



Technical Documentation Version 7.3

Release Notes



Center for Advanced Decision Support for
Water and Environmental Systems (CADSWES)

UNIVERSITY OF COLORADO **BOULDER**

This document describes new features, enhancements, and changes included in RiverWaretm Version 7.3. These changes are new to the executable since the release of RiverWaretm Version 7.2 on Jan 12, 2018.

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This document describes new features, enhancements, and changes in RiverWare Version 7.3.

1. Special Attention Notes

Following are special attention notes, indicating that functionality has changed that requires you to update models, that results may differ, or you might get a warning message when you first load a model in 7.3. If you have any questions, please contact RiverWare-Support@Colorado.edu.

1.1 Water User and Agg Diversion Site Notes

In addition to the Water User and Agg Diversion Site enhancements listed [HERE \(Section 6.2\)](#) and [HERE \(Section 12.1\)](#), the following changes in behavior were made:

- **Water User Return Flow Split method:** The existing **Return Flow Split** method **Irrigated Area GW Return Rate** was modified to correctly split the **Total Return Flow**, when using a **Conjunctive Use** method, instead of splitting **Return Flow**. This change makes the method consistent with other **Return Flow Split** methods but may change results.
- **Water User Salinity:** It is now an error if a **Return Flow Routing** method other than **None** is selected and salinity is being model.
- **Changed Category Name:** The **Salt Storage** category name was changed to be the **Salt Storage and Loading** category. When you first open your model in 7.3, you will see messages about the name change. No action is necessary.
- **Modified Slot Dependency:** on the Water User, the **Salt Storage** slot for the stand-alone and sequential water users was moved from a general slot to a new separate method called **Salt Storage** in the **Salt Storage and Loading** category. You should select this method if you want to store salt on the water user as before.
- **Propagation of Supplement Return Flow:** For sequential users, when using any of the **Supplemental Diversion** methods (with or without Soil Moisture), the **Supplement Return Flow** is now included in **Total Return Flow** and the **Outgoing Available Water**, when neither are linked. This water is passed to the next element in the aggregate. This change could increase the volume of water available for downstream users.

1.2 Storage and Level Power Reservoir Notes

On the Storage and Level Power Reservoir, the **Hydrologic Inflow and Loss** method was not executing correctly when **Inflow** was computed to be less than zero. Now the method will correctly set the **Inflow** to zero and set the negative value on the **Hydrologic Inflow Adjust** slot, as intended.

1.3 Power Reservoir - Unit Generator Notes

The **Unit Generator Power** method was not using the **Pool Elevation** slot value correctly when computing the **Operating Head**. As a result, it was calculating **Operating Head** using only the previous **Pool Elevation**, not the average from the previous timestep and the current timestep. This was fixed to be correct but could change model results.

2. Accounting

2.1 Water Rights Solver Performance Improvements

Run time performance was improved for models using the water rights solver and “Allow Negative Flows” on passthrough accounts. In a 100 year daily timestep test model, the run time decreased by 57%. Additional run time performance improvements were made to accounting and the water rights solver to further decrease run times.

2.2 New Empty Storage (E) flag

The new **Empty Storage**, E flag, set on an Outflow supply slot, will compute the value necessary to empty the Storage account of all its water (i.e. **Storage** will be zero). The new flag may be cleared interactively with the “Clear Values” operation, or overridden by setting its value with a rule.

For more information, see [HERE](#).

	Inflow Total cfs		Outflow Total cfs		Gain Loss cfs		Slot Inflow cfs		Storage acre-ft		Accrual acre-ft
01-04-2017 Wed	0.00	P	98.00	I	-0.02	m	0.00	m	617.09	A	0.00
01-05-2017 Thu	0.00	P	100.00	I	0.05	m	0.00	m	418.84	A	0.00
01-06-2017 Fri	0.00	P	99.00	I	0.17	m	0.00	m	222.81	A	0.00
01-07-2017 Sat	0.00	P	98.00	I	-0.00	m	0.00	m	28.41	A	0.00
01-08-2017 Sun	0.00	P	14.32	E	-0.00	m	0.00	m	0.00	A	0.00
01-09-2017 Mon	0.00	P		O	0.00	m	0.00	m	0.00	A	0.00

3. Data Management Interface

3.1 DSS Database Connectivity

The DSS server was upgraded from DSS-6 to DSS-7, but the server will still create files in DSS-6. The new server will be able to identify the version of the DSS file and then read / write existing files using their current format (DSS-6 or DSS-7).

