RELEASE NOTES

Geomodeling

Fully Integrated 3D Interpretation

Release Notes

GVERSE Geomodeling 2019.3

LMKR Corporate Headquarters
207, Building 4,
Gold and Diamond Park,
Sheikh Zayed Road,
Dubai, UAE, P.O.Box 62163.
Phone: +971 4 372 7900
FAX: +971 4 358 6386
Internet: www.lmkr.com

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Introduction

LMKR is pleased to announce the release of GVERSE® Geomodeling 2019.3.

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 by LMKR (http://www.lmkr.com/gverse).

LMKR 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:

- **Integrated 3D Visualization Environment**
  GVERSE Geomodeling introduces an integrated map, cross section, and 3D view of a geomodel which enables you to work in 2D or 3D views simultaneously. Observe the real time effect of topography and subsurface geology in your geomodel with tightly integrated and synchronous Map, CrossSection and 3D views. Designed for the geoscientists who work on integrated data sets that include petrophysical, geophysical, drilling, and GIS data.
- **Well Data Visualization and Management**
  GVERSE Geomodeling provides simple and flexible methods to create geomodel based on filtered set of wells. Wells can be filtered by spatial selection or by predefined filters created in GeoGraphix®.
- **Display Surface Tops, Fault Cuts and Well logs in 3D View**
  Enhance the understanding of your reservoir by displaying log curves, surface tops and fault cuts along the wells in 3D view. With these features you can characterize your reservoir on the basis of log curves and surface geometries.
- **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.

- **Fence**
  Construct a true geomodel of the region by creating fence diagrams. 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.
- **Displaying Petrophysical Model on Fence**
  Considering importance of Petrophysics, GVERSE Geomodeling represents petrophysical models (porosity, saturation and geomechanics etc.) based on statistical methods. These petrophysical modeling results are used to populate the fence diagrams to comprehend and analyze general behavior of the reservoir and future prospects.
- **Coblending Fence with Seismic**
  Justify the reservoir behavior by means of harmonizing acoustic impedance contrast with interpolated curve, lateral lithofacies variation, and relating structural geometries from both cross sections and seismic sections. Regional behavior of the reservoir can be quickly analyzed by applying co-blended Interpolated computed or raw curve responses over entire seismic.
- **Perforation Postings**
  Display Completion, Perforation Stage and Perforation along the wellbore path in 3D View to identify the productive zones of the targeted formations. Display of satellite image along the perforation data also helps to determine potential environmental hazards and plan areas for future prospect accordingly.

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 LMKR Support Portal > Knowledge Center > Release Notes and Installation Guides page.

