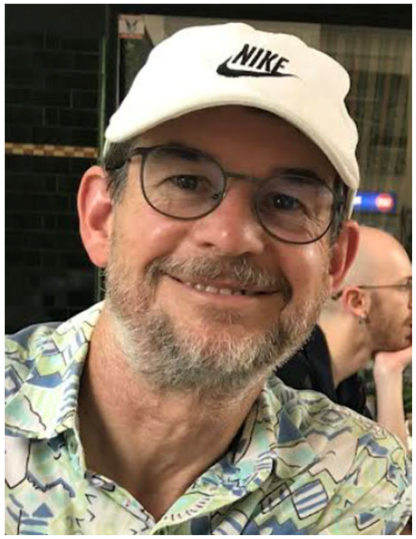
RORB Essentials for Water Modelling

Pre-course webinar

15 March 2023

Tony Ladson

About me



Tony Ladson

- Engineering undergrad back in the 1980s
- PhD in Environmental Engineering (River Health)
- Lecturer at Monash 2002-2007
- Wrote a book on Australian Hydrology
- Director of Moroka (Water Consultants)
- Blogger: tonyladson.wordpress.com
- ~~Twitter: @TonyLadson~~
- ~~Instagram: @tony.Ladson~~
- LinkedIn www.linkedin.com/in/tonyladson/
- Email: tony.ladson@moroka.com.au

Acknowledgements

David Stephens
Hydrology and Risk Consulting

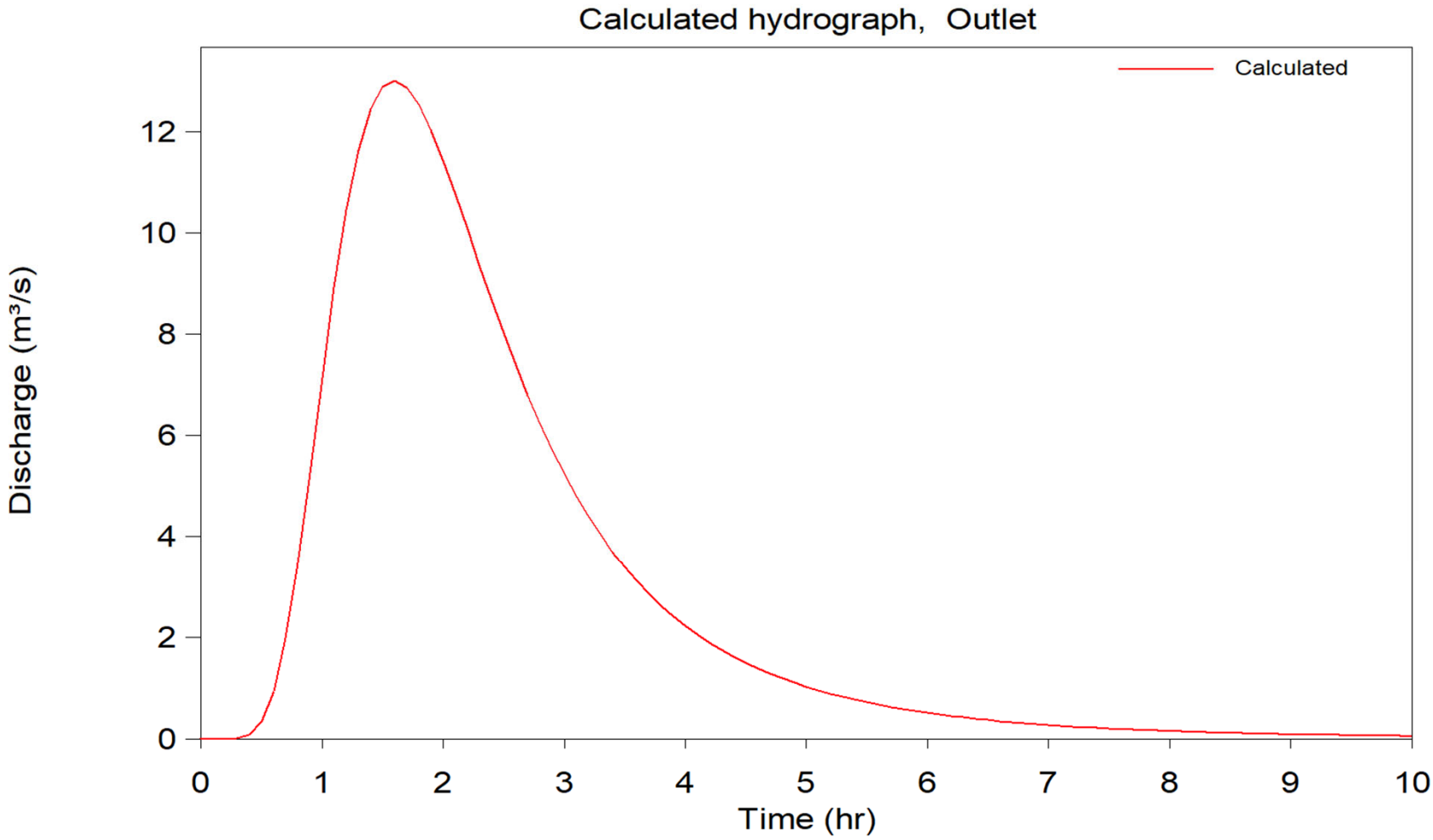
Rory Nathan
Uni of Melbourne

RORB Essentials for Water Modelling

- What RORB does (and doesn't)
- Why you may want to use it
- How RORB relates to Australian Rainfall and Runoff 2019
- Case study:
  - Inputs
  - Calculations
  - Outputs

What RORB does

RORB calculates flood hydrographs, usually from rainfall



Why RORB?

Easy to extract outputs to use for hydraulic model inputs

Been around, first release 1975

Kept up to date,
-Version ~6.5
- Runs under Windows 11

Supported by Melbourne Water

Can use data from the ARR data hub and BoM IFD

Handles multiple rainfall temporal patterns
- Ensemble modelling

Useful for retarding basin design

Before and after modelling of urban development

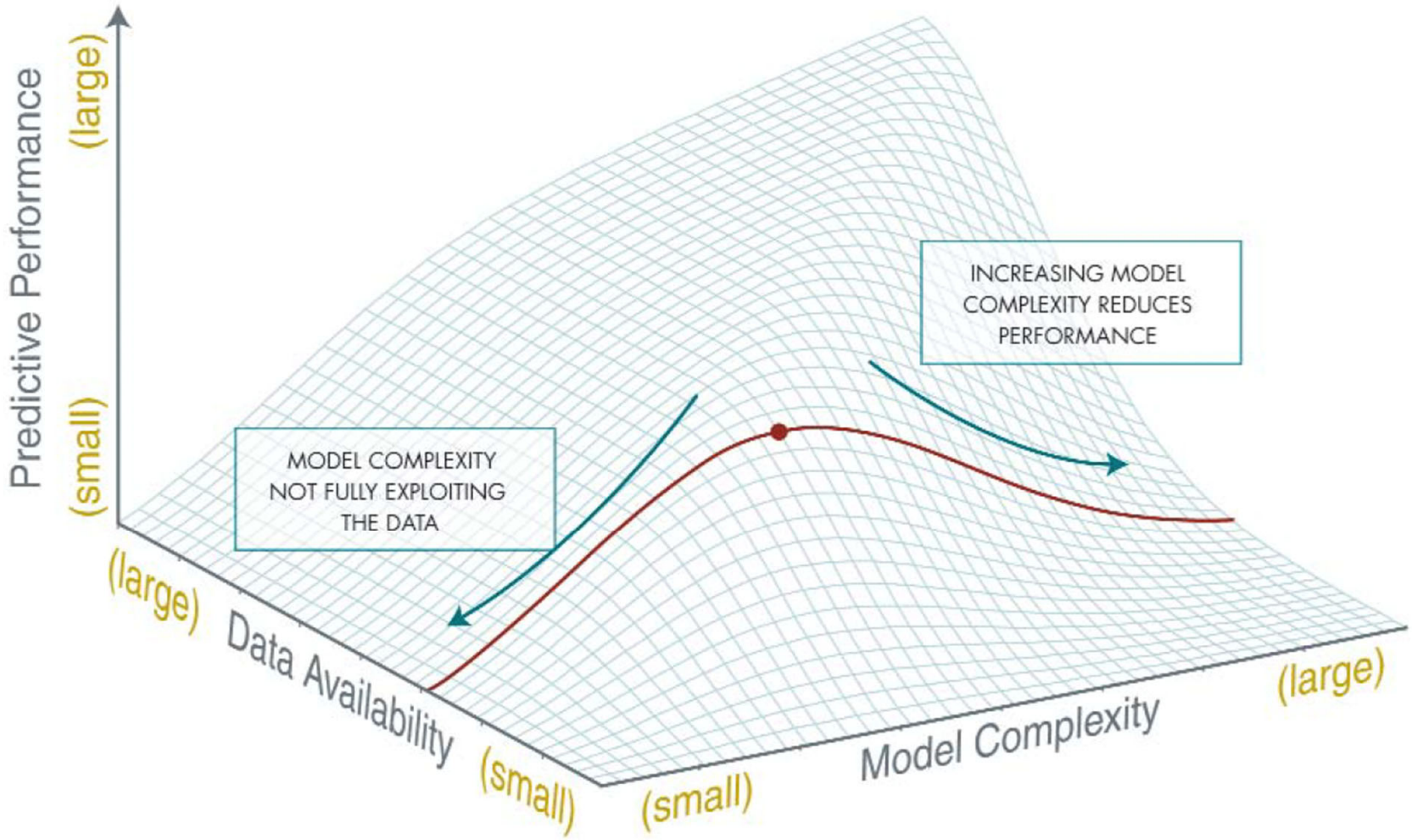
Monte Carlo sampling of inputs:
-rainfall depth
-temporal patterns
-losses

Models can be calibrated to stream gauge data

RORB is often used to:

- Estimate design flood hydrographs
- Design flood retarding/detention basins
- Generate hydrographs for input to hydraulic models
- Calculate rainfall excess for rain-on-grid modelling

Useful models balance complexity with data availability



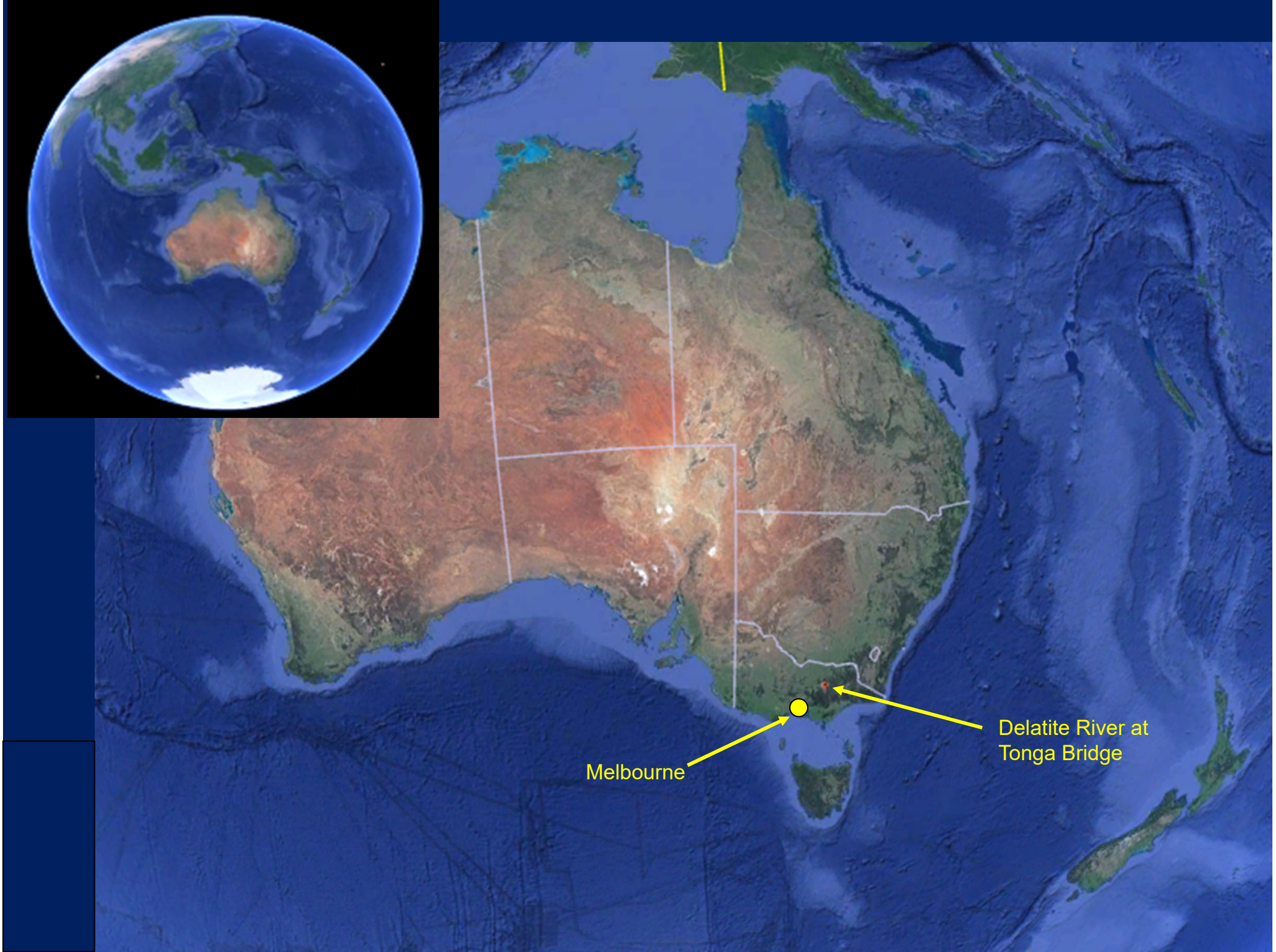
Some things RORB doesn't do

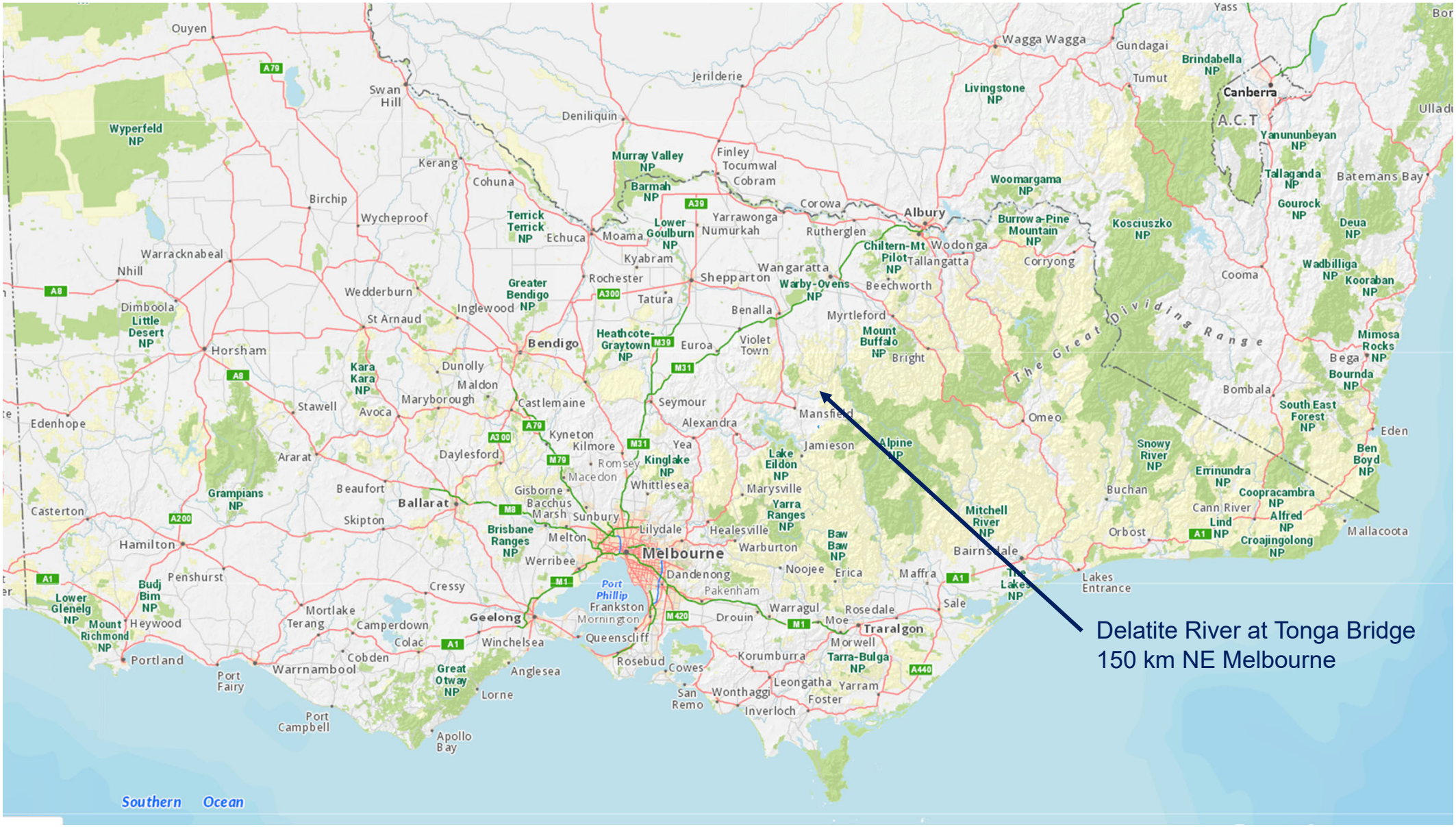
- Doesn't model
  - Evaporation/transpiration
  - Soil moisture movement
  - Groundwater interactions

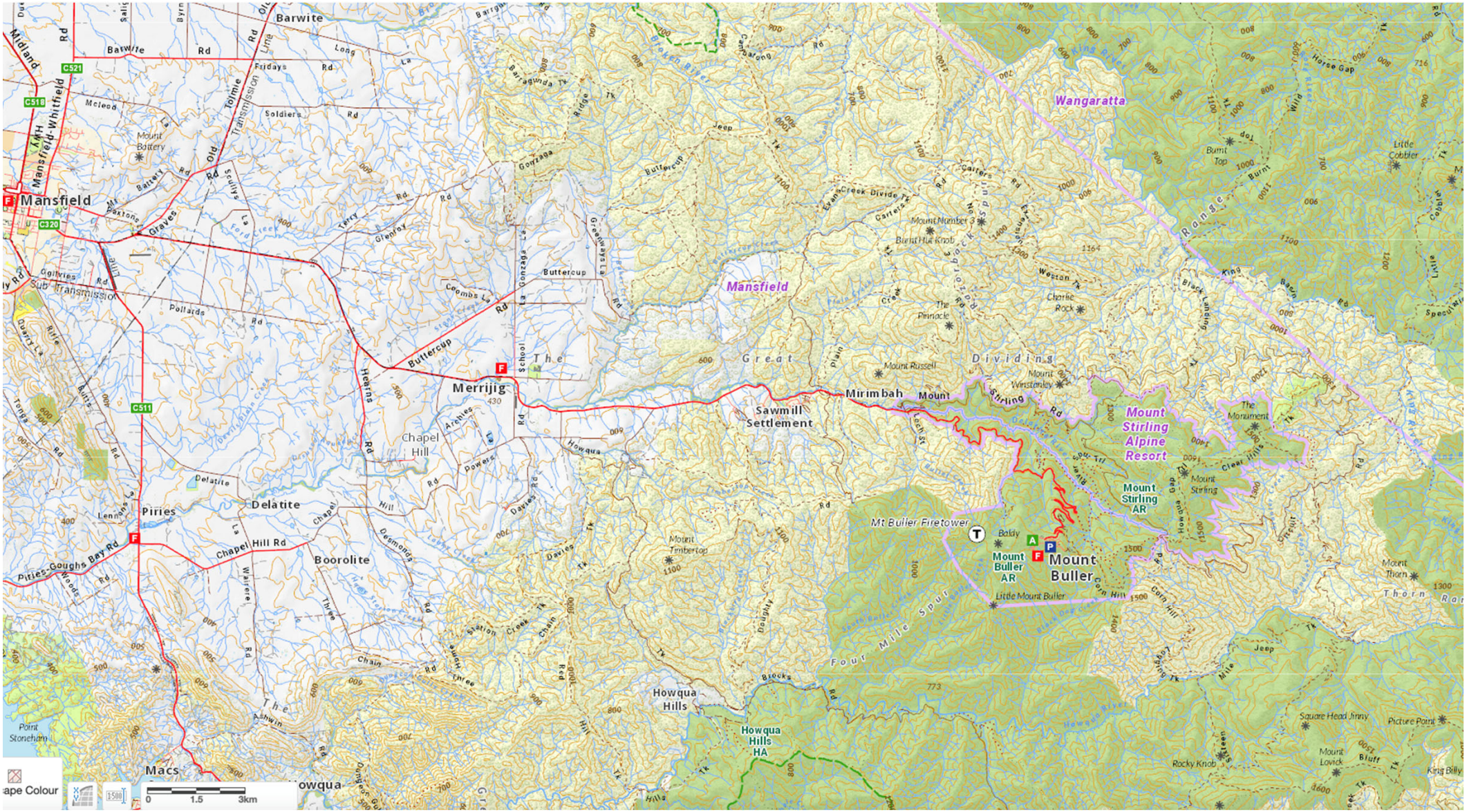
(Although you can add and subtract water from reaches)

Doesn't do hydraulics. Doesn't calculate velocities or depths

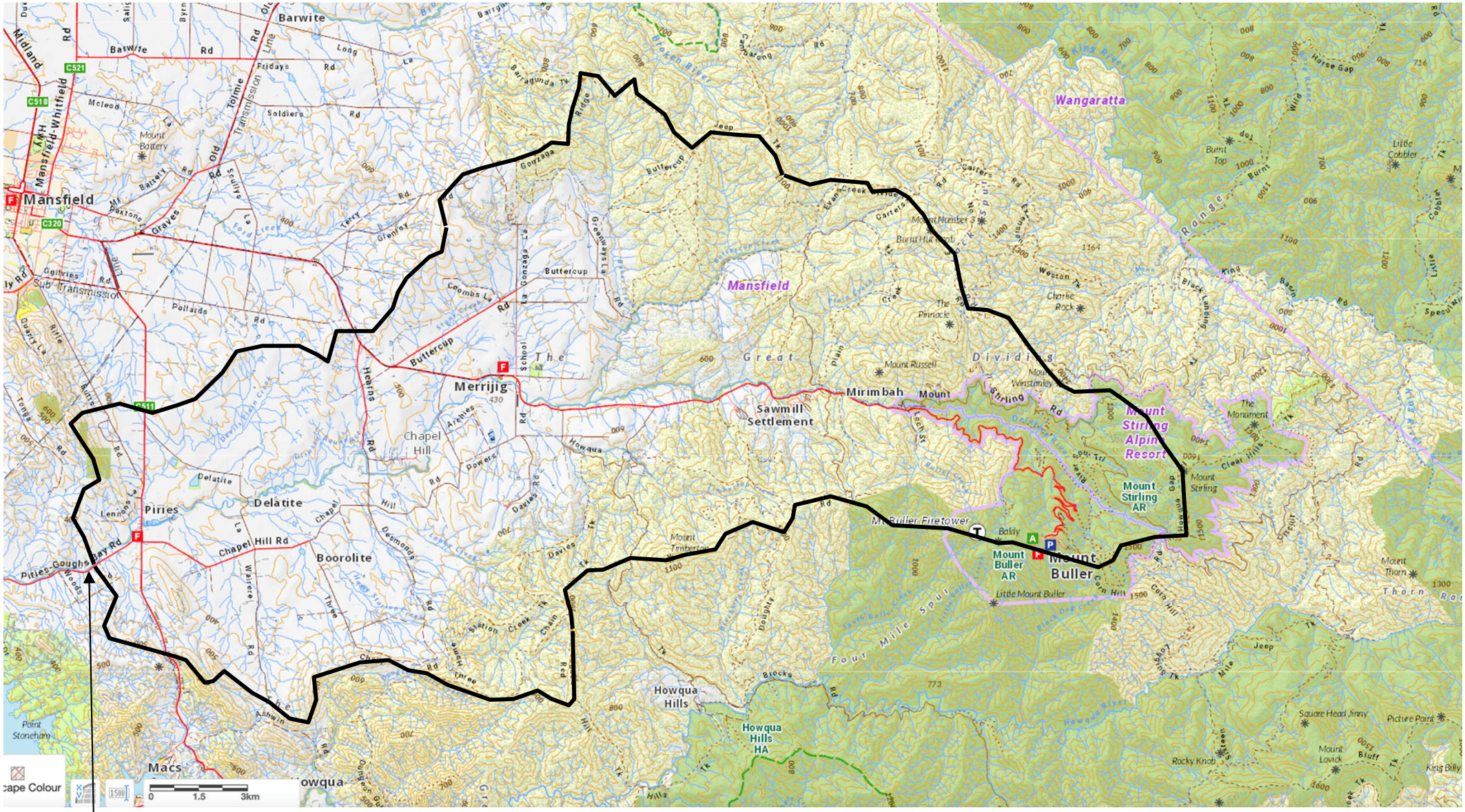
Case study:
Delatite River at Tonga Bridge