3.2 DSS Database DMI - Table Slot Import

Within DSS Database DMIs, you can now import a table slot without discarding extra rows at the bottom of the table. A new “Table Slot Data” option was added to the DSS dataset configuration which specifies how tables should be resized: If **Import and Resize** is selected, a DSS DMI will import paired data as before, by resizing the table to match the imported table. (This is the default and existing datasets will have this selected.)

If **Import Available** is selected, a DSS DMI will expand a table to accommodate the imported table but it won't contract a table. This will leave any extra rows that are in the table.

For more information, see [HERE \(DMI.pdf\)](#).

3.3 HDB Performance

The HDB Database DMI performance was improved for datasets which write a large number of slots and a small number of values for each slot. The performance improvement consists of grouping slots together when sending them across a network. Grouping is on a per-dataset basis and it is only for writing. The dataset configuration has a new checkbox which is shown when a dataset can group slots. This performance improvement is very much data dependent, but in one example with 2000 slots and 1 value per slot, the changes would reduce the database accesses from 4,000 to 1.

For more information, see [HERE \(DMI.pdf, Section 5.3.2\)](#)

4. Diagnostics

4.1 Iterative MRM and Initialization Rule Messages

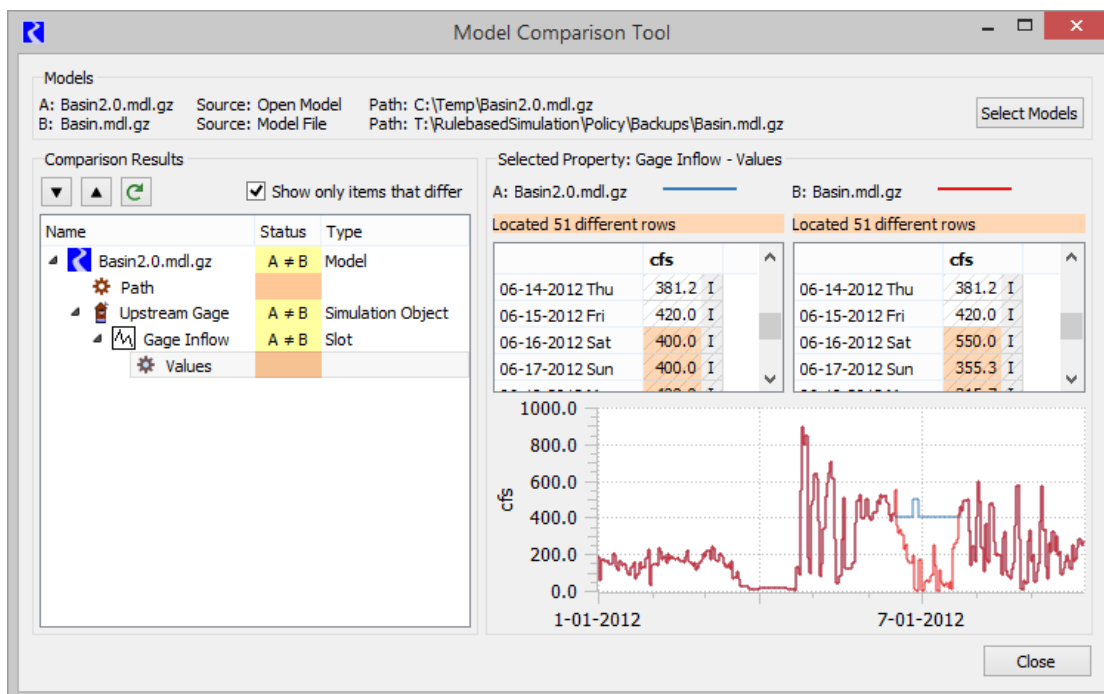
Iterative Multiple Run Management rules now show better rule context information for diagnostic and error messages. In addition Initialization Rule context information was improved to indicate the rule index number. Now messages relating to rules are show as:

- Iterative MRM Rules: RULE: (MRM 2)
- Initialization Rules: RULE: (IR 5)
- Rulebased Simulation rules and Optimization goals: RULE: (3)

5. Model Files

5.1 Model Comparison Tool

The **Model Comparison Tool** compares workspace objects and slots for two models and presents the differences in a hierarchical tree including highlighting differences. This tool allows you to see what objects, slots, and values are different between two models. The following screenshot shows the tool. See [HERE \(ModelFiles.pdf, Section 5\)](#) for more information.



