RELEASE NOTES

Geomodeling

Fully Integrated 3D Interpretation

Release Notes

GVERSE Geomodeling 2019.4

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Contents

Introduction

We are pleased to announce the release of GVERSE® Geomodeling 2019.4.

This document provides an introduction to the GVERSE Geomodeling features and benefits. It also lists the changes available in this release.

What is GVERSE Geomodeling?

GVERSE Geomodeling introduces an integrated environment for geological/reservoir modeling that incorporates existing mapping and cross section features of smartSECTION® with the 3D view. GVERSE Geomodeling takes advantage of existing XSection cross section by saving them to GVERSE Geomodeling interpretation folder in the common XSection/smartSECTION *.ssdx* format.

The application is part of the GVERSE application suite (http://www.gverse.com).

GVERSE consists of geoscience and engineering solutions focused on workflow optimization and enhancing productivity of teams working on diverse geological and geophysical projects.

Main Features

The main features of the Geomodeling application are as follows:

- **Integration**
  Observe the multi-disciplinary relationships in your geomodel with tightly integrated and synchronous Map, Cross Section and 3D views. GVERSE Geomodeling is designed for geoscientists who work with integrated data sets, including geological, petrophysical, geophysical, drilling, and GIS data. It includes an integrated Map, Cross Section, and 3D views of the geomodel which enables you to work in 2D and 3D views simultaneously. Use the GeoSurface Model tool to efficiently source and generate surfaces and faults and model complex geometries such as unconformities, channels, and subcrop maps, conformance relationships among surfaces, and fault offset and automatic fault polygon generation on all views of GVERSE Geomodeling.

- **Integration with GVERSE Petrophysics**
  Considering the importance of petrophysics in understanding the reservoir, the application facilitates the representation of petrophysical properties (i.e. porosity, saturation and geomechanics etc.) based on GVERSE Petrophysics models. These petrophysical modeling results can be displayed on fence diagrams as curves to better understand character of the reservoir or on presentation templates on the Cross Section view.

- **Integration with GVERSE Geophysics**
  Incorporate your seismic interpretation into your geomodel with dynamically depth converted horizons, faults, and seismic backdrops on cross sections and fence diagrams. Update the velocity model with interpreted interwell points from your smartSTRAT geosteered well for the most up-to-date depth conversion possible.

- **Block Diagrams**
  GVERSE Geomodeling allows you to create block diagrams or gun sight sections that show intersection point of horizontal wellbore with the line of section as it drills through the target formations. In block diagrams, the line of section is laid perpendicular to the wellbore path and in the Cross Section view, they show penetration point of the horizontal wellbore drilling inside the target horizon. This helps the drillers in planning inside the drilling section unit as distances between wells can be shown in the block diagram.

  Absolute and horizontal distances between wells drilling inside the same target can be determined easily in a block diagram. Likewise, Drilling Section Unit (DSU) boundary distances between corner wells and section boundary can also be determined in block diagrams. Additionally, you can add formation thickness, distance filtering on the basis of formations and wellbore custom properties to get the complete picture of drilling wells and their placement inside the respective target formations.

- **Fence Diagrams**
  Get a better understanding of the reservoir by creating fence diagrams of the open cross sections. This feature assists in construing and representing litho-stratigraphic relationship, pinchouts and truncations of units, unconformities, structural and stratigraphic traps and any other geological associations that exist in a region.

- **Co-blending**
  Validate the reservoir behavior by co-blending seismic attributes against interpolated curve properties, lateral lithofacies variation, and related structural geometries on cross sections and fence diagrams.

- **Interpolation**
  Log curve interpolation helps diagnose interplay between lithofacies, depositional trends as suggested by the log curve response. Advance your understanding of the reservoir by analyzing different geological sections and identifying lithofacies, stratigraphic sequences, and depositional trends from the interpolated logs.

- **Clipping Planes**
  In a complex geomodel, clipping plays a significant role in examining interrelationships and intrarelationships between surfaces and faults. Using GVERSE Geomodeling clipping tool, you can easily clip planes vertically or horizontally to keep a specific portion of the scene's geometry in focus and analyze trajectory of wells as they are drilled through geomodel surfaces.

- **Completion and Perforation Postings**
  Display Completion stages and Perforation clusters along the wellbore path in 3D View to identify the productive zones of the targeted formations.

- **Open XSection Cross Sections in GVERSE Geomodeling**
  Setup the loading of XSection cross-sections within the AOI of the active interpretation. This import feature validates the data in the file and tries to match the stratigraphic column, surfaces, faults, and even the file name until conflict dialogs are displayed where the user can easily define the desired stratigraphic columns, surfaces, faults, and file name manually

Benefits

- **Real-time Integrated Visualization of Results**
  GVERSE Geomodeling provides an integrated real-time map view, cross section view, and 3D visualization of a developing geomodel. Integrate petrophysical, geophysical, drilling, and GIS data into the interpretation and observe real time effect on a comprehensive geomodel.
- **Quick and Easy**
  As compared to traditional tools, GVERSE Geomodeling allows geoscientists to load and display large datasets with minimum time and effort required.
- **Scalability**
  GVERSE Geomodeling provides support for modeling surfaces created from wide range of datasets. Cross sections with high amount of wells and large aerial extents are handled in an efficient manner.
- **Flexibility**
  Features such as the ability to quick pick on Main Map view, clipping of 3D gird, developing fence diagrams, and creating regions and groups for wells offer greater flexibility in Interpretation workflows. Docking windows and panels provide the freedom to arrange the workspace as desired and saving complete state of the workspace facilitates the user to resume the work from where they left off.

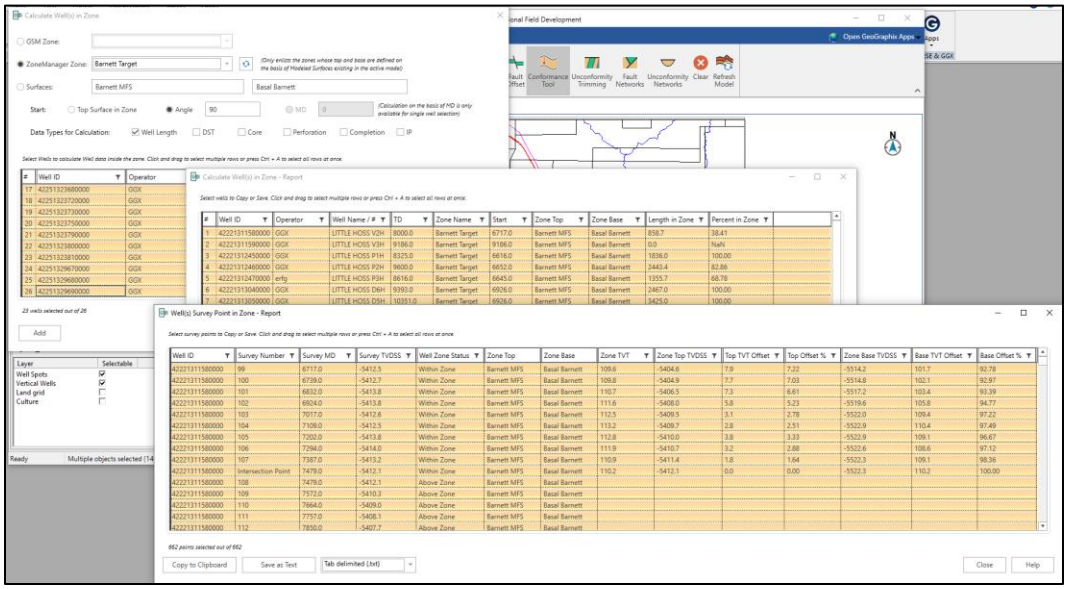
Installing GVERSE Geomodeling

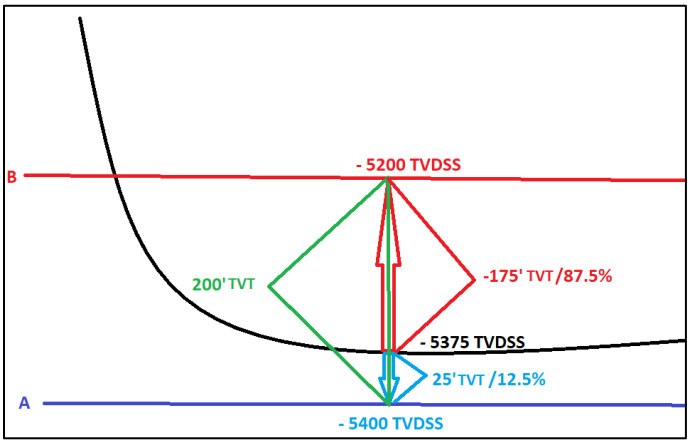
GVERSE Geomodeling is installed seamlessly as part of the GeoGraphix installation. For system prerequisites and installation instructions, refer to the GeoGraphix Installation Guide on the GVERSE GeoGraphix Support Portal > Knowledge Center > Release Notes and Installation Guides page.

