USER MANUAL GLIS

GERMI's Log Interpretation Software- A Plugin for OpendTect Software

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Table of Contents

Table of Contents 1

1. Overview 2

1.1 Special features of Software 2

1.2 Mouse Button Guide 2

1.3 How to use this Manual 2

1.4 Icons used in this Software 3

2. Running GLIS 4

2.1 Running GLIS 4

2.2 Project Data Tree 4

3. Well Data Manager 6

3.1 Well Logs Import (LAS format) 6

3.2 Well Data Manager 8

3.3 Well Logs Export (LAS format) 11

4. Template 13

4.1 Define Template 13

4.2 Edit Template 16

5. Well log Interpretation 17

5.1 Well logs View 17

5.2 Well Correlation View 17

1. Overview

1.1 SPECIAL FEATURES OF SOFTWARE

The GERMI's Well Log Interpretation plugin "GLIS" for OpendTect software has following features:

- Multi-LAS import
    - Interpolation option at desired depth interval
    - Check of existing logs
    - Options to select desired logs and Groups.
- Template based Well Log display
    - Template for standard and customize display
- Well Log Correlation
    - Multiple Correlations in the same session
    - Log Display with different templates for different wells.
    - "Flat on Top" option for structural correlation
    - Markers selection and Display
- Default Log Selection
- Multi-LAS export

1.2 MOUSE BUTTON GUIDE

Action can be applied to any mouse button includes:

- **Left Click**- Select
- **Right Click**- Options
- **Drag**-Select Together
- **Scroll**- Move up/down

1.3 HOW TO USE THIS MANUAL

This manual is prepared to familiarize the users with the methodology to operate the GLIS plugin of OpendTect software for well log interpretation.

1.4 ICONS USED IN THIS SOFTWARE

- **Sync Data** 
- **Import Well Log** 
- **Export Well Log** 
- **Print** 
- **Exit** 
- **Well Log Correlations** 
- **Define Template** 
- **Edit Template** 
- **Documentation** 
- **About** 

2. Running GLIS

2.1 RUNNING GLIS

To run the GLIS plugin user has to install OpendTect 6.4.0 version or above and click on "**Utilities>**  **GLIS".** The main software window will open as shown in figure 2.1.

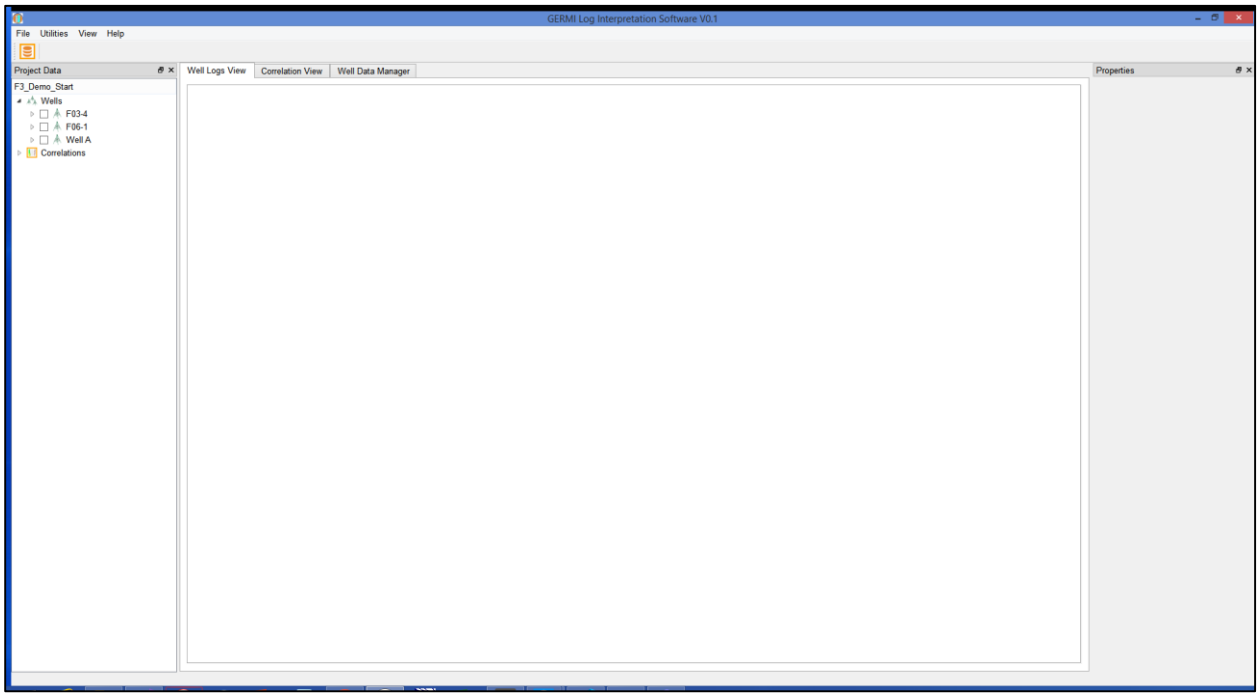


Figure 2.1: Window after opening a Project

2.2 PROJECT DATA TREE

It will show loaded Wells from Opendtect survey as shown in figure 2.2. Each Well contain three data set:

1) Logs
2) Markers
3) Template
    a) Global
    b) Well Template

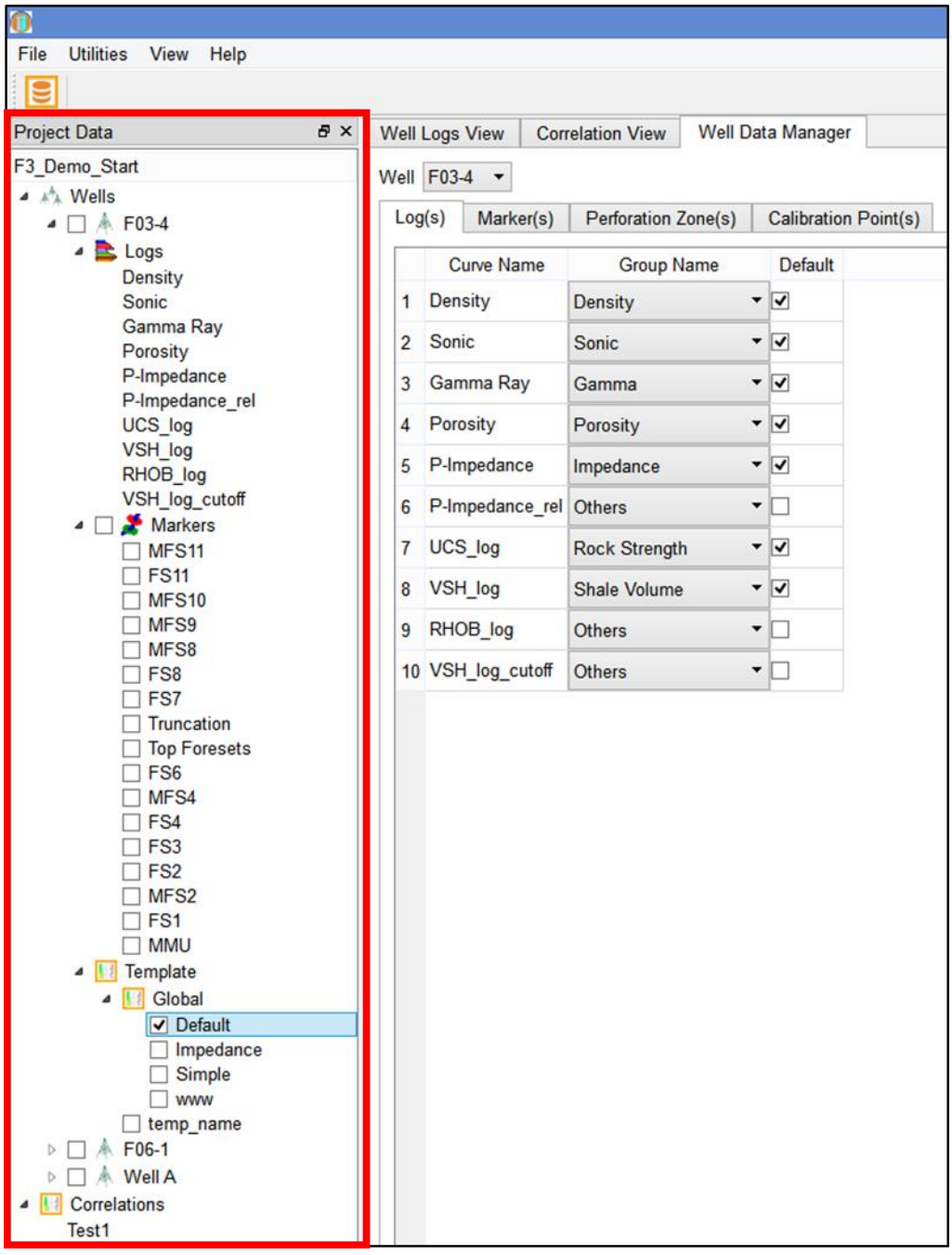


Figure 2.2: Project Data Tree

3. Well Data Manager

3.1 WELL LOGS IMPORT (LAS FORMAT)

Well Log files in LAS 2.0 format can be imported by clicking on file menu import well log option. User can import multi LAS file at a time by clicking on Select LAS File(s) numbers of time (Figure 3.3). There is an option to select and unselect any particular log for import based on user's requirement. User can change the **Depth Interval** as per requirement from the default 0.1524. The Logs will be interpolated to the given "Depth Interval" and stored in the database for interpretation use.

