



Release Notes

GeoStudio 2024.1 continues to build on Seequent's geotechnical analysis solution, adding new features to tackle complex problems involving rock slopes along with the capability to improve workflows and make analysis definition and results interpretation more intuitive. Moreover, this release also improves the 3D geometry building process through improved mesh handling upon import of geological model volumes and background meshes. Performance improvements affect meshing, solving, and visualisation, making for a better user experience and a more efficient modelling process.

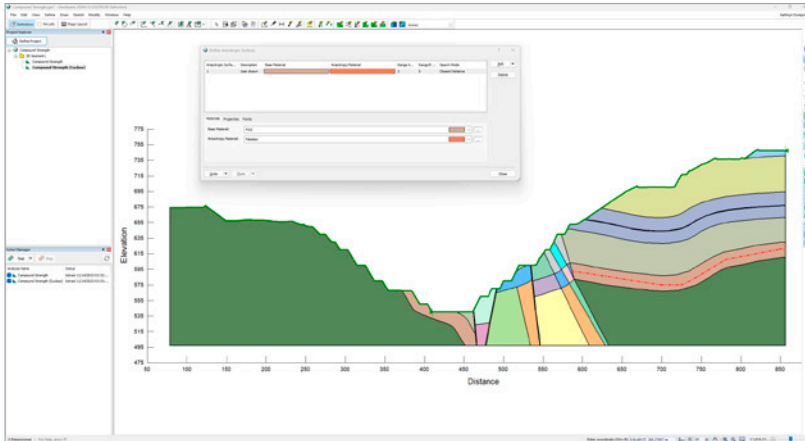
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New and improved features in GeoStudio 2024.1

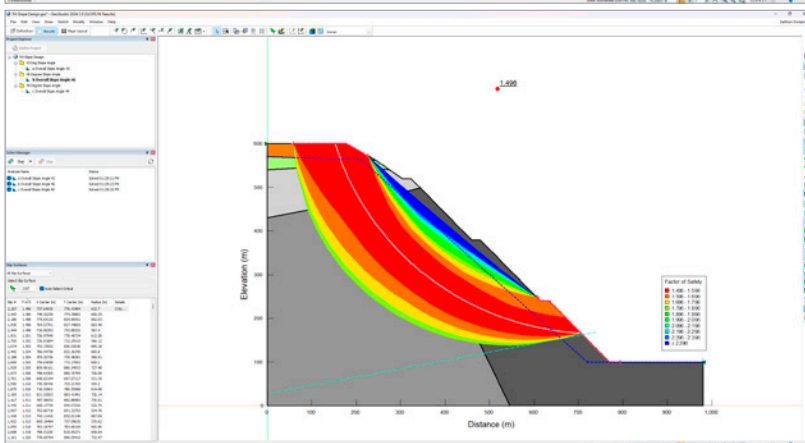
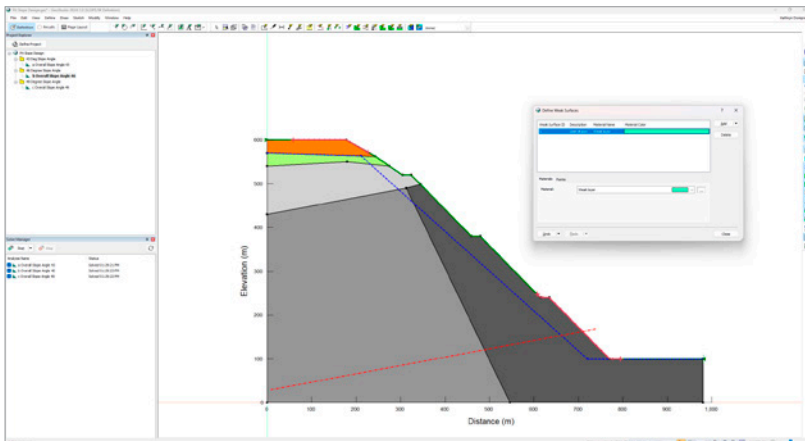
Anisotropic Surfaces in SLOPE/W & SLOPE3D

Easily capture the effects of non-planar geological discontinuities in your 2D and 3D stability analyses. Discontinuities are typically the result of bedding, schistosity, joints, foliation, cleavage, fractures, or faults. The strength anisotropy may occur ubiquitously in a geological unit (i.e., a discontinuity set) or as a single discontinuity. Anisotropic surfaces are defined using a polyline in 2D and a background mesh in 3D and associated with the appropriate material to define the strength of the discontinuity.