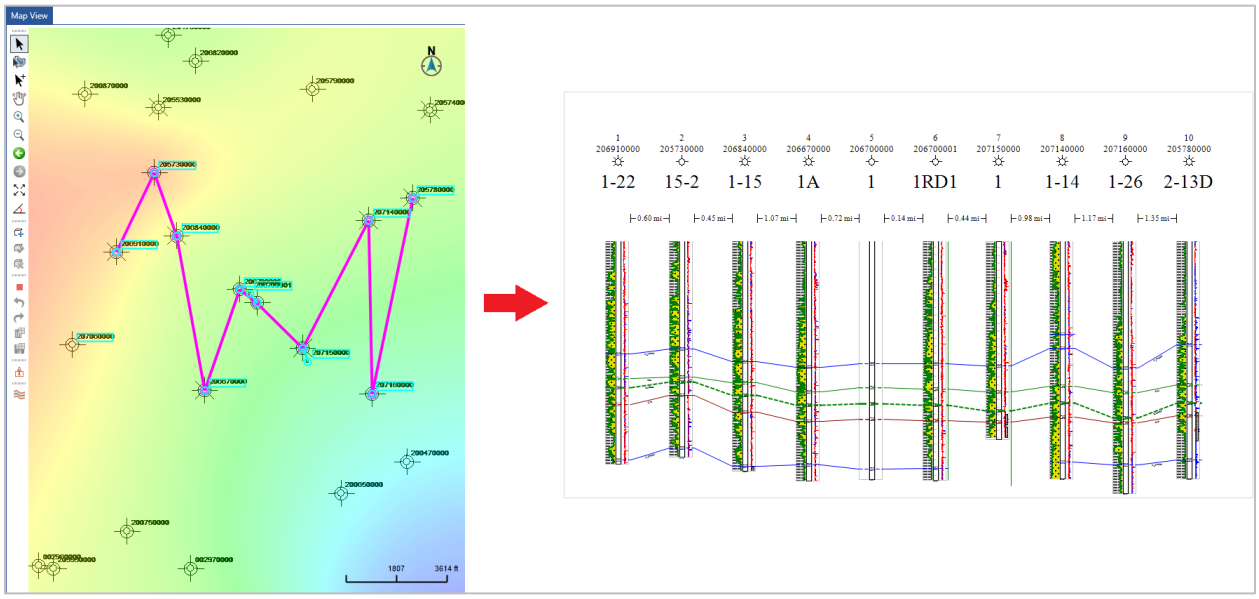
What's New in GVERSE Geomodeling 2019.3

Adding XSection Cross Section

A new workflow, where it is possible to set up the loading of XSection cross sections in the active interpretation. Load the cross sections by selecting the **Add X Section Cross Section** option either from the **Home tab** or **Cross Section tab**.

Aerial Cross Section

Select multiple wells in the Map View and create well to well spatial cross sections in either **North-South**, **East-West** direction or in **Ascending Order of Well ID's**. To create aerial cross sections, right-click on the selected wells and select **Create Cross Section** option from the context menu.



Perforations, DST and IP Calculation in Selected Zones

Calculate Perforations, Drill Stem Test and Instantaneous Potential within a defined zone by using the check boxes in the **Calculate Well(s) in Zone** dialog box.

Show/Hide Projected Tops

A new option to hide projected tops has been added, which looks for the projected tops (white triangles) in a projected cross section and hides them while keeping the projected surfaces visible. This option is accessed under the **Control Points** group box of the **Display Options tab** in the **Cross Section Display Preferences** dialog box and cross section context menu.

