The Integrated River System Modelling Framework

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June 2010

Report to Murray Darling Basin Authority
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ABBREVIATIONS

GW       groundwater
IRSMF    Integrated River System Modelling Framework
MDB      Murray-Darling Basin
MDBA     Murray-Darling Basin Authority
MDBSY    Murray-Darling Basin Sustainable Yields project
GLOSSARY

Model
An executable program, associated model configuration files, model system file and associated files that describes a particular valley, files that map the model to climate inputs, result output and summary files. Effectively everything needed to run the model and save results to the various databases. Each model is stored in an original model directory and is part of the subversion system.

Model template
A directory that contains the model with the system file modified to accommodate parameter changes within the Integrated River System Modelling Framework. These changes mean that the model template file cannot be used to run the model. Three model templates will be managed via subversion: natural, baseline and Basin Plan.

River system
A collection of models that are linked together.

River system configuration file
An XML file that describes the connection of models to form a river system.

Scenario
A combination of development conditions, climate and period that are used to configure a river system. For example: baseline development, with groundwater, for wet climate scenario one, run over the period 1/5/1895 to 30/6/2009.

Subversion
Subversion is a free/open-source version control system. That is, Subversion manages files and directories, and the changes made to them, over time. This allows you to recover older versions of your data, or examine the history of how your data changed.

Working copy
A directory that is created by checking in the subversion repository to a local computer. This directory is managed by subversions check in and out functionality.

Output directory
A directory set up by the Integrated River System Modelling Framework on a local machine for running river systems. This directory is only used for running models and is not part of the subversion system.
1. INTRODUCTION

The Murray-Darling Basin Authority (MDBA) is responsible for the management of the water resources of the Murray-Darling Basin (MDB). A strategic plan – the Basin Plan\(^1\) – is being developed for the integrated and sustainable management of MDB. In order to progress the Basin Plan, the Integrated River System Modelling Framework (IRSMF) from CSIRO is being further developed and enhanced to coordinate the numerous water models for the various regions of the MDB. IRSMF is a purpose-built modelling environment to link surface water and groundwater legacy models to enable integrated modelling of the connected hydrological systems of the MDB. It was initially developed in the Murray-Darling Basin Sustainable Yields project (MDBSY) in 2007/08. It provides a way of propagating impacts anywhere in the MDB throughout the system. This allows policy makers and researchers to better understand the connectivity of the system and how changes upstream in the system will impact on downstream users. Results for key locations in the system are provided to give an indication of how this tool can be used to understand connectivity in a basin.

This report contains a description of IRSMF, including surface water modelling processes implemented in IRSMF, and a simple user guide of IRSMF.

In MDBSY, IRSMF supported running certain groundwater models with interactions between surface water and groundwater models. It required modellers to specify where the groundwater models are stored. Each groundwater model needed a batch file to be run. As no groundwater is running within IRSMF in the Basin Plan project, this report contains no discussion on groundwater. To run groundwater models within IRSMF in the future will require further development and enhancement of IRSMF.

This report presents:

- a user guide that includes the adopted file structure, naming convention and model preparation
- discussion of the detailed modelling processes implemented in IRSMF
- description of several useful tools provided by IRSMF
- description of trajectory modelling and
- a troubleshooting section.

2. GETTING STARTED

Generally speaking, IRSMF undertakes three basic tasks:

1. It gathers climate and flow scenarios, modifies time series input files of the various models, then simulates the whole river system in a specified sequential manner (specified in an XML file).

2. It extracts specific time series information from models, allows for time step differences and inputs it to connected models. This includes flow, height, storage spills, storage volume, demands and resource availability (allocation) information.

3. It post processes results from the models. These results are subsequently used in preparing reports.

IRSMF is a scenario-based river system simulation system and works strictly on a predefined file structure and naming convention that is described in the following subsections. A scenario is a combination of development conditions, climate and period that are used to configure a simulated river system. Each scenario has to be named by a six-character string, \textit{xyzAAA}:

Where: \textit{x} = type of scenario (N = natural, B = baseline, P = Basin Plan)

\textit{y} = groundwater interaction (P/0 = with/without groundwater [GW] interaction, N = natural)

\textit{z} = climate condition (H = historical, W = wet, M = medium, D = dry)

\textit{AAA} = characters are reserved for future use – in the Basin Plan project, these are 000.

Without development scenario has to be named as \textit{NNzAAA}, such as NNH000, NND000, NNM000 and NNW000.

2.1 File Structure

Each model has three main directories (see also Figure 1):

a. \textit{Data directory}: contains all input data files (e.g. climate data, flow data). All the input files have to follow the set naming convention:

- A daily data input file has to be named as: \textit{XXXX\_xyzAAA\_TTTT.csv}
  
XXXX: four-character model name (e.g. NAMO)

xyzAAA: scenario name (e.g. B0C000)
TTTT: four-character data type (e.g. Rain, Evap, Tmax, Flow, Dvrt [diversion]) (e.g. NAMO_B0C000_Rain.csv, NAMo_BPD000_Flow.csv, …)

- A monthly data input file has to be named as XXXX_xyzAAA_TTTT_m.csv (e.g. NAMO_B0C000_Rain_m.csv, NAMO_BPD000_Flow_m.csv, …)

b. Model templates: contain all files required to run a model including model executable and configuration files. Each model must have a model template directory and a matched data directory.

c. Output directory: the directory where the model is running.

![Diagram of Main directories in the IRSMF](image)

Figure 1 Main directories in the IRSMF

Generally speaking, there are five steps to run a model:

1. copy all files from the model template directory to the output directory
2. modify the input files according to the corresponding scenario data in the data directory
3. run model in the output directory and all output files are generated in the output directory
4. extract key information for further analysis and
5. upload model results to a database or directly conduct data analysis.

The input file structure (see Figure 2) needs to be manually created before conducting any modelling tasks. The output file structure (see Figure 3) is automatically generated by specifying the output directory root.
Figure 2 Input file structure used in IRSMF

- ModelRoot
  - Region_name
  - River_modelling
    - Modelling
      - Demands
        - XXXX_xyzAAA
          - Contains all demand files
      - Groundwater
      - Prime_Diversions
        - B_Prime_Diversions
          - Contains all diversion files for baseline scenarios
        - P_Prime_Diversions
          - Contains all diversion files for basin Plan scenarios
        - N_Prime_Diversions
          - Contains all diversion files for without development scenarios
      - Prime_Climate
        - B_Prime_Climate
          - Contains all climate files for baseline scenarios
        - P_Prime_Climate
          - Contains all climate files for basin Plan scenarios
        - N_Prime_Climate
          - Contains all climate files for without development scenarios
      - Prime_Flows
        - B_Prime_Flows
          - Contains all flow files for baseline scenarios
        - P_Prime_Flows
          - Contains all flow files for basin Plan scenarios
        - N_Prime_Flows
          - Contains all flow files for without development scenarios
      - XXXX_ModelTemplate
        - Base line
      - XXXX_BP_ModelTemplate
        - Basin Plan
      - XXXX_NDEP_ModelTemplate
        - Natural
      - XXXX_OriginalModel
        - Original baseline model from States
      - XXXX_NDEP_OriginalModel
        - Original natural model from States

Figure 3 Output file structure used in IRSMF

- OutputDirectoryRoot
  - Region_name
  - River_modelling
    - XXXX
      - XXXX_xyzAAA
        - where the model XXXX is running here for scenario xyzAAA
Besides the above three directories, the MsmBigmod model has its own main directory containing all input files (see Figure 4).

![Diagram of MsmBigmod Main Directory in IRSMF](image)

2.2 Model Preparation

In order to use IRSMF, modellers should prepare each model they want to use in the modelling process according to the above file structure. This can be done manually on the local machine, or a copy can be acquired from elsewhere such as a subversion repository (Power & Seaton 2010a) in the Basin Plan project.

2.2.1 IQQM

All the files required by IQQM must be in the model template directory and it should at least contain the following files (see Appendix H for an example):

1. IQQM model itself including executable and associated files
2. all required idx/out files named as: XXXX_F|R|T|E.idx/out
3. IOFILE.csv which defines a set of required scenario input data for pre-processing (see Appendix A for file format)
4. IQQM pre-process mapping/index files named as XXXX[Rain|Tmax|Evap|Flow|DVRT]Index.csv (e.g. NamoRainIndex.csv) (see Appendix B for file format)

5. a system template file named as XXXX_ModelTemplate.sqq – this system file contains tagged information used for model tweaking and is renamed to XXXX.sqq in the model template directory after tweaking

6. a conversion file that defines what information is extracted from the IQQM raw outputs to the common Bigmod csv file format – named as XXXX.conversion.csv and is a Bigmod csv file without the data section

7. a statistical parameter file that defines which statistics are summarised by using BigArkW tool – named as XXXX.stats.param

8. all required scenario climate and flow data csv files are in the corresponding data directory (see above description) and can be automatically generated by using the data extraction tool in IRSMF (see Section 5.1).

2.2.2 REALM

All the files required by REALM must be in the model template directory as described above. The model template directory should at least contain the following files (see example in Appendix I):

1. REALM DOS version
2. ans_file.dat – the input file for the REALM DOS version
3. a system template file named as XXXX_ModelTemplate.sys, and containing tagged information used for model tweaking – it is renamed to: XXXX.sys in the model template directory after tweaking
4. for each scenario, a directory named as Demands_xyzAAA, which contains all the demand files for this scenario
5. a subdirectory 'Inputs' that contains all the input files to the model
6. a REALM pre-process control file named as XXXX.txt (see Appendix C for file format)
7. a conversion file that defines the kind of information extracted from the REALM output to a common Bigmod csv file format – named as XXXX.conversion.csv and with a file format that is the same as that in IQQM
8. a statistical parameter file that defines the statistics that will be summarised by using BigArkW tool – named as XXXX.stats.param.

2.2.3 MsmBigmod

All the files required by MsmBigmod are fed into the MsmBigmod main directory as described above. The model template directory should contain the following files:
1. all data csv files which may be modified during pre-process and/or model interaction; files that are is scenario dependent should use the scenario name as their extension (e.g. 1001-big-Other-Models-Flow-TLM-All.csv.B0H000)

2. a text file named as XXXX_ModelTemplate.txt that contains tagged information used for model tweaking – renamed to XXXX.txt after tweaking

3. a text file named as ParTargetName.txt that specifies the file the XXXX.txt is copied to

4. a text file named as BrokenCreek.trend that specifies the value of the trend used in the Broken Creek regression.

2.2.4 St George

All the files required by the St George model must be in the model template directory as described above. The model template directory should at least contain the following files (see Appendix J for an example):

1. St George DOS version

2. *.in which is the input file to the executable file

3. a pre-process control file named as StGeorgePre.control

4. a statistical parameter file that defines which statistics are summarised by using BigArkW tool – named as XXXX.stats.param.

2.2.5 SNOWY

All the files required by SNOWY model must be in the model template directory (see Appendix J for an example).
2.3 Interface

A modeller can create a new river system configuration or load an existing river system configuration and carry out simulation studies by using the main interface of the IRSMF (see Figure 5).

The file menu has five items (see Figure 6):

- **New** – create a new river system configuration
- **Open** – load an existing river system configuration file
- **Save** – save a river system configuration
- **Save as** – save a river system configuration with a different name
- **Exit** – exit IRSMF.

The Edit menu has six items (see Figure 6):

- **Undo** – undo what you did before
- **Redo** – redo what you undid
- **Selection** – select items in the main screen
• Link – draw link between two models
• Catchment – create a model for that catchment in the main screen
• Font – set font
• Lock model run period – prevent changing model run and report period.

The Scenario menu has five items (see Figure 7):

• Load map – load a map for the river system
• Remove map – remove the map
• Run – run all models in the river system locally
• Upload model output – upload model results to a database
• Run trajectory modelling

The Tools menu has four items (see Figure 7):

• Input data scalar – scale input climate and flow data
• Input data generator – IQQM input data generator
• IQQM output $\rightarrow$ Bigmod – IQQM to Bigmod output converter
• REALM $\rightarrow$ Bigmod – REALM to Bigmod output converter
• Purge backup results – remove all backups of the previous model results in the output directory
• System configuration – configure running environment

• Recall settings on Open – automatically load last time XML file and model run period when checked

Figure 7 Scenario and Tools menu

Only one item occurs in the view menu (see Figure 8). It is the button to open the interface (see Section 5.5) to view the model output.

Figure 8 View menu

2.4 Workflow

Typical steps for a modeller to create and run a river system simulation are:

Step 1. Click System configuration item in the Tools menu. The system configuration dialog (Figure 9) is popped up to allow a modeller to configure the running environment (see Section 3.1).

Step 2. Click Catchment item in the Edit menu and then click in the main screen to create an empty model (see Figure 10).
Step 3. Configure the model by double clicking the square in the main screen and a dialog is popped up for configuring the model (see Figure 11).
Step 4. Set status of all models that have been configured to Pending – the modeller can add as many models as wanted by following Steps 1, 2 and 3.

Step 5. If needed, click the Tweak button on the model configuration dialog to tweak interested models (see Section 4.2).

Step 6. Click Link item in the Edit menu or the icon on the toolbar and then draw an arrow from one model to another model (see Figure 12).

Step 7. Double click the arrow to pop up a dialog to allow configuration of a connection (see Figure 13); set the connection status to Pending after configuration.

Step 8. After completing configuration of all models and model interactions, save this river system as an XML file by clicking the Save or Save as item in the file menu.

Step 9. Select a scenario name from the scenario list, and provide a model run period and reporting period on the toolbar.

Step 10. Click Run button to run the river system just created for the selected scenario. A log file $<\text{RiverSystemXmlFileName}>_<\text{ScenarioName}>.log$ is automatically generated in the output root directory (see Appendix G for an example).
Figure 12 Create a model interaction

Figure 13 Configure a model interaction
3. RIVER SYSTEM SIMULATION

1. The IRSMF runs strictly on a predefined file structure. Therefore before starting a simulation, a modeller should either manually create such file structure and prepare all required data with correct file format, or check out the whole file structure from a subversion repository (Power & Seaton 2010a) environment (e.g. model template directory, data directory, output directory, scenario list, tweak tags).

2. Create/load a river system configuration file (XML) over two substeps: create and/or configure each model and each model interaction. After a river system is created, it can be saved as an XML file. Next time IRSMF can load this river system by opening this XML file.

3. Select a scenario name from the scenario list and provide modelling period including model run period and reporting period.

