4.9 - Production Release (June 2019)

eWater is pleased to announce the latest Production Release of Source version 4.9. Version 4.9 contains the new and updated features developed over the past 6 months since v4.7, along with stability and performance improvements. Version 4.9 also fixes a problem found in two Source models, where the same model would give different results on different computers. Plugin developers should read the details below.

Highlights of Source Version 4.9 include:

Different results on different machines has been fixed!

Technical details for the issue of different results on different machines:

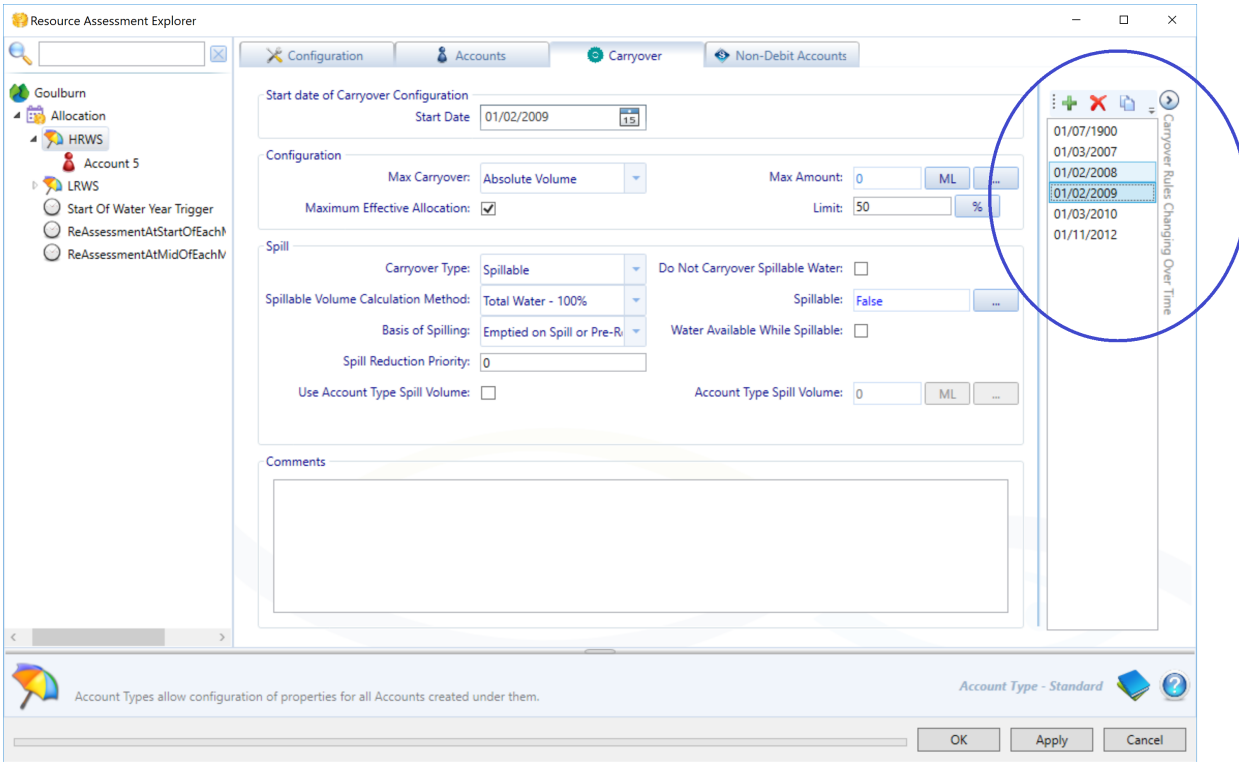
Source uses the Microsoft .NET framework, the problem was caused by 2 functions in the **System.Math** library. Both **System.Math.Pow()** and **System.Math.Exp()** can give different results for **some** number combinations on different machines. For individual function calls, different results occurred at 0.09% of the time with our randomly generated test data. We believe the issue is from different CPU's implementing different optimisations to perform the operations as efficiently as possible. The functions are not implemented directly within the Microsoft .NET framework, instead, they are implemented in the Microsoft C run-time libraries which are used by the .NET framework, as well as by a number of other languages including C++. So the nature of the .NET framework, which is an **interpreted language**, wasn't part of the issue and the same results would have been obtained if implemented in C++. We have since tested all available **System.Math** functions and these are the only two we have found that can produce different results on different machines. The vast majority of models don't see the issue since the differences are very minor and for an individual operation, the difference is only at the **last decimal place**. However, for very large models with lots of feedback in the model it can snowball into meaningful result differences.

