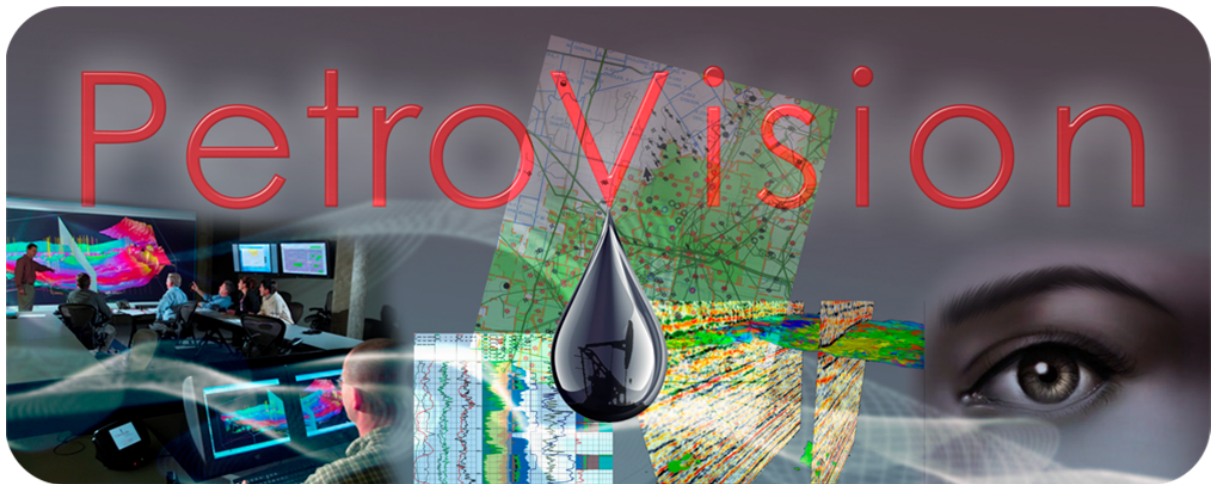


# Log Viewer



## *User Guide*

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## Introduction

The *Log Viewer* application for *PetroVision* is an auxiliary utility for visual interpretation of the results of geophysical surveys carried out throughout the entire life cycle of a well. The data is presented in the form of documents of the following types:

1. Log ASCII Standard (*.las* format, case insensitive)
  - 1.1. Version 1.2 [<sup>1</sup>]
  - 1.2. Version 2.0 [<sup>2</sup>]
  - 1.3. Version 3.0 [<sup>3</sup>]
2. Log Interchange Standard (*.lis* format, case insensitive) [<sup>4</sup>]
3. Digital Log Interchange Standard (*.dlis* format, case insensitive) [<sup>5</sup>]
4. Wellsite Information Transfer Standard Markup Language (*.witsml* format, case insensitive)[<sup>6</sup>]
5. *ZAK* and its subtypes *g*, *m*, *i*, *ir*, *in* etc. (Interlayer information etc., *.zak* format, case insensitive)
6. *ZAK* and its subtypes *h*, *gp* (Perforation and lithology information respectively, *.zak* format, case insensitive)

The application allows not only to display a visual interpretation of the results of geophysical surveys, but also helps to customize their display according to the needs of the user.

There are various settings to make visualization, data organization and analysis convenient. There is also a possibility to save schemes for later use.

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<sup>1</sup> [https://www.cwls.org/wp-content/uploads/2014/09/LAS12\\_Standards.txt](https://www.cwls.org/wp-content/uploads/2014/09/LAS12_Standards.txt)

<sup>2</sup> [https://www.cwls.org/wp-content/uploads/2017/02/Las2\\_Update\\_Feb2017.pdf](https://www.cwls.org/wp-content/uploads/2017/02/Las2_Update_Feb2017.pdf)

<sup>3</sup> [https://www.cwls.org/wp-content/uploads/2014/09/LAS\\_3\\_File\\_Structure.pdf](https://www.cwls.org/wp-content/uploads/2014/09/LAS_3_File_Structure.pdf)

<sup>4</sup> <http://w3.energistics.org/LIS/lis-79.pdf>

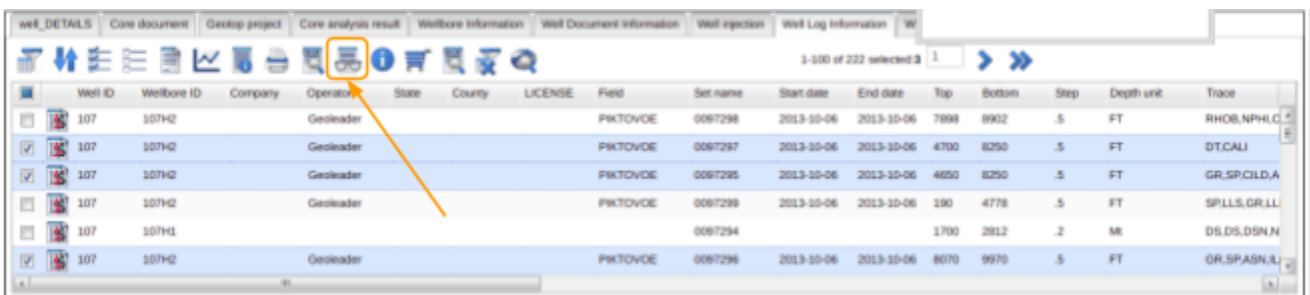
<sup>5</sup> <http://w3.energistics.org/rp66/v1/Toc/main.html>

<sup>6</sup> [http://w3.energistics.org/schema/witsml\\_v1.4.0\\_data/doc/witsml\\_schema\\_overview.html](http://w3.energistics.org/schema/witsml_v1.4.0_data/doc/witsml_schema_overview.html)

## Launching Log Viewer

This application is a utility for viewing documents in the .las, .lis, .dlis, .zak, .witsml format (case insensitive) and is available from *PetroVision* web application.

*LogViewer* is launched automatically by double-clicking on documents of the specified formats or using the View icon:



The application allows to simultaneously open several files of the specified formats.

## Glossary

**Object tree** - list of curves grouped by wells.

**Curve** - well log information collected through geophysical surveys.

**Link, linking** - manual or automatic setting of links between markers of different tablets.

**Locator** - a tool that displays data on the depth and values of curves belonging to the track on which the cursor is currently positioned.

**Marker** - a tool for visual cutting off the boundaries of geological objects in wells. It should be set manually.

**Tablet** - data display area, consisting of a set of tracks and belonging to one borehole / well. It includes a set of tracks, a curve header area and a scrollbar component.