4. If needed, tweak interested models by changing the value of each interested parameter.

5. Run the simulated river system.

6. Analyse model results or upload to a database for further analysis.

\[\text{Load/create a river system} \rightarrow \text{Select scenario name from list and provide modelling period} \rightarrow \text{Configure running environment} \rightarrow \text{Tweak interested models} \rightarrow \text{Run the defined river system} \rightarrow \text{Analyse results or upload results to database}\]

Figure 14 Typical workflow

3.1 Configure Running Environment

Information required for configuring the running environment in IRSMF is stored in two XML files that are automatically loaded when IRSMF starts each time. They are path, scenario list and tweaking tags.
The path information is project independent and is stored in the file called IRSMF.xml within the folder UserApplicationData\IRSMF. The information of scenario list and model tweaking tags are project dependent. They are therefore stored in another XML file called project.xml in the IRSMF executable file directory (see Appendices E and F respectively for examples of both IRSMF.xml and project.xml).

3.1.1 Path Configuration

Paths to be configured are (see Figure 15):

1. Input data root: the root directory containing both data and model template – the ModelRoot (see Figure 2)
2. Model template root: is automatically generated based on the input data root
3. Working Dir root: it is the OutputDirectoryRoot (see Figure 3)
4. Tool Dir: the directory contains all pre-/post- process tools
5. MsmBigmod root: it is the MsmBigmod main directory.

![Path configuration](image)

Figure 15 Path configuration
3.1.2 Scenario List

Before running a river system, a list of scenarios should be added into the system (see Figure 16). The scenario name has to follow the name convention as specified in Section 2.

![Figure 16 Scenario configuration](image)

3.1.3 Tweaking Tag

In order to tweak models, a set of tags has to be predefined (see Figure 17). Each model has its own set of tags.

![Figure 17 Tweaking tag configuration](image)
3.2 Define a Simulated River System

A river system contains river system models and model interactions and these must both be defined and configured in order to define a river system:

3.2.1 Configure Model

The following fields must be defined to configure a model (see Figure 9):

1. Name: the model name must be a unique, four-character string
2. Report region: each report region may consist of multiple models
3. Layer: the sequence to run models – they run from low to high layer
4. Model type: the current version of IRSMF supports five types of models: IQQM, REALM, MsmBigmod, St George and SNOWY
5. Post process type: listquan, Bigmod or none
6. Status: select one from the list:
   a. Initial – model has not been configured
   b. Pending – model has been configured and waiting for run
   c. Post-process – model run has completed and waiting for post-process
   d. Done – the post process has been done.
7. Swap model point: used for trajectory modelling and is the date to swap baseline model with the basin plan model.

3.2.2 Model Tweak

A modeller can tweak the model by clicking the Tweak button on the Model Configuration interface (see Figure 18) (see Section 4.2 for details of how to tweak a model).

Figure 18 Model configuration
3.2.3 Configure Model Interaction

The current version of IRSMF supports nine model interactions (see Section 4.3 for details).

IQQM → IQQM (Figure 19)

1. Upstream node number
2. Parameter number of the upstream node
3. Downstream model flow index item name
4. Downstream model flow index file name

![Figure 19 IQQM to IQQM configuration](image)

The data extracted from the upstream IQQM model based on the upstream node number and parameter number replaces the data of the specified downstream node in the downstream IQQM DA file.

IQQM → St George (Figure 20)

1. Upstream IQQM node number
2. Parameter number of upstream node

![Figure 20 IQQM to St George configuration](image)

The data extracted from the upstream IQQM model based on the upstream node number and parameter number is stored as a csv file:

```
<OutputDirectoryRoot>\03_conamine\River_modelling\STGE\STGE_B0H000\St_GeorgePreProcess\STGE_B0H000_SG.csv
```

This csv file is used by St George pre-process.
**IQQM → MsmBigmod (Figure 21)**

1. Upstream IQQM node number
2. Parameter number of upstream node
3. Column number in the data file of downstream MsmBigmod model
4. Data file name of the downstream MsmBigmod model

![Figure 21 IQQM to MsmBigmod configuration](image)

The data extracted from the upstream IQQM based on the upstream node number and parameter number replaces the data in the specified column in the data file of the downstream MsmBigmod model.

**IQQM → SNOWY (Figure 22)**

1. Upstream IQQM node number
2. Parameter number of upstream node
3. Output file name for SNOWY model.

![Figure 22 IQQM to SNOWY configuration](image)

The data extracted from the upstream IQQM model based on the upstream node number and parameter number is stored in the specified output file in the SNOWY output directory and is a csv file.
Configuring model interaction from REALM to MsmBigmod takes two steps:

1. Connection configuration (Figure 23):
   a. Carrier name used in the output of the upstream REALM name
   b. Output data type which is the superfix of the REALM output file
   c. Operation: subtract from or add to the time series
   d. MsmBigmod data file name pattern
   e. The column number in the MsmBigmod data file – data in that column is replaced with new time series from the REALM output
   f. Pattern file name – ? means it will use the pattern dynamically generated by the pattern configuration page
   g. The column number in the pattern file

Steps to process the configuration link are:

Step 1. Extract monthly data from REALM output based on the carrier name and data type.

Step 2. Disaggregate the monthly data to daily data.

   - If a pattern file is specified, the monthly data are disaggregated based on the daily pattern specified in the pattern file.
   - If the pattern file is a question mark, the monthly data are disaggregated based on the dynamically generated pattern defined in the Pattern tab (see Section 4.3.2 for a description of the disaggregation algorithm).
   - If the pattern file column is empty, the monthly data are disaggregated 'By mean' (see Section 4.3.2) to daily data.
Step 3. For the same column number, all the daily data are aggregated together based on the specified ‘Operation’ to a single daily datum.

Step 4. The generated daily data replace the data of the column in the data file of the MsmBigmod model.

2. Pattern configuration (Figure 24) dynamically generates pattern from the output of the upstream REALM model:
   a. Carrier name used in the output of the upstream REALM name
   b. Output data type that defines which file stores the data
   c. Operation: subtract from or add to the time series
   d. Pattern file
   e. The column number in the pattern file

![Figure 24 Pattern configuration in REALM to MsmBigmod interaction](image)

The whole ‘Pattern’ tab generates a single daily pattern that is used to disaggregate the monthly data from REALM model to daily data used in the MsmBigmod model. The steps to generate the daily pattern are:

Step 1. Extract monthly data from REALM output based on the carrier name and data type.

Step 2. Disaggregate the monthly data to daily data.
   - If a pattern file is specified, the monthly data are disaggregated based on the daily pattern specified in the pattern file (see Section 4.3.2 for a description of the disaggregation algorithm).
   - If the pattern file column is empty, the monthly data are disaggregated ‘By mean’ (see Section 4.3.2) to daily data.

Step 3. All daily data are aggregated together based on the specified ‘Operation’ to generate a single daily pattern.
St George → IQQM

The St George to IQQM transfer is embedded in the system and does not need to be configured. The St George outputs *.jck and *.ovf are transferred from IQQM file format to a two column csv file: `<ModelRoot>\Prime_Flows\B_Prime_Flows\LBON_B0D000_Flow.csv`. The data generated by the calculation (*.jck - *.why) is stored in a csv file `<ModelRoot>\03_condamine\River_modelling\Modelling\Prime_Diversions\B_Prime_Diversions\LBON_B0H000_dvrt.csv`.

Snowy → IQQM (Figure 25)

1. Operation: use either mean or predefined pattern to disaggregate the monthly output from SNOWY model to daily input for the downstream IQQM model
2. Header name in the output file (sim_out_syp.csv) of SNOWY model
3. Downstream model flow index file
4. Downstream model flow index file name

![Figure 25 SNOWY to IQQM configuration](image)

Steps to process this link are:

Step 1. Extract monthly data from SNOWY output file (sim_out_syp.csv) based on the specified header name.

Step 2. Disaggregate the monthly data to daily data. If the operation is 'average', the monthly data are disaggregated 'By mean' (see Section 4.3.2) to daily data. If the operation is 'pattern', the monthly data are disaggregated based on the daily pattern specified in the pattern file SNOW_ModelTemplate.pat in the SNOWY model template directory (see Section 4.3.2 for the disaggregation algorithm). The unit is converted from gigalitres to megalitres.

Step 3. The generated daily data replaces the data of the specified downstream node in the IQQM DA file.
Snowy → MSMBigmod (Figure 26)

1. Header name in the output file (sim_out_syp.csv) of SNOWY model
2. Column number in the data file of MsmBigmod
3. Data file of MsmBigmod model
4. Operation: specifies the disaggregation method.

The following steps are used to process the link:

Step 1. Extract monthly data from SNOWY output file (sim_out_syp.csv) based on the specified header name.

Step 2. Disaggregate the monthly data to daily data. The unit is converted from gigalitres to megalitres.
   - If the operation is 'average', the monthly data are disaggregated 'By mean' (see Section 4.3.2) to daily data.
   - If the operation is 'offset', the monthly data are shift forward one time step first and then disaggregated 'By mean'.

Step 3. The generated daily data replace the data of the column in the data file of the MsmBigmod model.

MsmBigmod → IQQM (Figure 27)

1. Column number in the data file of MsmBigmod model
2. The output file name pattern of MsmBigmod data file
3. Threshold. If the threshold is -1, the monthly data are disaggregated by the method specified in the column of 'Operation'. Otherwise, the monthly data are first transferred to a binary time series (either 0 or 1) based on this threshold. Then it is disaggregated constantly.

4. Factor which will be applied to the monthly data before it is disaggregated
5. Downstream model flow index item name
6. Downstream model flow index file name
7. Operation: specifies the disaggregation method.

The following steps are used to process the link:

Step 1. Extract monthly data from the specified column in the MsmBigmod output and then scale it with the specified the factor.

Step 2. If the threshold is not -1, the monthly data are transferred to a binary monthly data. If the value is larger than the threshold, it becomes 1. Otherwise it is 0. And then disaggregate the binary monthly data to a daily data 'Constantly' (see Section 4.3.2). Otherwise, if the operation is 'average', the monthly data are disaggregated 'By mean' (see Section 4.3.2) to daily data. If the operation is 'constant', the monthly data are disaggregated to daily data 'Constantly'.

The generated daily data replace the data of the specified downstream node in the IQQM DA file.

3.3 Store Model Results

After completion of a model run, a modeller can directly analyse the generated model results or store them for future analysis. In the Basin Plan project, the model results are uploaded to a relational database. In order to use this tool, a subversion repository and a relational database must first be developed and deployed (see Power & Seaton 2010a).

Figure 28 is the dialogue to upload model results to the database when the menu item 'Upload model output' is clicked (see Figure 7). The following steps are involved. For details of the uploading process, please refer to (Power & Seaton 2010b).
1. IRSMF checks for updates in the subversion repository. If there are updates, the modeller must update the local working copy and then rerun the model. IRSMF also checks for updated files and new created files in the local working copy. If these are present, the modeller must commit them to the subversion repository outside IRSMF.

2. The modeller needs to provide some useful information for this model run.

3. Press 'Upload' to upload generated data (*.bigmod.csv) and generated statistics (*.stats) for each model defined in the river system configuration.

![Figure 28 Uploading model results](image)
4. MODELLING PROCESS

The current version of IRSMF supports five types of models: IQQM (Simons et al. 1996), REALM (Diment 1991; Perera et al. 2005), MsmBigmod (MDBC 2001), St-George and SNOWY. Each model run by the IRSMF involves six processes, some of which are handled by the IRSMF, some of which are manual steps for the user:

1. Pre-process: the process to integrate all scenario climate, flow, temperature and/or diversion data into the input files
2. Model tweaking: the process to tune up the model parameters
3. Model interaction: the process to integrate the upstream flow data into the input files of the downstream model
4. Model run: the process to run the model with a DOS command
5. Post-process: the process to convert the model raw output into a common Bigmod csv file (see Appendix D) and then generate a statistical summary
6. Model result uploading: the process to upload the model results to the database. This process is described in the data management system documentation (Power & Seaton 2010b).

4.1 Pre-process

The key activity of the pre-process is to integrate all corresponding scenario data (e.g. climate, flow, temperature, diversion) into model input files for each model. It contains two steps:

1. copy all necessary files to the output directory, including all files in the model template directory and the pre-/post- process tools
2. run the pre-process tool to integrate required scenario data to the input files.

The command to run the pre-process tool is described for each type of model in the following subsections. If any required file is missing, the system crashes.
4.1.1 IQQM

The pre-process tool for IQQM is CsvIdx.exe. The command line to run it is:

```
CsvIdx.exe <input.csv> <input.idx> <index.csv> <output.idx>
```

Where:

- `<input.csv>` = Csv file to read data from
- `<input.idx>` = IQQM direct access file to update
- `<index.csv>` = Index file containing the site names, catchment areas and header row
- `<output.idx>` = IQQM direct access file to create

Program produces two log files `<output.idx>.log` and `csvidx.csv`

Example of use:

```
CsvIdx.exe NAMO_B0H000_FLOW.csv NAMO_F.idx NAMO_FlowIndex.csv NAMO_F.idx
```

Based on the requirement defined in the IOFILE.CSV, it may apply to flow, rainfall, evaporation and/or diversion data. All these data csv files are read from the model data directory (see Section 2.1). Each file should at least contain the data for the simulation period.

4.1.2 REALM

The pre-process tool for REALM is CsvRealm.exe. The command line to run it is:

```
CsvRealm.exe <configuration file> <control file> <scenario name> <out dir> <working dir>
```

Where:

- `<configuration file>` = a list of data type code
- `<control file>` = Realm pre-process control file, see Appendix C
- `<scenario name>` = 6 character scenario name, e.g. B0H000
- `<out dir>` = the directory where all new input files are generated
- `<working dir>` = the output directory for the model

Example of use:

```
CsvRealm.exe GBSM.txt B0H000 ..\inputs ..
```

4.1.3 Msmbigmod

Msmbigmod has its own file structure and there is no stand-alone pre-process tool for it. The steps for the pre-process of Msmbigmod are different from other types of models and include:

1. copy key data files from the model template directory to Msmbigmod main directory – this is because different scenarios have different data files

2. copy tweaked parameter file (XXXX.txt) from the model template directory to the file defined in ParTargetName.txt
3. run Broken creek regression (Foreman 2003)
4. extract climate and flow data from the scenario data file in the data directory and then modify the input data file with new scenario climate and flow data
5. integrate the AVOCA data to the input data file
6. retrieve the daily data from the daily flow csv file with the header '9999994' and replace column 33 in the MsmBigmod data file.

4.1.4 St George

The pre-process tool for St George model is StGeorgePre.exe. The command line is:

```
StGeorgePre.exe <control file> <rainfall file> <evap file> <flow file> <out dir>
```

Where:
- `<control file>` = the pre-process control file
- `<rainfall file>` = scenario rainfall data file
- `<evap file>` = scenario evaporation data file
- `<flow file>` = scenario flow data file
- `<out dir>` = output directory

Example of use:
```
StGeorgePre.exe StGeorgePre.control STGE_B0H000_RAIN.csv STGE_B0H000_EVAP.csv STGE_B0H000_FLOW.csv ..
```

4.1.5 SNOWY

The pre-process of SNOWY contains the following three steps:

1. copy all files in the model template directory to the output directory
2. copy the pre-process tool called reform2.exe – obtained from Snowy Hydro – to the output directory
3. extract scenario rainfall, evaporation and flow data from the data files in the data directory and then run reform2.exe to generate new binary input files for SNOWY model.

