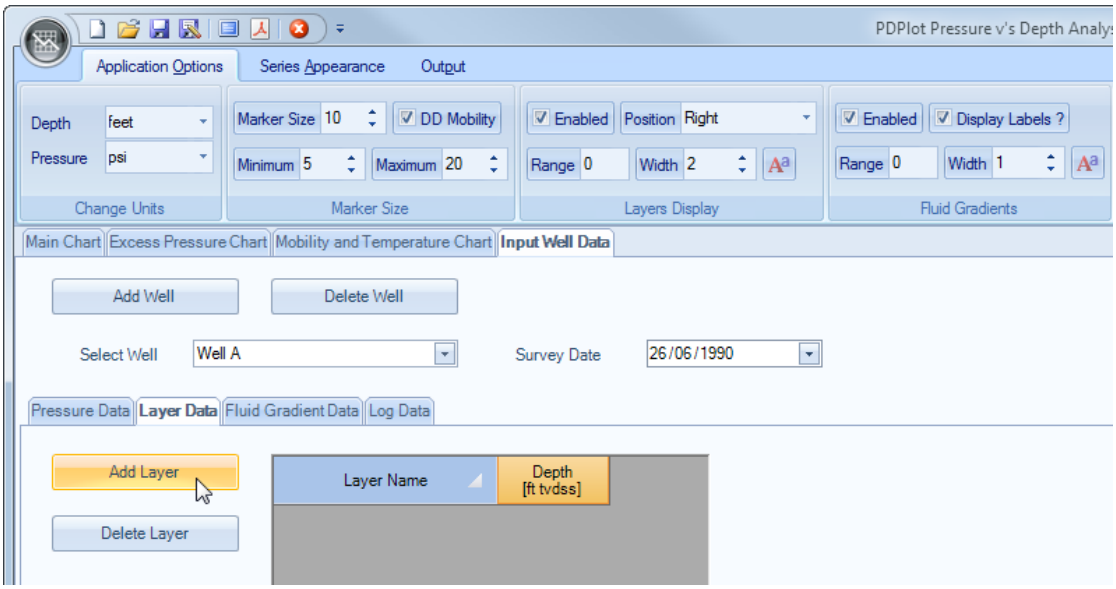
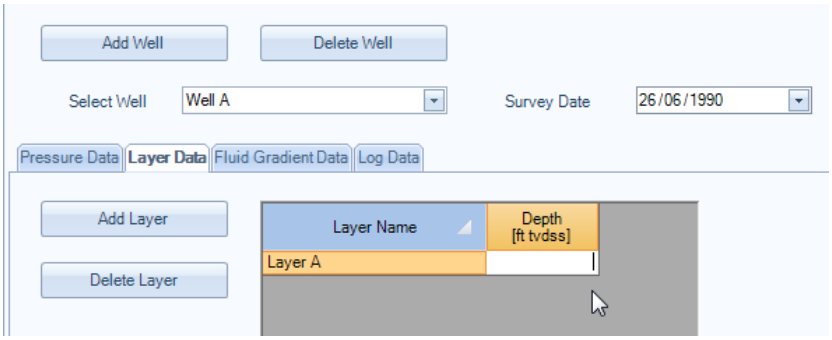


Once the user presses the "Add Layer" button, an input box will pop-up requesting a name or description for the layer name. Once the user has successfully input a Layer name, the name is added to list of layers on the Layer Data sub-panel, as shown below.



The user can then input data in a number of different ways :

- Either manually manually type depth values into the input text box adjacent to the Layer Name,
- Copy [CTRL+C] data from an external application and paste [CTRL+V] blocks of data into the Layer Data input table,
- Drag and drop data from an external application, that supports drag and drop operations, such as Microsoft Excel,
- or, if there are multiple layer names then the user can import a single column CSV file with associated depth values. The order of the depth values within the CSV file should correspond to the order of the Layer Names in the Layer Data sub-panel. Examples are shown below.

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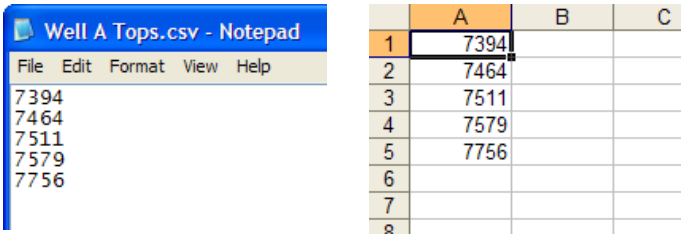

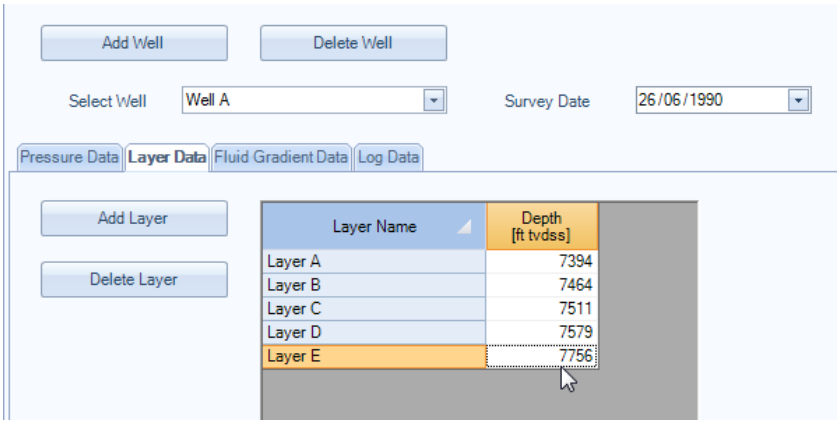

2.5 Input Log Data

Log data is treated in a similar fashion to Layer Data.

The intention is simply to display a log alongside the pressure vs depth data. The log type and values can represent any log, but the intent is to allow the user to better interpret layer pressure breaks to better aid individual layer correlation, as well as water saturation type logs for better determination of transition zones, oil water contacts and free water levels. Therefore recommendations for input logs would be gamma ray, vshale, resistivity, calculated Sw, etc.

Once individual logs have been successfully input they can be toggled on/off the Main display chart by toggling the selection in the Display Logs Toggle box.

To input a Log, the user must first add a Log, by pressing the "Add Log" button, as shown below.

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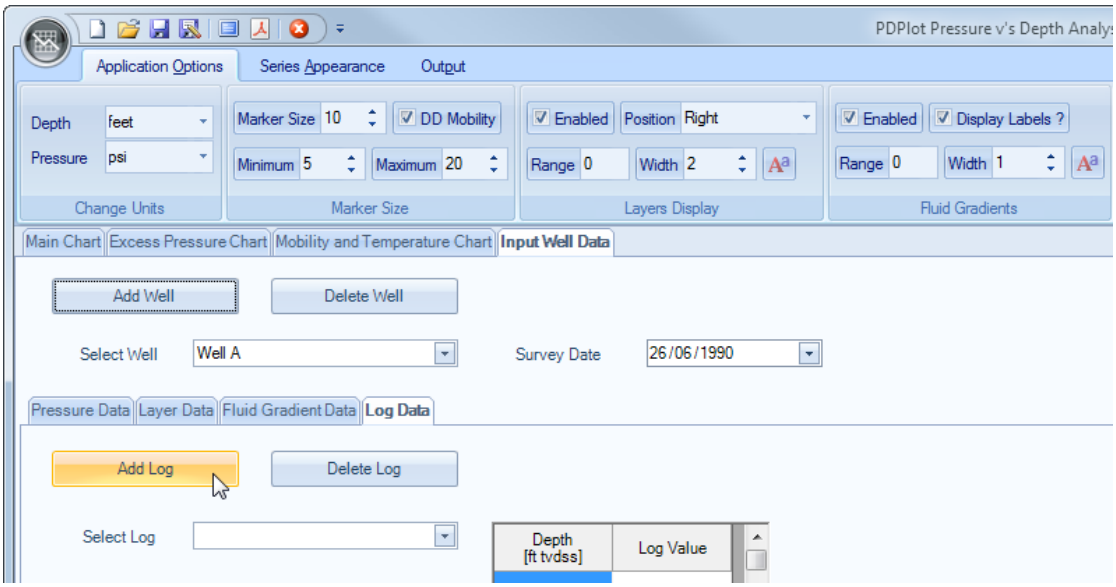

A confirmation box will pop-up in order to confirm that the fluid gradient will be associated with the currently selected well. To confirm press the "Yes" button, otherwise select the "No" button then select the Well required to add a log to via the Well Name drop-down box, located under the Main "Add Well" and "Delete Well" buttons, then repeat the process.

A further input box will pop-up asking the user to input a name or description for the well Log. This input box will automatically have the well name populated in the input box, but the user can delete/modify/add any text they wish to best describe the well Log.

Once the user has successfully input a description the remainder of the input Log data sub- panel will become visible, as shown below.

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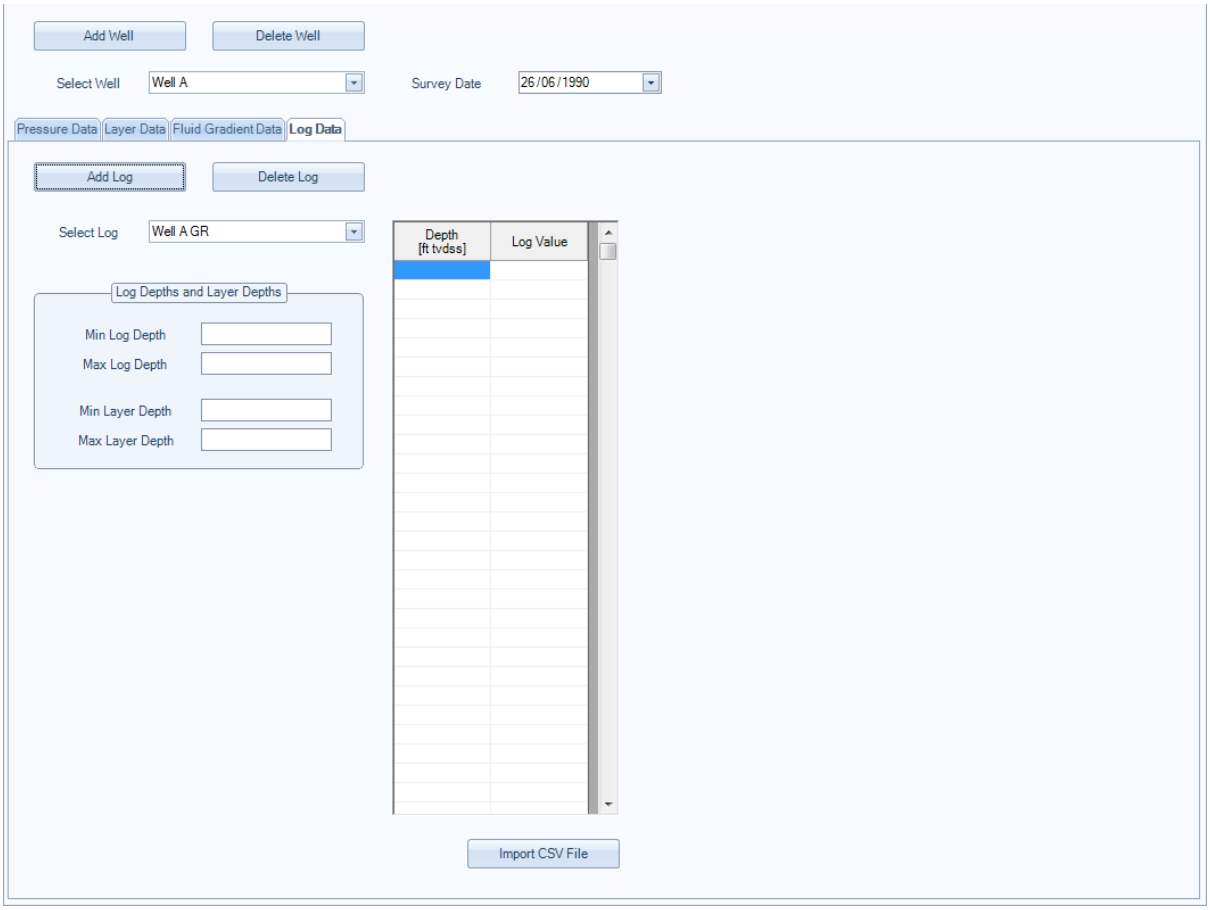

Again, the user can input data in a number of different ways :

- Either manually input depth and pressure data [typing and TABBING from cell to cell],
- Copy [CTRL+C] data from an external application and paste [CTRL+V] blocks of any data into the Log Data input table,
- Drag and drop data from an external application, that supports drag and drop operations, such as Microsoft Excel,
- or, perhaps best input via the Import CSV File button, as shown above. This will import a two column width CSV or ASCII txt file, examples are included below.

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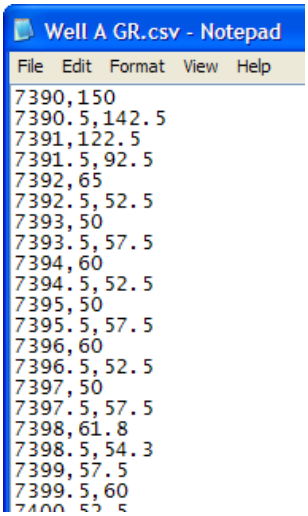
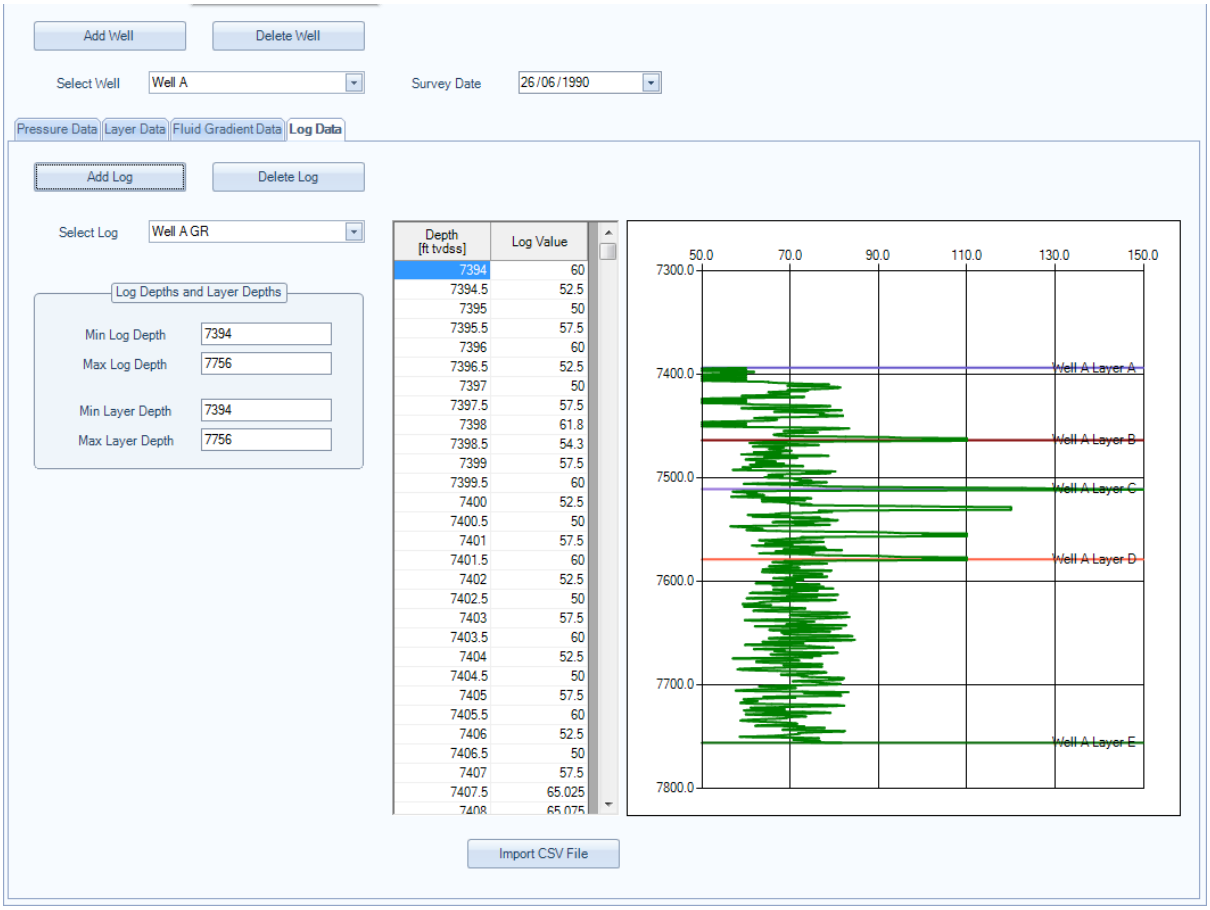


	A	B	C	D
1	7390	150		
2	7390.5	142.5		
3	7391	122.5		
4	7391.5	92.5		
5	7392	65		
6	7392.5	52.5		
7	7393	50		
8	7393.5	57.5		
9	7394	60		
10	7394.5	52.5		
11	7395	50		
12	7395.5	57.5		
13	7396	60		
14	7396.5	52.5		
15	7397	50		

Once the user presses the "Import CSV File" button and selects an appropriate file, a pop-up dialog box will ask the user if they want to clip the input log data to the minimum and maximum layer depth values associated with the selected well. Select the "Yes" button to clip the Import CSV data, otherwise select the "No" button to have the entire log displayed.