What's New in GVERSE Geomodeling 2019.4

Survey Points in Zone Reports

Create a Survey Point report of the position of the well within zone(s). This helps in ascertaining the distance of the survey point from the zone boundary.



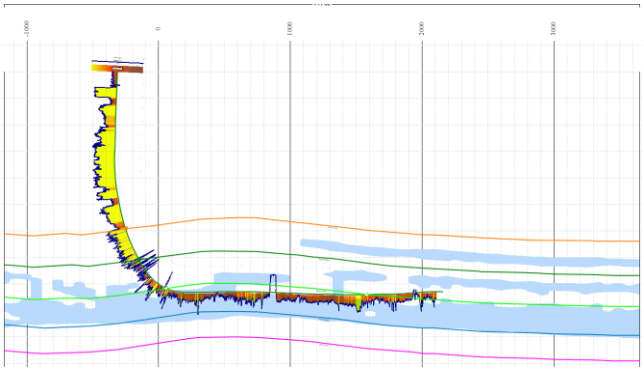


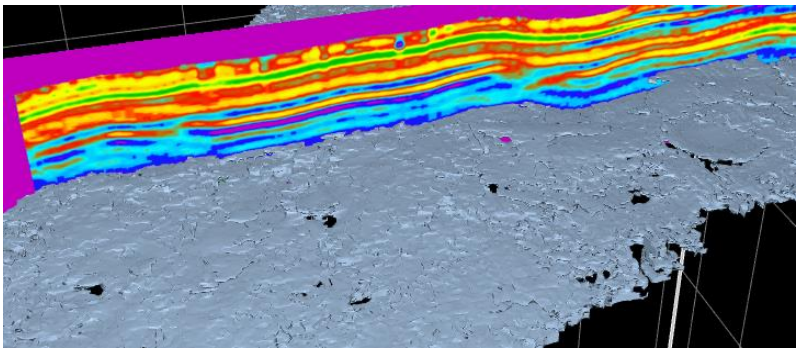
Apply Color on Type Logs and Correlation Logs

The user can now color the type logs and correlation logs, which allows users to differentiate between the correlation/type logs and the actual logs.

View and Save Geobodies in Cross Section View

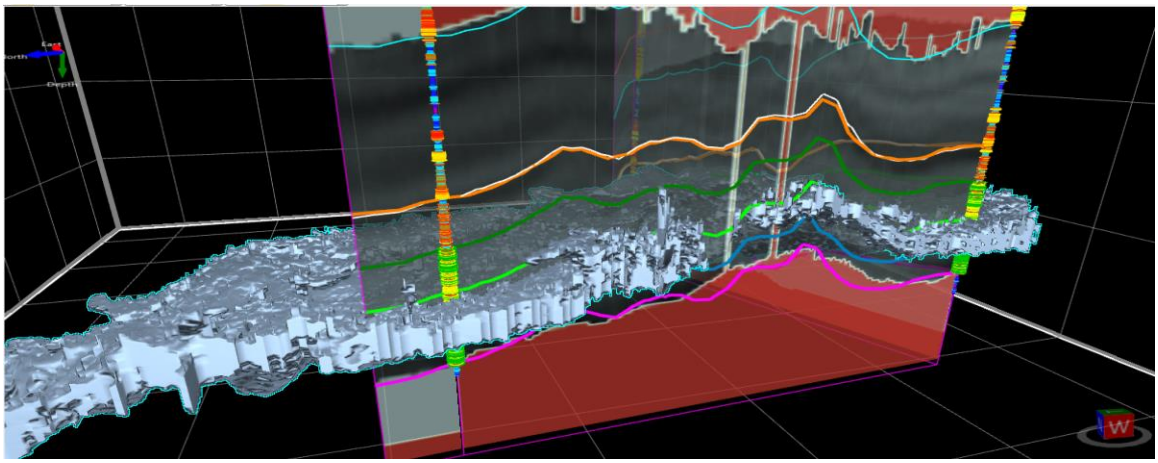
The users can now view and save geobodies in Cross Section view. The geobody properties can also be set in Cross Section view.





View and Save Geobodies in 3D View

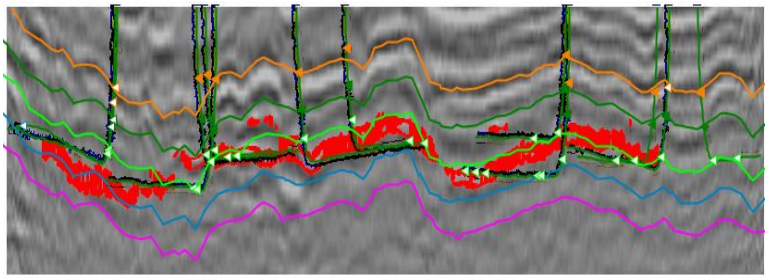
The users can now view and save geobodies in the 3D view. The geobody properties can also be set in the 3D view.

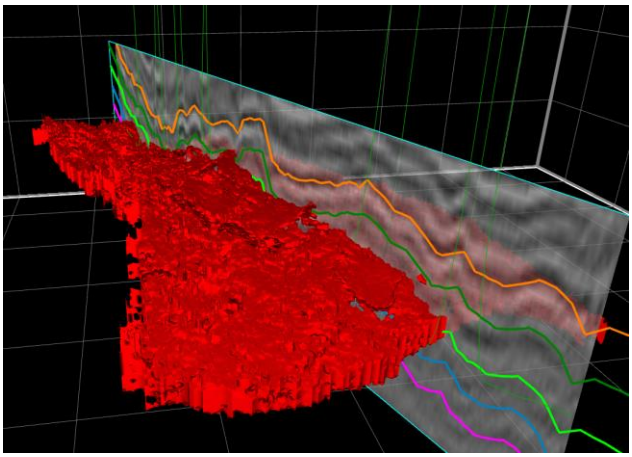


Performance Improvements in Well Zone Calculations

Performance has been improved in various Well Zone Calculations workflows. The performance is enhanced specially while:

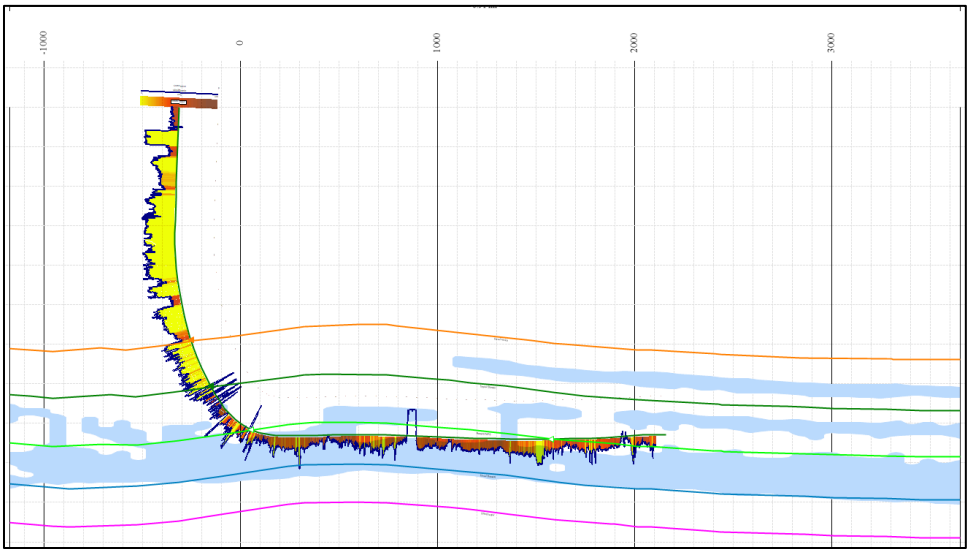
- Generating the error log
- Calculating well parameters
- Generating reports
- Saving reports
- Copying data from clipboard and pasting in any compatible application
- Using Angle as the starting parameter for calculations
- Reusing calculated data