4.2 Model Tweaking (manual)

Model tweaking is the process to adjust the parameters’ values in order to conduct ‘what-if’ analyses. The current IRSMF only supports tweaking IQQM, REALM and MsmBigmod models.
4.2.1 IQQM (Figure 29)

Figure 29 Tweaking IQQM model

1. Each interested parameter is tagged with special characters (e.g. $H, $G) in the system template file (XXXX_modeltemplate.sqq) in the model template directory. Tagging requires a prefix the same as that shown in the list and a suffix in the reverse order (e.g. $H1234H$). Whatever tag is used a $$ sign is put at the front of the node number so that a list showing the node numbers can be presented as well.

2. Modellers may give a new value for each tagged parameter by:
   - directly typing in a new value
   - changing the default value by percentage
   - changing the default value by absolute value proportionately.

Functions b and c work on all nodes in the list.

To complete a model tweaking, the modeller should press the 'Change by …' button and then press the 'Tweak' button.

3. After tweaking, a working system file without tags is generated in the model template directory and named as: XXXX.sqq.

4. Modellers can directly edit the working system file with a text editor as well.
5. When this model is next run in a loaded river system without tweaking, the previously generated working system file XXXX.sqq is used to run the model at this time.

4.2.2 REALM (Figure 30)

For a REALM model, a modeller can tweak limit curve and rural demand.

1. Each rural demand node in the system template file is tagged with special characters (e.g. $$, $F).

2. A modeller needs to give three fractions: HR, LR and the demand fraction:
   - all volumes for allocation up to 100% are multiplied by the HR fraction and all volumes for allocation above 100% are multiplied by the LR fraction
   - the default demand value is retrieved from the directory Demands_xyzAAA in the model template folder and the new value is the default value multiplied by the demand fraction
   - the modeller can apply this value on all nodes or selected nodes in the list.

3. After tweaking, a working system file without tags is generated and named as XXXX.sys and a set of new demand files are generated in the corresponding data directory: <ModelRoot><RegionName>Modelling\Demans\XXXX_xyz000
4. A modeller can then directly edit the working system file with a text editor.

4.2.3 MsmBigmod (Figure 31)

Figure 31 Tweaking MsmBigmod model

1. Each interested parameter is tagged with special characters (e.g. $$, $VH) in the system template file (XXXX_modeltemplate.txt) in the model template directory

2. Modellers may give the new value for each tagged parameter by:
   - directly typing in a new value
   - changing the default value by percentage
   The new parameter maintains the same length as the original parameter to ensure that no other parameter in the same row shifts its position.

3. After tweaking, a working system file is generated in the model template directory and named as: XXXX.txt.

4.3 Model Interaction

4.3.1 Overview

Two types of model interactions are modelled and implemented in IRSMF. If the outputs of a model A affect the inputs of another model B, we call this influence from A to B as 'feed forward' interaction. If A impacts B by 'feed forward' and the outputs of B affect the inputs of A in turn, we call the influence from B to A as 'feedback' interaction. There is no explicit implementation of feedback interaction in IRSMF. If B has
feedback influence on A, we duplicate A as A1 and A2. Then two feed forward interactions are created: A1 → B and B → A2. The feed forward interaction of B → A2 is used to simulate the feedback interaction from B to A.

Two steps are used to implement the interaction from model A to model B:

1. extract the time series data at the connection point (node) from the model A outputs

2. replace the data at the connection point (node) in the model B with the time series data extracted from the model A.

Nine types of feedforward interactions between surface water models are implemented in IRSMF: IQQM → IQQM, IQQM → St George, St George → IQQM, IQQM → MSMBigmod, Snowy → MsmBigmod, Snowy → IQQM and REALM → MsmBigmod (see Table 1).

Two types of feedback interactions are implemented in IRSMF: IQQM → Snowy and MsmBigmod → IQQM (see Table 2).

4.3.2 Aggregation and Disaggregation Algorithm

The time steps of models used in MDB are daily, weekly and monthly. When connecting models the outputs from one model are not necessarily the same time step as the inputs required to the connecting model. IRSMF provides several ways of handling both increases and decrease in time steps. The major challenge in connecting models together is to ensure that mass balance is preserved. This requires that the connection algorithm preserves mass balance for flows and that, in accounting for flow and use in the various regions, model connections are consistent with reporting.

Transforming time series data from shorter to longer time steps is done by simply adding data together – used for going from daily flow in the Upper Murrumbidgee IQQM model to monthly flow in the ACTEW REALM model.

Table 1 Feed forward interactions between surface water models

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warrego</td>
<td>Paroo</td>
<td>IQQM → IQQM</td>
<td>3</td>
</tr>
<tr>
<td>Upper Condamine</td>
<td>Mid Condamine</td>
<td>IQQM → IQQM</td>
<td>1</td>
</tr>
<tr>
<td>Mid Condamine</td>
<td>St George</td>
<td>IQQM → St George</td>
<td>1</td>
</tr>
<tr>
<td>St George</td>
<td>Lower Balonne</td>
<td>St George → IQQM</td>
<td>1</td>
</tr>
<tr>
<td>Lower Balonne</td>
<td>Darling (Culgoa)</td>
<td>IQQM → IQQM</td>
<td>3</td>
</tr>
<tr>
<td>Moonie</td>
<td>Darling (Gundablouie)</td>
<td>IQQM → IQQM</td>
<td>1</td>
</tr>
<tr>
<td>Macintyre Brook</td>
<td>Border Rivers (unreg)</td>
<td>IQQM → IQQM</td>
<td>2</td>
</tr>
<tr>
<td>Border Rivers</td>
<td>Darling (Little Weir)</td>
<td>IQQM → IQQM</td>
<td>3</td>
</tr>
<tr>
<td>From</td>
<td>To</td>
<td>Type</td>
<td>Number</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------</td>
<td>--------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Gwydir</td>
<td>Darling (Gil Gil + Gingham)</td>
<td>IQQM → IQQM</td>
<td>3</td>
</tr>
<tr>
<td>Peel</td>
<td>Namoi (Carrol Cap)</td>
<td>IQQM → IQQM</td>
<td>1</td>
</tr>
<tr>
<td>Namoi</td>
<td>Darling (Namoi)</td>
<td>IQQM → IQQM</td>
<td>2</td>
</tr>
<tr>
<td>Castlereagh-Macquarie</td>
<td>Darling (Marra Marthaguy and Bogan)</td>
<td>IQQM → IQQM</td>
<td>5</td>
</tr>
<tr>
<td>Darling</td>
<td>Menindee (Tallywalka)</td>
<td>IQQM → IQQM</td>
<td>2</td>
</tr>
<tr>
<td>Menindee</td>
<td>Murray</td>
<td>IQQM → MsmBigmod</td>
<td>1</td>
</tr>
<tr>
<td>Snowy</td>
<td>Murray</td>
<td>Snowy → MsmBigmod</td>
<td>3</td>
</tr>
<tr>
<td>Actew</td>
<td>Upper Murrumbidgee</td>
<td>Snowy → IQQM</td>
<td>2</td>
</tr>
<tr>
<td>UBID</td>
<td>Murrumbidgee</td>
<td>IQQM → IQQM</td>
<td>1</td>
</tr>
<tr>
<td>Snowy</td>
<td>Murrumbidgee</td>
<td>Snowy → IQQM</td>
<td>1</td>
</tr>
<tr>
<td>Murrumbidgee</td>
<td>Murray (Balranald)</td>
<td>IQQM → MsmBigmod</td>
<td>2</td>
</tr>
<tr>
<td>Ovens</td>
<td>Murray</td>
<td>REALM → MsmBigmod</td>
<td>1</td>
</tr>
<tr>
<td>GSM</td>
<td>Murray (Appin South and Rochester)</td>
<td>REALM → MsmBigmod</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 2 Feedback interactions between surface water models

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murrumbidgee</td>
<td>Snowy</td>
<td>IQQM → Snowy</td>
<td>2</td>
</tr>
<tr>
<td>Murray</td>
<td>Murrumbidgee</td>
<td>MsmBigmod → IQQM</td>
<td>4</td>
</tr>
<tr>
<td>Murray</td>
<td>Darling</td>
<td>MsmBigmod → IQQM</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>7</strong></td>
</tr>
</tbody>
</table>

Predominantly most of the connections between models are from a longer time step to a shorter time step and five disaggregation methods are adopted in IRSMF.

By historical time series pattern (monthly → daily)

The process for disaggregating monthly data into daily data based on a given daily pattern is as follows:

1. the daily values [of the historical pattern time series] for the month are summed
2. if the sum of the daily values is zero, the new daily values are set to:
   
   new monthly total / number of days in that month

3. otherwise, the new daily values are set to:
   
   old daily values x new monthly total / sum of daily values
Snowy releases for the Murrumbidgee

1. The Murrumbidgee (IQQM) requires a time series of how far ahead or behind the net Jounama releases are from a known fixed pattern. The period of calculation for this is the Snowy water year of May to April. The initial value for the year is calculated from:

$$\text{max}(1026 - \text{total net Jounama releases from May to April})$$

2. In a water year where the scheme is unable to deliver all of the 1026 GL expected then this is indicated by a value of greater than 0 on 1 May, otherwise it will be 0.

3. The values for the other days of the year are determined from:

$$\text{min}(\text{initial curve value} + \text{total net Jounama release from 1 May to date}, 1026) - \text{cumulative value of the standard pattern from 1 May to date}$$

4. The curve will finish each water year at zero and in a year where the water is delivered in the standard distribution the curve will not deviate from zero.

By mean

The new value in the time series with small time steps is equal to the average of the value in the time series with a large time step. For example, to disaggregate monthly data to daily data, the value of each day in a month is the average daily value of that month in the monthly data.

Constantly

The new value in the time series with a small time step is equal to the value in the time series with a large time step. For example, if we want to disaggregate monthly data to daily data, the value of each day in that month is the value of that month in the monthly data.

Snowy (SIMDIV) to Murray

1. Transfer the monthly data from the Snowy model into water-year–based monthly data:

$$\text{max}(0, 1062000 - \text{sum of the water year})$$

2. Disaggregate the water-year–based monthly data to the daily data by mean.

4.4 Model Run

IRSMF requires all models to run in a DOS console without any user interaction. Each model template should have only one executable (*.exe or *.bat).
4.4.1 IQQM

The DOS command to run IQQM is: iqqmnt.exe <XXXX.sqq> <start date> <end date>.

The executable can be any name but there should be only one in the directory. The format of the start and end date is dd/MM/yyyy.

4.4.2 REALM

The DOS command to run REALM is: realm_so_v501.exe. The executable can be any name but there can only be one in the directory. It does not take any argument when it is run and it requires a file called ans_file.dat in the same directory.

4.4.3 MsmBigmod

The executable of MsmBigmod model is: MSMBIGMOD_CUR.bat for the baseline scenarios, MSMBIGMOD_NAT.bat for the without development scenarios and MSMBIGMOD_BP.bat for the basin plan scenarios. The name of each batch file cannot be changed. The DOS command to run MsmBigmod is:

MSMBIGMOD_CUR.bat <msmbigmod dir> <scenario name> <run number> <out dir> <start year> <end year> <Bigmod data dir>

Where:

- <msmbigmod dir>: the MsmBigmod main directory
- <scenario name>: 6 characters scenario name, e.g. B0H000
- <run number>: a run number for the model, e.g. 99999
- <out dir>: output directory where all outputs and temporary files are stored
- <start year>: start year for the model run
- <end year>: end year for the model run
- <bigmod data dir>: the directory to store the bigmod data

4.4.4 St George

The DOS command to run St George model is: SGCS22NT.exe <input file>. The executable and the input file can be any name but there should be only one in the directory. The extension of the input file should be '.in'.

4.4.5 SNOWY

The DOS command to run SNOWY is: SIM_V9.exe. The executable can be any name but there can only be one in the directory. It does not take any argument when it is run.
4.5 Post-process

The post process for most models has two tasks:

1. extract key information from the model raw outputs and store them in a common Bigmod csv file format

2. run BigArkW tool to generate a statistics summary.

Each model should have a conversion file (XXXX.conversion.csv) that defines which key information is extracted from the model raw outputs and a BigArkW parameter file (XXXX.stats.param) that defines which statistics are to be generated.

To generate a flow and diversion file for LBON model in the St George model takes an extra step (for detail please refer to the section 'St George → IQQM').

The Barwon Darling IQQM model also requires an extra step. This model receives inflow from seven upstream catchments consisting of gauged tributary inflow, ungauged tributary inflow and floodplain flow. The floodplain flows are not reported as EOS (end of system) of upstream system. They are estimated on the basis of gauged tributary inflow. The purpose of the extra step is to disaggregate the total floodplain flow and attribute it to the upstream catchments and thereby estimate the total contribution from individual catchments. According to the configuration specified in the configuration file (see Appendix N), the generated time series are appended into the *.bigmod.csv.
5. UTILITIES

5.1 IQQM Input Data Generator

The IQQM input data generator () is a tool to generate input data from IQQM baseline model in the baseline model template directory and store the time series in the corresponding data directory (in the 'Modelling' folder under each region folder). It generates a set of csv files that follow the name convention described in Section 2.

![IQQM Input Data Generator](image)

Figure 32 IQQM input data generator
5.2 Input Data Scalar

Input data scalar () is a tool to scale input data for different future climate scenarios. It generates a set of input csv files which follow the name convention described in the Section 2 in the corresponding data directory.

5.2.1 Climate Data Scaling

For scaling evaporation and rainfall, data are multiplied by the corresponding seasonal scaling factor. For temperature, data are added with the corresponding seasonal value in the climate scaling factor file. The format of the climate scaling factor file is shown in the Appendix L.

5.2.2 Flow Data Scaling

*Monthly Flow Data*

Monthly flow data are multiplied by the corresponding seasonal scaling factor. The format of the flow data scaling factor file is shown in the Appendix M.
Daily Flow Data

The inflow is multiplied by the corresponding seasonal scaling factor except for the adjacent days between two seasons. The scaling factors for these days are generated by using linear regression. For example, assume that the number of regression days for scaling inflow is specified as 15 days. The scaling factor is generated by using linear regression for each day of the last 15 days in the previous season and the first 15 days in the current season. There should be 30 scaling factors generated. Then the inflow of each of these days is multiplied by the generated scaling factor respectively. Finally data are adjusted with the corresponding annual scaling factor.