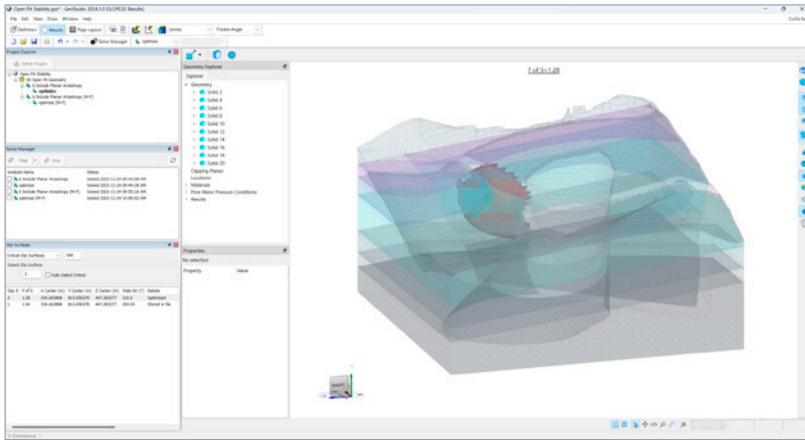
Weak Surfaces in SLOPE/W

Weak Surfaces are now available in SLOPE/W. A weak surface could be used to represent a single discontinuity, a shear zone at residual strength, or an interface along a geomembrane. It removes the need to use the impenetrable material model for translational modes of failure along the discontinuity. Weak surfaces are simply defined using a polyline in the same manner as a piezometric surface. Moreover, any material model can be associated with a weak surface, allowing maximum flexibility for defining the strength on the discontinuity.



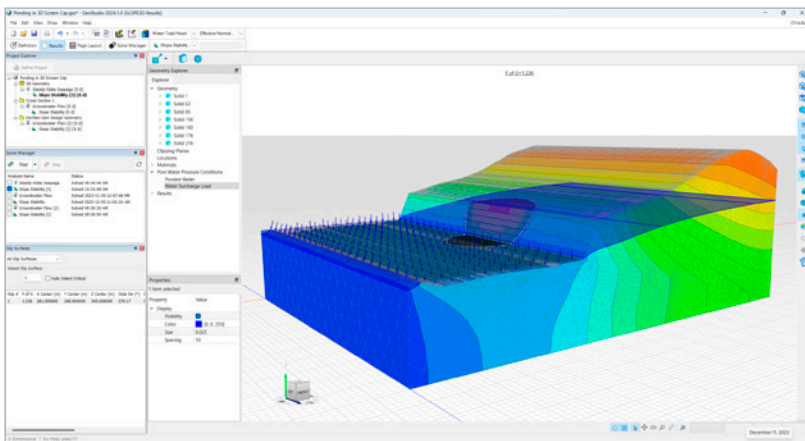
Slip Surface Optimization in SLOPE3D

Slip surface optimization has been added to SLOPE3D. Optimization is used to search for a modified slip surface shape that produces a lower factor of safety and a mode of failure that is in keeping with the physical system. The SLOPE3D methodology uses a nature-inspired optimization algorithm to quickly generate a slip surface that honours the controlling characteristics of the slope, ensuring that any analysis or design captures the physical reality.



