NSW GOVERNMENT

Manly Hydraulics Laboratory

NSW COASTAL FLOOD SUMMARY
March 2021

Report MHL2809
July 2021

Prepared for:

NSW GOVERNMENT | Planning, Industry & Environment

Biodiversity and Conservation Division

Additional data provided by:

Australian Government Bureau of Meteorology

clarence VALLEY COUNCIL

KEMPSEY Shire Council

NAMBUCCA VALLEY NAMBUCCA SHIRE COUNCIL

PORT MACQUARIE HASTINGS

Sydney WATER

WaterNSW

Department of Planning, Industry and Environment

Cover photograph: Hawkesbury River at Sackville, 23 March 2021

NSW COASTAL FLOOD SUMMARY
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Document control

Issue/ Revision	Author	Reviewer	Approved for issue	
			Name	Date
Draft	V Jiang B Tse C Chin	S Dakin	A Joyner	31 May 2021
Draft Ver. 2	V Jiang B Tse C Chin	Martin Fitzhenry (DPIE) Ainslie Frazer (DPIE) Stephen Yeo (Infrastructure NSW)	B. McPherson	28 June 2021
Final	B Tse	Ted Cutler (WaterNSW)	A Joyner	6 July 2021

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Report No. MHL2809

First published as draft in June 2021

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Foreword

New South Wales (NSW) government's specialist advisor, Manly Hydraulics Laboratory (MHL) was commissioned by Biodiversity and Conservation Division, NSW Department of Planning, Industry and Environment (DPIE) to summarise the March 2021 flood event on the coast of NSW. The areas of focus for this flood report include the Clarence River, Orara River, Nambucca River, Macleay River, Hastings and Camden Haven River, Manning River, Myall River, Paterson, Williams and Hunter River, Hawkesbury River and South Creek. DPIE manages an extensive water monitoring network in the NSW coastal zone. MHL operates and maintains the coastal water monitoring network via an annual agreement with DPIE.

Additional flood data is provided by the Bureau of Meteorology (BoM), Kempsey Shire Council, Nambucca Shire Council, Port Macquarie Hastings Council, Sydney Water, and WaterNSW.

An electronic copy of this report can be downloaded at www.mhl.nsw.gov.au.

Please note that in some cases the data presented in this report have had preliminary MHL data checks only and are not quality controlled to a specified error margin. Further data sourced from the BoM, WaterNSW and local councils are not quality reviewed.

This report presents only a subset (selected stations per region) of all the stations managed by each of the agencies and councils mentioned.

Quality controlled data for MHL maintained stations can be supplied through data request to MHL once post flood event status checks have been conducted. Water level values in this report are reported to 2 decimal places, which is not necessarily an indication of accuracy. Data are excluded from this report if preliminary checks show an issue or if advised by the data custodian. The data for DPIE, Sydney Water and WaterNSW stations are presented as 15 minute time series data, while all other data is event based. Data received from the BoM have been adjusted from Australian Eastern Daylight Time (AEDT), such that all data in this report are presented in Australian Eastern Standard Time (AEST).

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Executive summary

In March 2021, the east coast of NSW experienced extreme multi-day rainfall and significant flooding from 17 to 26 March 2021. This was the result of a blocking high pressure system in the Tasman Sea and a low-pressure system off north-west Australia in the Timor Sea feeding a large volume of moist tropical air into eastern Australia. Major flooding occurred on numerous rivers including the Clarence, Orara, Nambucca, Hastings and Camden Haven, Manning, Paterson and Hawkesbury-Nepean rivers. Only minor flooding occurred on the Myall River. The La Niña conditions meant antecedent soil moisture, runoff and water storage levels were higher in March 2021 than for a similar multi-day coastal rainfall event in February 2020. As a result the extent and severity of flooding was far greater in 2021 than 2020.

During the flood period, MHL staff monitored flood situations via telemetry tools and provided clients and the public with near real time access to the rainfall and water levels via customised client webpages and MHL's public webpage at www.mhl.nsw.gov.au, BoM website www.bom.gov.au/nsw/flood and NSW Government's Floods Near Me app http://floodsnearme.manly.hydraulics.works/, which displays latest recordings for water level recording stations. MHL deployed field teams to the flood-affected area to obtain flood status checks and to be available to address any system failures during the flood event. In addition, MHL's data team relayed critical information to flood response managers during the event.

During the flood event, the BoM used water level and rainfall data, quantitative precipitation forecasts and radar information to generate predicted water levels at warning locations on the flood-affected rivers. The water level predictions were used by the BoM to issue flood watches, flood warnings and severe weather warnings for heavy rain and local flooding.

This report presents a select group of wave, water level and rainfall hydrometric data collected from 05 March to 05 April 2021 along the NSW coast. This report incorporates water level and rainfall data provided by the BoM, Clarence Valley Council, Kempsey Shire Council, Nambucca Shire Council, Port Macquarie Hastings Council, Sydney Water and WaterNSW. Data presentation was undertaken by MHL for DPIE.

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1 Introduction

During the March 2021 flood event very high rainfalls were experienced on the east coast of NSW from Sydney to the Clarence River in the north. The high rainfall was generated by a strong slow moving high pressure system in the Tasman Sea, which was reinforced by a low pressure system in the Timor Sea. **Figure 1-1** and **Figure 1-2** display the mean sea level pressure (MSLP) maps showing the movement of the pressure systems over NSW from 18 to 21 March 2021. Significant rain began along parts of the NSW coast on 17 and 18 March, with heavy falls in the Port Stephens area on 18 March. The heaviest rain began on 19 March, focused on the Mid North Coast region, heavy falls extended south to the Sydney region on 21 and 22 March. Major flooding occurred on numerous rivers including the Clarence, Orara, Nambucca, Hastings and Camden Haven, Manning, Paterson and Hawkesbury-Nepean rivers. **Figure 1-3** shows the rainfall analysis map of NSW which presents the total rainfall recorded across NSW for March 2021. The highest daily totals of the event were on the Mid North Coast of NSW on 19 and 20 March.

Figure 1-4 to **Figure 1-6** present wind roses for Grafton Research Station (058077), Kempsey (059007), Taree Airport (060141), Maitland Airport (061428) and Richmond RAAF (067105) automatic weather stations (AWS) for 5 March to 5 April 2021. At Taree Airport the average of the maximum wind gust speeds over the peak of the event (18-21 March 2021) was 50 km/h.

During the flood event, the monitoring networks of water level recorders and rainfall gauges operated by MHL, on behalf of DPIE, were used extensively by the BoM, the SES and the local councils to generate flood warnings, emergency response and delivery of flood related services. Wave, water level and rainfall data captured during the flood event are summarised in the subsequent sections of this report. Station performance during the event is summarised in Appendix A. Photographs taken during the event are presented in Appendix B.

DPIE commissioned MHL to prepare this report to summarise the March 2021 flood event, which includes supplementary flood data provided from the BoM, Clarence Valley Council, Kempsey Shire Council, Nambucca Shire Council, Port Macquarie Hastings Council, Sydney Water and WaterNSW.

Rainfall intensity frequency duration (IFD) curves have been generated using the Australian Rainfall and Runoff 1987 (ARR1987) format in millimetres per hour for durations up to and including 72 hours. In addition, IFD curves have been generated using the latest IFD format, Australian Rainfall and Runoff 2019 (ARR2019), with results in millimetres per hour for durations up to and including 168 hours, which can be significant for this flood event (refer to Appendix C). This will allow this flood summary report to be comparable with past and future reports as agencies transition the IFD format to the ARR2019 version. It is noted that data from at least two of the rainfall stations supplied by the BoM and two supplied by Port Macquarie Hastings Council are affected by a loss of resolution, possibly caused by interruptions to radio signals during the event, and for three stations only 24-hour totals could be provided. In cases where this loss of resolution has affected the intensity frequency duration curves, the short duration event values have been removed as they could be

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misinterpreted. Impacted stations are noted. In addition, missing or incomplete supplied data is also noted. For third party stations, including those supplied by the BoM, it is recommended that further quality assurance checks are undertaken prior to interpretation and use of this data for decision making. Please contact the BoM for short duration rainfall statistics.

Please refer to Appendix D for the conversion of Sydney Water's and WaterNSW's water level gauges from local gauge datum to Australian Height Datum (AHD) where available.

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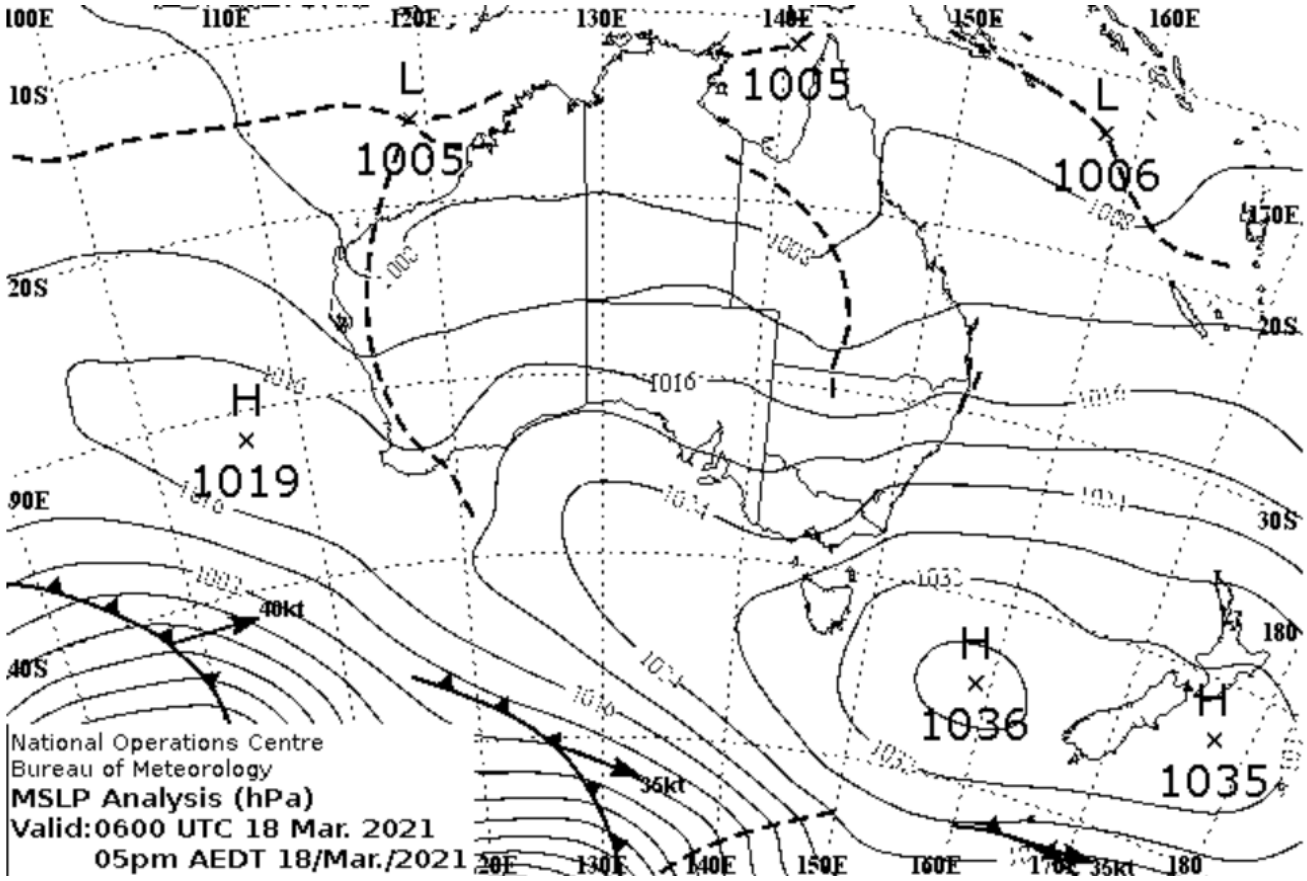

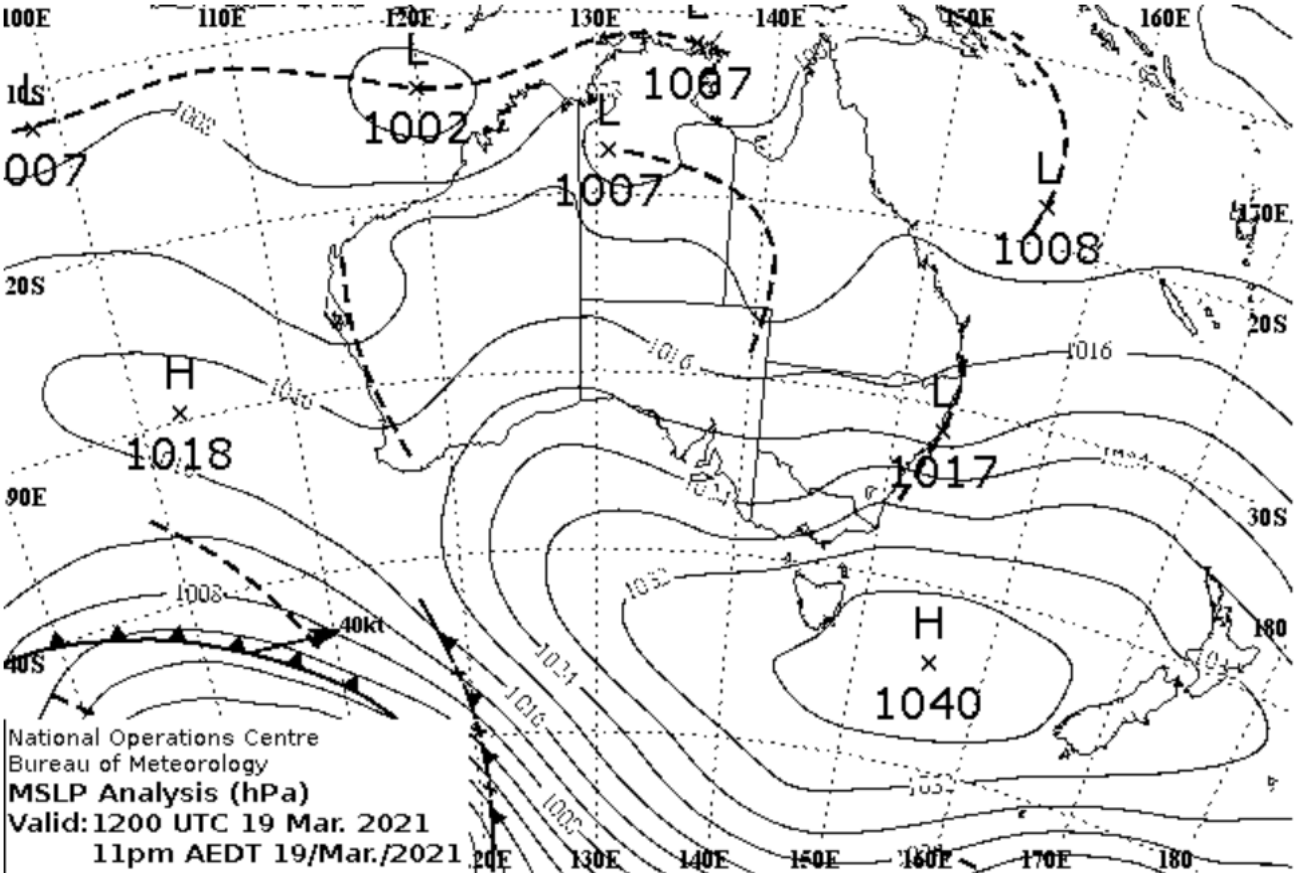

Source: Australian Bureau of Meteorology, 2021

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MEAN SEA LEVEL PRESSURE
18 AND 19 MARCH 2021

Manly Hydraulics Laboratory

Report MHL2809
Figure
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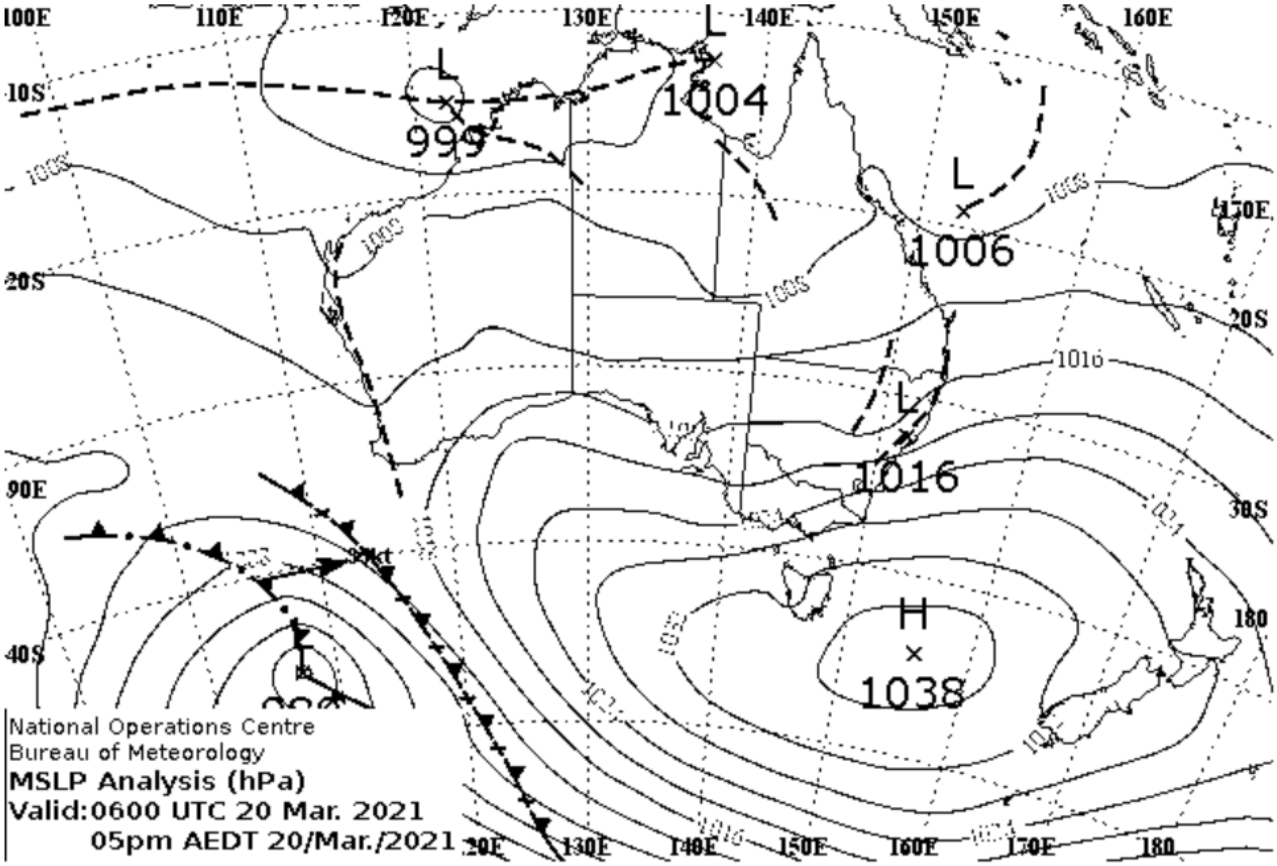

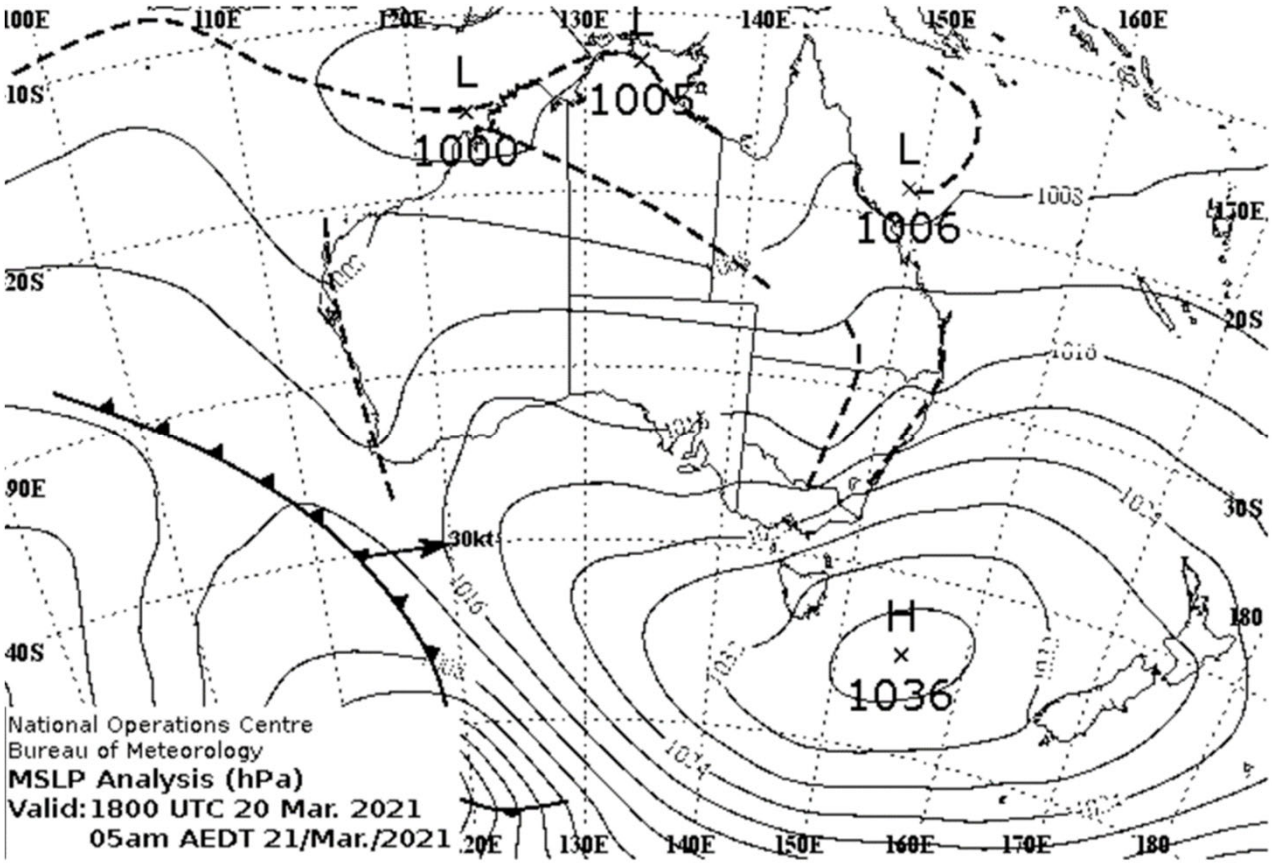

Source: Australian Bureau of Meteorology, 2021

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MEAN SEA LEVEL PRESSURE
20 AND 21 MARCH 2021

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Figure
1.2

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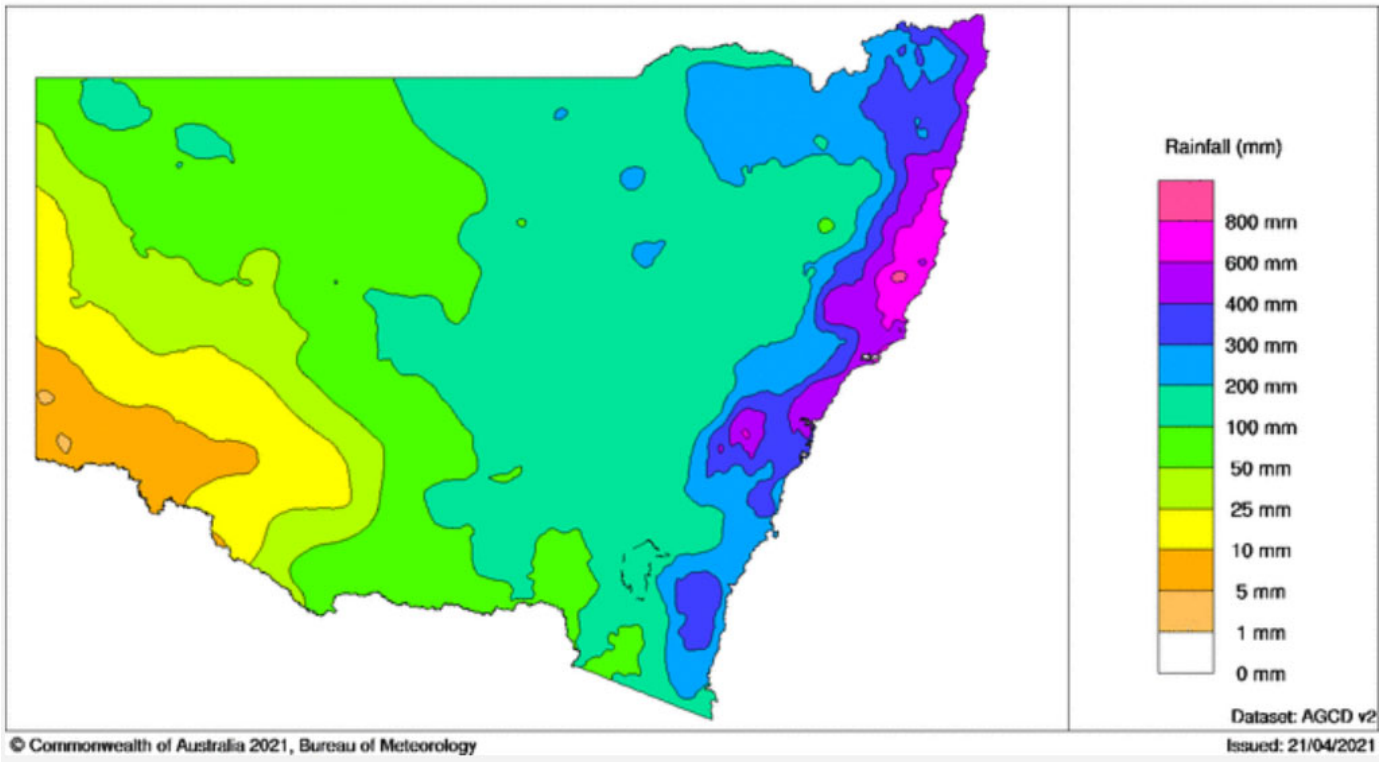

Source: Australian Bureau of Meteorology, 2021

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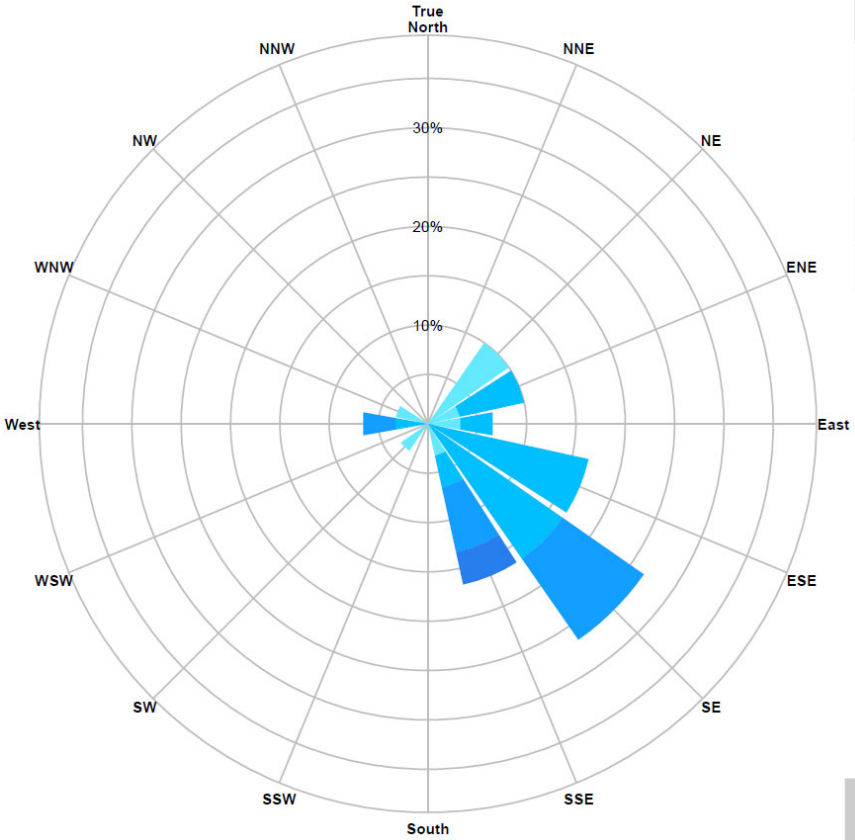
NEW SOUTH WALES RAINFALL ANALYSIS
MARCH 2021

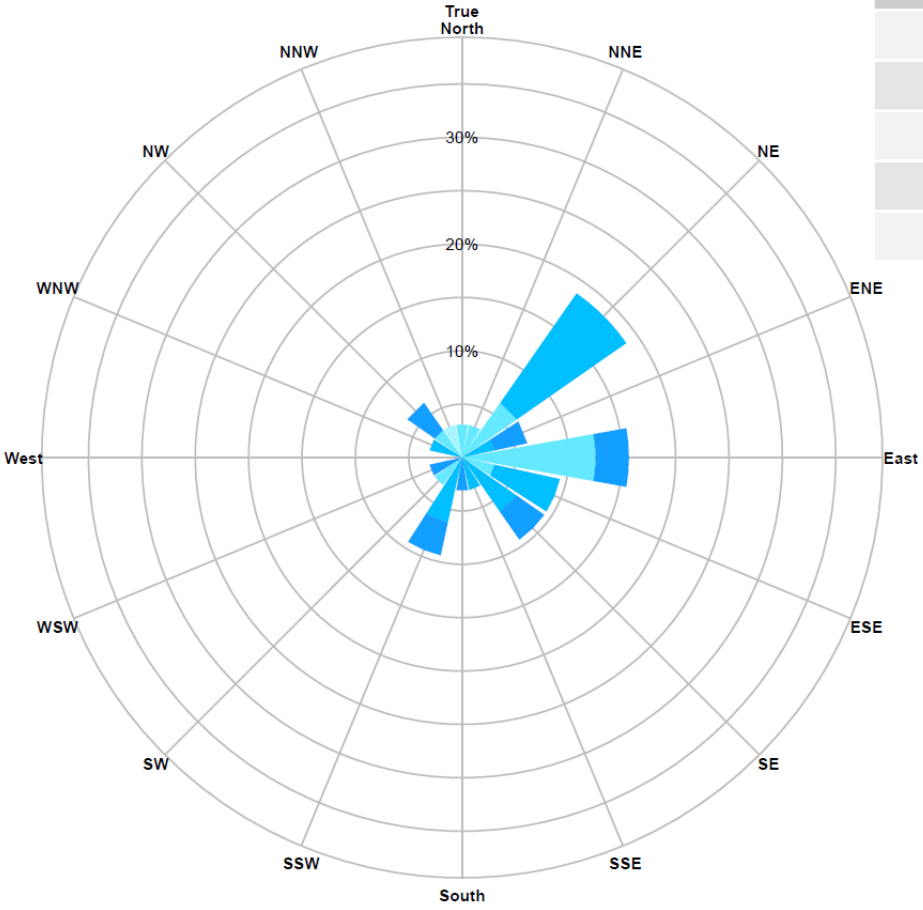
Manly Hydraulics Laboratory

Report MHL2809
Figure
1.3

Figures_MHL2809.pptx



Wind Speed vs. Direction Rose
Site: Grafton Research Station
Start: 05 March 2021
Finish: 05 April 2021
Record Length (days): 31
N° of Records: 30



Wind Speed vs. Direction Rose
Site: Kempsey
Start: 05 March 2021
Finish: 05 April 2021
Record Length (days): 31
N° of Records: 32

Wind Speed (km/h)

- 90 – 100
- 80 – 90
- 70 – 80
- 60 – 70
- 50 – 60
- 40 – 50
- 30 – 40
- 20 – 30
- 10 – 20
- 0 – 10

Source: Wind data collected by the Australian Bureau of Meteorology, 2021

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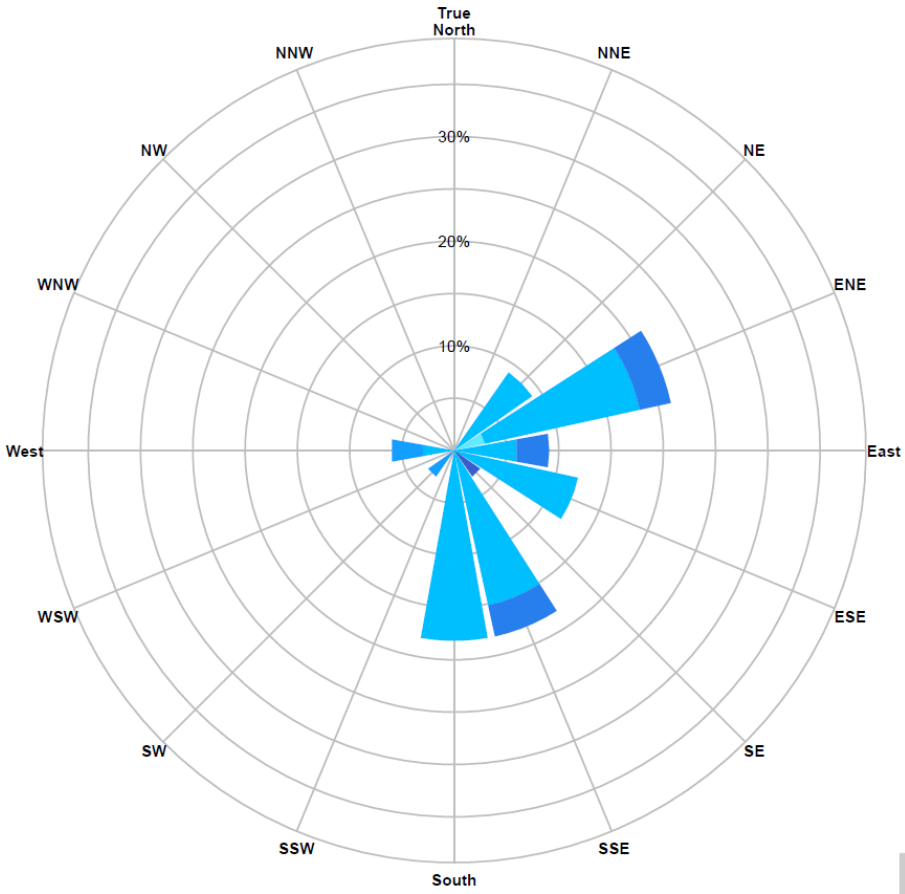
WIND ROSE FROM GRAFTON RESEARCH STATION AND KEMPSEY 5 MARCH – 5 APRIL 2021

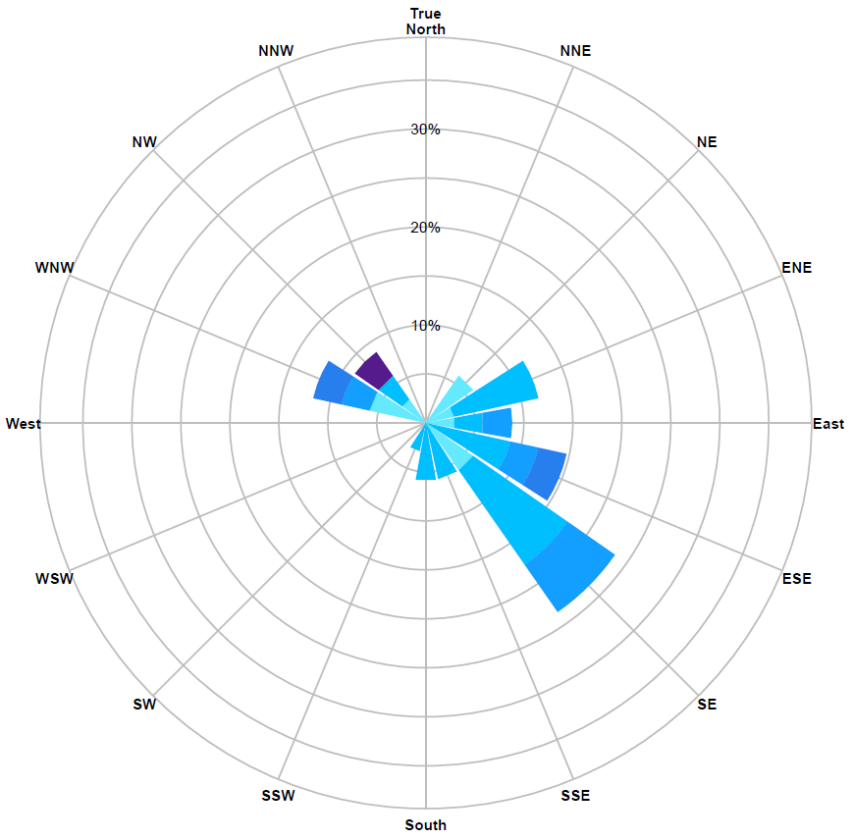
Manly Hydraulics Laboratory

Report MHL2809
Figure
1.4

Figures_MHL2809.pptx



Wind Speed vs. Direction Rose
Site: Taree Airport AWS
Start: 05 March 2021
Finish: 05 April 2021
Record Length (days): 35
N° of Records: 33



Wind Speed vs. Direction Rose
Site: Maitland Airport AWS
Start: 05 March 2021
Finish: 05 April 2021
Record Length (days): 35
N° of Records: 34

Wind Speed (km/h)

- 90 – 100
- 80 – 90
- 70 – 80
- 60 – 70
- 50 – 60
- 40 – 50
- 30 – 40
- 20 – 30
- 10 – 20
- 0 – 10

Source: Wind data collected by the Australian Bureau of Meteorology, 2021

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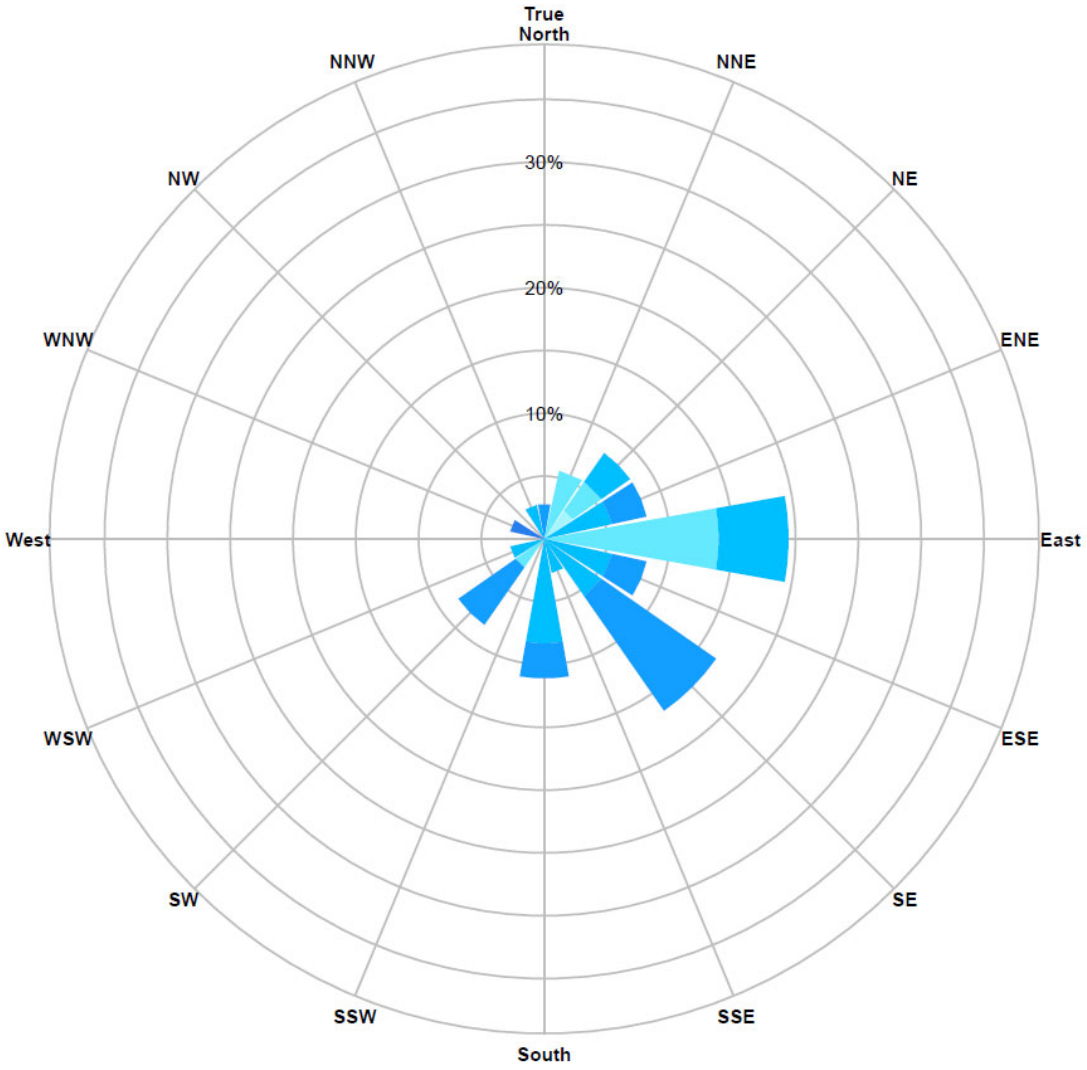
WIND ROSE FROM TAREE AIRPORT AWS AND MAITLAND AIRPORT AWS 5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MHL2809
Figure
1.5

Figures_MHL2809.pptx

Wind Speed vs. Direction Rose
Site: Richmond RAAF
Start: 05 March 2021
Finish: 05 April 2021
Record Length (days): 35
N° of Records: 36



Wind Speed (km/h)
- 90 – 100
- 80 – 90
- 70 – 80
- 60 – 70
- 50 – 60
- 40 – 50
- 30 – 40
- 20 – 30
- 10 – 20
- 0 – 10

Source: Wind data collected by the Australian Bureau of Meteorology, 2021

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WIND ROSE FROM RICHMOND RAAF
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MHL2809
Figure
1.6

Figures_MHL2809.pptx

2 Offshore wave data

The NSW Waverider buoy network monitors ocean wave conditions along the NSW coast. It is a network of seven Waverider stations operated by MHL on behalf of DPIE. Wave data have been collected since 1974 when the first Waverider buoy was deployed by MHL off Port Kembla. Meteorological conditions during the March 2021 flood event also generated moderate storm wave activity along the NSW coast from Coffs Harbour to Sydney.

A summary of the ocean wave conditions recorded by the Coffs Harbour and Sydney Waverider buoys for the March 2021 flood event is presented in **Table 2-1**. The locations of the Waverider buoys are shown in **Figure 2-1**. Time series plots of wave height, direction and period during the flood event are presented in **Figure 2-2** and **Figure 2-3**.

Table 2-1 Ocean wave storm summary 05 March – 05 April 2021

Wave conditions	Coffs Harbour	Sydney
Peak significant wave height (m)	4.90	4.18
Date and time of peak significant wave height (hrs AEST)	1300 21/3/21	0800 21/3/21
Peak maximum wave height (m)	8.91	7.76
Spectral peak wave period at storm peak (secs)	11.5	10.8
Wave direction at storm peak (ºTN)	99	85
Storm duration for Hsig greater than 3m (hrs)	87	52
Storm duration for Hsig greater than 4m (hrs)	17	4
Average Recurrence Interval for storm peak Hsig (years)	< 1.0	< 1.0

For all Waverider stations, the peak significant wave height (H_{sig}) ranged from 4.18m to 4.90m while the peak maximum individual wave height (H_{max}) ranged from 7.76m to 8.91m. The highest peak H_{sig} and peak H_{max} were recorded by the Coffs Harbour Waverider buoy. Based on over 40 years of wave data recorded at the Coffs Harbour Waverider buoy station, the Average Recurrence Interval (ARI) for the 4.90m peak H_{sig} is approximately one year.

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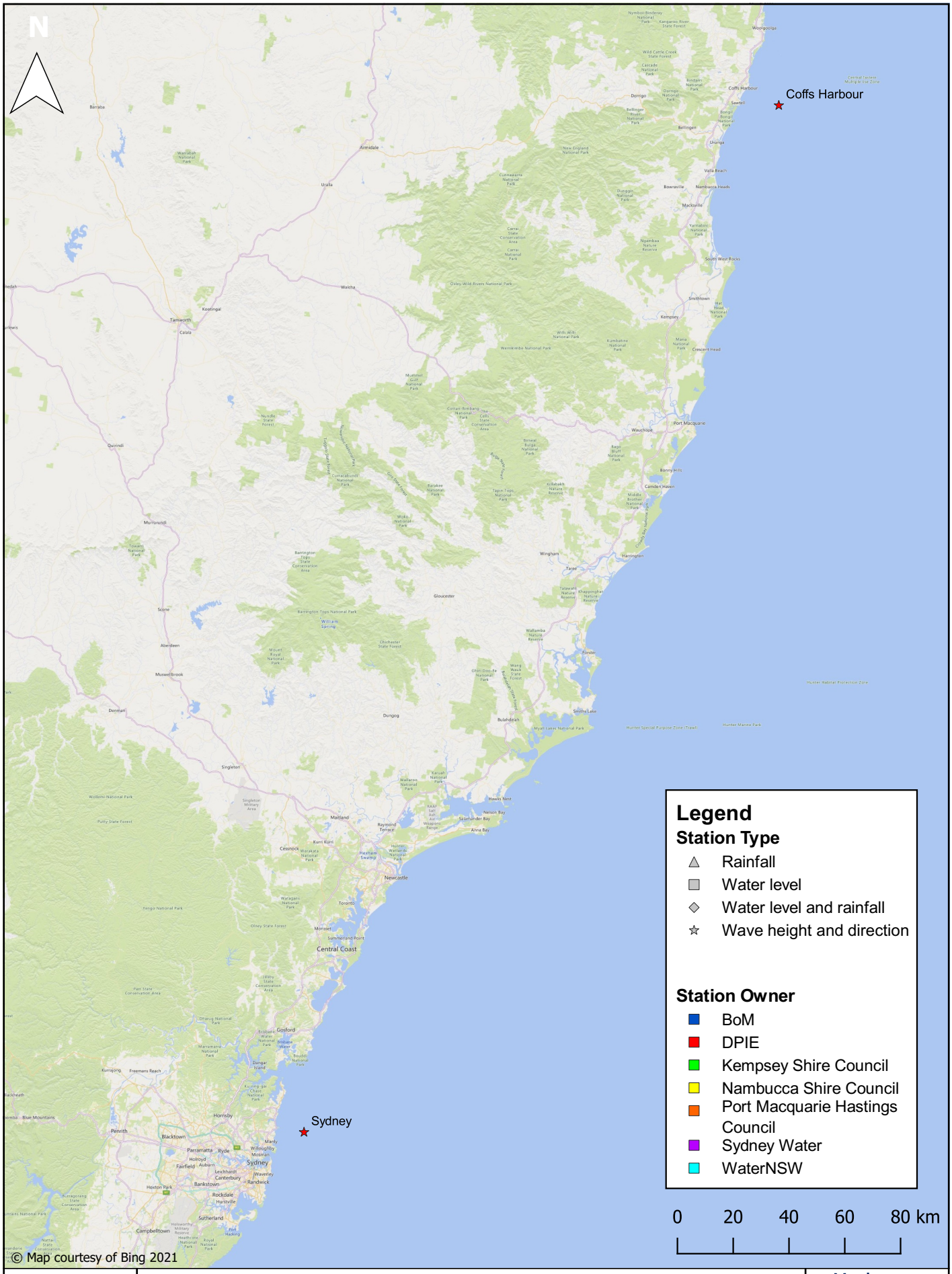

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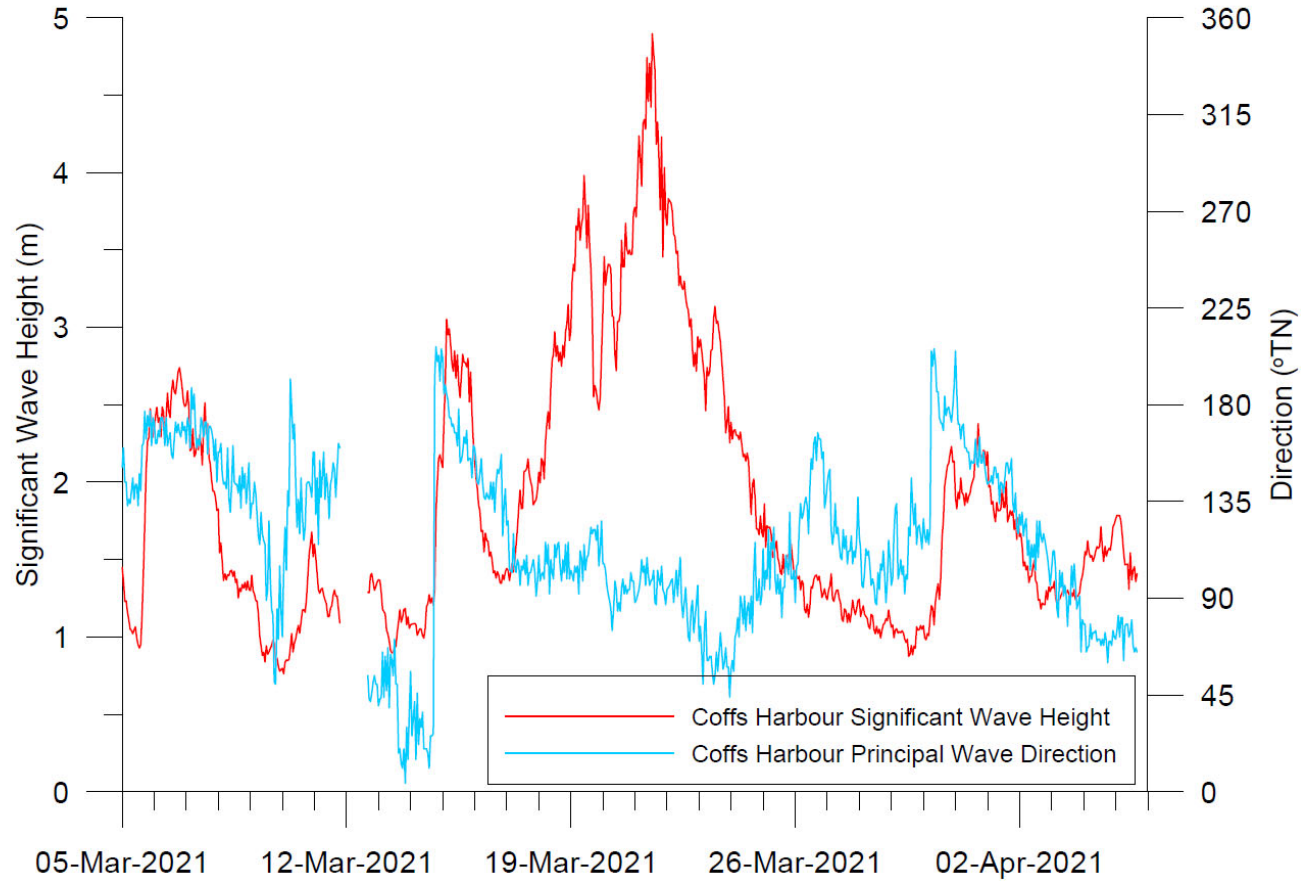
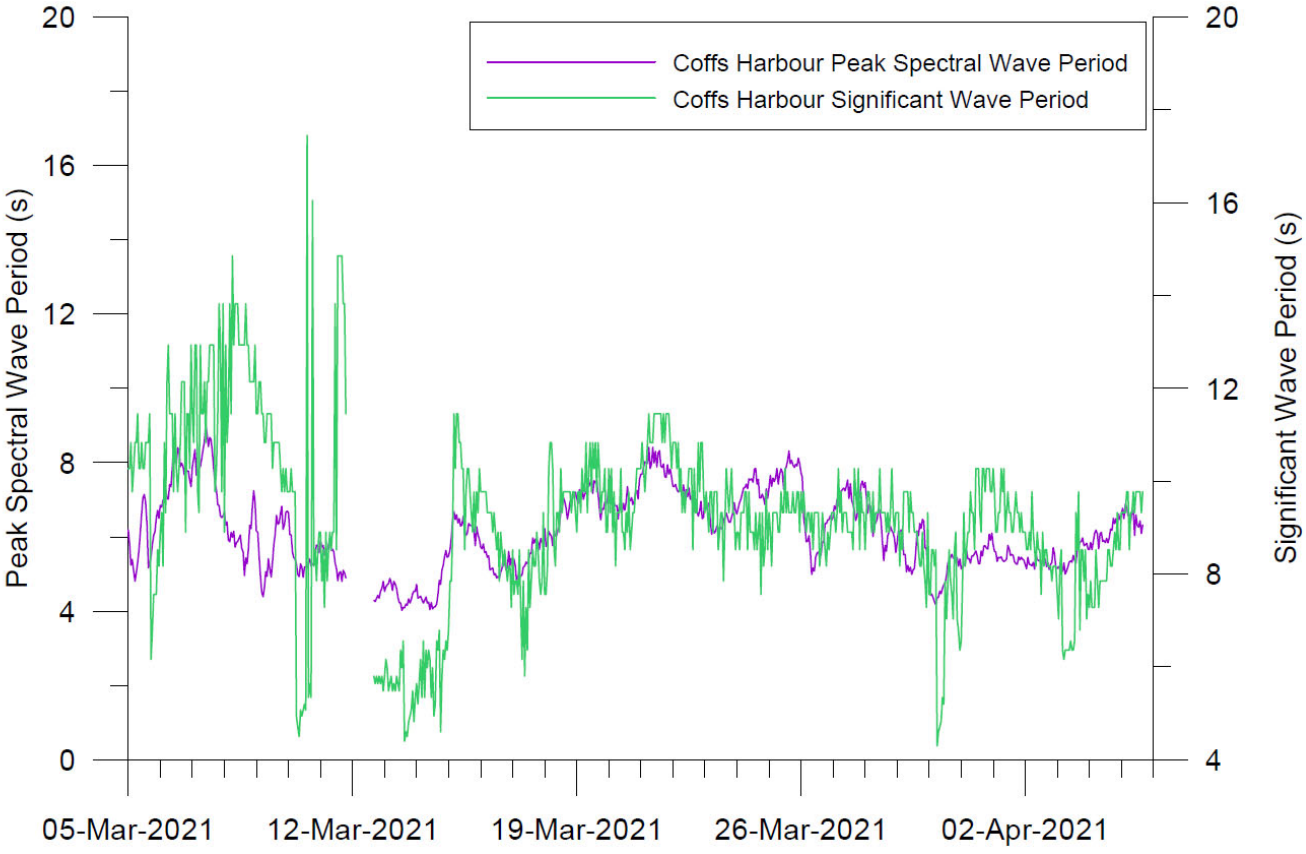
WAVE STATIONS

Manly Hydraulics Laboratory

Report MHL2752
Figure
2.1

Figures_MHL2752.qgs





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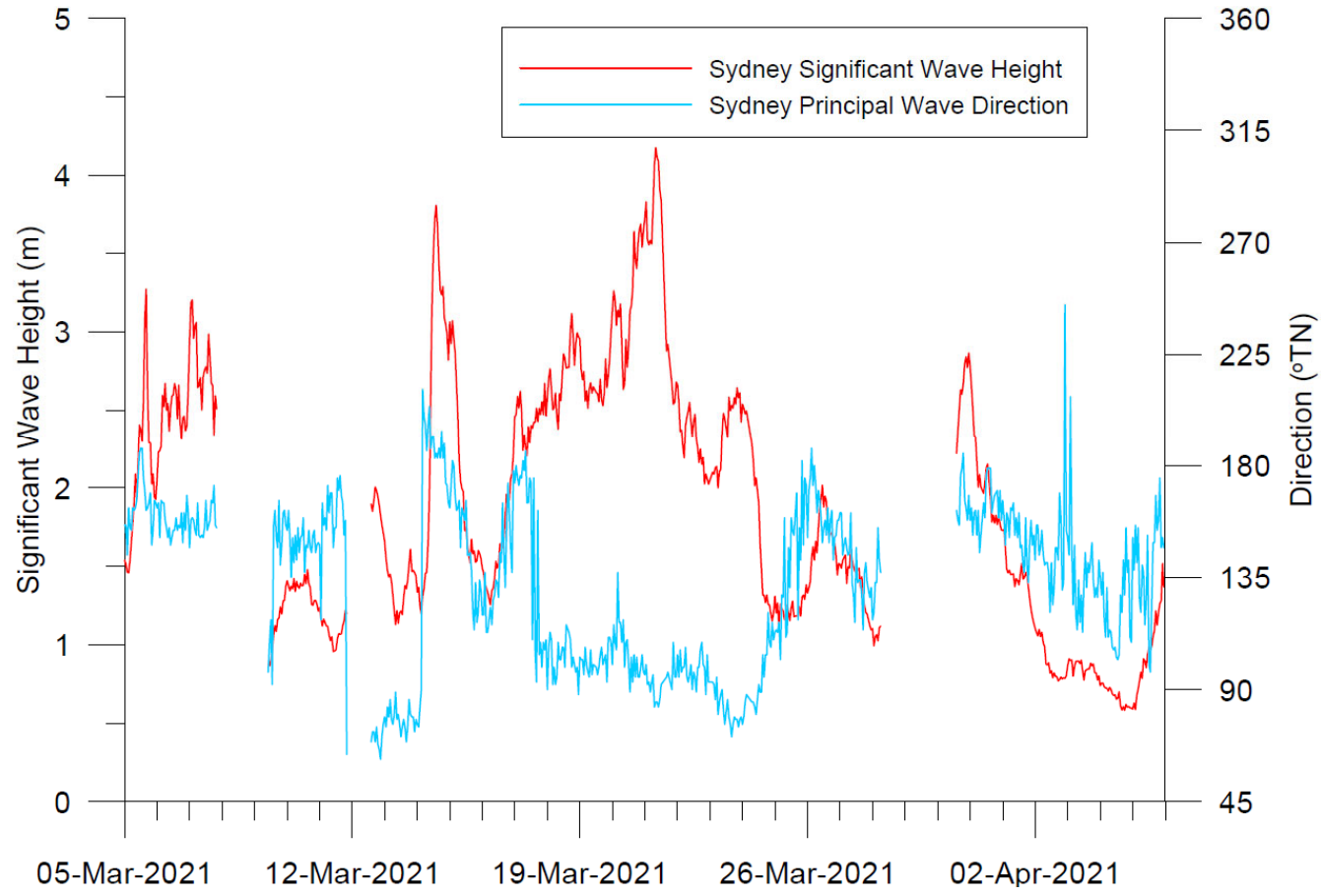
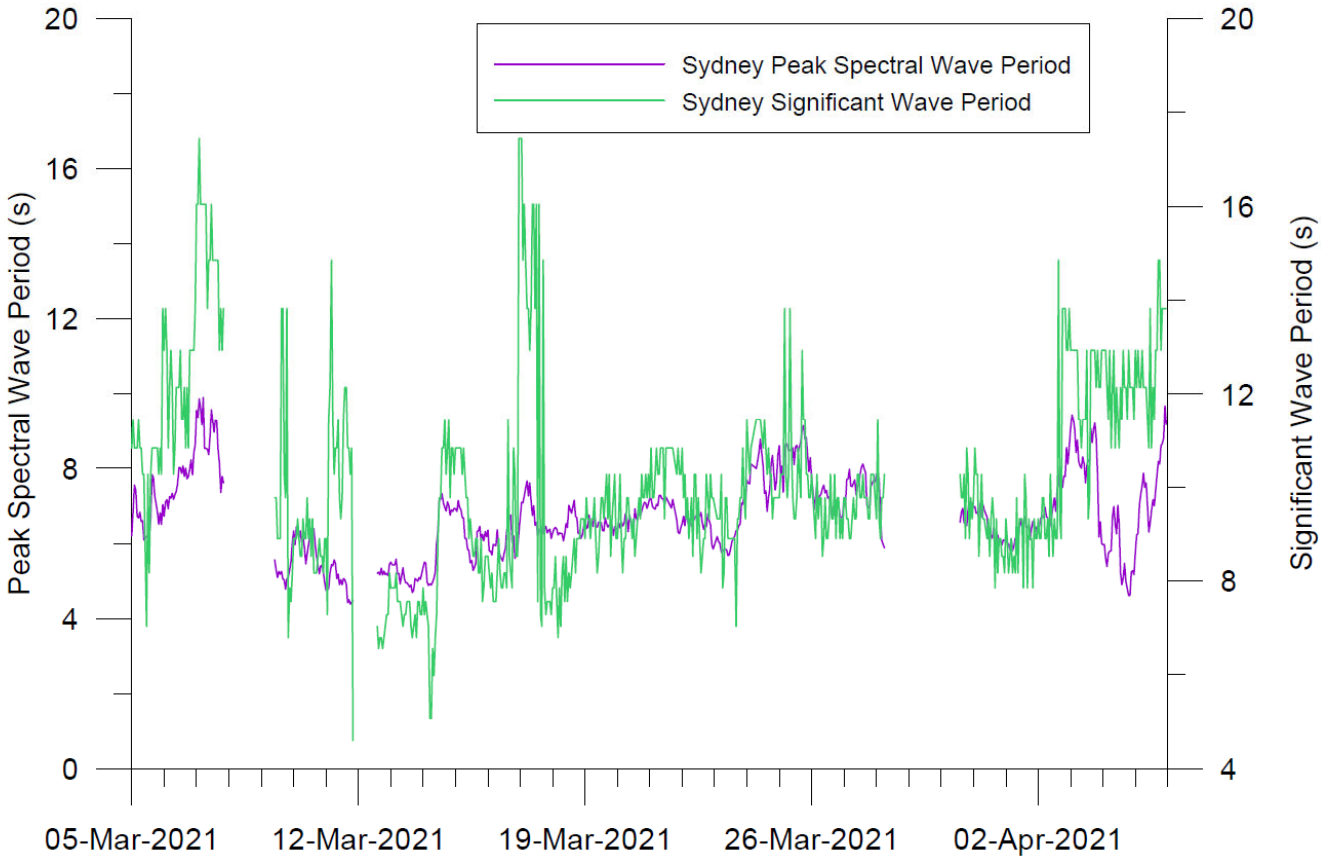
COFFS HARBOUR WAVERIDER BUOY
WAVE HEIGHT, DIRECTION AND PERIOD
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MHL2809
Figure
2.2

Figures_MHL2809.pptx





NSW GOVERNMENT

SYDNEY WAVERIDER BUOY
WAVE HEIGHT, DIRECTION AND PERIOD
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MHL2809
Figure
2.3

Figures_MHL2809.pptx

3 Water level and rainfall data

3.1 Water level and rainfall overview

A number of hydrometric stations are maintained by agencies in the NSW coastal region including MHL on behalf of DPIE, BoM, Clarence Council, Kempsey Shire Council, Nambucca Shire Council, Port Macquarie Hasting Council, Sydney Water and WaterNSW. In this report, there are 148 stations presented and **Table 3-1** provides the number of stations operated by each agency. A full list of stations for which data is presented in this summary report is provided in Appendix A. The stations included in the counts shown in **Table 3-1** are only a subset and does not present all the stations managed by the various agencies and local councils.

Table 3-1 Water level, rainfall and wave station summary

Agency^	Station type		
	Water level	Rainfall	Wave
BoM	1	14	0
Clarence Council	0	1	0
DPIE	79	15	2
Kempsey Shire Council	1	2	0
Nambucca Shire Council	1	0	0
Port Macquarie Hastings Council	2	4	0
Sydney Water	1	0	0
WaterNSW	33	11	0

^Please note this table does not represent all hydrometric stations owned by the various agencies, only a subset selected for presentation in this report.

3.2 River region overview

An overview of water level and rainfall stations in the NSW coast is provided in **Figure 3-1** in the maps at the start of each section. The river regions are grouped as follows:

- **Figure 4-1** – Clarence River region
- **Figure 5-1** – Orara River region
- **Figure 6-1** – Nambucca River region
- **Figure 7-1** – Macleay River region
- **Figure 8-1** – Hastings and Camden Haven River region
- **Figure 9-1** – Manning River region
- **Figure 10-1** – Myall River region
- **Figure 11-1** – Paterson, Williams and Hunter River region
- **Figure 12-1** – Hawkesbury River and South Creek region

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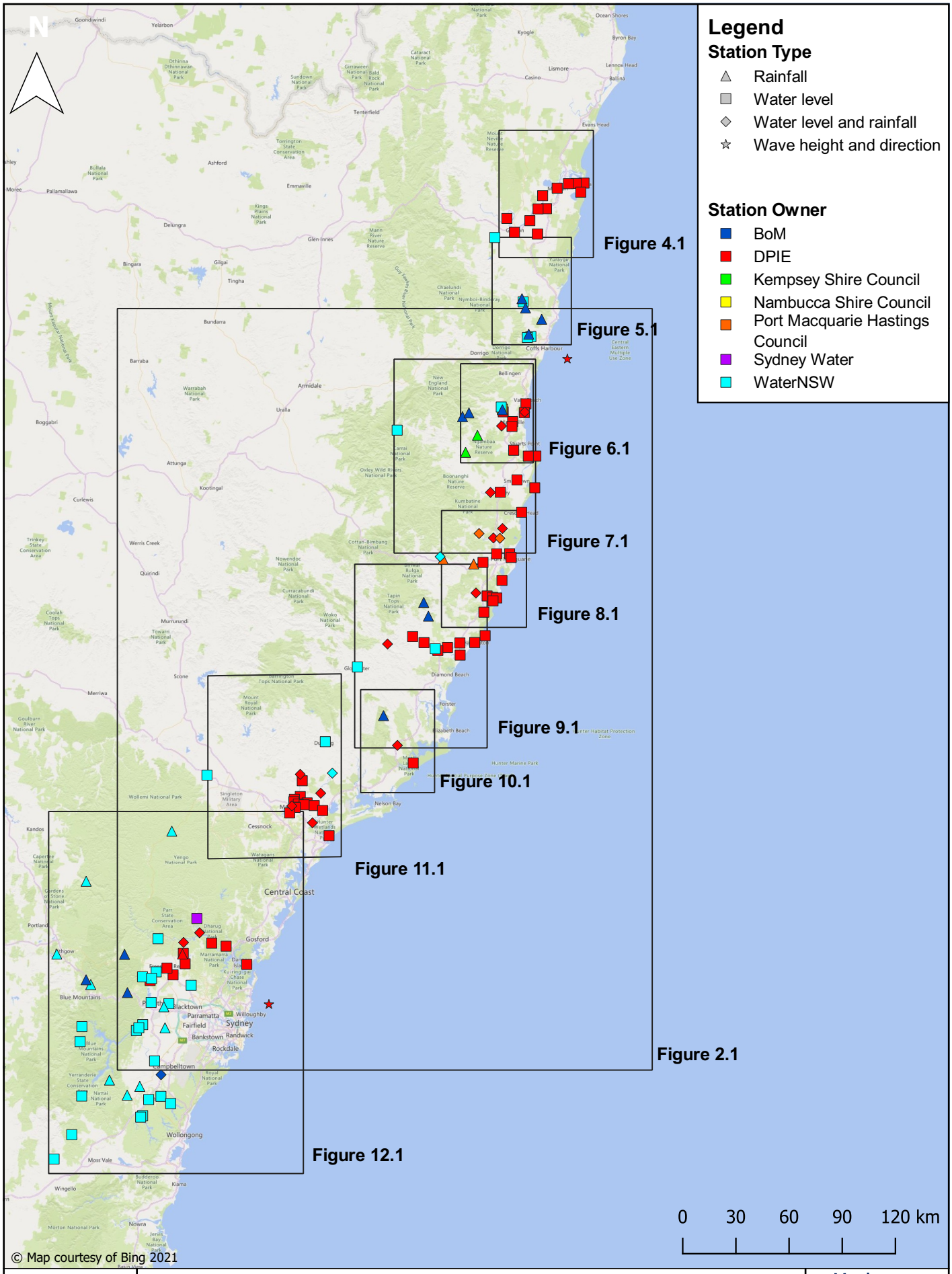

NSW GOVERNMENT

OVERALL VIEW OF STATIONS

Manly Hydraulics Laboratory

Report MHL2809
Figure
3.1

Figures_MHL2809.qgs

4 Clarence River region

4.1 Clarence River region – water level

The peak observed water levels for the Clarence River region are listed in **Table 4-1**. **Table 4-2** lists the SES flood classifications for Grafton, Ulmarra and Maclean. The locations of water level stations within the Clarence River region are shown in **Figure 4-1**. The water level data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 4-2** to **Figure 4-5.**

Table 4-1 Clarence River region flood peaks

River system	Station name	Station number	Owner	Datum	Level (m)
Clarence River	Yamba	204454	DPIE	AHD	1.17
Clarence River	Oyster Channel	204451	DPIE	AHD	1.15
Palmers Channel	Palmers Island Bridge	204426	DPIE	AHD	2.11
Clarence River	Maclean	204410	DPIE	AHD	2.66
Clarence River	Lawrence	204453	DPIE	AHD	3.82
Clarence River	Tyndale	204465	DPIE	AHD	4.08
Clarence River	Brushgrove	204406	DPIE	AHD	4.27
Clarence River	Ulmarra	204480	DPIE	AHD	5.13
Clarence River	The Avenue Downstream	204476	DPIE	AHD	3.32
Clarence River	The Avenue Upstream	204475	DPIE	AHD	3.34
Clarence River	Grafton	204400	DPIE	AHD	6.56
Clarence River	Rogans Bridge	204414	DPIE	AHD	10.67
Lake Wooloweyah	Lake Wooloweyah	204485	DPIE	AHD	1.07

Table 4-2 SES flood classification for Grafton, Ulmarra and Maclean

Station name	Station number	Flood classification			Flood peak (m)	Flood event classification
		Minor	Moderate	Major		
		Water level (m)				
Maclean	204410	1.6	2.2	2.5	2.66	Major
Ulmarra	204480	2.1	3.4	4.9	5.13	Major
Grafton	204400	2.1	3.6	5.4	6.56	Major

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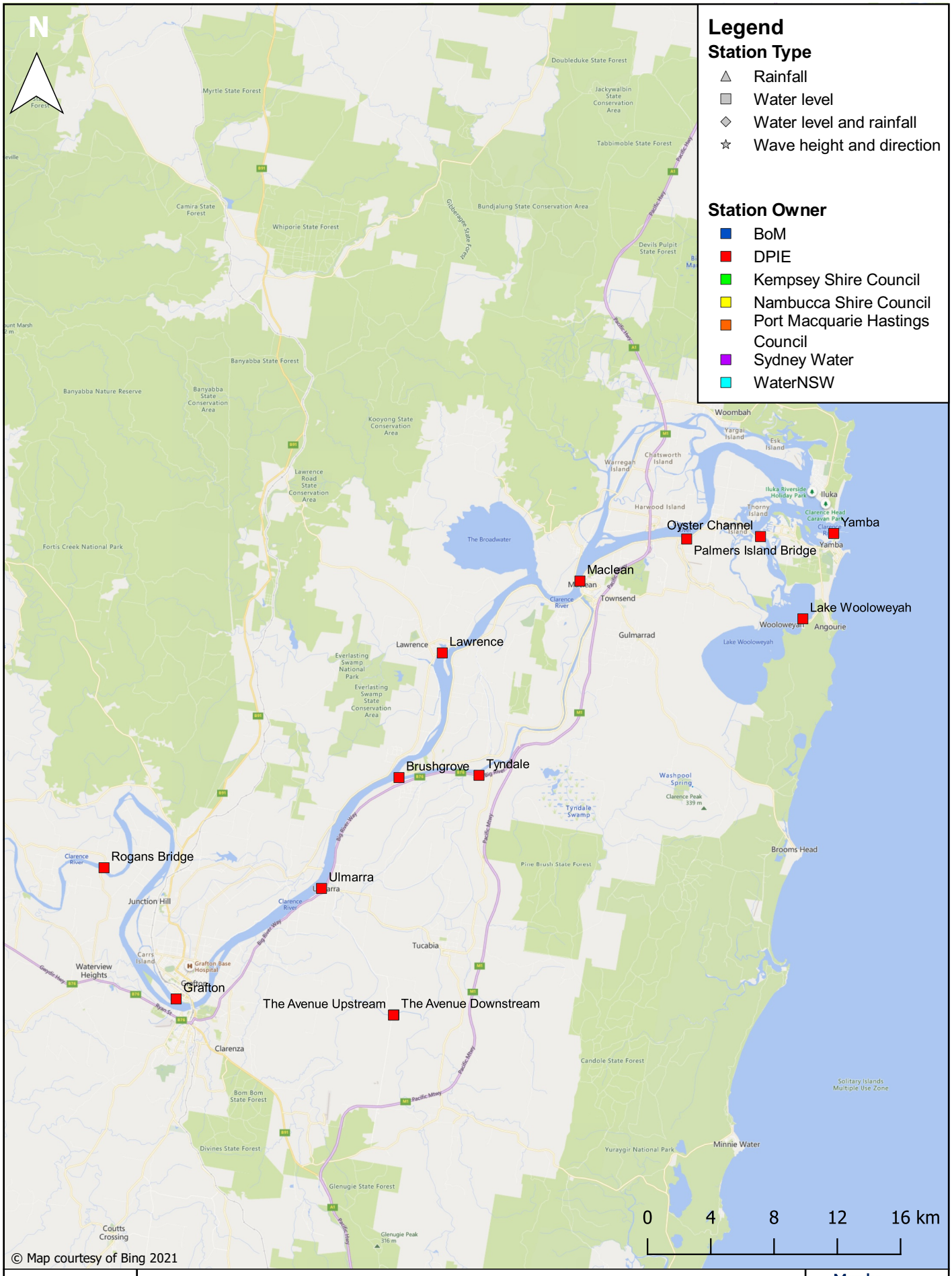
Classification: Public



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CLARENCE RIVER STATIONS

Manly Hydraulics Laboratory

Report MHL2809
Figure
4.1

Figures_MHL2809.qgs

4.2 Clarence River region – rainfall

The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 4-2** to **Figure 4-5**. 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 4-3** for the period 05 March to 05 April 2021. The rainfall intensities are displayed graphically in **Figure 4-6**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 4-3 Clarence River region daily rainfall totals

Date	**Yamba** 462994 (mm)
	Clarence Valley Council
05/03/2021	0.0
06/03/2021	7.0
07/03/2021	1.5
08/03/2021	2.0
09/03/2021	13.5
10/03/2021	1.0
11/03/2021	14.5
12/03/2021	6.5
13/03/2021	0.0
14/03/2021	0.0
15/03/2021	35.5
16/03/2021	1.5
17/03/2021	1.5
18/03/2021	15.5
19/03/2021	48.5
20/03/2021	21.5
21/03/2021	57.0
22/03/2021	92.0
23/03/2021	58.5
24/03/2021	16.5
25/03/2021	0.0
26/03/2021	0.0
27/03/2021	0.0
28/03/2021	0.0
29/03/2021	0.0
30/03/2021	5.0
31/03/2021	0.0
01/04/2021	0.5
02/04/2021	28.5
03/04/2021	0.0
04/04/2021	0.0
05/04/2021	3.5
06/04/2021	-

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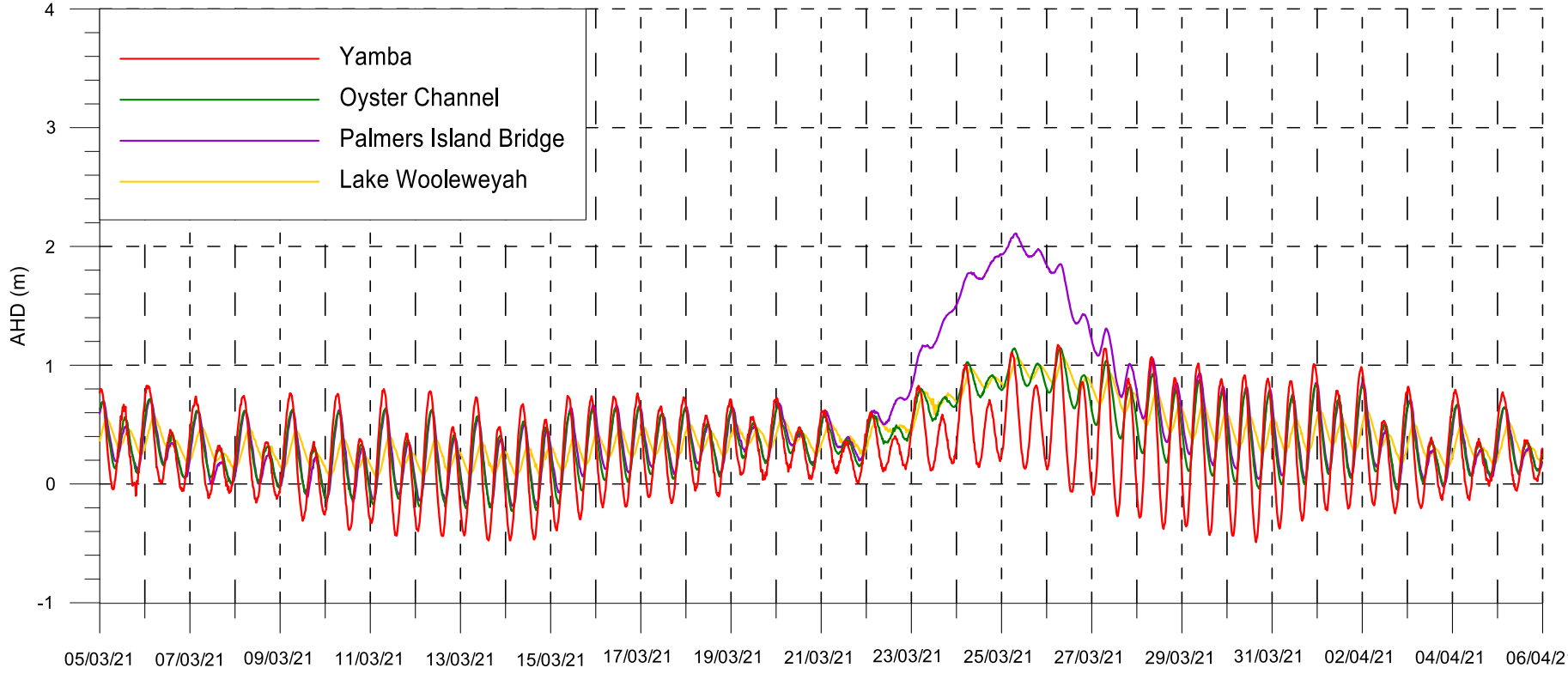
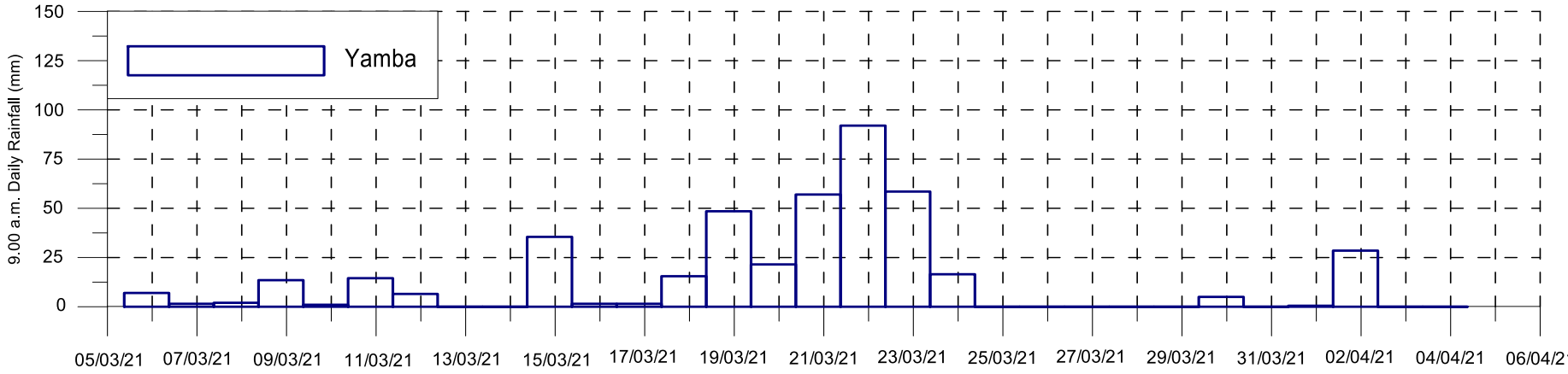
CLARENCE RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021





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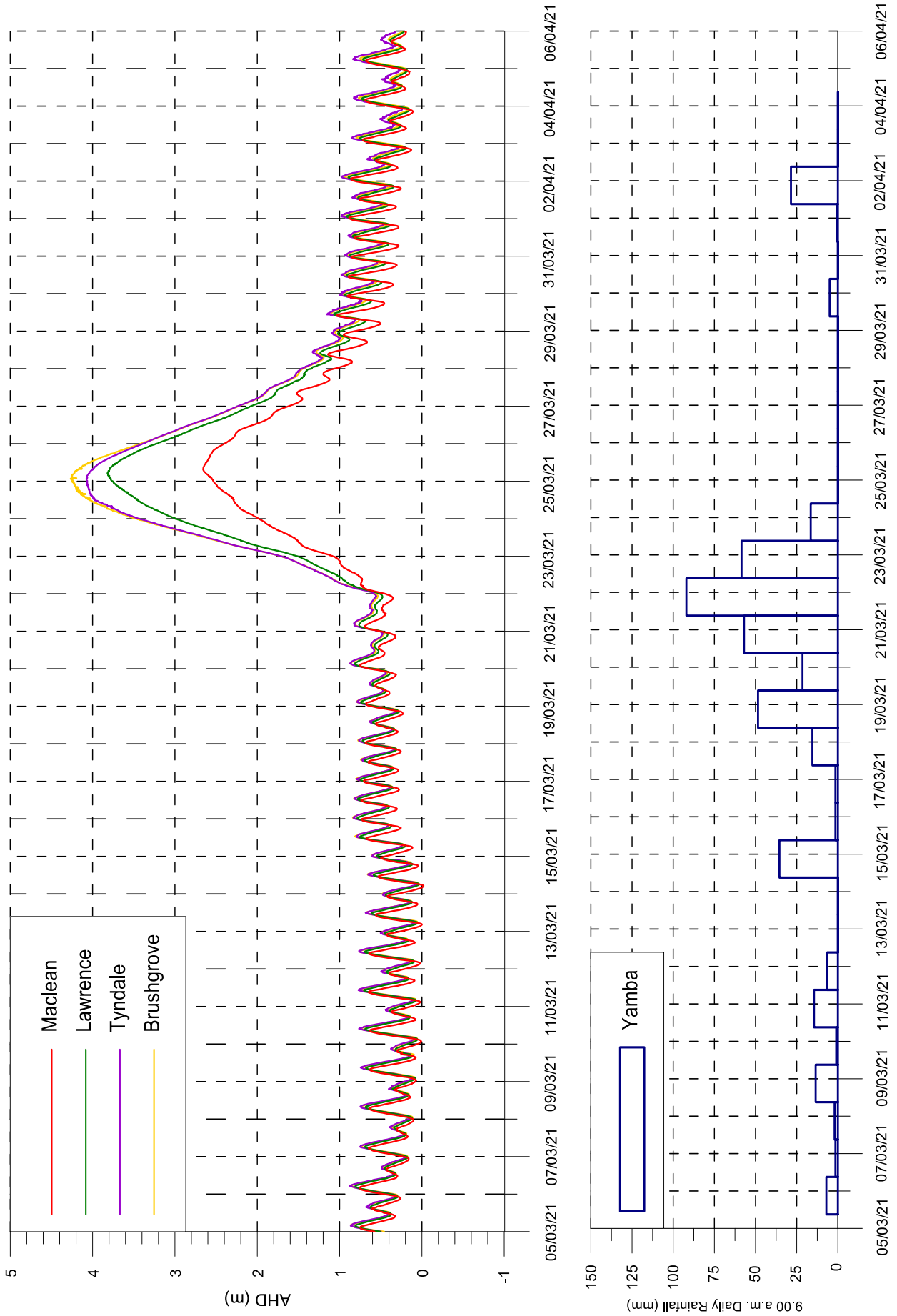
Report MH2809
Figure 4.2
4.2.GRF



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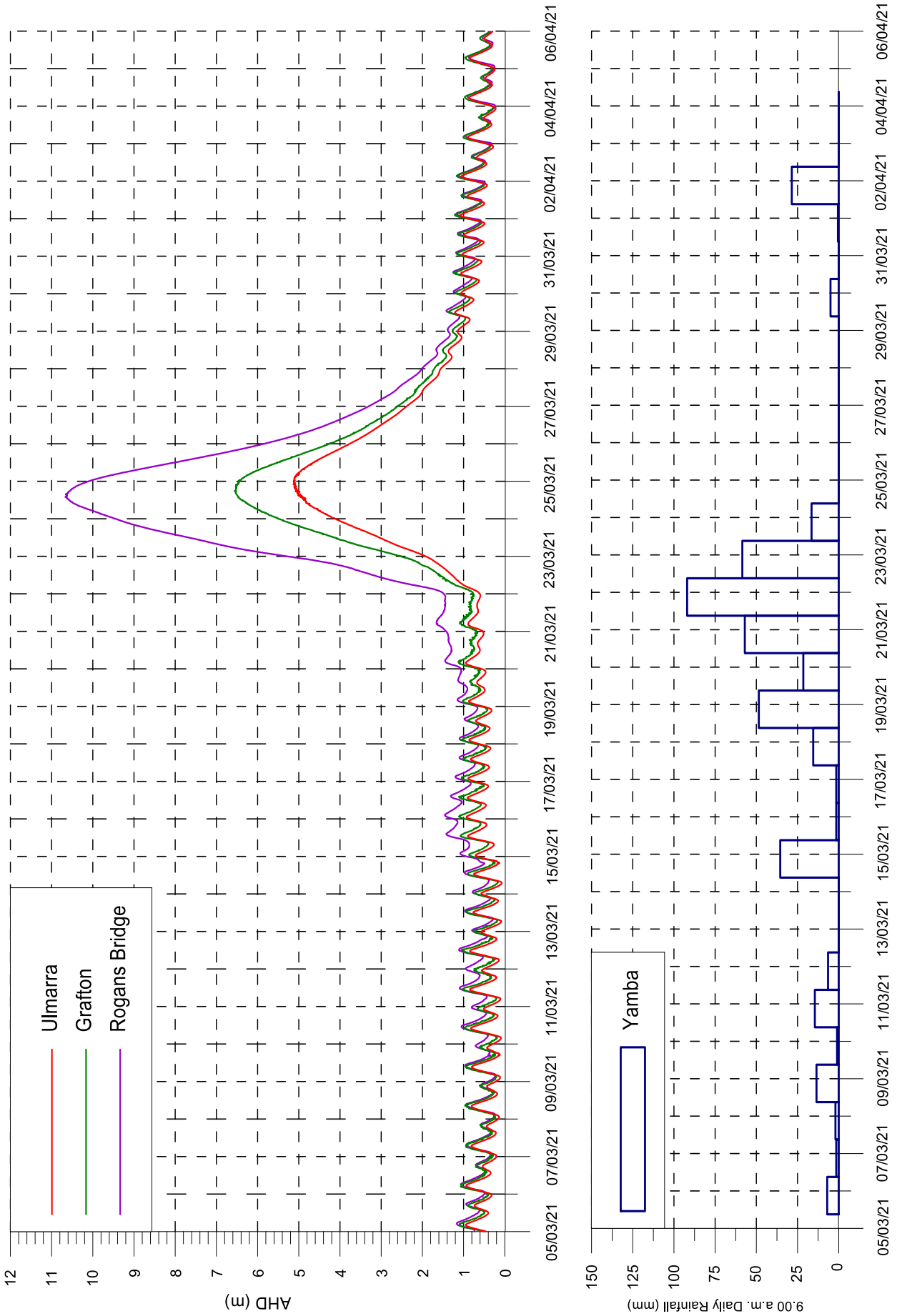
CLARENCE RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809
Figure
4.3

4.3.GRF



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CLARENCE RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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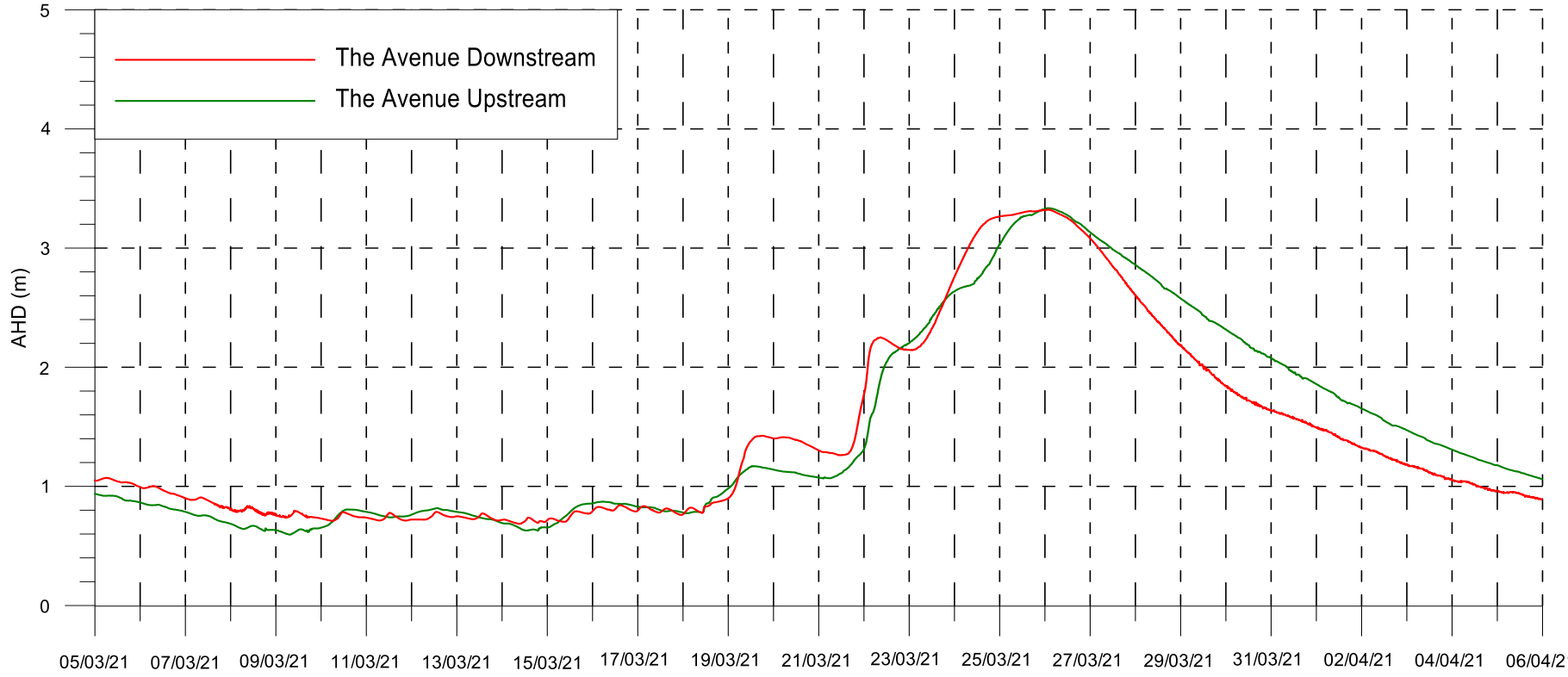
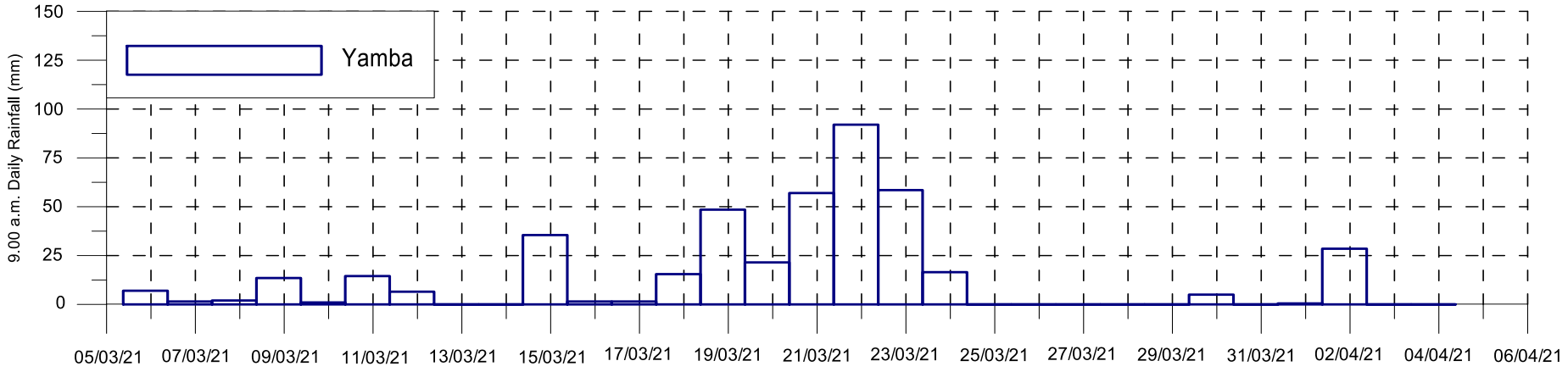
Report MH2809
Figure
4.4

4.4.GRF

CLARENCE RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

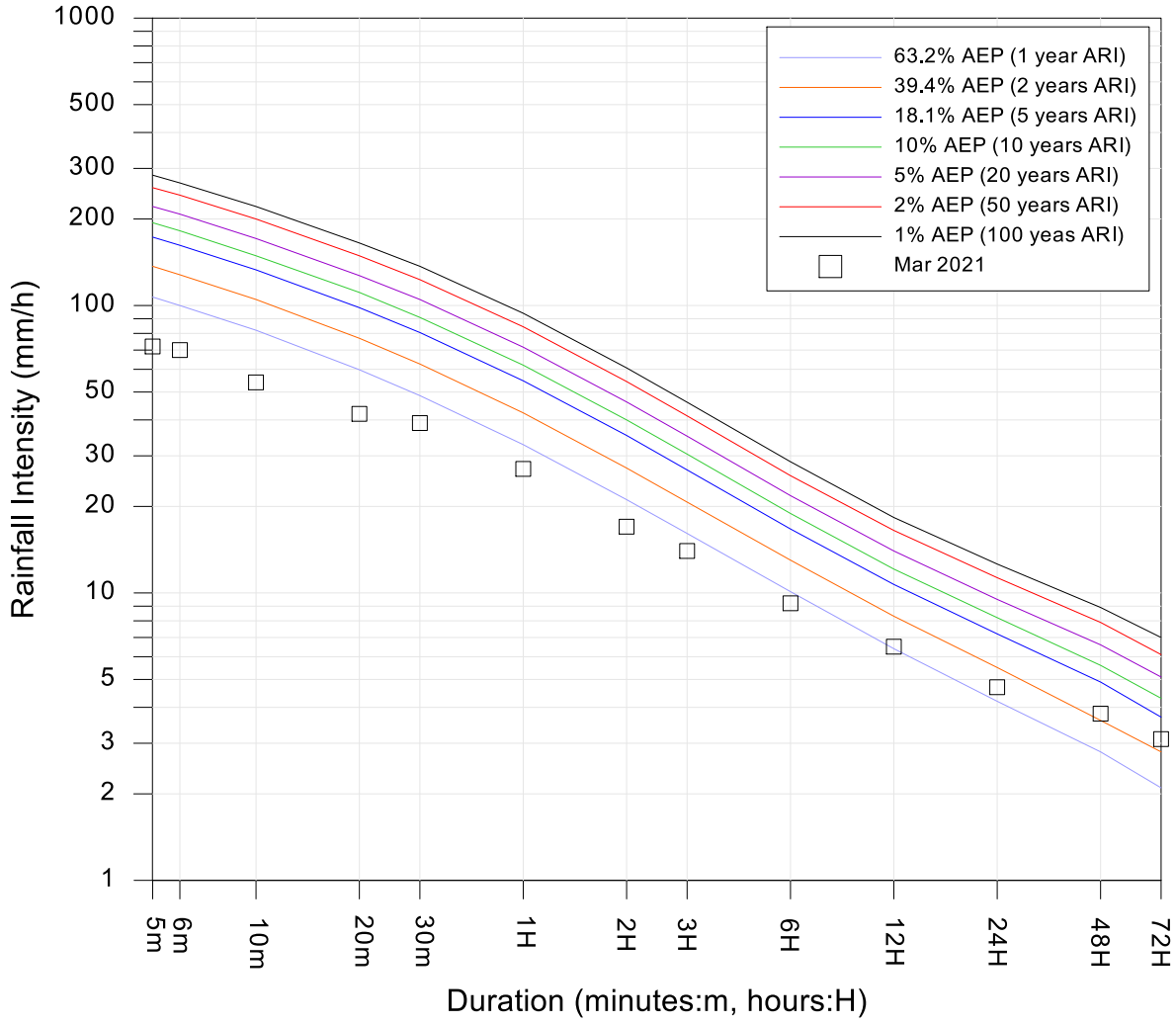




Manly Hydraulics Laboratory
Report MH2809
Figure 4.5
4.5.GRF

Site Owner: Clarence Valley Council
Latitude: -29.4326 Longitude:153.363

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	72	08:28 11 Mar 2021
6m	70	08:28 11 Mar 2021
10m	54	20:20 14 Mar 2021
20m	42	20:31 14 Mar 2021
30m	39	20:39 14 Mar 2021
1H	27	20:53 14 Mar 2021
2H	17	05:00 22 Mar 2021
3H	14	05:59 22 Mar 2021
6H	9.2	09:08 21 Mar 2021
12H	6.5	11:26 22 Mar 2021
24H	4.7	06:34 22 Mar 2021
48H	3.8	01:18 23 Mar 2021
72H	3.1	01:18 24 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

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YAMBA (462994)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

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Report MHL2809
Figure
4.6

IFD_462994_Figure 4.6.pdf

5 Orara River region

5.1 Orara River region – water level

The peak observed water levels for the Orara River region are listed in **Table 5-1**. **Table 5-2** lists the SES flood classification for Glenreagh. The locations of water level stations within the Orara River region are shown in Figure **5-1.** The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 5-2** to **Figure 5-6**.

Table 5-1 Orara River region flood peaks

River system	Station name	Station number	Owner	Datum	Level (m)
Orara River	Orara @ Bawden Bridge	204041	WaterNSW	Local Datum	19.12
Orara River	Orara River @ Glenreagh	204906	WaterNSW	Local Datum	10.65
Orara River	Orara @ Karangi	204025	WaterNSW	Local Datum	3.74
Orara River	Orara @ Orange Grove	204068	WaterNSW	Local Datum	5.27

Table 5-2 SES flood classification for Glenreagh

Station name	Station number	Flood classification			Flood peak (m)	Flood event classification
		Minor	Moderate	Major		
		Water level (m)				
Orara River @ Glenreagh	204906	4.0	7.0	10.0	10.65	Major

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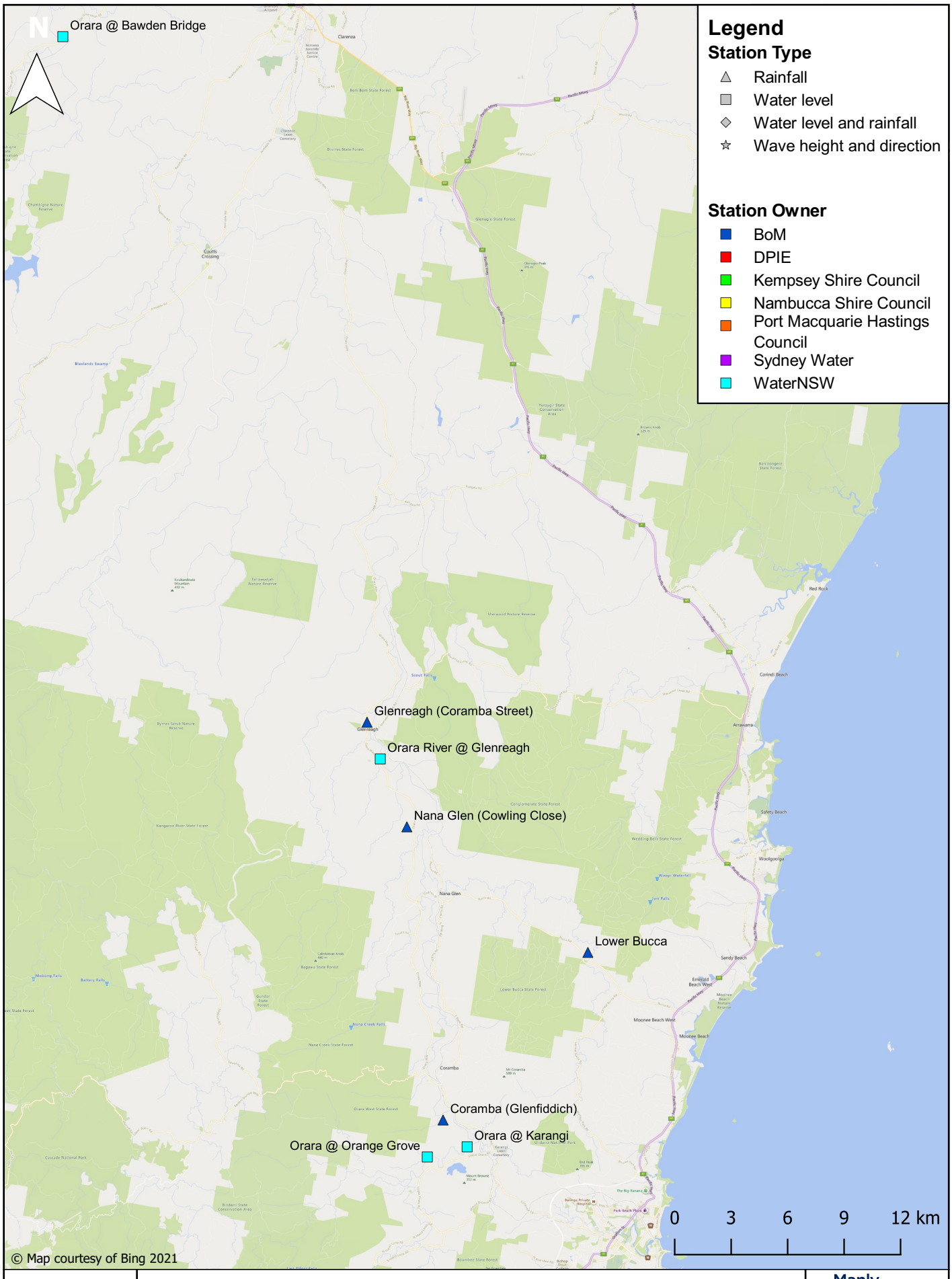

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ORARA RIVER STATIONS

Manly Hydraulics Laboratory

Report MHL2809
Figure
5.1

Figures_MHL2809.qgs

5.2 Orara River region – rainfall

The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 5-2** to **Figure 5-6.** 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 5-3** for the period 05 March to 05 April 2021. The rainfall intensities are displayed graphically in **Figure 5-7** to **Figure 5-10**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 5-3 Orara River region daily rainfall totals

Date	Coramba (Glenfiddich) 59009 (mm) BoM	Nana Glen (Cowling Close) 59139 (mm) BoM	Glenreagh (Coramba Street) 59054 (mm) BoM	Lower Bucca 59006 (mm) BoM
05/03/2021	1.4	0.6		0.0
06/03/2021	0.5	0.0	0.0	0.0
07/03/2021	2.0	0.0	0.2	0.0
08/03/2021	5.0	0.0	0.0	0.0
09/03/2021	0.0	8.0	6.6	7.6
10/03/2021	10.2	7.4	9.4	2.0
11/03/2021	6.6	0.0	0.0	24.0
12/03/2021	7.2	11.2	8.2	0.0
13/03/2021	0.4	0.0	0.0	0.0
14/03/2021	0.0	0.0	0.0	0.0
15/03/2021	25.6	14.0	12.2	13.0
16/03/2021	1.0	1.0	0.0	0.0
17/03/2021	7.0	9.2	4.8	9.2
18/03/2021	38.0	21.0	16.4	28.0
19/03/2021	126.0	82.0	89.6	138.2
20/03/2021	11.0	37.6	4.2	19.6
21/03/2021	27.0	93.0	9.4	198.2
22/03/2021	180.0	125.0	99.8	98.0
23/03/2021	65.0	82.0	72.0	30.4
24/03/2021	27.6	33.4	35.8	0.0
25/03/2021	0.4	0.0	0.0	0.0
26/03/2021	0.0	0.4	0.0	0.0
27/03/2021	0.0	0.0	0.0	0.0
28/03/2021	0.0	0.0	0.0	0.0
29/03/2021	0.0	0.0	0.0	0.0
30/03/2021	6.4	0.0	0.0	1.8
31/03/2021	1.6	0.0	0.0	4.4
01/04/2021	0.0	0.0	0.0	0.0
02/04/2021	3.0	2.4	1.2	6.2
03/04/2021	0.0	0.0	0.0	0.0
04/04/2021	0.0	0.6	0.0	1.8
05/04/2021	2.0	2.0	1.8	6.0
06/04/2021	22.4	0.6	12.2	15.2

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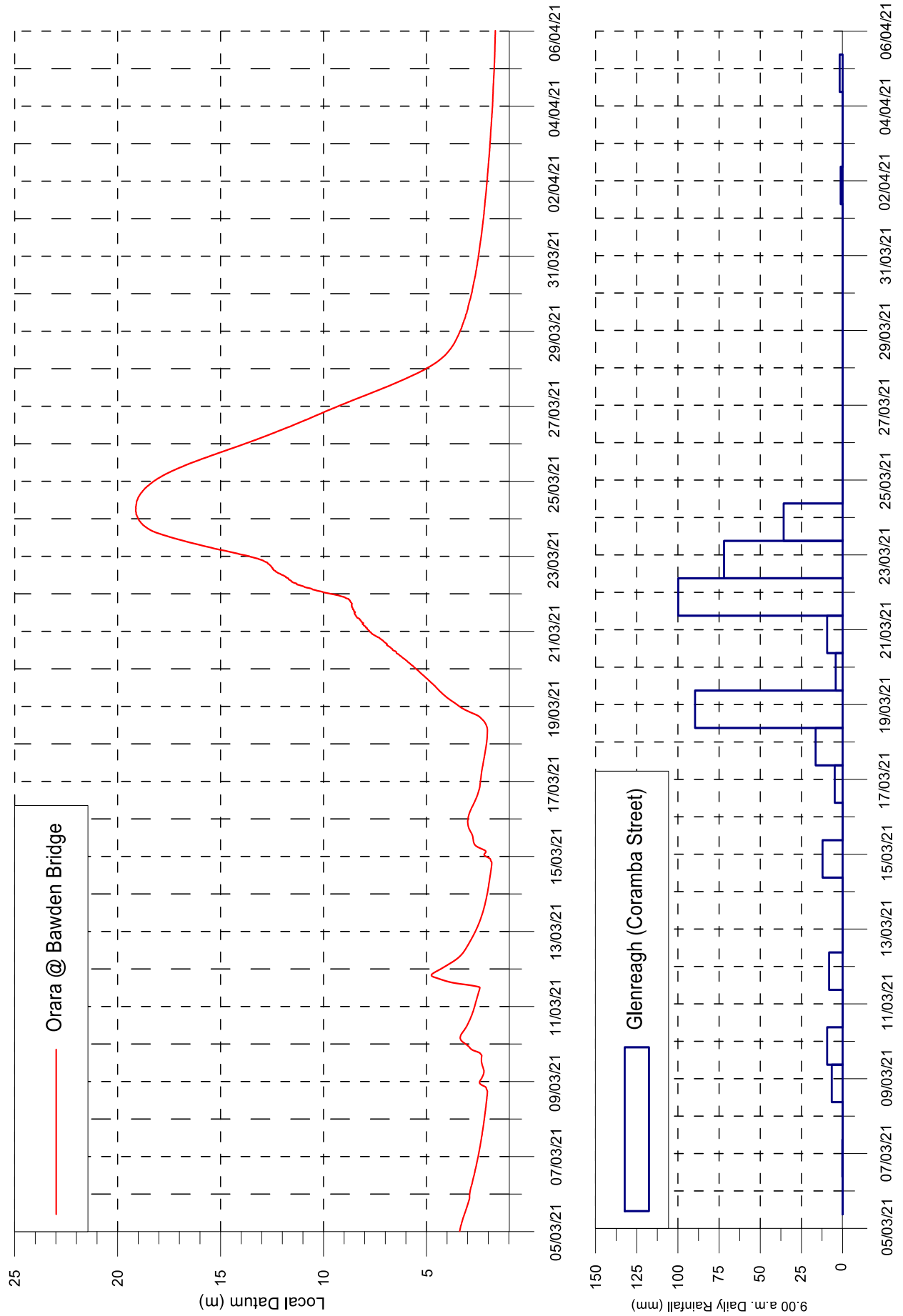

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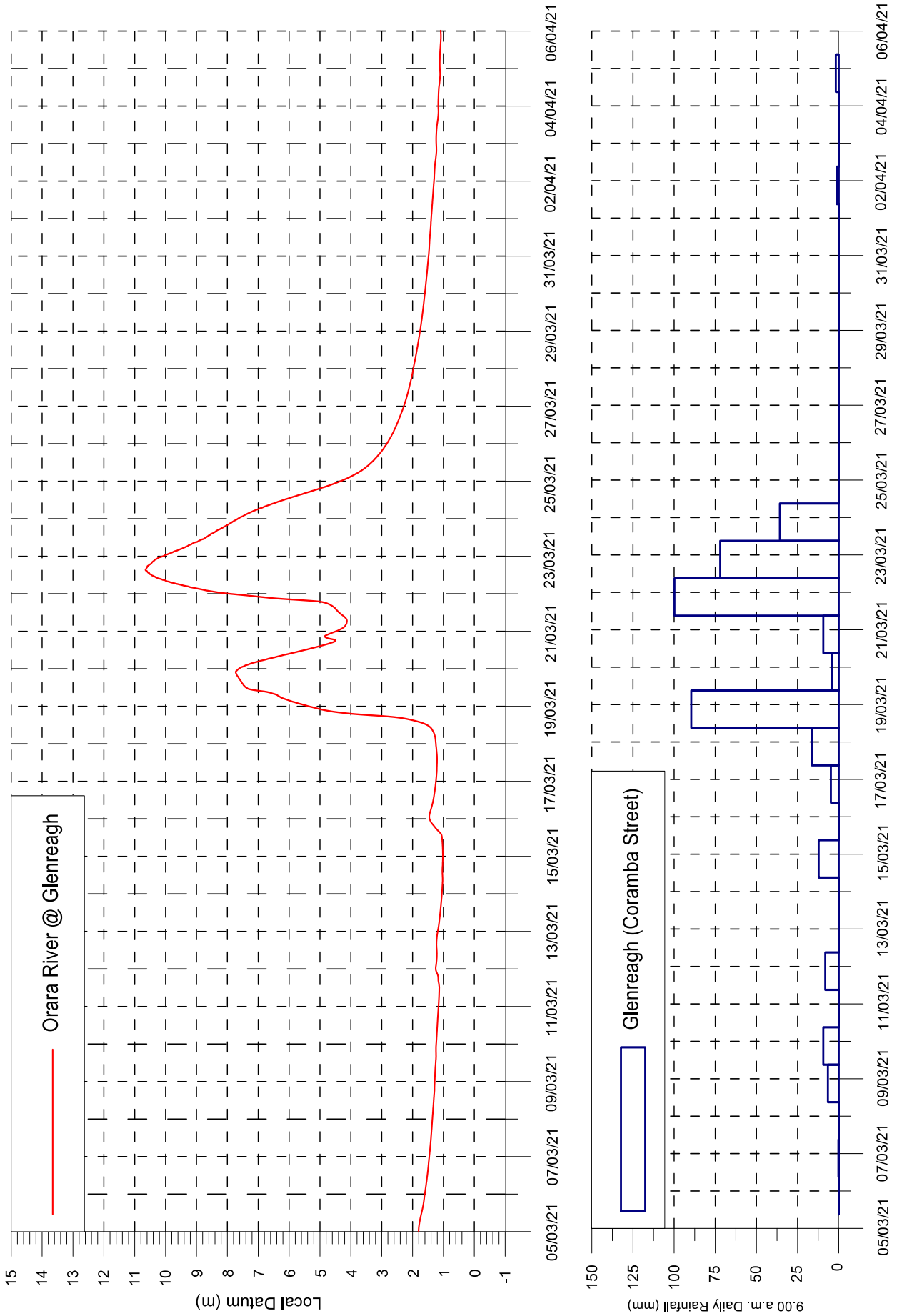
ORARA RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809
Figure
5.2

5.2.GRF



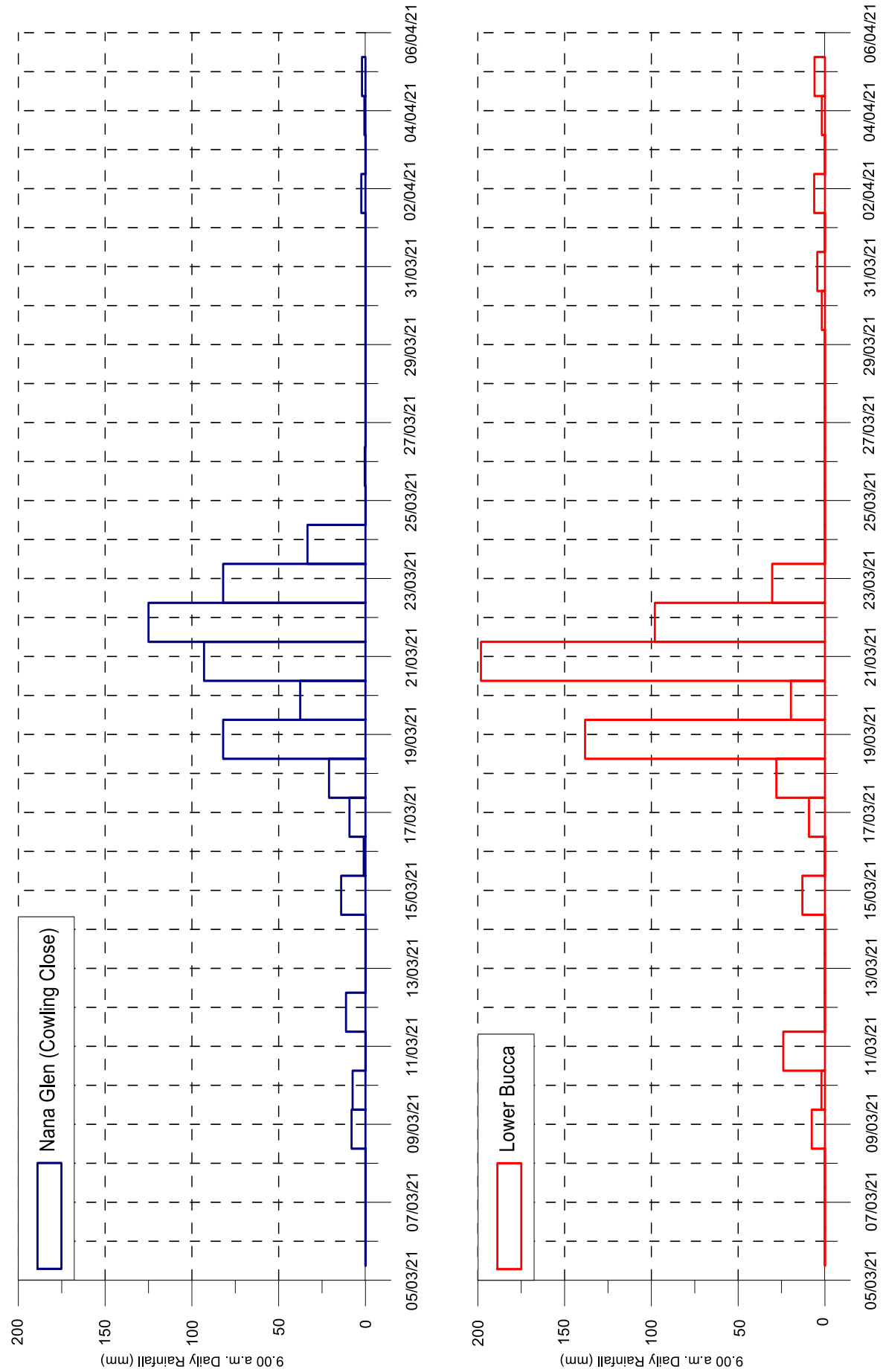
NSW GOVERNMENT

ORARA RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809
Figure
5.3

5.3.GRF



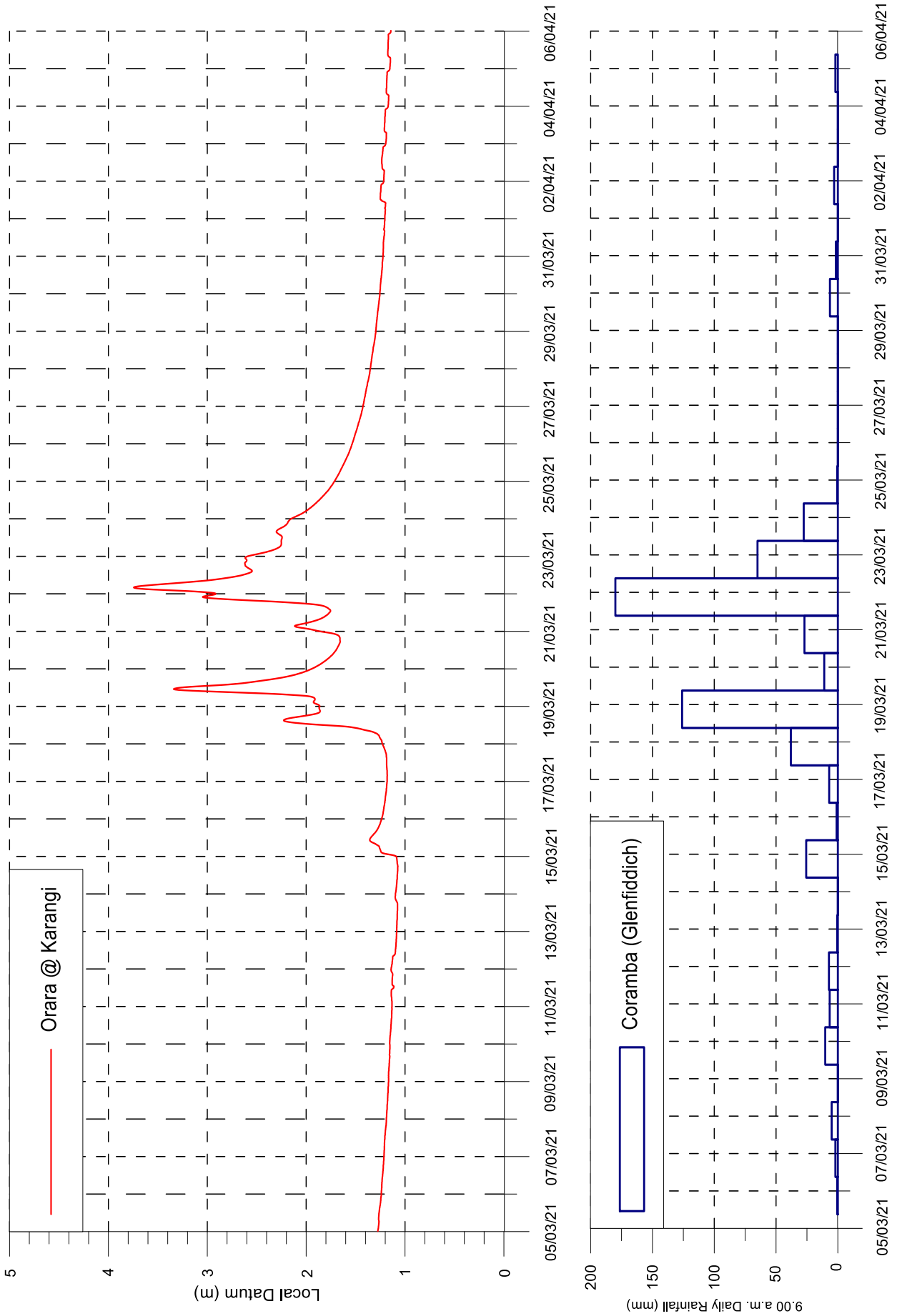
NSW GOVERNMENT

ORARA RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809
Figure
5.4

5.4.GRF



NSW GOVERNMENT

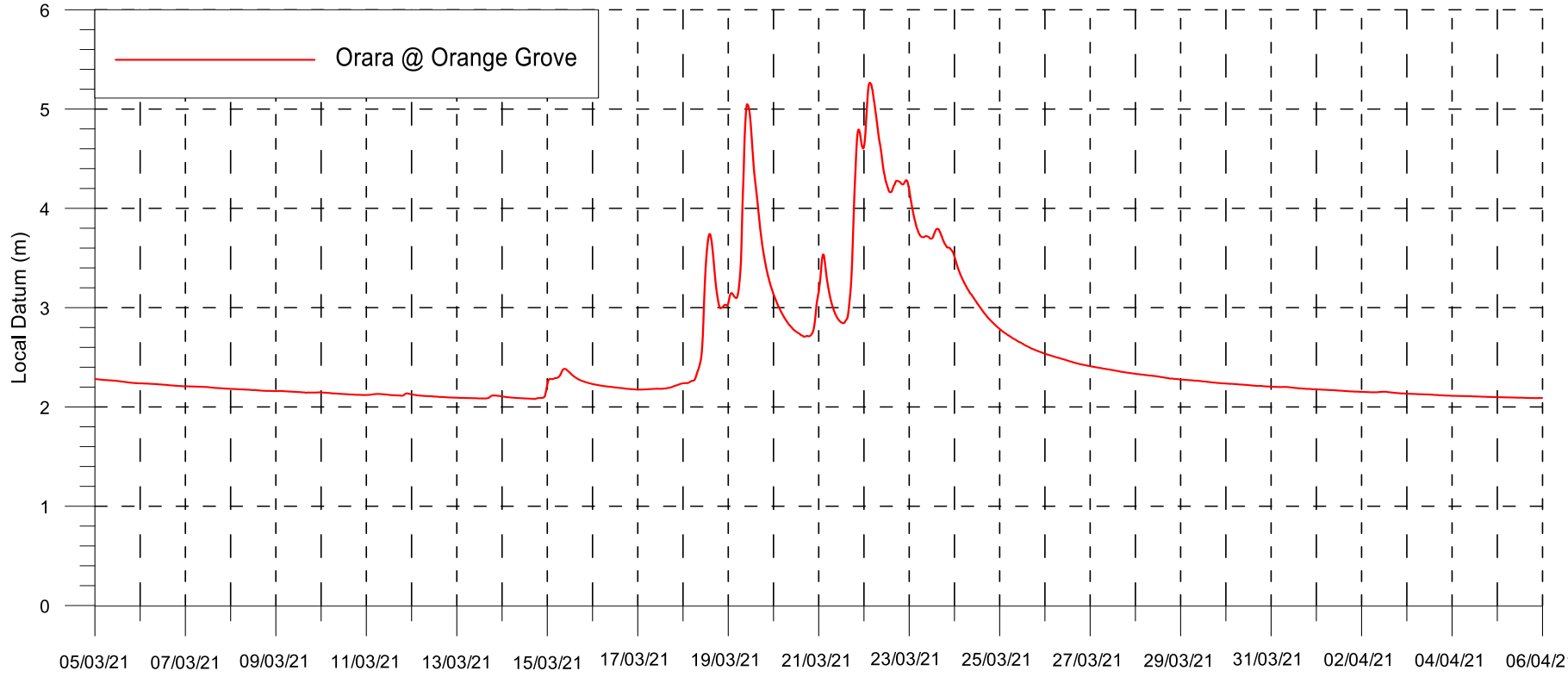
ORARA RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

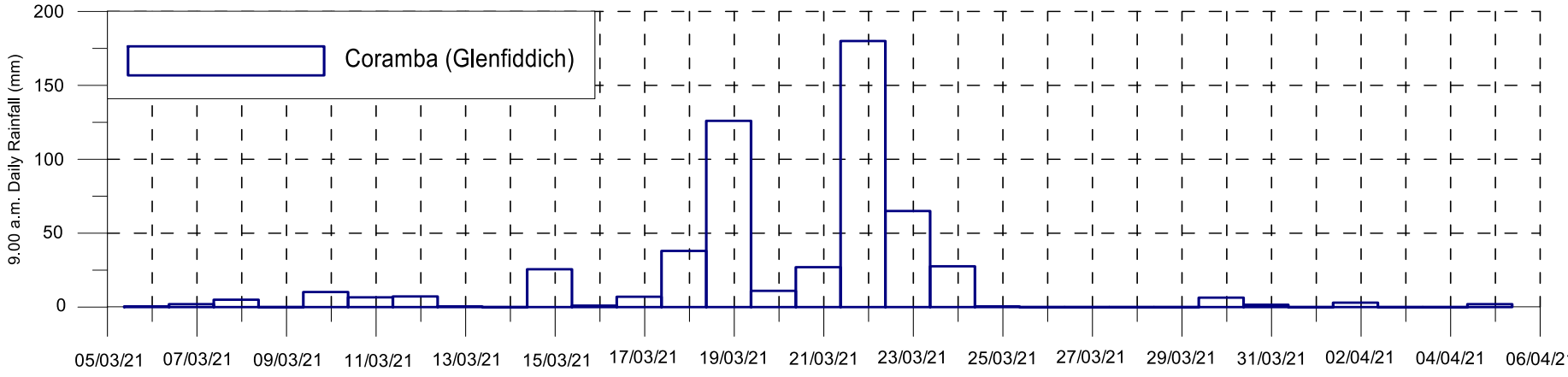
Manly Hydraulics Laboratory

Report MH2809
Figure
5.5

5.5.GRF

ORARA RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

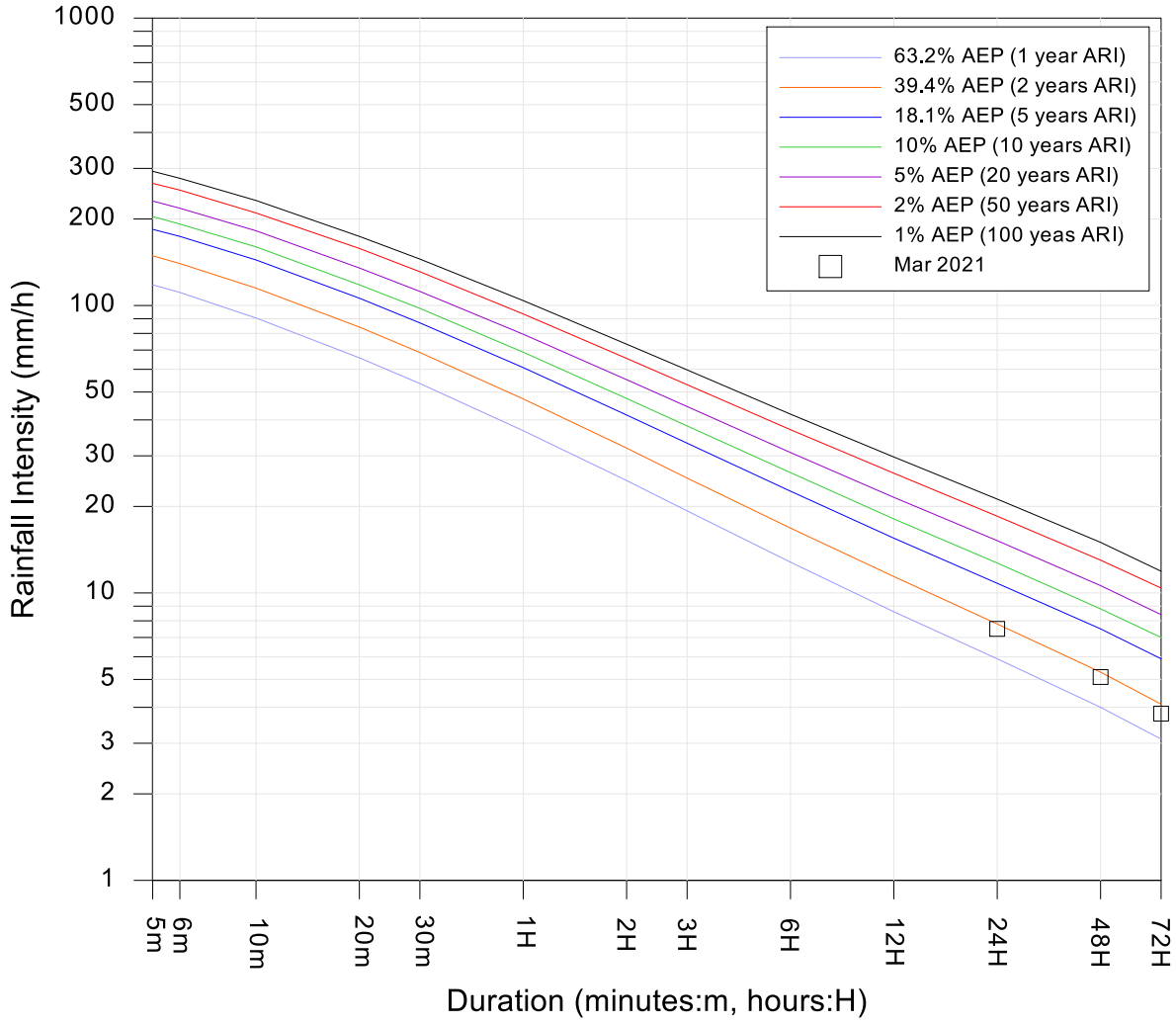




Manly Hydraulics Laboratory
Report MH2809
Figure 5.6
5.6.GRF

Site Owner: BoM
Latitude: -30.24 Longitude:153.02

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	-	-
6m	-	-
10m	-	-
20m	-	-
30m	-	-
1H	-	-
2H	-	-
3H	-	-
6H	-	-
12H	-	-
24H	7.5	23:59 22 Mar 2021
48H	5.1	23:59 23 Mar 2021
72H	3.8	23:59 24 Mar 2021

Rainfall data collected as 24 hour totals only.