**Track** - rendering area for one or more curves.

## Functionality

The functionality of the *LogViewer* application includes several blocks:

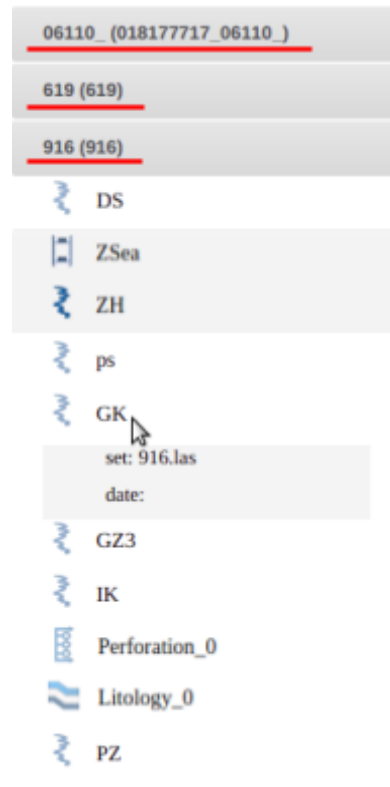
- Control panel
- Object tree. Contains curve headers grouped by wells
- View area
  - ◆ Linking area (the space between adjacent tablets. To edit it, see "Working with tablets").
  - ◆ Tablets
    - Curve header area
    - Curve rendering area
    - Scrollbar component



Below you will find a detailed description of the listed blocks and features of interaction with each of them.





## Object tree

This block provides access to ~~well-log curves grouped by wells~~ different datasets: well log curves, perforation and lithological layers. Data is grouped by wells. If you open several files related to one well, they will appear in one set.



Switching between wells is done by clicking on the header with the well identifier (*UWI*).

Types of data that can be presented in the object tree:

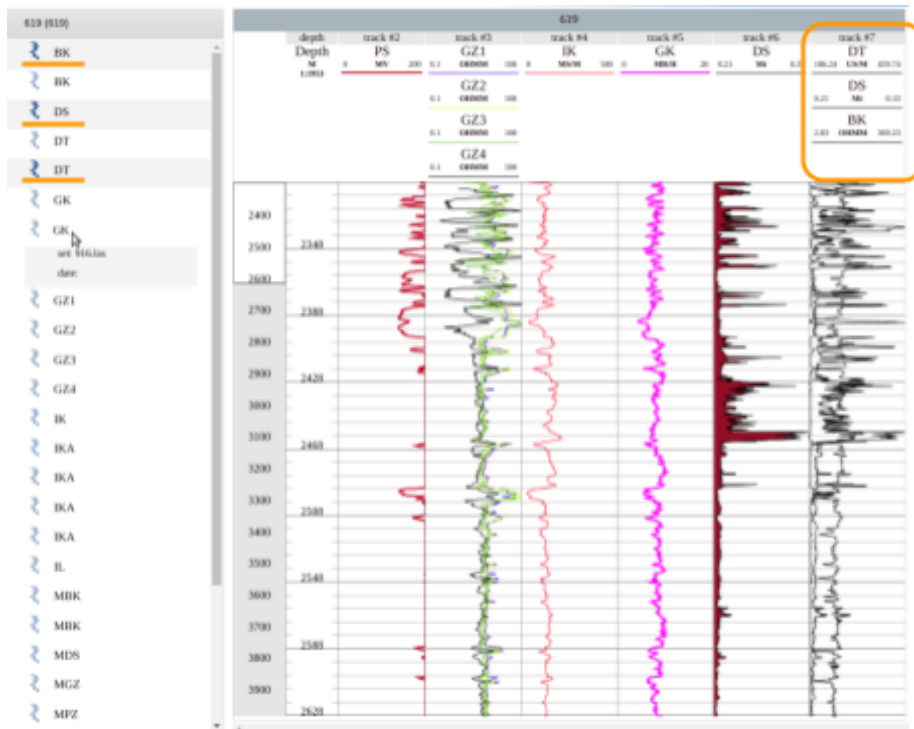
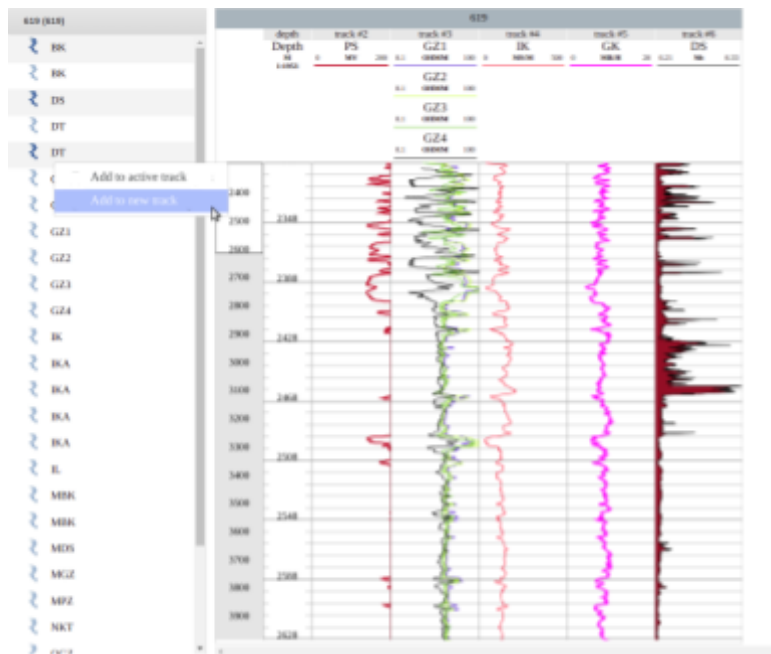
-  Curve - logging data (for details, see "Working with curves" section)
-  Perforation - data on perforation (for details, see "Specialized tracks" section)
-  Layer - data on lithological layers (for more details, see "Specialized tracks" section)
-  Additional depth scale - when added, this scale is tied to a specific track and will be removed along with it (see "Remove selected object" section)

Any dataset can be displayed on the tablet by dragging and dropping (*Drag&Drop*) the curve name onto the desired track of the tablet. You can drag and drop only to the rendering area. It is not necessary to preselect the curve before doing this.

Also, to add a curve from the object tree, you can do the following: select it, right-click and select one of the actions - Add to active track or Add to new track. Depending on the choice, the application will add the selected curve to the previously selected (active) track or create a new track with this curve on the active tablet.



In this block, multiple selection of curves is available using the *Ctrl* and *Shift* hotkeys. To add several curves to a track at once, just right-click on the selected sets and interact in the same way as in the case of a single curve.