Melbourne
Delatite River at
Tonga Bridge


Delatite River at Tonga Bridge
150 km NE Melbourne
Melbourne
Ballarat
Bendigo
Albury
Canberra
A.C.T
Wagga Wagga
Mildura
Swan Hill
Horsham
Warrnambool
Portland
Port Fairy
Port Campbell
Apollo Bay
Lorne
Great Otway NP
Anglesea
Geelong
Torquay
Lorne
Colac
Camperdown
Mortlake
Hamilton
Casterton
Edenhope
Penshurst
Heywood
Mount Richmond NP
Lower Glenelg NP
Budj Bim NP
Grampians NP
Ararat
Stawell
Maryborough
Dunolly
Kara Kara NP
Little Desert NP
Dimboola
Nhill
Warracknabeal
Wyperfeld NP
Ouyen
Birchip
Wycheproof
Kerang
Cohuna
Echuca
Deniliquin
Jerilderie
Finley
Tocumwal
Cobram
Murray Valley NP
Barmah NP
Lower Goulburn NP
Terrick Terrick NP
Moama
Numurkah
Yarrawonga
Corowa
Rutherglen
Wangaratta
Rochester
Kyabram
Shepparton
Tatura
Greater Bendigo NP
Wedderburn
Inglewood
St Arnaud
Heathcote-Graytown NP
Euroa
Violet Town
Benalla
Warby-Ovens NP
Beechworth
Myrtleford
Mount Buffalo NP
Bright
Chiltern-Mt Pilot NP
Tallangatta
Wodonga
Burrowa-Pine Mountain NP
Woomargama NP
Livingstone NP
Tumut
Gundagai
Brindabella NP
Yanununbeyan NP
Tallaganda NP
Batemans Bay
Gourock NP
Kosciuszko NP
Deua NP
Corryong
Cooma
Wadbilliga NP
Kooraban NP
Mimosa Rocks NP
Bega
Bournda NP
Bombala
South East Forest NP
Eden
Ben Boyd NP
Snowy River NP
Errinundra NP
Coopracambra NP
Cann River
Lind NP
Alfred NP
Croajingolong NP
Mallacoota
Orbost
Buchan
Omeo
Mansfield
Alpine NP
Jamieson
Lake Eildon NP
Marysville
Yarra Ranges NP
Healesville
Warburton
Baw Baw NP
Mitchell River NP
Bairnsdale
Lakes Entrance
The Lakes NP
Sale
Maffra
Erica
Noojee
Traralgon
Morwell
Tarra-Bulga NP
Rosedale
Moe
Drouin
Warragul
Korumburra
Leongatha
Yarram
Foster
Inverloch
San Remo
Wonthaggi
Cowes
Rosebud
Queenscliff
Port Phillip
Frankston
Mornington
Pakenham
Dandenong
Cranbourne
Lilydale
Melton
Werribee
Sunbury
Bacchus Marsh
Gisborne
Whittlesea
Kinglake NP
Romsey
Macedon
Kyneton
Kilmore
Yea
Seymour
Alexandra
Castlemaine
Maldon
Daylesford
Avoca
Skipton
Beaufort
Casterton
Great Dividing Range
The
Yass
Bor
Ulladu
Southern Ocean

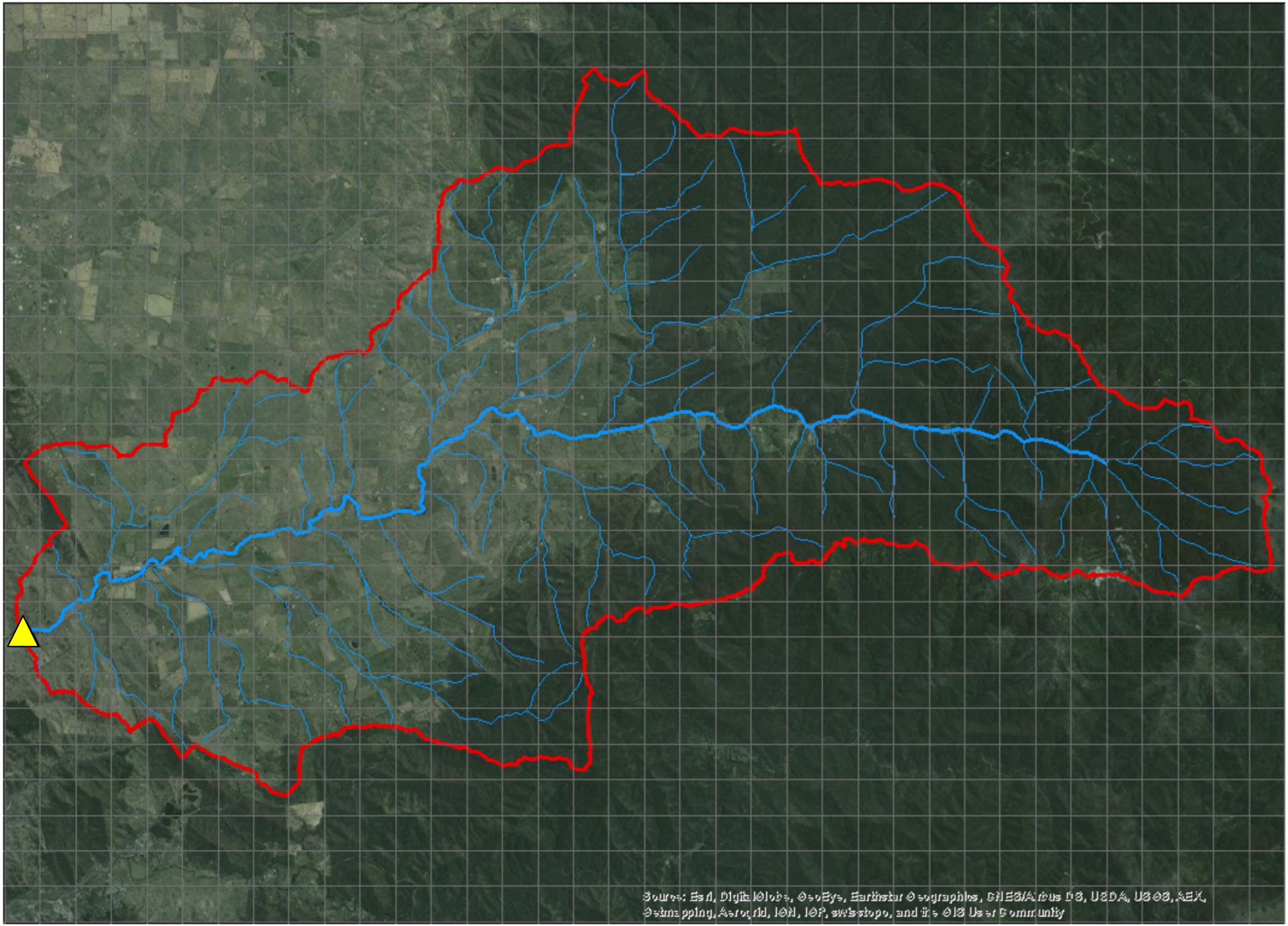

Barwite
Mansfield
Merrijig
Chapel Hill
Delatite
Piries
Boorolite
Macs
Mirimbah
Sawmill Settlement
Mount Stirling Alpine Resort
Mount Stirling AR
Mount Buller
Mount Buller AR
Mt Buller Firetower
Howqua Hills
Howqua Hills HA
Wangaratta
Great Dividing Range
Four Mile Spur
Scale Colour
0
1.5
3km