6. Objects

6.1 Pumped Storage Reservoirs

Previously the Pumped Storage Reservoir **Unit Pump Power** method only worked correctly when there was a single pump type. The method has been enhanced to work with multiple pump types. The pumps are added in the best efficiency order to meet the specified **Pumped Flow, Pump Power** or **Pumps Used**.

See [HERE \(Objects.pdf, Section 21.1.8\)](#) for more information.

6.2 Water User and Agg Diversion Site

6.2.1 Supplemental Diversions with Soil Moisture on a Sequential Agg Diversion Site

Modifications were made to allow Water User code to allow **Supplemental Diversions with Soil Moisture** on a sequential Agg Diversion Site. Now the user can select **Supplement Diversion**

with **Soil Moisture** from the **Conjunctive Use** category on a water user element when using the Sequential structure. See [HERE \(Objects.pdf, Section 27.1.8.3\)](#) for more information.

In addition, salinity can be modeled on these water users as described [HERE \(Section 12.1.2\)](#)

6.3 Reach and Distribution Canal

6.3.1 Conductance Factor:

On the Reach and Distribution Canal, a new **Conductance Factor** series slot with periodic input was added to the **Head Based Seepage** method. If the slot has a valid value, it is included in the seepage calculation as follows:

$$\text{Seepage} = \text{Conductance} \times \text{Conductance Factor} \times \text{computed head}$$

The **Conductance Factor** slot allows you to adjust the conductance within a run due to canal lining or other conditions where the conductance is not constant.

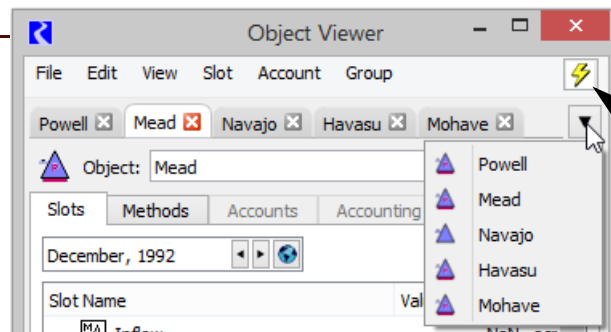
See [HERE \(Objects.pdf, Section 22.1.12.8\)](#) for more information on the reach method.

See [HERE \(Objects.pdf, Section 11.1.2.5\)](#) for more information on the distribution canal method.

7. Object Dialogs

7.1 Object Viewer

Within the **Object Viewer**, a new lightning bolt button removes all objects from the viewer and closes the dialog.



Remove all objects from the Viewer and Close

8. Output Devices

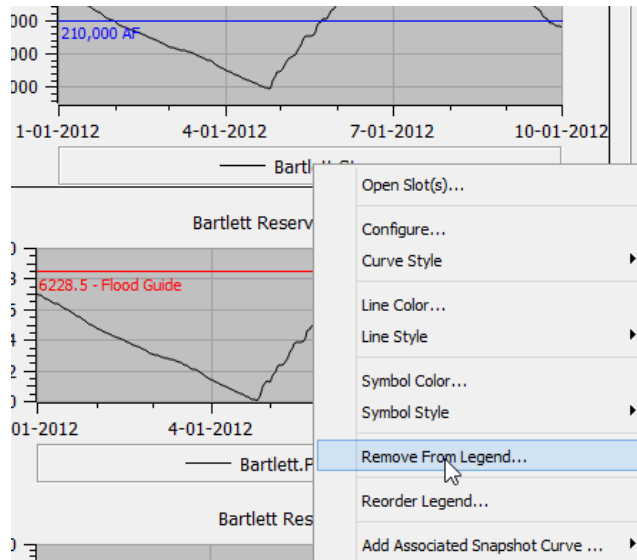
8.1 Plotting

8.1.1 Legends

Plot Legends were improved as follows:

- Markers can now be shown in the legend on a per-marker basis.

- Both curves and marker legend items can be removed from the legend. Configuration controls are available in the individual configuration dialogs, the **Configure Multiple Plots and Curves** and from the right-click context menu.