Step 1: To import log data in LAS format select **File menu>**  **Import Well Log> Select LAS file.**

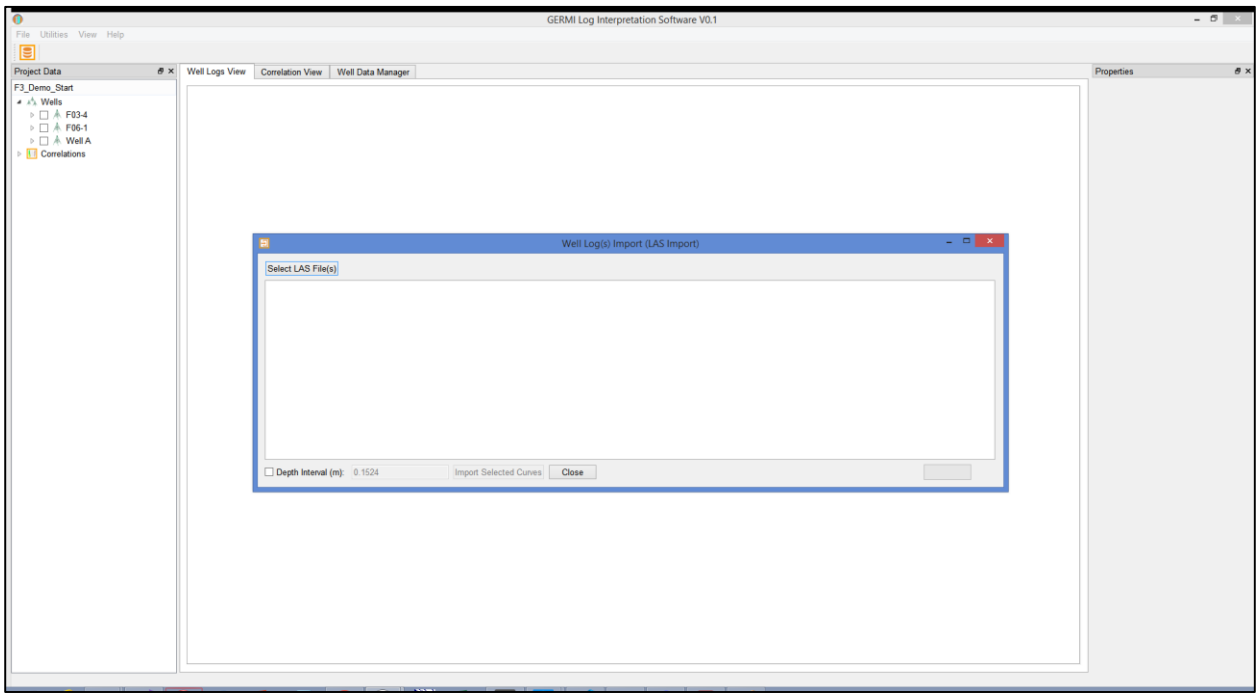


Figure 3.1: Las Import Window

Step 2: After selecting the LAS file, the input file will be shown in text browser for reference and logs present in the file will be displayed in the Left side of the window (Figure 3.2). User can select the types of logs for display. Logs present in LAS file with standard mnemonics will be automatically selected in this window. The detail headers of the Las file will display in the Well Log (s) Import (LAS Import) window.

Step 3: Select or **Unselect** the required log by check the combo box present beside the log name based on the requirement and click **Import Selected Curves**. Red color shows the

existing logs in the selected well. The already existing logs will be overwritten, if selected to import. The name of the tab indicates the UWI in the LAS file, if UWI in LAS file doesn't matches with the UWI of wells in the OpendTect project, then **"Unknown"** will be the name of tab. User can import the LAS file in the desired Well by selecting wells in the dropdown.

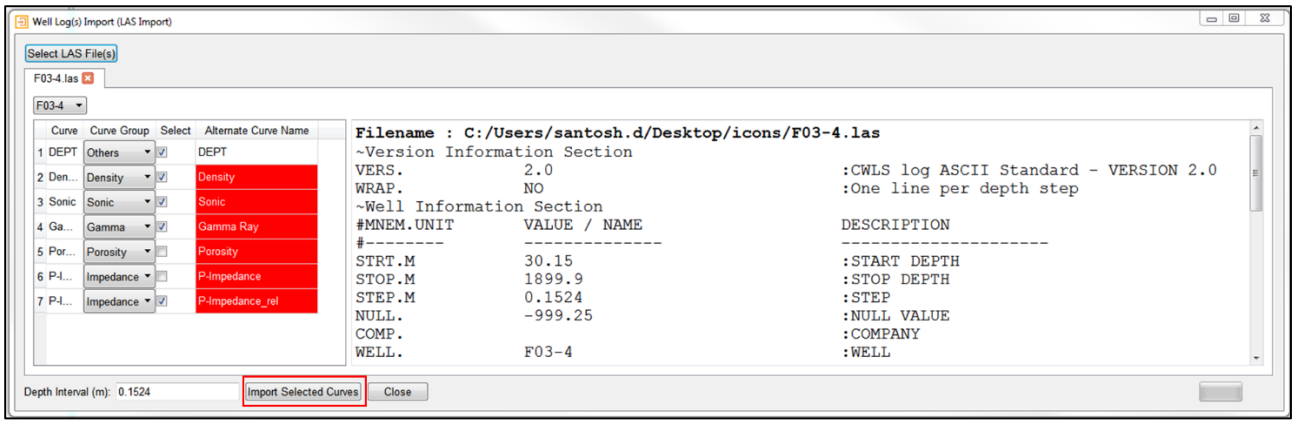


Figure 3.2: Log Curve Selection and Import Window.

Step 4: Multi-Las Import: User can also import numbers of LAS file together by clicking Select LAS File(s) and selecting number of LAS files required for import. User can also select the logs to be imported from each LAS file and the target well by clicking **Import Selected Curves**.

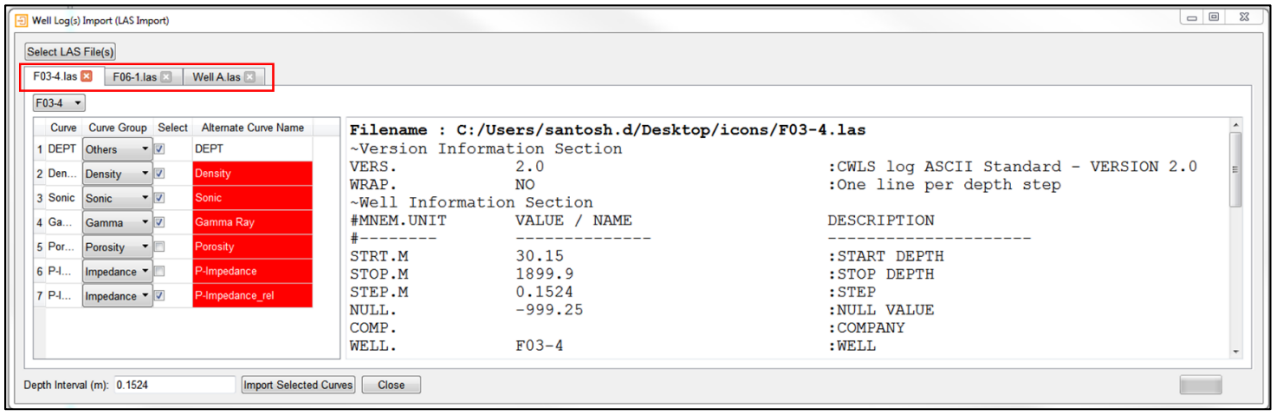


Figure 3.3: Multi LAS Import Window.

3.2 WELL DATA MANAGER

Default it will load existing well data (logs and markers) from Opendtect survey and displayed in respective **"Well Data Manager"** sub-tab.

3.2.1 LOG(S)

In this tab, loaded Well log(s) will be displayed. User can update or set the group of log and also set the default log for that group as shown in figure 3.4.

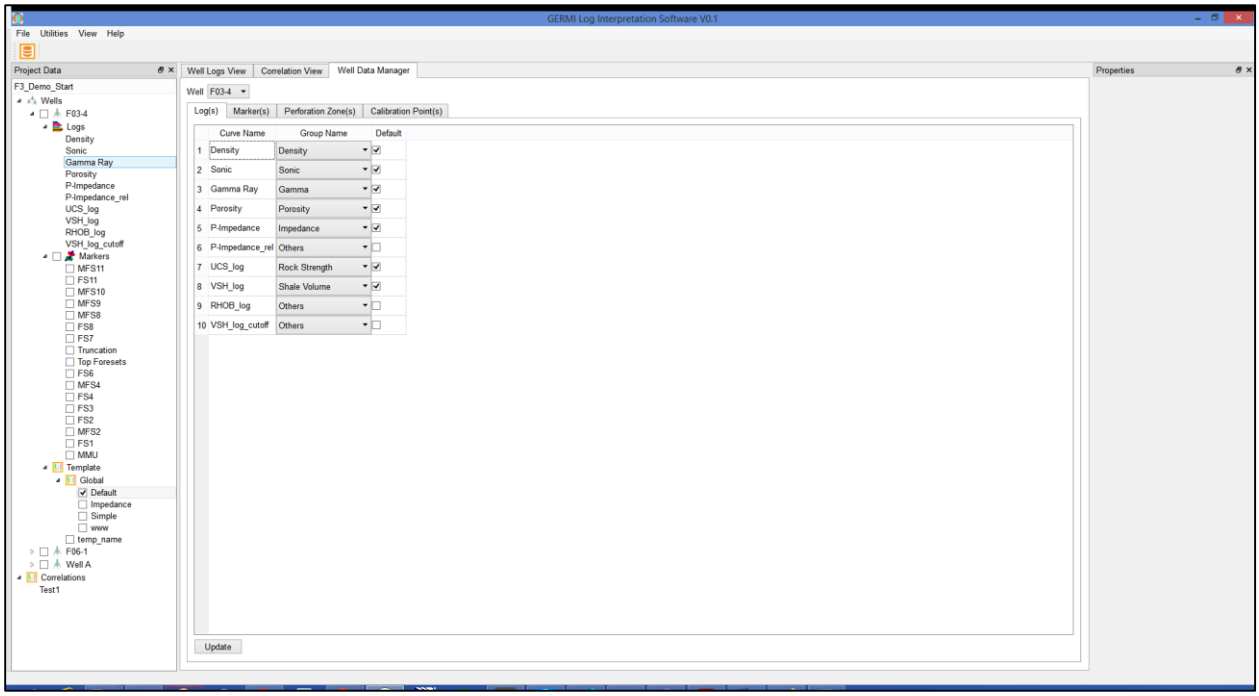


Figure 3.4 "Log(s)" tab.