5.3 IQQM to Bigmod Output Converter

IQQM to Bigmod output converter (see Figure 36) is a tool to extract a set of time series from IQQM raw outputs and store them in a Bigmod csv file. A conversion csv file is required and specifies which time series are extracted from IQQM raw outputs.

Figure 34 IQQM to Bigmod converter
5.4 REALM to Bigmod Output Converter

REALM to Bigmod output converter (see Figure 37) is a tool to extract a set of time series from REALM raw outputs and store them in a Bigmod csv file. A conversion csv file is required and specifies which time series are extracted from REALM raw outputs.

Figure 35 REALM to Bigmod converter
5.5 Model Output Viewer

Model output viewer (Figure 38) is a tool to graphically visualise the latest model outputs in the output directory. The viewer lists all the models in the loaded river system configuration. A modeller can either look at the time series of each interested site of a model or the statistical summary for a model generated by BigArkW tool.

Figure 36 Model output viewer
6. TRAJECTORY MODELLING

IRSMF allows a modeller to conduct trajectory modelling for IQQM, REALM, St George and MsmBigmod. It involves five steps:

1. create/load a river system
2. adjust initial storages for each model via tweaking functionality
3. set up the modelling length and interval between two model runs
4. run a set of simulations for the river system
5. collect model results (*.bigmod.csv) in a single directory for each model and then combine the time series for each column in the *.bigmod.csv file into a single csv file for further analysis.

Figure 40 is the interface for trajectory modelling that is invoked from the 'Run trajectory modelling' item in the Scenario menu.

![Figure 37 Trajectory modelling interface](image)

The modeller should provide the following information in order to conduct trajectory modelling:

1. Scenario: select one scenario from the list
2. Modelling length: how many years for a single model run
3. Interval: how many years between two model runs
4. Start year: the year to start to sample historical data
5. End year: the last year to sample historical data
6. Simulated start year: the year from which the trajectory modelling is simulated

7. Start month: the start month to report model results

8. End month: the end month to run models and report model results

9. Warmup months: the warming-up period to run the model

10. Output directory: this output directory will overwrite the output directory root specified in the system configuration

11. Ignor BigArkW tool: option not to run BigArkW tool or to run BigArkW tool without comparing with the results from natural scenario.

The example shown in the Figure 40, uses data sampled from 1/5/1895 to 30/06/1910; 1/5/1897 to 30/06/1912; 1/5/1899 to 30/06/1914; 1/5/1901 to 30/06/1916; 1/5/1903 to 30/06/1918; and 1/5/1905 to 30/06/1920 to simulate model runs from 01/05/2000 to 30/06/2015. Model results are reported from 01/07/2000 to 30/06/2015.

If the 'Swap model point' of a model is between 01/05/2000 and 30/06/2015, the baseline model is replaced by the basin plan model at that date. Modellers should assume that the 'Swap model point' is 01/07/2005 as the baseline model is running from 01/05/2000 to 30/06/2005. IRSMF then initialises the storage for the basin plan model with the storage on 30/06/2005 from the baseline model. After that the basin plan model is running from 01/05/2005 to 30/06/2015.

The raw model results are stored in the following directories:

- valleyNo_Name\river_modelling\model_name\scenario\1895_1910
- valleyNo_Name\river_modelling\model_name\scenario\1897_1912
- valleyNo_Name\river_modelling\model_name\scenario\1899_1914
- valleyNo_Name\river_modelling\model_name\scenario\1901_1916
- valleyNo_Name\river_modelling\model_name\scenario\1903_1918
- valleyNo_Name\river_modelling\model_name\scenario\1905_1920

All *.bigmod.csv files (named as modelName_scenario_startyr_endyr.bigmod.csv) are copied to <OutputDirectoryRoot>\TrajectoryModellingResults\. It then combines time series to a single csv file for each column. The csv file is named as: <ModelName>_ScenarioName_SimulatedStartYear_ModellingLength_ColumnNumber.bigmod.csv (e.g. MCON_B0H000_2000_10_000.bigmod.csv).

If needed, a separate conversion file can be used. It must be named as: modelNametrajectoryconversion.csv and there must be a matching parameter file named as: modelNametrajectorystats.param.
6.1 IQQM Model Preparation

If an IQQM model is needed to swap between baseline and basin plan models, the following files are required in the baseline model template directory:

1. initialise storage volumes for the baseline model either manually or through tweaking interface

2. a system file tagged with $SXX (XX is the two digit number starting from 01, 02, 03, …, etc.) for the basin plan model named as traj.sqq

3. a listquan file is used to generate storages at the end of baseline model run and is named as: StorageVolume.run – the listquan generates a csv file named as: StorageVolumes.csv.

The process to run trajectory modelling for an IQQM model that requires swapping models is:

1. initialise storages via the tweaking interface – each storage node is tagged by $SXX

2. run the baseline model from the start date to the swapping model point

3. extract storages by running listquan

4. initialise storages with the storages at the end of baseline model run

5. run the basin plan model from the swapping model point to the end

6. collect model results and combine time series for each column.

6.2 REALM Model Preparation

If a REALM model is needed to swap between baseline and basin plan model, the following files are required in the model template directory:

1. two system files: one for the baseline model and named as <ModelName>.sys and the other for the basin plan model and named as <ModelName>_trajectory.sys

2. an input file that uses the two system files and is named as ans_file.trajectory.dat and can be generated through REALM GUI version

3. a configuration file named as trajectory.config that specifies the list of input files needed to modify.
The process to run trajectory modelling for an IQQM model that requires swapping models is:

1. initialise storages via tweaking interface () – the storage volume is stored in the *.ri file in the subdirectory 'Inputs' in the model template directory

2. generate all demand files by combining the baseline data from start date to the 'Swap model point' with the basin plan data from the 'Swap model point' to the end date

3. generate all input files specified in the trajectory.config file combining the baseline data from start date to the 'Swap model point' with the basin plan data from the 'Swap model point' to the end date

4. run REALM model for the whole trajectory modelling period – REALM swaps the model system file at the 'Swap model point' automatically

5. collect model results and combine time series for each column.

Figure 38 Initialise storage for REALM
6.3 St George Model Preparation

The following files are required in the model template directory to run trajectory modelling for St George model:

1. a *.in.template file that stores the default storage volume – after storage initialisation, a *.in is generated for model run

2. a storage.config file that specifies the dead storage at the first line and the proportion for each share storage afterwards.

If swapping model is required, a *.in.bp is required and used for the basin plan model.

The process to run trajectory modelling for St George model requiring swapping models is:

1. initialise storages via tweaking interface (Figure 43) generating A *.in for the baseline model – if not initialised, the existing *.in is used for the model run

2. run the baseline model from the start date to the swapping model point

3. extract storage volume from *.bigmod.csv file – the storage has to be the first column in the bigmod.csv file

4. initialise share storages with the storage at the end of baseline model run based on the dead storage and the proportion specified in the storage.config file

5. run the basin plan model from the swapping model point to the end

6. collect model results and combine time series for each column.

![Initialise storage](image)

Figure 39 Initialise storage for St George
6.4 MsmBigmod Model Preparation

MsmBigmod model handles trajectory modelling by itself. The batch file to run trajectory modelling has to be MSMBIGMOD_CUR_TRAJECTORY.bat.
## 7. TROUBLESHOOTING

Whenever a problem arises, the problem can easily be identified from the log file in most cases. The log file will tell the modeller when and where the error occurs. Frequently occurring problems in different modelling processes are listed in Table 3. Possible error messages and possible solutions are listed in Table 4.

Table 3 Frequently occurring problems in the different modelling processes

<table>
<thead>
<tr>
<th>Process</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scaling data</td>
<td>Certain headers in the input data csv file are not in the scaling factor file.</td>
<td>Make sure the header in the input data csv file matches the subCat_Id or Station_Name in the scaling factor file</td>
</tr>
<tr>
<td>Pre-process</td>
<td>Mismatch among headers in the input data csv, items in the IQQM DA index file and items in the IOFILE.csv</td>
<td>Make sure headers in the input data csv file, items in the IQQM DA index file and items in the IOFILE.csv are matching</td>
</tr>
</tbody>
</table>
| Model interaction              | 1. no required output generated in the upstream model  
2. cannot replace data in the downstream model | 1. make sure the required information is within the output of the upstream model  
2. make sure the specified column number or column header or item name is correct |
| Model run                      | 1. required file missing  
2. wrong DOS command  
3. crash within model itself | Run the DOS command directly in the console according the log file. Some useful information or error message will be popped up. This information will help to solve the problem. |
<p>| Extracting model output in the Bigmod csv file | The specified item in the conversion file is not in model output | Make sure all specified information is within the model output |
| Generating stats by BigArkW tool | The parameter file is not configured correctly | If there is error file generated by BigArkW tool, check it and try to solve the problem from there. Otherwise run BigArkW tool directly in the console to identify what the problem is. |
| Uploading model results to database | 1. mismatch identifier between BigArkW parameter file and that stored in the database | 1. Make sure the identifier is not modified after it is used. If an identifier has to be changed, |</p>
<table>
<thead>
<tr>
<th>Process</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. some site IDs in the BigArkW parameter file are more than 7 characters</td>
<td></td>
<td>please give another unused id to it</td>
</tr>
<tr>
<td>3. BigArkW tool generates NaN or INF</td>
<td></td>
<td>2. make sure all site id has to be within seven characters</td>
</tr>
<tr>
<td>4. use space as delimiter in the BigArkW parameter file</td>
<td></td>
<td>3. make sure no such value generated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. make sure spaces are not used as the delimiter. Instead, try to use Tab or Comma as the delimiter in the BigArkW parameter file</td>
</tr>
</tbody>
</table>