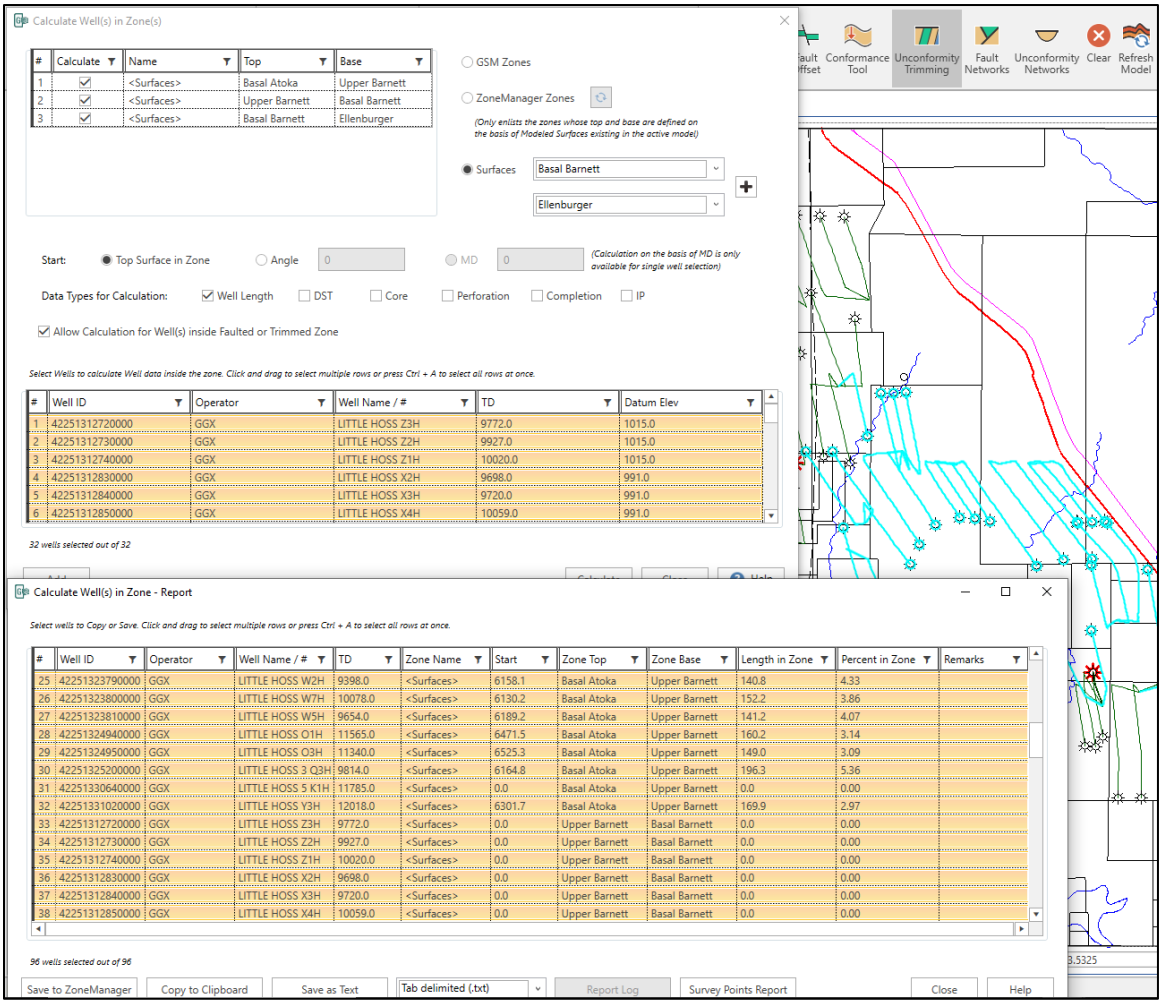




Calculate Well in Zone for Multiple Zones

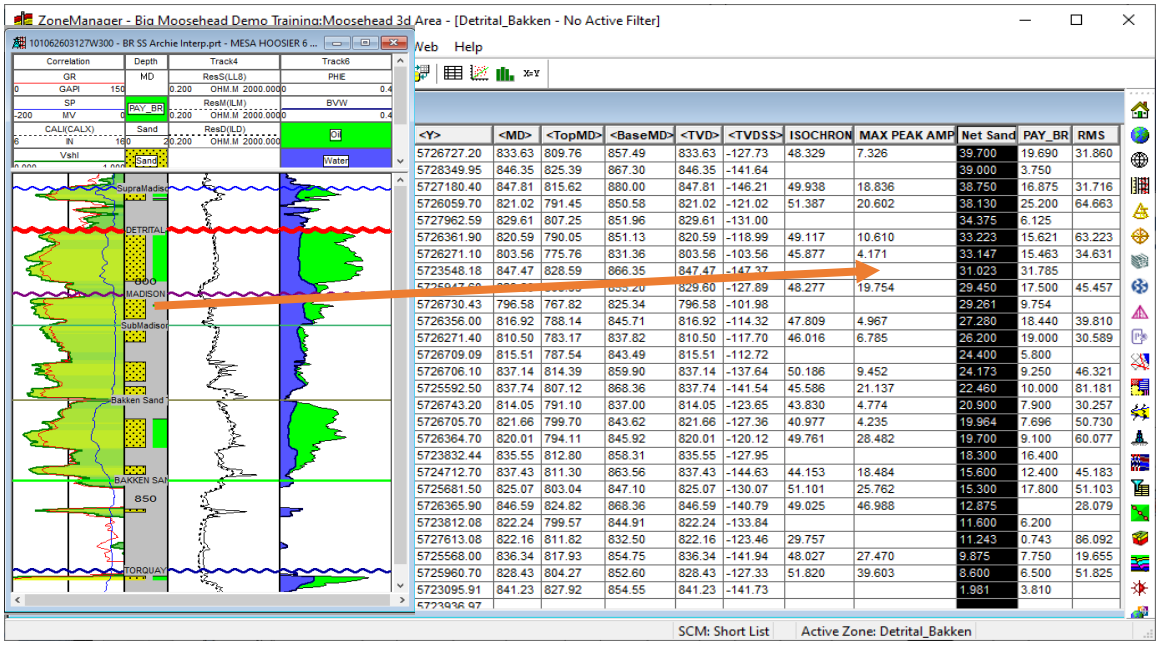
Calculate the length and percent of the wellbore and other core and test date within a zone for multiple zones.





Property Maps from ZoneManager Attributes

Generate on-the-fly property maps from attributes stored in any ZoneManager zone.