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

CORAMBA (GLENFIDDICH) (59009)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

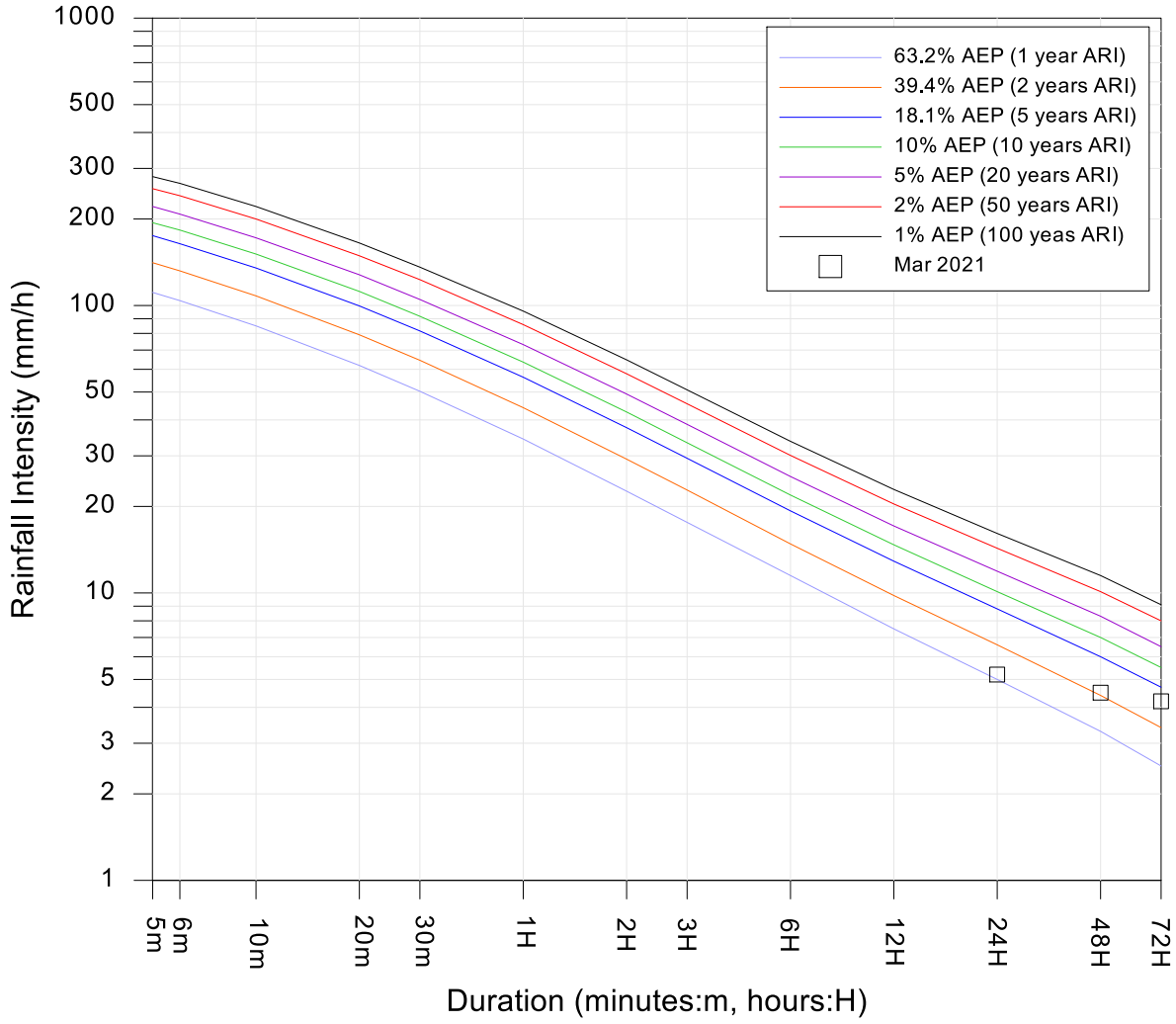
Manly Hydraulics Laboratory

Report MHL2809
Figure
5.7

IFD_59009_Figure 5.7.pdf

Site Owner: BoM
Latitude: -30.1 Longitude:153

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	-	-
6m	-	-
10m	-	-
20m	-	-
30m	-	-
1H	-	-
2H	-	-
3H	-	-
6H	-	-
12H	-	-
24H	5.2	23:59 22 Mar 2021
48H	4.5	23:59 22 Mar 2021
72H	4.2	23:59 23 Mar 2021

Rainfall data collected as 24 hour totals only.

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

NANA GLEN (COWLING CLOSE) (59139)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

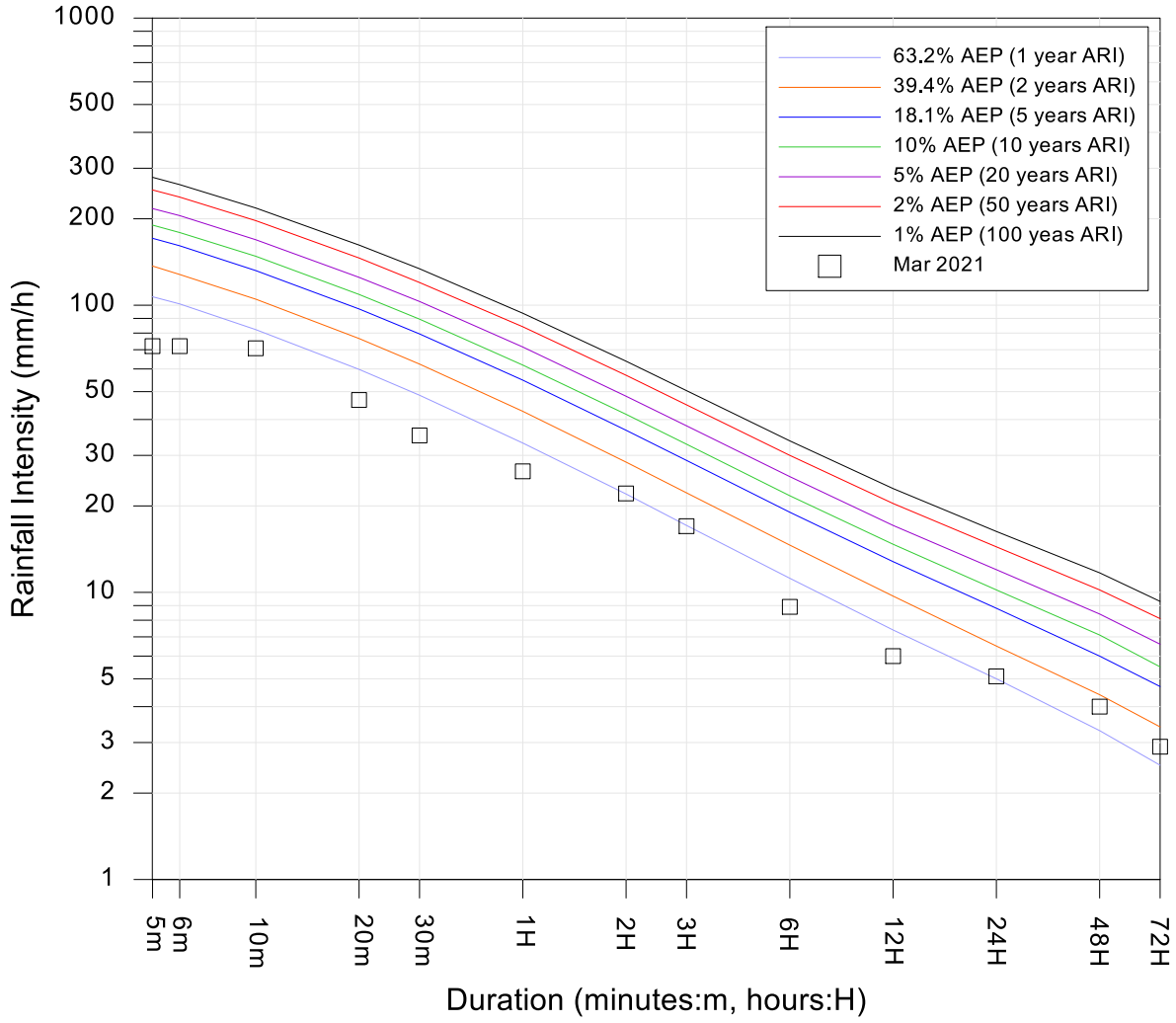
Manly Hydraulics Laboratory

Report MHL2809
Figure
5.8

IFD_59139_Figure 5.8.pdf

Site Owner: BoM
Latitude: -30.05 Longitude:152.978

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	72	16:34 18 Mar 2021
6m	72	16:33 18 Mar 2021
10m	70.8	16:34 18 Mar 2021
20m	46.8	16:40 18 Mar 2021
30m	35.2	16:39 18 Mar 2021
1H	26.4	17:20 18 Mar 2021
2H	22.1	18:02 18 Mar 2021
3H	17	18:34 18 Mar 2021
6H	8.9	20:28 18 Mar 2021
12H	6	05:33 22 Mar 2021
24H	5.1	17:33 22 Mar 2021
48H	4	14:37 23 Mar 2021
72H	2.9	15:51 23 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

GLENREAGH (CORAMBA STREET) (59054)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

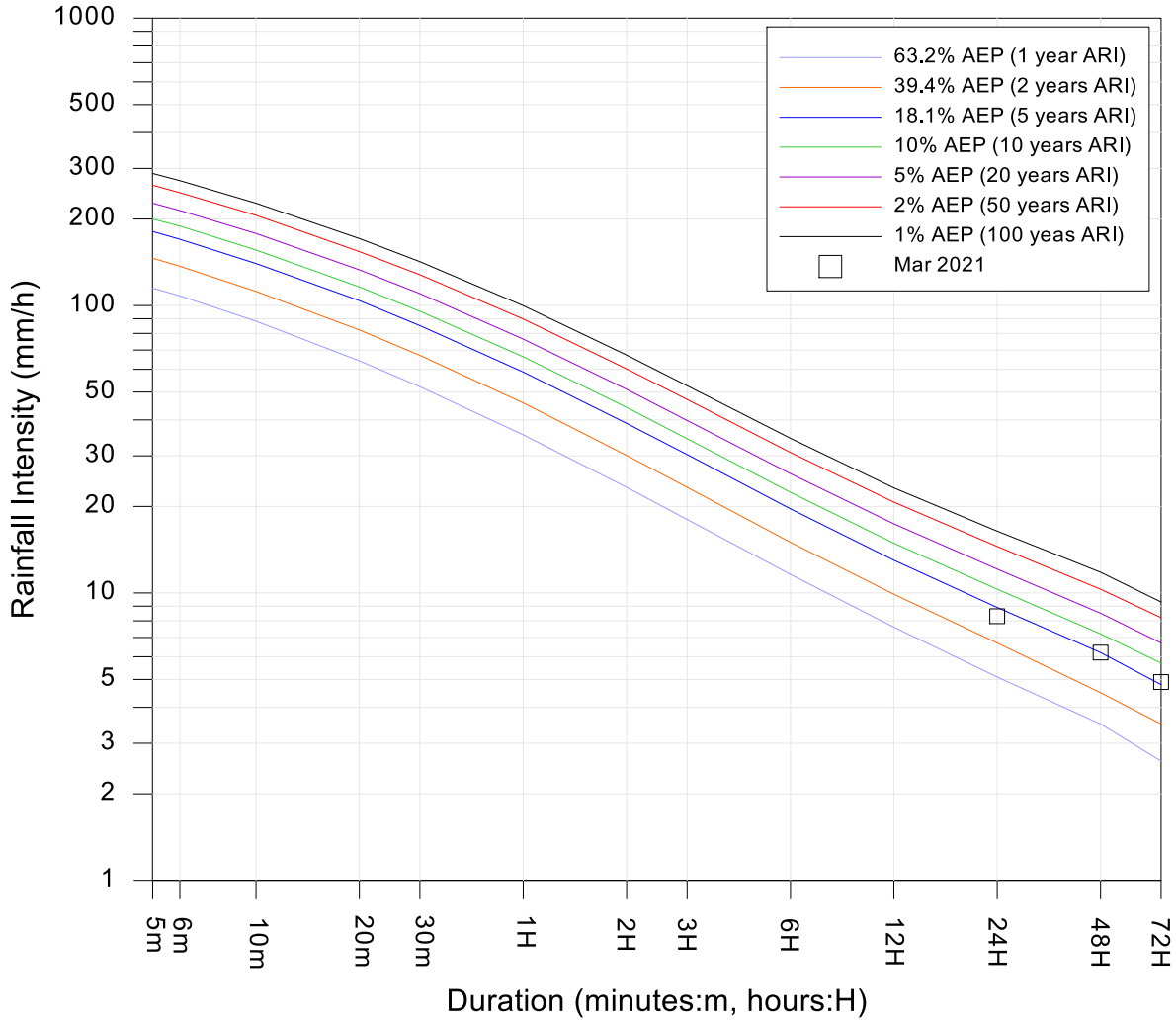
Manly Hydraulics Laboratory

Report MHL2809
Figure
5.9

IFD_59054_Figure 5.9.pdf

Site Owner: BoM
Latitude: -30.16 Longitude:153.1

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	-	-
6m	-	-
10m	-	-
20m	-	-
30m	-	-
1H	-	-
2H	-	-
3H	-	-
6H	-	-
12H	-	-
24H	8.3	23:59 21 Mar 2021
48H	6.2	23:59 22 Mar 2021
72H	4.9	23:59 21 Mar 2021

Rainfall data collected as 24 hour totals only.

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

LOWER BUCCA (59006)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

Manly Hydraulics Laboratory

Report MHL2809
Figure
5.10

IFD_59006_Figure 5.10.pdf

6 Nambucca River region

6.1 Nambucca River region – water level

The peak observed water levels for the Nambucca River region are listed in **Table 6-1**. **Table 6-2** lists the SES flood classifications for Bowraville Lanes Bridge and Macksville. The locations of water level stations within the Nambucca River region are shown in **Figure 6-1.** The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 6-2** to **Figure 6-6.**

Table 6-1 Nambucca River region flood peaks

River system	Station name	Station number	Owner	Datum	Level (m)
Deep Creek	Deep Creek	205485	DPIE	AHD	2.33
Nambucca River	Stuarts Island Downstream	205466	DPIE	AHD	2.09
Nambucca River	Macksville	205416	DPIE	AHD	2.94
Taylors Arm	Utungun	205414	DPIE	AHD	6.29
Nambucca River	Bowraville Downstream	205425	DPIE	AHD	7.88
Nambucca River	Bowraville Lanes Bridge	2054193	Nambucca Shire Council	AHD	10.06
Nambucca River	Nambucca River (North Arm) U/S Bowraville	205015	WaterNSW	Local datum	7.13
Warrell Creek	Warrell Creek	205490	DPIE	AHD	5.33

Table 6-2 SES flood classification for Bowraville Lanes Bridge and Macksville

Station name	Station number	Flood classification			Flood peak (m)	Flood event classification
		Minor	Moderate	Major		
		Water level (m)				
Macksville	205416	1.7	2.1	2.6	2.94	Major
Bowraville Lanes Bridge	2054193	5.5	5.8	10.1	10.06	Moderate

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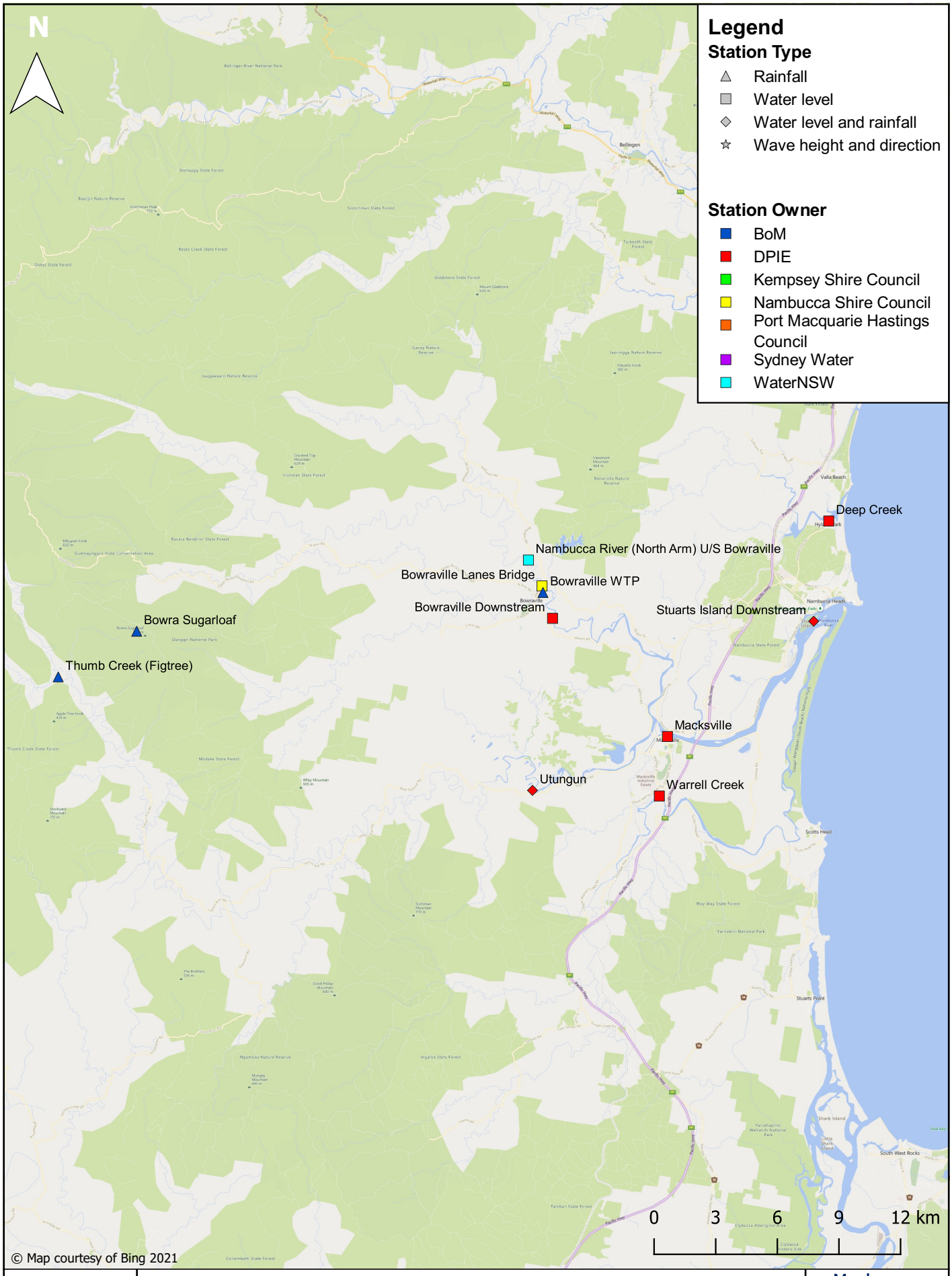
Classification: Public



NSW GOVERNMENT

NAMBUCCA RIVER STATIONS

Manly Hydraulics Laboratory

Report MHL2809
Figure
6.1

Figures_MHL2809.qgs

6.2 Nambucca River region – rainfall

The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 6-2** to **Figure 6-6**. 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 6-3** for the period 05 March to 05 April 2021. The rainfall intensities are displayed graphically in **Figure 6-7** to **Figure 6-11**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 6-3 Nambucca River region daily rainfall totals

Date	Bowraville WTP 559046 (mm)	Stuarts Island Downstream 205466 (mm)	Utungun 205414 (mm)	Thumb Creek (Figtree) 59120 (mm)	Bowra Sugarloaf 59138 (mm)
	BoM	DPIE	DPIE	BoM	BoM
05/03/2021	-	8.0	0.0	0.4	-
06/03/2021	-	0.0	0.0	0.0	1.0
07/03/2021	0.0	0.0	0.0	0.0	0.0
08/03/2021	0.0	0.0	0.0	0.0	0.0
09/03/2021	2.0	4.0	1.0	5.8	5.0
10/03/2021	16.0	3.5	8.5	3.8	3.0
11/03/2021	10.0	1.5	39.5	27.0	15.0
12/03/2021	0.0	4.0	4.0	6.6	14.0
13/03/2021	0.0	0.0	3.0	5.8	5.0
14/03/2021	0.0	0.0	0.0	2.0	0.0
15/03/2021	92.0	55.5	45.0	37.0	63.0
16/03/2021	0.0	13.0	0.0	0.4	3.0
17/03/2021	15.0	14.0	16.0	12.0	16.0
18/03/2021	68.0	13.0	97.5	22.8	30.0
19/03/2021	166.0	238.5	210.0	65.0	46.0
20/03/2021	176.0	182.0	211.5	98.0	1.0
21/03/2021	38.0	20.0	82.0	67.0	82.0
22/03/2021	172.0	182.0	173.0	45.2	90.0
23/03/2021	53.0	53.0	47.5	44.0	43.0
24/03/2021	10.0	24.5	10.0	9.4	8.0
25/03/2021	1.0	0.0	0.0	0.0	0.0
26/03/2021	0.0	0.0	0.0	0.0	0.0
27/03/2021	0.0	0.0	0.0	0.0	0.0
28/03/2021	0.0	0.0	0.0	0.0	0.0
29/03/2021	0.0	0.0	0.0	0.0	0.0
30/03/2021	0.0	0.0	2.0	0.0	0.0
31/03/2021	1.0	0.0	1.0	0.4	0.0
01/04/2021	1.0	1.0	0.0	0.0	0.0
02/04/2021	0.0	1.5	0.5	2.8	3.0
03/04/2021	2.0	0.0	1.5	2.6	2.0
04/04/2021	0.0	0.5	0.0	0.0	0.0
05/04/2021	0.0	0.0	0.0	0.0	0.0
06/04/2021	5.0	1.5	0.0	6.0	12.0

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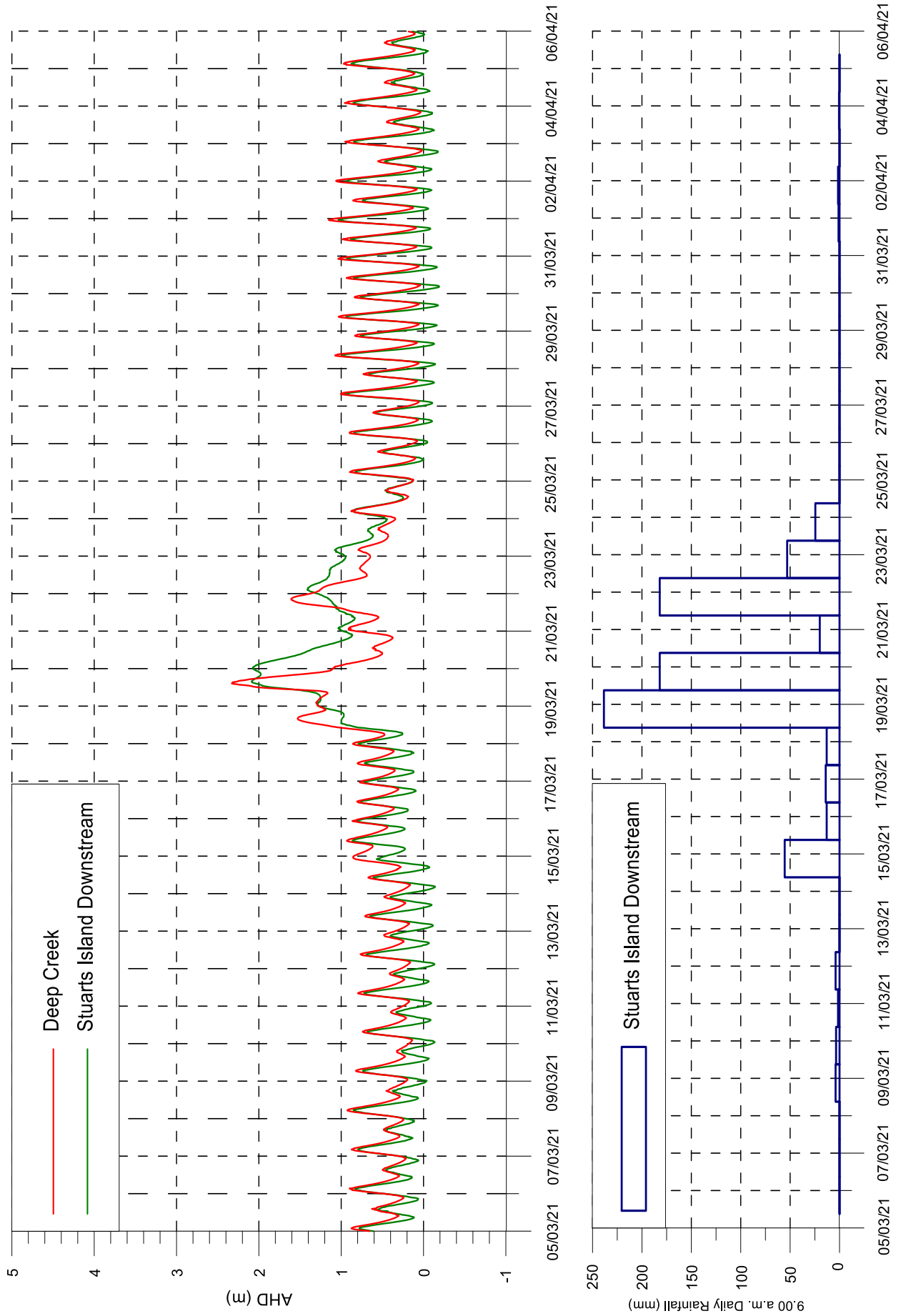
Classification: Public



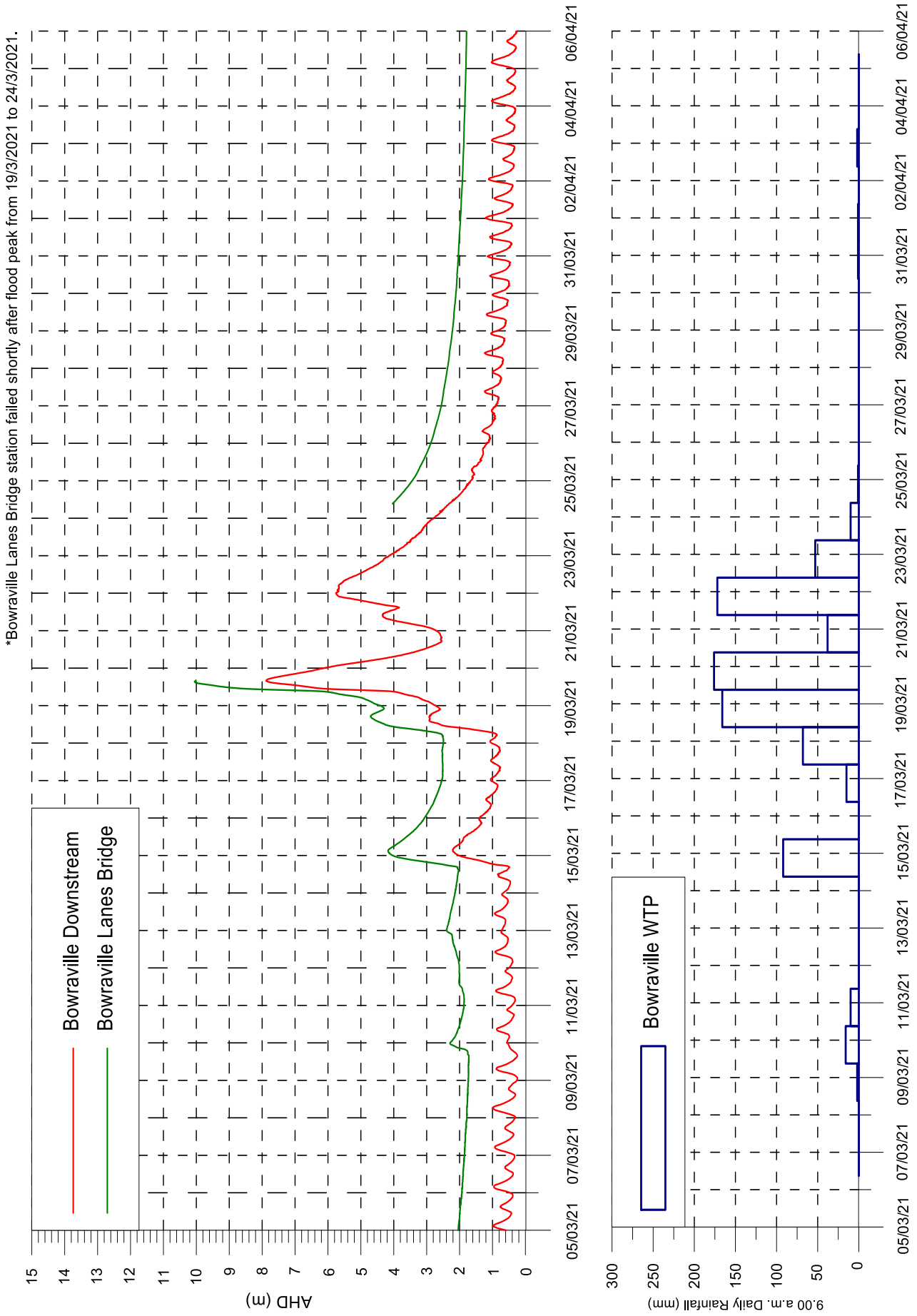
NSW GOVERNMENT

NAMBUCCA RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809
Figure
6.2

6.2.GRF



NSW GOVERNMENT

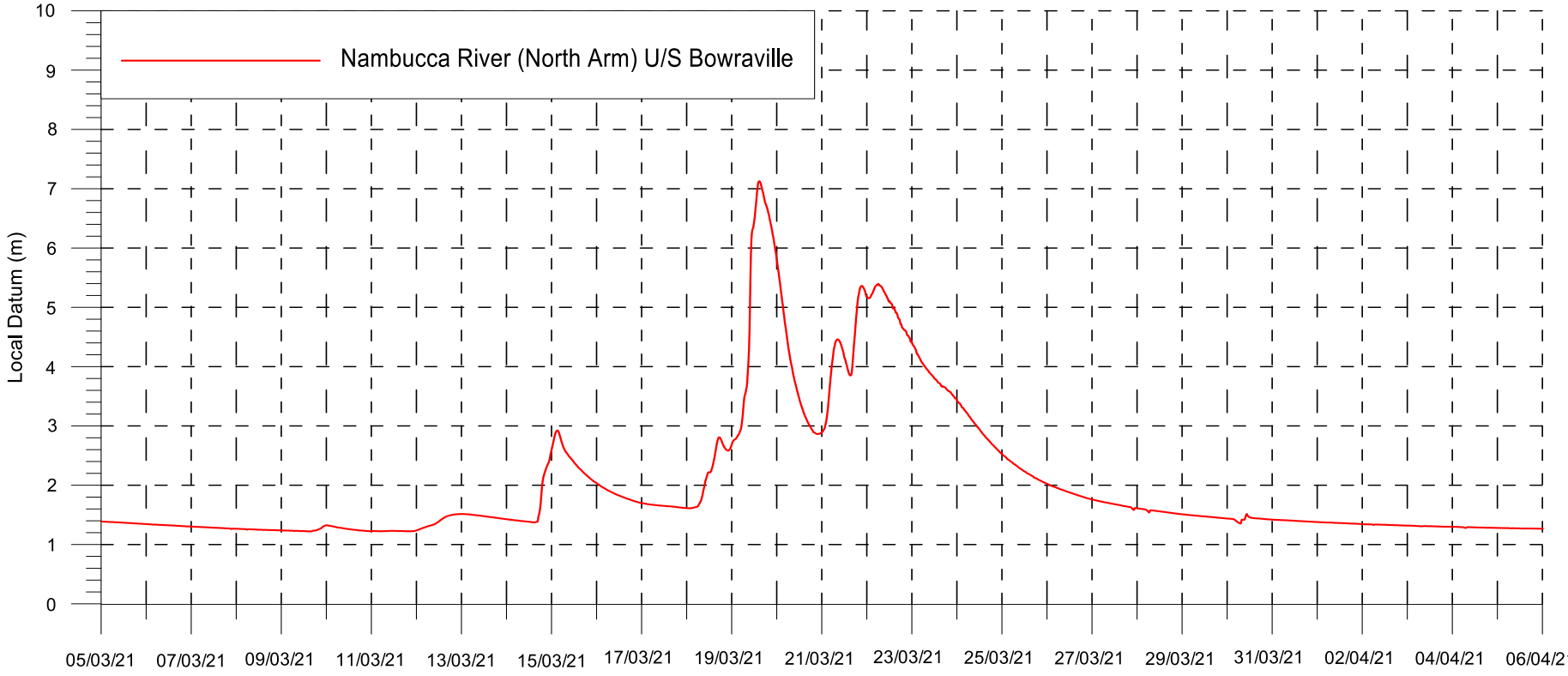
NAMBUCCA RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

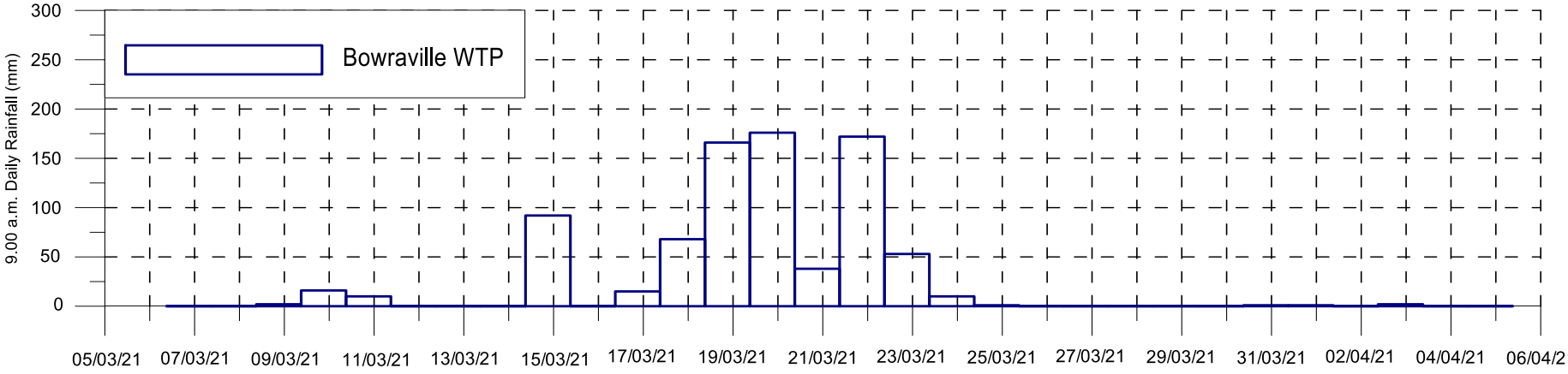
Manly Hydraulics Laboratory

Report MH2809
Figure
6.3

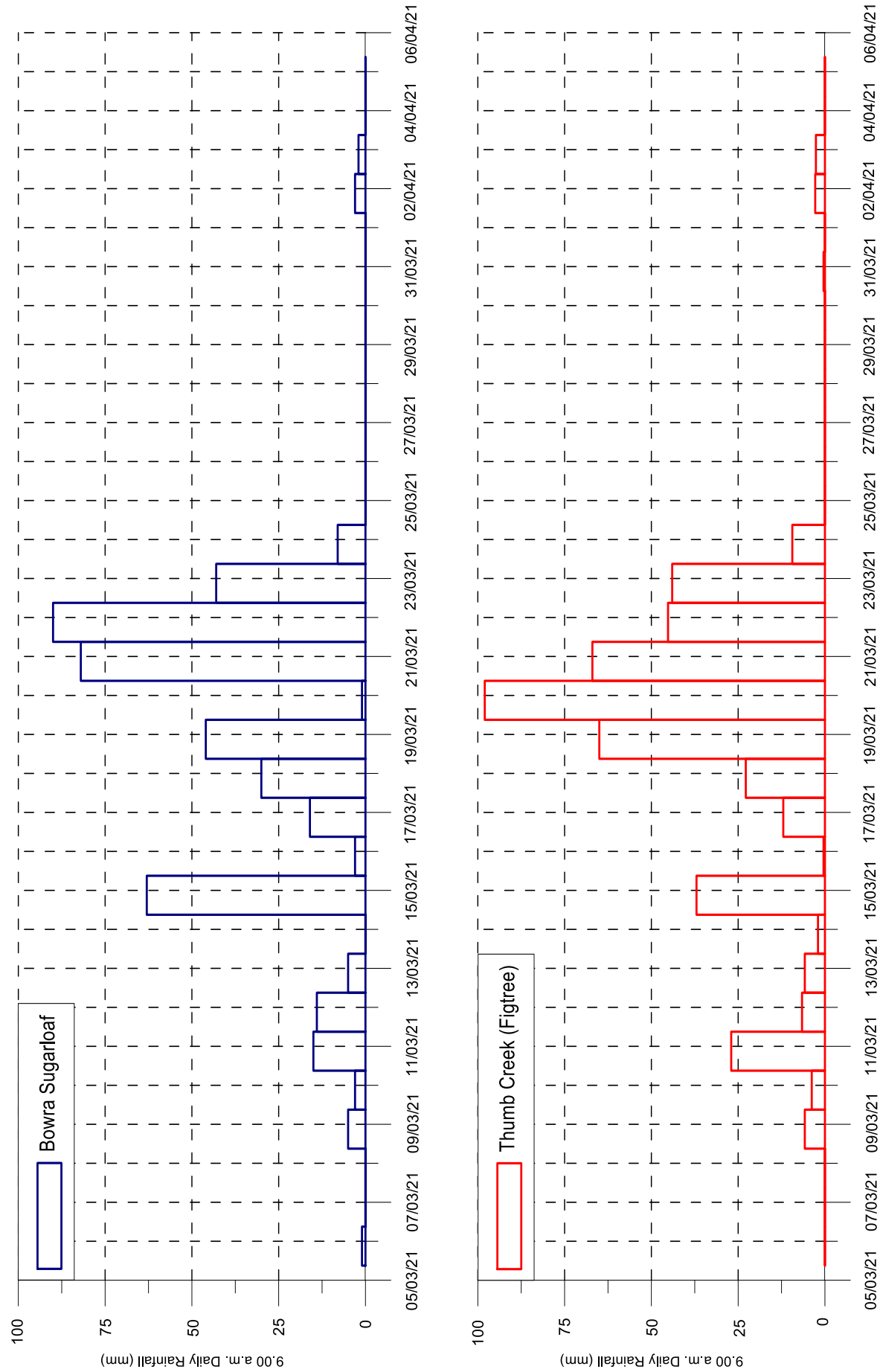
6.3.GRF

NAMBUCCA RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021





Manly Hydraulics Laboratory
Report MH2809
Figure 6.4
6.4.GRF



NSW GOVERNMENT

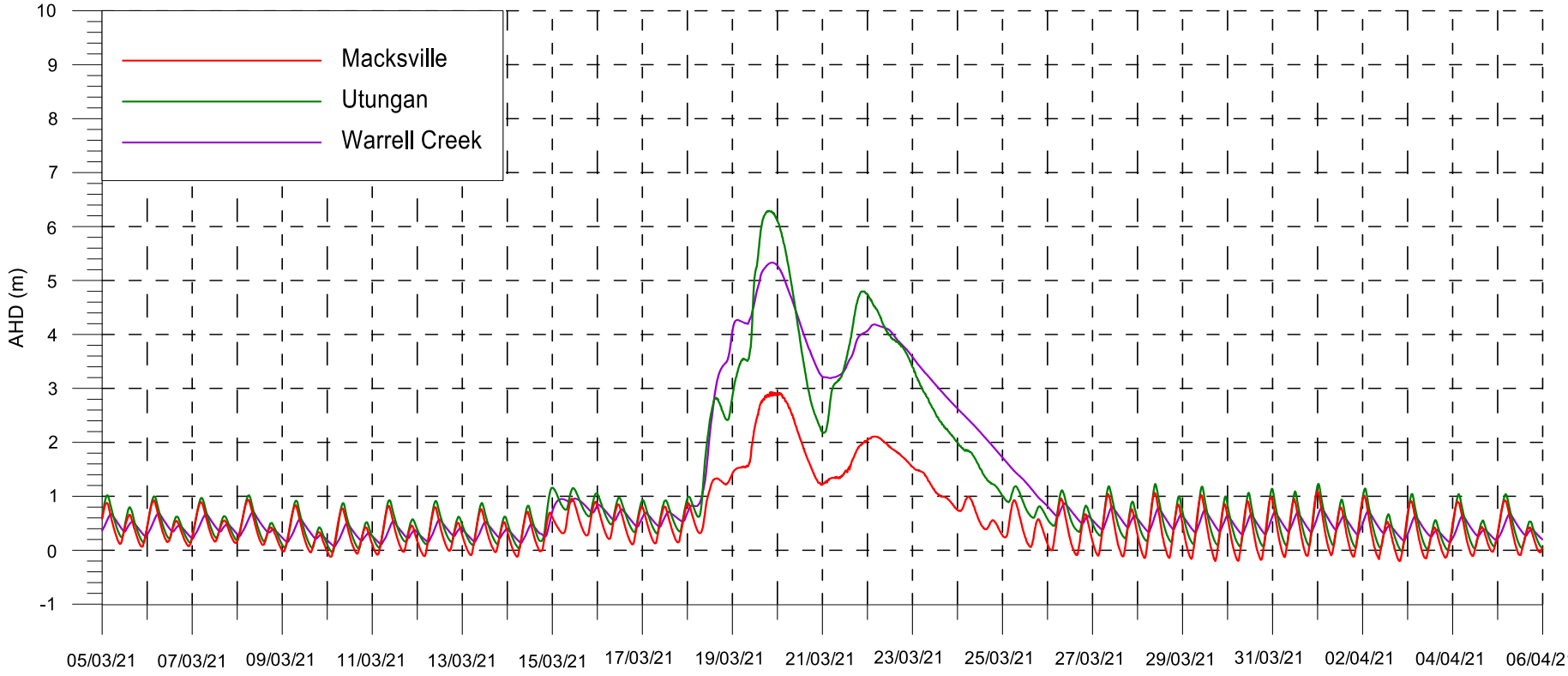
NAMBUCCA RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

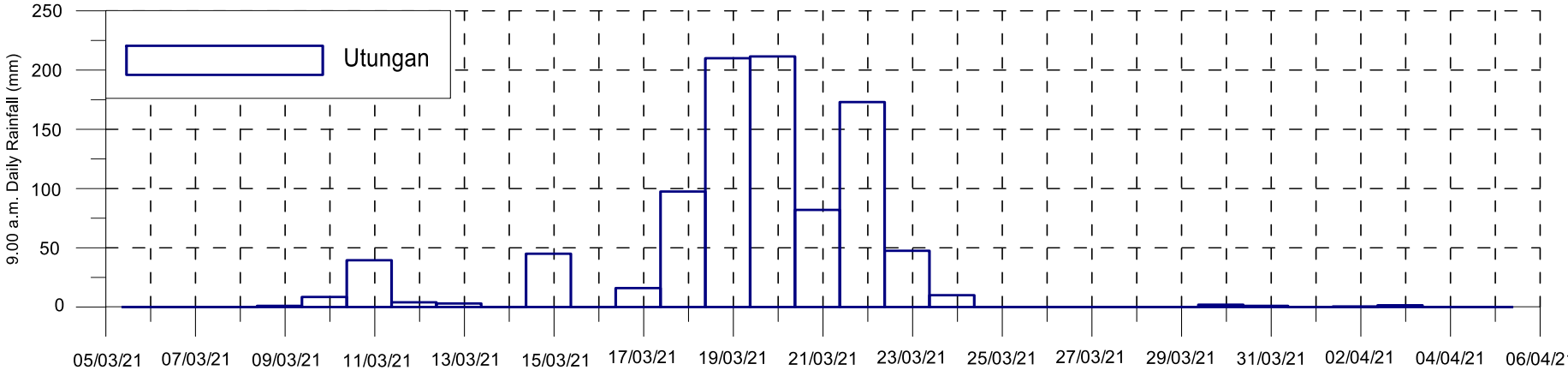
Manly Hydraulics Laboratory

Report MH2809
Figure
6.5

6.5.GRF

NAMBUCCA RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021





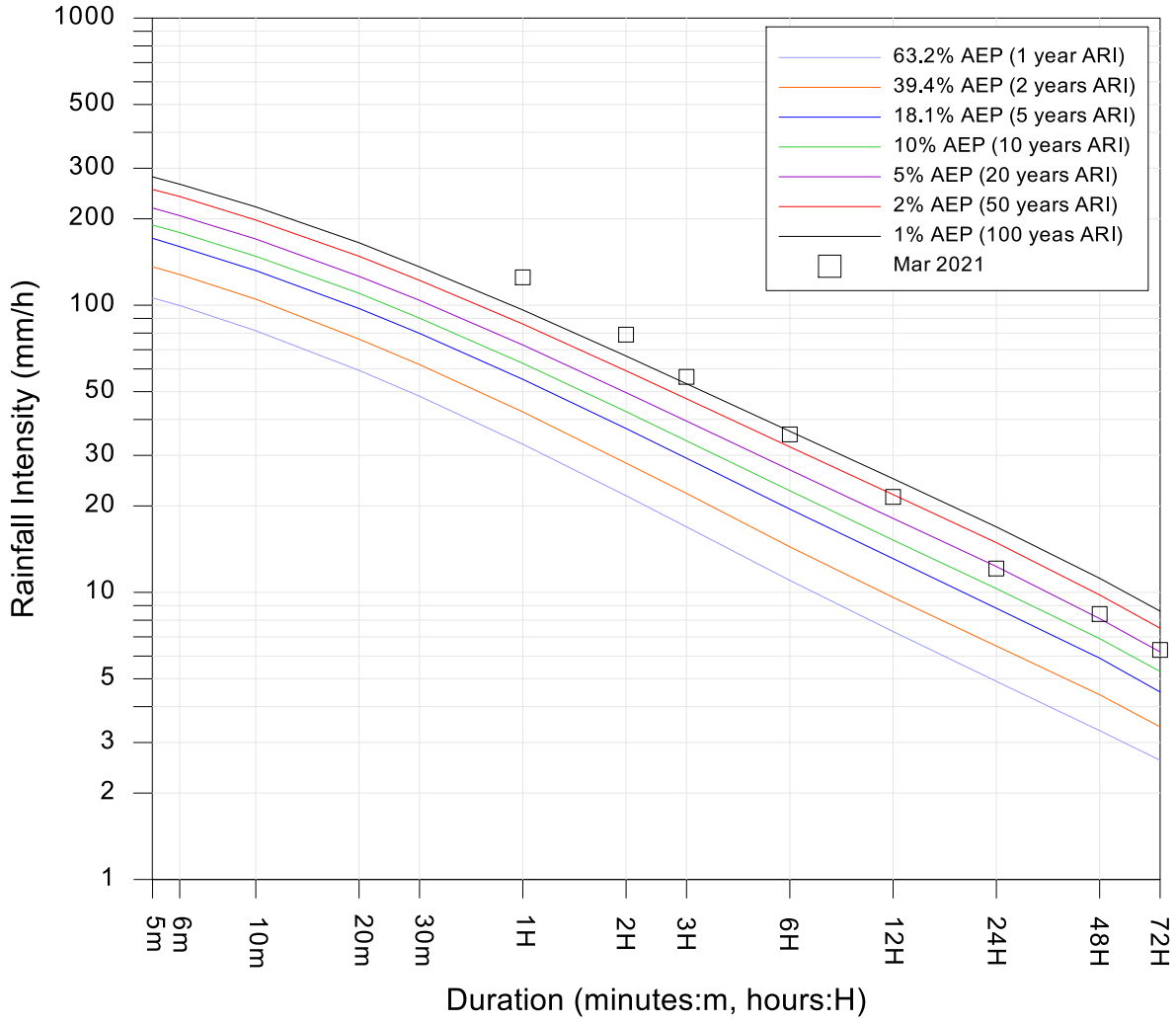
Manly Hydraulics Laboratory

Report MH2809
Figure 6.6

6.6.GRF

Site Owner: BoM
Latitude: -30.643 Longitude:152.857

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	-	-
6m	-	-
10m	-	-
20m	-	-
30m	-	-
1H	125	09:47 19 Mar 2021
2H	79	10:40 19 Mar 2021
3H	56.3	10:56 19 Mar 2021
6H	35.5	13:56 19 Mar 2021
12H	21.5	14:00 19 Mar 2021
24H	12.1	17:43 19 Mar 2021
48H	8.4	21:00 19 Mar 2021
72H	6.3	02:00 22 Mar 2021

Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

BOWRAVILLE WTP (559046)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

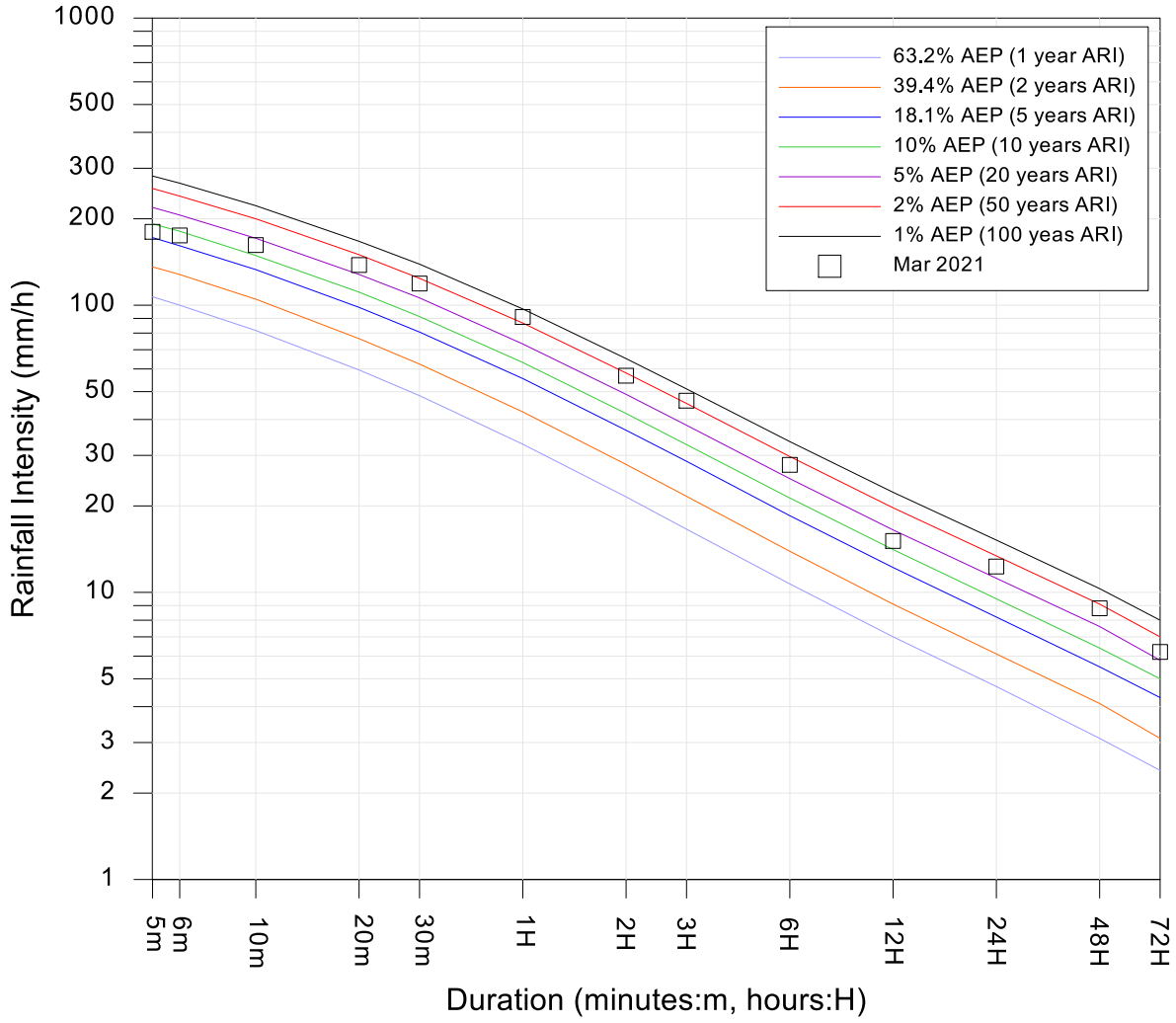
Manly Hydraulics Laboratory

Report MHL2809
Figure
6.7

IFD_559046_Figure 6.7.pdf

Site Owner: DPIE
Latitude: -30.6556 Longitude:152.995

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	180	09:39 19 Mar 2021
6m	175	09:40 19 Mar 2021
10m	162	09:43 19 Mar 2021
20m	138	09:53 19 Mar 2021
30m	119	09:59 19 Mar 2021
1H	91	10:14 19 Mar 2021
2H	56.8	10:23 19 Mar 2021
3H	46.5	12:00 19 Mar 2021
6H	27.8	14:23 19 Mar 2021
12H	15.1	13:34 18 Mar 2021
24H	12.3	11:38 19 Mar 2021
48H	8.8	23:22 19 Mar 2021
72H	6.2	18:56 19 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

STUARTS ISLAND DOWNSTREAM (205466)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

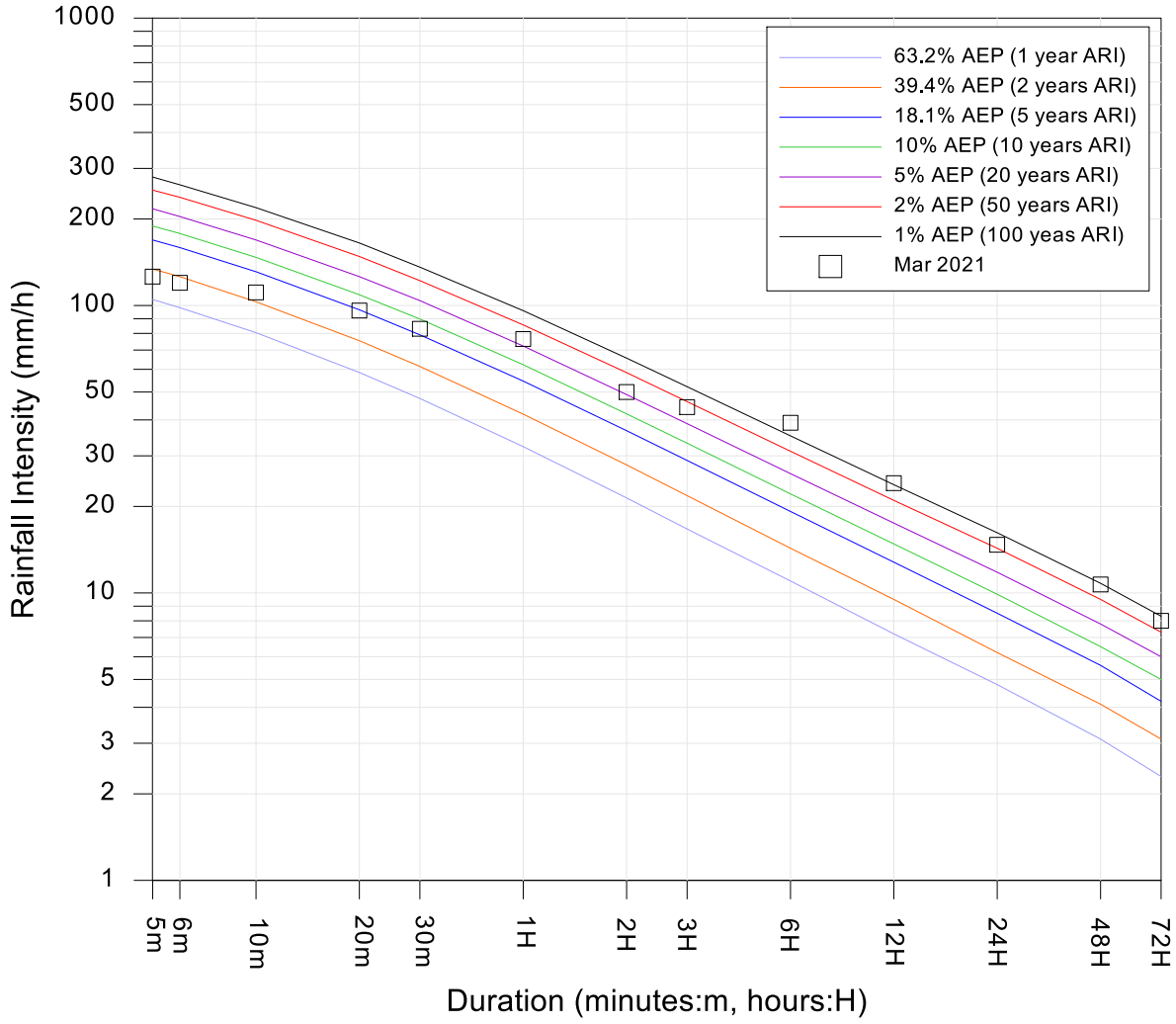
Manly Hydraulics Laboratory

Report MHL2809
Figure
6.8

IFD_205466_Figure 6.8.pdf

Site Owner: DPIE
Latitude: -30.7297 Longitude:152.852

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	126	08:41 19 Mar 2021
6m	120	13:13 19 Mar 2021
10m	111	13:15 19 Mar 2021
20m	96	13:22 19 Mar 2021
30m	83	13:31 19 Mar 2021
1H	76.5	13:57 19 Mar 2021
2H	50	11:30 19 Mar 2021
3H	44.3	11:27 19 Mar 2021
6H	39.1	14:21 19 Mar 2021
12H	24.1	14:08 19 Mar 2021
24H	14.7	19:37 19 Mar 2021
48H	10.7	18:19 19 Mar 2021
72H	8	04:09 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

UTUNGUN (205414)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

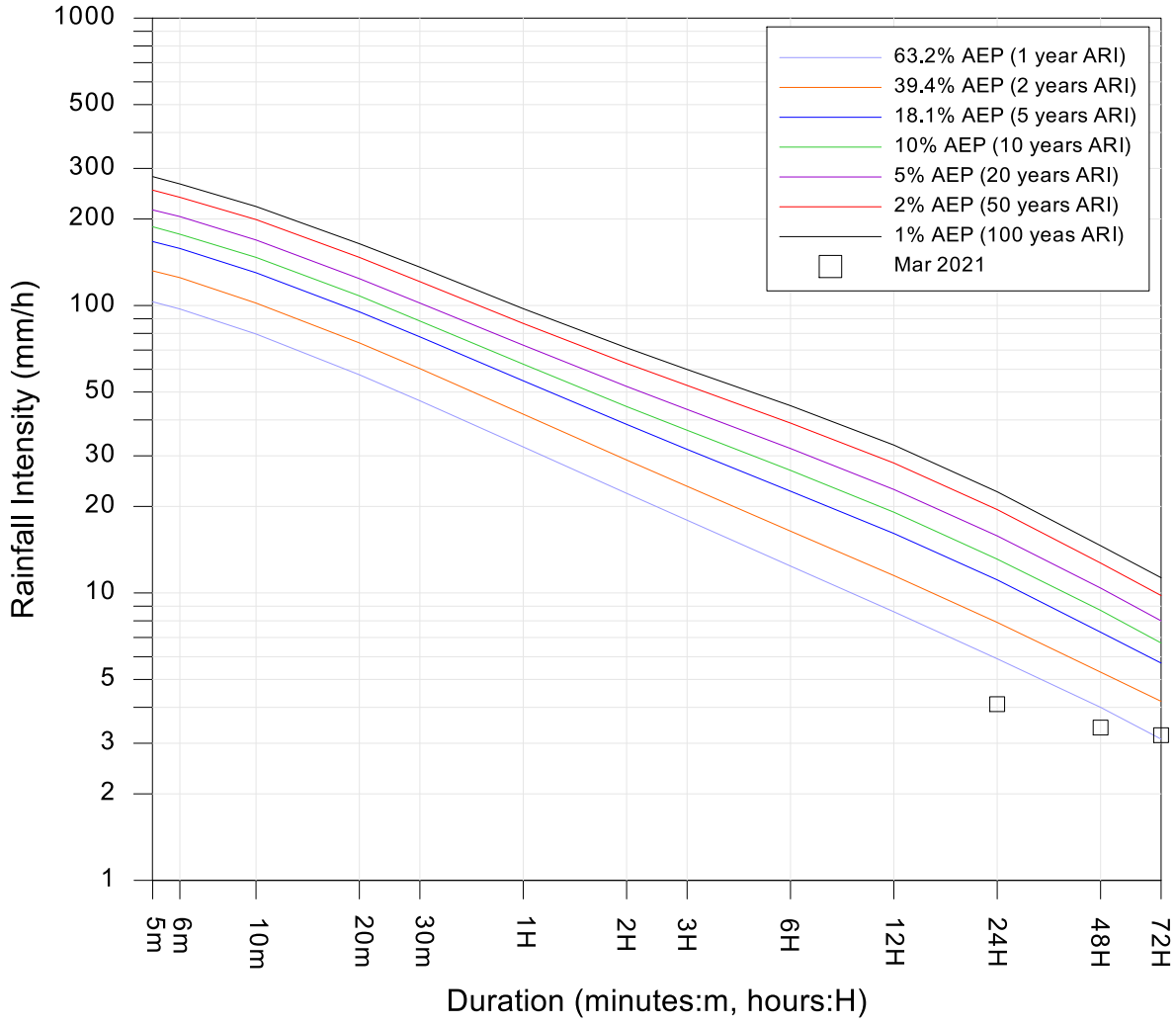
Manly Hydraulics Laboratory

Report MHL2809
Figure
6.9

IFD_205414_Figure 6.9.pdf

Site Owner: BoM
Latitude: -30.68 Longitude:152.61

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	-	-
6m	-	-
10m	-	-
20m	-	-
30m	-	-
1H	-	-
2H	-	-
3H	-	-
6H	-	-
12H	-	-
24H	4.1	23:59 20 Mar 2021
48H	3.4	23:59 21 Mar 2021
72H	3.2	23:59 21 Mar 2021

Rainfall data collected as 24 hour totals only.

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

THUMB CREEK (FIGTREE) (59120)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

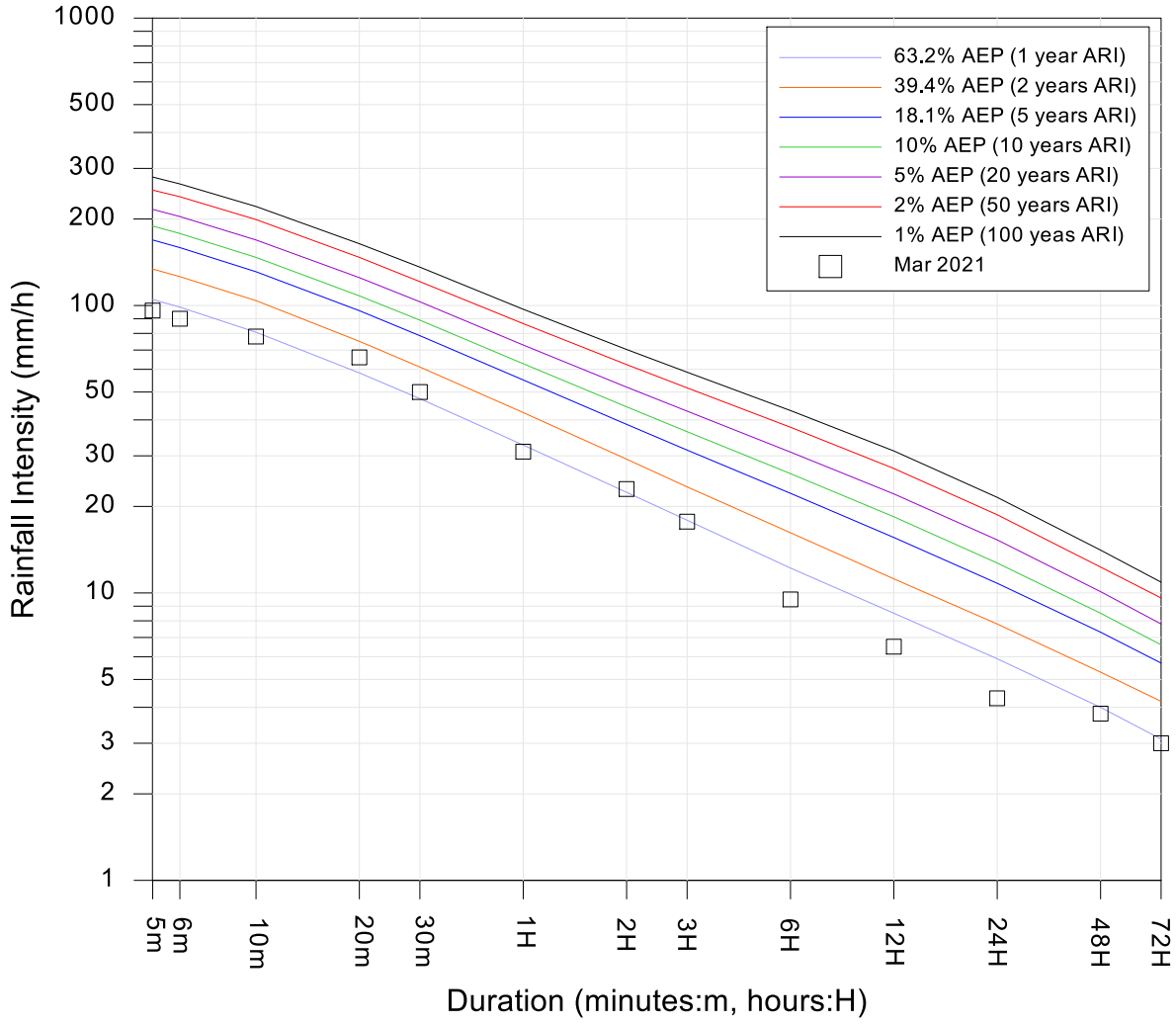
Manly Hydraulics Laboratory

Report MHL2809
Figure
6.10

IFD_59120_Figure 6.10.pdf

Site Owner: BoM
Latitude: -30.66 Longitude:152.65

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	96	16:41 14 Mar 2021
6m	90	16:42 14 Mar 2021
10m	78	16:43 14 Mar 2021
20m	66	16:43 14 Mar 2021
30m	50	16:50 14 Mar 2021
1H	31	17:23 14 Mar 2021
2H	23	18:20 14 Mar 2021
3H	17.7	19:14 14 Mar 2021
6H	9.5	22:14 14 Mar 2021
12H	6.5	01:18 21 Mar 2021
24H	4.3	17:39 21 Mar 2021
48H	3.8	13:50 22 Mar 2021
72H	3	13:06 23 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

BOWRA SUGARLOAF (59138)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

Manly Hydraulics Laboratory

Report MHL2809
Figure
6.11

IFD_59138_Figure 6.11.pdf

7 Macleay River region

7.1 Macleay River region – water level

The peak observed water levels for the Macleay River region are listed in **Table 7-1**. **Table 7-2** lists the SES flood classifications for Georges Creek, Kempsey and Smithtown. The locations of water level stations within the Macleay River region are shown in **Figure 7-1**. The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 7-2** to **Figure 7-4**.

Table 7-1 Macleay River region flood peaks

River system	Station name	Station number	Owner	Datum	Level (m)
Macleay River	South West Rocks	206456	DPIE	AHD	1.12
Boringalla Creek	Boringalla Creek	206450	DPIE	AHD	1.50
Macleay River	Macleay River at D/S Georges	206024	WaterNSW	Local datum	9.01
Macleay River	Smithtown	206406	DPIE	AHD	4.07
Macleay River	Kempsey	206402	DPIE	AHD	6.50
Macleay River	Aldavilla Downstream	206459	DPIE	AHD	8.69
Saltwater Lagoon	Saltwater Lagoon	206460	DPIE	AHD	2.16
Korogoro Creek	Hat Head	206465	DPIE	AHD	1.10^

^ This peak occurred on 31 March during a high tide after the peak of the flood event. On 24 March during the peak of the flood event Hat Head reached 0.90m AHD.

Table 7-2 SES flood classification for Georges Creek, Kempsey and Smithtown

Station name	Station number	Flood classification			Flood peak (m)	Flood event classification
		Minor	Moderate	Major		
		Water level (m)				
Macleay River at D/S Georges	206024	6.0	8.0	10.0	9.01	Moderate
Smithtown	206406	3.4	4.0	4.2	4.07	Moderate
Kempsey	206402	4.5	5.7	6.6	6.50	Moderate

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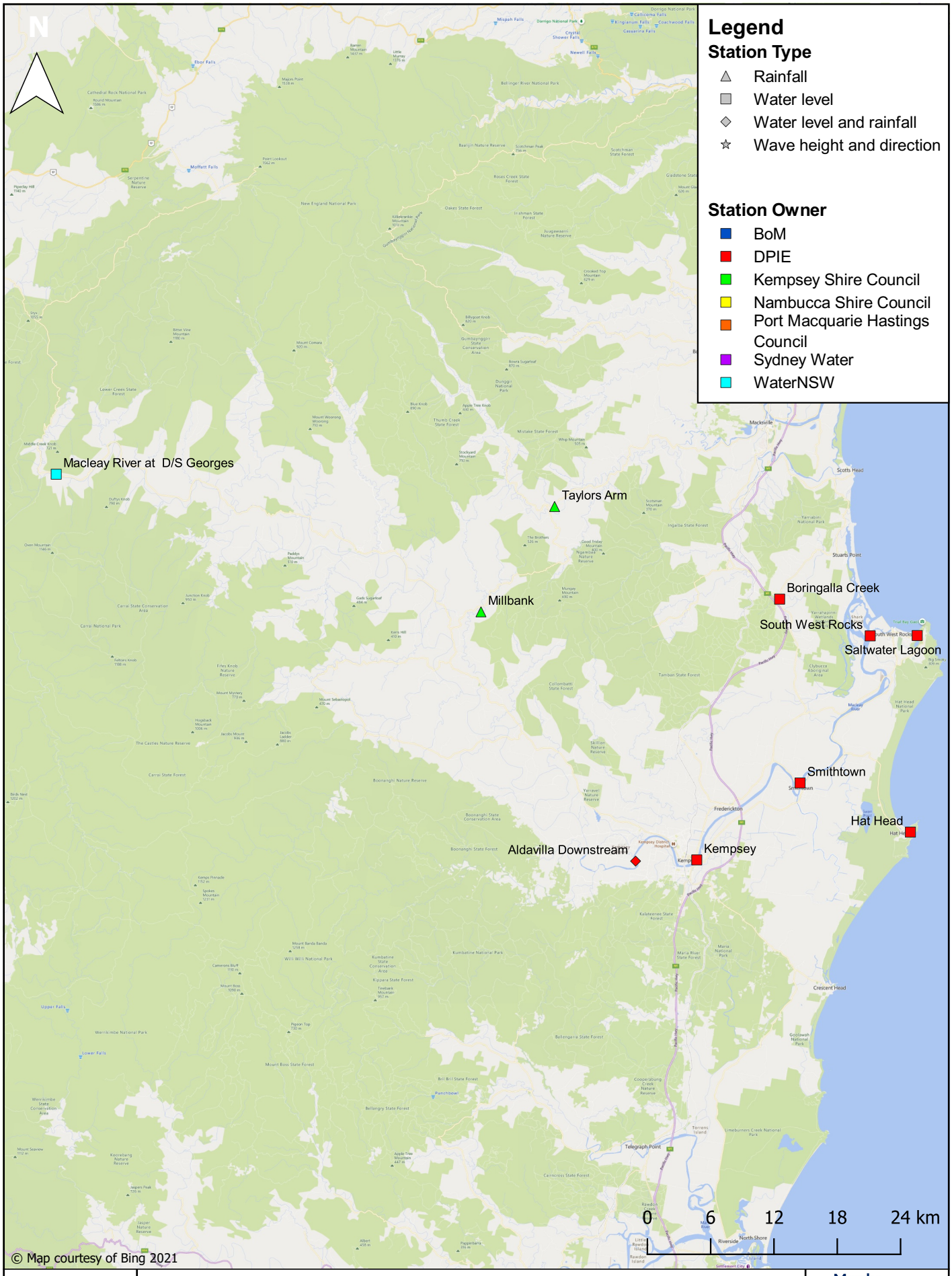
Classification: Public



NSW GOVERNMENT

MACLEAY RIVER STATIONS

Manly Hydraulics Laboratory

Report MHL2809
Figure
7.1

Figures_MHL2809.qgs

7.2 Macleay River region – rainfall

The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 7-2** to **Figure 7-4**. 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 7-3** for the period 05 March to 05 April 2021. The rainfall intensities are displayed graphically in **Figure 7-5** to **Figure 7-7**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 7-3 Macleay River region daily rainfall totals

Date	Aldavilla Downstream	Taylors Arm	Millbank
	206459 (mm)	59032 (mm)	59131 (mm)
	DPIE	Kempsey Shire Council	Kempsey Shire Council
05/03/2021	3.0	-	0.0
06/03/2021	0.0	0.0	0.0
07/03/2021	0.0	0.0	0.0
08/03/2021	0.0	5.0	10.0
09/03/2021	9.0	27.0	13.0
10/03/2021	3.0	0.0	0.0
11/03/2021	10.0	34.0	10.0
12/03/2021	1.0	0.0	7.0
13/03/2021	1.0	0.0	3.0
14/03/2021	0.0	44.0	18.0
15/03/2021	20.0	3.0	3.0
16/03/2021	0.0	0.0	0.0
17/03/2021	18.0	19.0	18.0
18/03/2021	72.0	82.0	64.0
19/03/2021	211.0	34.0	208.0
20/03/2021	152.0	21.0	60.0
21/03/2021	59.0	118.0	66.0
22/03/2021	143.0	88.0	73.0
23/03/2021	55.0	28.0	34.0
24/03/2021	14.0	1.0	0.0
25/03/2021	1.0	0.0	0.0
26/03/2021	0.0	0.0	0.0
27/03/2021	0.0	0.0	0.0
28/03/2021	0.0	0.0	0.0
29/03/2021	0.0	0.0	0.0
30/03/2021	0.0	0.0	0.0
31/03/2021	1.0	1.0	0.0
01/04/2021	1.0	1.0	0.0
02/04/2021	0.0	1.0	1.0
03/04/2021	1.0	1.0	3.0
04/04/2021	0.0	0.0	0.0
05/04/2021	0.0	1.0	0.0
06/04/2021	3.0	14.0	13.0

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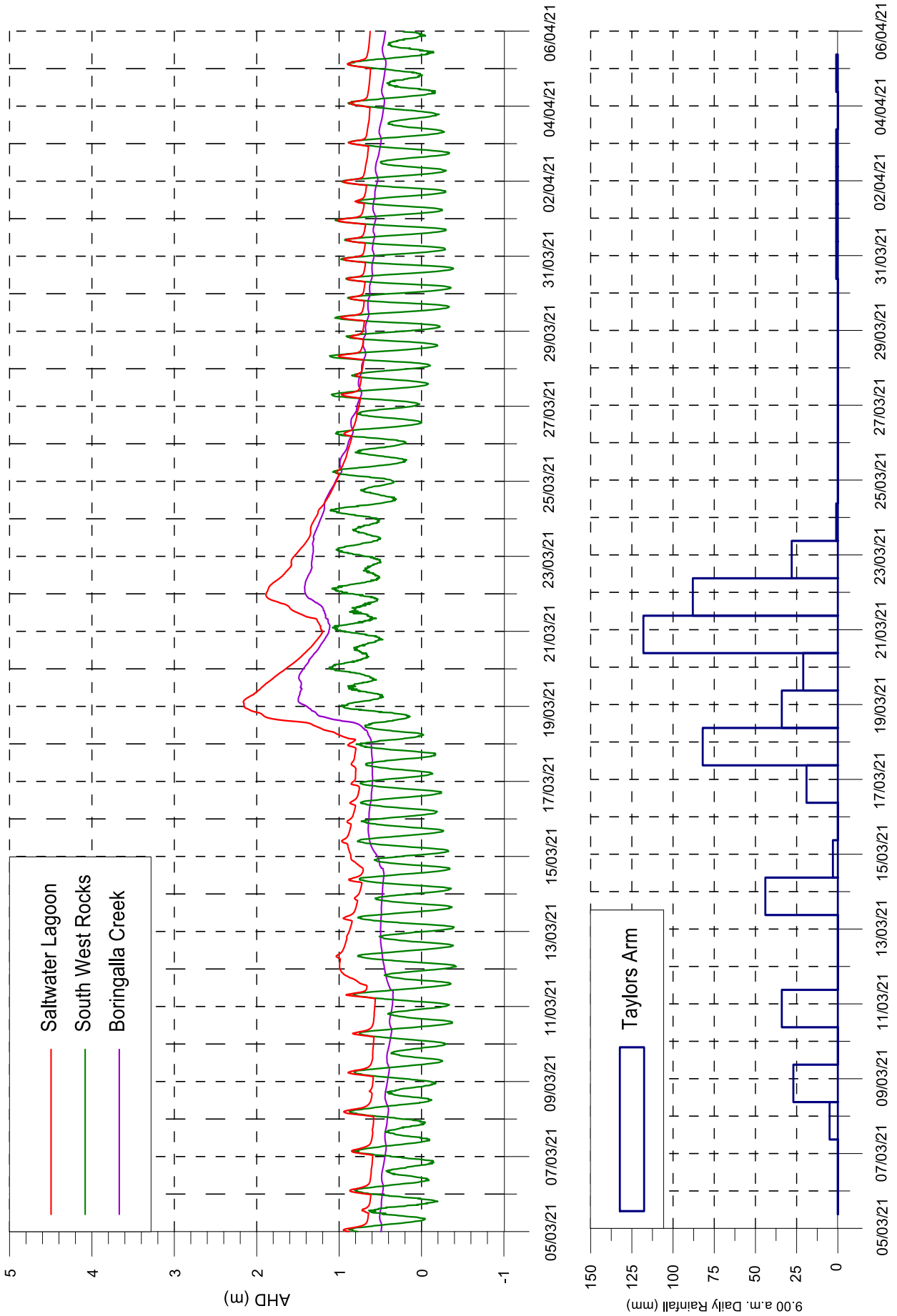

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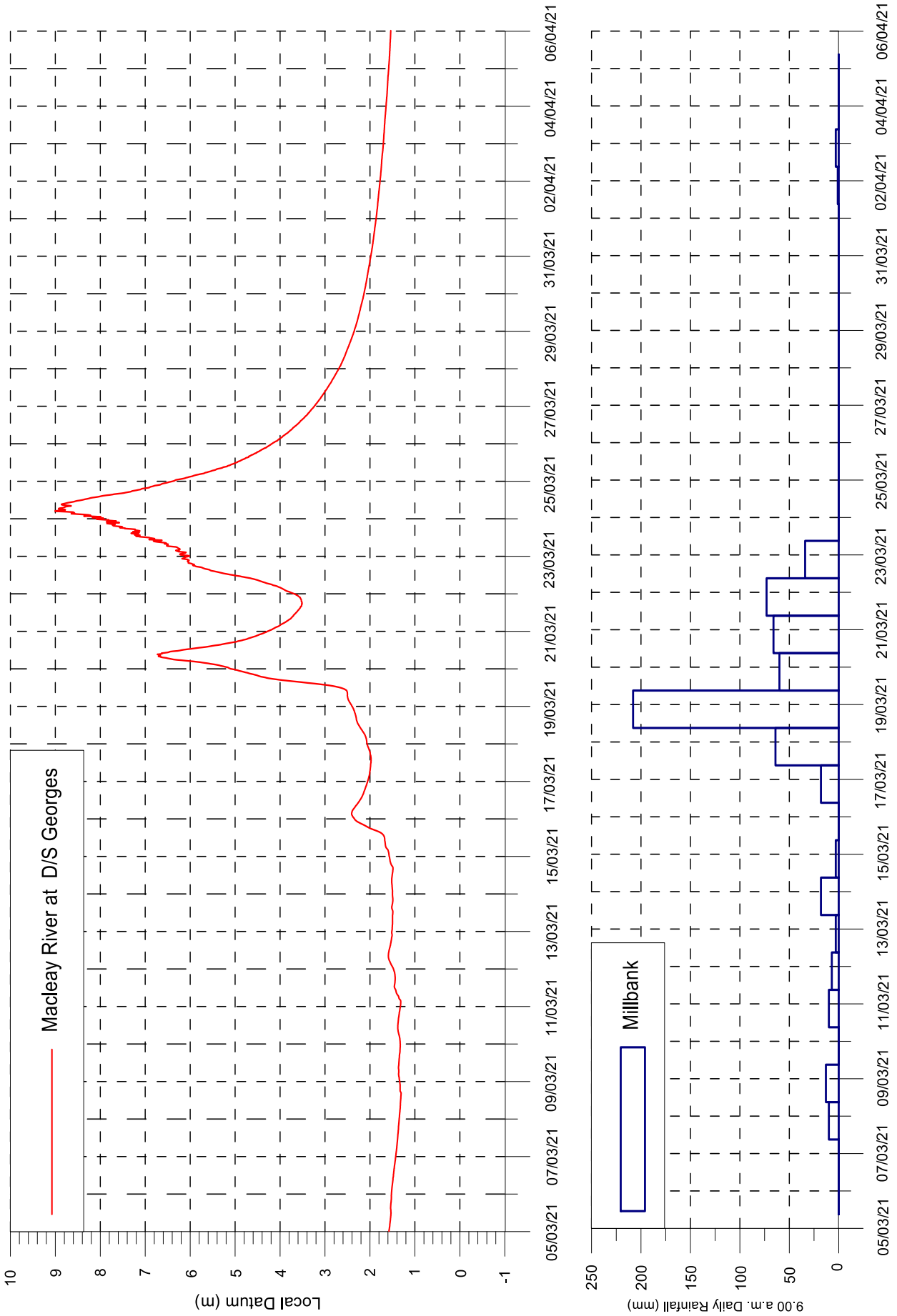
MACLEAY RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809
Figure
7.2

7.2.GRF



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MACLEAY RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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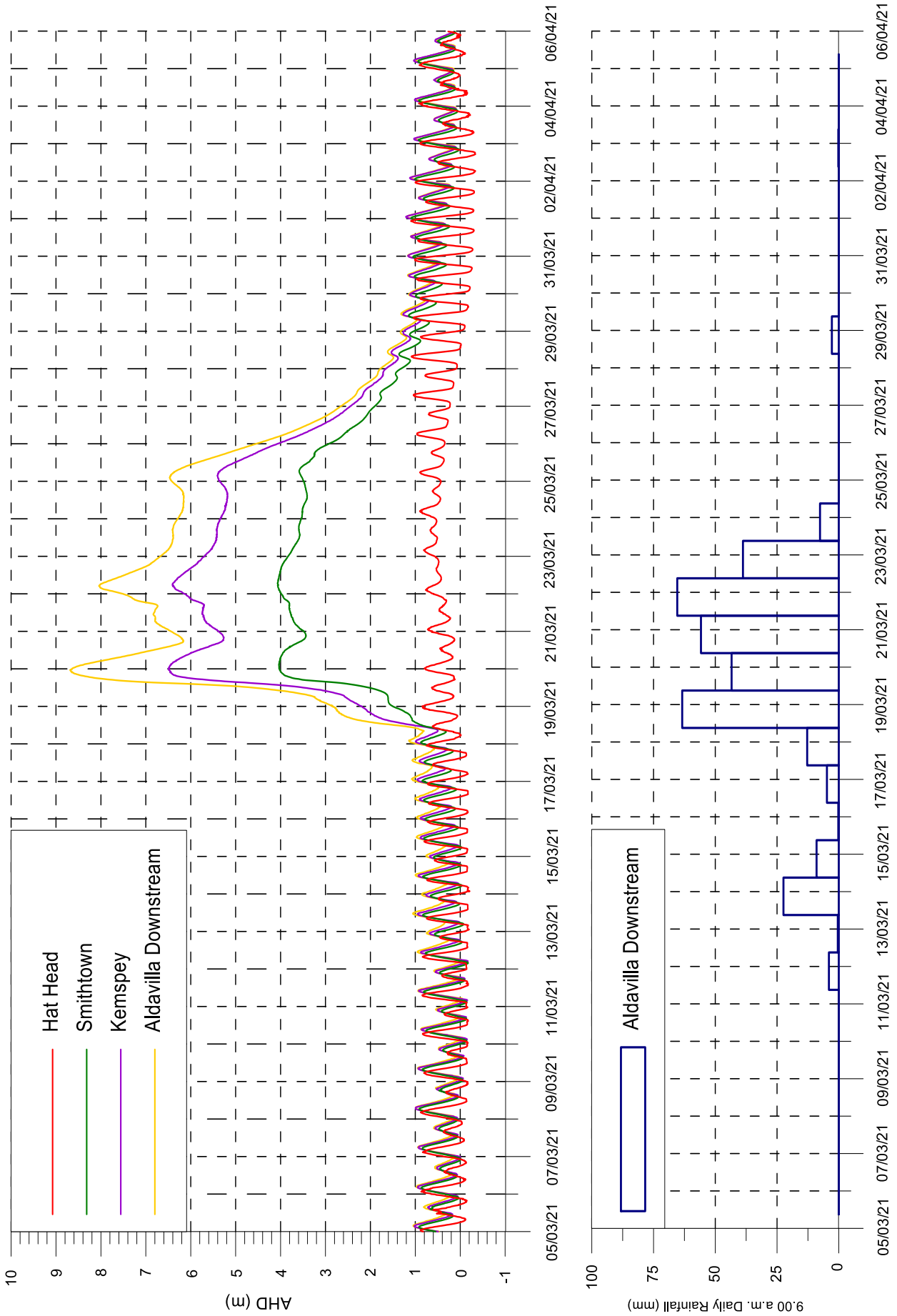
Report MH2809
Figure
7.3

7.3.GRF



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MACLEAY RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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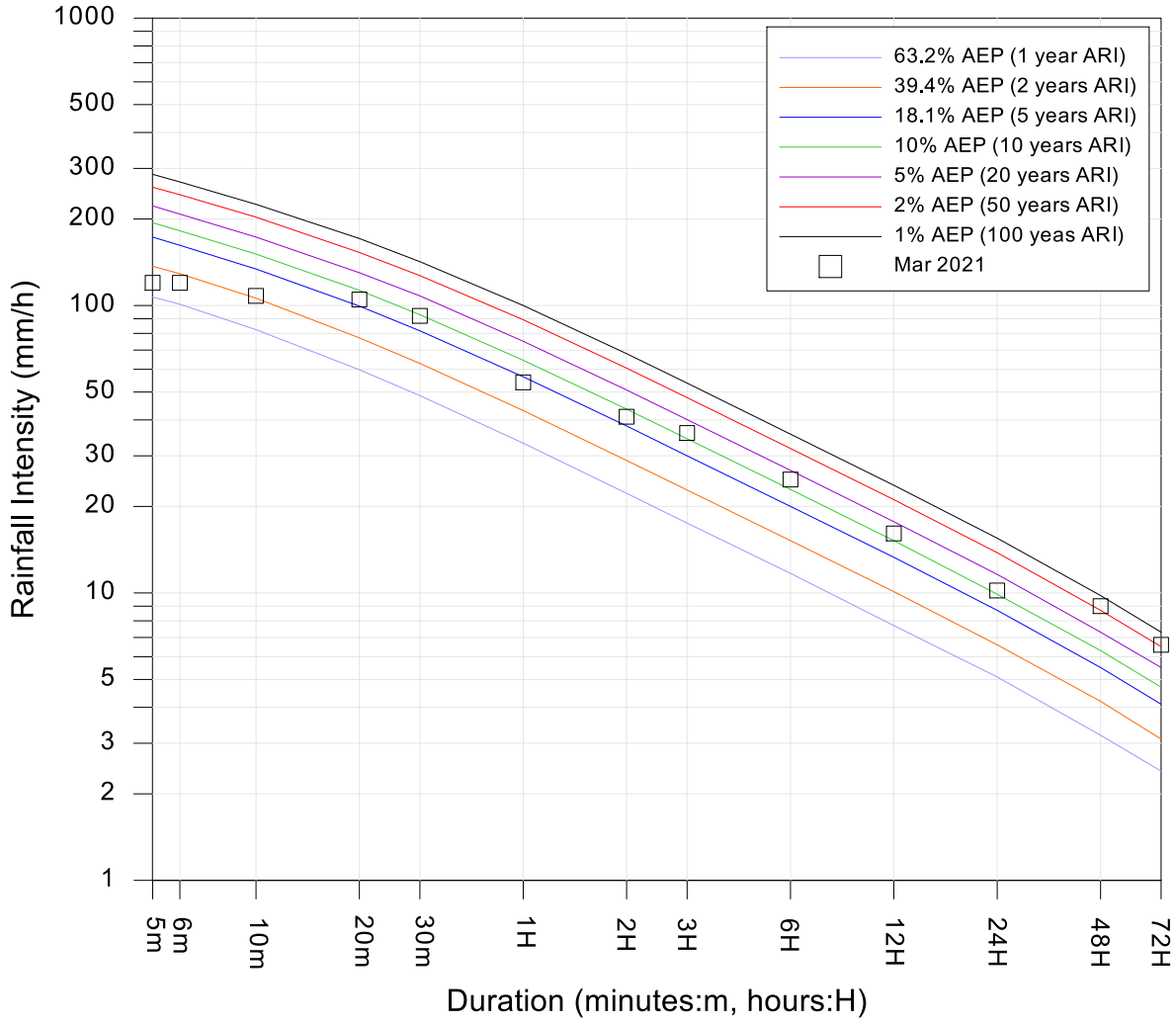
Report MH2809
Figure
7.4

7.4.GRF

Site Owner: DPIE
Latitude: -31.0825 Longitude:152.783

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	120	14:42 19 Mar 2021
6m	120	14:42 19 Mar 2021
10m	108	14:46 19 Mar 2021
20m	105	14:46 19 Mar 2021
30m	92	14:54 19 Mar 2021
1H	54	15:22 19 Mar 2021
2H	41	14:48 19 Mar 2021
3H	36	15:33 19 Mar 2021
6H	24.8	14:17 18 Mar 2021
12H	16.1	18:00 19 Mar 2021
24H	10.2	08:05 19 Mar 2021
48H	9	00:46 20 Mar 2021
72H	6.6	04:45 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

ALDAVILLA DOWNSTREAM (206459)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

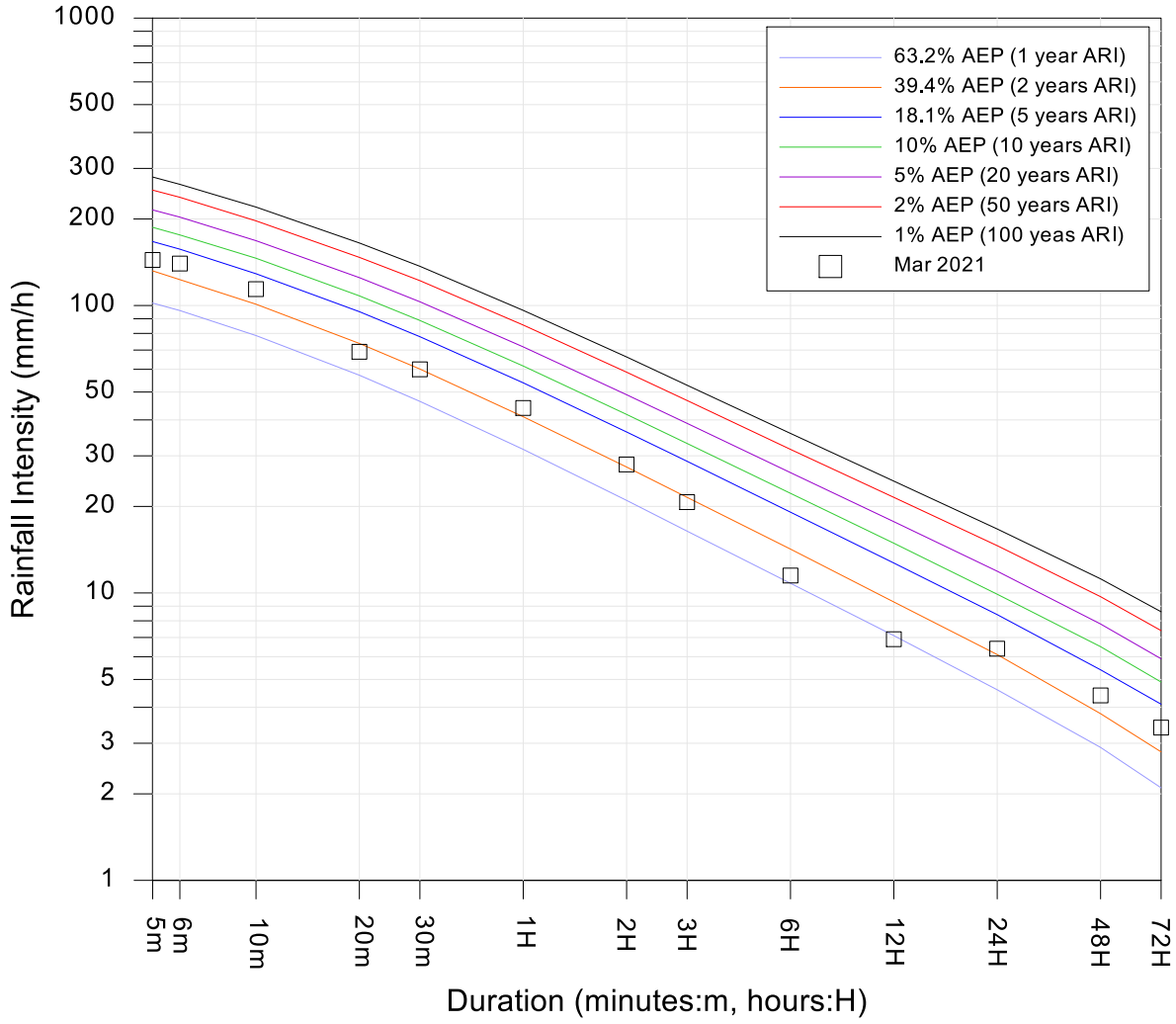
Manly Hydraulics Laboratory

Report MHL2809
Figure
7.5

IFD_206459_Figure 7.5.pdf

Site Owner: Kempsey Shire Council
Latitude: -30.7794 Longitude:152.702

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	144	05:30 09 Mar 2021
6m	140	05:31 09 Mar 2021
10m	114	05:35 09 Mar 2021
20m	69	16:55 20 Mar 2021
30m	60	17:05 20 Mar 2021
1H	44	17:31 20 Mar 2021
2H	28	17:36 20 Mar 2021
3H	20.7	17:26 20 Mar 2021
6H	11.5	17:45 20 Mar 2021
12H	6.9	17:58 20 Mar 2021
24H	6.4	13:50 21 Mar 2021
48H	4.4	06:40 22 Mar 2021
72H	3.4	02:26 23 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

TAYLORS ARM (59032)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

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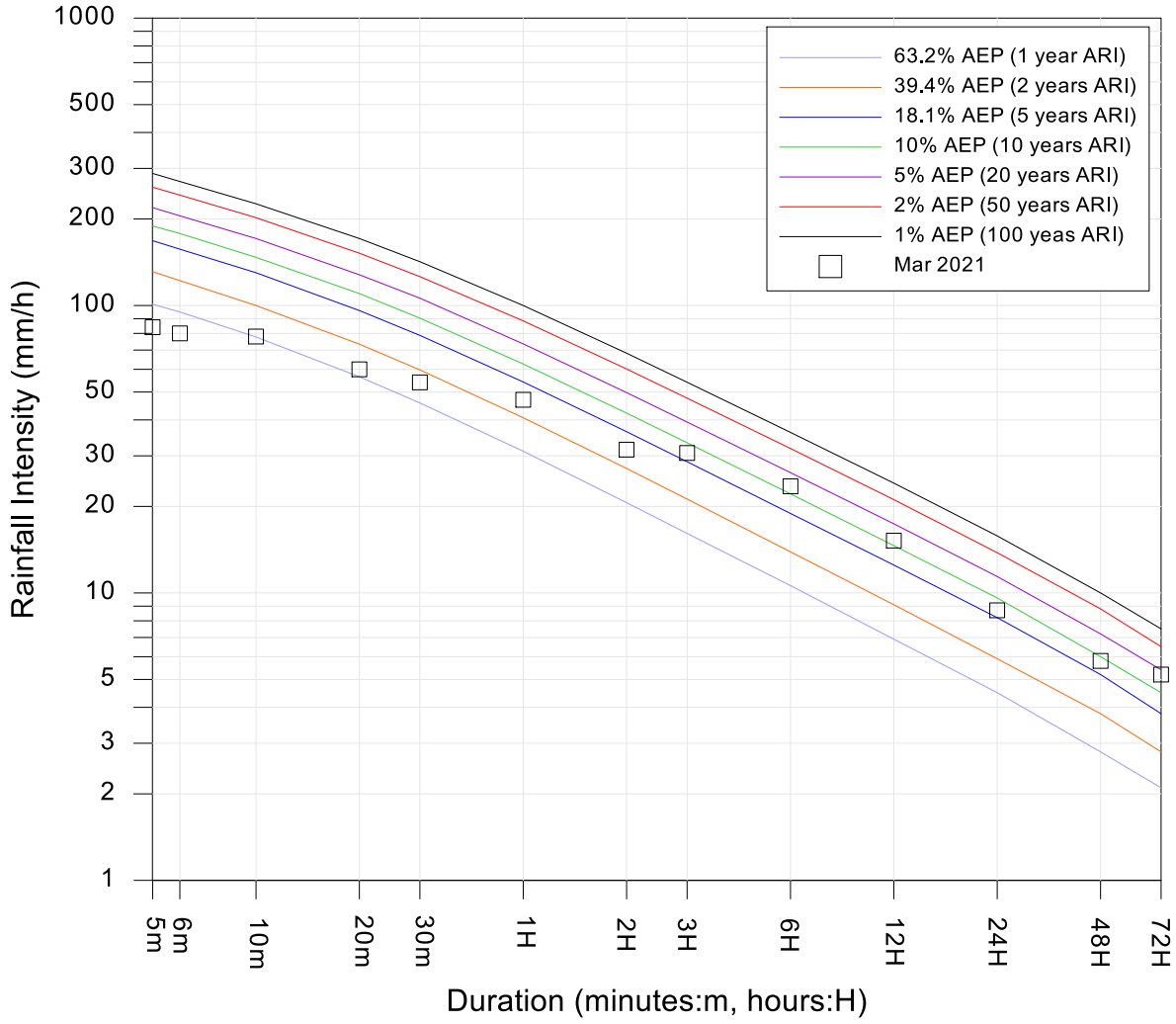
Report MHL2809
Figure
7.6

IFD_59032_Figure 7.6.pdf

Site Owner: Kempsey Shire Council
Latitude: -30.8695 Longitude:152.629

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	84	19:54 18 Mar 2021
6m	80	19:54 18 Mar 2021
10m	78	19:58 18 Mar 2021
20m	60	20:10 18 Mar 2021
30m	54	20:25 18 Mar 2021
1H	47	20:46 18 Mar 2021
2H	31.5	23:39 18 Mar 2021
3H	30.7	22:49 18 Mar 2021
6H	23.5	01:46 19 Mar 2021
12H	15.2	05:14 19 Mar 2021
24H	8.7	09:43 19 Mar 2021
48H	5.8	17:54 20 Mar 2021
72H	5.2	17:49 20 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

MILLBANK (59131)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

Manly Hydraulics Laboratory

Report MHL2809
Figure
7.7

IFD_59131_Figure 7.7.pdf

8 Hastings and Camden Haven River region

8.1 Hastings and Camden Haven River region – water level

The peak observed water levels for the Hastings and Camden Haven River region are listed in **Table 8-1**. **Table 8-2** lists the SES flood classifications for Kindee Bridge, Wauchope, Settlement Point, Logans Crossing and Laurieton. The locations of water level stations within the Hastings and Camden Haven River region are shown in **Figure 8-1**. The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 8-2** to **Figure 8-10**.