Table 4 Possible error messages and possible solutions

<table>
<thead>
<tr>
<th>Error message</th>
<th>Possible cause and solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>There should be a scenario name with six characters.</td>
<td>The specified scenario name is not six characters.</td>
</tr>
<tr>
<td>The specified input data root does not exist.</td>
<td>The specified input data root in the path configuration does not exist.</td>
</tr>
<tr>
<td>The specified model template root does not exist.</td>
<td>The specified model template directory root does not exist.</td>
</tr>
<tr>
<td>The specified tools directory does not exist.</td>
<td>As it means.</td>
</tr>
<tr>
<td>There is no working directory specified.</td>
<td>The specified output directory root in the path configuration does not exist.</td>
</tr>
<tr>
<td>The start date should be earlier than the end date.</td>
<td>The model run start date should be earlier than the model run end date.</td>
</tr>
<tr>
<td>The report start date should be earlier than the report end date.</td>
<td>The report start date should also be earlier than the report end date.</td>
</tr>
<tr>
<td>The scenario has not been properly configured.</td>
<td>Either the model name is not unique or the order to run models is not correct. The layer of the upstream model should be lower than that of the downstream model.</td>
</tr>
<tr>
<td>There is no natural results. Should run natural condition first.</td>
<td>There is no result for without development scenario in the directory of Modelling\NaturalModelResults\ for this model if it is required.</td>
</tr>
<tr>
<td>The upstream node …… has not been finished.</td>
<td>The model run of the upstream model crashed. Please check upstream model.</td>
</tr>
<tr>
<td>Therefore ……. will be skipped.</td>
<td></td>
</tr>
<tr>
<td>The forward link from … to … has not been</td>
<td>The link has not been configured.</td>
</tr>
<tr>
<td>Error message</td>
<td>Possible cause and solution</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>properly configured.</td>
<td></td>
</tr>
<tr>
<td>There is something wrong during model run.</td>
<td>As it means.</td>
</tr>
<tr>
<td>There is not any Bigmod csv file or more than on Bigmod csv files in the folder of ……</td>
<td>The process to extract data from the model output crashed. Check the conversion file and the model output.</td>
</tr>
<tr>
<td>The number of the data file of …… is more than one.</td>
<td>When processing the link from REALM to MsmBigmod, there are no or more than one input data files that match the file name pattern specified in the interface.</td>
</tr>
<tr>
<td>Only one STGE control file should exist.</td>
<td>There is either no or more than one control file in the STGE model template directory.</td>
</tr>
<tr>
<td>Only allow ONE input file (*.in) exists.</td>
<td>There is either no or more than one input file (*.in) in the STGE model template directory.</td>
</tr>
<tr>
<td>NaturalFlowMapping.csv does not exist.</td>
<td>As it means.</td>
</tr>
<tr>
<td>FLOW &lt;flow file name&gt; does not exist.</td>
<td>The specified flow file does not exist for SNOWY models.</td>
</tr>
<tr>
<td>EVAP &lt;evap file name&gt; does not exist.</td>
<td>The specified evap file does not exist for SNOWY model.</td>
</tr>
<tr>
<td>RAINFALL &lt;rain file name&gt; does not exist.</td>
<td>The specified rainfall fill does not exist for SNOWY model.</td>
</tr>
<tr>
<td>Mapping file &lt;file name&gt; does not exist.</td>
<td>The specified mapping file does not exist for SNOWY model.</td>
</tr>
<tr>
<td>&lt;header name&gt; is not found in &lt;file name&gt;.</td>
<td>The specified header was not found in the file when processing Broken Creek regression.</td>
</tr>
<tr>
<td>There is no output for the parameter … for the node … in the file …. Please have a double check.</td>
<td>The IQQM output does not include the specified parameter of the specified node.</td>
</tr>
<tr>
<td>Cannot find .iqn file in the folder of ….</td>
<td>There is no *.iqn file in the output directory for the model. It indicates that the mode run crashed.</td>
</tr>
<tr>
<td>The parameter number is larger than the number of variable for the node type: … in the iqn file: ….</td>
<td>The requested parameter number for that node is out of its range.</td>
</tr>
<tr>
<td>EOC is not found in the file of ….</td>
<td>Whenever trying to replace data in the Bigmod csv file, the string 'EOC' was not found.</td>
</tr>
<tr>
<td>EOH is not found in the file of ….</td>
<td>Whenever trying to replace data in the Bigmod csv file or retrieve data from that file, the string 'EOH' was not found.</td>
</tr>
<tr>
<td>Period of daily pattern is not overlapped with input data.</td>
<td>When disaggregating the monthly data to daily data by a historical data during processing the link to MsmBigmod, there is no common period between</td>
</tr>
<tr>
<td>Error message</td>
<td>Possible cause and solution</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>The specified field does not exist in <code>&lt;file name&gt;</code>. Please have a double check.</td>
<td>When trying to replace data in the Bigmod csv file, the specified header name is not in that file.</td>
</tr>
<tr>
<td>Error in loading file: <code>&lt;file name&gt;</code></td>
<td>Occurs when trying to open a REALM file. The file may not exist or be locked.</td>
</tr>
<tr>
<td>The data format should be either integer or float.</td>
<td>Occurs when trying to read a REALM file. The sixth line in that file is to specify the data type. It should be either integer or float.</td>
</tr>
<tr>
<td>ERROR: there is no parameter file or more than one parameter files for MsmBigmod model ….</td>
<td>There is no or more than one BigArkW parameter file in the model template directory.</td>
</tr>
<tr>
<td>ERROR: there is no statistic summary output file or more than one output file for MsmBigmod model ….</td>
<td>No or &gt;1 stdreport_*.csv found.</td>
</tr>
<tr>
<td>There is no or more than one data files … in the data directory:</td>
<td>No or &gt;1 data files were found when processing the link from IQQM to MsmBigmod.</td>
</tr>
<tr>
<td>There is no storagevolume.run in the output directory: ….</td>
<td>Only occurs when running trajectory modelling. There should be a storagevolume.run file to generate storage at the end of baseline model run.</td>
</tr>
<tr>
<td>There is no storage volume file in the output directory.</td>
<td>Only occurs when running trajectory modelling. *StorageVolumes.csv was not found in the output directory. This means that the listquan is not correct.</td>
</tr>
<tr>
<td>There should be only one executable file exists in this directory.</td>
<td>No or &gt;1 executables were found in the IQQM model template directory.</td>
</tr>
<tr>
<td>There is no or more than one associated files in the directory: ….</td>
<td>The data file of the MsmBigmod model was not found when processing the link from REALM to MsmBigmod.</td>
</tr>
<tr>
<td>ERROR: there is no daily pattern generated.</td>
<td>It requires using a dynamically generated pattern to process the link from REALM to MsmBigmod. But it seems the Pattern tab in the link was not configured correctly.</td>
</tr>
<tr>
<td>ERROR: operation of a connection should either + or -.</td>
<td>The operation can only be + or – in the link from REALM to MsmBigmod.</td>
</tr>
<tr>
<td>There is no or more than 1 data files … in the data directory: ….</td>
<td>The data file of the MsmBigmod model was not found when processing the link from SNOWY to MsmBigmod.</td>
</tr>
<tr>
<td>There should be only one link from IQQM to St George.</td>
<td>As it means.</td>
</tr>
<tr>
<td>Error message</td>
<td>Possible cause and solution</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>There is no or &gt;1 .JCK file in the St George output directory: .....</td>
<td>As it means.</td>
</tr>
<tr>
<td>There is no or &gt;1 .OVF file in the St George output directory: .....</td>
<td>As it means.</td>
</tr>
<tr>
<td>There is no or &gt;1 .WHY file in the St George output directory: .....</td>
<td>As it means.</td>
</tr>
<tr>
<td>The node description line should start with '.'.</td>
<td>Wrong format in the IQQM system template file *.ModelTemplate.sqq when tweaking IQQM model.</td>
</tr>
<tr>
<td>ERROR: the same node ( … ) has different node description.</td>
<td>Wrong format in the IQQM system template file *.ModelTemplate.sqq when tweaking IQQM model.</td>
</tr>
<tr>
<td>ERROR: one node should not have two values for a tweaked type.</td>
<td>One node was tagged more than once with the same tag in the IQQM system template file *.ModelTemplate.sqq when tweaking IQQM model.</td>
</tr>
<tr>
<td>Error with increased value.</td>
<td>When tweaking IQQM model with ChangeByProportion, the value should be either + or – in front of the value.</td>
</tr>
<tr>
<td>More than one region with the same name.</td>
<td>Occurs when trying to view model output.</td>
</tr>
<tr>
<td>The number of rows is not equal to the number of columns in the data file.</td>
<td>Occurs when trying to view model output. The description does not match the data in the model result *.bigmod.csv.</td>
</tr>
<tr>
<td>The node … has already been in the tweak node collection.</td>
<td>Two nodes with the same name found in the REALM system file when tweaking REALM model.</td>
</tr>
<tr>
<td>The carrier … appears more than once in the file ….</td>
<td>The specified carrier appears &gt;1 in the demand file when tweaking demand for the REALM model.</td>
</tr>
<tr>
<td>ERROR: cannot find the demand of the carrier: …..</td>
<td>The specified carrier was not found in all the demand files when tweaking demand for the REALM model.</td>
</tr>
<tr>
<td>There is no output for the model for the period … - ….</td>
<td>When collecting all *.bigmod.csv files for a trajectory modelling, the output for that period cannot be found. It suggests that the model run for that period crashed.</td>
</tr>
<tr>
<td>&lt;preprocess tool directory&gt; does not exist.</td>
<td>Cannot find the pre-process tool for a model.</td>
</tr>
<tr>
<td>&lt;postprocess tool directory&gt; does not exist.</td>
<td>Cannot find the post-process tool for a model.</td>
</tr>
<tr>
<td>&lt;IqnFile&gt; does not exist in the folder of: … during IQQM2Bigmod conversion.</td>
<td>When converting IQQM output to *.bigmod.csv file, IQN file cannot be found in the output directory.</td>
</tr>
<tr>
<td>ERROR: there should be only one exe in the BigArKW tool directory.</td>
<td>There is no or &gt;1 exe file found in the BigArKW tool directory.</td>
</tr>
<tr>
<td>ERROR: something wrong with BigArKW tool.</td>
<td>The statistics generation by using BigArKW tool</td>
</tr>
<tr>
<td>Error message</td>
<td>Possible cause and solution</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>There is no or more than one iqn file in the output directory: ....</td>
<td>As it means.</td>
</tr>
<tr>
<td>CSVIDX executed with error: &lt;error message&gt;</td>
<td>It occurs during IQQM pre-process. Correct it according to the error message.</td>
</tr>
<tr>
<td>There is no or &gt;1 .JCK file in the St George working directory: ....</td>
<td>As it means. It suggests that the model run for St George failed.</td>
</tr>
<tr>
<td>There is no or &gt;1 .OVF file in the St George working directory: ....</td>
<td>As it means. It suggests that the model run for St George failed.</td>
</tr>
<tr>
<td>There is no or &gt;1 .WHY file in the St George working directory: ....</td>
<td>As it means. It suggests that the model run for St George failed.</td>
</tr>
<tr>
<td>There is no executable in the directory of: ....</td>
<td>Cannot find the batch file to run MsmBigmod model.</td>
</tr>
<tr>
<td>There is no or more than one csv file called &quot;big-Other-Models-Flow&quot; in the Bigmod data directory.</td>
<td>Cannot find the Bigmod data file.</td>
</tr>
<tr>
<td>There is no or &gt;1 *ParTargetName.txt in the model template directory.</td>
<td>As it means.</td>
</tr>
<tr>
<td>The demand directory does not exist for baseline model.</td>
<td>Occurs in the trajectory modelling. It suggests that there is no subdirectory Demands_B0[H</td>
</tr>
<tr>
<td>The demand directory does not exist for basin plan model.</td>
<td>Occurs in the trajectory modelling. It suggests that there is no subdirectory Demands_BP[H</td>
</tr>
<tr>
<td>There is no 'Inputs' subdirectory in the output directory: ....</td>
<td>As it means.</td>
</tr>
<tr>
<td>There is no trajectory.config in the output directory: ....</td>
<td>As it means.</td>
</tr>
<tr>
<td>No system file exists in the output directory: ....</td>
<td>Occurs for REALM model.</td>
</tr>
<tr>
<td>Errors occur in transferring climate data into REALM inputs.</td>
<td>As it means.</td>
</tr>
<tr>
<td>ans file for trajectory modelling does not exist.</td>
<td>ans_file.trajectory.dat does not exist in the model template directory.</td>
</tr>
<tr>
<td>The Second character of scenario name should be P,0,N or _ .</td>
<td>As it means.</td>
</tr>
<tr>
<td>The header 'site' is not found.</td>
<td>Cannot find the column 'Site' in the conversion file</td>
</tr>
<tr>
<td>Error message</td>
<td>Possible cause and solution</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>during data conversion from IQQM output to *.bigmod.csv.</td>
<td>The specified reporting period is not within IQQM output period during IQQM conversion process.</td>
</tr>
<tr>
<td>The specified period is not within the time series.</td>
<td>The sum of all nodes with the same node type has already calculated.</td>
</tr>
<tr>
<td>The specified reporting period is not within IQQM output period during IQQM conversion process.</td>
<td>It suggests that there is duplicated line in the conversion file.</td>
</tr>
<tr>
<td>The sum of all nodes with the same node type has already calculated.</td>
<td>Error: there is no DOT in the node description &quot; ... &quot; at the line: ....</td>
</tr>
<tr>
<td>It suggests that there is duplicated line in the conversion file.</td>
<td>The format for this line is not correct.</td>
</tr>
<tr>
<td>Error: there is no DOT in the node description &quot; ... &quot; at the line: ....</td>
<td>Extraction of the data for this line failed.</td>
</tr>
<tr>
<td>The format for this line is not correct.</td>
<td>Cannot find the output for the specified parameter # of the specified node.</td>
</tr>
<tr>
<td>Extraction of the data for this line failed.</td>
<td>The sum of all nodes with the same node type has already calculated.</td>
</tr>
<tr>
<td>Cannot find the output for the specified parameter # of the specified node.</td>
<td>The Bigmod csv file supports daily and monthly data. It suggests that the data extracted from the model output is not either daily or monthly.</td>
</tr>
<tr>
<td>The Bigmod csv file supports daily and monthly data. It suggests that the data extracted from the model output is not either daily or monthly.</td>
<td>NaN is found in the model output when converting model output to Bigmod csv file.</td>
</tr>
<tr>
<td>NaN is found in the model output when converting model output to Bigmod csv file.</td>
<td>The time step is not supported for the Bigmod csv file format.</td>
</tr>
<tr>
<td>The Bigmod csv file supports daily and monthly data. It suggests that the data extracted from the model output is not either daily or monthly.</td>
<td>In the conversion file, only + or - is supported as an operation.</td>
</tr>
<tr>
<td>In the conversion file, only + or - is supported as an operation.</td>
<td>The carrier has to be tagged by '$' in the REALM conversion file.</td>
</tr>
<tr>
<td>The carrier has to be tagged by '$' in the REALM conversion file.</td>
<td>The number of REALM output files for the same data type is either 0 or &gt;1.</td>
</tr>
<tr>
<td>The number of REALM output files for the same data type is either 0 or &gt;1.</td>
<td>When trying to merge baseline time series with base plan time series during the trajectory modelling, these two time series are not adjacent.</td>
</tr>
<tr>
<td>When trying to merge baseline time series with base plan time series during the trajectory modelling, these two time series are not adjacent.</td>
<td>The same node ( ... ) has different node description.</td>
</tr>
<tr>
<td>When tweaking IQQM model, it found that the one node with different node description in the IQQM system template file in the model template directory.</td>
<td>ERROR: the same node ( ... ) has different node description.</td>
</tr>
<tr>
<td>ERROR: the same node ( ... ) has different node description.</td>
<td>When tweaking IQQM model, it found that the one node with different node description in the IQQM system template file in the model template directory.</td>
</tr>
<tr>
<td>More than one value for the same tweak type of the same node found in the IQQM system template file in the model template directory.</td>
<td>ERROR: a single node ( ... ) should not have two values for the tweaked typ: ....</td>
</tr>
<tr>
<td>ERROR: a single node ( ... ) should not have two values for the tweaked typ: ....</td>
<td>As it means.</td>
</tr>
<tr>
<td>ERROR: Can not find ... in the IDX file ....</td>
<td>As it means.</td>
</tr>
<tr>
<td>There is no overlap between two time series.</td>
<td>When trying to replace data into IQQM DA input file, it found that the data are out of the period of the data in the DA file.</td>
</tr>
<tr>
<td>When trying to replace data into IQQM DA input file, it found that the data are out of the period of the data in the DA file.</td>
<td>The node number ... does not exist in the IQN file:</td>
</tr>
<tr>
<td>The node number ... does not exist in the IQN file:</td>
<td>As it means.</td>
</tr>
<tr>
<td>Error message</td>
<td>Possible cause and solution</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>The node … is not included in the node type … in the IQN file: ….</td>
<td>The node type of the specified node in the IQN file is different from what is expected.</td>
</tr>
<tr>
<td>The specified field: … does not exist in &lt;data file name&gt;.</td>
<td>When trying to replace data in the Bigmod data file, it was found that there is no data for the specified item.</td>
</tr>
<tr>
<td>Header name … is not found in the datafile ….</td>
<td>When trying to read the data from the Bigmod csv file, it was found that the specified column does not exist.</td>
</tr>
<tr>
<td>The time step for two REALM data are different.</td>
<td>When trying to generate REALM inputs for trajectory modelling, the time step of data in the input file with the same file name are different from the baseline model and basin plan model.</td>
</tr>
<tr>
<td>The number of carriers in the two REALM data are different.</td>
<td>When trying to generate REALM inputs for trajectory modelling, the number of carriers in the input file with the same file name are different from the baseline model and basin plan model.</td>
</tr>
<tr>
<td>The time step in this REALM data file is not supported.</td>
<td>Only daily or monthly data are supported in the trajectory modelling for REALM model.</td>
</tr>
<tr>
<td>There is no storage configuration file.</td>
<td>Cannot find the storage configuration file storage.config in the St George model template directory.</td>
</tr>
<tr>
<td>The model template directory does not exist for ….</td>
<td>Cannot find the model template directory for the specified model.</td>
</tr>
<tr>
<td>Unknown TimeStep using the csv file.</td>
<td>When uploading model results to database, the time steps of the data in the Bigmod csv file is not either daily or monthly.</td>
</tr>
<tr>
<td>ERROR: there is null value at line &quot; … &quot; in the file ….</td>
<td>There is NaN in the specified statistics file generated by BigArkW tool.</td>
</tr>
<tr>
<td>ERROR: there is something wrong with line &quot; … &quot; in the file ….</td>
<td>The value for some statistics index in the specified file is not a number.</td>
</tr>
<tr>
<td>ERROR: BigArkW .Param file format is not correct for the model ….</td>
<td>As it means.</td>
</tr>
<tr>
<td>Line: ……</td>
<td></td>
</tr>
<tr>
<td>ERROR: Duplicate ID's (…) in BigArkW PARAM FILE for the model ….</td>
<td>A single ID has been defined more than once in the parameter file.</td>
</tr>
<tr>
<td>The details of the indicator in the database are: ……</td>
<td>The indicator is not the same as that stored in the database.</td>
</tr>
<tr>
<td>Error message</td>
<td>Possible cause and solution</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>The details of your new indicator are: ..............................................</td>
<td></td>
</tr>
<tr>
<td>The specified RiverSystem is not under source control.</td>
<td>When uploading results, it was found that the river system configuration XML file is not under source control.</td>
</tr>
<tr>
<td>Commit made when nothing to commit. Check there are no un-versioned files (Add them if there are).</td>
<td>As it means.</td>
</tr>
<tr>
<td>&lt;subCatName&gt; in the file &quot; ... &quot; does not exist in the scale factor file</td>
<td>When scaling data, the sub-catchment or climate station cannot be found in the scaling factor file.</td>
</tr>
<tr>
<td>The specified baseline data root does not exist: ..................................</td>
<td>The specified baseline data root does not exist when trying to generate input data for IQQM models.</td>
</tr>
</tbody>
</table>
REFERENCES


APPENDIX A – IOFILE.CSV FILE FORMAT

IOFile.csv is used to control which type of data are integrated into the model input files. Example content of a iofile.csv is:

```
#Catchment_yield
Flows,FLOW
Climate,RAIN
Climate,EVAP
Climate,TMAX
Diversions,DVRT
```

The wording in the file is not allowed to change, and you can only remove some lines if some types of data are not required for the model (e.g. if TMAX data are not required, you just remove the line 'Climate, TMAX').
APPENDIX B – IQQM PRE-PROCESS INDEX FILE

The IQQM pre-process index file is a comma separated csv file:

- the first line is the header
- the first column is the name of the site/node/gauge
- the second column is the constant.