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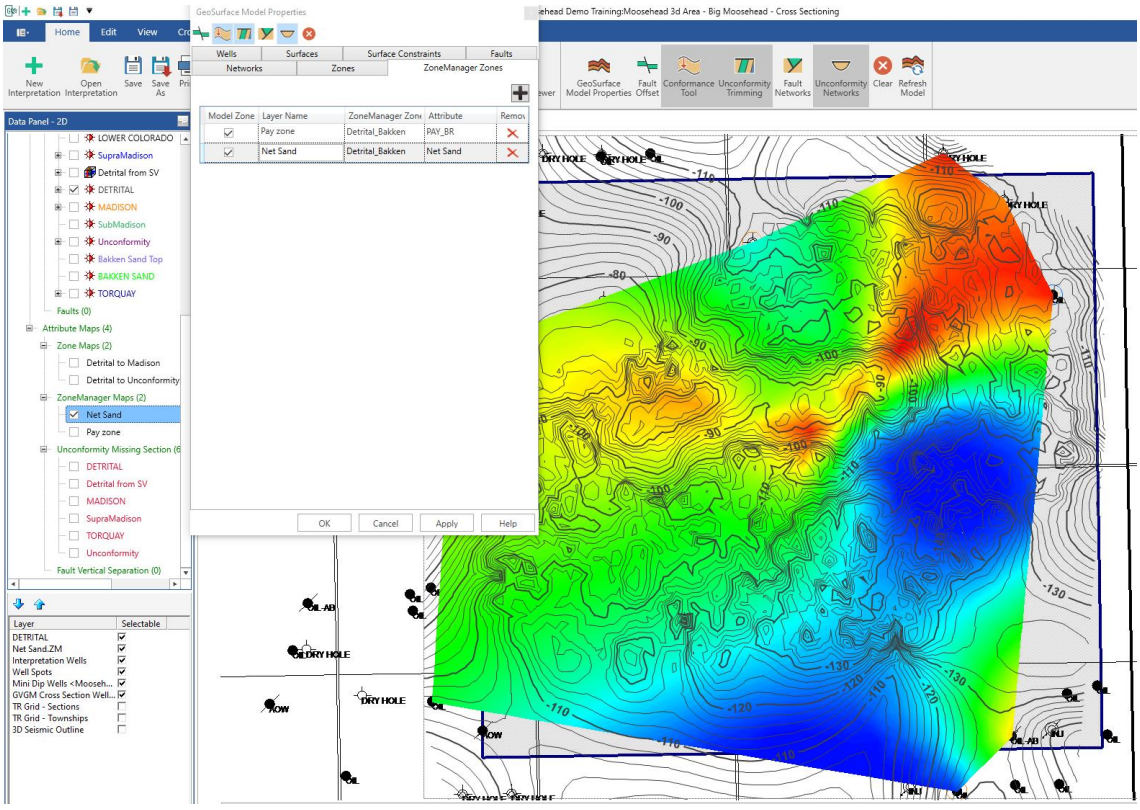
5728349.95	846.35	825.39	867.30	846.35	-141.64			39.000	3.750	
5727180.40	847.81	815.62	880.00	847.81	-146.21	49.938	18.836	38.750	16.875	31.716
5726059.70	821.02	791.45	850.58	821.02	-121.02	51.387	20.602	38.130	25.200	64.663
5727962.59	829.61	807.25	851.96	829.61	-131.00			34.375	6.125	
5726361.90	820.59	790.05	851.13	820.59	-118.99	49.117	10.610	33.223	15.621	63.223
5726271.10	803.56	775.76	831.36	803.56	-103.56	45.877	4.171	33.147	15.463	34.631
5723548.18	847.47	828.59	866.35	847.47	-147.37			31.023	31.785	
5725947.60	[illegible]			829.60	-127.89	48.277	19.754	29.450	17.500	45.457
5726730.43	796.58	767.82	825.34	796.58	-101.98			29.261	9.754	
5726356.00	816.92	788.14	845.71	816.92	-114.32	47.809	4.967	27.280	18.440	39.810
5726271.40	810.50	783.17	837.82	810.50	-117.70	46.016	6.785	26.200	19.000	30.589
5726709.09	815.51	787.54	843.49	815.51	-112.72			24.400	5.800	
5726706.10	837.14	814.39	859.90	837.14	-137.64	50.186	9.452	24.173	9.250	46.321
5725592.50	837.74	807.12	868.36	837.74	-141.54	45.586	21.137	22.460	10.000	81.181
5726743.20	814.05	791.10	837.00	814.05	-123.65	43.830	4.774	20.900	7.900	30.257
5726705.70	821.66	799.70	843.62	821.66	-127.36	40.977	4.235	19.964	7.696	50.730
5726364.70	820.01	794.11	845.92	820.01	-120.12	49.761	28.482	19.700	9.100	60.077
5723832.44	835.55	812.80	858.31	835.55	-127.95			18.300	16.400	
5724712.70	837.43	811.30	863.56	837.43	-144.63	44.153	18.484	15.600	12.400	45.183
5725681.50	825.07	803.04	847.10	825.07	-130.07	51.101	25.762	15.300	17.800	51.103
5726365.90	846.59	824.82	868.36	846.59	-140.79	49.025	46.988	12.875		28.079
5723812.08	822.24	799.57	844.91	822.24	-133.84			11.600	6.200	
5727613.08	822.16	811.82	832.50	822.16	-123.46	29.757		11.243	0.743	86.092
5725568.00	836.34	817.93	854.75	836.34	-141.94	48.027	27.470	9.875	7.750	19.655
5725960.70	828.43	804.27	852.60	828.43	-127.33	51.820	39.603	8.600	6.500	51.825
5723095.91	841.23	827.92	854.55	841.23	-141.73			1.981	3.810	
5723936.97										



Improvements in TGS Connectivity

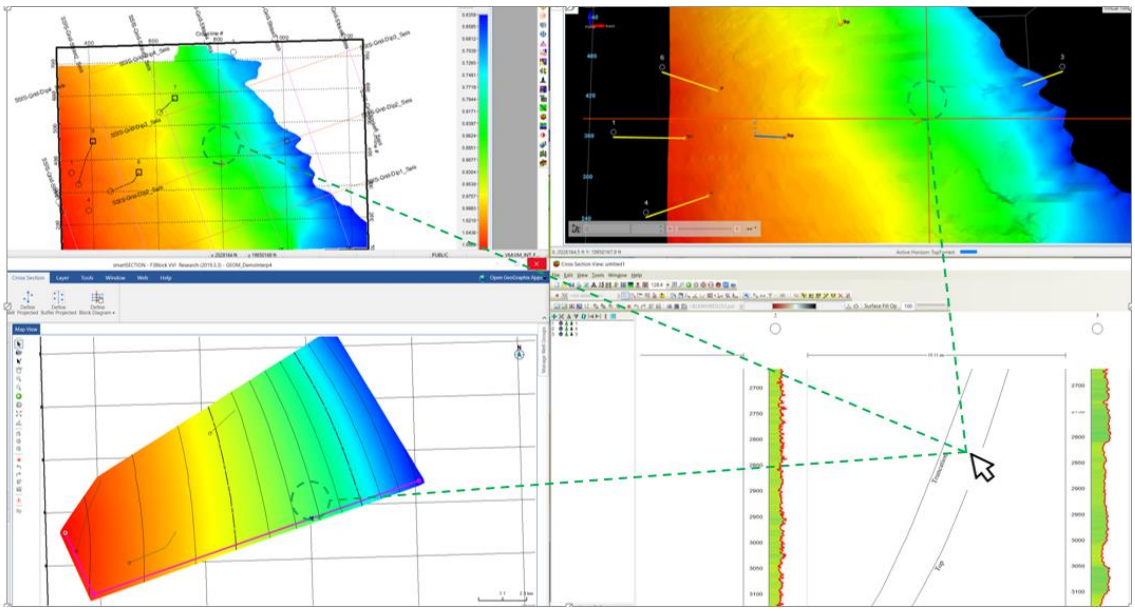
The mechanism to download items from the TGS shopping cart has been improved.

Calculate Parameters inside the Geobody

Well Length, Percentage, and some other parameters such as DST, Completions can now be calculated inside the geobody. This helps in determining high production or high risk areas.