Table 8-1 Hastings and Camden Haven River region flood peaks

River system	Station name	Station number	Owner	Datum	Level (m)
Killick Creek	Crescent Head Killick Creek	207452	DPIE	AHD	1.07
Port Macquarie	Port Macquarie	207420	DPIE	AHD	2.01
Hastings River	Settlement Point	207418	DPIE	AHD	2.48
Maria River	Maria River at Mundays Lane	2074127	Port Macquarie Hastings Council	AHD	3.26
Maria River	Green Valley	207406	DPIE	AHD	3.15
Wilson River	Telegraph Point	207415	DPIE	AHD	4.15
Wilson River	Telegraph Point (WTP)	560064	Port Macquarie Hastings Council	Local Datum	9.92^
Hastings River	Dennis Bridge Downstream	207444	DPIE	AHD	3.49
Hastings River	Wauchope Railway Bridge	207401	DPIE	AHD	8.72
Hastings River	Hastings River @ Ellenborough (Kindee Bridge)	207004	WaterNSW	Local datum	12.11
Hastings River	Lake Cathie	207441	DPIE	AHD	1.26
Camden Haven River	North Haven	207423	DPIE	AHD	1.70
Stingray Creek	West Haven	207437	DPIE	AHD	2.39
Queens Lake	Lakewood	207475	DPIE	AHD	2.41
Camden Haven River	Laurieton	207425	DPIE	AHD	2.47
Watson Taylors Lake	Watson Taylors Lake	207480	DPIE	AHD	3.12
Camden Haven River	Logans Crossing	207428	DPIE	AHD	8.82

^Instrumentation at the station was inundated by flood waters. This value represents the highest recorded level prior to data loss.

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Table 8-2 SES flood classifications for Kindee Bridge, Wauchope, Settlement Point, Logans Crossing and Laurieton

Station name	Station number	Flood classification			Flood peak (m)	Flood event classification
		Minor	Moderate	Major		
		Water level (m)				
Settlement Point	207418	1.2	1.5	1.75	2.48	Major
Wauchope Railway Bridge	207401	2.5	4.3	5.5	8.72	Major
Hastings River @ Ellenborough (Kindee Bridge)	207004	4.7	6.8	8.1	12.11	Major
Laurieton	207425	1.1	1.5	1.7	2.47	Major
Logans Crossing	207428	7.0	7.6	7.9	8.82	Major

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HASTINGS AND CAMDEN HAVEN RIVER STATIONS

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Report MHL2809
Figure
8.1

Figures_MHL2809.qgs

8.2 Hastings and Camden Haven River region – rainfall

The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 8-2** to **Figure 8-10** Hastings and Camden Haven River region water level and rainfall data 5 March – 5 April 2021**.** 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 8-3** for the period 05 March to 05 April 2021. The rainfall intensities are displayed graphically in **Figure 8-11** to **Figure 8-17**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 8-3 Hastings and Camden Haven region daily rainfall totals

Date	Ellenborough (Kindee Bridge) 207004 (mm) WaterNSW	Green Valley 207406 (mm) DPIE	Telegraph Point 207415 (mm) DPIE	Telegraph Point (WTP) 560064 (mm) Port Macquarie Hastings Council	Logans Crossing 207428 (mm) DPIE
05/03/2021	-	0.5	0.0	0.0	0.0
06/03/2021	-	0.0	0.0	0.0	0.0
07/03/2021	-	0.0	0.0	0.0	0.0
08/03/2021	-	0.0	0.0	3.8	0.0
09/03/2021	-	4.0	3.5	4.4	14.5
10/03/2021	3.0	2.0	3.5	0.6	9.0
11/03/2021	2.6	19.5	6.5	24.2	5.0
12/03/2021	0.2	39.0	29.5	0.6	25.5
13/03/2021	1.2	1.0	0.5	0.0	6.5
14/03/2021	0.0	0.0	0.0	9.4	0.0
15/03/2021	22.6	28.5	17.0	0.0	15.0
16/03/2021	0.2	0.0	0.0	7.8	0.0
17/03/2021	21.4	33.0	19.0	20	15.0
18/03/2021	13.8	34.5	30.0	181.4	25.5
19/03/2021	154.2	140.0	174.0	123.8	197.0
20/03/2021	269.0	135.5	159.5	0.0	354.0
21/03/2021	127.8	114.5	126.5	0.0	121.5
22/03/2021	111.8	92.5	90.0	0.0	63.5
23/03/2021	31.8	30.5	31.5	0.0	26.5
24/03/2021	12.6	16.5	19.0	0.0	21.0
25/03/2021	0.0	0.0	0.0	0.0	0.0
26/03/2021	0.0	0.0	0.0	0.0	0.0
27/03/2021	0.0	0.0	0.0	0.0	0.0
28/03/2021	0.0	0.0	0.0	0.0	0.0
29/03/2021	0.0	0.0	0.0	0.0	1.5
30/03/2021	0.0	0.0	0.0	0.0	0.5
31/03/2021	0.2	2.5	1.5	0.0	0.5
01/04/2021	-	0.5	1.0	0.0	4.5
02/04/2021	-	1.0	0.0	0.0	0.0
03/04/2021	-	0.0	0.0	0.0	0.0
04/04/2021	-	0.0	0.0	0.0	0.0
05/04/2021	-	0.0	0.0	0.0	0.0
06/04/2021	-	1.5	1.0	0.0	0.0

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Table 8-4 Hastings and Camden Haven region daily rainfall totals (cont.)

Date	Maria River at Mundays Lane 2074127 (mm) Port Macquarie Hastings Council	Koree Island 207442 (mm) Port Macquarie Hastings Council	Long Flat 207904 (mm) Port Macquarie Hastings Council
05/03/2021	0.0	-	-
06/03/2021	0.0	-	-
07/03/2021	0.0	-	-
08/03/2021	0.0	-	-
09/03/2021	2.4	-	-
10/03/2021	2	16.4	6.6
11/03/2021	9.6	2.6	2.0
12/03/2021	17.2	6.0	1.2
13/03/2021	0.6	5.8	2.6
14/03/2021	0.0	0.0	0.0
15/03/2021	11.8	12.0	18.8
16/03/2021	0.0	0.0	0.2
17/03/2021	17.4	15.8	17.4
18/03/2021	38.6	23.8	8.0
19/03/2021	142.8	192.2	126.6
20/03/2021	163.2	280.2	241.6
21/03/2021	100.6	191.0	115.2
22/03/2021	82.4	94.8	123.2
23/03/2021	34	26.4	30.8
24/03/2021	20.4	18.4	13.6
25/03/2021	0.2	0.0	0.0
26/03/2021	0.0	0.0	0.0
27/03/2021	0.0	0.0	0.0
28/03/2021	0.0	0.0	0.0
29/03/2021	0.0	0.0	0.0
30/03/2021	0.0	0.0	0.0
31/03/2021	1.4	0.0	-
01/04/2021	1.4	-	-
02/04/2021	0.0	-	-
03/04/2021	0.0	-	-
04/04/2021	0.0	-	-
05/04/2021	0.0	-	-
06/04/2021	0.0	-	-

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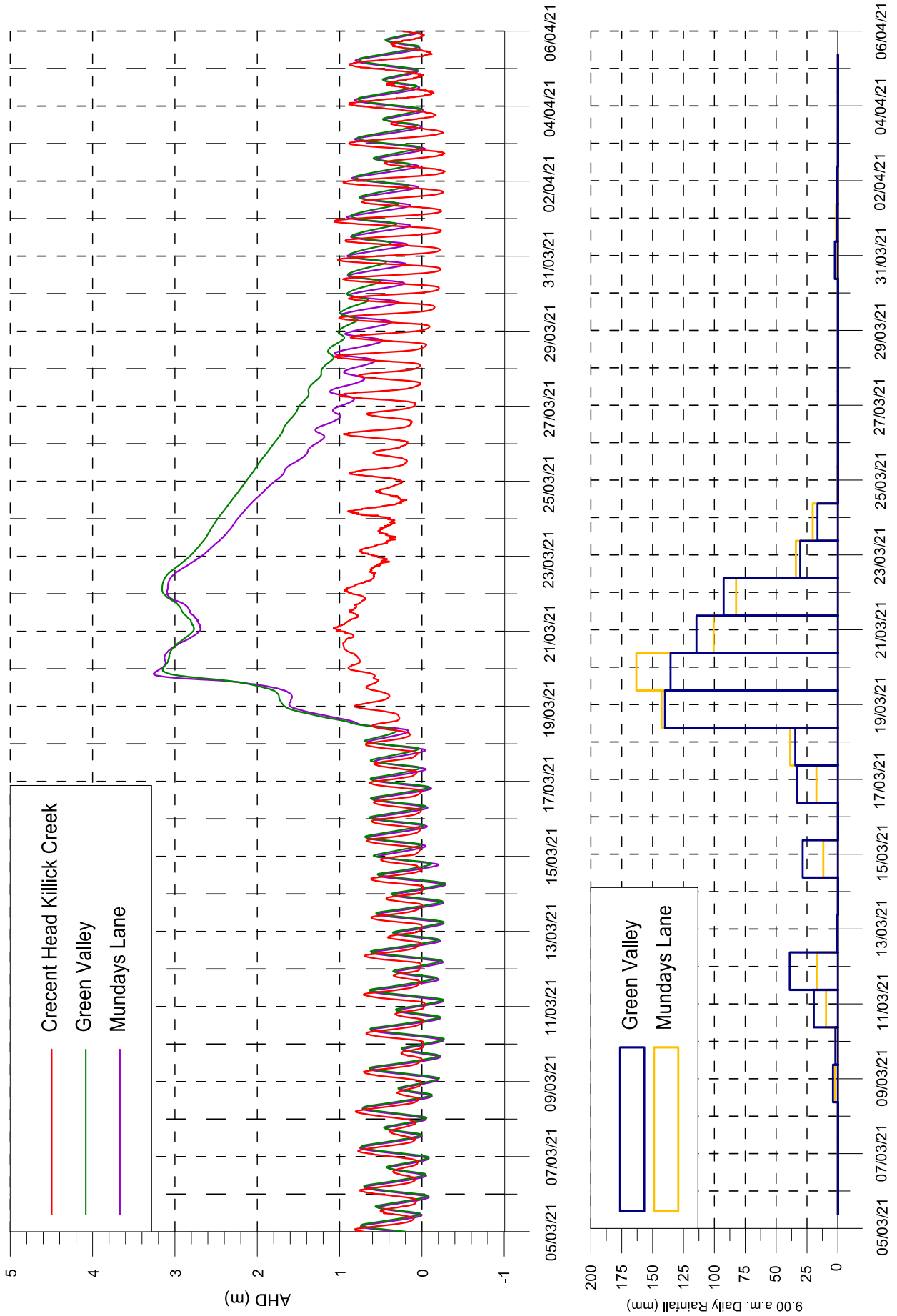

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HASTINGS AND CAMDEN HAVEN RIVER WATER LEVEL AND RAINFALL DATA 5 MARCH – 5 APRIL 2021

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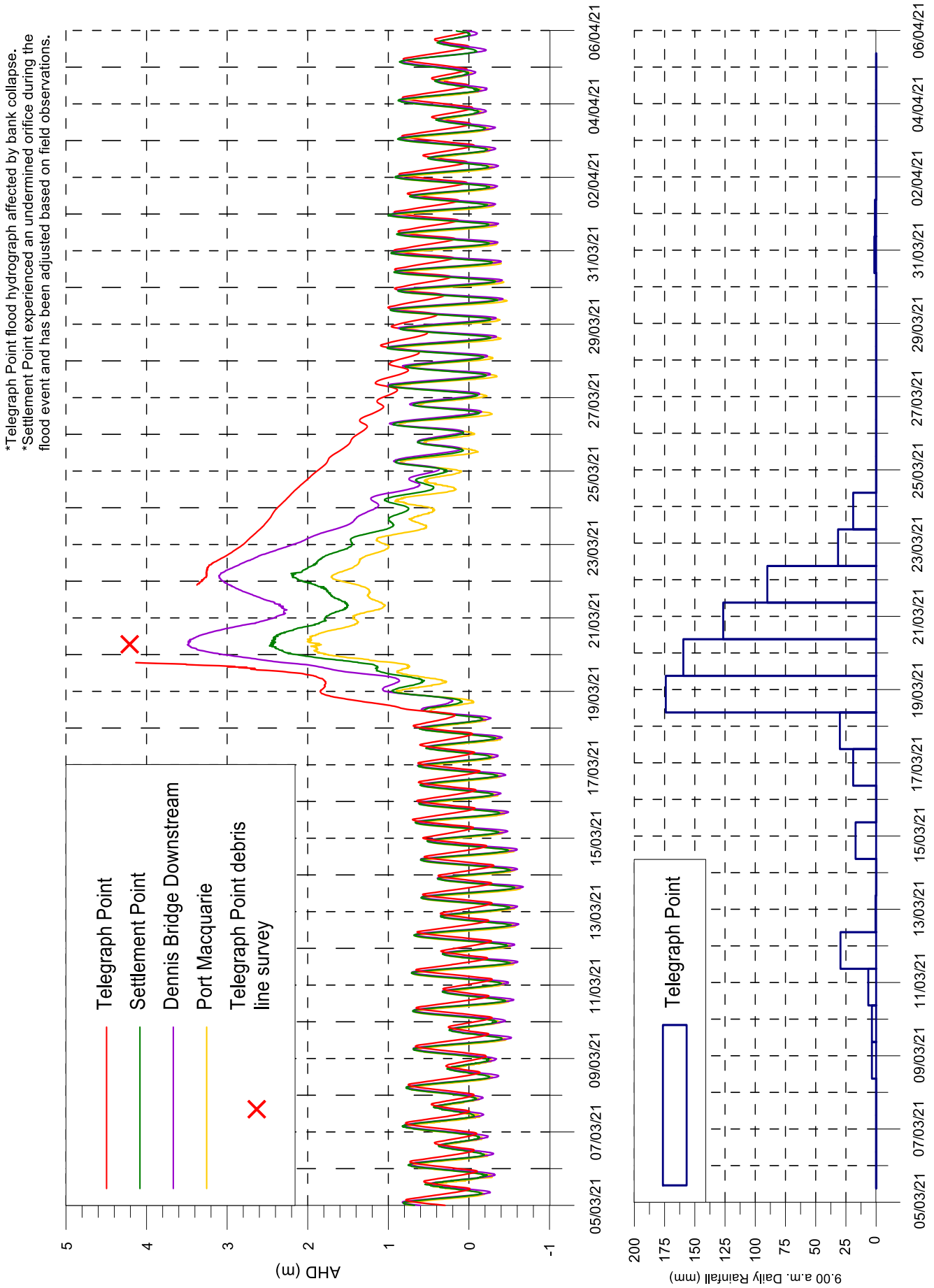
Report MH2809
Figure
8.2

8.2.GRF



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HASTINGS AND CAMDEN HAVEN RIVER WATER LEVEL AND RAINFALL DATA 5 MARCH – 5 APRIL 2021

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Report MH2809
Figure
8.3

8.3.GRF

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HASTINGS AND CAMDEN HAVEN RIVER
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

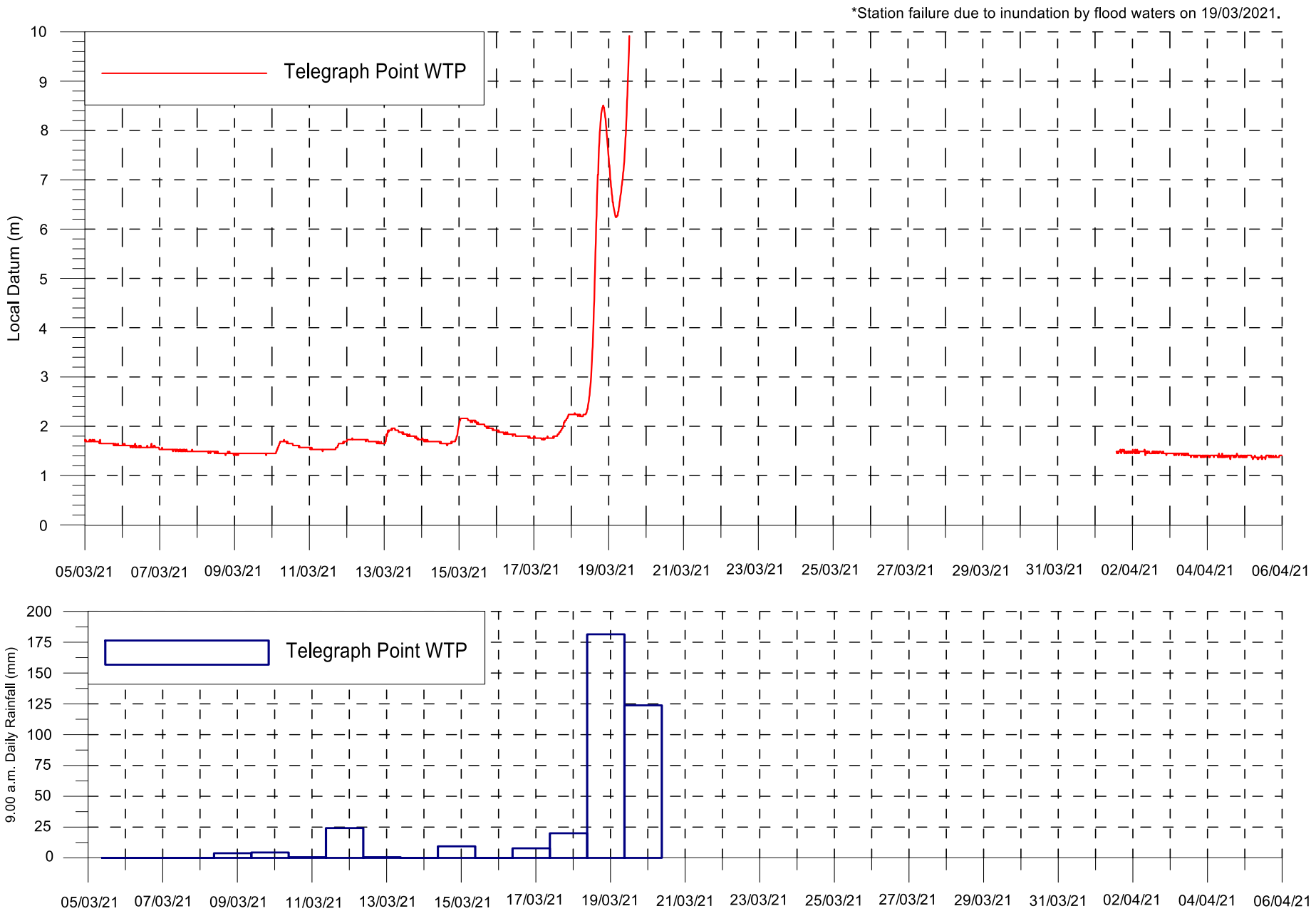

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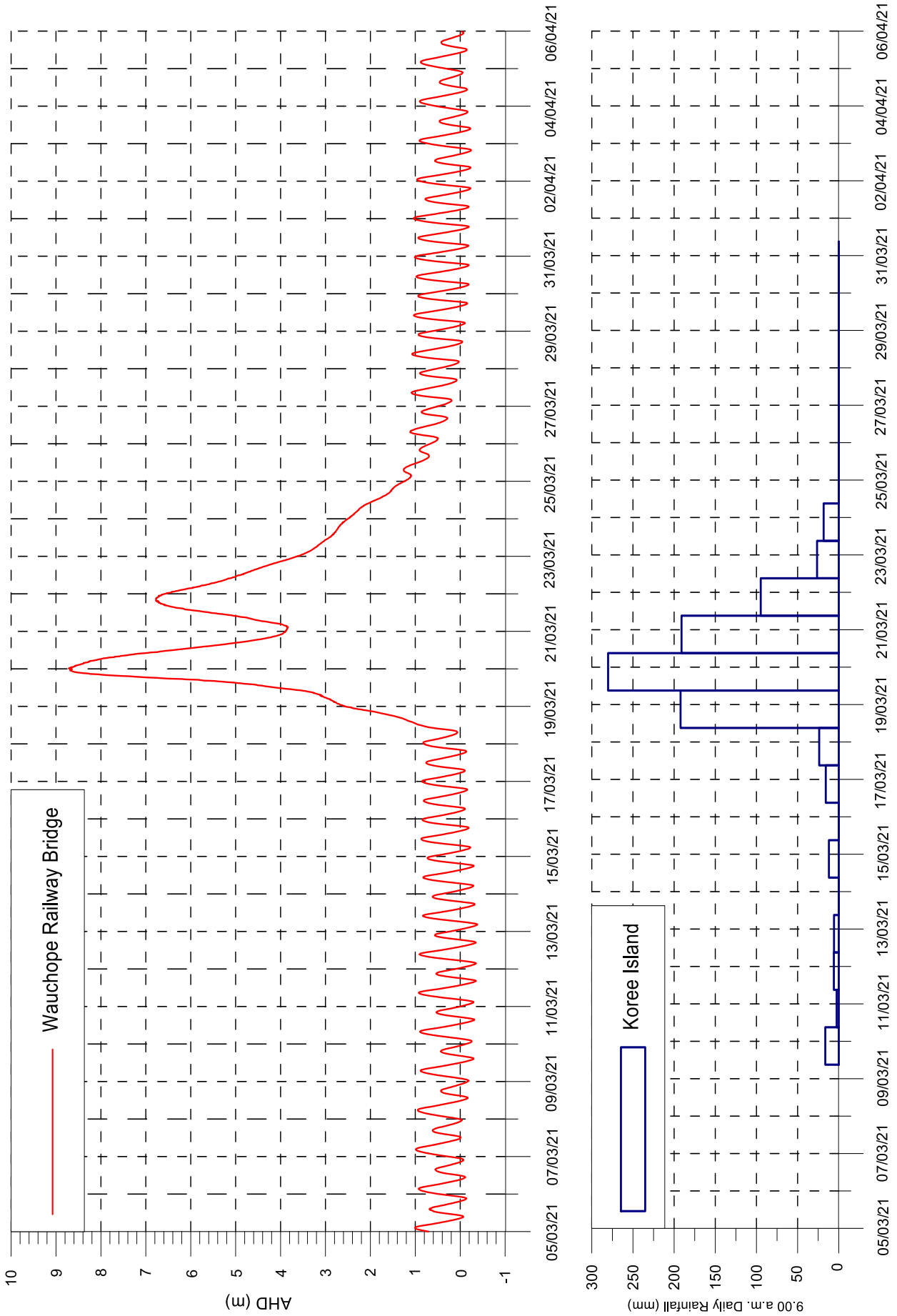
Figure 8.4

8.4.GRF



NSW GOVERNMENT

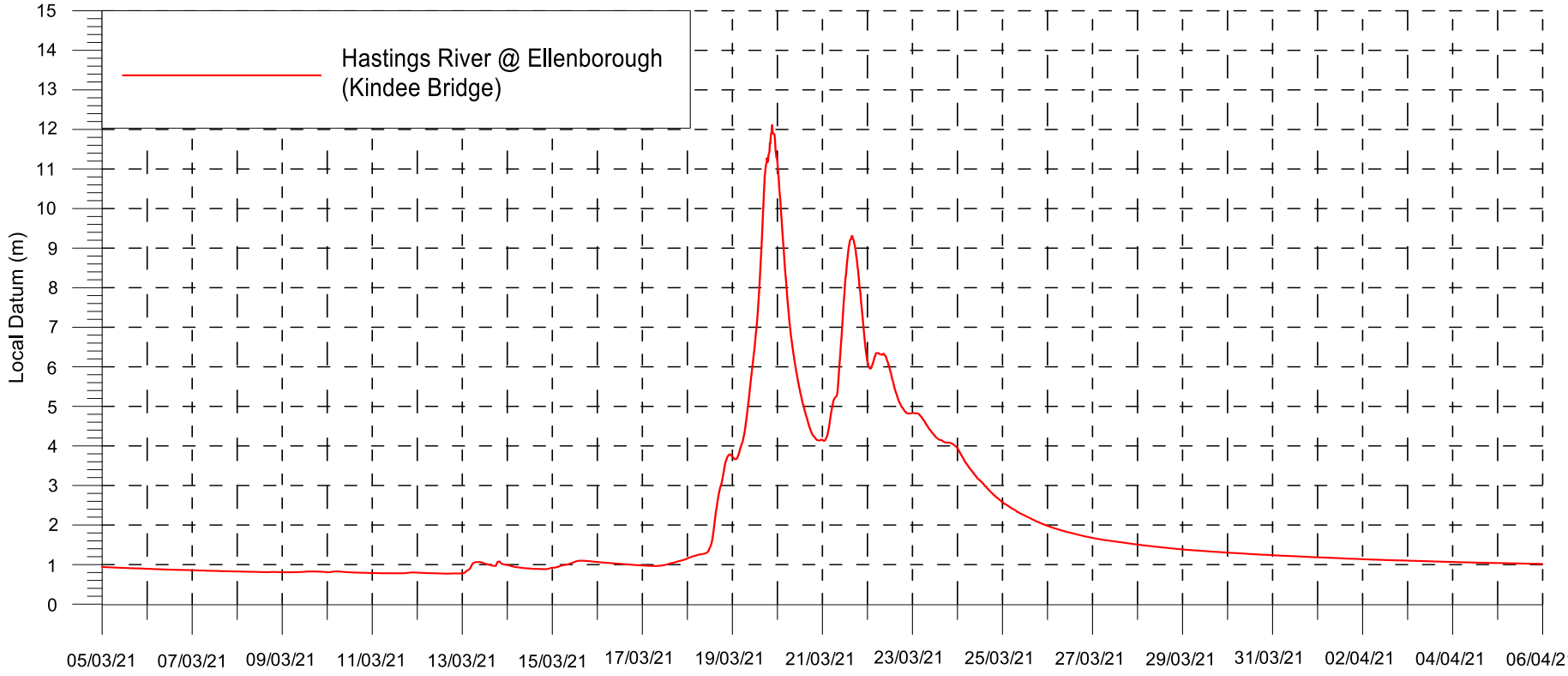
HASTINGS AND CAMDEN HAVEN RIVER WATER LEVEL AND RAINFALL DATA 5 MARCH – 5 APRIL 2021

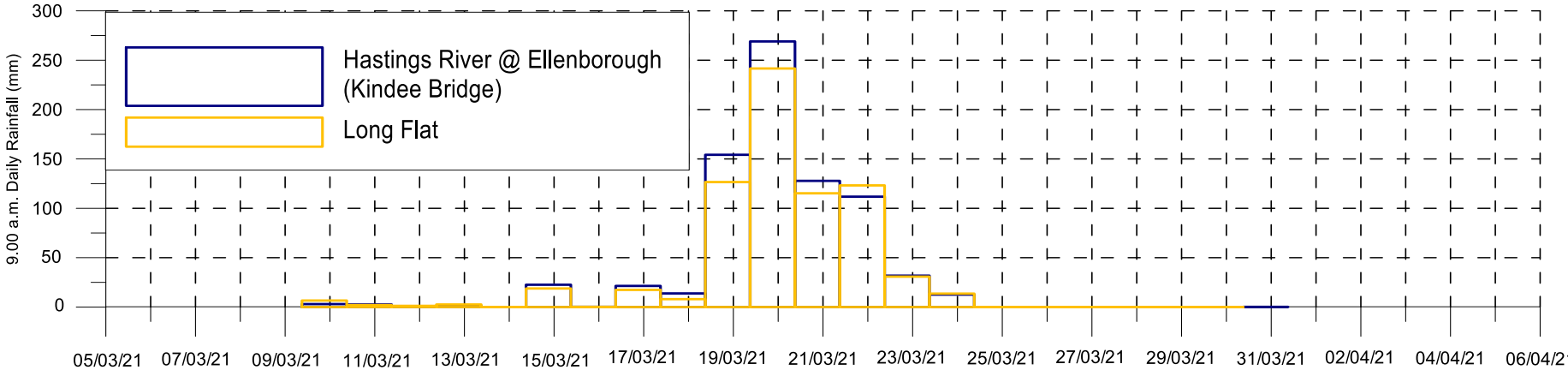
Manly Hydraulics Laboratory

Report MH2809
Figure
8.5

8.5.GRF

HASTINGS AND CAMDEN HAVEN RIVER
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021





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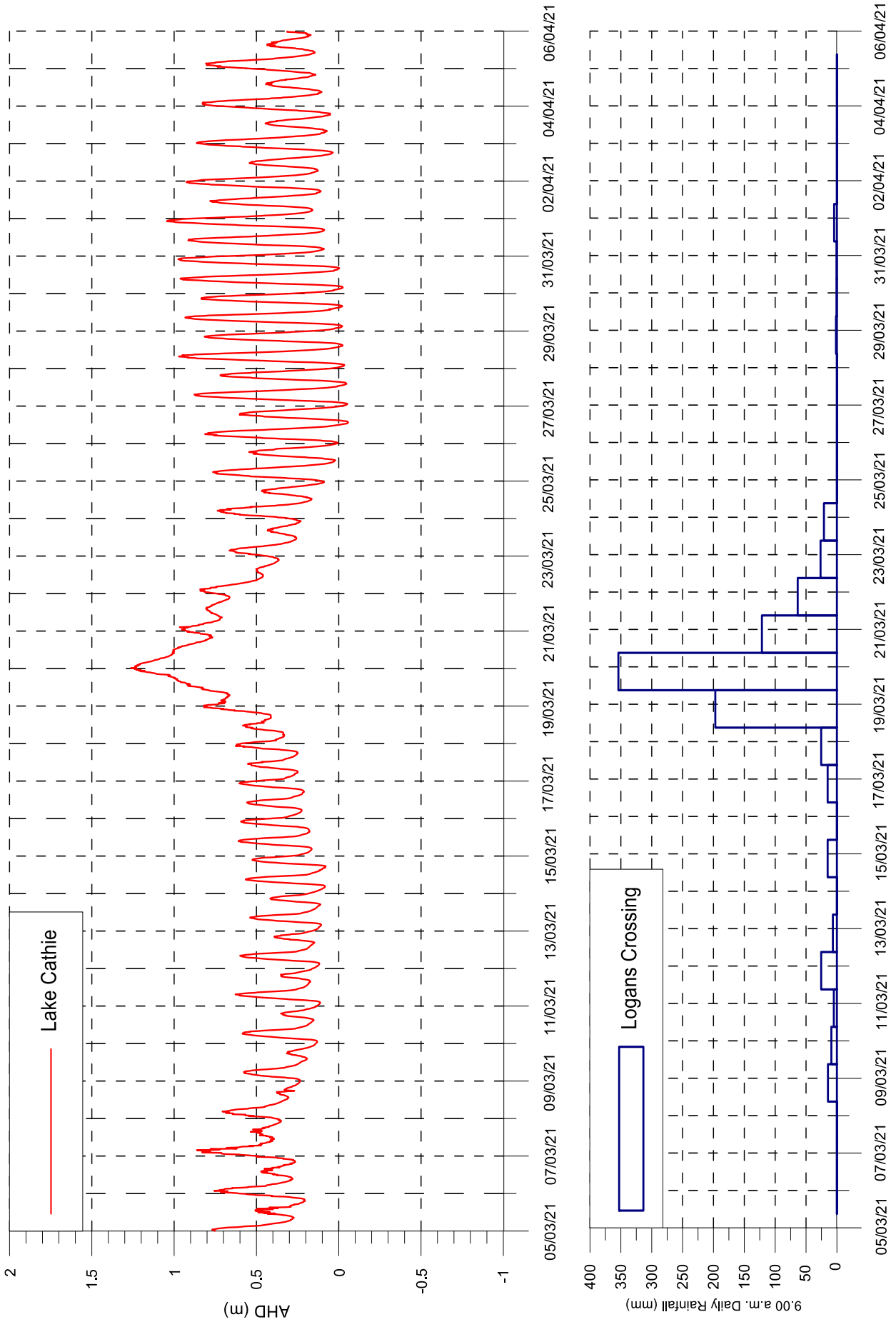
Report MH2809
Figure 8.6

8.6.GRF



NSW GOVERNMENT

HASTINGS AND CAMDEN HAVEN RIVER WATER LEVEL AND RAINFALL DATA 5 MARCH – 5 APRIL 2021

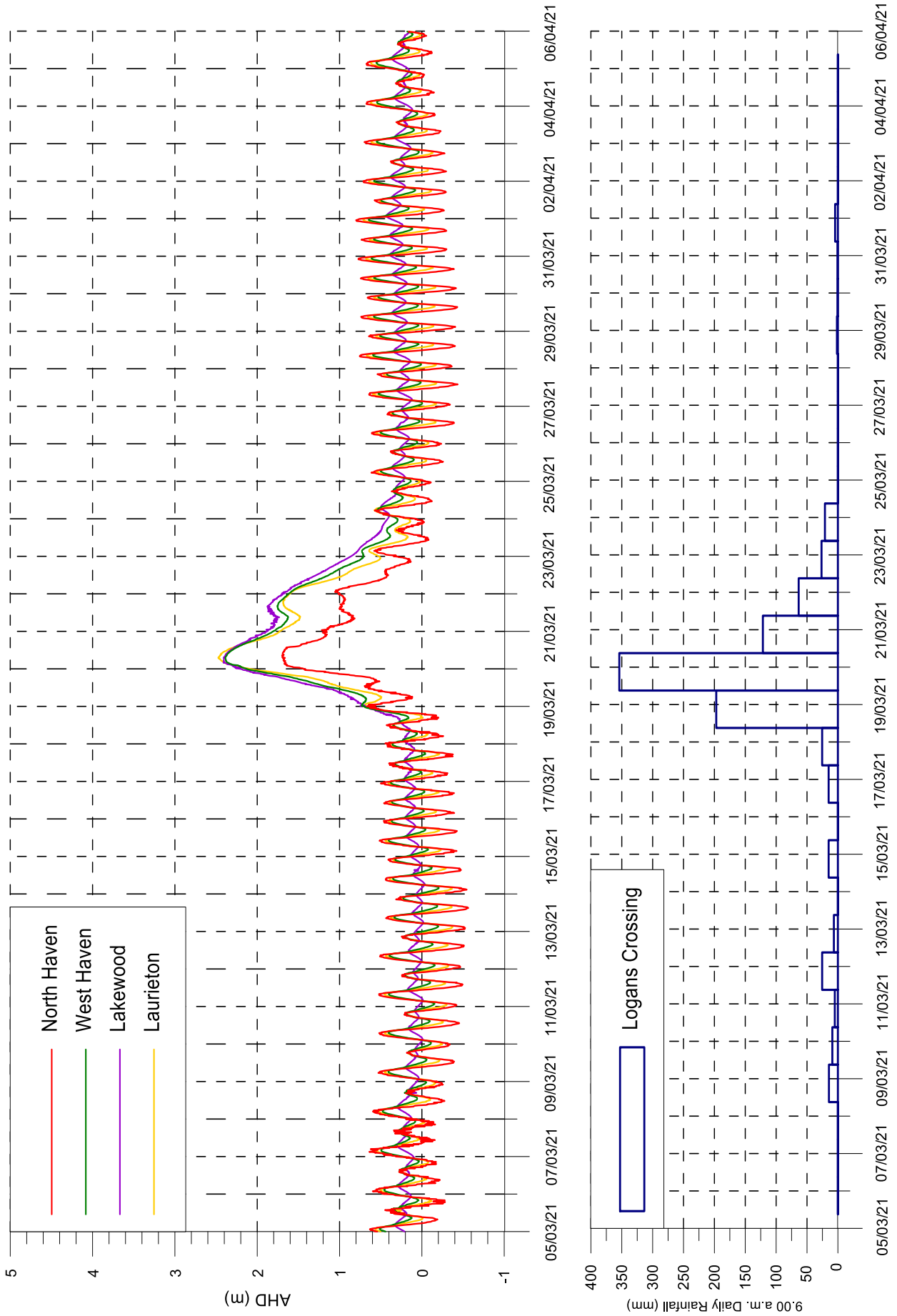
Manly Hydraulics Laboratory

Report MH2809

Figure

8.7

8.7.GRF



NSW GOVERNMENT

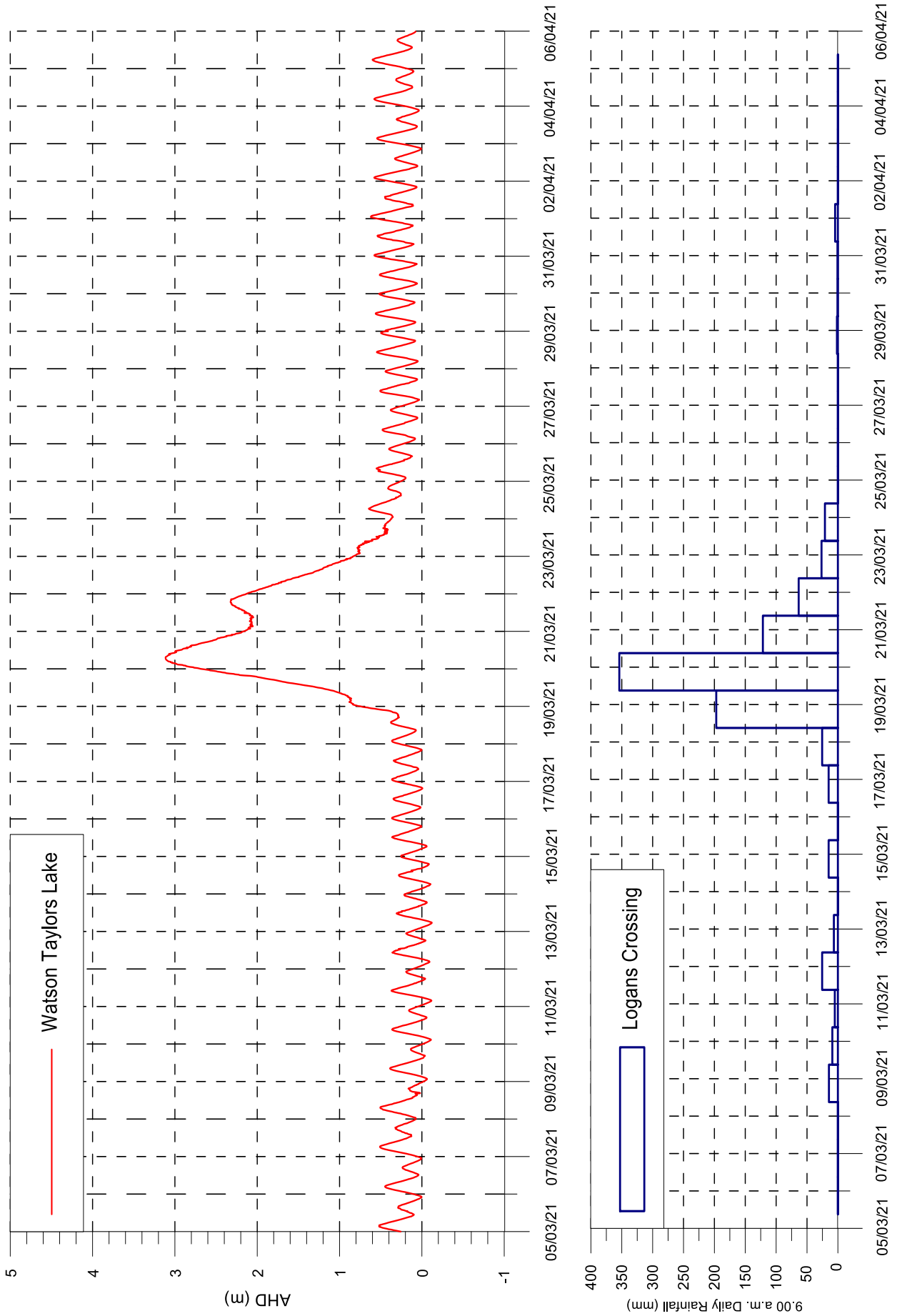
HASTINGS AND CAMDEN HAVEN RIVER WATER LEVEL AND RAINFALL DATA 5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809

Figure 8.8

8.8.GRF



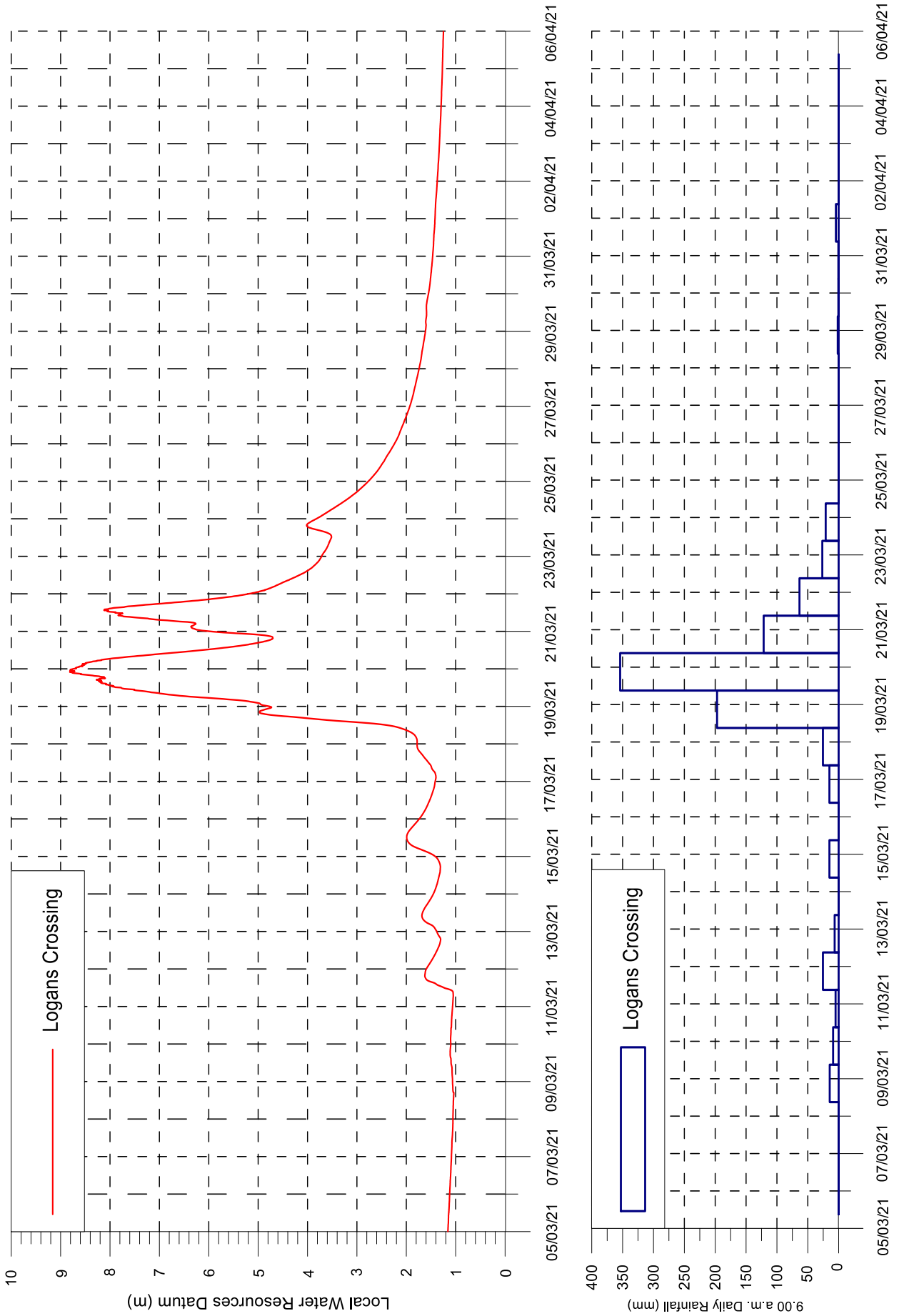
NSW GOVERNMENT

HASTINGS AND CAMDEN HAVEN RIVER
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809
Figure
8.9

8.9.GRF



NSW GOVERNMENT

HASTINGS AND CAMDEN HAVEN RIVER WATER LEVEL AND RAINFALL DATA 5 MARCH – 5 APRIL 2021

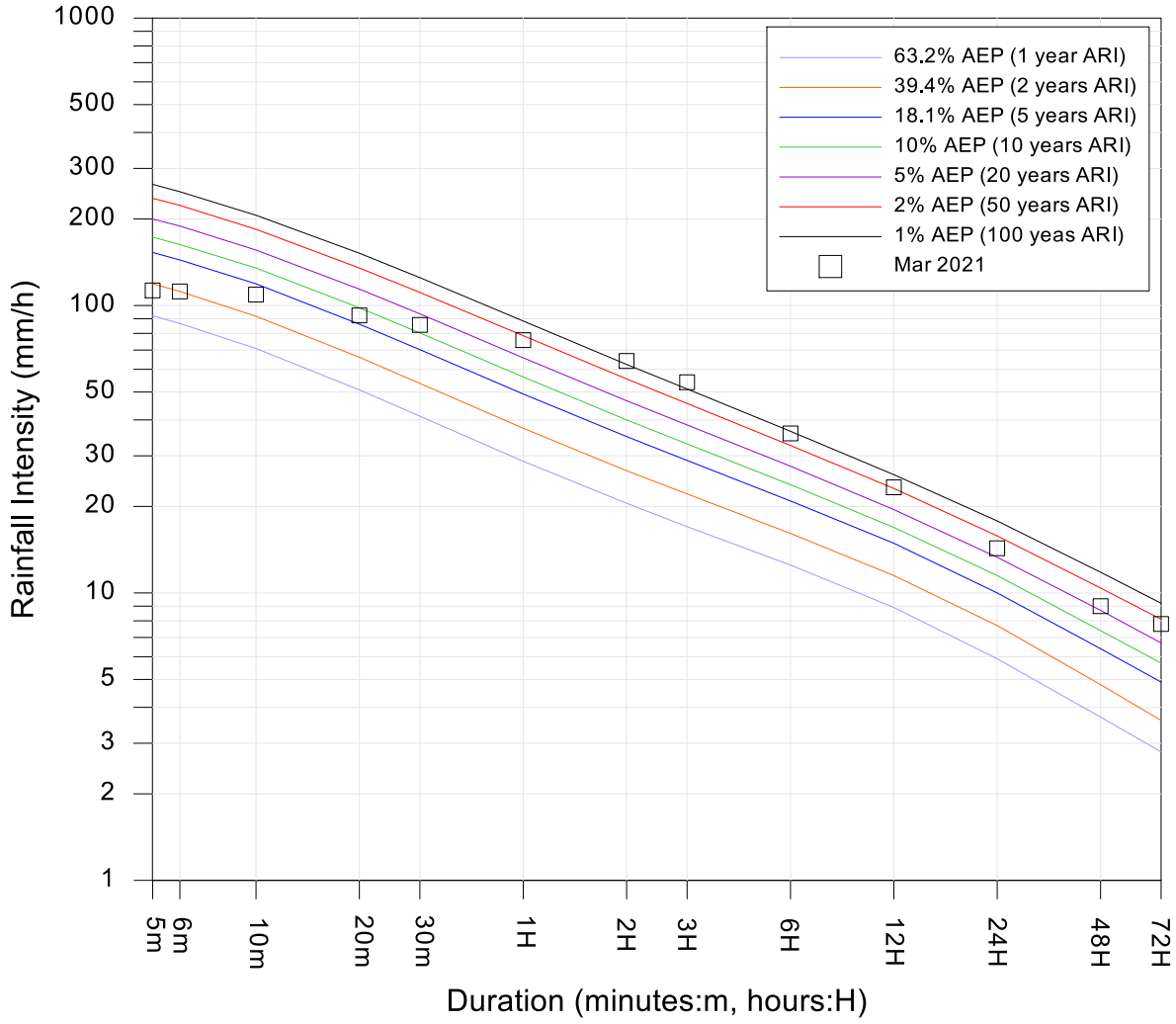
Manly Hydraulics Laboratory

Report MH2809
Figure
8.10

8.10.GRF

Site Owner: WaterNSW
Latitude: -31.4225 Longitude:152.471

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	112.8	15:42 19 Mar 2021
6m	112	15:42 19 Mar 2021
10m	109.2	16:41 19 Mar 2021
20m	92.4	15:49 19 Mar 2021
30m	85.6	16:01 19 Mar 2021
1H	75.8	16:18 19 Mar 2021
2H	64.1	16:47 19 Mar 2021
3H	54.1	16:42 19 Mar 2021
6H	35.9	16:54 19 Mar 2021
12H	23.3	17:03 19 Mar 2021
24H	14.3	20:39 19 Mar 2021
48H	9	02:44 20 Mar 2021
72H	7.8	10:36 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

HASTINGS RIVER @ ELLENBOROUGH KINDEE BRIDGE (207004)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

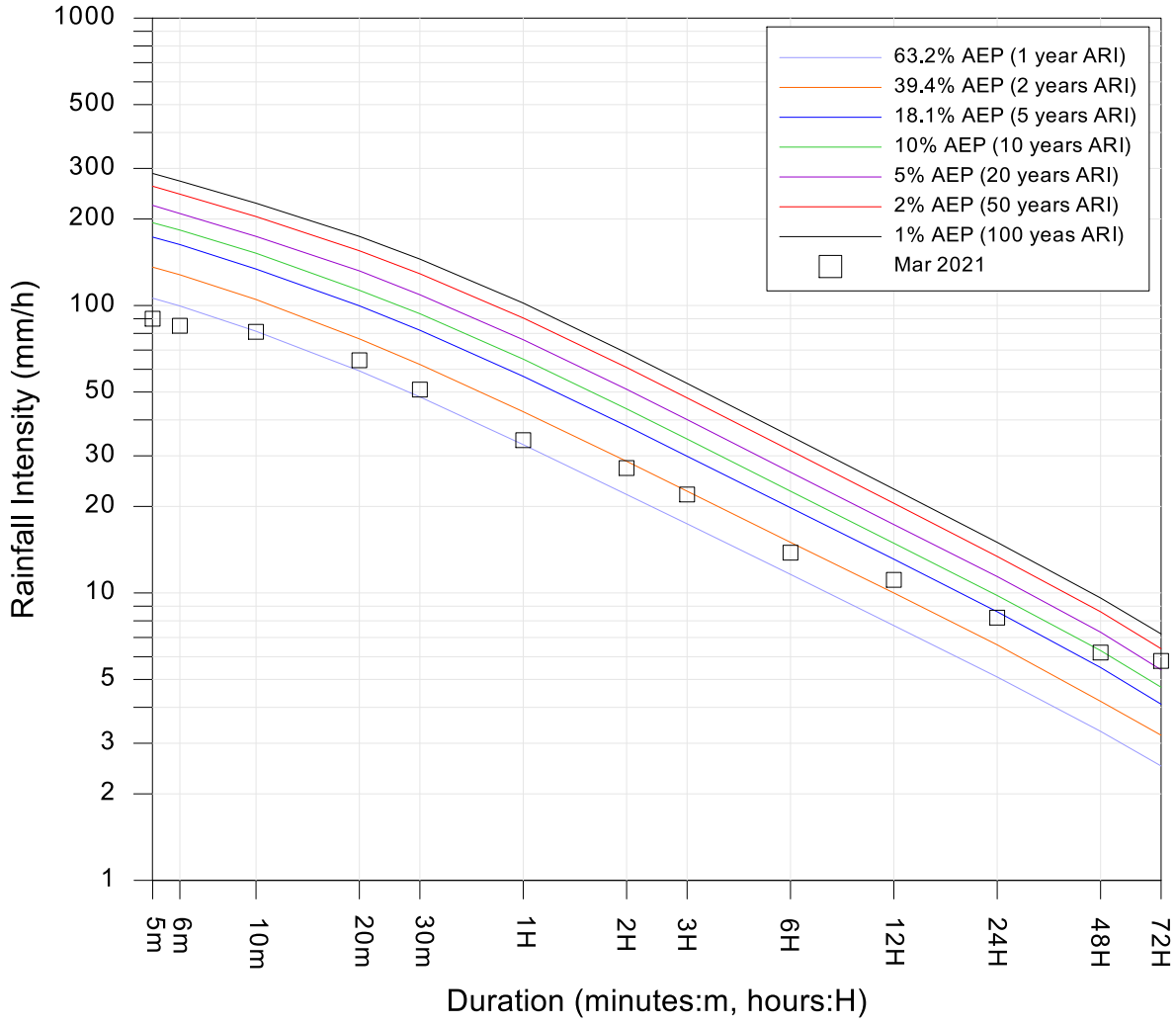
Manly Hydraulics Laboratory

Report MHL2809
Figure
8.11

IFD_207004_Figure 8.11.pdf

Site Owner: DPIE
Latitude: -31.2736 Longitude:152.857

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	90	16:22 19 Mar 2021
6m	85	17:25 19 Mar 2021
10m	81	17:26 19 Mar 2021
20m	64.5	13:11 11 Mar 2021
30m	51	13:15 11 Mar 2021
1H	34	14:41 18 Mar 2021
2H	27.2	15:39 18 Mar 2021
3H	22	16:41 18 Mar 2021
6H	13.8	19:17 18 Mar 2021
12H	11.1	18:26 19 Mar 2021
24H	8.2	13:17 19 Mar 2021
48H	6.2	04:02 20 Mar 2021
72H	5.8	12:16 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

GREEN VALLEY (207406)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

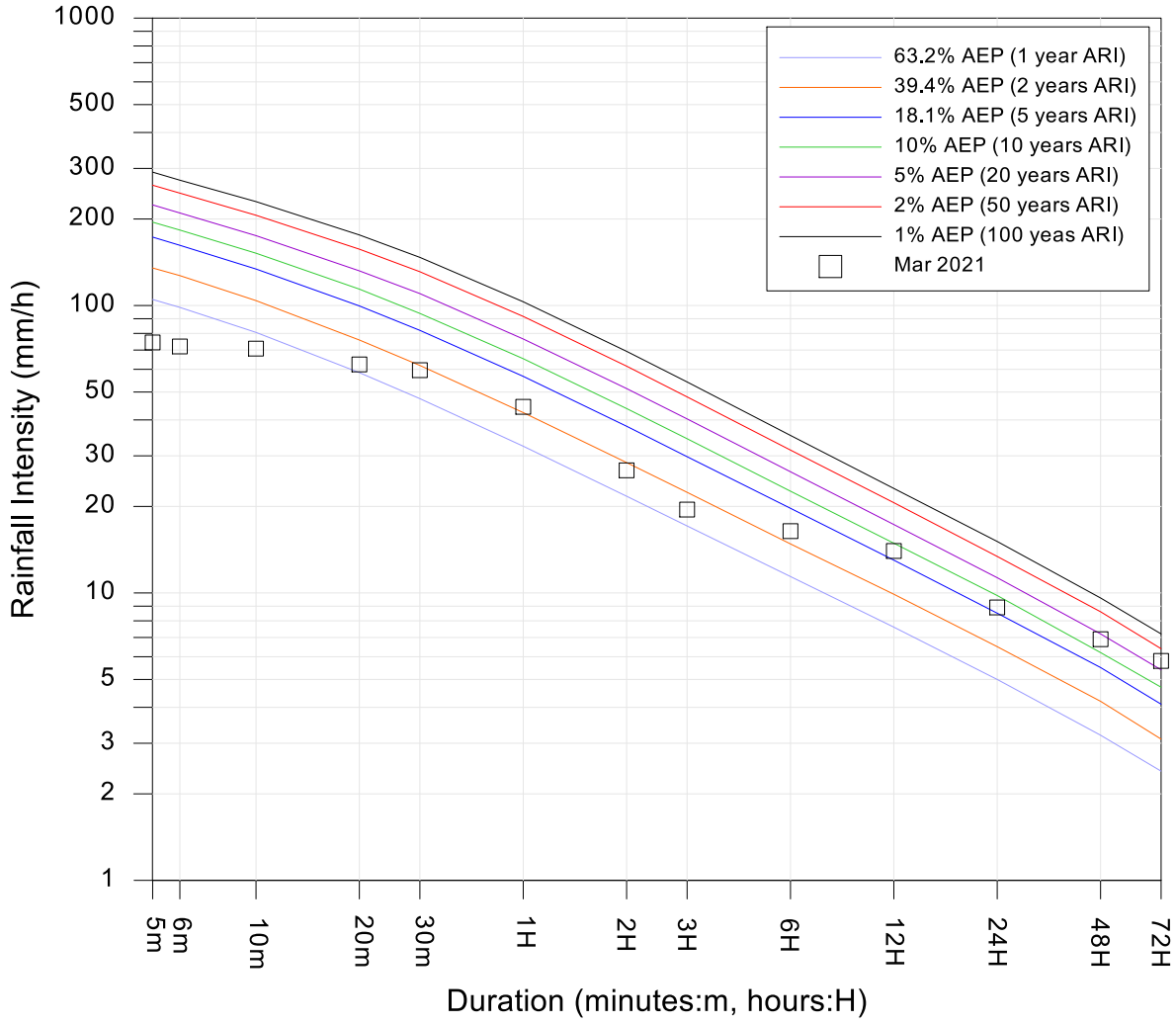
Manly Hydraulics Laboratory

Report MHL2809
Figure
8.12

IFD_207406_Figure 8.12.pdf

Site Owner: Port Macquarie Hastings Council
Latitude: -31.3253 Longitude:152.842

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	74.4	17:31 19 Mar 2021
6m	72	17:47 19 Mar 2021
10m	70.8	17:47 19 Mar 2021
20m	62.4	17:47 19 Mar 2021
30m	59.6	17:52 19 Mar 2021
1H	44.4	17:49 19 Mar 2021
2H	26.7	18:22 19 Mar 2021
3H	19.5	11:00 19 Mar 2021
6H	16.4	13:58 19 Mar 2021
12H	14	18:11 19 Mar 2021
24H	8.9	17:59 19 Mar 2021
48H	6.9	02:51 20 Mar 2021
72H	5.8	11:42 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

MARIA RIVER AT MUNDAYS LANE (2074127)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

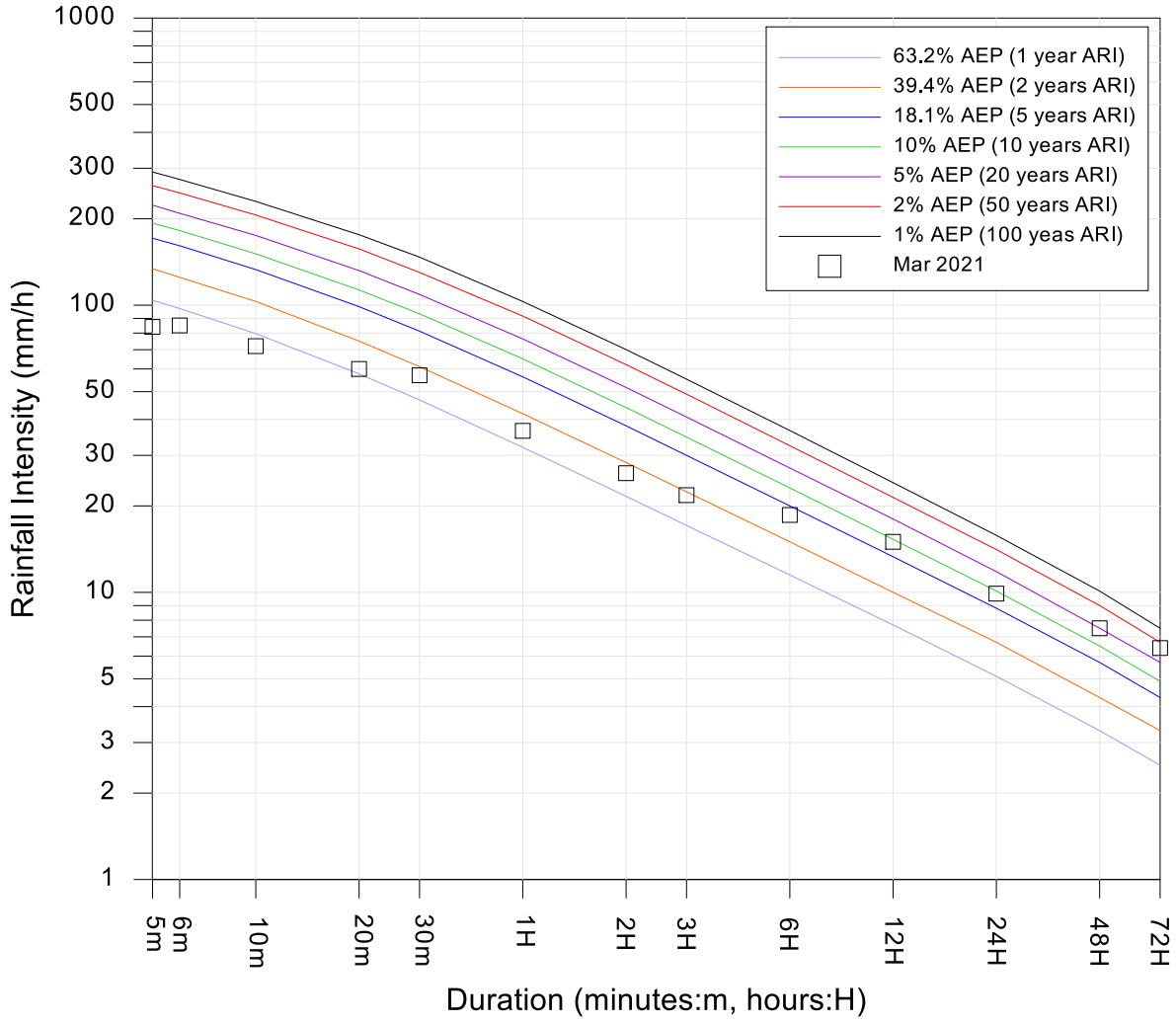
Manly Hydraulics Laboratory

Report MHL2809
Figure
8.13

IFD_2074127_Figure 8.13.pdf

Site Owner: DPIE
Latitude: -31.3236 Longitude:152.801

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	84	04:28 21 Mar 2021
6m	85	11:47 19 Mar 2021
10m	72	17:13 19 Mar 2021
20m	60	17:14 19 Mar 2021
30m	57	12:09 19 Mar 2021
1H	36.5	17:24 19 Mar 2021
2H	26	12:12 19 Mar 2021
3H	21.8	12:43 19 Mar 2021
6H	18.6	14:03 19 Mar 2021
12H	15	18:35 19 Mar 2021
24H	9.9	18:09 19 Mar 2021
48H	7.5	03:06 20 Mar 2021
72H	6.4	09:38 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

TELEGRAPH POINT (207415)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

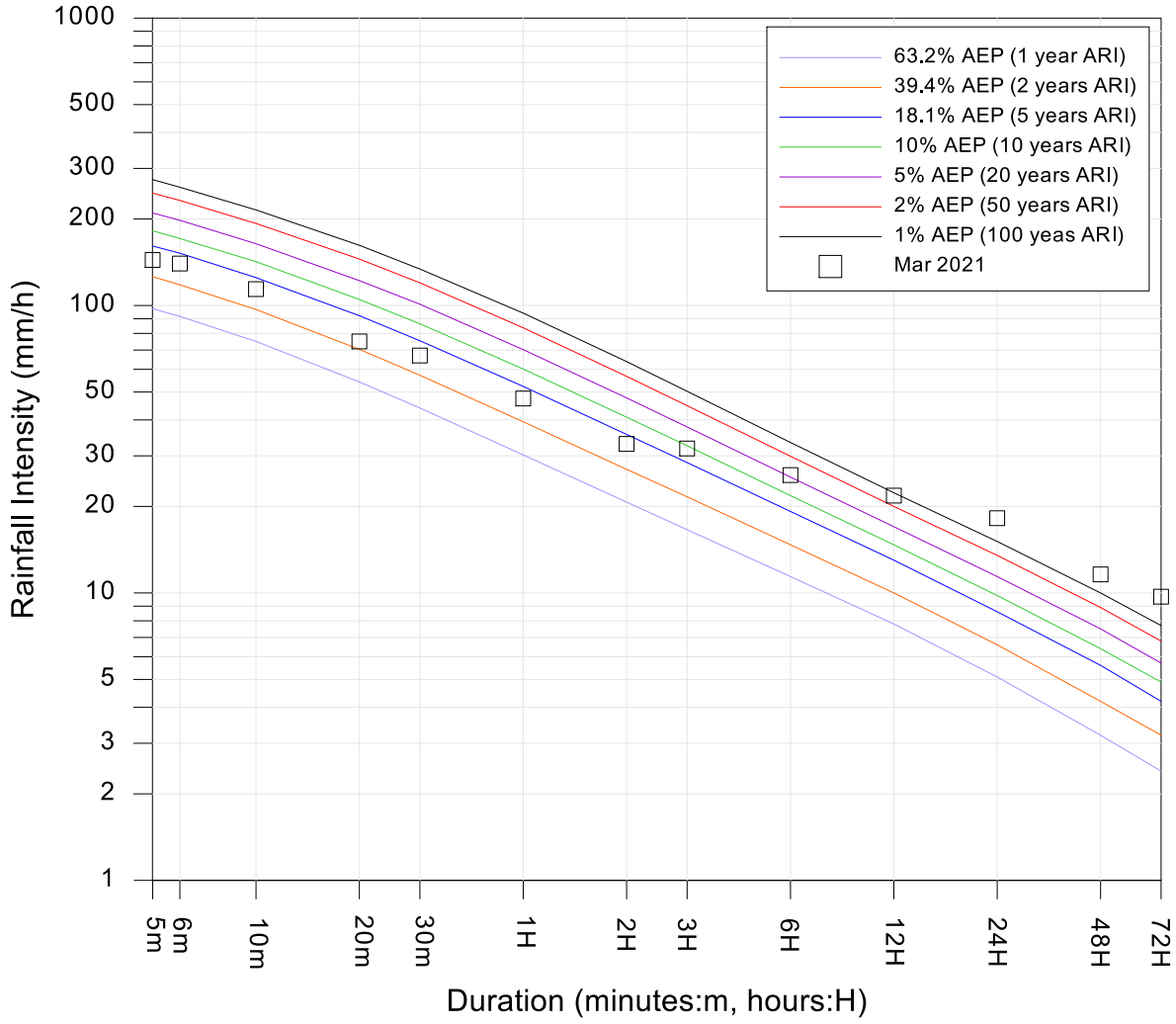
Manly Hydraulics Laboratory

Report MHL2809
Figure
8.14

IFD_207415_Figure 8.14.pdf

Site Owner: DPIE
Latitude: -31.6141 Longitude:152.693

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	144	02:37 20 Mar 2021
6m	140	02:37 20 Mar 2021
10m	114	02:39 20 Mar 2021
20m	75	02:37 20 Mar 2021
30m	67	02:40 20 Mar 2021
1H	47.5	03:05 20 Mar 2021
2H	33	21:14 19 Mar 2021
3H	31.8	21:47 19 Mar 2021
6H	25.7	22:46 19 Mar 2021
12H	21.8	23:55 19 Mar 2021
24H	18.2	03:23 20 Mar 2021
48H	11.6	03:30 20 Mar 2021
72H	9.7	15:02 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

LOGANS CROSSING (207428)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

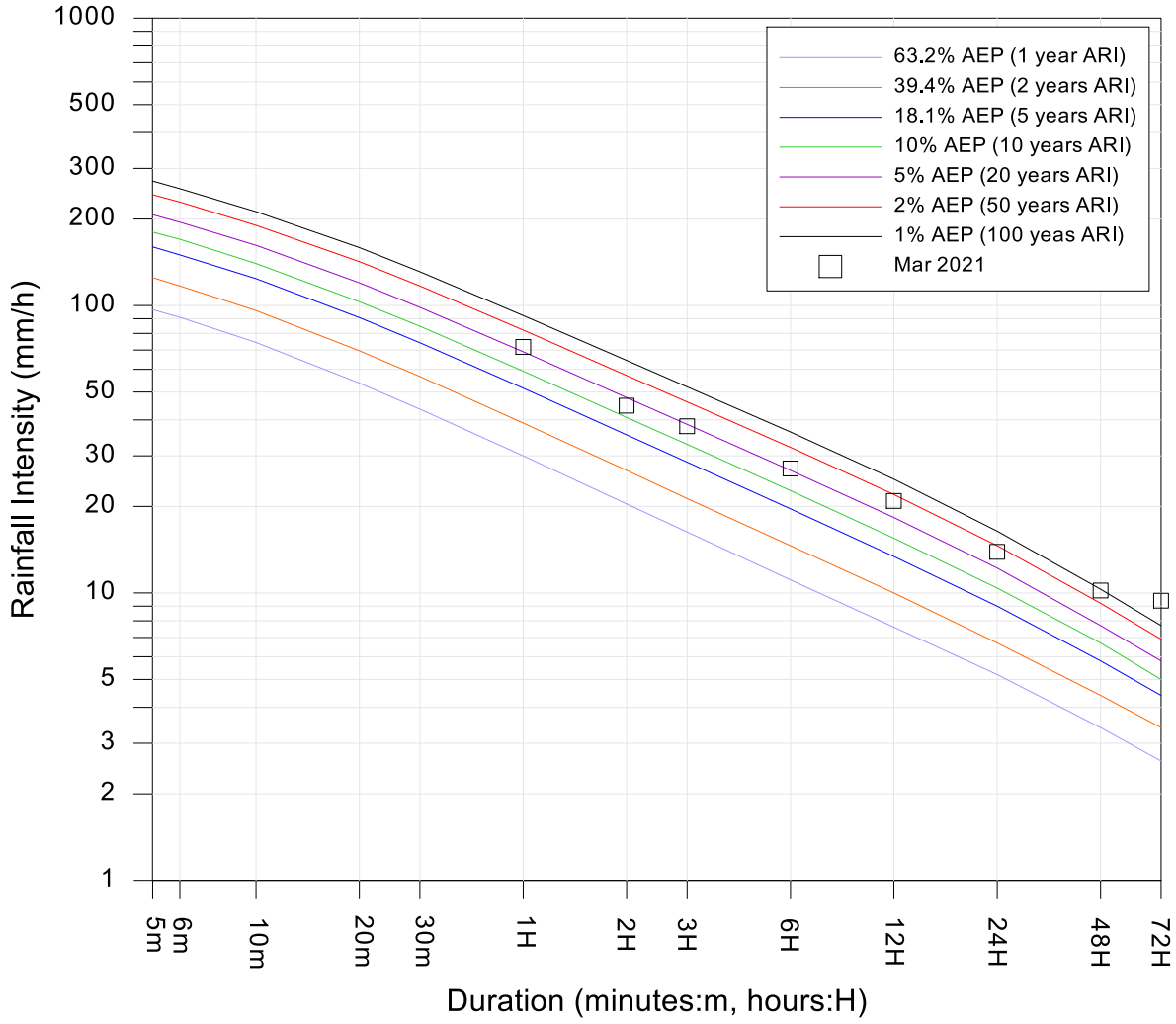
Manly Hydraulics Laboratory

Report MHL2809
Figure
8.15

IFD_207428_Figure 8.15.pdf

Site Owner: Port Macquarie Hastings Council
Latitude: -31.4611 Longitude:152.679

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	-	-
6m	-	-
10m	-	-
20m	-	-
30m	-	-
1H	71.8	06:30 21 Mar 2021
2H	44.8	07:30 21 Mar 2021
3H	38	06:22 21 Mar 2021
6H	27.1	08:11 21 Mar 2021
12H	20.9	20:10 19 Mar 2021
24H	13.9	20:22 19 Mar 2021
48H	10.2	08:34 21 Mar 2021
72H	9.4	10:17 21 Mar 2021

Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

KOREE ISLAND (207442)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

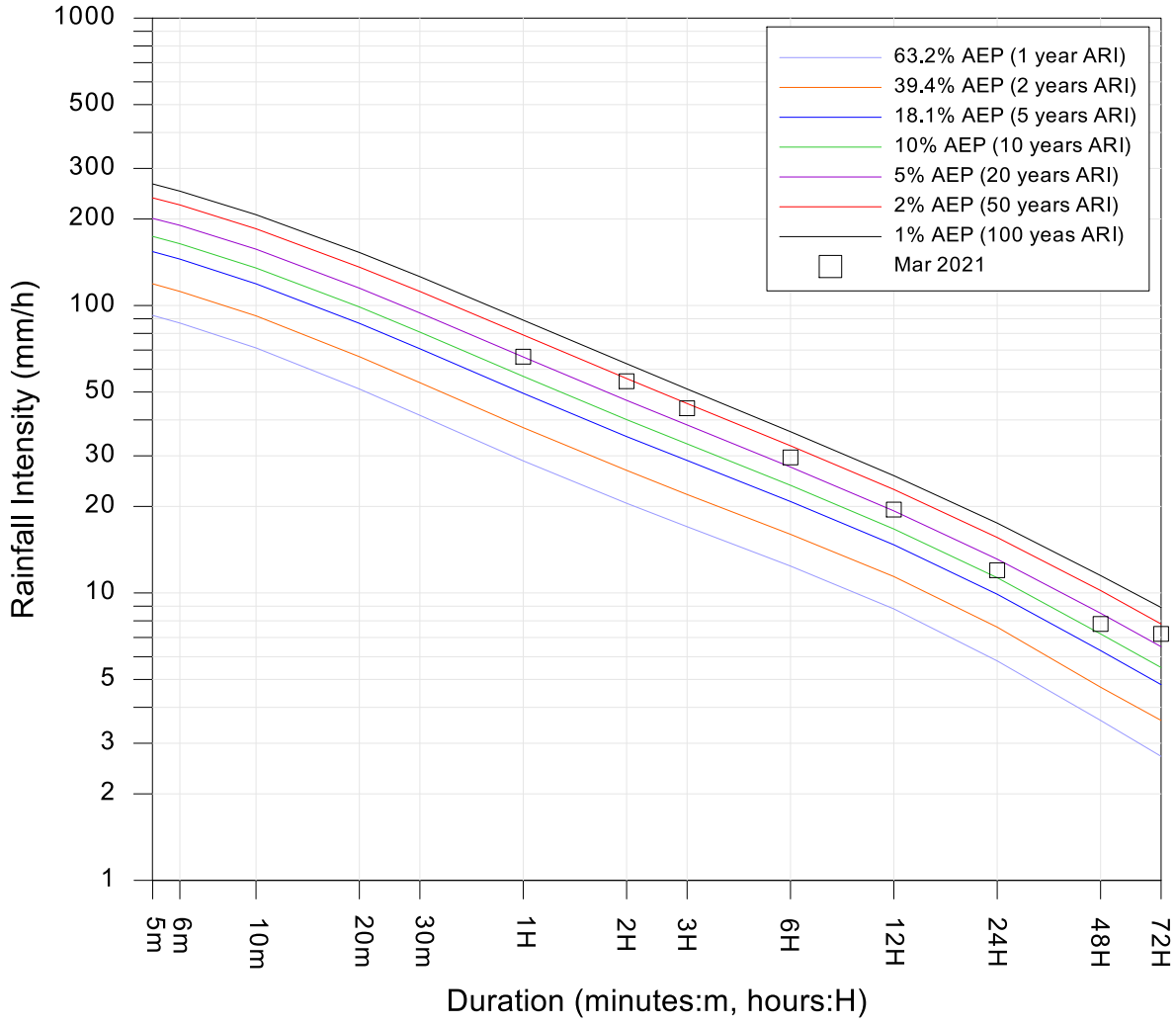
Manly Hydraulics Laboratory

Report MHL2809
Figure
8.16

IFD_207442_Figure 8.16.pdf

Site Owner: Port Macquarie Hastings Council
Latitude: -31.4353 Longitude:152.49

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	-	-
6m	-	-
10m	-	-
20m	-	-
30m	-	-
1H	66.4	17:42 19 Mar 2021
2H	54.5	17:52 19 Mar 2021
3H	43.9	17:51 19 Mar 2021
6H	29.6	17:59 19 Mar 2021
12H	19.5	18:04 19 Mar 2021
24H	12	20:58 19 Mar 2021
48H	7.8	10:59 21 Mar 2021
72H	7.2	00:51 22 Mar 2021

Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

LONG FLAT (207904)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

Manly Hydraulics Laboratory

Report MHL2809
Figure
8.17

IFD_207904_Figure 8.17.pdf

9 Manning River region

9.1 Manning River region – water level

The peak observed water levels for the Manning River region are listed in **Table 9-1**. **Table 9-2** lists the SES flood classifications for Gloucester, Wingham, Taree, Croki and Harrington. The locations of water level stations within the Manning River region are shown in Figure **9-1**. The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 9-2** to **Figure 9-6**.

Table 9-1 Manning River region flood peaks

River system	Station name	Station number	Owner	Datum	Level (m)
Tasman Sea	Crowdy Head	208471	DPIE	AHD	1.07
Manning River	Harrington	208425	DPIE	AHD	1.32
Manning River	Croki	208404	DPIE	AHD	2.97
Manning River	Dumaresq Island	208430	DPIE	AHD	4.25
Manning River	Taree	208410	DPIE	AHD	5.65
Manning River	Taree West	208420	WaterNSW	Local datum	9.82
Manning River	Wingham	208400	DPIE	AHD	14.37
Dingo Creek	Ashlea Bridge Downstream	208436	DPIE	AHD	10.97
Manning River	Mount George	208440	DPIE	AHD	13.38
Manning River	Farquhar Inlet	208415	DPIE	AHD	2.41
Gloucester River	Gloucester River at Gloucester	208020	WaterNSW	Local datum	6.41

Table 9-2 SES flood classification for Gloucester, Wingham, Taree, Croki and Harrington

Station name	Station number	Flood classification			Flood peak (m)	Flood event classification
		Minor	Moderate	Major		
		Water level (m)				
Harrington^	208425	1.9	2.2	2.8	1.32	<Minor
Croki	208404	1.5	n/a	n/a	2.97	>Minor
Taree	208410	1.8	2.4	3.7	5.65	Major
Wingham	208400	4.9	8.9	11.9	14.37	Major
Gloucester River at Gloucester	208020	4.3	4.9	5.2	6.41	Major

^SES is investigating the flood classifications for Harrington.

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MANNING RIVER STATIONS

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Report MHL2809
Figure
9.1

Figures_MHL2809.qgs

9.2 Manning River region – rainfall

The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 9-2** to **Figure 9-7**. 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 9-3** for the period 05 March to 05 April 2021. The rainfall intensities are displayed graphically in **Figure 9-8** to **Figure 9-10** in ARR1987 format. Appendix C provides ARR2019 format.

Table 9-3 Manning River region daily rainfall totals

Date	Mooral Creek 60165 (mm)	Killabakh 60147 (mm)	Mount George 208440 (mm)
	BoM	BoM	DPIE
05/03/2021	-	-	-
06/03/2021	0.0	0.0	0.0
07/03/2021	2.0	0.0	0.0
08/03/2021	0.0	0.0	0.0
09/03/2021	34.0	32.0	25.0
10/03/2021	4.0	7.0	5.5
11/03/2021	0.0	0.0	0.0
12/03/2021	0.0	0.0	0.0
13/03/2021	50.0	3.0	16.0
14/03/2021	1.0	0.0	0.0
15/03/2021	72.0	72.0	60.0
16/03/2021	1.0	1.0	0.0
17/03/2021	26.0	17.0	17.5
18/03/2021	21.0	20.0	17.0
19/03/2021	212.0	154.0	103.5
20/03/2021	273.0	303.0	148.5
21/03/2021	133.0	140.0	81.5
22/03/2021	100.0	97.0	73.5
23/03/2021	27.0	21.0	20.5
24/03/2021	14.0	13.0	10.5
25/03/2021	0.0	0.0	0.0
26/03/2021	0.0	0.0	0.0
27/03/2021	0.0	0.0	0.0
28/03/2021	0.0	0.0	0.0
29/03/2021	0.0	8.0	1.0
30/03/2021	0.0	1.0	0.5
31/03/2021	2.0	0.0	1.5
01/04/2021	2.0	0.0	2.0
02/04/2021	2.0	0.0	0.0
03/04/2021	0.0	0.0	0.0
04/04/2021	0.0	1.0	0.0
05/04/2021	0.0	0.0	0.0
06/04/2021	0.0	0.0	-

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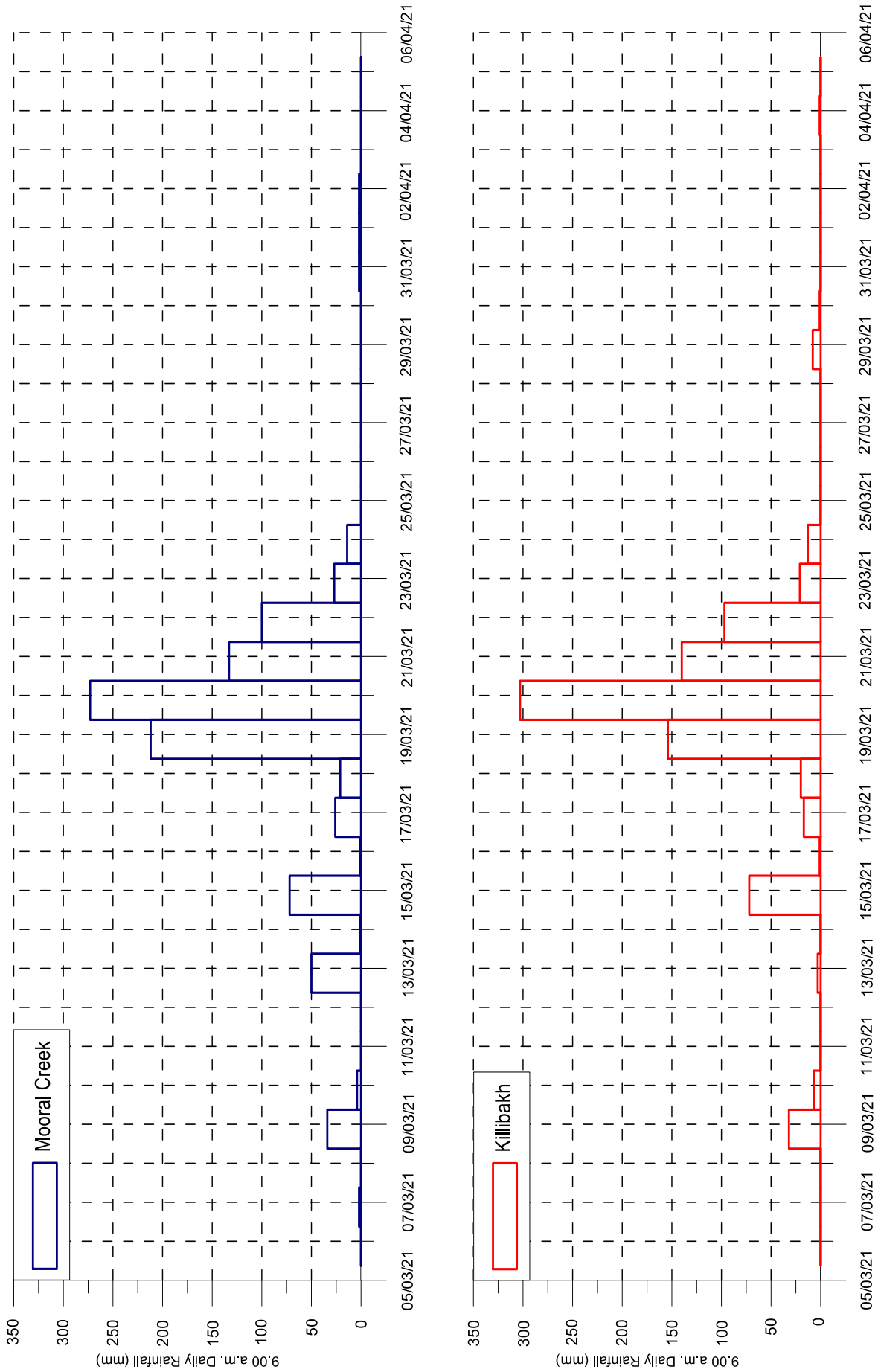
Classification: Public



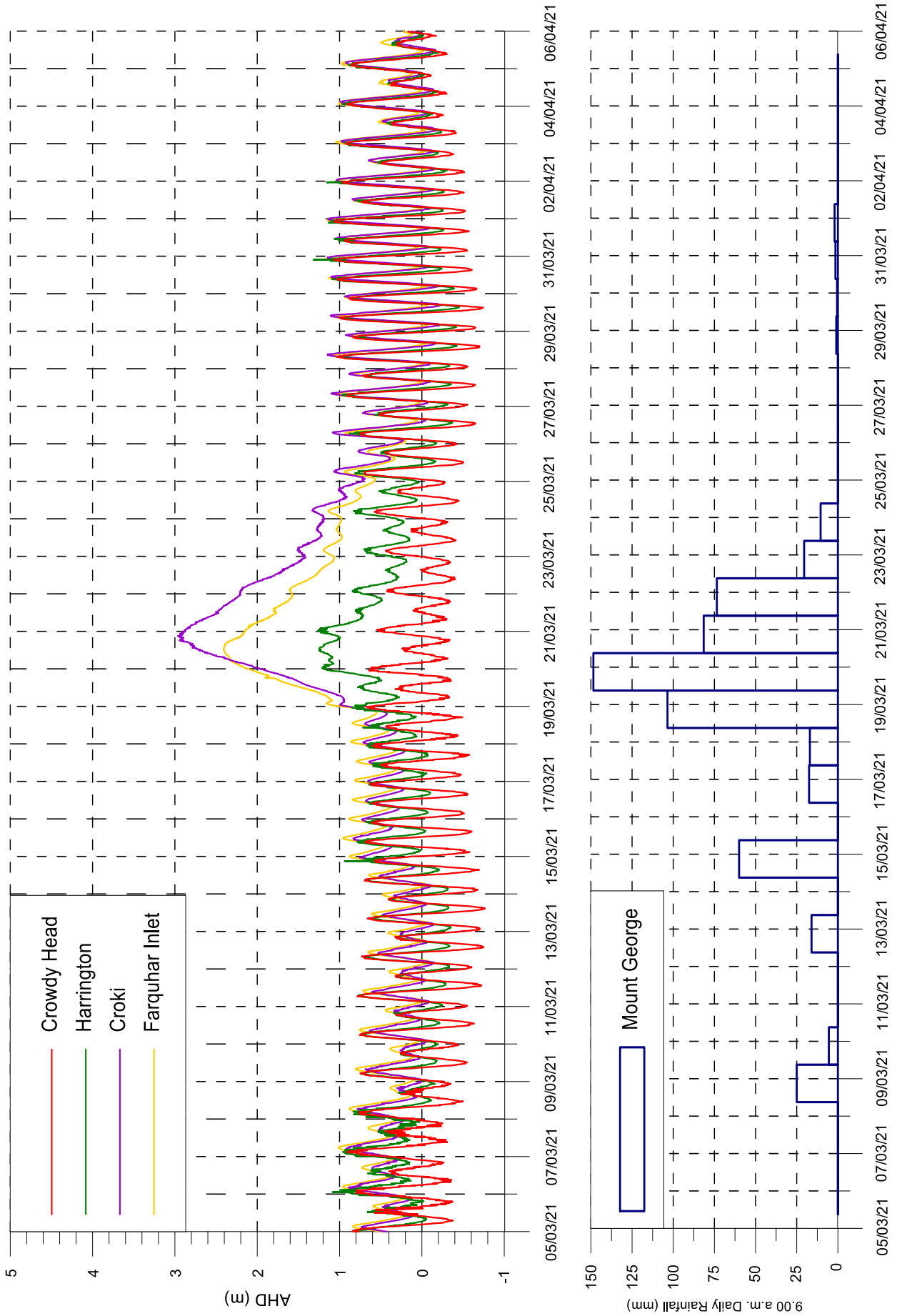
NSW GOVERNMENT

MANNING RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809
Figure
9.2

9.2.GRF



NSW GOVERNMENT

MANNING RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

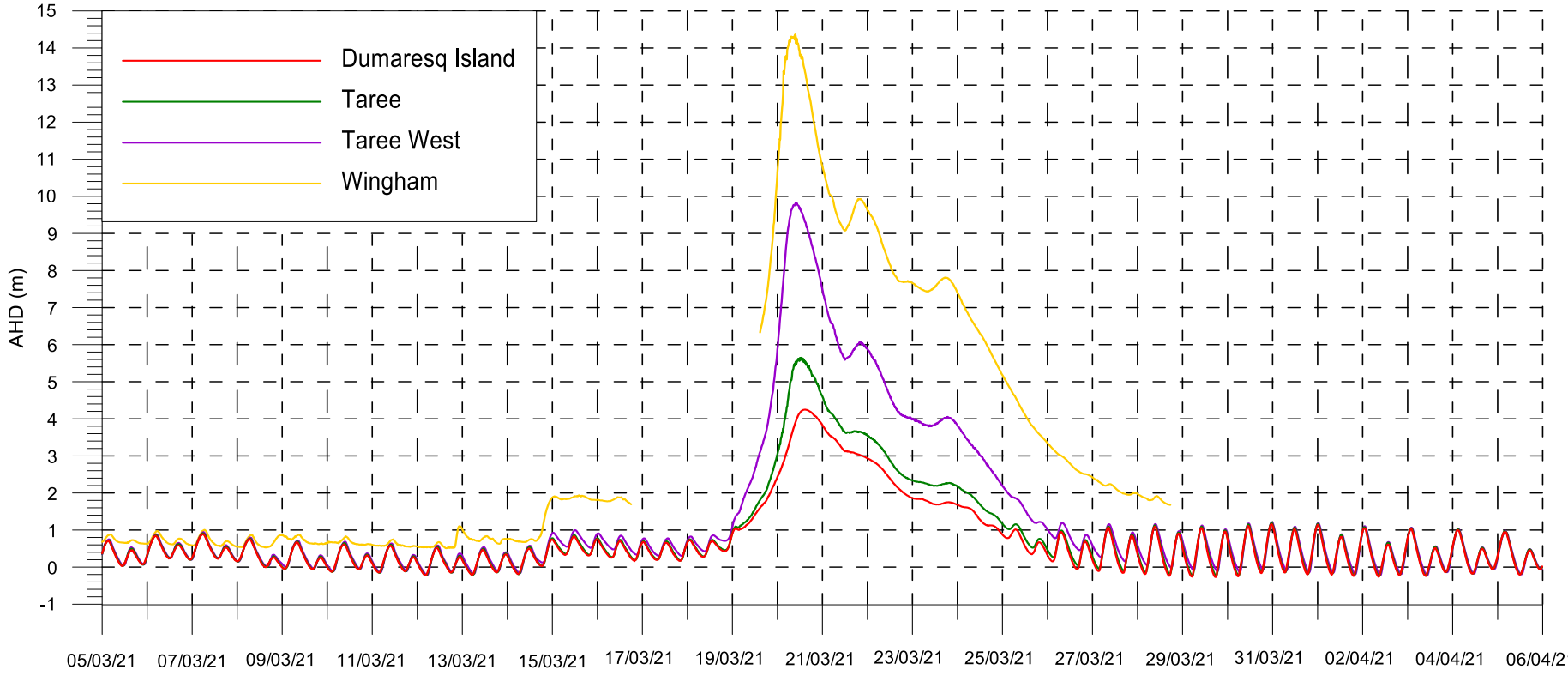
Manly Hydraulics Laboratory

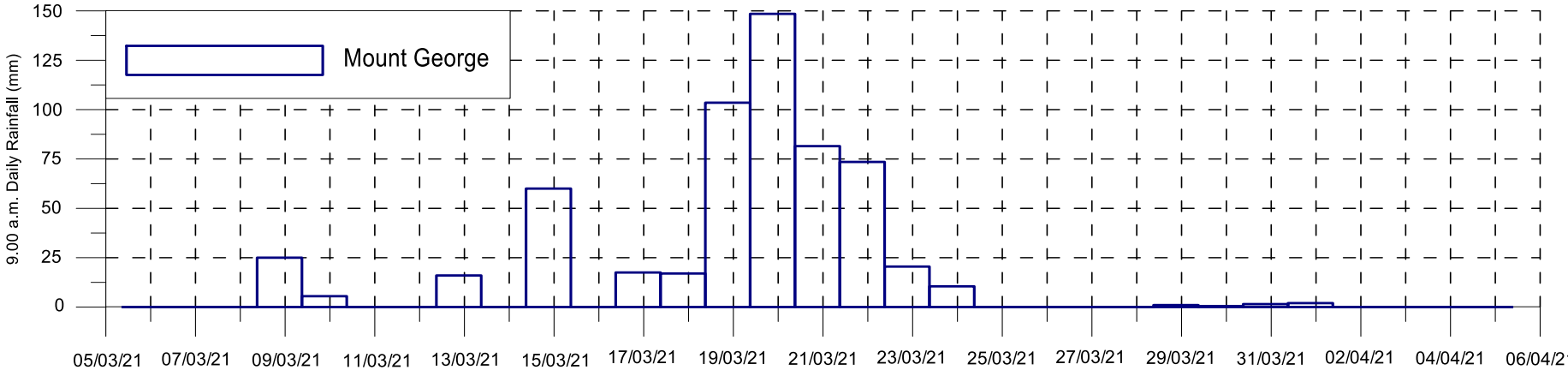
Report MH2809
Figure
9.3

9.3.GRF

MANNING RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

*Wingham station failed from 16/3/2021 to 19/3/2021.





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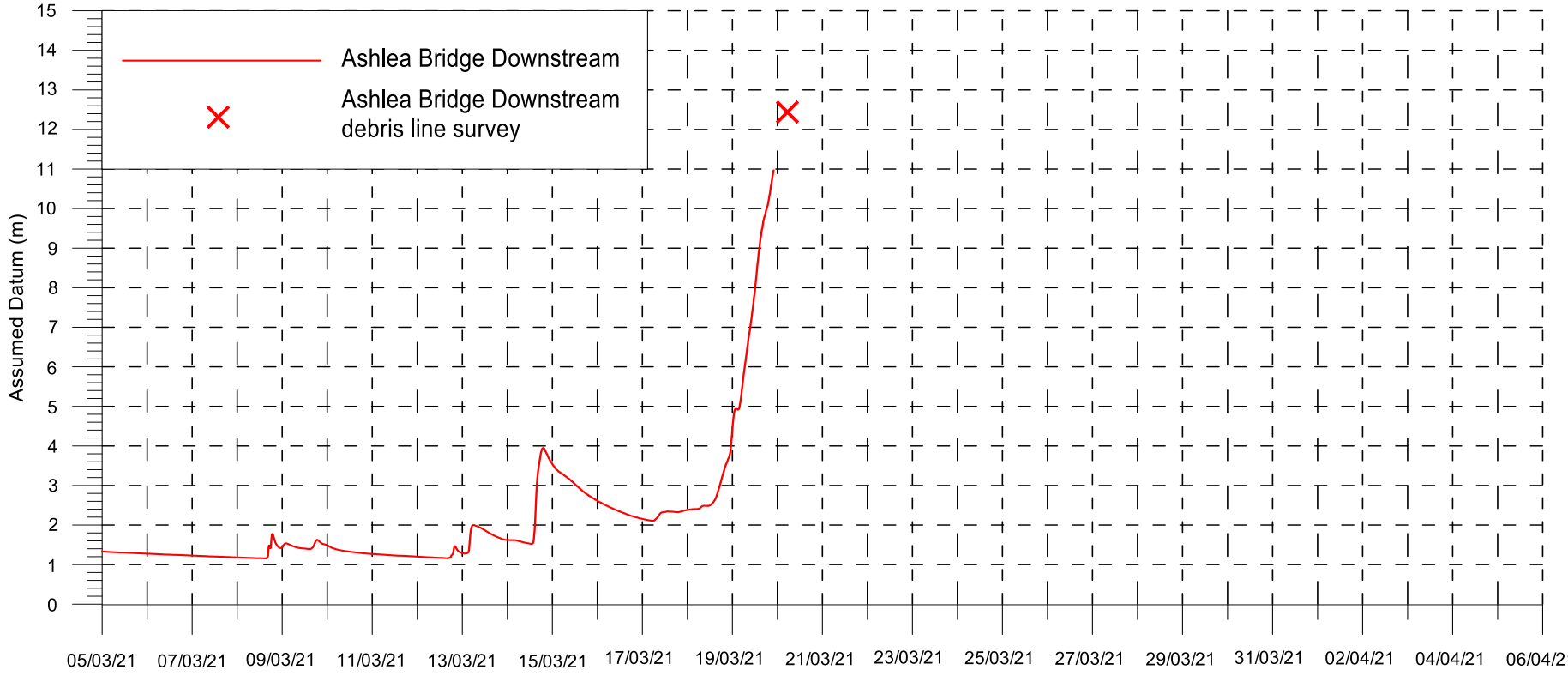
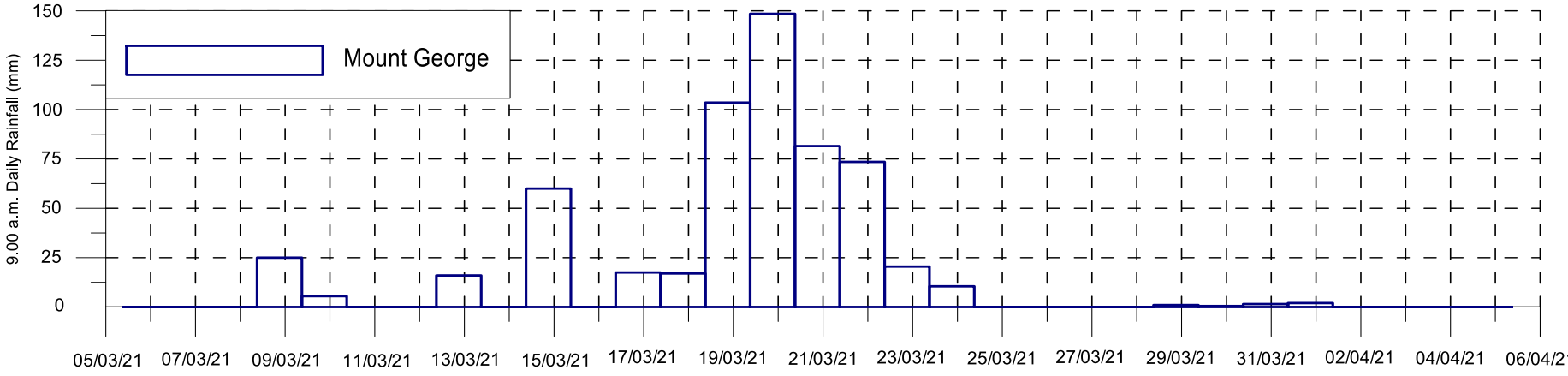
Report MH2809
Figure 9.4
9.4.GRF

NSW GOVERNMENT

MANNING RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

*Ashlea Bridge Downstream station failed on 19/03/2021 due to inundation of instrumentation by flood waters.



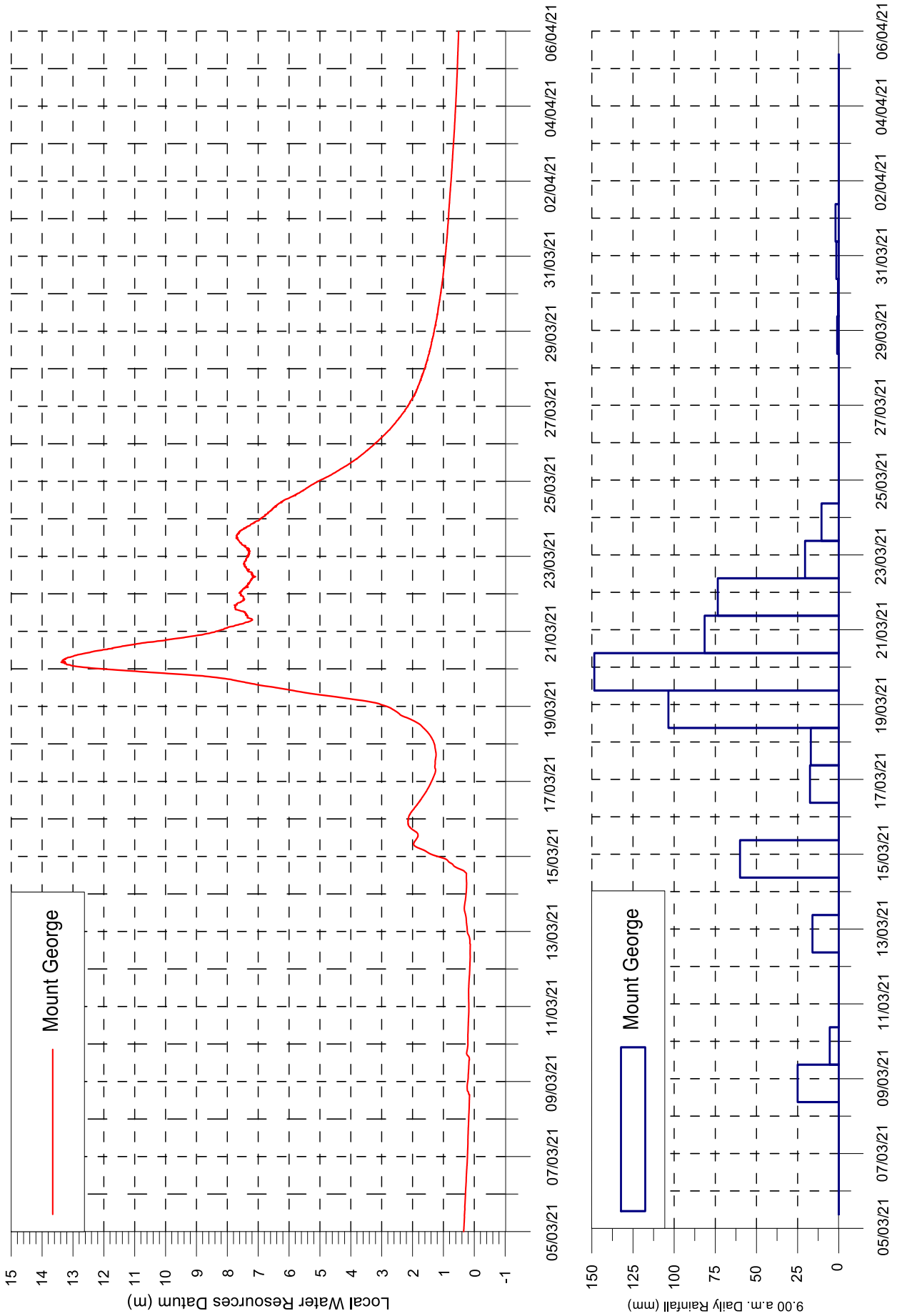


Manly Hydraulics Laboratory

Report MH2809

Figure 9.5

9.5.GRF



NSW GOVERNMENT

MANNING RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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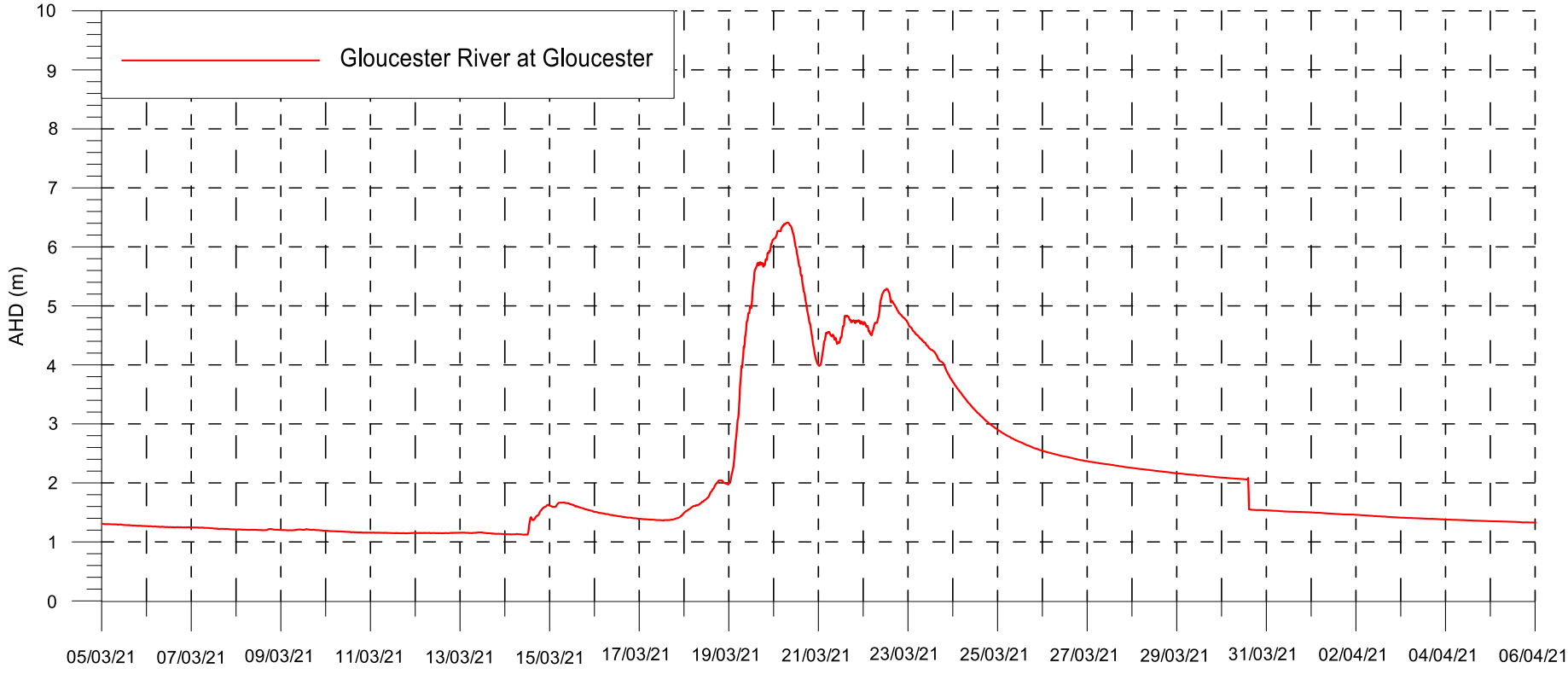
Report MH2809

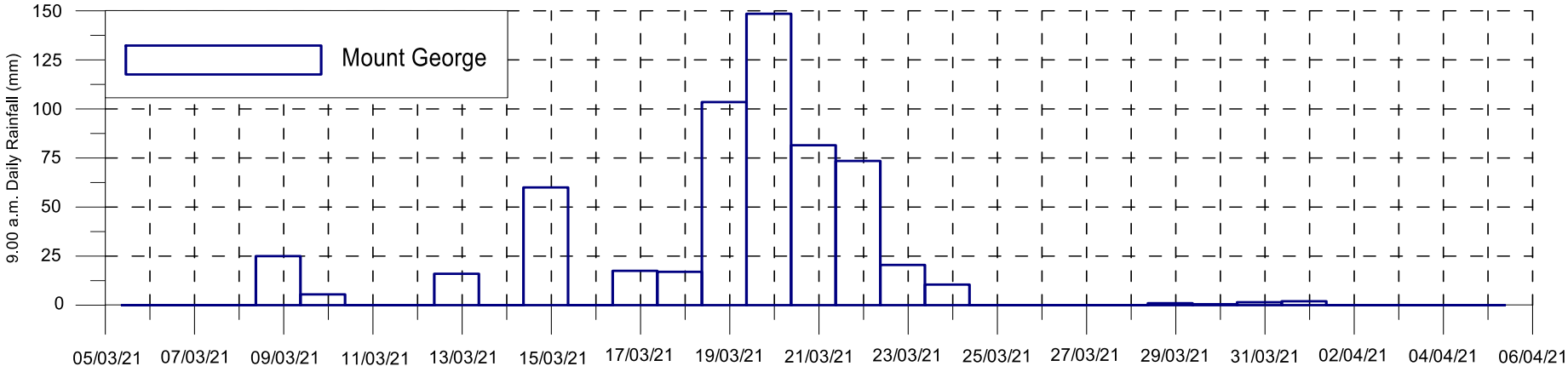
Figure

9.6

9.6.GRF

MANNING RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021





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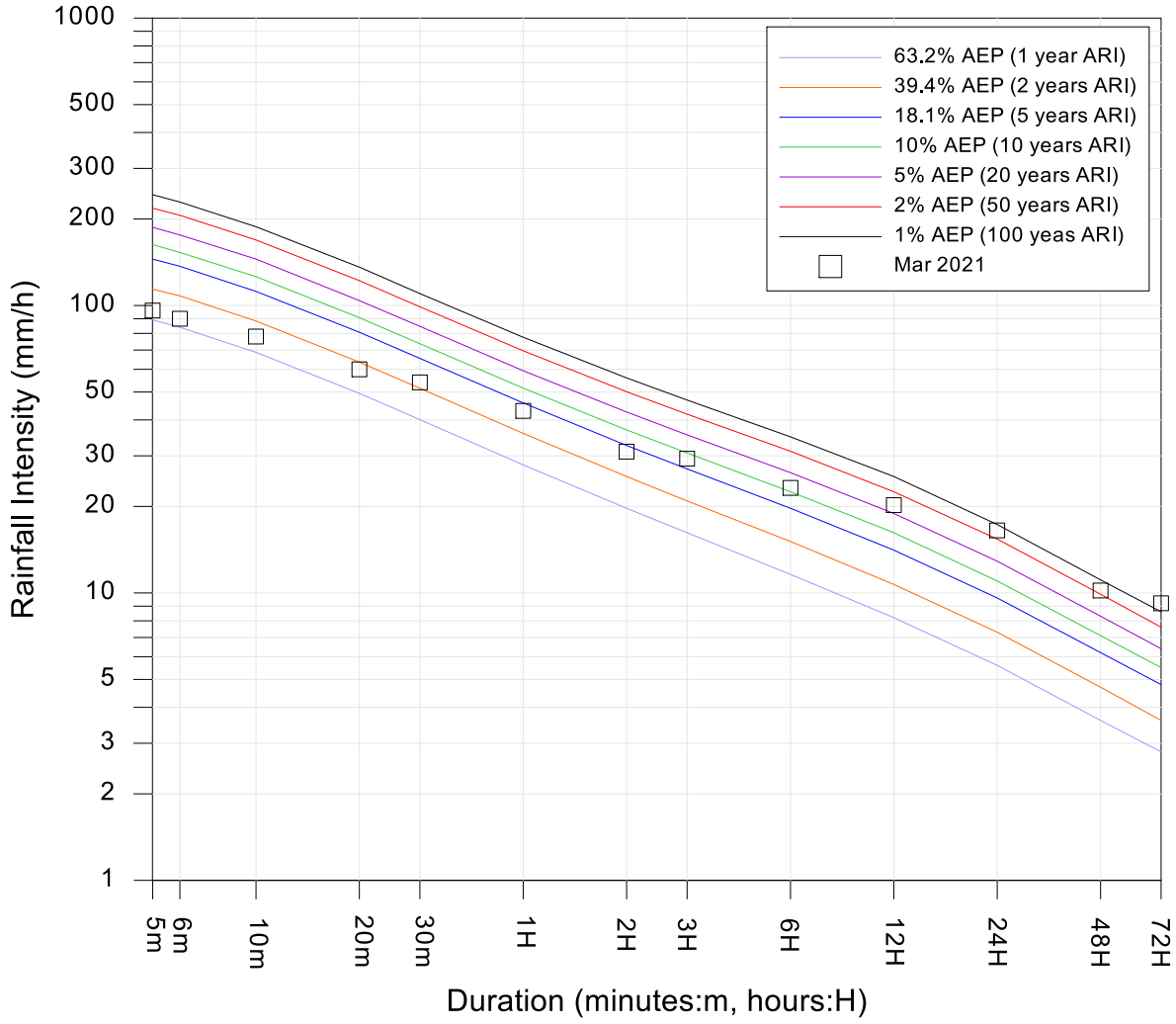
Report MH2809
Figure 9.7

9.7.GRF

Site Owner: BoM
Latitude: -31.664 Longitude:152.37

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	96	06:44 19 Mar 2021
6m	90	06:45 19 Mar 2021
10m	78	06:48 19 Mar 2021
20m	60	06:59 19 Mar 2021
30m	54	07:05 19 Mar 2021
1H	43	07:16 19 Mar 2021
2H	31	08:13 19 Mar 2021
3H	29.3	08:50 19 Mar 2021
6H	23.2	09:57 19 Mar 2021
12H	20.2	16:40 19 Mar 2021
24H	16.5	03:06 20 Mar 2021
48H	10.2	03:05 20 Mar 2021
72H	9.2	13:25 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

MOORAL CREEK (60165)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

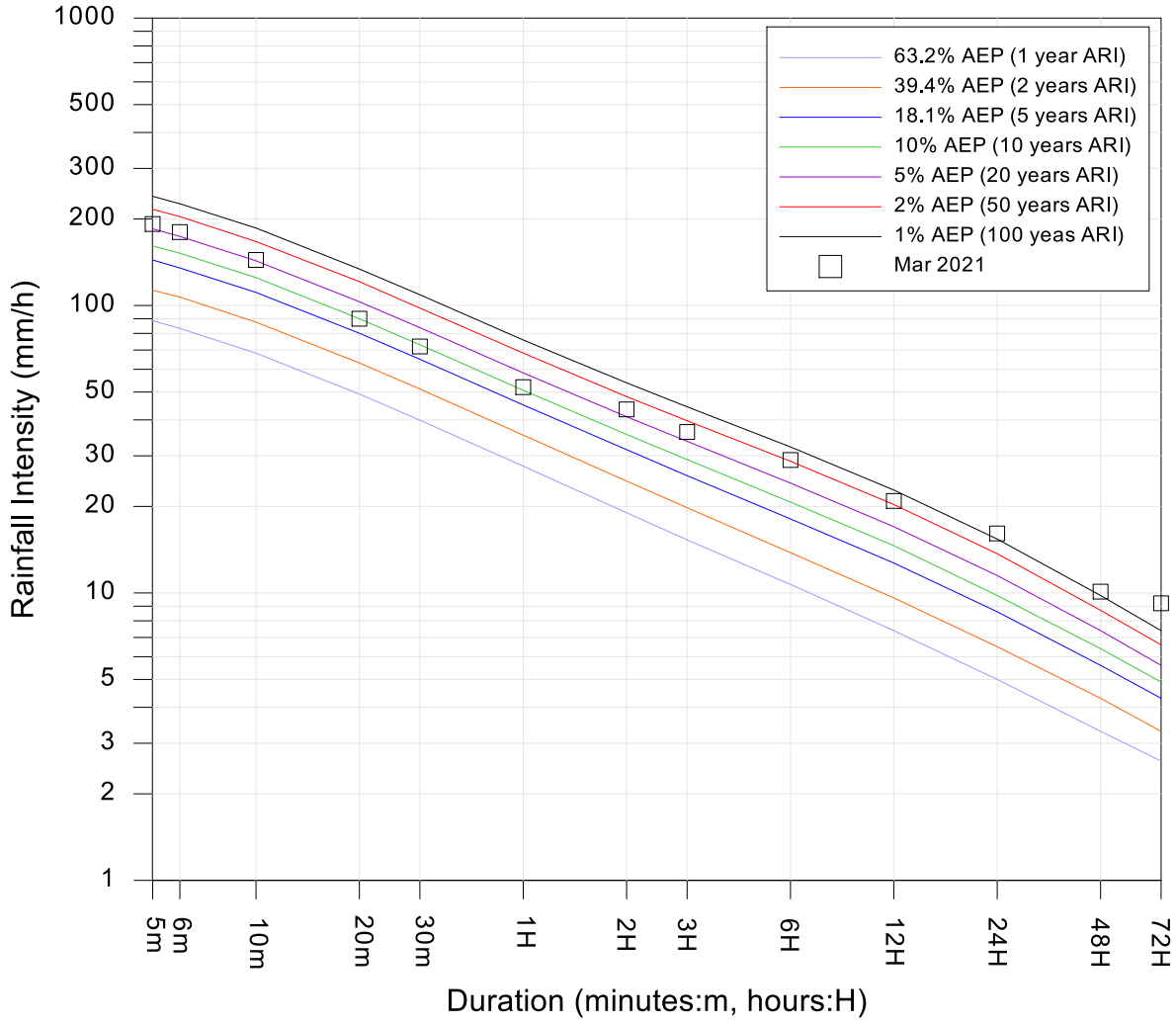
Manly Hydraulics Laboratory

Report MHL2809
Figure
9.8

IFD_60165_Figure 9.8.pdf

Site Owner: BoM
Latitude: -31.736 Longitude:152.399

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	192	13:40 14 Mar 2021
6m	180	13:41 14 Mar 2021
10m	144	13:44 14 Mar 2021
20m	90	13:52 14 Mar 2021
30m	72	05:50 19 Mar 2021
1H	52	20:44 19 Mar 2021
2H	43.5	20:33 19 Mar 2021
3H	36.3	21:33 19 Mar 2021
6H	29	23:32 19 Mar 2021
12H	20.9	01:43 20 Mar 2021
24H	16.1	02:38 20 Mar 2021
48H	10.1	22:19 20 Mar 2021
72H	9.2	13:03 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

KILLABAKH (60147)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

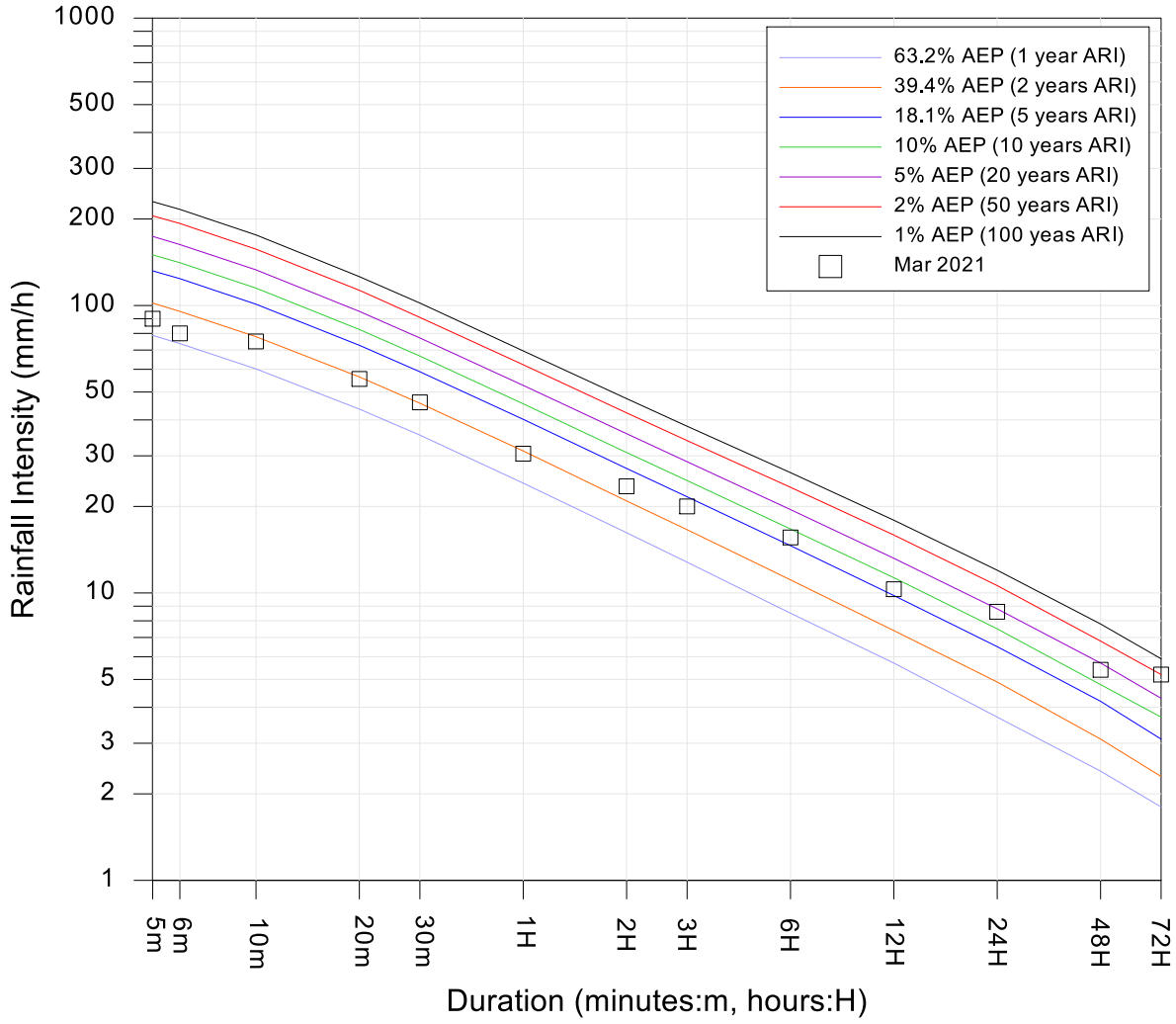
Manly Hydraulics Laboratory

Report MHL2809
Figure
9.9

IFD_60147_Figure 9.9.pdf

Site Owner: DPIE
Latitude: -31.8826 Longitude:152.146

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
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6m	80	15:39 08 Mar 2021
10m	75	15:38 08 Mar 2021
20m	55.5	15:41 08 Mar 2021
30m	46	13:36 14 Mar 2021
1H	30.5	14:01 14 Mar 2021
2H	23.5	21:31 19 Mar 2021
3H	20	21:36 19 Mar 2021
6H	15.6	23:26 19 Mar 2021
12H	10.3	23:40 19 Mar 2021
24H	8.6	23:24 19 Mar 2021
48H	5.4	13:59 21 Mar 2021
72H	5.2	21:52 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

MOUNT GEORGE (208440)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

Manly Hydraulics Laboratory

Report MHL2809
Figure
9.10

IFD_208440_Figure 9.10.pdf

10 Myall River region

10.1 Myall River region – water level

The peak observed water levels for the Myall River region are listed in **Table 10-1**. **Table 10-2** lists the SES flood classifications for Bulahdelah. The locations of water level stations within the Myall River region are shown in **Figure 10-1**. The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 10-2**.

