WBNM2019 AUG 2019

RELEASE NOTES FOR EXPERIENCED WBNM USERS

Introduction

These readme notes are intended as a summary description of the functionality and use of WBNM2019 and in particular, its differences with WBNM2017 It assumes readers are reasonably familiar with the operation of WBNM2017. This document is not a replacement for the WBNM User or Reference Manuals. If you are moving up from wbnm2012 to wbnm2019 then you should also read the WBNM2017 Release and Version Control docs.

In summary WBNM2019 is an upgraded extension of WBNM2017, recoded to primarily accommodate recent changes in BOM IFD data and download formats for that data as well as some changes in the recently updated ARR HUB data. These particular changes require some minor changes to the runfile when specifying the IFD sources. A new loss model has also been added, based on the Soil Conservation Service Curve Number approach, permitting different loss characteristics in different subareas based on soil type and cover. A number of more general changes were also made to provide more flexibility in what data is output to the metafile and to improve computation speed. These are discussed further in the following.

Differences from WBNM2017

1. More Flexible INI File format;

- Spaces are now allowed in the INI file as required to improve readability.
- Comments on an INI parameter can now be added on each line provided they are preceded by an exclamation mark '!'.

2. New INI File Parameters ;

- ***Org_web;*** added for those users that wish to record their web address in runfiles.
- ***Sum_gauge_hyetos;*** to optionally trigger the outrput of hyetographs to the meta file.
- ***Sum_local_struct_hydros;*** to optionally trigger the output of local structure hydrographs to the meta file.
- ***Sum_outlet_struct_hydros;*** to optionally trigger the output of outlet structure hydrographs to the meta file.
- ***Sum_subareal_hydros;*** to trigger the output of subareal hydrographs to the meta file.
- ***ARRminDura;*** (default of 10 minutes) to allow users to restrict computation and file output to a range of durations known to be appropriate to the needs of the

model without processing the full spectrum of durations. This is only relevant to ARR 2016/19 design spectrum storms (otherwise ignored).

- ***ARRmaxDura;*** (default 10080 minutes) As above to optionally provide an upper limit to the duration spectrum processed.

  Given the wide range of durations available, sensible choice of these min/max limits can significantly speed execution and reduce the size of output files, particularly for larger models.

3. Modification To Status Block (Optional)

While WBNM2017 will process a runfile with an older version number in the status block it will provide a warning in the QA file to the effect that WBNM2019 is not reading a version 2019 runfile. Best to update the runfile version to 2019_000 if an older runfile to avoid such messages.

4. Modifications to Storm Block

New Design Rainfall Header Line (Optional)

At some point in time DES87 and EMB87 design storms to ARR 1987 will be depreciated. Only the current version of ARR,s design storms will be supported. To this end ;

#####START_DESIGN_RAIN_ARR is now the recommended header line for the ARR 2016/19 design rainfall block, although
#####START_DESIGN_RAIN_ARR2016 is still supported

New Design Rainfall IFD Input Format

As you will know if you have recently tried to download BOM IFD data for a gauge site, IFD data has been added for the rarer events (not present in 21016/17) the website has been overhauled and the download formats altered.

The IFD procedure in wbnm2017 no longer works with these new data extents and formats. These IFD format changes have resulted in significant changes to how IFD data is read into WBNM2019.

The new wbnm2019 format for the runfile DESIGN_RAIN header is now as described in the following example.

```
#####START_DESIGN_RAIN_ARR          (Optional change)
      1.0       -1       -1      -1.0     (No change)
IFD_DATA_IN_GAUGE_FILES                    (Mandatory change)
       3                                   ( No change)
SorellCkBot                                ( No change but must now be csv
SorellCkMid                                ( files with the downloaded  BOM
```

SorellCkTop (IFD for each in the runfile directory)
PAT_DATA_IN_REGION_FILE (No change)
Southern_Slopes_Tasmania_Increments.csv
CAT_DATA_IN_CATCHMENT_FILE
SorellCk_Catchment.txt
#####END_DESIGN_RAIN_ARR (Optional change)

Format changes are indicated in red. It is important that the correct format be chosen for IFD download from the BOM website. WBNM2019 requires the 'download all design rainfalls csv' be selected as follows.