The constant for flow data, where the data unit is mm/day, should be the catchment area; where the data unit is ML/day, the constant should be 1. The constant for both temperature and evaporation should be 10; for rainfall data it should be 1.

Example of LACH model

The content of LachEvapIndex is:

<table>
<thead>
<tr>
<th>Lach Evap,Catchment Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>050014,10</td>
</tr>
<tr>
<td>063019,10</td>
</tr>
<tr>
<td>063022,10</td>
</tr>
<tr>
<td>063267,10</td>
</tr>
<tr>
<td>065016,10</td>
</tr>
<tr>
<td>075007,10</td>
</tr>
<tr>
<td>075032,10</td>
</tr>
<tr>
<td>075039,10</td>
</tr>
<tr>
<td>075050,10</td>
</tr>
<tr>
<td>075050_1,10</td>
</tr>
</tbody>
</table>

The content of LachFlowIndex.csv is:

<table>
<thead>
<tr>
<th>LACH Areas,Catchment Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>4120021,1</td>
</tr>
<tr>
<td>4120041,1</td>
</tr>
<tr>
<td>4120091,1</td>
</tr>
<tr>
<td>4120100,1</td>
</tr>
<tr>
<td>4120290,1</td>
</tr>
<tr>
<td>4120300,1</td>
</tr>
<tr>
<td>4120361,1</td>
</tr>
<tr>
<td>4120430,1</td>
</tr>
<tr>
<td>4120481,1</td>
</tr>
<tr>
<td>4120551,1</td>
</tr>
<tr>
<td>4120571,1</td>
</tr>
<tr>
<td>4120720,1</td>
</tr>
<tr>
<td>4120900,1</td>
</tr>
</tbody>
</table>
The content of LachRainIndex.csv is:

<table>
<thead>
<tr>
<th>Lach Rain, Catchment Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>050020, 1</td>
</tr>
<tr>
<td>063019, 1</td>
</tr>
<tr>
<td>063022, 1</td>
</tr>
<tr>
<td>063267, 1</td>
</tr>
<tr>
<td>065016, 1</td>
</tr>
<tr>
<td>073014, 1</td>
</tr>
<tr>
<td>073054, 1</td>
</tr>
<tr>
<td>075007, 1</td>
</tr>
<tr>
<td>075039, 1</td>
</tr>
<tr>
<td>075050, 1</td>
</tr>
</tbody>
</table>
APPENDIX C – REALM PRE-PROCESS CONTROL FILE

The first line of the control file defines the number of input models and files. It has three sections:

1. required input files
2. files being modified and
3. the pre-process operation definition.

The file is finished with 'END'.

In the required input file section, the first line contains three columns: the data directory path, model name and the number of files required for this model. Each required input file is defined by three columns: the file suffix, data type and comments starting with '/'.

In the file being modified section, the first line is the number of modified files. Each modified file has two columns: original file name and new file name. Where they are the same, the same name is also used.

In the pre-process operation definition section:

1. the first column is the carrier name in the modified files
2. the second column specifies which input file is used to generate the data for this carrier
3. the third column specifies how many time series are used in the input file to generate the data for the carrier
4. one or more than one columns are used to specify the name(s) of carrier/node/gauge/sites in the input file to generate data for the carrier
5. one or more than one columns are used to specify the scaling factor for each carrier/node/gauge/site in the input file
6. the last column specifies the data type: 1 – rainfall, 2 – evaporation and 3 – flow.

An example of this file is shown below. In this example, three models and nine input files are required.

3 9 / 3 models 9 files
"14_glb_broken\River_modelling\Modelling" "GBSM" 3
Rain_M.csv Climate / File 1
Evap_M.csv Climate / File 2
Flow_M.csv Flows / File 3
"15_campaspe\River_modelling\Modelling" "CAMP" 3
Rain_M.csv Climate / File 4
Evap_M.csv Climate / File 5
Flow_M.csv Flows / File 6
"16_loddon_avoca\River_modelling\Modelling" "LODD" 3
Rain_M.csv Climate / File 7
Evap_M.csv Climate / File 8
Flow_M.csv Flows / File 9
5 / Number of REALM files to modify
Brok09.sf Brok09.sf
Goul09.sf Goul09.sf
Camp09.sf Camp09.sf
Lodd09.sf Lodd09.sf
mrb-inf-09.sf mrb-inf-09.sf
"RAIN MOKOAN" 1 1 "Mokoan_A.rain" 1.0 1
"EVAP MOKOAN ADJ" 2 1 "Mokoan_A.evap" 1.0 2
"EVAP NILLALCOTTIE" 2 1 "Nillahcootie_A.evap" 1.0 2
"MOONEE CK INFLOW" 3 1 "4042082" 1.0 3
"HOLLANDS CK INFLOW" 3 1 "4042122" 1.0 3
"UPPER BROKEN UNG." 3 1 "4042161" 1.0 3
"IM CHANNELS INFLOW" 3 1 "4042163" 1.0 3
"FIVE MILE CK INFLOW" 3 1 "4042243" 1.0 3
"IM UNG. INFLOW" 3 1 "4042190" 1.0 3
"NILLAHCOOTIE INFLOW" 3 1 "4042181" 1.0 3
"BACK CK INFLOW" 3 1 "4042061" 1.0 3
"EILDON RAIN" 1 1 "Eildon_A.rain" 1.0 1
"WARANGA RAIN" 1 1 "Waranga_A.rain" 1.0 2
"EILDON EVAP" 2 1 "Eildon_A.evap" 1.0 2
"WARANGA EVAP" 2 1 "Waranga_A.evap" 1.0 2
"EILDON INFLOW" 3 1 "4052580" 1.0 3
"TRAMOOL INFLOW" 3 3 "4052015" "4052014" "4052013" 1.0 1.0 1.0 3
"G.W. INFLOW" 3 3 "4052595" "4052594" "4052593" 1.0 1.0 1.0 3
"PARA INFLOW" 3 1 "4052592" 1.0 3
"MID GOULB UG INF" 3 1 "4052042" 1.0 3
"L/GOULB UG INF" 3 1 "4052321" 1.0 3
"EPPALOCK RAIN" 4 1 "Eppalock_A.rain" 1.0 1
"MALMSBURY RAIN" 4 1 "Malsbury_A.rain" 1.0 1
"EPPALOCK EVAP" 5 1 "Eppalock_A.evap" 1.0 1
"MALMSBURY EVAP" 5 1 "Malsbury_A.evap" 1.0 2
"U/C-F/HILL INFLOW" 6 1 "4062001" 1.0 3
"CAMP RES INFLOW" 6 1 "4062134" 1.0 3
"FERNHILL INFLOW" 6 1 "4062003" 1.0 3
"PARA INFLOW" 6 1 "4062331" 1.0 3
"EPPALOCK2 INFLOW" 6 6 "4062492" "4062392" "4062352" "4062152" "4062132" 1.0 1.0 1.0 1.0 1.0 3
"CAMPASPE INFLOW" 6 7 "4062651" "4062612" "4062620" "4062142" "4062032" 1.0 1.0 1.0 1.0 1.0 3
"CAIRN C RAIN" 7 1 "Cairn Curran_A.rain" 1.0 1
"CAIRN C EVAP" 8 1 "Cairn Curran_A.evap" 1.0 2
"CAIRN C INFLOW" 9 1 "4072411" 1.0 3
"TULL INFLOW" 9 1 "4072440" 1.0 3
"TULL TO LAAN INF" 9 1 "4072132" 1.0 3
"CC TO LAAN INF" 9 1 "4072401" 1.0 3
"LAAN INF" 9 1 "4072112" 1.0 3
"UNGAU LAAN TO LOD" 9 1 "4072431" 1.0 3
"TALBOT RAIN" 7 1 "Talbot_A.rain" 1.0 1
"MARYBOROUGH EVAP" 8 1 "Maryborough_A.evap" 1.0 1
"STONY CK FLOW" 9 1 "4072133" 1.0 3
"CK TO TALBOT FLOW" 9 1 "4072134" 1.0 3
"CK TO EVAN FLOW" 9 1 "4072135" 1.0 3
END
APPENDIX D – BIGMOD CSV FILE FORMAT

(taken from Power and Seaton 2010a)

The BigMOD csv file consists of three sections:

1. comments – providing comments and a description of the header columns that follow
2. header – describing the sites for which time series data are present
3. data – time series data listed as a comma separated table, with values for different dates occurring on successive lines, and values for each site listed in its own column.

A portion of a sample BigMOD csv file generated by the IRSMF is shown below. This listing only includes the first 18 lines, truncating the header fields to not include the descriptions as they make the lines too long.

```
7.67.4 11/12/2009 15:22:53.88
PEEL.sqq
1/06/1895,30/06/2009
Field,Precision,Infill,Last month,Site,Measurand,Quality,Name,Description
EOC
6
1,4,0,0,7PIALMG,1,9,Flow at Piallamore Gauge ,,
2,4,0,0,7PARDWG,1,9,Flow at Paradise W Gauge,
3,4,0,0,7CARGPG,1,9,Flow at Carroll Gap Gauge,
4,4,0,0,7LOSR03,86,9,Loss from Chaffey Dam to Piallamore Gauge,
5,4,0,0,7LOSR04,86,9,Loss from Piallamore to Paradise Weir gauge,
6,4,0,0,7LOSR05,86,9,Loss from reach Paradise Weir to Carroll Gap Gauge,
Dy,Mn,Year,7PIALMG,7PARDWG,7CARGPG,7LOSR03,7LOSR04,7LOSR05
EOH
1,6,1895,0.125145792961121,0,7.93157243728638,1.49324928596616,0,0
2,6,1895,0.912952780723572,3.31032642861828E-05,18.2151641845703,2.34267681092024,4.9654900067253E-05,0
3,6,1895,2.27326226234436,0.00235522584989667,23.4766502380371,2.55709782242775,0.0035328390767565,0
4,6,1895,3.581524391743,0.0238809622824192,26.3991718292236,2.60512413084507,0.0358214415609837,0
5,6,1895,4.5070276260376,0.101537317037582,27.7190971374512,2.642677500844,0.15230597556374,0
```

The comment section of this example has four lines, finishing with the single line EOC (end of comment). The timestamp of the model run is on the first line, followed by the
name of the IQQM SQQ file. Then the reporting period is shown, followed by the column headings used to describe the fields in the header section that follows.

The header section starts with a number indicating the number of header columns – in this case six. These lines describe the locations for which time series data are reported. The locations are uniquely described by the combination of 'site', 'measurand' and 'quality'. The header then lists the field names to appear in the data section. When the first three fields are 'Dy', 'Mn' and 'Year' then the time series is recorded as daily measurements. When the first field is 'Date', then the measurements are monthly using the notation 'YYYY.MM', for example '2009.12' for December 2009. The header section concludes with the single line: EOH (end of header).

The data then follow sequentially from the first timestep to the last with values recorded as rows for each location in the sequence indicated in the header section. The values are separated by commas.
APPENDIX E – AN EXAMPLE OF IRSMF.XML

The following is an example of IRSMF.xml.

```xml
<?xml version="1.0"?>
<Configuration>
  <InputDataRoot>m:\yan062\WorkingCopy\ModelRoot</InputDataRoot>
  <ModelTemplateRoot>m:\yan062\WorkingCopy\ModelRoot</ModelTemplateRoot>
  <WorkingDirectoryRoot>m:\YAN062\Output</WorkingDirectoryRoot>
  <ToolsDirectory>m:\YAN062\WorkingCopy\Tools</ToolsDirectory>
  <MsmBigmodModelRoot>m:\YAN062\WorkingCopy\BigMod</MsmBigmodModelRoot>
  <GroundwaterModelRoot />
</Configuration>
```
APPENDIX F – AN EXAMPLE OF PROJECT.XML

The following is an example of project.xml.

```xml
<?xml version="1.0"?>
<ProjectConfiguration>
  <Scenario>
    <Name>B0H000</Name>
    <Description>Baseline, Historical</Description>
  </Scenario>
  <Scenario>
    <Name>B0D000</Name>
    <Description>Baseline future dry</Description>
  </Scenario>
  <Scenario>
    <Name>NNH000</Name>
    <Description>Natural, Historical</Description>
  </Scenario>
  <Scenario>
    <Name>NNW000</Name>
    <Description>Natural, future wet</Description>
  </Scenario>
  <Scenario>
    <Name>P0H000</Name>
    <Description>Basin Plan, Historical</Description>
  </Scenario>
  <Scenario>
    <Name>P0M000</Name>
    <Description>Basin Plan, Future Medium</Description>
  </Scenario>
  <ModelTweaking>
    <ModelType>IQQM</ModelType>
    <Tag>$G</Tag>
    <Description>General security licence volume</Description>
  </ModelTweaking>
  <ModelTweaking>
    <ModelType>IQQM</ModelType>
    <Tag>$H</Tag>
    <Description>High security licence volume</Description>
  </ModelTweaking>
  <ModelTweaking>
    <ModelType>IQQM</ModelType>
    <Tag>$E</Tag>
    <Description>Environment licence volume</Description>
  </ModelTweaking>
  <ModelTweaking>
    <ModelType>IQQM</ModelType>
    <Tag>$A</Tag>
    <Description>Maximum irrigable area</Description>
  </ModelTweaking>
  <ModelTweaking>
    <ModelType>IQQM</ModelType>
    <Tag>$S</Tag>
    <Description>Maximum summer crop area</Description>
  </ModelTweaking>
  <ModelTweaking>
    <ModelType>IQQM</ModelType>
    <Tag>$W</Tag>
    <Description>Winter crop area</Description>
  </ModelTweaking>
  <ModelTweaking>
    <ModelType>IQQM</ModelType>
    <Tag>$D</Tag>
    <Description>Demand</Description>
  </ModelTweaking>
  <ModelTweaking>
    <ModelType>IQQM</ModelType>
    <Tag>$V</Tag>
    <Description>Initial Volume</Description>
  </ModelTweaking>
  <ModelTweaking>
    <ModelType>IQQM</ModelType>
    <Tag>$P</Tag>
    <Description>Max pumping rate</Description>
  </ModelTweaking>
</ProjectConfiguration>
```
APPENDIX G – AN EXAMPLE OF LOG FILE

The following is an example of log file.