3.2.2 MARKER(S)

In this tab, loaded Well Marker(s) will be displayed. User can change or update name, depth and color of marker. User can also load new markers from ASCII file using **"ASCII File"** option.

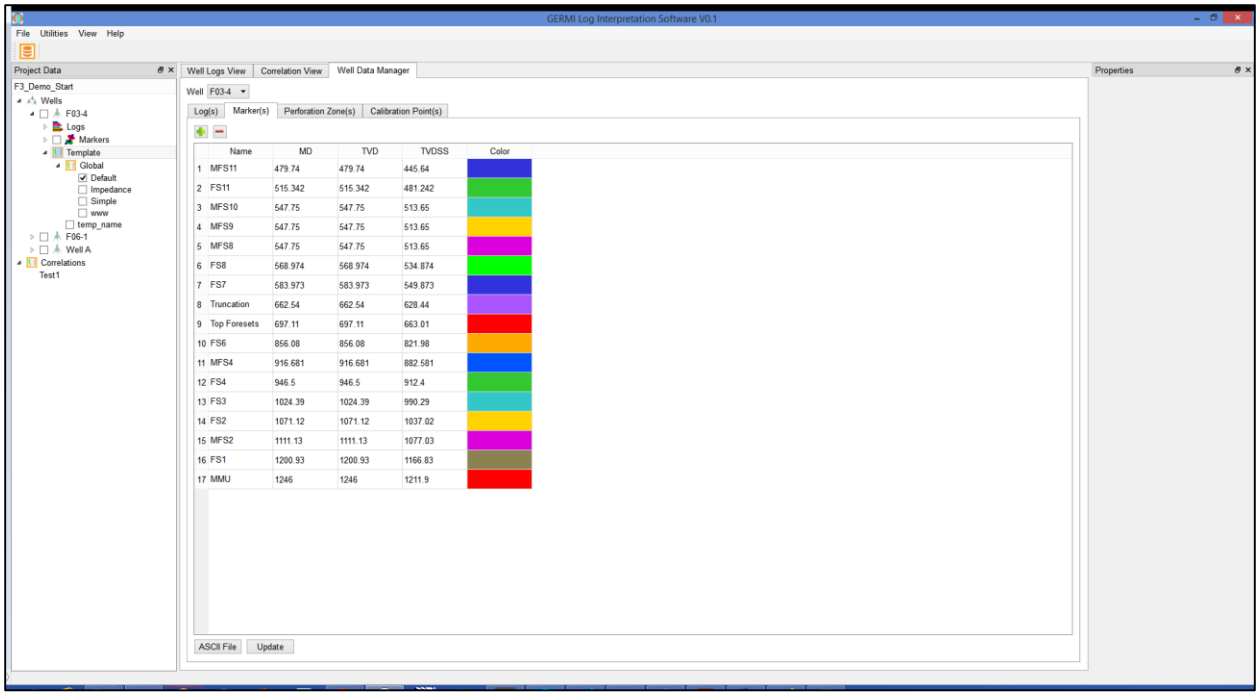


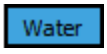
Figure 3.5 "Marker(s)" tab.

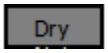
3.2.3 PERFORATION ZONE(S)

In this tab, user can view Well Perforation(s) data as shown in figure 3.6. User can add or remove Perforation data and set or update zone start and end depth as well as type of zone i.e.:

a) Oil 

b) Gas 

c) Water 

d) Dry 

e) Not-Tested 

f) Oil-Gas 

g) Oil-Water 

h) Gas-Water 

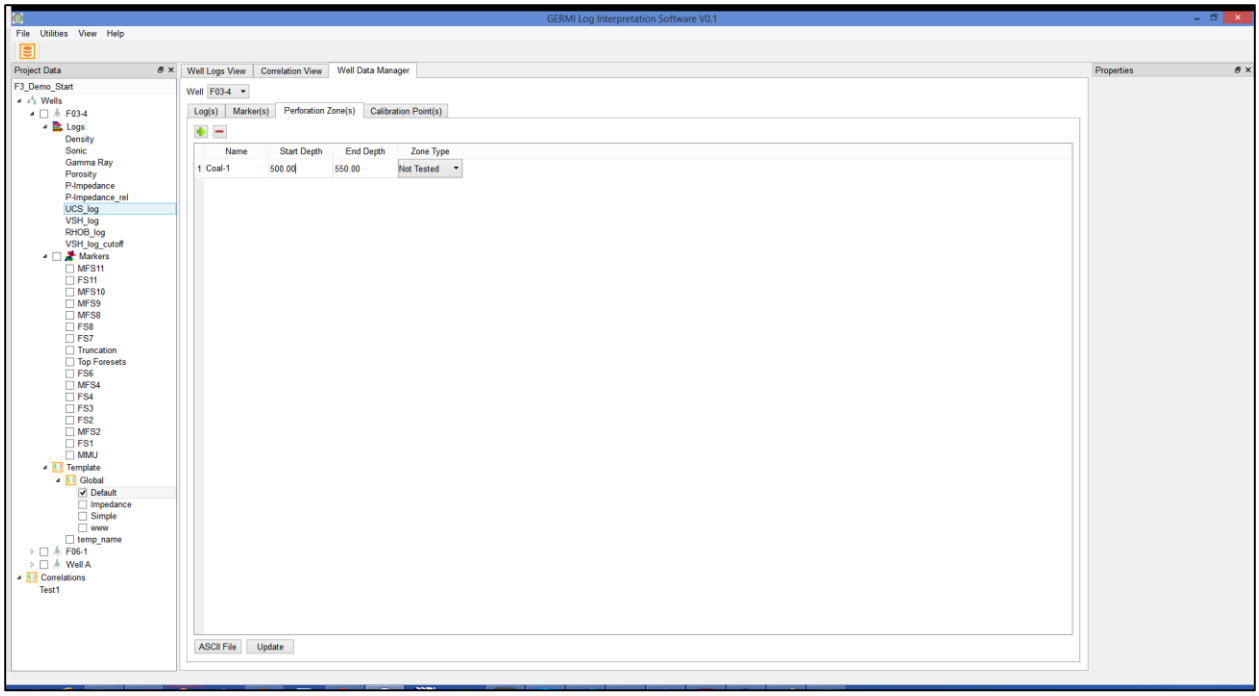


Figure 3.6 “Perforation Zone(s)” tab.

3.2.4 CALIBRATION POINT(S)

In this tab, user can view Calibration point(s) as shown in figure 3.7. User can add or remove calibration points for each group and also import from ASCII file using “ASCII File” option.

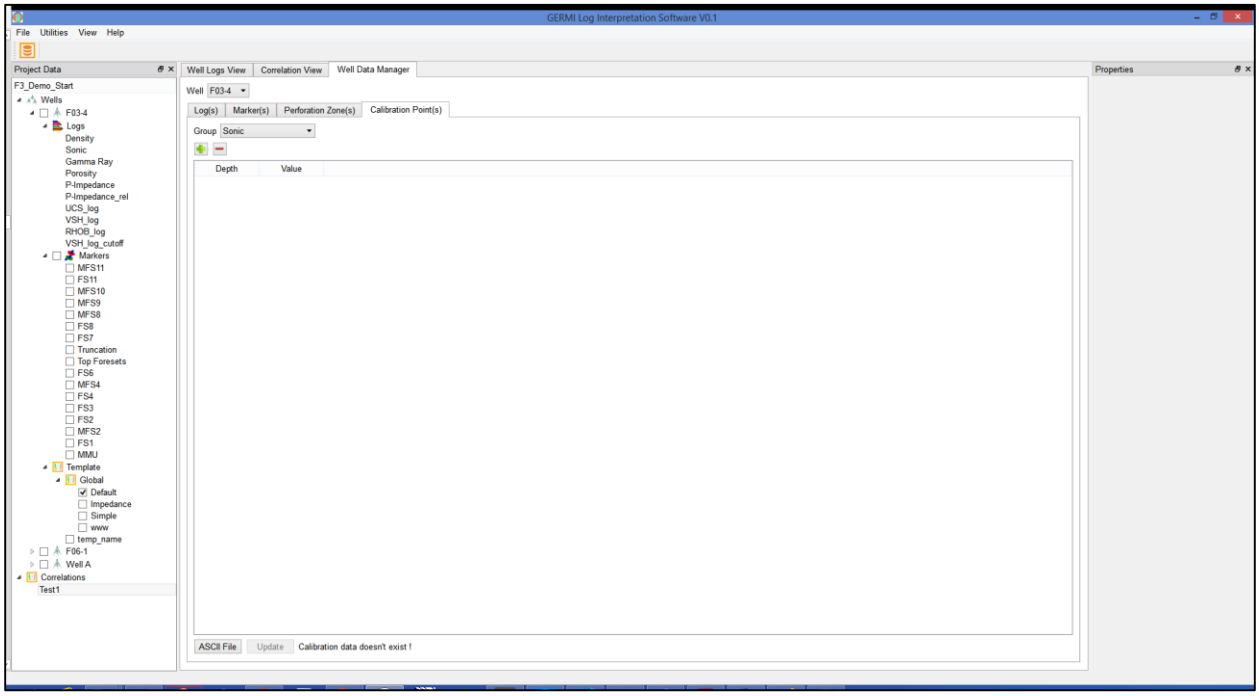


Figure 3.7 “Calibration Point(s)” tab.

3.3 WELL LOGS EXPORT (LAS FORMAT)

User can export the well logs from survey in LAS format. User can also export logs from multiple well in each separate LAS file.

To export well logs, follow the following steps:

Step 1: Go to **"File->Export Well logs"** option. It will open the dialog as shown in figure 3.8.