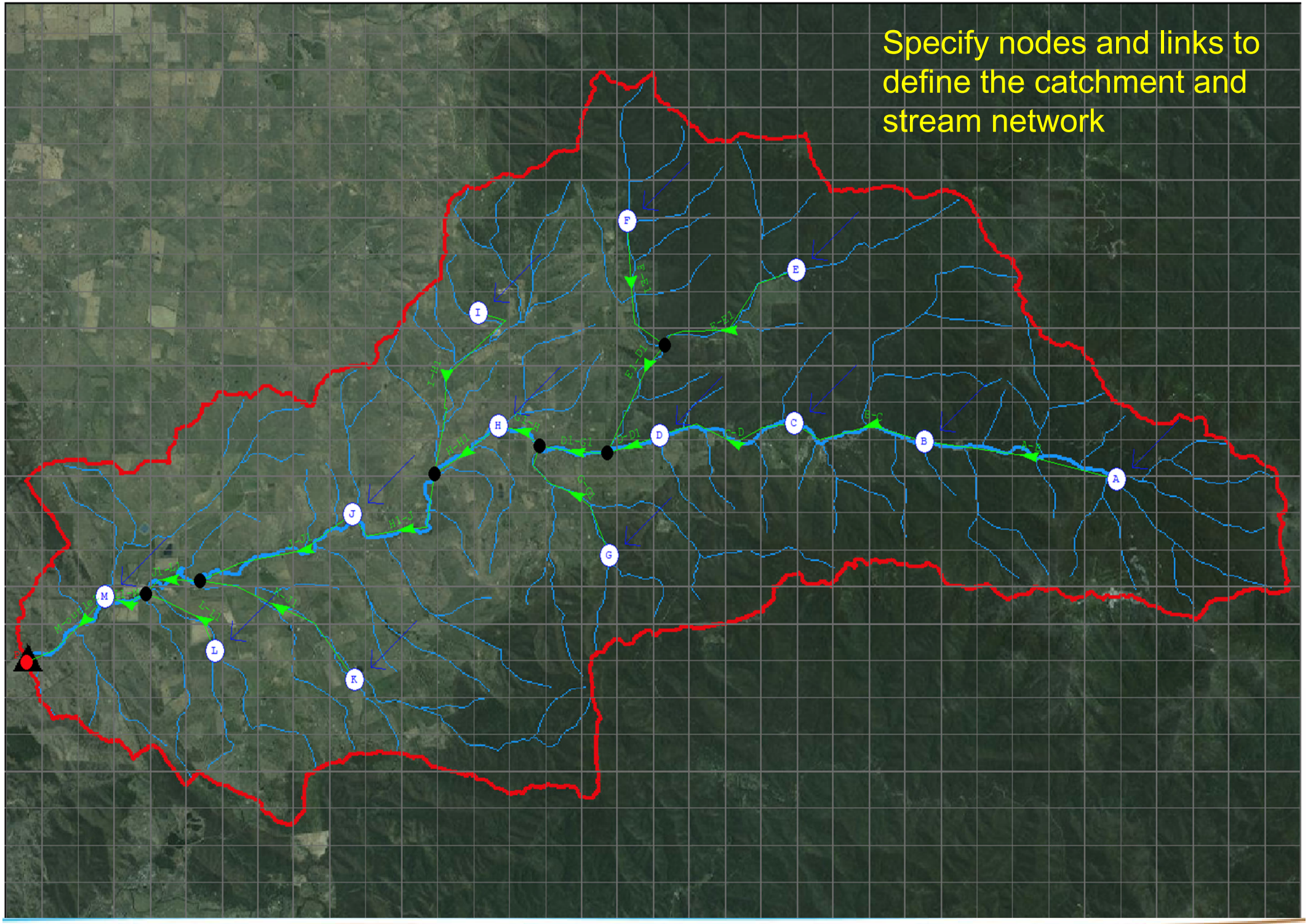
moroka

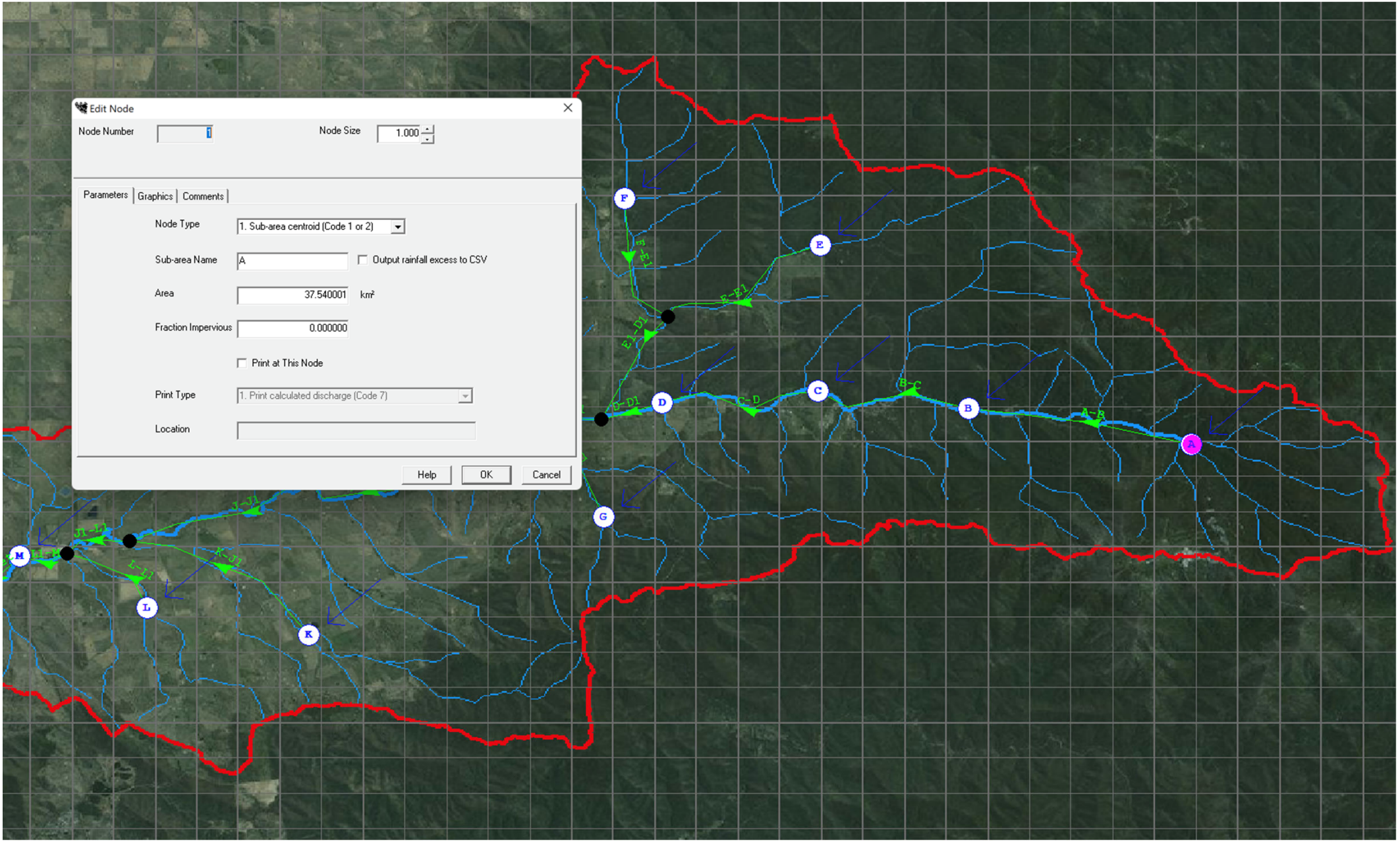


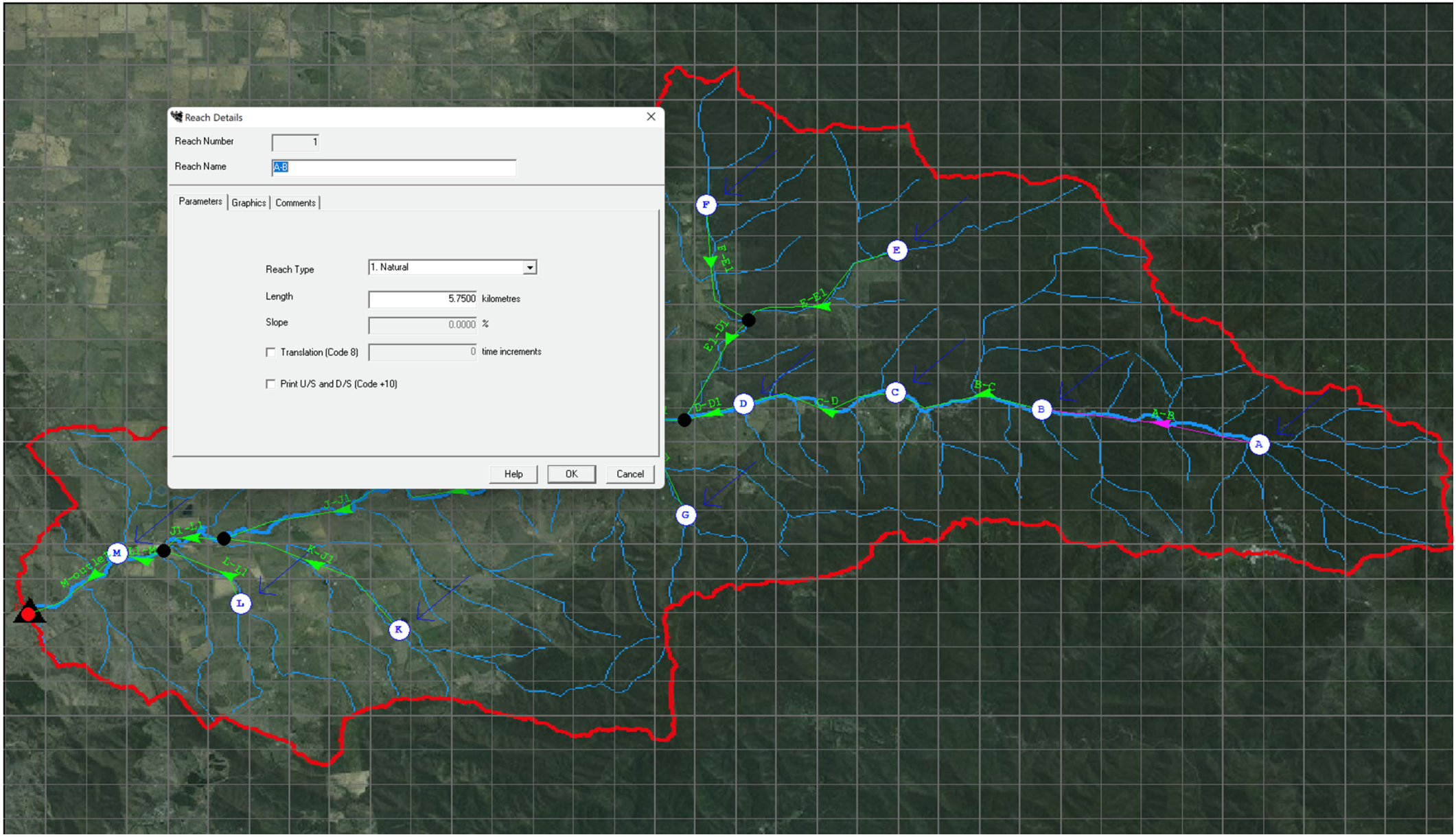
Delatite River at Tonga Bridge

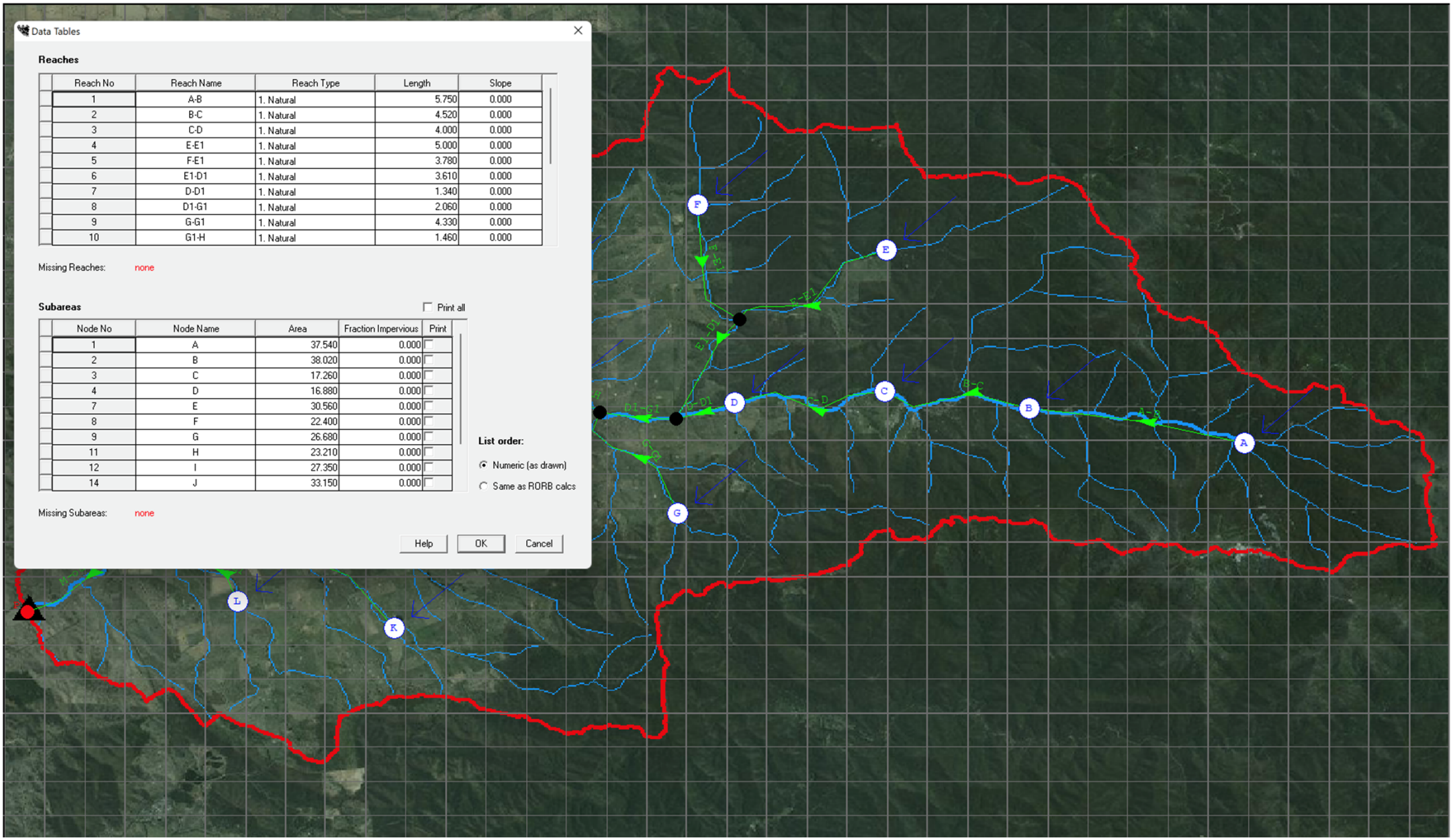
Catchment area = 368 km^2

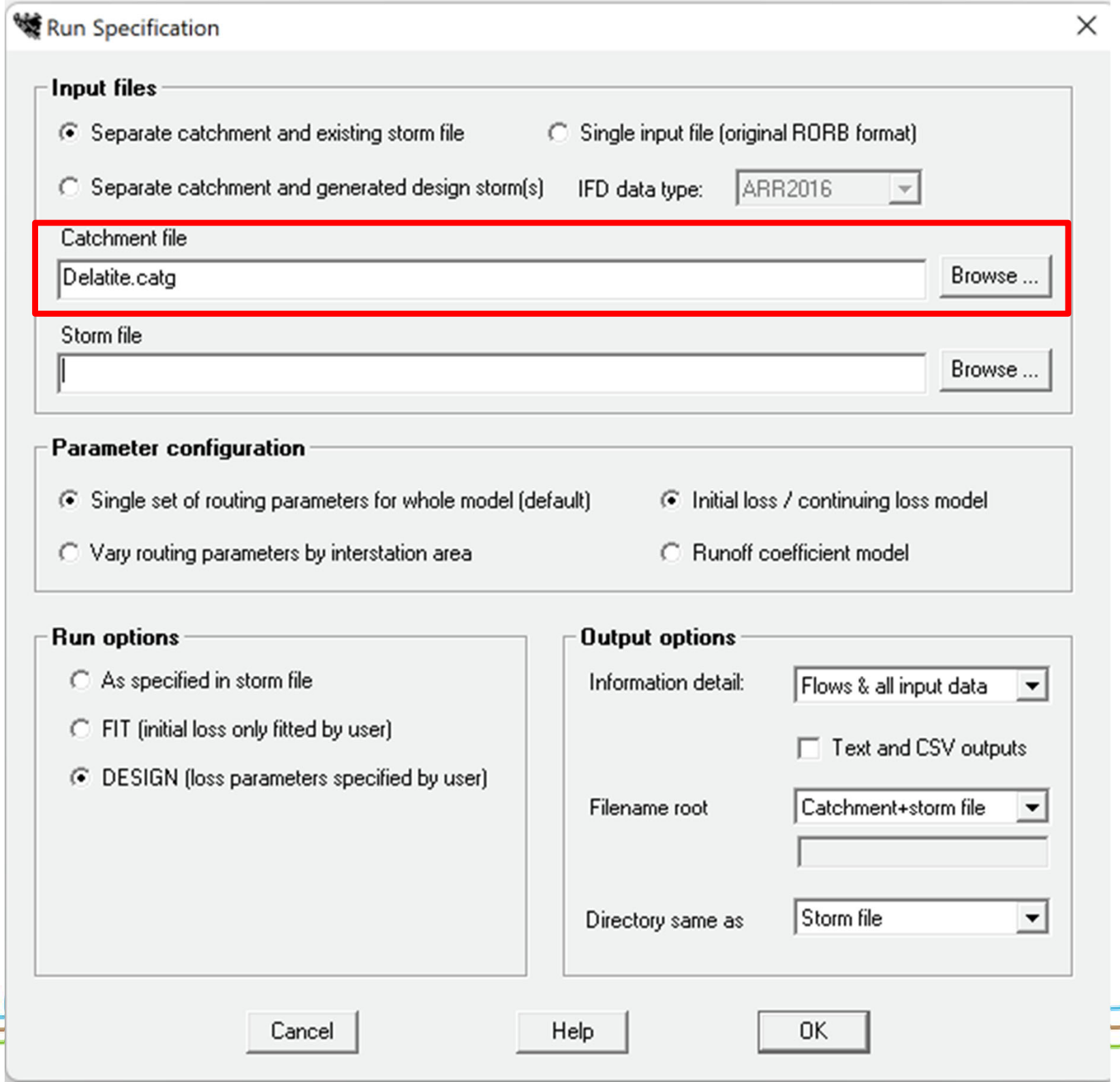

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

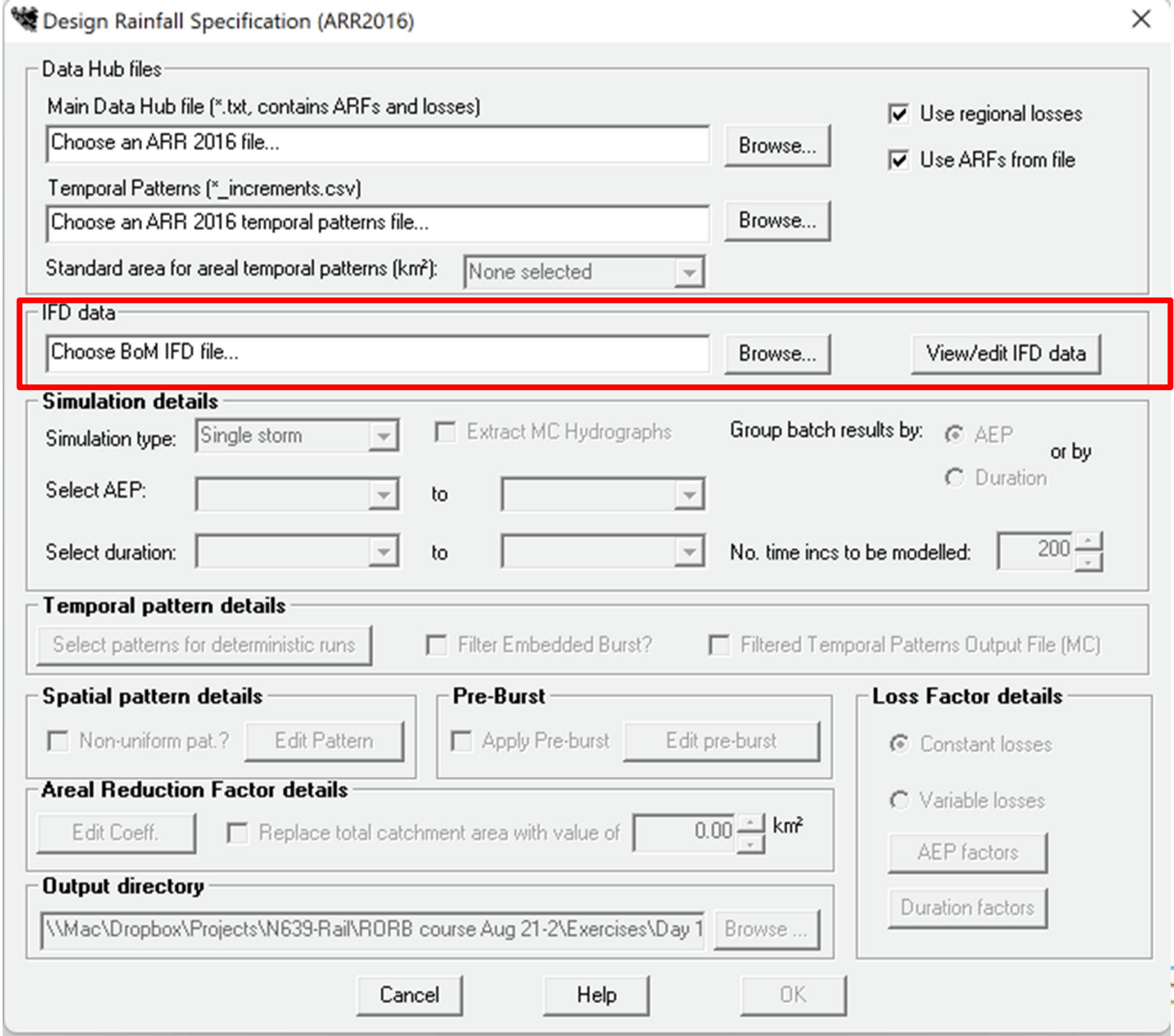

Specify nodes and links to define the catchment and stream network
A
B
C
D
E
F
G
H
I
J
K
L
M


Edit Node
Node Number
1
Node Size
1.000
Parameters
Graphics
Comments
Node Type
1. Sub-area centroid (Code 1 or 2)
Sub-area Name
A
Output rainfall excess to CSV
Area
37.540001
km²
Fraction Impervious
0.000000
Print at This Node
Print Type
1. Print calculated discharge (Code 7)
Location
Help
OK
Cancel
F
E
F-E1
E-E1
E1_D1
D
D-D1
C-D
C
B-C
B
A-B
A
G
M
J1-J2
J-J1
K-J1
L-J1
L
K


Reach Details
Reach Number
1
Reach Name
A-B
Parameters
Graphics
Comments
Reach Type
1. Natural
Length
5.7500
kilometres
Slope
0.0000
%
Translation (Code 8)
0
time increments
Print U/S and D/S (Code +10)
Help
OK
Cancel
A
B
C
D
E
F
G
K
L
M
A-B
B-C
C-D
D-D1
E-E1
E1-D1
F-E1
K-J1
L-J1
J1-J2
M-J2

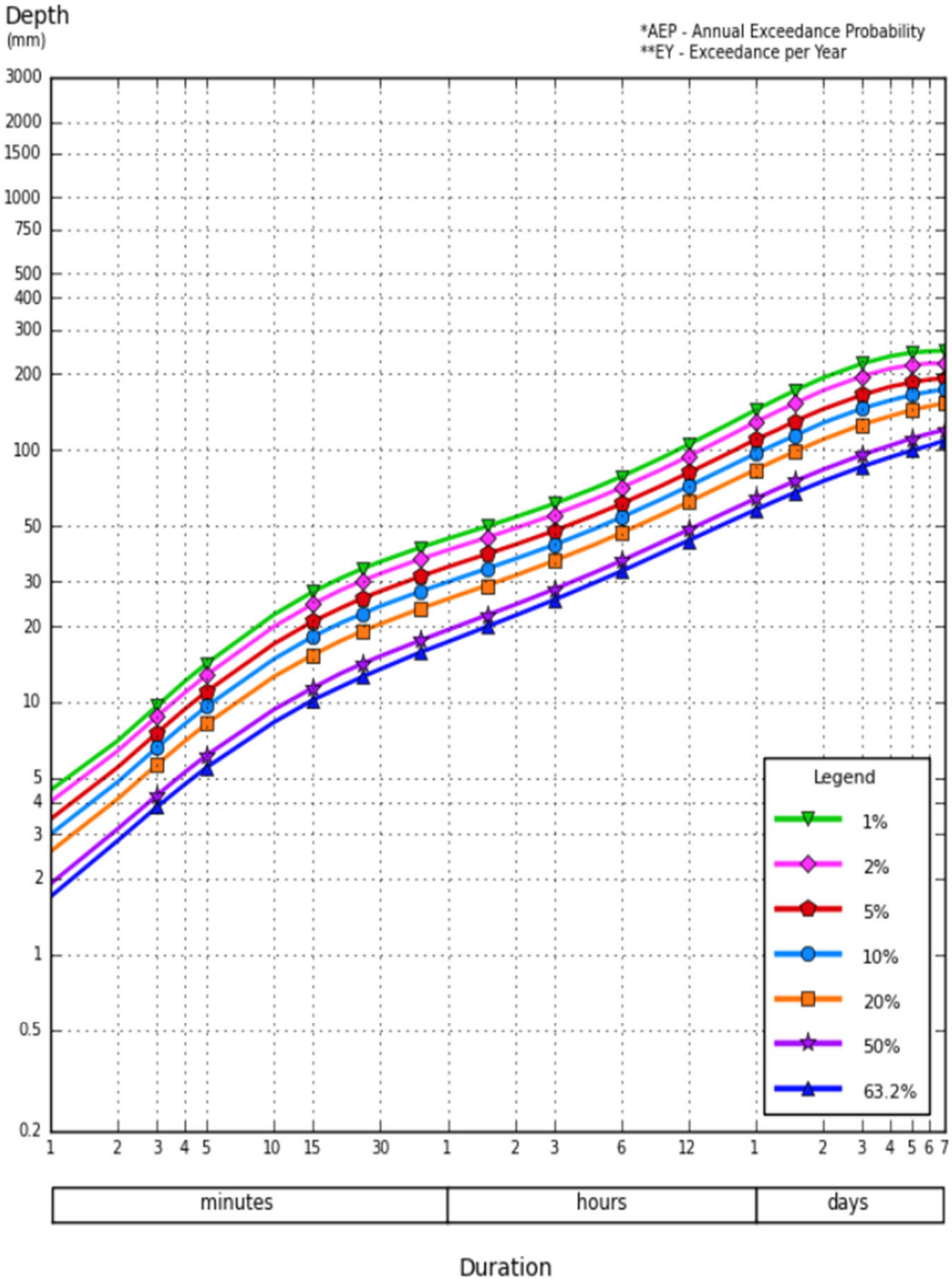

Data Tables
Reaches
Reach No | Reach Name | Reach Type | Length | Slope
1 | A-B | 1. Natural | 5.750 | 0.000
2 | B-C | 1. Natural | 4.520 | 0.000
3 | C-D | 1. Natural | 4.000 | 0.000
4 | E-E1 | 1. Natural | 5.000 | 0.000
5 | F-E1 | 1. Natural | 3.780 | 0.000
6 | E1-D1 | 1. Natural | 3.610 | 0.000
7 | D-D1 | 1. Natural | 1.340 | 0.000
8 | D1-G1 | 1. Natural | 2.060 | 0.000
9 | G-G1 | 1. Natural | 4.330 | 0.000
10 | G1-H | 1. Natural | 1.460 | 0.000
Missing Reaches: none
Subareas
Print all
Node No | Node Name | Area | Fraction Impervious | Print
1 | A | 37.540 | 0.000
2 | B | 38.020 | 0.000
3 | C | 17.260 | 0.000
4 | D | 16.880 | 0.000
7 | E | 30.560 | 0.000
8 | F | 22.400 | 0.000
9 | G | 26.680 | 0.000
11 | H | 23.210 | 0.000
12 | I | 27.350 | 0.000
14 | J | 33.150 | 0.000
List order:
Numeric (as drawn)
Same as RORB calcs
Missing Subareas: none
Help
OK
Cancel
A
B
C
D
E
F
G
K
L


Run Specification
Input files
Separate catchment and existing storm file
Single input file (original RORB format)
Separate catchment and generated design storm(s)
IFD data type:
ARR2016
Catchment file
Delatite.catg
Browse ...
Storm file
Browse ...
Parameter configuration
Single set of routing parameters for whole model (default)
Initial loss / continuing loss model
Vary routing parameters by interstation area
Runoff coefficient model
Run options
As specified in storm file
FIT (initial loss only fitted by user)
DESIGN (loss parameters specified by user)
Output options
Information detail:
Flows & all input data
Text and CSV outputs
Filename root
Catchment+storm file
Directory same as
Storm file
Cancel
Help
OK

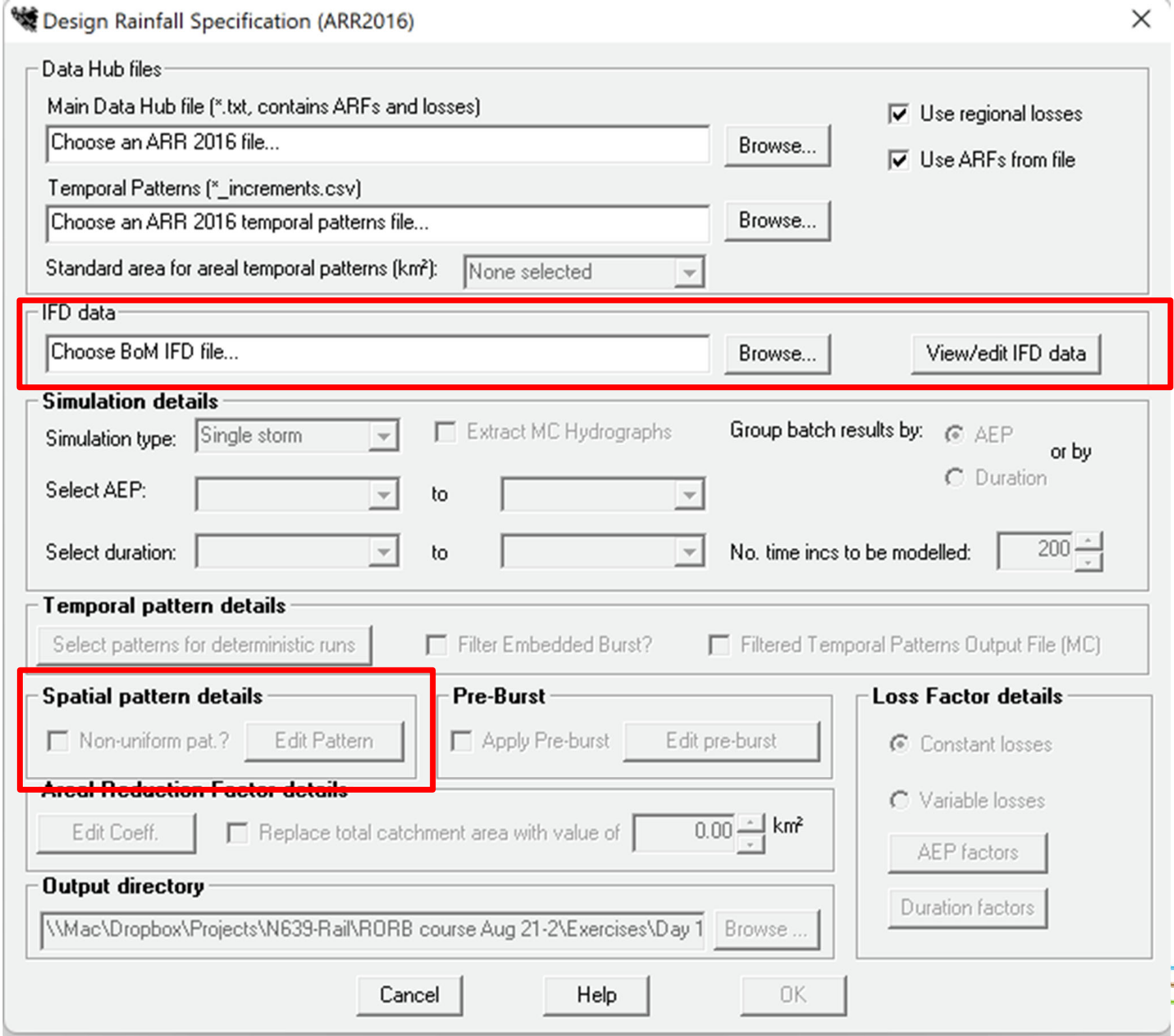

Design Rainfall Specification (ARR2016)
Data Hub files
Main Data Hub file (*.txt, contains ARFs and losses)
Choose an ARR 2016 file...
Browse...
Use regional losses
Use ARFs from file
Temporal Patterns (*_increments.csv)
Choose an ARR 2016 temporal patterns file...
Browse...
Standard area for areal temporal patterns (km²):
None selected
IFD data
Choose BoM IFD file...
Browse...
View/edit IFD data
Simulation details
Simulation type:
Single storm
Extract MC Hydrographs
Group batch results by:
AEP
or by
Duration
Select AEP:
to
Select duration:
to
No. time incs to be modelled:
200
Temporal pattern details
Select patterns for deterministic runs
Filter Embedded Burst?
Filtered Temporal Patterns Output File (MC)
Spatial pattern details
Non-uniform pat.?
Edit Pattern
Pre-Burst
Apply Pre-burst
Edit pre-burst
Loss Factor details
Constant losses
Variable losses
AEP factors
Duration factors
Areal Reduction Factor details
Edit Coeff.
Replace total catchment area with value of
0.00
km²
Output directory
\\Mac\Dropbox\Projects\N639-Rail\RORB course Aug 21-2\Exercises\Day 1
Browse ...
Cancel
Help
OK

- Rainfall
  - From a historical storm – when calibrating a model
  - Design rainfall based on Intensity, Frequency, Duration data