To fix it, we implemented new versions of the two functions that produce consistent results on different machines. The problem has only been detected in 2 Source models, which happen to be 2 of the largest and most complicated. With the fix, we are now getting consistent results for both models, across different machines that were previously giving different results. There will be changes for Plugin developers to use the same functions we are using, instead of the inbuilt **System.Math** functions when using **Pow** or **Exp**. We recommend plugin developers use the new implementations of the functions which are in the **TIME.Science.ConsistentMaths** class within the **TIME** assembly.

This was a really difficult problem to isolate and fix. We are VERY happy that we worked it out!!

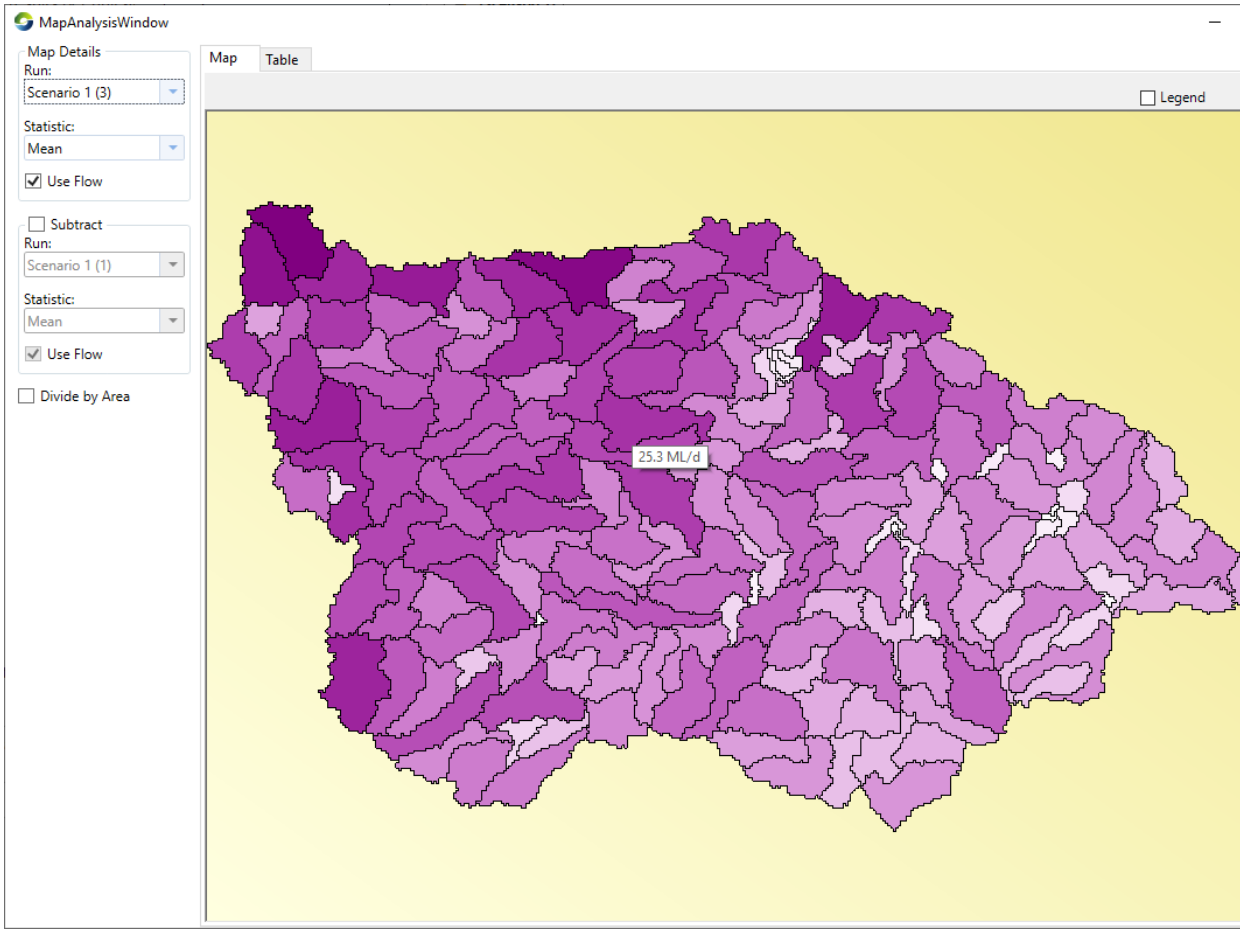
Model changes to carryover rules over time

Carryover configuration in Resource Assessment can now change over time to assist with calibration.