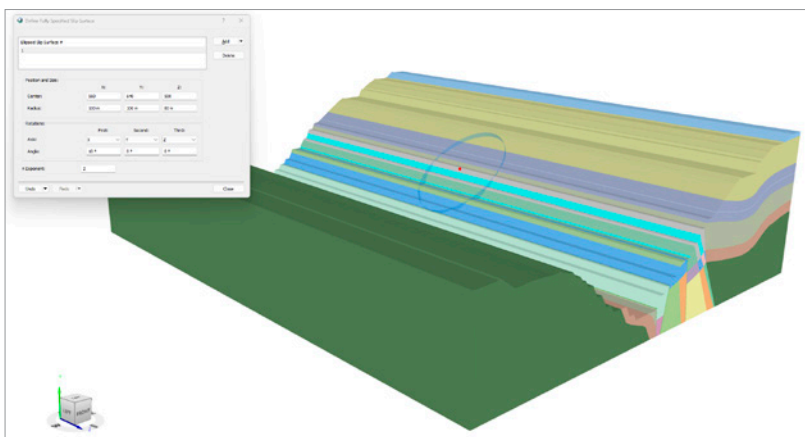
Ponding Visualization in 3D

Customer feedback over many years has reinforced the importance of visualizing the presence of ponded water along the ground surface given that it results in an automatic surcharge load in slope stability analyses. This feature has now been implemented in GeoStudio 3D, ensuring consistency between 2D and 3D analysis visualization. In the case of SLOPE3D, automatic surcharge loads are applied under the ponded condition.



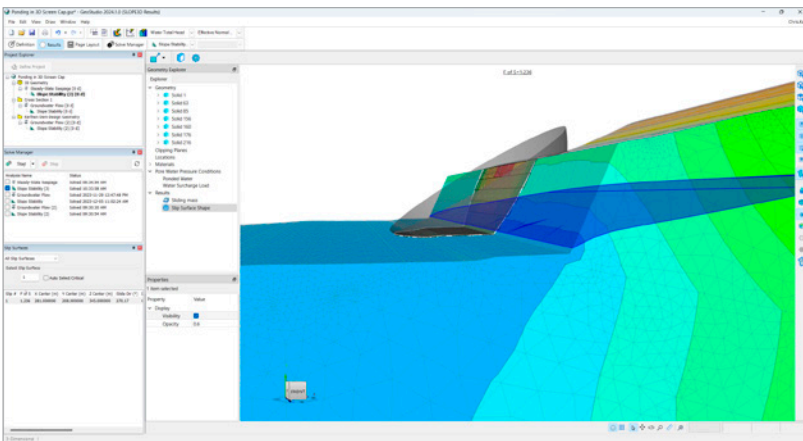
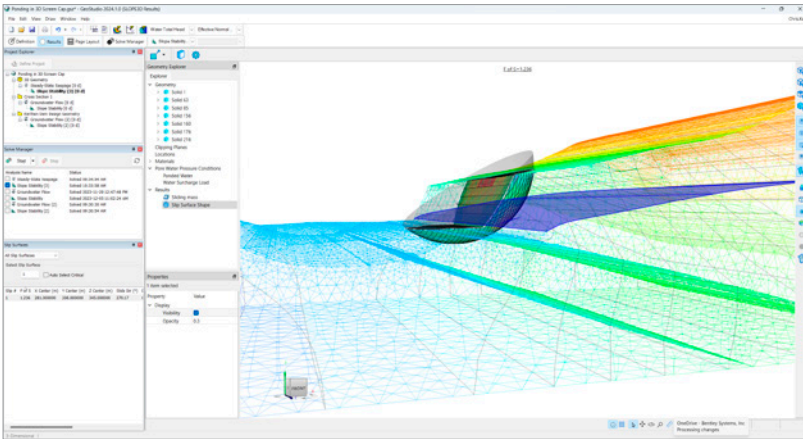
Fully Specified Slip Surface in SLOPE3D

The ability to fully specify three-dimensional slip surfaces in SLOPE3D provides a quick and easy workflow to focus attention on a specific mode of failure or simply learn the ins and outs of SLOPE3D.



