leapfrog | GEO

Leapfrog Geo **2023.1**

new release

Leapfrog 2023.1 Release Notes

In Leapfrog 2023.1, we've put 2D output capabilities (sections and plan views) in the spotlight, from significant plan view enhancements to major new features. For the first time, you can automatically add strip views to your vertical cross sections. Users in civil engineering and mining will benefit from simple linked workflows to produce the relevant outputs for reports and communication.

For your resource estimation workflows, we've made changes to domained estimators and further improvements to block modelling – a reflection of our ongoing commitment to this important area. You'll also notice more flexibility for your resource modelling workflows, including sharing variable orientation objects and variogram models, along with tweaks to the UI. Look out for more improvements in the future – these changes are necessary precursor work to support wider changes in estimation workflows.

Leapfrog 2023.1 introduces a new block model creation dialogue that simplifies model creation, while fully-sub-blocked models have been migrated to the same storage as regular and octree models, leveraging earlier improvements to performance, 2D visualisation and sectional display. The changes also enable a long-standing request to import a wider variety of sub-blocked model types.

Finally, you'll find continued improvements to our base geological modelling tools. Surfacing improvements have been made to intrusion surfaces, giving you more control and flexibility when modelling intrusive units.

Leapfrog 2023.1 continues to deliver performance improvements, better interoperability, and enhanced visualisation – impactful, intuitive ways to make your workflows even better.

Seequent, The Bentley Subsurface Company

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2023.1 New Release Functionality

Improved Project Upgrade Messaging

In Leapfrog 2023.1, we have improved the messaging displayed when a project is upgraded from a previous version. Because of the linked nature of Leapfrog project workflows, upgrades may sometimes result in changes to output objects, particularly geological model surfaces or block models. Providing better warning of possible changes gives customers more opportunity to identify and check whether upgrading has induced any changes in output.

There are three types of warning, one that applies to all objects in a project, one that applies only to meshes and one for block models. These warnings have been introduced to give users a greater understanding of the impact of upgrading versions of Leapfrog on their projects.
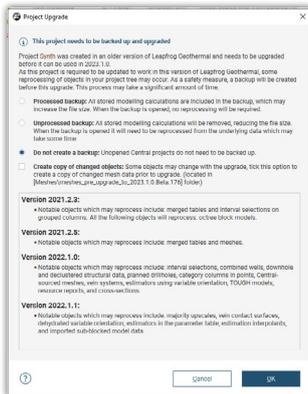

General Upgrade Warning

When a project has been opened, and objects in it have been upgraded, a message will be displayed that provides an option for saving a list of changes. These changes can be saved as a text file when the project is upgraded, providing improved understanding and auditability of the impact of upgrades on projects.
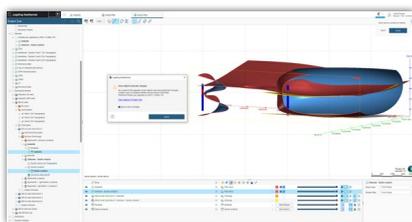
Upgrade Notification Warning of Possibility of Significant Changes to Meshes

At times we need to make changes to our base algorithms or underlying code that can result in changes to output objects when projects are upgraded. In 2023.1, we have introduced a new upgrade message to alert users when objects may have changed. When a project upgrade results in changes to surfaces, we now allow users the option of saving pre-upgrade copies of meshes that may have changed. When this option is enabled, a folder is created in the Meshes folder containing non-editable copies of the pre-upgrade mesh, along with a link to the active surface in the project. A list of changed objects can also be exported to a text file. This allows users to compare before and after upgrade changes and take appropriate action.
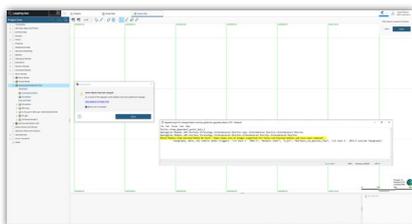
### Upgrade Notification Warning of Possibility of Significant Changes to Block Models

Fully sub-blocked models have been migrated to the same storage as regular and octree models, leveraging earlier improvements to performance, 2D visualisation and sectional display for these models. With this migration, there are changes to how sub-blocking evaluations and triggers are applied. Previously, trigger and evaluations were separate processes. These two steps have been merged, making it no longer possible to trigger sub-blocking without also evaluating the model or mesh. Furthermore, open meshes can no longer be directly used to trigger sub-blocking, although it is now possible to incorporate open surfaces in a Grouped Mesh and evaluate that, achieving the same outcome. If during a project upgrade, a fully sub-blocked model has mesh triggers that are no longer supported, a message will appear, and a list of affected block models can be exported as a text file. Open meshes previously used to trigger sub-blocking directly can be re-applied using a Grouped Mesh after the project upgrade.