Open GeoAtlas Map

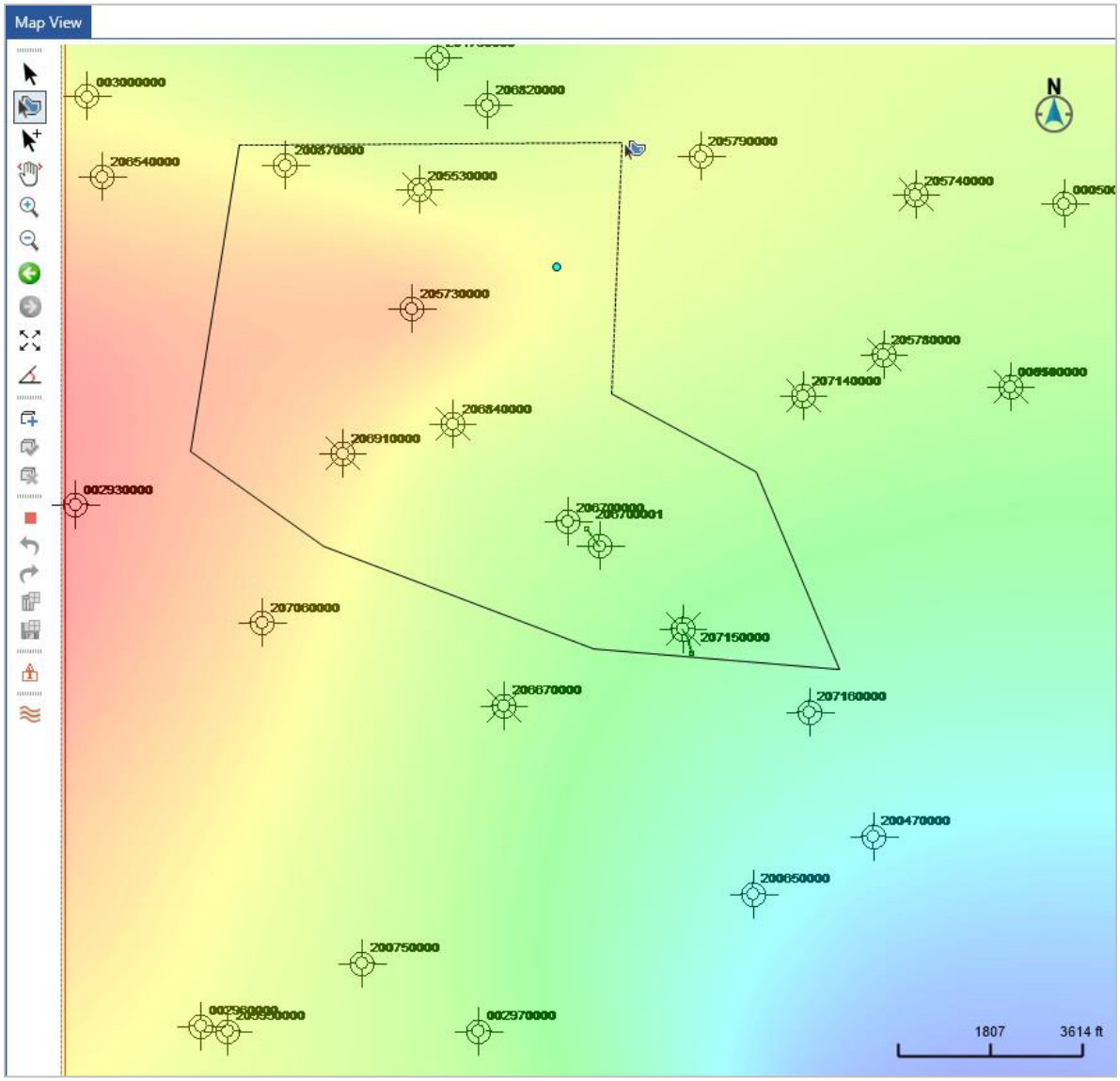
This new functionality aims to introduce a workflow of adding a GeoAtlas map in the active interpretation. To load a GeoAtlas map, select **Open GeoAtlas Map** either from the **Home** tab or the **Layer** tab**.**

Export smartSTRAT Interwell Points

smartSTRAT now supports the export of all the tie points and fault offsets to a (.csv) file format using the **Tie Points** tab of the **smartSTRAT** dialog box.

Polygonal Selection

The Polygonal Selection tool allows you to quickly generate a polygon around the desired wells in Map View to include the selected wells for cross section creation. This tool can be accessed from the **GVERSE Geomodeling** toolbar.