## Control panel

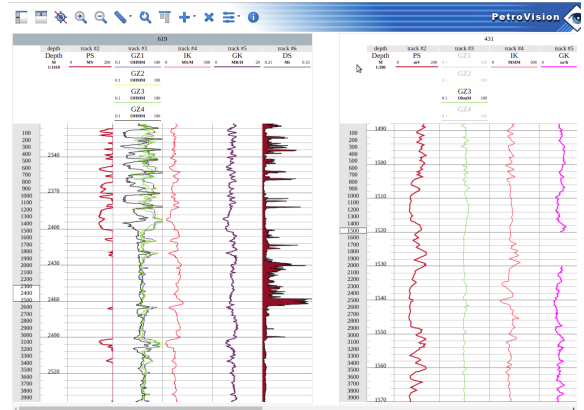
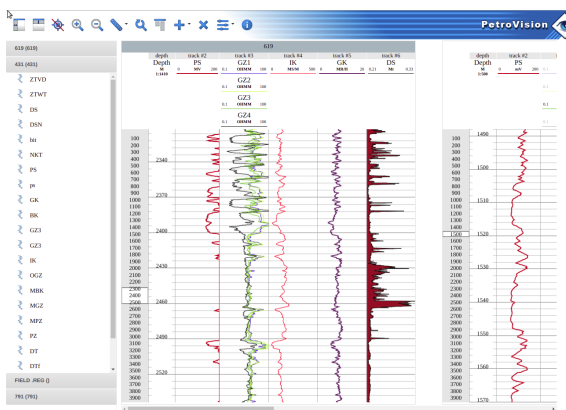
The Control panel is located in the upper left corner of the application. It includes the following buttons:



Hide/show object tree



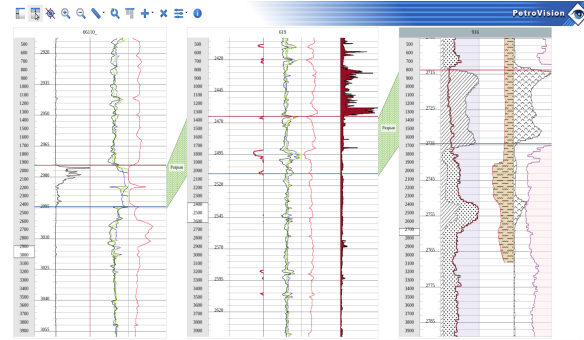
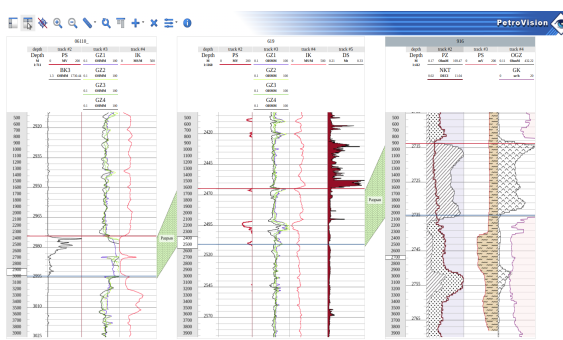
This button hides the object tree;



Hide/show curve header area

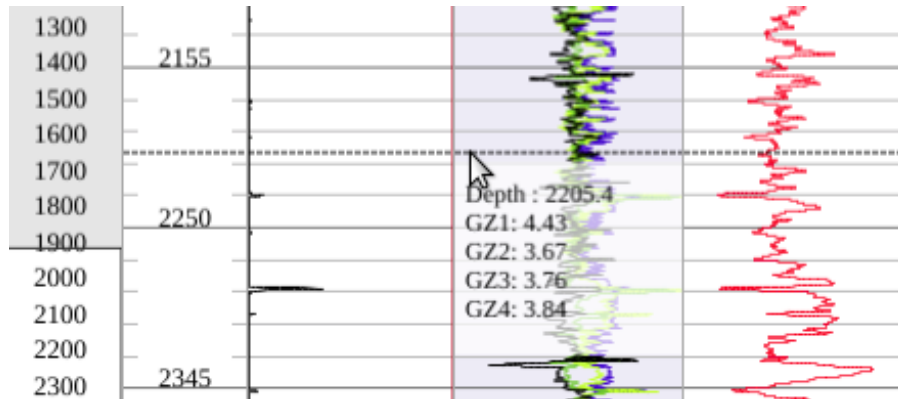


This button hides all curve headers that are displayed in the View area of tablets;



Show/hide locator 

Allows to show or hide data of the “Locator” tool (see Glossary);



Zoom in  and Zoom out 

One-time zoom for each of the tablets (including hidden) for a value of 25% of the current state;

“Scale” dropdown menu 

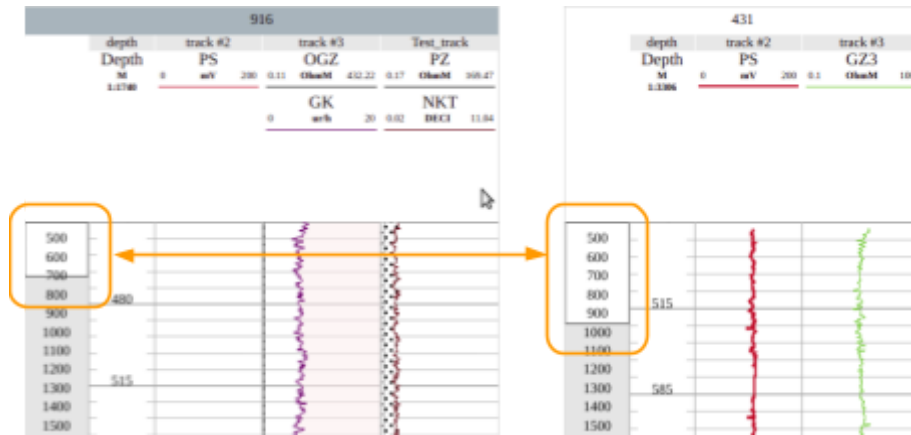
Scale list from 1:10 to 1:100000 inclusive, applied simultaneously to all tablets, including hidden ones;

Reset zoom 

This button returns zoom to a default value for all tablets, including hidden ones. This value depends on the scheme applied to the tablet;




 **Align wells**

Sets the depth value to the starting position for each of the tablets;



 **“Add object to selected manager” dropdown menu**

Provides the ability to add one of three objects:

-  - add new empty tablet
-  - add a track with depth to the current (active) tablet
-  - add an empty track to the current (active) tablet

 **Remove selected object**

Removes the selected object: marker, marker link, curve or track ~~with all curves associated with it~~ of any kind described (see the “Working with tracks” section), with all perforation/lithological layer curves or values associated with it. If there is no selected item, removes the active one.

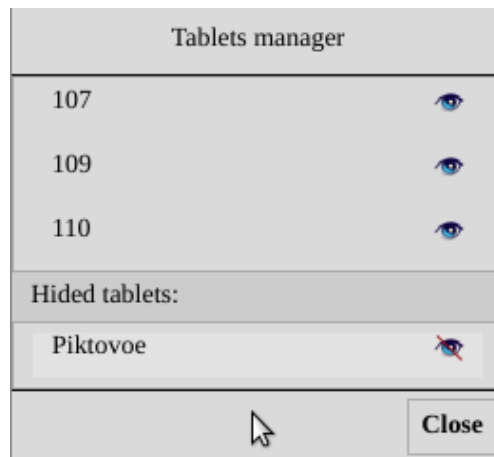
The tablet cannot be removed. If necessary, you can hide it (see "Tablets manager" item).