Drillhole Correlation
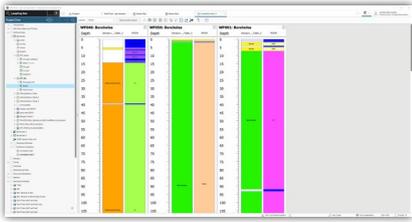
Our popular drillhole correlation tool saw several significant improvements to its interface in 2022.1 to enhance its appearance and usability. In 2023.1, we have put the finishing touches on this greatly improved tool. Enhancements to drillhole correlations have been made to ensure that very long drillholes render correctly. We have also improved the snapping behaviour when the data has very small intervals in the drilling data.

## Geological Modelling – Greater Control of Intrusions
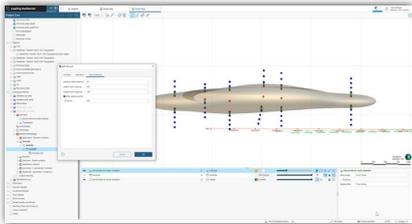
When modelling intrusions from drilling data, interval information is automatically converted into interior and exterior points that inform the Radial Basis Function (RBF) solution. Previously, the same spacing was applied to interior and exterior points. A small change has been made to allow a different spacing to be specified for interior vs exterior points, providing more control on surface geometry.

In addition, it is now also possible to filter out exterior points based on their distance from interior points. In situations where small intrusions are being modelled within large data sets, this can drastically improve processing time, as far fewer data points are being fed into the RBF solution.
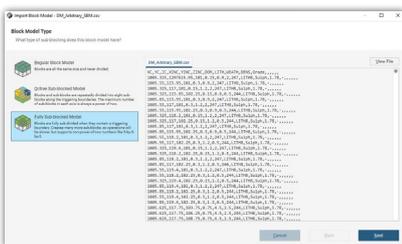
Block Models

In Leapfrog 2023.1, we have made several enhancements to block models. These enhancements provide performance benefits, improve interoperability, and unlock greater flexibility for more advanced workflows.
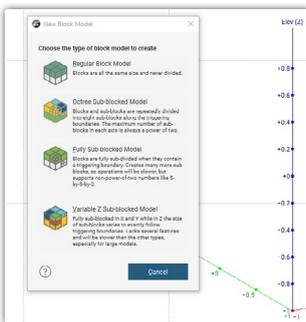
New Block Model Wizard

To simplify the creation and import of block models, we have introduced a new block model dialogue. From the project tree, you now choose to import or create a block model, and Leapfrog will guide you through the steps. A description provides an overview of the different block model options available. The new block model dialogue is designed to enhance the user experience and reduce confusion around the many block model types.


Importing Arbitrary Block Models

To continue to improve interoperability, we've extended our block model import capabilities to allow import of sub-block models with any (integer) number of sub-divisions from CSV. This includes fully sub-blocked models (for example, models exported from Leapfrog) and models where multiples of the minimum sub-block size have been merged into larger regular-shaped aggregations, such as those commonly exported from other mining software. The latter models are commonly referred to as having 'arbitrary' block sizes, although this is a misnomer as there is nothing arbitrary about the resultant aggregated sub-blocks – they always have dimensions that are multiples of the minimum sub-block size.

When 'arbitrary' block models are imported, parent blocks are retained, but any merged sub-blocks are mapped onto the underlying minimum sub-blocks. This process will result in an increase in the number of blocks within a model, but global volumes and values are unchanged.