BOM screen1

- Select Single Point
- Input your gauge cords
- Name your gauge (same as in wbnm runfile)

BOM Screen2

- Select Frequent & Infrequent rainfall IFD
- Download all design rainfall.csv – grey icon top right of screen)

When downloaded you will need to rename to delete the depths_ prefix and _all_design suffix from the file name to make it the same as in your runfile.

Note that the runfile just contains the gauge name – no .csv – WBNM2019 appends the csv when opening the file to read the IFD data.

New Losses Header Line (Optional)

Similar to the reasons for the new Design Rainfall header line, the following new ARRLOSSES header line is recommended for ARR 2016/19 loss rates based losses. Eg.

#####START_LOSS_RATES

ARRLOSSES (although ARR16LOSSES is still supported)

#####END_LOSS_RATES

New Losses Model (Optional)

Losses in ARR 2016/19 are heavily focussed on the IL-CL loss model. While simple to calibrate and use in design flood simulation for a gauged catchment, this model is derived from calibration of historic flows at a relatively small number of gauged catchment's outlets, and contains no physical parameters that might offer confidence in the application of these derived losses in an ungauged nearby catchment, or at points internal to the gauged catchment. With the mapping of hydrologic soil types (A-E) completed in at least NSW and Tasmania, an opportunity arises to use these datasets with aerial photography to reflect the spatial variation in losses within a catchment, arising from different soil types and cover within a catchment, and to reflect differences in losses between catchments. To utilise this data, WBNM2019

has optionally added support for the SCS CN loss model to the range of loss models supported by WBNM.

The format for using this new loss model is;

```
#####START_SCSCN_INFILT
        3       0.05       1.0        1.0
Sub01             60
Sub02             73
Sub03             60
Sub04             79
Sub05             78
Sub06             69                    (These should all be AMC2 CNs!!)
Sub07             60
Sub08             66
Sub09             84
Sub10             84
Sub11             79
Sub12             84
Sub13             79
Sub14             79
Sub15             79
Sub16             79
Sub17             49
#####END_SCSCN_INFILT
```

Refer SCS_CN documentation for more detail of development and application.

In the first data line – in summary;

First value) **(3)** is the AMC of the event being modelled (1 dry catch, 2 Intermediate, 3 Wet)

Second value **(0.05)** is the initial abstraction as a fraction of the soil storage potential S mm (range 0.05 to 0.2)

Third value **(1.0)** is the global CN adjustment factor (typically 1.0) that allows varying CN globally by this factor to assist calibration.

Fourth value **(1.0)** is the initial loss on impervious surfaces in mm. WBNM2019 assumes impervious continuing loss is zero.

5. Modifications to DFE Simulation

Application of WBNM using several ARR 2016/19 design flood estimation models has made clear that the strict selection of the pattern hydrograph closest to but with a peak flow greater than the ARR DFE, sometimes leads to selection of a pattern hydrograph with a peak discharge significantly higher than the DFE. This usually occurs when the next lower pattern discharge is very close to the DFE. WBNM now selects the nearest pattern hydrograph that has a peak discharge greater than or equal to 95% of the DFE. In this way the selected pattern hydrograph peak

discharge is now generally closer to the DFE (but sometimes slightly lower than the DFE).

Running WBNM2019 on WINDOWS :

Make sure you have the new global.ini in the WBNM2019.exe directory (appropriately configured for your purposes).

Make sure you have the new project.ini in the directory of your runfile (appropriately configured).

All Fatal Errors display on screen.

All warnings are recorded in the QA file (so important to enable it in INI settings)

Output to the metafile is now much more deliberately controlled (through your INI file settings).

Minor additions and some format upgrades to the debug log – can be a very very large file! Really only used for debugging during code development so normally keep turned off.

Running from the command line - in a command window type :

cd fullpath_to_my_runfiles

(eg c:\WBNM2019\SampleRunfiles) then type

full path to_WBNM2019_var.exe <space> mymodel.wbn

(eg c:\WBNM2019\WBNM2019_w64.exe Natural16.wbn)

Running from a batch file - (Note - relative addressing does not seem to work!)