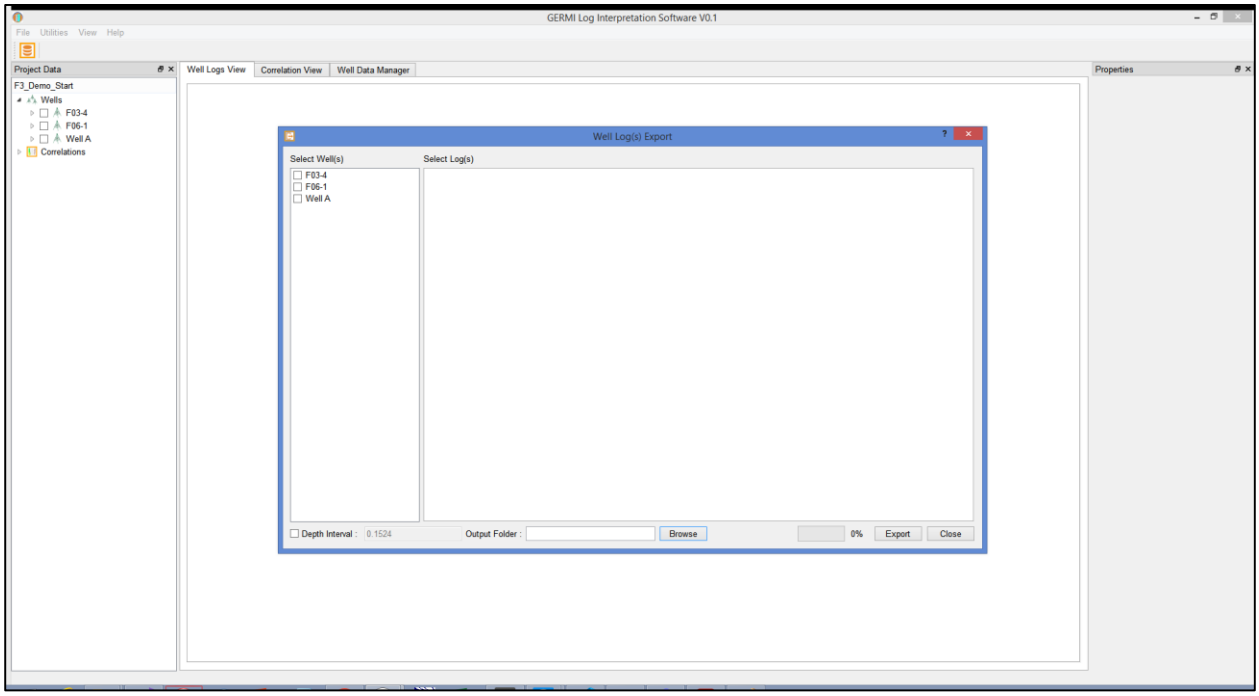


Figure 3.8 "Well log(s) Export" dialog.

Step 2: Now select well and then select the logs and then set output folder and then click on **"Export"** button to export the logs as shown in figure 3.9. User can also set depth interval, default it will be 0.1524 m.

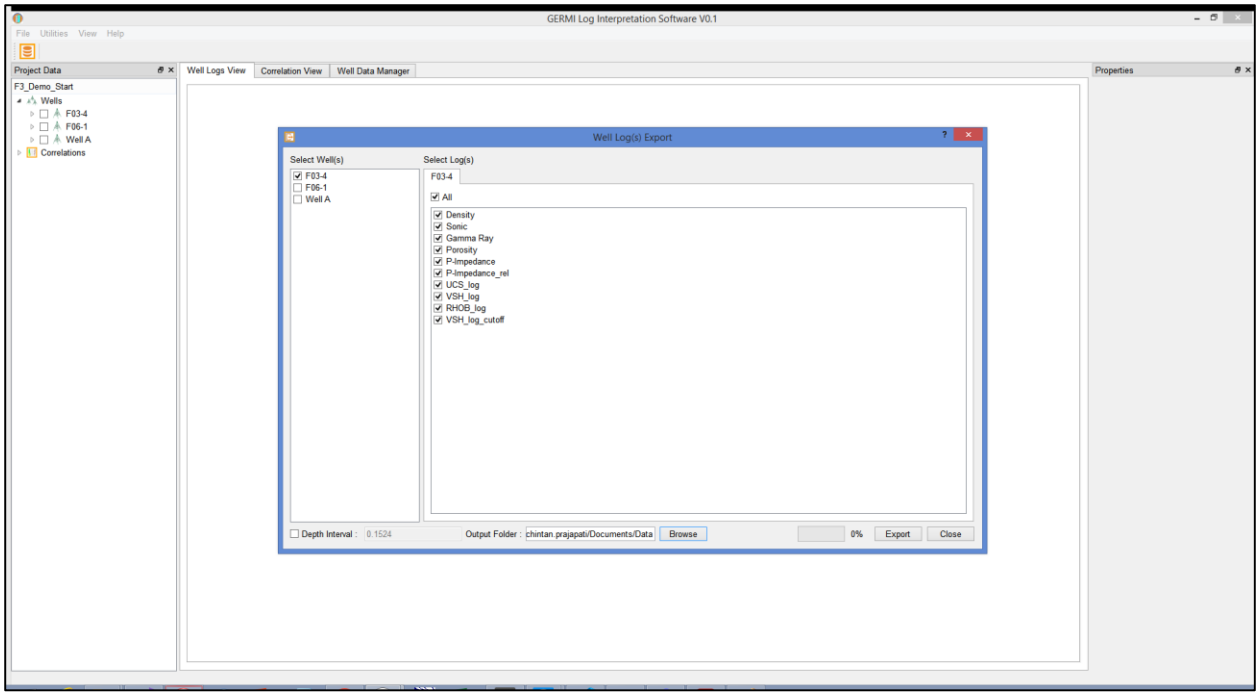


Figure 3.8 “Well log(s) Export” dialog.

4. Template

4.1 DEFINE TEMPLATE

A **Default** template is provided for reference along-with other standard log plotting templates. User can define numbers of templates with different scales and parameters as per requirement.

New well templates for display can be defines by following steps:

Step 1: Right click on **"Template"** from that Well on project data tree and then click on **"Create New Template"** as show in figure 4.1.

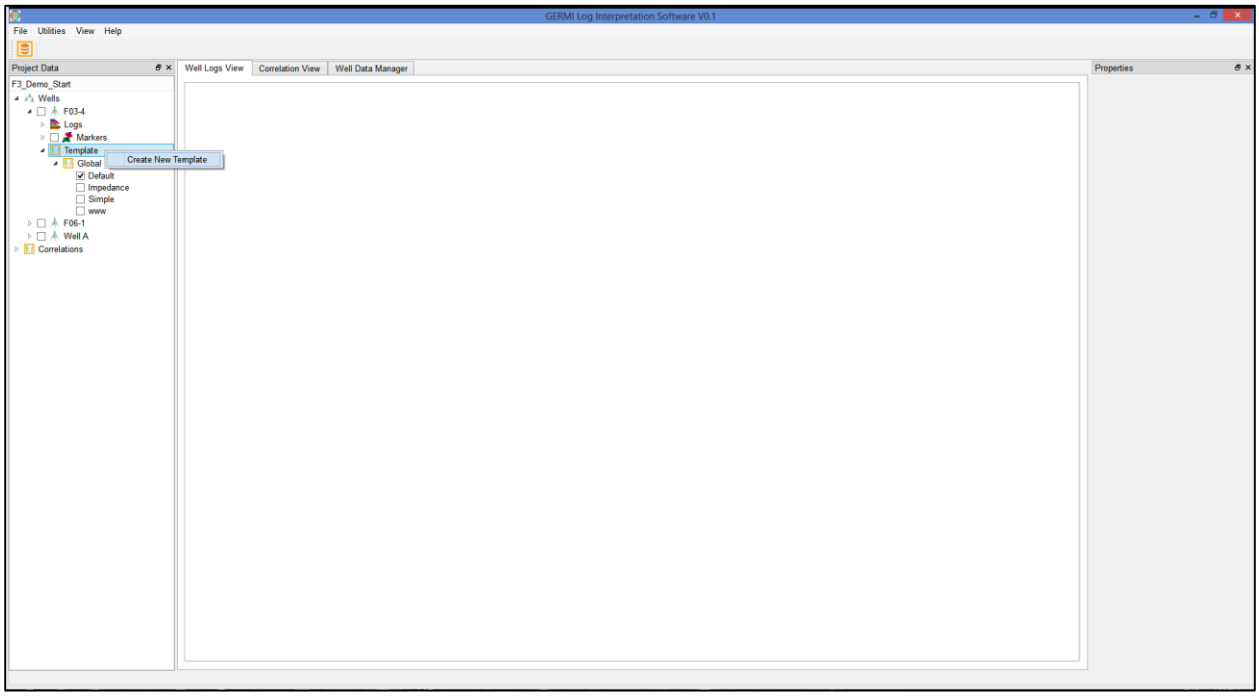


Figure 4.1 "Create New Template" option from project data tree.

Step 2: It will open the **"Define Display Template"** window as shown in figure 4.2. By default, 1st track will be added in template.

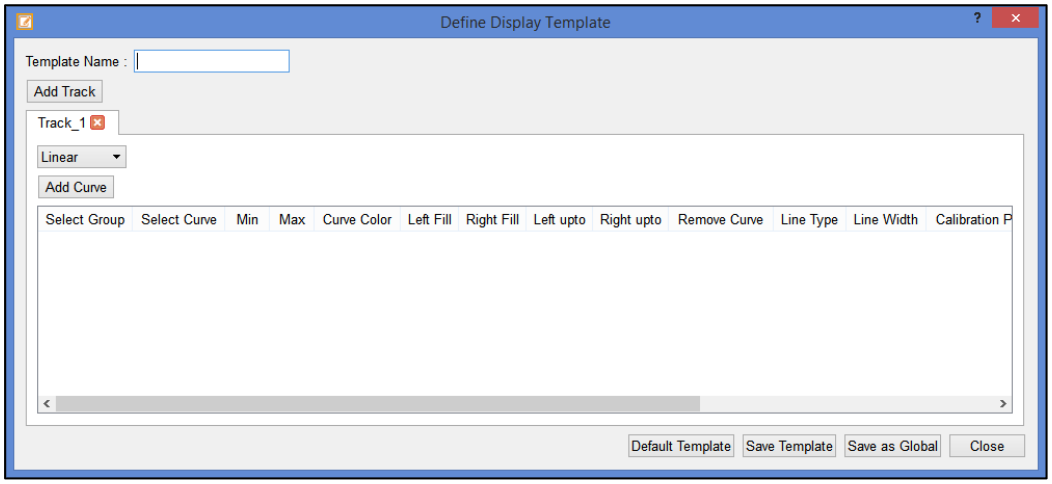


Figure 4.2 "Define Display Template" window.