The resultant input Log display should look like the example below :



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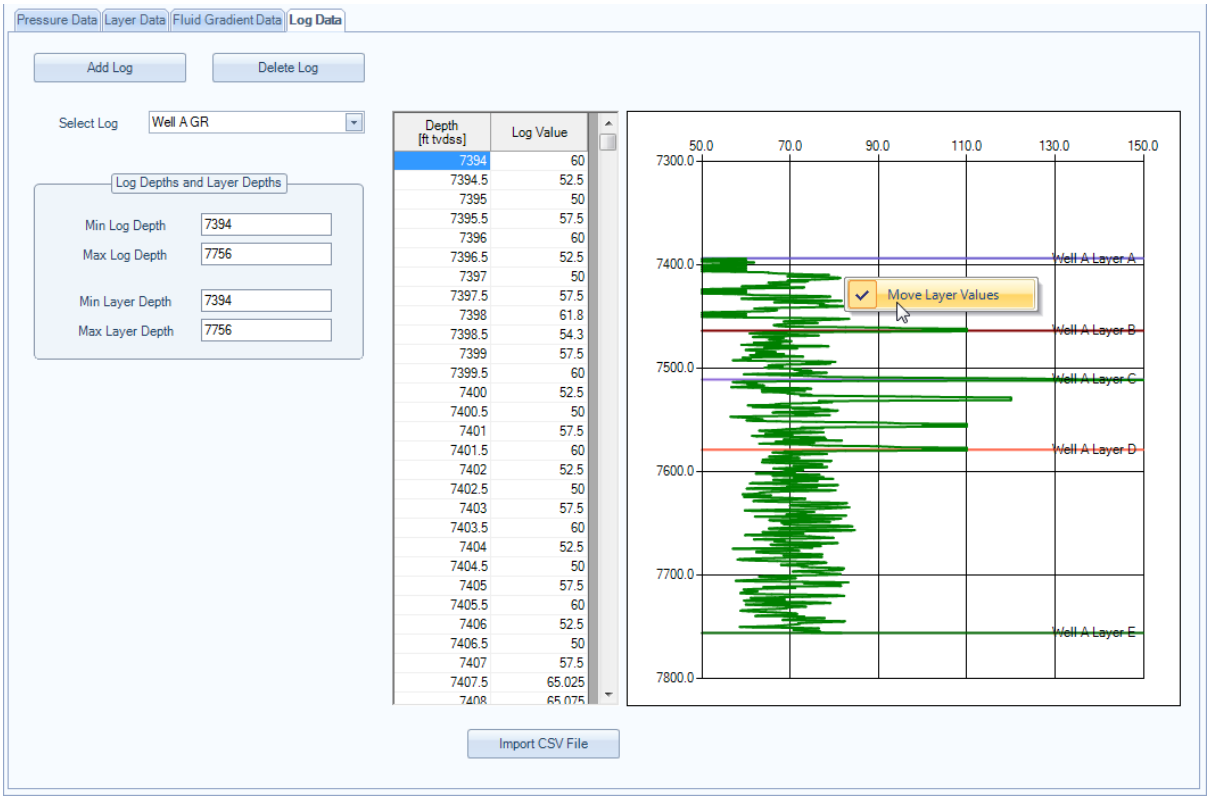
In the Main Display Chart, the Log Values are scaled between the Minimum and Maximum Pressure values of the selected well, via a scaling parameter that can be varied by selecting the Main Menu item "Options", then "Chart Display", then "Logs X Range Tolerance". The user can input a value from 0 to 1 to scale between the Minimum and Maximum Pressure values.

The user can also zoom in/out in the log display, and by a right mouse click in the Log Display Chart select the "Move layer Values" menu item. Once this menu item is checked, the user can left mouse click and drag the layer to the desired depth. Once this process is complete un-check the "Move layer Values" menu item to toggle off the modification of Layer Values.



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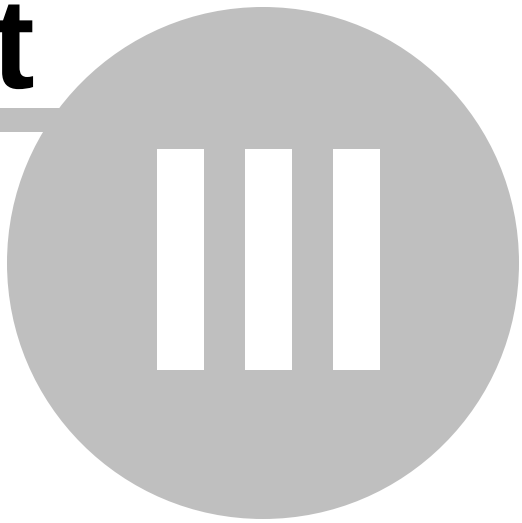
PDPlot

Pressure vs Depth Analysis

Part

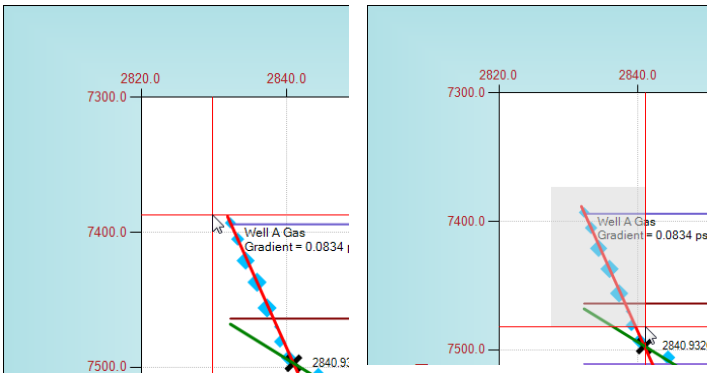


3 Main Chart Operations

3.1 Zooming / Unzooming

Zooming and unzooming within the main chart area couldn't be easier !

Simply single click the left mouse button and hold down and drag a highlighted rectangle. See the following pictures below that demonstrate zooming into a specific area.



To unzoom simply single (left mouse button) click in the top left hand corner Reset Button, as highlighted with the Cursor in the picture below.

The user can also scroll horizontally and vertically using the scroll bar arrows and bars located within the horizontal and vertical scrollbar tracks.

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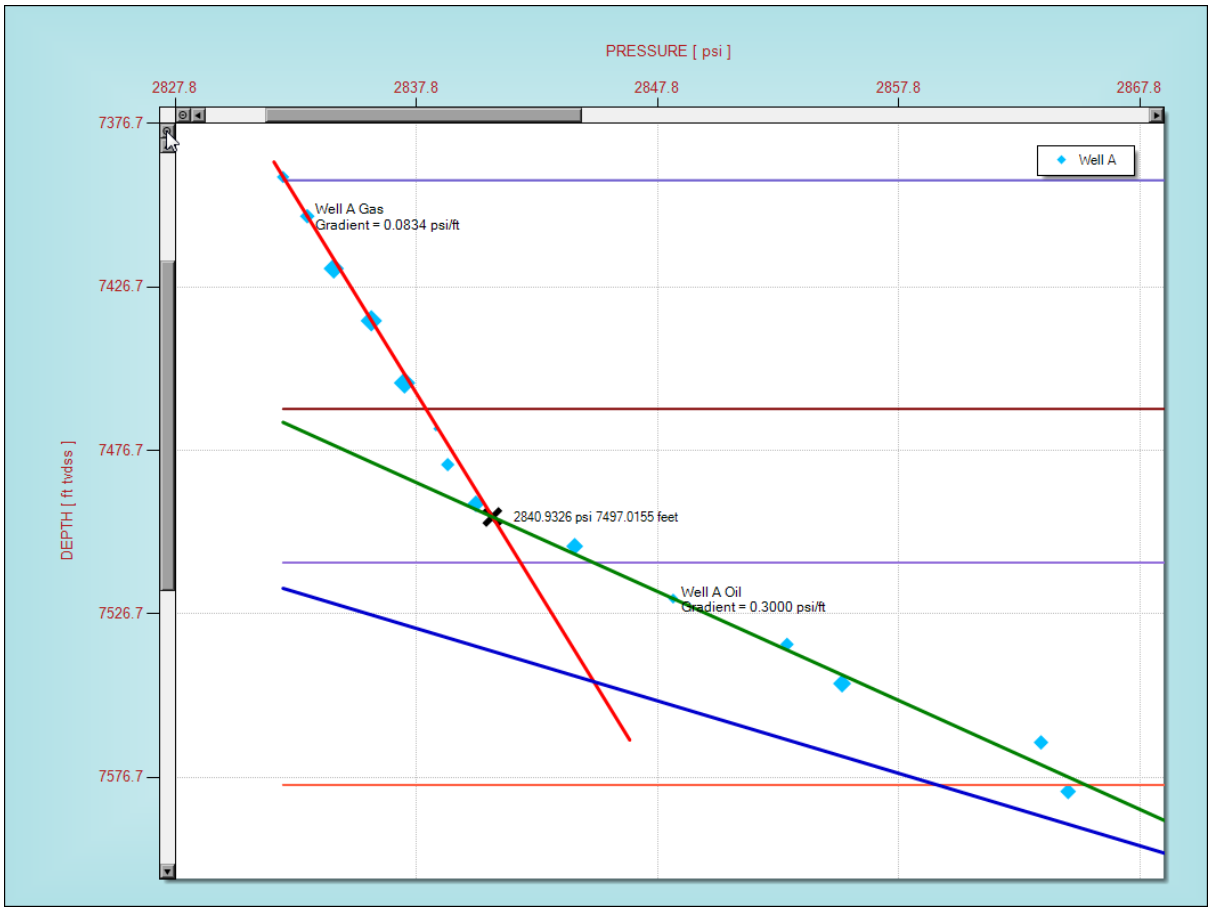

3.2 Chart Tooltips

Chart tooltips are created automatically and their content depends on the amount of data the user enters. The more data entered, the more data is added as tooltips to aid the user interpret and display representative fluid pressure gradients.

To display tooltips simply hold the cursor over a datapoint, fluid gradient, layer or log display.

Examples are provided below of tooltips.

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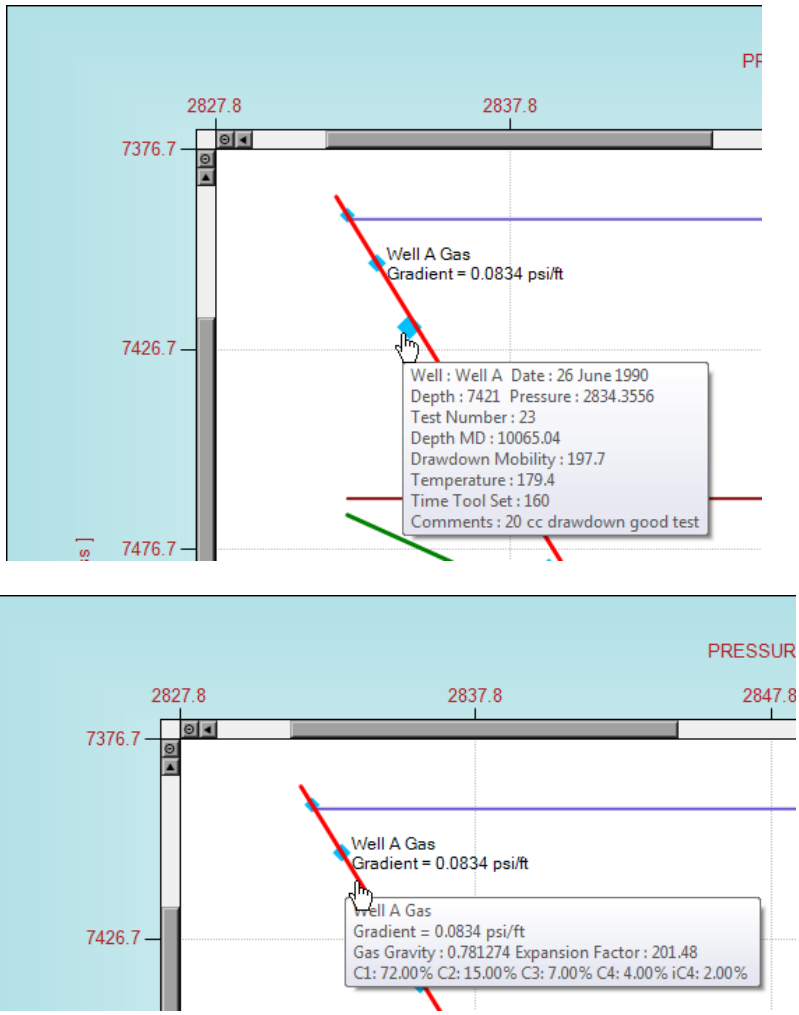

3.3 Fit Linear Gradient

As well as entering fluid gradient data via the Input Fluid Gradient Data, which calculates fluid density with the knowledge of other fluid properties, the user can simply add a fluid pressure gradient via the Fit Linear Gradient menu, accessed by a single right click on the main chart area, see below.

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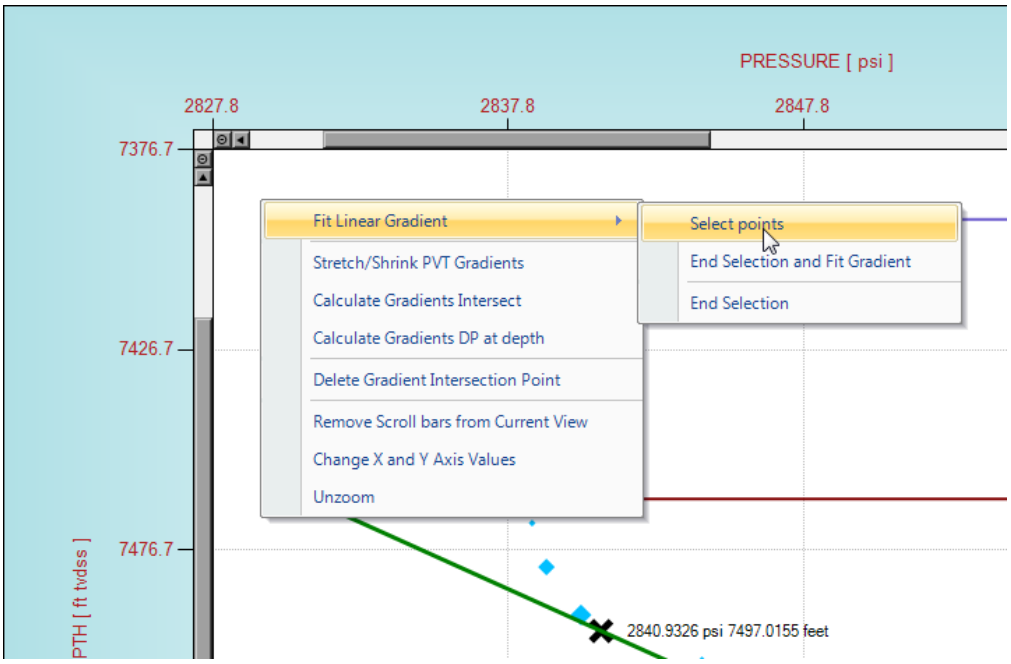
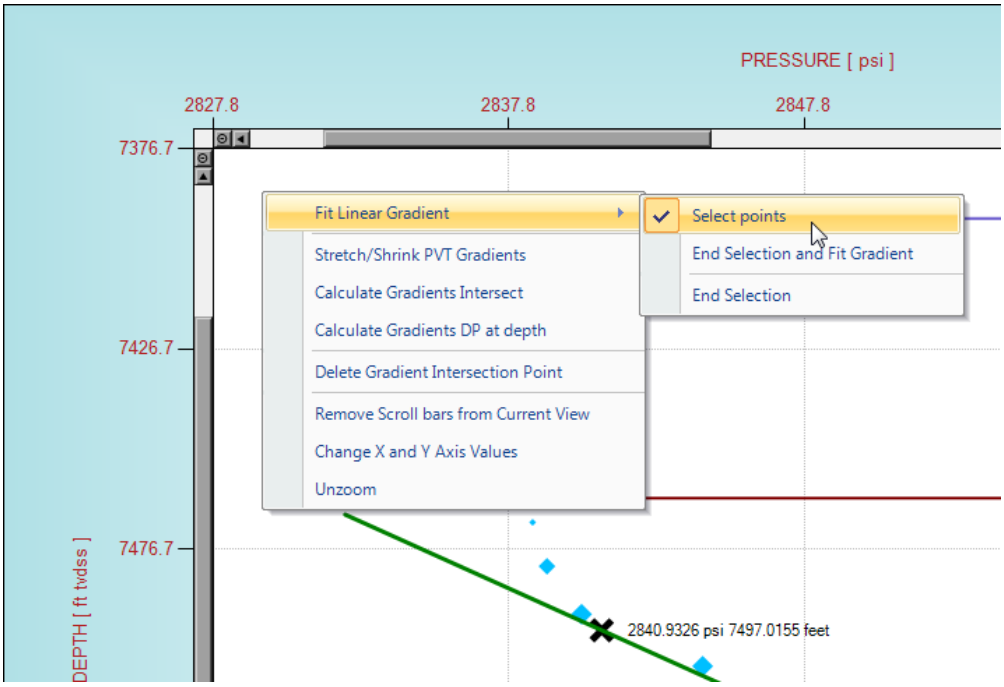


To select individual points to be regressed select the ***Select Points*** menu option, to toggle on, to the right of the ***Fit Linear Gradient*** menu item.

Once this ***Select Points*** menu option is toggled on [check mark against ***Select Points*** menu option], see below, simply select points by single right mouse clicking on specific datapoints.