All common regularly sub-blocked model formats can now be imported into Leapfrog for visualisation and statistical reporting. Imported models can have new triggers and evaluations added, for example, new pit surfaces and/or stope designs, geological surfaces or volumes.
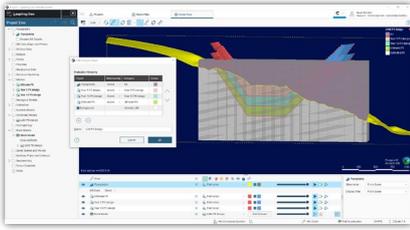
Allow Open Surfaces to be Used in Grouped Mesh

You can now use open surfaces within Grouped Meshes. Any open mesh from the meshes folder or from a geological model can now be added to a Grouped Mesh along with closed volumes and evaluated onto block models. Evaluation of surfaces can be specified as above or below an open surface. When evaluated onto a block model, the user controls whether these open surfaces trigger sub-blocking or are simply evaluated onto existing sub-blocks or parent blocks. This improvement allows for quick and easy evaluations of open surfaces such as topographies, pit shells, oxidation and colluvial surfaces onto block models. The resultant category can then be used as a grouping item in reporting or is available in calculations/filters.
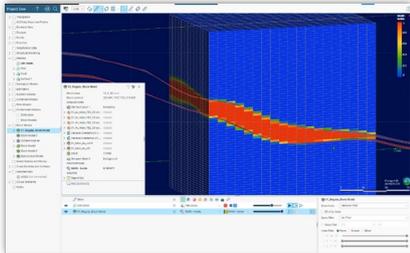
Store Proportions Inside / Outside Volumes

We have now created a simple workflow for users to calculate and store proportions on block models. Proportions stored on block models will better represent the geometry of surfaces in a model and provide greater precision to reported volumes. In this first phase of development, Stored Proportions will allow for a closed mesh to be selected from within the Leapfrog project. It will calculate and store the percentage of each block within the closed mesh as an additional column on the block model. Stored Proportions is accessed directly via the block model and will dynamically update as the block model, or input mesh is updated. Stored proportions can be visualised within the 3D scene or used within block model statistics, calculations and other downstream workflows.
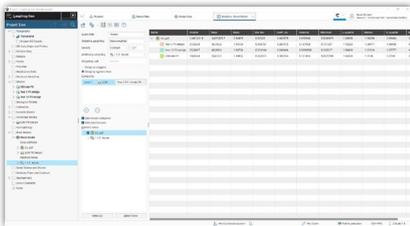

Add Proportional Weighting to Block Model Statistical Reports

Proportional weighting has now been added to several block model statistics reports, including Table of Statistics, Boxplots, Grade-Tonnage Curves and Resource Reports. Users can now select additional weighting attributes for statistics, such as metallurgical and mining recovering, or utilise statistics on block models that include proportions as an alternative to sub-blocking.

Sections and Plans

In Leapfrog 2023.1, we've continued to build upon the work in previous releases and make further improvements to sections and plans based on customer feedback. Several improvements have been made to Plan Views, a new strip view has been introduced to cross sections, and we can now incorporate isosurfacing colours on sections. With the extensive suite of improvements made across the cross sections functionality, the folder in the project tree has been renamed to 'Sections, Plans and Contours'.
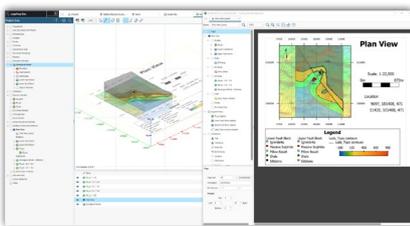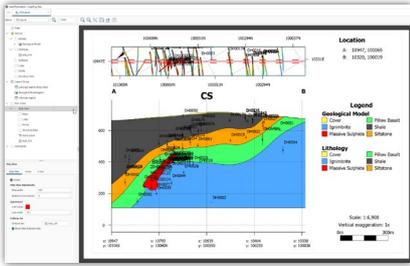

Plan View

Several improvements have been made to the Plan View. These include:
- Copy Plan View layouts between two or more plan views.
- Highlight the Section Line depicted on a Plan View. When Plan Views are added to Sections, the corresponding Section Line will automatically display on the Plan View using default settings.
- Set the position of the section labels adjacent to the section lines.
- Customise page margins on Plan View layouts to improve the look of plan views on cross sections.
- Plan Views are now organised into a folder within the layout section tree.
- A new multiple-section object is now available, grouping all the Lines by their parent group to create a simpler list view.
- Select multiple section lines on a plan view layout and change their settings in one action rather than on a section line-by-line basis.
- Customise the planned drillhole projection on sections independent for traces and intercept points. This is available on plan views and sections.
- Allow elevation to be set for Plan Views.
- Models and surfaces that interact with the Plan View elevation can now be evaluated onto Plan Views.
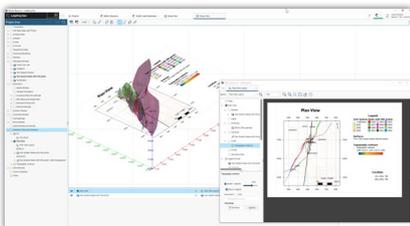
Strip View