8.1.2 Adding Snapshot Curves

Snapshots are way to preserve results between runs, as described [HERE \(Output.pdf, Section 7\)](#). For comparison, it is useful to plot both the slot and one or more of its snapshots. The plotting utility now allows you to quickly add curves for the associated snapshots. Under the **Add Curve** button, **Plot** menu, and right-click context menu on the legend item, there is now an add **Associated Snapshot Curve** option (see image above).

For more information, see [HERE \(Output.pdf, Section 2.3.5\)](#).

8.1.3 Defaults and Settings Dialogs

The plot “Preferences” dialog was split into two separate dialogs for clarity:

- The **Plot Page Settings** dialog applies settings to old and new plots, described [HERE \(Output.pdf\)](#)
- The **Plot Defaults** for general defaults applies to new plots only, described [HERE \(Output.pdf\)](#)

8.1.4 Better Defaults

Plotting now provides better defaults: a white background, thin dotted gray major grid lines, no minor grid lines, and system fonts. Also, the RiverWare plot default settings can be easily restored. A **Restore RiverWare Default** button was added to the **Plot Defaults** dialog and **Plot Page Settings** dialog.

8.1.5 Copy Plot as Image

You can now copy a plot as an image to the Windows system clipboard for pasting into other applications. This allows a plot or a plot page to be copied and then immediately pasted into an

external document without exporting it to a file. For more information, see [HERE \(Output.pdf, Section 2.8.3\)](#).

9. RPL

9.1 New RPL Predefined Functions

9.1.1 *Get3DTableValsSkipNaN*

This function gets the values in a 3D table slot as a list, but if a NaN is encountered, the function treats that as the end of the column and continues processing values in the other columns of the table. For information, see [HERE \(RPLPredefinedFunctions.pdf, Section 45\)](#).

9.1.2 *MemoryUsage*

This new RPL function returns RiverWare's current virtual memory size, in kilobytes (KB). This information can be useful for performance analysis. For more information, click [HERE \(RPLPredefinedFunctions.pdf, Section 121\)](#).

9.1.3 *OptDualPrice*

Given an object, string identifying a physical constraint category, and a date/time, which together identify a particular physical constraint, the function returns the dual price for that constraint from the last optimization solution. For more information, click [HERE \(RPLPredefinedFunctions.pdf, Section 144\)](#).

9.1.4 *OptReducedCost and OptReducedCostByCol*

Given a series slot (or agg series slot) and a date/time, the function returns the corresponding optimization variable's reduced cost from the last optimization solution. For more information, click [HERE \(RPLPredefinedFunctions.pdf, Section 145\)](#).

10. Run Control

10.1 Run Initialization Messages

Previously, there was no "Run Started" message when clicking the **Init** button on the Run Control. Now there is a message when you click **Init** and when you continue or step.

11. Units

11.1 New Unit Type: PowerPerTime

A new unit type, PowerPerTime, was added. User units include, for example, MW/s (default), MW/min, MW/hr, etc.

11.2 New Units

The following new units were added

- Velocity: ft/5min
- FlowPerTime: kcfs/5min

12. Water Quality

12.1 Water User / Agg Diversion Site

12.1.1 Water Quality Salinity Pickup Methods

On the Water User (either as a sequential element in an Agg Diversion Site or as a stand alone water user), new methods were added to better model salinity gains. The water user can add salt using either the **Salt Pickup Concentration** or **Salt Pickup Mass** in the **Salt Storage and Loading** category. These methods behave like the methods of similar names on the lumped structure Agg Diversion Site.

For more information, see [HERE \(WaterQuality.pdf, Section 18.1.2.3\)](#).

12.1.2 Supplemental Diversions with Soil Moisture Salt on a Sequential Agg Diversion Site

Modifications were made to allow sequential Water Users to model the salinity of **Supplemental Diversions** with **Soil Moisture** on a Sequential Agg Diversion Site. Now you can select **Soil Moisture Salt Storage with Supplemental Flows** from the **Salt Storage and Loading** category on a water user element when using the sequential structure. With this method, the salinity concentration of the **Supplemental Diversion** and **Supplement Return** is tracked in the element and passed on to downstream elements based on the specified links.

For more information, click [HERE \(WaterQuality.pdf, Section 18.1.2.6\)](#).

12.1.3 Changes to Soil Moisture Unavailable Gain Loss Salt Calculation

Previously, on a water user modeling Soil Moisture, if **Irrigated Area** increased, then the user would have to specify the **Soil Moisture Unavailable Gain Loss** and its concentration as there was no way to know how full the soil moisture was or its concentration for the new area. Without specifying values, the code assumed it was full but had no concentration. Thus the total **Soil Moisture Salt Concentration** decreased.