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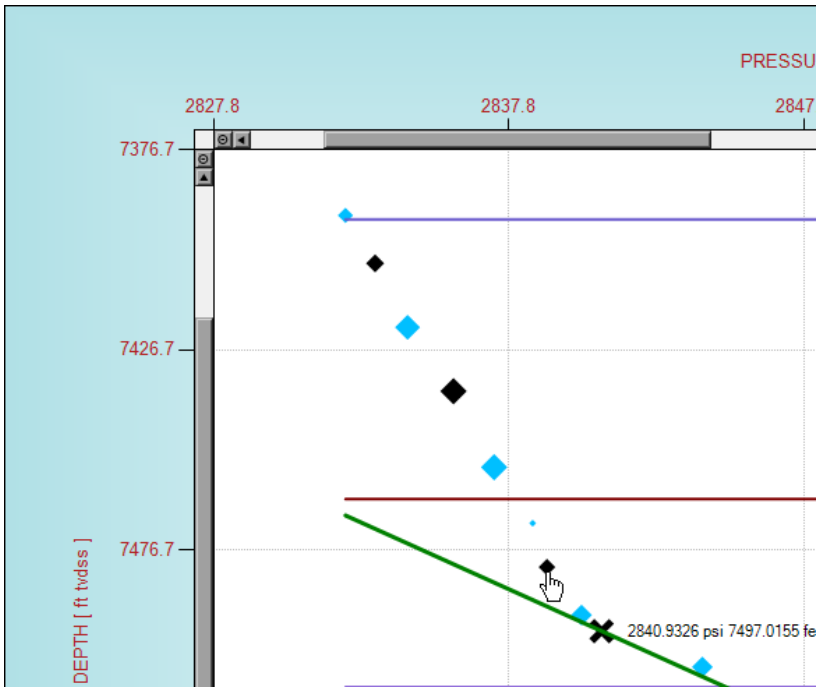
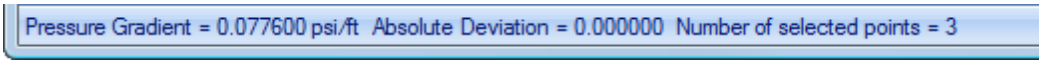


To remove specific datapoints from selection simply re-click the same point. As points are added to the selection their color turns to black to highlighted they are selected and the pressure gradient, absolute deviation and number of selected points are shown in the status bars panels at the base of the application. Absolute deviation is the mean absolute deviation (in terms of y) of the points from the fitted line.



Once the user is happy with the number and selection of data points for linear regression, they can either select the ***End Selection*** menu item to clear the selection and NOT add a linear fluid gradient, or select the ***End Selection and Fit Gradient*** menu item to add a linear fluid gradient through the selected points. See picture below.

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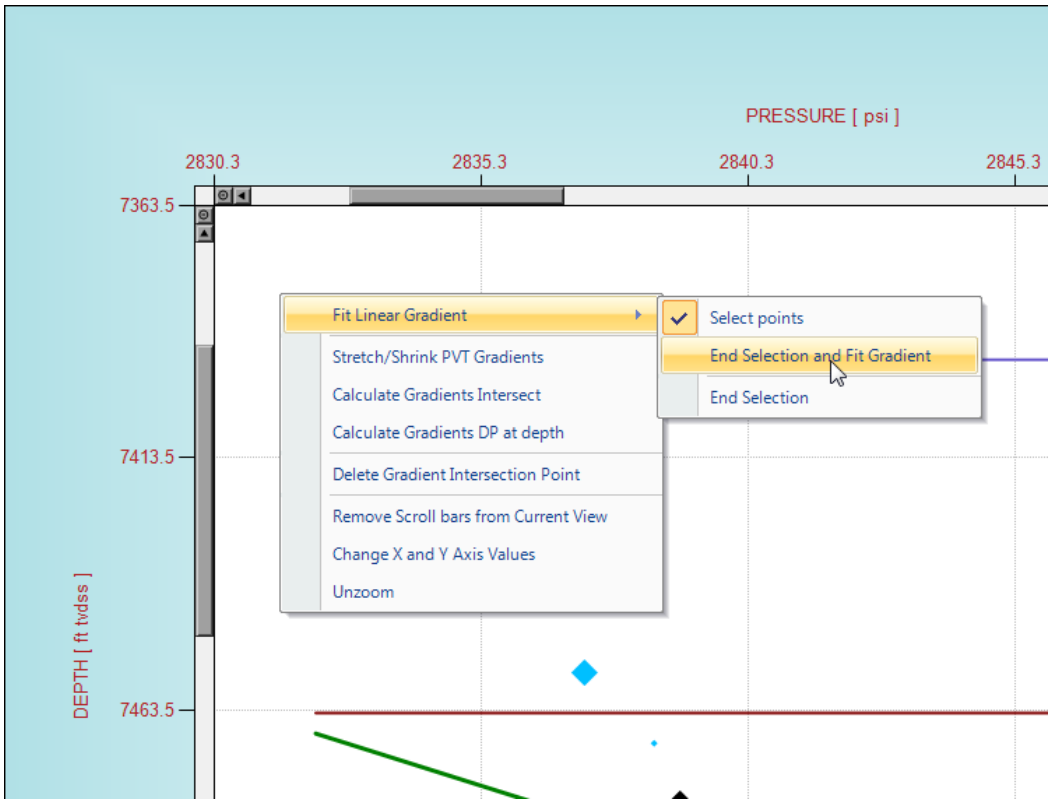
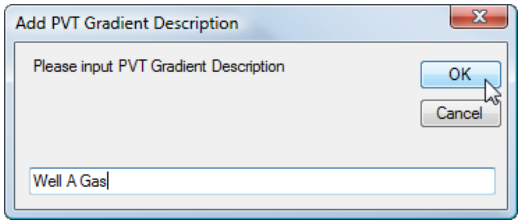


Assuming the user clicked the ***End Selection and Fit Gradient*** menu item, the user will be prompted to enter a PVT gradient description to identify the specific fluid gradient. The input textbox will automatically contain the wellname that the selected datapoints were associated to. The user can change/modify any text to best describe that specific fluid gradient, but please attempt to use a unique description, since identical descriptions can cause confusion for the application.

Once the description has been input correctly, the user will be prompted with another input dialog box to identify the type of fluid. The application will attempt to identify the fluid type depending on the fluid gradient value, but the user can change this fluid type by selecting the appropriate radio button. See pictures below.



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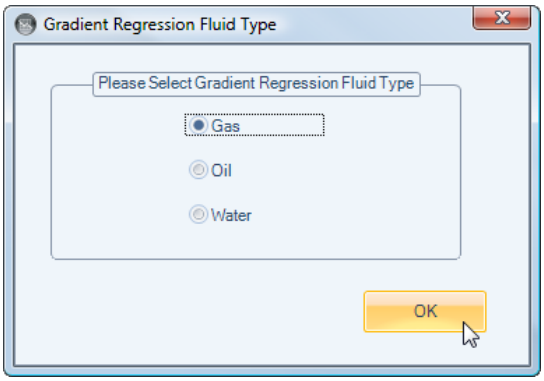
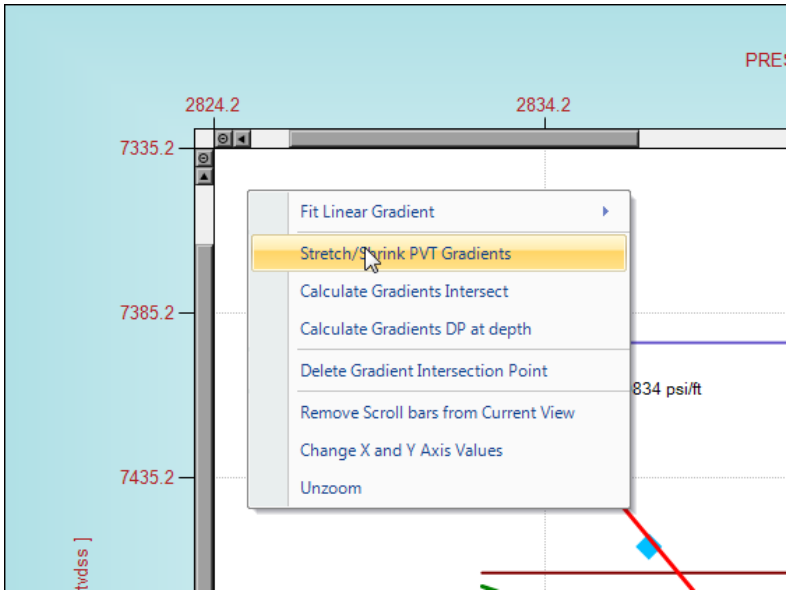


Once the user has successfully completed the above, a fluid gradient is added to the main chart display and the ***Display Fluid Gradient*** checked listbox, located at the right hand side edge of the application.

3.4 Stretch/Shrink PVT Gradients

The user can stretch or shrink the fluid gradient by selecting [to toggle on] the ***Stretch/Shrink PVT Gradients*** menu option is [check mark against ***Stretch/Shrink PVT Gradients*** menu option], accessed by a single right click on the main chart area. See below.



Once the Stretch/Shrink PVT Gradients menu option is toggled on, the user can left-hand mouse click and drag the extremes of the fluid gradient. The cursor will change to a NW-SE arrows to indicate the user can drag the fluid gradient to the required location.

Once the user is happy with the position of all the fluid gradients, select the Stretch/Shrink PVT Gradients menu option again to toggle off this option. The check mark should disappear against Stretch/ Shrink PVT Gradients menu option.

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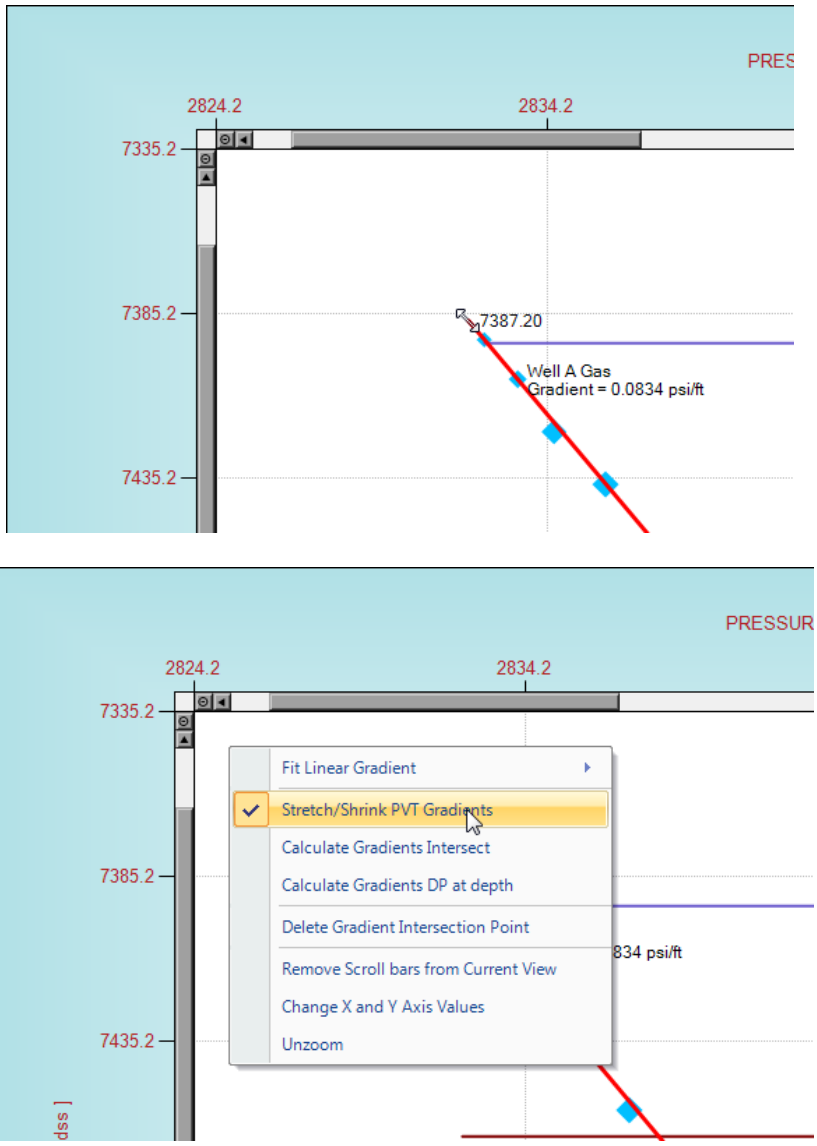

3.5 Calculate Gradients Intersect

Assuming the user has input 2 non-parallel fluid gradients, the user can select the Calculate Gradients Intersect menu item, accessed by a single right click on the main chart area. See below.

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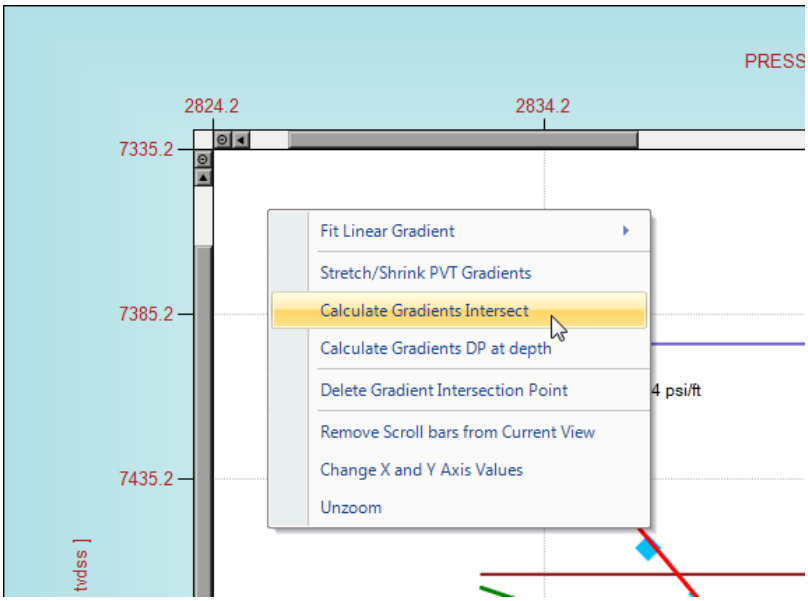
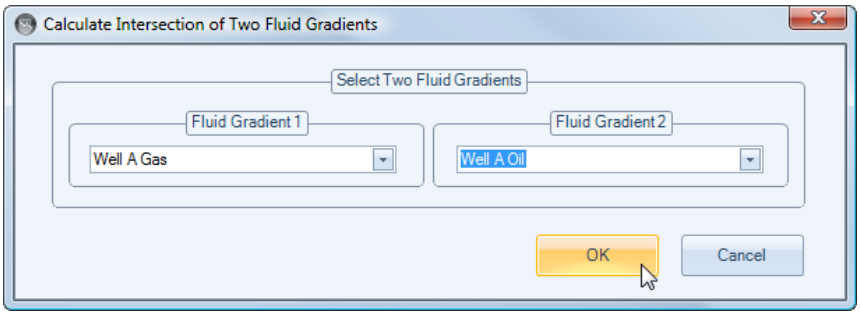
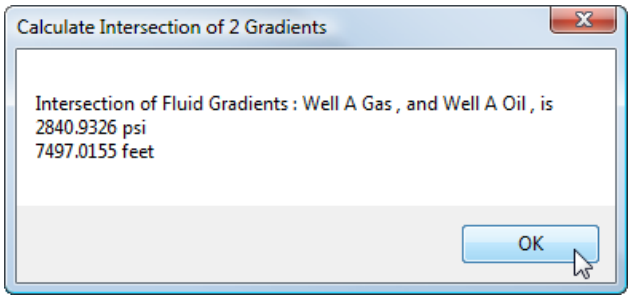
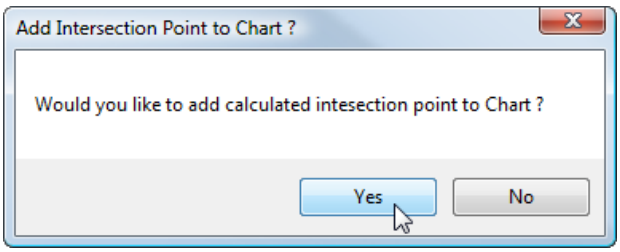


The user will be prompted with an input box that permits the selection of the 2 non-parallel fluid gradients. Once the user selects these 2 fluid gradients, then presses OK button a messagebox will appear with the calculated intersected pressure and depth point. A further input box will pop-up asking the user if they would like the calculated intersection point added to the main chart. See pictures below.