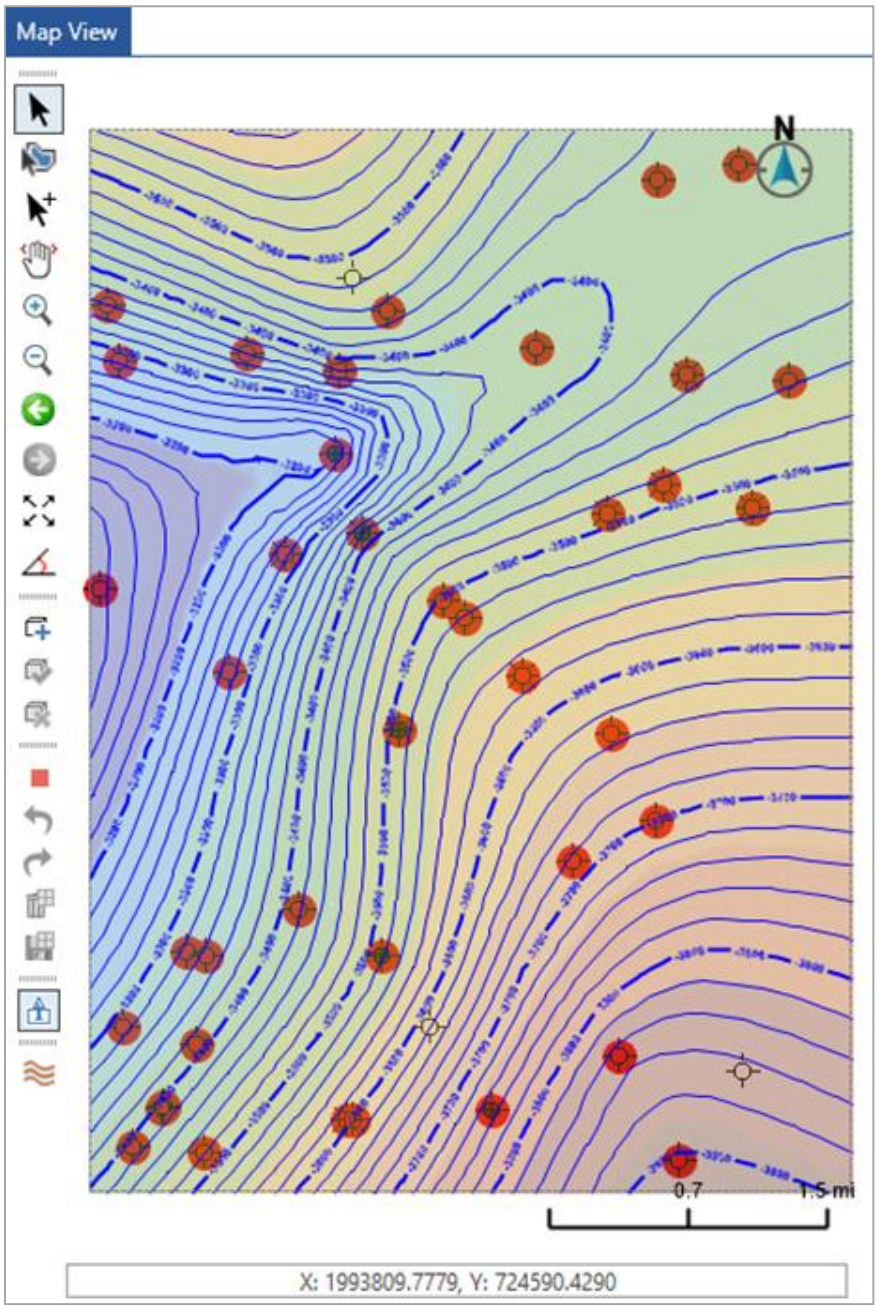


Add or Remove Modeled Zones from the Geomodel

An additional option is provided inside the **GeoSurface Model Properties** dialog box to toggle the modeling of zones, thereby, allowing you to include or exclude the zones from the active model.