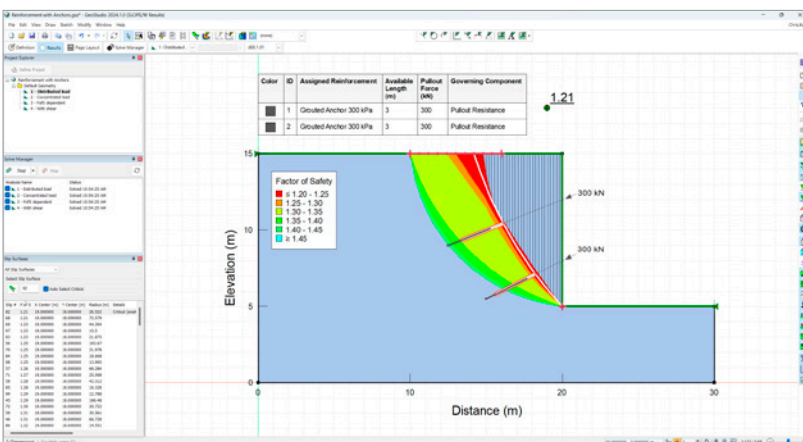
3D Slip Surface Visualization in Results View

You can now see the three-dimensional 'bowl' used to generate a slip surface, creating better insight into the behaviour of the software, and helping to provide greater clarity for results visualization.



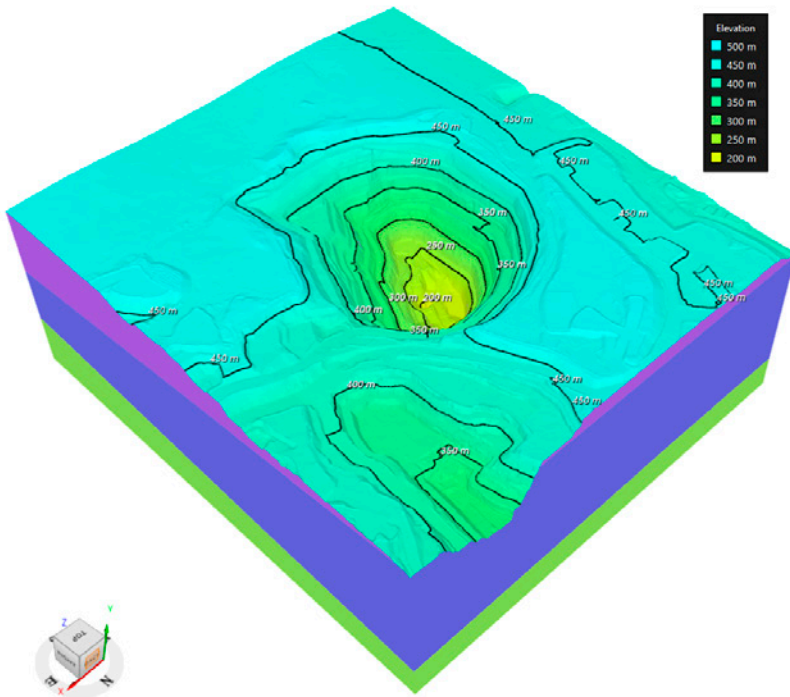
New Reinforcement Results Display in SLOPE/W

Engineers need to quickly understand the load transfer into nails, anchors, and geosynthetics to make informed design decisions. Reinforcement loads can now be visualized in Results View, along with a new table enumerating the reinforcement data. This will not only lead to quicker interpretation but also better reporting.



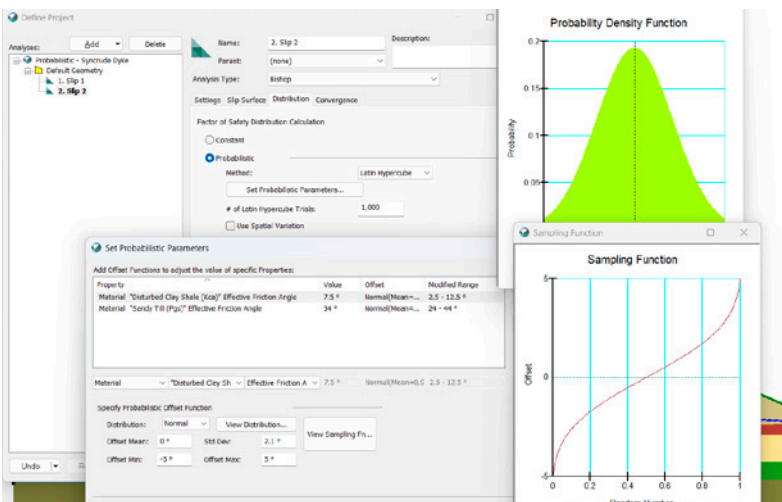
Elevation Contouring of Geological Model Volumes