Step 3: Now set the template name in **"Template Name"** text edit and then select the type of track i.e. Linear, Logarithmic and Depth. After that click on **"Add Curve"** button to add the curve in that track. It will add the curve in table with curve parameters as shown in figure 4.3.

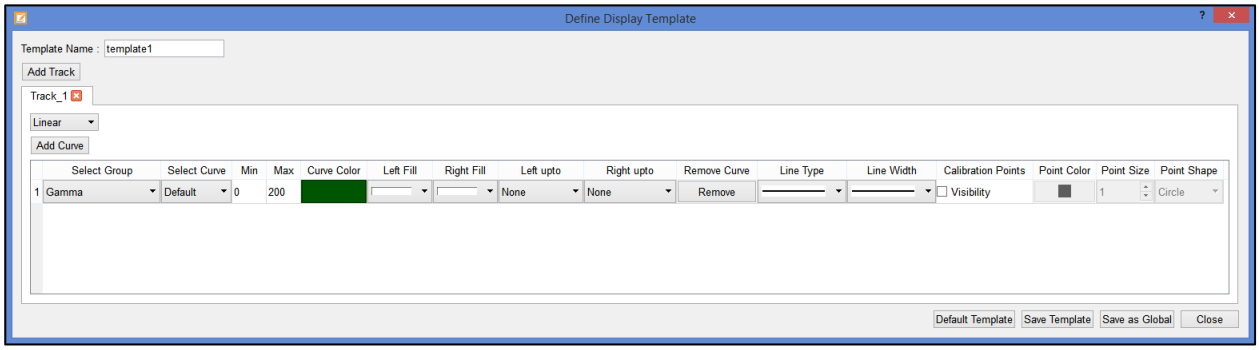


Figure 4.3 Curve with parameters.

Step 4: User will allow to add multiple curve and multiple track in template.

Step 5: Curve parameters and options for display are:

1) **Group**: User has to select the group of the curve from **None** option which wants to display. The group comprises of Sonic, Resistivity, Gamma, Caliper, SP, Porosity, Density, Impedance, Shale Volume, Effective Porosity, Water Saturation, Shear Modulus, Lame's Modulus, Poisons Ratio, Young's Modulus, Overburden Pressure, Pore Pressure, Horizontal Stress, Rock Strength and Other (if the curve is not either from the mention group).
2) **Curve**: By default, the **"Default"** curve is selected for that group but user can select which want to display.

3) **Curve Min and Max**: User can set curve minimum and maximum value.
4) **Curve Color**: User can set the curve color.
5) **Left Fill**: User can set fill color for left side of curve.
6) **Right Fill**: User can set fill color for right side of curve.
7) **Left upto**: User can set upto where to fill the left color in left side of curve.
8) **Right upto**: User can set upto where to fill the right color in right side of curve.
9) **Remove Curve:** User can remove the added curve.
10) **Line Type:** User can set the Line style like solid, dot, dash-dot etc.
11) **Line Width:** User can set line width.
12) **Calibration Points:** User can set calibration points overlay flag to display the calibration points on that track.
13) **Point Color:** User can set calibration points color.
14) **Point Size:** User can set calibration point size.
15) **Point Shape:** User can set calibration point shape like circle and rectangle.

Step 6: After that user can save this template as Global template or Well template. If user save as Global template, then this template will be used and access by all the loaded Wells and if user save this template as Well template then this will be used by only that Well.

4.2 EDIT TEMPLATE

User can edit any existing template based on their requirement by right click on template from project data tree and then clicking on “Edit” button as shown in figure 4.4.

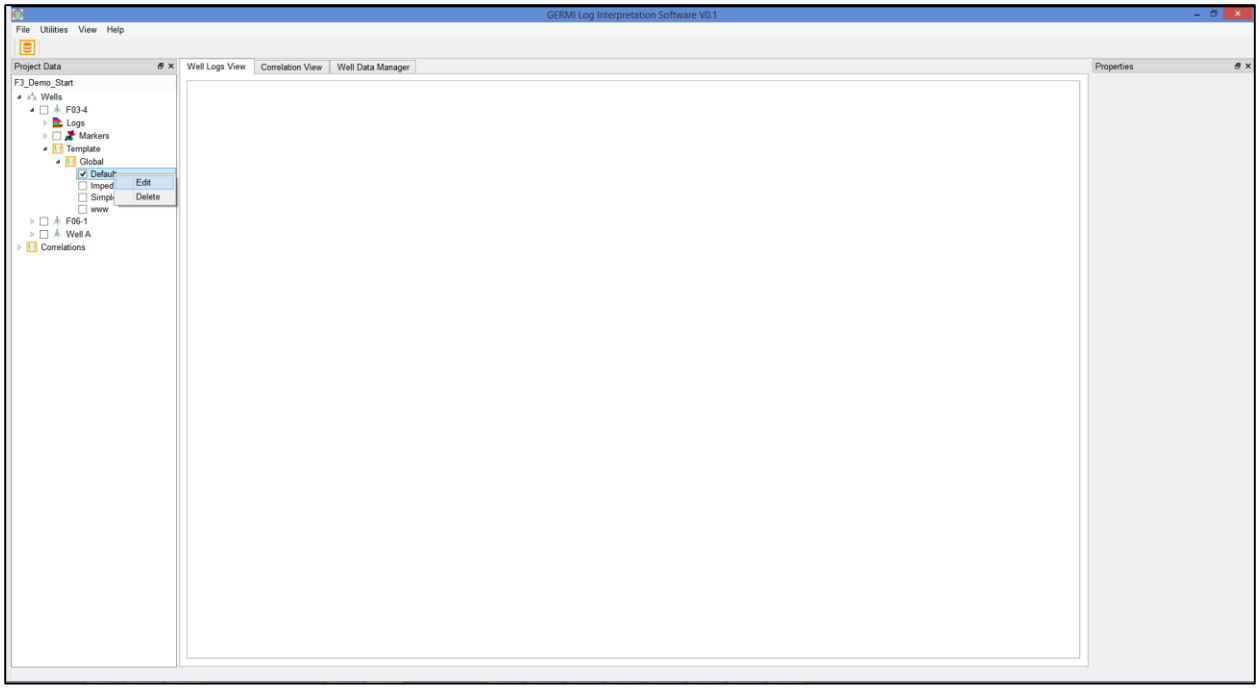


Figure 4.4 Template “Edit” option from project data tree.

It will open the **“Edit Display Template”** window as shown in figure 4.5. Here user can edit existing template and save the template again. If it is well template, then user can save this template as Global.

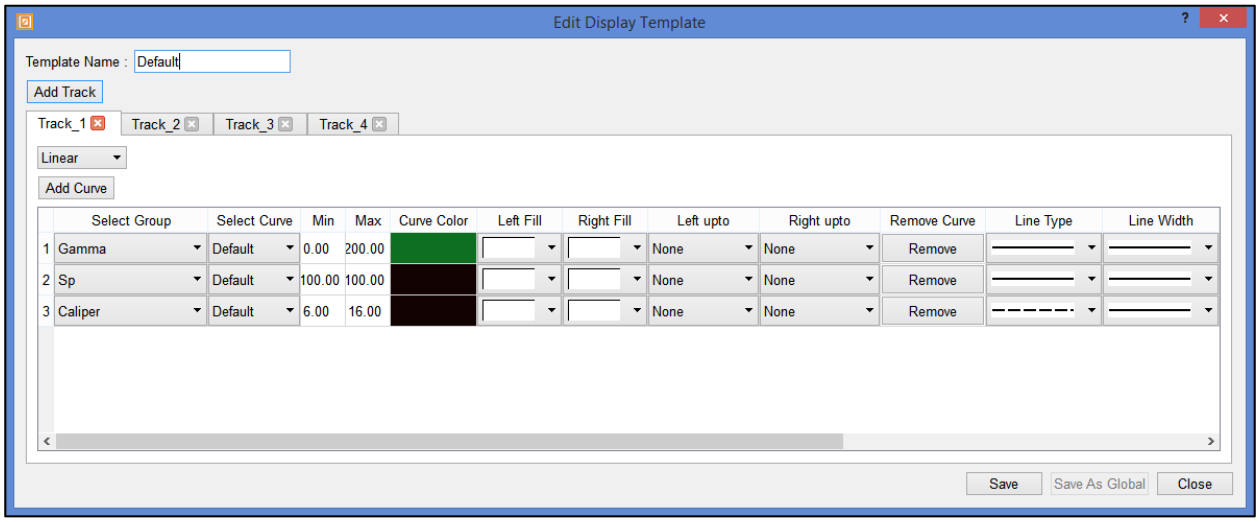


Figure 4.5 “Edit Display Template” window.

5. Well log Interpretation

5.1 WELL LOGS VIEW

User can view the well log display based on selected template as shown in figure 5.1. User need to check the Well item in project data tree. In project data tree, under the Well item there is Template item in this item user can select the template for display the Well logs. For Well Markers, user need to check Marker item under that Well item. User can check/uncheck the particular marker to display in Well logs view.

Figure 5.1 "Well Logs View" tab window.

User can view multiple Well logs view in different sub tab window in the "Well Logs View" tab window.

5.2 WELL CORRELATION VIEW

5.2.1 CREATE NEW WELL CORRELATION

To create new Well Correlation, follow the following steps:

Step 1: Right click on **"Correlations"** item in project data tree then click on **"Add Correlation"** as shown in figure 5.2.