Table 10-1 Myall River region flood peaks

River system	Station name	Station number	Owner	Datum	Level (m)
Myall River	Bulahdelah	209460	DPIE	AHD	4.34
Myall River	Bombah Point	209475	DPIE	AHD	2.89^

^Debris line survey value provided as the station was inundated by flood waters.

Table 10-2 SES flood classification for Bulahdelah

Station name	Station number	Flood classification			Flood peak (m)	Flood event classification
		Minor	Moderate	Major		
		Water level (m)				
Bulahdelah	209460	3.0	n/a	4.5	4.34	>Minor

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MYALL RIVER STATIONS

Manly Hydraulics Laboratory

Report MHL2809
Figure
10.1

Figures_MHL2809.qgs

10.2 Myall River region – rainfall

The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 10-2**. 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 10-3** for the period 05 March to 05 April 2021. The rainfall intensities are displayed graphically in **Figure 10-3** to **Figure 10-4**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 10-3 Myall River region daily rainfall totals

Date	Bulahdelah 209460 (mm) DPIE	Cabbage Tree Mountain 60096 (mm) BoM
05/03/2021	0.0	-
06/03/2021	0.5	0.0
07/03/2021	0.0	0.0
08/03/2021	0.0	0.0
09/03/2021	37.0	12.0
10/03/2021	1.0	6.0
11/03/2021	0.0	1.0
12/03/2021	0.0	2.0
13/03/2021	0.0	1.0
14/03/2021	0.5	0.0
15/03/2021	39.0	29.0
16/03/2021	0.0	1.0
17/03/2021	8.0	8.0
18/03/2021	75.5	34.0
19/03/2021	66.0	180.0
20/03/2021	144.0	199.0
21/03/2021	78.0	160.0
22/03/2021	78.5	109.0
23/03/2021	14.0	27.0
24/03/2021	17.0	22.0
25/03/2021	0.0	0.0
26/03/2021	0.0	0.0
27/03/2021	0.0	0.0
28/03/2021	0.0	0.0
29/03/2021	6.5	0.0
30/03/2021	1.0	3.0
31/03/2021	1.5	4.0
01/04/2021	0.5	1.0
02/04/2021	0.0	2.0
03/04/2021	0.0	0.0
04/04/2021	0.0	0.0
05/04/2021	0.0	0.0
06/04/2021	0.0	0.0

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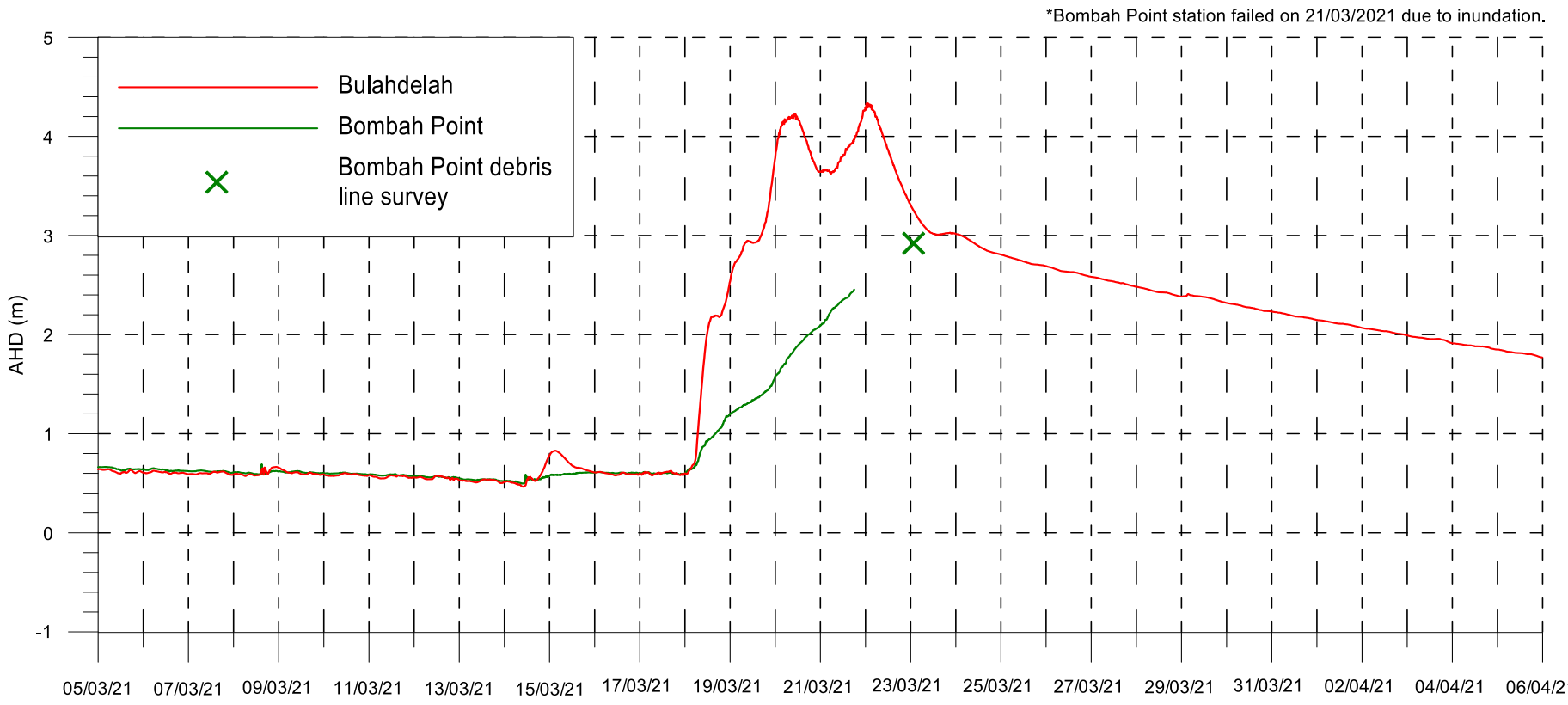
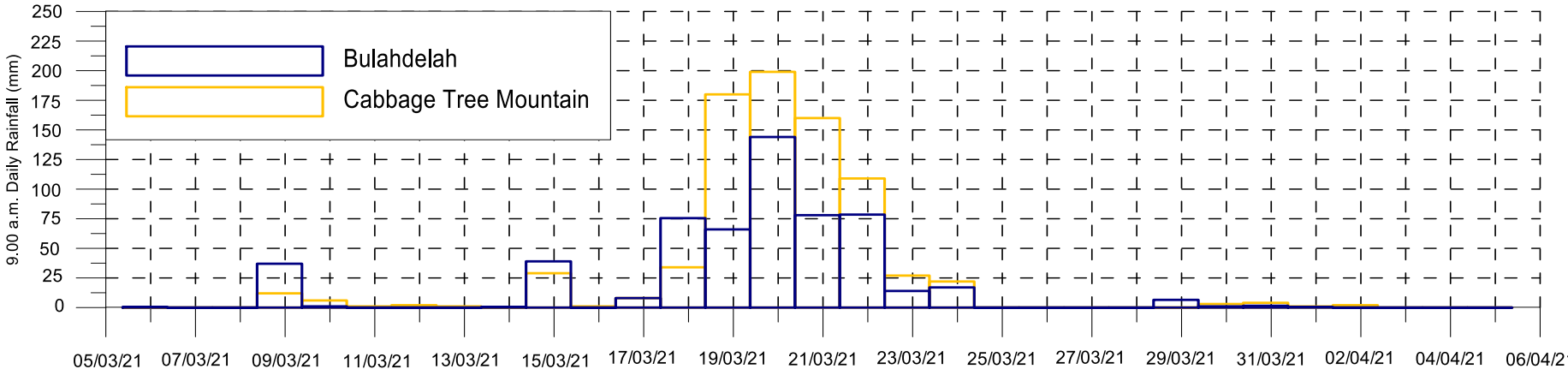
Classification: Public

MYALL RIVER
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021





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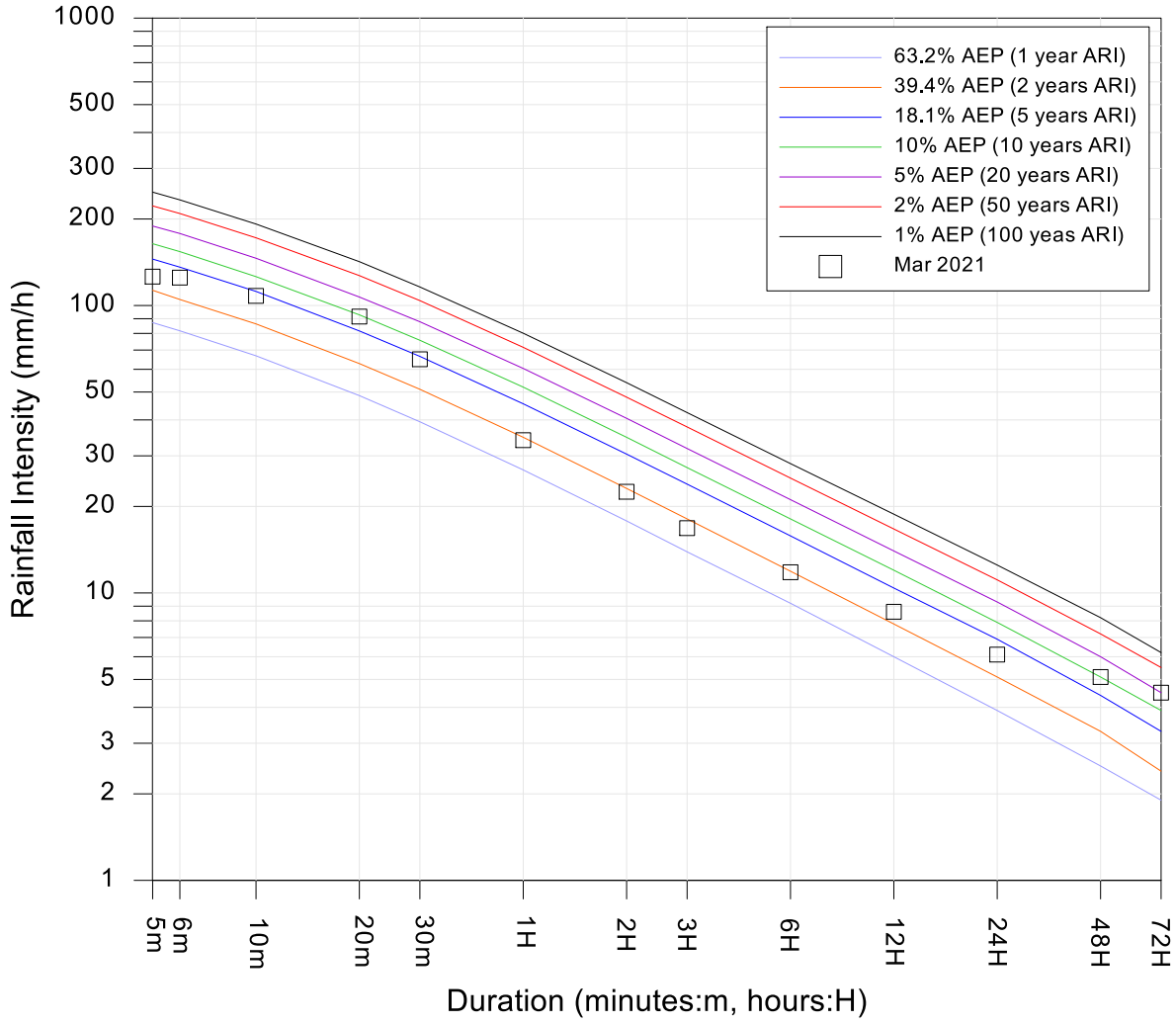
Report MH2809
Figure 10.2
10.2.GRF

Site Owner: DPIE
Latitude: -32.4139 Longitude:152.207

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	126	14:45 08 Mar 2021
6m	125	14:46 08 Mar 2021
10m	108	14:50 08 Mar 2021
20m	91.5	14:59 08 Mar 2021
30m	65	15:08 08 Mar 2021
1H	34	15:38 08 Mar 2021
2H	22.5	06:55 18 Mar 2021
3H	16.8	07:08 18 Mar 2021
6H	11.8	23:23 19 Mar 2021
12H	8.6	05:34 20 Mar 2021
24H	6.1	11:17 20 Mar 2021
48H	5.1	05:04 20 Mar 2021
72H	4.5	00:10 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

BULAHDELAH (209460)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

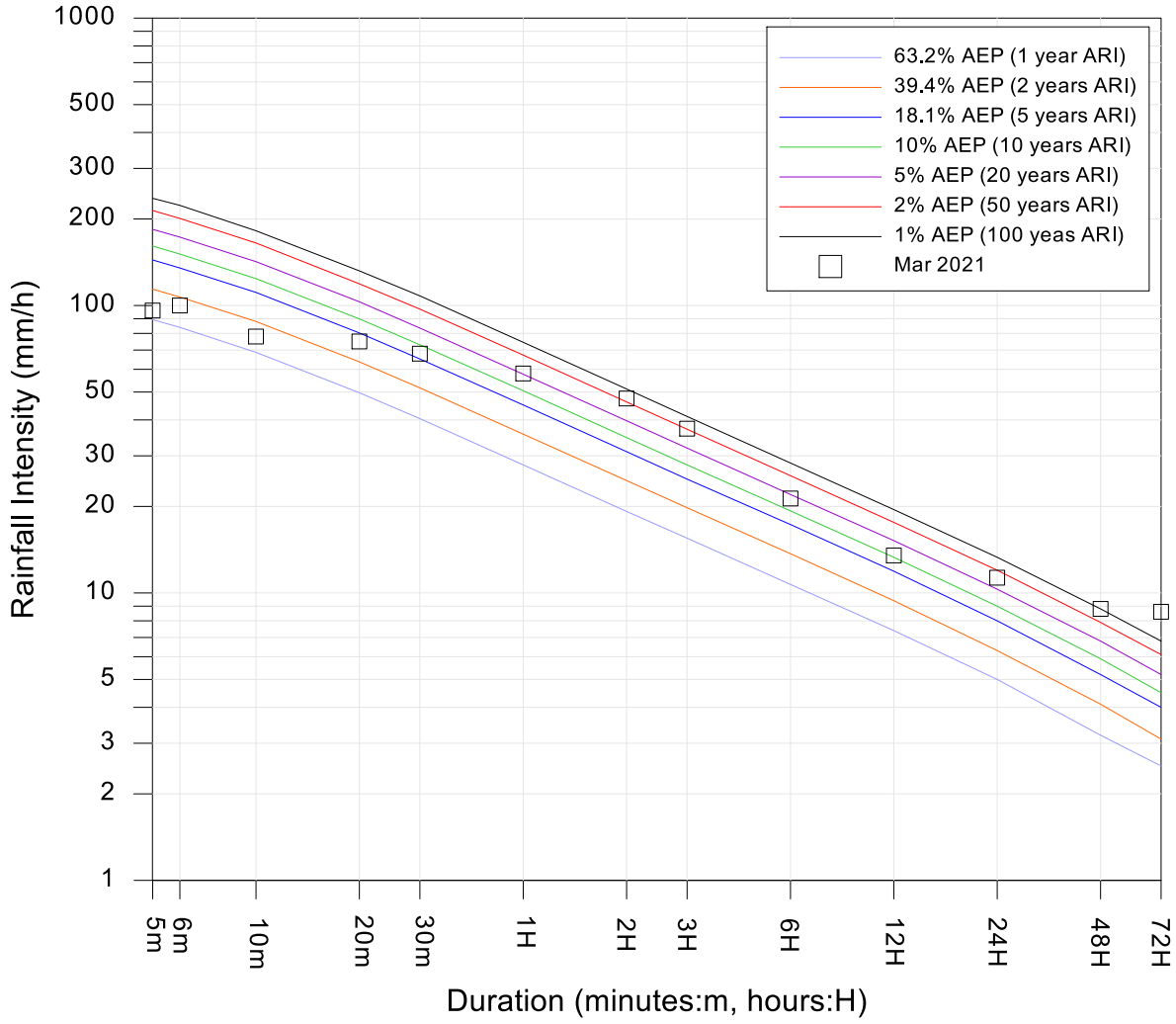
Manly Hydraulics Laboratory

Report MHL2809
Figure
10.3

IFD_209460_Figure 10.3.pdf

Site Owner: BoM
Latitude: -32.258 Longitude:152.121

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	96	23:43 18 Mar 2021
6m	100	23:29 18 Mar 2021
10m	78	23:48 18 Mar 2021
20m	75	23:43 18 Mar 2021
30m	68	23:51 18 Mar 2021
1H	58	23:58 18 Mar 2021
2H	47.5	00:16 19 Mar 2021
3H	37.3	00:16 19 Mar 2021
6H	21.3	00:44 19 Mar 2021
12H	13.5	06:15 19 Mar 2021
24H	11.3	22:19 19 Mar 2021
48H	8.8	17:50 20 Mar 2021
72H	8.6	18:01 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

CABBAGE TREE MOUNTAIN (60096)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

Manly Hydraulics Laboratory

Report MHL2809
Figure
10.4

IFD_60096_Figure 10.4.pdf

11 Paterson, Williams and Hunter River region

11.1 Paterson, Williams and Hunter River region – water level

The peak observed water levels for the Paterson, Williams and Hunter River region are listed in **Table 11-1**. **Table 11-2** lists the SES flood classifications for Dungog, Belmore Bridge, Gostwyck and Raymond Terrace. The locations of water level stations within the Paterson, Williams and Hunter River region are shown in **Figure 11-1**. The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 11-2** to **Figure 11-11**.

Table 11-1 Paterson, Williams and Hunter River region flood peaks

River system	Station name	Station number	Owner	Datum	Level (m)
Hunter River	Stockton Bridge	210456	DPIE	AHD	1.05
Hunter River	Hexham Bridge	210448	DPIE	AHD	1.37
Williams River	Raymond Terrace	210452	DPIE	AHD	2.64
Williams River	Seaham	210462	DPIE	AHD	3.31
Williams River	Williams River at Glen Martin	210010	WaterNSW	Local Datum	9.44
Williams River	Williams River at Dungog	210903	WaterNSW	Local Datum	8.19
Hunter River	Green Rocks	210432	DPIE	AHD	3.87
Paterson River	Hinton Bridge	210410	DPIE	AHD	5.26
Paterson River	Dunmore	210409	DPIE	AHD	6.37
Paterson River	Paterson Railway Bridge	210406	DPIE	AHD	9.57
Paterson River	Gostwyck	210402	DPIE	AHD	13.61
Hunter River	Morpeth	210430	DPIE	AHD	5.24
Hunter River	McKimms Corner	210455	DPIE	AHD	5.89
Wallis Creek	Wallis Creek Downstream	210457	DPIE	AHD	6.94
Wallis Creek	Wallis Creek Upstream	210428	DPIE	AHD	5.61
Wallis Creek	Louth Park	210453	DPIE	AHD	5.78
Hunter River	Belmore Bridge	210458	DPIE	AHD	7.56
Hunter River	Bolwarra Downstream	210451	DPIE	AHD	8.45
Hunter River	Oakhampton Railway Bridge	210475	DPIE	AHD	8.78
Wollombi Brook	Wollombi Brook	210004	WaterNSW	Local Datum	7.20

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Classification: Public

Table 11-2 SES flood classification for Dungog, Belmore Bridge, Gostwyck and Raymond Terrace

Station name	Station number	Flood classification			Flood peak (m)	Flood event classification
		Minor	Moderate	Major		
		Water level (m)				
Raymond Terrace	210452	2.5	3.1	3.5	2.64	Minor
Williams River at Dungog	210903	4.9	7.6	8.5	8.19	Moderate
Gostwyck	210402	9.1	10.7	12.2	13.61	Major
Belmore Bridge	210458	5.9	8.9	10.5	7.56	Minor

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PATERSON, WILLIAMS AND HUNTER RIVER STATIONS

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Report MHL2809
Figure
11.1

Figures_MHL2809.qgs

11.2 Paterson, Williams and Hunter River region – rainfall

The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 11-2** to **Figure 11-10**. 24-hour rainfall totals up until 9:00 a.m. are displayed in Error! Reference source not found. for the period 05 March to 05 April 2021. The rainfall intensities are displayed graphically in **Figure 11-12** to **Figure 11-16**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 11-3 Paterson, Williams and Hunter River region daily rainfall totals

Date	Williams River at Glen Martin	Gostwyck	Seaham	Belmore Bridge	Hexham Bridge
	210010 (mm)	210402 (mm)	210462 (mm)	210458 (mm)	210448 (mm)
	WaterNSW	DPIE	DPIE	DPIE	DPIE
05/03/2021	-	-	-	-	-
06/03/2021	-	0.0	0.0	0.0	0.5
07/03/2021	-	0.0	0.0	0.0	0.0
08/03/2021	0.0	0.0	0.0	0.0	0.0
09/03/2021	16.4	7.0	7.5	27.0	12.5
10/03/2021	10.2	9.0	0.0	0.0	0.0
11/03/2021	0.0	0.0	0.0	0.0	0.0
12/03/2021	0.0	0.5	0.0	0.0	0.0
13/03/2021	5.6	0.0	1.0	2.0	0.0
14/03/2021	0.0	1.5	0.0	1.5	0.5
15/03/2021	22.0	60.0	44.5	49.5	35.0
16/03/2021	0.0	0.0	0.5	0.0	0.0
17/03/2021	1.4	5.5	9.5	7.5	11.0
18/03/2021	14.6	23.0	43.5	25.5	39.5
19/03/2021	18.6	16.5	28.5	33.5	50.5
20/03/2021	50.0	100.5	78.0	62.0	61.0
21/03/2021	17.4	17.5	17.0	10.0	14.5
22/03/2021	13.2	20.5	15.5	21.5	39.0
23/03/2021	11.8	18.5	15.5	20.5	20.5
24/03/2021	4.6	5.0	6.5	2.5	4.5
25/03/2021	0.0	0.0	0.0	0.0	0.0
26/03/2021	0.0	0.0	0.0	0.5	0.0
27/03/2021	0.0	0.0	0.0	0.5	0.0
28/03/2021	0.0	0.0	0.0	0.0	0.0
29/03/2021	0.0	0.0	0.0	0.0	0.0
30/03/2021	1.8	2.5	4.0	1.0	1.0
31/03/2021	2.2	1.5	3.0	0.0	3.5
01/04/2021	-	2.0	7.5	1.0	1.5
02/04/2021	-	1.0	1.5	0.0	0.5
03/04/2021	-	0.5	0.0	0.5	0.0
04/04/2021	-	0.0	0.0	0.0	0.5
05/04/2021	-	0.0	0.0	0.0	0.0
06/04/2021	-	-	-	-	-

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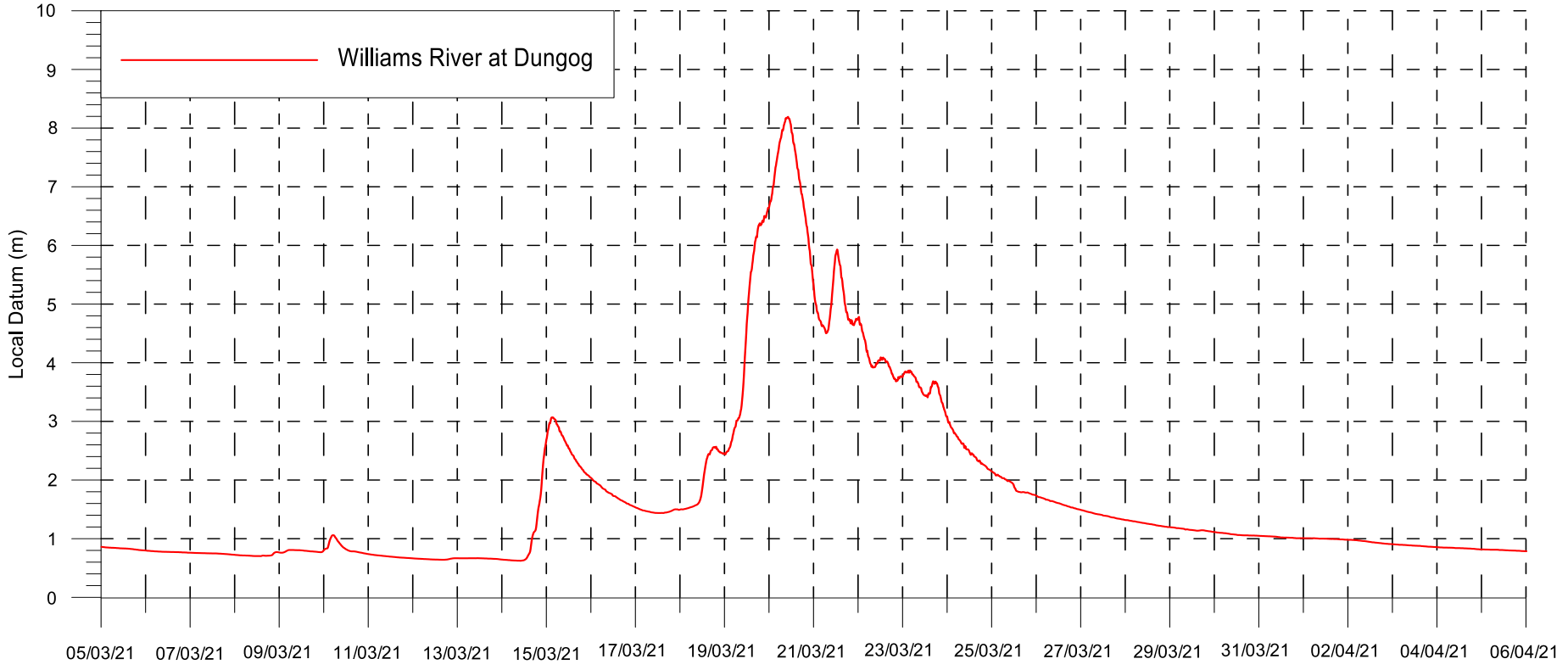
PATERSON, WILLIAMS AND HUNTER RIVER REGION

WATER LEVEL AND RAINFALL DATA

5 MARCH – 5 APRIL 2021



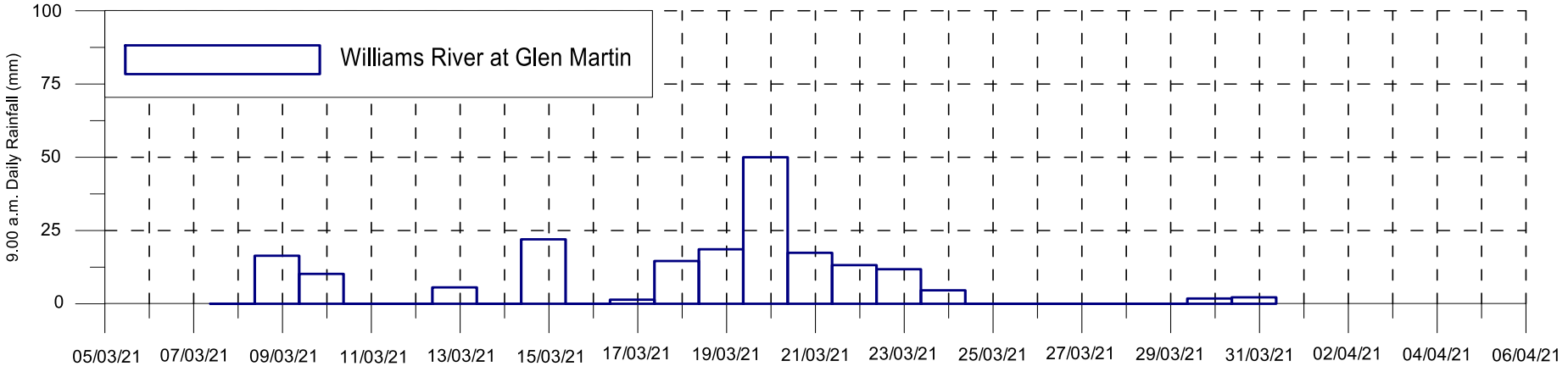


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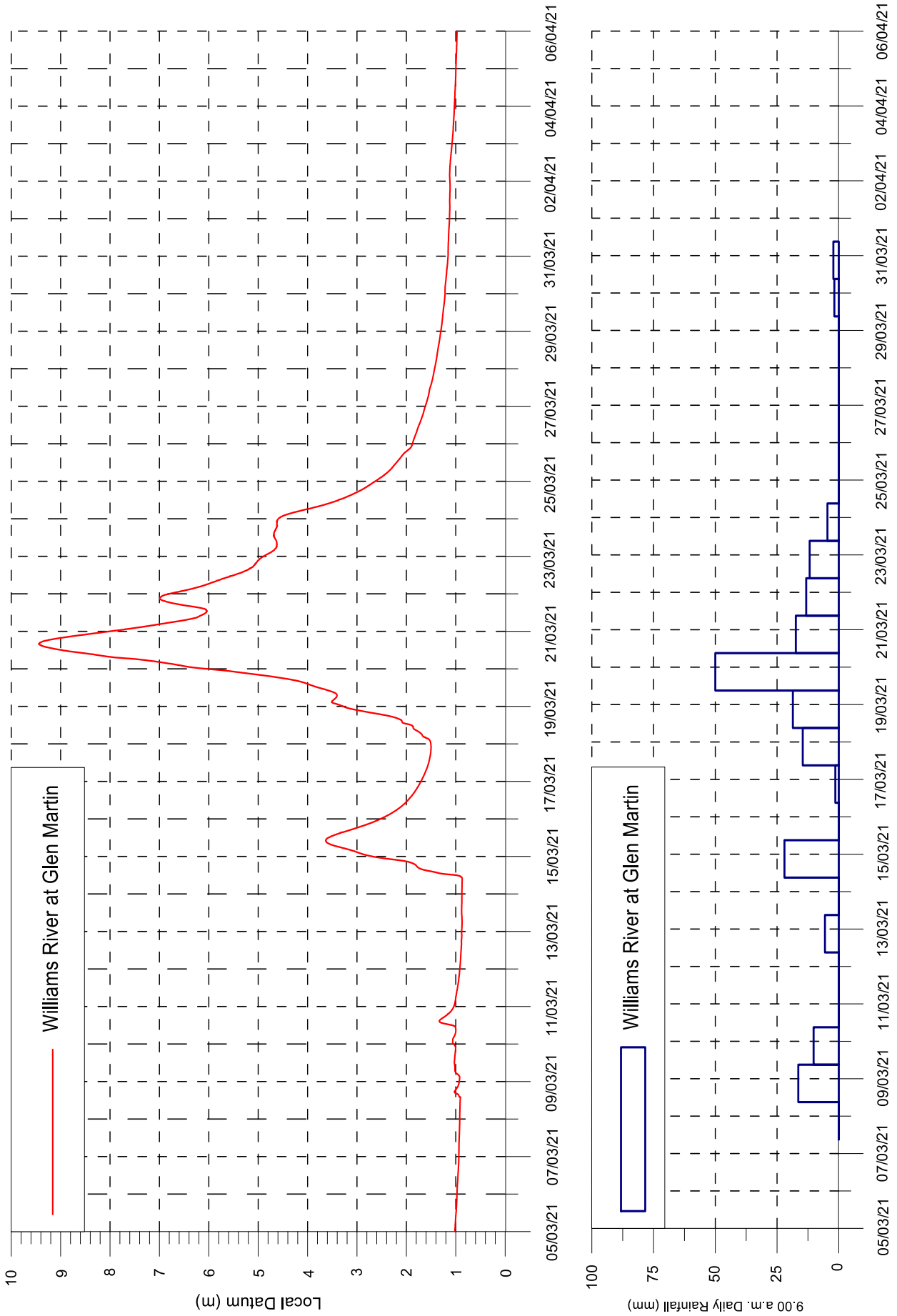
Figure 11.2

11.2.GRF



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PATERSON, WILLIAMS AND HUNTER RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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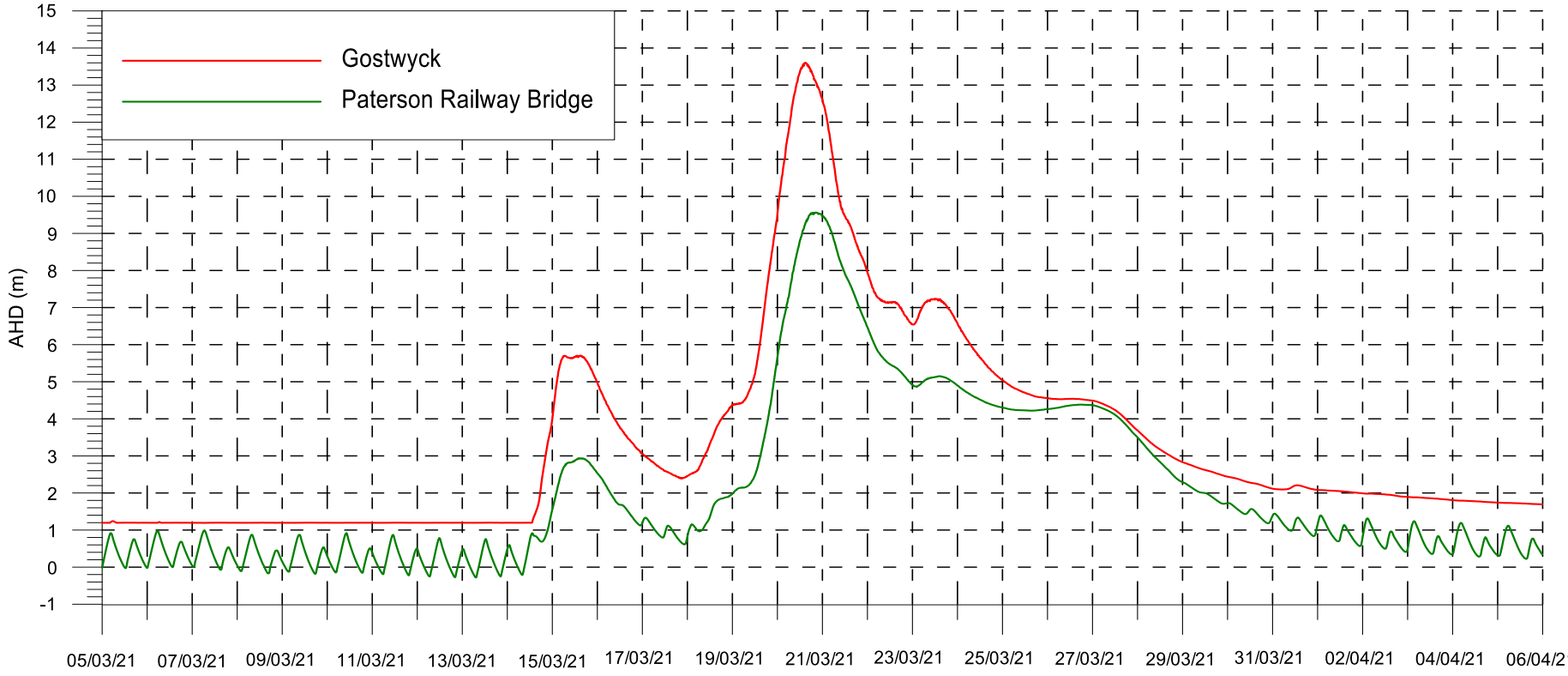
Report MH2809
Figure
11.3

11.3.GRF

PATERSON, WILLIAMS AND HUNTER RIVER REGION

WATER LEVEL AND RAINFALL DATA

5 MARCH – 5 APRIL 2021



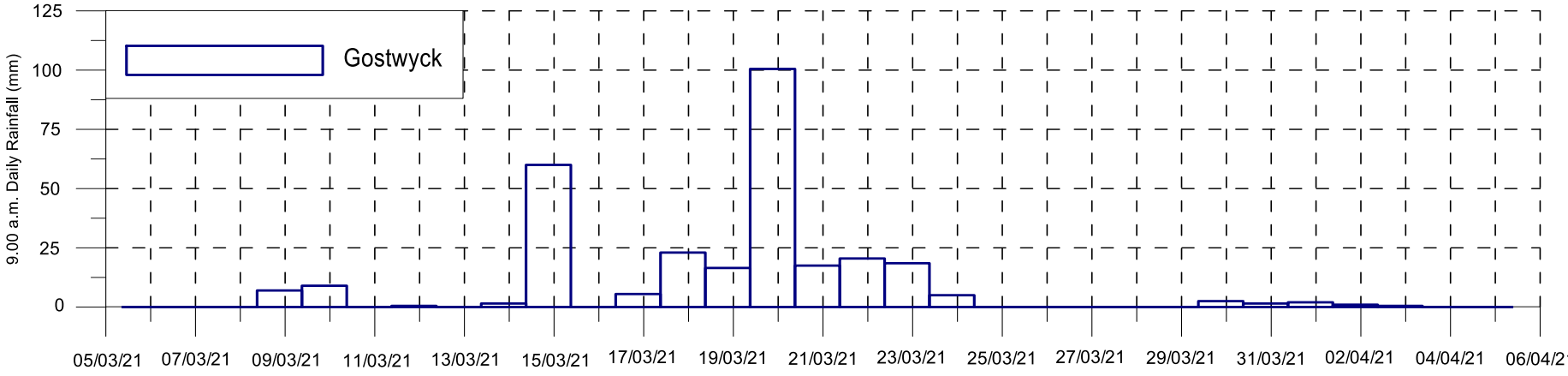


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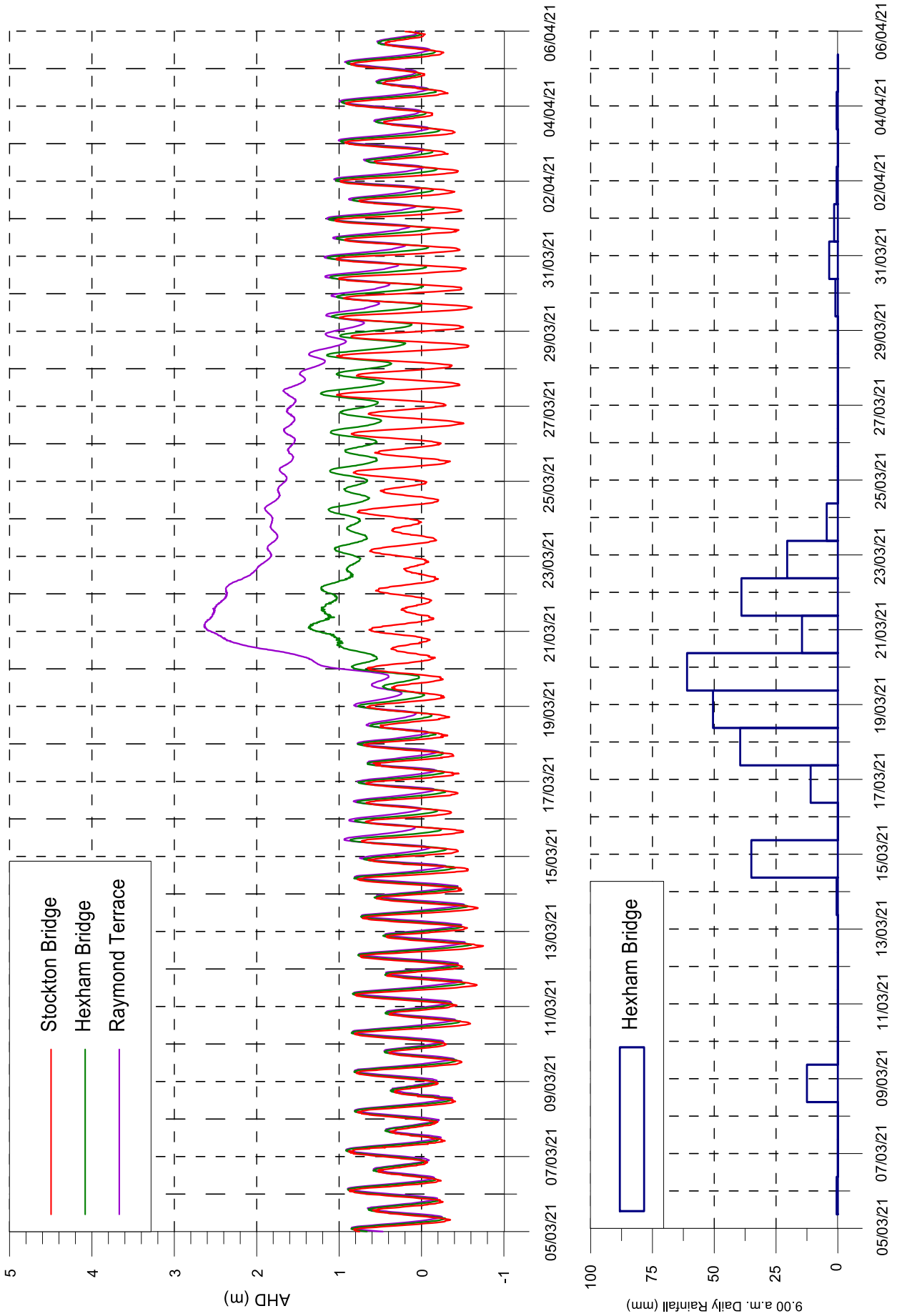
Figure 11.4

11.4.GRF



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PATERSON, WILLIAMS AND HUNTER RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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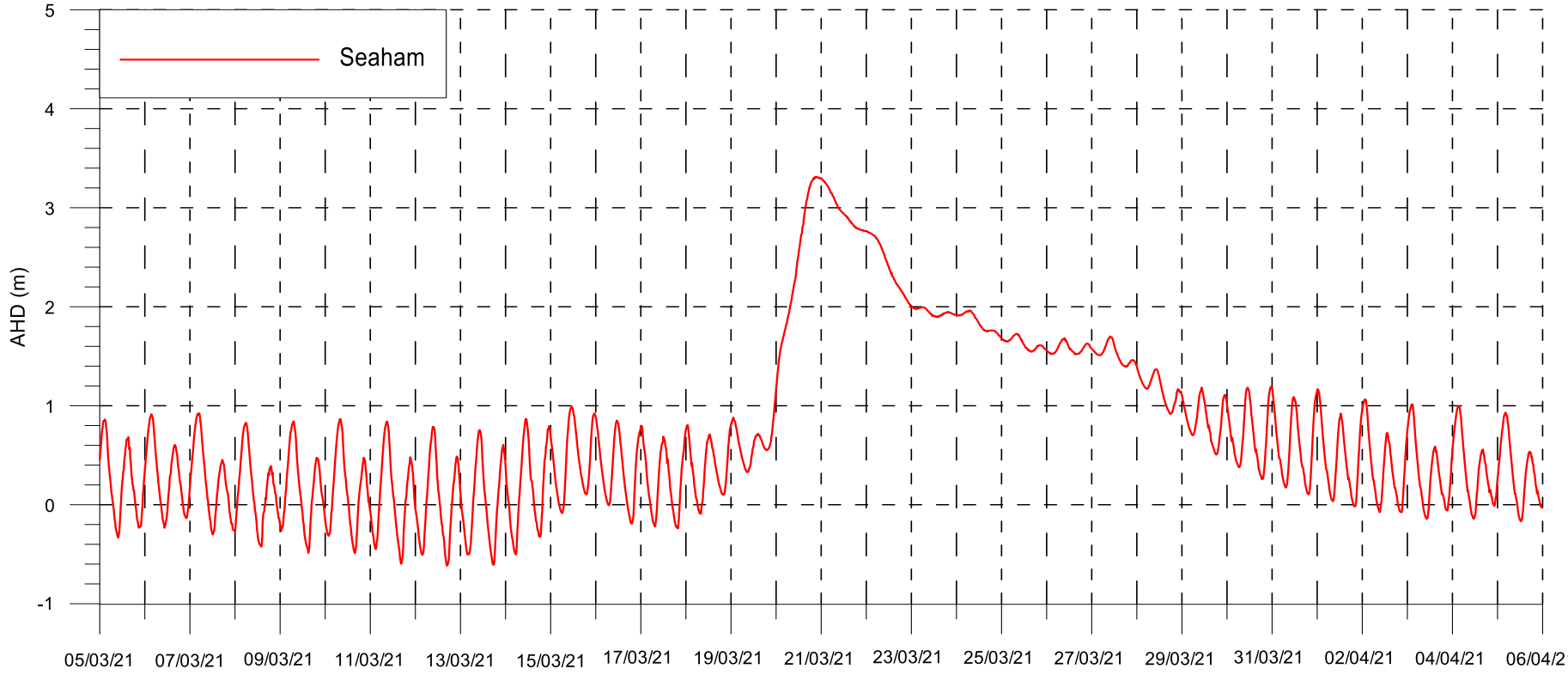
Report MH2809
Figure
11.5

11.5.GRF

PATERSON, WILLIAMS AND HUNTER RIVER REGION

WATER LEVEL AND RAINFALL DATA

5 MARCH – 5 APRIL 2021



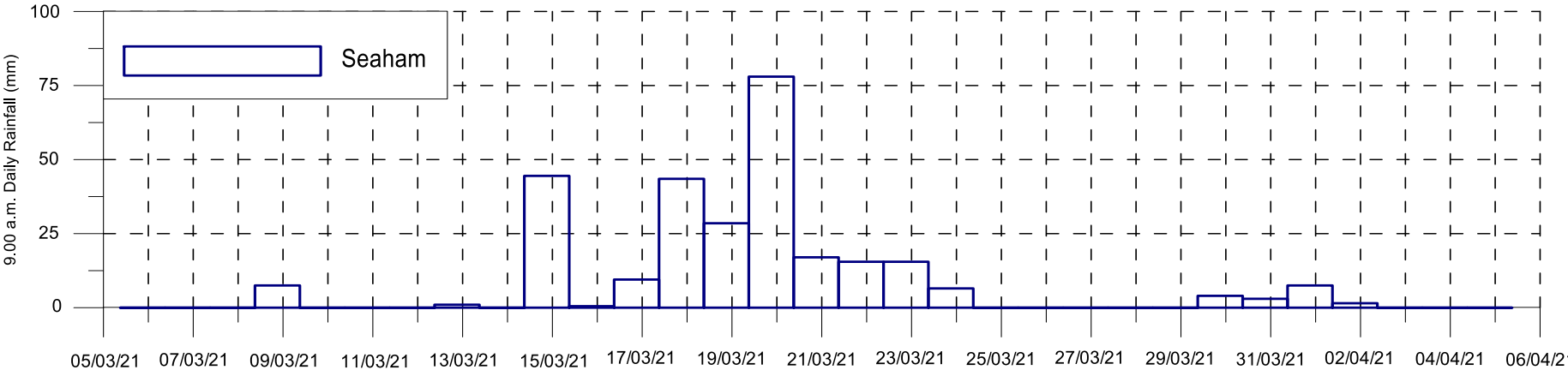


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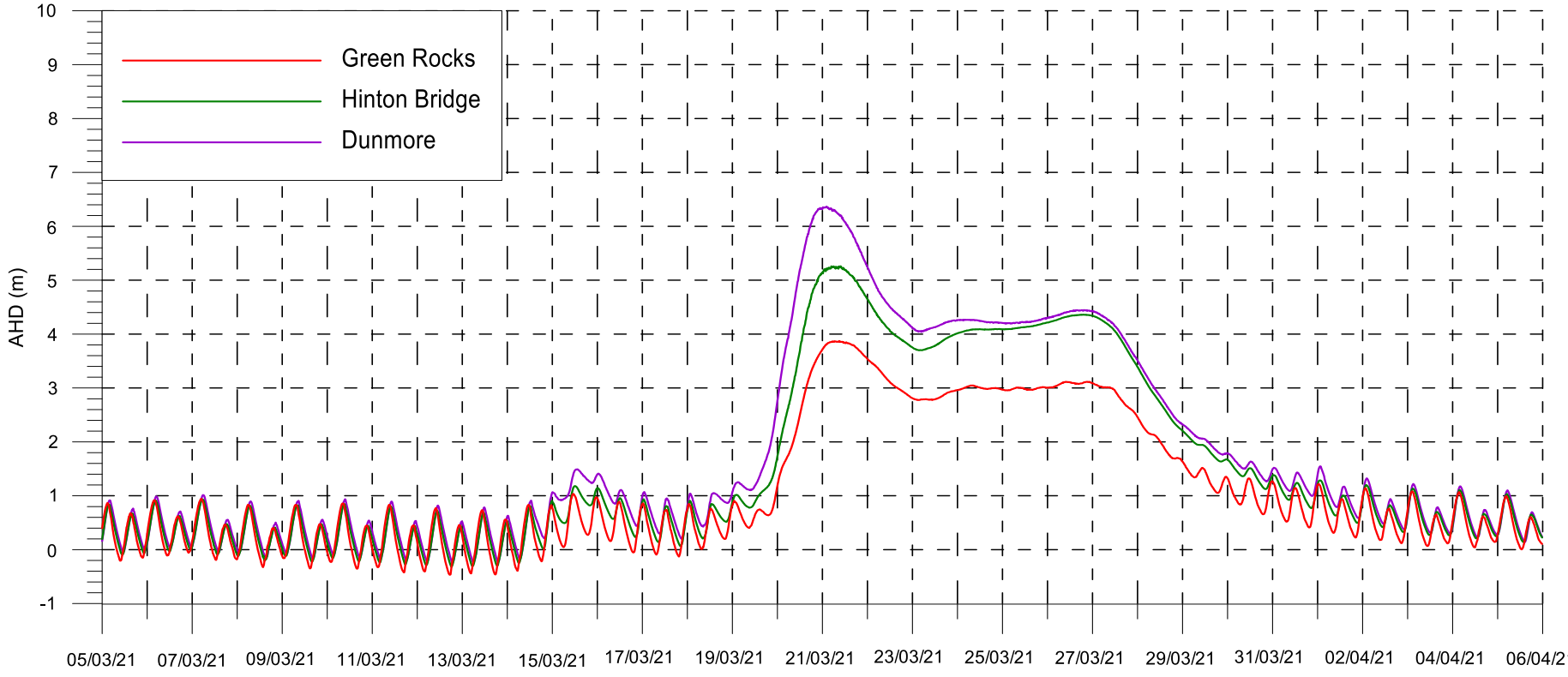
Figure 11.6

11.6.GRF

PATERSON, WILLIAMS AND HUNTER RIVER REGION

WATER LEVEL AND RAINFALL DATA

5 MARCH – 5 APRIL 2021



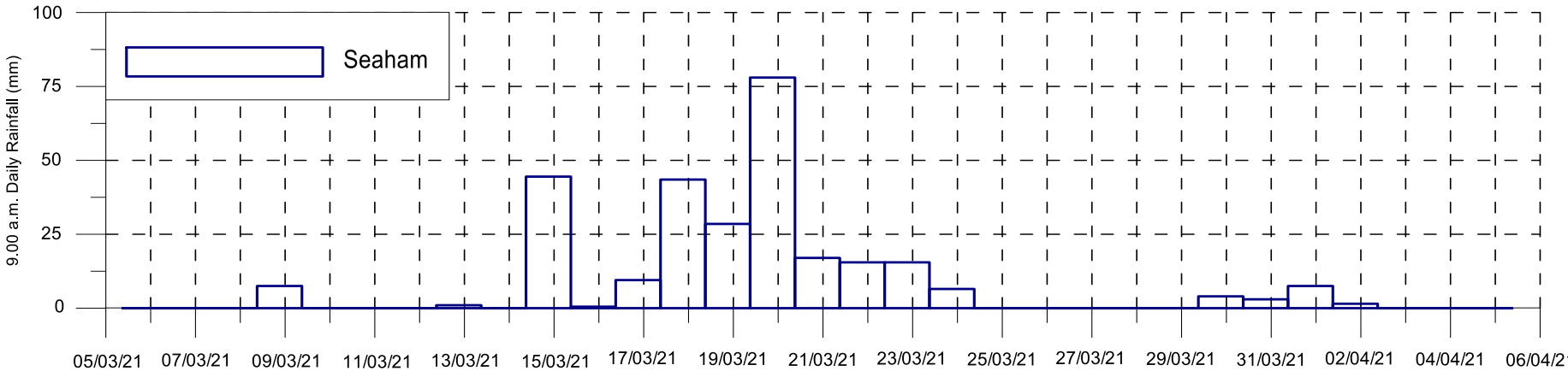


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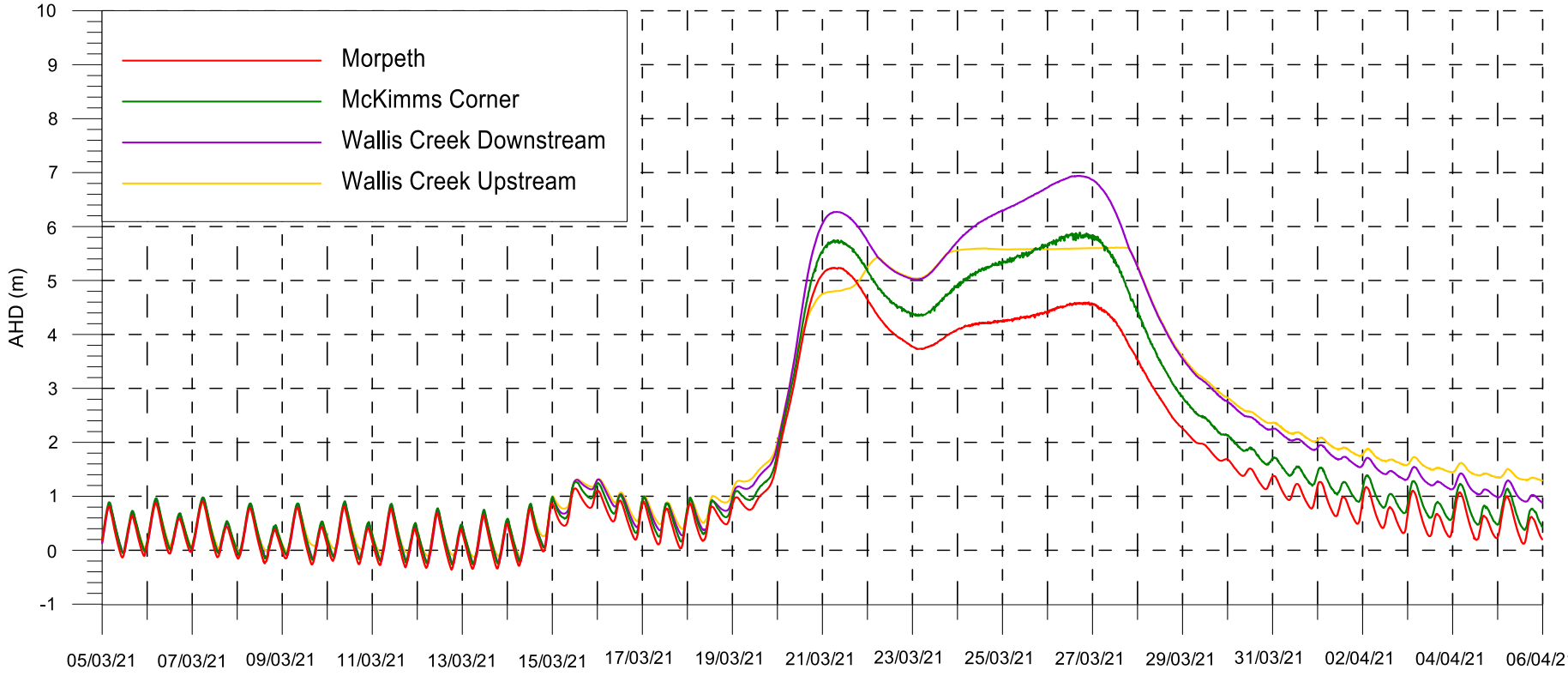
Figure 11.7

11.7.GRF

PATERSON, WILLIAMS AND HUNTER RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

*Wallis Creek Upstream flood hydrograph is influenced by the flood gate activity.



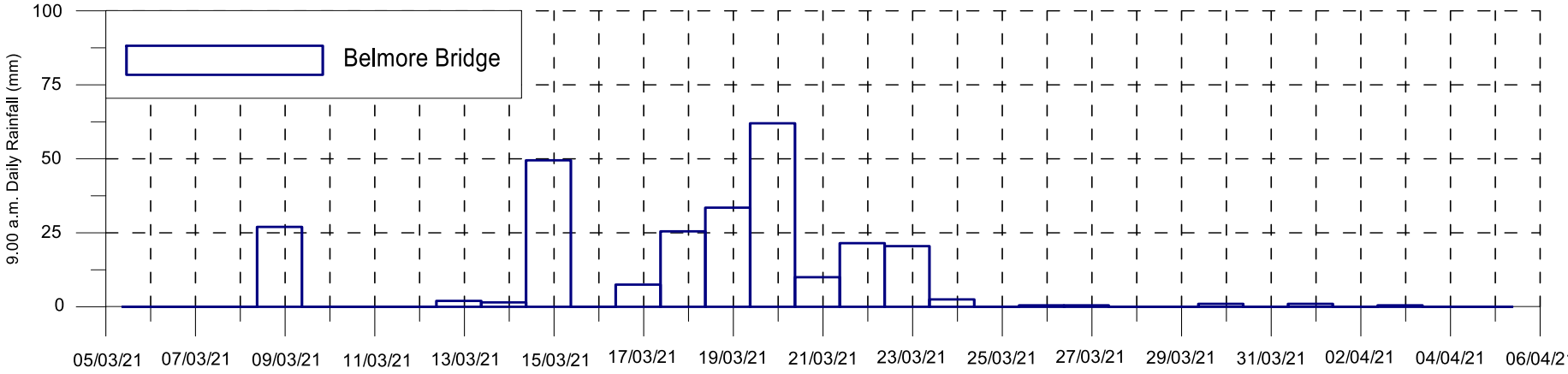


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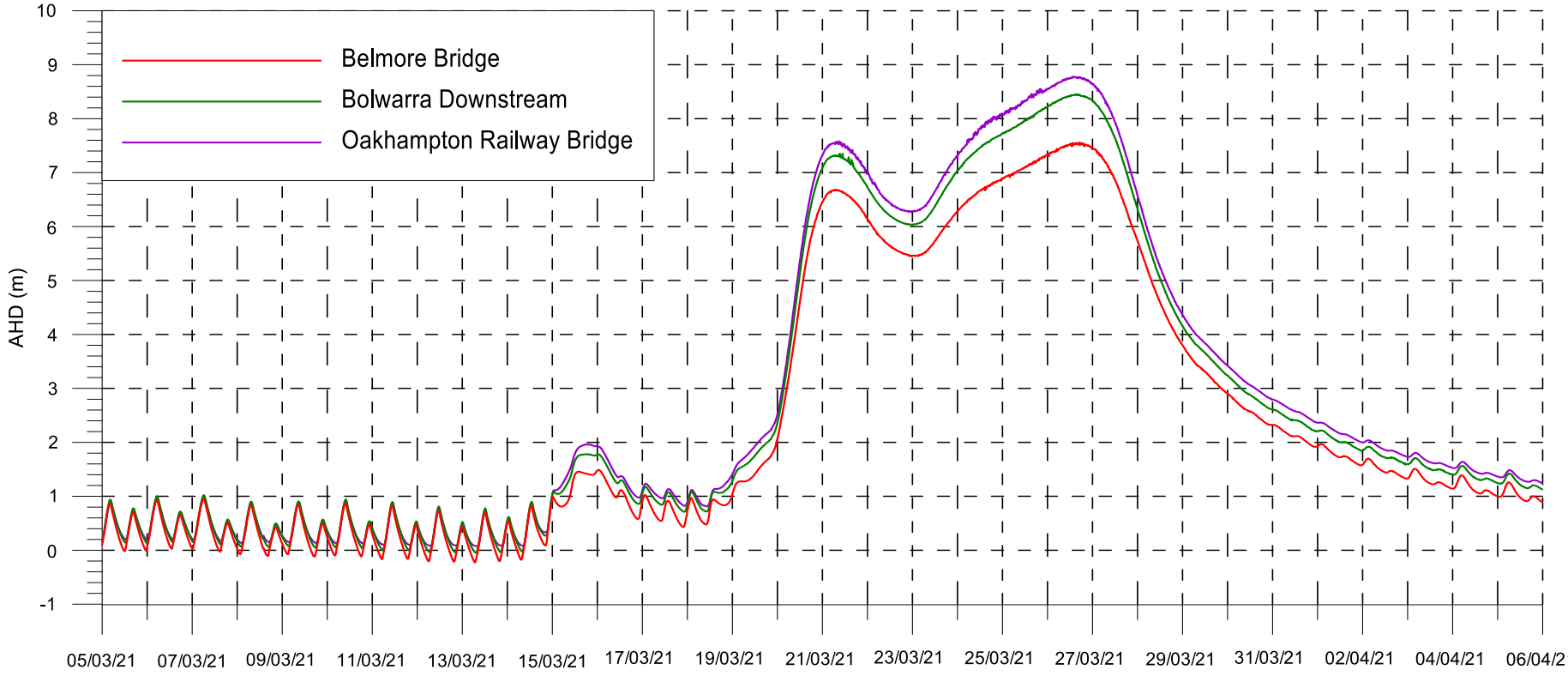
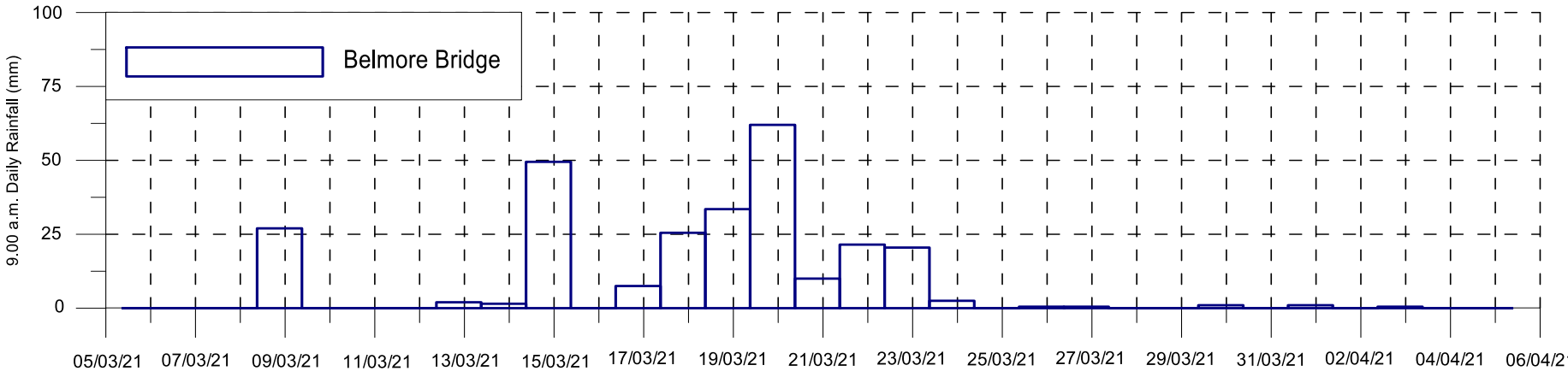
Figure 11.8
11.8.GRF

PATERSON, WILLIAMS AND HUNTER RIVER REGION

WATER LEVEL AND RAINFALL DATA

5 MARCH – 5 APRIL 2021





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Report MH2809

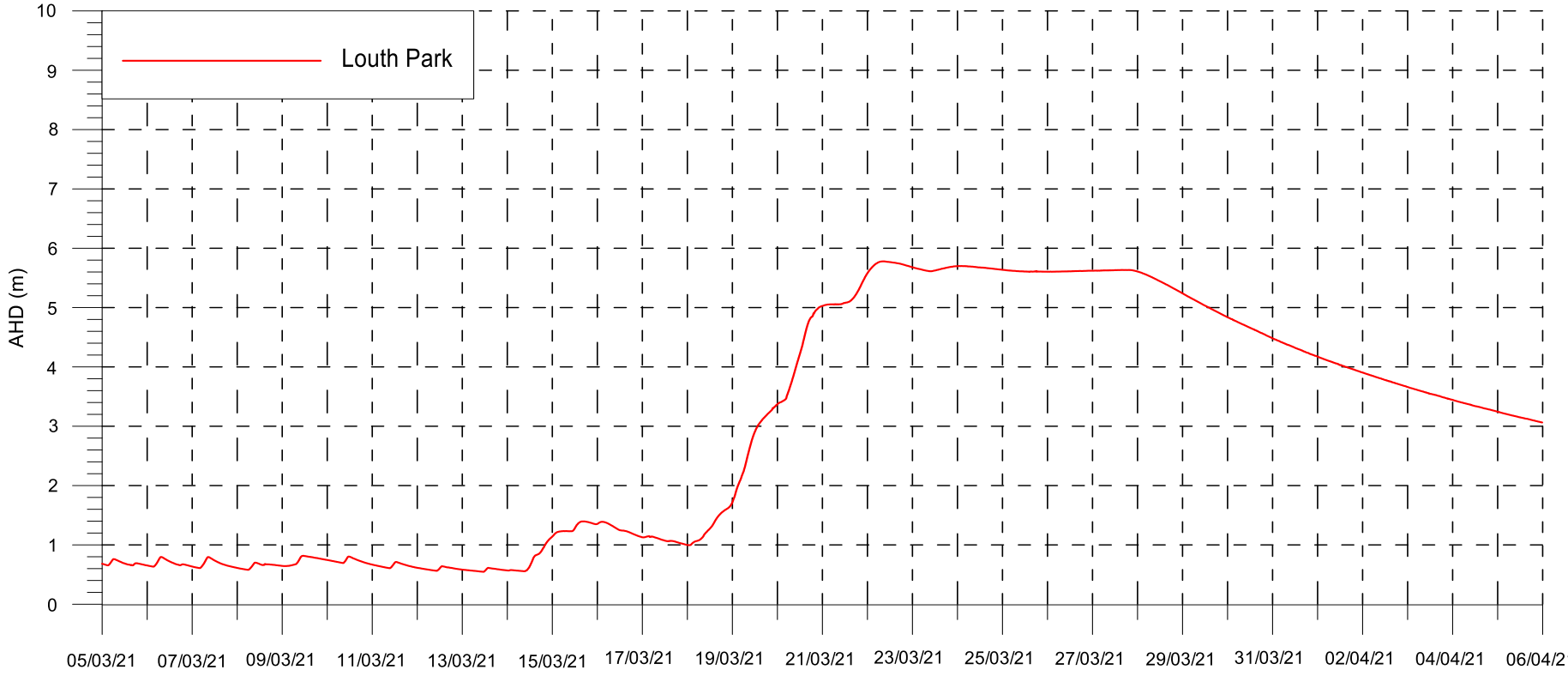
Figure 11.9

11.9.GRF

PATERSON, WILLIAMS AND HUNTER RIVER REGION

WATER LEVEL AND RAINFALL DATA

5 MARCH – 5 APRIL 2021



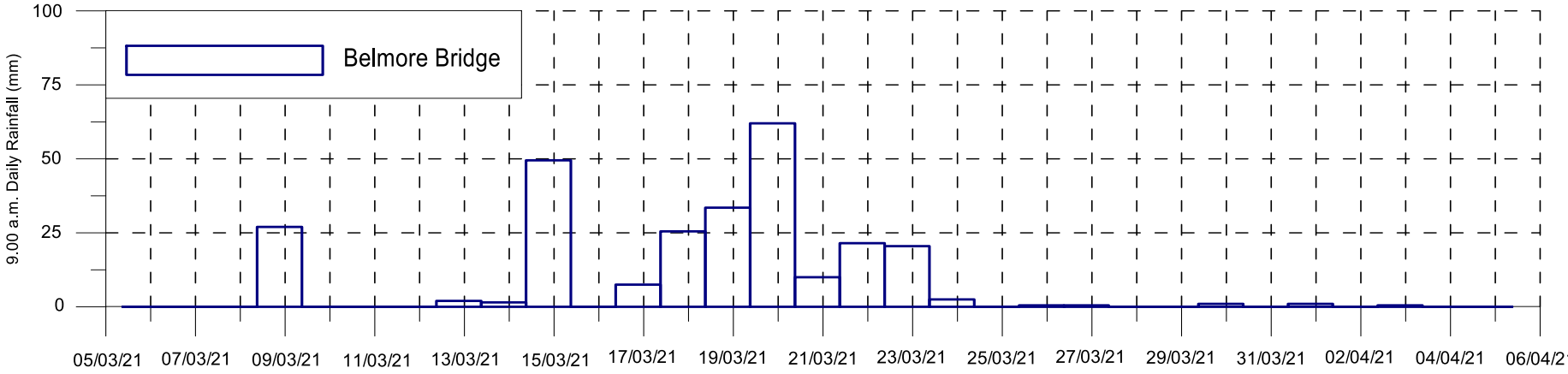


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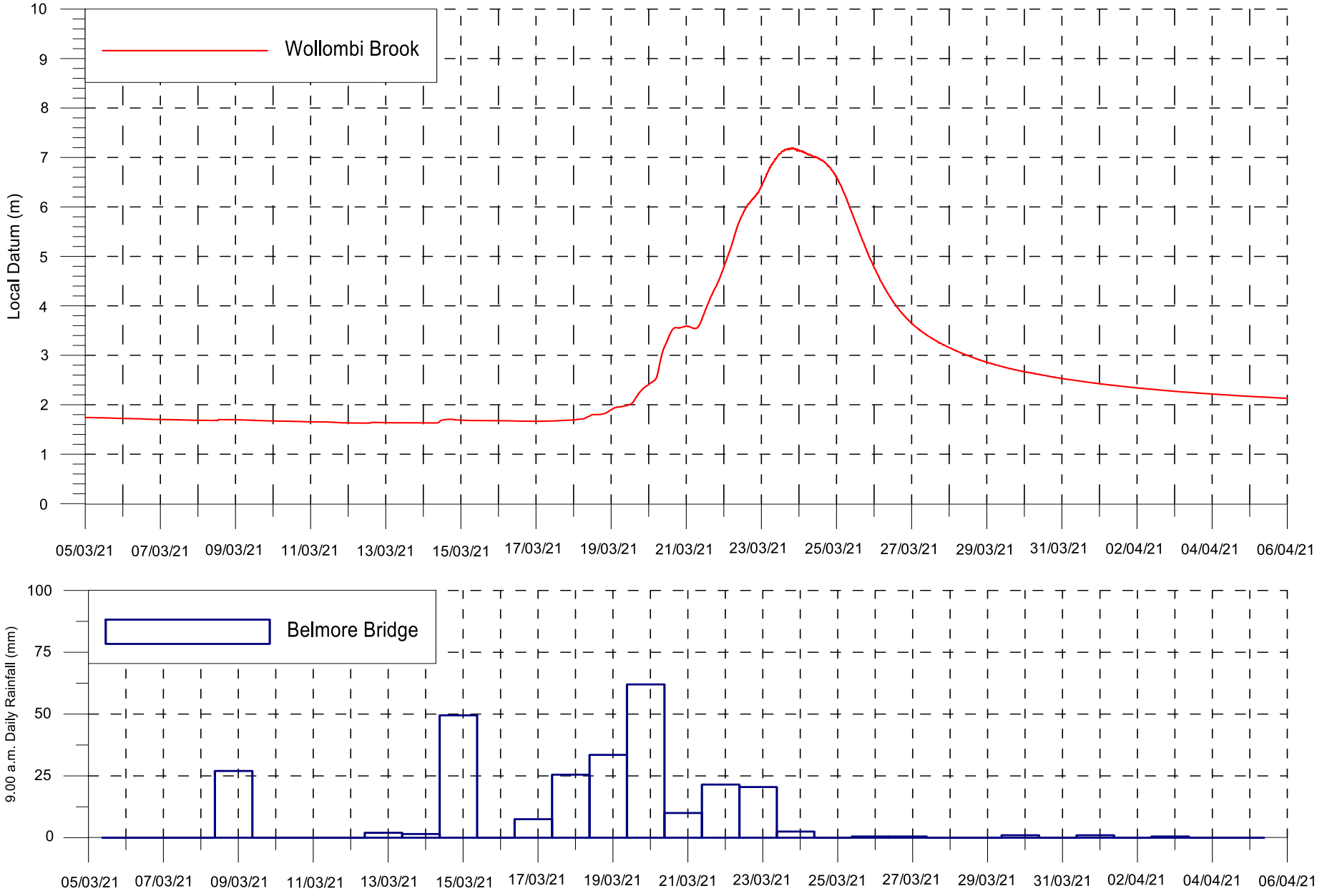
Figure 11.10

11.10.GRF



PATERSON, WILLIAMS AND HUNTER RIVER REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

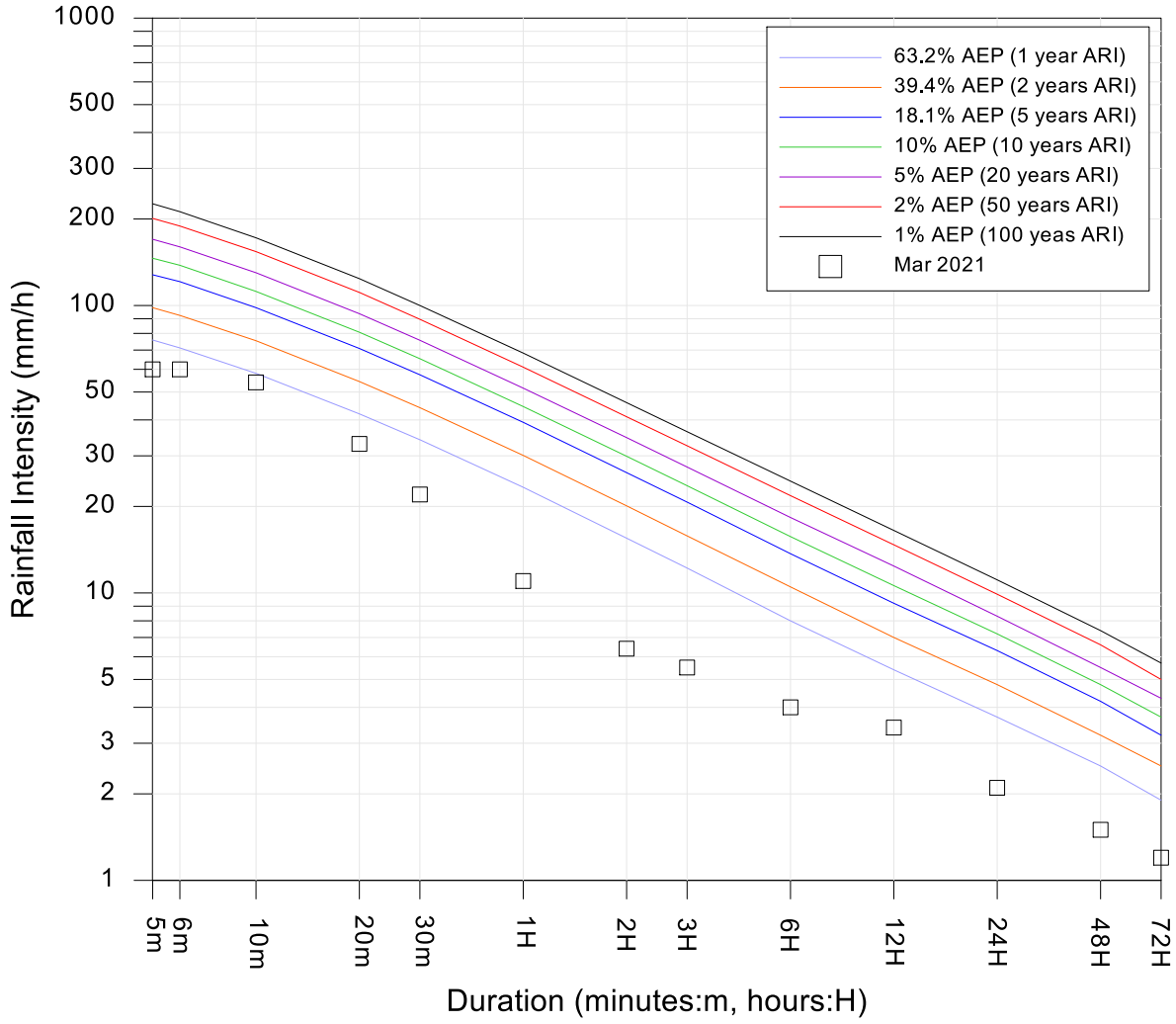
Manly Hydraulics Laboratory

Report MH2809
Figure
11.11

11.11.GRF

Site Owner: WaterNSW
Latitude: -32.5586 Longitude:151.804

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	60	14:06 08 Mar 2021
6m	60	14:07 08 Mar 2021
10m	54	14:09 08 Mar 2021
20m	33	14:15 08 Mar 2021
30m	22	14:25 08 Mar 2021
1H	11	14:55 08 Mar 2021
2H	6.4	23:45 19 Mar 2021
3H	5.5	16:55 08 Mar 2021
6H	4	03:43 20 Mar 2021
12H	3.4	07:04 20 Mar 2021
24H	2.1	10:30 20 Mar 2021
48H	1.5	07:07 20 Mar 2021
72H	1.2	11:00 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

WILLIAMS RIVER AT GLEN MARTIN (210010)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

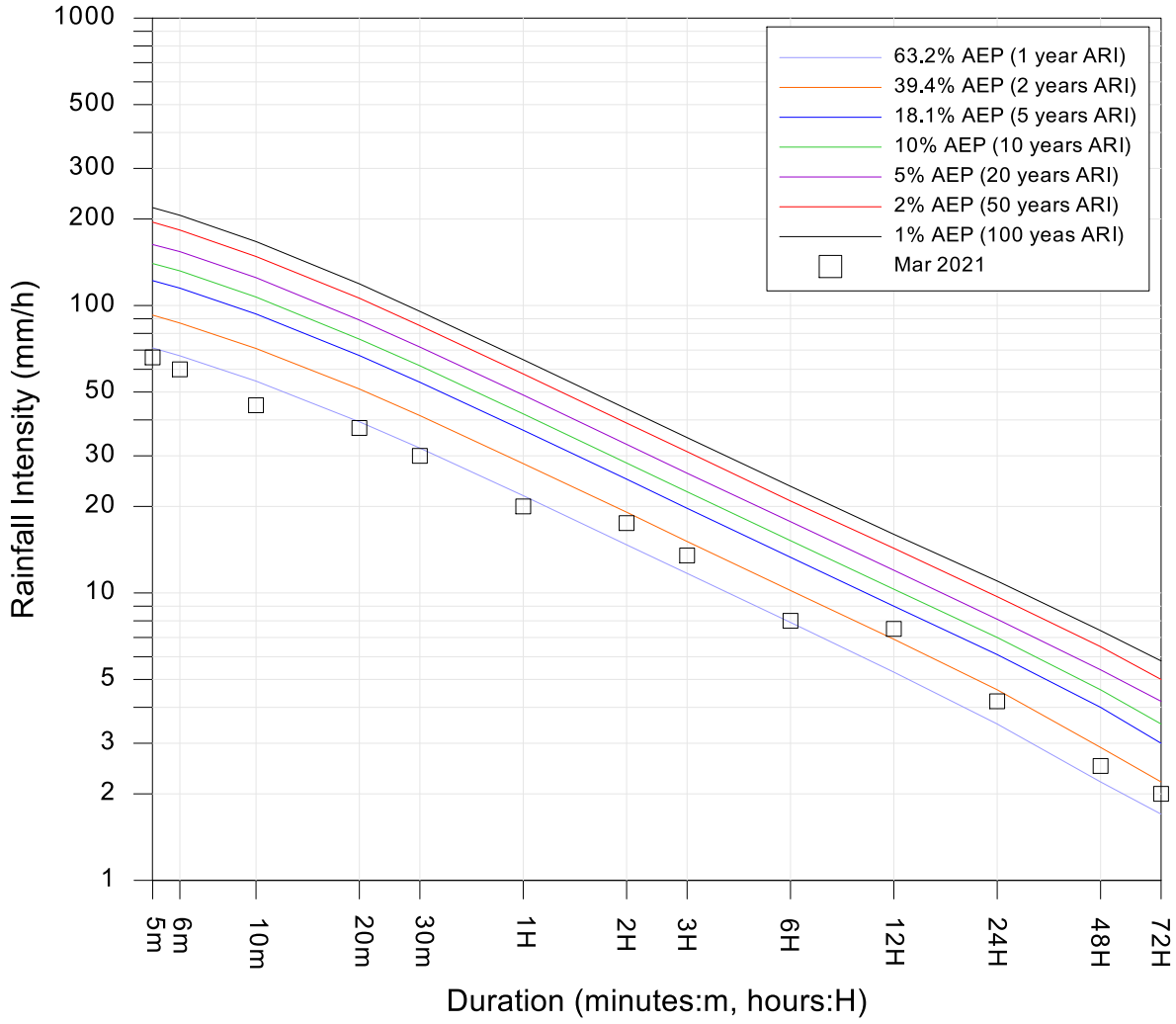
Manly Hydraulics Laboratory

Report MHL2809
Figure
11.12

IFD_210010_Figure 11.12.pdf

Site Owner: DPIE
Latitude: -32.565 Longitude:151.605

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	66	21:26 09 Mar 2021
6m	60	21:27 09 Mar 2021
10m	45	06:22 20 Mar 2021
20m	37.5	06:32 20 Mar 2021
30m	30	06:42 20 Mar 2021
1H	20	06:59 20 Mar 2021
2H	17.5	11:45 14 Mar 2021
3H	13.5	12:26 14 Mar 2021
6H	8	15:26 14 Mar 2021
12H	7.5	07:18 20 Mar 2021
24H	4.2	07:12 20 Mar 2021
48H	2.5	11:04 21 Mar 2021
72H	2	00:42 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

GOSTWYCK (210402)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

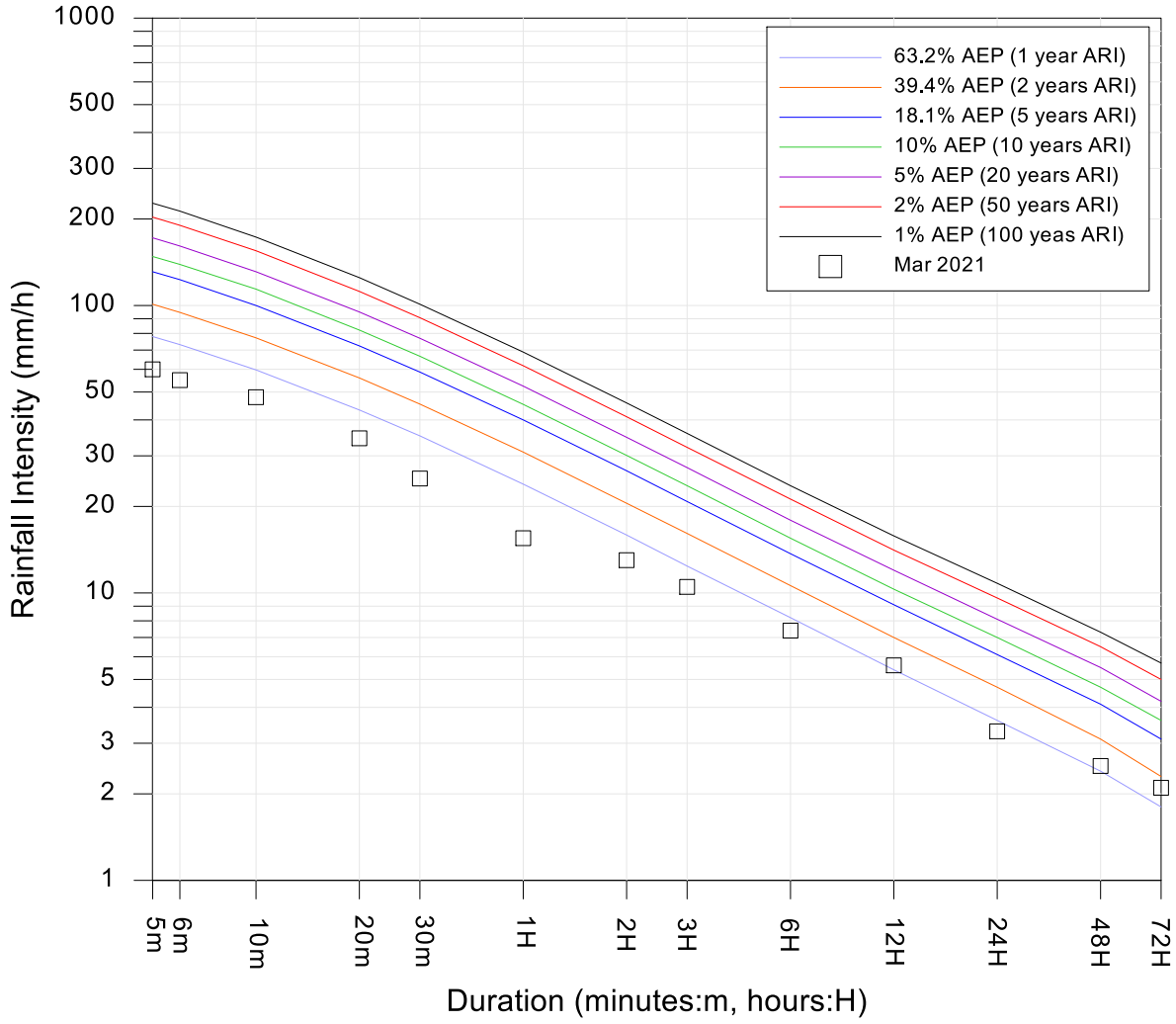
Manly Hydraulics Laboratory

Report MHL2809
Figure
11.13

IFD_210402_Figure 11.13.pdf

Site Owner: DPIE
Latitude: -32.6634 Longitude:151.732

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	60	03:05 18 Mar 2021
6m	55	03:06 18 Mar 2021
10m	48	03:06 18 Mar 2021
20m	34.5	03:07 18 Mar 2021
30m	25	03:13 18 Mar 2021
1H	15.5	10:52 14 Mar 2021
2H	13	11:43 14 Mar 2021
3H	10.5	12:34 14 Mar 2021
6H	7.4	00:51 20 Mar 2021
12H	5.6	07:17 20 Mar 2021
24H	3.3	08:23 20 Mar 2021
48H	2.5	00:53 20 Mar 2021
72H	2.1	23:40 20 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

SEAHAM (210462)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

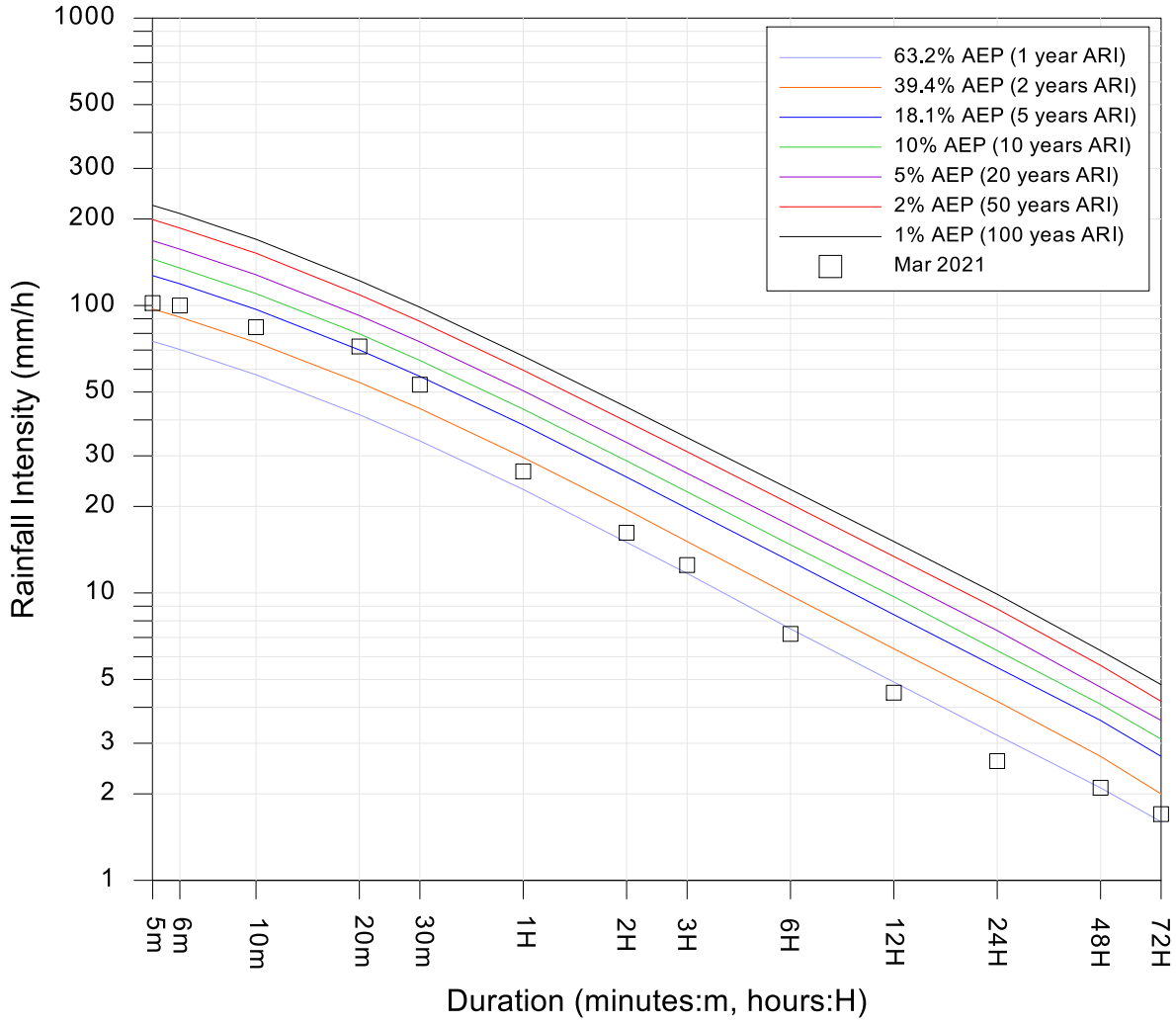
Manly Hydraulics Laboratory

Report MHL2809
Figure
11.14

IFD_210462_Figure 11.14.pdf

Site Owner: DPIE
Latitude: -32.7295 Longitude:151.554

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	102	13:52 08 Mar 2021
6m	100	13:52 08 Mar 2021
10m	84	13:56 08 Mar 2021
20m	72	13:56 08 Mar 2021
30m	53	14:05 08 Mar 2021
1H	26.5	14:35 08 Mar 2021
2H	16.2	11:21 14 Mar 2021
3H	12.5	12:19 14 Mar 2021
6H	7.2	15:15 14 Mar 2021
12H	4.5	08:36 20 Mar 2021
24H	2.6	09:26 20 Mar 2021
48H	2.1	07:48 20 Mar 2021
72H	1.7	00:03 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

BELMORE BRIDGE (210458)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

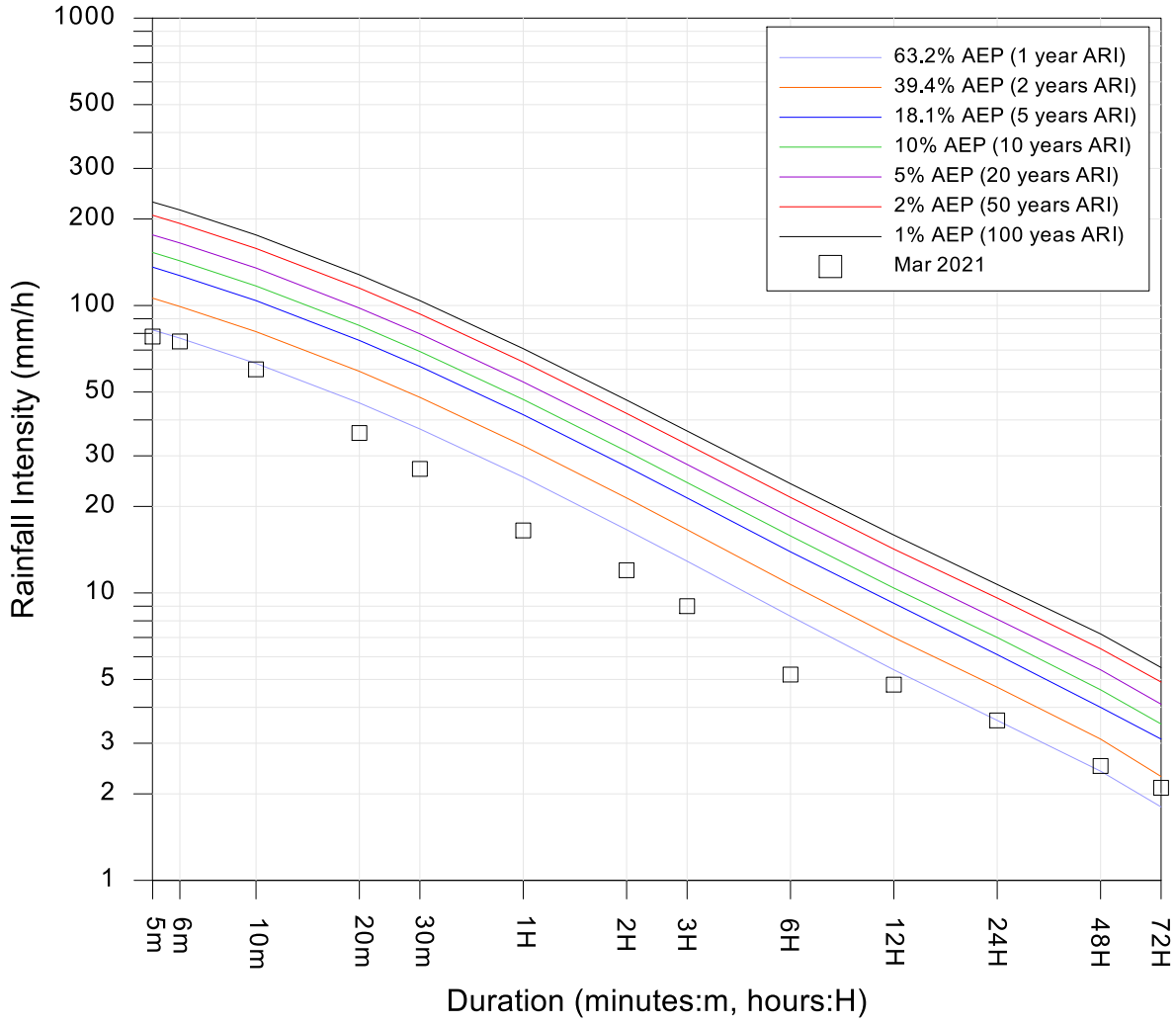
Manly Hydraulics Laboratory

Report MHL2809
Figure
11.15

IFD_210458_Figure 11.15.pdf

Site Owner: DPIE
Latitude: -32.8177 Longitude:151.681

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	78	09:51 14 Mar 2021
6m	75	09:51 14 Mar 2021
10m	60	09:54 14 Mar 2021
20m	36	10:02 14 Mar 2021
30m	27	10:04 14 Mar 2021
1H	16.5	08:11 20 Mar 2021
2H	12	08:27 20 Mar 2021
3H	9	12:27 14 Mar 2021
6H	5.2	14:23 21 Mar 2021
12H	4.8	08:28 20 Mar 2021
24H	3.6	00:44 19 Mar 2021
48H	2.5	08:02 20 Mar 2021
72H	2.1	00:29 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

HEXHAM BRIDGE (210448)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

Manly Hydraulics Laboratory

Report MHL2809
Figure
11.16

IFD_210448_Figure 11.16.pdf

12 Hawkesbury River and South Creek region

12.1 Hawkesbury River and South Creek region – water level

The peak observed water levels for the Hawkesbury River and South Creek region are listed in **Table 12-1**. **Table 12-2** lists the SES flood classifications for Webbs Creek, Colo Junction, Sackville, Windsor, Wallacia Weir, Penrith and North Richmond. The locations of water level stations within the Hawkesbury River and South Creek region are shown in **Figure 12-1**. The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 12-2** to **Figure 12-32**.

Table 12-1 Hawkesbury River and South Creek region flood peaks

River system	Station name	Station number	Owner	Datum	Level (m)
Hawkesbury River	Patonga	212440	DPIE	AHD	1.03
Hawkesbury River	Spencer	212431	DPIE	AHD	1.44
Hawkesbury River	Gunderman Caravan Park	212429	DPIE	AHD	2.54
Hawkesbury River	Wisemans Ferry	212460	DPIE	AHD	3.91
Macdonald River	St Albans	212228	Sydney Water	Local datum	7.67
Hawkesbury River	Webbs Creek	212408	DPIE	AHD	4.36
Hawkesbury River	Colo Junction	212407	DPIE	AHD	7.84
Colo River	Upper Colo	212290	WaterNSW	Local datum	14.98
Hawkesbury River	Sackville	212406	DPIE	AHD	9.71
Hawkesbury River	Ebenezer	212427	DPIE	AHD	11.79
Cattai Creek	Cattai Creek at Murphys Bridge	212059	WaterNSW	Local datum	6.16
Ropes Creek	Ropes Creek at Debrincat Ave	212049	WaterNSW	Local datum	4.01
Hawkesbury River	Windsor	212426	DPIE	AHD	12.93
Hawkesbury River	Freemans Reach	212410	DPIE	AHD	13.42
Hawkesbury River	North Richmond	212200	WaterNSW	Local datum	14.36
Grose River	Grose River at Burralow	212291	WaterNSW	Local datum	8.83
Nepean River	Yarramundi	2122001	WaterNSW	Local datum	15.54
Nepean River	Castlereagh	212404	DPIE	AHD	16.82^

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Nepean River	Penrith	212201	WaterNSW	Local datum	9.99
Warragamba River	Warragamba Weir	212241	WaterNSW	Local datum	22.90
Warragamba River	Warragamba Dam	212243	WaterNSW	Local datum	118.21
Coxs River	Kelpie Point	212250	WaterNSW	Local datum	7.58
Kowmung River	Cedar Ford	212260	WaterNSW	Local datum	9.11
Wollondilly River	Jooriland	212270	WaterNSW	Local datum	5.25
Wingecarribee River	Greenstead	212009	WaterNSW	Local datum	2.95
Wollondilly River	Golden Valley	212271	WaterNSW	Local datum	5.15
Nepean River	Wallacia Weir	212202	WaterNSW	Local datum	8.57
Nepean River	Camden Weir	212216	WaterNSW	Local datum	8.45
Nepean River	Menangle Bridge	212904	BoM	Local datum	12.87
Cataract River	Broughtons Pass	212233	WaterNSW	Local datum	1.10
Cataract River	Cataract Dam	212232	WaterNSW	Local datum	290.33
Nepean River	Pheasants Nest	212203	WaterNSW	Local datum	3.99
Nepean River	Avon Dam Road	212204	WaterNSW	Local datum	16.73
Nepean River	Nepean Dam	212205	WaterNSW	Local datum	318.68

^Monitored peak value prior to station failure provided. Debris survey flood peak estimate is 16.74m AHD.

Table 12-2 SES flood classifications for Webbs Creek, Colo Junction, Sackville, Windsor, North Richmond, Penrith and Wallacia Weir

Station name	Station number	Flood classification			Flood peak (m)	Flood event classification
		Minor	Moderate	Major		
		Water level (m)				
Webbs Creek	212408	N/A	3.5	4.2	4.36	Major
Colo Junction	212407	4.6	6.1	7.6	7.84	Major
Sackville	212406	4.6	7.3	9.7	9.71	Major
Windsor	212426	5.8	7.0	12.2	12.93	Major
North Richmond	212200	3.8	7.9	10.5	14.36	Major
Penrith	212201	3.9	7.9	10.4	9.99	Moderate
Wallacia Weir	212202	5.0	8.7	11.0	8.57	Minor

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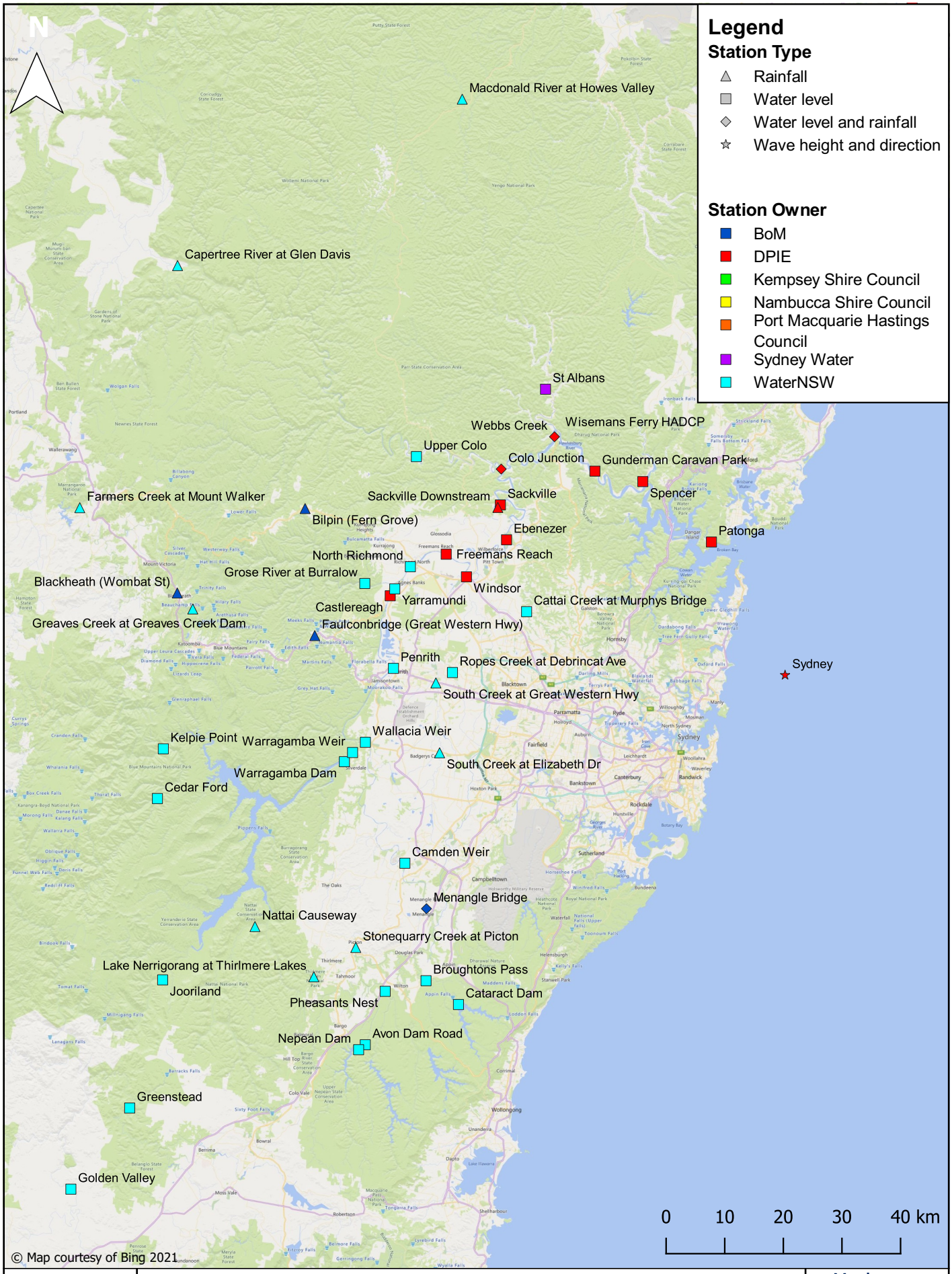

NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK STATIONS

Manly Hydraulics Laboratory

Report MHL2809
Figure
12.1

Figures_MHL2809.qgs

12.2 Hawkesbury River and South Creek region – rainfall

The water level and rainfall data for the period 05 March to 05 April 2021 are displayed graphically in **Figure 12-2** to **Figure 12-32**. 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 12-3** to **Table 12-5** for the period 05 March to 05 April 2021. The rainfall intensities are displayed graphically in **Figure 12-33** to **Figure 12-48**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 12-3 Hawkesbury River and South Creek region daily rainfall totals

Date	Webbs Creek	Colo Junction	Sackville DS	Menangle Bridge	Macdonald River at Howes Valley	Capertree River at Glen Davis
	212408 (mm)	212407 (mm)	212438 (mm)	212904 (mm)	212021 (mm)	212018 (mm)
	DPIE	DPIE	DPIE	BoM	WaterNSW	WaterNSW
05/03/2021	0.0	0.2	0.0	-	-	-
06/03/2021	0.0	0.0	0.0	0.0	0.0	-
07/03/2021	0.0	0.0	0.0	0.0	0.0	-
08/03/2021	0.0	0.0	0.0	0.0	0.0	-
09/03/2021	0.2	0.0	0.0	0.0	1.0	-
10/03/2021	0.0	0.0	0.0	0.0	0.0	0.5
11/03/2021	0.2	0.0	0.0	0.0	0.0	0.0
12/03/2021	1.4	2.2	4.0	1.0	1.8	13.5
13/03/2021	0.2	0.4	0.4	0.0	16.6	4.0
14/03/2021	21.4	22.0	22.4	16.0	42.8	27.0
15/03/2021	10.0	8.2	9.0	5.0	15.0	4.5
16/03/2021	0.0	0.0	0.2	0.0	0.0	0.0
17/03/2021	1.8	6.4	4.8	1.0	2.6	2.5
18/03/2021	11.8	8.8	12.8	3.0	11.0	4.5
19/03/2021	52.0	43.2	63.4	28.0	14.6	4.5
20/03/2021	67.2	41.6	43.4	15.0	39.4	21.5
21/03/2021	55.8	49.2	55.8	84.0	15.0	5.0
22/03/2021	69.4	68.4	65.4	37.0	61.0	24.0
23/03/2021	30.2	33.6	38.8	44.0	45.4	41.5
24/03/2021	5.0	6.8	7.6	28.0	3.4	-
25/03/2021	0.2	0.0	0.0	0.0	0.2	-
26/03/2021	2.4	0.0	0.0	0.0	0.0	-
27/03/2021	0.2	0.0	0.0	0.0	0.0	-
28/03/2021	0.0	0.0	0.0	0.0	0.0	-
29/03/2021	0.0	0.0	2.8	0.0	0.0	-
30/03/2021	0.8	0.0	0.0	0.0	0.0	-
31/03/2021	0.2	0.0	0.0	0.0	0.0	
01/04/2021	0.8	0.0	0.0	0.0	0.2	-
02/04/2021	0.2	0.0	0.0	0.0	0.0	-
03/04/2021	0.0	0.0	0.2	0.0	0.0	-
04/04/2021	0.0	0.0	0.0	0.0	0.0	-
05/04/2021	0.0	0.0	0.0	0.0	0.0	-
06/04/2021	0.0	0.0	0.2	0.0	-	-

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Table 12-4 Hawkesbury River and South Creek region daily rainfall totals (cont.)