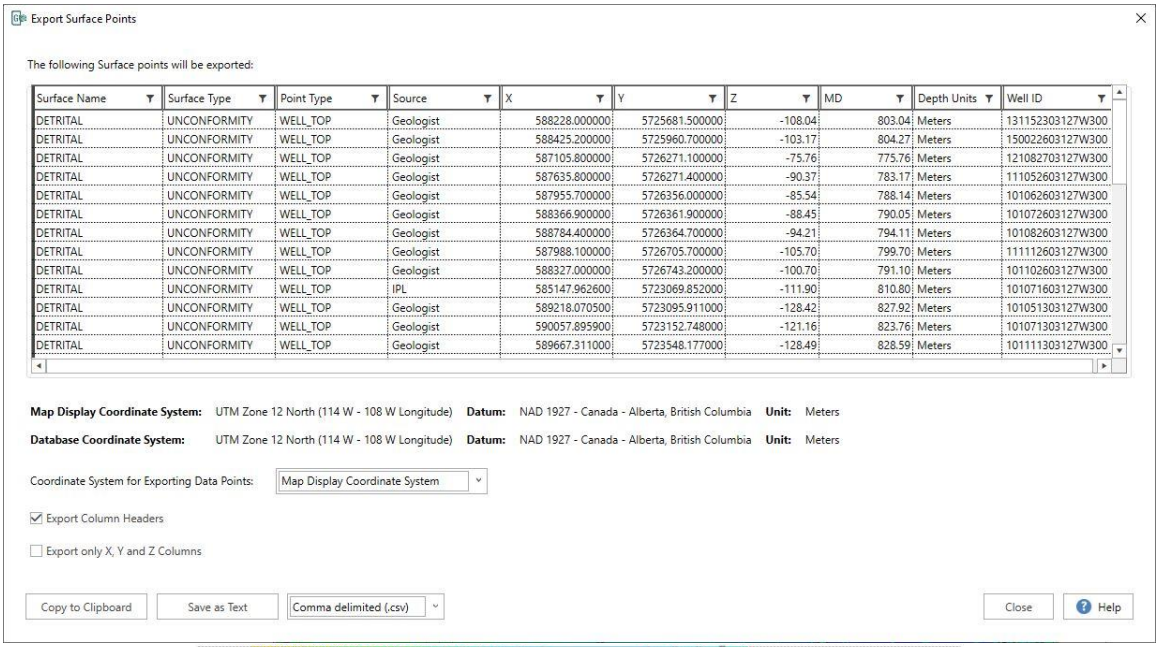
Cursor Tracking between GVERSE Geomodeling and GVERSE Geophysics

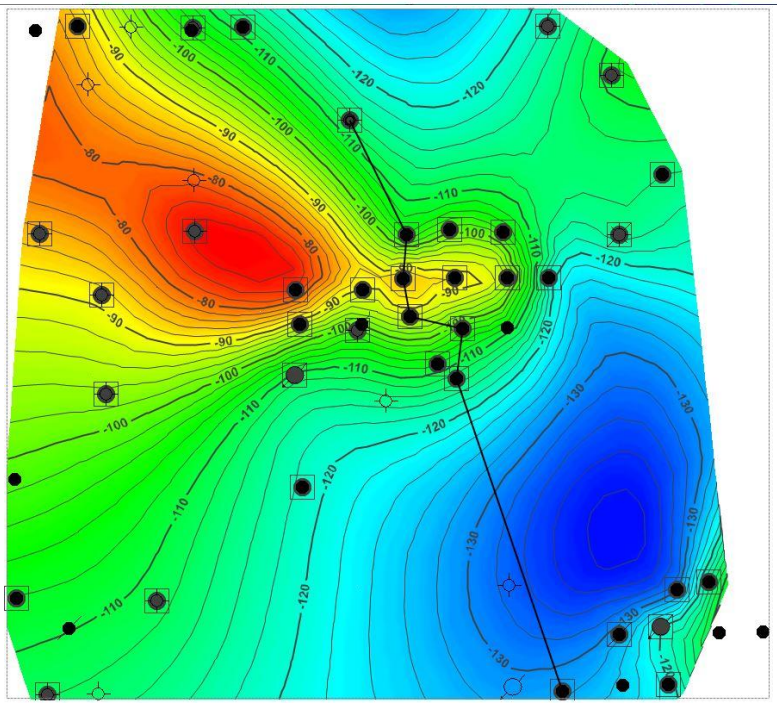
The mouse cursor tracking functionality is now enabled between the views in GVERSE Geomodeling and GVERSE Geophysics. This results in an effective correlation between the two applications.



Export Surface Points

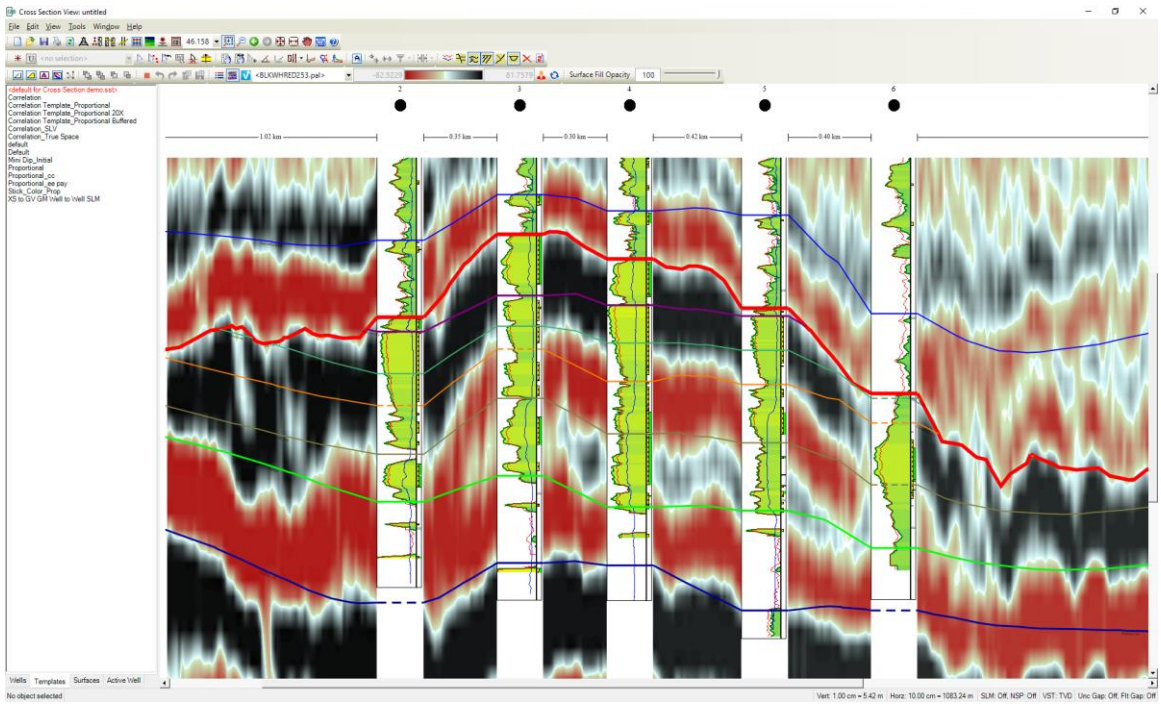
Export well and interwell points from either map or cross section. Points can be exported as CSV, tab, or space delimited file.

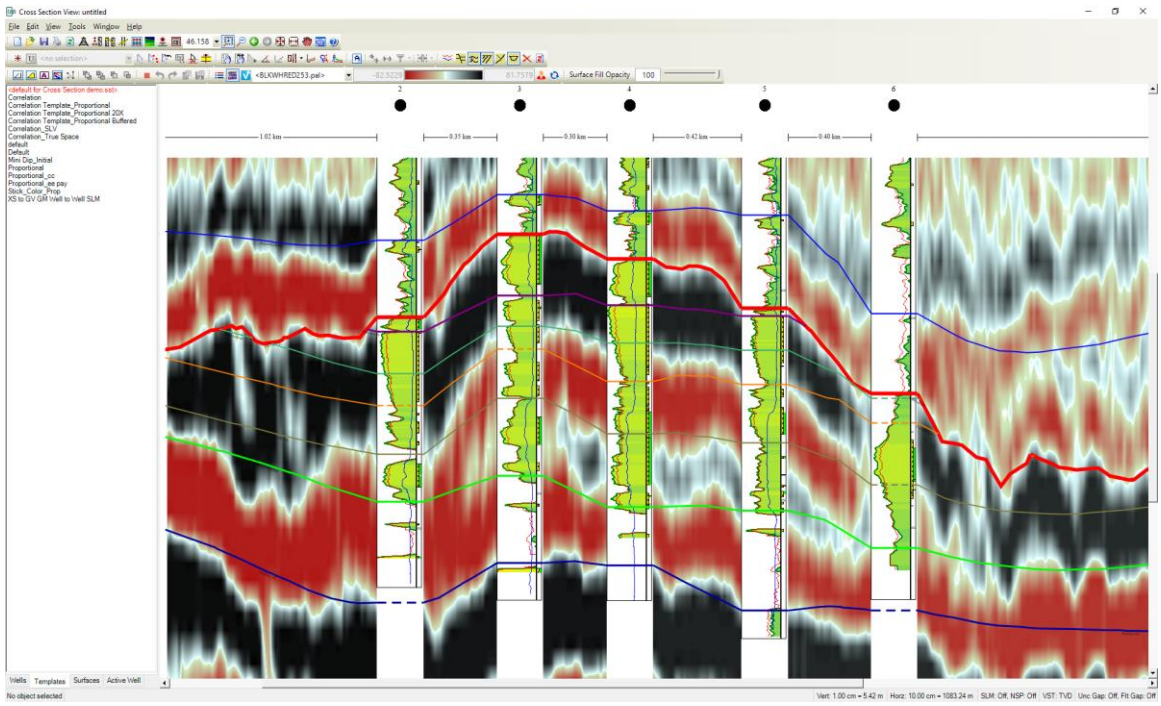




Open GVERSE Geomodeling Cross Section as an Arbitrary Line in GVERSE Geophysics

This is another example of applications cross functioning seamlessly within the GVERSE GeoGraphix solution. You can now open any GVERSE Geomodeling cross section as an arbitrary line (arbline) in GVERSE Geophysics.