For maximum reliability suggest formatting the batch file as follows;

```
REM move to the runfile drive
 Z:
REM cd to the runfiles directory on that drive
cd Z:\projects\WBNM2019\SampleRunfiles
REM run WBNM2019  with the runfile
REM runfile and PROJECT.INI are now in the current directory
Z:\projects\WBNM2019\WBNM2019_w64.exe   Natural16.wbn
```

The above command line can be repeated as many times as necessary.

```
Pause
```
(if you want to see screen output in a multistorm runfile)

Running Using Association

In windows, any file can be 'associated' with a program of your choice so that clicking the file executes the associated program. If say WBNM2019_w64.exe is associated with files with a wbn extension, clicking on a runfile with that extension will run it with WBNM2019_w64.exe. This is probably the most efficient approach for those windows users that are normally running only a single wbn runfile at a time.

Running WBNM2019 on LINUX/UBUNTU :

!!!! NOTE LINUX IS CASE SENSITIVE !!!!!

Make sure you have the new global.ini in the WBNM2019 directory (appropriately configured for your purposes).

Make sure you have the new project.ini in the directory of your runfile (appropriately configured).

All Fatal Errors display on screen.

All warnings are recorded in the QA file (so important to enable it in INI settings)

Output to the metafile is now much more deliberately controlled (through your INI file settings).

Minor additions and some format upgrades to the debug log – can be a very very large file! Really only used for debugging during code development so normally keep turned off.

Running from the command line - in a terminal window type :

cd fullpath_to_my_runfiles

(eg cd /home/ted/projects/WBNM2019/SampleRunfiles) then type

full path to_WBNM2017 <space> mymodel.wbn

(eg /home/ted/projects/WBNM2019/WBNM2019_u64 Natural16.wbn)

Running from a script file - (Note - relative addressing does not work!)

For maximum reliability suggest formatting the bash script as follows;

```
# cd to the runfiles directory
cd /home/ted/projects/WBNM2019/SampleRunfiles
# run the engine with the runfile
# runfile and PROJECT.INI are now in the current directory
/home/ted/projects/WBNM2017\WBNM2019_u64 Natural16.wbn
```

The above command line can be repeated as many times as necessary.

LIMITATIONS (WBNM2019 @ August 2019)

- No monte carlo capability exists at this time. (Future option)
- The limits of the various parameters used in an ARR2016/19 DFE are not well correlated. When spectrums are run, the range may be significantly curtailed by these different limits from what one would expect (eg 720min lower limit for areal temporal patterns compared with 1min for point). (ARR2016/19 limitation). Some values exist in one dataset but not the other. Where these are internal to the dataset, suitable values are interpolated.
- WBNM does not currently respond when a CR is typed in response to a 'hit any key to terminate' request. To terminate type any key (but CR) and follow with a CR. (A current Portable Fortran Limitation.)

GENERAL COMMENT

There are several variants of the compiled code available. Only the common windows 64 bit version is provided in the distribution. Other (32 bit Windows and Linux) versions are available on request to support as noted on the distribution website.

There is no major difference in speed apparent between the Windows and Linux executables but the 32 bit versions do run slightly slower and have smaller allocatable array limits. These memory based limits may be important in running very large complex models.

WBNM2017_w64.exe (Intel fortran Windows 64 bit)

WBNM2017_w32.exe (Intel fortran Windows 32 bit) Available on request!

WBNM2017_U (gfortran Linux/ubuntu 64 bit) Available on Request!

It is strongly suggested that the full WBNM2019_var name be used in command strings to identify what compilation variant is in use. The running code version (as distinct from compilation variant) is displayed in the on screen header text and in the QAfile.

It is recommended that you always turn on output to the QA file in your INI together with the sum_storms (storm based summary) . The QA file is particular important as it includes any warnings encountered during the run. It is also helpful to include the echo log for a run or two when first running a new model. In WBNM2019 all file output can be optionally turned off to minimise run times for the output you need! Writing out files (particularly the debug file and to a lesser extent the meta file} does very significantly extend run times even on a fast SSD.

Yours

Ted Rigby

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