☐ “Schemes” dropdown menu 

The drop-down menu contains the following items:

Tablets manager

With Tablet manager, you can control the visibility of tablets. The control element is represented by the eye icon.



Schemes manager

The schemes manager allows you to apply the selected scheme to the active (selected) tablet or simultaneously to all existing tablets, including hidden ones.

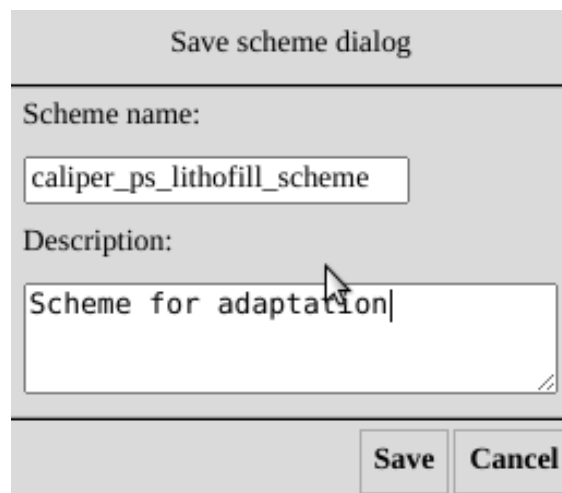


It displays the schemes created by the current user and the administrator (*admin*).

The user can only delete the schemes created by them. Deleted schemes can be restored within one session.

### Save scheme

Saves the scheme for the active (selected) tablet.



Scheme description - tooltip when hovering over a scheme in the "Schemes manager"

When saving, the following parameters are written to the scheme:

- A set of displayed curves (location on tracks, color, fill and all other settings for each curve, including display boundaries)
- All track settings
- All scale settings for the active (selected) tablet

If you add several identical curves to the tablet and try to save the scheme, then when saving and reopening the scheme, only the first occurrence of the curve is rendered, the rest of them become inaccessible (see Fig. 2 in the section "Working with curves").

Markers, their fill and links, as well as other tablet settings are not saved to the scheme.

### Show file header

When you click on this button, the "File's headers" window appears.

It contains all the accompanying information on the file. Depending on the type of opened file, the following sections may be displayed:

- File version
- Well data (location, depth, spacing, etc.)
- Names and parameters of curves

File's headers

---

107\_1.las

```

~Version Information Block
VERS.          2.00:    CWLS LOG ASCII STANDARD - VERSION 2.000000
WRAP.          NO:     One Line Per Depth Step
#
~Well Information Block
#MNEM.UNIT          Data          Information
#-----
STRT.FT            4650.0000:    START DEPTH
STOP.FT            8250.0000:    STOP DEPTH
STEP.FT            0.5000:     STEP
NULL.              -999.2500:    NULL VALUE
COMP.              Geoleader:    COMPANY
WELL.              107:        WELL
FLD .              PIKTOVOE:    FIELD
CONC.              OML 18:    Concession Licence
LONG DMS.          :         Well Surface
Longitude DMS Datum MINNA
LAT_DMS.          :         Well Surface
Latitude DMS Datum MINNA
LONG DD.          :         Well Surface

```

Prev Next Close

When opened multiple times, it is possible to switch to other opened files using the "Prev" and "Next" buttons.

Data from the file's header window can be copied to clipboard.

## View area

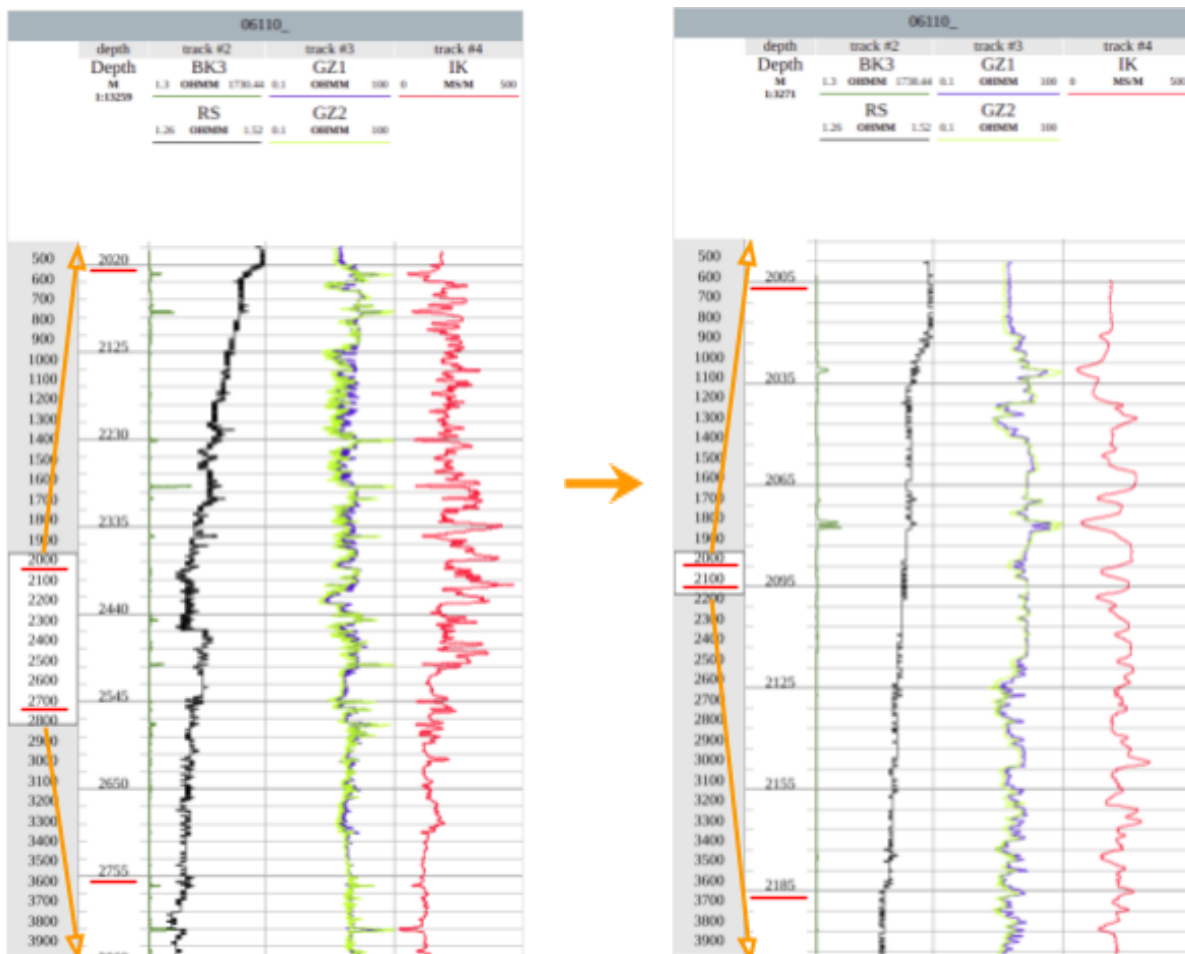
### “Scrollbar” component

This component is responsible for scaling and scrolling the curve rendering area. Its values depend on the edge depth values for the data contained in the document.