Date	Farmers Creek at Mount Walker	Greaves Creek at Greaves Creek Dam	South Creek at Great Western Hwy	South Creek at Elizabeth Dr	Nattai Causeway	Lake Nerrigorang at Thirlmere Lakes
	212042 (mm)	212285 (mm)	212048 (mm)	212320 (mm)	568140 (mm)	212063 (mm)
	WatetNSW	WaterNSW	WaterNSW	WaterNSW	WaterNSW	WaterNSW
05/03/2021	-	-	-		-	-
06/03/2021	-	-	-		-	-
07/03/2021	-	-	-		-	-
08/03/2021		-	-		-	-
09/03/2021	-	-	-		-	-
10/03/2021	-	-	0.0	0.0	-	-
11/03/2021	-	-	0.0	1.0	-	0.6
12/03/2021	-	49.0	5.5	6.0	9.6	3.0
13/03/2021	1.5	1.0	2.5	3.0	6.6	5.6
14/03/2021	5.5	7.0	18.5	19.0	15.0	16.0
15/03/2021	9.0	11.5	5.5	6.0	7.4	6.8
16/03/2021	0.5	0.0	0.0	0.0	0.0	0.2
17/03/2021	7.0	19.0	2.5	7.0	4.8	4.0
18/03/2021	11.5	37.0	6.0	9.0	11.0	10.8
19/03/2021	18.0	77.0	44.5	60.0	51.8	50.6
20/03/2021	18.0	54.0	38.0	26.0	23.0	15.6
21/03/2021	23.5	132.5	104.5	97.0	149.8	102.0
22/03/2021	32.5	96.5	62.5	58.0	46.0	28.0
23/03/2021	36.5	65.5	42.0	53.0	52.0	55.6
24/03/2021	7.0	9.5	-		21.8	30.0
25/03/2021	0.5	0.0	-		0.0	-
26/03/2021	0.0	0.0	-		0.0	-
27/03/2021	-	0.0	-		0.0	-
28/03/2021	-	0.0	-		0.0	-
29/03/2021	-	0.0	-		0.0	-
30/03/2021	-	0.0	-		0.0	-
31/03/2021	-	0.0	-		0.0	-
01/04/2021	-	-	-		-	-
02/04/2021	-	-	-		-	-
03/04/2021	-	-	-		-	-
04/04/2021	-	-	-		-	-
05/04/2021	-	-	-		-	-
06/04/2021	-	-	-		-	-

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Table 12-5 Hawkesbury River and South Creek region daily rainfall totals (cont.)

Date	Stonequarry Creek at Picton 212053 (mm) WatetNSW	Bilpin (Fern Grove) 63118 (mm) BoM	Faulconbridge (Great Western Hwy) 63081 (mm) BoM	Blackheath (Wombat St) 63295 (mm) BoM
05/03/2021	-	-	-	-
06/03/2021	-	-	0.0	-
07/03/2021	-	0.0	0.0	0.0
08/03/2021	-	0.0	0.0	0.0
09/03/2021	-	0.0	4.0	0.0
10/03/2021	-	2.0	0.0	0.0
11/03/2021	-	0.0	1.0	4.0
12/03/2021	6.5	21.0	15.0	25.0
13/03/2021	4.0	1.0	20.0	1.0
14/03/2021	21.5	7.0	11.0	11.0
15/03/2021	14.5	8.0	5.0	14.0
16/03/2021	0.0	0.0	0.0	0.0
17/03/2021	3.0	12.0	6.0	24.0
18/03/2021	11.0	30.0	15.0	44.0
19/03/2021	72.0	51.0	23.0	91.0
20/03/2021	32.0	77.0	37.0	62.0
21/03/2021	196.0	85.0	88.0	139.0
22/03/2021	114.0	139.0	92.0	107.0
23/03/2021	105.0	57.0	46.0	60.0
24/03/2021	-	7.0	7.0	9.0
25/03/2021	-	0.0	0.0	0.0
26/03/2021	-	0.0	0.0	0.0
27/03/2021	-	0.0	0.0	0.0
28/03/2021	-	0.0	0.0	0.0
29/03/2021	-	0.0	0.0	0.0
30/03/2021	-	0.0	0.0	0.0
31/03/2021	-	0.0	0.0	0.0
01/04/2021	-	0.0	0.0	0.0
02/04/2021	-	0.0	0.0	0.0
03/04/2021	-	0.0	0.0	0.0
04/04/2021	-	0.0	0.0	0.0
05/04/2021	-	0.0	0.0	0.0
06/04/2021	-	0.0	0.0	0.0

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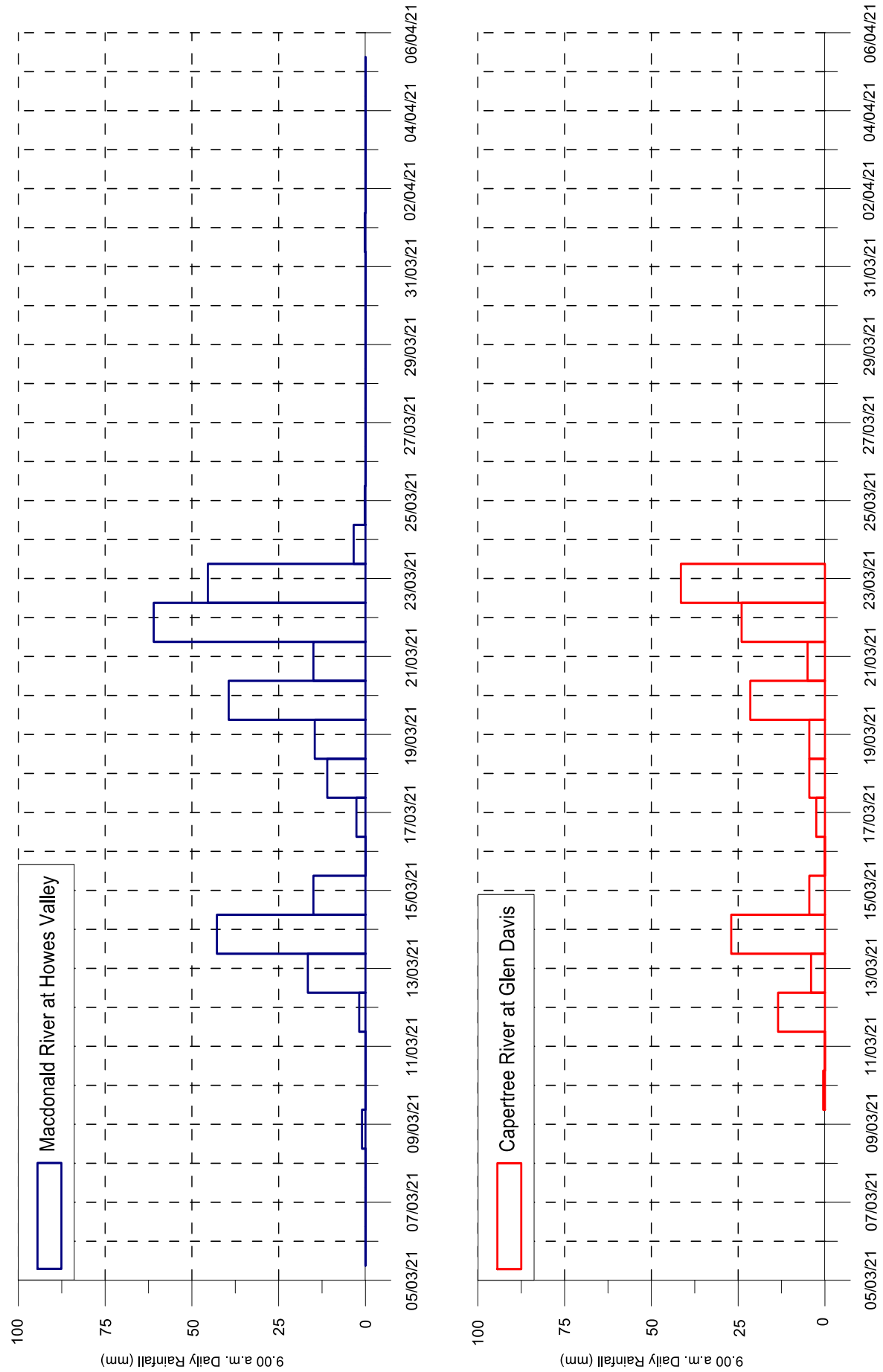


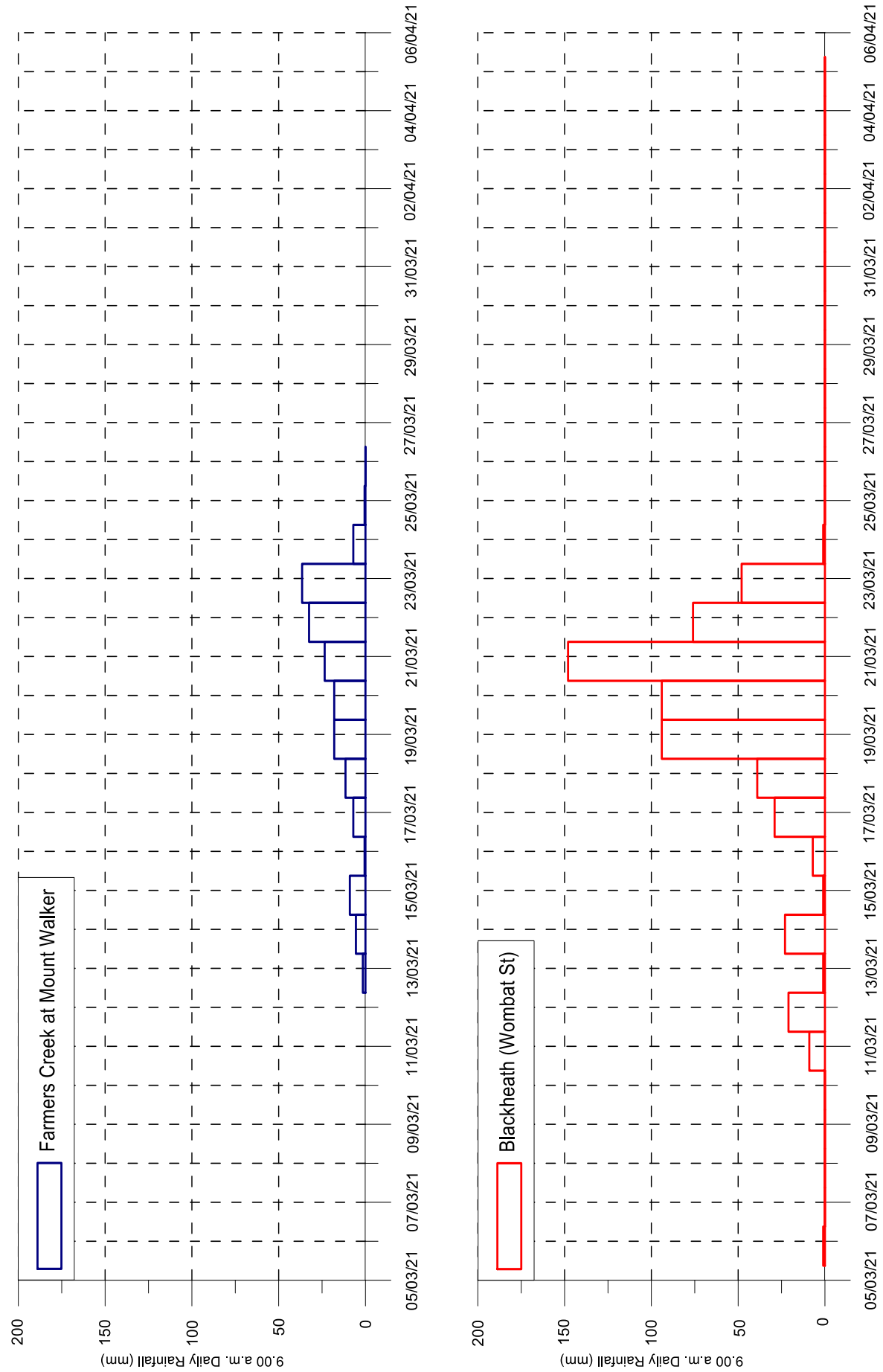
NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809
Figure
12.2

12.2.GRF



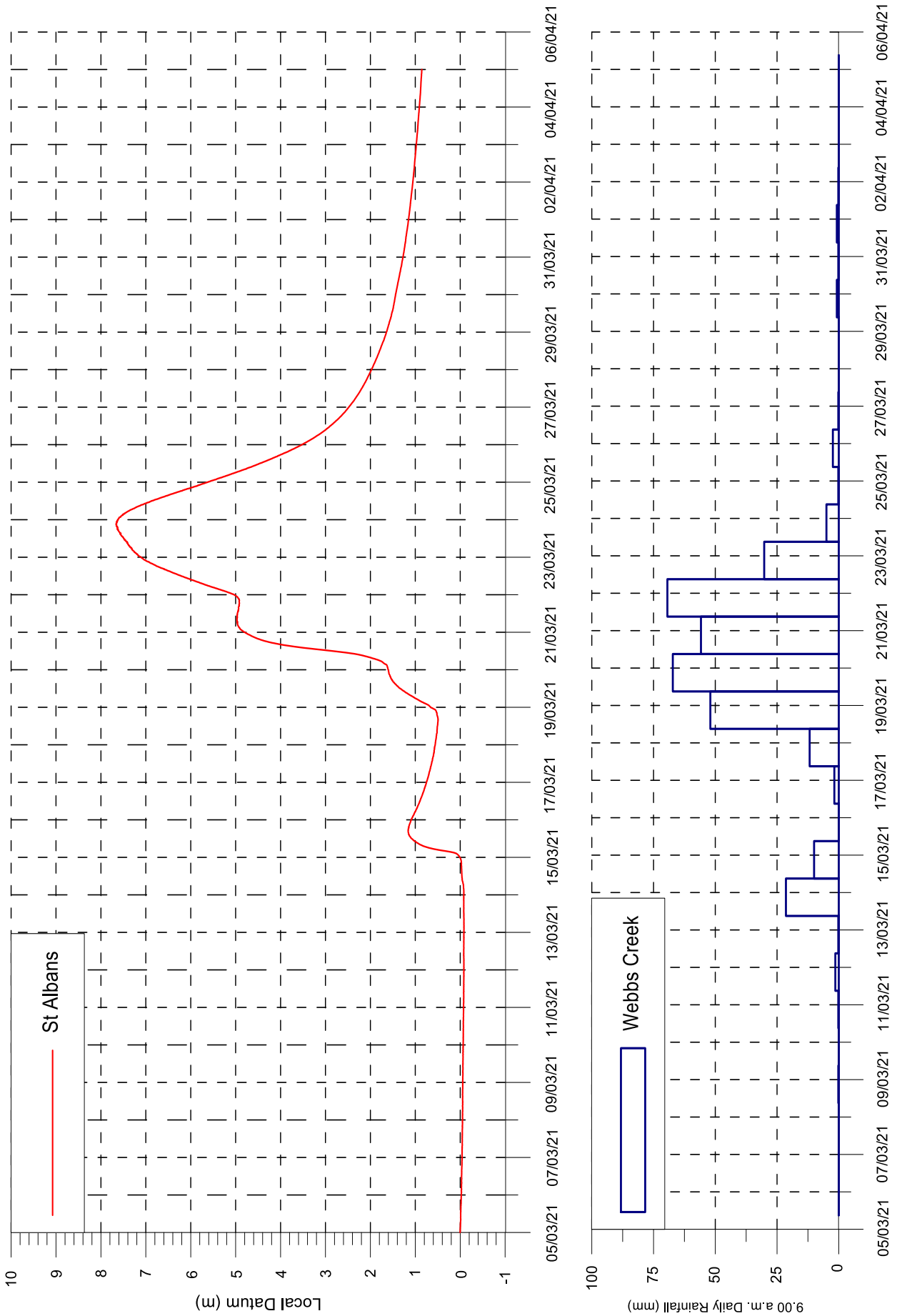
NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809
Figure
12.3

12.3.GRF



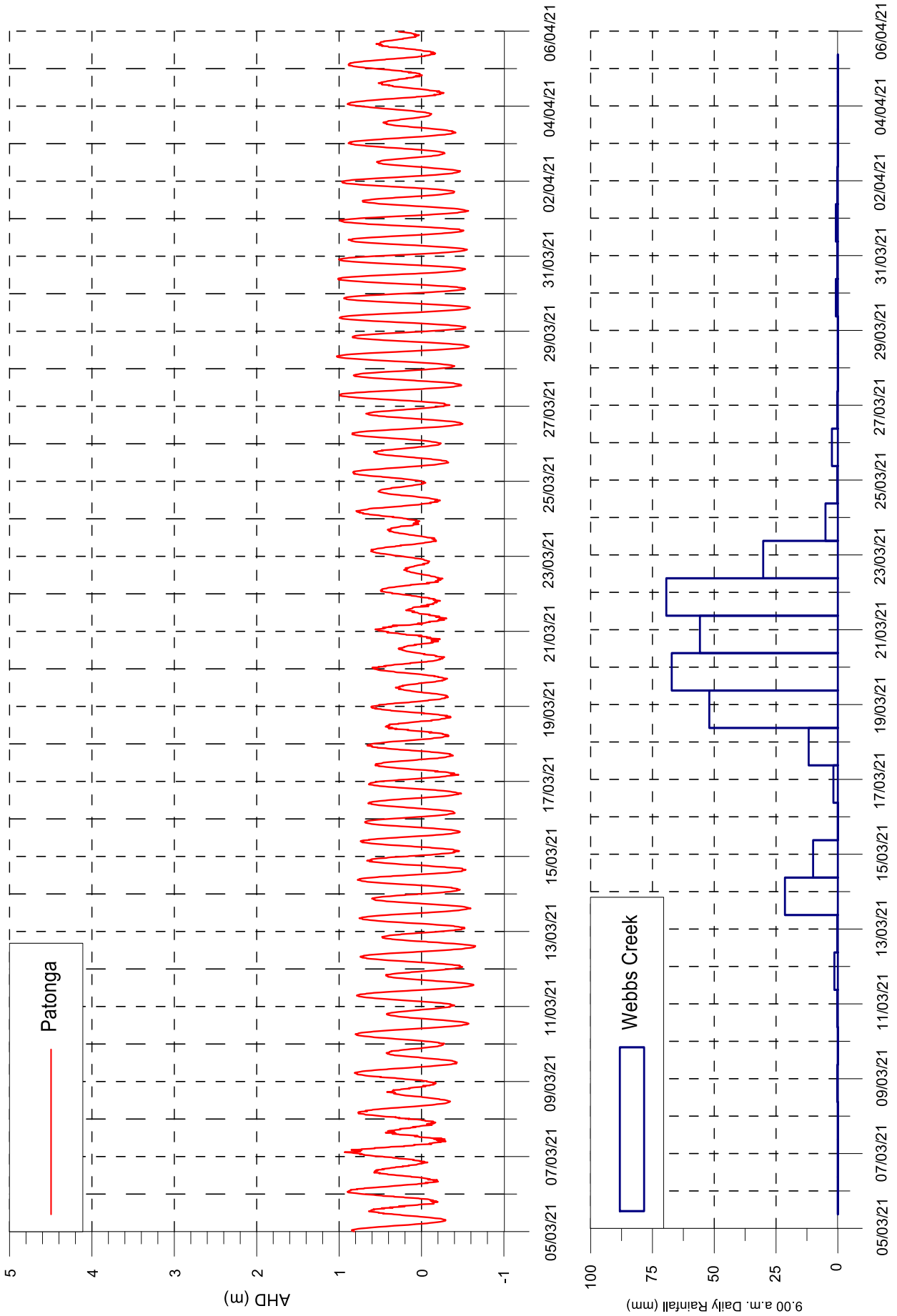
NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809
Figure
12.4

12.4.GRF



NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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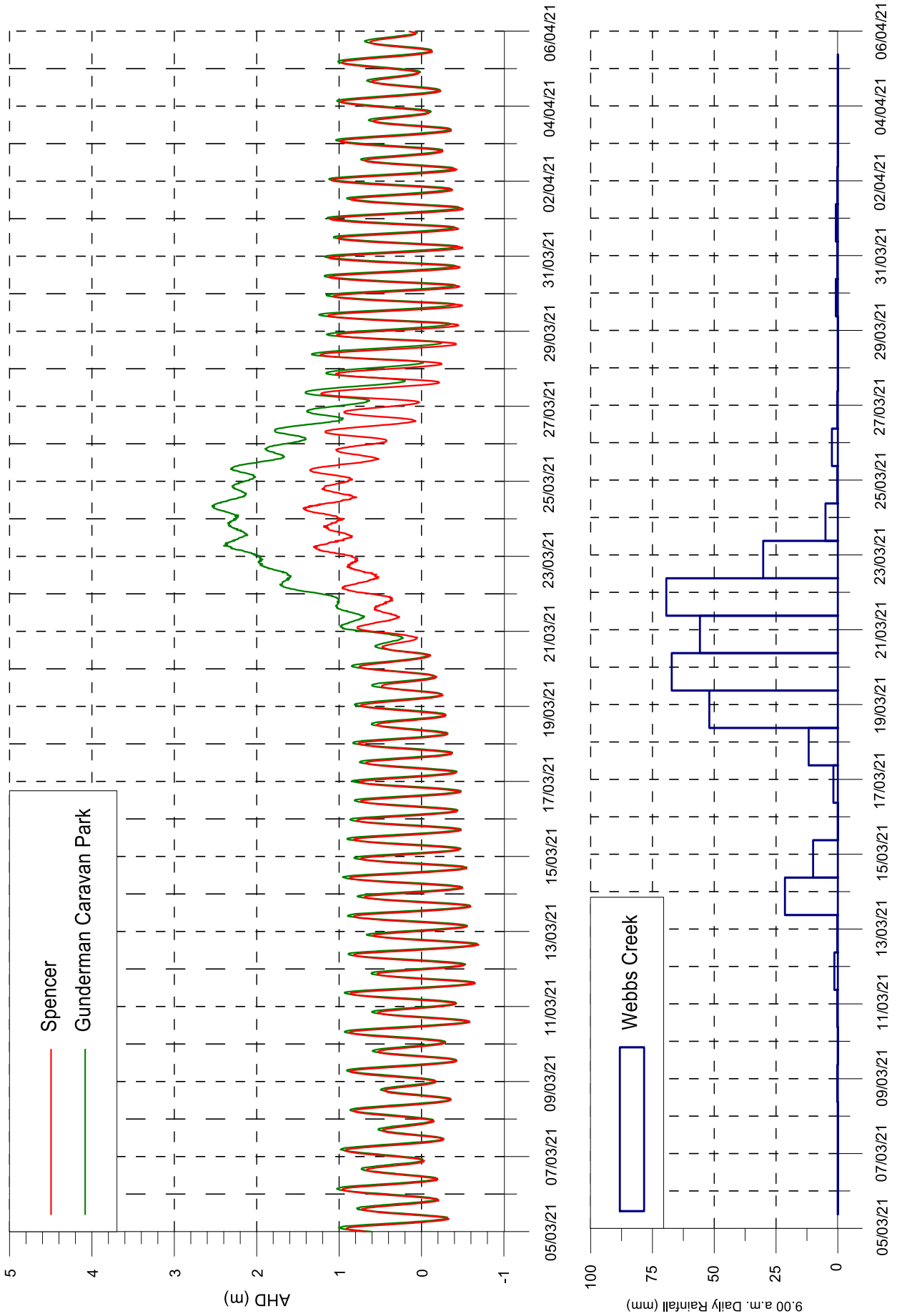
Report MH2809
Figure
12.5

12.5.GRF



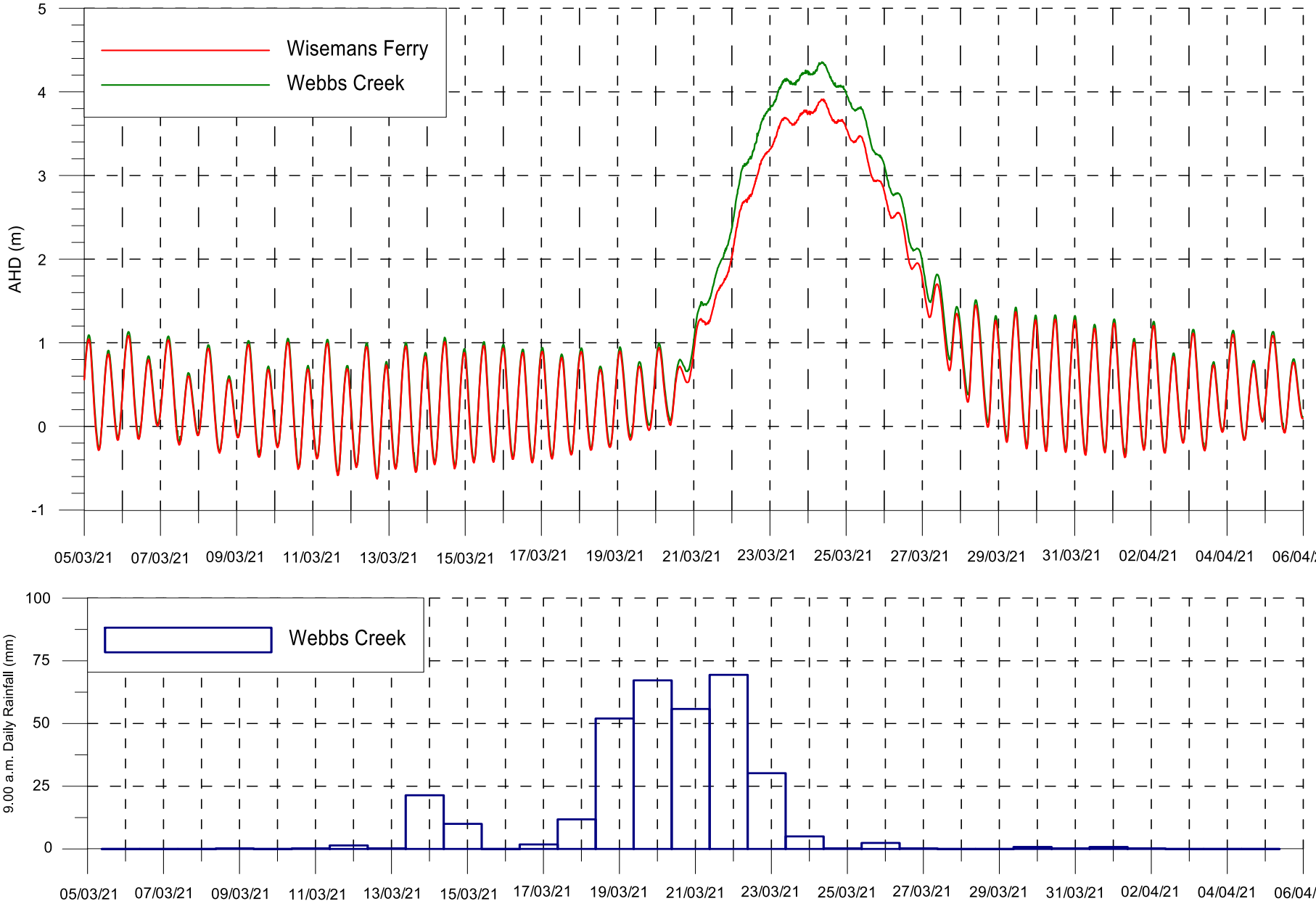
NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809
Figure
12.6

12.6.GRF



HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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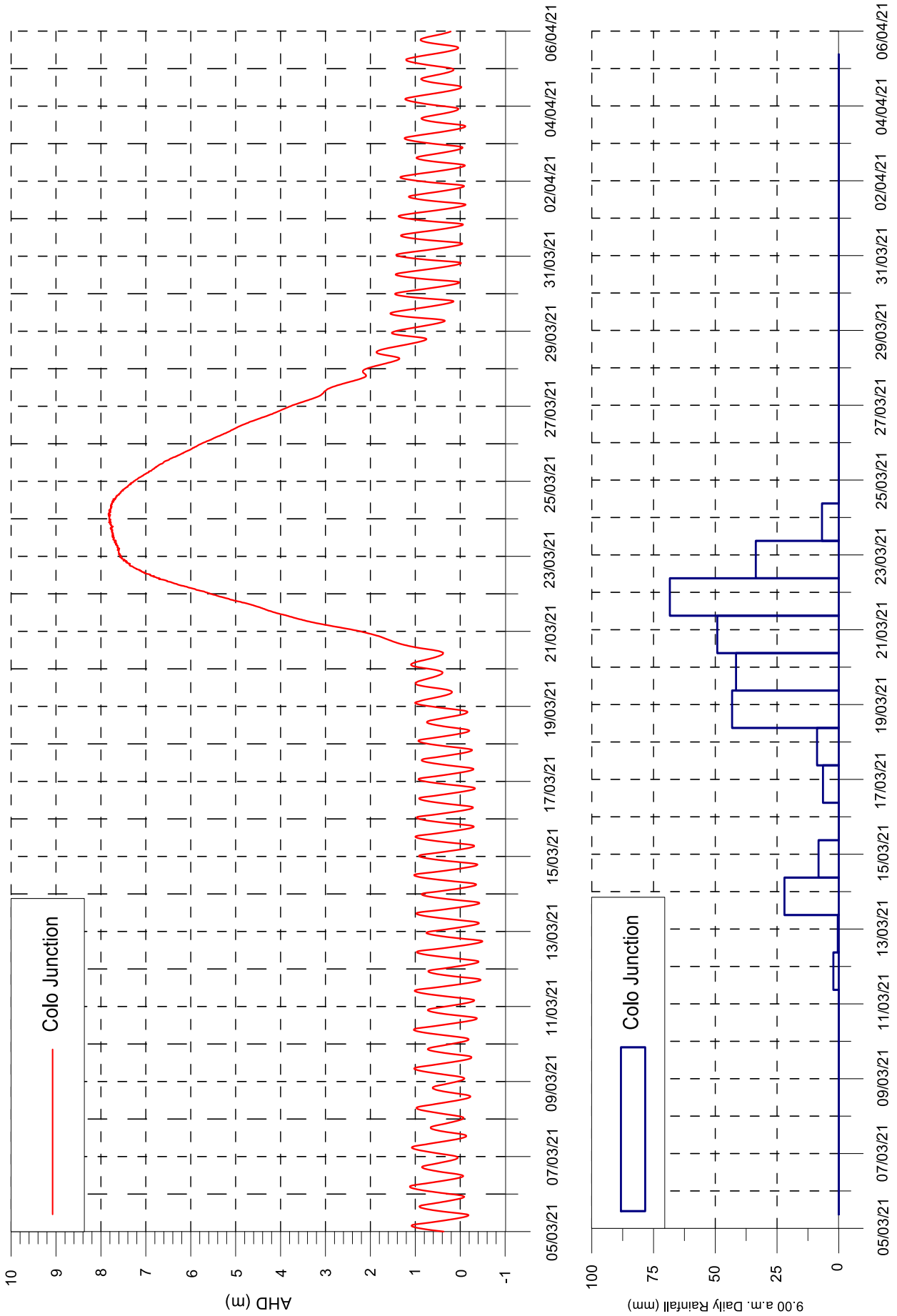
Report MH2809
Figure
12.7

12.7.GRF



NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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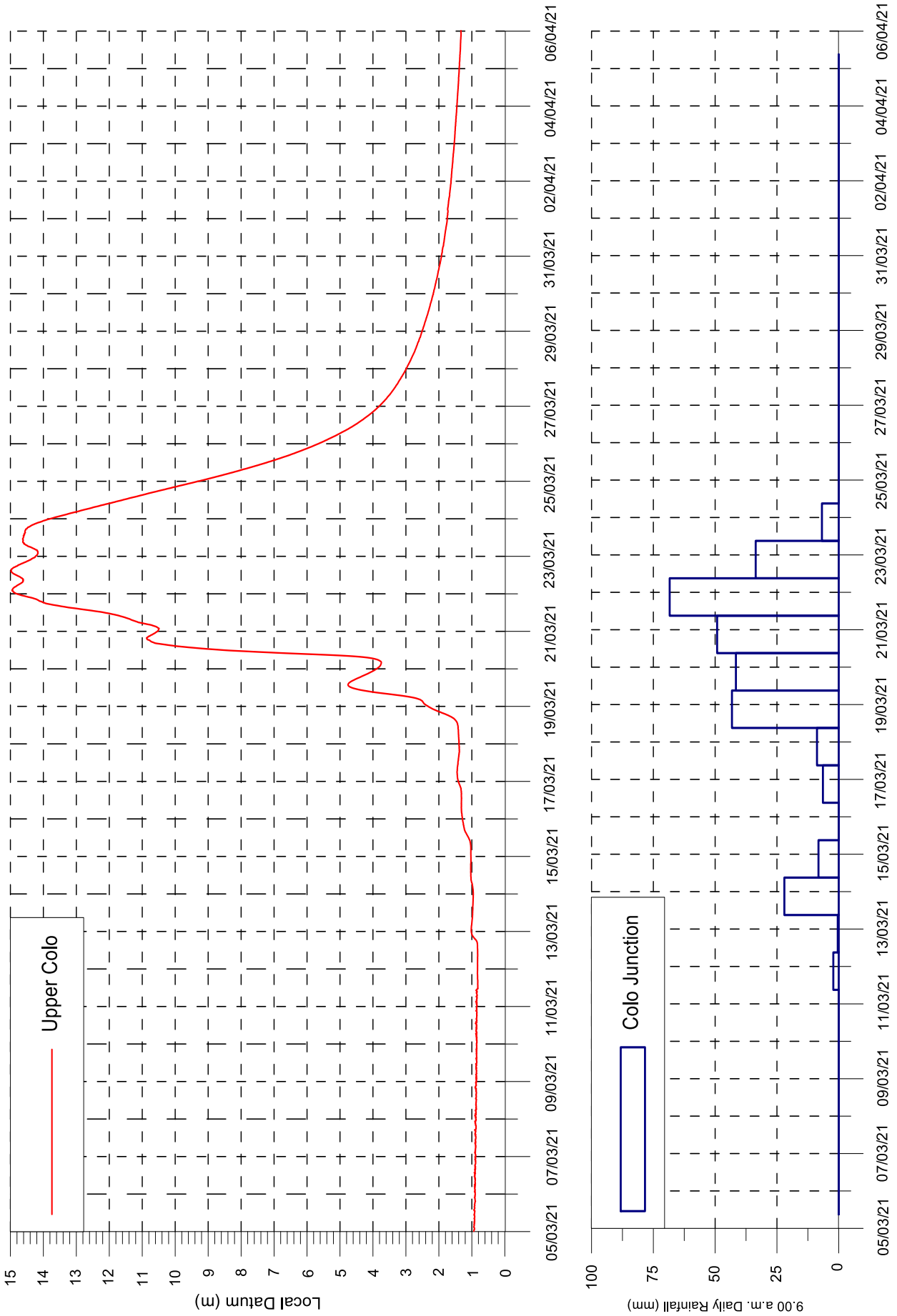
Report MH2809
Figure
12.8

12.8.GRF



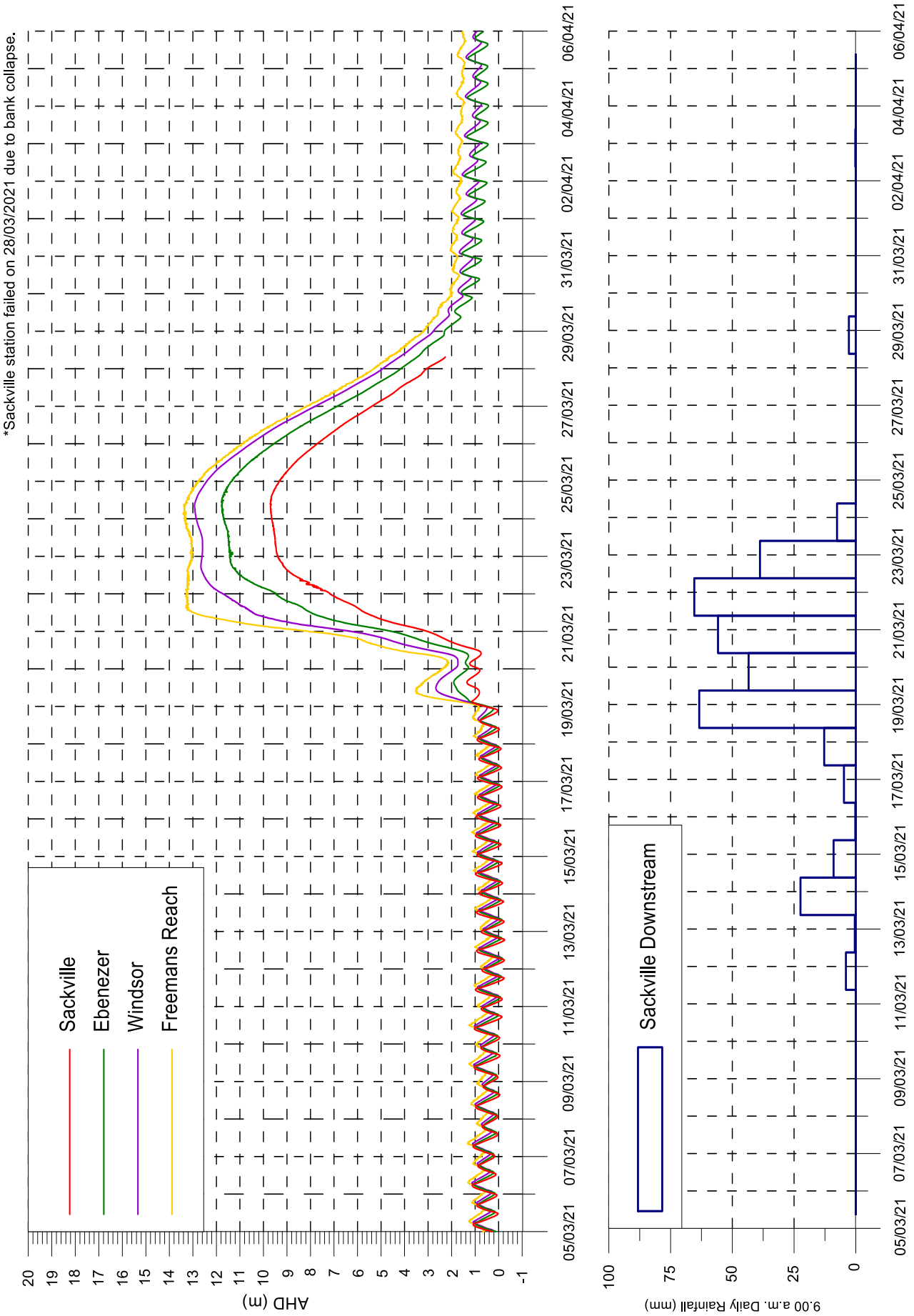
NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809
Figure
12.9

12.9.GRF



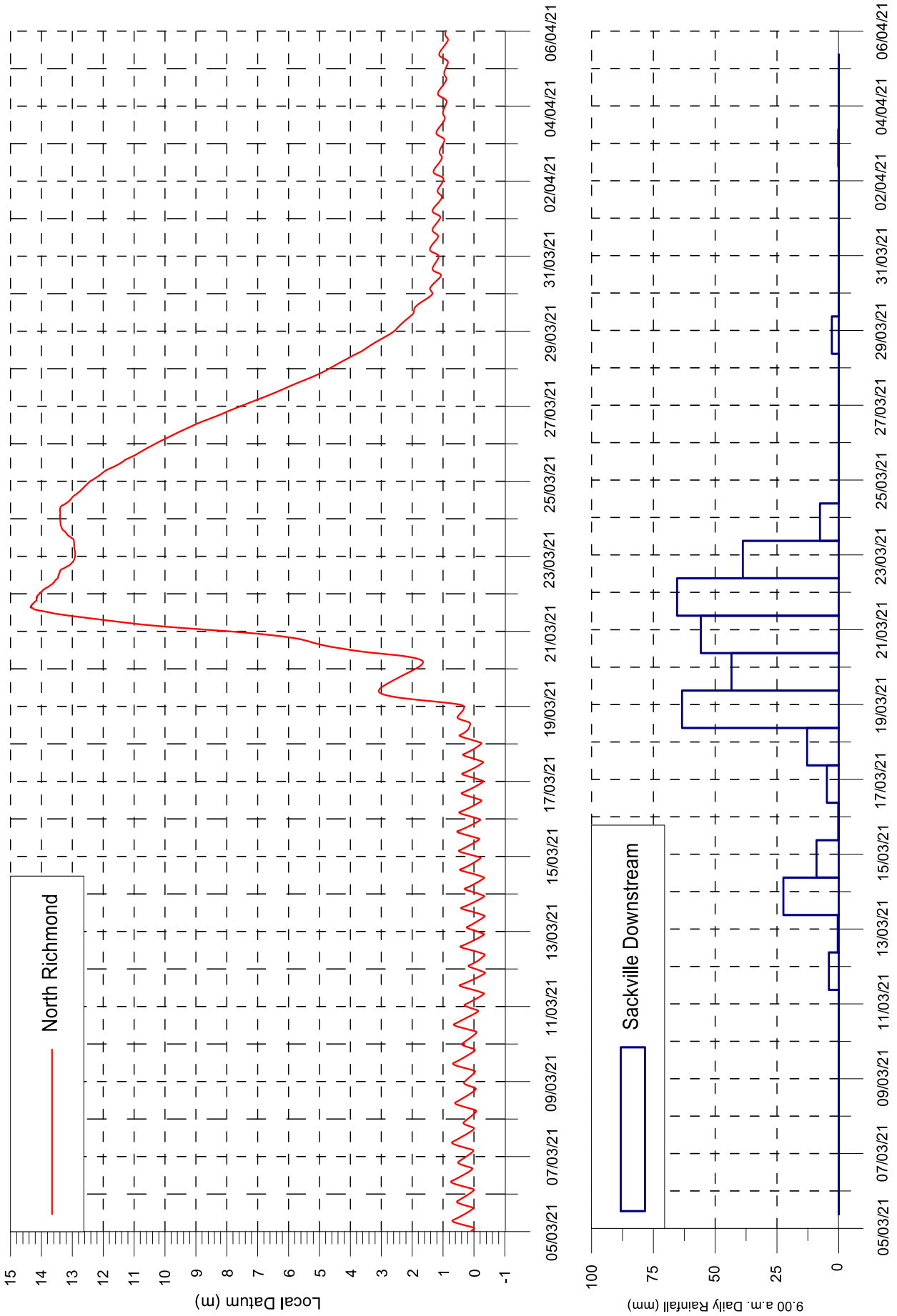
NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809
Figure
12.10

12.10.GRF



NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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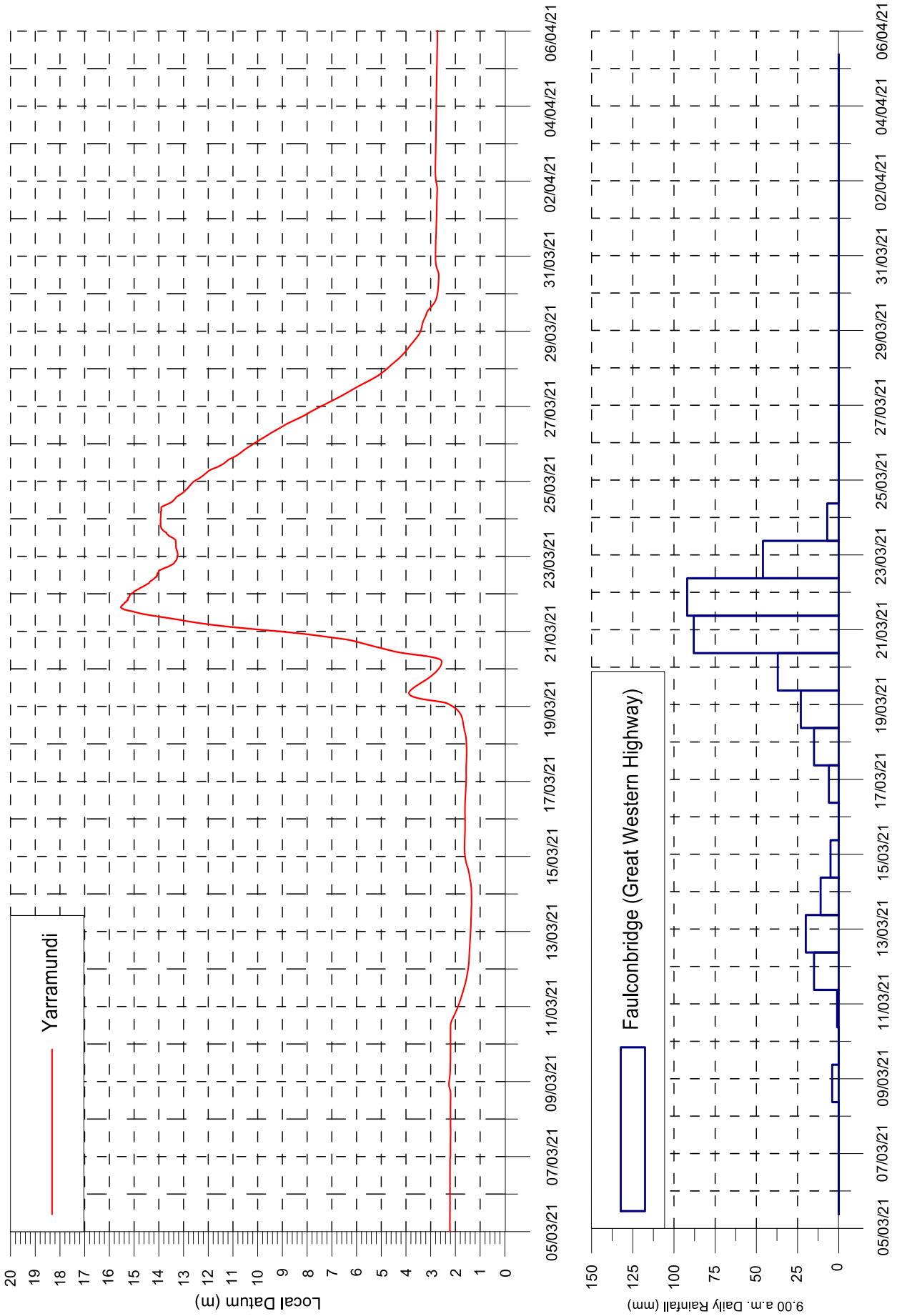
Report MH2809
Figure
12.11

12.11.GRF



NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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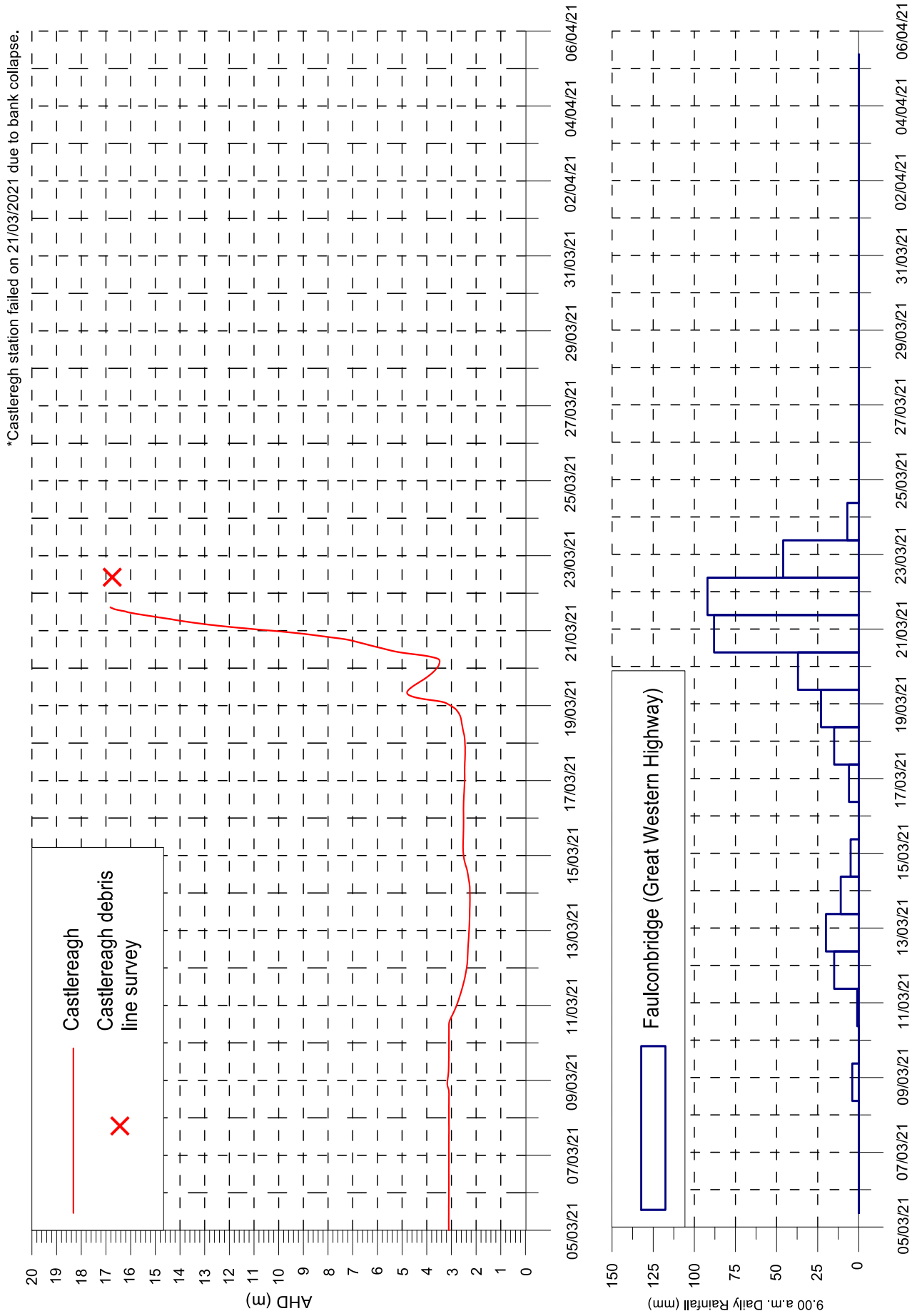
Report MH2809
Figure
12.12

12.12.GRF



NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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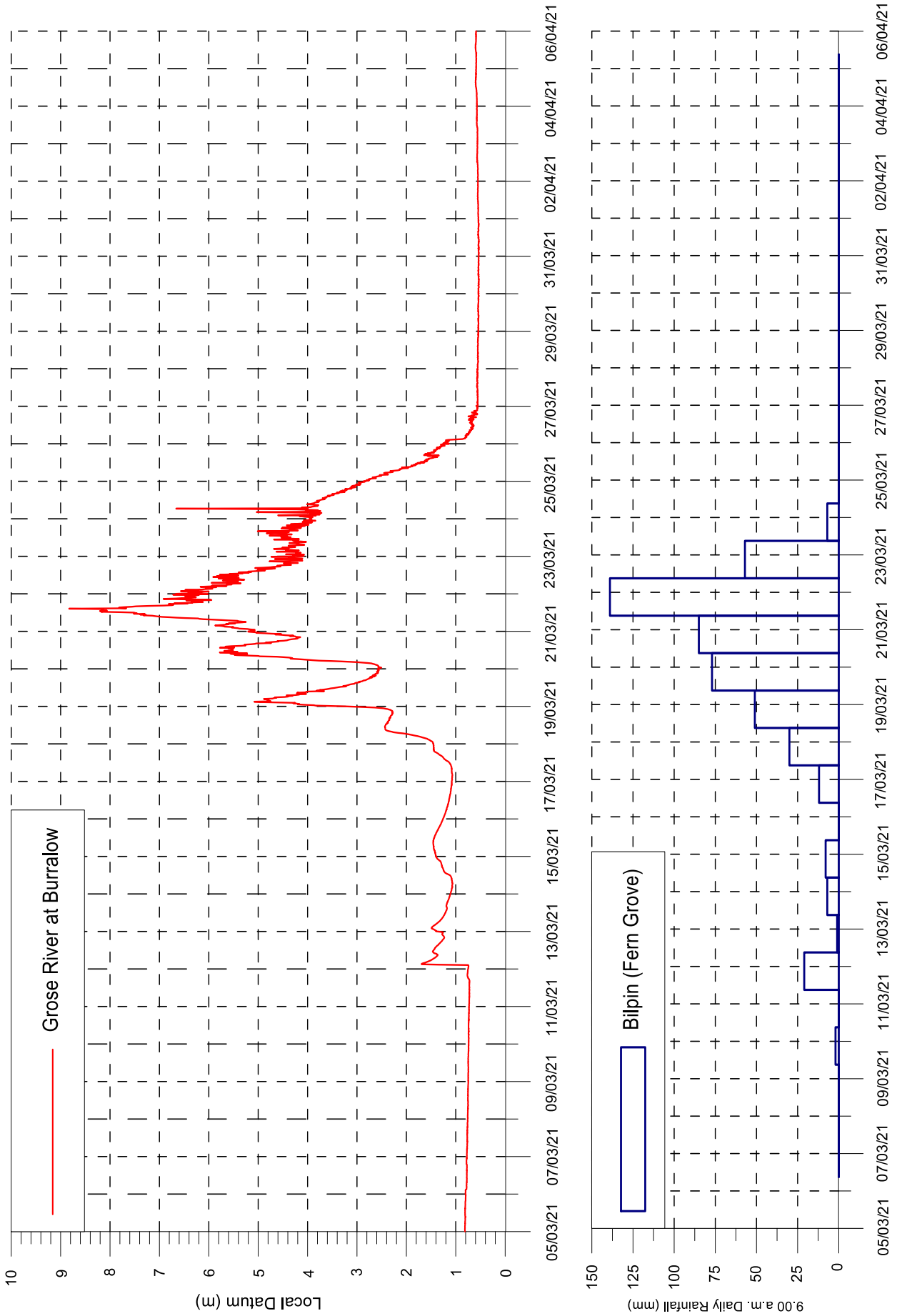
Figure
12.13

12.13.GRF



NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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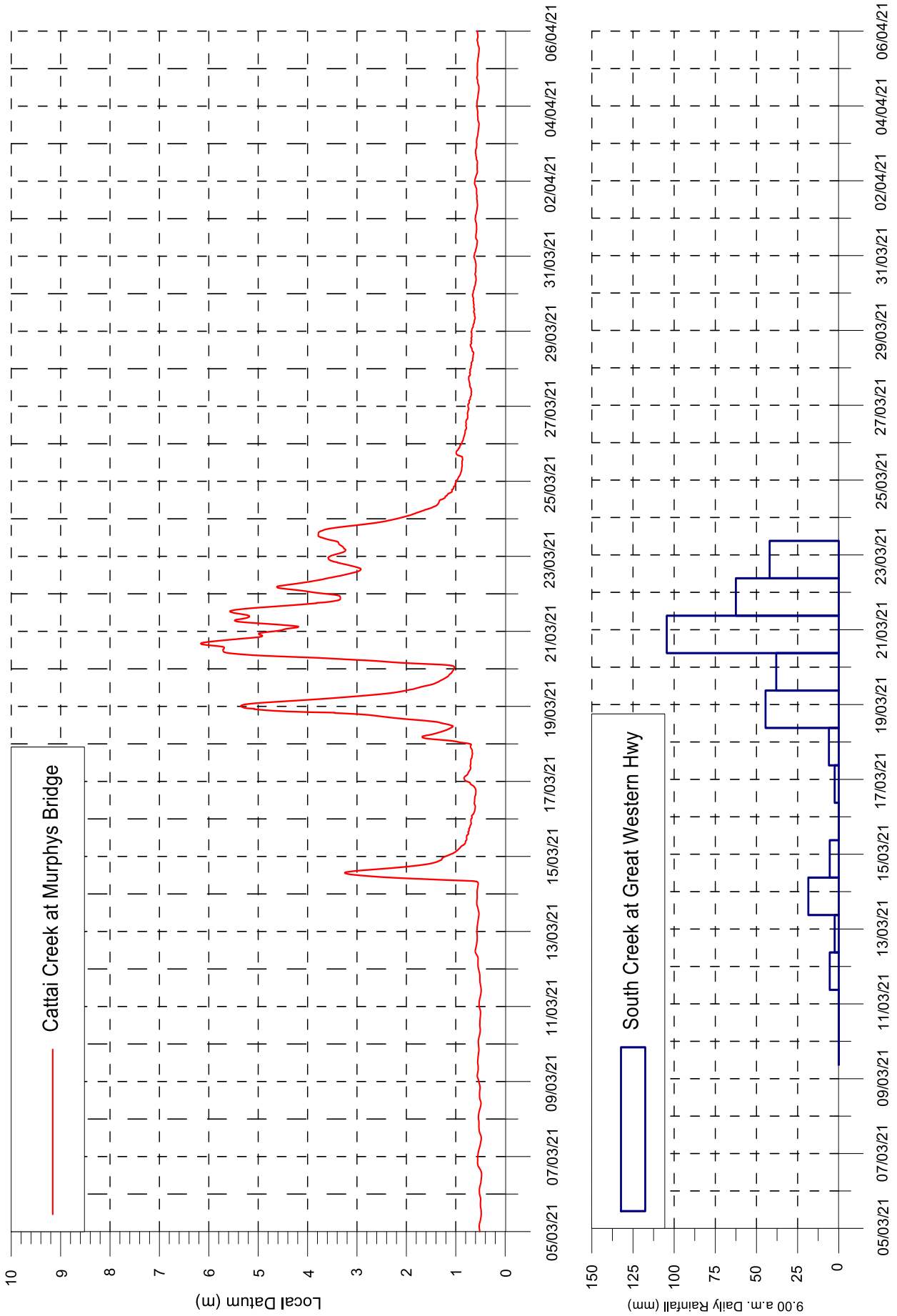
Report MH2809
Figure
12.14

12.14.GRF



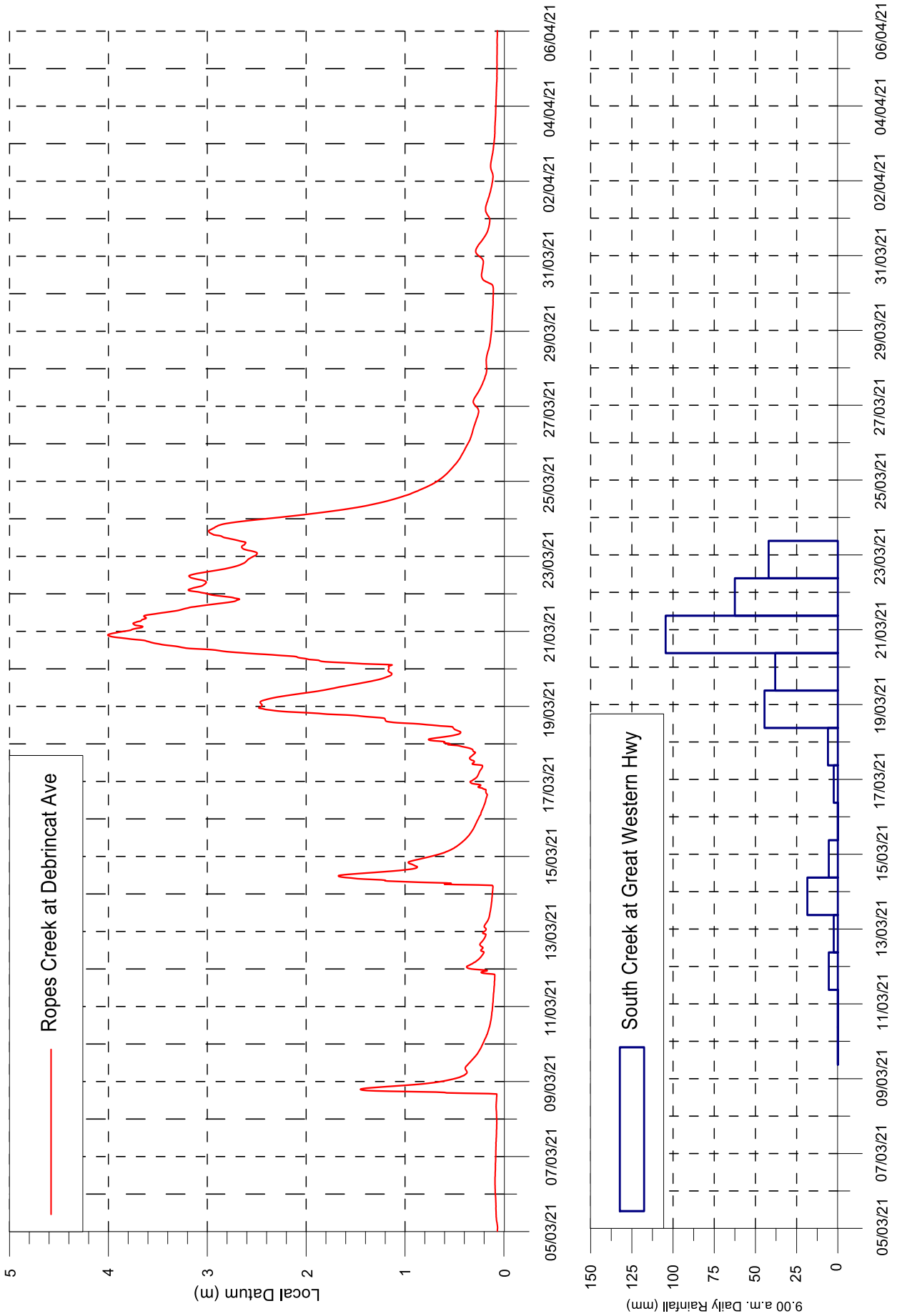
NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809
Figure
12.15

12.15.GRF



NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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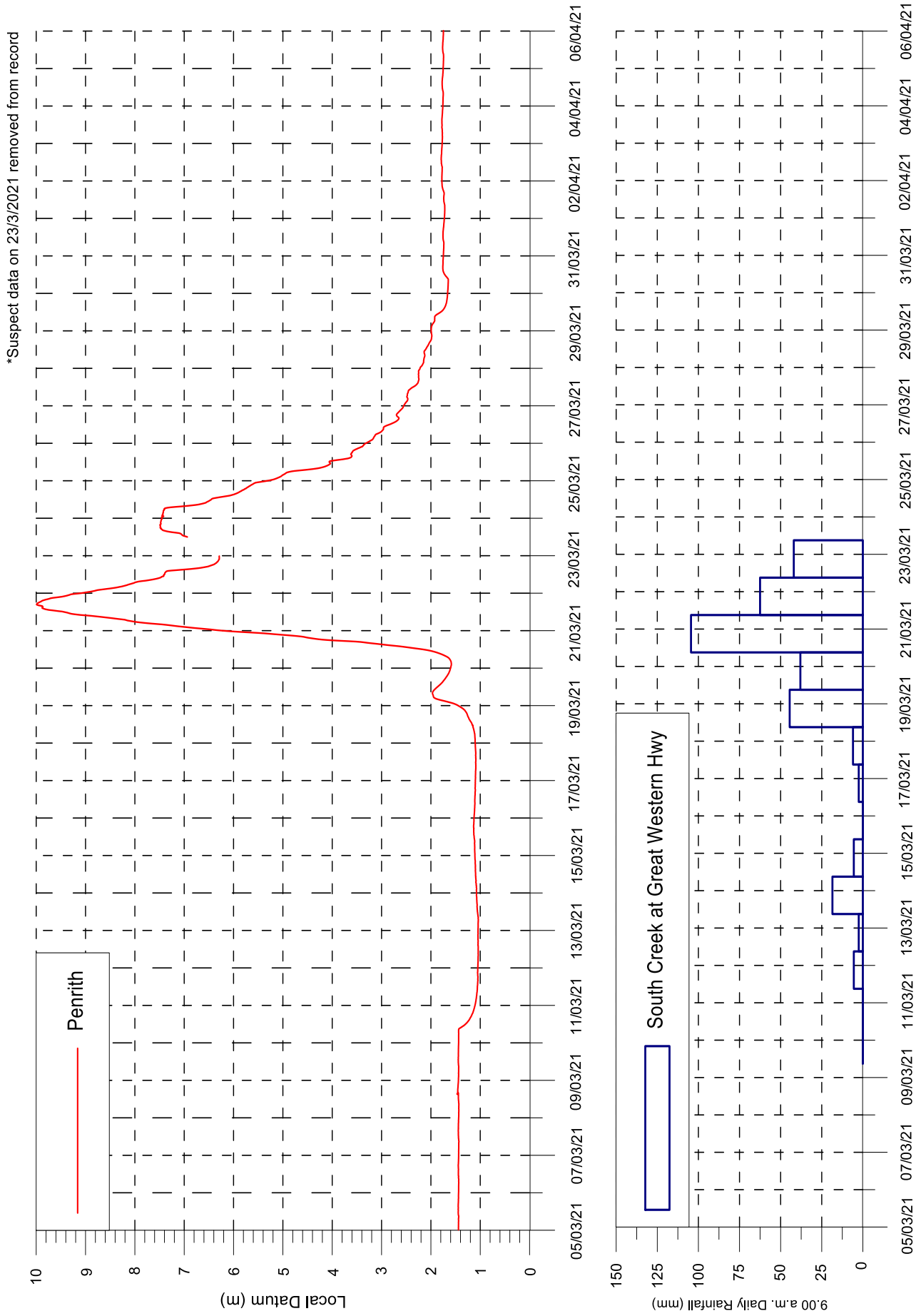
Report MH2809
Figure
12.16

12.16.GRF



NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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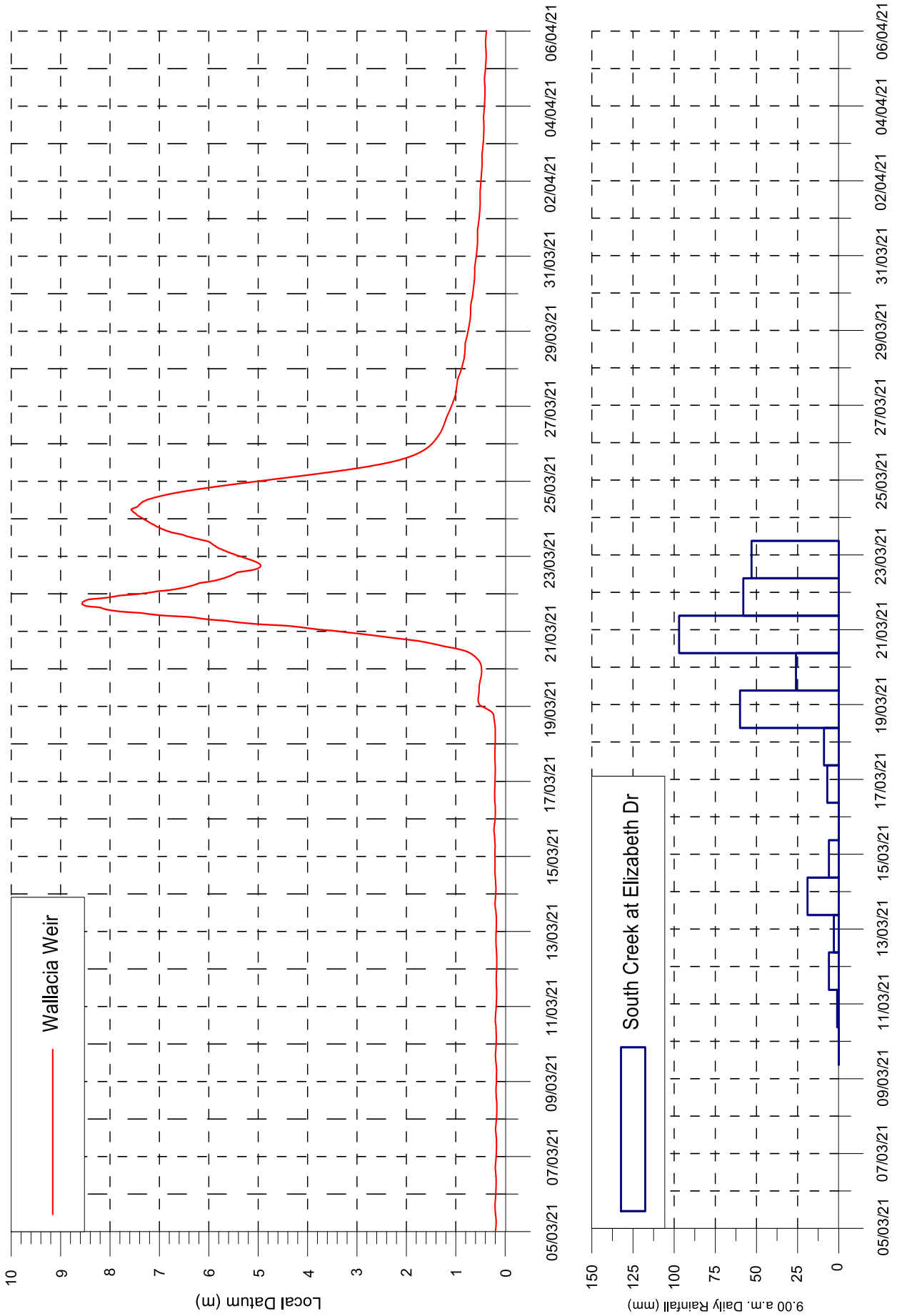
Report MH2809
Figure
12.17

12.17.GRF



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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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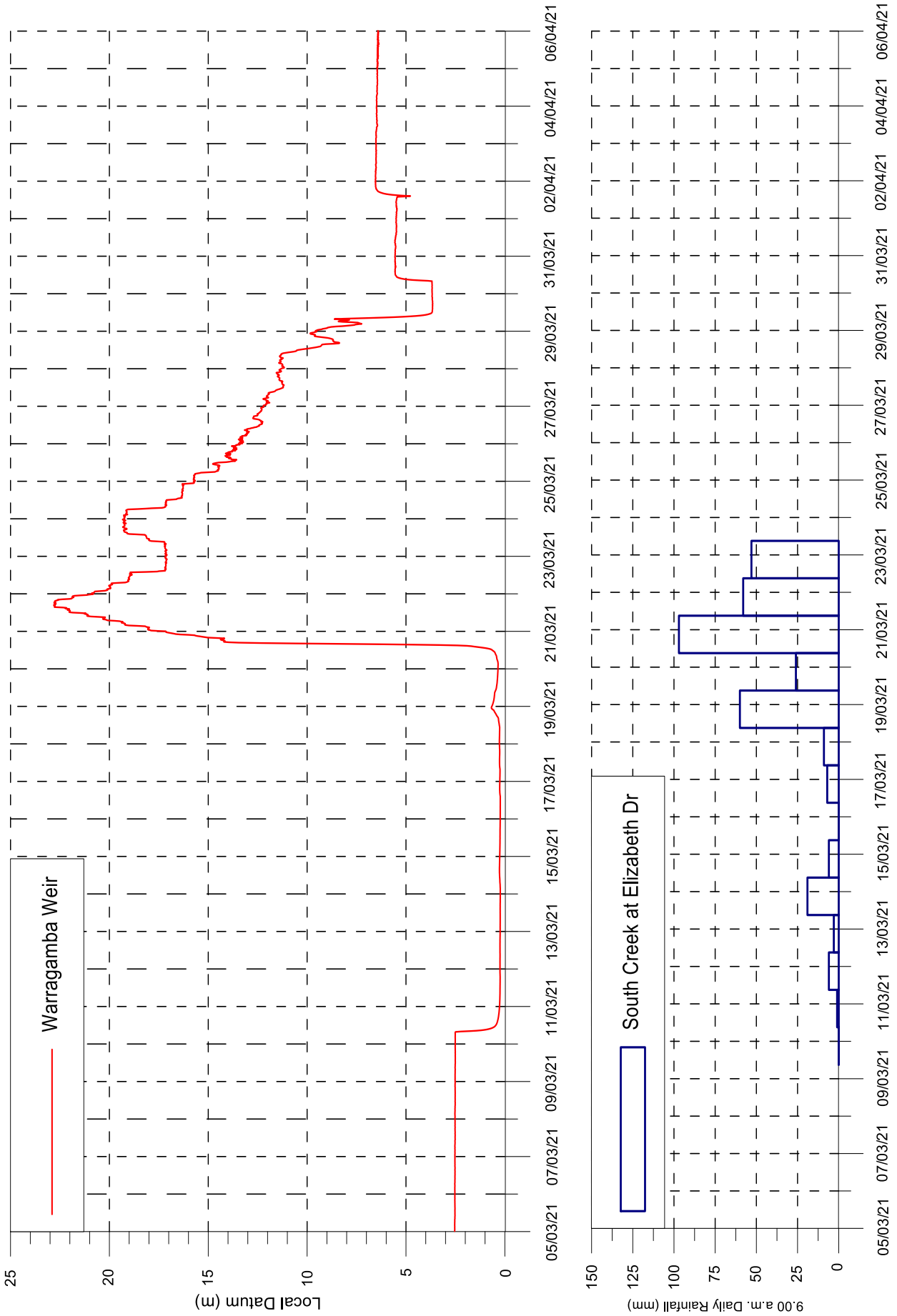
Report MH2809
Figure
12.18

12.18.GRF



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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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Report MH2809
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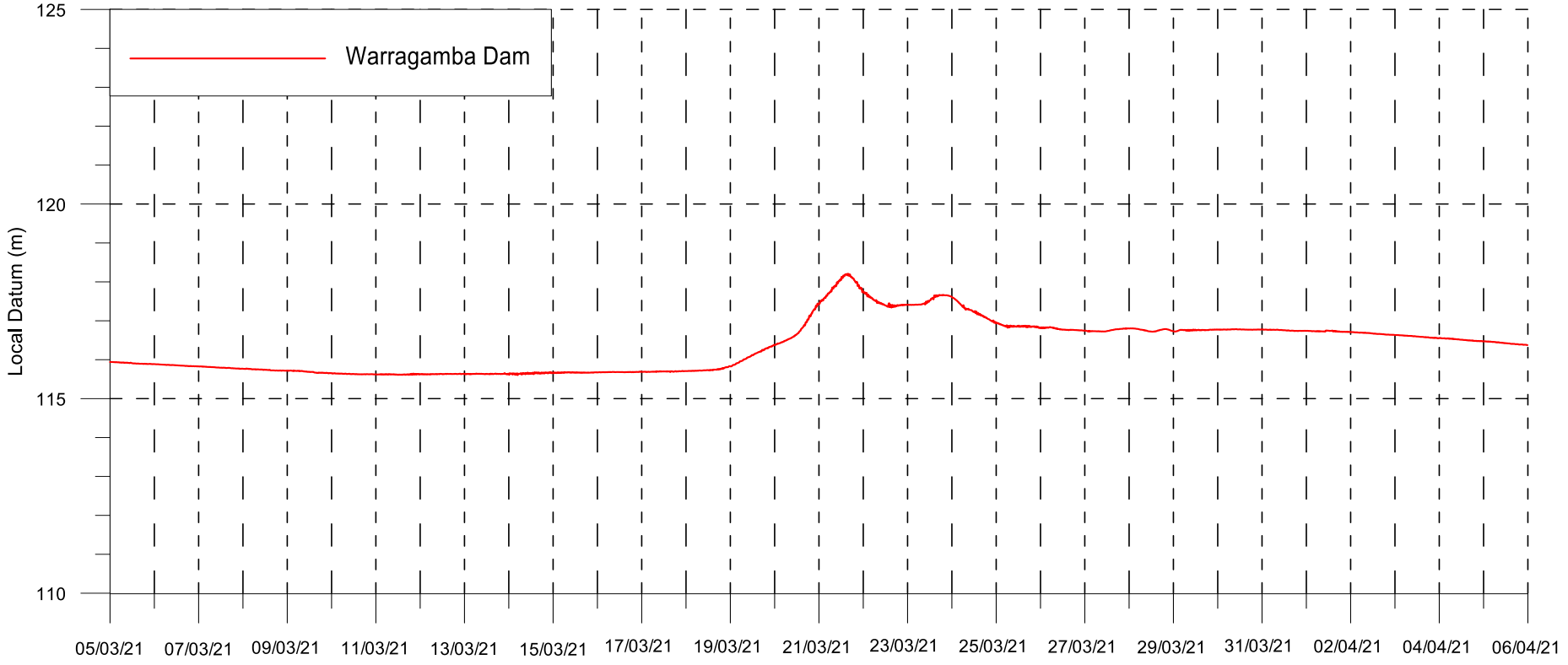
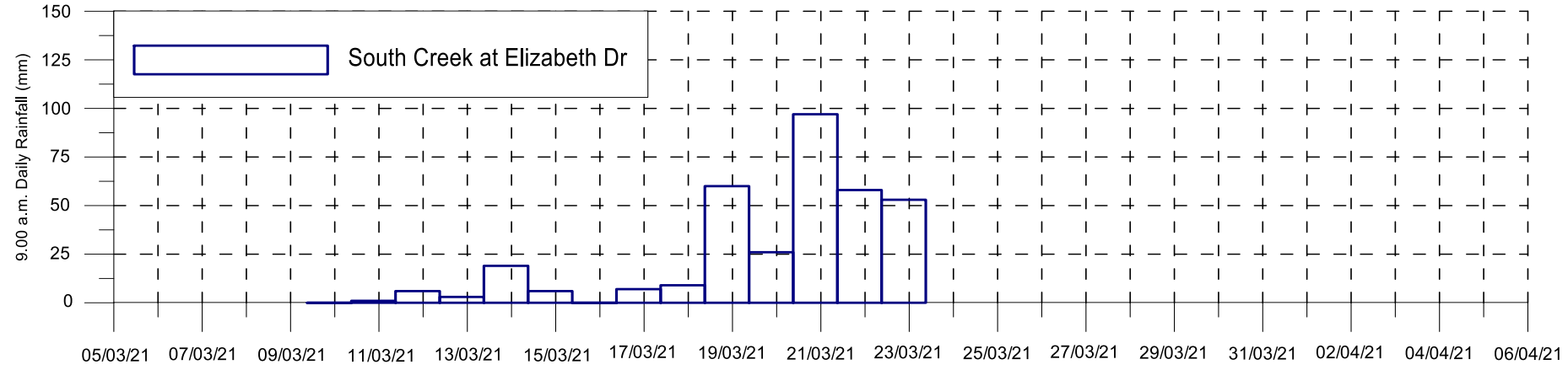
12.19

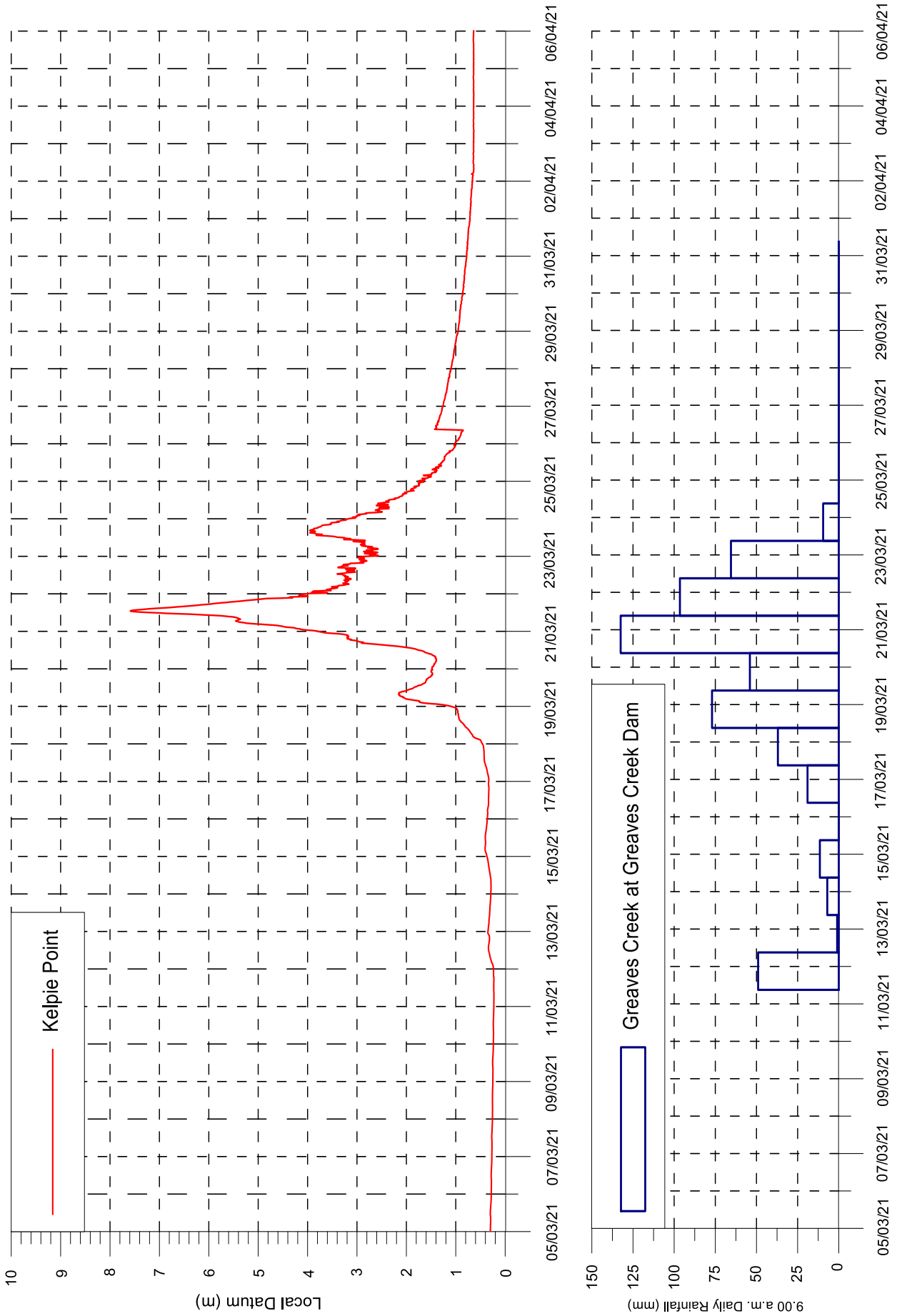
12.19.GRF

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021





Manly Hydraulics Laboratory
Report MH2809
Figure 12.20
12.20.GRF



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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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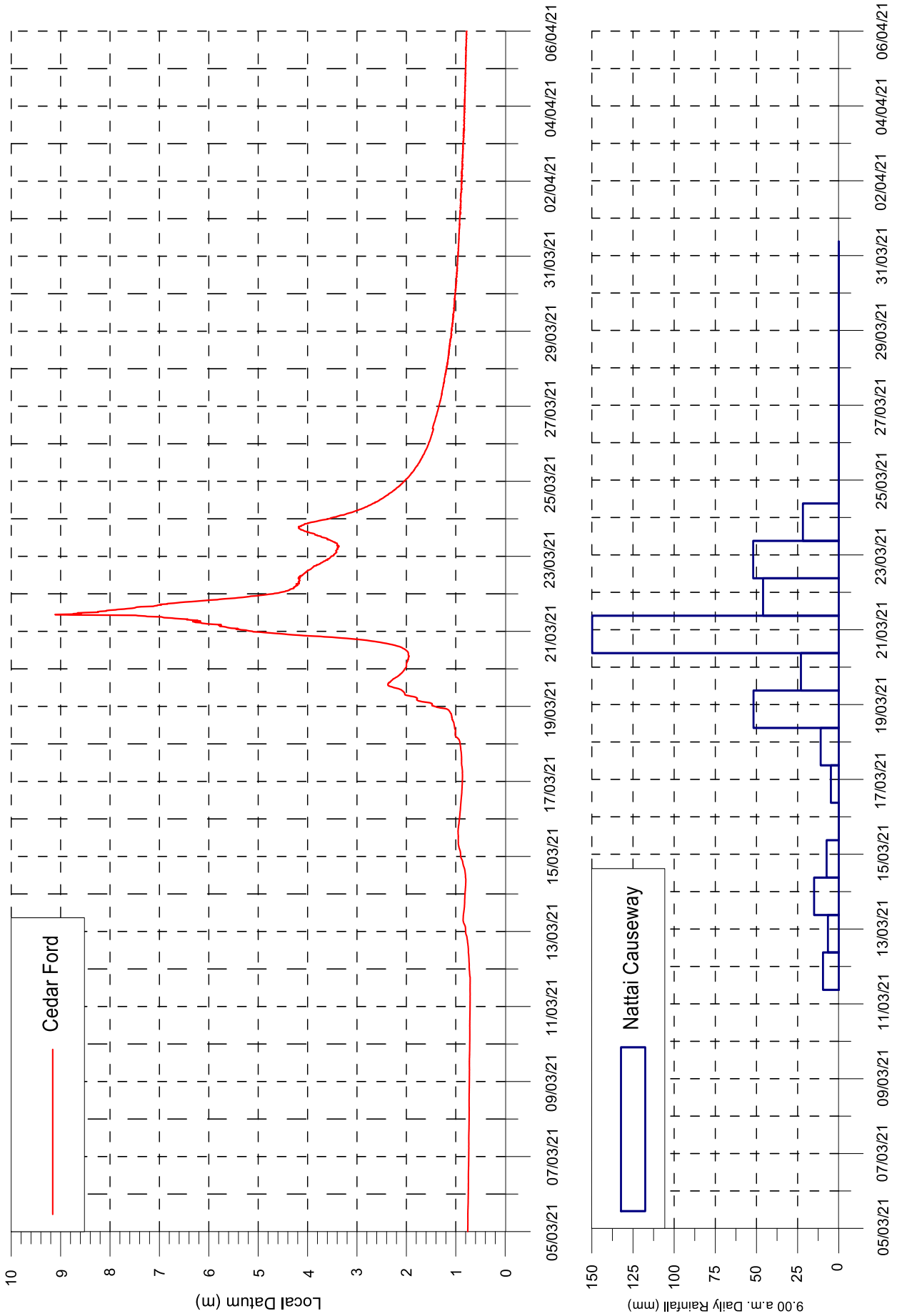
Report MH2809
Figure
12.21

12.21.GRF



NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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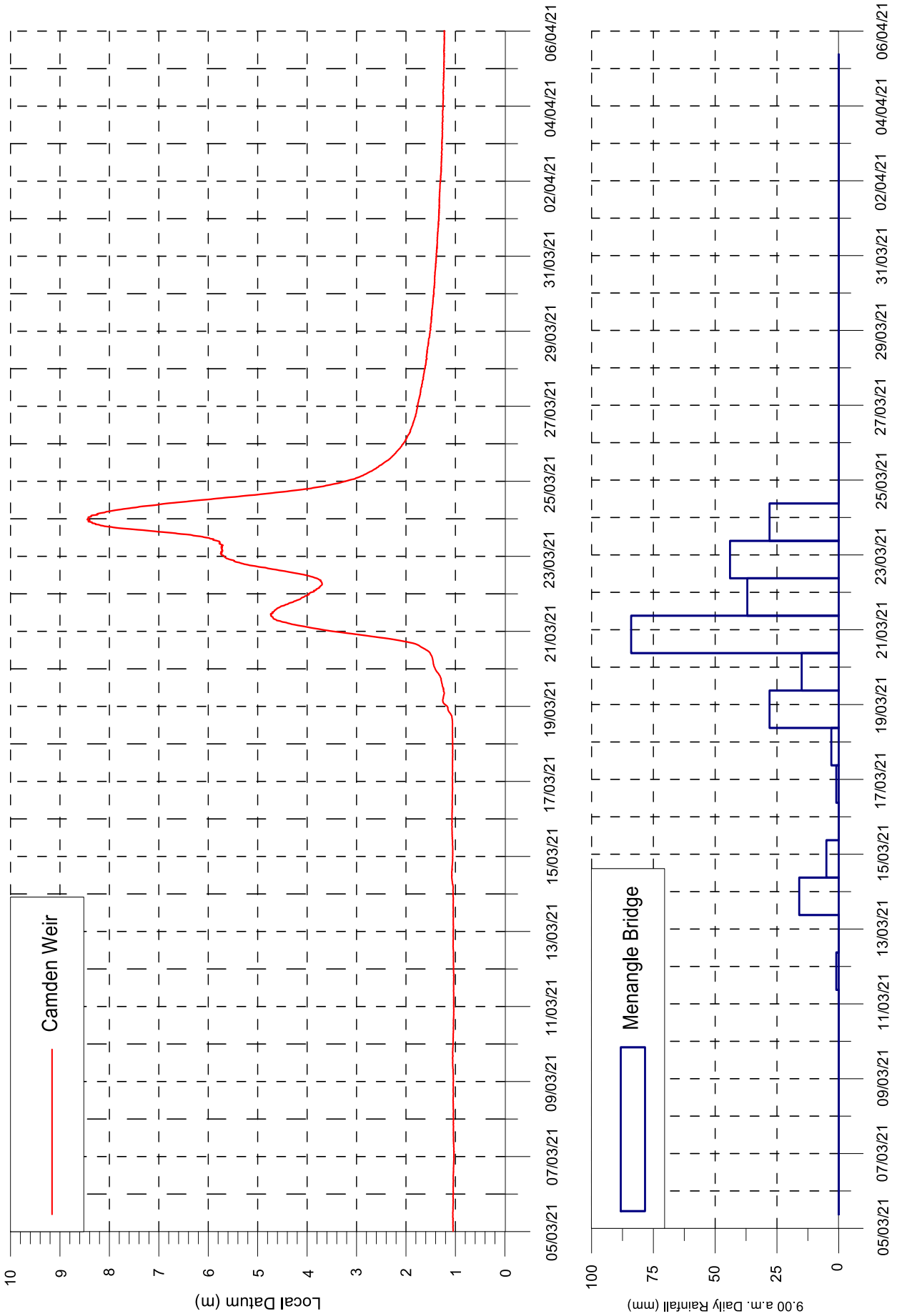
Report MH2809
Figure
12.22

12.22.GRF



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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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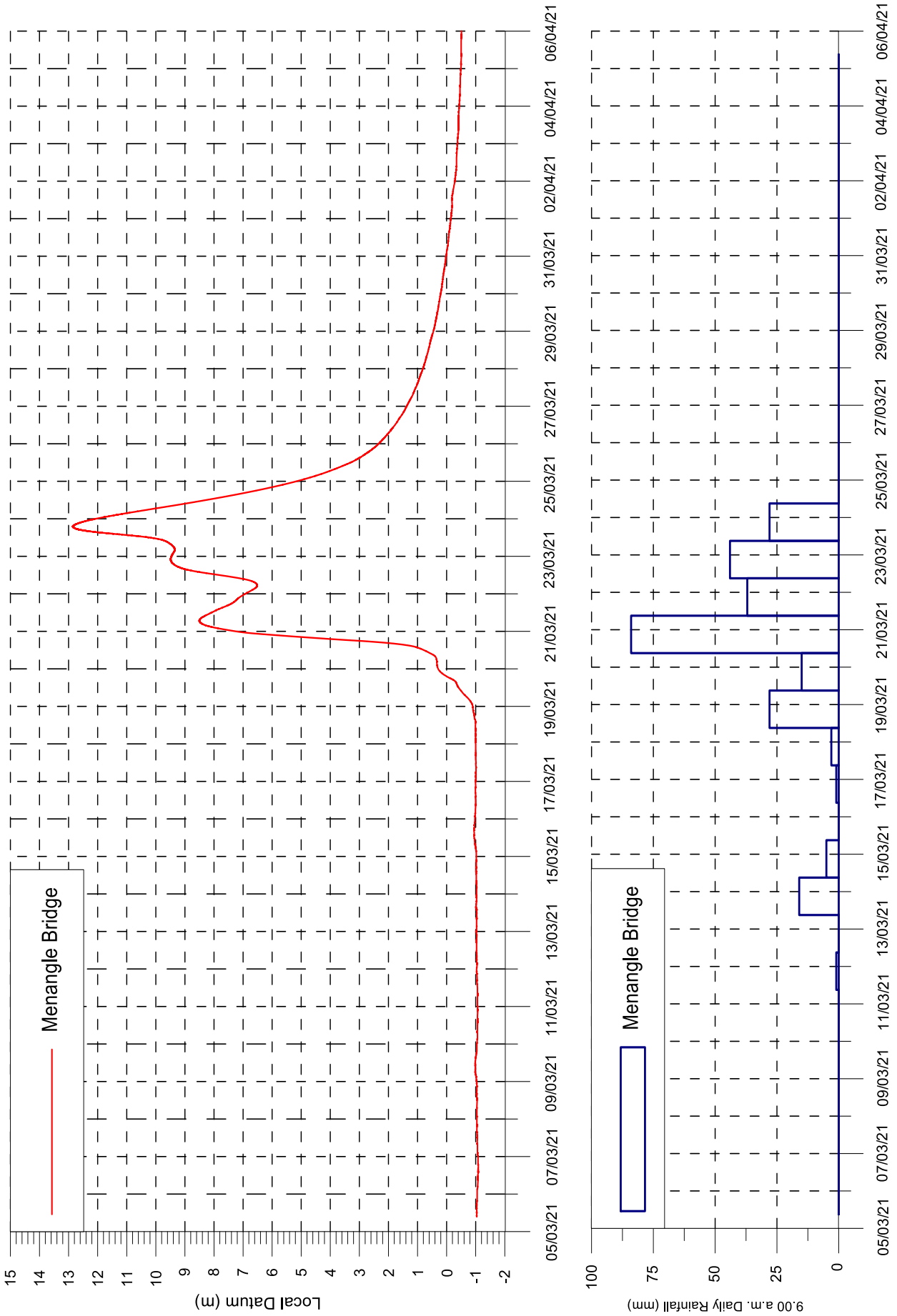
Report MH2809
Figure
12.23

12.23.GRF



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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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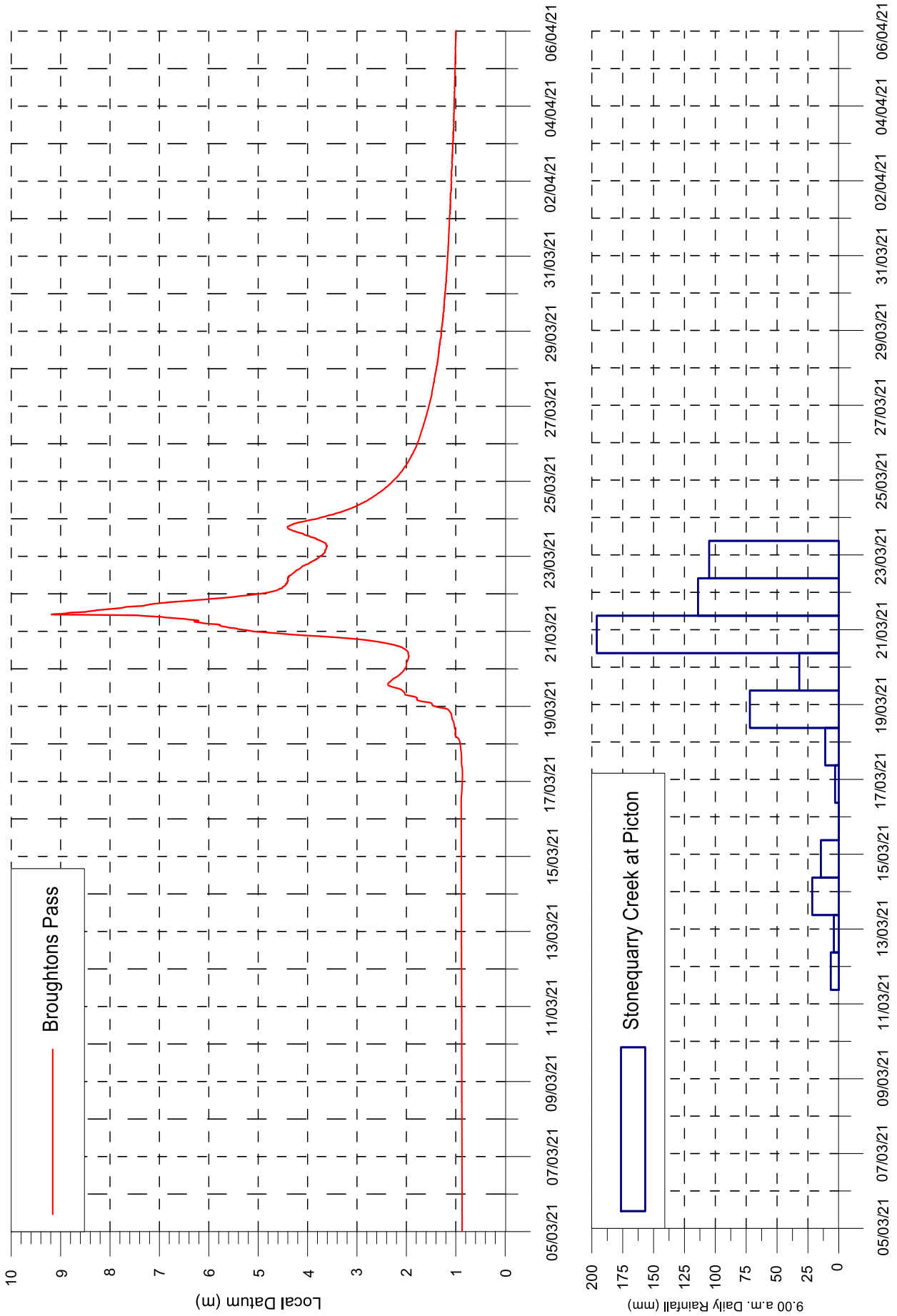
Report MH2809
Figure
12.24

12.24.GRF



NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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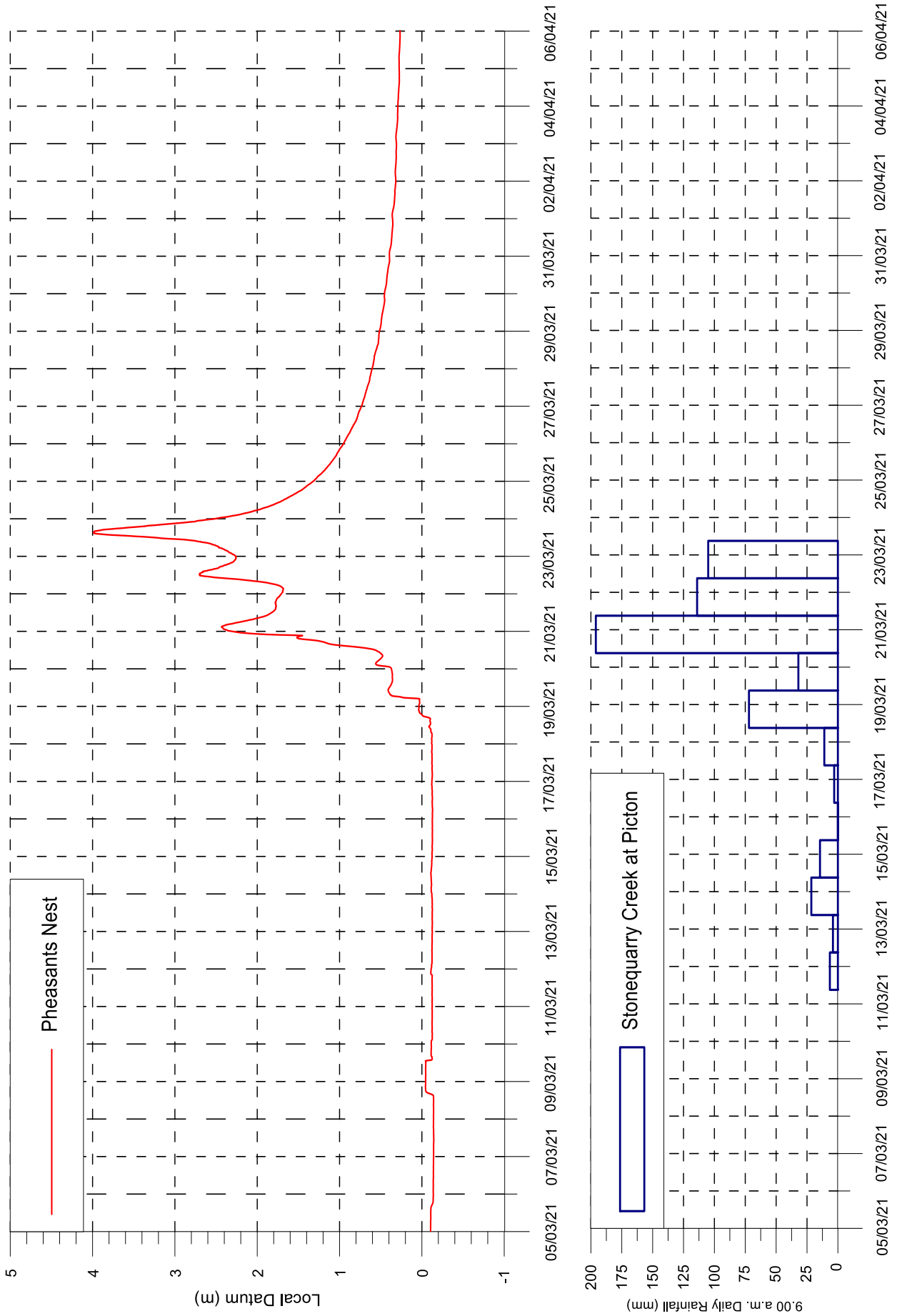
Figure
12.25

12.25.GRF



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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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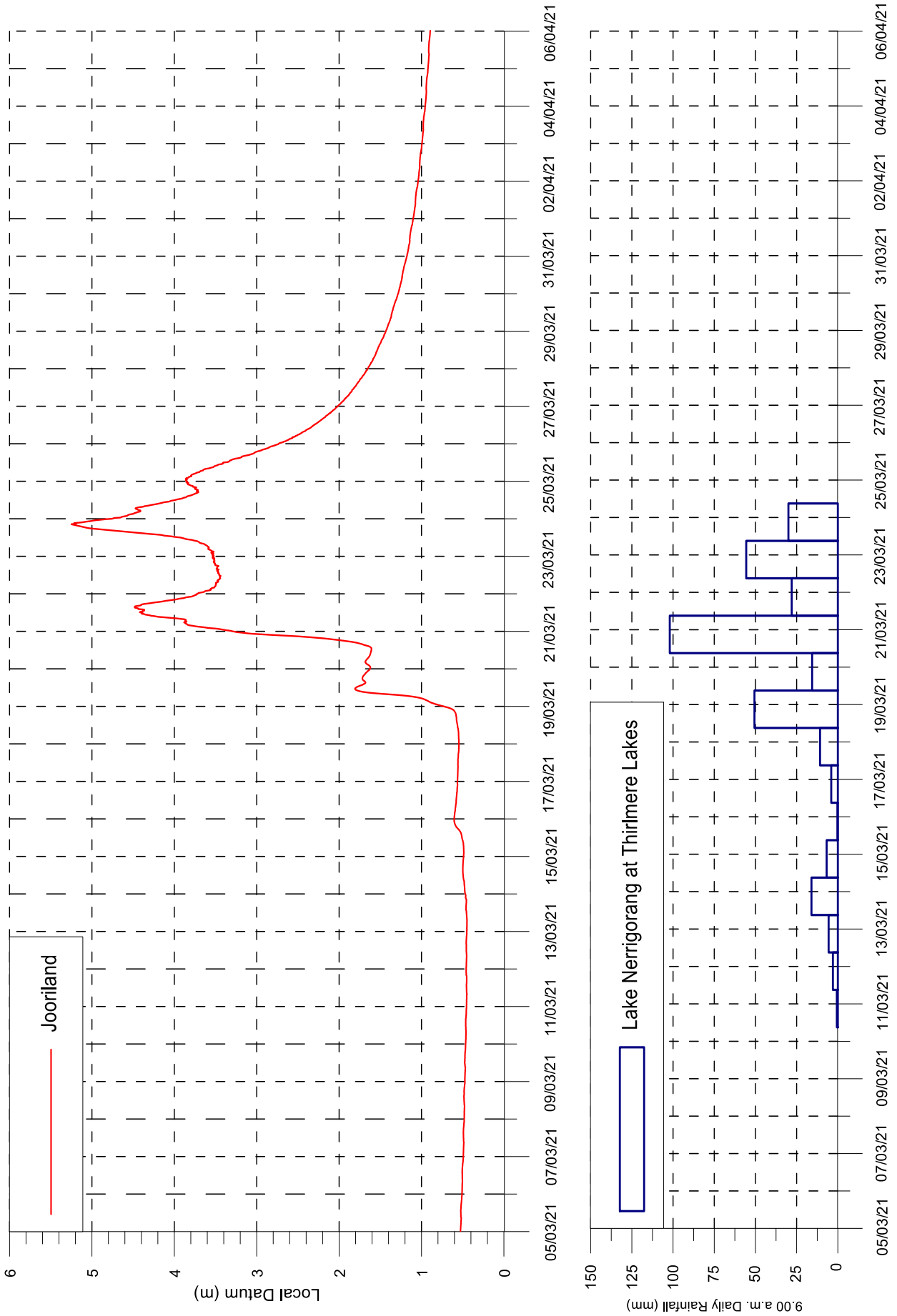
Report MH2809
Figure
12.26

12.26.GRF



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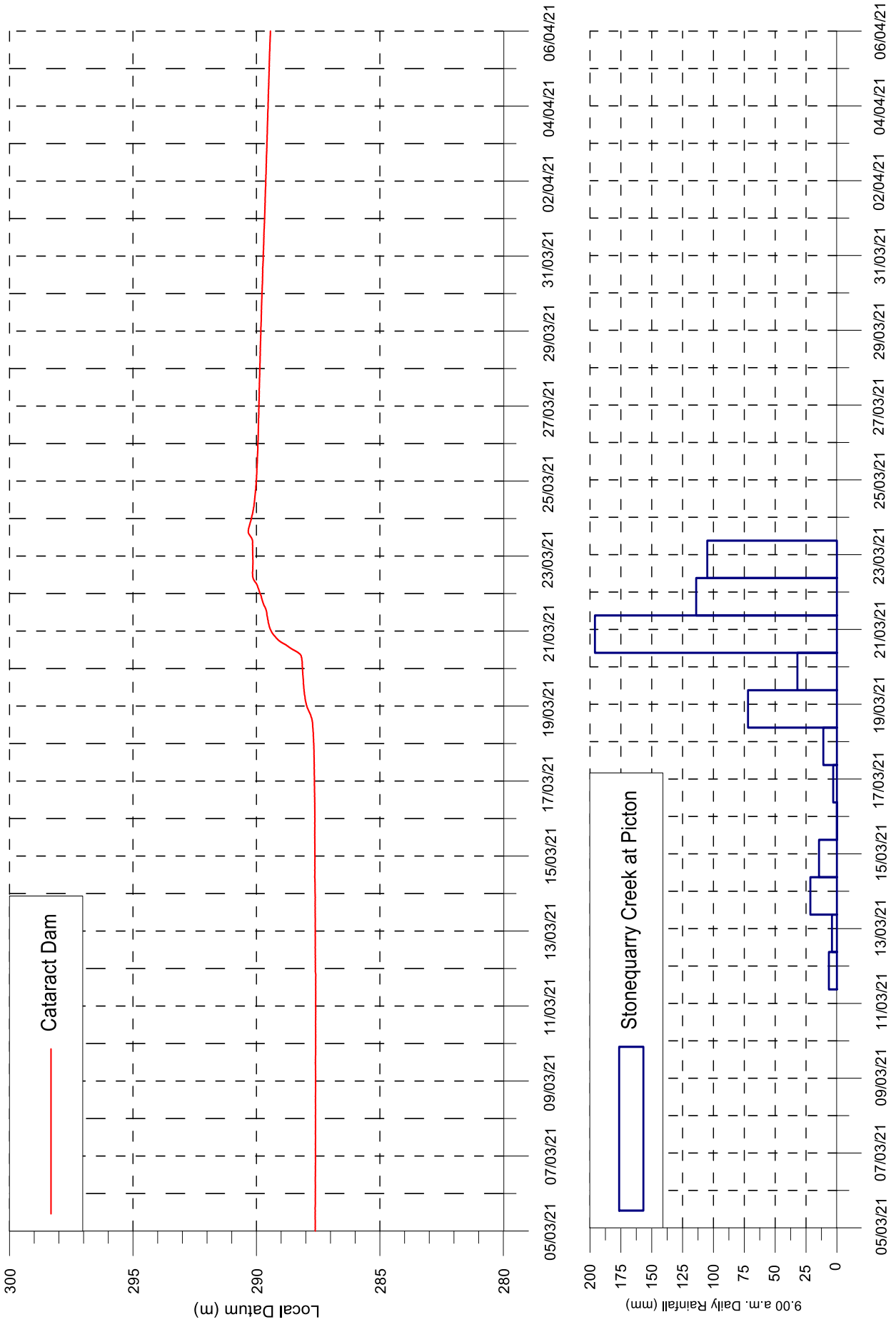
HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

Manly Hydraulics Laboratory

Report MH2809
Figure
12.27

12.27.GRF



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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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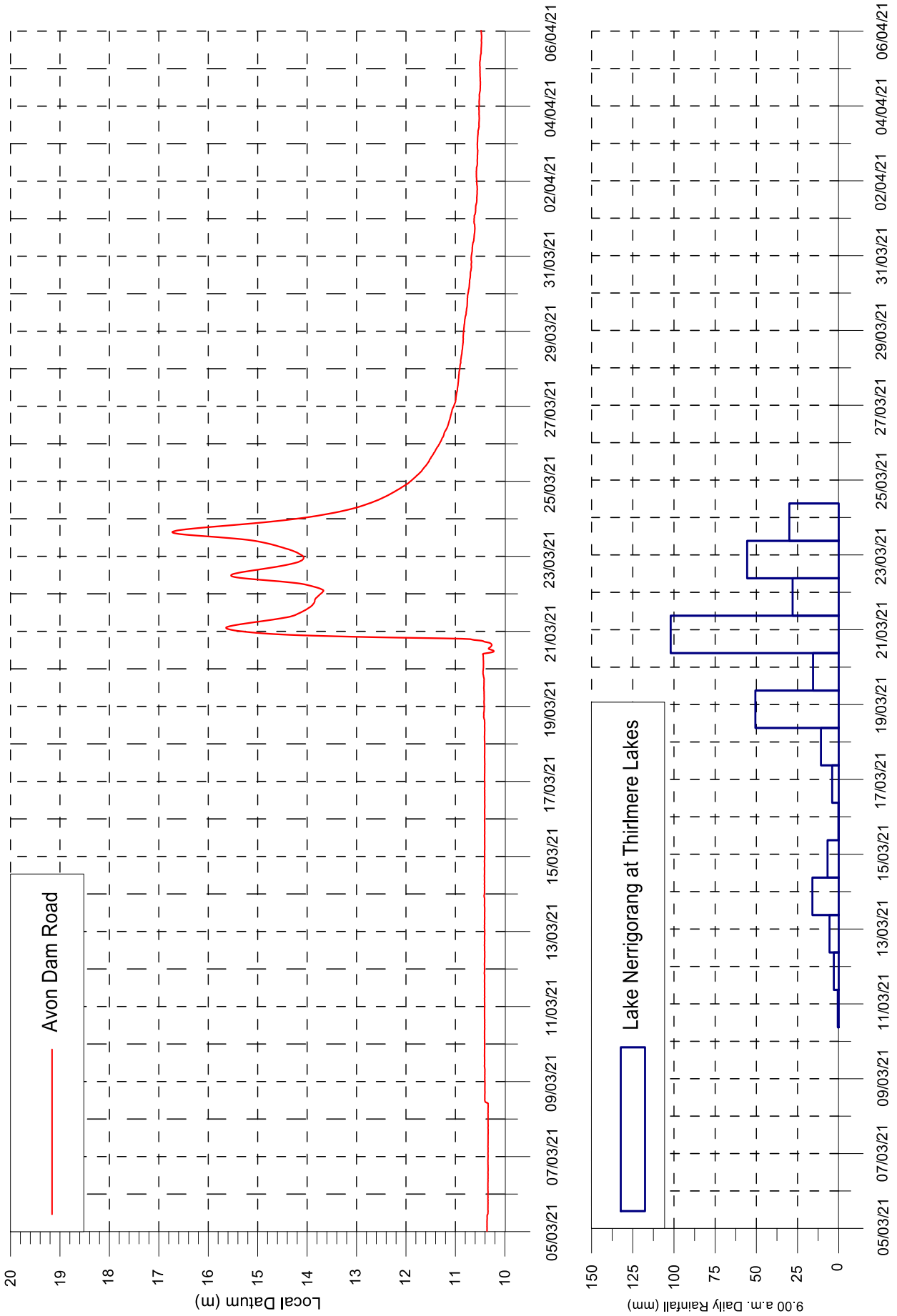
Figure
12.28