Elevation contours are critical to visualizing the topographic variability in a 3D stability analysis, and therefore informing the engineer on the most likely location for instability. Contours can now be visualized on geological models brought in directly from Leapfrog or by importing OBJ files. Moreover, improvements have been made to ensure that contours are not rendered outside the ground surface.



Latin Hypercube Sampling in SLOPE/W

Probabilistic analysis is critical for risk management in geotechnical engineering, but it is computationally demanding as thousands of trials are conducted on every slip surface. The addition of the Latin Hypercube technique to SLOPE/W provides a more efficient approach for sampling the key parameters, therefore accelerating solve times while providing accurate solutions.



SLOPE3D Performance Improvements

Three-dimensional slope stability analyses are computationally demanding due to the size of the domains, the number of columns within a slip surface, and most importantly, the number of iterations required to find the critical sliding direction. Many iterations are required to find the intercolumn force function weighting parameter for force and moment equilibrium and to handle the non-linear nature of the solution strategy. Moreover, the substantive amount of data puts additional strain on results visualization, including the ability to efficiently switch between Define and Results. This release improves solve times via optimizations in the GeoStudio-'solver', quicker responsiveness in the user interface for performing actions, faster rendering of objects, and much more.

GeoStudio Finite Element Solver Performance Improvements

Performance improvements to GeoStudio's handling of large finite element meshes have made it approximately 2x faster to open, solve, and view results.

Improved Mesh Handling in GeoStudio 3D

Significant effort was dedicated towards better mesh handling within GeoStudio to improve the workflow for importing Leapfrog geological model volumes. Specifically, non-manifold structures and degenerate triangles are now handled. In addition, degenerate triangles associated with imported background mesh are also now handled. This substantially improves the success rate of imported geological models, further streamlining the construction of three-dimensional geometries for SLOPE3D analysis.

UI Improvement: Camera View Saved for Each 2D Geometry

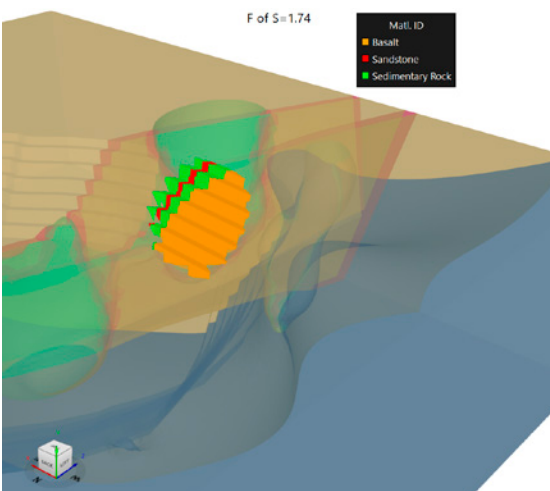
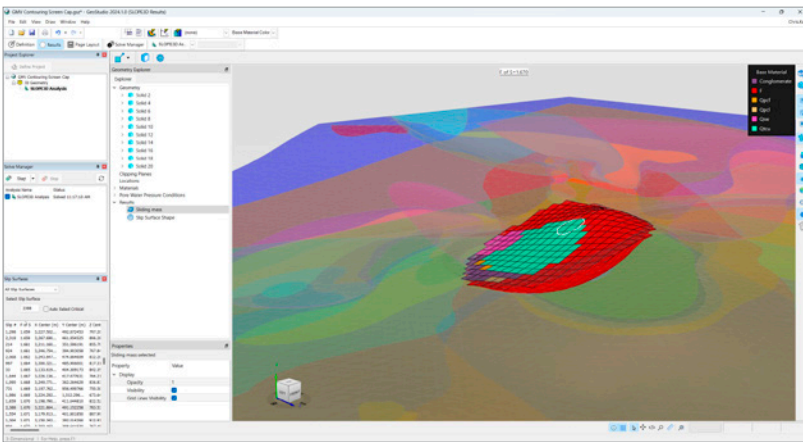
The workflows for GeoStudio files with multiple 2D geometries are improved with the introduction of a saved camera view per geometry. Quickly navigate between analyses under different geometries without having to re-set the camera view. Changing the zoom or scale in one geometry no longer affects other geometries in the file.