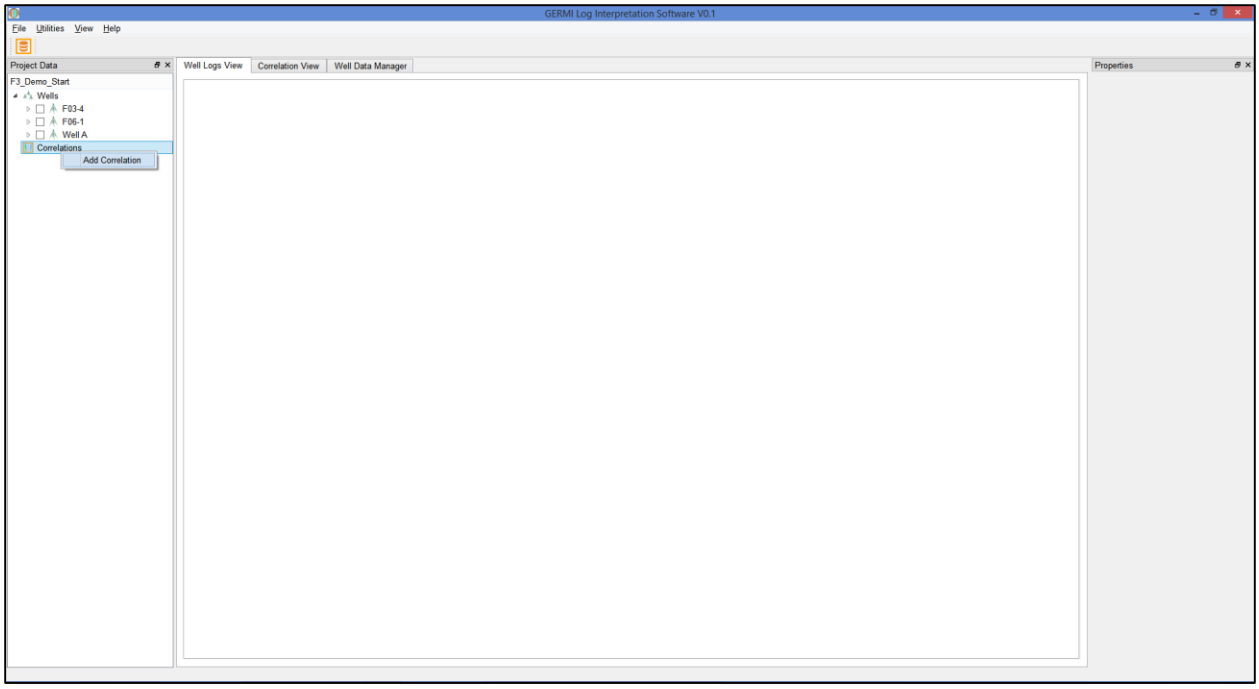


Figure 5.2 "Add Correlation" option to create new Well Correlation.

Step 2: It will open the Well Correlation Display template window as shown in figure 5.3.

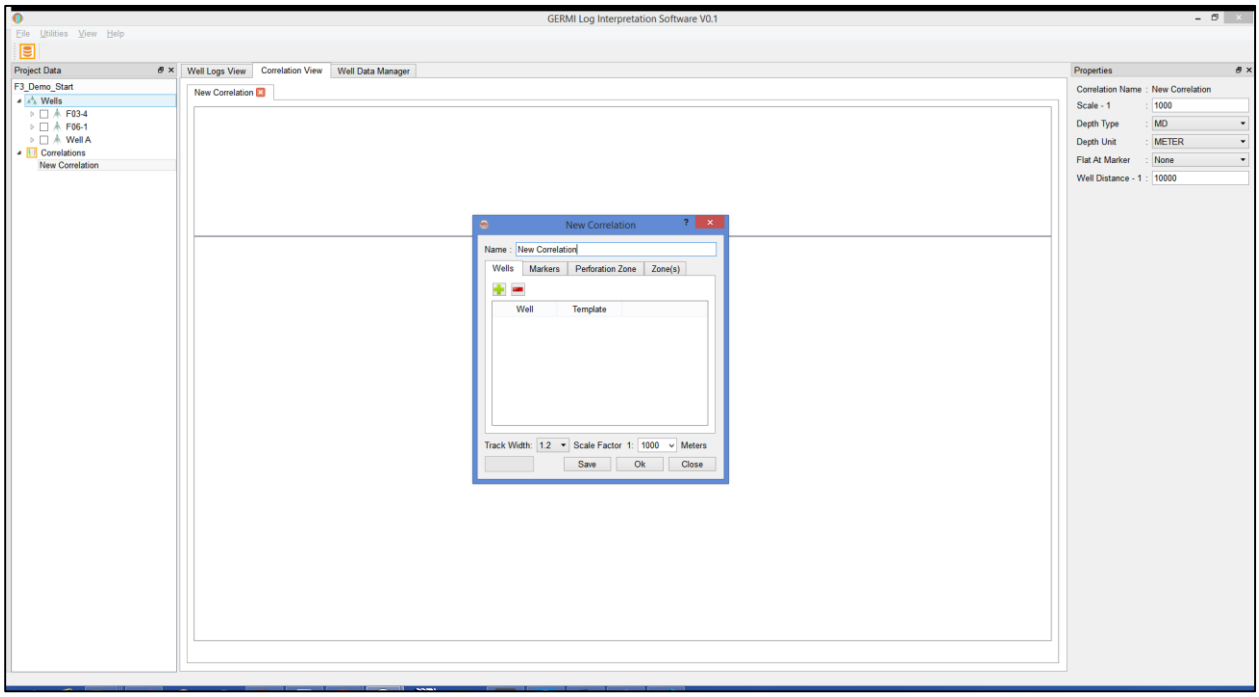


Figure 5.3 Well Correlation Display template window.

Step 3: Set the Correlation name in **"Name"** edit and then click on **"save"** button to save the Correlation template with that name as shown in figure 5.4.

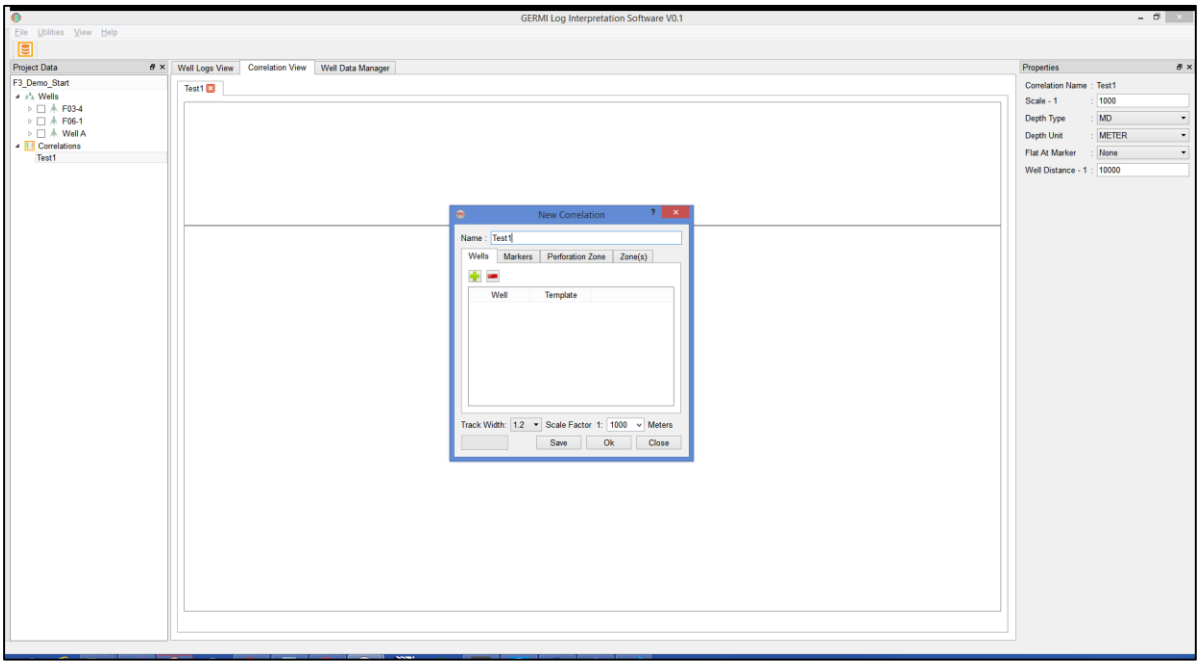


Figure 5.4 Set the Well Correlation Display template name.

Step 4: Click on plus button to add the multiple Well. For each well user can select different template or same global template for logs display as shown in figure 5.5.

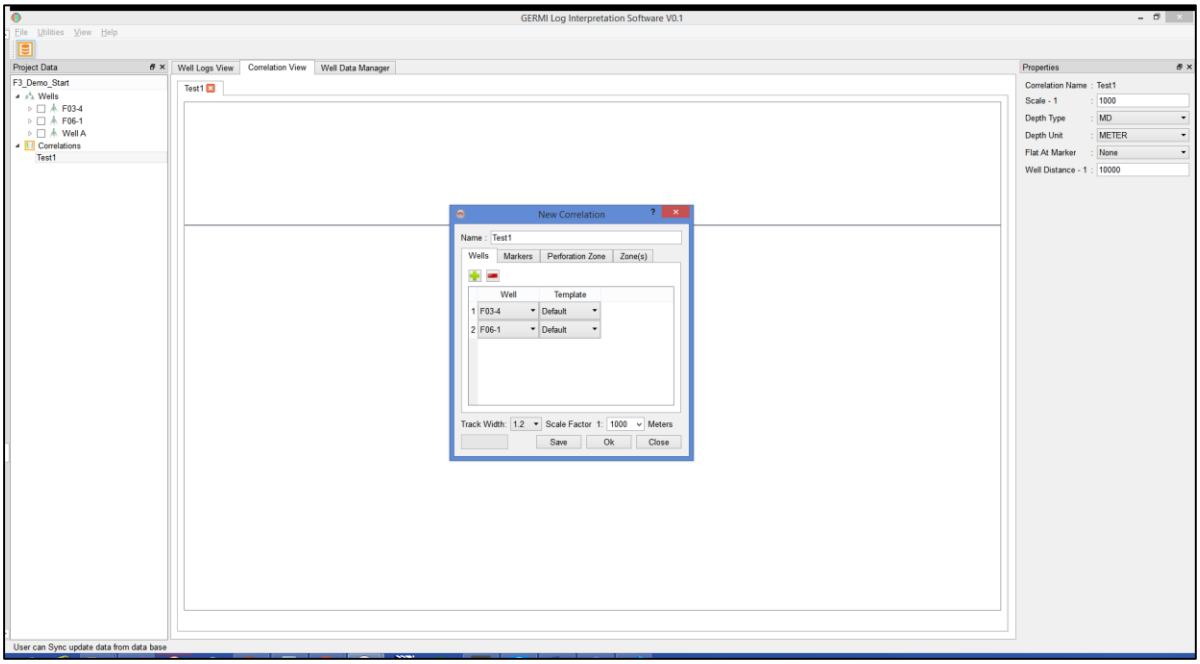


Figure 5.5 Wells tab in correlation template.