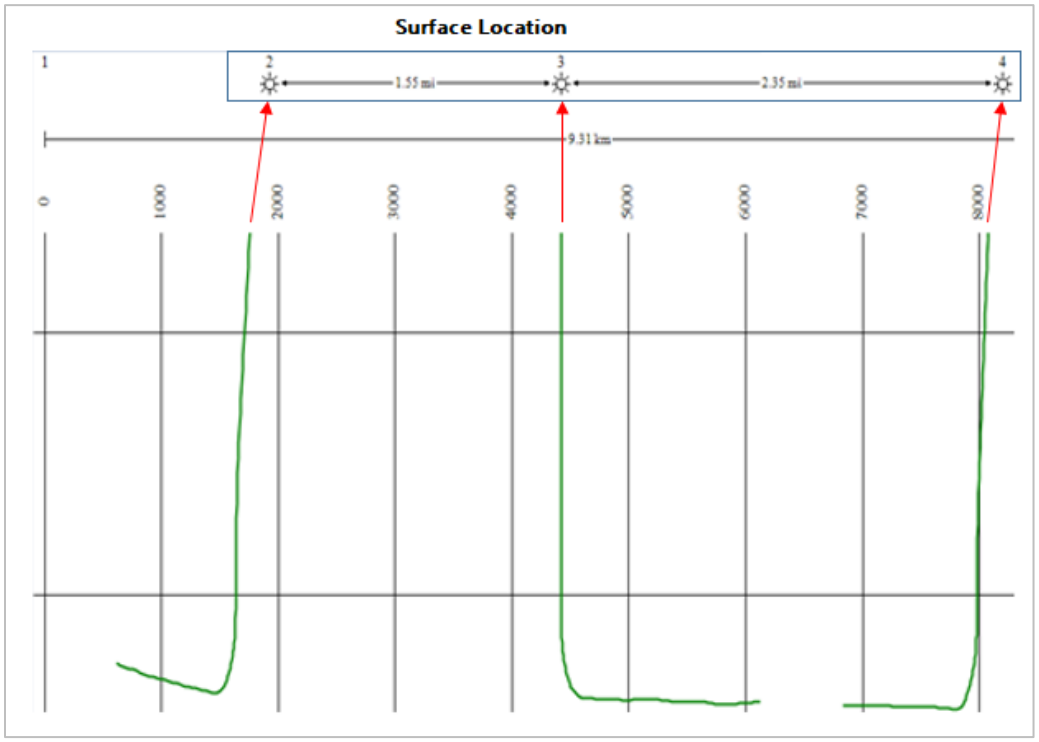
Surface Well Intersections

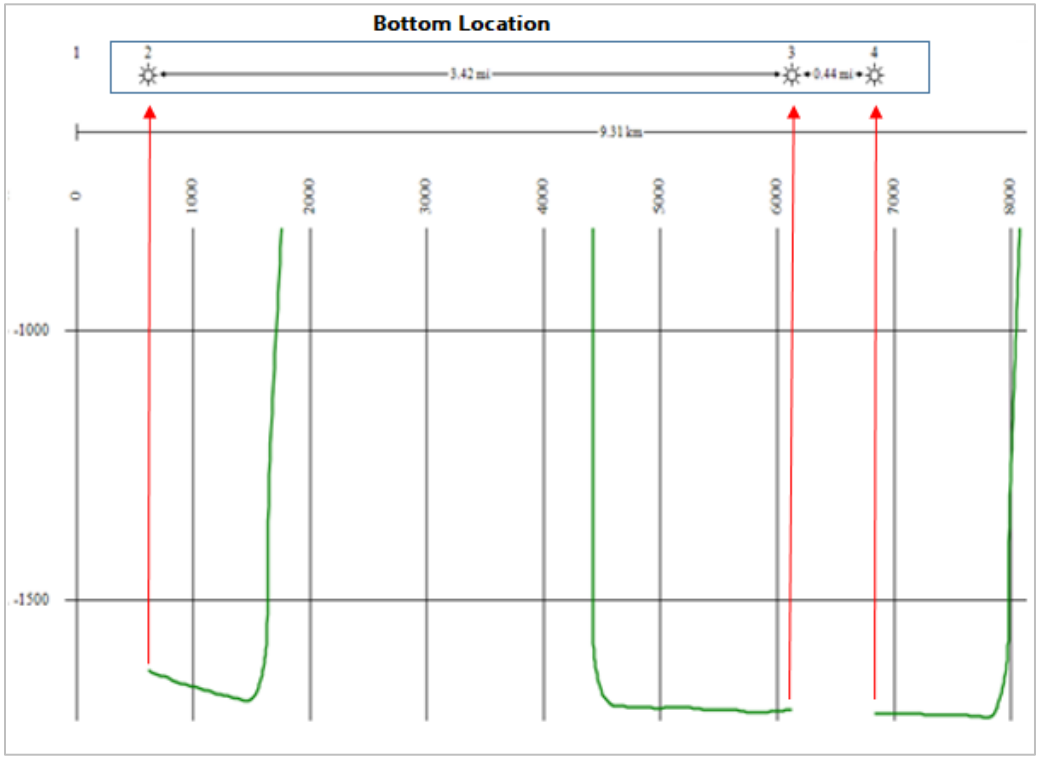
You can now turn on the **Surface Well Intersections** from the GVERSE Geomodeling **toolbar** that displays intersection points as (pies) on the wells intersecting the active surface in the Map View. This is very useful in removing the unnecessary wells from the model or cross-sections.