Compound Strength Overlapping Joints

The compound strength material model in SLOPE/W and SLOPE3D has been improved over the last couple of years to handle multiple planar discontinuities within an intact material. This release sees an additional improvement to handle overlapping joints. Specifically, the selection of the closest discontinuity at the base of a slip surface now acknowledges the 'A' and 'B' angle ranges controlling the transition of strength from the weak material to the intact material.

Contour Material Colour on Columns in SLOPE3D

Material colours, representing the material at the base of each column, can now be contoured on the column grid in a 3D stability analysis, making it easier to interpret the results.



Bug Fixes and Changes

BUILD3D / 3D Products

Bug	1269651	Added mesh healing for a case with mixed quads and triangles to prevent a crash during Import Background Mesh.
Bug	1270359	Added projection plane options to Fit to Surface to handle cases where the auto-plane detection was inadequate.
Bug	1241962	Added warning messages for missing Geological Model Volume, Background Mesh, and other input files on reload operations and other import operations.
Bug	1307553	Bodies whose Meshed option is set to false will no longer be considered for the display of the Ground Surface in Define View.
Bug	957761	Enclosed lenses inside regions are now correctly imported onto 2D Sections when importing from Central.
Bug	1108668	Fixed a case where an Invalid location was reported when importing an STL file with Unicode characters in the filename as a background mesh.
Bug	1243932	Fixed a case where material assignments were not set if Geological Model Volumes (GMVs) were deleted prior to the same GMVs being imported a second time.
Bug	1176928	Fixed a crash that occurred when meshing errors were encountered when importing Geological Model Volumes from Central. Now proper meshing error messages are reported in this case.
Bug	1341635	Fixed a memory leak that would occur after upgrading a file from an older version in some cases without first remeshing the file.
Bug	1215366	Fixed a problem introduced in V2022.1, where Section-Vertical Plane properties were not being properly updated when edited.
Bug	1341651	Fixed cases where elevation labels on isosurface contours were sometimes missing or incorrect.
Bug	1253634	Fixed failure to assign material associations to Geological Model Volumes (GMVs) in some cases with nested Analyses.
Bug	1241877	Fixed freeze that occurred on reload of Geological Model Volumes when original OBJ file was missing from the expected directory.
Bug	1192928	Fixed the missing selection of surfaces in the graphics area for easier application of boundary conditions.
Bug	1265661	Improved error message descriptions in the Task Manager for some cases encountered building meshes.
Bug	1353219	Removed a No Results message appearing incorrectly in the Task Manager after resolving an analysis that was caused by attempting to refresh the display before the new results were ready.
Bug	1165152	Resolved cases where materials were mapped incorrectly during a Clone Analysis operation.