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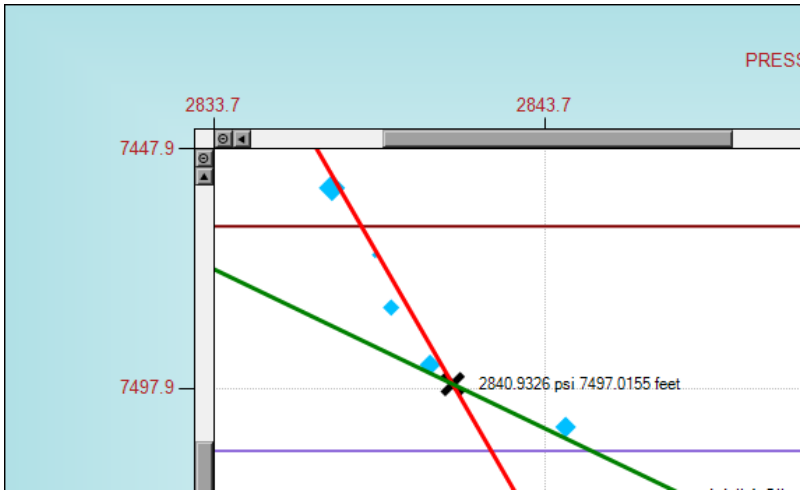
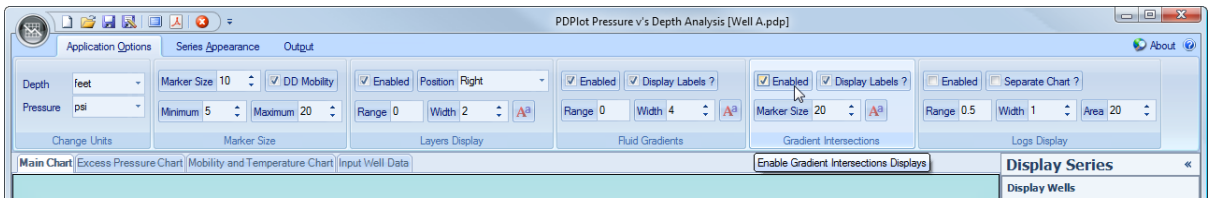
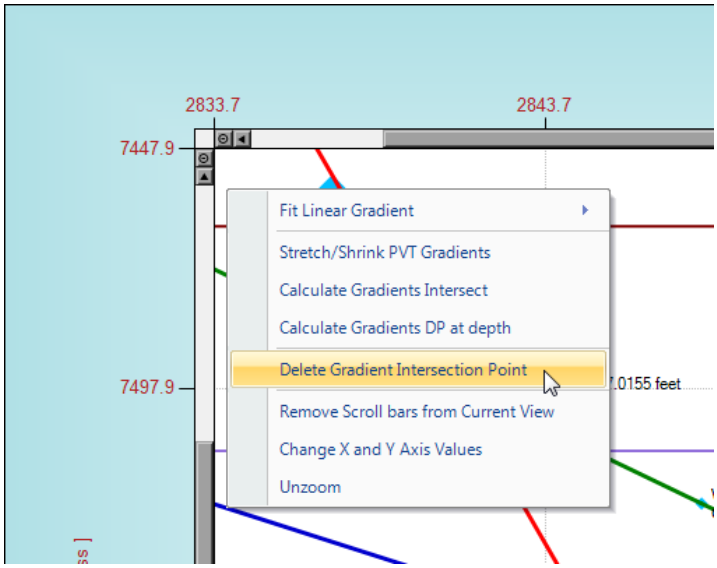
Assuming the user pressed the ***Yes*** button in the above ***Add Intersection Point to Chart ?*** pop-up input box, the intersection point will be added to the chart as shown below.



Should the user wish to not display the intersection point or intersection point label or change the label font, then the user can toggle on/off the these displays by enabling or disabling the ***Gradient Intersections*** options contained within the ***Application Options*** Ribbon tab, as shown below.



Should the user wish to delete an intersection point, the user can select the ***Delete Gradient Intersection Point*** menu item, accessed by a single right click on the main chart area. See below.



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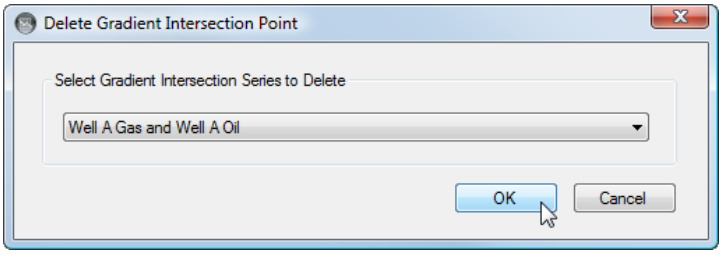
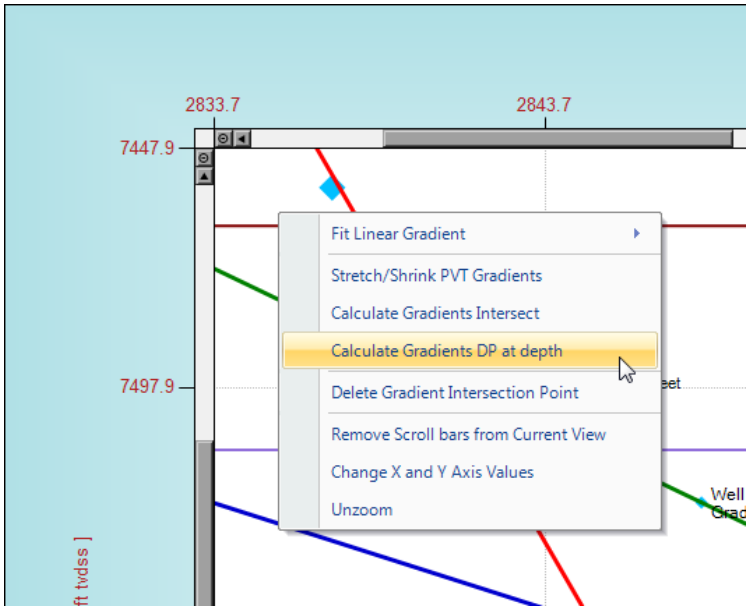
The user will then be prompted with an input box, requesting the user to select which gradient intersection point to delete.



3.6 Calculate Gradients DP at depth

This routine is similar to the previous calculation of intersection points, however the intention is to provide a simple way of calculating the pressure difference between any 2 parallel or non- parallel fluid gradients for a given depth value.

To calculate the pressure difference between any 2 fluid gradients, the user can select the ***Calculate Gradients DP at depth*** menu item, accessed by a single right click on the main chart area. See below.



The user will then be prompted to select 2 fluid gradients and then input the required depth value to calculate the pressure difference. See below.

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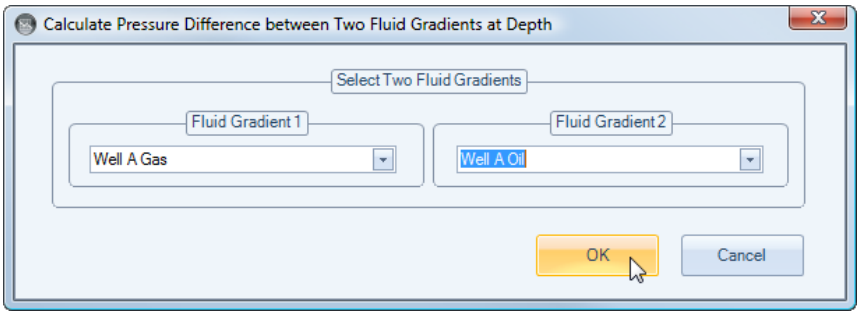
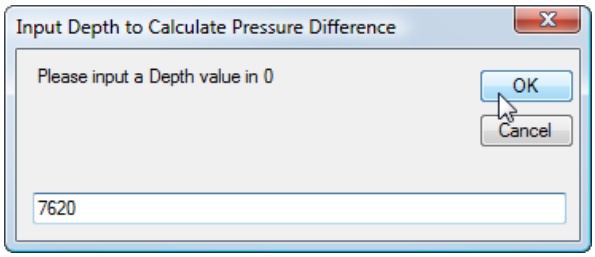
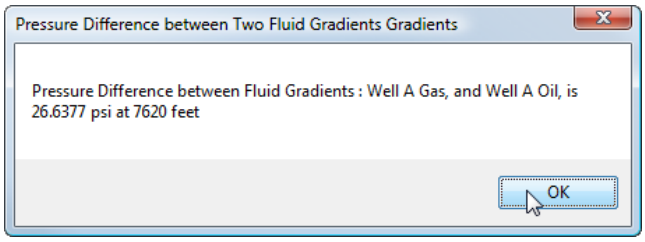




Once 2 fluid gradients have been chosen and a depth value input, a message box will pop-up with the calculated pressure difference.



3.7 Change X and Y Axis Values

The ***Change X and Y Axis Values*** menu toggle item, accessed by a single right click on the main chart area, is provided primarily for presentation and report output but also provided as a global reset view option.

Once the user selects the ***Change X and Y Axis Values*** menu toggle item an input box will popup with the current X and Y minimum and maximum values. To change these values to more aesthetic or rounded numbers simply type in new values and press the OK button. See pictures below.

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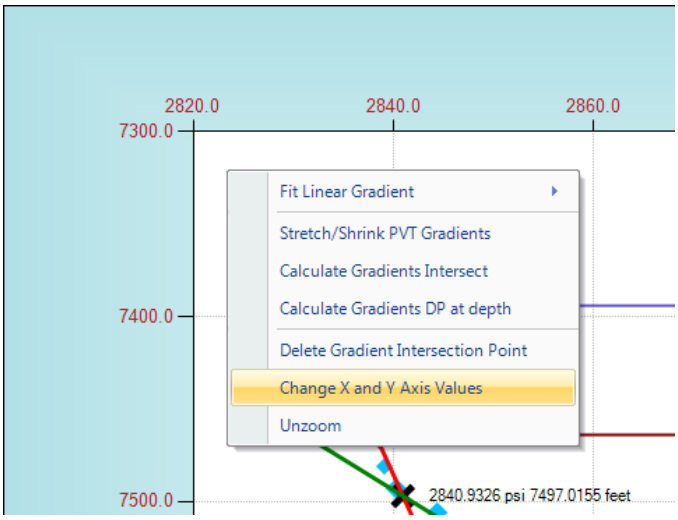

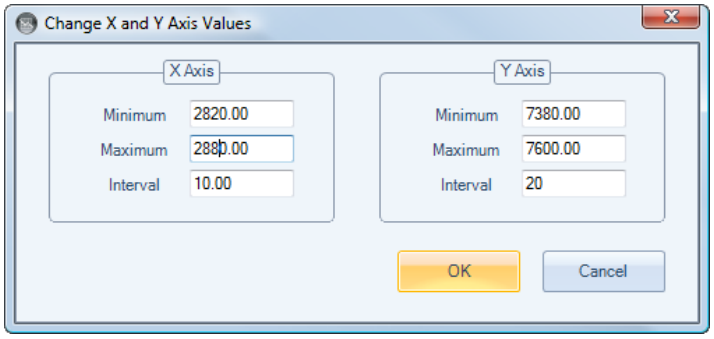

The result should like the following:

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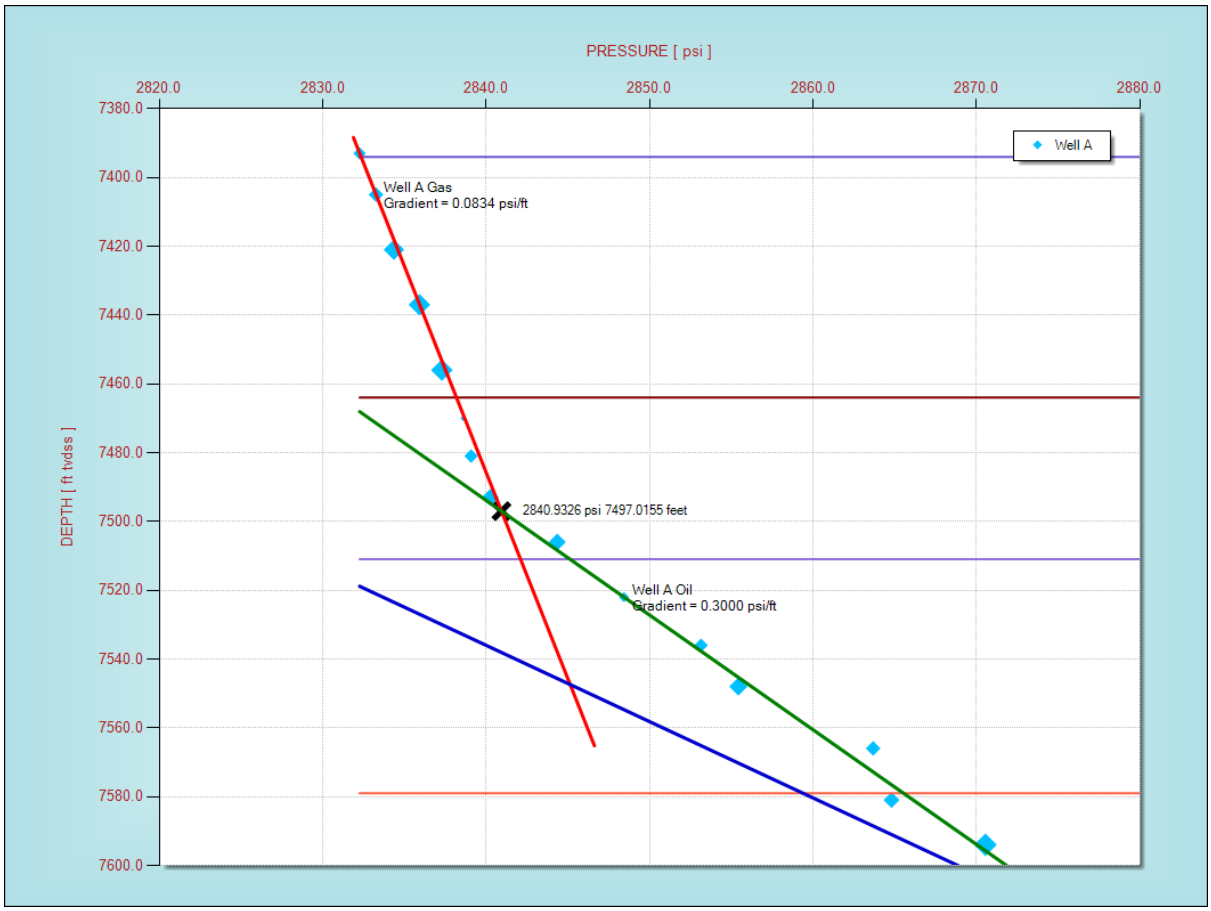

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PDPlot

Pressure vs Depth Analysis

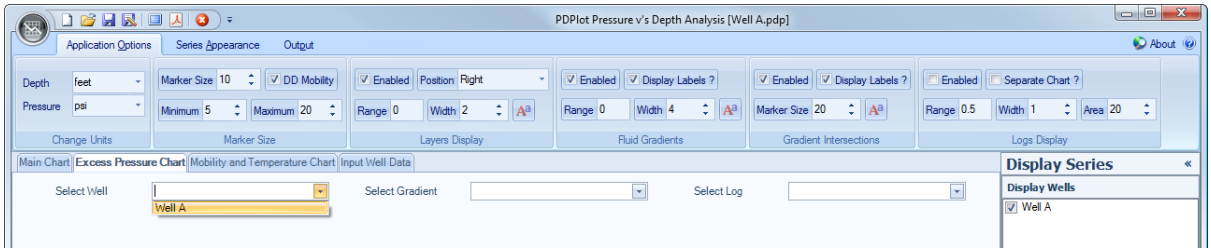
Part

4 Excess Pressure Chart Operations

The Excess pressure chart is an alternative pressure vs depth display. This display normalises the pressure data for a specific Fluid gradient. This technique essentially removes the effects of the selected fluid density, and therefore improves the visualisation of small density differences and pressure barriers that may not be as apparent on standard pressure vs depth plots.

For more details on the use of Excess Pressure Plots please refer to "Improved Interpretation of Wireline Pressure Data", by Alton Brown, AAPG Bulletin v87 No2, February 2003.

The Excess Pressure chart becomes active when at least one well pressure vs depth data has been entered, together with at least one Fluid gradient. To display the Excess Pressure chart select a well and gradient via the dropdown listboxes located at the base of the Excess Pressure chart area, as shown below.



In the example shown below, the selected Fluid Gradient is the "Well A Oil" gradient. All other pressure data and existing gradient data are normalised to this selected gradient. The selected gradient appears as a vertical line. Any pressure data or other gradient data that deviates from this gradient can either relate to density differences, pressure barriers or non- representative datapoints (eg. supercharged). In the example below, it becomes very apparent that both the pressure data and gradient data deviate as a result of the gas and water fluid density differences.