A new 'Strip View' option is now available for cross sections to enable you to incorporate a 'strip' that shows a plan view along the top of your cross sections. The plan view conveys important contextual information about the geometric relationship of drill holes to the section plane/window. Strip Views are only available on vertical cross sections and serial sections. Drillholes, maps, lines, points and structural data can all be shown in the Strip View.
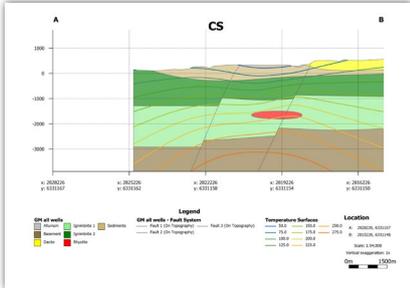

Numeric Model Colouring on Cross Sections

Previously, when numeric model surfaces were added to sections, these could only be displayed, and the fill colour needed to be changed manually. It is now possible to display numeric model isosurfaces or output volumes using the colour map options available on that object. If these colourmaps are updated, the changes will be dynamically updated on the section layout. If desired, the style of objects can still be overridden within section layouts.
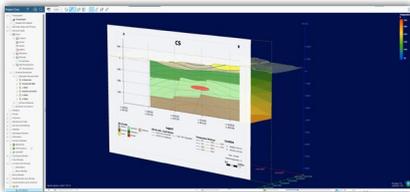

Flatten Long Sections on Export

Producing 2D sectional outputs is an essential part of sharing subsurface information with other stakeholders (engineers, regulators etc.). We have extended the export options available on section to include Long Section evaluations flattened to 2D (dxf, dwg, dgn formats).
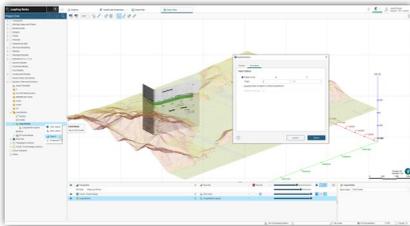
Estimation

We are committed to improving our geology-driven geostatistical tools in Leapfrog with enhancements focused on driving efficiency when setting up resource estimation workflows. In Leapfrog 2023.1, flexibility has been added to modelling workflows through sharing of variable orientation objects and variogram models. It is now also possible to import multi-structure variograms into Leapfrog and integrate these into your current kriging workflows. These changes are necessary pre-cursor work to further planned improvements in estimation workflows.
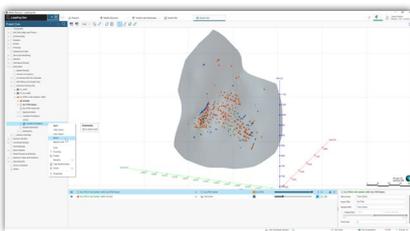

Variable Orientation

Leapfrog's Variable Orientation (VO) tool is very popular due to its ease of use and the quality of results it produces. To improve the performance of the VO tool, we have implemented sharing of VO objects through a new Variable Orientation folder. VO objects can now be created in the shared folder and linked to from any domained estimator or created locally and shared upwards. Shared VO's can also be copied locally and edited.

There are two situations where the restructuring of VO's will bring significant performance benefits:
- Where multiple variables are being estimated into identical domains and
- Where a single VO is being used to inform multiple domains.

It will also save time when setting up new estimation workflows.

An upgrade step has been provided, where any VOs with identical inputs will be automatically moved to the shared folder and linked.
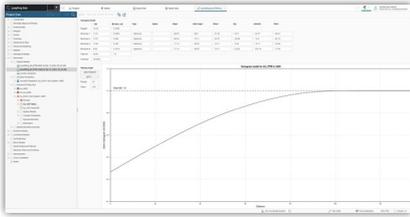
## Import and Linking of Multi-Structure Variogram Models

In Leapfrog 2023.1, we have introduced support for the bulk import of variogram models into a newly created Spatial Models folder. Variograms with up to 4 structures and independent rotations per structure can be imported. Kriging algorithms have also been updated to accommodate such models. Visualisation of variogram models has been enhanced to allow all structures to be toggled on/off in the 3D scene.
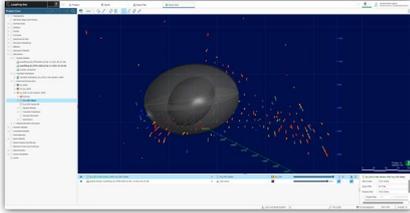
To support the use of imported variogram models, we now allow estimators to select a variogram model from the Spatial Models folder or from within any domained estimation object in the project.