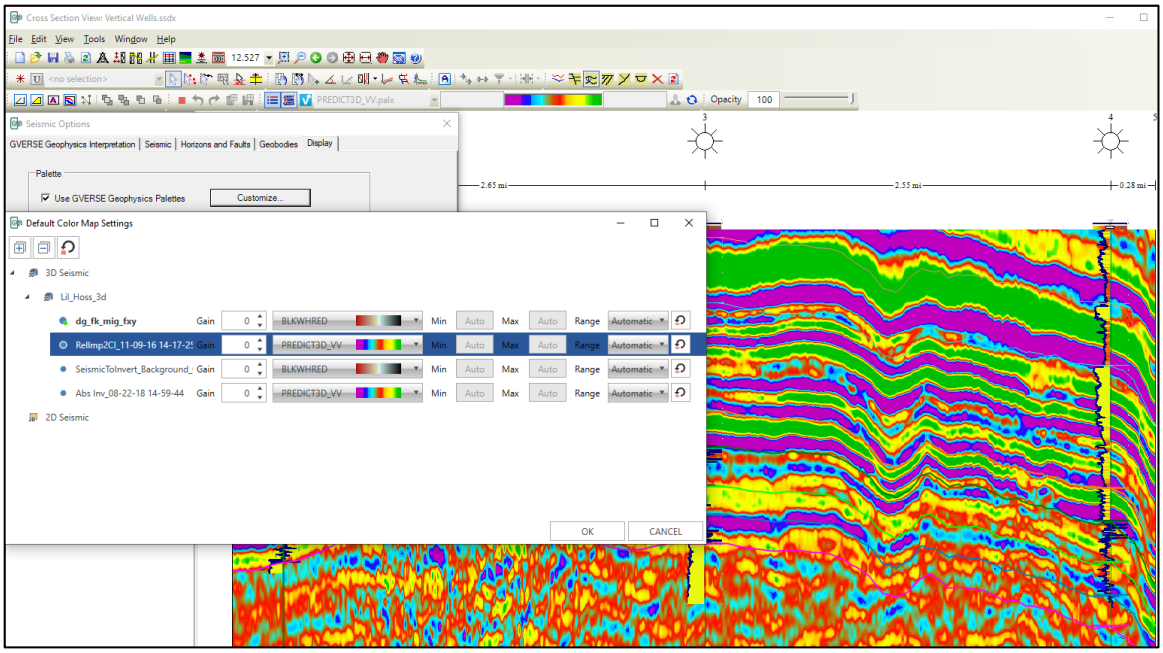


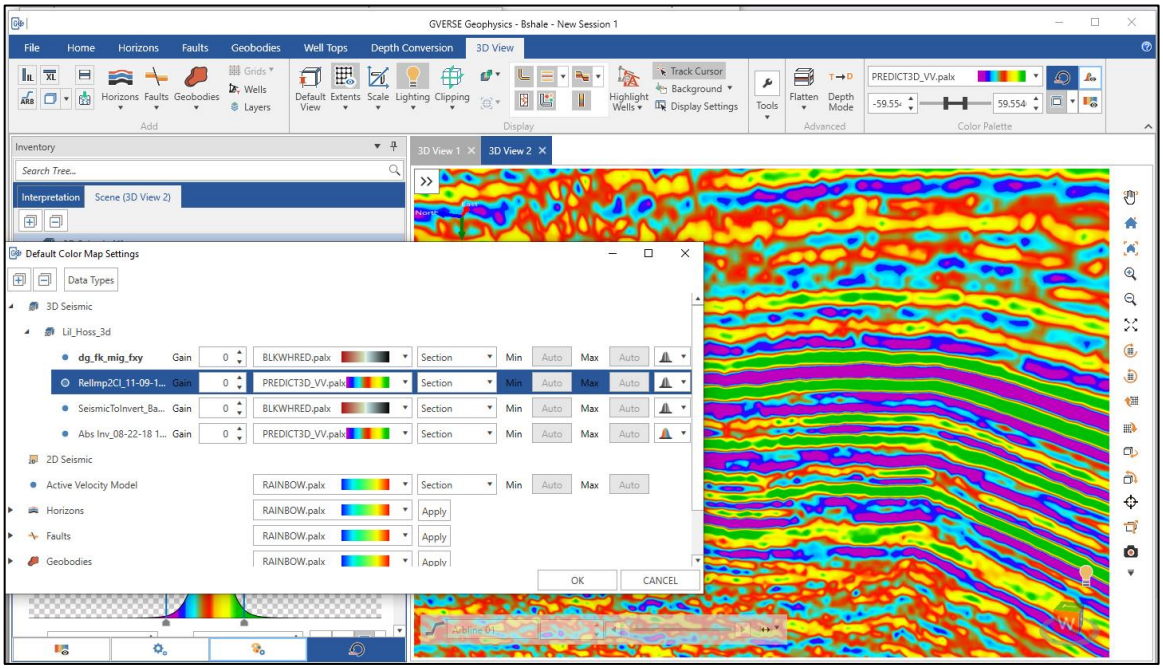
Import Surface Points in ASCII XYZ Format

Surface points can be imported as interwell points in ASCII XYZ format, which aids in updating the geomodel.

Color Palette Control for Individual Versions of Seismic Backdrop

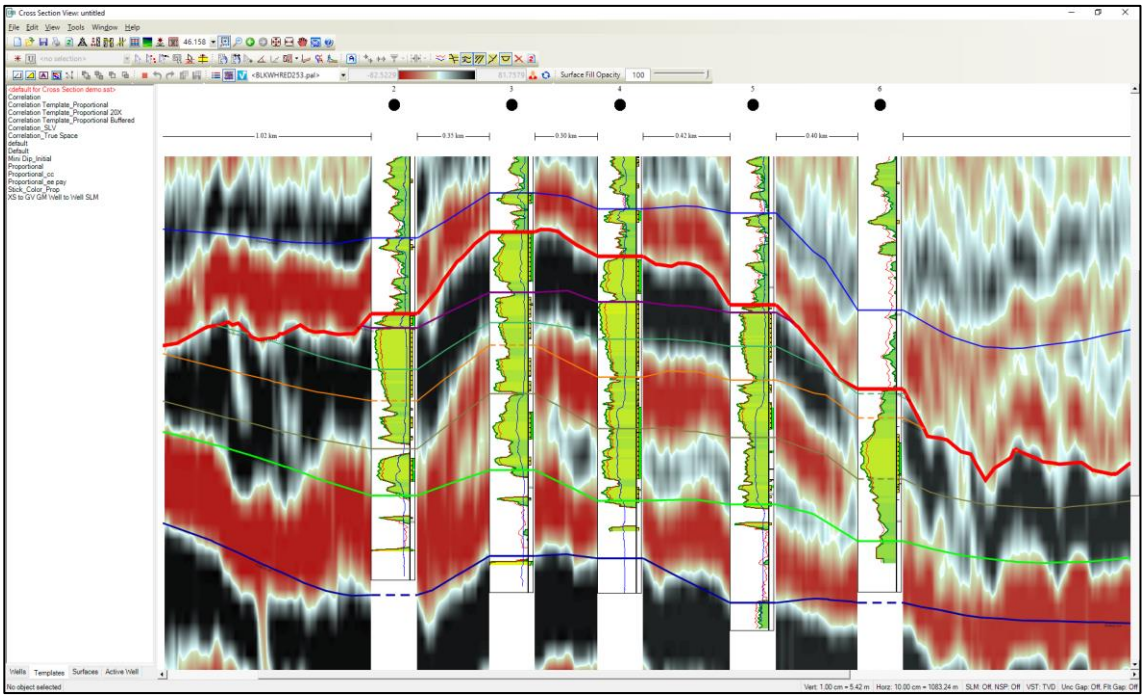
Individual color palettes can now be saved with different seismic versions, which allows you to view all versions with their respective color palettes.