12.28.GRF



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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
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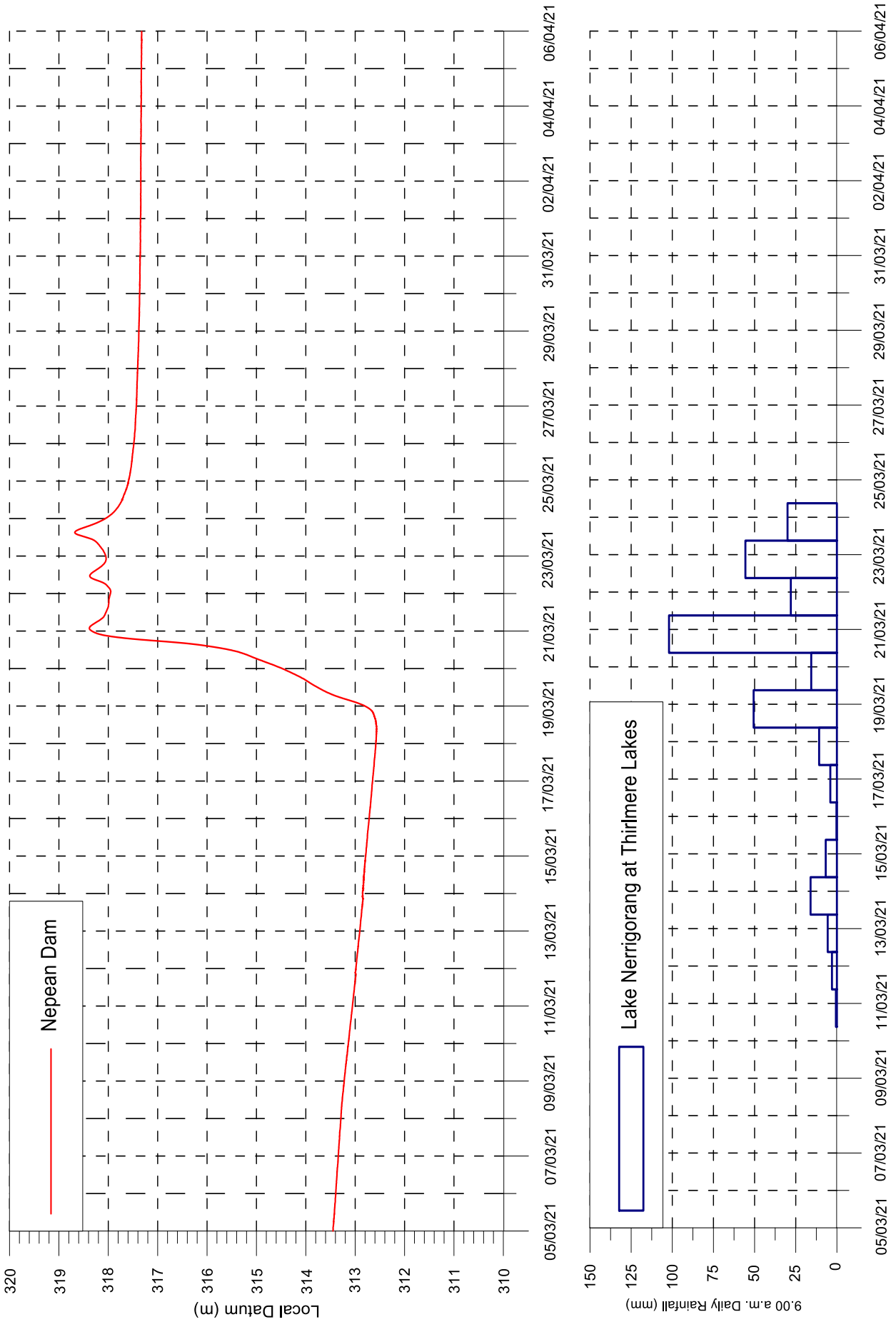
Figure
12.29

12.29.GRF



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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
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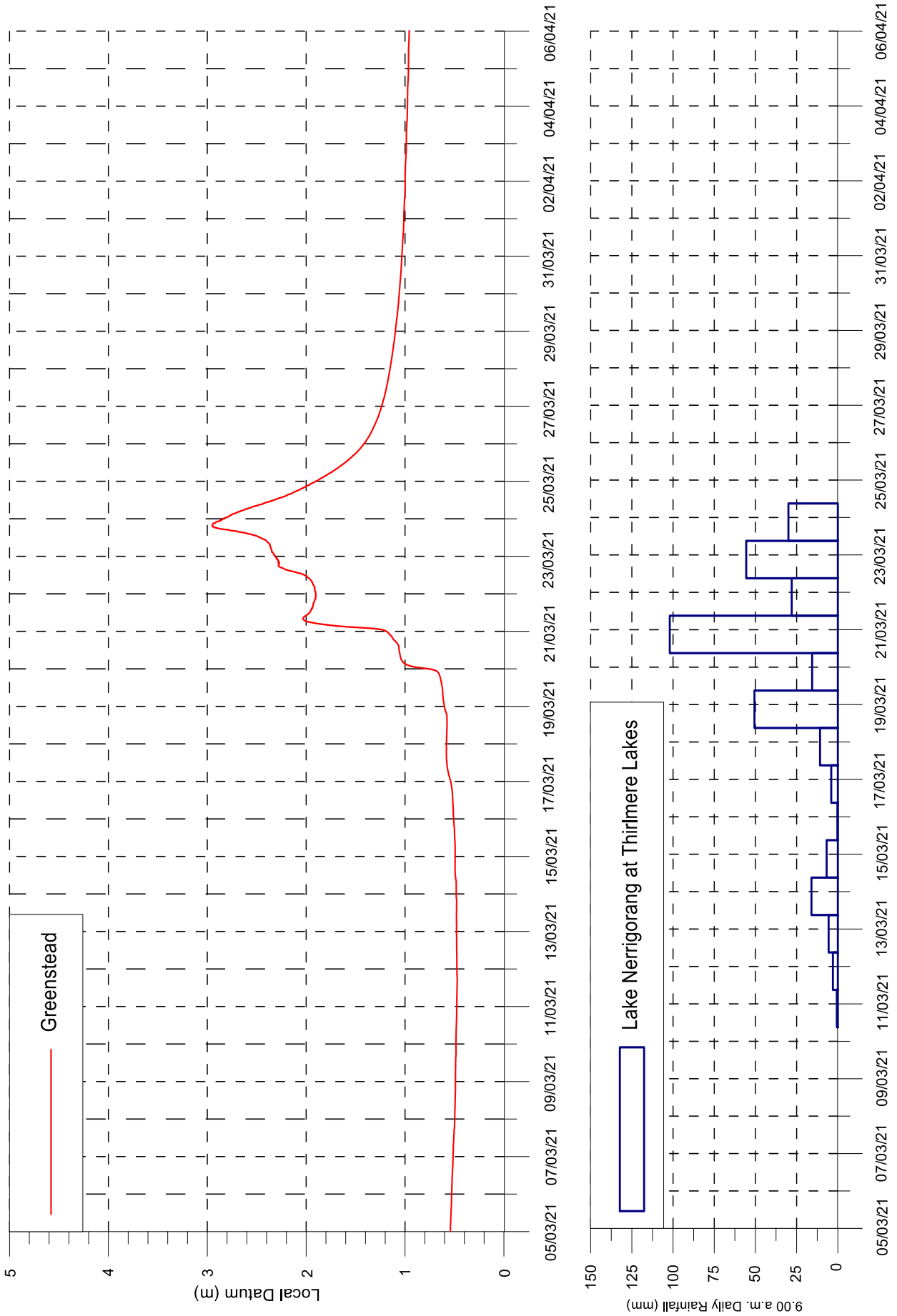
12.30

12.30.GRF



NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

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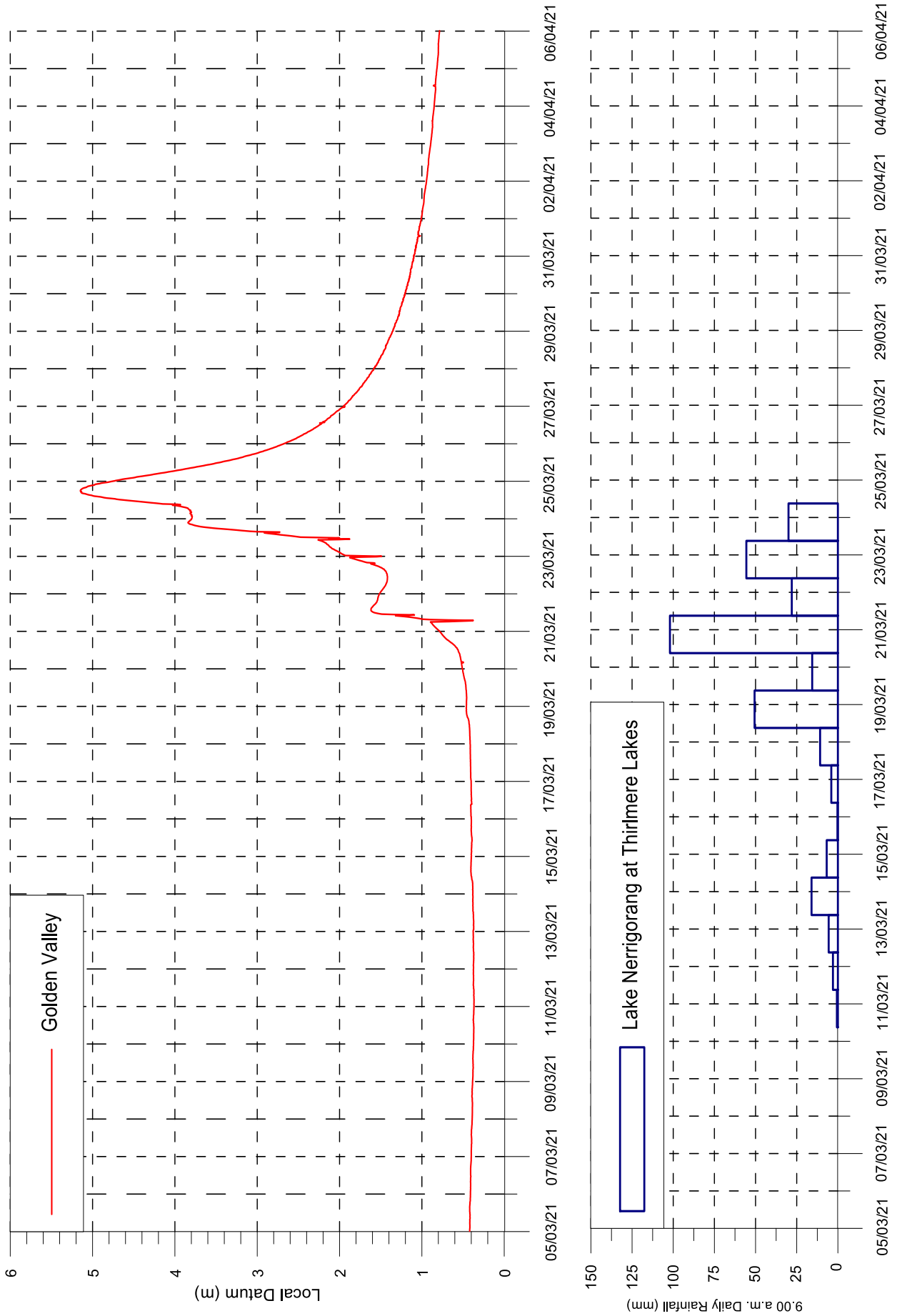
Report MH2809
Figure
12.31

12.31.GRF



NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
5 MARCH – 5 APRIL 2021

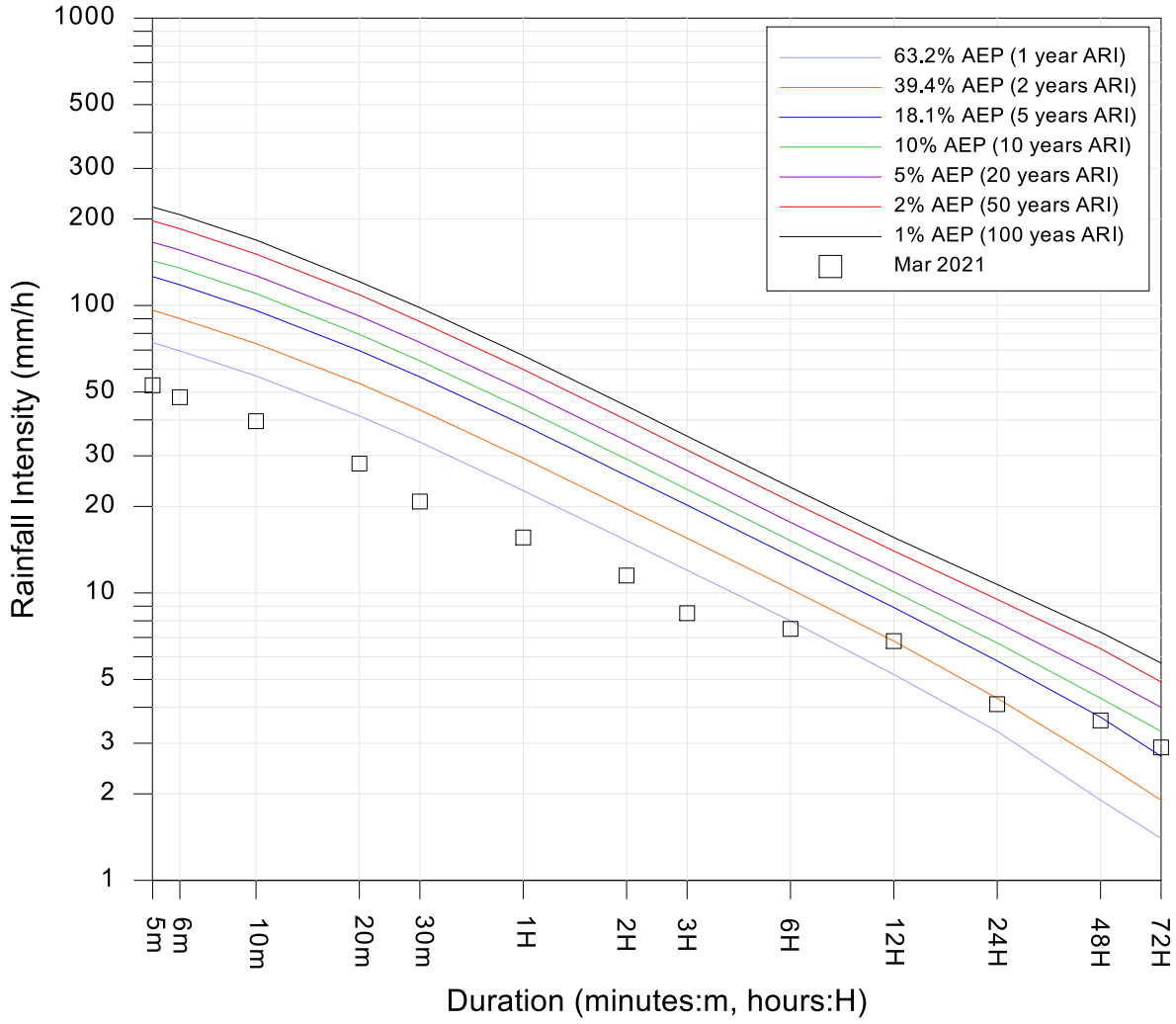
Manly Hydraulics Laboratory

Report MH2809
Figure
12.32

12.32.GRF

Site Owner: DPIE
Latitude: -33.3875 Longitude:150.982

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	52.8	07:05 20 Mar 2021
6m	48	07:04 20 Mar 2021
10m	39.6	00:29 20 Mar 2021
20m	28.2	00:35 20 Mar 2021
30m	20.8	00:45 20 Mar 2021
1H	15.6	01:12 20 Mar 2021
2H	11.5	01:33 20 Mar 2021
3H	8.5	07:15 20 Mar 2021
6H	7.5	05:33 20 Mar 2021
12H	6.8	11:33 20 Mar 2021
24H	4.1	23:33 20 Mar 2021
48H	3.6	23:33 21 Mar 2021
72H	2.9	23:33 22 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

WEBBS CREEK (212408)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

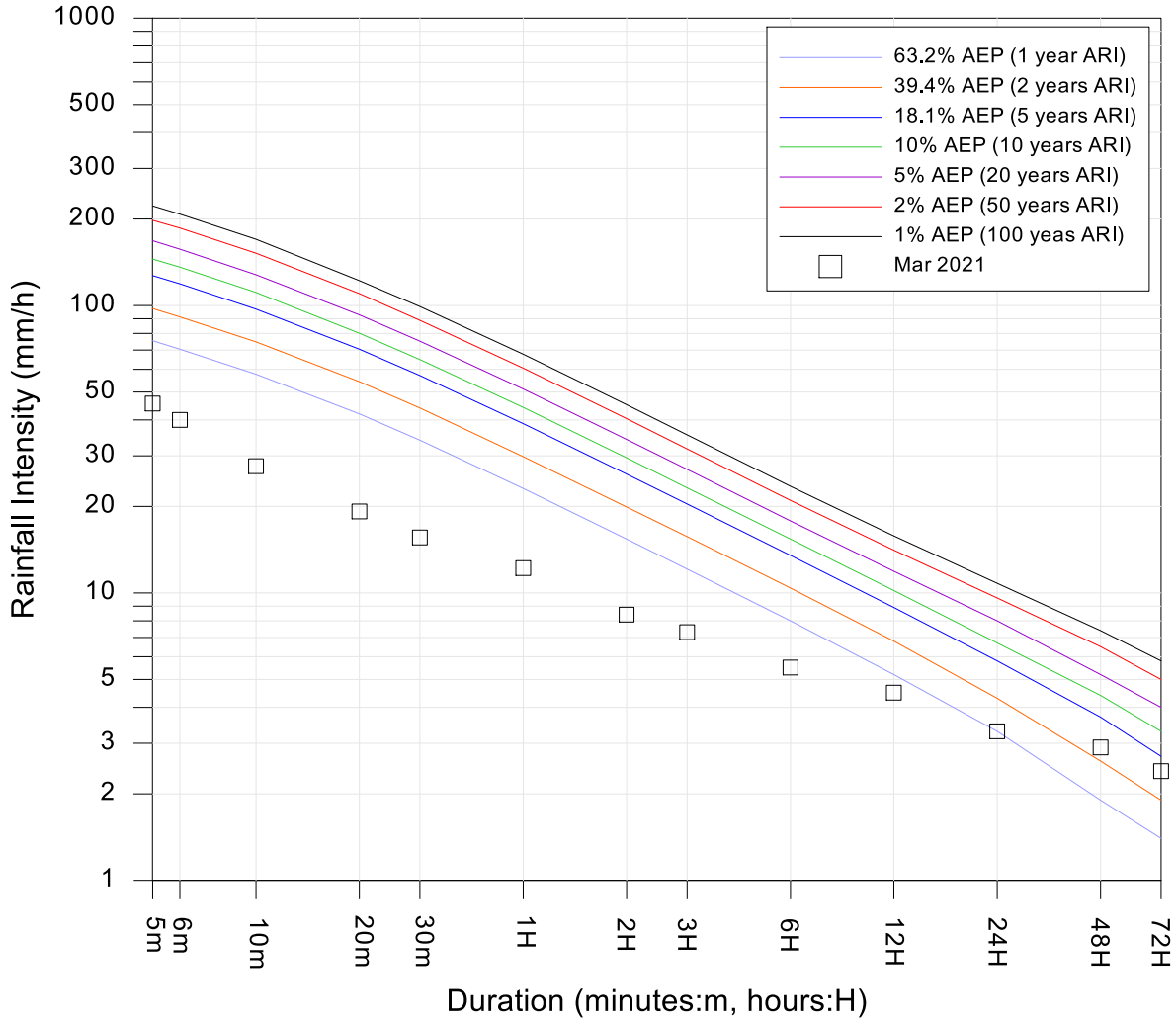
Manly Hydraulics Laboratory

Report MHL2809
Figure
12.33

IFD_212408_Figure 12.33.pdf

Site Owner: DPIE
Latitude: -33.4377 Longitude:150.883

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	45.6	08:50 14 Mar 2021
6m	40	08:51 14 Mar 2021
10m	27.6	08:52 14 Mar 2021
20m	19.2	05:50 20 Mar 2021
30m	15.6	08:01 21 Mar 2021
1H	12.2	08:24 21 Mar 2021
2H	8.4	05:54 20 Mar 2021
3H	7.3	06:20 20 Mar 2021
6H	5.5	06:19 20 Mar 2021
12H	4.5	12:37 20 Mar 2021
24H	3.3	05:17 22 Mar 2021
48H	2.9	00:25 22 Mar 2021
72H	2.4	22:51 22 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

COLO JUNCTION (212407)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

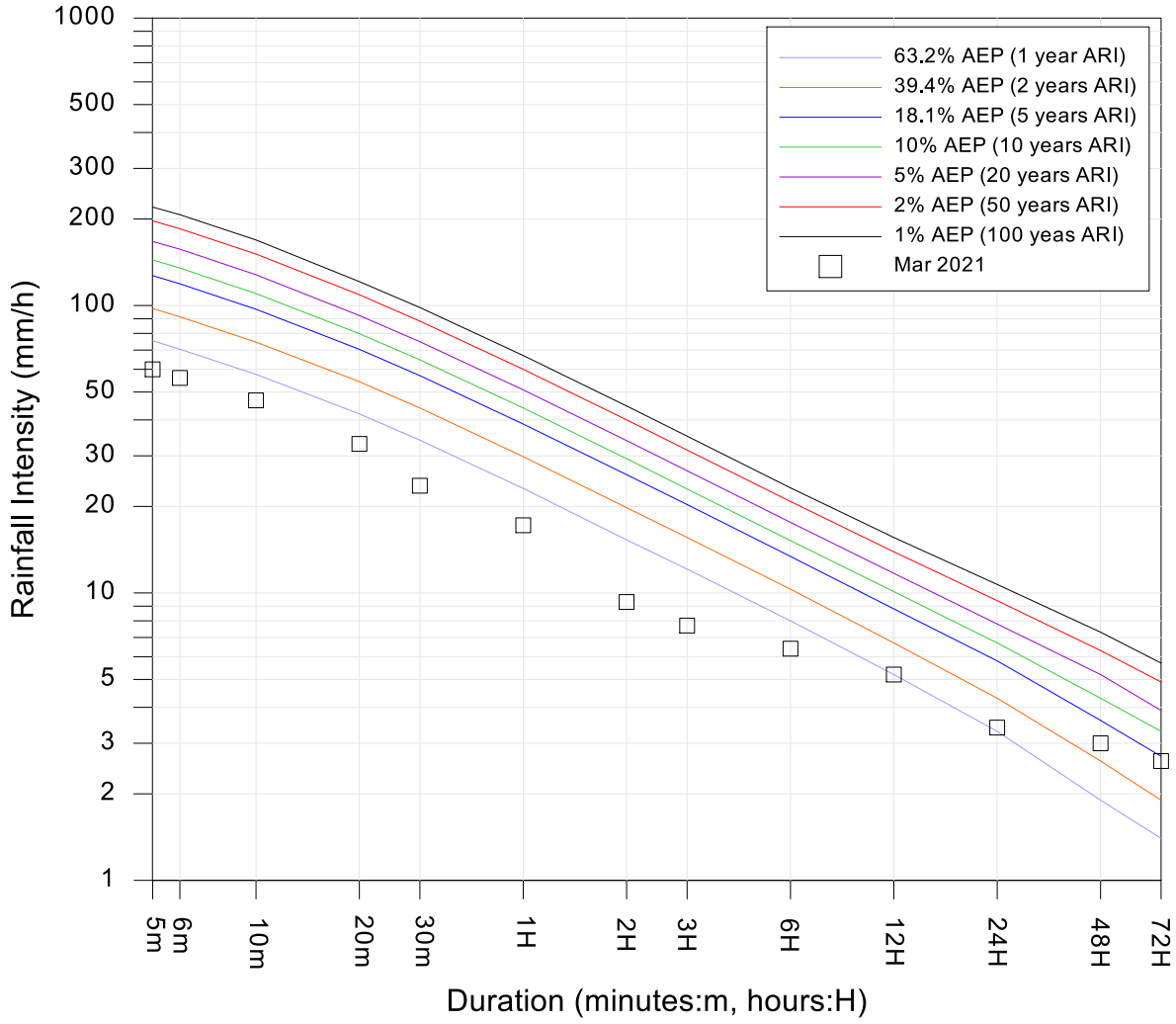
Manly Hydraulics Laboratory

Report MHL2809
Figure
12.34

IFD_212407_Figure 12.34.pdf

Site Owner: DPIE
Latitude: -33.4973 Longitude:150.877

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	60	00:55 20 Mar 2021
6m	56	00:55 20 Mar 2021
10m	46.8	00:55 20 Mar 2021
20m	33	01:01 20 Mar 2021
30m	23.6	01:11 20 Mar 2021
1H	17.2	01:41 20 Mar 2021
2H	9.3	02:24 20 Mar 2021
3H	7.7	03:41 20 Mar 2021
6H	6.4	06:41 20 Mar 2021
12H	5.2	12:41 20 Mar 2021
24H	3.4	23:55 20 Mar 2021
48H	3	00:41 22 Mar 2021
72H	2.6	00:41 23 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

SACKVILLE DOWNSTREAM (212438)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

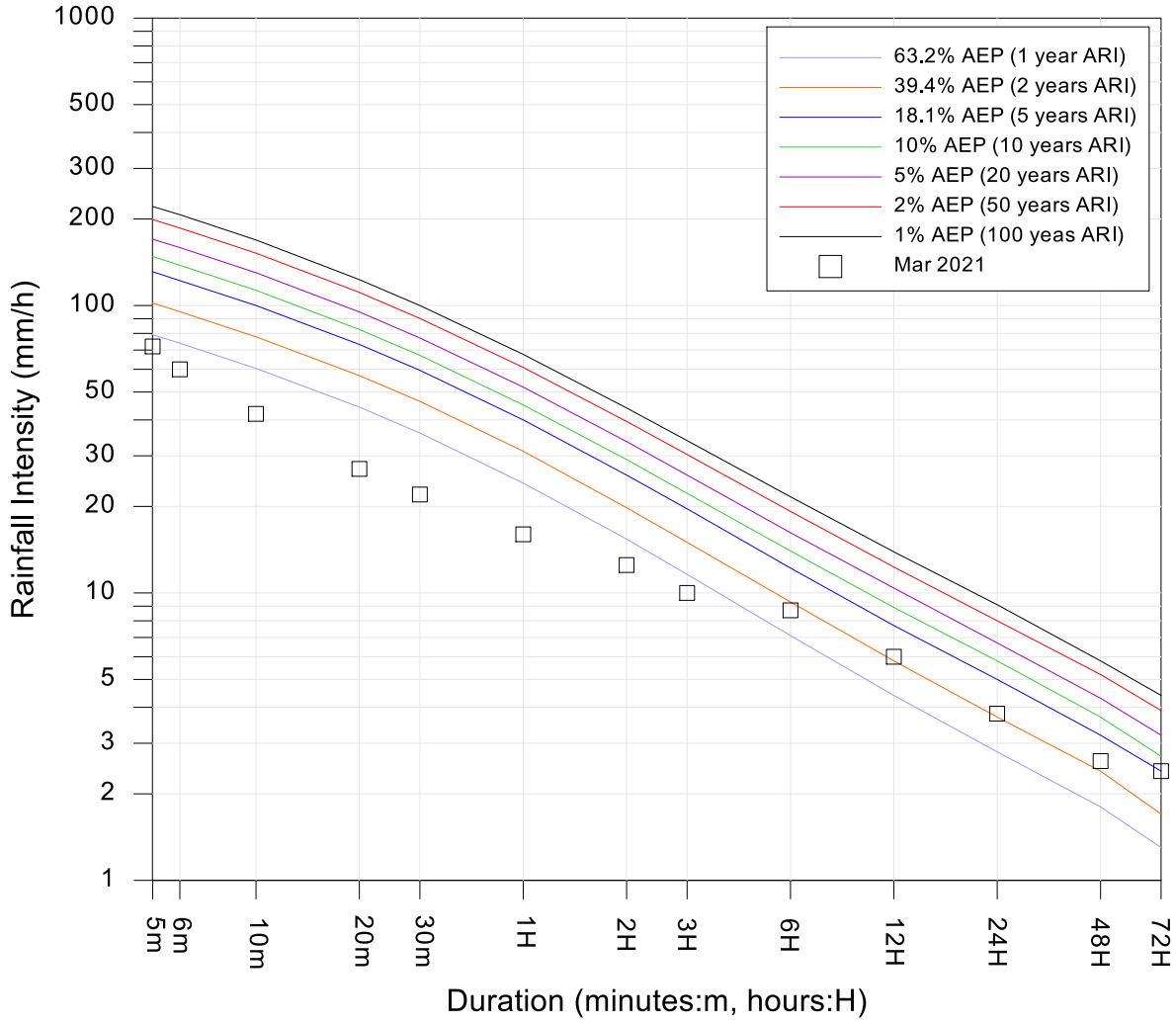
Manly Hydraulics Laboratory

Report MHL2809
Figure
12.35

IFD_212438_Figure 12.35.pdf

Site Owner: BoM
Latitude: -34.118 Longitude:150.744

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	72	17:06 20 Mar 2021
6m	60	17:07 20 Mar 2021
10m	42	17:11 20 Mar 2021
20m	27	11:51 20 Mar 2021
30m	22	12:01 20 Mar 2021
1H	16	12:01 20 Mar 2021
2H	12.5	13:01 20 Mar 2021
3H	10	14:01 20 Mar 2021
6H	8.7	17:12 20 Mar 2021
12H	6	19:41 20 Mar 2021
24H	3.8	04:50 21 Mar 2021
48H	2.6	07:05 22 Mar 2021
72H	2.4	11:01 23 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

MENANGLE BRIDGE (212904)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

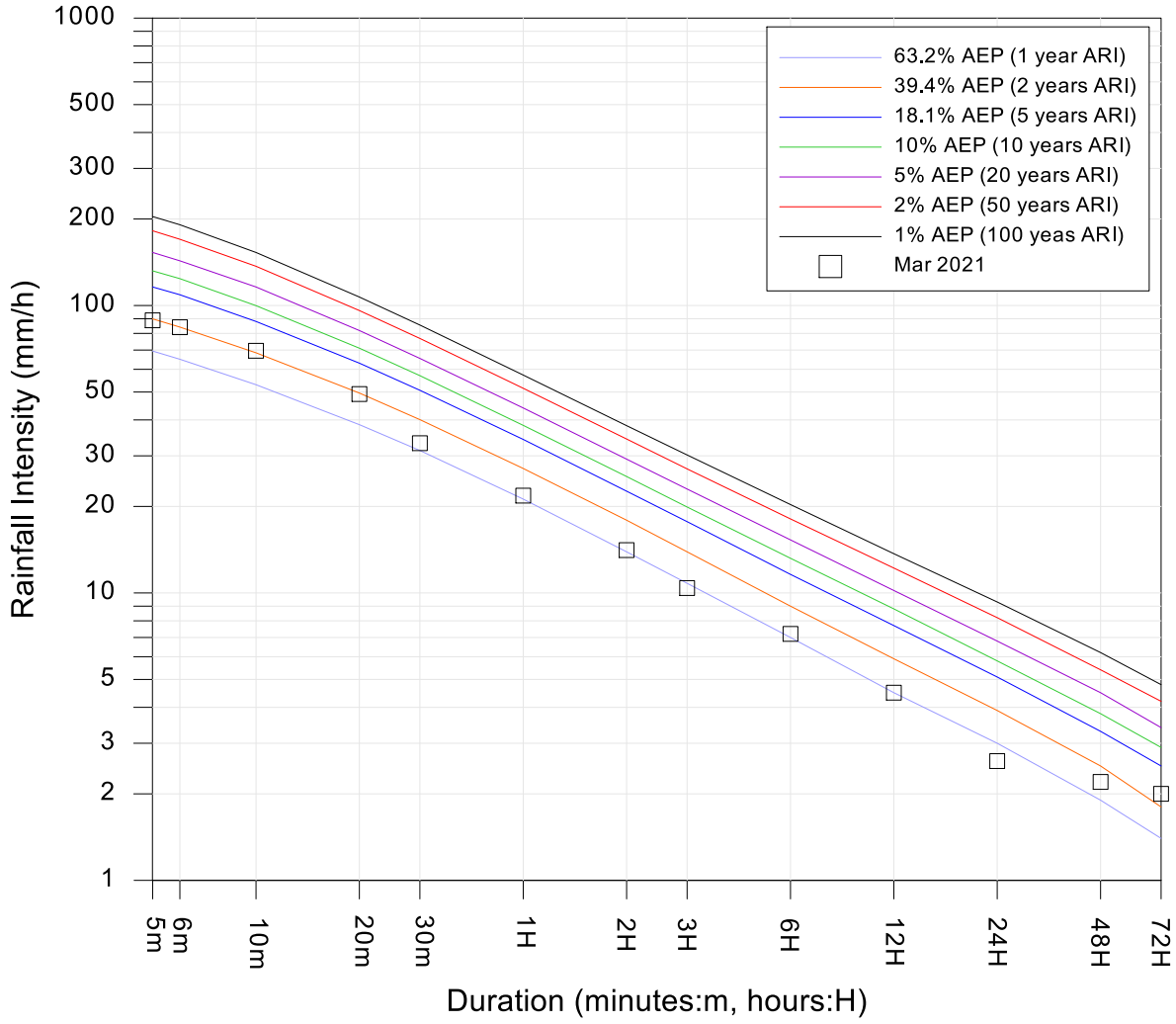
Manly Hydraulics Laboratory

Report MHL2809
Figure
12.36

IFD_212904_Figure 12.36.pdf

Site Owner: WaterNSW
Latitude: -32.8611 Longitude:150.811

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	88.8	17:09 12 Mar 2021
6m	84	17:09 12 Mar 2021
10m	69.6	17:12 12 Mar 2021
20m	49.2	17:17 12 Mar 2021
30m	33.2	17:27 12 Mar 2021
1H	21.8	08:30 14 Mar 2021
2H	14.1	08:48 14 Mar 2021
3H	10.4	09:48 14 Mar 2021
6H	7.2	09:07 14 Mar 2021
12H	4.5	15:07 14 Mar 2021
24H	2.6	09:09 22 Mar 2021
48H	2.2	08:49 23 Mar 2021
72H	2	01:05 23 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

MACDONALD RIVER AT HOWES VALLEY (212021)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

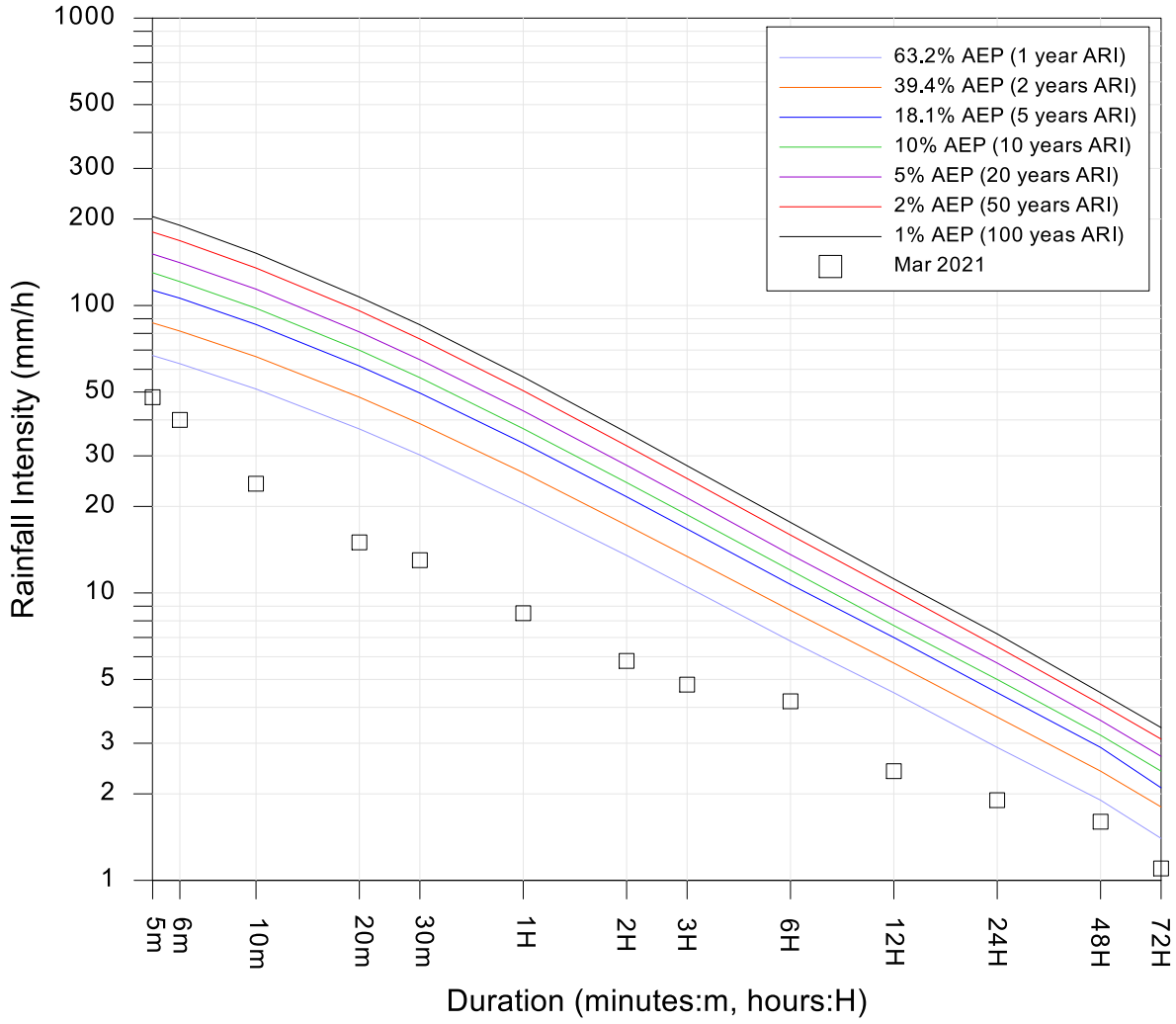
Manly Hydraulics Laboratory

Report MHL2809
Figure
12.37

IFD_212021_Figure 12.37.pdf

Site Owner: WaterNSW
Latitude: -33.121 Longitude:150.281

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	48	01:39 14 Mar 2021
6m	40	01:40 14 Mar 2021
10m	24	01:44 14 Mar 2021
20m	15	01:54 14 Mar 2021
30m	13	02:05 14 Mar 2021
1H	8.5	02:34 14 Mar 2021
2H	5.8	03:34 14 Mar 2021
3H	4.8	07:59 14 Mar 2021
6H	4.2	07:34 14 Mar 2021
12H	2.4	13:34 14 Mar 2021
24H	1.9	02:02 23 Mar 2021
48H	1.6	12:48 23 Mar 2021
72H	1.1	01:29 23 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

CAPERTREE RIVER AT GLEN DAVIS (212018)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

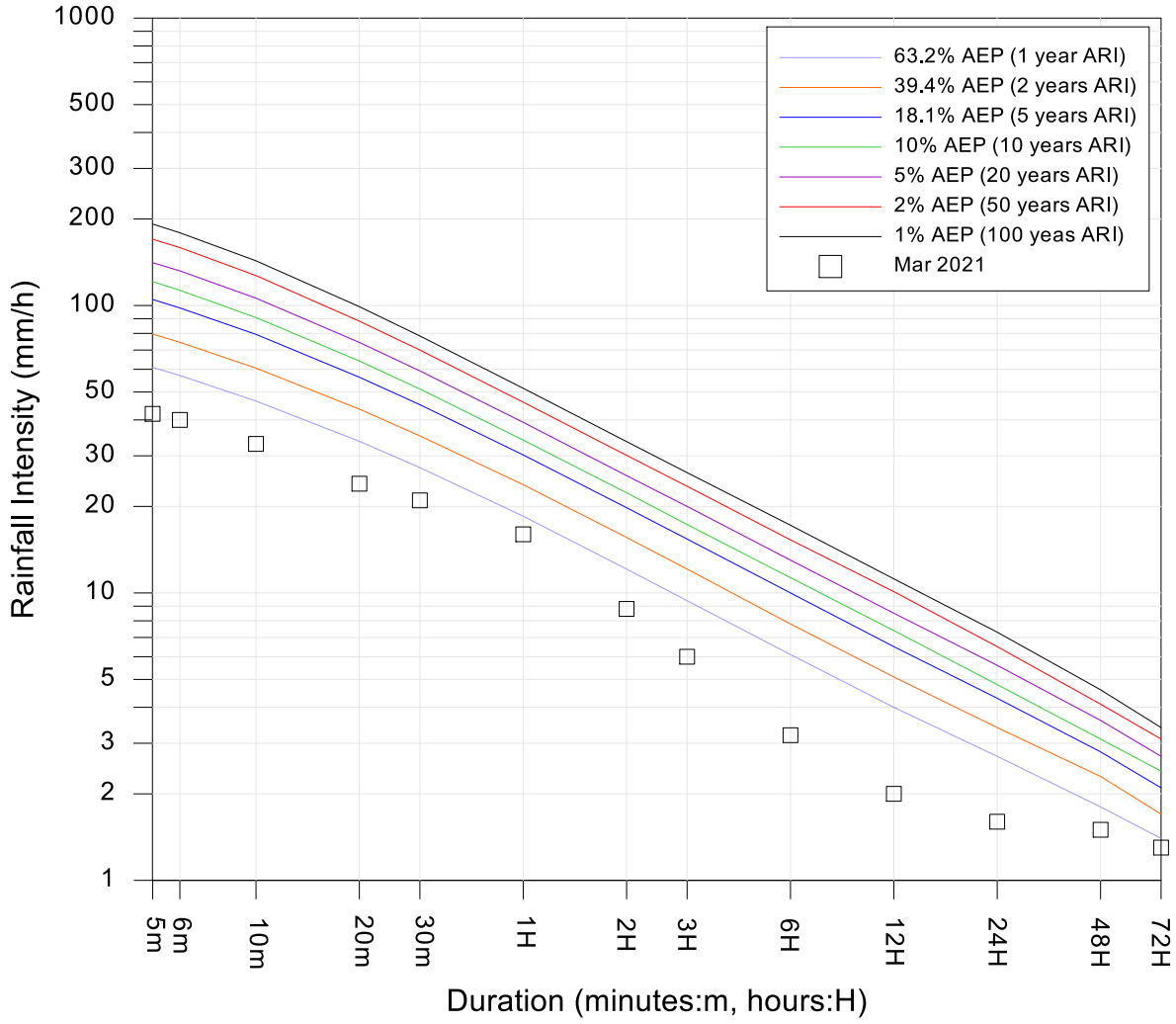
Manly Hydraulics Laboratory

Report MHL2809
Figure
12.38

IFD_212018_Figure 12.38.pdf

Site Owner: WaterNSW
Latitude: -33.4977 Longitude:150.099

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	42	07:52 12 Mar 2021
6m	40	07:51 12 Mar 2021
10m	33	07:54 12 Mar 2021
20m	24	08:05 12 Mar 2021
30m	21	08:05 12 Mar 2021
1H	16	08:11 12 Mar 2021
2H	8.8	09:06 12 Mar 2021
3H	6	10:11 12 Mar 2021
6H	3.2	13:06 12 Mar 2021
12H	2	08:20 12 Mar 2021
24H	1.6	12:36 23 Mar 2021
48H	1.5	08:17 23 Mar 2021
72H	1.3	11:51 23 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

FARMERS CREEK AT MOUNT WALKER (212042)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

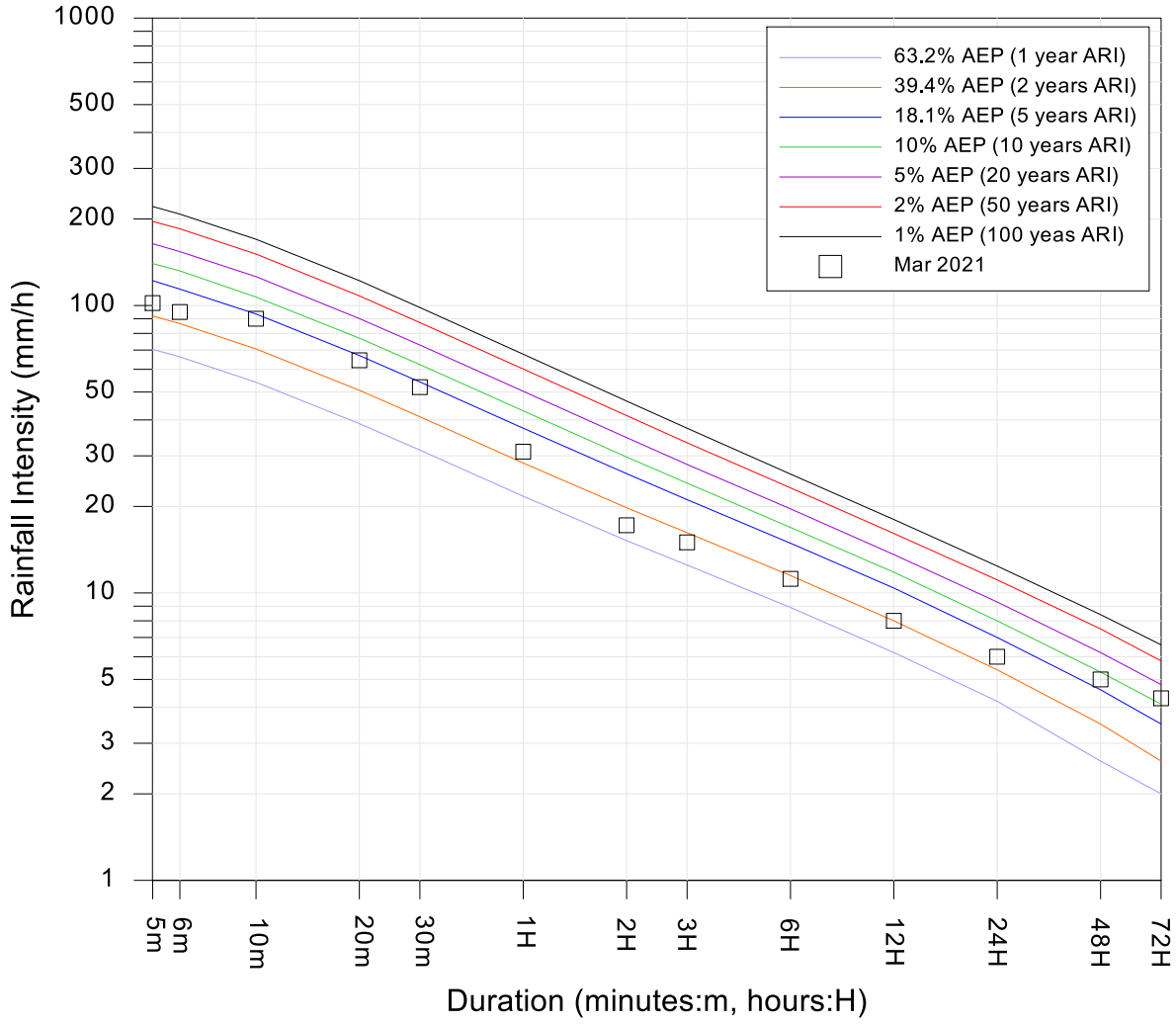
Manly Hydraulics Laboratory

Report MHL2809
Figure
12.39

IFD_212042_Figure 12.39.pdf

Site Owner: WaterNSW
Latitude: -33.6547 Longitude:150.309

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	102	20:22 11 Mar 2021
6m	95	20:23 11 Mar 2021
10m	90	20:25 11 Mar 2021
20m	64.5	20:33 11 Mar 2021
30m	52	20:36 11 Mar 2021
1H	31	20:54 11 Mar 2021
2H	17.2	07:59 21 Mar 2021
3H	15	20:57 11 Mar 2021
6H	11.2	11:55 21 Mar 2021
12H	8	11:47 21 Mar 2021
24H	6	11:49 21 Mar 2021
48H	5	02:23 22 Mar 2021
72H	4.3	02:23 23 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

GREAVES CREEK AT GREAVES CREEK DAM (212285)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

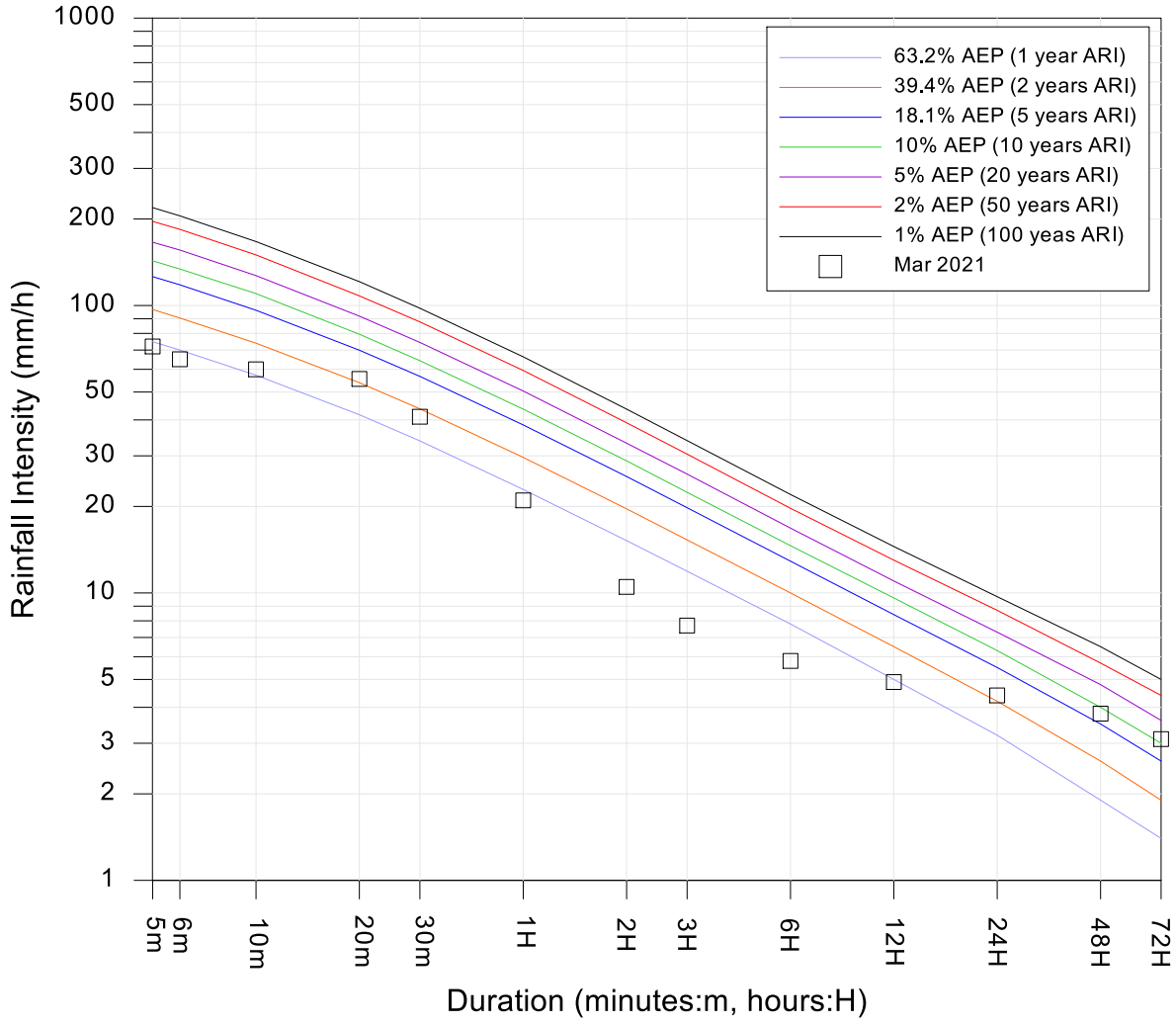
Manly Hydraulics Laboratory

Report MHL2809
Figure
12.40

IFD_212285_Figure 12.40.pdf

Site Owner: WaterNSW
Latitude: -33.7692 Longitude:150.762

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	72	15:27 08 Mar 2021
6m	65	15:39 08 Mar 2021
10m	60	15:32 08 Mar 2021
20m	55.5	15:42 08 Mar 2021
30m	41	15:49 08 Mar 2021
1H	21	16:19 08 Mar 2021
2H	10.5	17:19 08 Mar 2021
3H	7.7	03:13 21 Mar 2021
6H	5.8	13:22 20 Mar 2021
12H	4.9	19:22 20 Mar 2021
24H	4.4	09:30 21 Mar 2021
48H	3.8	02:00 22 Mar 2021
72H	3.1	02:00 23 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

SOUTH CREEK AT GREAT WESTERN HWY (212048)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

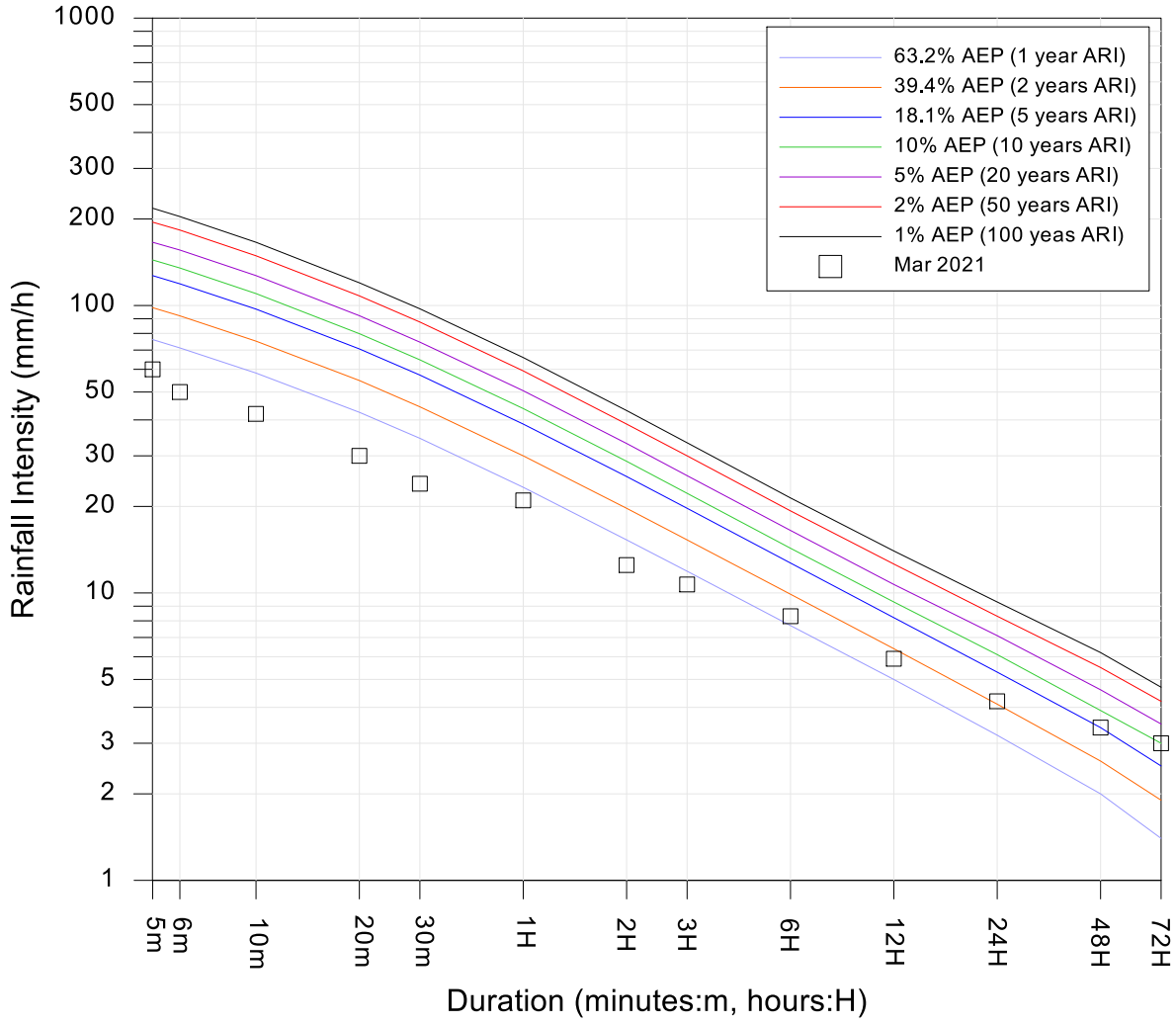
Manly Hydraulics Laboratory

Report MHL2809
Figure
12.41

IFD_212048_Figure 12.41.pdf

Site Owner: WaterNSW
Latitude: -33.8774 Longitude:150.768

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	60	12:48 20 Mar 2021
6m	50	12:49 20 Mar 2021
10m	42	12:53 20 Mar 2021
20m	30	18:50 18 Mar 2021
30m	24	19:09 18 Mar 2021
1H	21	19:18 18 Mar 2021
2H	12.5	20:22 18 Mar 2021
3H	10.7	21:18 18 Mar 2021
6H	8.3	15:42 20 Mar 2021
12H	5.9	17:59 20 Mar 2021
24H	4.2	05:59 21 Mar 2021
48H	3.4	05:59 22 Mar 2021
72H	3	09:42 23 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

SOUTH CREEK AT ELIZABETH DR (212320)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

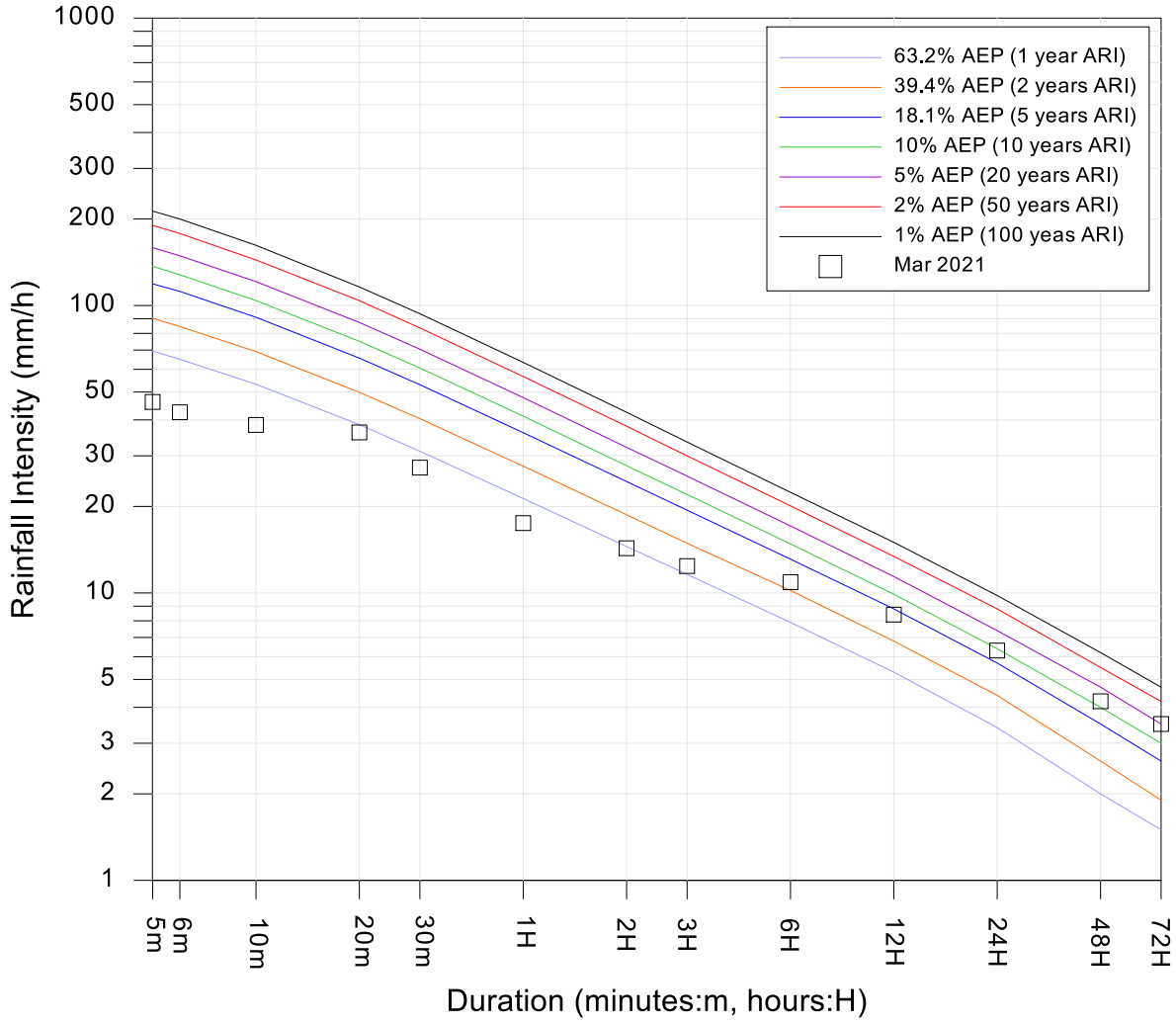
Manly Hydraulics Laboratory

Report MHL2809
Figure
12.42

IFD_212320_Figure 12.42.pdf

Site Owner: WaterNSW
Latitude: -34.1455 Longitude:150.425

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	46.2	13:12 20 Mar 2021
6m	42.5	13:13 20 Mar 2021
10m	38.4	13:26 20 Mar 2021
20m	36.2	13:27 20 Mar 2021
30m	27.3	13:28 20 Mar 2021
1H	17.5	14:07 20 Mar 2021
2H	14.3	17:30 20 Mar 2021
3H	12.4	17:50 20 Mar 2021
6H	10.9	17:57 20 Mar 2021
12H	8.4	20:21 20 Mar 2021
24H	6.3	07:21 21 Mar 2021
48H	4.2	07:18 22 Mar 2021
72H	3.5	10:28 23 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

NATTAI RIVER AT THE CAUSEWAY (568140)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

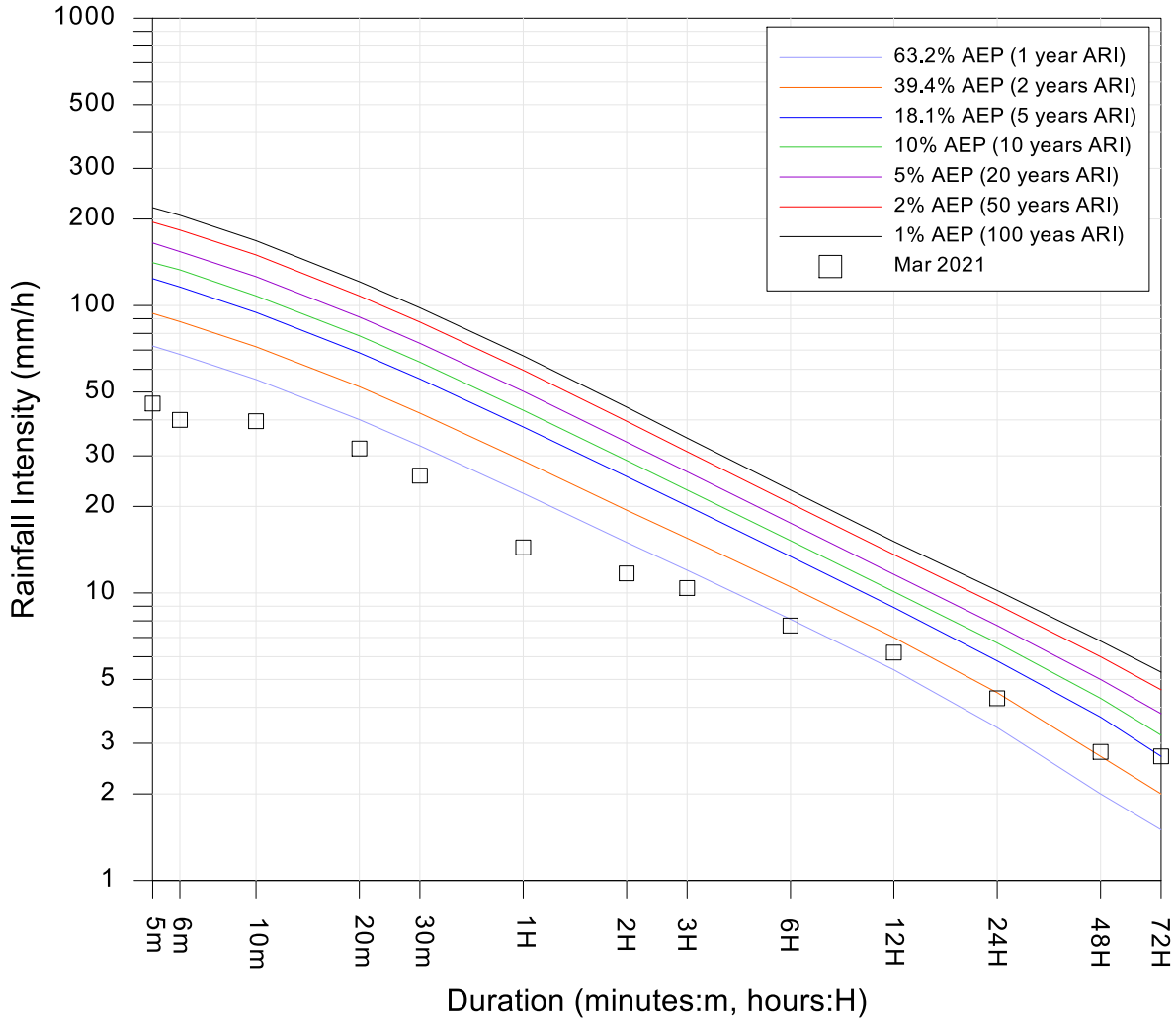
Manly Hydraulics Laboratory

Report MHL2809
Figure
12.43

IFD_568140_Figure 12.43.pdf

Site Owner: WaterNSW
Latitude: -34.2229 Longitude:150.534

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	45.6	17:38 20 Mar 2021
6m	40	17:40 20 Mar 2021
10m	39.6	17:38 20 Mar 2021
20m	31.8	17:48 20 Mar 2021
30m	25.6	17:54 20 Mar 2021
1H	14.4	17:50 20 Mar 2021
2H	11.7	17:50 20 Mar 2021
3H	10.4	17:55 20 Mar 2021
6H	7.7	17:55 20 Mar 2021
12H	6.2	20:42 20 Mar 2021
24H	4.3	08:42 21 Mar 2021
48H	2.8	05:28 22 Mar 2021
72H	2.7	10:22 23 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

LAKE NERRIGORANG AT THIRLMERE LAKES (212063)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

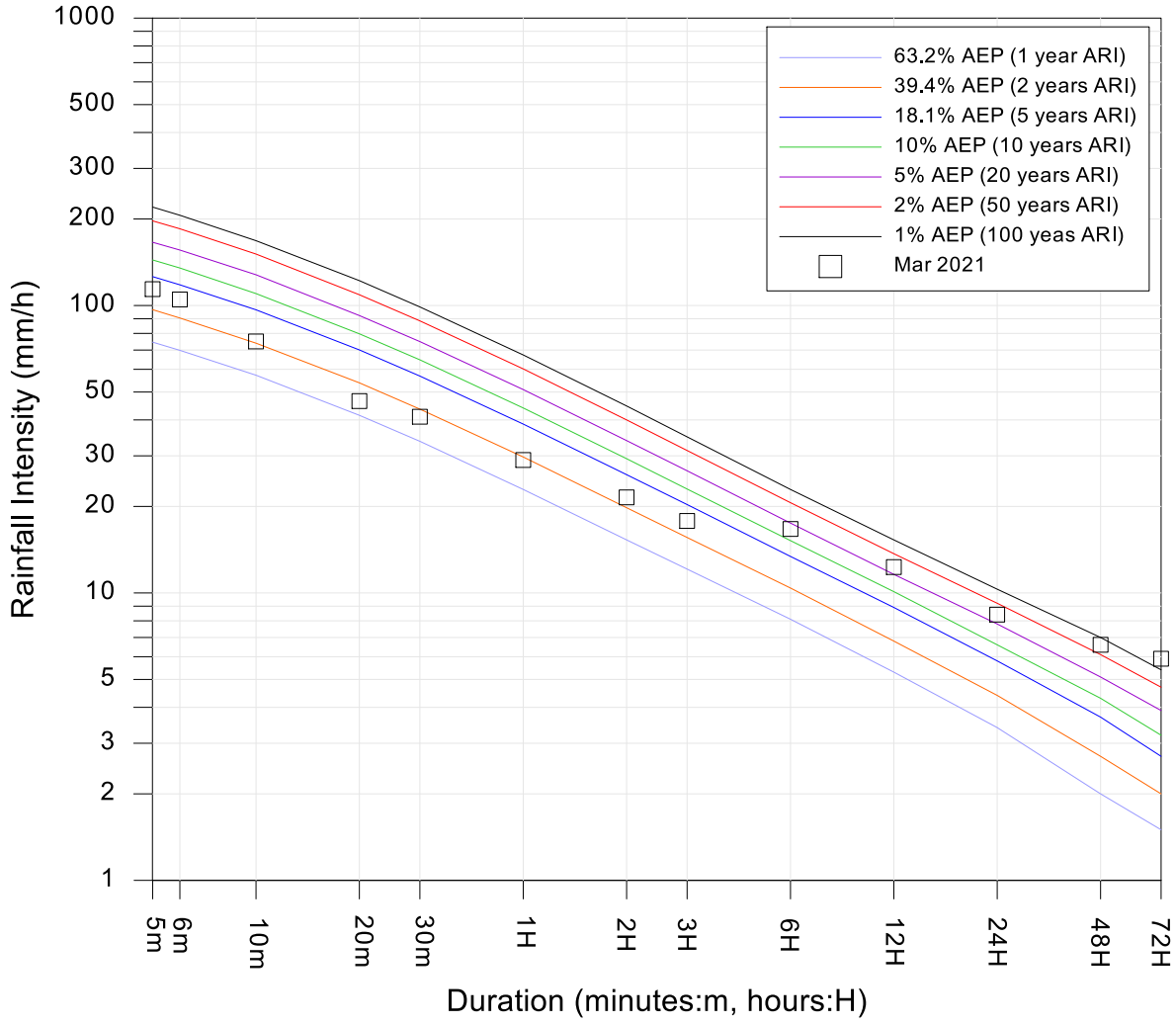
Manly Hydraulics Laboratory

Report MHL2809
Figure
12.44

IFD_212063_Figure 12.44.pdf

Site Owner: WaterNSW
Latitude: -34.1777 Longitude:150.612

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	114	12:09 20 Mar 2021
6m	105	12:10 20 Mar 2021
10m	75	12:12 20 Mar 2021
20m	46.5	12:08 20 Mar 2021
30m	41	12:18 20 Mar 2021
1H	29	12:54 20 Mar 2021
2H	21.5	13:09 20 Mar 2021
3H	17.8	17:38 20 Mar 2021
6H	16.7	17:39 20 Mar 2021
12H	12.3	20:20 20 Mar 2021
24H	8.4	08:20 21 Mar 2021
48H	6.6	07:02 22 Mar 2021
72H	5.9	11:14 23 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

STONEQUARRY CREEK AT PICTON (212053)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

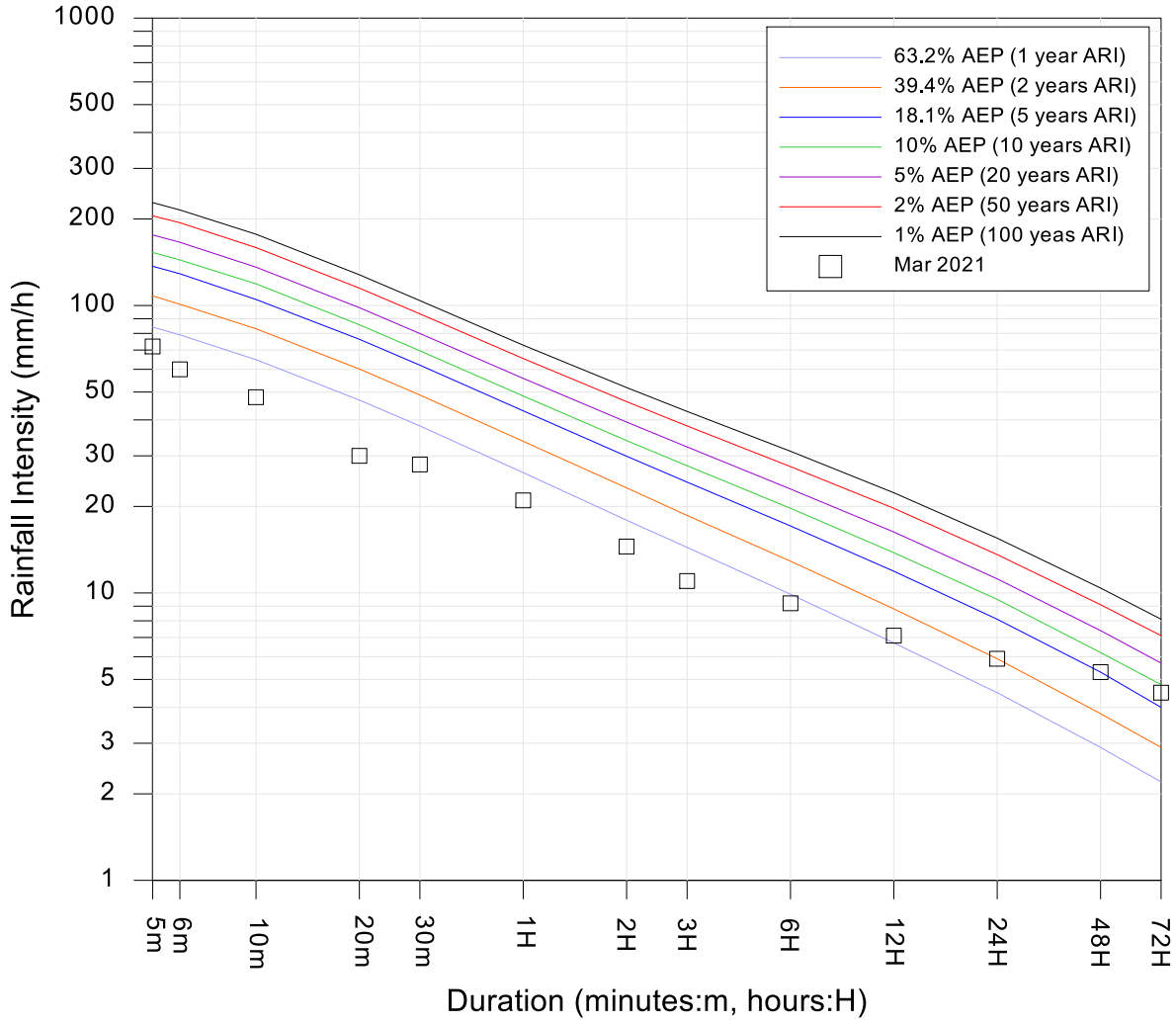
Manly Hydraulics Laboratory

Report MHL2809
Figure
12.45

IFD_212053_Figure 12.45.pdf

Site Owner: BoM
Latitude: -33.499 Longitude:150.518

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	72	19:55 18 Mar 2021
6m	60	19:57 18 Mar 2021
10m	48	19:58 18 Mar 2021
20m	30	10:21 21 Mar 2021
30m	28	10:31 21 Mar 2021
1H	21	10:56 21 Mar 2021
2H	14.5	11:18 21 Mar 2021
3H	11	12:18 21 Mar 2021
6H	9.2	08:21 20 Mar 2021
12H	7.1	21:08 21 Mar 2021
24H	5.9	04:52 22 Mar 2021
48H	5.3	01:56 22 Mar 2021
72H	4.5	01:56 23 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

BILPIN (FERN GROVE) (63118)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

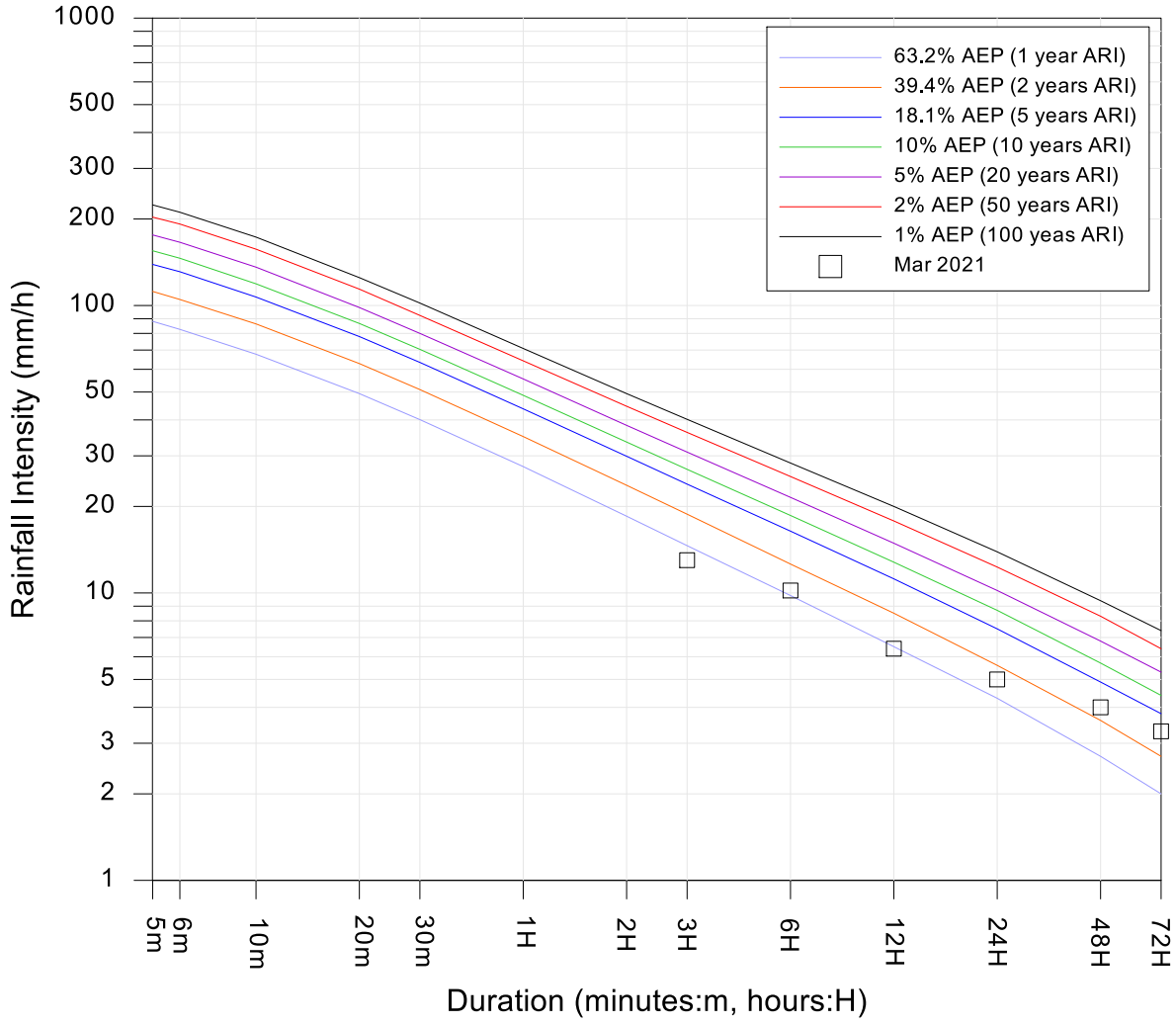
Manly Hydraulics Laboratory

Report MHL2809
Figure
12.46

IFD_63118_Figure 12.46.pdf

Site Owner: BoM
Latitude: -33.696 Longitude:150.536

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	-	-
6m	-	-
10m	-	-
20m	-	-
30m	-	-
1H	-	-
2H	-	-
3H	13	12:26 21 Mar 2021
6H	10.2	11:55 21 Mar 2021
12H	6.4	17:55 21 Mar 2021
24H	5	21:02 21 Mar 2021
48H	4	02:33 22 Mar 2021
72H	3.3	02:21 23 Mar 2021

Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

FAULCONBRIDGE (GREAT WESTERN HWY) (63081)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

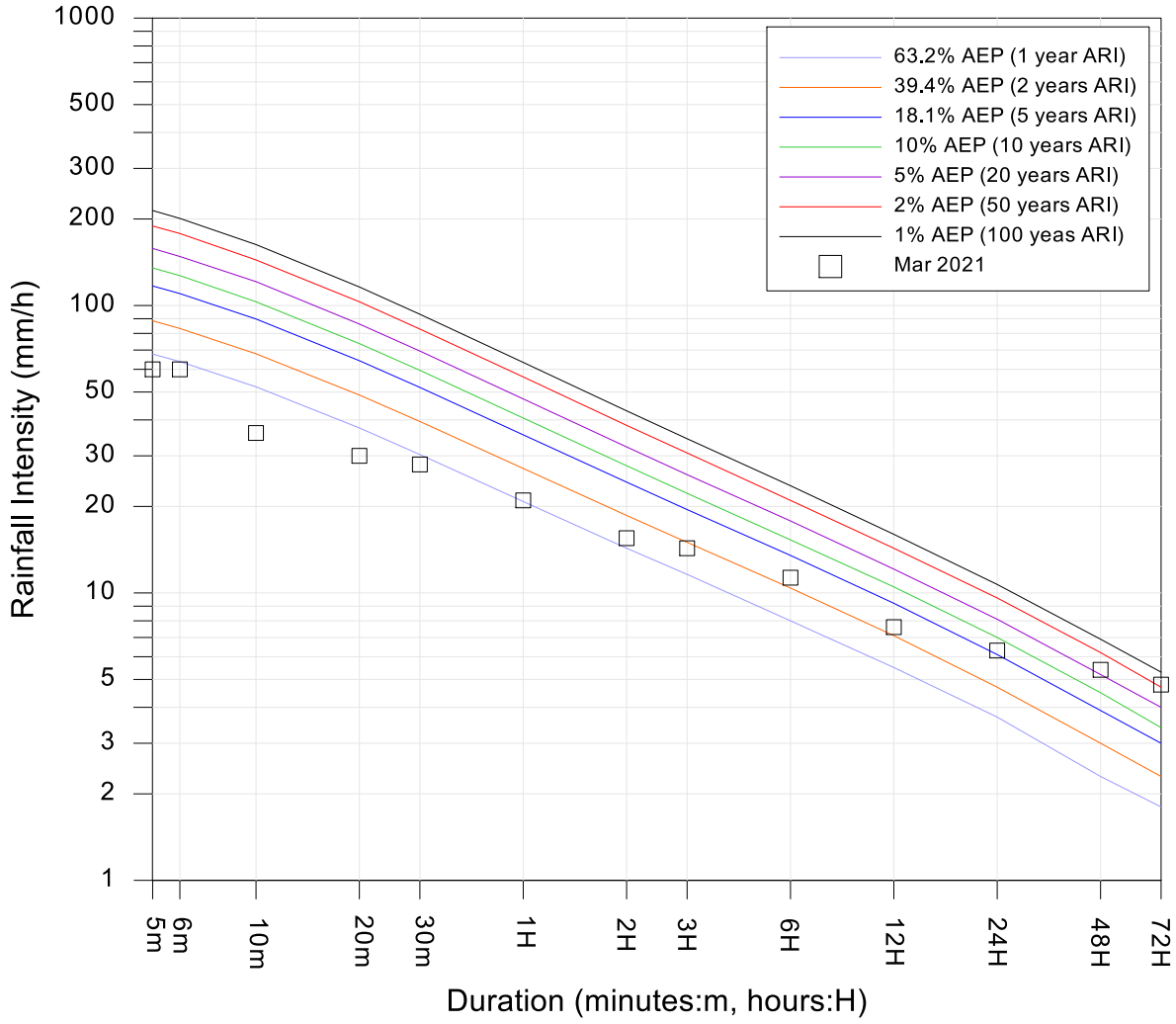
Manly Hydraulics Laboratory

Report MHL2809
Figure
12.47

IFD_63081_Figure 12.47.pdf

Site Owner: BoM
Latitude: -33.63 Longitude:150.28

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	60	23:18 21 Mar 2021
6m	60	01:25 19 Mar 2021
10m	36	23:23 21 Mar 2021
20m	30	03:14 19 Mar 2021
30m	28	03:17 19 Mar 2021
1H	21	07:07 21 Mar 2021
2H	15.5	03:19 19 Mar 2021
3H	14.3	03:23 19 Mar 2021
6H	11.3	03:50 19 Mar 2021
12H	7.6	14:05 21 Mar 2021
24H	6.3	17:53 21 Mar 2021
48H	5.4	02:46 22 Mar 2021
72H	4.8	21:29 21 Mar 2021

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

BLACKHEATH (WOMBAT ST) (63295)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

Manly Hydraulics Laboratory

Report MHL2809
Figure
12.48

IFD_63295_Figure 12.48.pdf

Appendix A Station performance

Appendix A provides an overview of data capture percentages of all stations proposed to be included (with reasons as to why they could not be presented) and those that are presented in this report. In total, stations recorded an average of 98.2% data recovery during the March 2021 flood event.

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Table A.1 Station metadata and performance

Station Name	Station code	Station Type	Owner	Latitude	Longitude	Datum	Data recovery %	Comment
Wave								
Coffs Harbour	COFHOW	Wave height and direction	DPIE	-30.37277778	153.2588889	N/A	100%	
Sydney	SYDDOW	Wave height and direction	DPIE	-33.75722200	151.41166700	N/A	100%	
Clarence River								
Yamba	204454	Water level	DPIE	-29.428958	153.362061	AHD	100%	
Oyster Channel	204451	Water level	DPIE	-29.43069947	153.3141236	AHD	100%	
Palmers Island Bridge	204426	Water level	DPIE	-29.4321194	153.26579	AHD	100%	
Maclean	204410	Water level	DPIE	-29.45602524	153.1959277	AHD	100%	
Lake Wooloweyah	204485	Water level	DPIE	-29.4775694	153.34184	AHD	100%	
Lawrence	204453	Water level	DPIE	-29.49696691	153.1058388	AHD	100%	
Tyndale	204465	Water level	DPIE	-29.56662948	153.1298728	AHD	100%	
Brushgrove	204406	Water level	DPIE	-29.56791583	153.0775117	AHD	100%	
Rogans Bridge	204414	Water level	DPIE	-29.61921949	152.88445	AHD	100%	
Ulmarra	204480	Water level	DPIE	-29.63096744	153.0268175	AHD	100%	
Grafton	204400	Water level	DPIE	-29.69380313	152.9316536	AHD	100%	
The Avenue Downstream	204476	Water level	DPIE	-29.70283404	153.0741623	AHD	100%	
The Avenue Upstream	204475	Water level	DPIE	-29.70298761	153.0739143	AHD	100%	
Yamba Rainfall	462994	Rainfall	Clarence Valley Council	-29.43257806	153.3632878	N/A	100%	
Orara River								
Orara @ Karangi	204025	Water level	WaterNSW	-30.2528	153.0333	Local datum	100%	
Orara @ Bawden Bridge	204041	Water level	WaterNSW	-29.7226	152.8103	Local datum	100%	
Orara @ Orange Grove	204068	Water level	WaterNSW	-30.2579	153.0111	Local datum	100%	
Orara River @ Glenreagh	204906	Water level	WaterNSW	-30.0676	152.986	Local datum	100%	
Coramba (Glenfiddich)	59009	Rainfall	BoM	-30.24	153.02	N/A	100%	
Nana Glen (Cowling Close)	59139	Rainfall	BoM	-30.1	153	N/A	100%	
Glenreagh (Coramba Street)	59054	Rainfall	BoM	-30.05	152.978	N/A	100%	
Lower Bucca	59006	Rainfall	BoM	-30.16	153.1	N/A	100%	
Nambucca River								
Deep Creek	205485	Water level	DPIE	-30.61169246	153.0026395	AHD	100%	
Bowraville Downstream	205425	Water level	DPIE	-30.65435553	152.8618915	AHD	100%	
Bowraville Lanes Bridge	2054193	Water level	Nambucca Shire Council	-30.640147	152.856528	AHD	85.3%	Flood peak missed due to equipment malfunction. Debris survey mark recorded.
Bowraville WTP	559046	Rainfall	BoM	-30.643	152.857	N/A	100%	
Nambucca River (North Arm) U/S Bowraville	205015	Water level	WaterNSW	-30.6288	152.8496	Local Datum	100%	

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Classification: Public

Station Name	Station code	Station Type	Owner	Latitude	Longitude	Datum	Data recovery %	Comment
Stuarts Island Downstream	205466	Water level and rainfall	DPIE	-30.65561091	152.9949795	AHD	100%	
Macksville	205416	Water level	DPIE	-30.70609212	152.920445	AHD	100%	
Utungun	205414	Water level and rainfall	DPIE	-30.72970069	152.8516729	AHD	100%	
Warrell Creek	205490	Water level	DPIE	-30.73217677	152.916287	AHD	100%	
Thumb Creek (Figtree)	59120	Rainfall	BoM	-30.68	152.61	N/A	100%	
Bowra Sugarloaf	59138	Rainfall	BoM	-30.66	152.65	N/A	100%	
Macleay River								
Boringalla Creek	206450	Water level	DPIE	-30.85863586	152.9268164	AHD	100%	
Saltwater Lagoon	206460	Water level	DPIE	-30.88979219	153.0640226	AHD	100%	
South West Rocks	206456	Water level	DPIE	-30.89008662	153.0171383	AHD	100%	
Smithtown	206406	Water level	DPIE	-31.01582554	152.9471977	AHD	100%	
Hat Head	206465	Water level	DPIE	-31.0577814	153.0572486	AHD	100%	
Kempsey	206402	Water level	DPIE	-31.08150296	152.8441786	AHD	100%	
Aldavilla Downstream	206459	Water level and rainfall	DPIE	-31.08253367	152.7831708	AHD	100%	
Macleay River at D/S Georges	206024	Water level	WaterNSW	-30.7517	152.2054	Local datum	100%	
Bellbrook	206019	Water level	Kempsey Shire Council	-30.8198	152.509	Local datum	N/A	Station not functioning due to bushfire damage.
Belmore River Entrance	206405	Water level	Kempsey Shire Council	-31.0339	152.944	Local datum	N/A	Level data during flood period is suspect, station not used in report.
Belmore River U/S Floodgates	206604	Water level	Kempsey Shire Council	-31.0729	152.963	Local datum	N/A	Station decommissioned by KSC.
Seale Road	206601	Water level	Kempsey Shire Council	-31.1086	152.952	Local datum	N/A	Station decommissioned by KSC.
Taylors Arm	59032	Rainfall	Kempsey Shire Council	-30.7794	152.7024	N/A	100%	
Millbank	59131	Rainfall	Kempsey Shire Council	-30.8695	152.629	N/A	100%	
Hastings and Camden Haven River								
Hastings River @ Ellenborough (Kindee Bridge)	207004	Water level and rainfall	WaterNSW	-31.422471	152.471453	Local Datum	100%	
Crescent Head Killick Creek	207452	Water level	DPIE	-31.18741107	152.9759	AHD	100%	
Green Valley	207406	Water level and rainfall	DPIE	-31.27358997	152.8572996	AHD	100%	
Maria River at Mundays Lane	2074127	Water level and rainfall	Port Macquarie Hastings Council	-31.32531600	152.84153500	AHD	100%	
Telegraph Point (WTP)	560064	Water level and rainfall	Port Macquarie Hastings Council	-31.300167	152.712383	Local Datum	45%	Data loss due to inundation of the equipment by flood waters.
Telegraph Point	207415	Water level and rainfall	DPIE	-31.32364594	152.8011608	AHD	93.4%	Station flood data affected by bank collapse. Post flood debris line survey indicated a flood peak of 4.18m AHD.
Settlement Point	207418	Water level	DPIE	-31.40677103	152.9014922	AHD	100%	Station experienced an undermined orifice during the flood event and has been adjusted based on field observations.

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Classification: Public

Station Name	Station code	Station Type	Owner	Latitude	Longitude	Datum	Data recovery %	Comment
Dennis Bridge Downstream	207444	Water level	DPIE	-31.4073788	152.821109	AHD	100%	
Port Macquarie	207420	Water level	DPIE	-31.426825	152.911125	AHD	100%	
Wauchope Railway Bridge	207401	Water level	DPIE	-31.45273433	152.7368233	AHD	100%	
Lake Cathie	207441	Water level	DPIE	-31.54777536	152.854208	AHD	100%	
Logans Crossing	207428	Water level and rainfall	DPIE	-31.61411178	152.6933336	Local Water Resources Datum	100%	
Lakewood	207475	Water level	DPIE	-31.62975	152.7622665	AHD	100%	
West Haven	207437	Water level	DPIE	-31.63711657	152.7960887	AHD	100%	
North Haven	207423	Water level	DPIE	-31.64035842	152.8221303	AHD	100%	
Laurieton	207425	Water level	DPIE	-31.65538195	152.7987807	AHD	100%	
Watson Taylors Lake	207480	Water level	DPIE	-31.71538631	152.7422374	AHD	100%	
Koree Island	207442	Rainfall	Port Macquarie Hastings Council	-31.46111111	152.6791667	AHD	100%	
Long Flat	207904	Rainfall	Port Macquarie Hastings Council	-31.43527778	152.4897222	AHD	100%	
Manning River								
Gloucester River at Gloucester	208020	Water level	WaterNSW	-32.00336601	151.9592203	Local Datum	100%	
Crowdy Head	208471	Water level	DPIE	-31.838706	152.750014	AHD	100%	
Ashlea Bridge Downstream	208436	Water level	DPIE	-31.84372695	152.3011243	Assumed Datum	46.6%	Station failure due to the instrumentation housing being inundated by flood waters.
Harrington	208425	Water level	DPIE	-31.87486801	152.6855163	AHD	100%	
Wingham	208400	Water level	DPIE	-31.87531872	152.3715519	AHD	65.2%	Removed suspect rising trace prior to flood peak when a temporary kink in the gas line formed as the rising flood waters separated a join in the orifice line. Data loss following flood peak was due to damage caused by flood debris.
Croki	208404	Water level	DPIE	-31.87709843	152.5938951	AHD	100%	
Mount George	208440	Water level and rainfall	DPIE	-31.8825741	152.1459771	Local Water Resources Datum	100%	
Dumaresq Island	208430	Water level	DPIE	-31.90064721	152.5170032	AHD	100%	
Taree	208410	Water level	DPIE	-31.91702412	152.4572404	AHD	100%	
Mooral Creek	60165	Rainfall	BoM	-31.664	152.370	N/A	100%	
Killabakh	60147	Rainfall	BoM	-31.736	152.399	N/A	100%	
Taree West	208420	Water level	WaterNSW	-31.9075808	152.4411566	AHD	100%	
Farquhar Inlet	208415	Water level	DPIE	-31.94110371	152.5952538	AHD	100%	
Myall River								
Bulahdelah	209460	Water level and rainfall	DPIE	-32.41391408	152.20708148	AHD	100%	
Bombah Point	209475	Water level	DPIE	-32.50558301	152.30464200	AHD	52.4%	Station failure due to the instrumentation housing being inundated by flood waters.
Cabbage Tree Mountain	60096	Rainfall	BoM	-32.25800000	152.12100000	N/A	100%	
Paterson, Williams and Hunter River								
Williams River at Dungog	210903	Water level	WaterNSW	-32.3946	151.7606	Local Datum	100%	

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Classification: Public

Station Name	Station code	Station Type	Owner	Latitude	Longitude	Datum	Data recovery %	Comment
Williams River at Glen Martin	210010	Water level and rainfall	WaterNSW	-32.5586	151.8043	Local Datum	100%	
Gostwyck	210402	Water level and rainfall	DPIE	-32.56503515	151.6054711	AHD	100%	Gostwyck is an intermittently dry water level monitoring station and was dry prior to the flood event.
Paterson Railway Bridge	210406	Water level	DPIE	-32.59832049	151.6179021	AHD	100%	
Seaham	210462	Water level and rainfall	DPIE	-32.6634134	151.73235	AHD	100%	
Dunmore	210409	Water level	DPIE	-32.68068942	151.6056921	AHD	100%	
Oakhampton Railway Bridge	210475	Water level	DPIE	-32.69517761	151.569082	AHD	100%	
Bolwarra Downstream	210451	Water level	DPIE	-32.70755285	151.5659507	AHD	100%	
Hinton Bridge	210410	Water level	DPIE	-32.71392306	151.6481616	AHD	100%	
McKimms Corner	210455	Water level	DPIE	-32.71954535	151.5935003	AHD	100%	
Morpeth	210430	Water level	DPIE	-32.72396001	151.6296996	AHD	100%	
Green Rocks	210432	Water level	DPIE	-32.72771311	151.69227	AHD	100%	
Belmore Bridge	210458	Water level and rainfall	DPIE	-32.72945799	151.5538726	AHD	100%	
Wallis Creek Downstream	210457	Water level	DPIE	-32.73675711	151.5745435	AHD	100%	
Wallis Creek Upstream	210428	Water level	DPIE	-32.73717853	151.5743233	AHD	100%	
Raymond Terrace	210452	Water level	DPIE	-32.75338218	151.7441767	AHD	100%	
Louth Park	210453	Water level	DPIE	-32.76616031	151.5400313	AHD	100%	
Hexham Bridge	210448	Water level and rainfall	DPIE	-32.81767045	151.6814361	AHD	100%	
Stockton Bridge	210456	Water level	DPIE	-32.88488487	151.7838126	AHD	100%	
Wollombi Brook	210004	Water level	WaterNSW	-32.56900928	151.0281484	Local Datum	100%	
Hawkesbury River and South Creek								
Patonga	212440	Water level	DPIE	-33.550983	151.274619	AHD	100%	
Spencer	212431	Water level	DPIE	-33.45713768	151.1468412	AHD	100%	
Gunderman Caravan Park	212429	Water level	DPIE	-33.44085545	151.057566	AHD	100%	
Wisemans Ferry	212460	Water level	DPIE	-33.3818915	150.9892584	AHD	100%	
Webbs Creek	212408	Water level and rainfall	DPIE	-33.38746021	150.9823365	AHD	100%	
Colo Junction	212407	Water level and rainfall	DPIE	-33.43771295	150.8831666	AHD	100%	
Sackville	212406	Water level	DPIE	-33.49333109	150.8816445	AHD	72.8%	Station failed following flood event due to bank collapse.
Sackville Downstream	212438	Rainfall	DPIE	-33.49727115	150.8768775	N/A	100%	
Ebenezer	212427	Water level	DPIE	-33.54746726	150.8930851	AHD	100%	
Windsor	212426	Water level	DPIE	-33.60492817	150.8184109	AHD	100%	
Freemans Reach	212410	Water level	DPIE	-33.56986748	150.7807423	AHD	100%	
Castlereagh	212404	Water level	DPIE	-33.63435259	150.6765343	AHD	51.9%	Station failed during flood event due to bank slump. Debris survey mark recorded.
Menangle Bridge	212904	Water level and rainfall	BoM	-34.118	150.744	N/A	100%	
Camden Weir	212216	Water level	WaterNSW	-34.047869	150.703806	Local datum	100%	
Wallacia Weir	212202	Water level	WaterNSW	-33.86111111	150.6302778	Local datum	100%	

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Classification: Public

Station Name	Station code	Station Type	Owner	Latitude	Longitude	Datum	Data recovery %	Comment
Penrith	212201	Water level	WaterNSW	-33.74677778	150.6825	Local datum	98.4%	Spike in data during flood event removed.
North Richmond	212200	Water level	WaterNSW	-33.58930125	150.7140311	Local datum	100%	
Avon Dam Road	212204	Water level	WaterNSW	-34.327461	150.630042	Local datum	100%	
Broughtons Pass	212233	Water level	WaterNSW	-34.228931	150.743181	Local datum	100%	
Cataract Dam	212232	Water level	WaterNSW	-34.26558369	150.8035525	Local datum	100%	
Cedar Ford	212260	Water level	WaterNSW	-33.94805556	150.2430556	Local datum	100%	
Golden Valley	212271	Water level	WaterNSW	-34.5491667	150.0819448	Local datum	100%	
Greenstead	212009	Water level	WaterNSW	-34.42472222	150.1913889	Local datum	100%	
Grose River at Burralow	212291	Water level	WaterNSW	-33.61527778	150.6291667	Local datum	100%	
Jooriland	212270	Water level	WaterNSW	-34.22765922	150.2527921	Local datum	100%	
Kelpie Point	212250	Water level	WaterNSW	-33.87124191	150.2540137	Local datum	100%	
Nepean Dam	212205	Water level	WaterNSW	-34.33504622	150.6176662	Local datum	100%	
Pheasants Nest	212203	Water level	WaterNSW	-34.245297	150.667111	Local datum	100%	
St Albans	212228	Water level	Sydney Water	-33.294	150.9727	Local datum	100%	
Upper Colo	212290	Water level	WaterNSW	-33.41833333	150.7252778	Local datum	100%	
Warragamba Dam	212243	Water level	WaterNSW	-33.89111111	150.5911111	Local datum	100%	
Warragamba Weir	212241	Water level	WaterNSW	-33.87694444	150.6063889	Local datum	100%	
Yarramundi	2122001	Water level	WaterNSW	-33.6236111	150.685	Local datum	100%	
Macdonald River at Howes Valley	212021	Rainfall	WaterNSW	-32.861096	150.8105886	N/A	100%	
Capertree River at Glen Davis	212018	Rainfall	WaterNSW	-33.121	150.2806	N/A	100%	
Farmers Creek at Mount Walker	212042	Rainfall	WaterNSW	-33.497674	150.098527	N/A	100%	
Greaves Creek at Greaves Creek Dam	212285	Rainfall	WaterNSW	-33.65472266	150.3088892	N/A	100%	
South Creek at Great Western Hwy	212048	Rainfall	WaterNSW	-33.76923333	150.7615667	N/A	100%	
South Creek at Elizabeth Dr	212320	Rainfall	WaterNSW	-33.87738333	150.7684667	N/A	100%	
Nattai Causeway	568140	Rainfall	WaterNSW	-34.14547799	150.4247248	N/A	100%	
Lake Nerrigorang at Thirlmere Lakes	212063	Rainfall	WaterNSW	-34.22289316	150.5343169	N/A	100%	
Stonequarry Creek at Picton	212053	Rainfall	WaterNSW	-34.1777	150.6124	N/A	100%	
Bilpin (Fern Grove)	63118	Rainfall	BoM	-33.499	150.518	N/A	100%	
Faulconbridge (Great Western Hwy)	63081	Rainfall	BoM	-33.696	150.536	N/A	100%	
Blackheath (Wombat St)	63295	Rainfall	BoM	-33.63	150.28	N/A	100%	
Cattai Creek at Murphys Bridge	212059	Water level	WaterNSW	-33.658933	150.930414	Local datum	100%	
Ropes Creek at Debrincat Ave	212049	Water level	WaterNSW	-33.753217	150.792394	Local datum	100%	

© Crown 2021

Classification: Public

Appendix B Flood photographs March 2021 event

Appendix B provides flood photographs captured during and after the flood event, including debris lines indicating maximum water levels. Photographs are courtesy of MHL staff.

Clarence River at Grafton 15:36 (AEST) 24 March 2021 6.51m AHD

Clarence River at Ulmarra 14: 58 (AEST) 24 March 2021 5.02m AHD

© Crown 2021

Nambucca River at Lanes Bridge Bowraville 09:45 (AEST) 24 March 2021 4.01m AHD

Taylors Arm at Utungun 12:22 (AEST) 24 March 2021 1.50m AHD

© Crown 2021

Hastings River Settlement Point Ferry 16:08 (AEST) 27 March 2021 0.27m AHD

Hastings River at Wauchope 13:00 (AEST) 19 March 2021 4.37m AHD

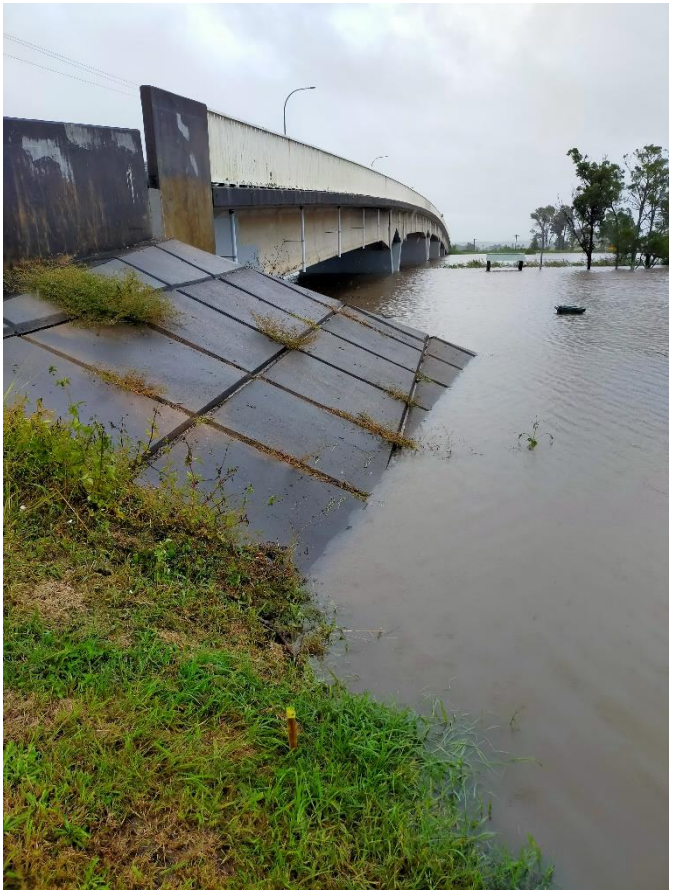
© Crown 2021

Classification: Public

Taree town centre 14:18 (AEST) 20 March 2021 5.58m AHD (Manning River at Taree)

Manning River at Taree West 13:15 (AEST) 20 March 2021 9.57m AHD

© Crown 2021



Williams River at Raymond Terrace 15:15 (AEST) 21 March 2021 2.50m AHD

Williams River at Seaham 10:00 (AEST) 21 March 2021 2.98m AHD

© Crown 2021

Hawkesbury River at Sackville 13:00 (AEST) 26 March 2021 6.54m AHD

Hawkesbury River at Wisemans Ferry 13:00 (AEST) 24 March 2021 3.78m AHD

© Crown 2021

Appendix C 2019 Intensity-frequency-duration

Appendix C displays the rainfall intensities in the ARR2019 format. Refer to **Table C-1** for a reference list of the 2019 intensity-frequency-duration (IFD) curves. Stations are ordered from north to south.