SLOPE3D

Bug	1133989	3D reports no longer display some 2D information.
Bug	1367318	Corrected the direction of the applied external ponded water load when using the Janbu analysis type.
Bug	1170504	Fixed a case where a SLOPE3D analysis failed to solve after changing the PWP Conditions option from Piezometric Surfaces to None.
Bug	1222313	Fixed a crash that would occasionally occur using the View Report in Results for a SLOPE3D analysis.
Bug	1241744	Fixed an 'Unexpected termination of solve server process' error that occurred when a material was missing a Slope Stability Material Model setting.
Bug	1164989	Fixed cases in SLOPE3D where multiple slips could not be imported from the parent analysis even when more than one critical (i.e. stored) slip surface exists in the parent. In all cases only a single slip was imported from the parent analysis.
Bug	1168258	Fixed some cases where the column base dip direction was reported wrong for some columns in the Result Information dialog.
Bug	1369127	Horizontal surcharge loads caused by ponded water were slightly in error for columns at the outer edge of a sliding mass on the sloping portion of the ground surface.
Bug	1184232	Some data points were missing on the convergence graph of F of S vs. Sliding Direction Angle in some cases.

SLOPE/W

Change	1023976	Grouted Anchor with Friction option added to the SLOPE/W reinforcement option to consider scenarios in which the pull-out resistance is calculated based on frictional properties and effective over-burden stress.
Bug	1225526	A value greater than 0, instead of allowing 0, is now enforced for the Hoek-Brown mb parameter to prevent a crash on View Graph.
Bug	1315273	Added a warning message for the case when the slip surface optimization exceeds the maximum concave angle.
Bug	1228217	Added a warning prior to solving, for matching domain coordinates when using the 'Critical Slip Surface' from 'Other GeoStudio Analysis' option.
Bug	1329757	Fixed a crash that occurred for a SLOPE/W (QUAKE/W) stress-based stability analysis crashes if the parent QUAKE/W analysis has the View Preference Liquefaction Zone toggled on.
Bug	1224839	Fixed a crash that occurred if the sliding direction was changed, and an attempt was made to view results without first solving the analysis.
Bug	1277860	Fixed a specific case where the Water Surcharge Load on a vertical ground surface segment was determined incorrectly for a 2D Section analysis from a 3D analysis. A 2D analysis not referencing the 3D analysis was already correct.
Bug	1258452	Fixed an error where a slope stability analysis whose analysis type is set to SIGMA/W Stress was attempting to consider surcharge loads that were defined in a limit-equilibrium analysis prior to the analysis type change.
Bug	1199150	Some Add-In CustomParams were not being saved in a SLOPE/W analysis.
Bug	1274289	Toggling off Max. Suction in SLOPE/W and SLOPE3D now correctly negates the entered value. The negative pore-water water pressures were always being limited to the user entered value.

SEEP3D

Bug	1100060	Fixed some cases where boundary conditions colors were not displaying correctly.
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SEEP/W

Bug	1186027	Corrected a solver hang when overlapping nodes are set on segments with impervious barriers.
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Bug	1210051	Fixed the case where the reported evaporation rate may be incorrect when over-drying occurs while accounting for evaporation during rainfall events in the land-climate interaction boundary condition.
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Bug	1248753	Solver no longer hangs when starting an analysis that refers to a parent analysis in which particles have ended up on (or very close to) impervious barriers.
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SIGMA/W

Bug	1307957	Improved the accuracy of the forcing vector calculated by the software when an excavation was simulated in multiple stages.
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Bug	1214288	Revised the materials dialog for the Hardening Soil model so that all controls are accessible on small displays.
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Bug	1053029	The wrong pore-water pressure was being displayed on screen as initial conditions in a SIGMA/W analysis using the Final PWP Conditions set to a Parent Analysis in some parent-child analysis relationships, however the results were correct.
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TEMP/W

Change	1327235	The Maximum Allowable Temperature Difference on the Heat Transfer Convergence tab was incorrectly defaulted to 0.03 F in US Customary Units. The default is now 0.18 F, which is equivalent to the metric default of 0.1 C.
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Bug	1327230	Fixed a case where thermal boundary conditions we not being applied when a hydraulic boundary condition was applied to the same boundary.
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All Products

Bug	1206738	A crash was encountered on Export as Previous Version if analysis names contained quotes.
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Bug	990148	Fixed a file path problem where the results from another file were used as starting conditions and activation of a new region occurred in a single analysis.
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Bug	1204125	Using consolidation analyses for imported water physics is now available. This fix also improves the accuracy of results imported from other analyses where coupled physics are used.
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