Step 5: Check/Uncheck the Well Markers in “Markers” tab in correlation template window to plot the markers in correlation view as shown in figure 5.6.

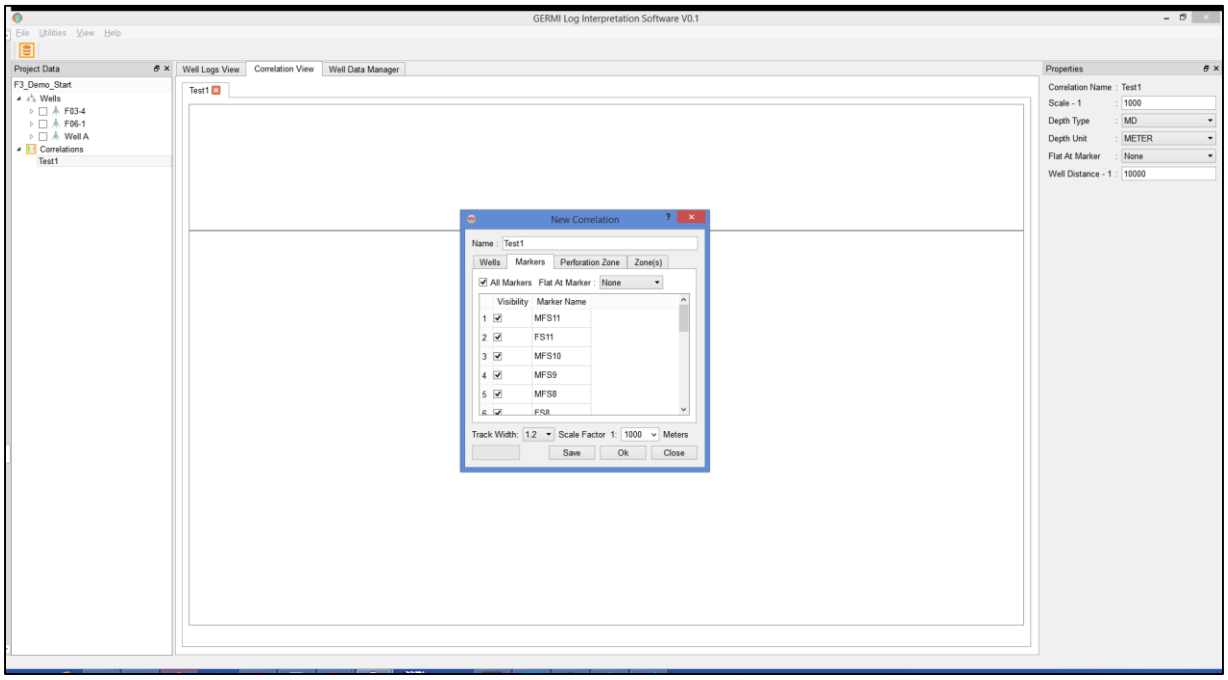


Figure 5.6 Wells tab in correlation template.

Step 6: After that click on “Ok” button to display the Well correlation as shown in figure 5.7.

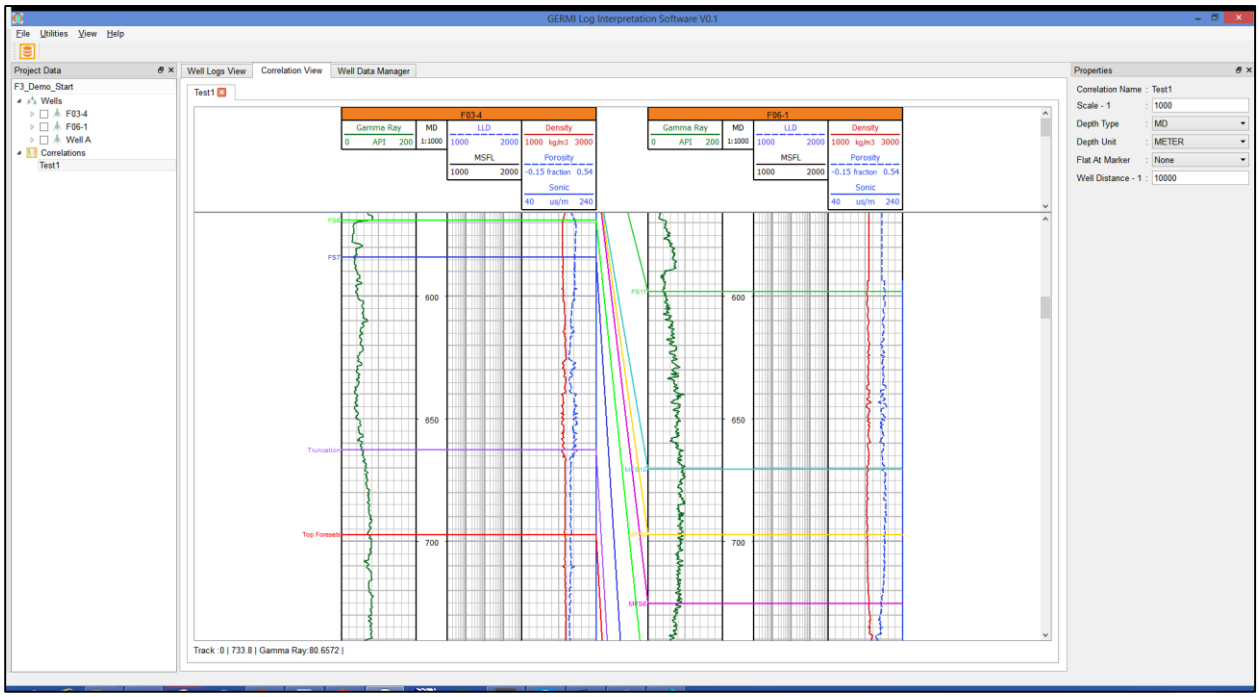


Figure 5.7 Wells Correlation view.

Step 6: After that click on “Save” button to save the correlation template.

Step 7: User can open the correlation template edit window using right click on correlation view and then click on **“Correlation Template”** as shown in figure 5.8.

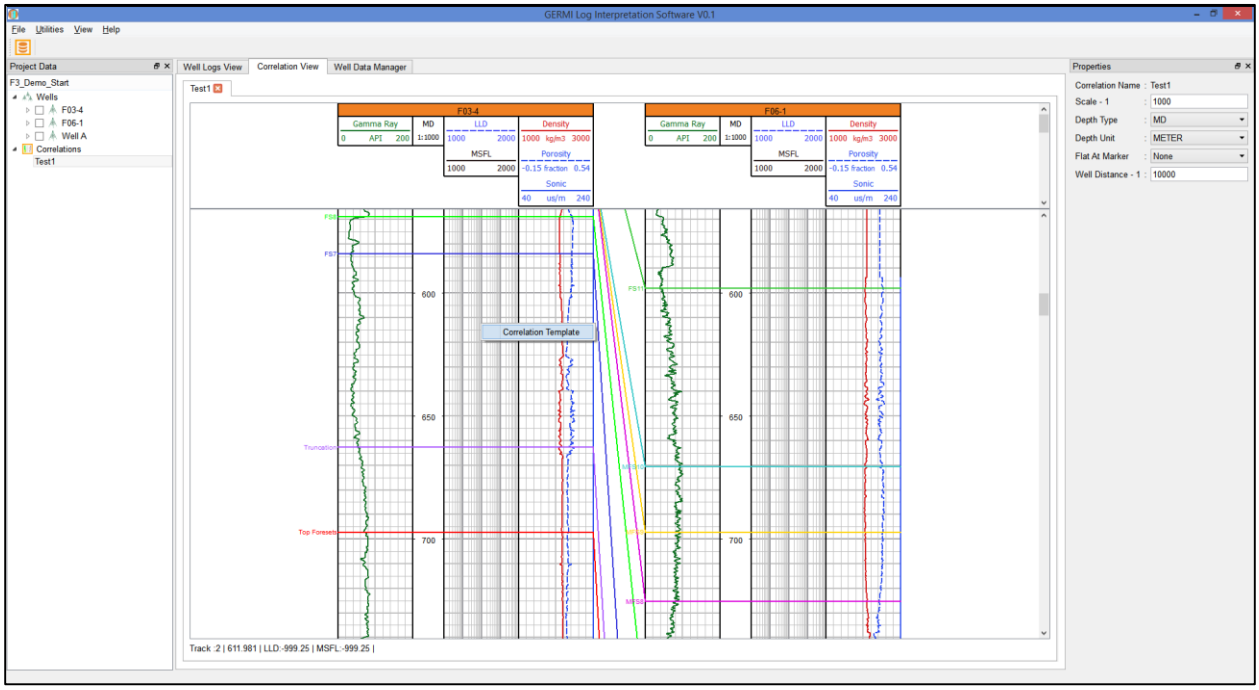


Figure 5.8 “Correlation Template” option in Correlation view.

Step 8: User can set the “Perforation Zone” flag check to display the Test zone of each well as shown in figure 5.9.