This change has been made in anticipation of future cloud-based automated variogram modelling workflows and to facilitate the use of variograms created in other software.

It is important to note that no changes have been made to Leapfrog's variogram modelling tool – this is still limited to the creation of models with two structures and common rotation.
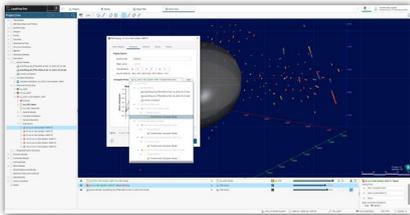
Sharing Variogram Models

It is now possible to share variograms directly between domained estimations. We have introduced a new Spatial Models folder allowing compatible Variograms to be bulk imported and used within domained estimations inside Leapfrog. The user can now also select any variogram within the Leapfrog project to be used in the estimator; it is no longer restricted to the domain estimation object.
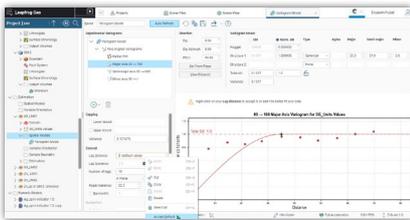

Improved UI for Variogram Lag Distances

We have simplified the calculations used when initialising new variograms, resulting in improved default lag distance values and faster processing.

For the radial plot, major axis, semi-major and custom variograms, the average inter-drillhole spacing distance is used, rounded to a whole number. For the minor axis and downhole variogram, the default value depends on the input data: composite length, interval length, or average point spacing. This change applies to newly created variograms and transformed variograms.

The final selection of lag distance is a user choice. While the defaults provided are good, we recommend that customers test sensitivity of experimental variograms to lag distance and consequently now provide an overlay that shows when default lags have not been tested. The overlay is only informational, and you can proceed with estimation workflows without accepting or changing default lag distances.
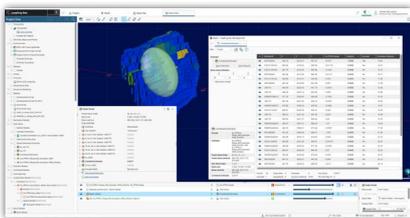
Enable Block Interrogation on Suitable Combined Estimators

The interrogation tool provides a powerful method for assessing the neighbourhood choices of an estimator. Previously this tool was only available on individual domained estimators, meaning that estimators needed to be evaluated onto a block model in order to perform neighbourhood analysis. Evaluating individual estimation objects results in a separate column (or group of columns) for each evaluation. To be useful, the evaluations for separate domains or from multiple passes within domains need to be brought together – this job is carried out by our Combined Estimator tool.


We have now extended block interrogation capabilities so that block interrogation can be invoked directly on Combined Estimators. Querying a block will open an interrogation window for the estimator that informs that particular block. By eliminating the necessity to evaluate individual estimators that are inputs to a combined estimator, customers now have the ability to significantly reduce the amount of evaluation time required and the size of resultant block models.

Additionally, the block interrogation has been extended to also include Nearest Neighbour estimators.
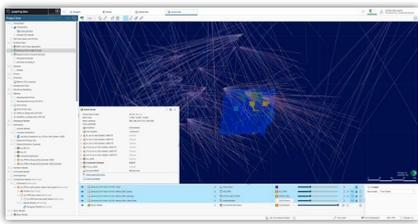
Improved Performance of Combined Estimators

Along with the benefits of the feature outlined above, another great motivator for the use of combined estimators is that we have significantly enhanced their performance through code improvement. Evaluation of a combined estimator directly is considerably faster than evaluating the individual inputs individually and then combining these into a single column with a calculation.
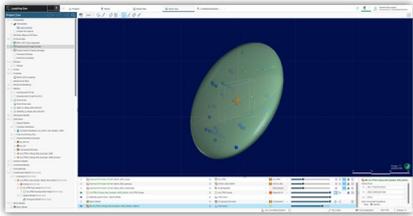
### Improvements to Neighbourhood Search Performance