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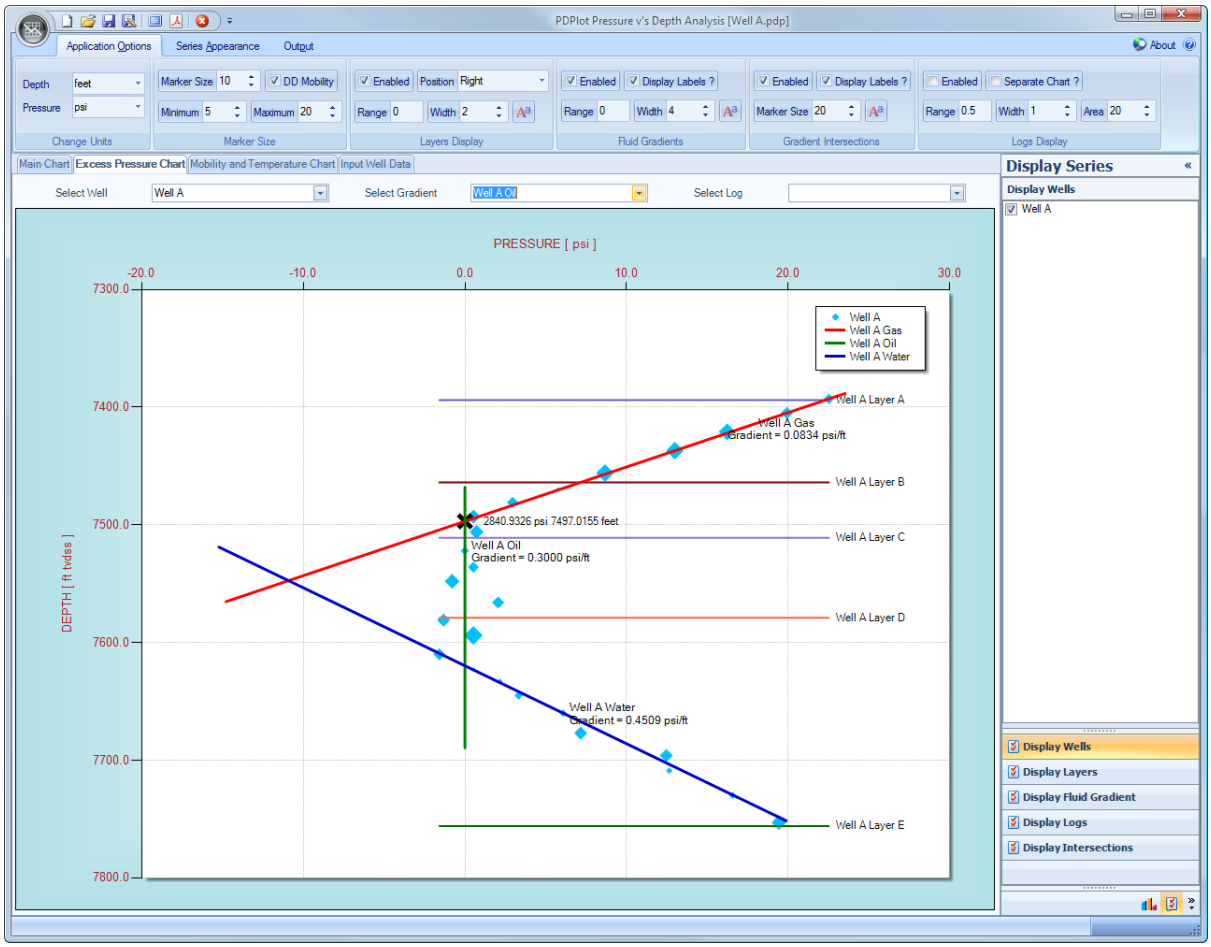
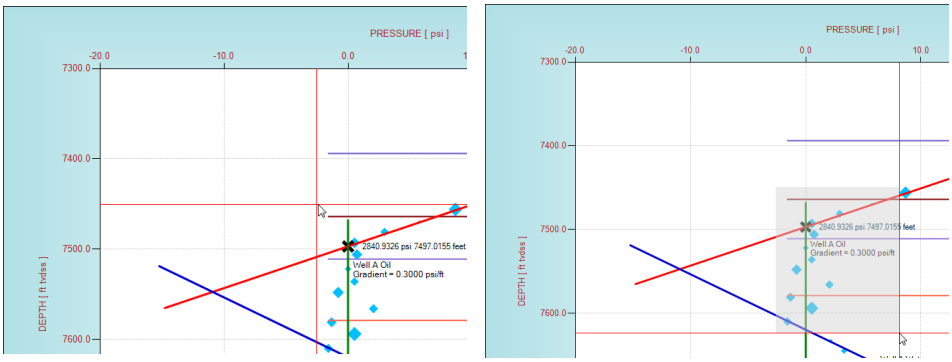


4.1 Zooming / Unzooming

As with the Main chart, Zooming and unzooming within the Excess Pressure chart area couldn't be easier !

Simply single click the left mouse button and hold down and drag a highlighted rectangle. See the following pictures below that demonstrate zooming into a specific area.



To unzoom simply single (left mouse button) click in the top left hand corner Reset Button, as

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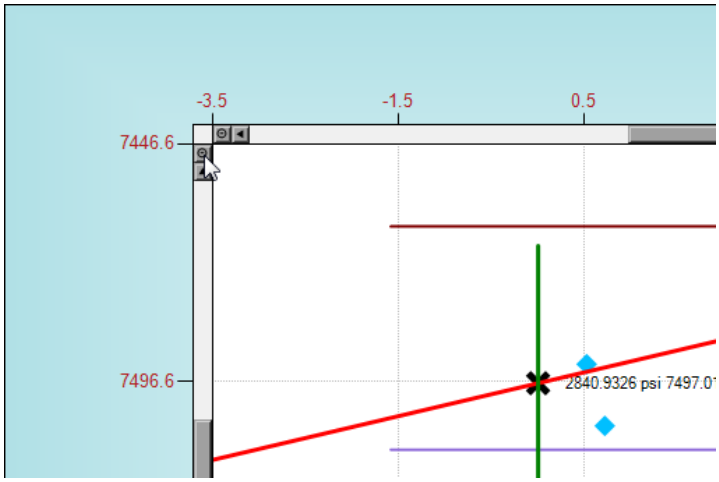
highlighted with the Cursor in the picture below.

The user can also scroll horizontally and vertically using the scroll bar arrows and bars located within the horizontal and vertical scrollbar tracks.

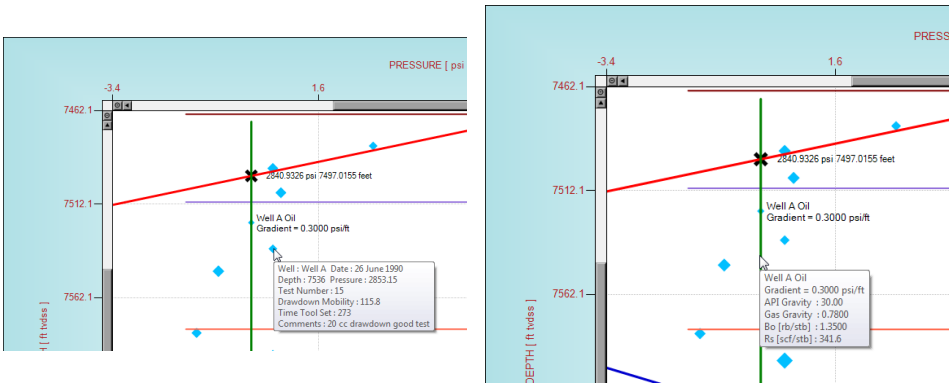


4.2 Chart Tooltips

As with the Main chart, Chart tooltips are created automatically and their content depends on the amount of data the user enters. The more data entered, the more data is added as tooltips to aid the user interpret and display representative fluid pressure gradients.

To display tooltips simply hold the cursor over a datapoint, fluid gradient, layer or log display.

Examples are provided below of tooltips.



4.3 Change X and Y Axis Values

The ***Change X and Y Axis Values*** menu toggle item, accessed by a single right click on the main chart area, is provided primarily for presentation and report output but also provided as a global reset view

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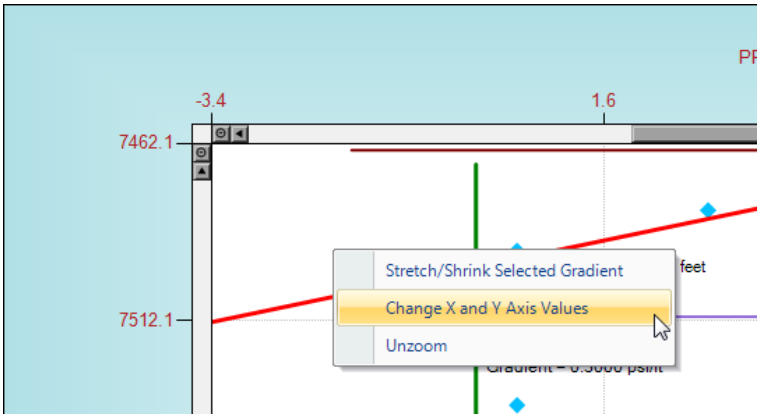
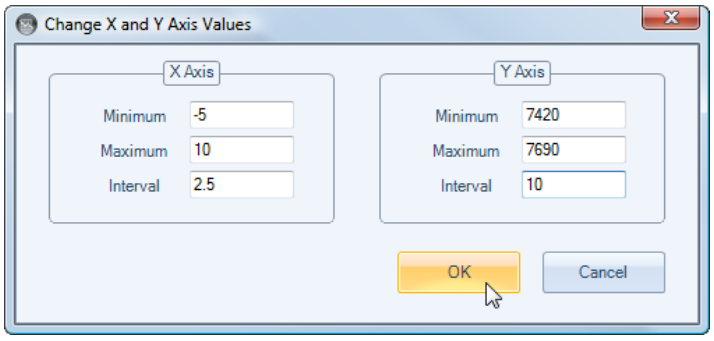
option.

Once the user selects the ***Change X and Y Axis Values*** menu toggle item an input box will popup with the current X and Y minimum and maximum values. To change these values to more aesthetic or rounded numbers simply type in new values and press the OK button. See pictures below.





The result should like the following:

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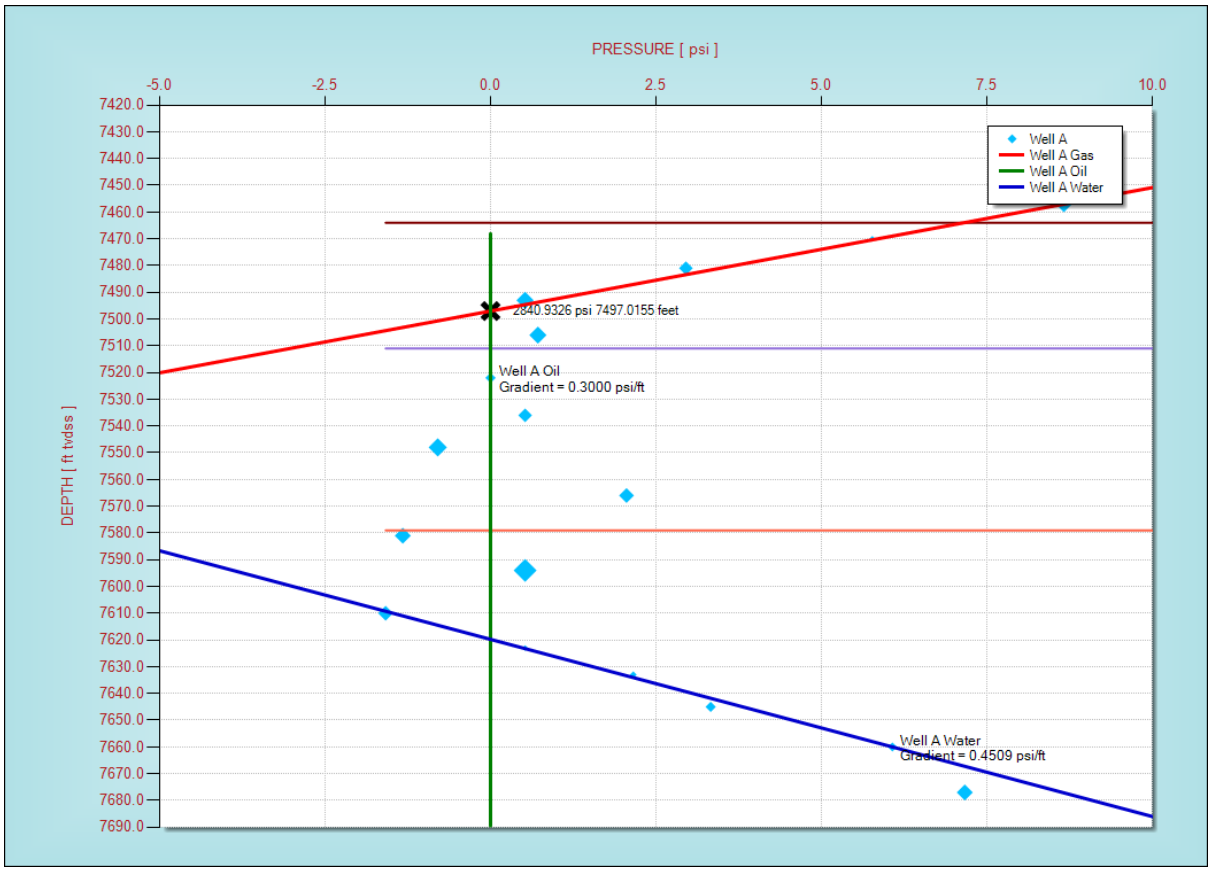

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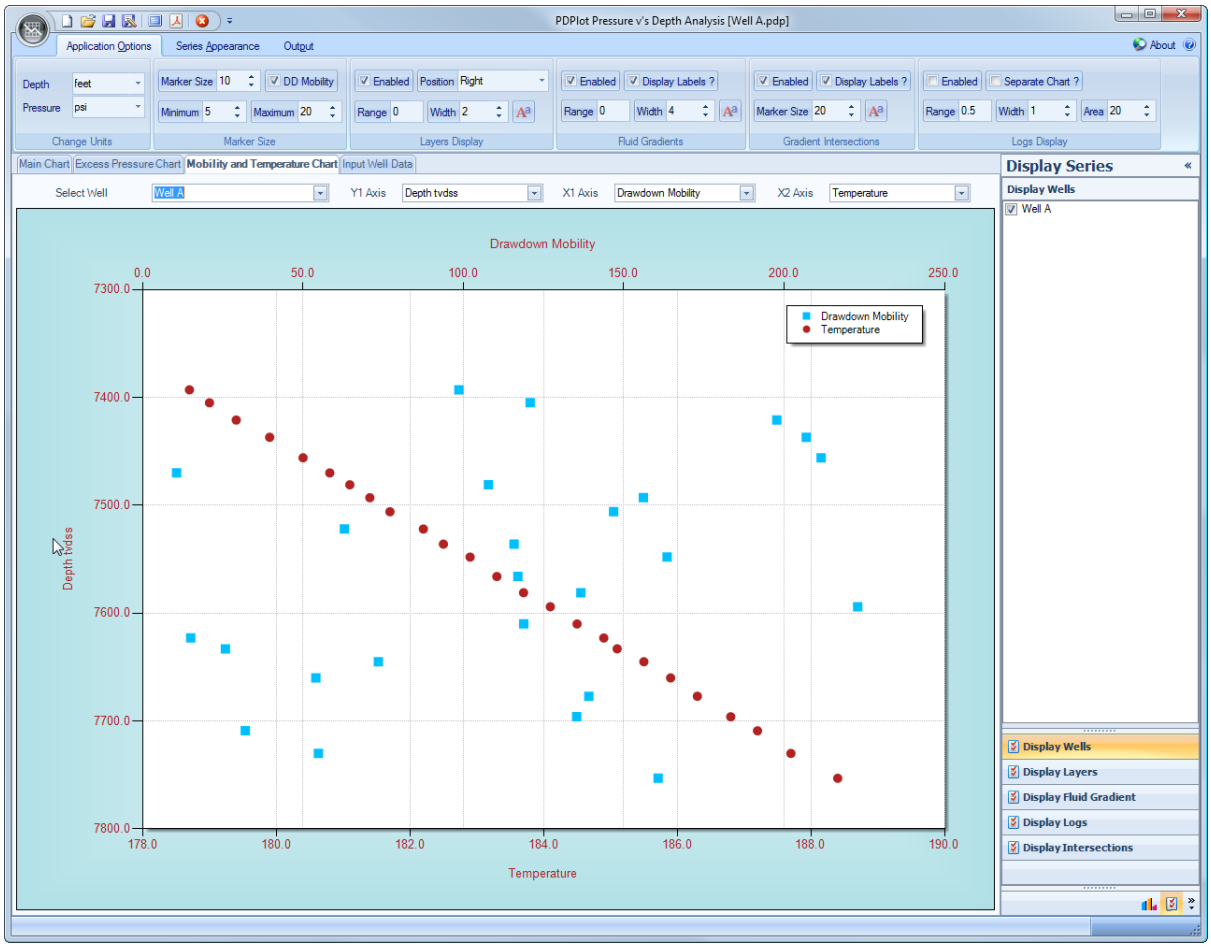
PDPlot

Pressure vs Depth Analysis

Part V

5 Mobility and Temperature Chart Operations

A third chart is provided for additional quick data quality control.



Assuming data has been entered, the user can toggle between the various dropdown boxes to display either Depth as tvd or md, and drawdown mobility and temperature.

Tooltips are also provided for this chart. See below.