When opening several documents, the application calculates the minimum and maximum depth values, taking into account the data for each of the wells, and applies these values to each tablet.

Scrolling is carried out manually by dragging the zoom window - the area that is responsible for the values of the visible area of the curves viewing. It is also possible to scroll on all tablets at once - for this you need to use the mouse wheel.

To change the scale, just click and drag one of the edges of the zoom window. The tablet depth scale adjusts to the values. The grid rendering is also adjusted if the automatic spacing is set in the tablet settings.





## Working with curves

To see the visual interpretation of the log curve, you need to add it to the tablet. To do this, drag it to the desired track using the *Drag & Drop* function. You can also select a curve and interact with it through the Object tree (see “Object Tree” item). When added in any convenient way, automatic boundaries are set for the curve.

All curves can be moved within one tablet. To do this, drag the name of the required curve in the area of curve headers using the *Drag & Drop* function. Moving curves between tablets is not possible.

When you hover the cursor over the name of the curve in the area of curve headers, a hint pops up - the name of the document to which the curve belongs, and the date of the logging (if it is specified in the document).

107							
depth	track #2		track #3				
Depth	DT		CILD				
M	48.65	US/F	167.06	-25.05	MMHO	2712.42	10.1
1:4386							
	GR		GR				
	11.24	GAPI	108.3	11.24	GAPI	108.3	-10

set: 107\_2.las  
 date: 2013-10-06

In order to select a specific curve on a track, you need to click on its display or on its name in the Curve headers.

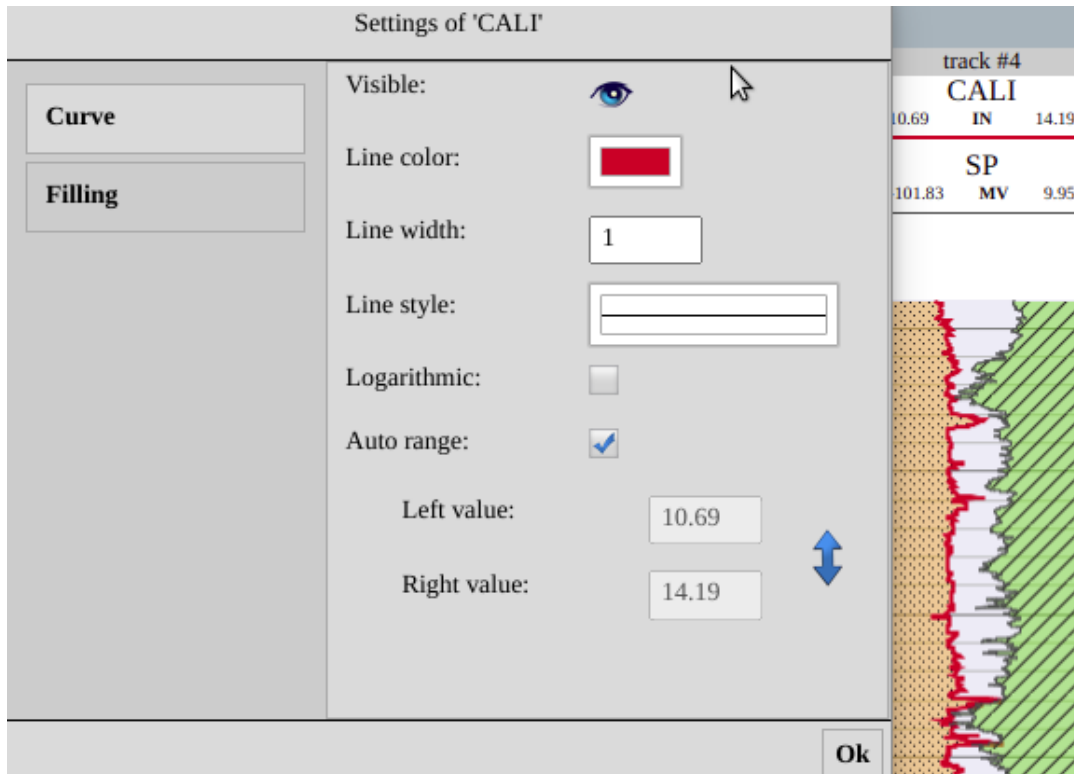
If a Curve exists in the applied scheme, but it is not in the selected document, it looks like this

619							
depth	track #1		track #3		track #4		
Depth	PS		GZ1		IK		
M	0	MV	200	0.1	OHMM	100	0
1:1636							
	BK3		GZ2				
			0.1		OHMM		100
			GZ3				
			0.1		OHMM		100

Duplicate curves are displayed in the same way when you save the tablet scheme.

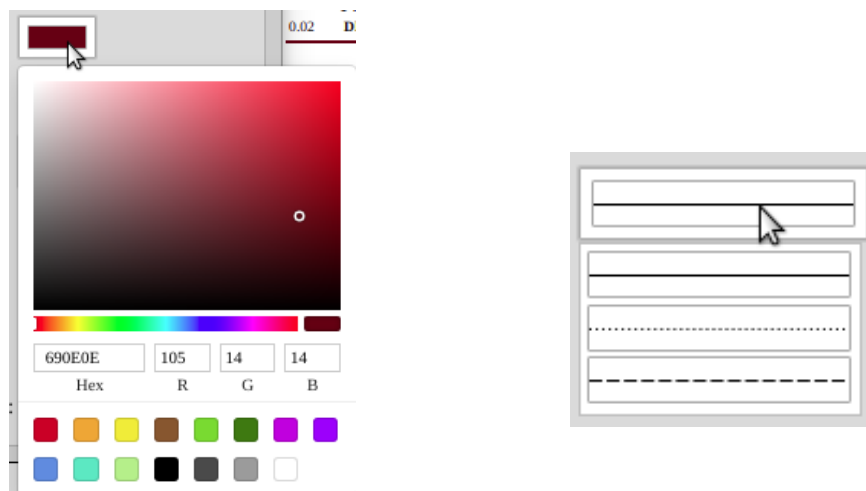
If you try to add a curve from a document that does not match the tablet, a curve from the document that matches the tablet will be displayed.

When you double-click on the curve displayed on the track, or on its name in the area of curve headers, a window with display settings will open.