Distance between Wells in Cross Section

Manage the well distance postings in a projected cross section based on the surface and TD projections. This functionality enables you to align the distance annotations at the surface or bottom-hole location in the Cross Section View. This operation is available in the **Well Distance** group box of the **Marginalia tab** in the **Cross-Section Display Preferences** dialog box.





Refreshing All Views

Refresh all views in a couple of seconds to quickly update data changes in the geomodel.

Reloading Surface

Reload surface in a fraction of a second after adding and modifying well points in the database.

Reloading Well

Reload a well in few seconds after updating the well or log data.

Known Issues

This section lists the known issues in this release.

ID	Description
190798	Zone map values are different from those present in WellBase.
190843	Cos10 fault picks that reverse direction snap to a polygon.
192401	Color fill in S. Pelto project differs from COS8.1.
194930	Surface Offset not visible in cross section.
196402	Inconsistent modeling results when adding second well top on the well.

Third Party Acknowledgements

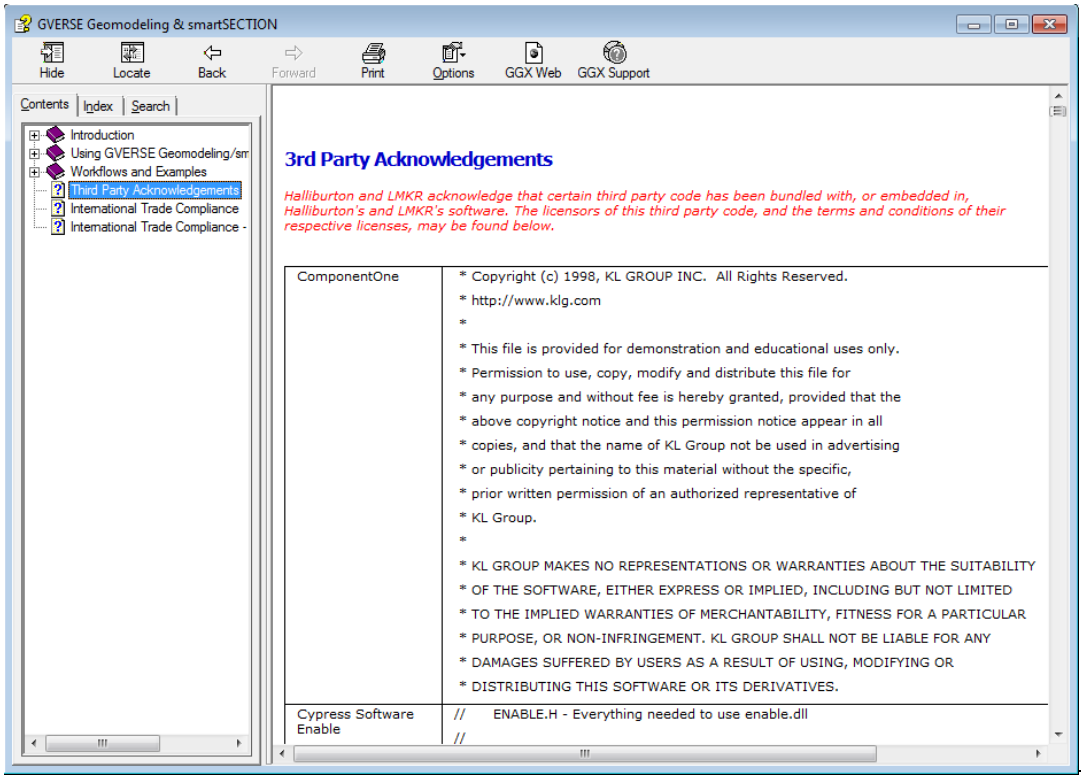
LMKR acknowledges that certain third party code has been bundled with, or embedded in, its software. The licensors of this third party code, and the terms and conditions of their respective licenses, may be found in the help file.

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.



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The ECCNs provided here (if available) represent LMKR's 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

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LMKR GVERSE	http://www.lmkr.com/gverse
LMKR Support Portal	http://support.lmkr.com