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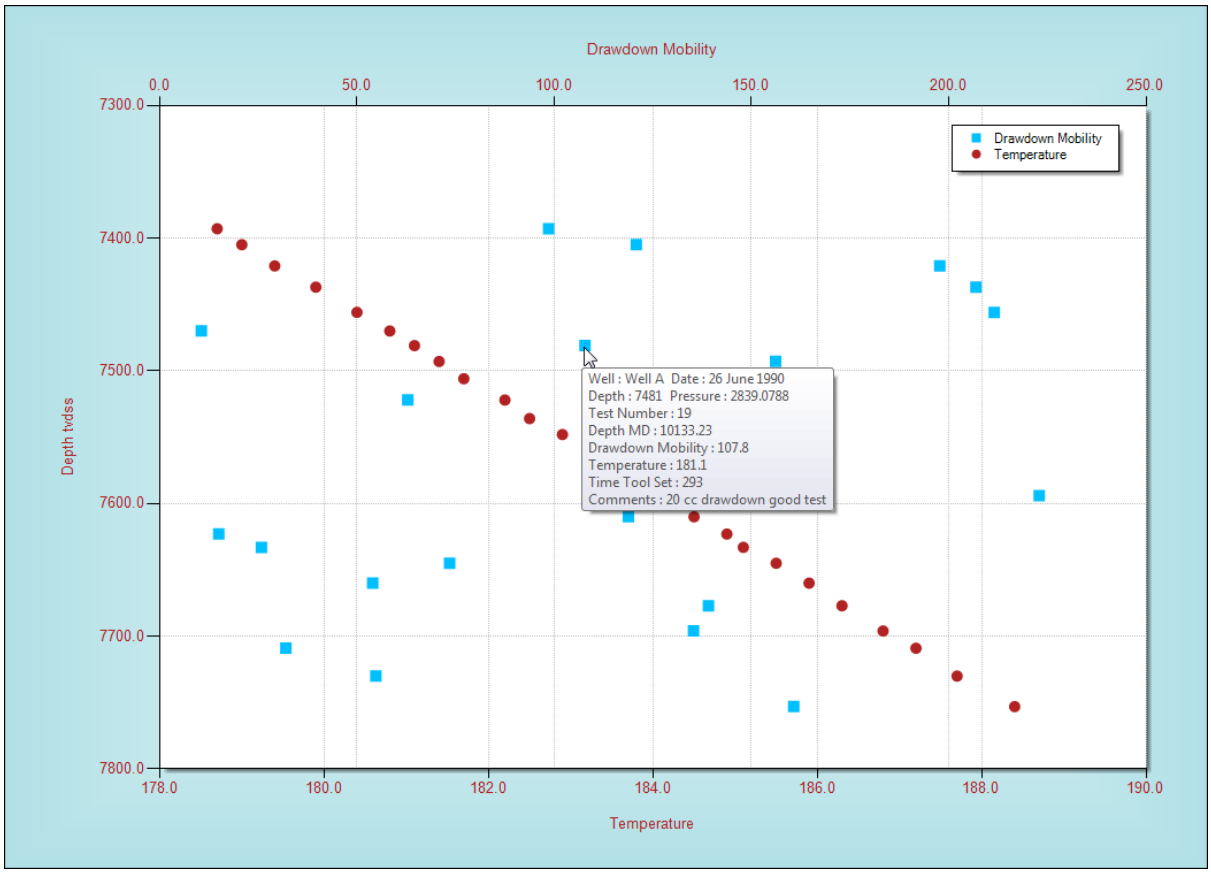

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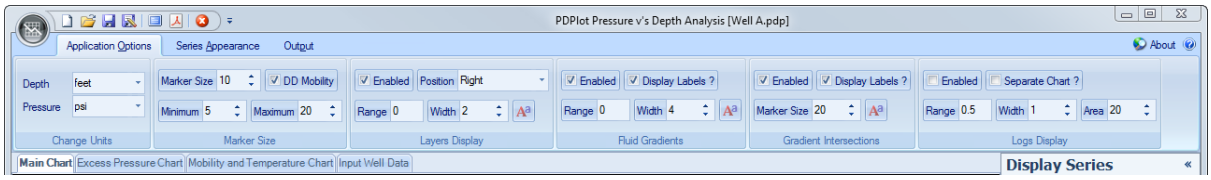
PDPlot

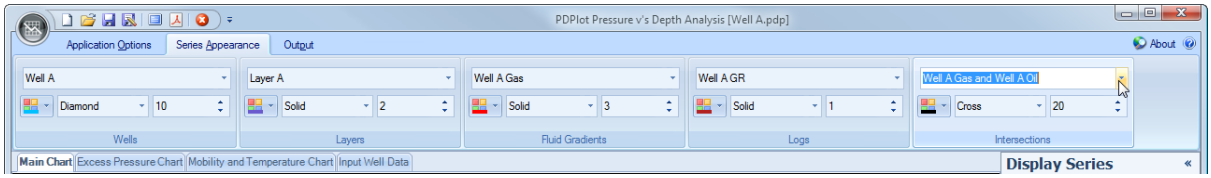
Pressure vs Depth Analysis

Part

6 Chart Display Options

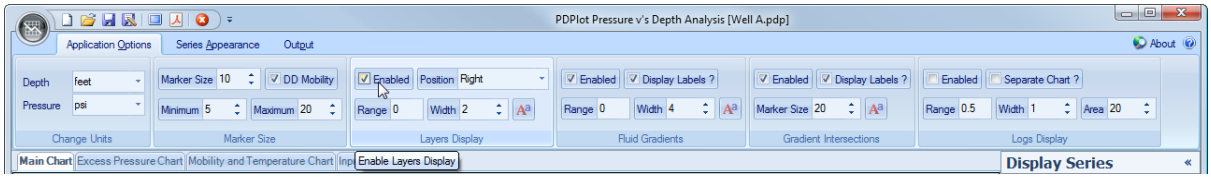
Within the PDPlot Application Options and Series Appearance Ribbonbar tabs, shown below, there are numerous options to change almost all aspects of the chart display. A brief description is provided below for each of these options.





6.1 Display Layers

To toggle on or off all the available display layers within the main chart display set the Layers Display Enabled checkbox option to True or False, see screen capture below.



To toggle off individual layers globally, use the checked list box located at the right hand side of the application, see screen capture below.

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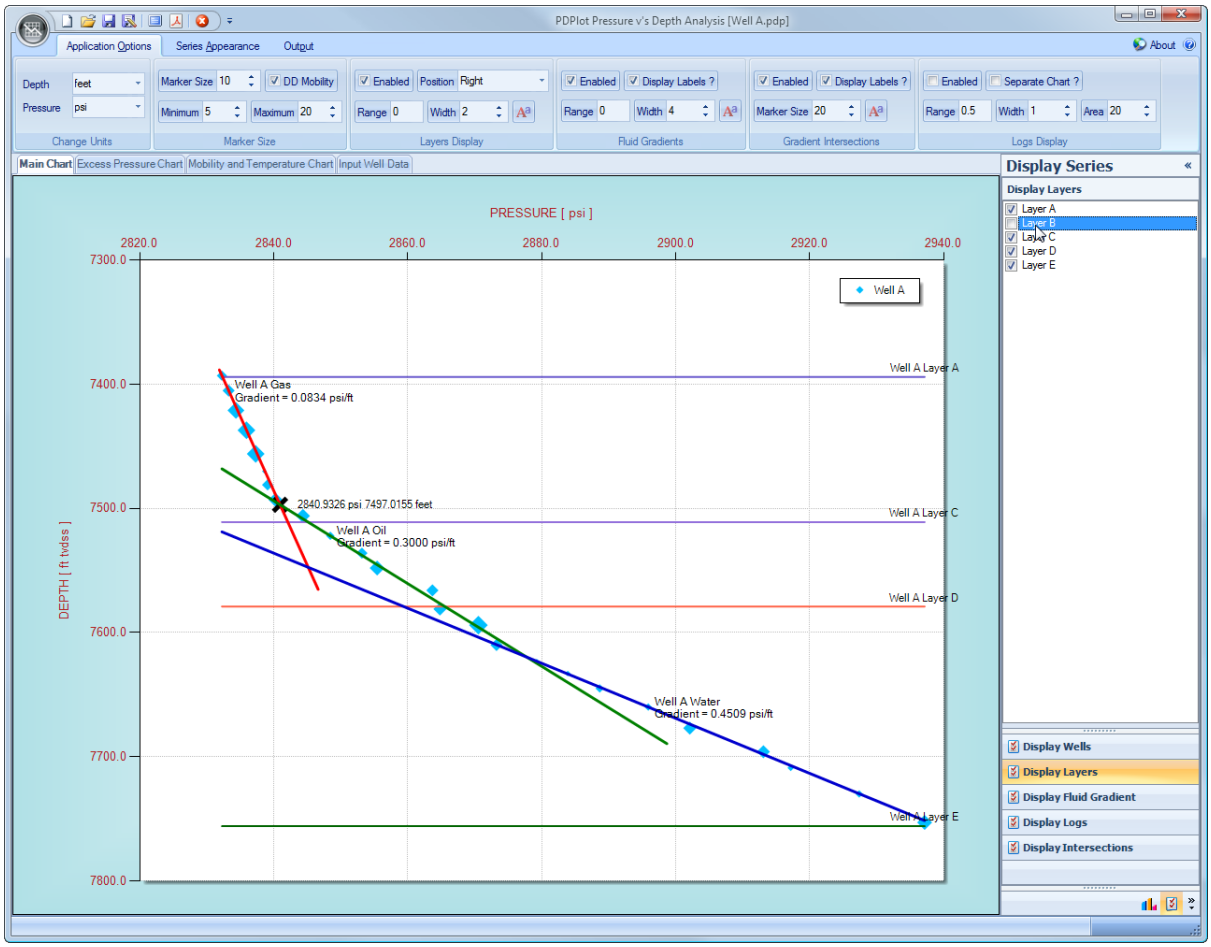
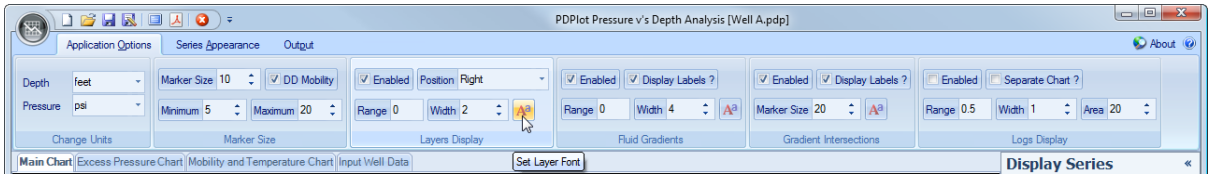


The ***Set Label Font*** button allows the user to change the font style and size for the display layer labels. Once the user selects the ***Font*** button, a Font Dialog box is displayed and allows the User to change the font style and size.



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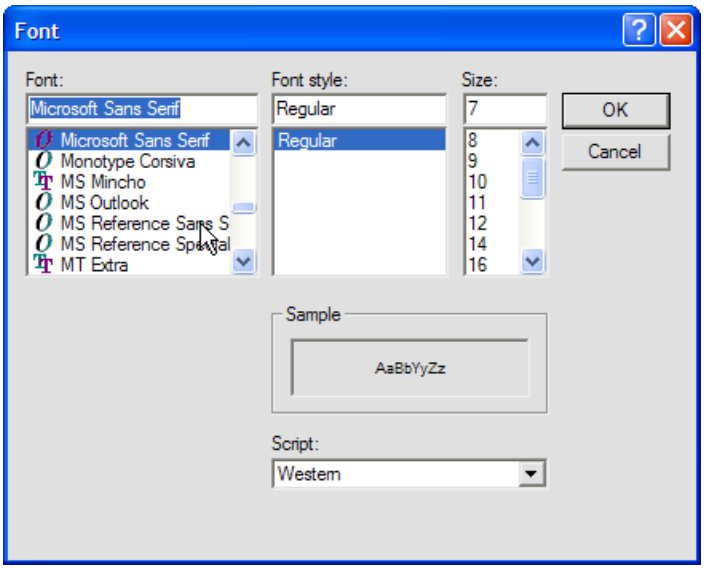
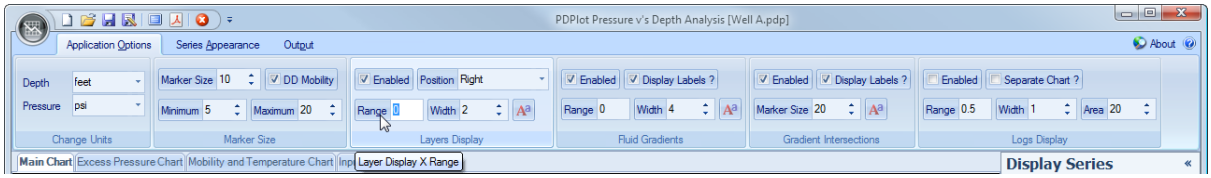
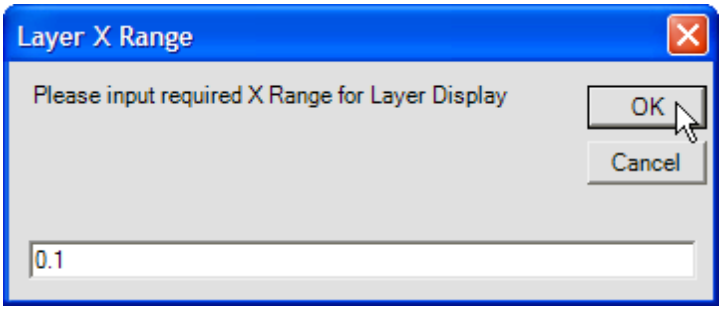


The ***Layer X Range Tolerance*** inputbox allows the user to change to range over which individual layer depth values are displayed over the well specific pressure range.



A value of 0 results in the layer depth value being displayed exactly from the minimum to maximum pressure values entered for a specific well.

A value of 0.1 will result in the layer depth value being displayed 10% less than the minimum pressure value and 10% more than the maximum pressure value entered for a specific well.



6.2 Display PVT Gradients

To toggle on or off all the available PVT Gradients within the main chart display set the Fluid Gradients Enabled checkbox option to True or False, see screen capture below.

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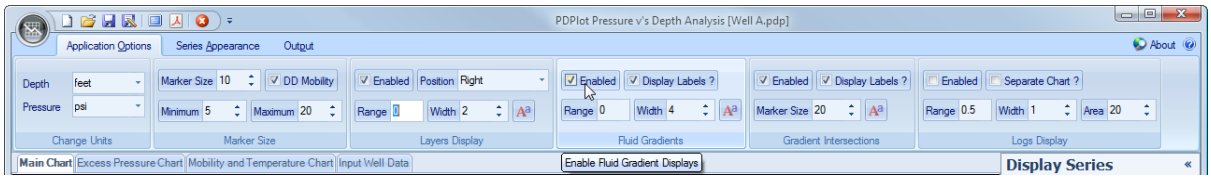
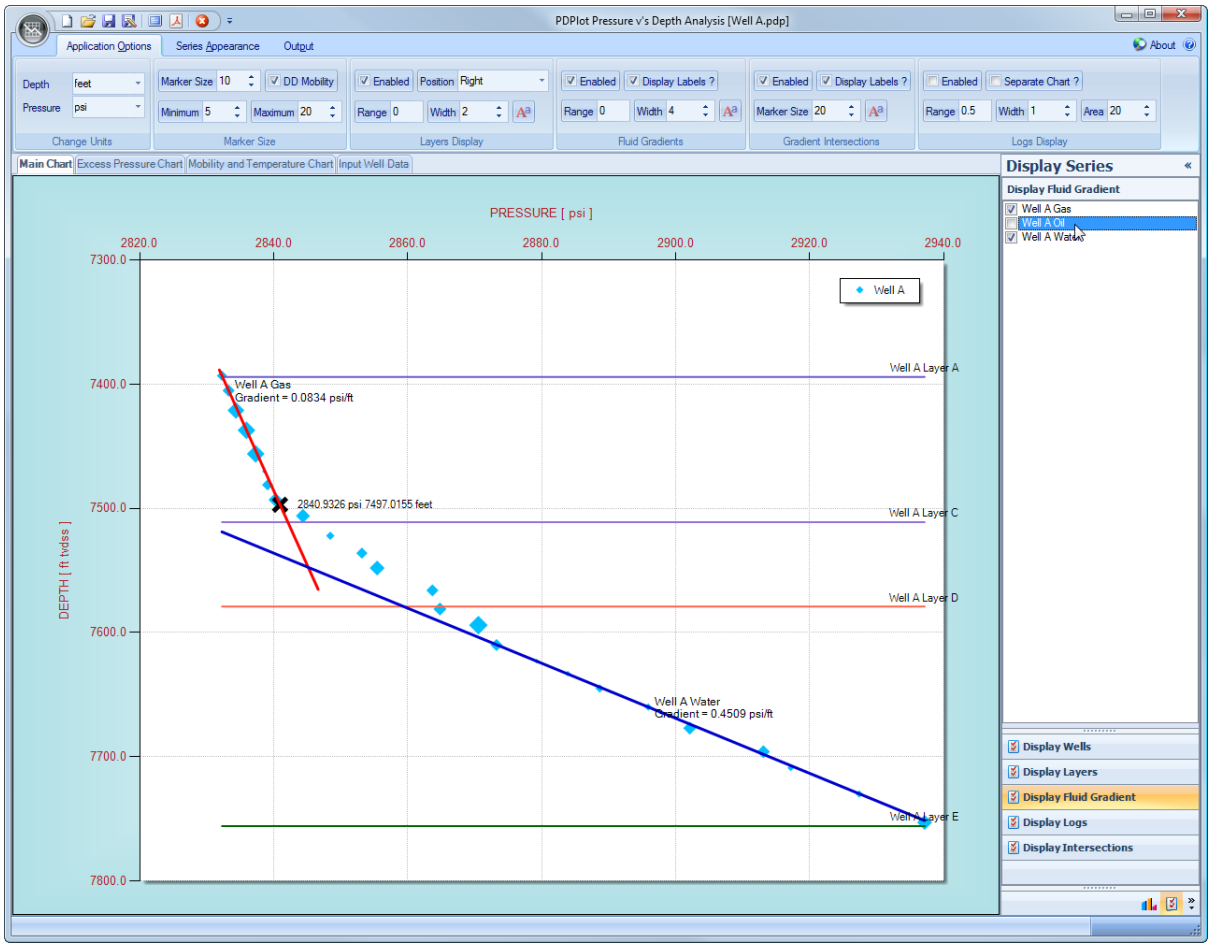
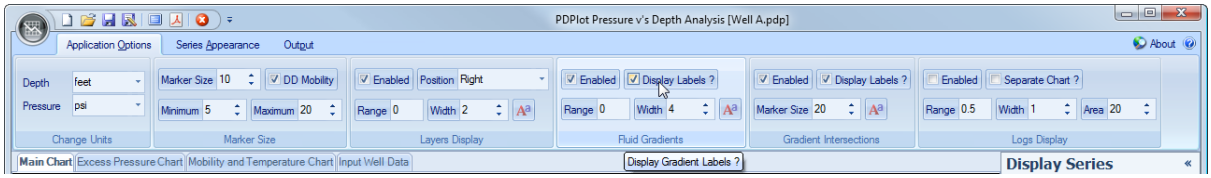


To toggle off individual Gradients, use the checked list box located at the right hand side of the application, see screen capture below.



The ***Display Labels ?*** checkbox item allows the user to toggle on / off all the available display PVT Gradient labels.



The ***Set Fluid Gradients Font*** button allows the user to change the font style and size for the display PVT Gradient labels. Once the user selects the ***Font*** button, a Font Dialog box is displayed and allows the User to change the font style and size.