Table C-1 2019 IFD figure reference list

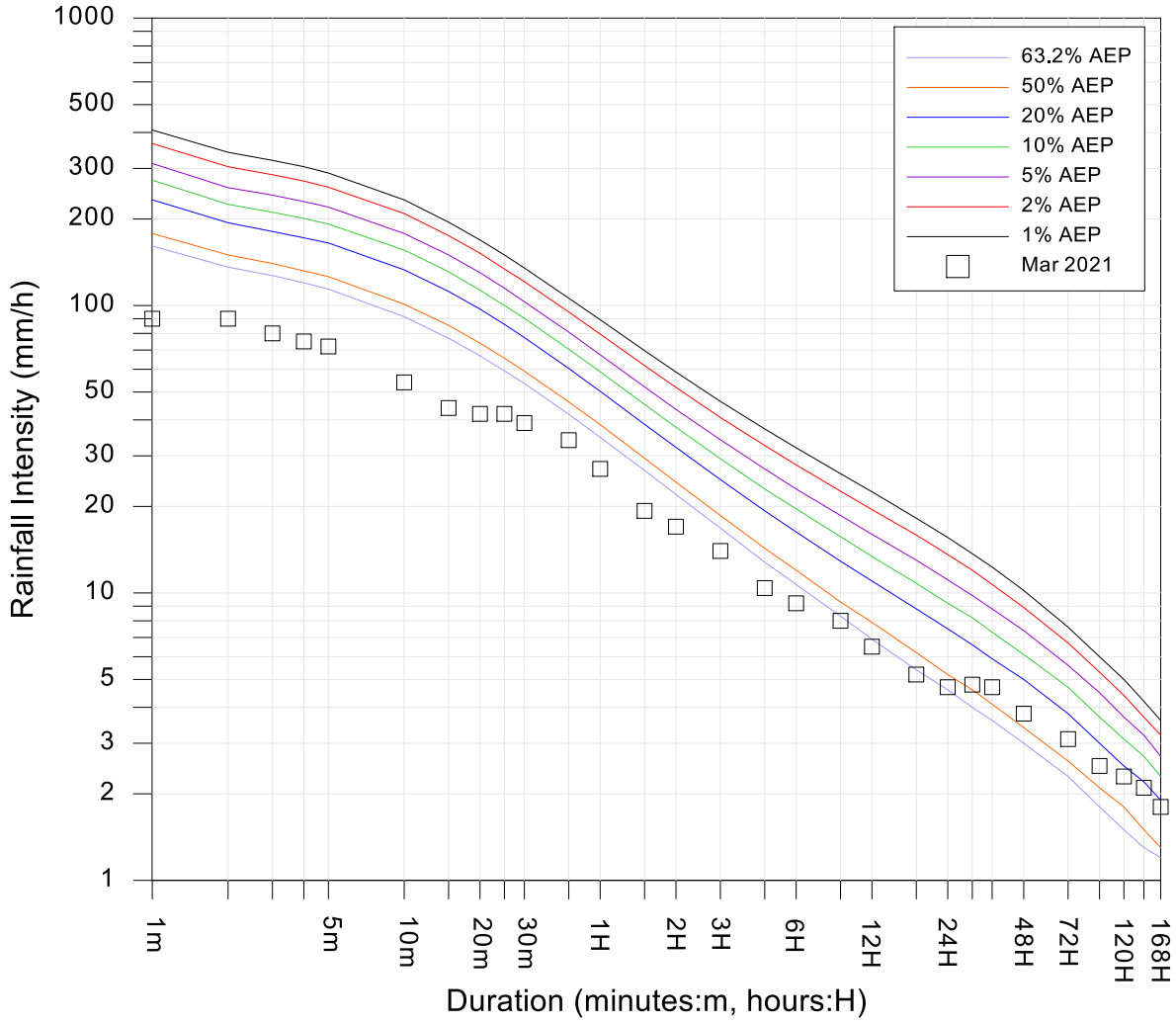
Figure reference	Station	Figure reference	Station
C01	Yamba	C28	Seaham
C02	Coramba (Glenfiddich)	C29	Belmore Bridge
C03	Nana Glen (Cowling Close)	C30	Hexham Bridge
C04	Glenreagh (Coramba Street)	C31	Webbs Creek
C05	Lower Bucca	C32	Colo Junction
C06	Bowraville WTP	C33	Sackville Downstream
C07	Stuarts Island Downstream	C34	Menangle Bridge
C08	Utungun	C35	Macdonald River at Howes Valley
C09	Thumb Creek (Figtree)	C36	Capertree River at Glen Davis
C10	Bowra Sugarloaf	C37	Farmers Creek at Mount Walker
C11	Aldavilla Downstream	C38	Greaves Creek at Greaves Creek Dam
C12	Taylors Arm	C39	South Creek at Great Western Hwy
C13	Millbank	C40	South Creek at Elizabeth Dr
C14	Hastings River @ Ellenborough (Kindee Bridge)	C41	Nattai Causeway
C15	Green Valley	C42	Lake Nerrigorang at Thirlmere Lakes
C16	Maria River at Mundays Lane	C43	Stonequarry Creek at Picton
C17	Telegraph Point	C44	Bilpin (Fern Grove)
C18	Logans Crossing	C45	Faulconbridge (Great Western Hwy
C19	Koree Island	C46	Blackheath (Wombat St)
C20	Long Flat		
C21	Mooral Creek		
C22	Kilabakh		
C23	Mount George		
C24	Bulahdelah		
C25	Cabbage Tree Mountain		
C26	Williams River at Glen Martin		
C27	Gostwyck		

© Crown 2021

Classification: Public

Site Owner: Clarence Valley Council
Latitude: -29.4326 Longitude:153.363

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	90	17:17 01 Apr 2021
2m	90	03:21 21 Mar 2021
3m	80	20:16 14 Mar 2021
4m	75	08:27 11 Mar 2021
5m	72	08:28 11 Mar 2021
10m	54	20:20 14 Mar 2021
15m	44	20:25 14 Mar 2021
20m	42	20:31 14 Mar 2021
25m	42	20:35 14 Mar 2021
30m	39	20:39 14 Mar 2021
45m	34	20:40 14 Mar 2021
1H	27	20:53 14 Mar 2021
1.5H	19.3	21:23 14 Mar 2021
2H	17	05:00 22 Mar 2021
3H	14	05:59 22 Mar 2021
5H	10.4	07:29 22 Mar 2021
6H	9.2	09:08 21 Mar 2021
9H	8	11:59 22 Mar 2021
12H	6.5	11:26 22 Mar 2021
18H	5.2	14:00 22 Mar 2021
24H	4.7	06:34 22 Mar 2021
30H	4.8	09:08 22 Mar 2021
36H	4.7	13:18 22 Mar 2021
48H	3.8	01:18 23 Mar 2021
72H	3.1	01:18 24 Mar 2021
96H	2.5	15:12 23 Mar 2021
120H	2.3	20:53 23 Mar 2021
144H	2.1	20:38 23 Mar 2021
168H	1.8	20:50 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

YAMBA (462994)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

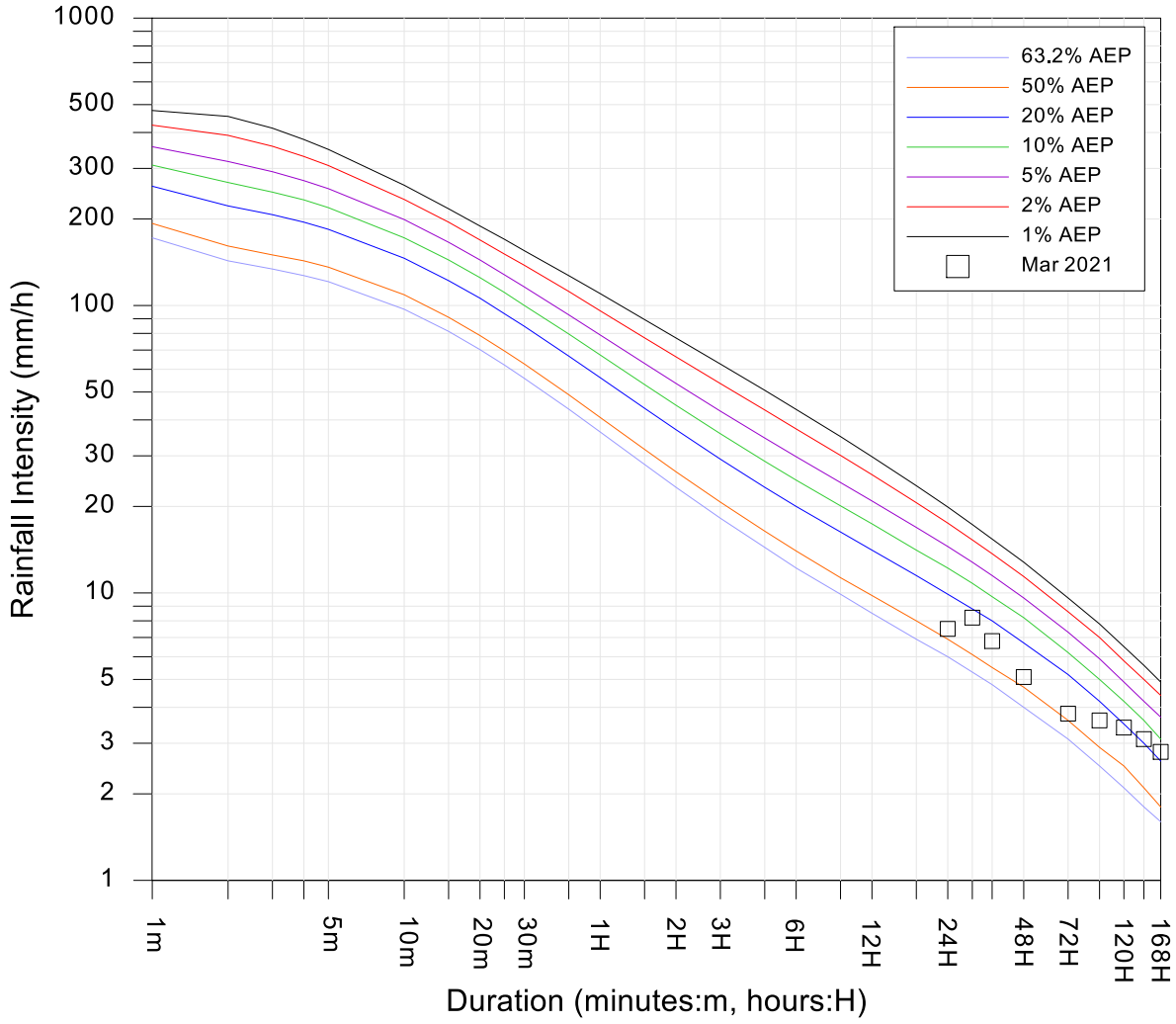
Manly Hydraulics Laboratory

Report MHL2809
Figure
C1

IFD_462994_Figure C1.pdf

Site Owner: BoM
Latitude: -30.24 Longitude:153.02

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	-	-
2m	-	-
3m	-	-
4m	-	-
5m	-	-
10m	-	-
15m	-	-
20m	-	-
25m	-	-
30m	-	-
45m	-	-
1H	-	-
1.5H	-	-
2H	-	-
3H	-	-
5H	-	-
6H	-	-
9H	-	-
12H	-	-
18H	-	-
24H	7.5	23:59 22 Mar 2021
30H	8.2	05:59 23 Mar 2021
36H	6.8	11:59 23 Mar 2021
48H	5.1	23:59 23 Mar 2021
72H	3.8	23:59 24 Mar 2021
96H	3.6	23:59 22 Mar 2021
120H	3.4	23:59 23 Mar 2021
144H	3.1	23:59 23 Mar 2021
168H	2.8	23:59 24 Mar 2021

Rainfall data collected as 24 hour totals only.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

CORAMBA (GLENFIDDICH) (59009)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

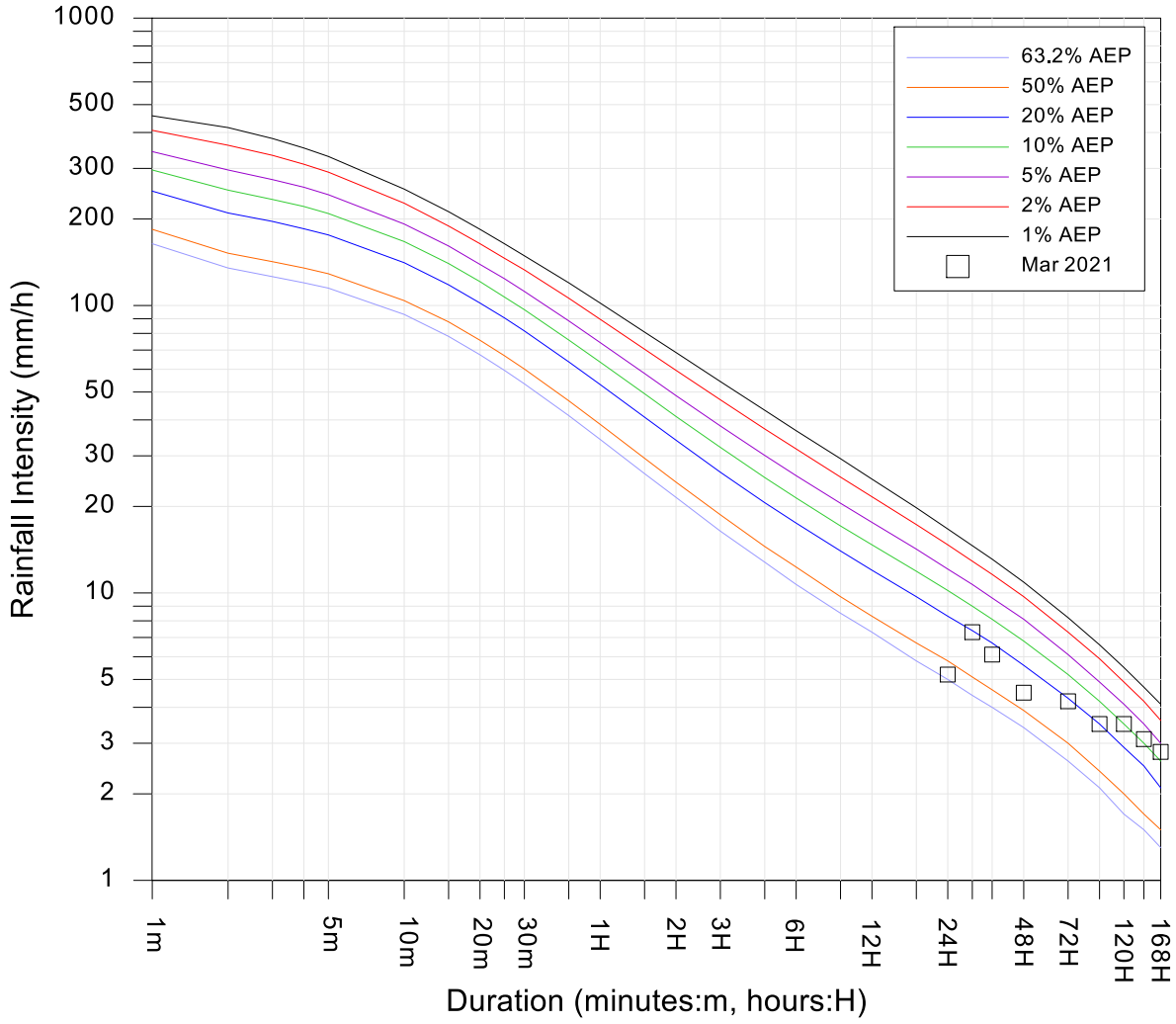
Manly Hydraulics Laboratory

Report MHL2809
Figure
C2

IFD_59009_Figure C2.pdf

Site Owner: BoM
Latitude: -30.1 Longitude:153

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	-	-
2m	-	-
3m	-	-
4m	-	-
5m	-	-
10m	-	-
15m	-	-
20m	-	-
25m	-	-
30m	-	-
45m	-	-
1H	-	-
1.5H	-	-
2H	-	-
3H	-	-
5H	-	-
6H	-	-
9H	-	-
12H	-	-
18H	-	-
24H	5.2	23:59 22 Mar 2021
30H	7.3	05:59 22 Mar 2021
36H	6.1	11:59 22 Mar 2021
48H	4.5	23:59 22 Mar 2021
72H	4.2	23:59 23 Mar 2021
96H	3.5	23:59 23 Mar 2021
120H	3.5	23:59 23 Mar 2021
144H	3.1	23:59 24 Mar 2021
168H	2.8	23:59 24 Mar 2021

Rainfall data collected as 24 hour totals only.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

NANA GLEN (COWLING CLOSE) (59139)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

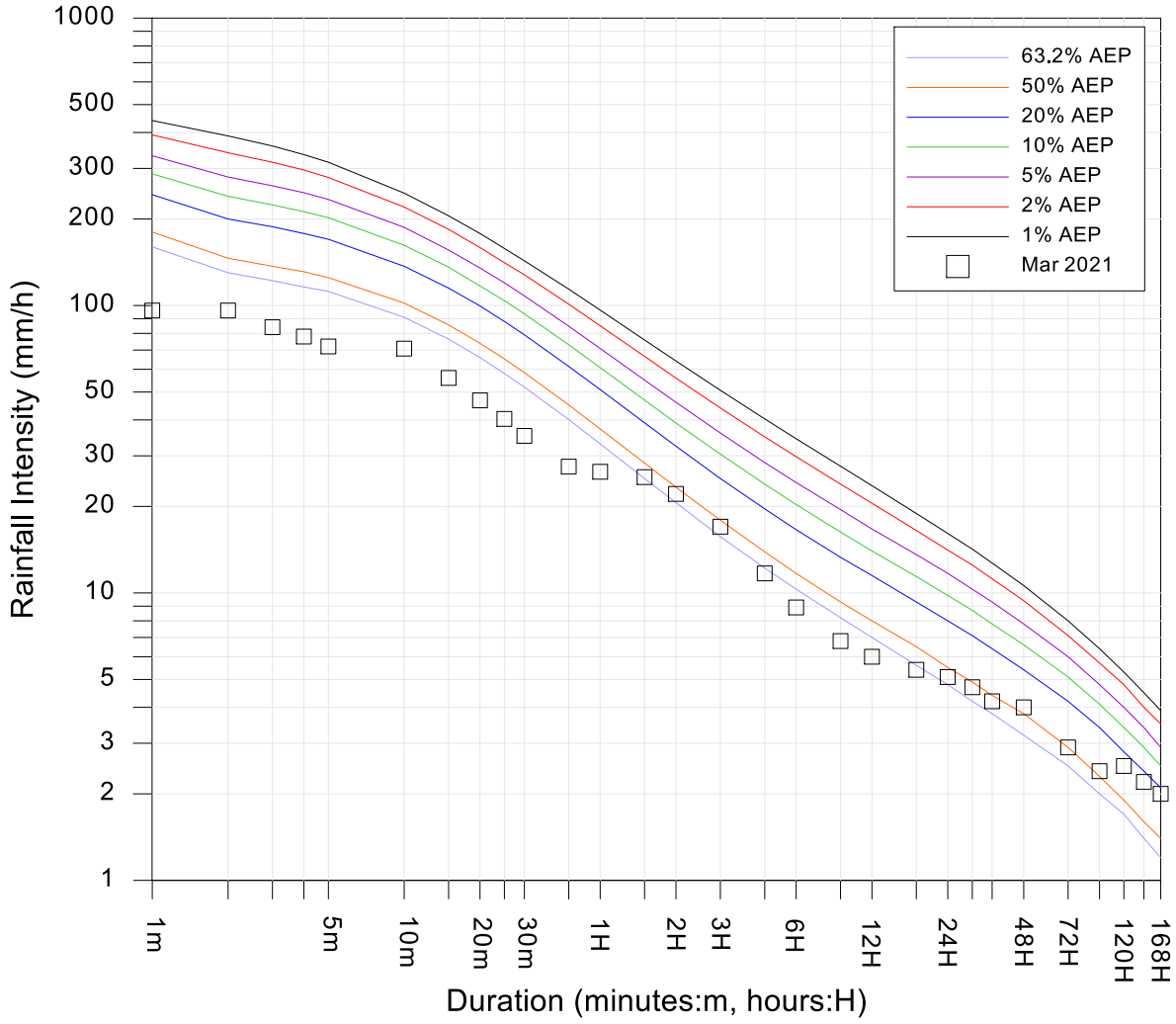
Manly Hydraulics Laboratory

Report MHL2809
Figure
C3

IFD_59139_Figure C3.pdf

Site Owner: BoM
Latitude: -30.05 Longitude:152.978

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	96	16:33 18 Mar 2021
2m	96	16:33 18 Mar 2021
3m	84	16:34 18 Mar 2021
4m	78	16:34 18 Mar 2021
5m	72	16:34 18 Mar 2021
10m	70.8	16:34 18 Mar 2021
15m	56	16:39 18 Mar 2021
20m	46.8	16:40 18 Mar 2021
25m	40.3	16:42 18 Mar 2021
30m	35.2	16:39 18 Mar 2021
45m	27.5	16:43 18 Mar 2021
1H	26.4	17:20 18 Mar 2021
1.5H	25.3	17:50 18 Mar 2021
2H	22.1	18:02 18 Mar 2021
3H	17	18:34 18 Mar 2021
5H	11.7	19:46 18 Mar 2021
6H	8.9	20:28 18 Mar 2021
9H	6.8	02:44 22 Mar 2021
12H	6	05:33 22 Mar 2021
18H	5.4	11:33 22 Mar 2021
24H	5.1	17:33 22 Mar 2021
30H	4.7	20:37 22 Mar 2021
36H	4.2	23:44 22 Mar 2021
48H	4	14:37 23 Mar 2021
72H	2.9	15:51 23 Mar 2021
96H	2.4	15:58 22 Mar 2021
120H	2.5	15:34 23 Mar 2021
144H	2.2	21:26 23 Mar 2021
168H	2	00:26 24 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

GLENREAGH (CORAMBA STREET) (59054)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

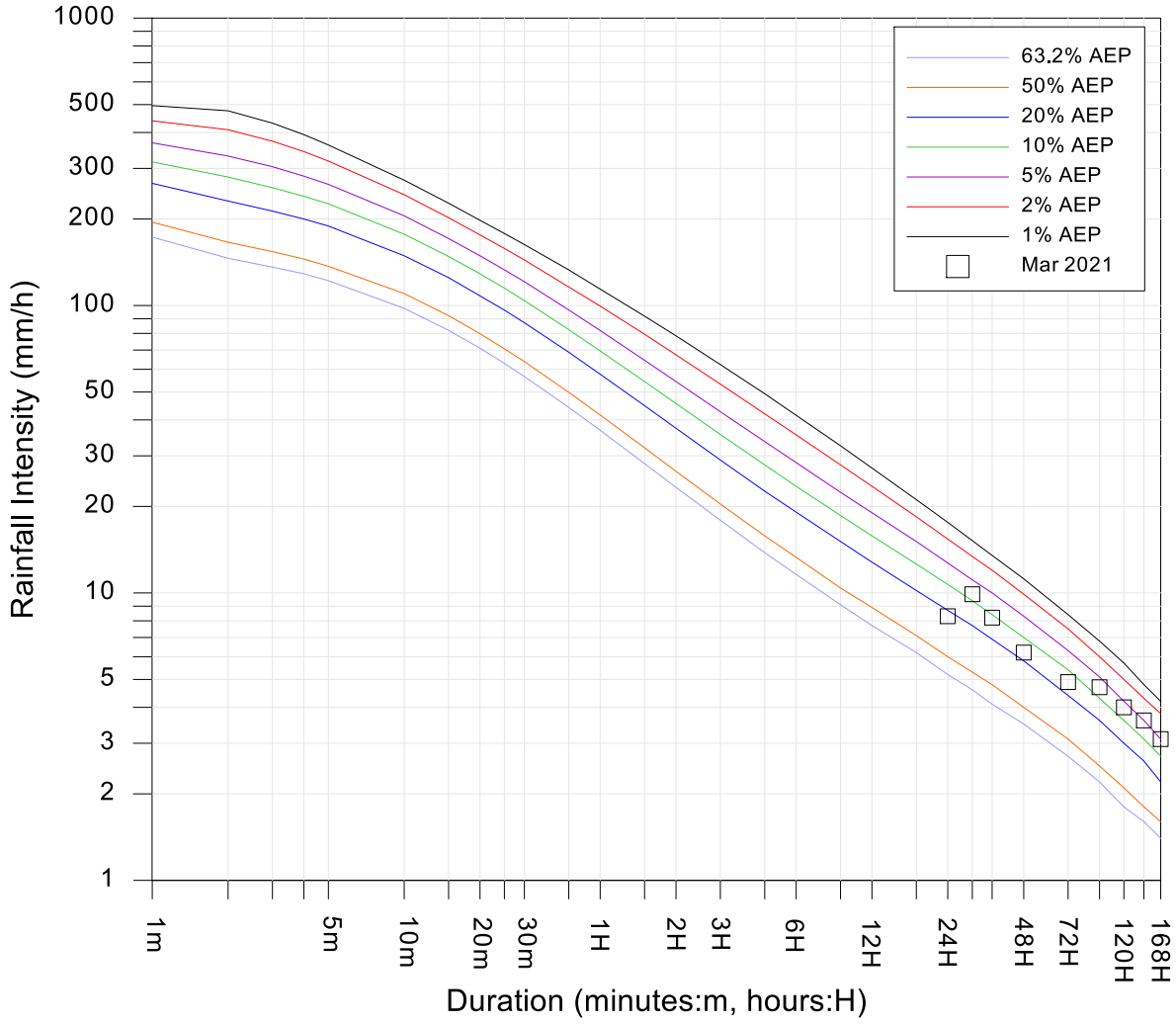
Manly Hydraulics Laboratory

Report MHL2809
Figure
C4

IFD_59054_Figure C4.pdf

Site Owner: BoM
Latitude: -30.16 Longitude:153.1

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	-	-
2m	-	-
3m	-	-
4m	-	-
5m	-	-
10m	-	-
15m	-	-
20m	-	-
25m	-	-
30m	-	-
45m	-	-
1H	-	-
1.5H	-	-
2H	-	-
3H	-	-
5H	-	-
6H	-	-
9H	-	-
12H	-	-
18H	-	-
24H	8.3	23:59 21 Mar 2021
30H	9.9	05:59 22 Mar 2021
36H	8.2	11:59 22 Mar 2021
48H	6.2	23:59 22 Mar 2021
72H	4.9	23:59 21 Mar 2021
96H	4.7	23:59 22 Mar 2021
120H	4	23:59 23 Mar 2021
144H	3.6	23:59 23 Mar 2021
168H	3.1	23:59 23 Mar 2021

Rainfall data collected as 24 hour totals only.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

LOWER BUCCA (59006)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

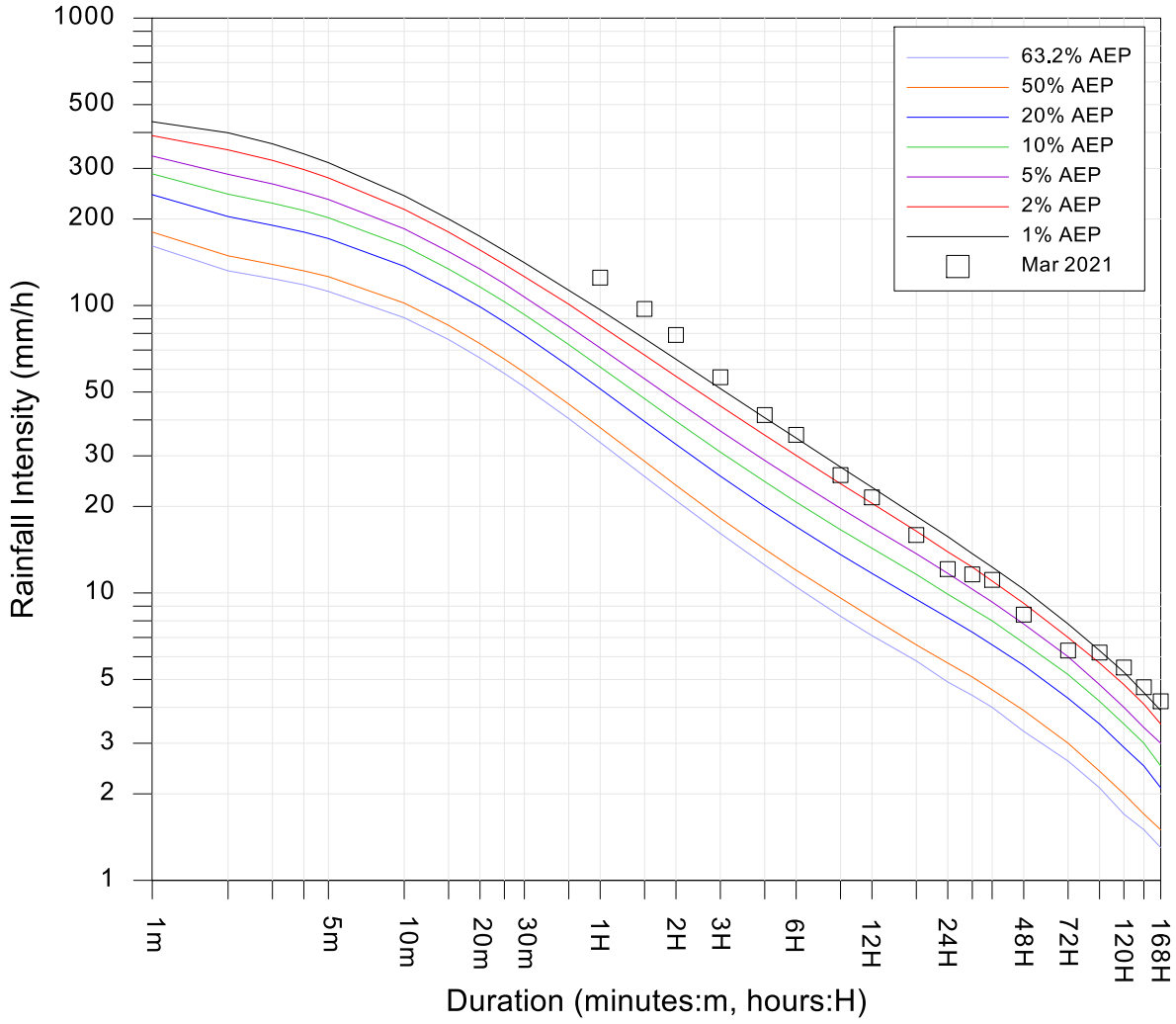
Manly Hydraulics Laboratory

Report MHL2809
Figure
C5

IFD_59006_Figure C5.pdf

Site Owner: BoM
Latitude: -30.643 Longitude:152.857

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	-	-
2m	-	-
3m	-	-
4m	-	-
5m	-	-
10m	-	-
15m	-	-
20m	-	-
25m	-	-
30m	-	-
45m	-	-
1H	125	09:47 19 Mar 2021
1.5H	97.3	10:07 19 Mar 2021
2H	79	10:40 19 Mar 2021
3H	56.3	10:56 19 Mar 2021
5H	41.6	13:17 19 Mar 2021
6H	35.5	13:56 19 Mar 2021
9H	25.7	13:43 19 Mar 2021
12H	21.5	14:00 19 Mar 2021
18H	15.9	14:25 19 Mar 2021
24H	12.1	17:43 19 Mar 2021
30H	11.6	11:27 19 Mar 2021
36H	11.1	14:00 19 Mar 2021
48H	8.4	21:00 19 Mar 2021
72H	6.3	02:00 22 Mar 2021
96H	6.2	02:00 22 Mar 2021
120H	5.5	23:48 22 Mar 2021
144H	4.7	21:00 23 Mar 2021
168H	4.2	21:47 23 Mar 2021

Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

BOWRAVILLE WTP (559046)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

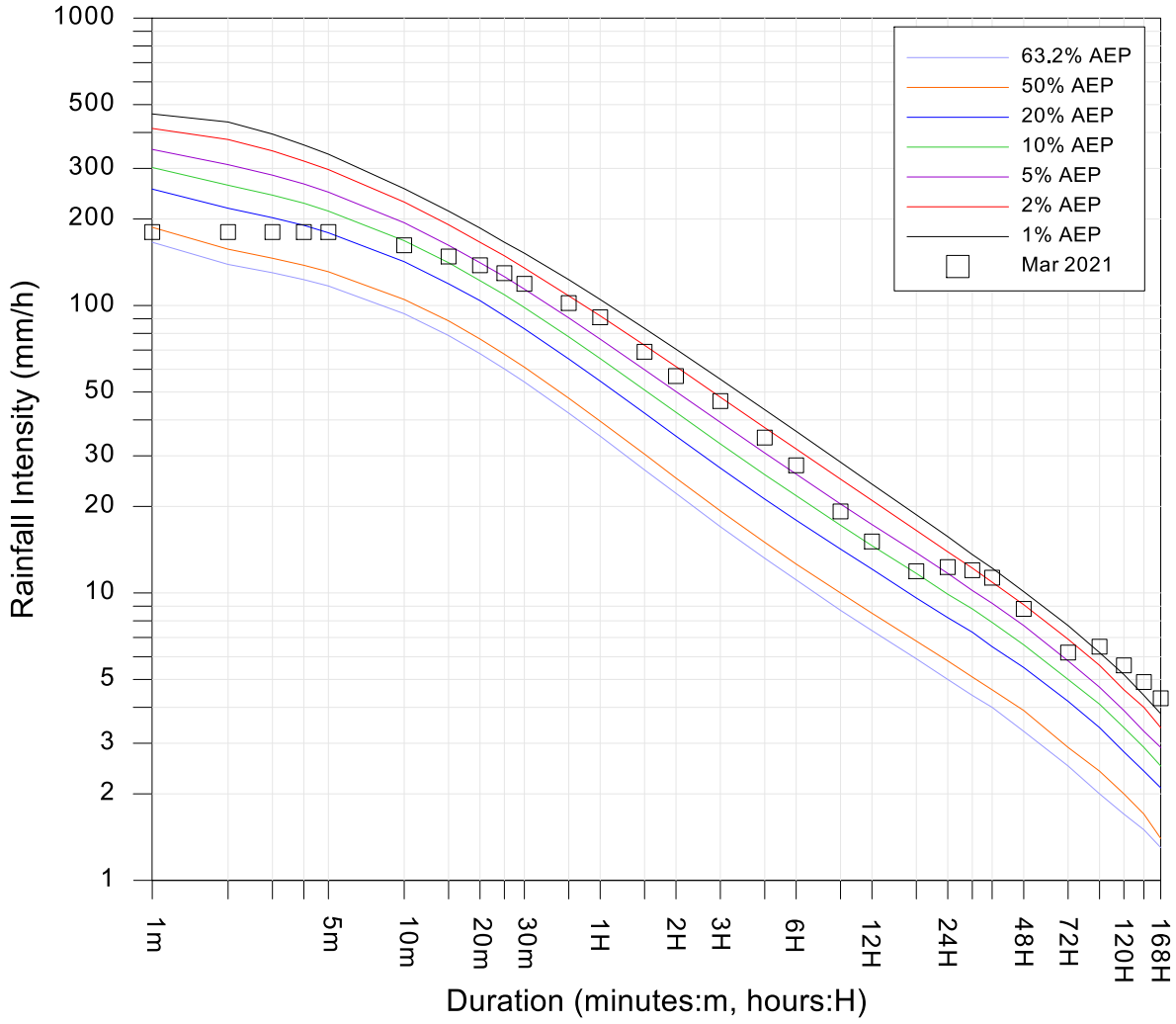
Manly Hydraulics Laboratory

Report MHL2809
Figure
C6

IFD_559046_Figure C6.pdf

Site Owner: DPIE
Latitude: -30.6556 Longitude:152.995

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	180	09:39 19 Mar 2021
2m	180	09:39 19 Mar 2021
3m	180	09:39 19 Mar 2021
4m	180	09:39 19 Mar 2021
5m	180	09:39 19 Mar 2021
10m	162	09:43 19 Mar 2021
15m	148	09:47 19 Mar 2021
20m	138	09:53 19 Mar 2021
25m	129.6	09:55 19 Mar 2021
30m	119	09:59 19 Mar 2021
45m	102	10:00 19 Mar 2021
1H	91	10:14 19 Mar 2021
1.5H	69	10:13 19 Mar 2021
2H	56.8	10:23 19 Mar 2021
3H	46.5	12:00 19 Mar 2021
5H	34.7	12:53 19 Mar 2021
6H	27.8	14:23 19 Mar 2021
9H	19.2	17:23 19 Mar 2021
12H	15.1	13:34 18 Mar 2021
18H	11.9	14:02 19 Mar 2021
24H	12.3	11:38 19 Mar 2021
30H	12	12:23 19 Mar 2021
36H	11.3	14:22 19 Mar 2021
48H	8.8	23:22 19 Mar 2021
72H	6.2	18:56 19 Mar 2021
96H	6.5	01:34 22 Mar 2021
120H	5.6	00:08 23 Mar 2021
144H	4.9	23:22 23 Mar 2021
168H	4.3	18:56 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

STUARTS ISLAND DOWNSTREAM (205466)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

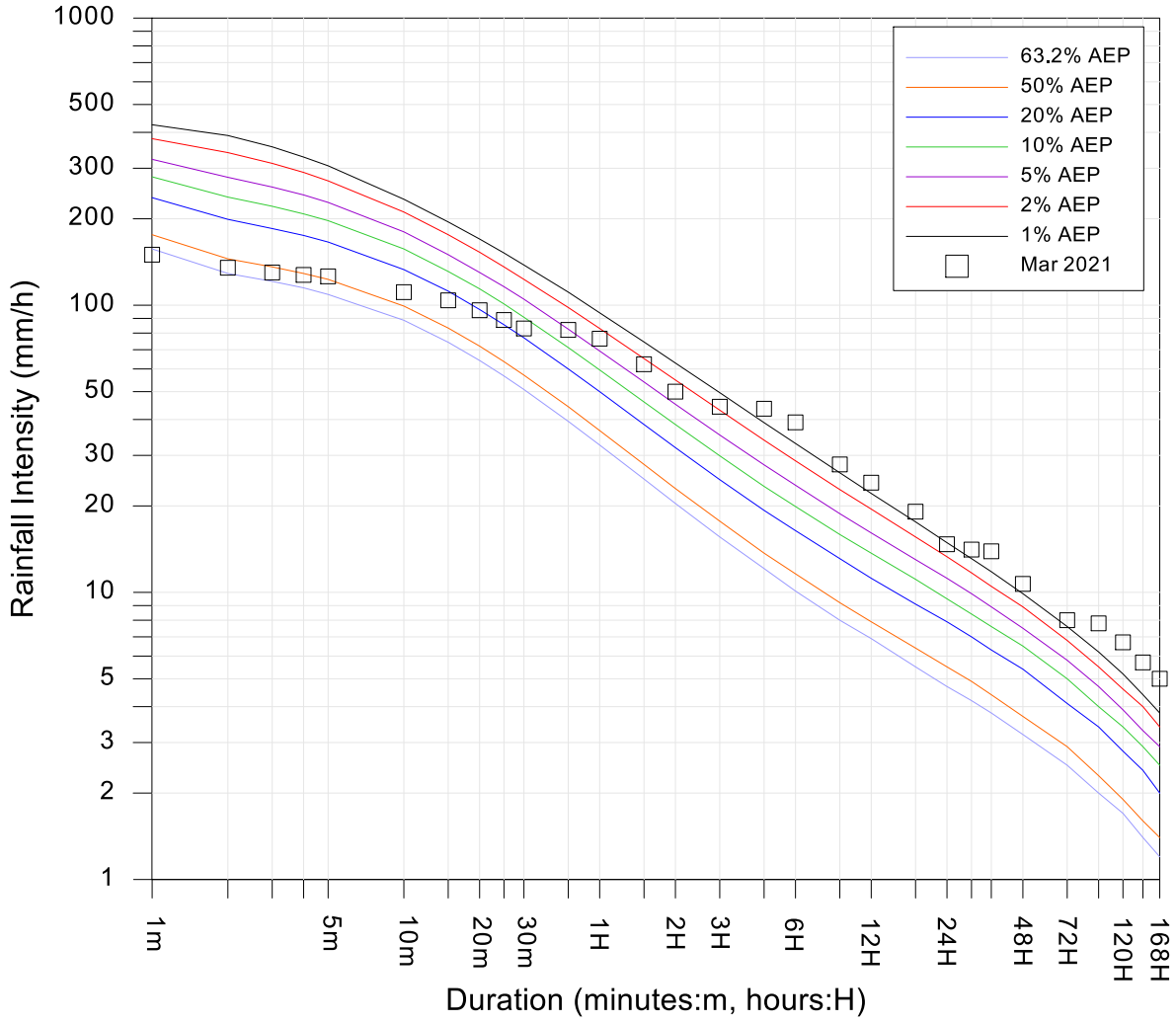
Manly Hydraulics Laboratory

Report MHL2809
Figure
C7

IFD_205466_Figure C7.pdf

Site Owner: DPIE
Latitude: -30.7297 Longitude:152.852

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	150	16:45 20 Mar 2021
2m	135	16:46 20 Mar 2021
3m	130	08:41 19 Mar 2021
4m	127.5	08:41 19 Mar 2021
5m	126	08:41 19 Mar 2021
10m	111	13:15 19 Mar 2021
15m	104	13:20 19 Mar 2021
20m	96	13:22 19 Mar 2021
25m	88.8	13:23 19 Mar 2021
30m	83	13:31 19 Mar 2021
45m	82	13:47 19 Mar 2021
1H	76.5	13:57 19 Mar 2021
1.5H	62.3	11:09 19 Mar 2021
2H	50	11:30 19 Mar 2021
3H	44.3	11:27 19 Mar 2021
5H	43.6	14:07 19 Mar 2021
6H	39.1	14:21 19 Mar 2021
9H	27.9	15:57 19 Mar 2021
12H	24.1	14:08 19 Mar 2021
18H	19.1	14:05 19 Mar 2021
24H	14.7	19:37 19 Mar 2021
30H	14.1	14:27 19 Mar 2021
36H	13.9	14:53 19 Mar 2021
48H	10.7	18:19 19 Mar 2021
72H	8	04:09 21 Mar 2021
96H	7.8	02:12 22 Mar 2021
120H	6.7	02:12 23 Mar 2021
144H	5.7	18:19 23 Mar 2021
168H	5	21:17 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

UTUNGUN (205414)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

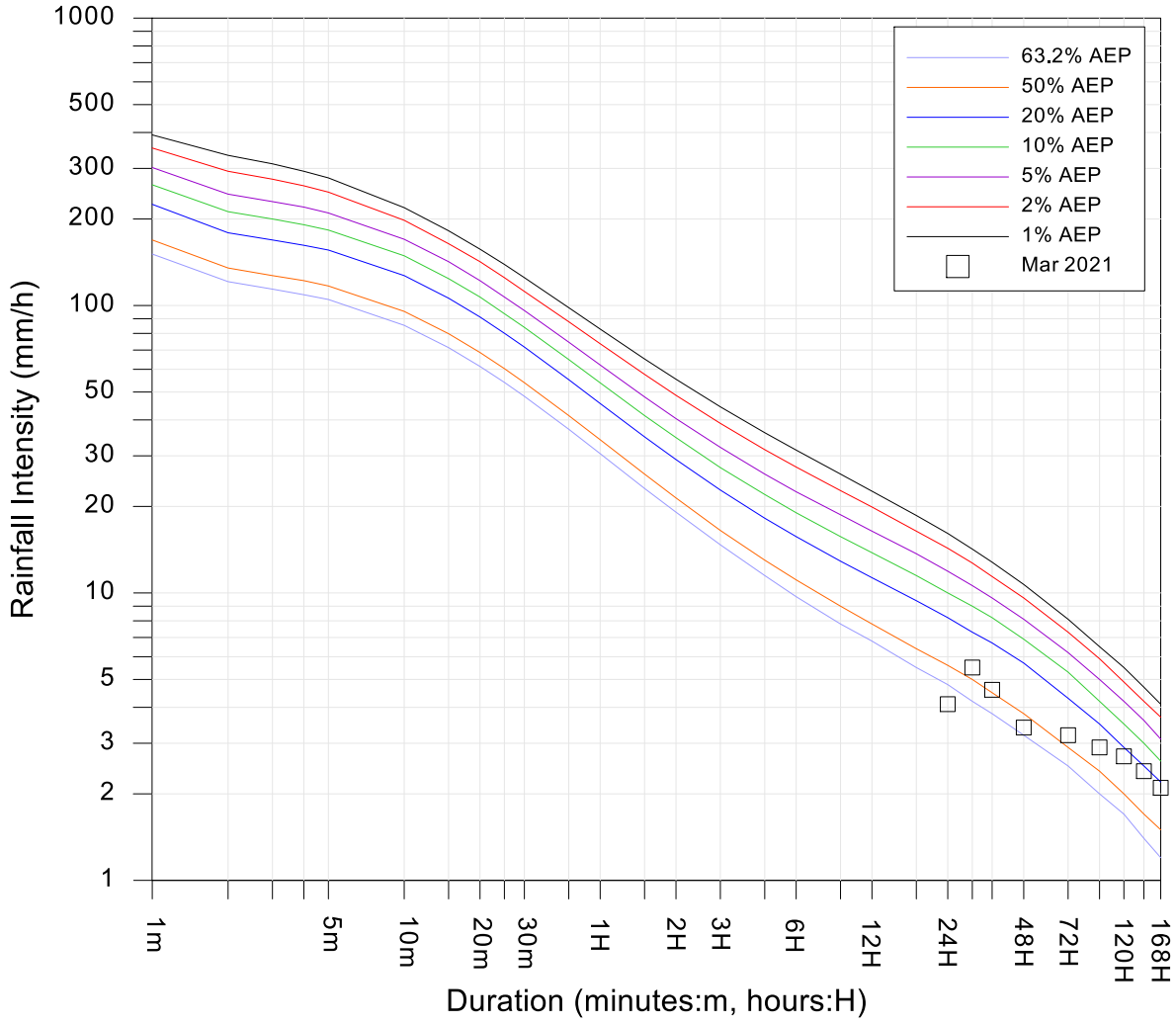
Manly Hydraulics Laboratory

Report MHL2809
Figure
C8

IFD_205414_Figure C8.pdf

Site Owner: BoM
Latitude: -30.68 Longitude:152.61

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	-	-
2m	-	-
3m	-	-
4m	-	-
5m	-	-
10m	-	-
15m	-	-
20m	-	-
25m	-	-
30m	-	-
45m	-	-
1H	-	-
1.5H	-	-
2H	-	-
3H	-	-
5H	-	-
6H	-	-
9H	-	-
12H	-	-
18H	-	-
24H	4.1	23:59 20 Mar 2021
30H	5.5	05:59 21 Mar 2021
36H	4.6	11:59 21 Mar 2021
48H	3.4	23:59 21 Mar 2021
72H	3.2	23:59 21 Mar 2021
96H	2.9	23:59 22 Mar 2021
120H	2.7	23:59 23 Mar 2021
144H	2.4	23:59 23 Mar 2021
168H	2.1	23:59 23 Mar 2021

Rainfall data collected as 24 hour totals only.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

THUMB CREEK (FIGTREE) (59120)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

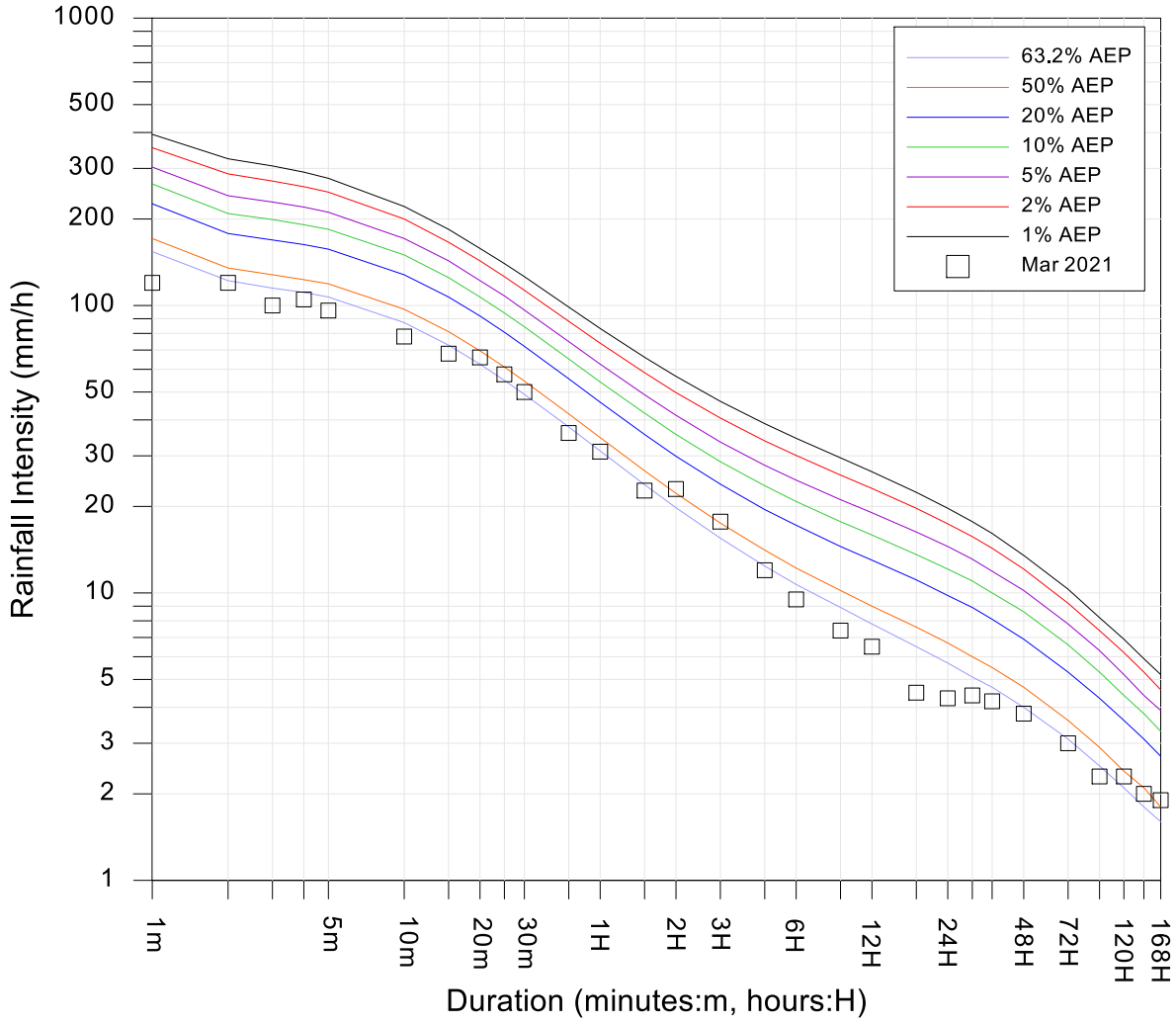
Manly Hydraulics Laboratory

Report MHL2809
Figure
C9

IFD_59120_Figure C9.pdf

Site Owner: BoM
Latitude: -30.66 Longitude:152.65

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	120	14:50 21 Mar 2021
2m	120	16:38 14 Mar 2021
3m	100	16:40 14 Mar 2021
4m	105	16:40 14 Mar 2021
5m	96	16:41 14 Mar 2021
10m	78	16:43 14 Mar 2021
15m	68	16:43 14 Mar 2021
20m	66	16:43 14 Mar 2021
25m	57.6	16:48 14 Mar 2021
30m	50	16:50 14 Mar 2021
45m	36	17:05 14 Mar 2021
1H	31	17:23 14 Mar 2021
1.5H	22.7	17:53 14 Mar 2021
2H	23	18:20 14 Mar 2021
3H	17.7	19:14 14 Mar 2021
5H	12	20:50 14 Mar 2021
6H	9.5	22:14 14 Mar 2021
9H	7.4	00:17 21 Mar 2021
12H	6.5	01:18 21 Mar 2021
18H	4.5	05:53 21 Mar 2021
24H	4.3	17:39 21 Mar 2021
30H	4.4	23:39 21 Mar 2021
36H	4.2	01:50 22 Mar 2021
48H	3.8	13:50 22 Mar 2021
72H	3	13:06 23 Mar 2021
96H	2.3	03:25 24 Mar 2021
120H	2.3	03:11 23 Mar 2021
144H	2	07:43 23 Mar 2021
168H	1.9	19:47 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

BOWRA SUGARLOAF (59138)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

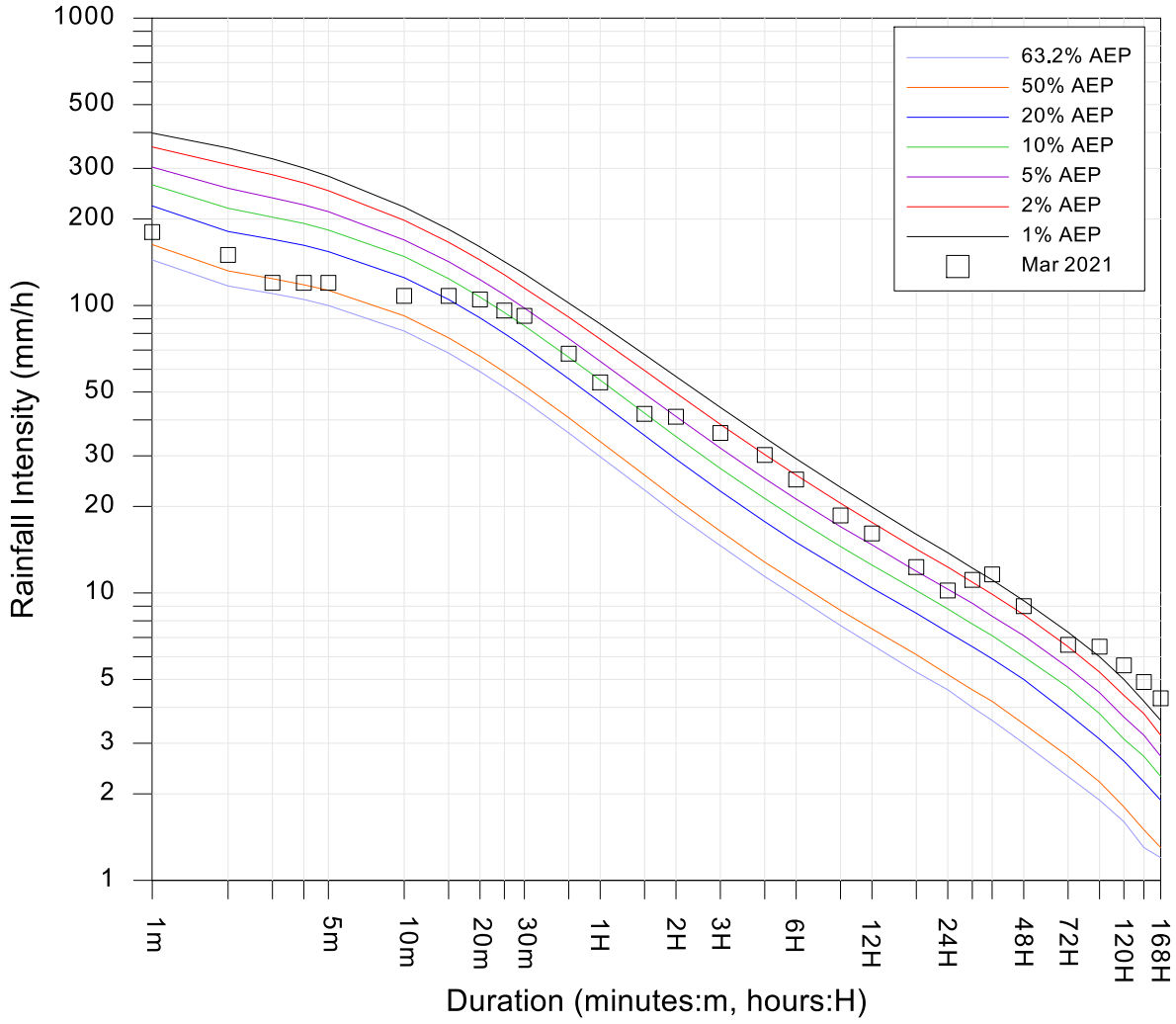
Manly Hydraulics Laboratory

Report MHL2809
Figure
C10

IFD_59138_Figure C10.pdf

Site Owner: DPIE
Latitude: -31.0825 Longitude:152.783

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	180	08:42 18 Mar 2021
2m	150	08:42 18 Mar 2021
3m	120	14:42 19 Mar 2021
4m	120	14:42 19 Mar 2021
5m	120	14:42 19 Mar 2021
10m	108	14:46 19 Mar 2021
15m	108	14:42 19 Mar 2021
20m	105	14:46 19 Mar 2021
25m	96	14:52 19 Mar 2021
30m	92	14:54 19 Mar 2021
45m	68	15:07 19 Mar 2021
1H	54	15:22 19 Mar 2021
1.5H	42	15:52 19 Mar 2021
2H	41	14:48 19 Mar 2021
3H	36	15:33 19 Mar 2021
5H	30.2	12:47 18 Mar 2021
6H	24.8	14:17 18 Mar 2021
9H	18.6	14:11 18 Mar 2021
12H	16.1	18:00 19 Mar 2021
18H	12.3	16:50 19 Mar 2021
24H	10.2	08:05 19 Mar 2021
30H	11.1	15:48 19 Mar 2021
36H	11.6	17:01 19 Mar 2021
48H	9	00:46 20 Mar 2021
72H	6.6	04:45 21 Mar 2021
96H	6.5	04:02 22 Mar 2021
120H	5.6	03:55 23 Mar 2021
144H	4.9	00:46 24 Mar 2021
168H	4.3	19:42 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

ALDAVILLA DOWNSTREAM (206459)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

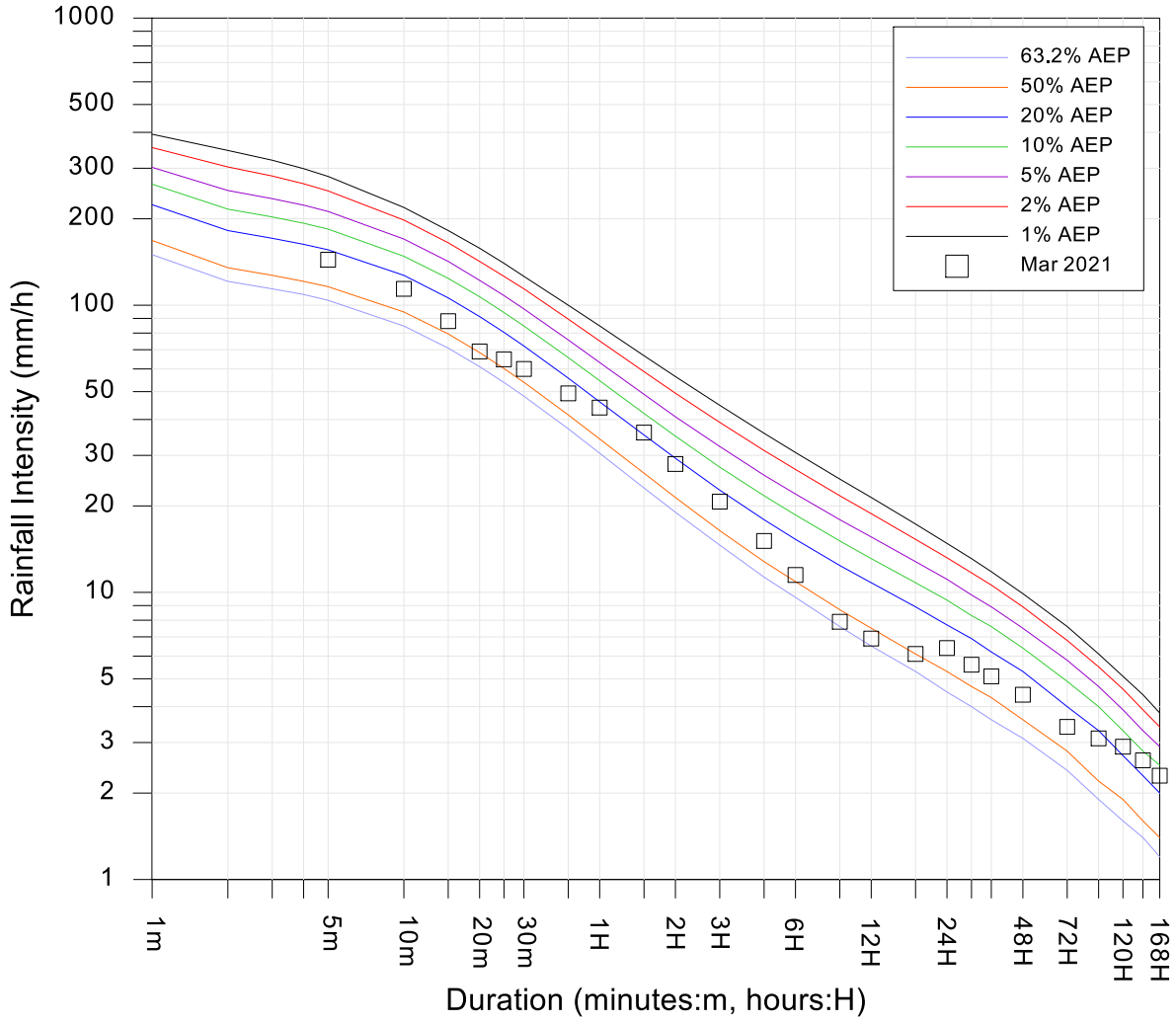
Manly Hydraulics Laboratory

Report MHL2809
Figure
C11

IFD_206459_Figure C11.pdf

Site Owner: Kempsey Shire Council
Latitude: -30.7794 Longitude:152.702

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	-	-
2m	-	-
3m	-	-
4m	-	-
5m	144	05:30 09 Mar 2021
10m	114	05:35 09 Mar 2021
15m	88	05:40 09 Mar 2021
20m	69	16:55 20 Mar 2021
25m	64.8	16:58 20 Mar 2021
30m	60	17:05 20 Mar 2021
45m	49.3	17:14 20 Mar 2021
1H	44	17:31 20 Mar 2021
1.5H	36	17:34 20 Mar 2021
2H	28	17:36 20 Mar 2021
3H	20.7	17:26 20 Mar 2021
5H	15.1	18:20 20 Mar 2021
6H	11.5	17:45 20 Mar 2021
9H	7.9	18:20 20 Mar 2021
12H	6.9	17:58 20 Mar 2021
18H	6.1	07:50 21 Mar 2021
24H	6.4	13:50 21 Mar 2021
30H	5.6	20:26 21 Mar 2021
36H	5.1	01:50 22 Mar 2021
48H	4.4	06:40 22 Mar 2021
72H	3.4	02:26 23 Mar 2021
96H	3.1	16:05 21 Mar 2021
120H	2.9	17:21 22 Mar 2021
144H	2.6	21:38 22 Mar 2021
168H	2.3	10:49 23 Mar 2021

Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

TAYLORS ARM (59032)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

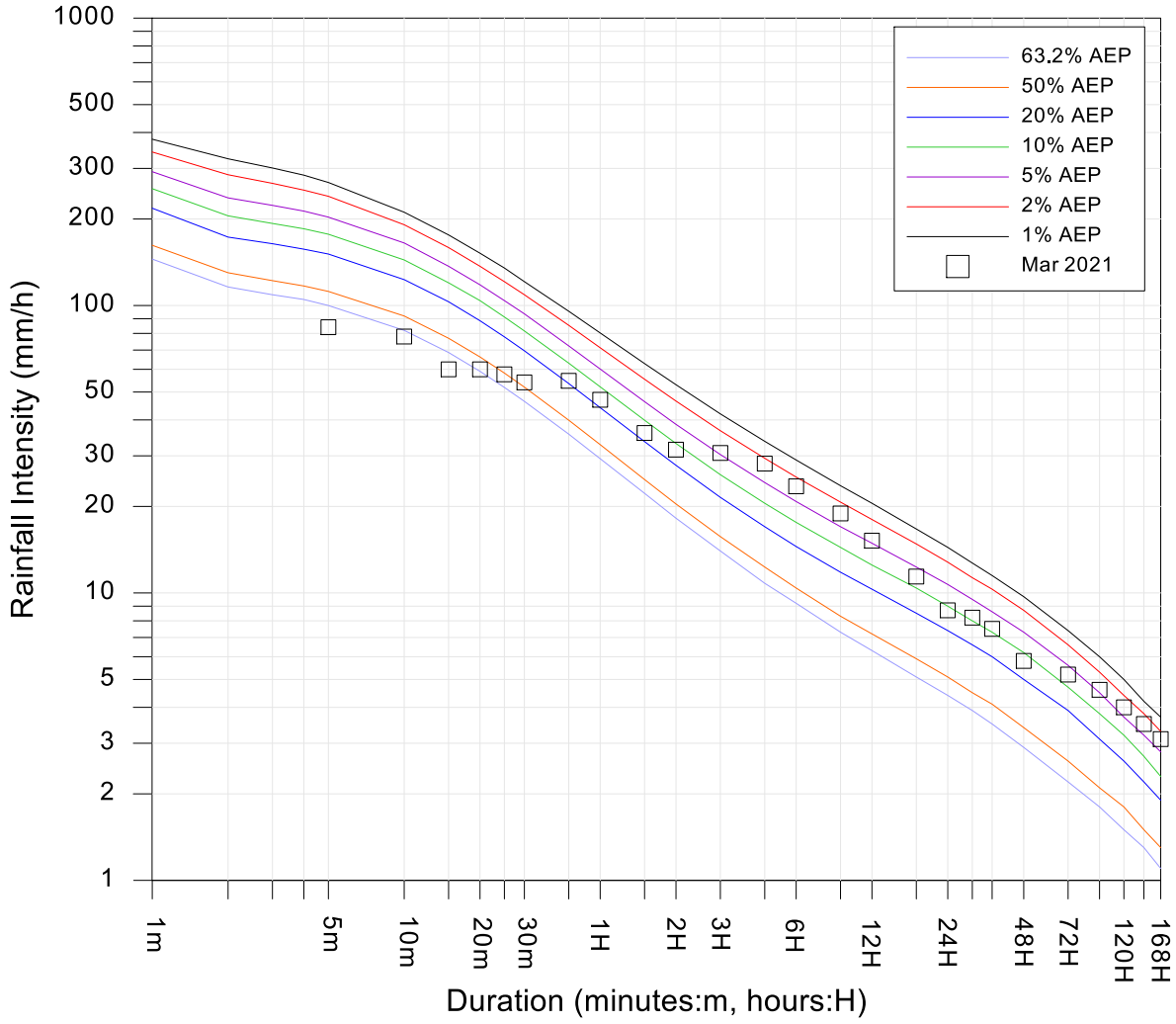
Manly Hydraulics Laboratory

Report MHL2809
Figure
C12

IFD_59032_Figure C12.pdf

Site Owner: Kempsey Shire Council
Latitude: -30.8695 Longitude:152.629

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	-	-
2m	-	-
3m	-	-
4m	-	-
5m	84	19:54 18 Mar 2021
10m	78	19:58 18 Mar 2021
15m	60	22:12 18 Mar 2021
20m	60	20:10 18 Mar 2021
25m	57.6	20:13 18 Mar 2021
30m	54	20:25 18 Mar 2021
45m	54.7	20:33 18 Mar 2021
1H	47	20:46 18 Mar 2021
1.5H	36	20:45 18 Mar 2021
2H	31.5	23:39 18 Mar 2021
3H	30.7	22:49 18 Mar 2021
5H	28.2	23:46 18 Mar 2021
6H	23.5	01:46 19 Mar 2021
9H	18.9	02:54 19 Mar 2021
12H	15.2	05:14 19 Mar 2021
18H	11.4	04:57 19 Mar 2021
24H	8.7	09:43 19 Mar 2021
30H	8.2	02:44 19 Mar 2021
36H	7.5	05:49 19 Mar 2021
48H	5.8	17:54 20 Mar 2021
72H	5.2	17:49 20 Mar 2021
96H	4.6	17:55 21 Mar 2021
120H	4	17:49 22 Mar 2021
144H	3.5	15:21 23 Mar 2021
168H	3.1	11:14 23 Mar 2021

Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

MILLBANK (59131)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

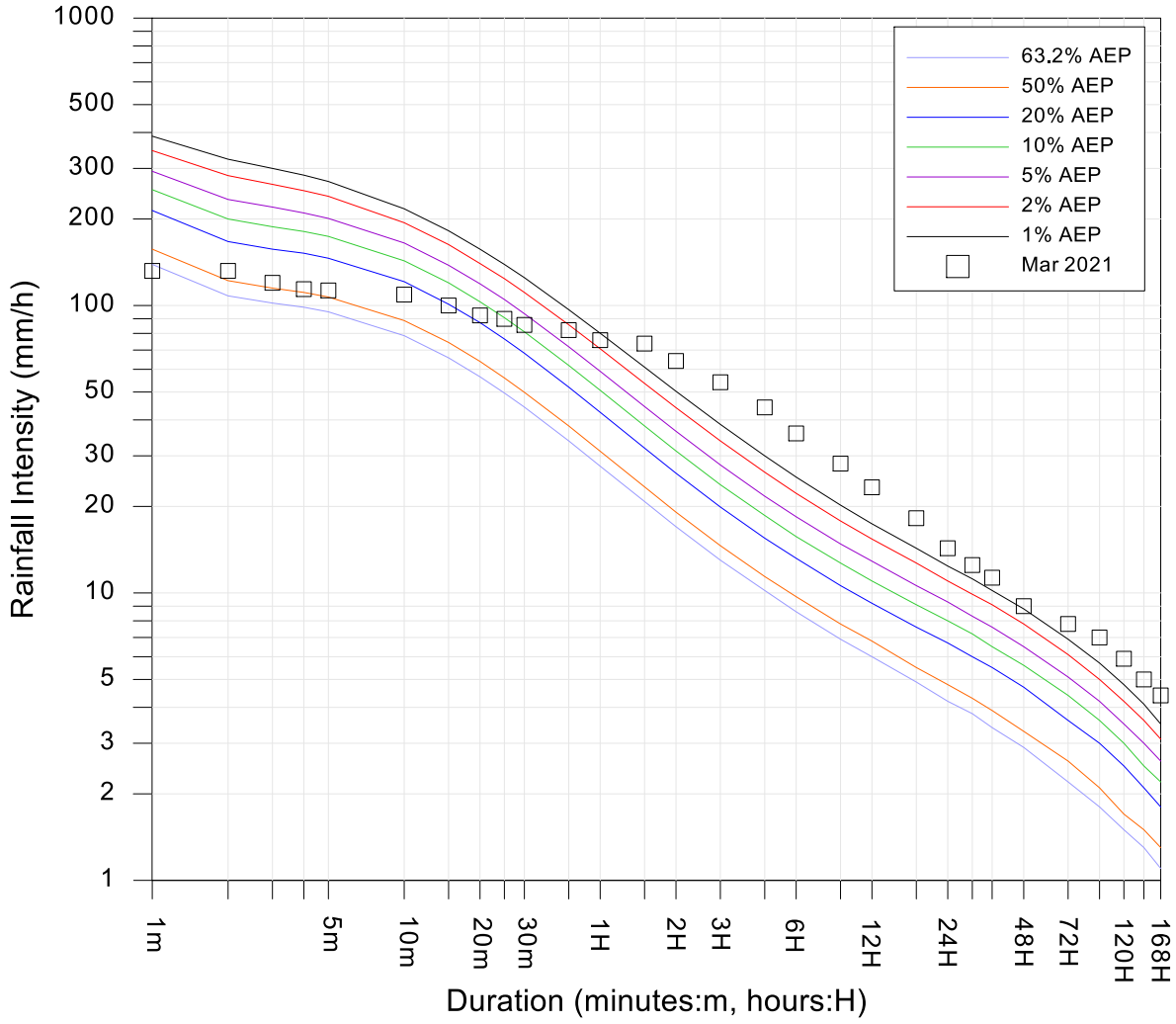
Manly Hydraulics Laboratory

Report MHL2809
Figure
C13

IFD_59131_Figure C13.pdf

Site Owner: WaterNSW
Latitude: -31.4225 Longitude:152.471

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	132	16:40 19 Mar 2021
2m	132	16:33 19 Mar 2021
3m	120	16:34 19 Mar 2021
4m	114	15:41 19 Mar 2021
5m	112.8	15:42 19 Mar 2021
10m	109.2	16:41 19 Mar 2021
15m	100	16:42 19 Mar 2021
20m	92.4	15:49 19 Mar 2021
25m	89.8	15:53 19 Mar 2021
30m	85.6	16:01 19 Mar 2021
45m	82.1	16:13 19 Mar 2021
1H	75.8	16:18 19 Mar 2021
1.5H	73.7	16:44 19 Mar 2021
2H	64.1	16:47 19 Mar 2021
3H	54.1	16:42 19 Mar 2021
5H	44.2	16:47 19 Mar 2021
6H	35.9	16:54 19 Mar 2021
9H	28.2	16:53 19 Mar 2021
12H	23.3	17:03 19 Mar 2021
18H	18.2	17:27 19 Mar 2021
24H	14.3	20:39 19 Mar 2021
30H	12.5	16:45 19 Mar 2021
36H	11.3	19:42 19 Mar 2021
48H	9	02:44 20 Mar 2021
72H	7.8	10:36 21 Mar 2021
96H	7	04:46 22 Mar 2021
120H	5.9	03:51 23 Mar 2021
144H	5	01:58 24 Mar 2021
168H	4.4	21:44 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

HASTINGS RIVER @ ELLENBOROUGH KINDEE BRIDGE (207004)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

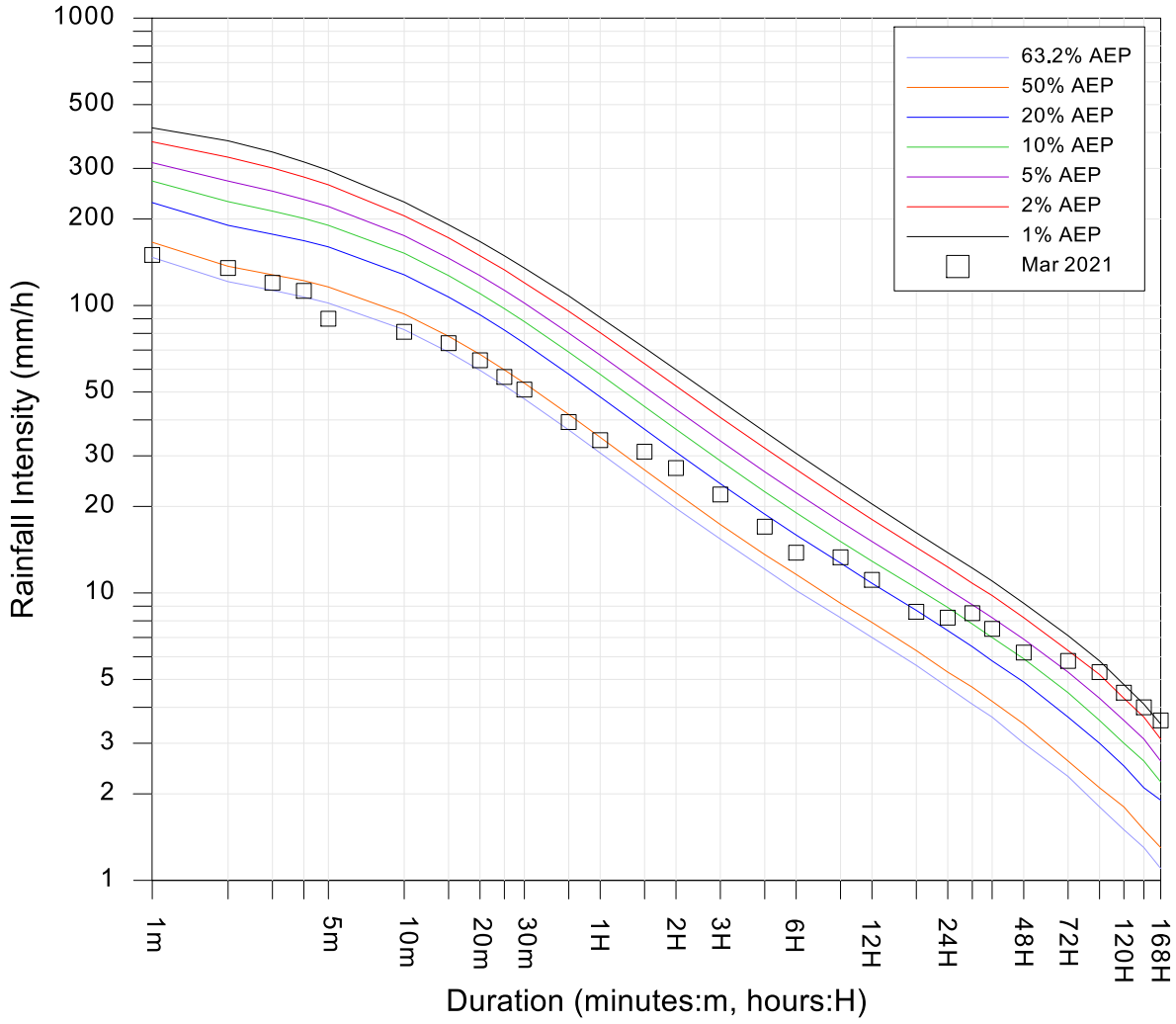
Manly Hydraulics Laboratory

Report MHL2809
Figure
C14

IFD_207004_Figure C14.pdf

Site Owner: DPIE
Latitude: -31.2736 Longitude:152.857

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	150	14:21 18 Mar 2021
2m	135	14:21 18 Mar 2021
3m	120	16:21 19 Mar 2021
4m	112.5	16:21 19 Mar 2021
5m	90	16:22 19 Mar 2021
10m	81	17:26 19 Mar 2021
15m	74	13:10 11 Mar 2021
20m	64.5	13:11 11 Mar 2021
25m	56.4	13:15 11 Mar 2021
30m	51	13:15 11 Mar 2021
45m	39.3	14:33 18 Mar 2021
1H	34	14:41 18 Mar 2021
1.5H	31	15:18 18 Mar 2021
2H	27.2	15:39 18 Mar 2021
3H	22	16:41 18 Mar 2021
5H	17	17:44 18 Mar 2021
6H	13.8	19:17 18 Mar 2021
9H	13.3	18:18 19 Mar 2021
12H	11.1	18:26 19 Mar 2021
18H	8.6	18:12 19 Mar 2021
24H	8.2	13:17 19 Mar 2021
30H	8.5	18:16 19 Mar 2021
36H	7.5	18:16 19 Mar 2021
48H	6.2	04:02 20 Mar 2021
72H	5.8	12:16 21 Mar 2021
96H	5.3	03:34 22 Mar 2021
120H	4.5	00:52 22 Mar 2021
144H	4	22:04 22 Mar 2021
168H	3.6	22:04 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

GREEN VALLEY (207406)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

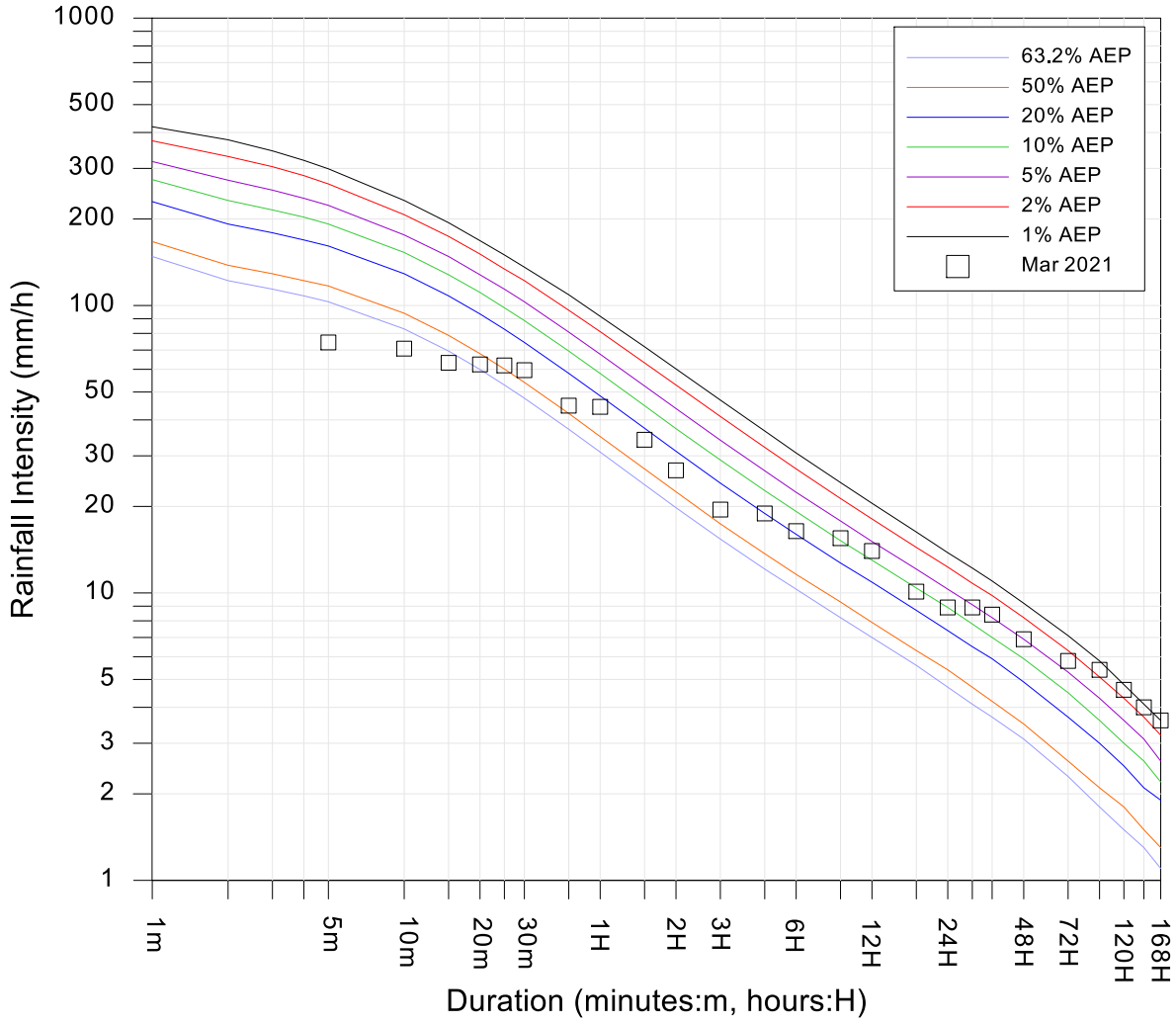
Manly Hydraulics Laboratory

Report MHL2809
Figure
C15

IFD_207406_Figure C15.pdf

Site Owner: Port Macquarie Hastings Council
Latitude: -31.3253 Longitude:152.842

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	-	-
2m	-	-
3m	-	-
4m	-	-
5m	74.4	17:31 19 Mar 2021
10m	70.8	17:47 19 Mar 2021
15m	63.2	17:52 19 Mar 2021
20m	62.4	17:47 19 Mar 2021
25m	61.9	17:47 19 Mar 2021
30m	59.6	17:52 19 Mar 2021
45m	44.8	18:03 19 Mar 2021
1H	44.4	17:49 19 Mar 2021
1.5H	34.1	17:55 19 Mar 2021
2H	26.7	18:22 19 Mar 2021
3H	19.5	11:00 19 Mar 2021
5H	18.9	12:30 19 Mar 2021
6H	16.4	13:58 19 Mar 2021
9H	15.5	17:57 19 Mar 2021
12H	14	18:11 19 Mar 2021
18H	10.1	18:00 19 Mar 2021
24H	8.9	17:59 19 Mar 2021
30H	8.9	18:27 19 Mar 2021
36H	8.4	18:03 19 Mar 2021
48H	6.9	02:51 20 Mar 2021
72H	5.8	11:42 21 Mar 2021
96H	5.4	02:51 22 Mar 2021
120H	4.6	02:51 23 Mar 2021
144H	4	20:05 23 Mar 2021
168H	3.6	22:05 23 Mar 2021

Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

MARIA RIVER AT MUNDAYS LANE (2074127)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

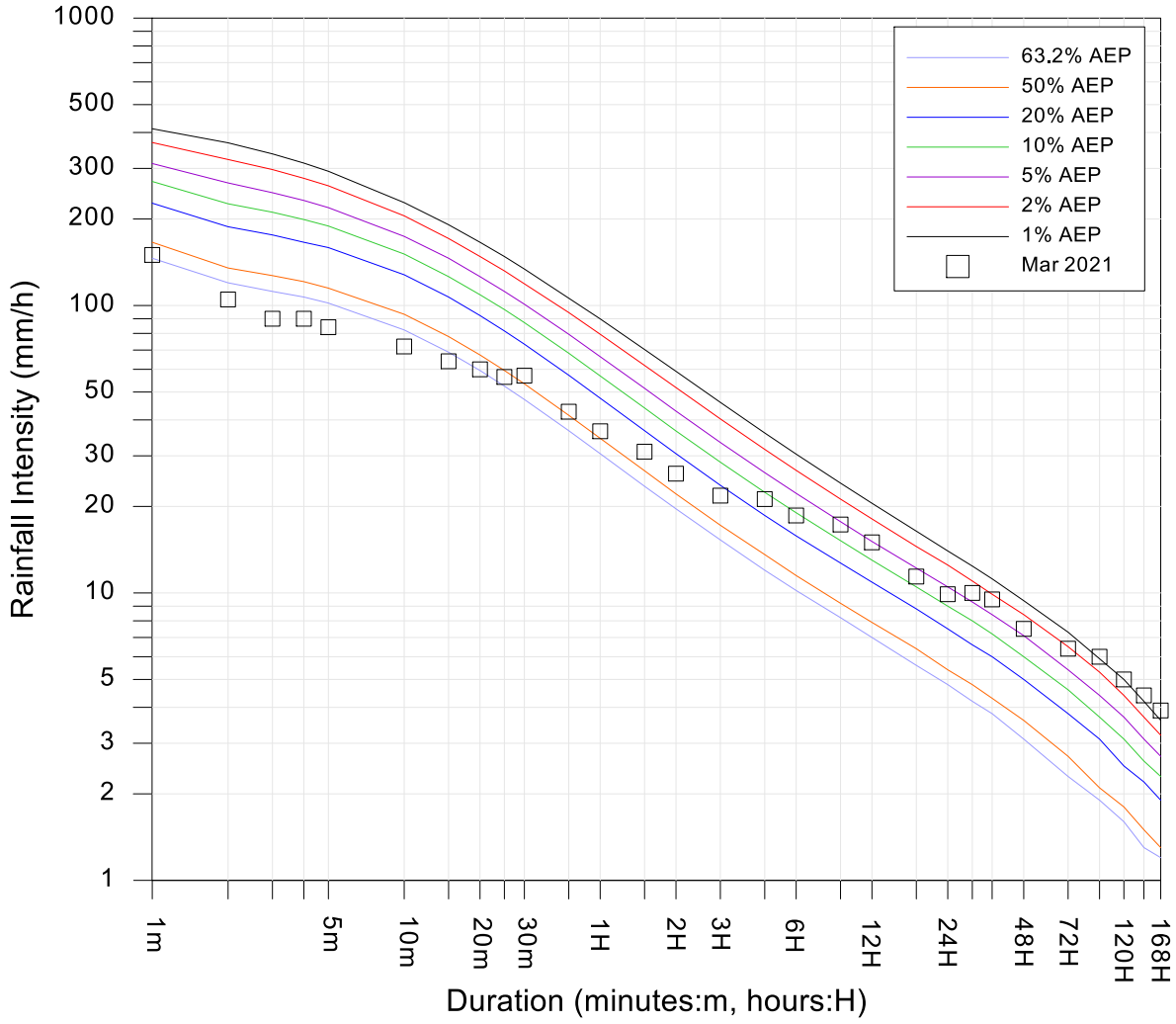
Manly Hydraulics Laboratory

Report MHL2809
Figure
C16

IFD_2074127_Figure C16.pdf

Site Owner: DPIE
Latitude: -31.3236 Longitude:152.801

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	150	12:09 18 Mar 2021
2m	105	12:10 18 Mar 2021
3m	90	04:26 21 Mar 2021
4m	90	11:45 19 Mar 2021
5m	84	04:28 21 Mar 2021
10m	72	17:13 19 Mar 2021
15m	64	17:16 19 Mar 2021
20m	60	17:14 19 Mar 2021
25m	56.4	17:19 19 Mar 2021
30m	57	12:09 19 Mar 2021
45m	42.7	12:21 19 Mar 2021
1H	36.5	17:24 19 Mar 2021
1.5H	31	17:54 19 Mar 2021
2H	26	12:12 19 Mar 2021
3H	21.8	12:43 19 Mar 2021
5H	21.2	12:43 19 Mar 2021
6H	18.6	14:03 19 Mar 2021
9H	17.3	17:19 19 Mar 2021
12H	15	18:35 19 Mar 2021
18H	11.4	18:49 19 Mar 2021
24H	9.9	18:09 19 Mar 2021
30H	10	18:08 19 Mar 2021
36H	9.5	18:13 19 Mar 2021
48H	7.5	03:06 20 Mar 2021
72H	6.4	09:38 21 Mar 2021
96H	6	02:26 22 Mar 2021
120H	5	01:51 23 Mar 2021
144H	4.4	00:37 24 Mar 2021
168H	3.9	22:07 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

TELEGRAPH POINT (207415)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

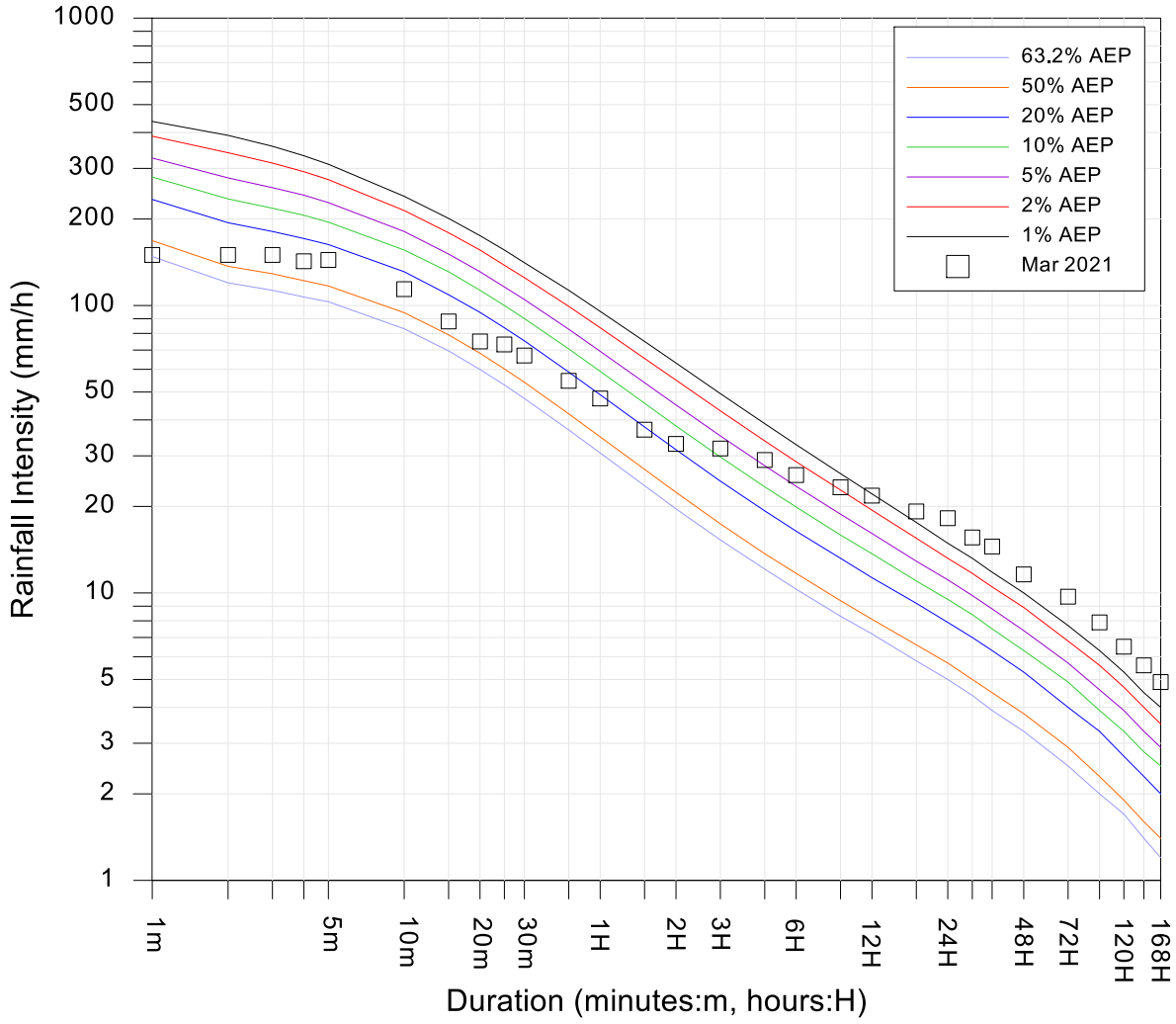
Manly Hydraulics Laboratory

Report MHL2809
Figure
C17

IFD_207415_Figure C17.pdf

Site Owner: DPIE
Latitude: -31.6141 Longitude:152.693

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	150	02:37 20 Mar 2021
2m	150	02:35 20 Mar 2021
3m	150	02:35 20 Mar 2021
4m	142.5	02:37 20 Mar 2021
5m	144	02:37 20 Mar 2021
10m	114	02:39 20 Mar 2021
15m	88	02:42 20 Mar 2021
20m	75	02:37 20 Mar 2021
25m	73.2	02:39 20 Mar 2021
30m	67	02:40 20 Mar 2021
45m	54.7	02:59 20 Mar 2021
1H	47.5	03:05 20 Mar 2021
1.5H	37	13:18 19 Mar 2021
2H	33	21:14 19 Mar 2021
3H	31.8	21:47 19 Mar 2021
5H	29	21:20 19 Mar 2021
6H	25.7	22:46 19 Mar 2021
9H	23.3	20:51 19 Mar 2021
12H	21.8	23:55 19 Mar 2021
18H	19.2	03:11 20 Mar 2021
24H	18.2	03:23 20 Mar 2021
30H	15.6	03:24 20 Mar 2021
36H	14.5	03:04 20 Mar 2021
48H	11.6	03:30 20 Mar 2021
72H	9.7	15:02 21 Mar 2021
96H	7.9	00:33 22 Mar 2021
120H	6.5	21:56 22 Mar 2021
144H	5.6	21:56 23 Mar 2021
168H	4.9	20:57 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

LOGANS CROSSING (207428)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

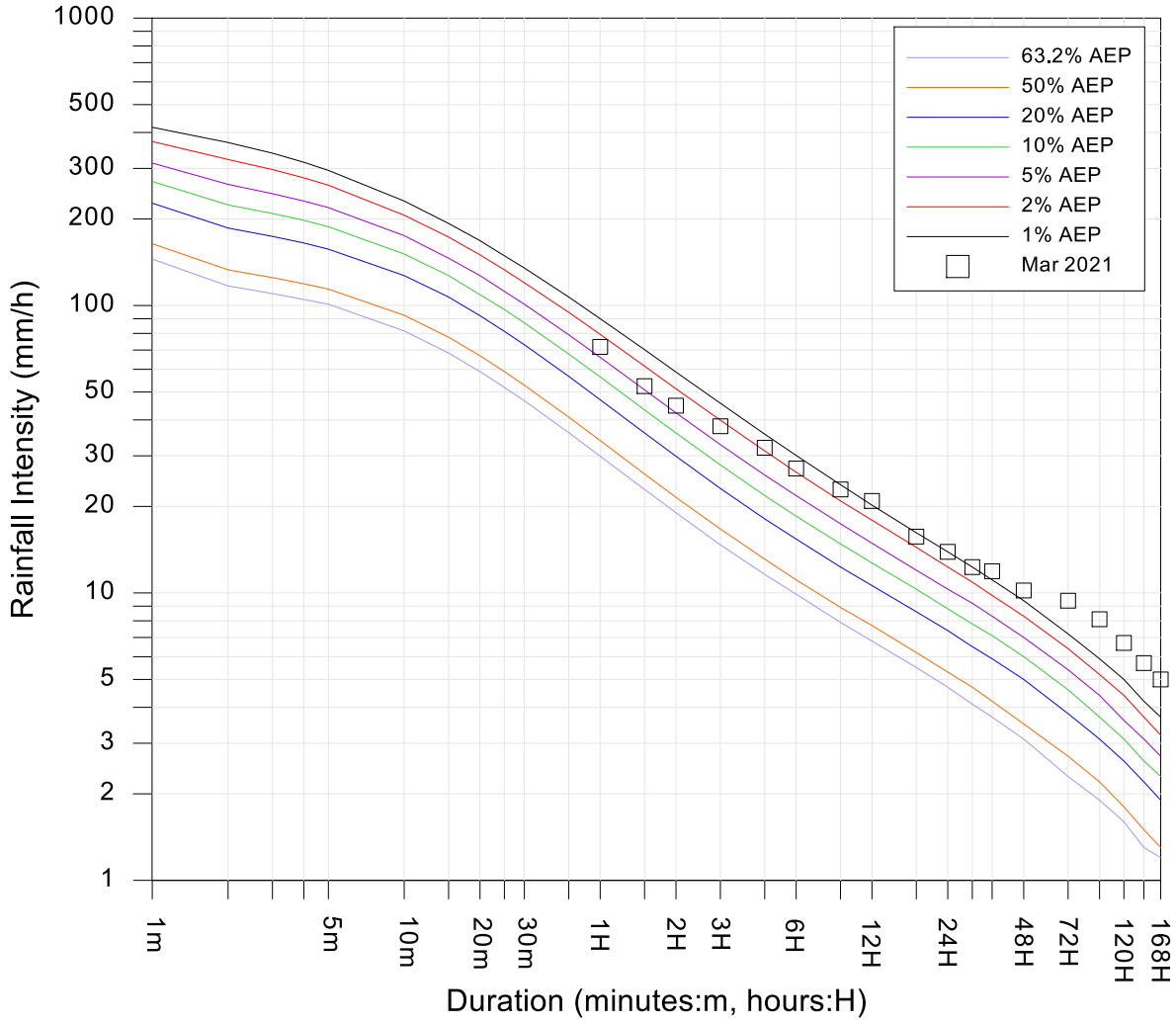
Manly Hydraulics Laboratory

Report MHL2809
Figure
C18

IFD_207428_Figure C18.pdf

Site Owner: Port Macquarie Hastings Council
Latitude: -31.4611 Longitude:152.679

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	-	-
2m	-	-
3m	-	-
4m	-	-
5m	-	-
10m	-	-
15m	-	-
20m	-	-
25m	-	-
30m	-	-
45m	-	-
1H	71.8	06:30 21 Mar 2021
1.5H	52.4	07:00 21 Mar 2021
2H	44.8	07:30 21 Mar 2021
3H	38	06:22 21 Mar 2021
5H	32	07:42 21 Mar 2021
6H	27.1	08:11 21 Mar 2021
9H	22.9	19:14 19 Mar 2021
12H	20.9	20:10 19 Mar 2021
18H	15.7	20:01 19 Mar 2021
24H	13.9	20:22 19 Mar 2021
30H	12.3	20:11 19 Mar 2021
36H	11.9	20:15 19 Mar 2021
48H	10.2	08:34 21 Mar 2021
72H	9.4	10:17 21 Mar 2021
96H	8.1	02:22 22 Mar 2021
120H	6.7	22:10 22 Mar 2021
144H	5.7	20:09 23 Mar 2021
168H	5	22:17 23 Mar 2021

Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

KOREE ISLAND (207442)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

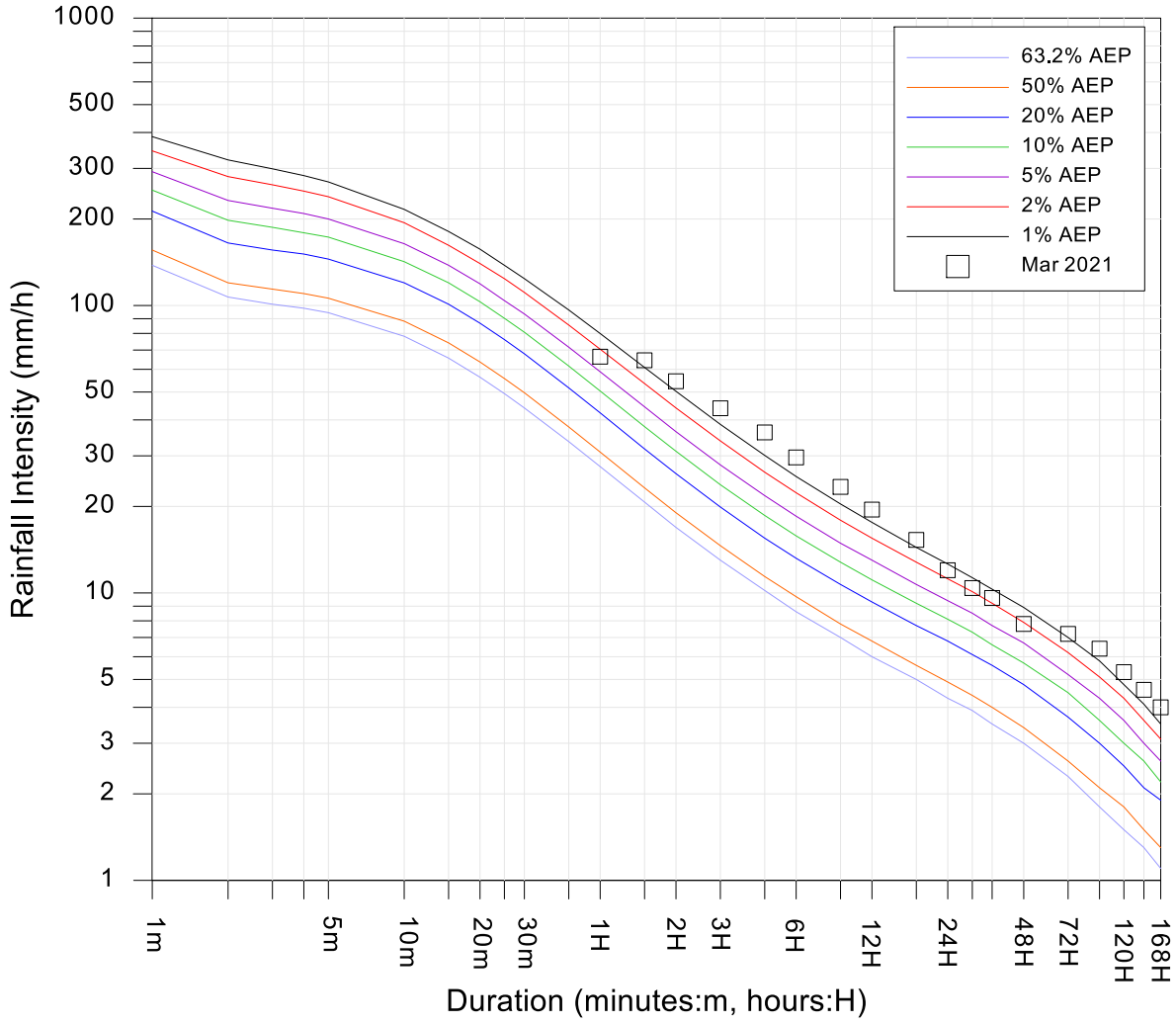
Manly Hydraulics Laboratory

Report MHL2809
Figure
C19

IFD_207442_Figure C19.pdf

Site Owner: Port Macquarie Hastings Council
Latitude: -31.4353 Longitude:152.49

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	-	-
2m	-	-
3m	-	-
4m	-	-
5m	-	-
10m	-	-
15m	-	-
20m	-	-
25m	-	-
30m	-	-
45m	-	-
1H	66.4	17:42 19 Mar 2021
1.5H	64.5	17:52 19 Mar 2021
2H	54.5	17:52 19 Mar 2021
3H	43.9	17:51 19 Mar 2021
5H	36.2	18:01 19 Mar 2021
6H	29.6	17:59 19 Mar 2021
9H	23.4	17:56 19 Mar 2021
12H	19.5	18:04 19 Mar 2021
18H	15.3	18:51 19 Mar 2021
24H	12	20:58 19 Mar 2021
30H	10.4	17:47 19 Mar 2021
36H	9.6	21:10 19 Mar 2021
48H	7.8	10:59 21 Mar 2021
72H	7.2	00:51 22 Mar 2021
96H	6.4	06:09 22 Mar 2021
120H	5.3	04:52 23 Mar 2021
144H	4.6	03:48 24 Mar 2021
168H	4	22:51 23 Mar 2021

Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

LONG FLAT (207904)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

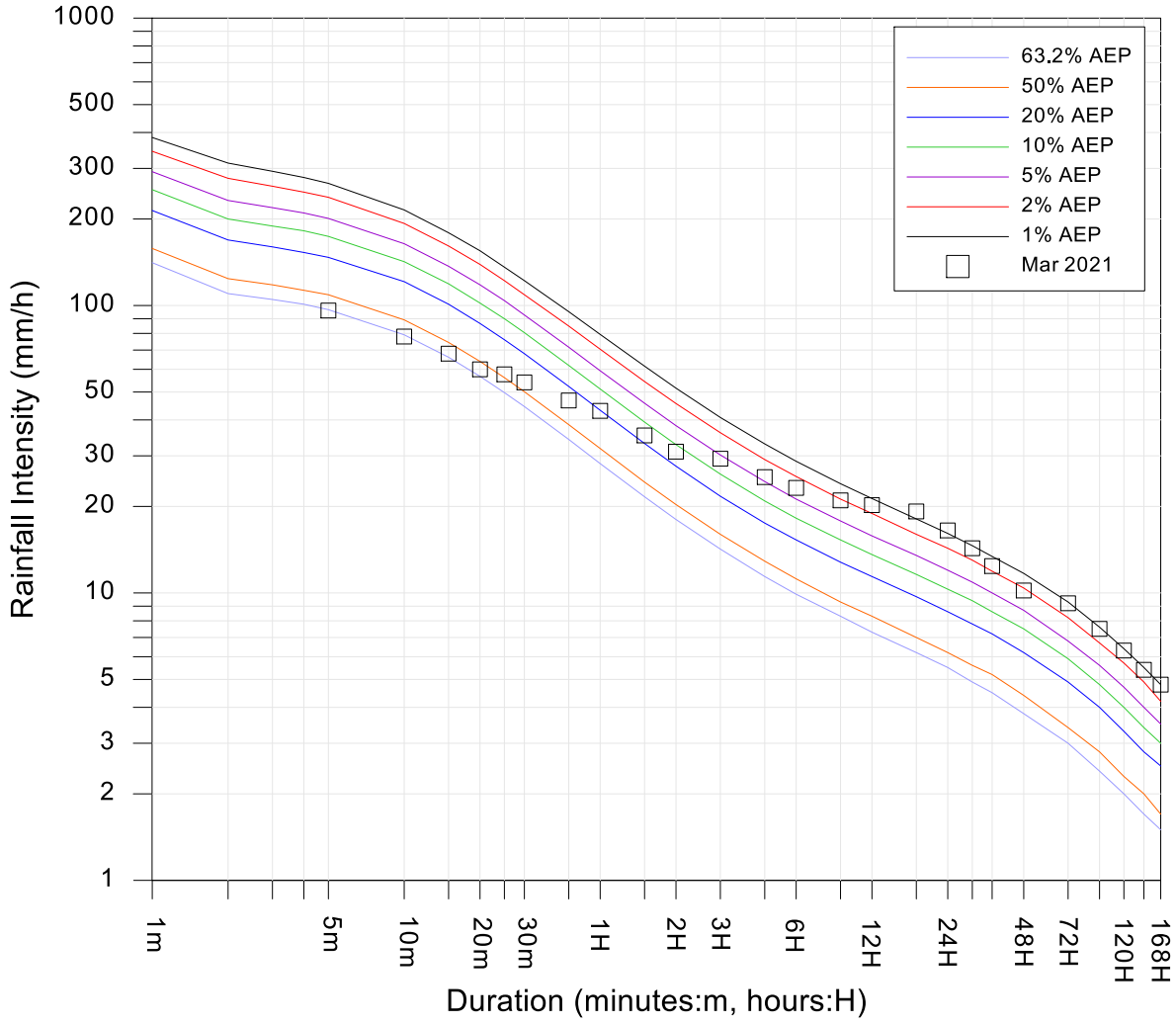
Manly Hydraulics Laboratory

Report MHL2809
Figure
C20

IFD_207904_Figure C20.pdf

Site Owner: BoM
Latitude: -31.664 Longitude:152.37

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	-	-
2m	-	-
3m	-	-
4m	-	-
5m	96	06:44 19 Mar 2021
10m	78	06:48 19 Mar 2021
15m	68	06:53 19 Mar 2021
20m	60	06:59 19 Mar 2021
25m	57.6	06:59 19 Mar 2021
30m	54	07:05 19 Mar 2021
45m	46.7	07:02 19 Mar 2021
1H	43	07:16 19 Mar 2021
1.5H	35.3	07:17 19 Mar 2021
2H	31	08:13 19 Mar 2021
3H	29.3	08:50 19 Mar 2021
5H	25.3	10:17 19 Mar 2021
6H	23.2	09:57 19 Mar 2021
9H	21	15:08 19 Mar 2021
12H	20.2	16:40 19 Mar 2021
18H	19.2	21:06 19 Mar 2021
24H	16.5	03:06 20 Mar 2021
30H	14.3	03:25 20 Mar 2021
36H	12.4	03:04 20 Mar 2021
48H	10.2	03:05 20 Mar 2021
72H	9.2	13:25 21 Mar 2021
96H	7.5	03:51 22 Mar 2021
120H	6.3	04:14 22 Mar 2021
144H	5.4	04:14 23 Mar 2021
168H	4.8	13:36 21 Mar 2021

Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

MOORAL CREEK (60165)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

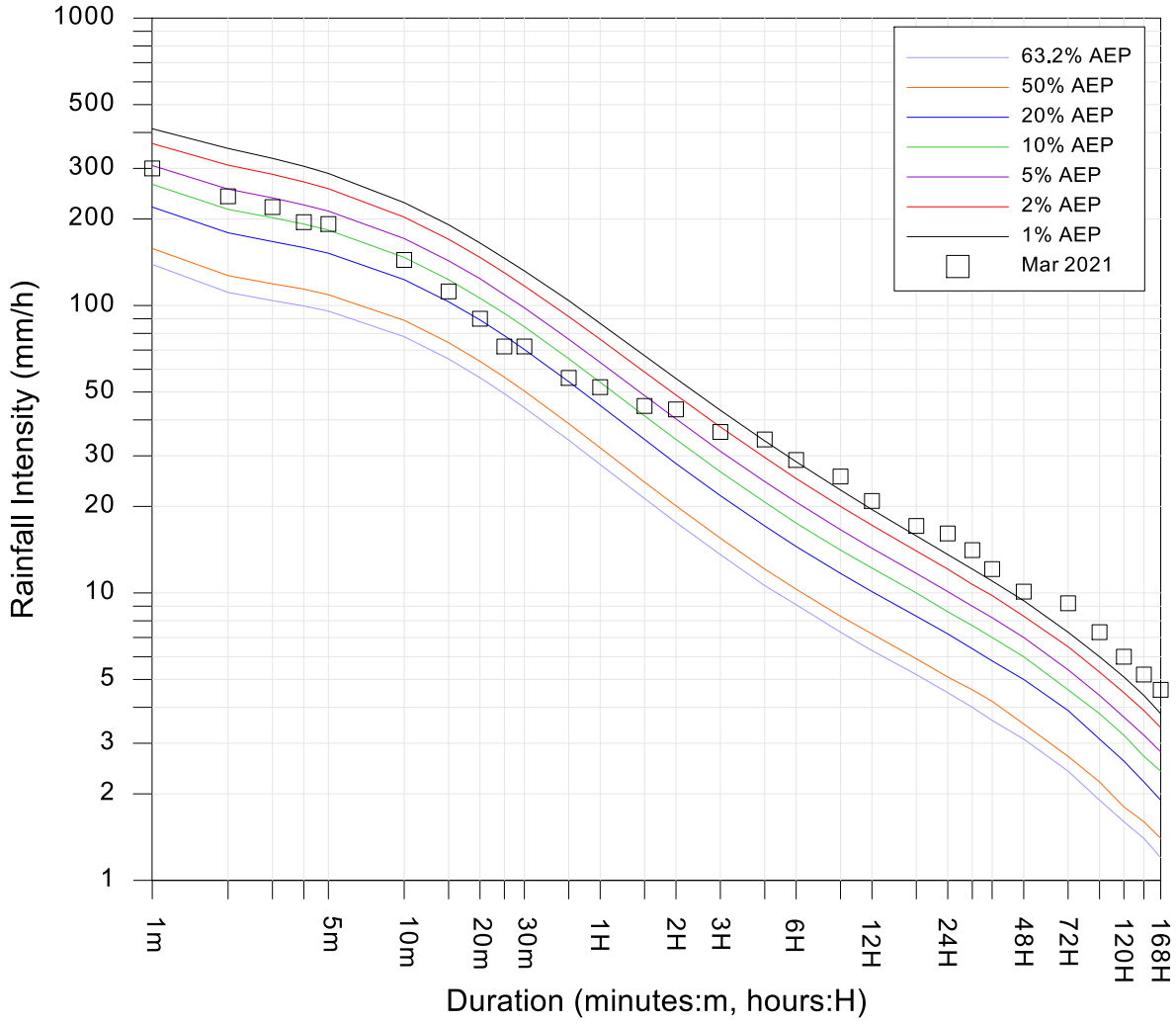
Manly Hydraulics Laboratory

Report MHL2809
Figure
C21

IFD_60165_Figure C21.pdf

Site Owner: BoM
Latitude: -31.736 Longitude:152.399

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	300	00:59 20 Mar 2021
2m	240	13:39 14 Mar 2021
3m	220	13:40 14 Mar 2021
4m	195	13:41 14 Mar 2021
5m	192	13:40 14 Mar 2021
10m	144	13:44 14 Mar 2021
15m	112	13:47 14 Mar 2021
20m	90	13:52 14 Mar 2021
25m	72	05:53 19 Mar 2021
30m	72	05:50 19 Mar 2021
45m	56	20:36 19 Mar 2021
1H	52	20:44 19 Mar 2021
1.5H	44.7	20:50 19 Mar 2021
2H	43.5	20:33 19 Mar 2021
3H	36.3	21:33 19 Mar 2021
5H	34.2	23:06 19 Mar 2021
6H	29	23:32 19 Mar 2021
9H	25.4	01:40 20 Mar 2021
12H	20.9	01:43 20 Mar 2021
18H	17.1	22:48 19 Mar 2021
24H	16.1	02:38 20 Mar 2021
30H	14.1	04:19 20 Mar 2021
36H	12.1	04:18 20 Mar 2021
48H	10.1	22:19 20 Mar 2021
72H	9.2	13:03 21 Mar 2021
96H	7.3	03:32 22 Mar 2021
120H	6	03:32 23 Mar 2021
144H	5.2	04:09 23 Mar 2021
168H	4.6	13:32 21 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

KILLABAKH (60147)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

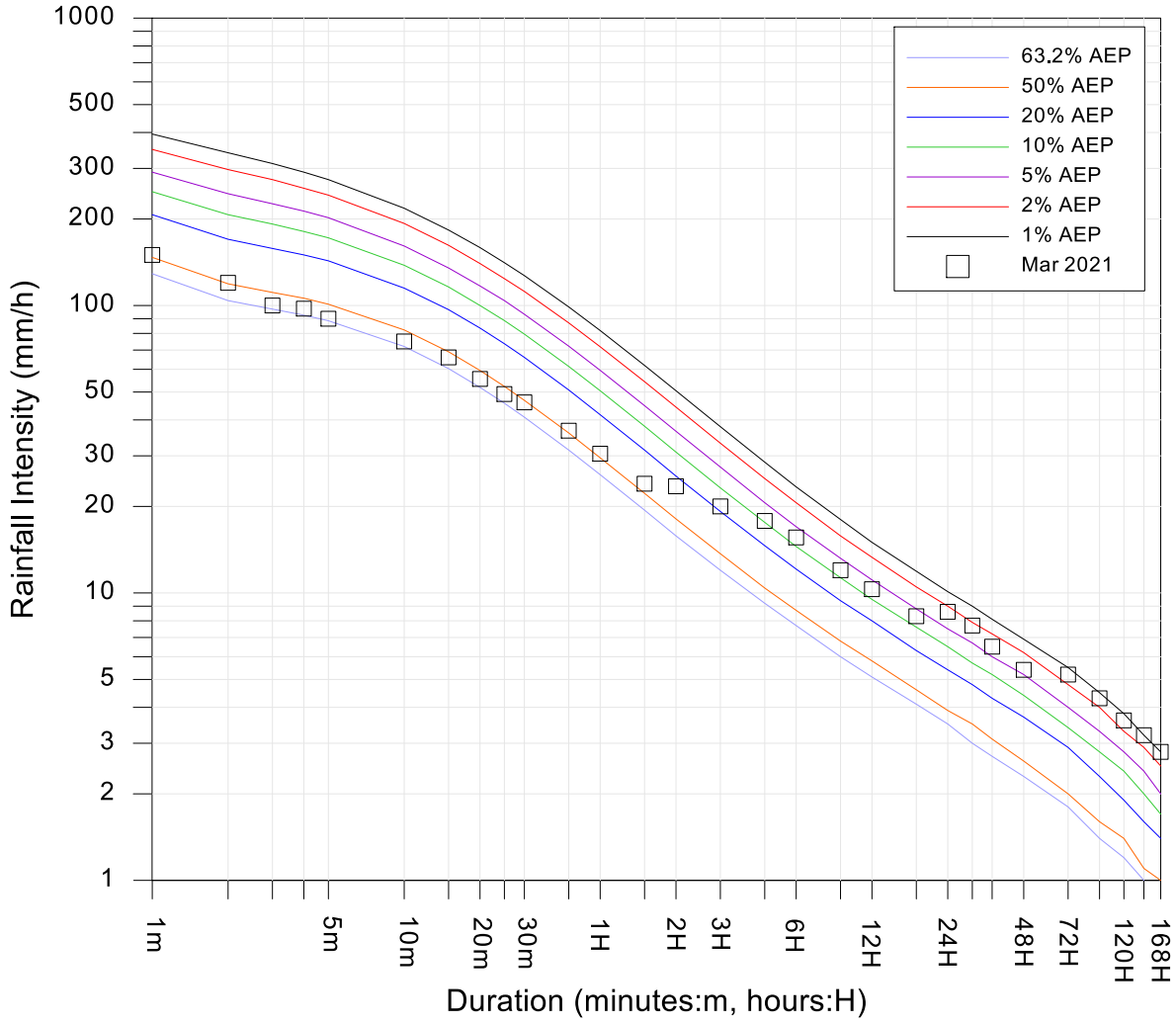
Manly Hydraulics Laboratory

Report MHL2809
Figure
C22

IFD_60147_Figure C22.pdf

Site Owner: DPIE
Latitude: -31.8826 Longitude:152.146

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	150	15:36 08 Mar 2021
2m	120	15:37 08 Mar 2021
3m	100	15:38 08 Mar 2021
4m	97.5	15:37 08 Mar 2021
5m	90	15:38 08 Mar 2021
10m	75	15:38 08 Mar 2021
15m	66	15:39 08 Mar 2021
20m	55.5	15:41 08 Mar 2021
25m	49.2	13:33 14 Mar 2021
30m	46	13:36 14 Mar 2021
45m	36.7	13:47 14 Mar 2021
1H	30.5	14:01 14 Mar 2021
1.5H	24	20:36 19 Mar 2021
2H	23.5	21:31 19 Mar 2021
3H	20	21:36 19 Mar 2021
5H	17.8	23:26 19 Mar 2021
6H	15.6	23:26 19 Mar 2021
9H	12	00:13 20 Mar 2021
12H	10.3	23:40 19 Mar 2021
18H	8.3	21:34 19 Mar 2021
24H	8.6	23:24 19 Mar 2021
30H	7.7	03:52 20 Mar 2021
36H	6.5	08:55 20 Mar 2021
48H	5.4	13:59 21 Mar 2021
72H	5.2	21:52 21 Mar 2021
96H	4.3	03:46 22 Mar 2021
120H	3.6	05:17 22 Mar 2021
144H	3.2	05:17 23 Mar 2021
168H	2.8	17:06 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