Design Rainfall



	Annual Exceedance Probability (AEP)						
Duration	**63.2%**	**50%#**	**20%***	**10%**	**5%**	**2%**	**1%**
1 min	1.69	1.90	2.55	2.99	3.43	4.02	4.47
2 min	2.82	3.14	4.13	4.82	5.51	6.40	7.02
3 min	3.84	4.27	5.65	6.60	7.54	8.77	9.65
4 min	4.72	5.27	7.00	8.19	9.38	10.9	12.1
5 min	5.50	6.15	8.20	9.61	11.0	12.8	14.2
10 min	8.31	9.33	12.6	14.8	17.0	19.9	22.2
15 min	10.2	11.4	15.4	18.2	20.9	24.5	27.4
20 min	11.5	13.0	17.5	20.6	23.6	27.8	31.0
25 min	12.6	14.2	19.1	22.4	25.8	30.3	33.8
30 min	13.5	15.2	20.4	24.0	27.5	32.3	36.0
45 min	15.7	17.5	23.4	27.4	31.4	36.8	40.9
1 hour	17.3	19.3	25.6	29.9	34.3	40.0	44.4
1.5 hour	19.9	22.1	29.0	33.8	38.6	44.9	49.7
2 hour	22.0	24.3	31.7	36.9	42.0	48.8	54.0
3 hour	25.4	28.0	36.3	42.0	47.7	55.3	61.1
4.5 hour	29.6	32.5	41.9	48.4	54.9	63.5	70.2
6 hour	33.0	36.3	46.8	54.0	61.1	70.7	78.3
9 hour	38.9	42.8	55.1	63.5	71.8	83.3	92.5
12 hour	43.7	48.2	62.1	71.7	81.1	94.3	105
18 hour	51.6	57.0	73.9	85.4	96.7	113	126
24 hour	57.9	64.1	83.5	96.7	110	129	144
30 hour	63.2	70.1	91.6	106	120	142	159
36 hour	67.7	75.2	98.5	114	130	153	172
48 hour	75.1	83.5	110	128	145	172	193
72 hour	85.9	95.6	126	146	165	196	220
96 hour	93.5	104	136	157	178	210	235
120 hour	99.5	111	144	165	185	217	243
144 hour	104	116	149	170	190	220	246
168 hour	109	120	153	174	192	220	247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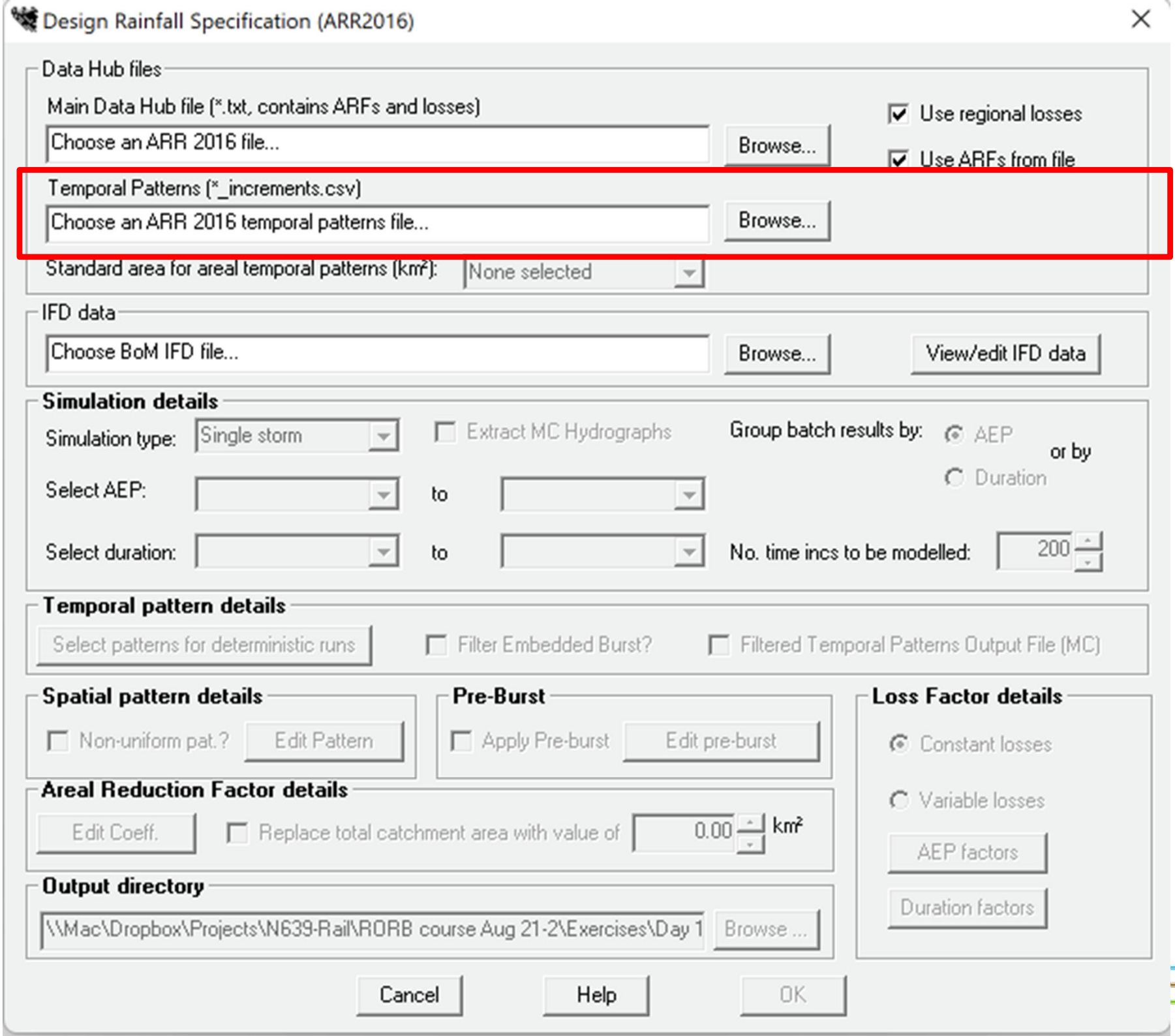
Choose an ARR 2016 temporal patterns file...
Browse...
Standard area for areal temporal patterns (km²):
None selected
IFD data
Choose BoM IFD file...
Browse...
View/edit IFD data
Simulation details
Simulation type:
Single storm
Extract MC Hydrographs
Group batch results by:
AEP
or by
Duration
Select AEP:
to
Select duration:
to
No. time incs to be modelled:
200
Temporal pattern details
Select patterns for deterministic runs
Filter Embedded Burst?
Filtered Temporal Patterns Output File (MC)
Spatial pattern details
Non-uniform pat.?
Edit Pattern
Pre-Burst
Apply Pre-burst
Edit pre-burst
Loss Factor details
Constant losses
Variable losses
AEP factors
Duration factors
Areal Reduction Factor details
Edit Coeff.
Replace total catchment area with value of
0.00
km²
Output directory
\\Mac\Dropbox\Projects\N639-Rail\RORB course Aug 21-2\Exercises\Day 1
Browse ...
Cancel
Help
OK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Variable losses
AEP factors
Duration factors
Areal Reduction Factor details
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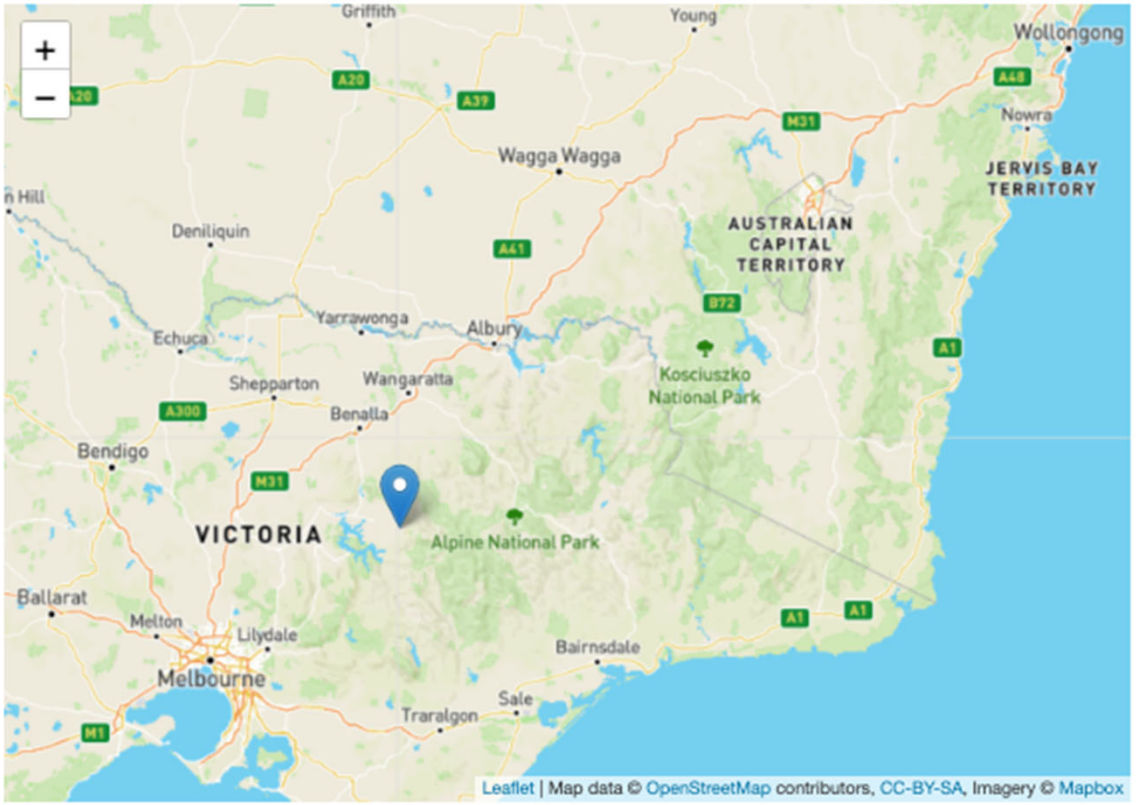
Replace total catchment area with value of
0.00
km²
Output directory
\\Mac\Dropbox\Projects\N639-Rail\RORB course Aug 21-2\Exercises\Day 1
Browse ...
Cancel
Help
OK

Australian Rainfall & Runoff Data Hub - Results

Input Data

Longitude	146.26
Latitude	-37.1
Selected Regions (clear)	
Temporal Patterns	show



Data

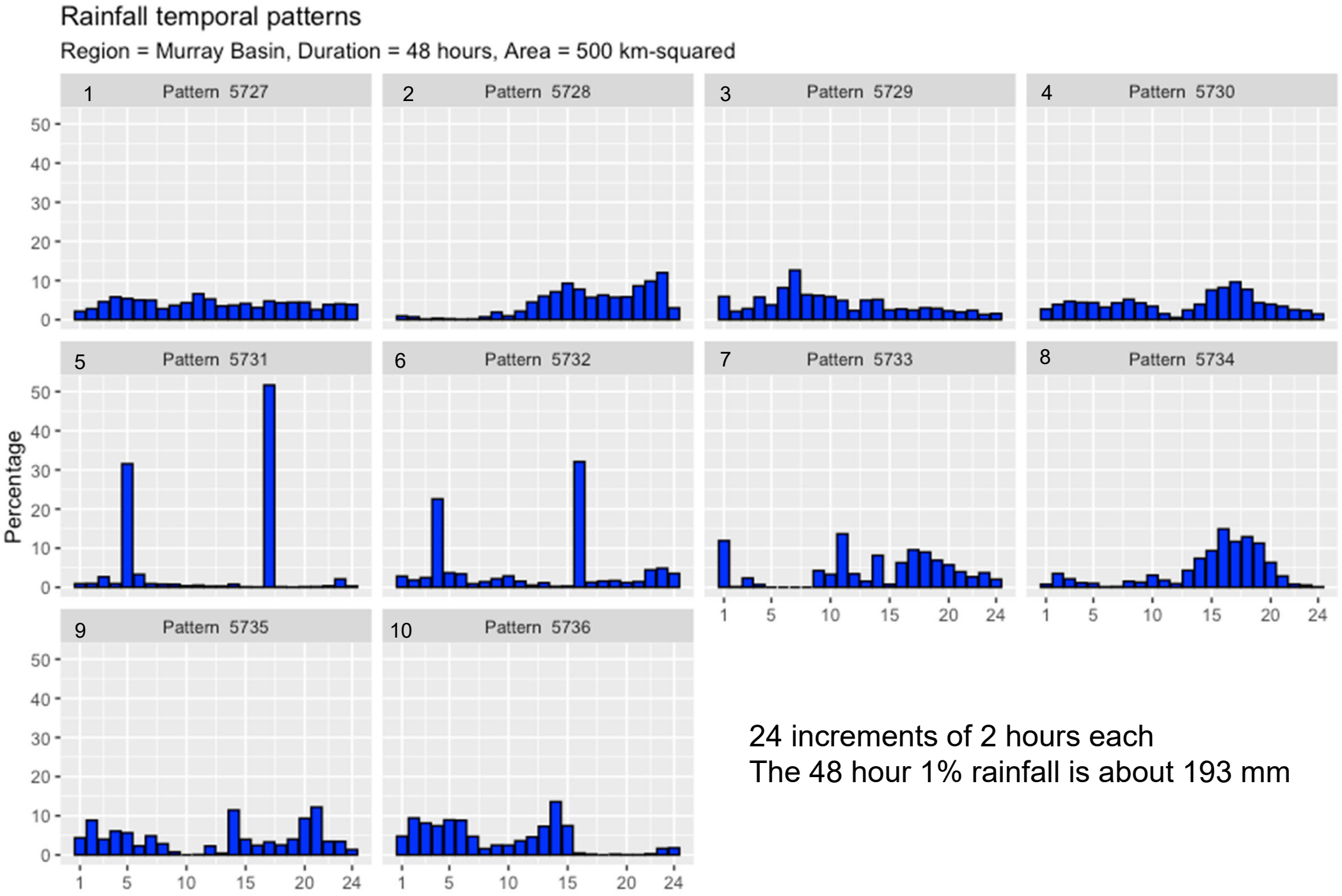
Temporal Patterns | Download (.zip)

code	MB
Label	Murray Basin

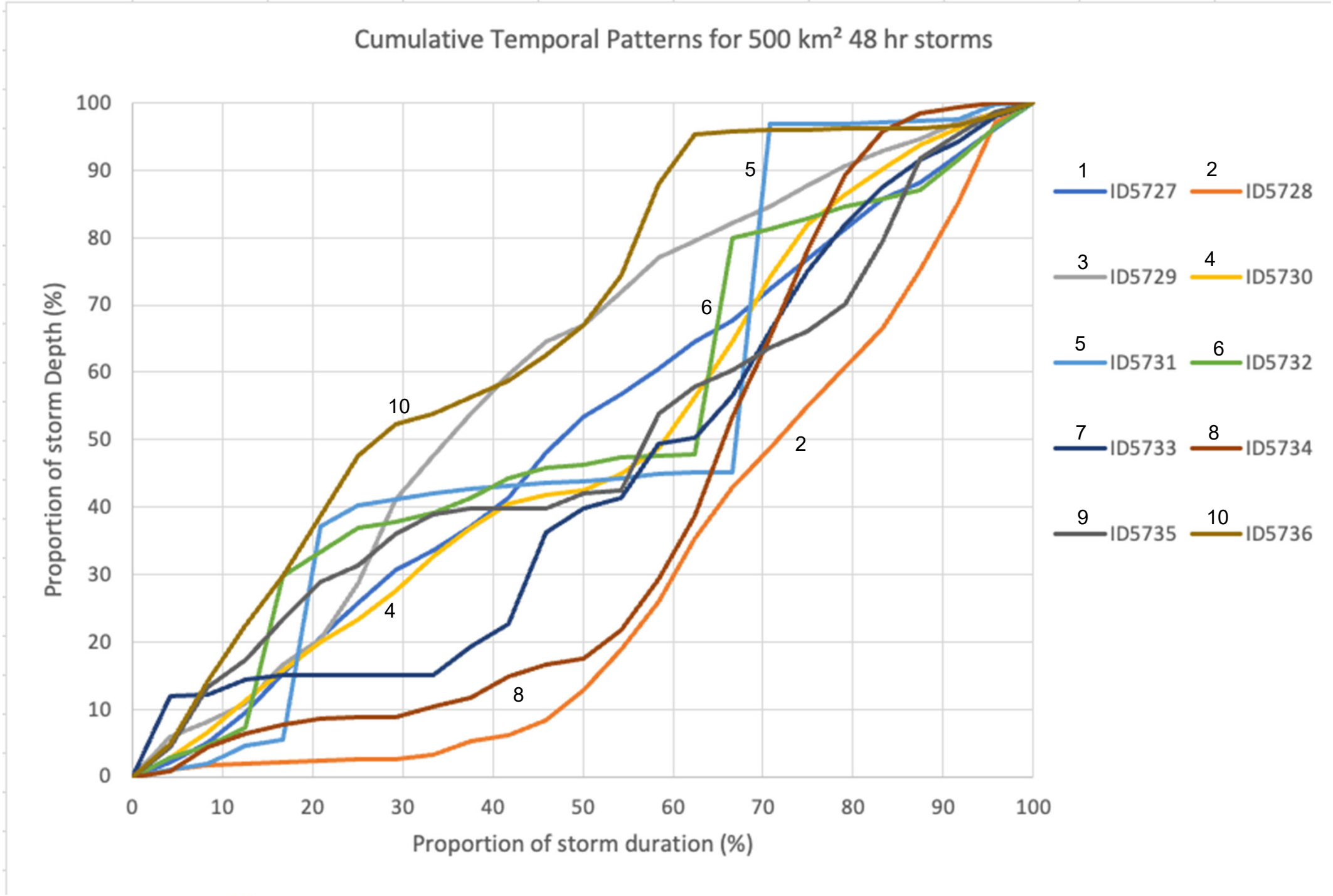
Layer Info

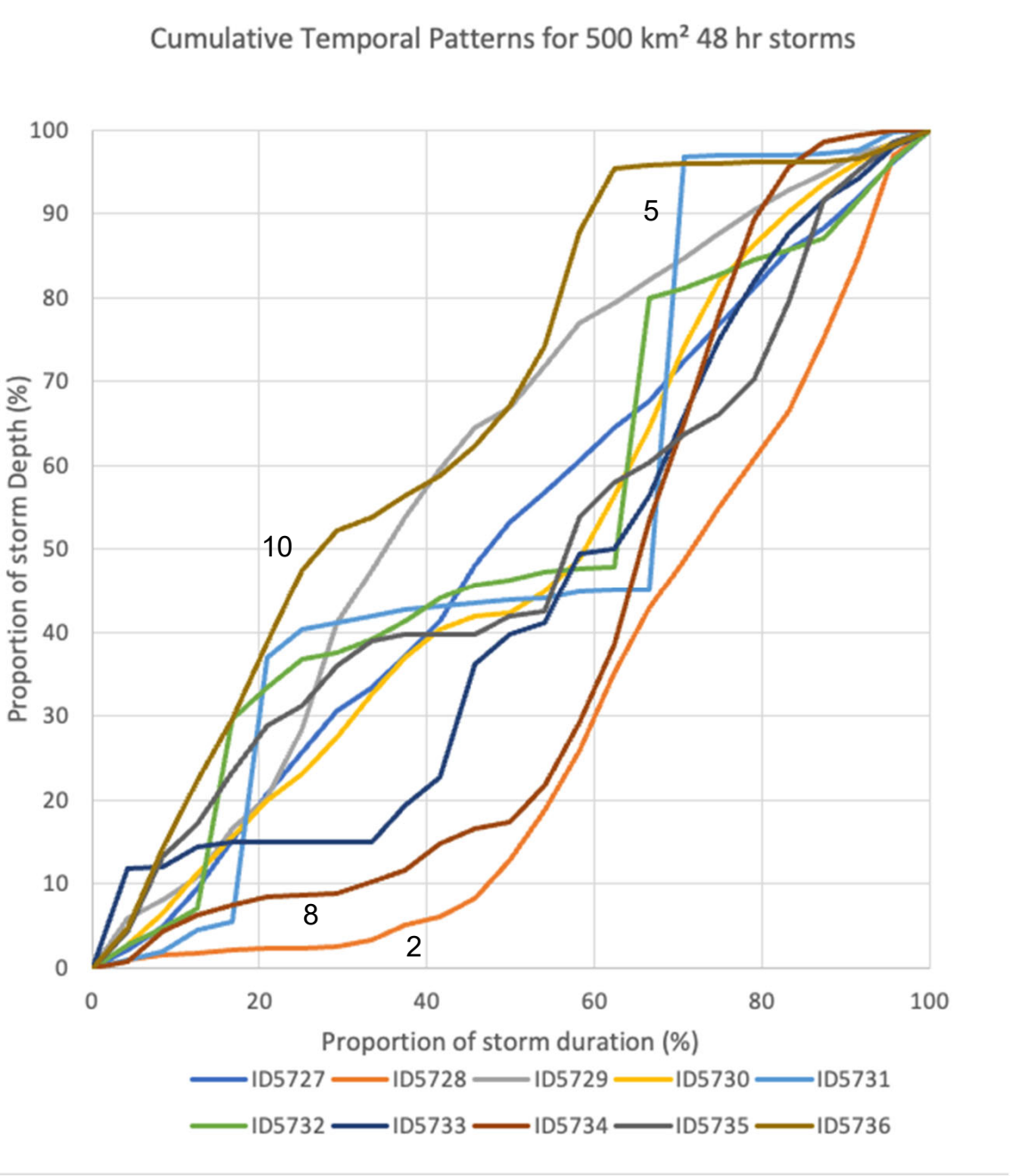
Time Accessed	14 March 2023 04:33PM
Version	2016_v2

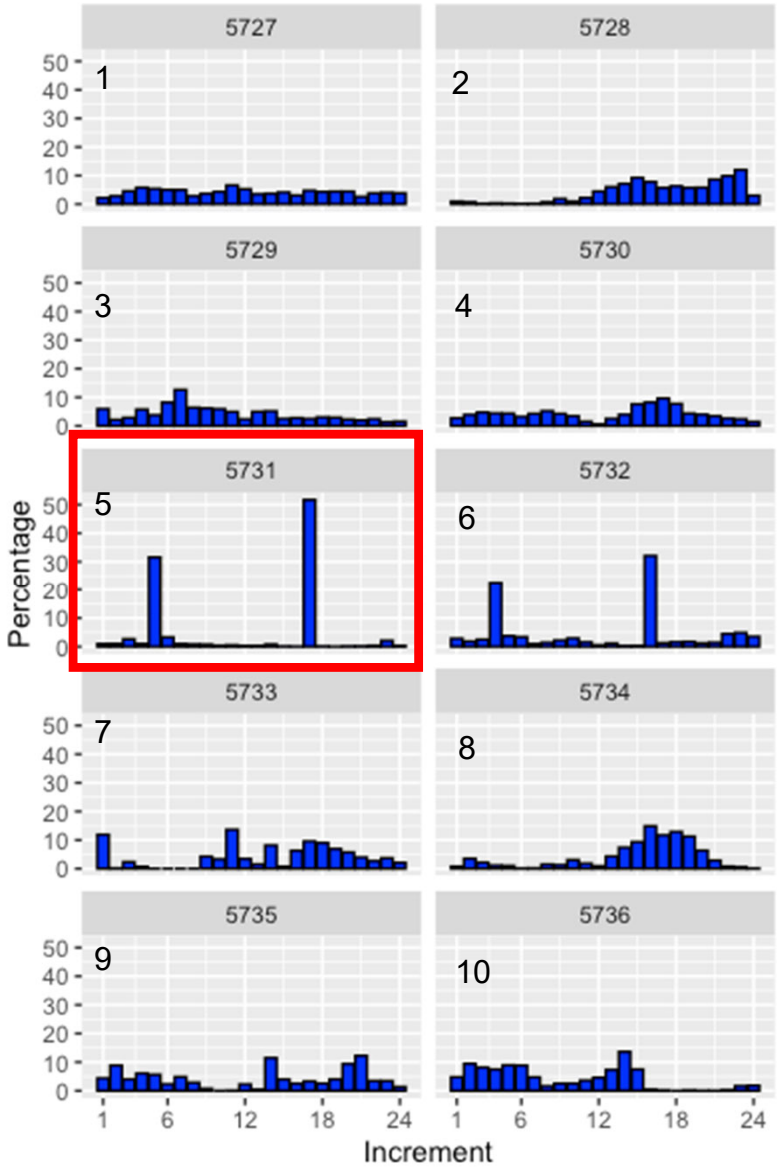
Download TXT | Download JSON | Generating PDF...



24 increments of 2 hours each
The 48 hour 1% rainfall is about 193 mm


Cumulative Temporal Patterns for 500 km² 48 hr storms
Proportion of storm Depth (%)
Proportion of storm duration (%)
0
10
20
30
40
50
60
70
80
90
100
1 ID5727
2 ID5728
3 ID5729
4 ID5730
5 ID5731
6 ID5732
7 ID5733
8 ID5734
9 ID5735
10 ID5736


Cumulative Temporal Patterns for 500 km² 48 hr storms
Proportion of storm Depth (%)
Proportion of storm duration (%)
0
10
20
30
40
50
60
70
80
90
100
5
10
8
2
ID5727
ID5728
ID5729
ID5730
ID5731
ID5732
ID5733
ID5734
ID5735
ID5736