With this change, the **Unavailable Gain Loss** will actually show the increase in the volume in the unavailable zone. The concentration is set to the previous timestep's **Soil Moisture Salt Conc.** This keeps the overall **Soil Moisture Salt Concentration** from decreasing, but does lead to an increase in **Soil Moisture Salt Mass**.

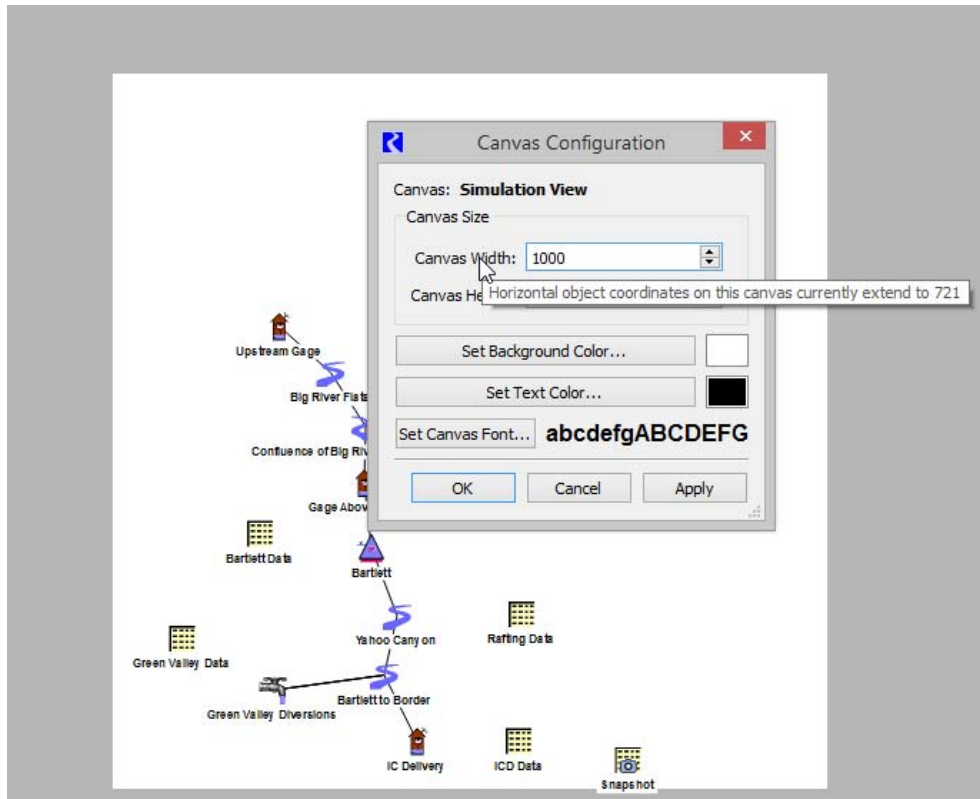
For more information, see [HERE \(WaterQuality.pdf, Section 18.1.2.5\)](#).

13. Workspace

13.1 Workspace Improvements

In each of the three workspace views, the area beyond the configured canvas rectangle is now shown with a darker background color. Further, on the simulation and accounting canvas configurations, tooltips now show the largest horizontal and vertical object coordinates.

Together, these allow you to better fit your objects within your canvas boundaries and allow you to resize your canvas to the minimum size.



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14. Closed Bug Reports

The following bugs have been closed since the last major release(7.2). For more information on any bug, see the CADSWES website. The bugs are listed in order by bug number:

Num	Synopsis
4192	MRM Output Control File related Assertion Failure
4356	local inflow disagg with forecasting algorithm won't work with routing directly below confluences
6018	Excel DMI - Table Series Slot times are not handled as datetimes
6040	RiverSMART crash when executing hydrology simulator
6041	Configure Existing Slots dialog doesn't allow Apply operation
6044	MRM RdfToExcel gives misleading message if Excel output file is open
6045	MRM environment variables do not work
6046	RiverSMART crashes when adding a Model or MRM event
6051	Distributed MRM does not work correctly with multiple rulesets
6055	POSAT Dual Price Raw and Reduced Cost Raw always display zero
6056	POSAT reports NaN for Dual Price and Reduced Cost for Maximize objective
6060	Auto Unit Max Turbine Q Table by column name
6064	Run status in RPL debugger does not always refresh
6065	RiverSMART does not have read/write access to certain windows folders
6066	Adding objects to one workspace view get misplaced in other views
6067	No message when a run is started with the Init button
6068	RDF output from MRM is not correctly identifying agg series slots
6069	RiverSMART crash from right-click on event name
6070	Max iterations for accounts: over 5000
6071	Expression Slot Evaluation Range fields not resized correctly for different font size
6072	Slot Viewer and Slot Dialogs data table row heights are not adjusted when Font is changed
6073	Crash deleting Policy Group that has two rules open in RPL Viewer
6076	RPL set will not open if parentheses are used in a function argument name
6077	DSS DMI permission problem
6078	RiverWISE: editing scalar data isn't working well
6079	SCT - after using Set Labels To menu, accept is not available
6081	RiverSmart failed to create output folder in Scenario directory
6082	Minimizing RPL Viewer dialog instead closes the window

Num	Synopsis
6083	When loading a ruleset from a Script that was saved in a previous version of RiverWare, the ruleset cannot be loaded and Script aborts
6084	Importing a DMI into RW 7.2 crashes the program.
6085	SCT crash when changing start of week for aggregation
6086	Table value not being updated internally?
6087	Output Canvas does not show up in Model Report
6088	GetMaxOutflowGivenInflow disparity
6089	Changing Agg Series time range can cause loss of data
6090	Output Canvas not Displaying in Model Report
6091	Tooltip on Workspace in Background Focuses Workspace
6092	Copy/Export Copy from Slot Viewer doesn't reflect reordered slots
6094	In Slot Viewer you cannot change a slot name after using Slot Configuration dialog
6095	Slot Viewer Import Paste does not work correctly
6096	DMI "Not Fully Successful" Error when there isn't an error
6097	Crash when removing RPL set by script action with RPL Viewer open
6098	Output Canvas Text Item on workspace does not retain position when copied from another Text Item
6099	Plot x-axis labels overlap while zooming in and out
6100	Crash after removing Output Canvas display from workspace
6101	Crash loading a new model file after model with Output Canvas displayed
6102	Stop On NaN functionality not working
6104	RiverWISE crash changing periodic slot column width after a run
6105	RiverWISE crash editing multiple periodic slot values after a run
6107	Script Remove RPL Set Confirm Removal setting not applied correctly
6109	Executing the same Subscript twice does not work
6111	"Set Scalar Slot Value" action Min/Max Edit Values replace with static date
6112	Crashes while entering values into a periodic slot
6113	Crash when applying multi-plot edit to Y axis with an empty plot
6114	Wrong operating head with Unit Generator Power method
6116	Multiple errors coming up when attempting to generate certain pie graphs
6117	Issue with Hydrologic Inflow Method
6118	RiverWare run can be started while debugging expression slot
6119	Reservoir pool elevation outputs change when re-opening model saved with outputs
6120	Many NaNs in POSAT
6123	RiverWare crashes clicking outside of object viewer tabs
6124	Opening a RPL block from another source leads to a crash
6125	Changing date value in table via script action results in NaN.
6126	Socket Error - DSS Database DMI loses server connection

Closed Bug Reports

6127

Num	Synopsis
6127	exported plots resize to default when reopen
6128	Newly set defaults aren't shown in Curve Dialog and Axis Dialog.
6132	Crash when starting run while entering data in SCT
6138	Integer Indexed Series Slots in hourly timestep model open in the Slot Viewer
6139	Diagnostic error messages for Iterative MRM rules do not have a rule context
6141	If object name changes slot viewer doesn't reflect change
6142	The Slot Viewer doesn't deal well with changing a slot's timestep
6144	Model comparison tool fails to compare to optimization models
6145	File paths with spaces does not work with distributed MRM
6146	Sim Energy Changed to Max Flag and larger Energy scheduled
6147	Closing Database DMI Editor with dataset changes using red X fails then crashes
6148	Control File DMI export of Agg Series Slot sub slots is incorrect
6150	Read-only slots don't behave well in the Slot Viewer
6152	On plots the 1-21 18:00 datetime format does not work
6153	Ctrl File / exec DMI not displaying executable error messages
6154	In the CSV Output Device the Timestep Size field is exported incorrectly