Map tool improvements

The tool is available under Tools > Analysis Windows > Map... It now works better for constituents and comparing multiple runs.

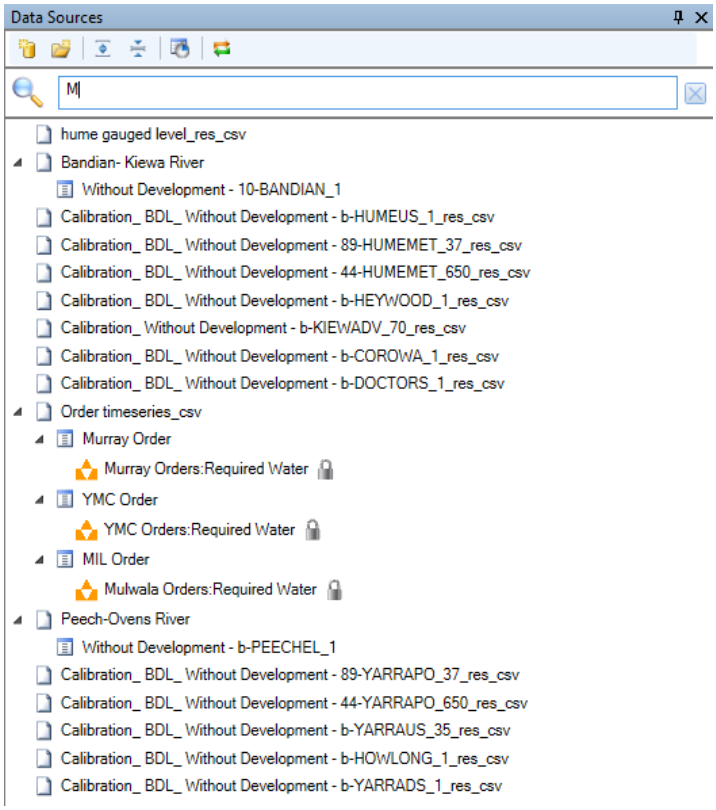


Calibration performance improvements

The calibration tool is now faster for all models. Models with a large number of parameters will see the greatest benefit.

Data Sources filter

There is now a filter for when looking for a data source or its usage:

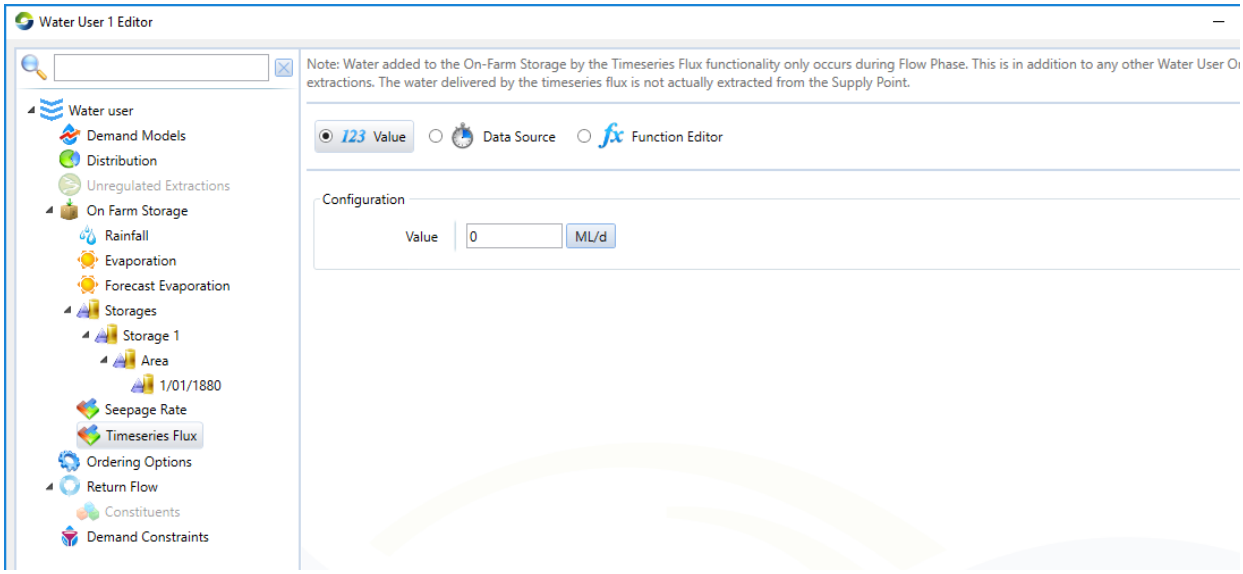


Lascam Plugin improvements

The Lascam plugin now includes better value ranges to help determine the appropriate ranges to use when using the calibration tool to calibrate the rainfall-runoff model.