5727
5728
5729
5730
5731
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5734
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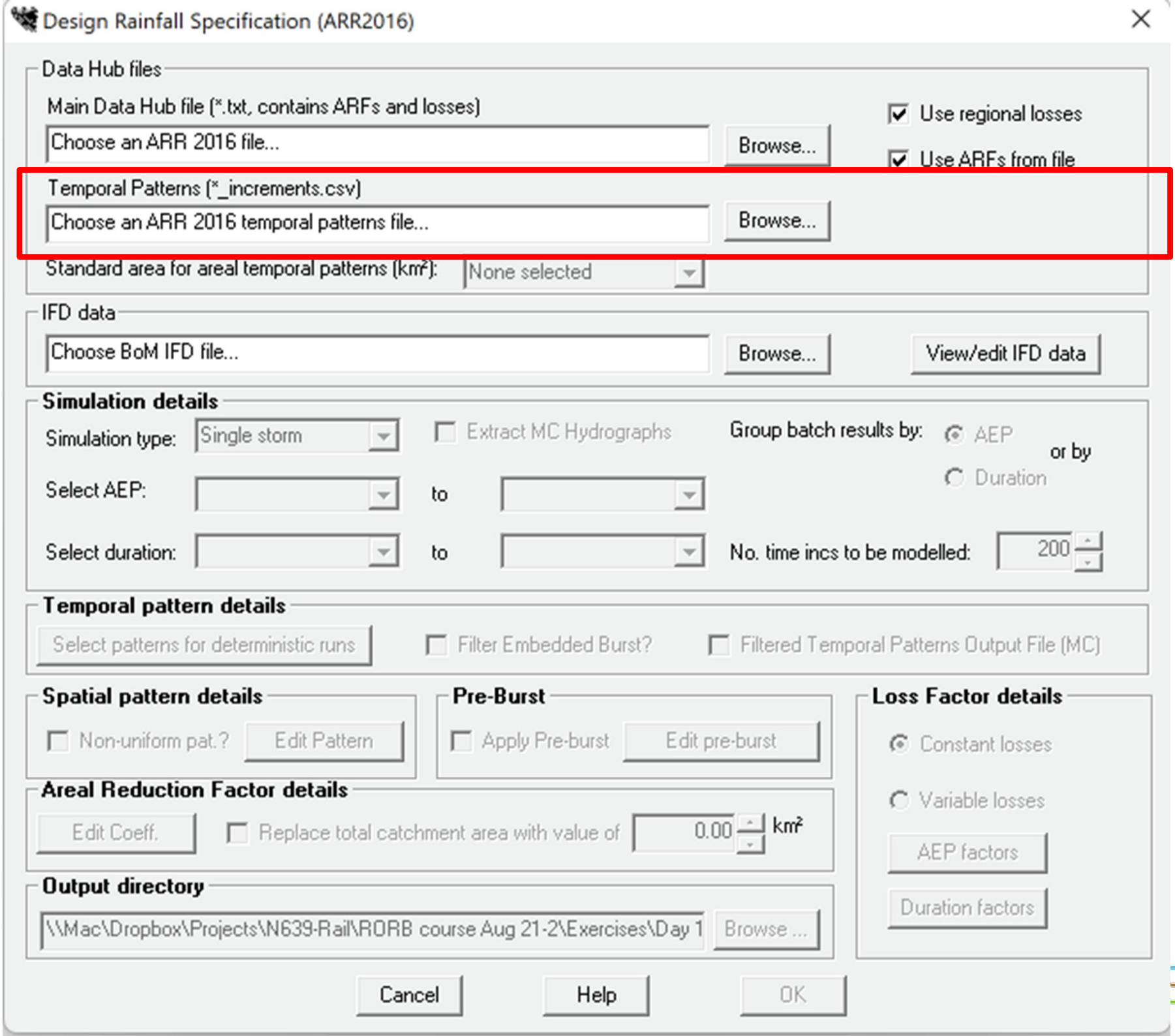
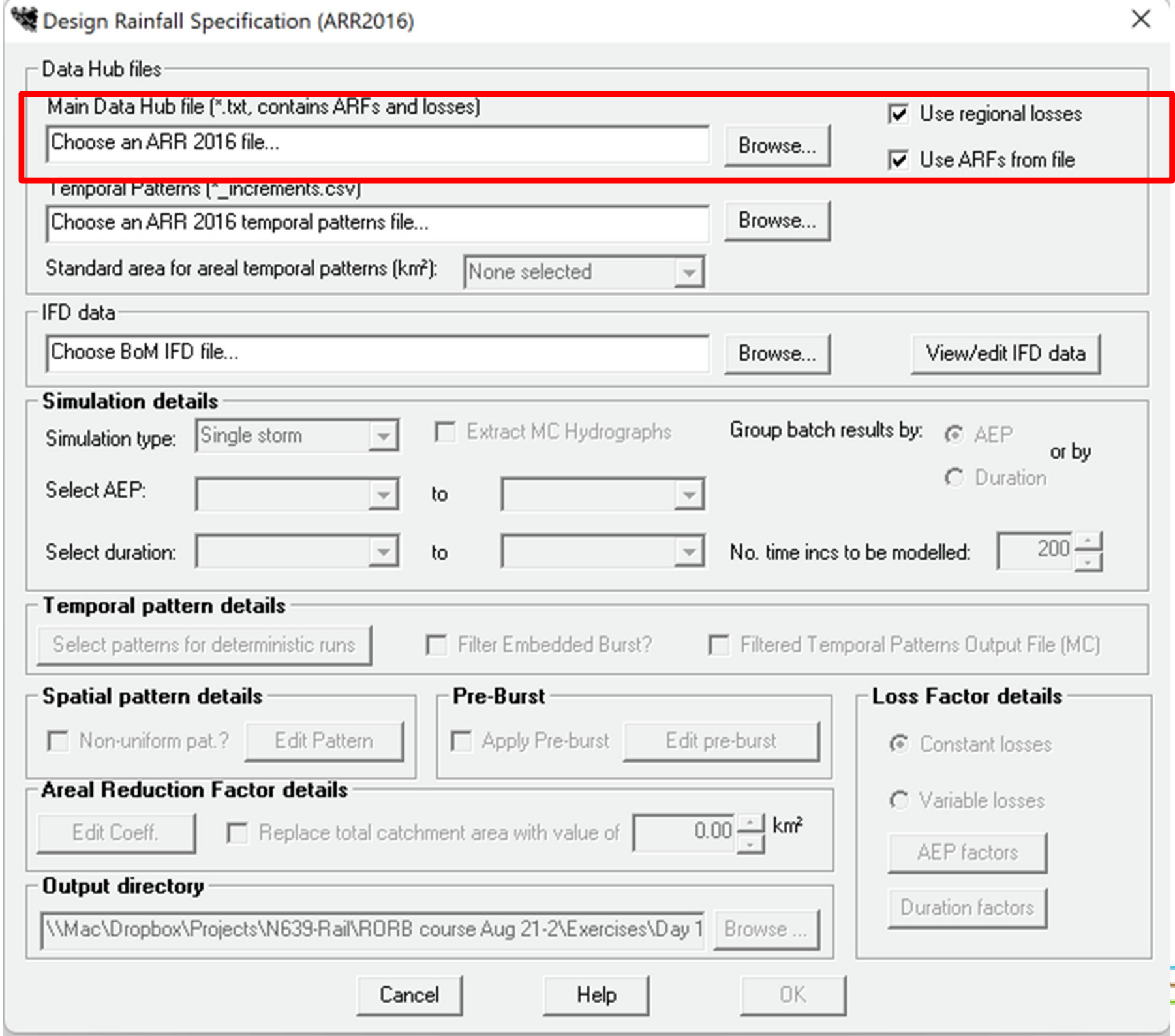
5736
1
2
3
4
5
6
7
8
9
10
Percentage
Increment
1
6
12
18
24


Design Rainfall Specification (ARR2016)
Data Hub files
Main Data Hub file (*.txt, contains ARFs and losses)
Choose an ARR 2016 file...
Browse...
Use regional losses
Use ARFs from file
Temporal Patterns (*_increments.csv)
Choose an ARR 2016 temporal patterns file...
Browse...
Standard area for areal temporal patterns (km²):
None selected
IFD data
Choose BoM IFD file...
Browse...
View/edit IFD data
Simulation details
Simulation type:
Single storm
Extract MC Hydrographs
Group batch results by:
AEP
or by
Duration
Select AEP:
to
Select duration:
to
No. time incs to be modelled:
200
Temporal pattern details
Select patterns for deterministic runs
Filter Embedded Burst?
Filtered Temporal Patterns Output File (MC)
Spatial pattern details
Non-uniform pat.?
Edit Pattern
Pre-Burst
Apply Pre-burst
Edit pre-burst
Loss Factor details
Constant losses
Variable losses
AEP factors
Duration factors
Areal Reduction Factor details
Edit Coeff.
Replace total catchment area with value of
0.00
km²
Output directory
\\Mac\Dropbox\Projects\N639-Rail\RORB course Aug 21-2\Exercises\Day 1
Browse ...
Cancel
Help
OK


Design Rainfall Specification (ARR2016)
Data Hub files
Main Data Hub file (*.txt, contains ARFs and losses)
Choose an ARR 2016 file...
Browse...
Use regional losses
Use ARFs from file
Temporal Patterns (*_increments.csv)
Choose an ARR 2016 temporal patterns file...
Browse...
Standard area for areal temporal patterns (km²):
None selected
IFD data
Choose BoM IFD file...
Browse...
View/edit IFD data
Simulation details
Simulation type:
Single storm
Extract MC Hydrographs
Group batch results by:
AEP
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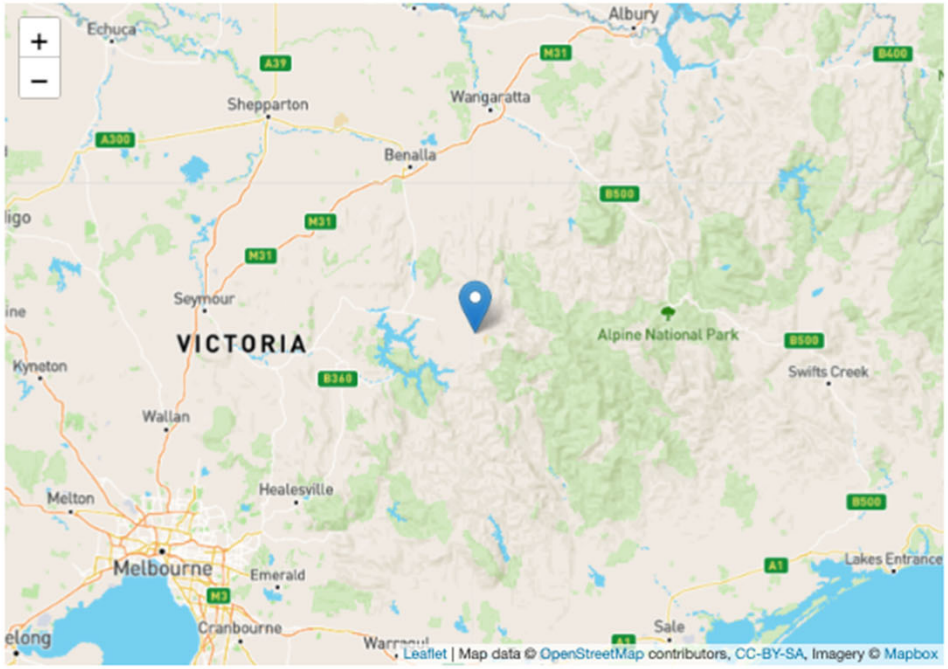
Duration
Select AEP:
to
Select duration:
to
No. time incs to be modelled:
200
Temporal pattern details
Select patterns for deterministic runs
Filter Embedded Burst?
Filtered Temporal Patterns Output File (MC)
Spatial pattern details
Non-uniform pat.?
Edit Pattern
Pre-Burst
Apply Pre-burst
Edit pre-burst
Loss Factor details
Constant losses
Variable losses
AEP factors
Duration factors
Areal Reduction Factor details
Edit Coeff.
Replace total catchment area with value of
0.00
km²
Output directory
\\Mac\Dropbox\Projects\N639-Rail\RORB course Aug 21-2\Exercises\Day 1
Browse ...
Cancel
Help
OK

Home About Limitations Changelog Publications Jurisdiction Specifics

Australian Rainfall & Runoff Data Hub - Results

Input Data

Longitude	146.26
Latitude	-37.1
Selected Regions (clear)	
ARF Parameters	show



Areal Reduction Factor: Converts the rainfall intensity as measured at a rain gauge (0.01 m^2), to the rainfall intensity suitable for a catchment (10^6 m^2)

Data

ARF Parameters

$$ARF = Min\left\{1, \left[1 - a\left(Area^{b} - c\log_{10}Duration\right)Duration^{-d} + eArea^{f}Duration^{g}\left(0.3 + \log_{10}AEP\right) + h10^{iArea\frac{Duration}{1440}}\left(0.3 + \log_{10}AEP\right)\right]\right\}$$

Zone	a	b	c	d	e	f	g	h	i
Southern Temperate	0.158	0.276	0.372	0.315	0.000141	0.41	0.15	0.01	-0.0027

Layer Info

Time Accessed	14 March 2023 04:53PM
Version	2016_v1

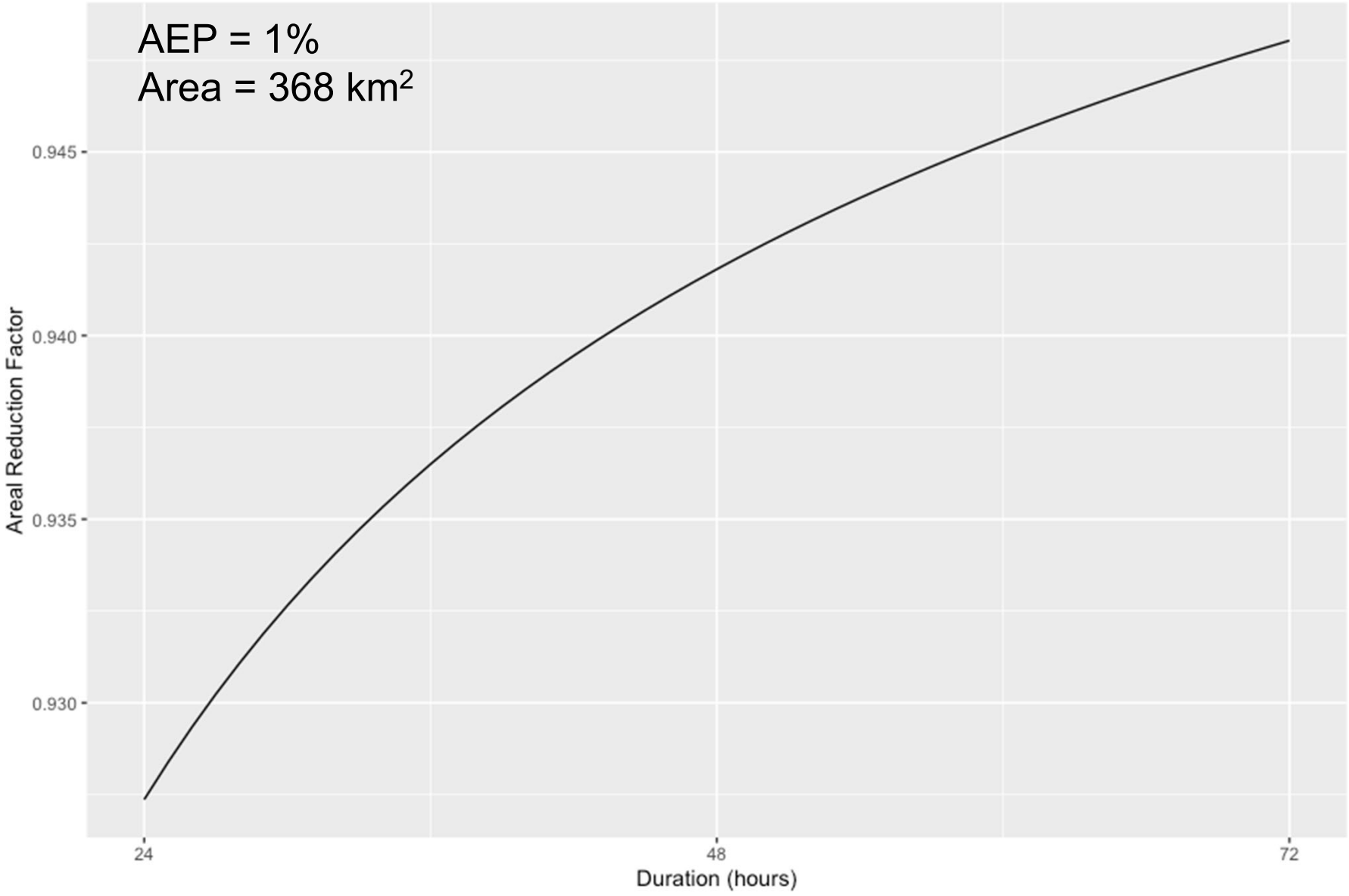
Function of duration, AEP and catchment area

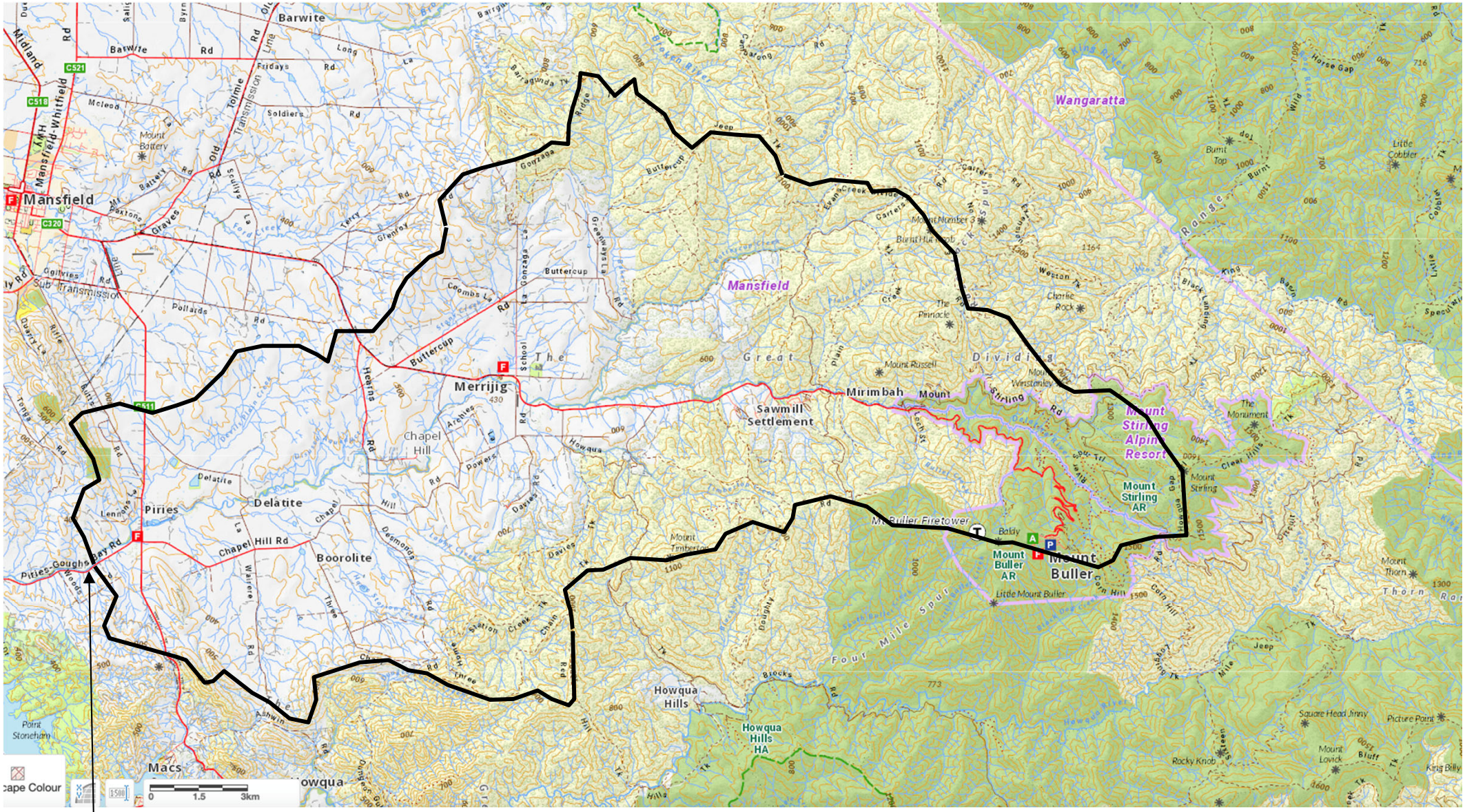
Short Duration ARF

$$ARF = Min\left[1, 1 - 0.287\left(Area^{0.265} - 0.439\log_{10}(Duration)\right).Duration^{-0.36} + 2.26\ \text{x}\ 10^{-3}\ \text{x}\ Area^{0.226}.Duration^{0.125}\left(0.3 + \log_{10}(AEP)\right) + 0.0141\ \text{x}\ Area^{0.213}\ \text{x}\ 10^{-0.021\frac{(Duration-180)^2}{1440}}\left(0.3 + \log_{10}(AEP)\right)\right]$$

Download TXT | Download JSON | Generating PDF...

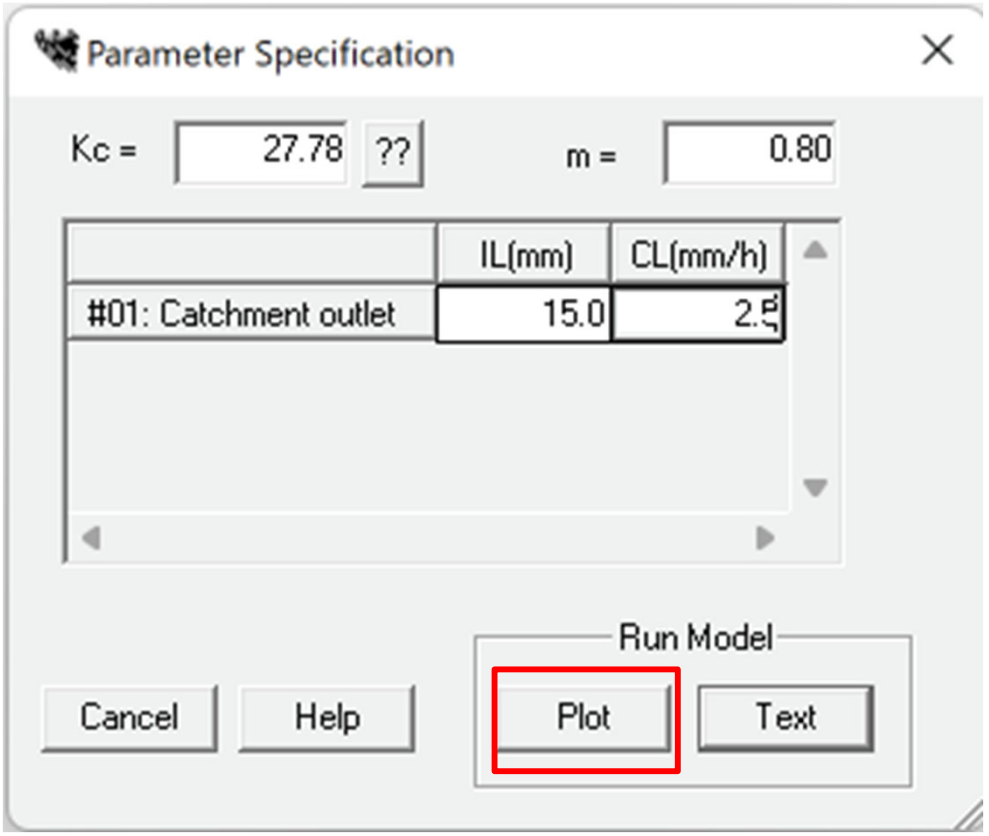
Areal Reduction Factor





Catchment area = 368 km^2

Other things we need



Routing parameters:

- Kc
- M

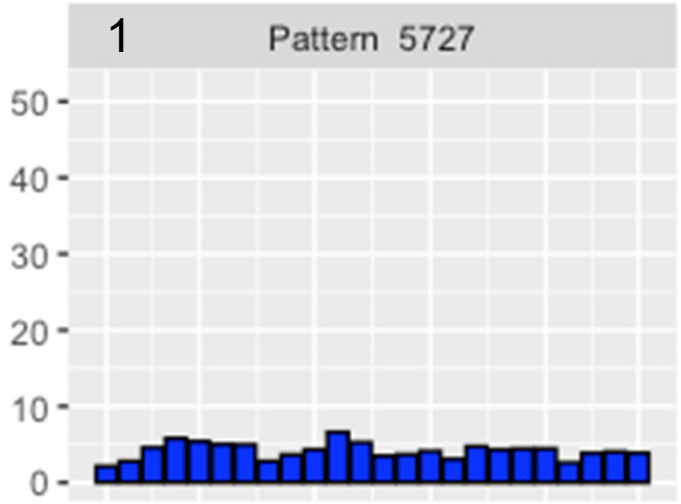
(Calibration or literature values.
RORB will suggest suitable values)

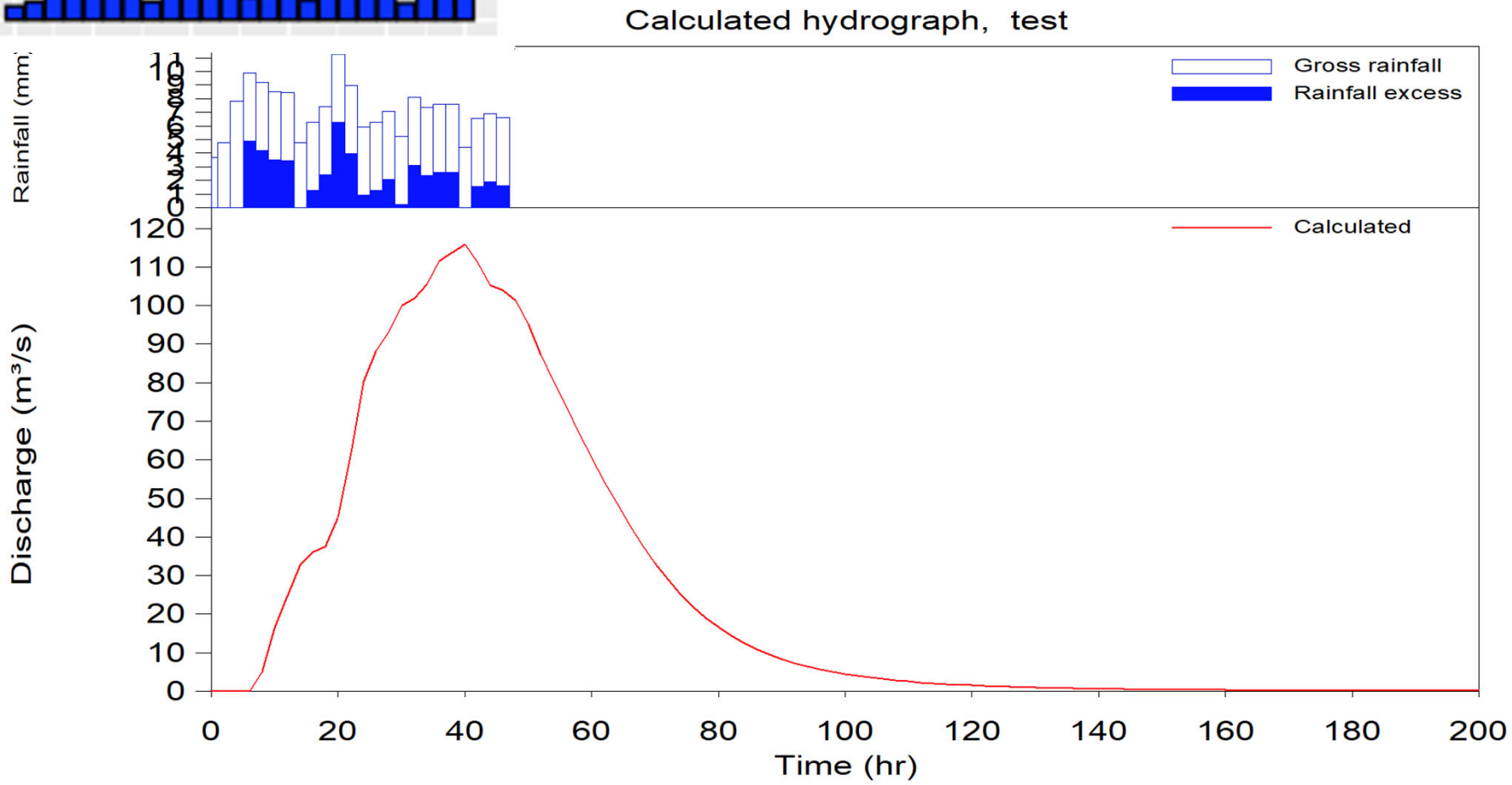
Losses

- Initial loss (IL) (mm)
- Continuing loss (CL) (mm/h)