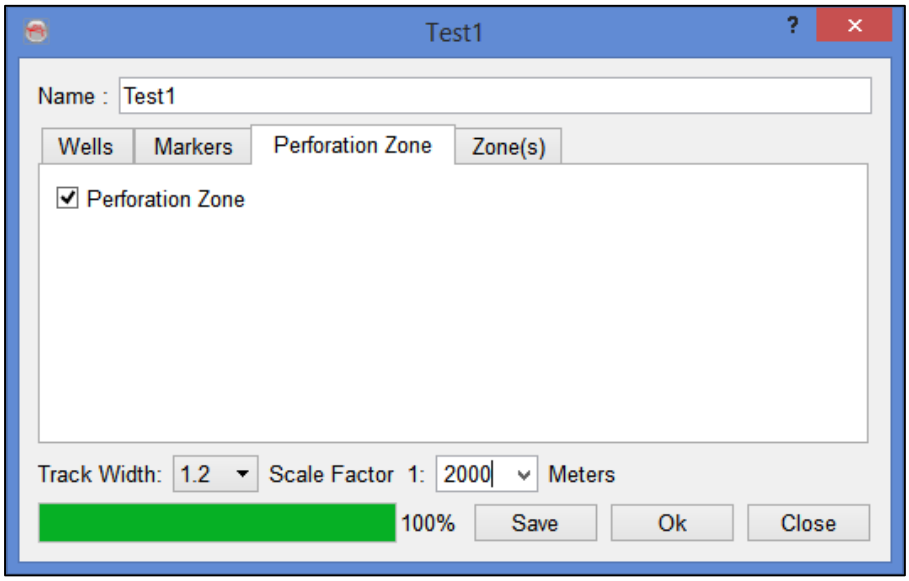


Figure 5.9 “Perforation Zone” option in Correlation view.

Step 9: User can also add Zone with Zone color in correlation view as shown in figure 5.10.

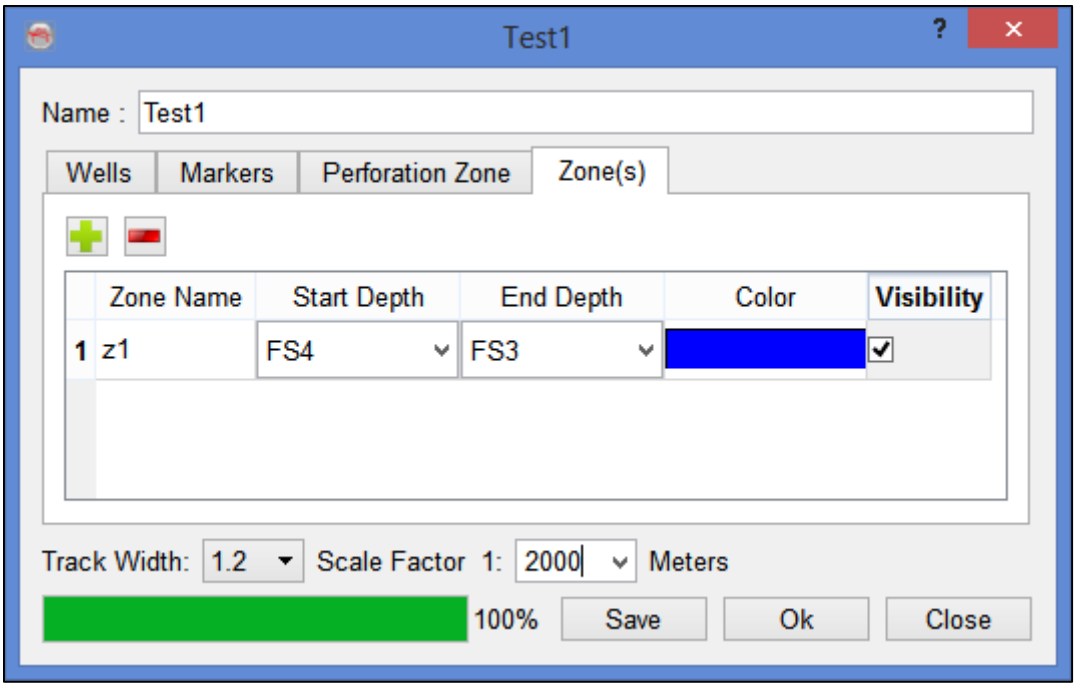


Figure 5.10 "Zone(s)" option in Correlation view.

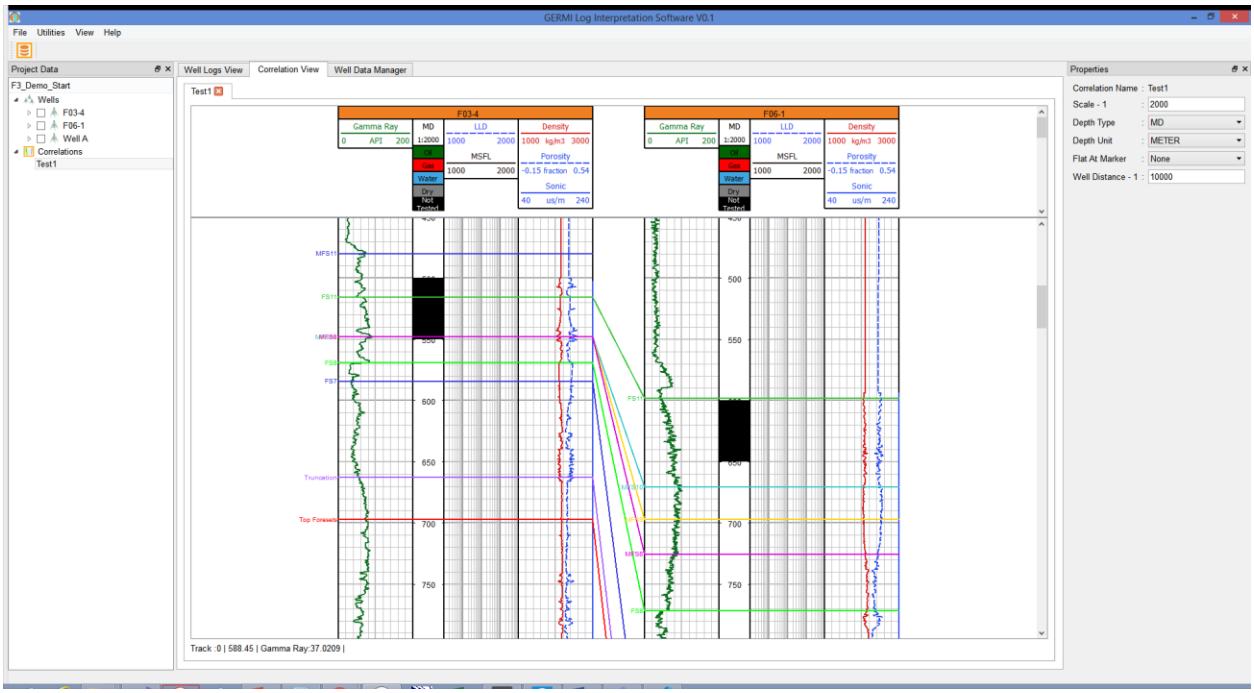


Figure 5.11 Test Zones in Correlation display.

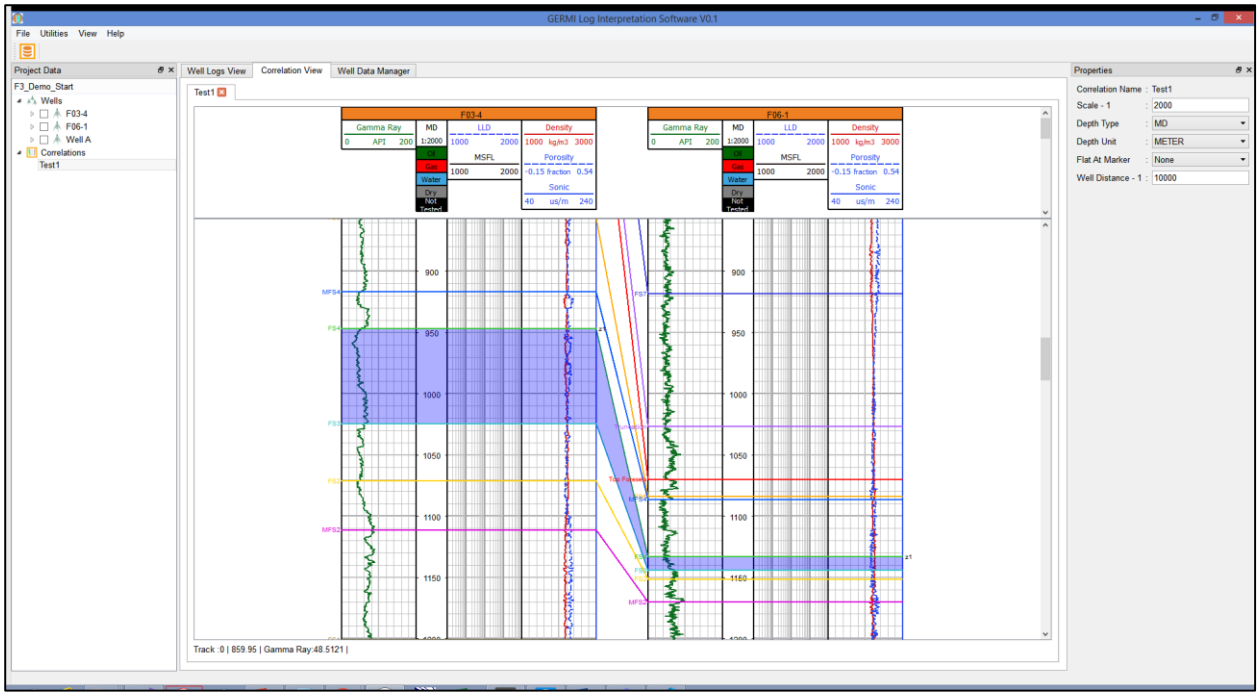


Figure 5.12 Zones in Correlation display.

To open the existing correlation, user need to double click on Correlation name under "Correlations" item in project data tree.