Code level improvements have also been made to the search algorithm used in Nearest Neighbour, Inverse Distance and Kriging estimators, resulting in faster evaluations.
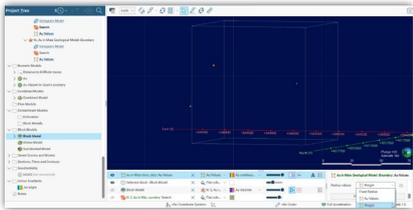
### 'Included Points' Can be Sized by Weight within Interrogation Tool

To further enhance the block interrogation experience, it is now possible to scale the size of points, informing a block estimate by the kriging or inverse distance weight assigned to those points. This provides a visual indication in the 3D scene of the strength and influence of points in defining the estimate of a specific block.

Usability Enhancements
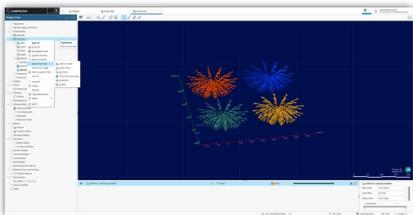
Import Downhole Lineation Data

A minor feature that has been highly requested is the ability to import measured downhole lineations directly on drilling tables, and we are pleased to announce that this has been implemented. It is no longer necessary to convert downhole lineations into trend and plunge before import. Instead, Leapfrog will now directly convert downhole alpha, beta and gamma measurements on import, creating lineation cones that can be visualised in the 3D scene alongside your geological data.
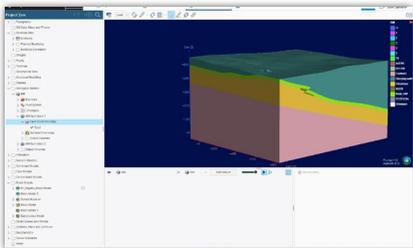

Turn Off Dashed Slicer Line in 3D

When rendering images or creating scenes or movies, it was previously not possible to turn off the dashed line that borders the slicer plane. This could clutter the scene and did not allow for a clean render when creating images or movies to be used in presentations.It is now possible to turn off the slicer outline within the 3D scene from the settings menu and remove it from the overlay when rendering images. This change allows users to turn the slicer on or off, depending on your needs.
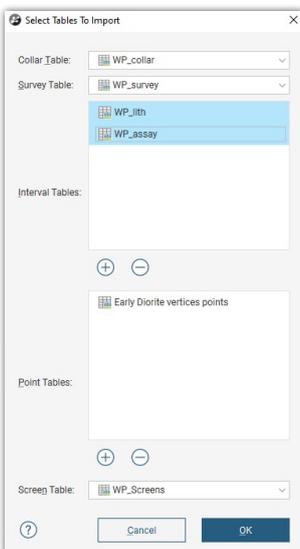
Multi-Select Removal of Tables for ODBC

Changes have been made to the way in which tables are imported using the ODBC link. Previously, when importing interval tables via ODBC, Leapfrog automatically identifies Lithology tables, and users can use any additional tables selecting multiple objects at a time if desired. However, it was only possible to remove tables from the list individually, which could be time-consuming when regularly loading data. It is now possible to select multiple tables at a time to remove from the import list, speeding up the import of drilling information.
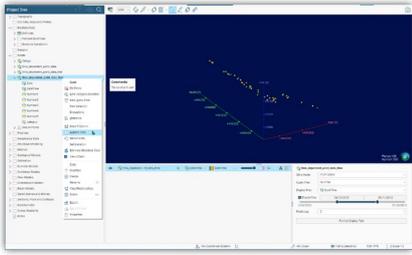
Improved Time Dependent Points

Data with a time component is collected continuously (for example, microseismicity events or piezometer measurements), and previously it was not possible to append new data to the same file to keep it up to date with recent information. Users would have to import each new set of data independently and then recreate any downstream calculations, filters or models that depend on this information. To provide a more efficient workflow consistent with other data types, Leapfrog now allows time-dependent points to be appended and re-loaded, additional columns to be added, and calculations and filters created. We have also improved identification and handling of duplicate points, so that points with identical coordinates and date/time stamps are flagged as duplicates, but points with identical coordinates and different date/time stamps are not.