2010-05-03 15:39:21,890 INFO IRSMF.ScenBuilderForm [1631] - Start to run the whole river system at 2010-05-03 03:39:21

2010-05-03 15:39:22,026 INFO IRSMF.ScenBuilderForm [1650] - Start to run model PEEL......

2010-05-03 15:39:22,056 INFO PreProcess.AbstractProcess [71] - Template directory:\wron\Working\MDBA\yan062\WorkingCopy\ModelRoot\07_namoi\River_modelling\PEEL\PEEL_ModelTemplate
Tools directory:\wron\Working\MDBA\YAN062\WorkingCopy\Tools\_IQQMPreProcess\Working directory
\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000


2010-05-03 15:39:22,079 INFO PreProcess.AbstractProcess [79] - Copy \wron\Working\MDBA\yan062\WorkingCopy\ModelRoot\07_namoi\River_modelling\PEEL\PEEL_ModelTemplate to working directory
\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000

2010-05-03 15:39:32,208 INFO PreProcess.AbstractProcess [214] - Copy Preprocess tools \wron\Working\MDBA\YAN062\WorkingCopy\Tools\_IQQMPreProcess\ to working directory
\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000.

to:\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000\_IQQMPreProcess

2010-05-03 15:39:33,003 INFO PreProcess.AbstractProcess [230] - Copy Postprocess tools \wron\Working\MDBA\YAN062\WorkingCopy\Tools\_IQQMPostProcess\ to working directory
\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000.

2010-05-03 15:39:34,989 INFO PreProcess.AbstractProcess [244] - Preprocess tools directory is switched
to:\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000\_IQQMPostProcess


2010-05-03 15:39:35,103 INFO PreProcess.AbstractProcess [553] - Run CSVIDX.exe \wron\Working\MDBA\yan062\WorkingCopy\ModelRoot\07_namoi\River_modelling\Modelling\PRIME_Flows\_B_PRIME_Flows\PEEL_BOH000_FLOW.csv
\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000\PEEL_F.IDX
\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000\PEELFLOWIndex.CSV
\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000\PEEL_F.IDX

2010-05-03 15:39:37,203 INFO PreProcess.AbstractProcess [553] - Run CSVIDX.exe \wron\Working\MDBA\yan062\WorkingCopy\ModelRoot\07_namoi\River_modelling\Modelling\PRIME_Climate\_B_PRIME_Climate\PEEL_BOH000_RAIN.csv
\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000\PEEL_R.IDX
\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000\PEELRAINIndex.CSV
\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000\PEEL_R.IDX

2010-05-03 15:39:39,056 INFO PreProcess.AbstractProcess [553] - Run CSVIDX.exe \wron\Working\MDBA\yan062\WorkingCopy\ModelRoot\07_namoi\River_modelling\Modelling\PRIME_Climate\_B_PRIME_Climate\PEEL_BOH000_EVAP.csv
\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000\PEEL_E.IDX
\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000\PEELEVAPIndex.CSV


2010-05-03 15:39:39,067 INFO IRSMF.ScenBuilderForm [1685] - Call pre-process for PEEL


2010-05-03 15:39:22,079 INFO PreProcess.AbstractProcess [79] - Copy \wron\Working\MDBA\yan062\WorkingCopy\ModelRoot\07_namoi\River_modelling\PEEL\PEEL_ModelTemplate to working directory
\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000

2010-05-03 15:39:32,208 INFO PreProcess.AbstractProcess [214] - Copy Preprocess tools \wron\Working\MDBA\YAN062\WorkingCopy\Tools\_IQQMPreProcess\ to working directory
\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000.

to:\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000\_IQQMPreProcess

2010-05-03 15:39:33,003 INFO PreProcess.AbstractProcess [230] - Copy Postprocess tools \wron\Working\MDBA\YAN062\WorkingCopy\Tools\_IQQMPostProcess\ to working directory
\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000.

2010-05-03 15:39:34,989 INFO PreProcess.AbstractProcess [244] - Preprocess tools directory is switched
to:\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000\_IQQMPostProcess


  Total average of new files being inserted (excluding duplicates): 1121.81
  Volume ratio: 100.0%
Total average of old files being replaced (excluding duplicates): 13.5450
  Total average of new files being inserted (excluding duplicates): 13.5450
  Volume ratio: 100.0%
Total average of old files being replaced (excluding duplicates): 390.565
  Total average of new files being inserted (excluding duplicates): 390.565
  Volume ratio: 100.0%
Total average of old files being replaced (excluding duplicates): 239.983
  Total average of new files being inserted (excluding duplicates): 239.983
  Volume ratio: 100.0%
2010-05-03 15:39:41,942 INFO RiverSystemIntegratedModel.AbstractCatchment [21] - The executable file is: \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\Modelling\PRIME\Climate\B_PRIME_Climate\PEEL_BOH000\TMAX.csv
2010-05-03 15:39:41,946 INFO RiverSystemIntegratedModel.AbstractCatchment [22] - The system file is: \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL_BOH000\PEEL.sqq
2010-05-03 15:39:41,949 INFO IRSMF.ScenBuilderForm [1696] - Check if there is a link ready to process for PEEL
2010-05-03 15:39:41,953 INFO IRSMF.ScenBuilderForm [1745] - Set simulation period....
2010-05-03 15:39:42,094 INFO IRSMF.ScenBuilderForm [1748] - Call the model run process for PEEL
2010-05-03 15:39:42,236 INFO RiverSystemIntegratedModel.AbstractCatchment [55] - Run command for PEEL as: \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000\iqmgui.exe 01/06/1895 30/06/2009
2010-05-03 15:41:52,356 INFO IRSMF.ScenBuilderForm [1802] - The run for PEEL has been finished
2010-05-03 15:41:52,382 INFO IRSMF.ScenBuilderForm [1808] - Call the post-process for PEEL
2010-05-03 15:41:52,393 INFO PreProcess.AbstractProcess [657] - Start to rename output files...
2010-05-03 15:41:52,410 INFO PreProcess.AbstractProcess [688] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000\PEEL.IQN has been renamed to PEEL_BOH000.IQN
2010-05-03 15:41:52,426 INFO PreProcess.AbstractProcess [688] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000\PEEL00.out has been renamed to PEEL_BOH00000.out
2010-05-03 15:41:52,440 INFO PreProcess.AbstractProcess [688] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH000\PEEL01.aal has been renamed to PEEL_BOH00001.aal

69
2010-05-03 15:41:54,216 INFO PreProcess.AbstractProcess [409] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH00\run.log deleted [Postprocess]

2010-05-03 15:41:54,222 INFO PreProcess.AbstractProcess [409] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH00\yan062.junk deleted [Postprocess]

2010-05-03 15:41:54,416 INFO PreProcess.AbstractProcess [259] - Start to run LG ListQuan...


2010-05-03 15:41:54,511 INFO IRSMFUtility.ConvertOutput [59] - Output file: \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\PEEL\PEEL_BOH00\PEEL.bigmod.csv

2010-05-03 15:41:54,616 INFO IRSMFUtility.ConvertOutput [85] - Retrieve all required data type by type ....

2010-05-03 15:41:54,621 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 1.0

2010-05-03 15:41:56,051 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 1.1


2010-05-03 15:41:59,753 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 3.4

2010-05-03 15:42:00,032 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 8.0


2010-05-03 15:42:05,601 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 0.0


2010-05-03 15:42:06,143 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 1.2


2010-05-03 15:42:06,615 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 4.1

2010-05-03 15:42:06,676 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 0.3

2010-05-03 15:42:07,073 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 2.1

2010-05-03 15:42:08,717 INFO IRSMFUtility.ConvertOutput [186] - All required data has been successfully extracted.


2010-05-03 15:42:08,750 INFO IRSMFUtility.ConvertOutput [99] - process line: 60.01


2010-05-03 15:42:08,768 INFO IRSMFUtility.ConvertOutput [99] - process line: 100.01

2010-05-03 15:42:08,776 INFO IRSMFUtility.ConvertOutput [99] - process line: 112.02
2010-05-03 15:42:09,975 INFO IRSMFUtility.ConvertOutput [99] - process line: 61.01
2010-05-03 15:42:09,992 INFO IRSMFUtility.ConvertOutput [99] - process line: 61.02
2010-05-03 15:42:10,151 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.03
2010-05-03 15:42:10,173 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.01
2010-05-03 15:42:10,185 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.02
2010-05-03 15:42:10,339 INFO IRSMFUtility.ConvertOutput [99] - process line: 61.01+62.01+106.01+70.01+74.01
2010-05-03 15:42:10,376 INFO IRSMFUtility.ConvertOutput [99] - process line: 14.01+16.01+109.01+51.01+3.01
2010-05-03 15:42:10,406 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.01
2010-05-03 15:42:10,414 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.02
2010-05-03 15:42:10,568 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.01
2010-05-03 15:42:10,609 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.01
2010-05-03 15:42:10,637 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.02
2010-05-03 15:42:10,671 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.02
2010-05-03 15:42:10,679 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.01
2010-05-03 15:42:10,739 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.02
2010-05-03 15:42:10,781 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.02
2010-05-03 15:42:10,800 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.02
2010-05-03 15:42:10,809 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.02
2010-05-03 15:42:10,818 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.02
2010-05-03 15:42:11,003 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.02
2010-05-03 15:42:11,123 INFO IRSMFUtility.ConvertOutput [99] - process line: 106.02
2010-05-03 15:42:19,541 INFO IRSMFUtility.ConvertOutput [168] - Conversion takes 0.417750466667 minutes
2010-05-03 15:42:19,547 INFO PreProcess.AbstractProcess [345] - Start to run BigArcW tool...
The Post-Process for PEEL finished.

The model run of PEEL takes around 3.08989229166667 minutes.

Start to run model NAMO......

Initialisation of the pre-process for NAMO has been done.

Call pre-process for NAMO

Preprocess starts

Copy \wron\Working\MDBA\yan062\WorkingCopy\ModelRoot\07_namoi\River_modelling\NAMO\_NAMO_ModelTemplate to working directory

Copy \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_BOH000.

Preprocess tools directory is switched to:\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_BOH000\_IQQMPreProcess

Preprocess tools directory is switched to:\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_BOH000\_IQQMPostProcess

Write metadata to file: who and when to run the model and the template directory.

Process catchment yield

Run CSVIDX.exe

Result from CSVIDX.exe:Total average of old files being replaced (excluding duplicates): 4085.05
Total average of new files being inserted (excluding duplicates): 4085.05
Volume ratio: 100.0%
Total average of old files being replaced (excluding duplicates): 19.4446
Volume ratio: 100.0%
Total average of new files being inserted (excluding duplicates): 19.4446
Volume ratio: 100.0%
Total average of old files being replaced (excluding duplicates): 892.700
Volume ratio: 100.0%


\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\ NAMO_B0H000\iqmgui.exe

\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\ NAMO_B0H000\NAMO.sqq

2010-05-03 15:42:54,526 INFO IRSMF.ScenBuilderForm [1696] - Check if there is a link ready to process for NAMO

2010-05-03 15:42:54,534 INFO IRSMF.ScenBuilderForm [1708] - Call the process link function for the link(s) from PEEL to NAMO.

2010-05-03 15:42:54,691 INFO RiverSystemIntegratedModel.ModelLink [33] - Start to process link from 78 (IQQM) to 4190060.a01 (IQQM).

2010-05-03 15:42:56,959 INFO RiverSystemIntegratedModel.ModelLink [79] - The link from 78 to 4190060.a01 has been successfully processed.

2010-05-03 15:42:56,963 INFO IRSMF.ScenBuilderForm [1745] - Set simulation period....

2010-05-03 15:42:56,967 INFO IRSMF.ScenBuilderForm [1748] - Call the model run process for NAMO

as:"\\\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\ NAMO_B0H000\iqmgui.exe" NAMO.sqq 01/06/1895 30/06/2009

2010-05-03 15:50:07,586 INFO IRSMF.ScenBuilderForm [1802] - The run for NAMO has been finished

2010-05-03 15:50:07,608 INFO IRSMF.ScenBuilderForm [1808] - Call the post-process for NAMO


2010-05-03 15:50:07,620 INFO PreProcess.AbstractProcess [657] - Start to rename output files...

\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\ NAMO_B0H000\NAMO.IQN has been renamed to NAMO_B0H000.IQN

\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\ NAMO_B0H000\NAMO00.out has been renamed to NAMO_B0H00000.out

\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\ NAMO_B0H000\NAMO01.aal has been renamed to NAMO_B0H00001.aal

\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\ NAMO_B0H000\NAMO01.out has been renamed to NAMO_B0H00001.out

\wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\ NAMO_B0H000\NAMO02.out has been renamed to NAMO_B0H00002.out
2010-05-03 15:50:10,005 INFO PreProcess.AbstractProcess [688] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO03.out has been renamed to NAMO_B0H00003.out

2010-05-03 15:50:10,021 INFO PreProcess.AbstractProcess [688] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO04.out has been renamed to NAMO_B0H00004.out

2010-05-03 15:50:10,038 INFO PreProcess.AbstractProcess [688] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO05.out has been renamed to NAMO_B0H00005.out

2010-05-03 15:50:10,054 INFO PreProcess.AbstractProcess [688] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO06.out has been renamed to NAMO_B0H00006.out

2010-05-03 15:50:10,069 INFO PreProcess.AbstractProcess [688] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO07.out has been renamed to NAMO_B0H00007.out

2010-05-03 15:50:10,084 INFO PreProcess.AbstractProcess [688] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO08.out has been renamed to NAMO_B0H00008.out

2010-05-03 15:50:10,220 INFO PreProcess.AbstractProcess [688] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO09.out has been renamed to NAMO_B0H00009.out

2010-05-03 15:50:10,232 INFO PreProcess.AbstractProcess [688] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO10.out has been renamed to NAMO_B0H00010.out

2010-05-03 15:50:10,244 INFO PreProcess.AbstractProcess [688] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO11.out has been renamed to NAMO_B0H00011.out

2010-05-03 15:50:10,256 INFO PreProcess.AbstractProcess [688] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO12.out has been renamed to NAMO_B0H00012.out

2010-05-03 15:50:10,419 INFO PreProcess.AbstractProcess [388] - Start to delete intermediate files generated from model run...