TimeSeries flux for on-farm storages

On-Farm storages at a water user node can now define a **Timeseries Flux** to assist with calibration. Water added to the On-Farm Storage by the Timeseries Flux functionality only occurs during the Flow Phase. This is in addition to any other Water User Ordering and extractions. The water delivered by the timeseries flux is not actually extracted from the Supply Point.



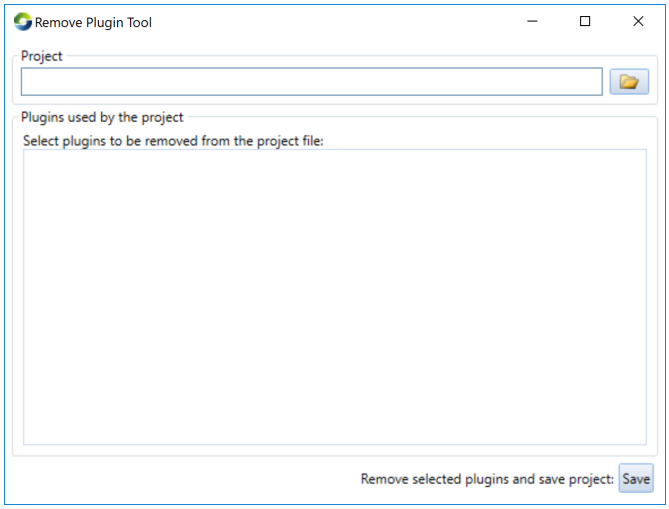
Charting tool changes

Chart settings have been redone to improve chart stability.

Plugin removal tool

Plugins that need persistence can now include a removal script so plugins can remove themselves from a project when they are not needed or have been added accidentally.

The tool is available in: **Tools \ Remove Plugin from Project File**.



There is an example provided in the Example Node model plugin.

Minor changes

- The Geographic zoom tool has been fixed and improved.
- The run period was constrained when some observed data had been included. We have removed this restriction to allow the model run period to be longer than observed data in the model.
- Changes to "Safe Release" functionality for storages with multiple outlets. See: Storage node - OperatingConstraints
- Improvements to recorder sets, See: Configuring Scenarios - Recorder Sets
- Scenario Input Sets, Recorder Sets and Functions can be searched using **Ctrl+F**
- Run information is now saved in the Results Manager. See: Results Manager - Scenario Run Metadata
- We have improved the performance of editing large constituent models.
- Changes to stop Model Variables breaking when Functions are moved.
- Improvements to handling distribution loss at **Supply Points** with travel time. See: Supply point node - Distribution Loss
- Improvements to Weirs, including fixing mass balance for constituents with lumped routing.
- Orders can now be redistributed to different accounts at extraction time for use debit accounts. See: Resource assessment - Usage

Community Plugins

Arrange Nodes plugin

You can now use the Arrange Nodes community plugin to rearrange all the schematic nodes of a network. This can be particularly handy if you have built a model starting with a Geographic Scenario. **CommunityPlugins \ SourcePlugin.ArrangeNodes.dll**

NetLPMonthly Optimiser

A number of changes to the NetLP Monthly Optimiser have been implemented:

- An option to allow the export of model input settings to excel has been added
- Allow adjustment of forecast inflows for 2nd and third replicates
- New recorder "Requirement" for look ahead period in Arc Flows

Plugin Developers

We are currently on .net 4.6.2, which hasn't changed from Source 4.7. We are planning on moving to C# 7, Visual Studio 2019 and .NET 4.8.0 soon, so you will need to make sure you have updated Visual Studio to continue developing plugins in the beta versions. We also intend to move to .NET 5 in 2020. .NET 5. Note the section above on the fix for different results from the same model on different machines.

Results and Configuration Changes

Some results have changed between Source 4.7 and Source 4.9. Result changes are mostly around Annual Accounting, Weirs and specific ordering settings. The eWater development team maintains a detailed system to track when results vary between different version of Source. The details at the following link will help you work out why the results have changed, and any alterations you may need to make to your model configuration. Details of result changes: 4.9 Result Changes from 4.7