Save Zoom State

GVERSE Geomodeling saves the zoom level and state of the cross section and displays the same zoom level the next time a saved cross section is opened.



Calculate Well Zone Statistics for Multiple Zones

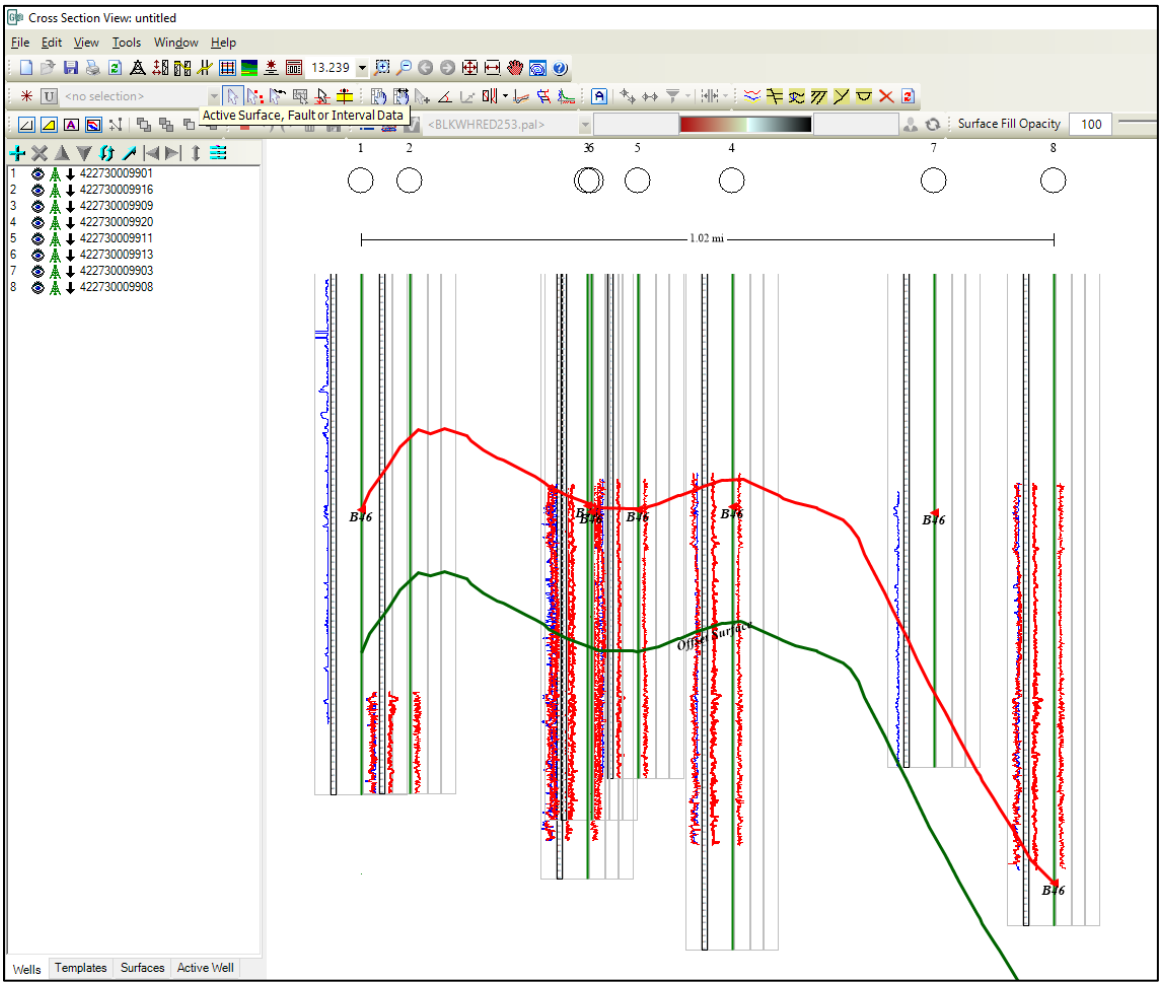
Well zone statistics can now be calculated for multiple zones at the same time. This reduces the effort in calculating these statistics for different zones.

Control Number of Decimal Places while Posting Data in Cross Section/Block Diagram

The users can now post numeric data up to the desired decimal places in Cross Section/Block diagrams.

Offset Lines on Cross Sections hung on Modeled Surfaces

You can now create an offset surface which is same as the parent surface. This new surface can be shifted to any place. This offset surface can be used to create pre-drilled cross sections for target zones.



Post MD values along Horizontal Distance in Projected Cross Sections

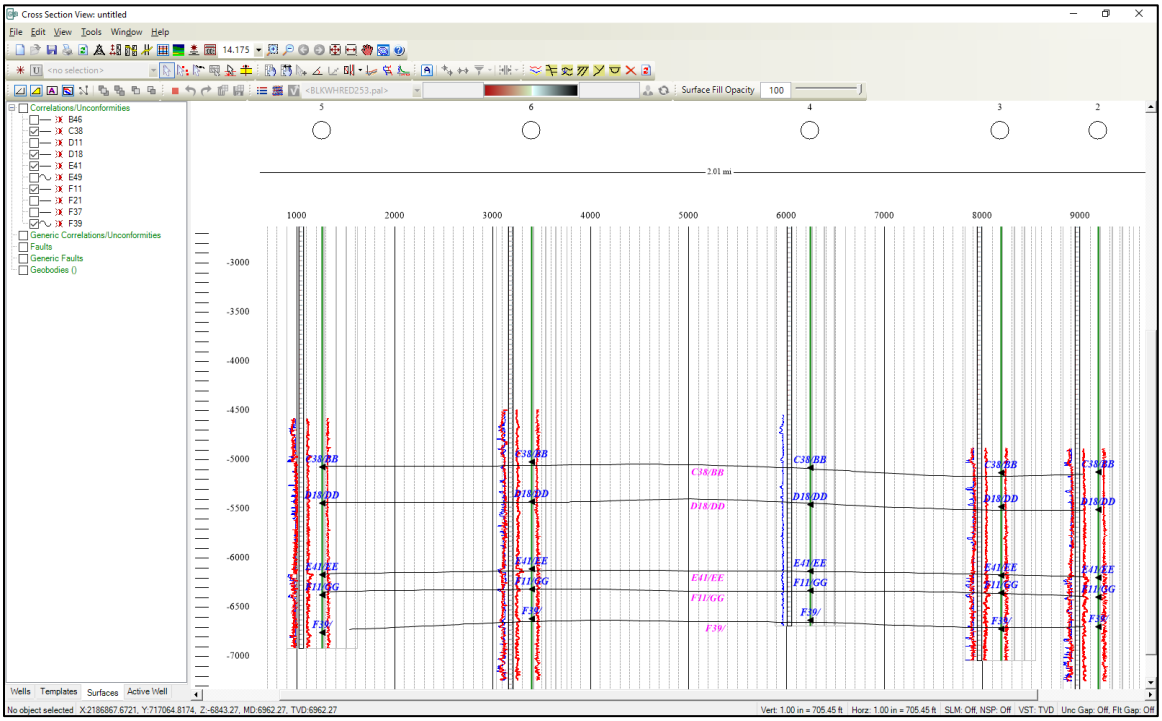
The MD values of the wellbore can be displayed along with horizontal distance values in Projected Cross Sections, which enables users to determine MD of the wellbore at a plane of cross section on a specific vertical scale.

Support for Extended Well Name, ZoneManager Zone and Attributes map

Wells, ZoneManager Zones and Attribute Maps can have a name of up to 40 characters, which can be displayed within the entire GVERSE Geomodeling application.