2010-05-03 15:50:10,439 INFO PreProcess.AbstractProcess [409] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\error.log deleted [Postprocess]

2010-05-03 15:50:10,439 INFO PreProcess.AbstractProcess [409] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\iqqmm1.txt deleted [Postprocess]

2010-05-03 15:50:10,444 INFO PreProcess.AbstractProcess [409] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO.dat deleted [Postprocess]

2010-05-03 15:50:10,449 INFO PreProcess.AbstractProcess [409] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO.off deleted [Postprocess]

2010-05-03 15:50:10,613 INFO PreProcess.AbstractProcess [409] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO.pdt deleted [Postprocess]

2010-05-03 15:50:10,620 INFO PreProcess.AbstractProcess [409] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO.rat deleted [Postprocess]

2010-05-03 15:50:10,626 INFO PreProcess.AbstractProcess [409] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO.ukc deleted [Postprocess]

2010-05-03 15:50:10,632 INFO PreProcess.AbstractProcess [409] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO1.IQL deleted [Postprocess]

2010-05-03 15:50:10,818 INFO PreProcess.AbstractProcess [409] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\NAMO100.out deleted [Postprocess]
2010-05-03 15:50:11,888 INFO PreProcess.AbstractProcess [409] - \wron\Working\MDBA\YAN062\Output\07_namoi\River_modelling\NAMO\_NAMO_B0H000\yan062.junk deleted [Postprocess]

2010-05-03 15:50:11,891 INFO PreProcess.AbstractProcess [257] - Start to run LG ListQuan...


2010-05-03 15:50:12,073 INFO PreProcess.AbstractProcess [271] - Start to convert IQQM to Bigmod format...

2010-05-03 15:50:12,089 INFO PreProcess.AbstractProcess [271] - Start to convert IQQM to Bigmod format...

2010-05-03 15:50:12,621 INFO IRSMFUtility.ConvertOutput [85] - Retrieve all required data type by type ....

2010-05-03 15:50:12,625 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 1.0

2010-05-03 15:50:19,588 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 5.0

2010-05-03 15:50:19,645 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 5.1

2010-05-03 15:50:19,700 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 11.0

2010-05-03 15:50:19,830 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 0.0

2010-05-03 15:50:25,854 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 0.3

2010-05-03 15:50:29,399 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 4.0


2010-05-03 15:50:56,08,423 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 8.3

2010-05-03 15:56:12,630 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 3.0

2010-05-03 15:56:59,591 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 2.1

2010-05-03 15:57:00,305 INFO IRSMFUtility.ConvertOutput [178] - extract data for the type of 2.0

2010-05-03 15:57:01,547 INFO IRSMFUtility.ConvertOutput [186] - All required data has been successfully extracted.

2010-05-03 15:57:01,552 INFO IRSMFUtility.ConvertOutput [99] - process line: 11.01

2010-05-03 15:57:01,560 INFO IRSMFUtility.ConvertOutput [99] - process line: 12.01


2010-05-03 15:57:01,580 INFO IRSMFUtility.ConvertOutput [99] - process line: 56.01

2010-05-03 15:57:01,589 INFO IRSMFUtility.ConvertOutput [99] - process line: 72.01

2010-05-03 15:57:01,597 INFO IRSMFUtility.ConvertOutput [99] - process line: 125.01

2010-05-03 15:57:01,607 INFO IRSMFUtility.ConvertOutput [99] - process line: 5.01

2010-05-03 15:57:01,617 INFO IRSMFUtility.ConvertOutput [99] - process line: 15.01

2010-05-03 15:57:01,768 INFO IRSMFUtility.ConvertOutput [99] - process line: 19.01
APPENDIX H – AN EXAMPLE OF IQQM MODEL TEMPLATE DIRECTORY

calculations.log
IOFILE.CSV
IQQM_CFG
IQQM.CHR
IQQM.ERR
IQQM.MNU
IQQM.SMB
iqqmnt.exe
MCONIE.CRP
PARO.Conversion.CSV
Paro.stats.param
ParoEvapIndex.csv
ParoFlowIndex.csv
ParoRainIndex.csv
PARO_E.idx
PARO_E.out
PARO_F.idx
PARO_F.out
PARO_ModelTemplate.run
PARO_ModelTemplate.sqq
PARO_ModelTemplate_DL.run
PARO_R.idx
PARO_R.out
sim.pat
APPENDIX I – AN EXAMPLE OF REALM MODEL TEMPLATE

DIRECTORY

_WIMM_ModelTemplate:
   |   ans_file.dat
   |   Baseline.log
   |   realm.exe
   |   REALM.SET
   |   realm_so.exe
   |   WIMM.conversion.csv
   |   WIMM.scn
   |   WIMM.stats.param
   |   WIMM.sys
   |   WIMM.txt
   |   WIMM_comments.txt
   
   +---Demands_B0D000
   |   |   Ham&Cavendish_Historical_SKMRev.dm
   |   |   WIMMdemd2_02.dm
   |   |   WIMMdemd_1891_09_BE.prn
   |   |
   +---Demands_B0H000
   |   |   Ham&Cavendish_Historical_SKMRev.dm
   |   |   WIMMdemd2_02.dm
   |   |   WIMMdemd_1891_09_BE.prn
   |   |
   +---Demands_B0M000
   |   |   Ham&Cavendish_Historical_SKMRev.dm
   |   |   WIMMdemd2_02.dm
   |   |   WIMMdemd_1891_09_BE.prn
   |   |
   +---Demands_B0W000
   |   |   Ham&Cavendish_Historical_SKMRev.dm
   |   |   WIMMdemd2_02.dm
   |   |   WIMMdemd_1891_09_BE.prn
   |   |
   \---Inputs
      |   CLIM_103_09temp.prn
      |   ENVDEM_02.sf
      |   GLEN_01_09temp.sf
      |   Historic Waranga supply and system diversions_1891_09.prn
      |   INFN_108_09temp.prn
      |   PRIDEclimate_1891_09.prn
      |   PRIDEcropfactor_1891_09.prn
      |   WIMMenv_1891_09.prn
      |   WIMMevap_1891_09.prn
      |   WIMMflow_1891_09.prn
      |   WIMMtrain_1891_09.prn
      |   WIMM_chflows_1891_09.prn
      |   WIMM_hdwkfl1_1891_09.prn
      |   WIMM_hdwkfl2_1891_09.prn
APPENDIX J – AN EXAMPLE OF ST GEORGE MODEL TEMPLATE DIRECTORY

911A#160.D1d
ev911A01.OUT
per.out
psuee909.dmd
sg912AL.in
sg912AL.in.bp
sg912AL.in.template
SGCS22nt.exe
sgdm9509.txt
SGEU9509.txt
STGE.stats.Param
STGE.trajectory.stats.Param
STGEInit.csv
StGeorgePre.control
storage.config
temp.response
zero.qgm
APPENDIX K – AN EXAMPLE OF SNOWY MODEL TEMPLATE DIRECTORY

bjuk
blow
blow_evap
eucm
eucm_evap
flowMapping.csv
gehi
goob
irreq
jxsp
khan
MkInputBinFile.bat
RunSnowyModel.bat
ShlMonthlyOpsModel_Instructions1.doc
sim_inp
sim_out_inp.csv
sim_out_syp.csv
SIM_V9.exe
SNOW_ModelTemplate.pat
tant
toom
took
tpnd
xta_evap
xta_evapmapping.csv
xta_flow
xta_flowmapping.csv
APPENDIX L – FILE FORMAT OF CLIMATE SCALING FACTOR

The climate scaling factor file is a comma delimited csv file where the first line is a header. The column is in the following order:

1. Region_ID: region id
2. Region_Name: region name
3. Station_Name: station name
4. Lat: latitude of the station
5. Long: longitude of the station
6. ch10_djf: the dry scaling factor for December, January and February
7. ch10_mam: the dry scaling factor for March, April and May
8. ch10_jja: the dry scaling factor for June, July and August
9. ch10_son: the dry scaling factor for September, October and November
10. cm50_djf: the medium scaling factor for December, January and February
11. cm50_mam: the medium scaling factor for March, April and May
12. cm50_jja: the medium scaling factor for June, July and August
13. cm50_son: the medium scaling factor for September, October and November
14. ch90_djf: the wet scaling factor for December, January and February
15. ch90_mam: the wet scaling factor for March, April and May
16. ch90_jja: the wet scaling factor for June, July and August
17. ch90_son: the wet scaling factor for September, October and November
APPENDIX M – FILE FORMAT OF FLOW SCALING FACTOR

The flow scaling factor file is a comma delimited csv file where the first line is a header. The column is in the following order:

1. Region_ID: region id
2. Region_Name: region name
3. SubCat_ID: subcatchment id
4. ch10_djf: the dry scaling factor for December, January and February
5. ch10_mam: the dry scaling factor for March, April and May
6. ch10_jja: the dry scaling factor for June, July and August
7. ch10_son: the dry scaling factor for September, October and November
8. ch10_ann: the annual dry scaling factor
9. cm50_djf: the medium scaling factor for December, January and February
10. cm50_mam: the medium scaling factor for March, April and May
11. cm50_jja: the medium scaling factor for June, July and August
12. cm50_son: the medium scaling factor for September, October and November
13. cm50_ann: the annual medium scaling factor
14. ch90_djf: the wet scaling factor for December, January and February
15. ch90_mam: the wet scaling factor for March, April and May
16. ch90_jja: the wet scaling factor for June, July and August
17. ch90_son: the wet scaling factor for September, October and November
18. ch90_ann: the annual wet scaling factor
APPENDIX N – CONFIGURATION FILE FOR DISAGGREGATING INFLOW OF BARWON DARLING

There are three sections: input, calculation and header starting with #Input, #Calculation and #Header.

The section #Input has only two lines. The second line consists of all site names separated with comma.

For each line in the section #Calculation, + or - cannot be mixed with * or /.

The header fields are separated with comma.

There should not be any empty line within each section. The following is an example of the content of configuration file:

#Input
9INFPWA, 9INFPBO, 9INEXME, 9INBRIV, 9INWEIR, 9INGWME, 9INNAPI, 9INMOON, 9INMACA, 9INWARR, 9INLBON, 9INNARA, 9UNMACQ, 9UNLBON, 9UNGWYD, 9GTINWA, 9TOTGTI

#Calculation
9FPBRI1=9INFPWA*9INBRIV/9GTINWA
9FPGWY1=9INFPWA*9INGWME/9GTINWA
9FPNAM1=9INFPWA*9INNAPI/9GTINWA
9FPMOO1=9INFPWA*9INMOON/9GTINWA
Temp1=9UNMACQ+9UNLBON
9FPMAC1=9INFPBO*9UNMACQ/Temp1
9FPLBO1=9INFPBO*9UNLBON/Temp1
9FPBRI2=9INEXME*9INBRIV/9TOTGTI
9FPGWY2=9INEXME*9INGWME/9TOTGTI
9FPNAM2=9INEXME*9INNAPI/9TOTGTI
9FPMOO2=9INEXME*9INMOON/9TOTGTI
9FPMAC2=9INEXME*9INMACA/9TOTGTI
9FPLBO2=9INEXME*9INLBON/9TOTGTI
9FPWARR=9INEXME*9INWARR/9TOTGTI
9FPBRIV=9FPBRI1+9FPBRI2
9FPGWYD=9FPGWY1+9FPGWY2
9FPNAMO=9FPNAM1+9FPNAM2
9FPMOON=9FPMOO1+9FPMOO2
9FPMACQ=9FPMAC1+9FPMAC2
9FPLBON=9FPLBO1+9FPLBO2
9TINWAR=9INWARR+9FPWARR
9TINBRI=9INBRIV+9INWEIR+9FPBRIV
9TINGWY=9INGWME+9UNGWYD+9FPGWYD
9TINNAM=9INNAPI+9FPNAMO
9TINMOO=9INMOON+9FPMOON
9TINMAC=9INMACA+9UNMACQ+9FPMACQ
9TINLBO=9INLBON+9INNARA+9UNLBON+9FPLBON

#Header
4, 0, 6, 9FPWARR, 1, 9, Ungauged inflow, Ungauged floodplain inflow from Warrego,
9INEXME*9INWARR/9TOTGTI
4, 0, 6, 9FPBRIV, 1, 9, Ungauged inflow, Ungauged floodplain inflow from Border
Rivers, 9INFPWA*9INBRIV/9GTINWA+9INEXME*9INBRIV/9TOTGTI
4, 0, 6, 9FPGWYD, 1, 9, Ungauged inflow, Ungauged floodplain inflow from Gwydir
system, 9INFPWA*9INGWME /9GTINWA+9INEXME*9INGWME/9TOTGTI
4, 0, 6, 9FPNAMO, 1, 9, Ungauged inflow, Ungauged floodplain inflow from Namoi
system, 9INFPWA*9INNAPI /9GTINWA+9INEXME*9INNAPI/9TOTGTI
4, 0, 6, 9FPMOON, 1, 9, Ungauged inflow, Ungauged floodplain inflow from Moonie,
9INFPWA*9INMOON /9GTINWA+9INEXME*9INMOON/9TOTGTI
4, 0, 6, 9FPMACQ, 1, 9, Ungauged inflow, Ungauged floodplain inflow from Macquarie
Castlereagh system, 9INFPBO*9UNMACQ/(9UNMACQ+9UNLBON)+
9INEXME*9INMACA/9TOTGTI
4, 0, 6, 9FPLBON, 1, 9, Ungauged inflow, Ungauged floodplain inflow from Condamine
Balonne system, 9INFPBO*9UNLBON/(9UNMACQ+9UNLBON)+
9INEXME*9INLBO/9TOTGTI
4, 0, 6, 9TINWAR, 1, 9, Catchment inflow, Tributary and floodplain inflow from
Warrego, Gauged tributary inflow +ungauged floodplain inflow
4, 0, 6, 9TINBRI, 1, 9, Catchment inflow, Tributary and floodplain inflow from Border
Rivers, Gauged & ungauged tributary inflow + ungauged inflow +ungauged floodplain
inflow
4, 0, 6, 9TINGWY, 1, 9, Catchment inflow, Tributary and floodplain inflow from Gwydir
system, Gauged tributary inflow + ungauged inflow +ungauged floodplain inflow
4, 0, 6, 9TINNAM, 1, 9, Catchment inflow, Tributary and floodplain inflow from Namoi
system, Gauged tributary inflow +ungauged floodplain inflow
4, 0, 6, 9TINMOO, 1, 9, Catchment inflow, Tributary and floodplain inflow from Moonie,
Gauged tributary inflow +ungauged floodplain inflow
4, 0, 6, 9TINMAC, 1, 9, Catchment inflow, Tributary and floodplain inflow from
Macquarie Castlereagh system, Gauged tributary inflow + ungauged inflow +ungauged
floodplain inflow
4, 0, 6, 9TINLBO, 1, 9, Catchment inflow, Tributary and floodplain inflow from
Condamine Balonne system, Gauged & ungauged tributary inflow + ungauged inflow
+ungauged floodplain inflow