(Data hub or other studies)

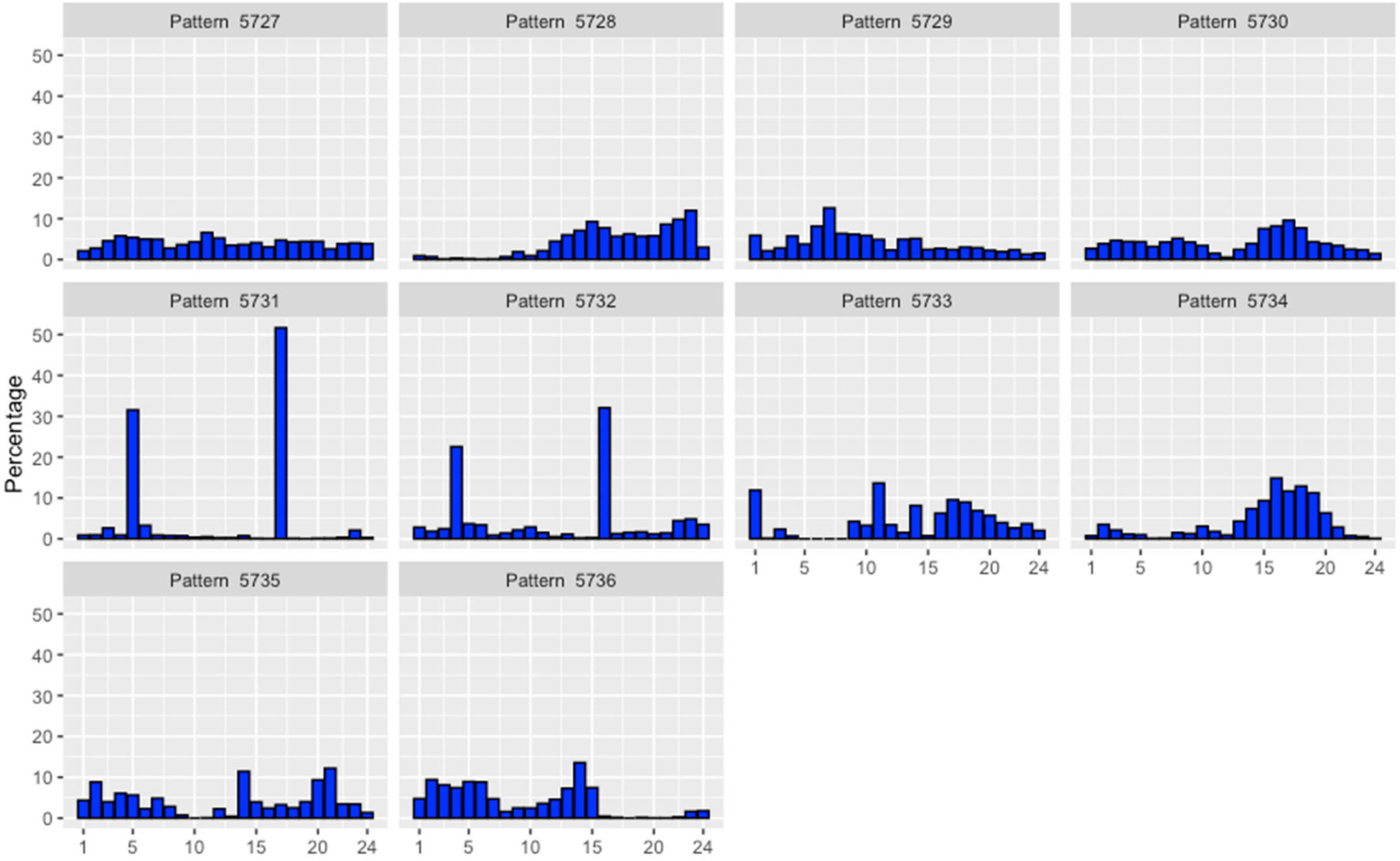
ΞP rainfall, single pattern



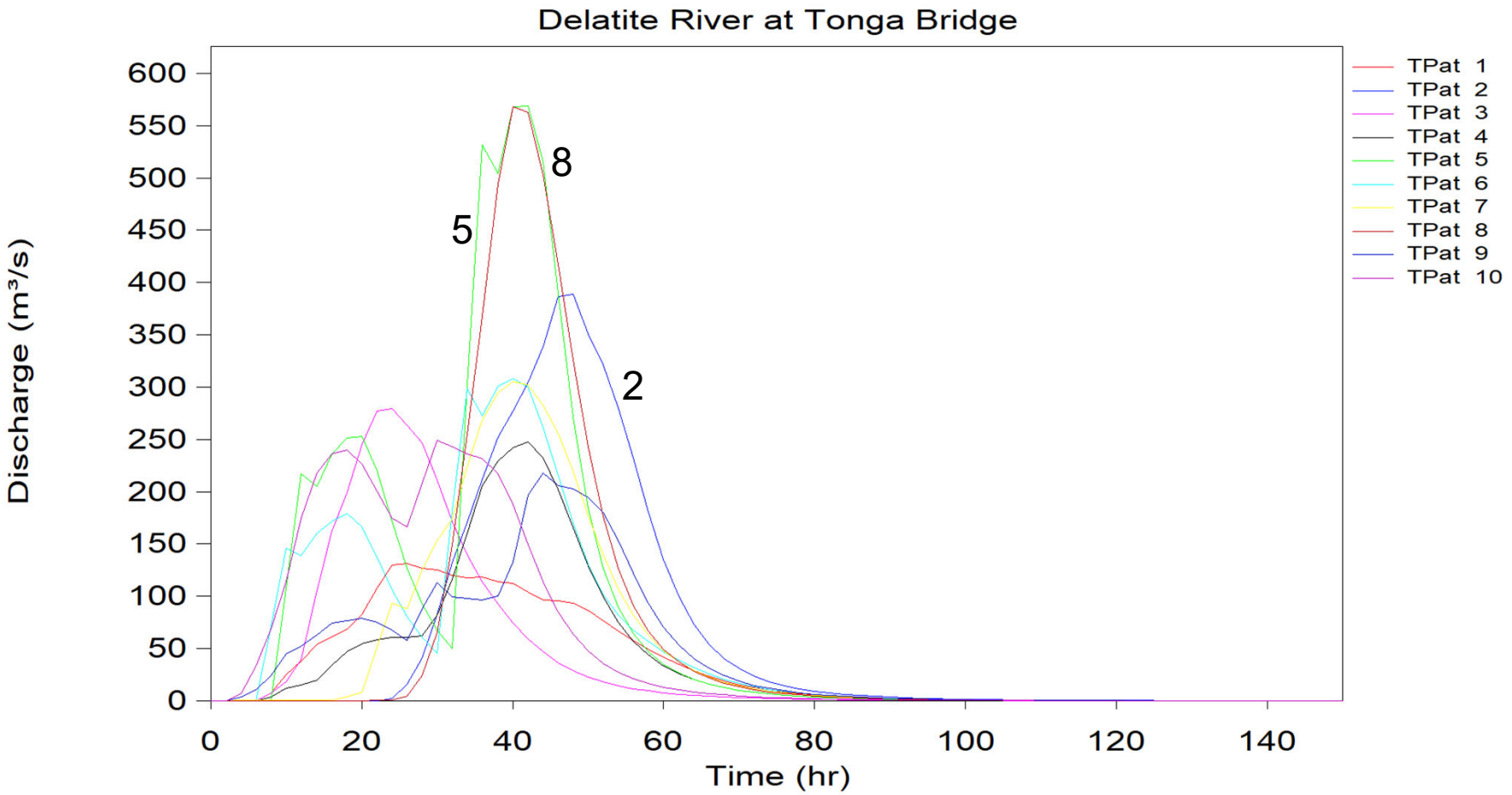


Rainfall temporal patterns

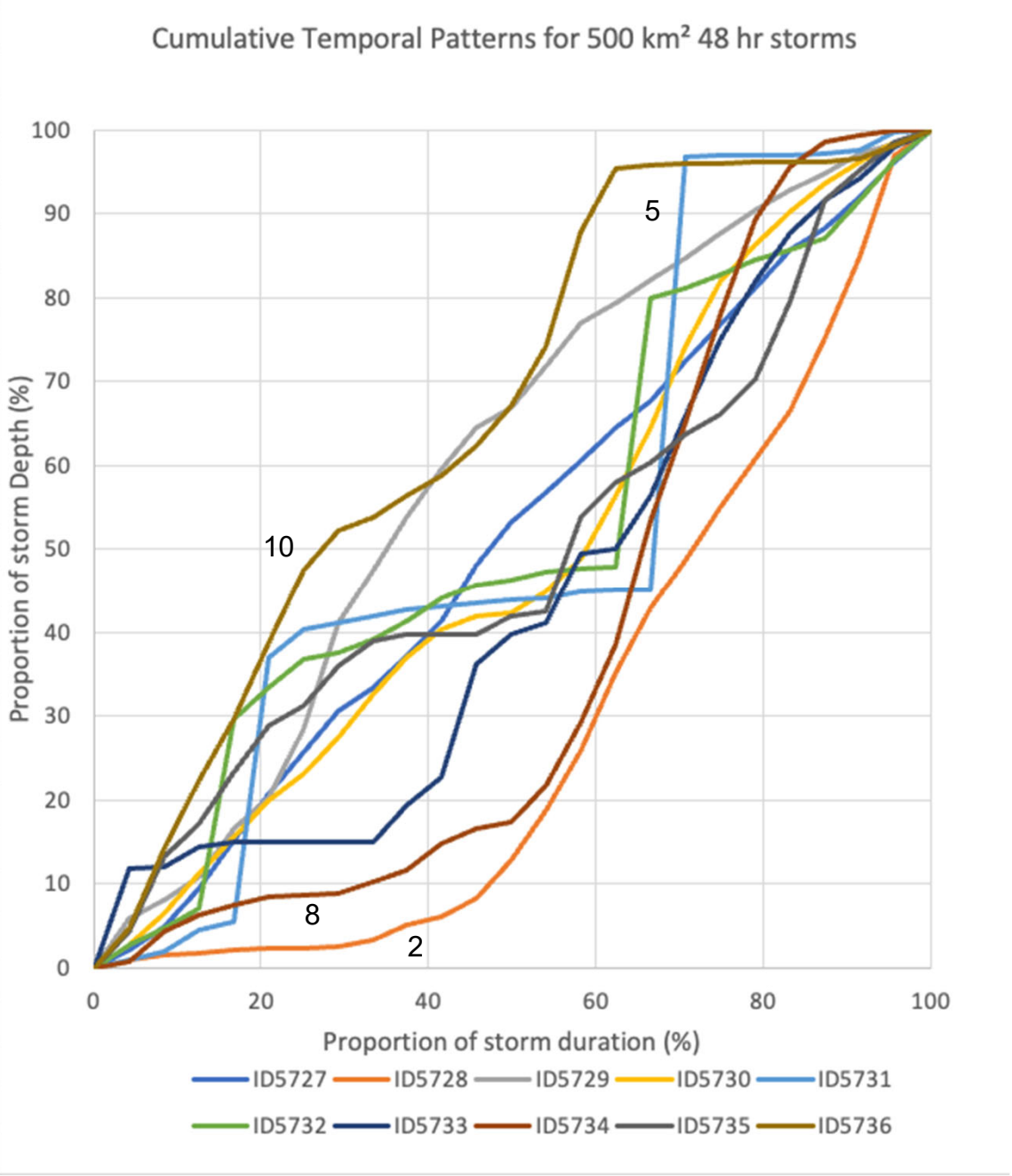
Region = Murray Basin, Duration = 48 hours, Area = 500 km-squared

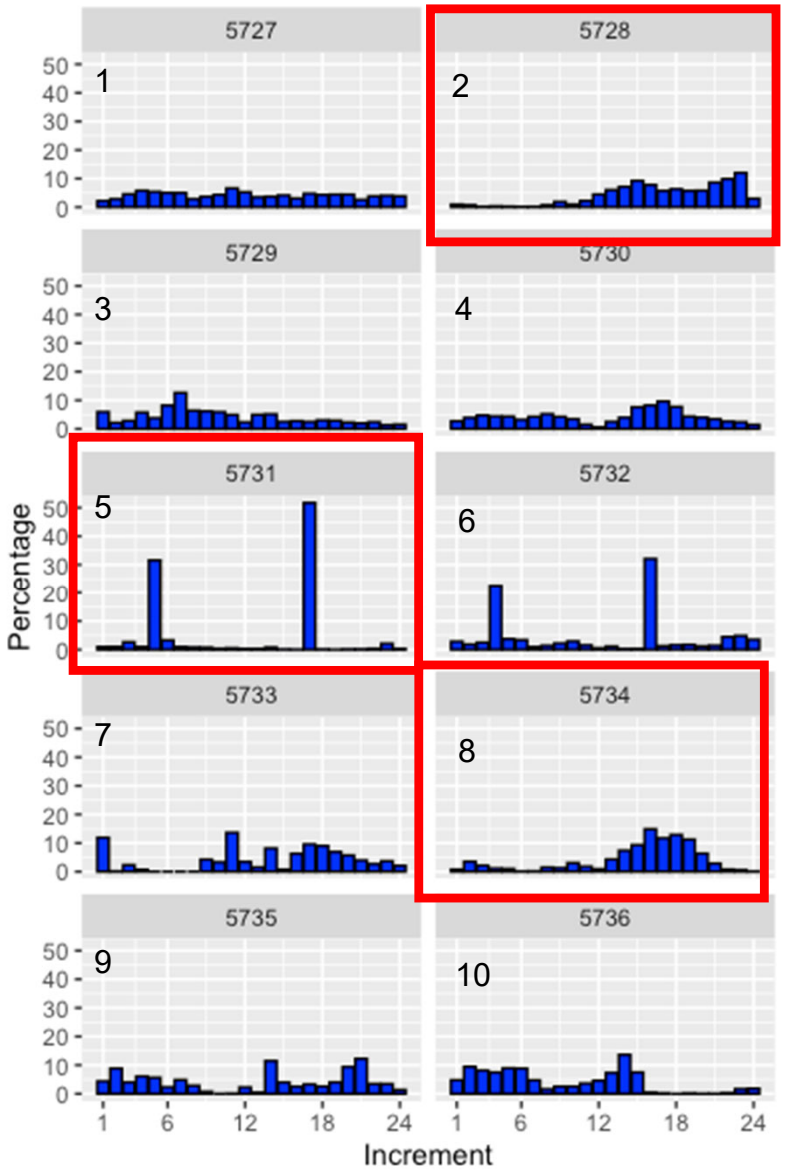


48 hour, 1% AEP rainfall, 10 rainfall temporal patterns

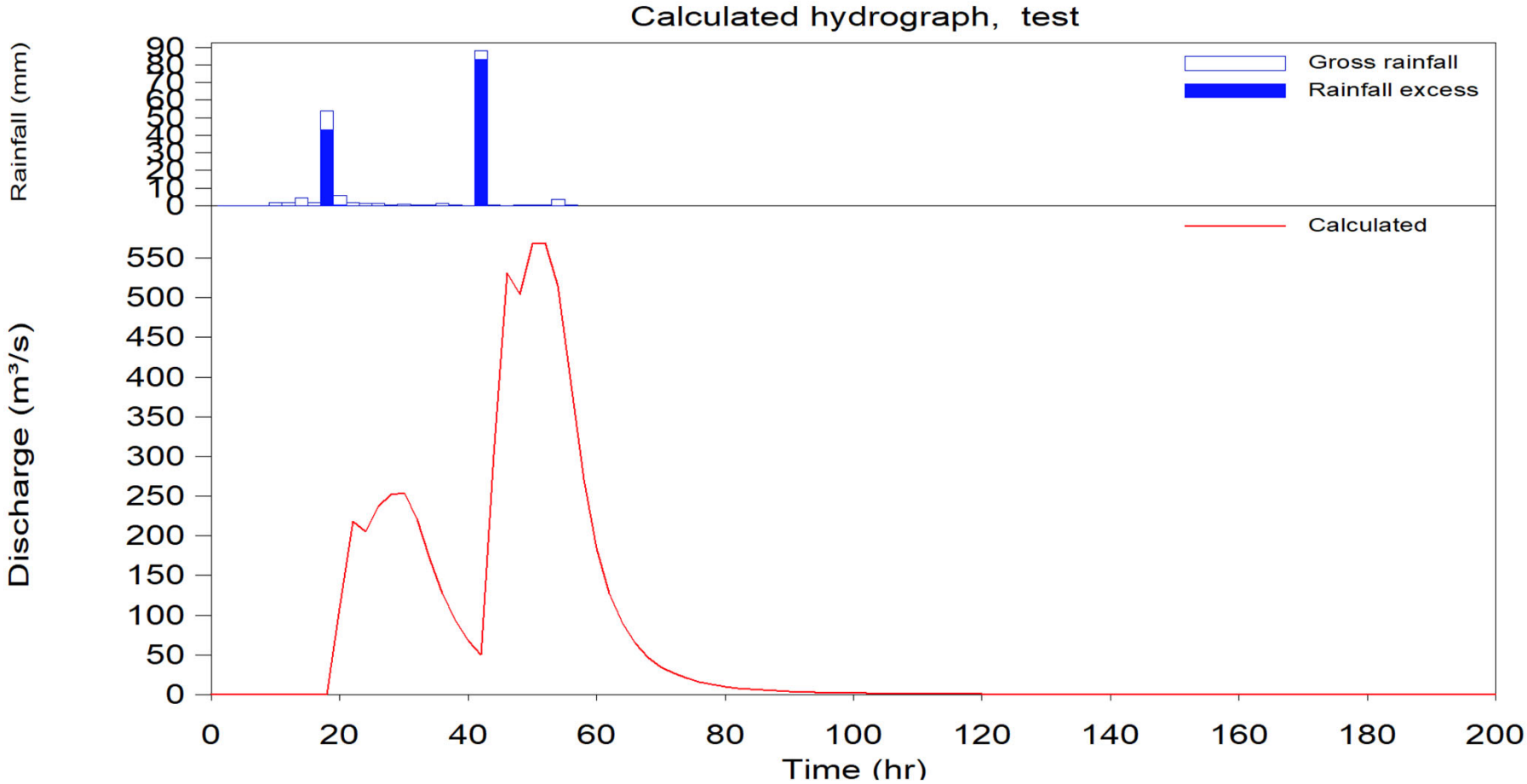


IL = 15, CL = 2.5


Cumulative Temporal Patterns for 500 km² 48 hr storms
Proportion of storm Depth (%)
Proportion of storm duration (%)
0
10
20
30
40
50
60
70
80
90
100
5
10
8
2
ID5727
ID5728
ID5729
ID5730
ID5731
ID5732
ID5733
ID5734
ID5735
ID5736


5727
5728
5729
5730
5731
5732
5733
5734
5735
5736
1
2
3
4
5
6
7
8
9
10
Percentage
Increment
1
6
12
18
24

Pattern 5


Calculated hydrograph, test
Rainfall (mm)
Gross rainfall
Rainfall excess
Calculated
Discharge (m³/s)
0
50
100
150
200
250
300
350
400
450
500
550
0
20
40
60
80
100
120
140
160
180
200
Time (hr)