Due to this change, additional points in existing data sets may now be considered duplicates. And Time Dependent Points affected by this change will be flagged with an upgrade notification (see section 4.1.2).
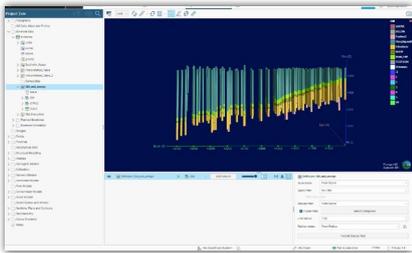
Rapid Value Filtering for Points, Block Models, and Interval Tables

Enhanced filtering is now available on points, block models and interval tables. Previously, interactive filters were limited to the attribute that was displayed in the 3D scene. Whilst more complex filtering could be applied through the application of query filters, this required the user to first create the query filter. Now it is possible to separately control the display of data from the scene list while filtering by other data from the properties panel, giving rapid in-scene data analysis and improved identification of patterns and trends. The new rapid value filtering is available on points, interval tables and block models, except for the legacy variable z sub-blocked models.

Modification of Composite Weighting Calculations

Geostatistical estimation methods are predicated on the use of samples of equal 'support' or length. Compositing is the process used to convert numeric values from drillhole intervals of irregular length into composite intervals of regular (or defined) length based on pre-defined rules. Composites are always weighted by sample length and may optionally be weighted by other factors – commonly density when there is a strong correlation between grade and density values.

An issue was identified whereby if a column used for additional weighting was included as an output column, it was incorrectly being double weighted. This has now been rectified, and the weighting column in the output is now composited using length-weighted averaging only.

The change only impacts compositing at the drillhole level. Compositing in domained estimators is unchanged.

Affected composites will be flagged as part of the new upgrade notification (see section 4.1.2). Any estimation outputs based on the weighting column should be checked after upgrade.
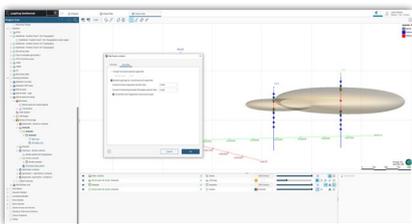
Add 'Enclose' Option to Lithology (lith) Compositing

In previous versions, the parameter options available in lith compositing could sometimes result in illogical composite generation. To improve this behaviour, a new optional setting has been added to the compositing dialogues, which allows the user to specify whether primary or exterior composite segments must be "enclosed" before they are converted. This will allow for better handling of intervals in situations where a primary or exterior short segment is only bounded on one side by another segment type. We have also changed the terminology from 'Filter' to 'Convert' when simplifying geology for short segments to provide a clearer understanding of the functionality. This improved optionality has been applied to the drillhole categorical compositing as well as composite settings for deposit, erosion, and intrusion surfaces.

By default, for any existing surfaces, the option will be set so that surfaces are unchanged after upgrade. For new surfaces created post-upgrade, the option will be unset by default. We recommend that you experiment with this setting on a copy of your surfaces to investigate the effect.
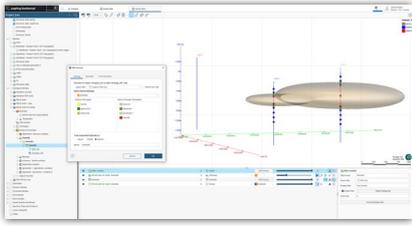
Change to Handling of 'Unspecified Intervals' When Using Collar Query Filters on Geological Model Surfaces

A change has been made to rectify unexpected behaviour when creating Geological Model surfaces (intrusion/erosion/deposit) using composited data with a collar level query filter applied.

The compositing process in GM surfacing tools allows the way unspecified intervals are treated to be defined – these can be ignored or converted to interior or exterior. When a collar level query filter was being applied, however, these instructions were ignored, so that output surfaces in this situation were being influenced by intervals from holes that should have been excluded.

A change has been made to ensure that these intervals are now correctly excluded. Surfaces that were affected by this explicit set of circumstances WILL change on upgrade. Consequently, we have implemented a new upgrade notification (see section 4.1.2).