Ability to Post SCM Name for Surfaces in the Cross Section

Both the Surface Name and the Strat Column Name (SCM) can now be posted on wells along with surfaces correlation. The SCM name and surface posting can either be displayed between the first and the last well, or between all wells.



Zones Tab Renamed

The Zones tab has been renamed to Thickness Maps in the GeoSurface Model Properties dialog, as well as the Data panel.

Introduction of What's New Dialog

A What's New dialog box launches when GVERSE Geomodeling is opened, which shows a list of new features being added to the release.

Fixed Issues

This section lists the customer reported bugs that are fixed in this release.

ID	Description
218623	When the **Tie Points** panel was full of tie point records, a new record was added at the bottom of the list and was not visible without extensive scrolling. This issue has been fixed and now the new record is scrolled into view in the **Tie Points** panel.
220997	The surface did not show any kind of data (contours) in **Map view** when **GVERSE Geophysics** was selected as the surface source in the **Geosurface Model Properties** dialog box. This issue has been fixed.

Known Issues

This section lists the known issues in this release.

ID	Description
222407	The **View Cross Section in GVERSE Geophysics** option is greyed out in the context menu if the cross sections are hidden from the **Map view**. **Workaround:** Display the cross sections in **Map view** by turning on their display from the **2D Data panel**. The option is enabled when cross sections are displayed in **Map view**.

Third Party Acknowledgements

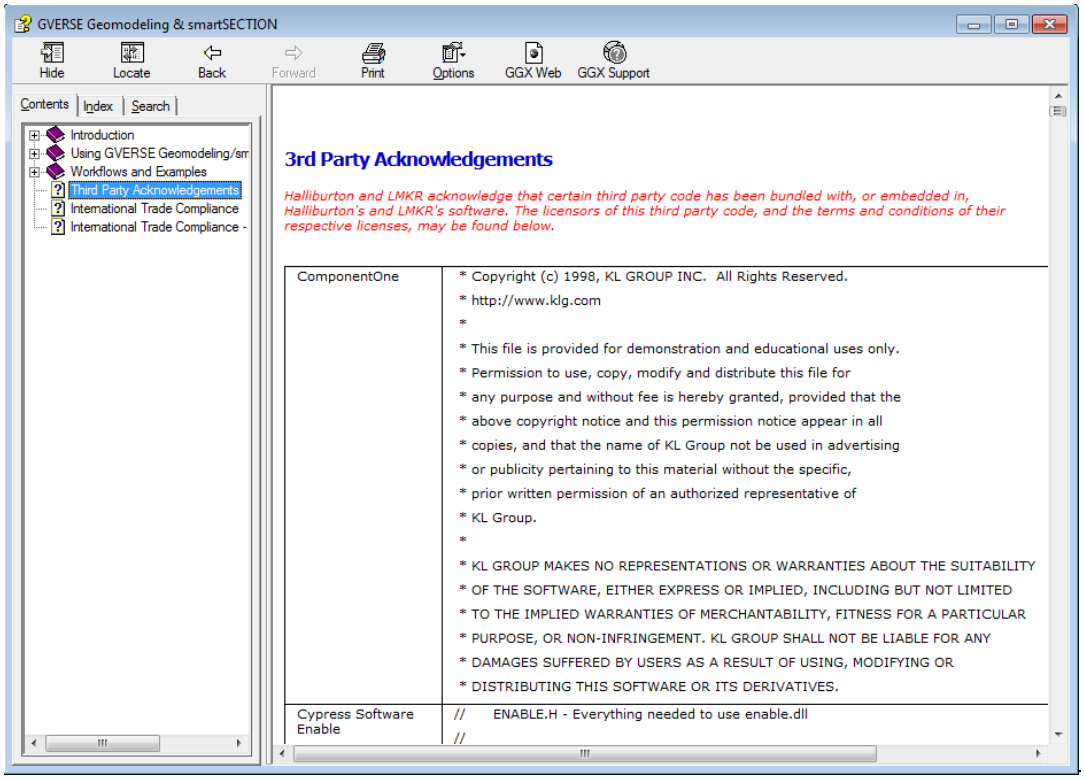
We acknowledge that certain third party code has been bundled with, or embedded in, our software. The licensors of this third party code, and the terms and conditions of their respective licenses, may be found in the help file.

To access the 3rd party license agreements:

1. To access the online help, click the **Help** tab located on the tab commands bar.

   The Help window displays.

2. In the **Contents** pane, locate the **Third Party Acknowledgements** help topic as shown in the image below.



International Trade Compliance

This application is manufactured or designed using U.S. origin technology and is therefore subject to the export control laws of the United States. Any use or further disposition of such items is subject to U.S. law. Exports from the United States and any re-export thereafter may require a formal export license authorization from the government. If there are doubts about the requirements of the applicable law, it is recommended that the buyer obtain qualified legal advice. These items cannot be used in the design, production, use, or storage of chemical, biological, or nuclear weapons, or missiles of any kind.

The ECCNs provided here (if available) represent our opinion of the correct classification for the product today (based on the original software and/or original hardware). Classifications are subject to change. If you have any questions or need assistance please contact us at support@lmkr.com.

Under the U.S. Export Administration Regulations (EAR), the U.S. Government assigns your organization or client, as exporter/importer of record, responsibility for determining the correct authorization for the item at the time of export/import. Restrictions may apply to shipments based on the products, the customer, or the country of destination, and an export license may be required by the Department of Commerce prior to shipment. The U.S. Bureau of Industry and Security provides a website to assist you with determining the need for a license and with information regarding where to obtain help.

The URL is: http://www.bis.doc.gov.

Definitions

ECCN - Export Control Classification Number - The ECCN is an alpha-numeric code, e.g., 3A001, that describes a particular item or type of item, and shows the controls placed on that item. The CCL (Commerce Control List) is divided into ten broad categories, and each category is further subdivided into five product groups. The CCL is available on the EAR Website.

EAR - Export Administration Regulation - The EAR is a set of regulations that are administered by the Bureau of Industry and Security, which is part of the US Commerce Department. In general, the EAR govern whether a person may export a thing from the U.S., re-export the thing from a foreign country, or transfer a thing from one person to another in a foreign country. The EAR apply to physical things (sometimes referred to as "commodities") as well as technology and software.

The EAR number and the License type for this product are included in the table below. Also included is the date the table was last updated.

Product/Component/R5000	EAR Number	License	Last Updated On
GVERSE Geomodeling	EAR99	EAR	11/28/2017

Contacting GVERSE GeoGraphix Support

We are committed to providing the highest level of technical customer support in the industry. With an average tenure of more than thirteen years, our highly trained and experienced staff of technical analysts is comprised of geoscientists, engineers, land professionals, petrophysicists, and system specialists.

Please refer to our Customer Support timings mentioned below to ensure that you have access to our support analysts assigned to your region. When getting in touch with GVERSE GeoGraphix support, please remember that real-time support will not be available during bank holidays or after office hours. If you do get in touch with GVERSE GeoGraphix Support outside of work hours, please leave a voice message with a brief description of the issue that you are facing. Your voice message will be used to automatically create a support case for you. This will enable our analysts to attend to your issue and provide you with a resolution as soon as possible

North and South America	**Europe, Middle East & Africa**
Monday – Friday 8 am-6 pm CST* Toll Free (US/Canada) : +1 855 449 5657 **Colombia:** +57 1381 4908 **United States:** +1 303 295 0020 **Canada:** +1 587 233 4004 **Excluding bank holidays*	**UK:** Monday - Friday 8 am – 5 pm* +44 20 3608 8042 **UAE:** Sunday - Thursday (Dubai GMT+4) 8 am – 5 pm* +971 4 3727 999 **Excluding bank holidays*
Asia Pacific & Australian Continent	**Southwest Asian countries**
Malaysia: Monday - Friday (Kuala Lumpur GMT+8) 9 am – 6 pm* +60 32 300 8777 **Excluding bank holidays*	**Pakistan:** Monday - Friday (Islamabad GMT+5) 9 am – 6 pm* +92 51 209 7400 **Excluding bank holidays*

Helpful Links

Name	Website Address
GVERSE Homepage	http://www.gverse.com