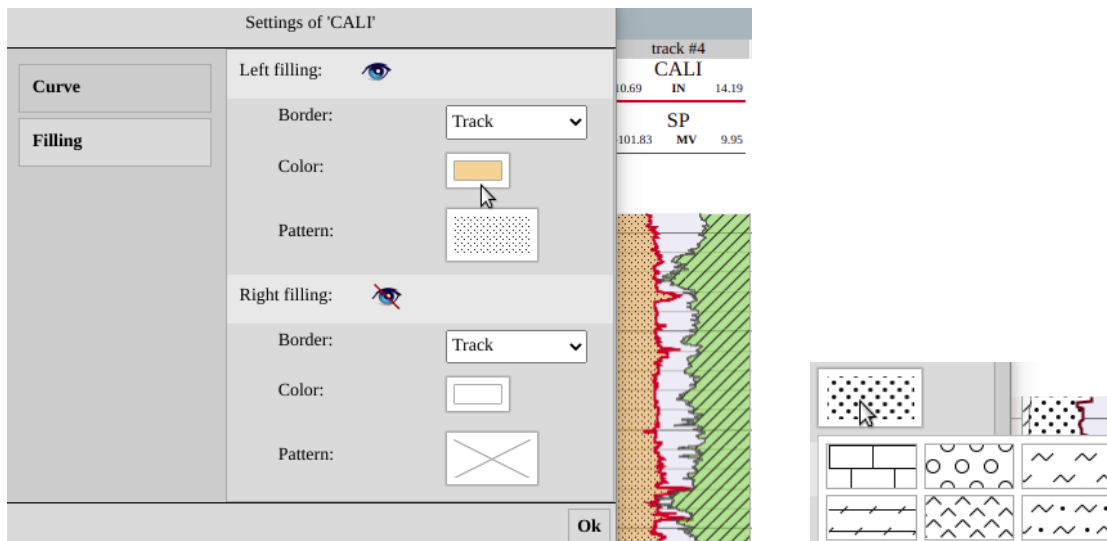


Here you can set the visibility of the curve, set automatic rendering borders, or manually specify border values.

Here you can also select the thickness of the curve, its color and style:



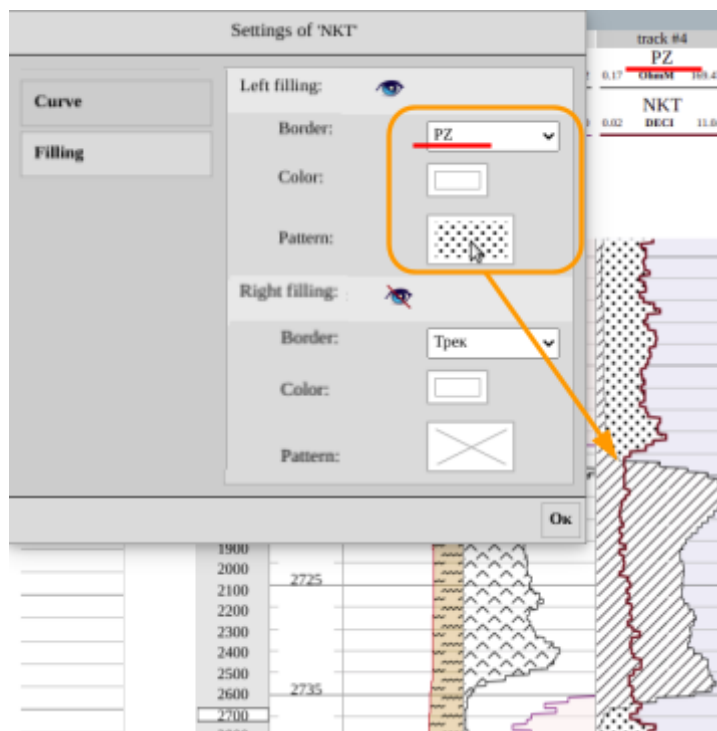
When you switch to the “Filling” tab, the visibility of the fill on the left and right becomes available:



A color and a fill pattern are selected for each fill.

You can also set the borders of the fill:

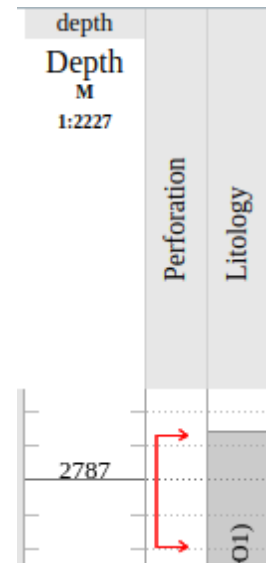
- Track - the borders of the track itself
- Value - select a specific value for clipping the fill
- “Name of another curve belonging to the track” - when two curves intersect, the fill will look like this



## Working with tracks

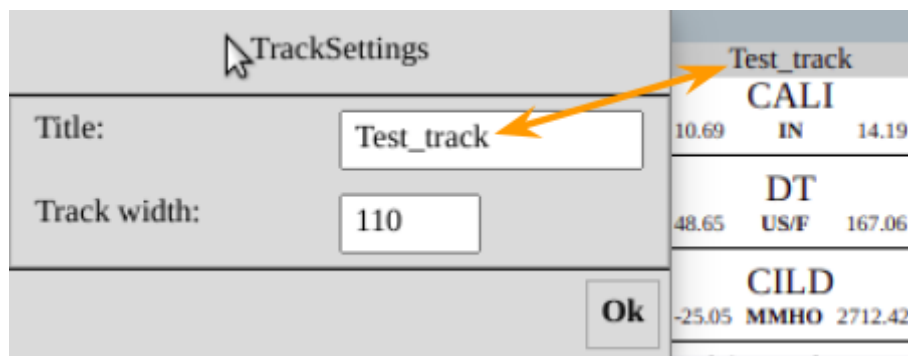
There are three kinds of tracks:

- **Regular track - *track***  
Curves are added to it to be displayed
- **Depth track - *depth***  
Shows depth values for the rendering area measured in meters. In certain cases, it is replaced by a time track measured in milliseconds
- **Specialized tracks**  
The perforation track "Perforation" and the lithological layer track "Layer", similar in type and functionality (working with them is described in more detail in the "Specialized tracks" section)



The depth track shows the scale of the rendering area within the tablet. The step with which the area for rendering curves is shown is selected in the tablet settings (see "Working with tablets", grid, scale and step).

If you double-click on an empty space of a track or its title, a window with settings will open (this works only for tracks with depth and curves). Here you can set the track name and width. For a depth track, settings are the same. No settings are provided for specialized tracks.



Tracks can be swapped using the *Drag & Drop* function while saving all settings and curves. To do this, click on the track header with the left mouse button and drag it to the desired location. If the track names have not been changed, the application will rename them by default. Moving tracks between tablets is not possible.

## Specialized tracks

This type of tracks is responsible for showing perforation and lithology data. Data visualization is organized in such a way that there is a connection with values from reference material.

Reference information can be added/changed if necessary. To do this, you need to contact the specialists of technical support from Geoleader LLC.