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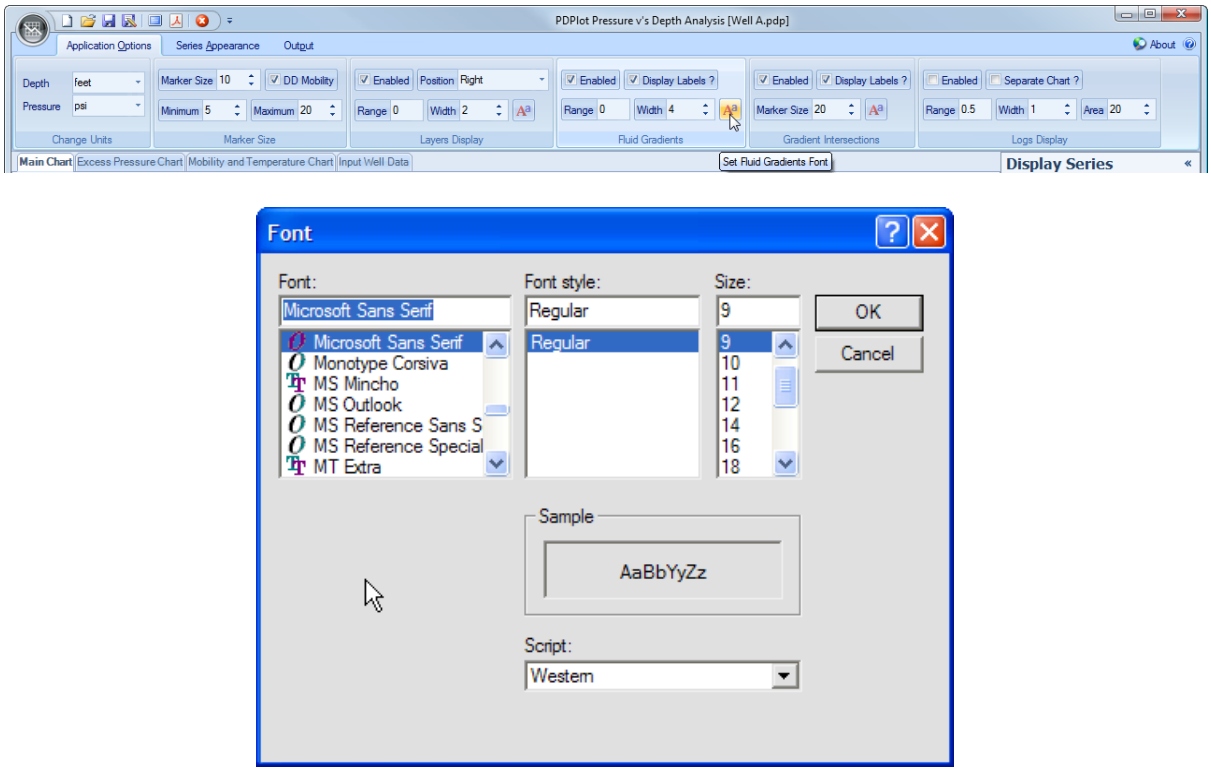
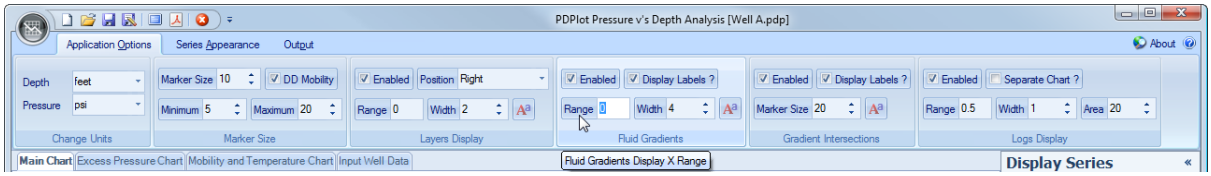


The ***Gradient X Range*** property item allows the user to change to range over which individual PVT Gradients, entered via the Input Fluid Gradient Data method, are displayed over the well specific pressure range.



A value of 0 results in the PVT Gradient being displayed exactly from the minimum to maximum pressure values entered for a specific well.

A value of 0.1 will result in the PVT Gradient being displayed 10% less than the minimum pressure value and 10% more than the maximum pressure value entered for a specific well.

6.3 Display Gradient Intersections

To toggle on or off all the available PVT Gradient Intersections displayed on the main chart set set the Layers Display Enabled checkbox option to True or False, see screen capture below.

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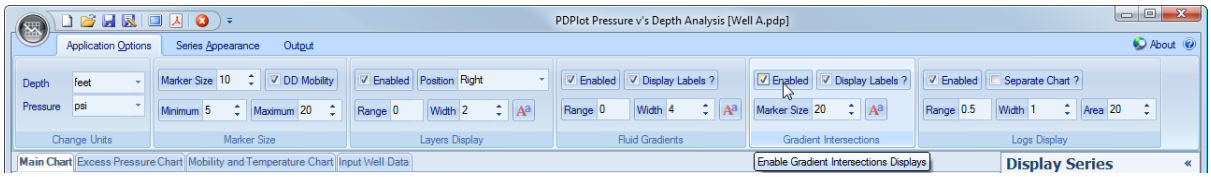
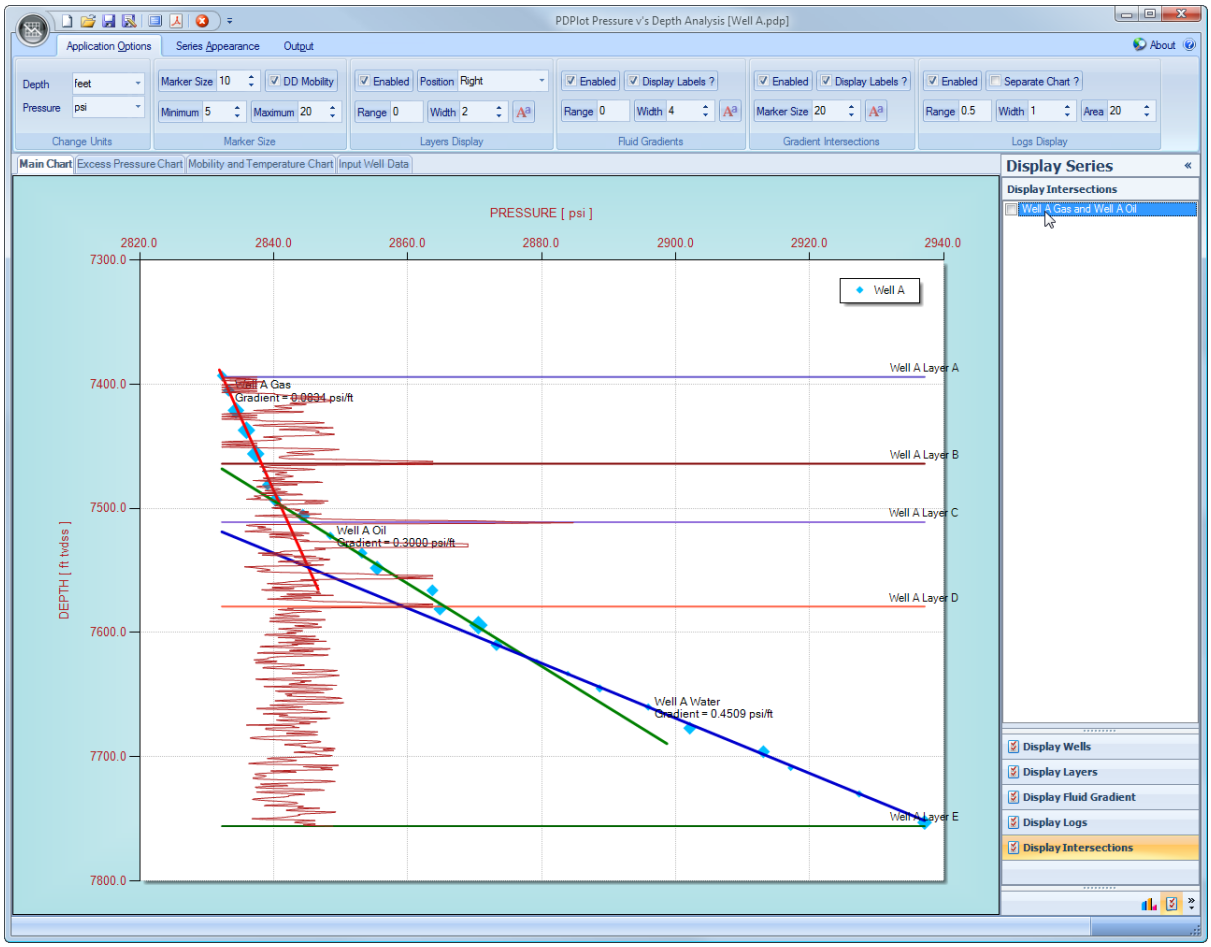
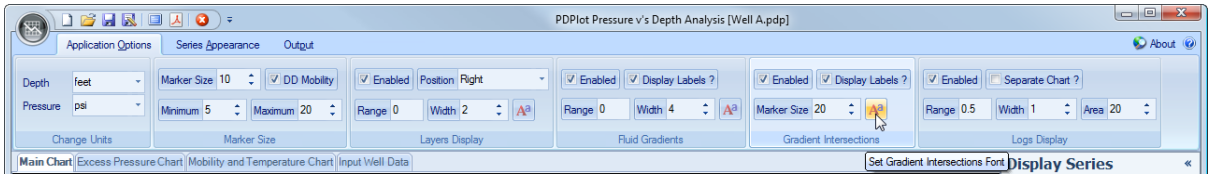


To toggle off individual Intersections, use the checked list box located at the right hand side of the application, see screen capture below.



The ***Set Gradient Intersections Font*** button allows the user to change the font style and size for the display Intersection labels. Once the user selects the ***Label Font*** button, a Font Dialog box is displayed and allows the User to change the font style and size.



To remove individual Gradient Intersection points, please refer to ***Delete Gradient Intersection Point*** menu item, accessed by a single right click on the main chart area, discussed in Calculate Gradients Intersect section. See picture below.

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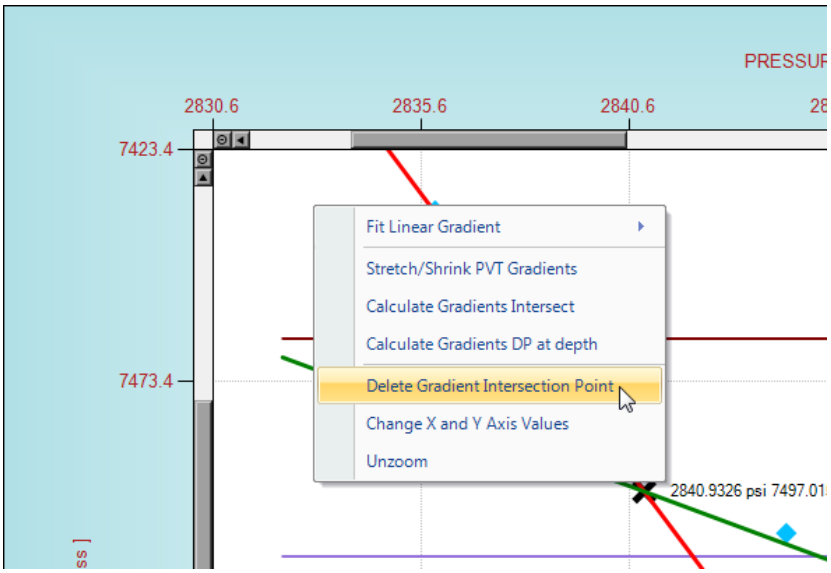
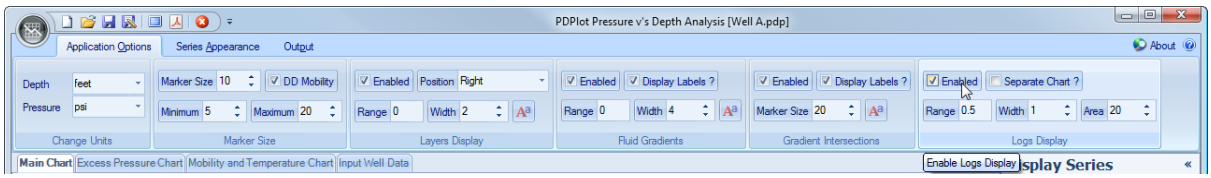


6.4 Display Logs

To toggle on or off all the available Logs displayed on the main chart, set the Logs Display Enabled checkbox option to True or False, see screen capture below.



To toggle off individual Logs, use the checked list box located at the right hand side of the application, see screen capture below.

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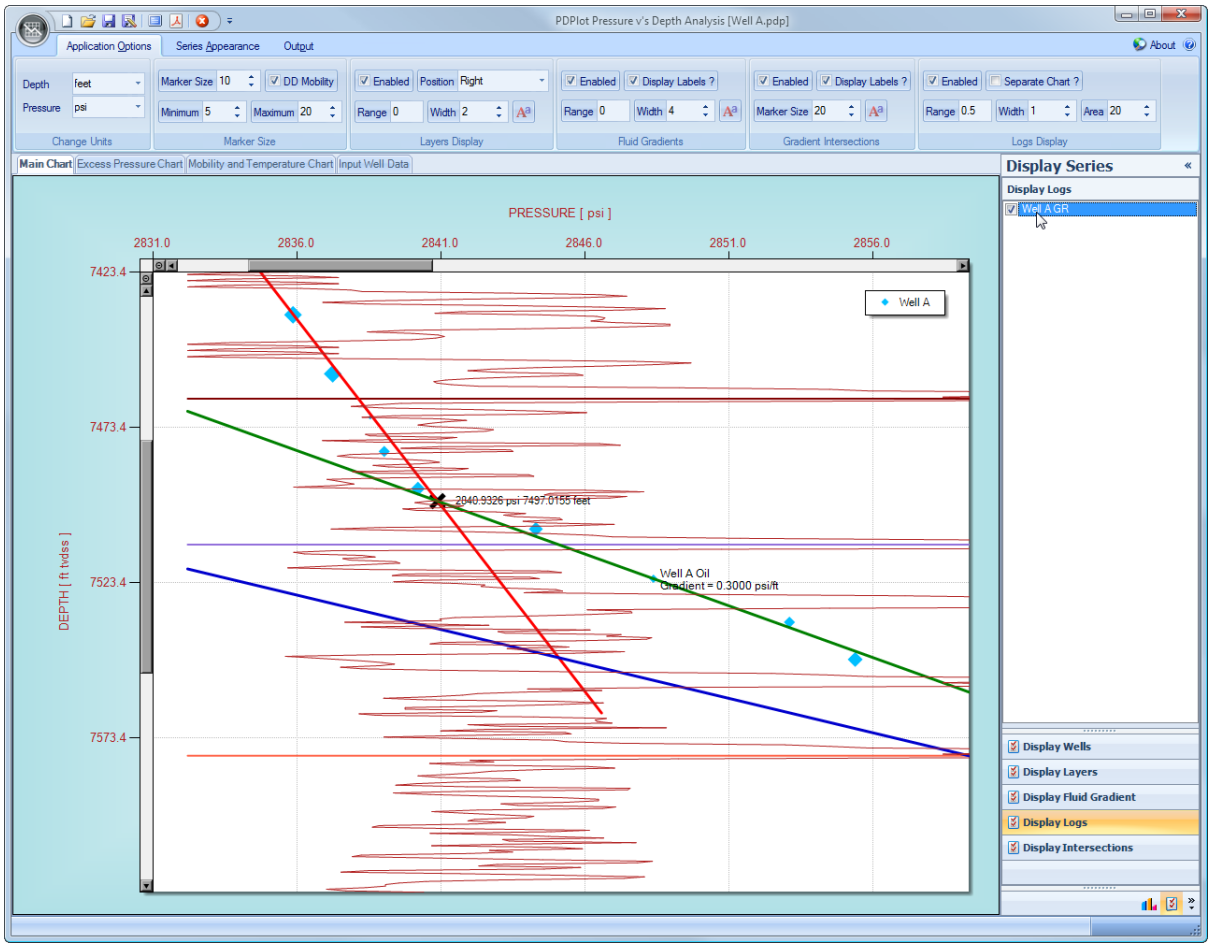
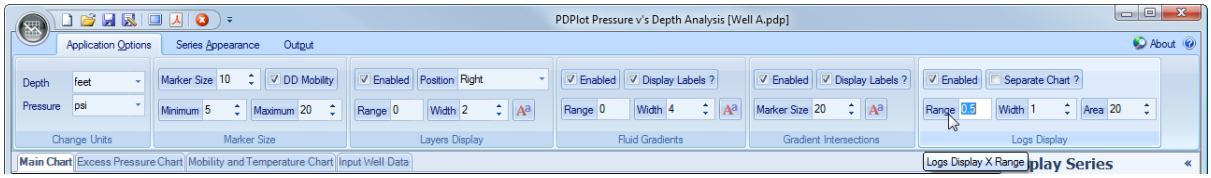


The ***Logs X Range Tolerance*** property item allows the user to change to range over which individual Logs are displayed over the well specific pressure range. The value should be greater than 0 and less than 1.



A value of 0.25 results in Logs being displayed from the minimum pressure value, entered for a specific well, to 25% of the range (maximum - minimum) of pressure values entered for a specific well. Likewise a value of 0.5 will display the Logs across 50% of the pressure range of values entered for a specific well.

The option is also provided to toggle between the logs displayed either as a separate chart parallel to the main display chart, or integrated into the main chart area. To toggle between these display options select the ***Display Logs as Separate Chart*** property option highlighted below.