Evaluate Numerical Models onto Interval Tables

Numerical models can now be evaluated directly onto drilling data. The mode of evaluation depends on the type of numeric model. RBF interpolants, multi-domain interpolants and distance functions, can now be evaluated onto downhole intervals (at the midpoint location), depth points or downhole structural points. Values returned are the numerical value of the interpolant at the target points.

This complements the existing evaluation of categories from GM's or indicator output volumes.

Interoperability
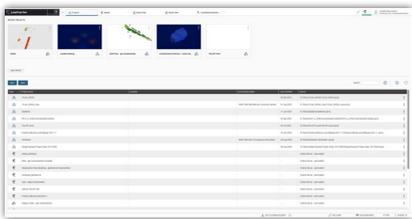
Filter Central Projects

With Central expanding its powerful centralised model management capabilities to Oasis montaj, it is now possible for there to be a variety of projects within Central alongside Leapfrog. Improvements have been made to filter the display of Central projects within Leapfrog so that only Leapfrog projects will be displayed and available for download.
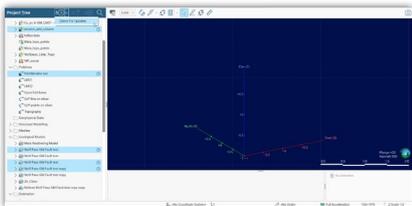
New Central 'Out of Date' Workflows

Currently, when using Leapfrog projects connected with Central, Leapfrog performs automatic checking every 5 minutes for all connected files. This can often create unnecessary network traffic, particularly if objects remain unchanged. We have reduced the polling time and introduced the ability for users to manually check for updates, as well as to bulk update Central objects when new information is available. Improvements have been made to the user interface to more easily identify objects imported through Central and Seequent Cloud. This improvement facilitates better integration of data and enhances connected workflows.
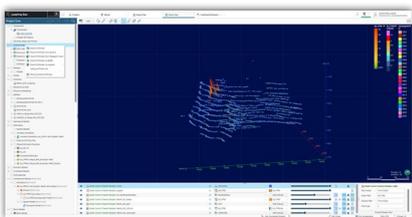
Improve Consistency for Import from Seequent Cloud

We previously released the ability for users to import drill holes directly from Seequent Cloud. To further enhance this work, users with access to more than one organisation can now select the organisation hub they wish to import data. We have also made changes to the UI to help distinguish which data hosted in Seequent Cloud are geoscience objects and which data are hosted as files so that you can decide which data to import into your projects.

Point Release 2023.1.1

Desurveying

An issue has been identified in Leapfrog 2023.1 with Balanced Tangent de-surveying of drillhole traces, where the incorrect azimuth may be applied to the first segment of the hole path. If this situation occurs, the position of drillholes and any models built from them may be incorrect. This issue is specific to LF2023.1 and does not affect earlier versions. Read more here.

Central

Several issues have been identified in Central Webviz related to changes that were made to the way HoleID data is published from Leapfrog 2023.1. These issues mostly relate to the visualisation of drillhole collars in the Webviz view, but do also impact other areas.

A detailed description of the issues which may occur can be found here. In general, if you are experiencing issues when viewing drillhole collars in Webviz, upgrading to Leapfrog 2023.1.1 and re-publishing projects will rectify the issue. However, in some limited circumstances project versions published in LF 2023.1 remain broken and there is no way to get them back.

Issue Key Summary

ISSUE KEY	SUMMARY
LF-48092 TB:	Upgrading project with non-variable Z legacy SBM with sub-block count of 1,1,1
LF-48624 TB:	Economic composite with query filter and "Use true thickness" checked
LF-48661	Publish progress bar stays at 0%
LF-48679 TB:	No attribute on old_table_file_path
LF-48684	Numeric Model volumes can't be hidden from section legend
LF-48688	Legend not updating with changes to max-min colourmap limits
LF-48733 TB:	Clicking on an evaluated numeric model on a DH composite table
LF-48809 TB:	Exporting interval start, mid and/or endpoints from table with invalid rows to Release 2023.1.1
LF-48814	Hard crash when editing category selection on points and changin their size
LF-48935 TB:	When selecting Face Dip or Dip Az for topography when Display Filter set to Elevation
LF-48949	Discrete colourmap behaviour
LF-48997	Evaluation table output is incorrect
LF-49003	Blob data is not updated when publishing to same branch – Central
LF-49085	User created Subfolders can be deleted unexpectedly
LF-49098	Fix calculation of balanced tangent in desurveyor

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