### Working with specialized tracks

For the perforation and/or lithological layer values to appear on the tablet, drag and drop the corresponding values from the object tree into the tablet using the *Drag&Drop* function.

Tracks of this type can contain several perforations/layers.

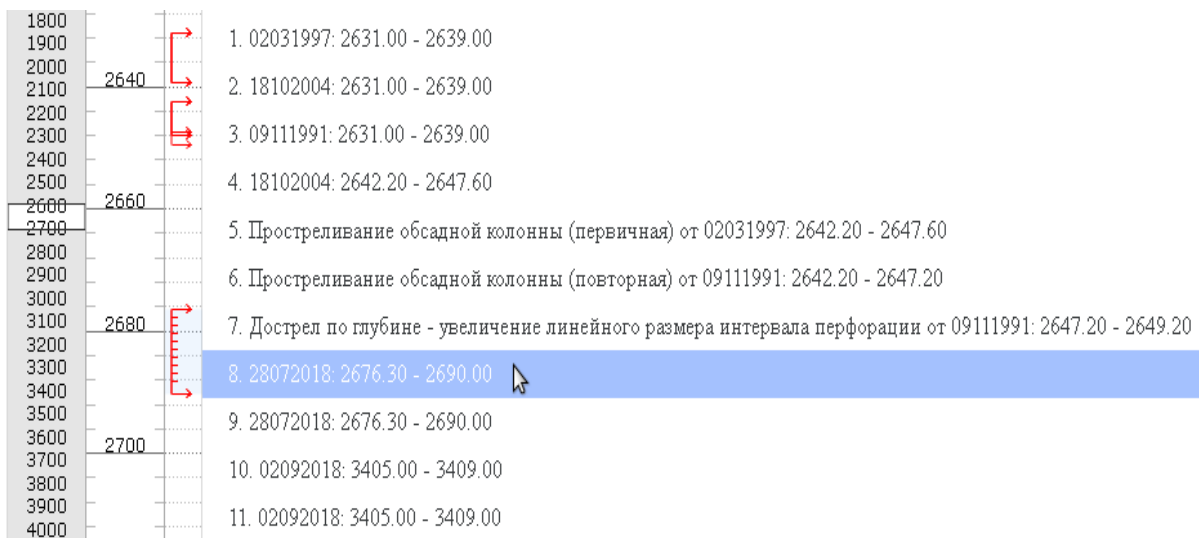
When dragging and dropping perforation/lithological layer to a tablet that does not correspond to the well, the first occurrence of perforation/lithological layer of a corresponding well will be added to it, or an empty specialized track will appear (if there is no data about perforation/lithological layer in the files related to this well).

When saving a scheme (see “Save scheme” section), only the presence or absence of specialized tracks and their position in the tablet is recorded.

When applying a saved scheme, containing specialized tracks, to a tablet (see “Schemes manager” section), all occurrences of perforation and/or lithology data are rendered in specialized tracks. If there is no data, the track will be left empty.

### Perforation

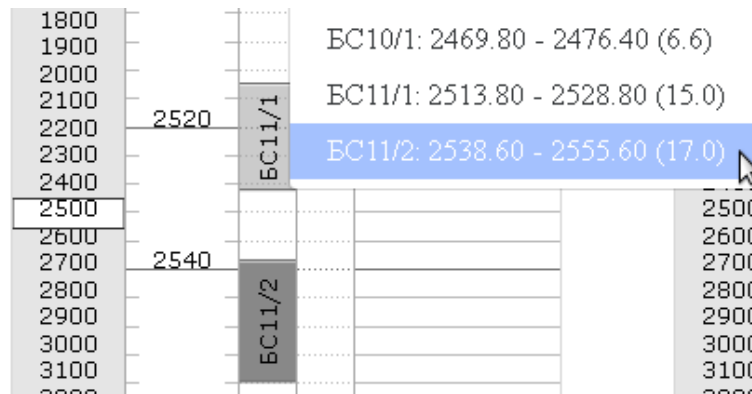
When right-clicking on the "Perforation" track rendering area, a window appears with a list of available perforations. It contains values from the reference materials, the date of perforation and its edge values. When placing the cursor over a perforation, it is highlighted within the track:



## Lithology

При нажатии правой кнопкой мыши на области отрисовки трека “Пласт” появляется окно со списком имеющихся литологических пластов. В нём записаны обозначения из справочника и краевые значения пласта. При наведении курсора на литологический пласт, он подсвечивается в рамках трека:

When right-clicking on a "Layer" track rendering area, a window appears with a list of available lithological layers. It contains values from the reference materials and the layer's edge values. When placing the cursor over a lithological layer, it is highlighted within the track:



## Working with tablets

Each well has its own tablet. Different schemes can be applied to each tablet. By default, all tablets use the current user's default scheme.

To compare curves from different wells, create a new tablet that is not tied to any of the wells (see “Add object”).

When you double-click on the tablet header, the tablet settings window appears. In it, you can change the name, adjust the visibility of the depth ruler, scale, and also work with the horizontal grid.

Tablet settings	
Title:	<input type="text" value="107"/>
Show depth bar:	<input checked="" type="checkbox"/>
Right shift:	<input type="text" value="60"/>
Scale 1:	<input type="text" value="4386"/>
Horizontal grid:	<input checked="" type="checkbox"/>
Auto step:	<input checked="" type="checkbox"/>
Minor step:	<input type="text" value="1"/>
Major step:	<input type="text" value="10"/>
<input type="button" value="Ok"/>	

In the example, the scale is manually set to 1:412. Automatic step means automatic recalculation of values when changing the scale using the “Scrollbar” component (see “Scrollbar” component) and rendering the depth ruler. The indent on the right adjusts the width of the linking area. Each tablet has its own width of the linking area.

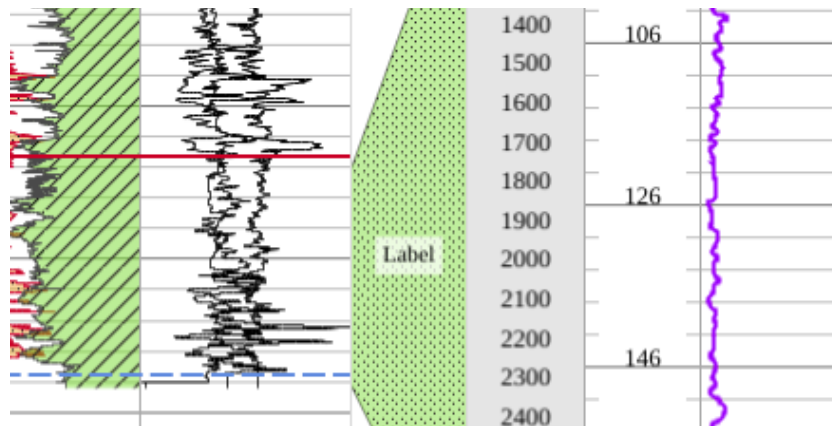
The possibility to move tablets relative to each other using the *Drag & Drop* function is also implemented.