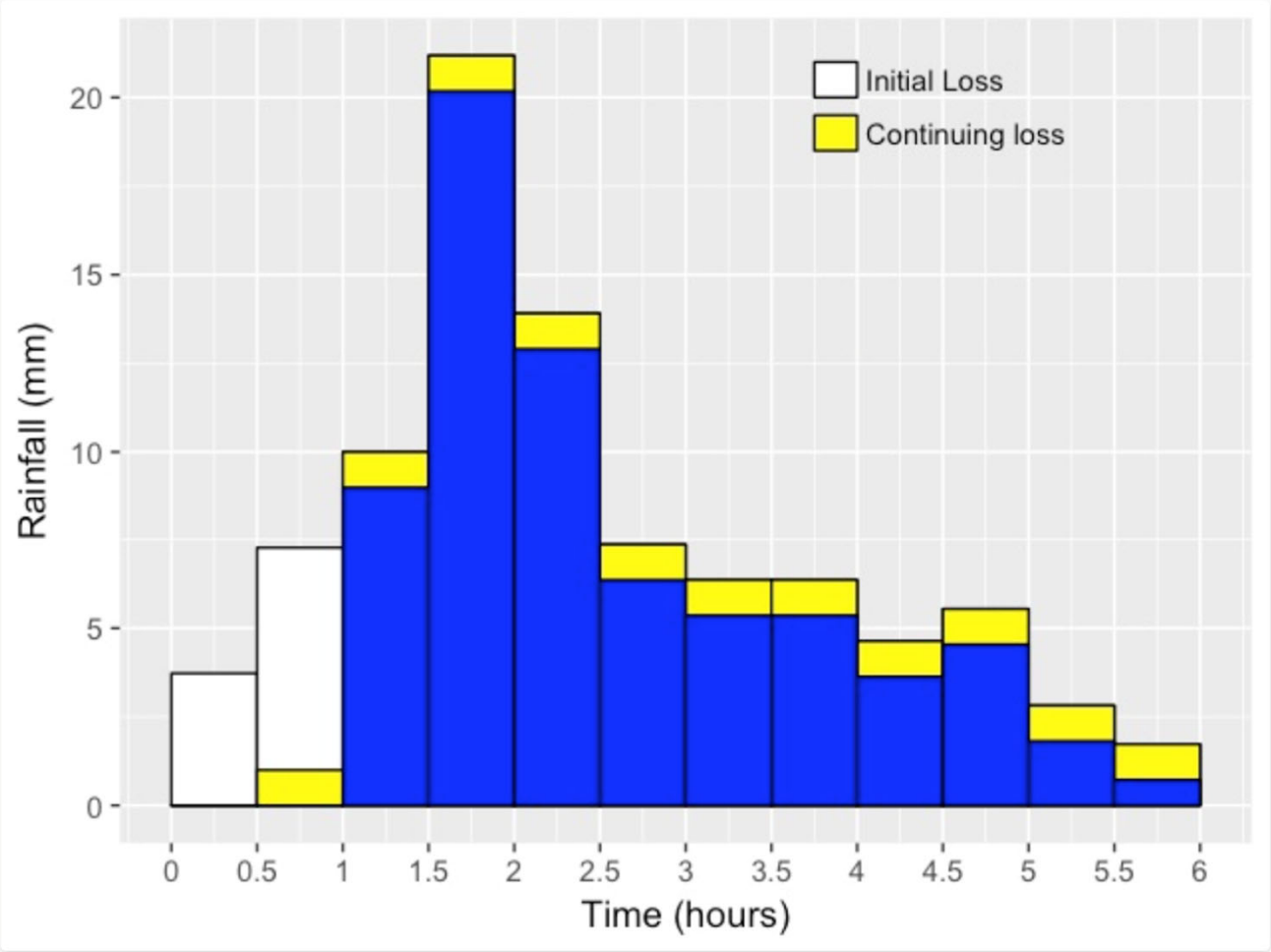
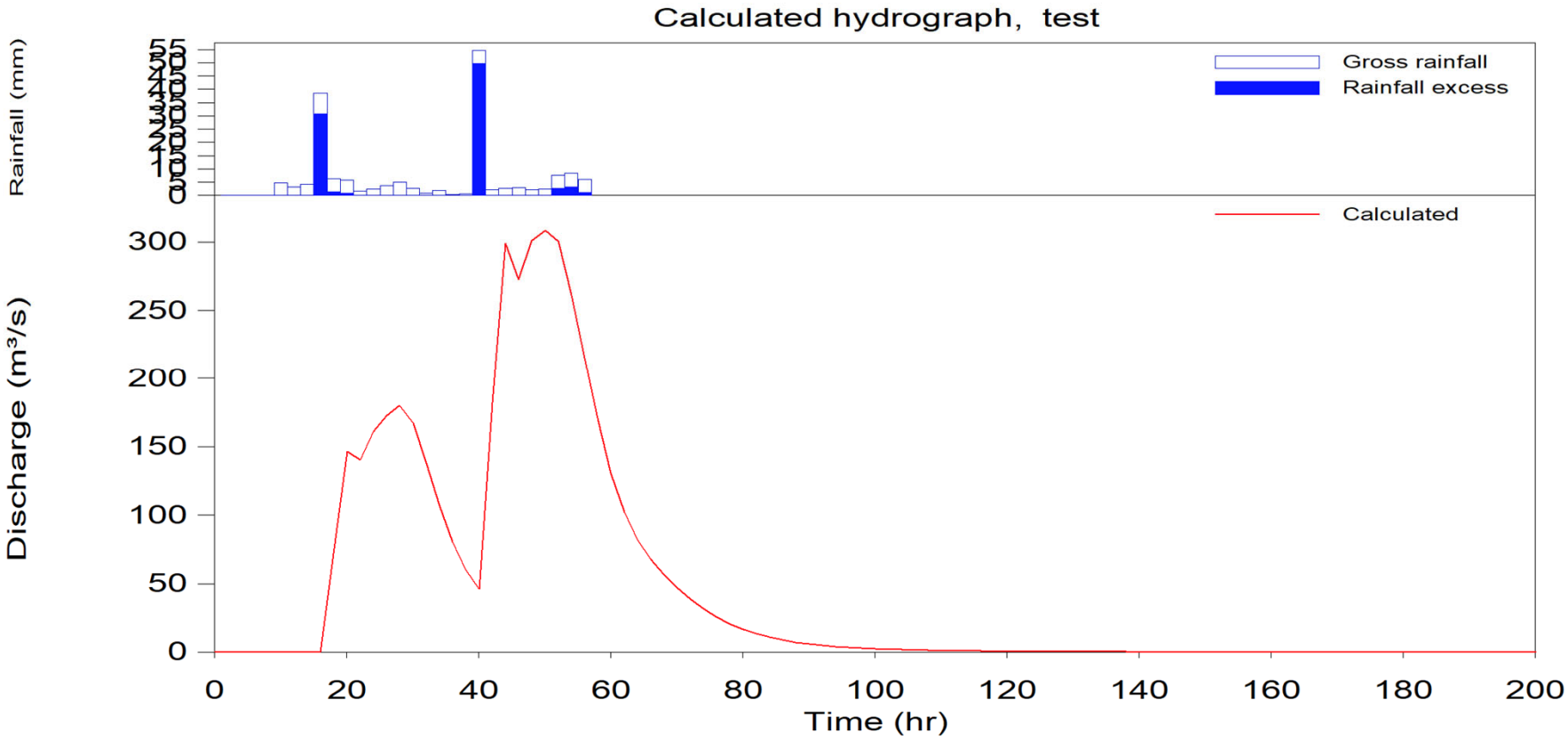
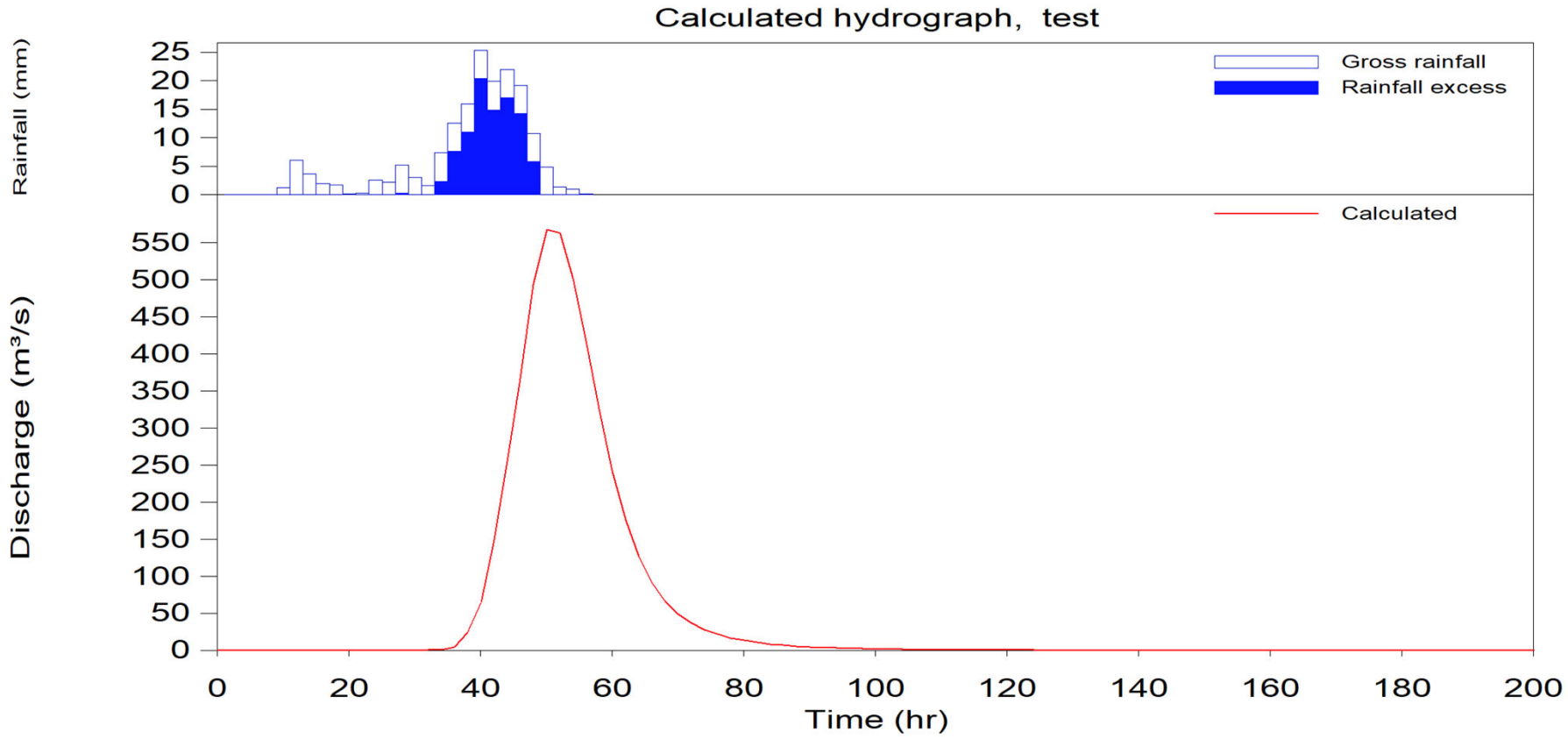


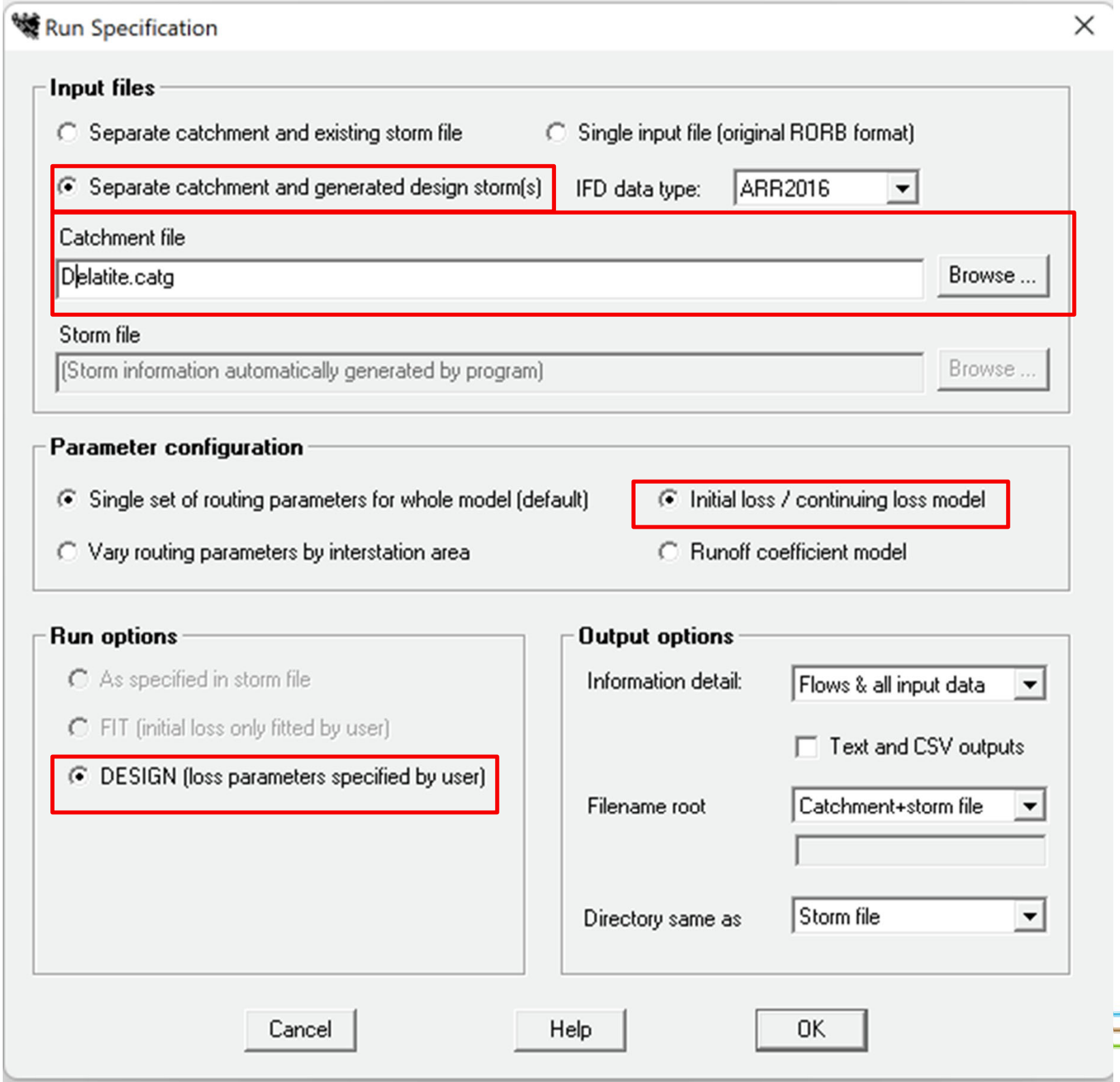
Figure 2: Rainfall excess hyetograph

Remove the initial loss at the start of the storm

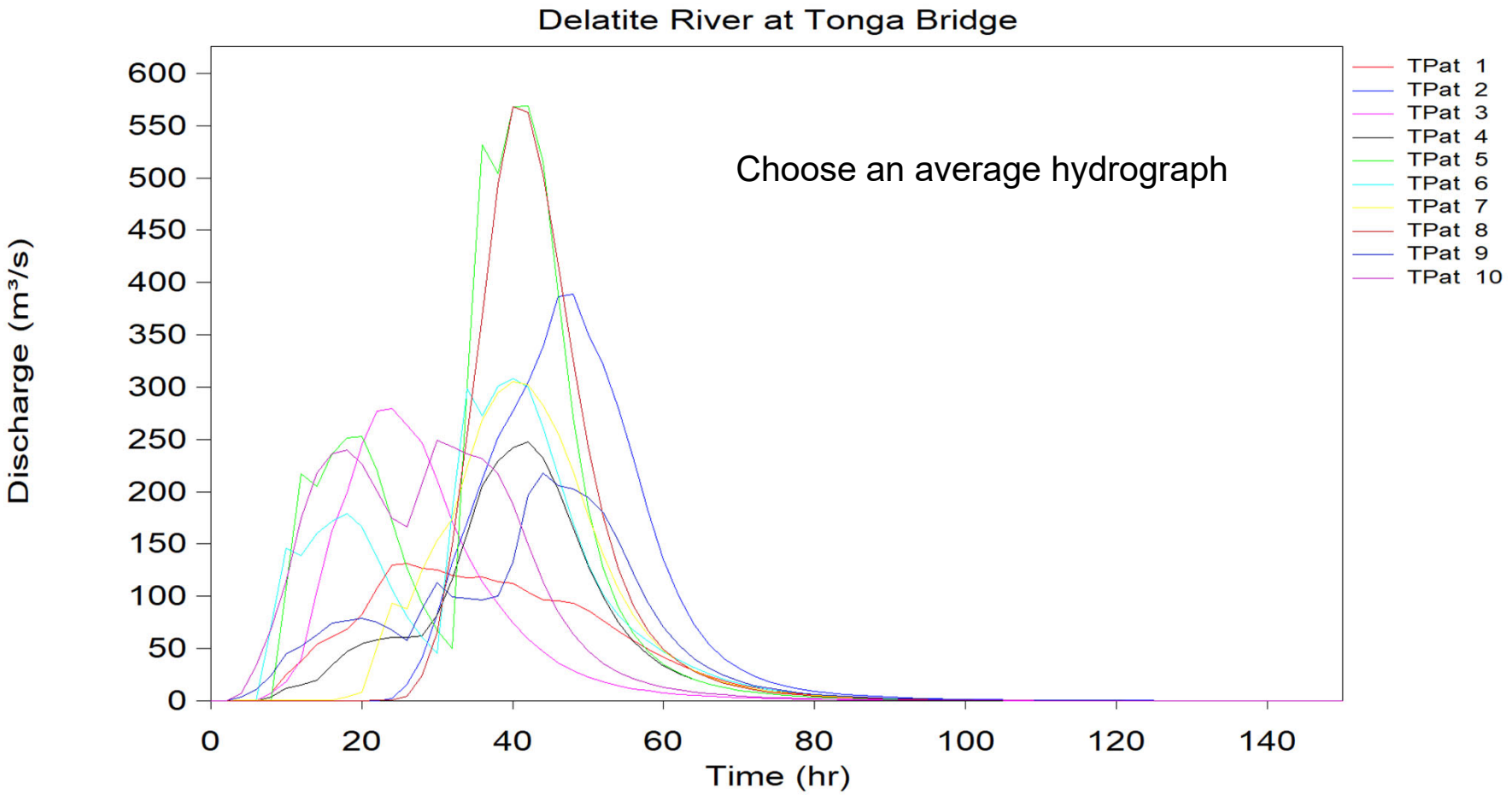
Remove the continuing loss for every time step once the initial loss is satisfied


Calculated hydrograph, test
Rainfall (mm)
Gross rainfall
Rainfall excess
Calculated
Discharge (m³/s)
0
50
100
150
200
250
300
0
20
40
60
80
100
120
140
160
180
200
Time (hr)


Calculated hydrograph, test
Rainfall (mm)
25
20
15
10
5
0
Gross rainfall
Rainfall excess
Calculated
Discharge (m³/s)
550
500
450
400
350
300
250
200
150
100
50
0
0
20
40
60
80
100
120
140
160
180
200
Time (hr)


Run Specification
Input files
Separate catchment and existing storm file
Single input file (original RORB format)
Separate catchment and generated design storm(s)
IFD data type:
ARR2016
Catchment file
Delatite.catg
Browse ...
Storm file
(Storm information automatically generated by program)
Browse ...
Parameter configuration
Single set of routing parameters for whole model (default)
Initial loss / continuing loss model
Vary routing parameters by interstation area
Runoff coefficient model
Run options
As specified in storm file
FIT (initial loss only fitted by user)
DESIGN (loss parameters specified by user)
Output options
Information detail:
Flows & all input data
Text and CSV outputs
Filename root
Catchment+storm file
Directory same as
Storm file
Cancel
Help
OK

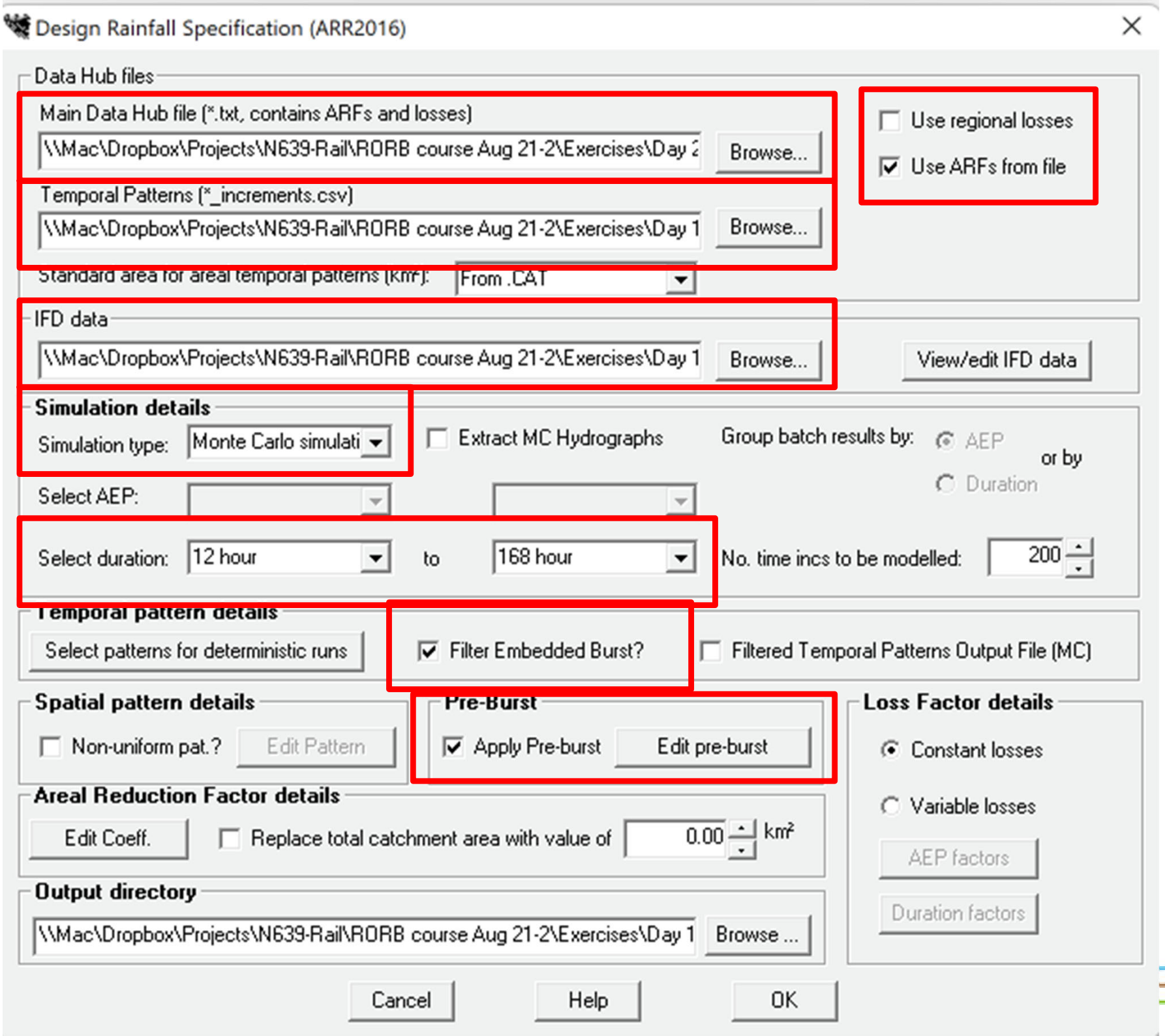
48 hour, 1% AEP rainfall, 10 rainfall temporal patterns