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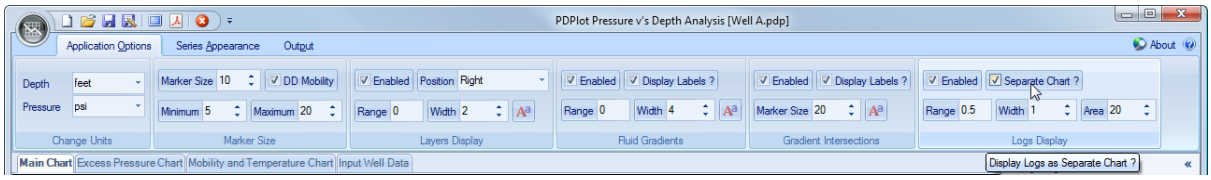
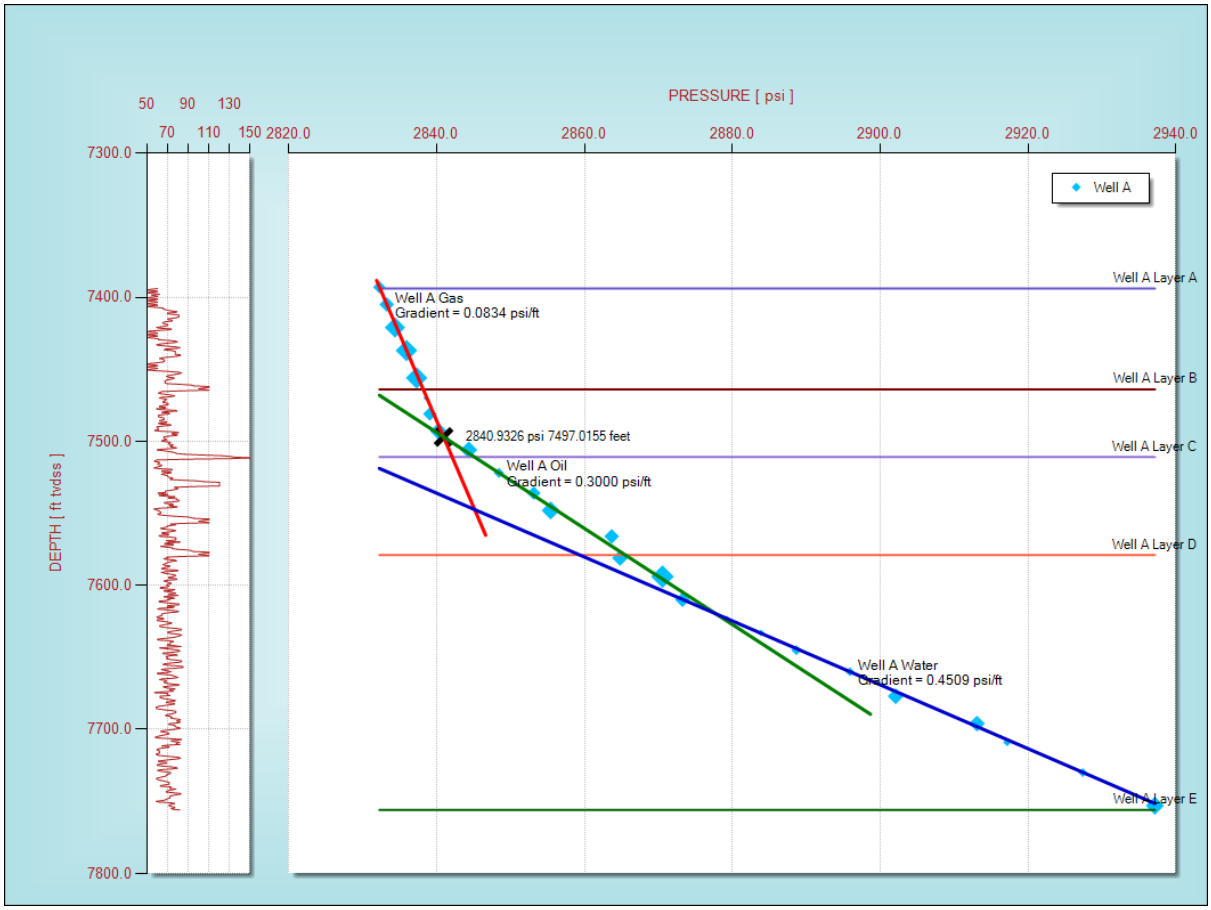


Examples of resultant displays are shown below :



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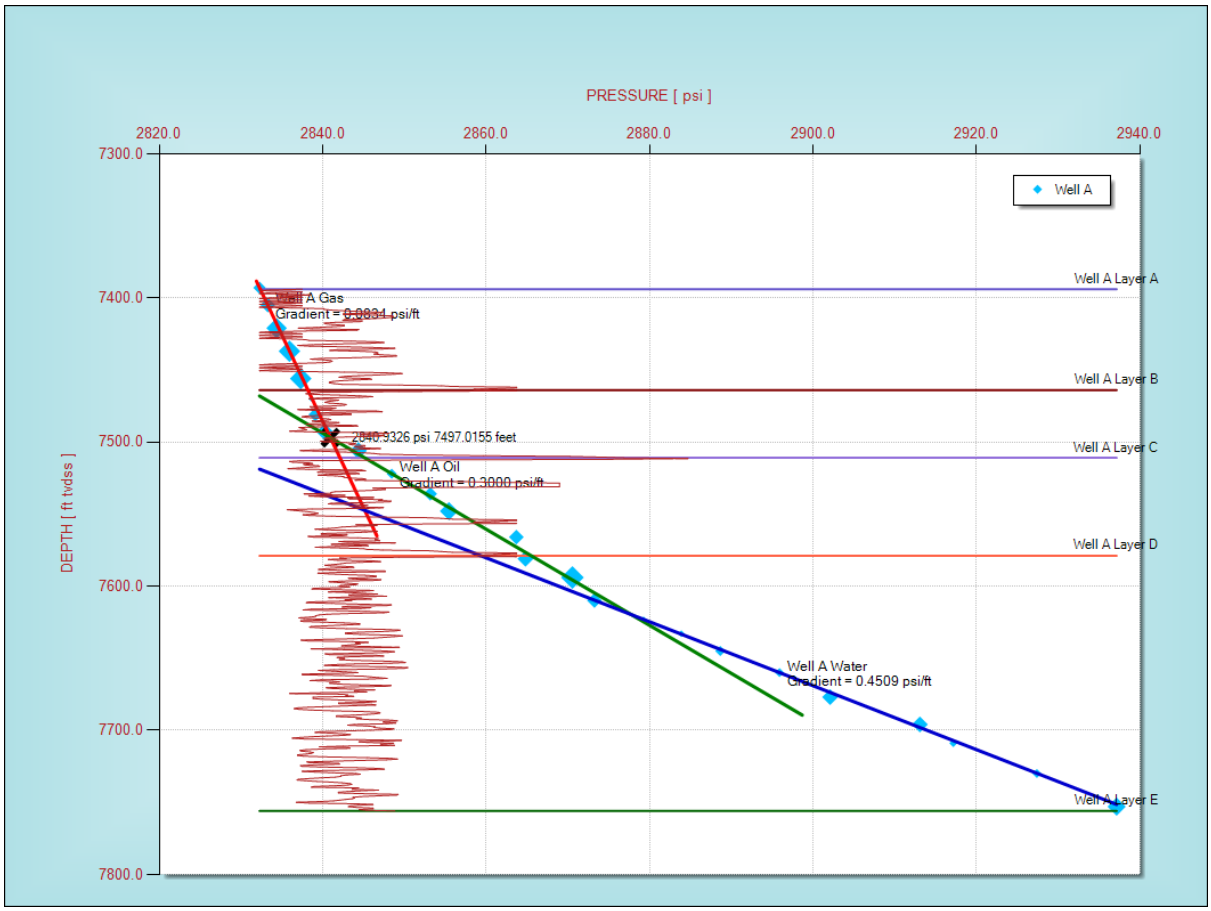

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PDPlot

Pressure vs Depth Analysis

Part VII

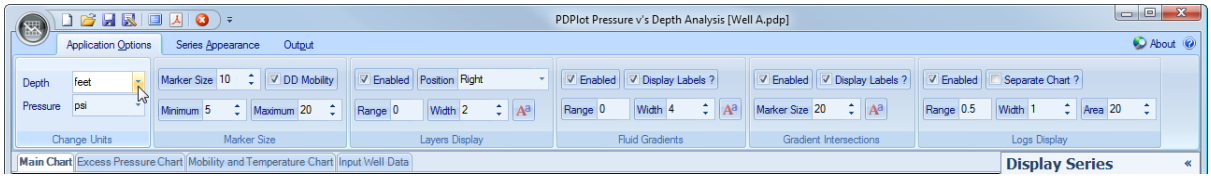
7 Units

7.1 Depth

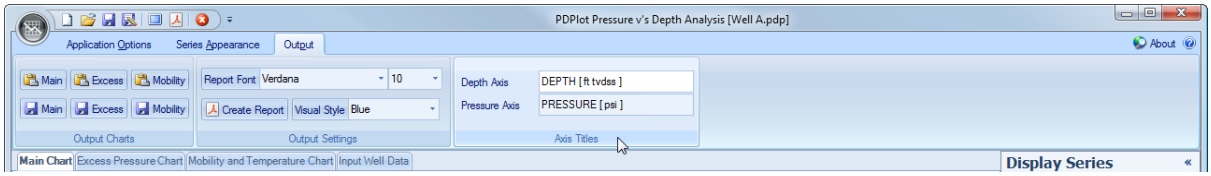
Units have been kept simple. ie., Depth units consist of ***feet*** and ***metres*** and Pressure units consist of ***psi*** and ***bar***.

Fluid gradients and PVT input have deliberately been left entirely in Oilfield imperial units; ie. "psi/ft", since it is very common industry practice to quote fluid density values in this manner. For example gas gradient of 0.08 psi/ft, oil gradient of 0.3 psi/ft and water gradient of 0.45 psi/ft.

To select between the available depth units, simply toggle between main menu items of ***feet*** and ***metres***, as shown below. Any depth values already entered into the application will automatically be changed to the new selected unit.



To change the chart Axis Title for Depth simply edit the text contained with the Axis Title Input box, located in the Output ribbon tab, as shown below.



7.2 Pressure

Units have been kept simple. ie., Depth units consist of ***feet*** and ***metres*** and Pressure units consist of ***psi*** and ***bar***.

Fluid gradients and PVT input have deliberately been left entirely in Oilfield imperial units; ie. "psi/ft", since it is very common industry practice to quote fluid density values in this manner. For example gas gradient of 0.08 psi/ft, oil gradient of 0.3 psi/ft and water gradient of 0.45 psi/ft.

To select between the available pressure units, simply toggle between main menu items of ***psi*** and ***bar***, as shown below. Any pressure values already entered into the application will automatically be changed to the new selected unit.

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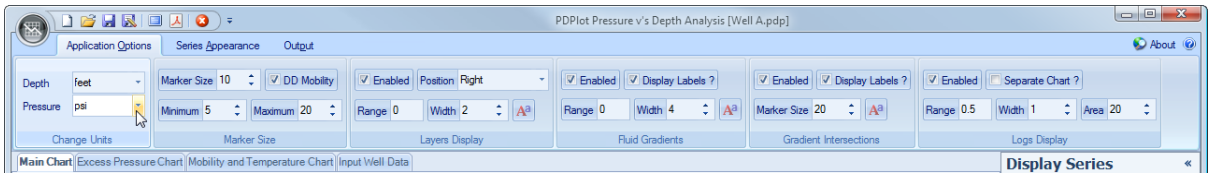
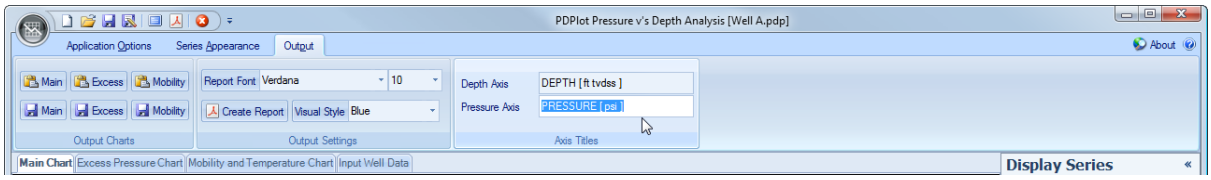


To change the chart Axis Title for Pressure simply edit the text contained with the Axis Title Input box, located in the Output ribbon tab, as shown below.



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PDPlot

Pressure vs Depth Analysis

Part VII

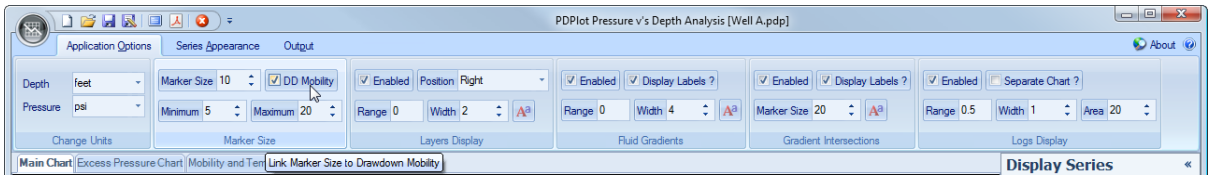
8 Change Chart Colors and Formats

8.1 Change Series Appearance

For individual pressure depth series, the user can either :

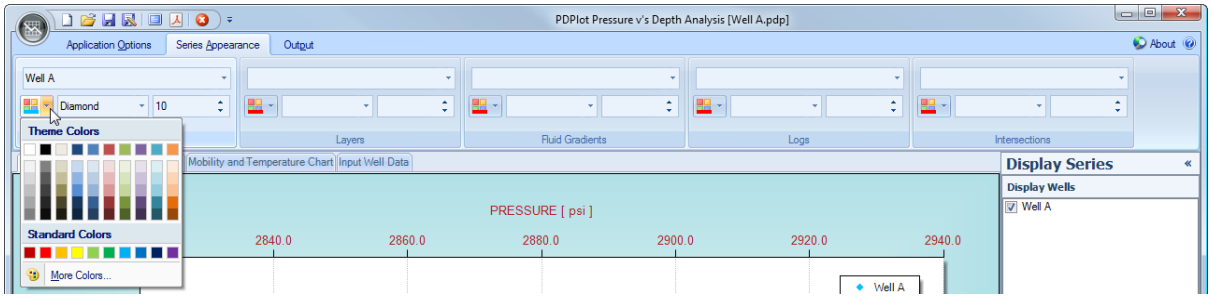
- Choose to to have a fixed marker size, or
- Link the marker size to the value of drawdown mobility, ie., the higher the value of drawdown mobility the larger the marker size.

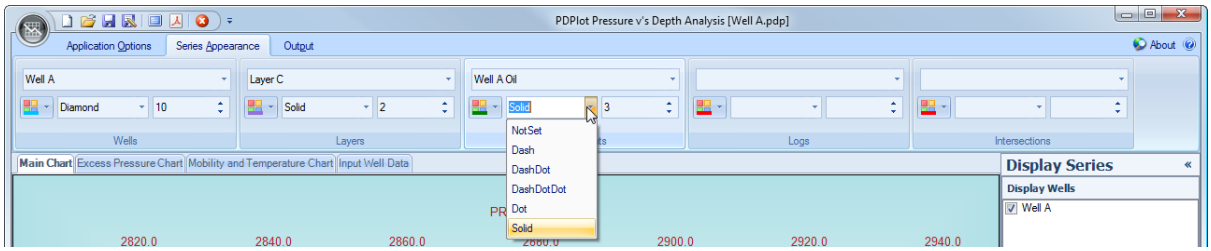
To select the latter option, select the checkbox item in the PDPlot Application Options ribbonbar tab ***DD Mobility***, *as shown below.*



The minimum and maximum values of marker size can also be changed by selecting the items immediately underneath called ***Mininum*** and ***Maximum***. See above screenshot.

Various options are also provided to allow the user to change the color and style for all of the individually displayed series, via the Series Appearance ribbonbar tab, as shown below.





8.2 Change Chart Settings

Various options are provided to allow the user to change the format and label displayed for both the X and Y Axes, the Chart Legend and overall Chart Appearance.

To change any of the chart options select the Chart Settings navigation panel (or Chart icon), in the

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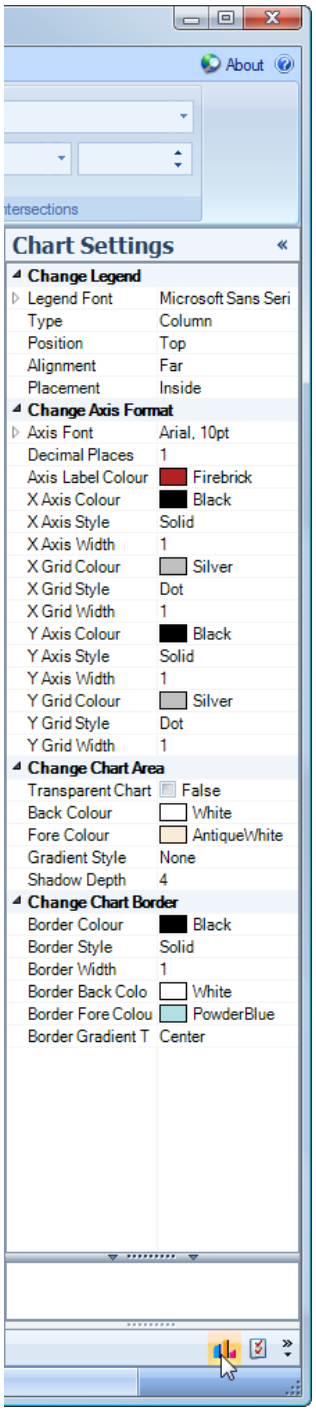
Container Bar on the right hand side of the application. See screen captures below.



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