The visibility of tablets is configured in the "Tablets manager" (see the item "Tablets manager").

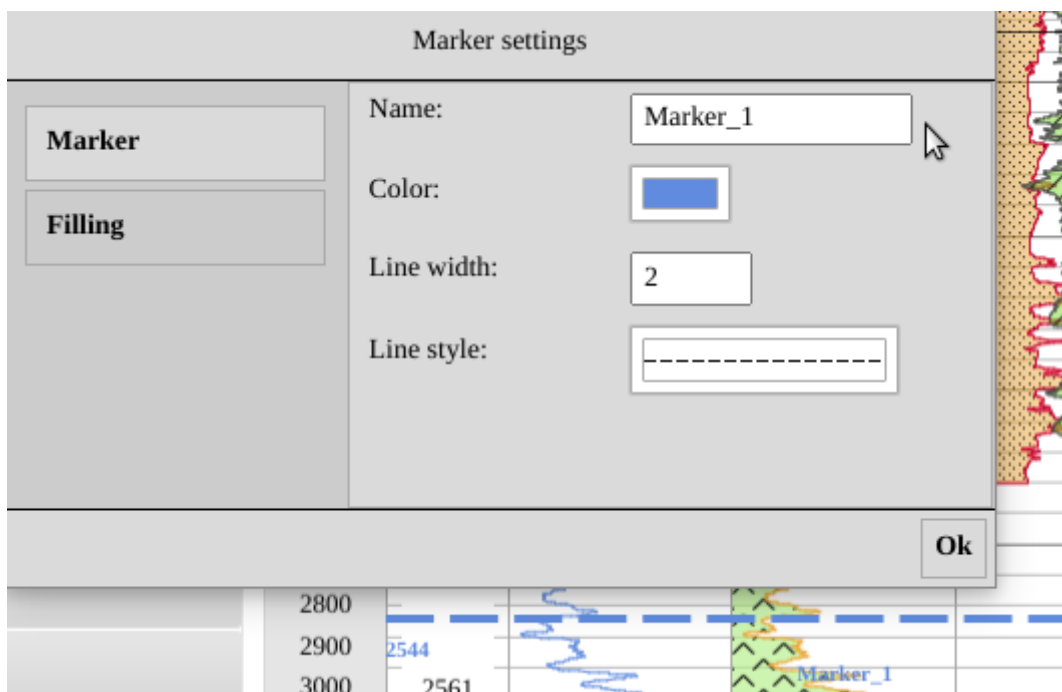
## Markers

To add a new marker, right-click on the desired location and select “Add new marker”. The location of the marker is changed by dragging with the *Drag & Drop* function.

If you add an existing marker to another tablet, they will link automatically. Moving the tablets does not affect the display of the link.

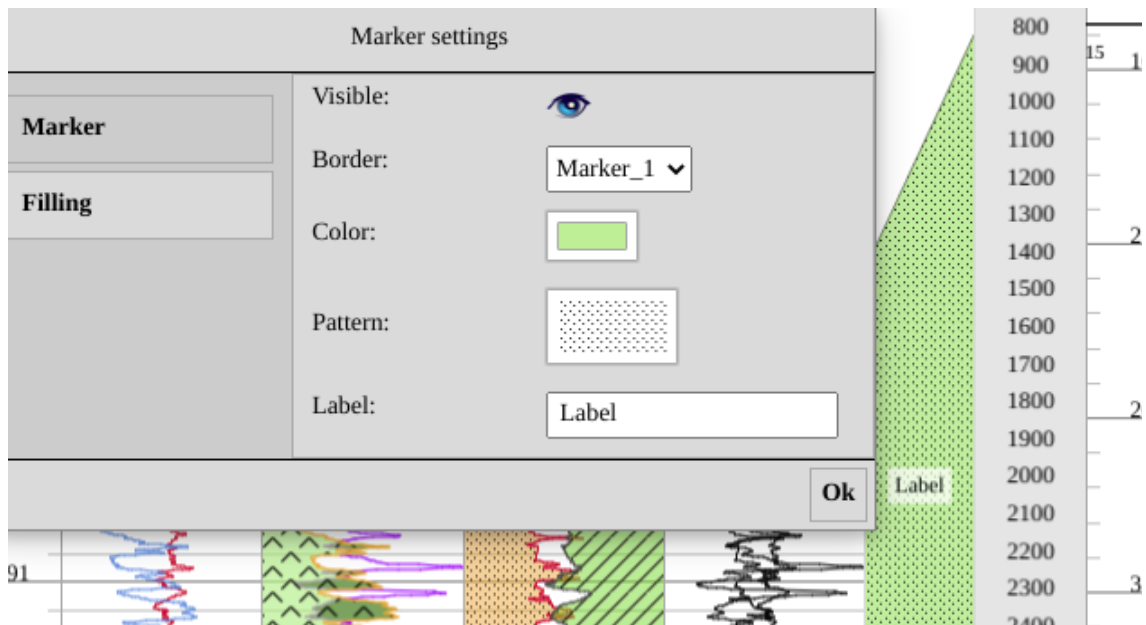


When you double-click on a marker, a settings window appears, in which you can change the marker name, color, line width and style.



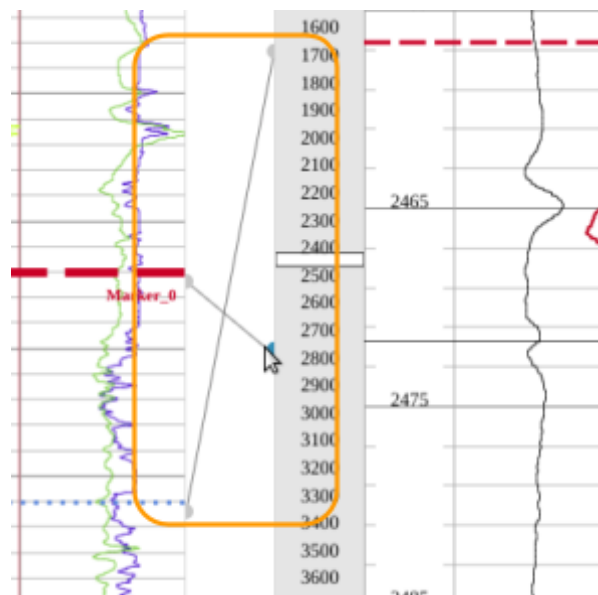
If there are more than one markers and they are linked (one marker is a border for another), the Fill applied to the linked area becomes available.





There is also a possibility of manually linking the markers. To do this, you need to perform the following steps:

1. Move the cursor over the marker edge in the linking area
2. Left-click on the appeared gray semicircle (at the moment of linking it will turn blue)
3. Link (connect) with the desired marker



In order to delete an existing link, select it and click on the Remove selected object button on the Control panel.