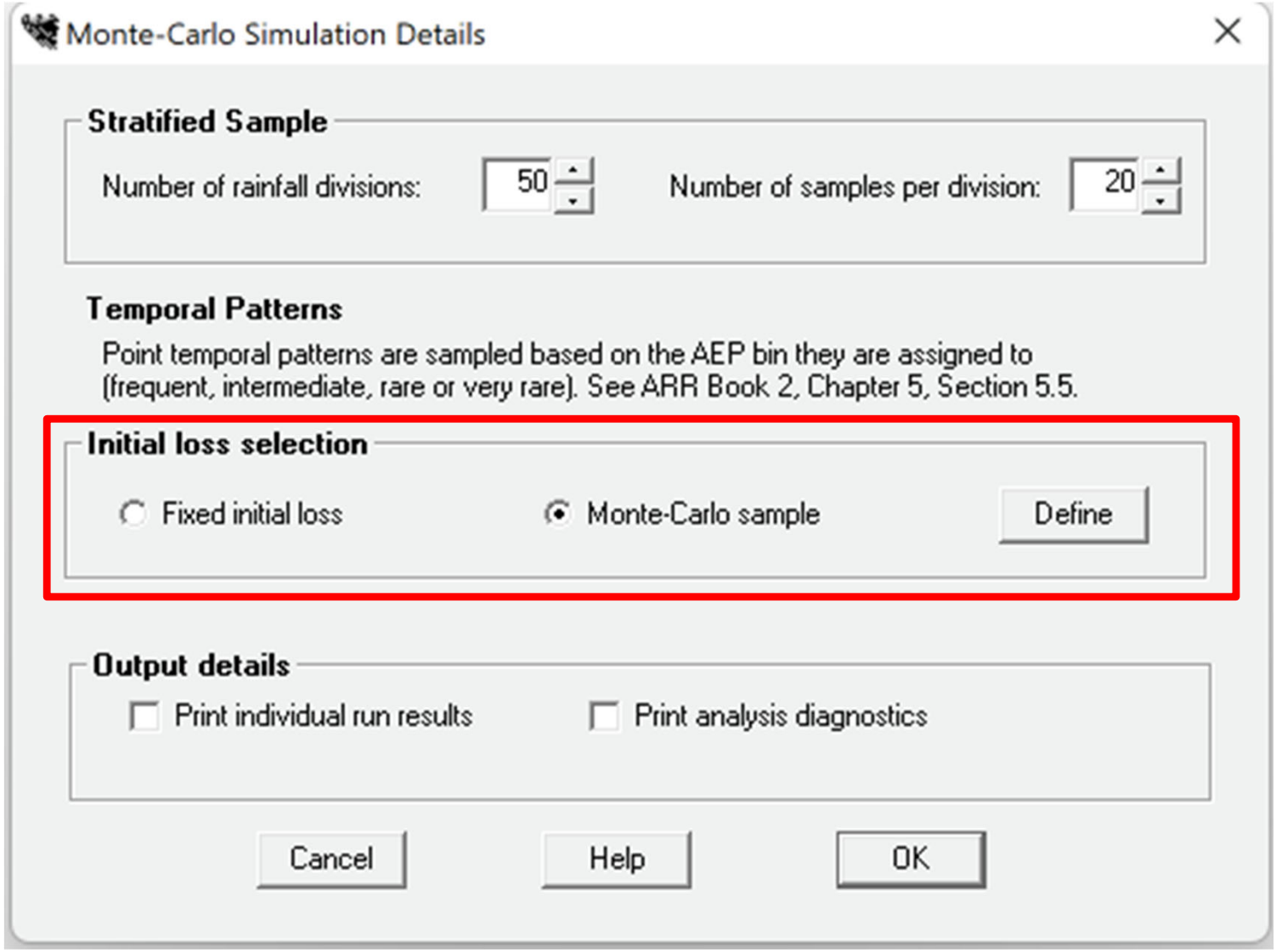


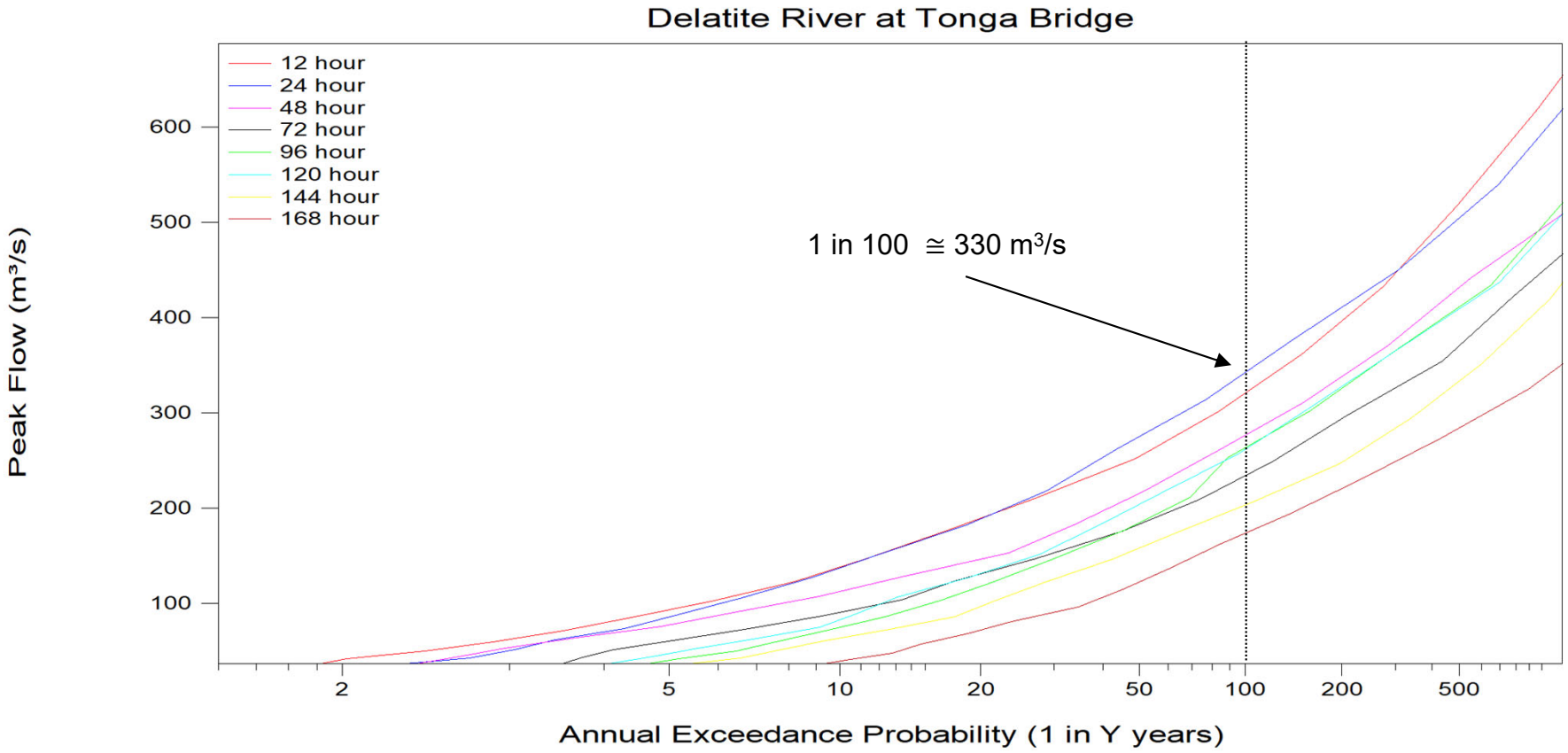
IL = 15, CL = 2.5

Monte Carlo

- Sample:
  - Rainfall depth
  - Temporal Pattern
  - Initial Loss
  - Duration


Design Rainfall Specification (ARR2016)
Data Hub files
Main Data Hub file (*.txt, contains ARFs and losses)
\\Mac\Dropbox\Projects\N639-Rail\RORB course Aug 21-2\Exercises\Day 2
Browse...
Use regional losses
Use ARFs from file
Temporal Patterns (*_increments.csv)
\\Mac\Dropbox\Projects\N639-Rail\RORB course Aug 21-2\Exercises\Day 1
Browse...
Standard area for areal temporal patterns (km²):
From .CAT
IFD data
\\Mac\Dropbox\Projects\N639-Rail\RORB course Aug 21-2\Exercises\Day 1
Browse...
View/edit IFD data
Simulation details
Simulation type:
Monte Carlo simulati
Extract MC Hydrographs
Group batch results by:
AEP
or by
Duration
Select AEP:
Select duration:
12 hour
to
168 hour
No. time incs to be modelled:
200
Temporal pattern details
Select patterns for deterministic runs
Filter Embedded Burst?
Filtered Temporal Patterns Output File (MC)
Spatial pattern details
Non-uniform pat.?
Edit Pattern
Pre-Burst
Apply Pre-burst
Edit pre-burst
Loss Factor details
Constant losses
Variable losses
AEP factors
Duration factors
Areal Reduction Factor details
Edit Coeff.
Replace total catchment area with value of
0.00
km²
Output directory
\\Mac\Dropbox\Projects\N639-Rail\RORB course Aug 21-2\Exercises\Day 1
Browse ...
Cancel
Help
OK


Monte-Carlo Simulation Details
Stratified Sample
Number of rainfall divisions:
50
Number of samples per division:
20
Temporal Patterns
Point temporal patterns are sampled based on the AEP bin they are assigned to (frequent, intermediate, rare or very rare). See ARR Book 2, Chapter 5, Section 5.5.
Initial loss selection
Fixed initial loss
Monte-Carlo sample
Define
Output details
Print individual run results
Print analysis diagnostics
Cancel
Help
OK


Delatite River at Tonga Bridge
12 hour
24 hour
48 hour
72 hour
96 hour
120 hour
144 hour
168 hour
1 in 100 ≅ 330 m³/s
Peak Flow (m³/s)
600
500
400
300
200
100
2
5
10
20
50
100
200
500
Annual Exceedance Probability (1 in Y years)

DELATITE RIVER @ TONGA BRIDGE

Station number	405214
Latitude	-37.16
Longitude	146.11
Data owner	VIC - Department of Environment, Land, Water and Planning

Watercourse discharge

- Time series explorer
- Period of record summary
- Quality and gap summary
- Daily data summary
- Monthly data summary
- Yearly data summary
- Monthly mean statistical analysis
- Yearly statistical analysis
- Ratings and gaugings
- Duration curve
- Flood frequency analysis
- Difference from mean analysis

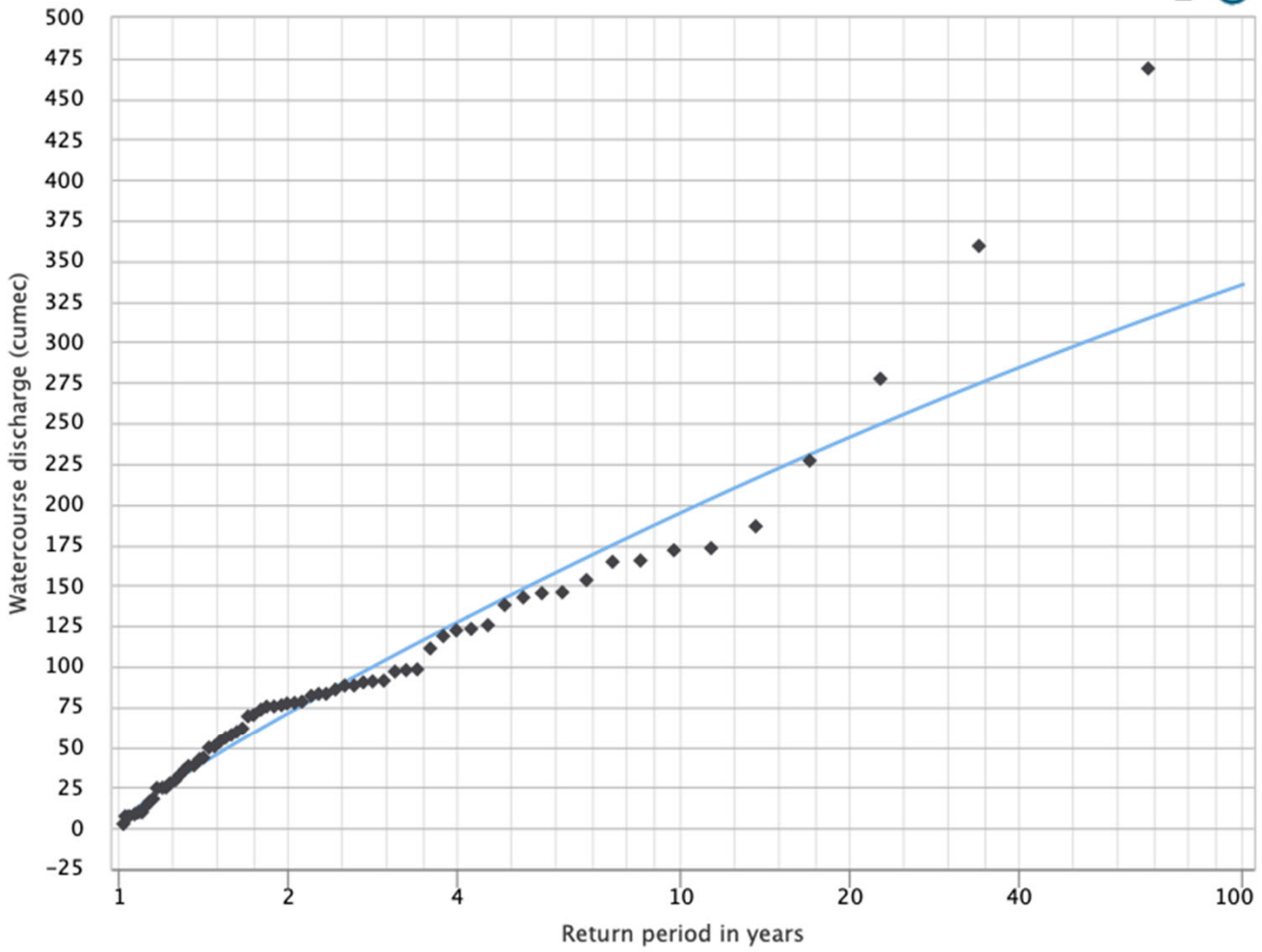
Watercourse level

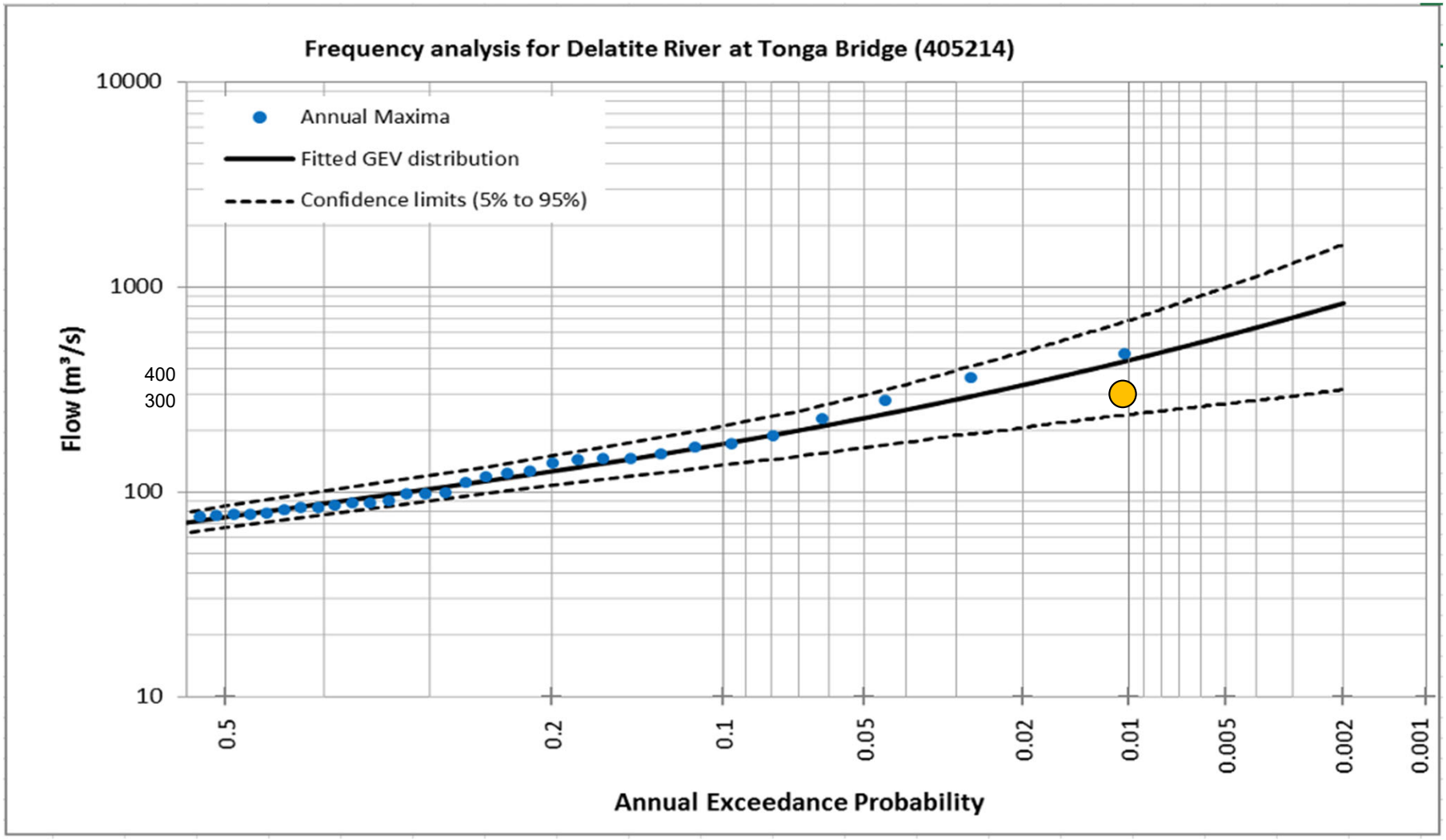
Rainfall

Data download

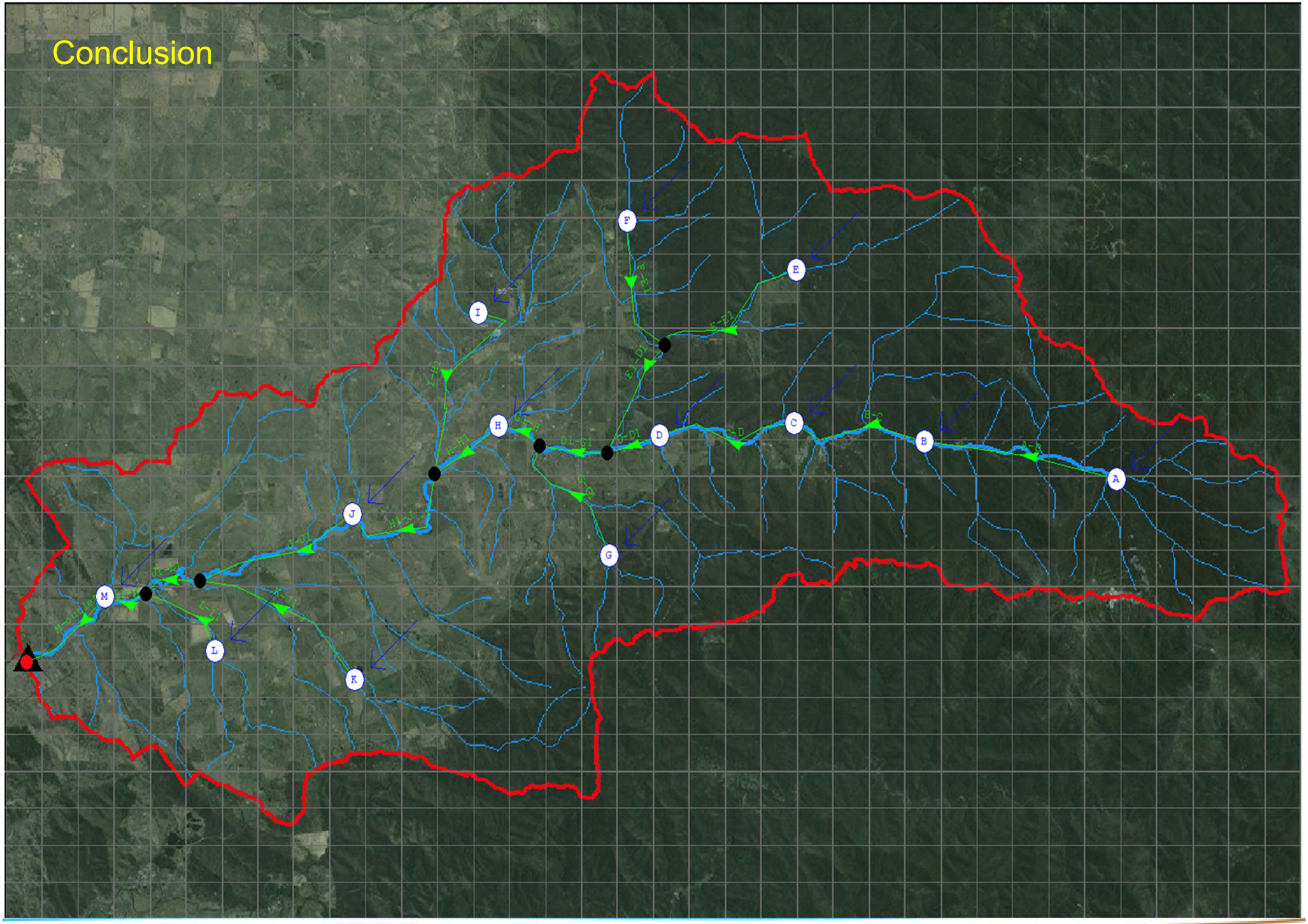
Flood frequency analysis

Function Pearson Log.3




Frequency analysis for Delatite River at Tonga Bridge (405214)
Annual Maxima
Fitted GEV distribution
Confidence limits (5% to 95%)
Flow (m³/s)
10000
1000
400
300
100
10
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
0.001
Annual Exceedance Probability

Conclusion



What's next?

Courses:

- Live Course: RORB essentials for water modelling

- On-demand: ARR Training Series
- Especially: ARR Course #5: Design Estimation (included in the RORB course fee)

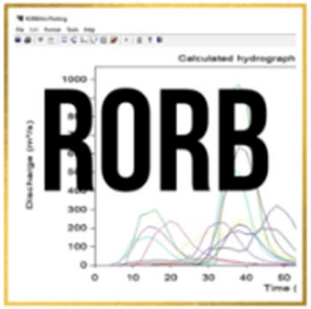
- On-demand: Hydrology and Hydraulics Essentials Series
- Especially: Stochastic hydrology, #4 H&H Essentials;
- Flow routing, #3 H&H Essentials; Infiltration and losses, #2 H&H Essentials
- On-demand: HEC-HMS Essentials

Free Webinars:

- What's new with Australian Rainfall and Runoff 2019: https://youtu.be/YIcYIYtiDW8
- Australian Rainfall Runoff ARR Essentials: https://youtu.be/hsTjFBkdInE- Probable Maximum Flood (PMF): https://youtu.be/0etZZ7M3nAQ

- Panel Event: Australian Rainfall and Runoff – to the extreme! https://youtu.be/Nb03NF91Okw
- Fitting the curve: https://youtu.be/ekduoQrOU2o
- Manning equation in hydraulic modelling: https://youtu.be/JhIPDFwA5UU

Live Course: RORB essentials for water modelling



Pre-course webinar 15th Mar - register today

Using RORB to model general runoff and streamflow routing from rainfall and other channel inputs

(Course code: LC-23-2-073)

This course is focused on getting started with RORB and building attendees' understanding so that they can take on more advanced topics.
This two-session live online course also incorporates the material covered in AWS's On-demand ARR Course 5: Design Estimation. The principles of Design Estimation will be introduced in the first session of RORB essentials, and discussed further in the second live session.

Further course details below.

Date: Thursday, 20 April 2023 - Thursday, 18 May 2023

Time: 10:00am (Australia/Sydney; find your local time)

Location: Online

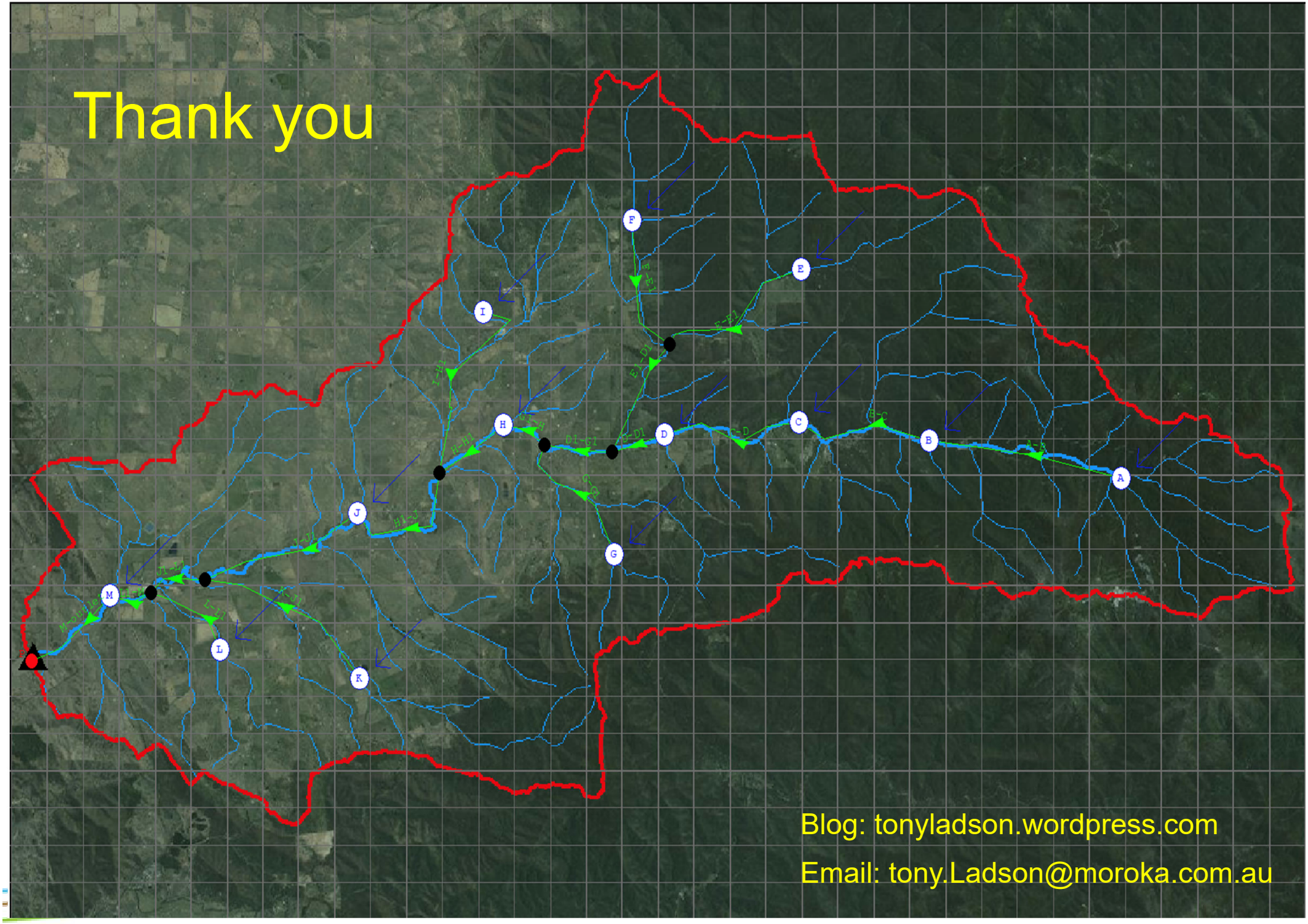
Format: x2, 2 hour live interactive sessions + ARR On-demand Course 5 (3hrs); live recordings available post session

Cost: Early bird rate - AUD$495.00 (INC GST) closes 20th March 2023
Enter coupon code at checkout: Early-Bird-Rate-LC-23-2-073
Standard fee $595.00 (INC GST)

Contact: training@awschool.com.au

Register Print Share

Thank you



Blog: tonyladson.wordpress.com

Email: tony.Ladson@moroka.com.au