MOUNT GEORGE (208440)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

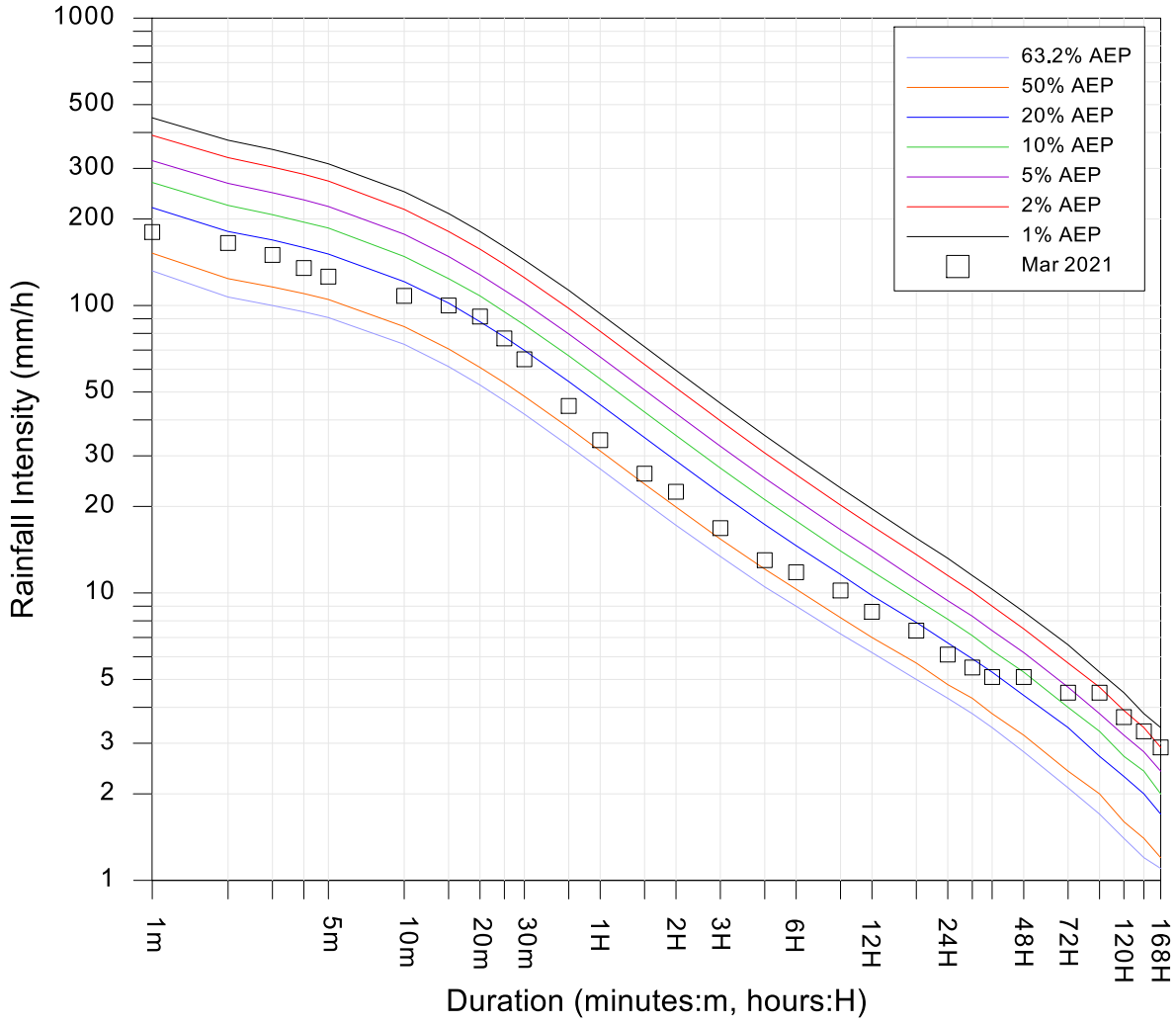
Manly Hydraulics Laboratory

Report MHL2809
Figure
C23

IFD_208440_Figure C23.pdf

Site Owner: DPIE
Latitude: -32.4139 Longitude:152.207

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	180	14:41 08 Mar 2021
2m	165	14:42 08 Mar 2021
3m	150	14:43 08 Mar 2021
4m	135	14:43 08 Mar 2021
5m	126	14:45 08 Mar 2021
10m	108	14:50 08 Mar 2021
15m	100	14:55 08 Mar 2021
20m	91.5	14:59 08 Mar 2021
25m	76.8	15:04 08 Mar 2021
30m	65	15:08 08 Mar 2021
45m	44.7	15:23 08 Mar 2021
1H	34	15:38 08 Mar 2021
1.5H	26	06:45 18 Mar 2021
2H	22.5	06:55 18 Mar 2021
3H	16.8	07:08 18 Mar 2021
5H	13	00:04 20 Mar 2021
6H	11.8	23:23 19 Mar 2021
9H	10.2	23:34 19 Mar 2021
12H	8.6	05:34 20 Mar 2021
18H	7.4	08:34 20 Mar 2021
24H	6.1	11:17 20 Mar 2021
30H	5.5	21:22 20 Mar 2021
36H	5.1	23:24 20 Mar 2021
48H	5.1	05:04 20 Mar 2021
72H	4.5	00:10 21 Mar 2021
96H	4.5	00:59 22 Mar 2021
120H	3.7	22:02 22 Mar 2021
144H	3.3	19:36 23 Mar 2021
168H	2.9	19:15 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

BULAHDELAH (209460)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

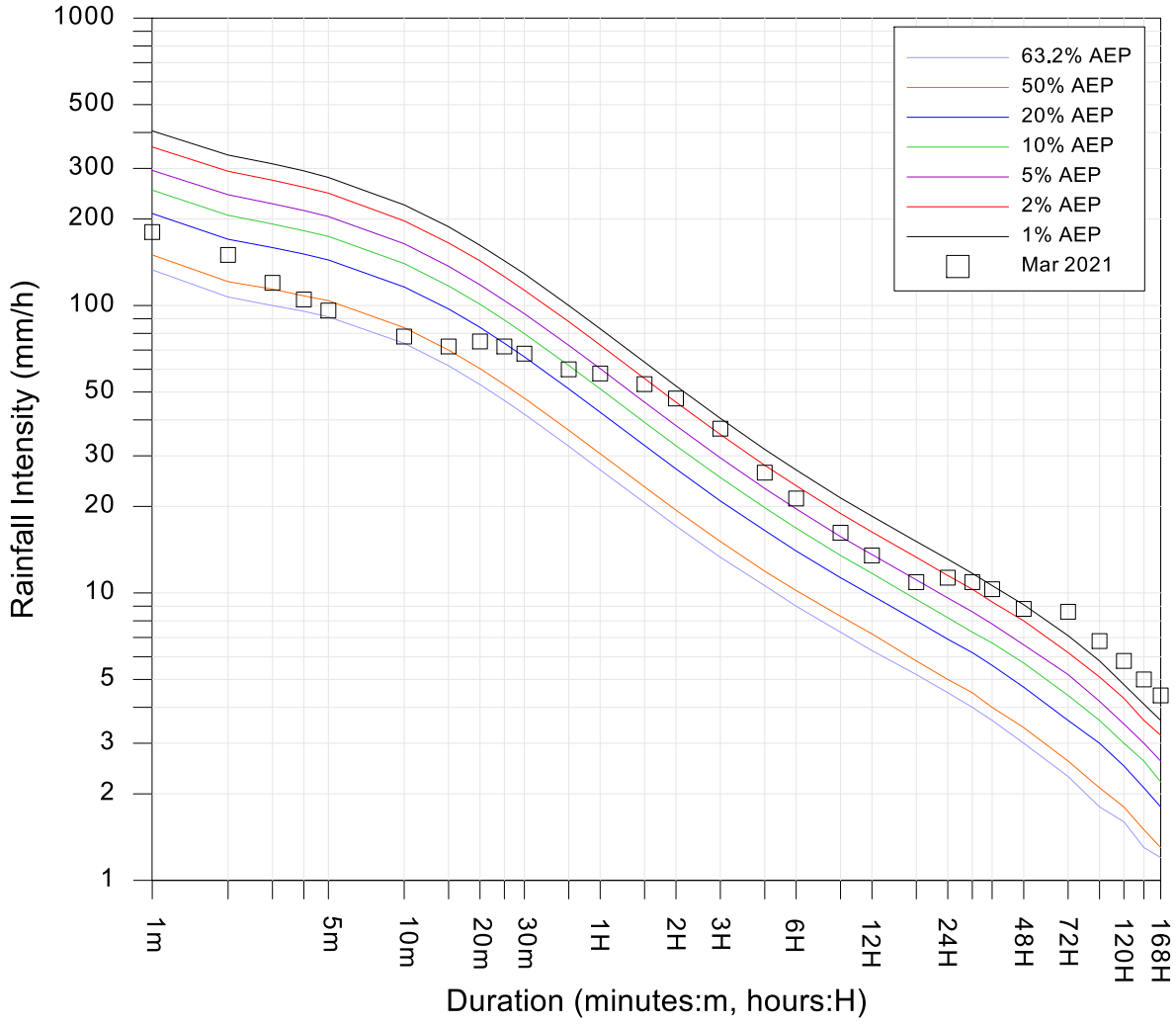
Manly Hydraulics Laboratory

Report MHL2809
Figure
C24

IFD_209460_Figure C24.pdf

Site Owner: BoM
Latitude: -32.258 Longitude:152.121

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	180	23:57 18 Mar 2021
2m	150	23:25 18 Mar 2021
3m	120	23:26 18 Mar 2021
4m	105	23:42 18 Mar 2021
5m	96	23:43 18 Mar 2021
10m	78	23:48 18 Mar 2021
15m	72	23:36 18 Mar 2021
20m	75	23:43 18 Mar 2021
25m	72	23:48 18 Mar 2021
30m	68	23:51 18 Mar 2021
45m	60	00:08 19 Mar 2021
1H	58	23:58 18 Mar 2021
1.5H	53.3	23:58 18 Mar 2021
2H	47.5	00:16 19 Mar 2021
3H	37.3	00:16 19 Mar 2021
5H	26.2	00:43 19 Mar 2021
6H	21.3	00:44 19 Mar 2021
9H	16.2	06:16 19 Mar 2021
12H	13.5	06:15 19 Mar 2021
18H	10.9	05:57 20 Mar 2021
24H	11.3	22:19 19 Mar 2021
30H	10.9	00:44 20 Mar 2021
36H	10.3	06:06 20 Mar 2021
48H	8.8	17:50 20 Mar 2021
72H	8.6	18:01 21 Mar 2021
96H	6.8	16:26 22 Mar 2021
120H	5.8	17:50 23 Mar 2021
144H	5	16:29 23 Mar 2021
168H	4.4	21:43 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

CABBAGE TREE MOUNTAIN (60096)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

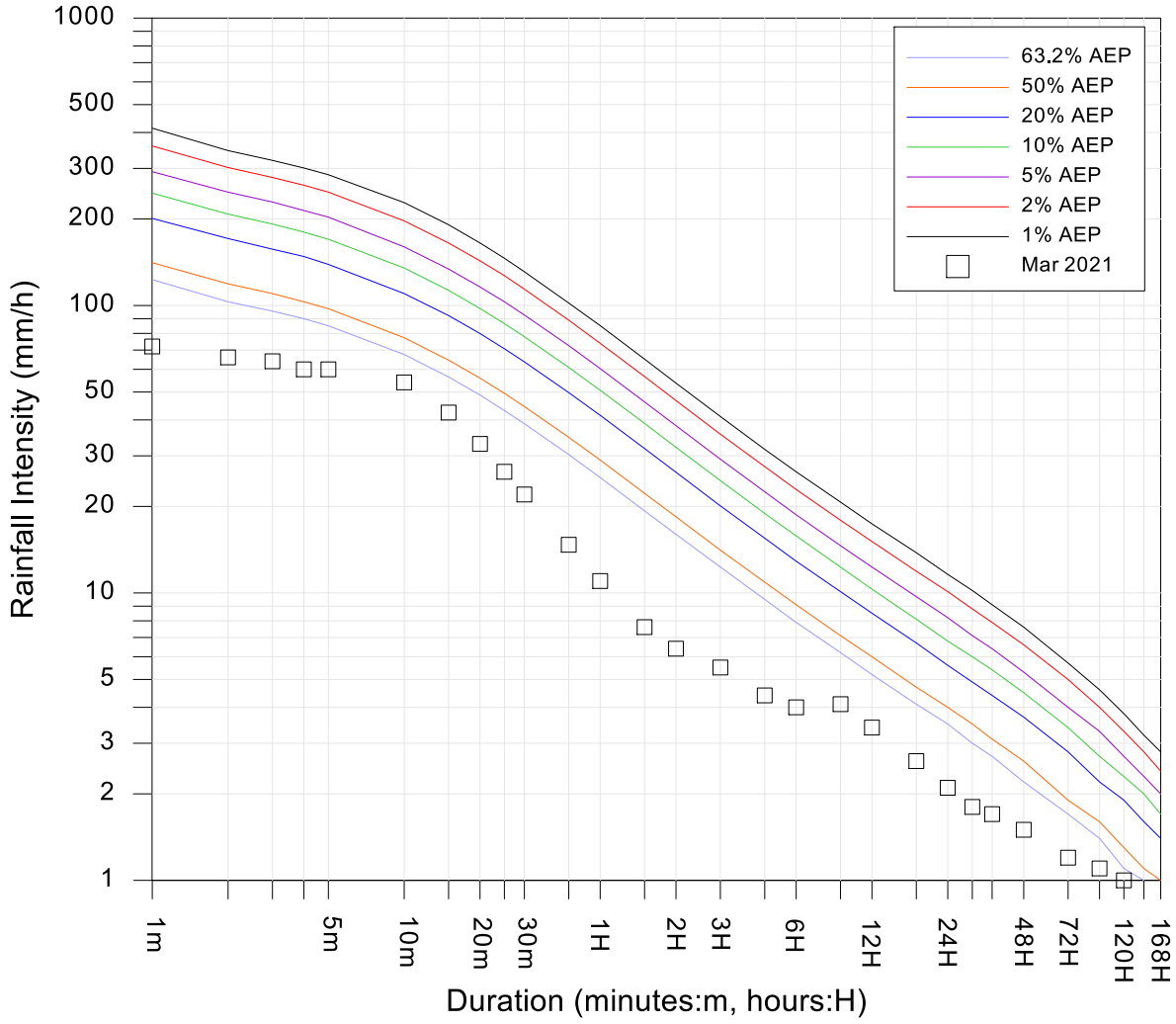
Manly Hydraulics Laboratory

Report MHL2809
Figure
C25

IFD_60096_Figure C25.pdf

Site Owner: WaterNSW
Latitude: -32.5586 Longitude:151.804

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	72	14:02 08 Mar 2021
2m	66	14:03 08 Mar 2021
3m	64	14:04 08 Mar 2021
4m	60	14:05 08 Mar 2021
5m	60	14:06 08 Mar 2021
10m	54	14:09 08 Mar 2021
15m	42.4	14:13 08 Mar 2021
20m	33	14:15 08 Mar 2021
25m	26.4	14:20 08 Mar 2021
30m	22	14:25 08 Mar 2021
45m	14.7	14:40 08 Mar 2021
1H	11	14:55 08 Mar 2021
1.5H	7.6	11:23 14 Mar 2021
2H	6.4	23:45 19 Mar 2021
3H	5.5	16:55 08 Mar 2021
5H	4.4	07:00 20 Mar 2021
6H	4	03:43 20 Mar 2021
9H	4.1	06:33 20 Mar 2021
12H	3.4	07:04 20 Mar 2021
18H	2.6	09:43 20 Mar 2021
24H	2.1	10:30 20 Mar 2021
30H	1.8	12:05 20 Mar 2021
36H	1.7	07:09 20 Mar 2021
48H	1.5	07:07 20 Mar 2021
72H	1.2	11:00 21 Mar 2021
96H	1.1	01:33 22 Mar 2021
120H	1	01:33 23 Mar 2021
144H	0.9	15:37 23 Mar 2021
168H	0.8	17:50 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

WILLIAMS RIVER AT GLEN MARTIN (210010)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

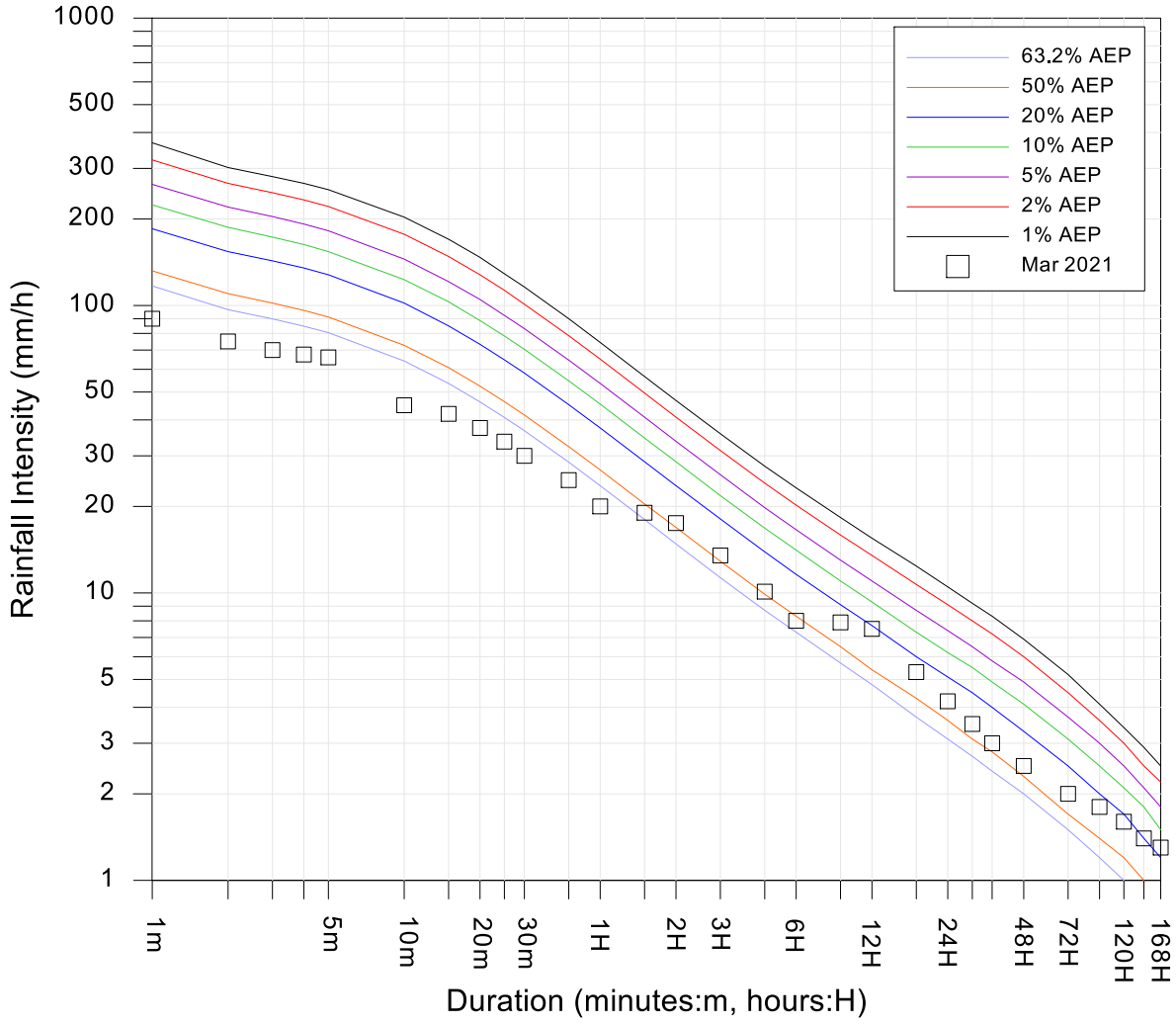
Manly Hydraulics Laboratory

Report MHL2809
Figure
C26

IFD_210010_Figure C26.pdf

Site Owner: DPIE
Latitude: -32.565 Longitude:151.605

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	90	21:26 09 Mar 2021
2m	75	21:24 09 Mar 2021
3m	70	21:26 09 Mar 2021
4m	67.5	21:26 09 Mar 2021
5m	66	21:26 09 Mar 2021
10m	45	06:22 20 Mar 2021
15m	42	06:27 20 Mar 2021
20m	37.5	06:32 20 Mar 2021
25m	33.6	06:35 20 Mar 2021
30m	30	06:42 20 Mar 2021
45m	24.7	06:51 20 Mar 2021
1H	20	06:59 20 Mar 2021
1.5H	19	11:41 14 Mar 2021
2H	17.5	11:45 14 Mar 2021
3H	13.5	12:26 14 Mar 2021
5H	10.1	13:56 14 Mar 2021
6H	8	15:26 14 Mar 2021
9H	7.9	07:08 20 Mar 2021
12H	7.5	07:18 20 Mar 2021
18H	5.3	10:04 20 Mar 2021
24H	4.2	07:12 20 Mar 2021
30H	3.5	10:48 20 Mar 2021
36H	3	11:35 20 Mar 2021
48H	2.5	11:04 21 Mar 2021
72H	2	00:42 21 Mar 2021
96H	1.8	02:06 22 Mar 2021
120H	1.6	01:36 23 Mar 2021
144H	1.4	09:26 20 Mar 2021
168H	1.3	09:26 21 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

GOSTWYCK (210402)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

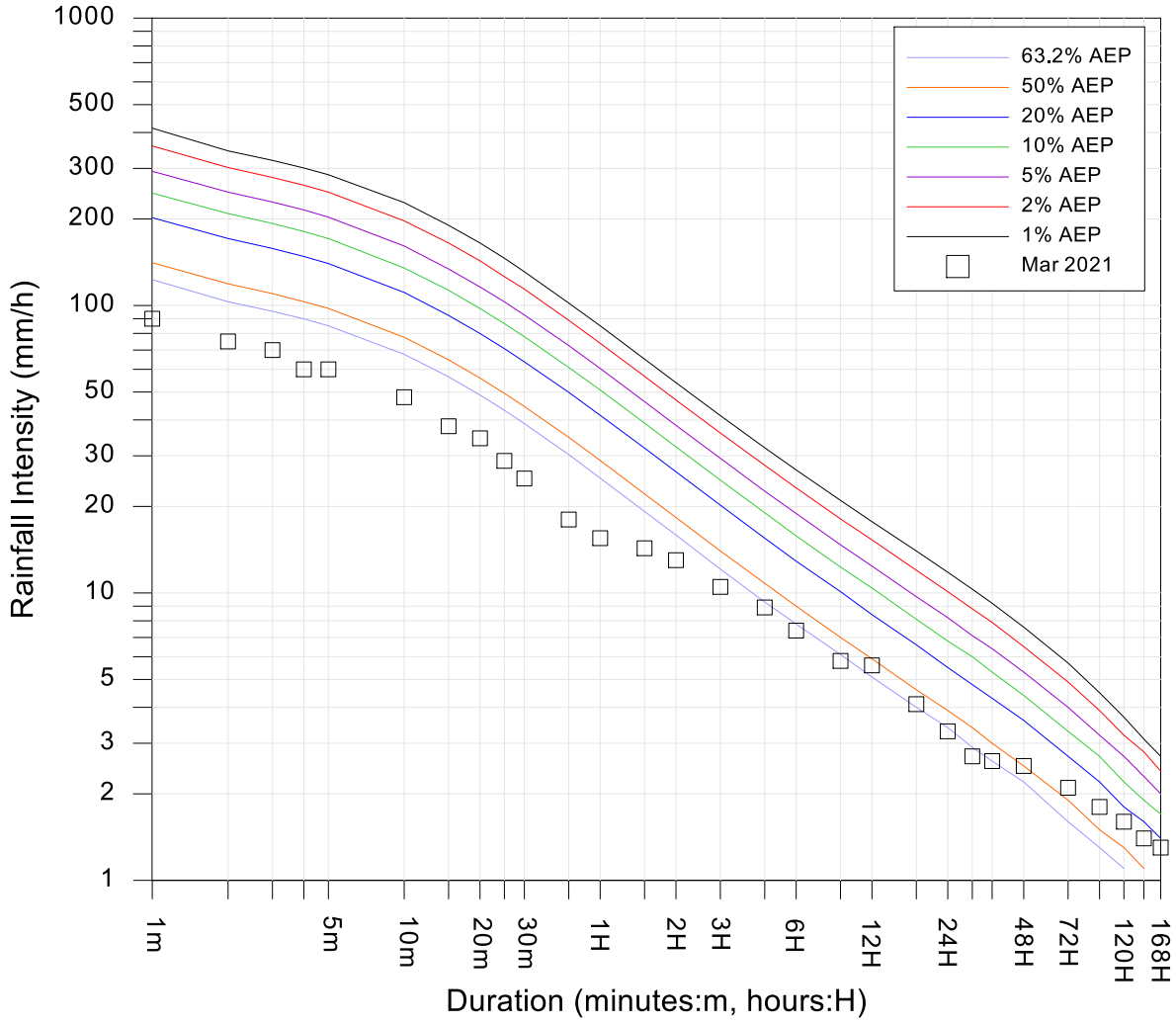
Manly Hydraulics Laboratory

Report MHL2809
Figure
C27

IFD_210402_Figure C27.pdf

Site Owner: DPIE
Latitude: -32.6634 Longitude:151.732

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	90	03:02 18 Mar 2021
2m	75	03:03 18 Mar 2021
3m	70	03:03 18 Mar 2021
4m	60	03:05 18 Mar 2021
5m	60	03:05 18 Mar 2021
10m	48	03:06 18 Mar 2021
15m	38	03:08 18 Mar 2021
20m	34.5	03:07 18 Mar 2021
25m	28.8	03:08 18 Mar 2021
30m	25	03:13 18 Mar 2021
45m	18	03:32 18 Mar 2021
1H	15.5	10:52 14 Mar 2021
1.5H	14.3	11:13 14 Mar 2021
2H	13	11:43 14 Mar 2021
3H	10.5	12:34 14 Mar 2021
5H	8.9	23:47 19 Mar 2021
6H	7.4	00:51 20 Mar 2021
9H	5.8	04:20 20 Mar 2021
12H	5.6	07:17 20 Mar 2021
18H	4.1	10:32 20 Mar 2021
24H	3.3	08:23 20 Mar 2021
30H	2.7	14:23 20 Mar 2021
36H	2.6	08:17 20 Mar 2021
48H	2.5	00:53 20 Mar 2021
72H	2.1	23:40 20 Mar 2021
96H	1.8	00:29 22 Mar 2021
120H	1.6	00:44 23 Mar 2021
144H	1.4	09:34 20 Mar 2021
168H	1.3	09:34 21 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

SEAHAM (210462)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

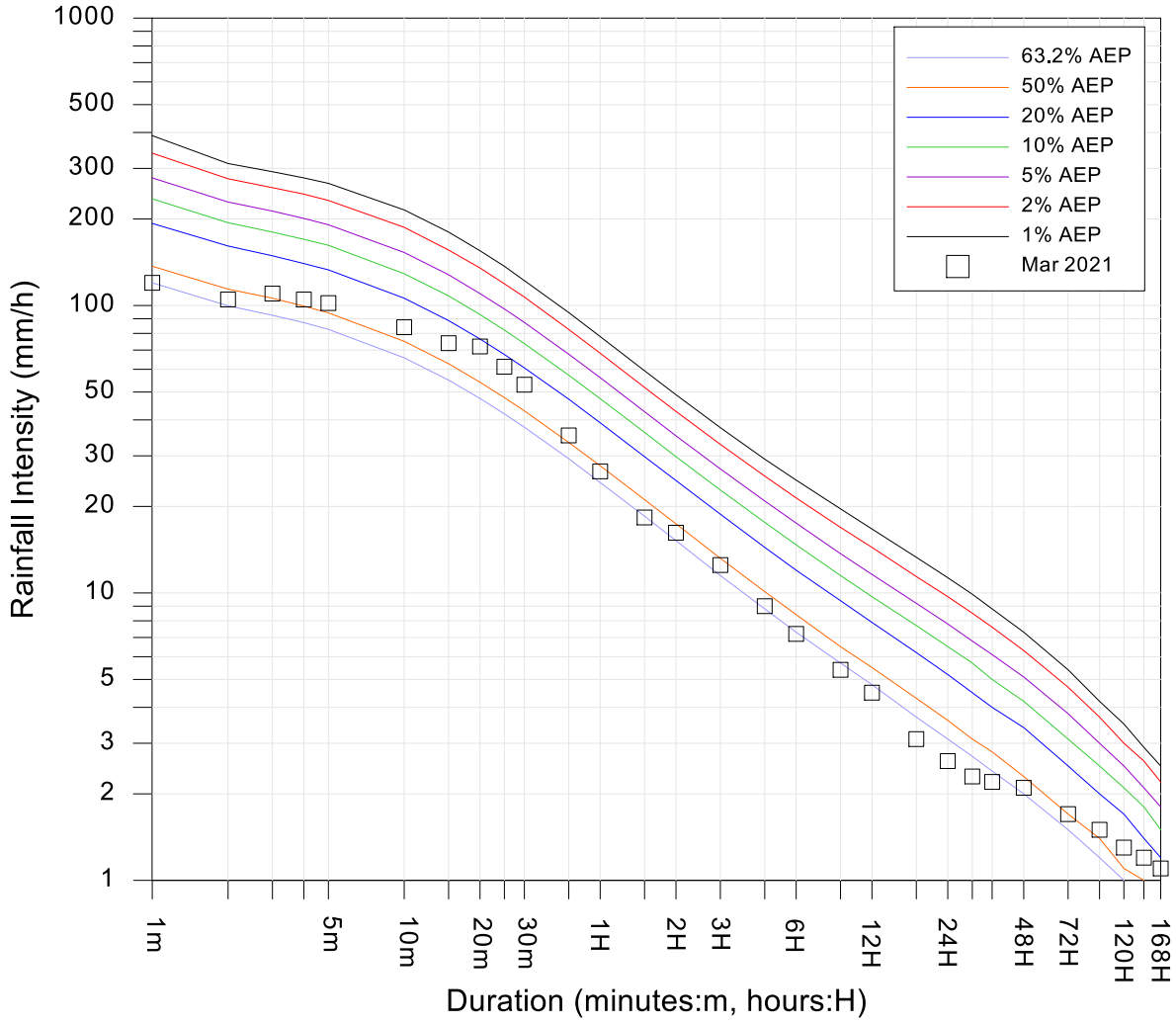
Manly Hydraulics Laboratory

Report MHL2809
Figure
C28

IFD_210462_Figure C28.pdf

Site Owner: DPIE
Latitude: -32.7295 Longitude:151.554

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	120	13:51 08 Mar 2021
2m	105	13:52 08 Mar 2021
3m	110	13:51 08 Mar 2021
4m	105	13:52 08 Mar 2021
5m	102	13:52 08 Mar 2021
10m	84	13:56 08 Mar 2021
15m	74	13:53 08 Mar 2021
20m	72	13:56 08 Mar 2021
25m	61.2	14:01 08 Mar 2021
30m	53	14:05 08 Mar 2021
45m	35.3	14:20 08 Mar 2021
1H	26.5	14:35 08 Mar 2021
1.5H	18.3	11:00 14 Mar 2021
2H	16.2	11:21 14 Mar 2021
3H	12.5	12:19 14 Mar 2021
5H	9	13:45 14 Mar 2021
6H	7.2	15:15 14 Mar 2021
9H	5.4	18:15 14 Mar 2021
12H	4.5	08:36 20 Mar 2021
18H	3.1	11:26 20 Mar 2021
24H	2.6	09:26 20 Mar 2021
30H	2.3	10:09 20 Mar 2021
36H	2.2	08:33 20 Mar 2021
48H	2.1	07:48 20 Mar 2021
72H	1.7	00:03 21 Mar 2021
96H	1.5	00:03 22 Mar 2021
120H	1.3	00:03 23 Mar 2021
144H	1.2	09:15 20 Mar 2021
168H	1.1	09:15 21 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

BELMORE BRIDGE (210458)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

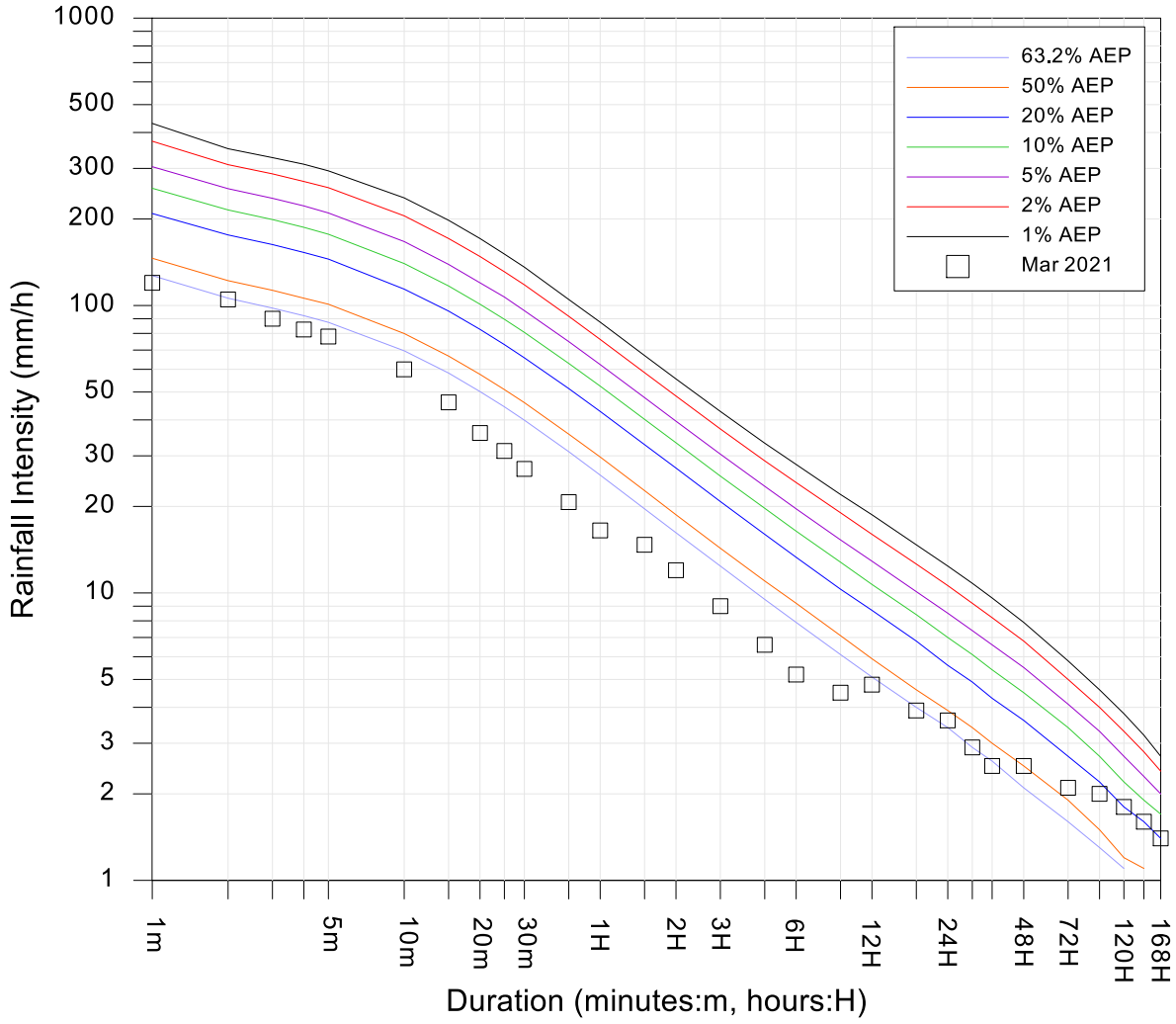
Manly Hydraulics Laboratory

Report MHL2809
Figure
C29

IFD_210458_Figure C29.pdf

Site Owner: DPIE
Latitude: -32.8177 Longitude:151.681

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	120	07:48 20 Mar 2021
2m	105	07:49 20 Mar 2021
3m	90	07:50 20 Mar 2021
4m	82.5	07:50 20 Mar 2021
5m	78	09:51 14 Mar 2021
10m	60	09:54 14 Mar 2021
15m	46	09:57 14 Mar 2021
20m	36	10:02 14 Mar 2021
25m	31.2	09:59 14 Mar 2021
30m	27	10:04 14 Mar 2021
45m	20.7	08:02 20 Mar 2021
1H	16.5	08:11 20 Mar 2021
1.5H	14.7	07:59 20 Mar 2021
2H	12	08:27 20 Mar 2021
3H	9	12:27 14 Mar 2021
5H	6.6	12:53 21 Mar 2021
6H	5.2	14:23 21 Mar 2021
9H	4.5	09:44 18 Mar 2021
12H	4.8	08:28 20 Mar 2021
18H	3.9	23:04 18 Mar 2021
24H	3.6	00:44 19 Mar 2021
30H	2.9	06:29 19 Mar 2021
36H	2.5	12:29 19 Mar 2021
48H	2.5	08:02 20 Mar 2021
72H	2.1	00:29 21 Mar 2021
96H	2	00:29 22 Mar 2021
120H	1.8	00:29 23 Mar 2021
144H	1.6	16:17 23 Mar 2021
168H	1.4	16:39 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

HEXHAM BRIDGE (210448)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

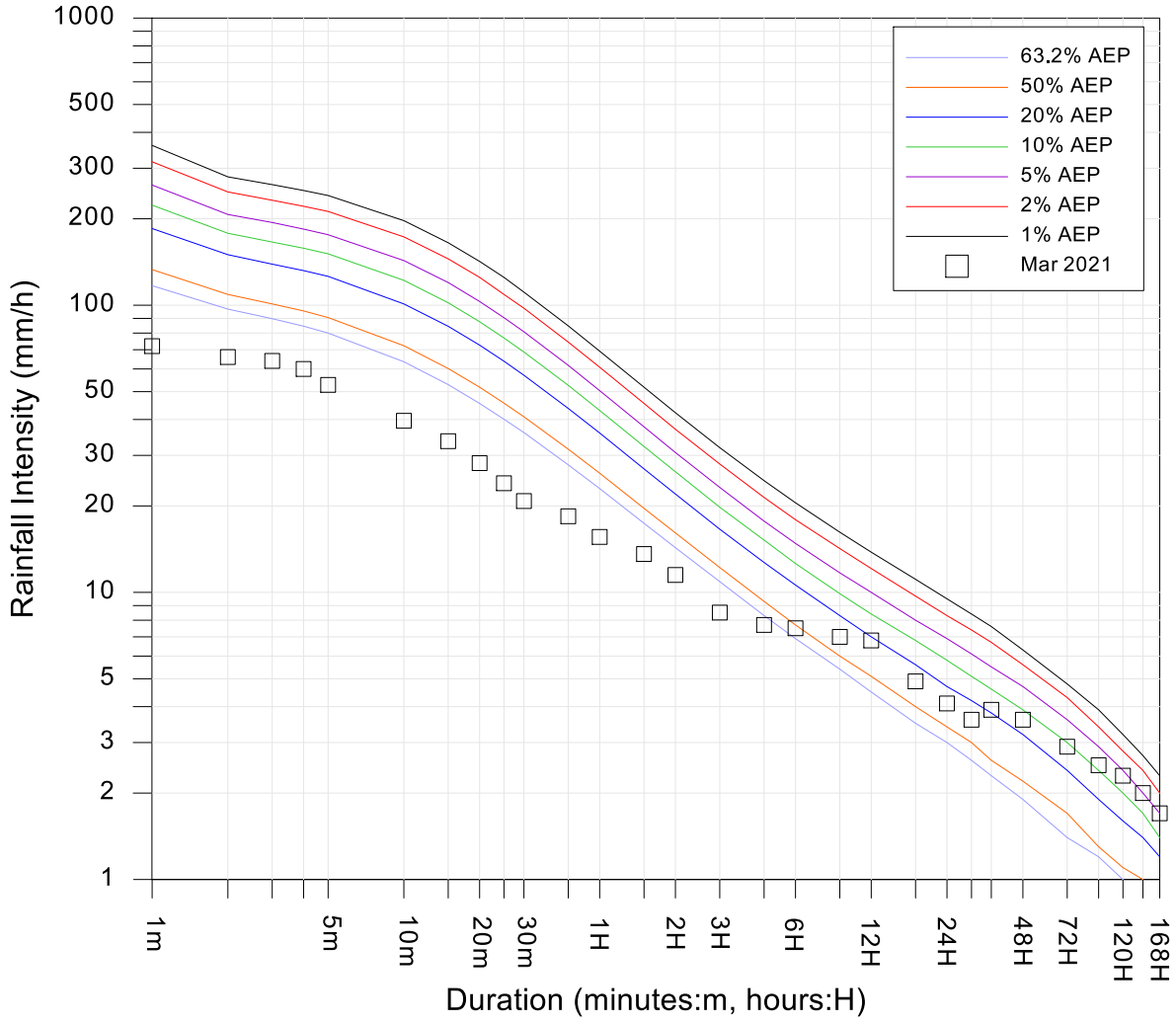
Manly Hydraulics Laboratory

Report MHL2809
Figure
C30

IFD_210448_Figure C30.pdf

Site Owner: DPIE
Latitude: -33.3875 Longitude:150.982

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	72	00:23 20 Mar 2021
2m	66	07:04 20 Mar 2021
3m	64	07:04 20 Mar 2021
4m	60	07:04 20 Mar 2021
5m	52.8	07:05 20 Mar 2021
10m	39.6	00:29 20 Mar 2021
15m	33.6	00:30 20 Mar 2021
20m	28.2	00:35 20 Mar 2021
25m	24	00:39 20 Mar 2021
30m	20.8	00:45 20 Mar 2021
45m	18.4	00:59 20 Mar 2021
1H	15.6	01:12 20 Mar 2021
1.5H	13.6	01:03 20 Mar 2021
2H	11.5	01:33 20 Mar 2021
3H	8.5	07:15 20 Mar 2021
5H	7.7	07:15 20 Mar 2021
6H	7.5	05:33 20 Mar 2021
9H	7	08:33 20 Mar 2021
12H	6.8	11:33 20 Mar 2021
18H	4.9	17:33 20 Mar 2021
24H	4.1	23:33 20 Mar 2021
30H	3.6	05:33 21 Mar 2021
36H	3.9	11:33 21 Mar 2021
48H	3.6	23:33 21 Mar 2021
72H	2.9	23:33 22 Mar 2021
96H	2.5	09:31 22 Mar 2021
120H	2.3	08:24 23 Mar 2021
144H	2	13:45 23 Mar 2021
168H	1.7	16:47 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

WEBBS CREEK (212408)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

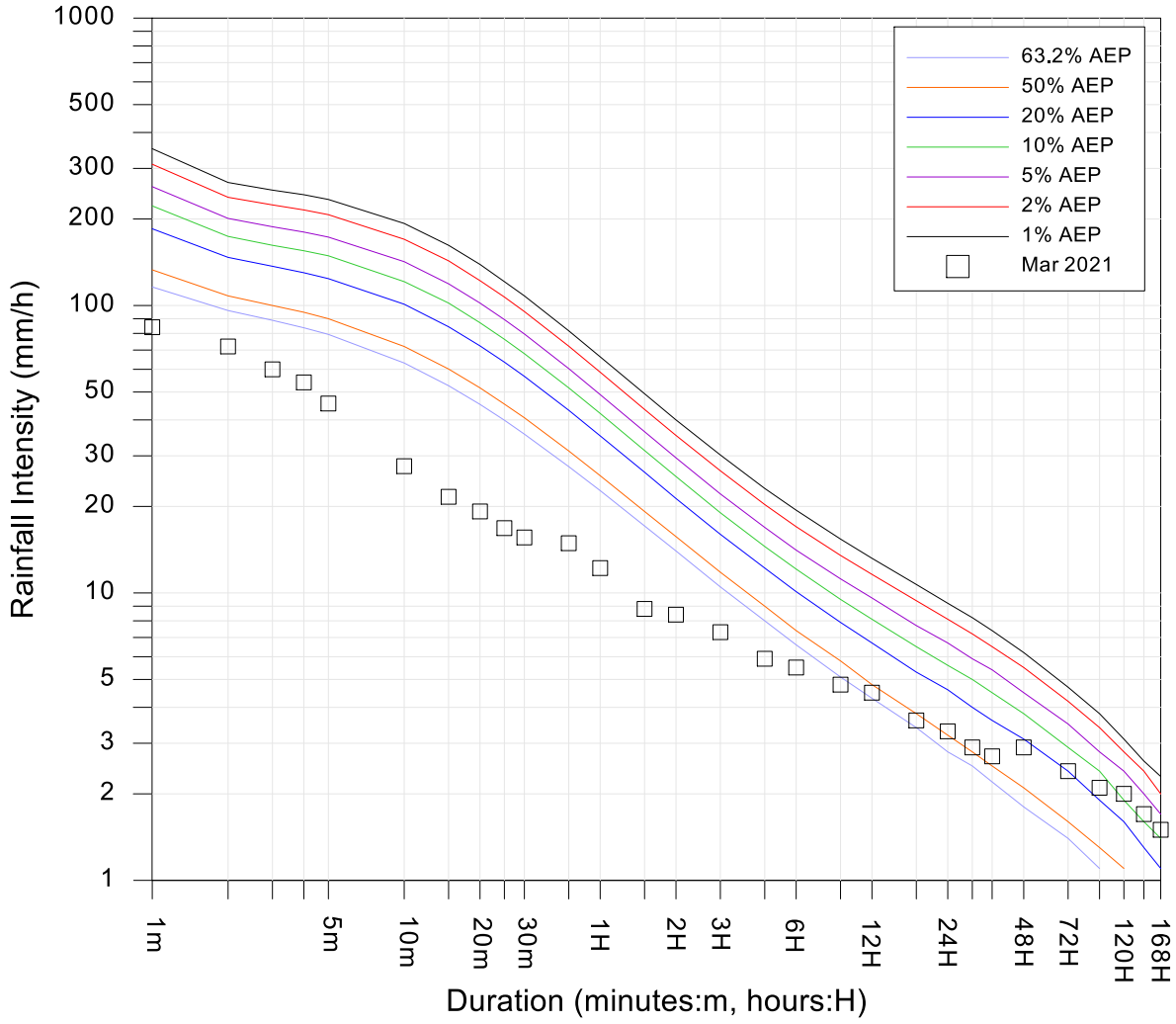
Manly Hydraulics Laboratory

Report MHL2809
Figure
C31

IFD_212408_Figure C31.pdf

Site Owner: DPIE
Latitude: -33.4377 Longitude:150.883

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	84	08:47 14 Mar 2021
2m	72	08:47 14 Mar 2021
3m	60	08:48 14 Mar 2021
4m	54	08:49 14 Mar 2021
5m	45.6	08:50 14 Mar 2021
10m	27.6	08:52 14 Mar 2021
15m	21.6	05:50 20 Mar 2021
20m	19.2	05:50 20 Mar 2021
25m	16.8	05:53 20 Mar 2021
30m	15.6	08:01 21 Mar 2021
45m	14.9	08:12 21 Mar 2021
1H	12.2	08:24 21 Mar 2021
1.5H	8.8	05:54 20 Mar 2021
2H	8.4	05:54 20 Mar 2021
3H	7.3	06:20 20 Mar 2021
5H	5.9	05:48 20 Mar 2021
6H	5.5	06:19 20 Mar 2021
9H	4.8	12:20 20 Mar 2021
12H	4.5	12:37 20 Mar 2021
18H	3.6	01:24 22 Mar 2021
24H	3.3	05:17 22 Mar 2021
30H	2.9	12:45 22 Mar 2021
36H	2.7	18:45 22 Mar 2021
48H	2.9	00:25 22 Mar 2021
72H	2.4	22:51 22 Mar 2021
96H	2.1	09:40 22 Mar 2021
120H	2	08:32 23 Mar 2021
144H	1.7	13:58 23 Mar 2021
168H	1.5	17:05 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

COLO JUNCTION (212407)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

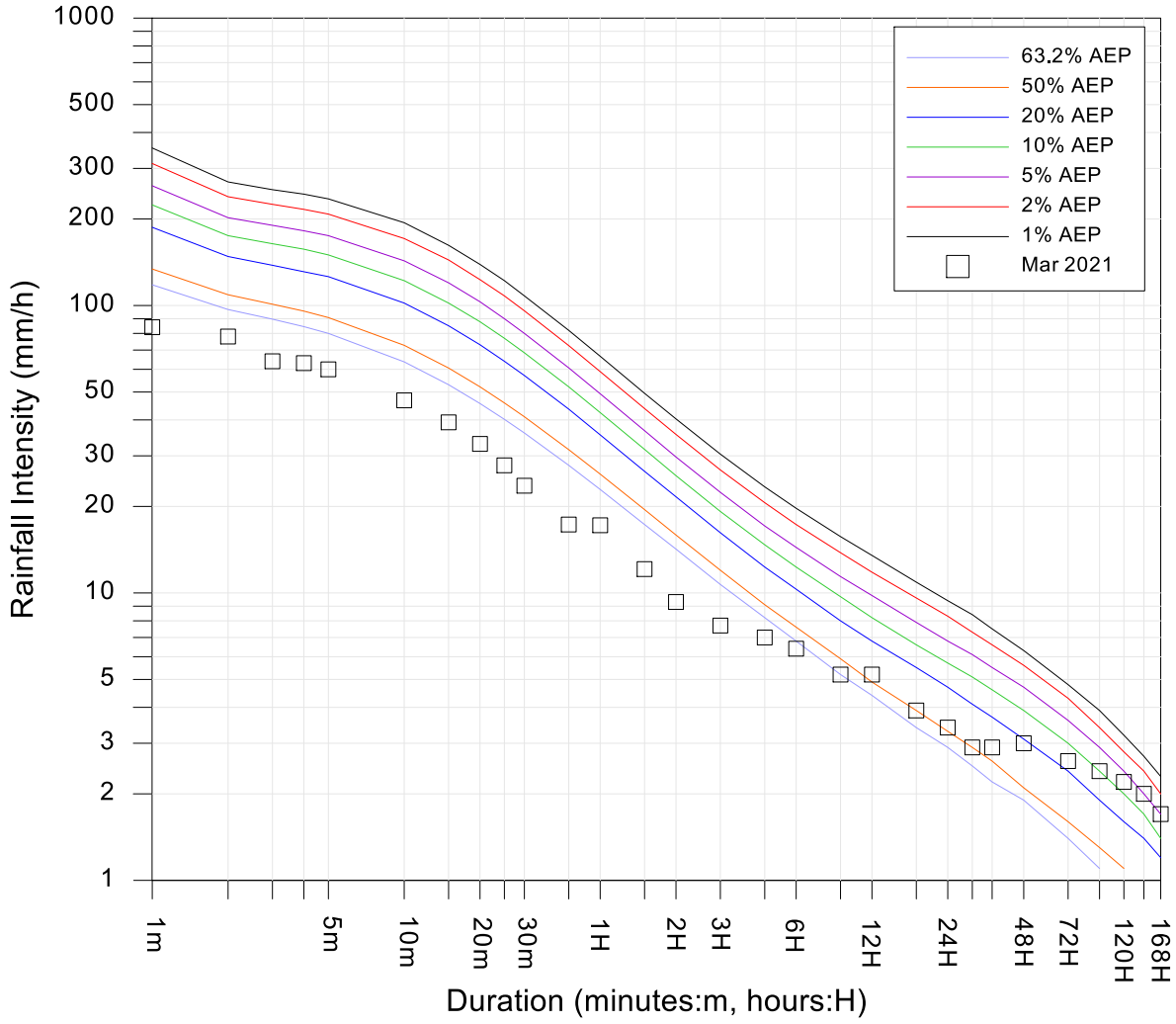
Manly Hydraulics Laboratory

Report MHL2809
Figure
C32

IFD_212407_Figure C32.pdf

Site Owner: DPIE
Latitude: -33.4973 Longitude:150.877

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	84	00:52 20 Mar 2021
2m	78	22:14 17 Mar 2021
3m	64	00:54 20 Mar 2021
4m	63	00:55 20 Mar 2021
5m	60	00:55 20 Mar 2021
10m	46.8	00:55 20 Mar 2021
15m	39.2	00:57 20 Mar 2021
20m	33	01:01 20 Mar 2021
25m	27.8	01:06 20 Mar 2021
30m	23.6	01:11 20 Mar 2021
45m	17.3	01:26 20 Mar 2021
1H	17.2	01:41 20 Mar 2021
1.5H	12.1	02:11 20 Mar 2021
2H	9.3	02:24 20 Mar 2021
3H	7.7	03:41 20 Mar 2021
5H	7	05:11 20 Mar 2021
6H	6.4	06:41 20 Mar 2021
9H	5.2	09:41 20 Mar 2021
12H	5.2	12:41 20 Mar 2021
18H	3.9	17:55 20 Mar 2021
24H	3.4	23:55 20 Mar 2021
30H	2.9	06:24 21 Mar 2021
36H	2.9	11:55 21 Mar 2021
48H	3	00:41 22 Mar 2021
72H	2.6	00:41 23 Mar 2021
96H	2.4	09:31 22 Mar 2021
120H	2.2	08:21 23 Mar 2021
144H	2	16:33 23 Mar 2021
168H	1.7	17:03 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

SACKVILLE DOWNSTREAM (212438)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

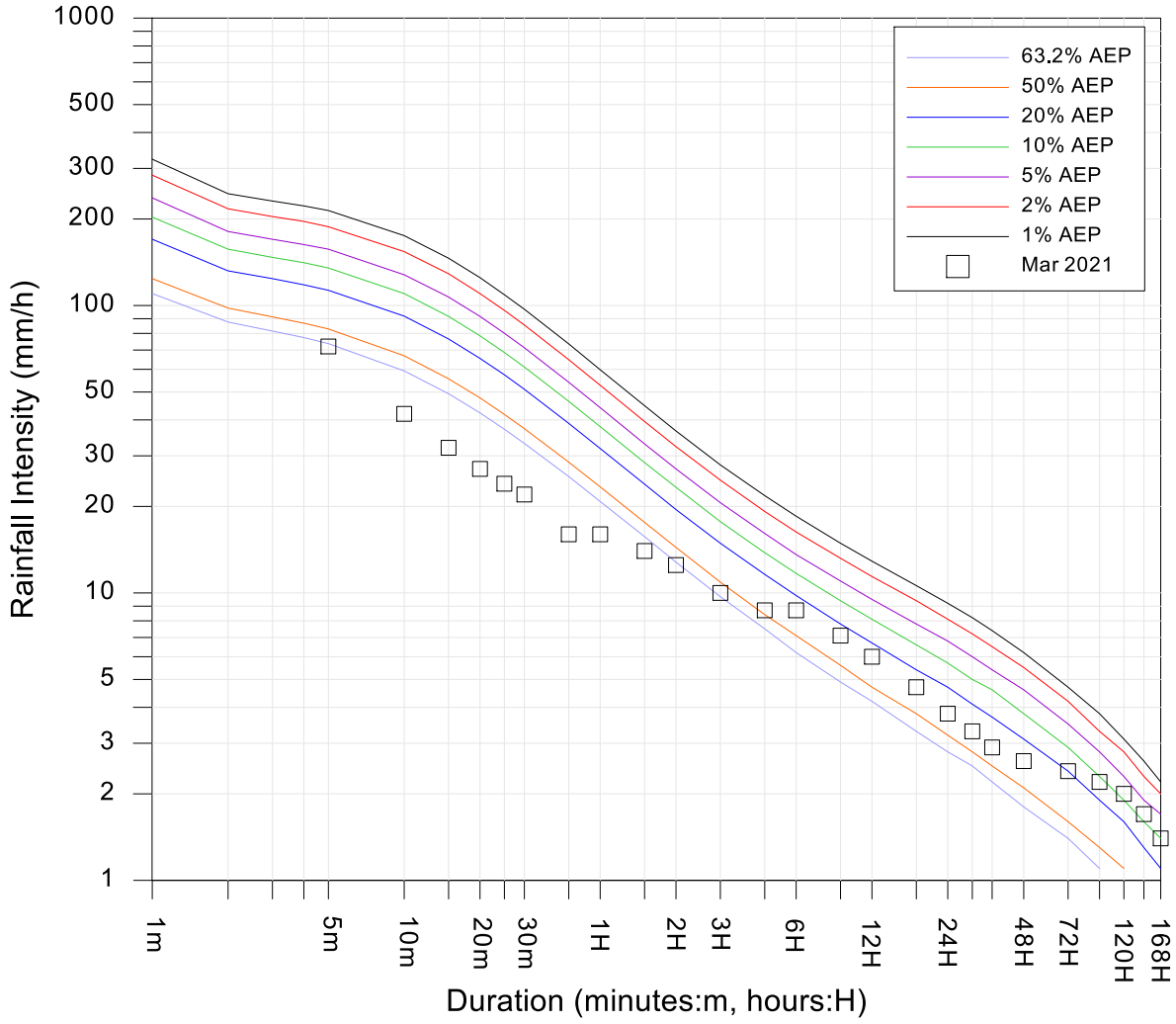
Manly Hydraulics Laboratory

Report MHL2809
Figure
C33

IFD_212438_Figure C33.pdf

Site Owner: BoM
Latitude: -34.118 Longitude:150.744

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	-	-
2m	-	-
3m	-	-
4m	-	-
5m	72	17:06 20 Mar 2021
10m	42	17:11 20 Mar 2021
15m	32	17:14 20 Mar 2021
20m	27	11:51 20 Mar 2021
25m	24	12:01 20 Mar 2021
30m	22	12:01 20 Mar 2021
45m	16	12:16 20 Mar 2021
1H	16	12:01 20 Mar 2021
1.5H	14	12:48 20 Mar 2021
2H	12.5	13:01 20 Mar 2021
3H	10	14:01 20 Mar 2021
5H	8.7	16:01 20 Mar 2021
6H	8.7	17:12 20 Mar 2021
9H	7.1	17:50 20 Mar 2021
12H	6	19:41 20 Mar 2021
18H	4.7	22:40 20 Mar 2021
24H	3.8	04:50 21 Mar 2021
30H	3.3	10:40 21 Mar 2021
36H	2.9	16:40 21 Mar 2021
48H	2.6	07:05 22 Mar 2021
72H	2.4	11:01 23 Mar 2021
96H	2.2	00:48 24 Mar 2021
120H	2	15:32 23 Mar 2021
144H	1.7	01:29 24 Mar 2021
168H	1.4	14:59 23 Mar 2021

Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

MENANGLE BRIDGE (212904)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

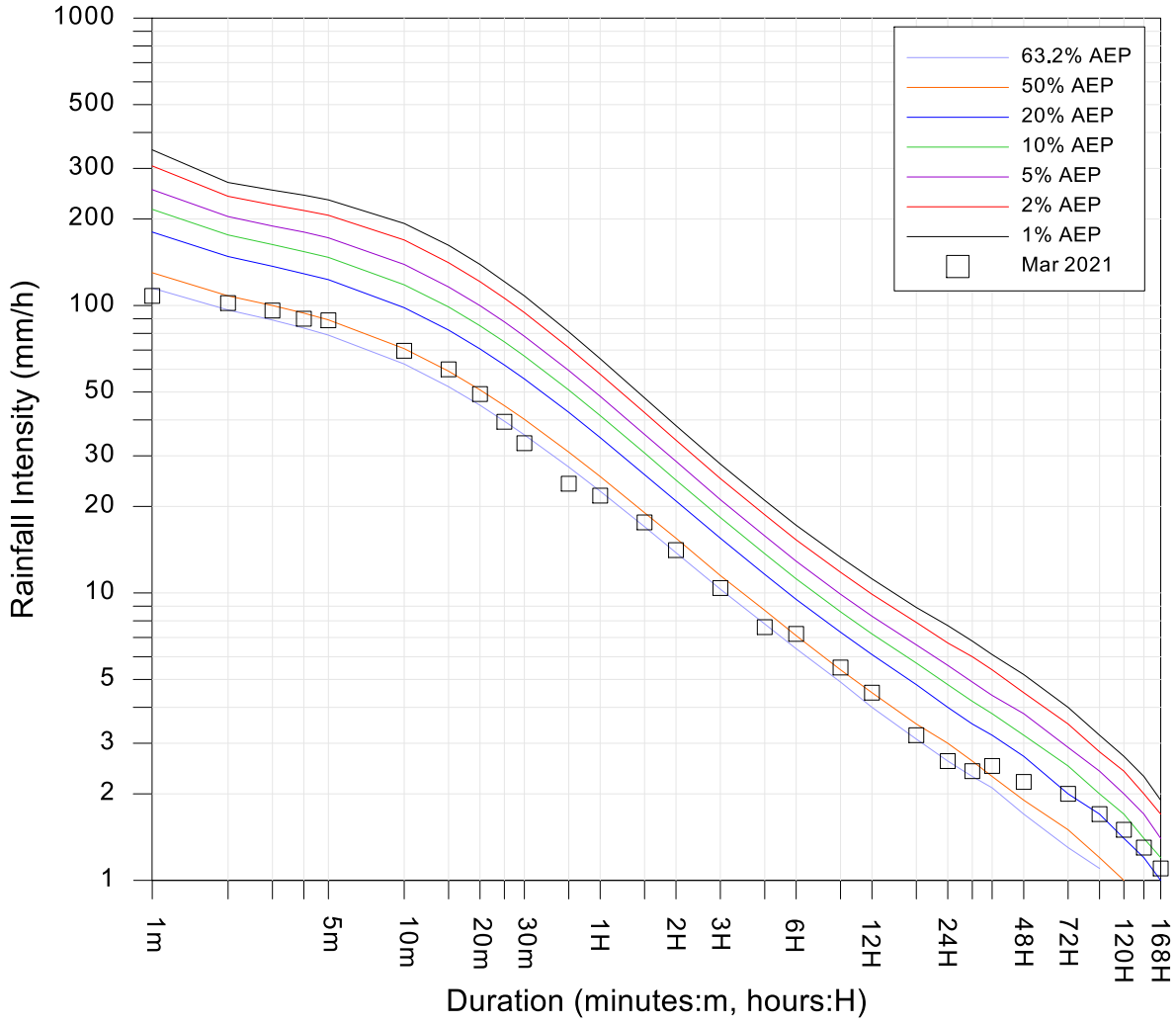
Manly Hydraulics Laboratory

Report MHL2809
Figure
C34

IFD_212904_Figure C34.pdf

Site Owner: WaterNSW
Latitude: -32.8611 Longitude:150.811

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	108	17:05 12 Mar 2021
2m	102	17:06 12 Mar 2021
3m	96	17:07 12 Mar 2021
4m	90	17:08 12 Mar 2021
5m	88.8	17:09 12 Mar 2021
10m	69.6	17:12 12 Mar 2021
15m	60	17:17 12 Mar 2021
20m	49.2	17:17 12 Mar 2021
25m	39.4	17:22 12 Mar 2021
30m	33.2	17:27 12 Mar 2021
45m	24	08:30 14 Mar 2021
1H	21.8	08:30 14 Mar 2021
1.5H	17.6	08:48 14 Mar 2021
2H	14.1	08:48 14 Mar 2021
3H	10.4	09:48 14 Mar 2021
5H	7.6	11:18 14 Mar 2021
6H	7.2	09:07 14 Mar 2021
9H	5.5	11:55 14 Mar 2021
12H	4.5	15:07 14 Mar 2021
18H	3.2	20:55 14 Mar 2021
24H	2.6	09:09 22 Mar 2021
30H	2.4	02:30 23 Mar 2021
36H	2.5	02:01 23 Mar 2021
48H	2.2	08:49 23 Mar 2021
72H	2	01:05 23 Mar 2021
96H	1.7	13:57 23 Mar 2021
120H	1.5	06:15 23 Mar 2021
144H	1.3	13:51 23 Mar 2021
168H	1.1	18:25 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

MACDONALD RIVER AT HOWES VALLEY (212021)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

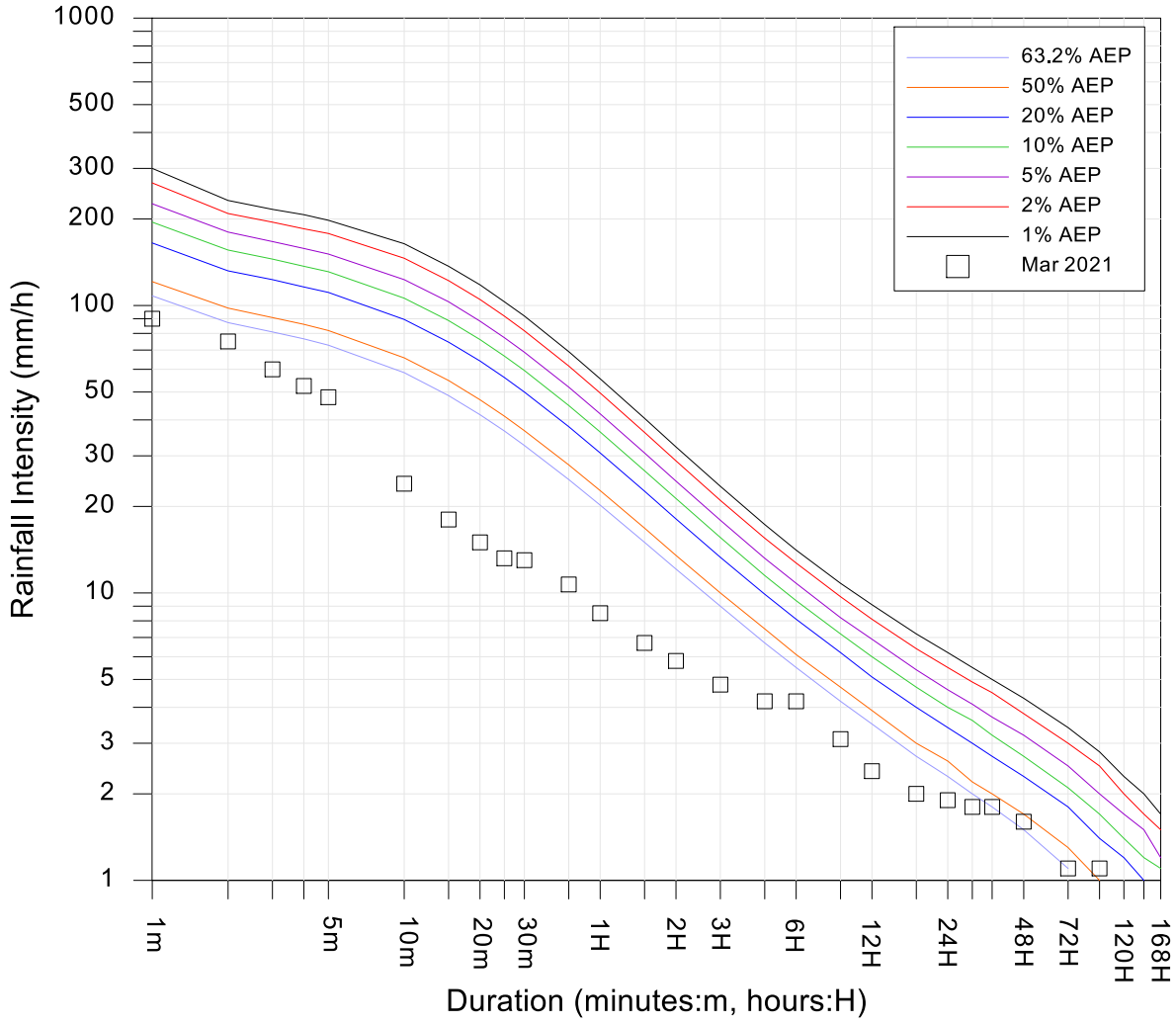
Manly Hydraulics Laboratory

Report MHL2809
Figure
C35

IFD_212021_Figure C35.pdf

Site Owner: WaterNSW
Latitude: -33.121 Longitude:150.281

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	90	01:36 14 Mar 2021
2m	75	01:37 14 Mar 2021
3m	60	01:38 14 Mar 2021
4m	52.5	01:39 14 Mar 2021
5m	48	01:39 14 Mar 2021
10m	24	01:44 14 Mar 2021
15m	18	01:49 14 Mar 2021
20m	15	01:54 14 Mar 2021
25m	13.2	02:00 14 Mar 2021
30m	13	02:05 14 Mar 2021
45m	10.7	02:19 14 Mar 2021
1H	8.5	02:34 14 Mar 2021
1.5H	6.7	03:04 14 Mar 2021
2H	5.8	03:34 14 Mar 2021
3H	4.8	07:59 14 Mar 2021
5H	4.2	06:05 14 Mar 2021
6H	4.2	07:34 14 Mar 2021
9H	3.1	10:34 14 Mar 2021
12H	2.4	13:34 14 Mar 2021
18H	2	12:21 23 Mar 2021
24H	1.9	02:02 23 Mar 2021
30H	1.8	12:52 23 Mar 2021
36H	1.8	12:56 23 Mar 2021
48H	1.6	12:48 23 Mar 2021
72H	1.1	01:29 23 Mar 2021
96H	1.1	15:07 23 Mar 2021
120H	0.9	23:03 23 Mar 2021
144H	0.8	12:51 23 Mar 2021
168H	0.7	00:05 24 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

CAPERTREE RIVER AT GLEN DAVIS (212018)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

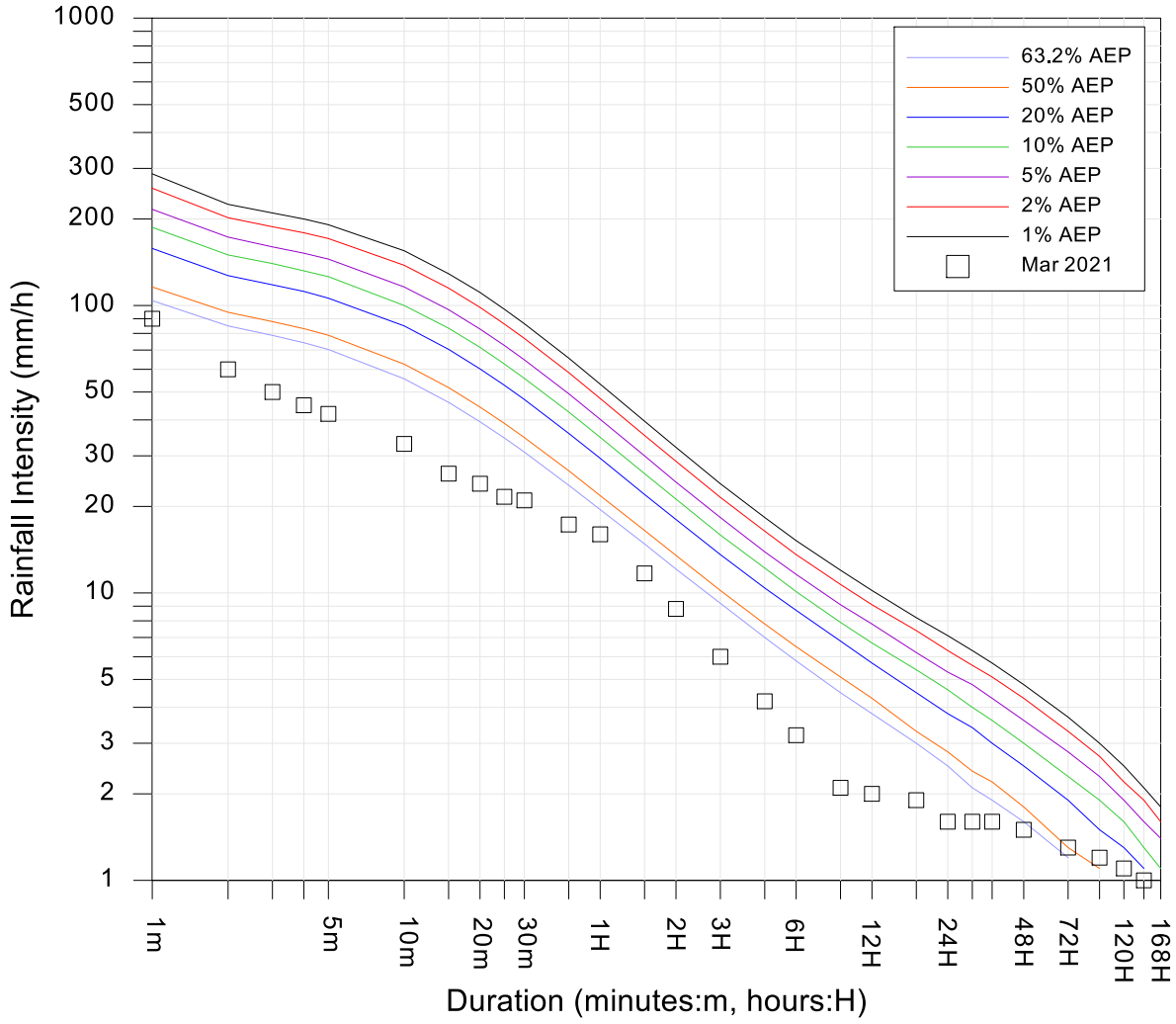
Manly Hydraulics Laboratory

Report MHL2809
Figure
C36

IFD_212018_Figure C36.pdf

Site Owner: WaterNSW
Latitude: -33.4977 Longitude:150.099

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	90	07:49 12 Mar 2021
2m	60	07:50 12 Mar 2021
3m	50	07:51 12 Mar 2021
4m	45	07:52 12 Mar 2021
5m	42	07:52 12 Mar 2021
10m	33	07:54 12 Mar 2021
15m	26	08:00 12 Mar 2021
20m	24	08:05 12 Mar 2021
25m	21.6	08:09 12 Mar 2021
30m	21	08:05 12 Mar 2021
45m	17.3	08:00 12 Mar 2021
1H	16	08:11 12 Mar 2021
1.5H	11.7	08:36 12 Mar 2021
2H	8.8	09:06 12 Mar 2021
3H	6	10:11 12 Mar 2021
5H	4.2	11:36 12 Mar 2021
6H	3.2	13:06 12 Mar 2021
9H	2.1	12:17 23 Mar 2021
12H	2	08:20 12 Mar 2021
18H	1.9	12:06 23 Mar 2021
24H	1.6	12:36 23 Mar 2021
30H	1.6	11:57 23 Mar 2021
36H	1.6	10:17 23 Mar 2021
48H	1.5	08:17 23 Mar 2021
72H	1.3	11:51 23 Mar 2021
96H	1.2	15:33 23 Mar 2021
120H	1.1	19:02 23 Mar 2021
144H	1	12:06 23 Mar 2021
168H	0.9	16:50 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

FARMERS CREEK AT MOUNT WALKER (212042)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

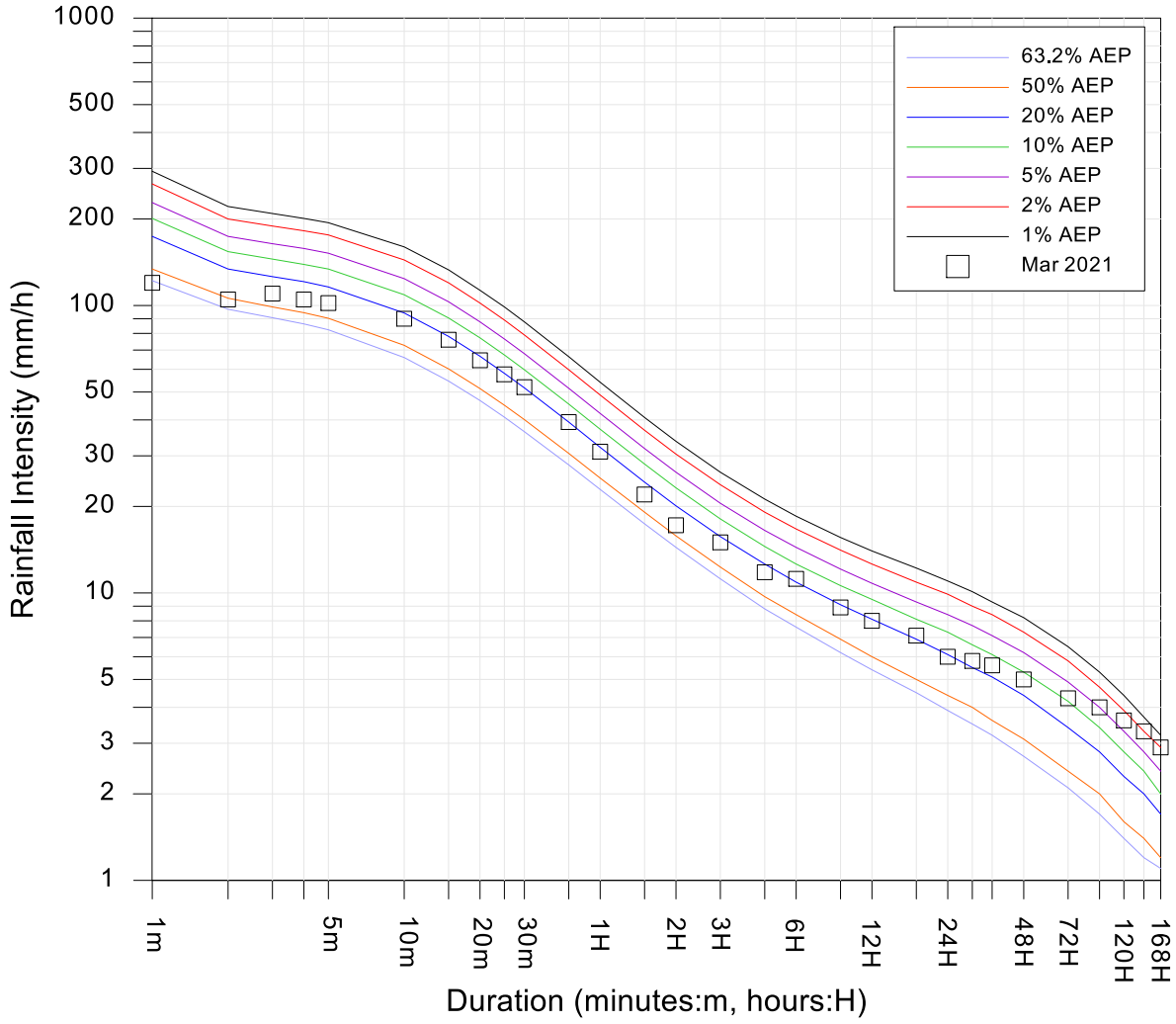
Manly Hydraulics Laboratory

Report MHL2809
Figure
C37

IFD_212042_Figure C37.pdf

Site Owner: WaterNSW
Latitude: -33.6547 Longitude:150.309

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	120	20:20 11 Mar 2021
2m	105	20:21 11 Mar 2021
3m	110	20:20 11 Mar 2021
4m	105	20:21 11 Mar 2021
5m	102	20:22 11 Mar 2021
10m	90	20:25 11 Mar 2021
15m	76	20:28 11 Mar 2021
20m	64.5	20:33 11 Mar 2021
25m	57.6	20:36 11 Mar 2021
30m	52	20:36 11 Mar 2021
45m	39.3	20:45 11 Mar 2021
1H	31	20:54 11 Mar 2021
1.5H	22	20:44 11 Mar 2021
2H	17.2	07:59 21 Mar 2021
3H	15	20:57 11 Mar 2021
5H	11.8	10:31 21 Mar 2021
6H	11.2	11:55 21 Mar 2021
9H	8.9	14:11 21 Mar 2021
12H	8	11:47 21 Mar 2021
18H	7.1	13:58 21 Mar 2021
24H	6	11:49 21 Mar 2021
30H	5.8	12:58 21 Mar 2021
36H	5.6	14:27 21 Mar 2021
48H	5	02:23 22 Mar 2021
72H	4.3	02:23 23 Mar 2021
96H	4	19:32 22 Mar 2021
120H	3.6	12:58 23 Mar 2021
144H	3.3	13:23 23 Mar 2021
168H	2.9	14:32 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

GREAVES CREEK AT GREAVES CREEK DAM (212285)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

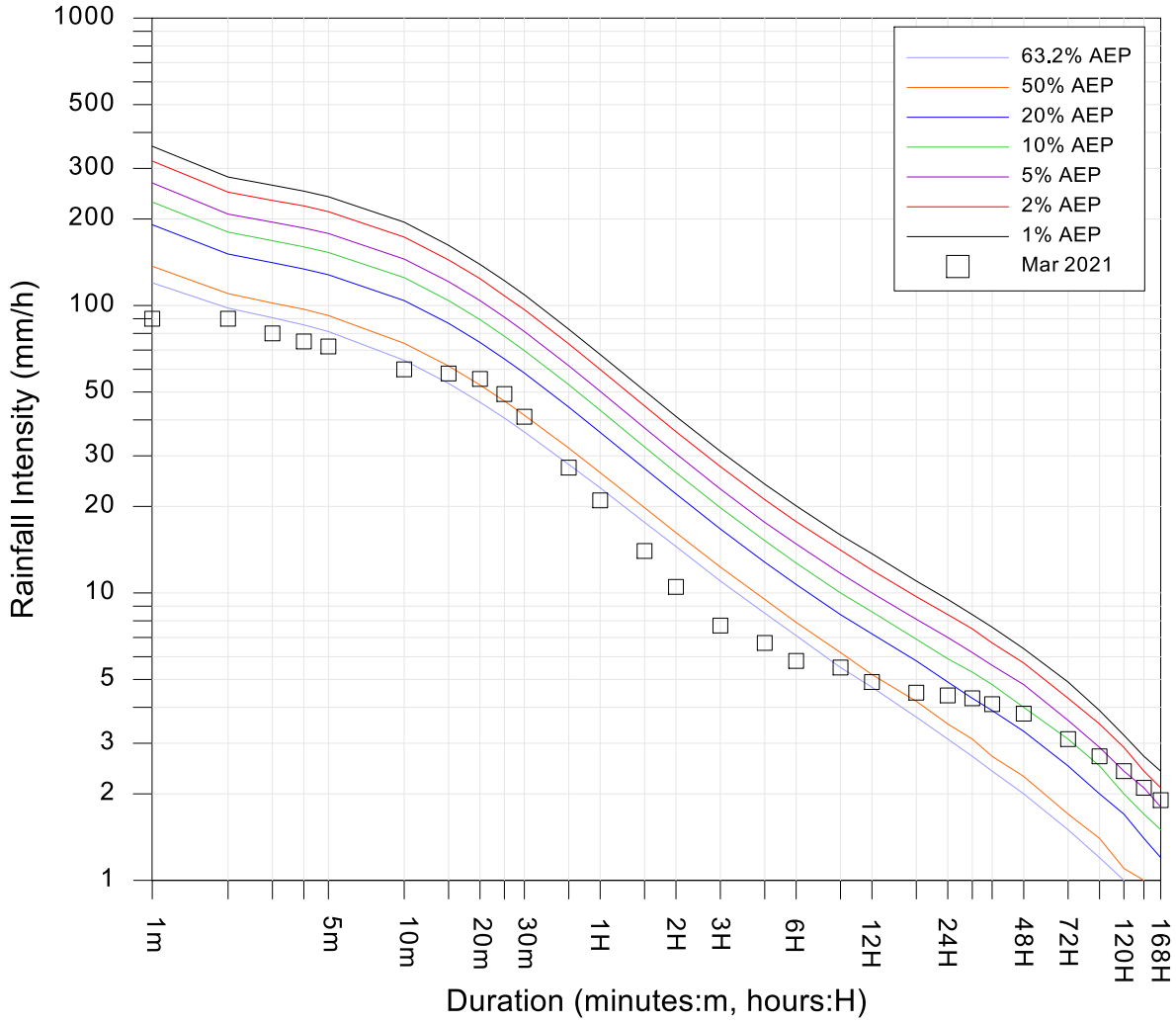
Manly Hydraulics Laboratory

Report MHL2809
Figure
C38

IFD_212285_Figure C38.pdf

Site Owner: WaterNSW
Latitude: -33.7692 Longitude:150.762

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	90	15:39 08 Mar 2021
2m	90	15:25 08 Mar 2021
3m	80	15:26 08 Mar 2021
4m	75	15:27 08 Mar 2021
5m	72	15:27 08 Mar 2021
10m	60	15:32 08 Mar 2021
15m	58	15:37 08 Mar 2021
20m	55.5	15:42 08 Mar 2021
25m	49.2	15:44 08 Mar 2021
30m	41	15:49 08 Mar 2021
45m	27.3	16:04 08 Mar 2021
1H	21	16:19 08 Mar 2021
1.5H	14	16:49 08 Mar 2021
2H	10.5	17:19 08 Mar 2021
3H	7.7	03:13 21 Mar 2021
5H	6.7	04:37 21 Mar 2021
6H	5.8	13:22 20 Mar 2021
9H	5.5	09:07 21 Mar 2021
12H	4.9	19:22 20 Mar 2021
18H	4.5	03:38 21 Mar 2021
24H	4.4	09:30 21 Mar 2021
30H	4.3	10:48 21 Mar 2021
36H	4.1	13:53 21 Mar 2021
48H	3.8	02:00 22 Mar 2021
72H	3.1	02:00 23 Mar 2021
96H	2.7	15:06 23 Mar 2021
120H	2.4	10:57 23 Mar 2021
144H	2.1	17:47 23 Mar 2021
168H	1.9	17:21 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

SOUTH CREEK AT GREAT WESTERN HWY (212048)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

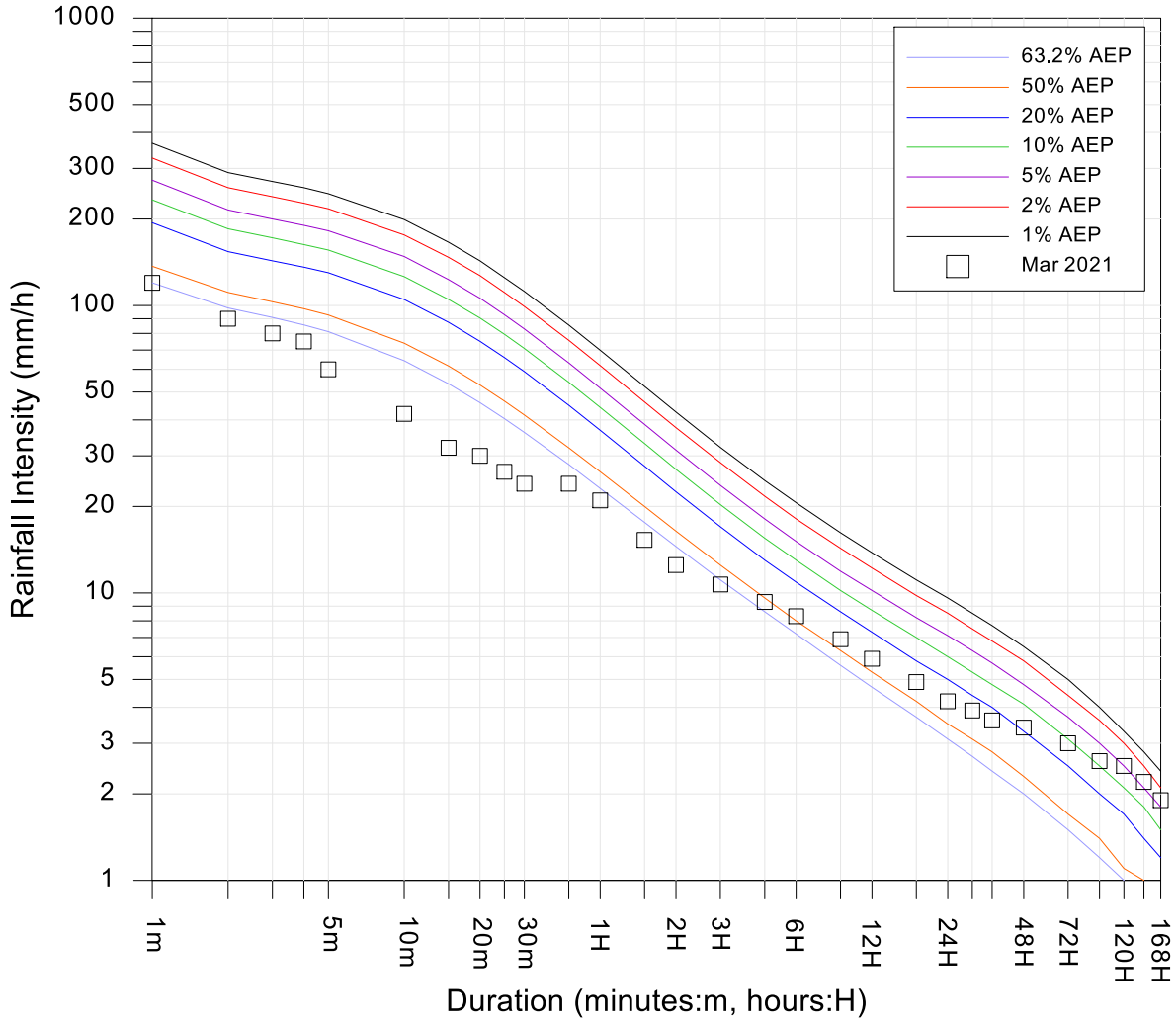
Manly Hydraulics Laboratory

Report MHL2809
Figure
C39

IFD_212048_Figure C39.pdf

Site Owner: WaterNSW
Latitude: -33.8774 Longitude:150.768

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	120	18:42 18 Mar 2021
2m	90	18:43 18 Mar 2021
3m	80	18:43 18 Mar 2021
4m	75	18:43 18 Mar 2021
5m	60	12:48 20 Mar 2021
10m	42	12:53 20 Mar 2021
15m	32	12:58 20 Mar 2021
20m	30	18:50 18 Mar 2021
25m	26.4	18:51 18 Mar 2021
30m	24	19:09 18 Mar 2021
45m	24	19:15 18 Mar 2021
1H	21	19:18 18 Mar 2021
1.5H	15.3	19:48 18 Mar 2021
2H	12.5	20:22 18 Mar 2021
3H	10.7	21:18 18 Mar 2021
5H	9.3	14:20 20 Mar 2021
6H	8.3	15:42 20 Mar 2021
9H	6.9	17:19 20 Mar 2021
12H	5.9	17:59 20 Mar 2021
18H	4.9	20:30 20 Mar 2021
24H	4.2	05:59 21 Mar 2021
30H	3.9	08:41 21 Mar 2021
36H	3.6	14:30 21 Mar 2021
48H	3.4	05:59 22 Mar 2021
72H	3	09:42 23 Mar 2021
96H	2.6	14:29 23 Mar 2021
120H	2.5	11:09 23 Mar 2021
144H	2.2	16:45 23 Mar 2021
168H	1.9	14:58 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

SOUTH CREEK AT ELIZABETH DR (212320)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

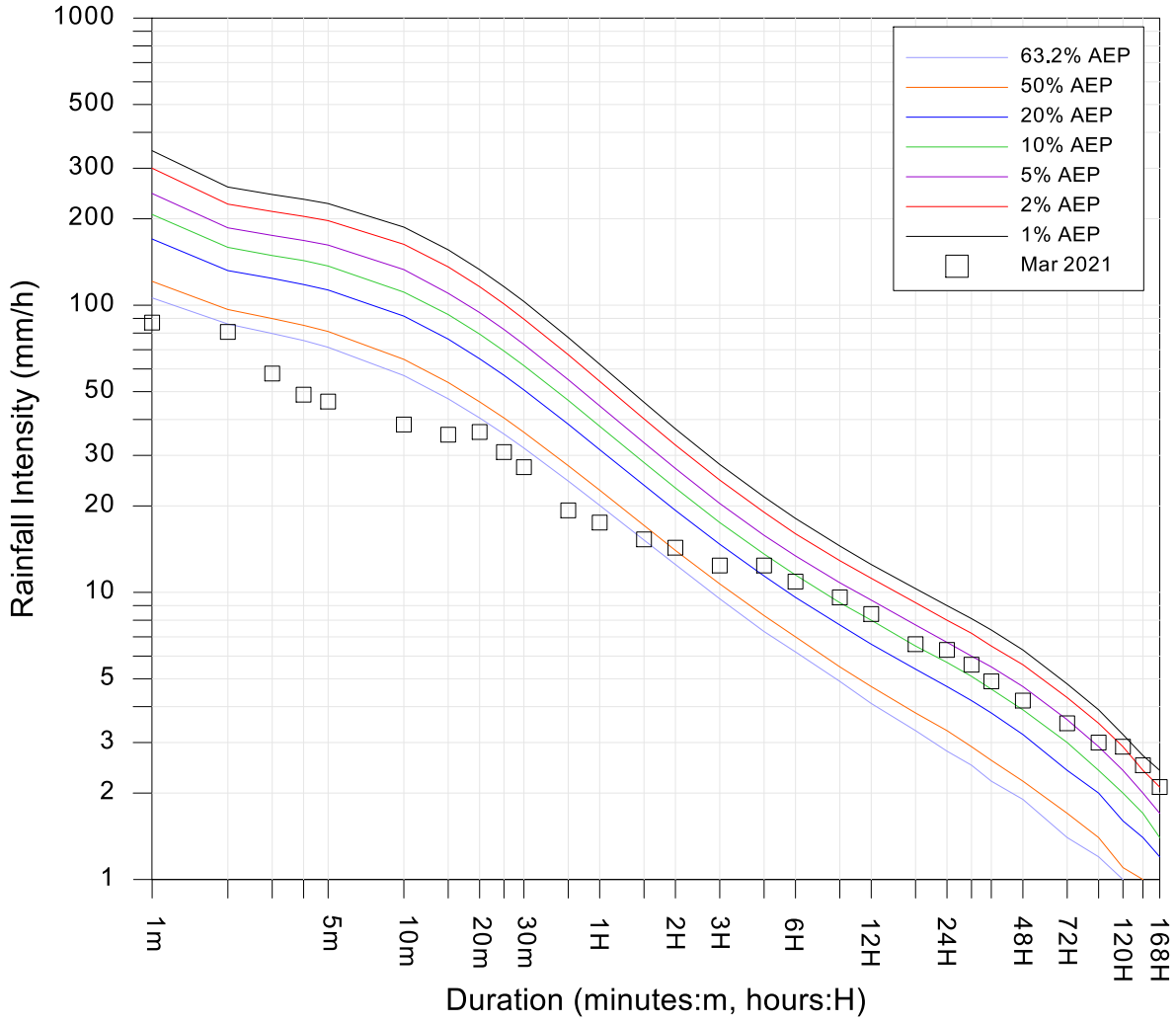
Manly Hydraulics Laboratory

Report MHL2809
Figure
C40

IFD_212320_Figure C40.pdf

Site Owner: WaterNSW
Latitude: -34.1455 Longitude:150.425

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	87	09:04 20 Mar 2021
2m	80.7	09:05 20 Mar 2021
3m	57.8	09:06 20 Mar 2021
4m	48.8	13:12 20 Mar 2021
5m	46.2	13:12 20 Mar 2021
10m	38.4	13:26 20 Mar 2021
15m	35.4	13:23 20 Mar 2021
20m	36.2	13:27 20 Mar 2021
25m	30.8	13:28 20 Mar 2021
30m	27.3	13:28 20 Mar 2021
45m	19.3	13:34 20 Mar 2021
1H	17.5	14:07 20 Mar 2021
1.5H	15.3	17:37 20 Mar 2021
2H	14.3	17:30 20 Mar 2021
3H	12.4	17:50 20 Mar 2021
5H	12.4	17:37 20 Mar 2021
6H	10.9	17:57 20 Mar 2021
9H	9.6	17:55 20 Mar 2021
12H	8.4	20:21 20 Mar 2021
18H	6.6	23:39 20 Mar 2021
24H	6.3	07:21 21 Mar 2021
30H	5.6	13:18 21 Mar 2021
36H	4.9	15:13 21 Mar 2021
48H	4.2	07:18 22 Mar 2021
72H	3.5	10:28 23 Mar 2021
96H	3	17:36 23 Mar 2021
120H	2.9	13:01 23 Mar 2021
144H	2.5	14:47 23 Mar 2021
168H	2.1	14:53 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

NATTAI RIVER AT THE CAUSEWAY (568140)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

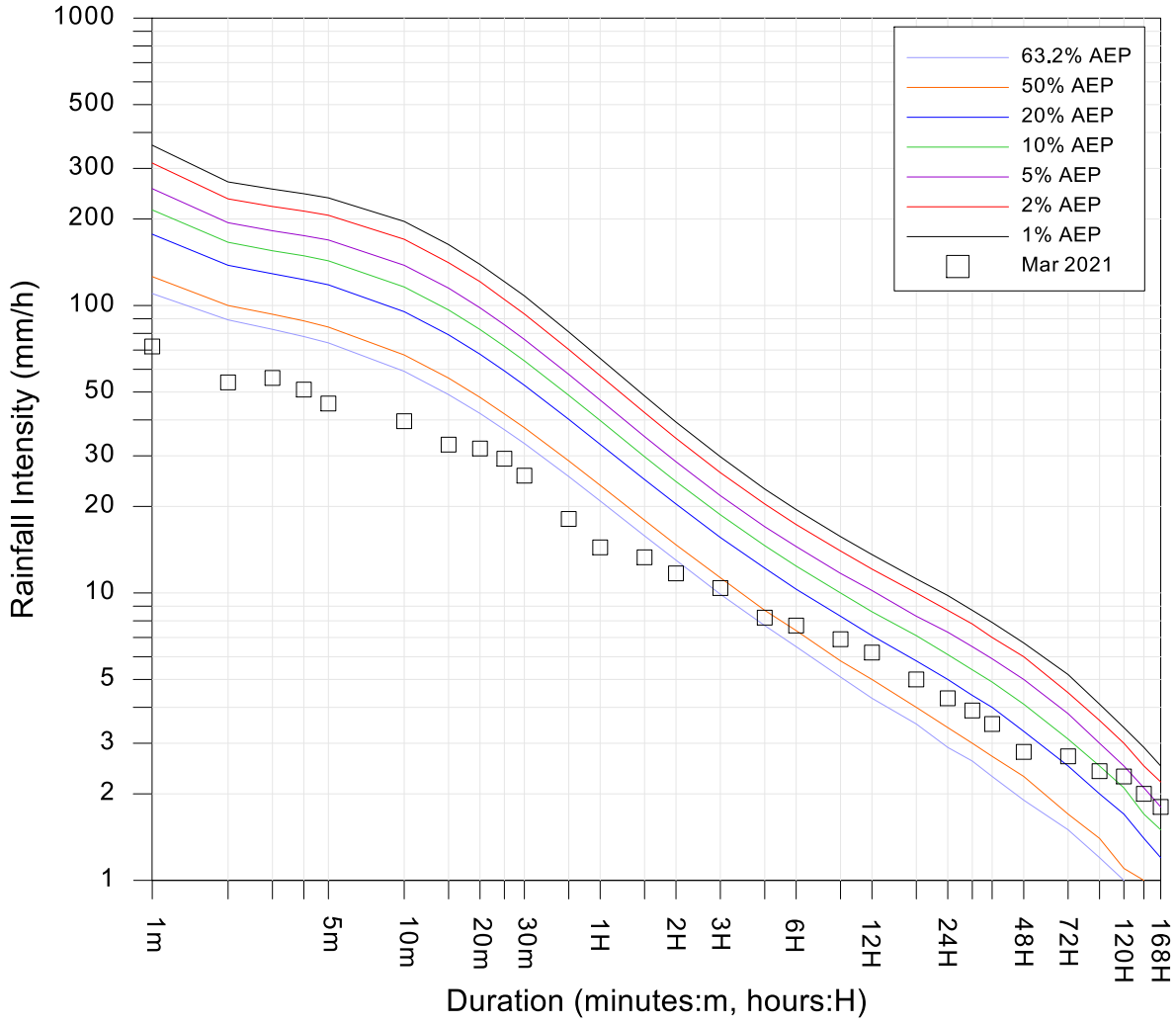
Manly Hydraulics Laboratory

Report MHL2809
Figure
C41

IFD_568140_Figure C41.pdf

Site Owner: WaterNSW
Latitude: -34.2229 Longitude:150.534

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	72	17:35 20 Mar 2021
2m	54	17:36 20 Mar 2021
3m	56	17:37 20 Mar 2021
4m	51	17:38 20 Mar 2021
5m	45.6	17:38 20 Mar 2021
10m	39.6	17:38 20 Mar 2021
15m	32.8	17:49 20 Mar 2021
20m	31.8	17:48 20 Mar 2021
25m	29.3	17:52 20 Mar 2021
30m	25.6	17:54 20 Mar 2021
45m	18.1	18:00 20 Mar 2021
1H	14.4	17:50 20 Mar 2021
1.5H	13.3	17:52 20 Mar 2021
2H	11.7	17:50 20 Mar 2021
3H	10.4	17:55 20 Mar 2021
5H	8.2	19:56 20 Mar 2021
6H	7.7	17:55 20 Mar 2021
9H	6.9	17:55 20 Mar 2021
12H	6.2	20:42 20 Mar 2021
18H	5	23:46 20 Mar 2021
24H	4.3	08:42 21 Mar 2021
30H	3.9	10:42 21 Mar 2021
36H	3.5	15:35 21 Mar 2021
48H	2.8	05:28 22 Mar 2021
72H	2.7	10:22 23 Mar 2021
96H	2.4	13:20 23 Mar 2021
120H	2.3	13:48 23 Mar 2021
144H	2	13:05 23 Mar 2021
168H	1.8	15:33 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

LAKE NERRIGORANG AT THIRLMERE LAKES (212063)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

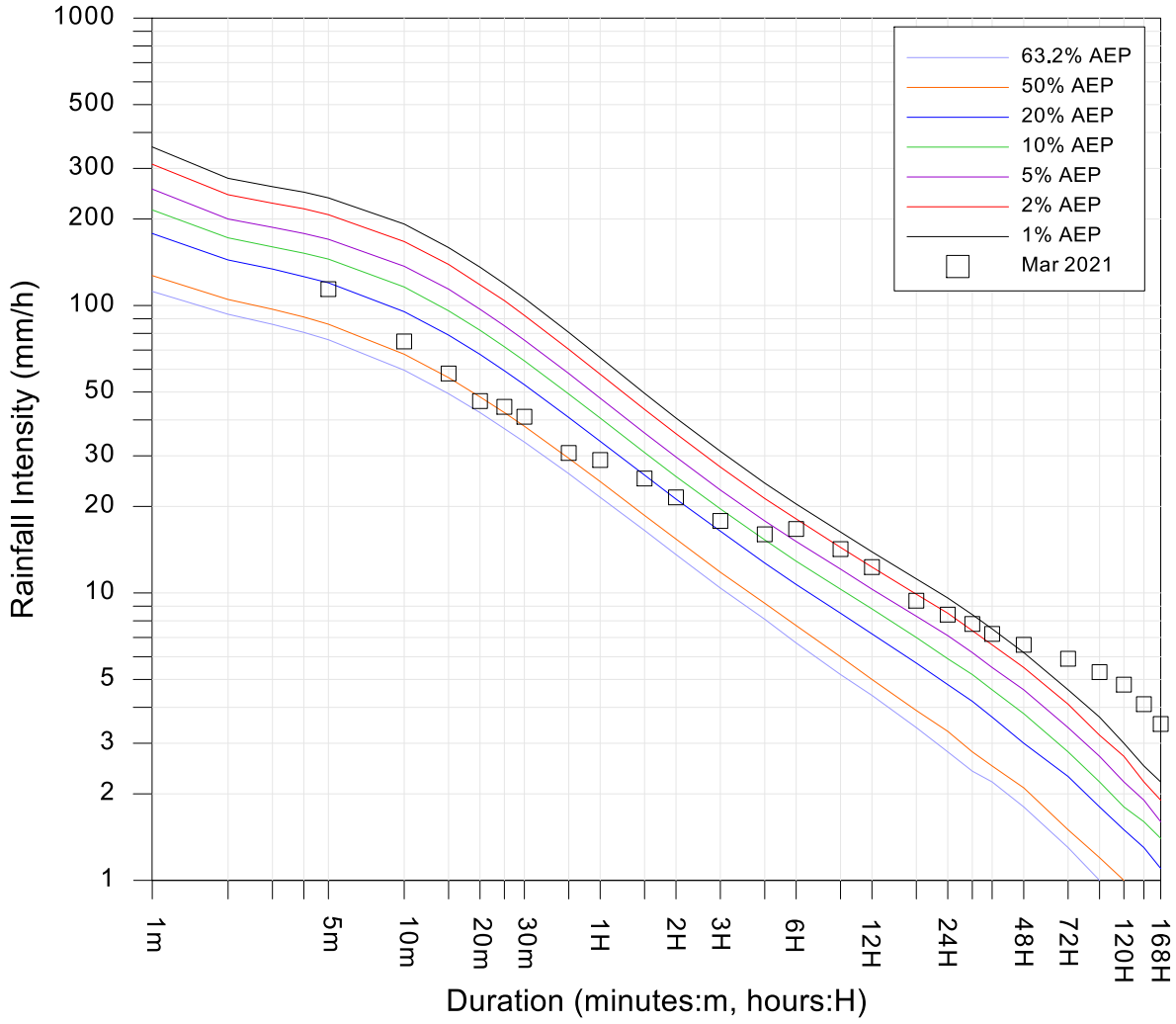
Manly Hydraulics Laboratory

Report MHL2809
Figure
C42

IFD_212063_Figure C42.pdf

Site Owner: WaterNSW
Latitude: -34.1777 Longitude:150.612

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	-	-
2m	-	-
3m	-	-
4m	-	-
5m	114	12:09 20 Mar 2021
10m	75	12:12 20 Mar 2021
15m	58	12:17 20 Mar 2021
20m	46.5	12:08 20 Mar 2021
25m	44.4	12:13 20 Mar 2021
30m	41	12:18 20 Mar 2021
45m	30.7	12:24 20 Mar 2021
1H	29	12:54 20 Mar 2021
1.5H	25	13:09 20 Mar 2021
2H	21.5	13:09 20 Mar 2021
3H	17.8	17:38 20 Mar 2021
5H	16	16:09 20 Mar 2021
6H	16.7	17:39 20 Mar 2021
9H	14.2	17:39 20 Mar 2021
12H	12.3	20:20 20 Mar 2021
18H	9.4	23:22 20 Mar 2021
24H	8.4	08:20 21 Mar 2021
30H	7.8	14:57 21 Mar 2021
36H	7.2	15:25 21 Mar 2021
48H	6.6	07:02 22 Mar 2021
72H	5.9	11:14 23 Mar 2021
96H	5.3	13:05 23 Mar 2021
120H	4.8	15:10 23 Mar 2021
144H	4.1	21:56 23 Mar 2021
168H	3.5	20:17 23 Mar 2021

Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

STONEQUARRY CREEK AT PICTON (212053)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

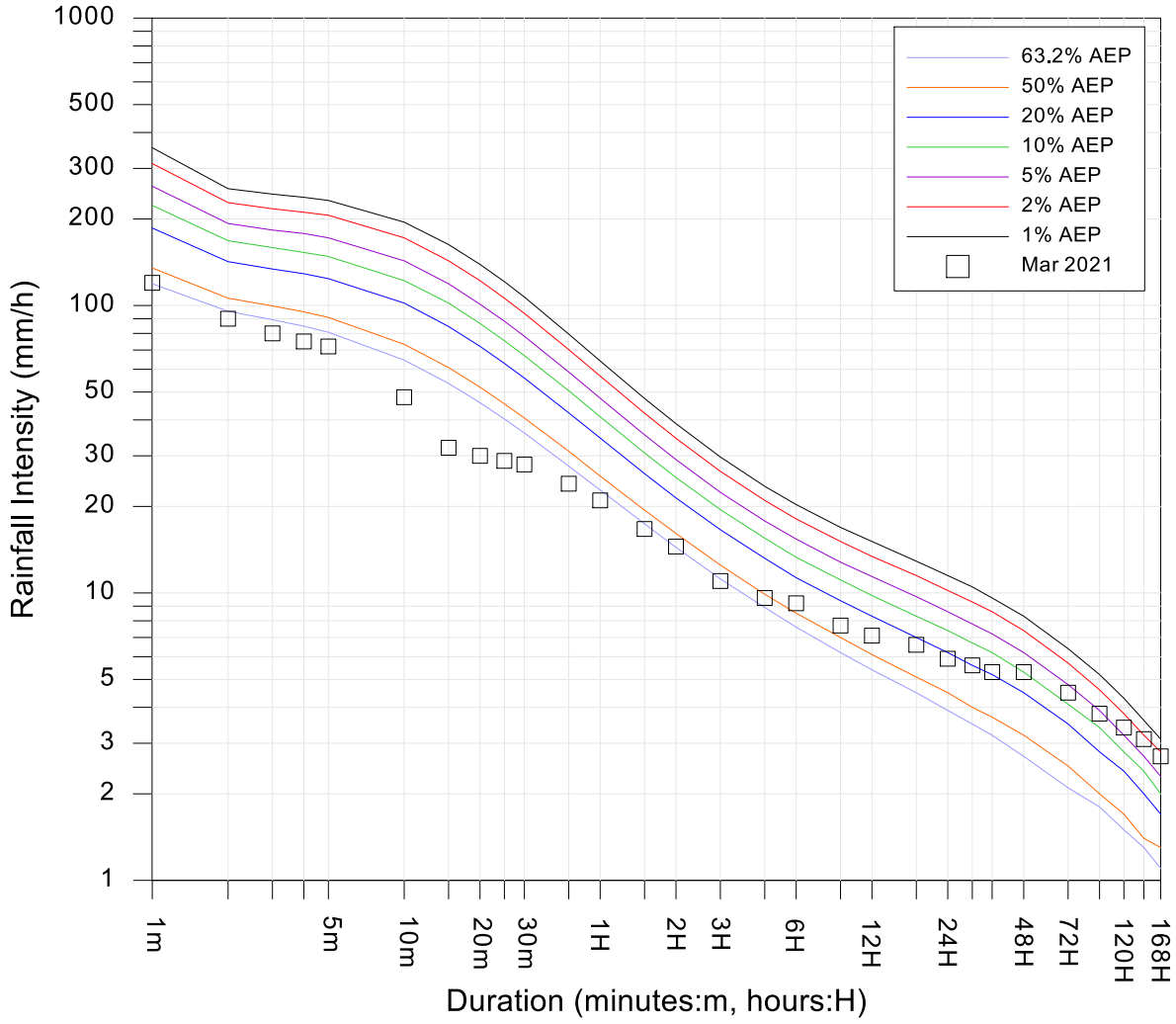
Manly Hydraulics Laboratory

Report MHL2809
Figure
C43

IFD_212053_Figure C43.pdf

Site Owner: BoM
Latitude: -33.499 Longitude:150.518

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	120	04:00 23 Mar 2021
2m	90	19:54 18 Mar 2021
3m	80	19:55 18 Mar 2021
4m	75	19:55 18 Mar 2021
5m	72	19:55 18 Mar 2021
10m	48	19:58 18 Mar 2021
15m	32	10:16 21 Mar 2021
20m	30	10:21 21 Mar 2021
25m	28.8	10:26 21 Mar 2021
30m	28	10:31 21 Mar 2021
45m	24	10:46 21 Mar 2021
1H	21	10:56 21 Mar 2021
1.5H	16.7	10:48 21 Mar 2021
2H	14.5	11:18 21 Mar 2021
3H	11	12:18 21 Mar 2021
5H	9.6	13:48 21 Mar 2021
6H	9.2	08:21 20 Mar 2021
9H	7.7	11:14 20 Mar 2021
12H	7.1	21:08 21 Mar 2021
18H	6.6	22:52 21 Mar 2021
24H	5.9	04:52 22 Mar 2021
30H	5.6	10:52 22 Mar 2021
36H	5.3	13:50 21 Mar 2021
48H	5.3	01:56 22 Mar 2021
72H	4.5	01:56 23 Mar 2021
96H	3.8	16:52 22 Mar 2021
120H	3.4	16:29 23 Mar 2021
144H	3.1	15:22 23 Mar 2021
168H	2.7	15:50 23 Mar 2021

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

BILPIN (FERN GROVE) (63118)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

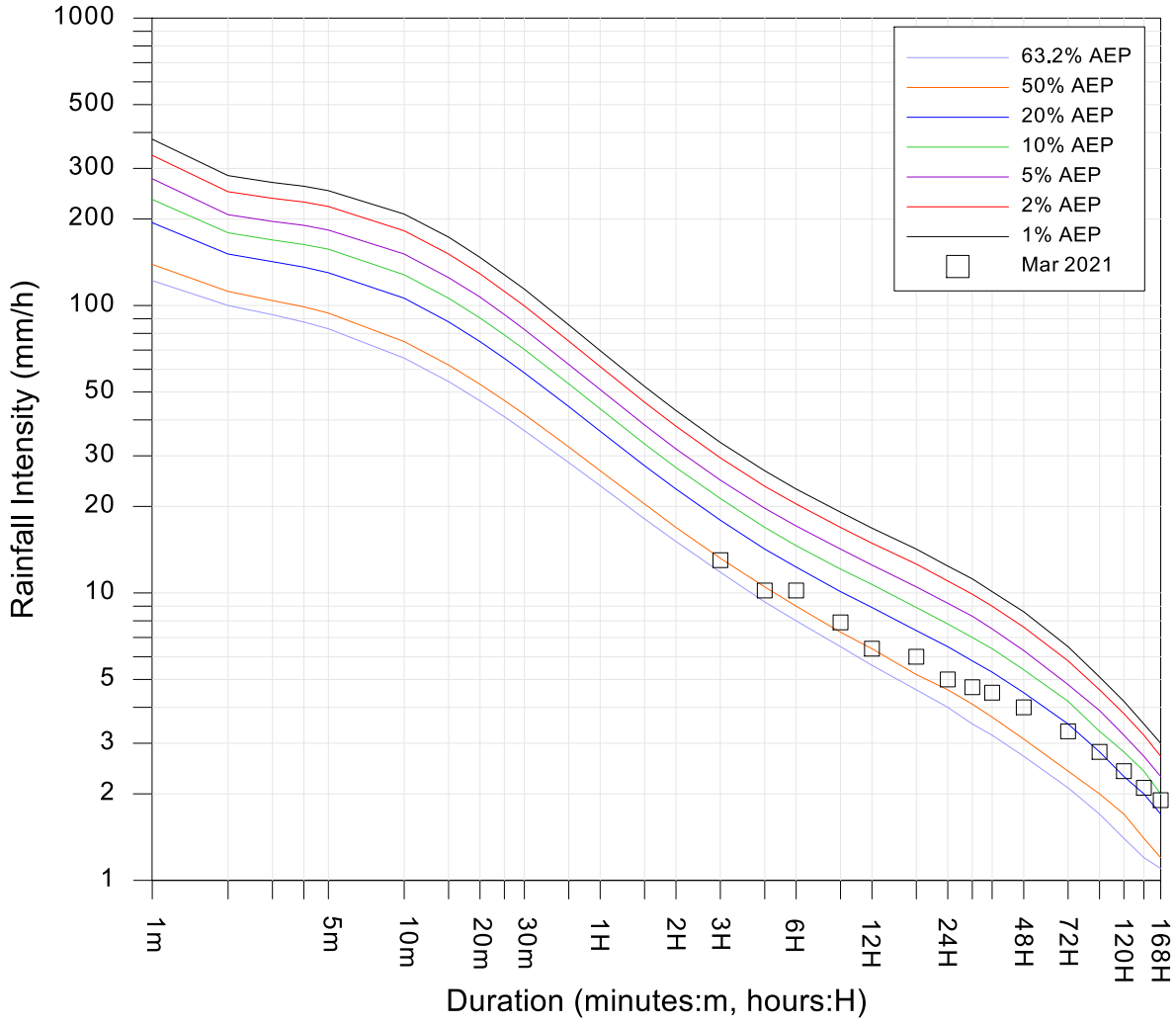
Manly Hydraulics Laboratory

Report MHL2809
Figure
C44

IFD_63118_Figure C44.pdf

Site Owner: BoM
Latitude: -33.696 Longitude:150.536

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	-	-
2m	-	-
3m	-	-
4m	-	-
5m	-	-
10m	-	-
15m	-	-
20m	-	-
25m	-	-
30m	-	-
45m	-	-
1H	-	-
1.5H	-	-
2H	-	-
3H	13	12:26 21 Mar 2021
5H	10.2	10:25 21 Mar 2021
6H	10.2	11:55 21 Mar 2021
9H	7.9	14:55 21 Mar 2021
12H	6.4	17:55 21 Mar 2021
18H	6	13:49 21 Mar 2021
24H	5	21:02 21 Mar 2021
30H	4.7	13:40 21 Mar 2021
36H	4.5	14:21 21 Mar 2021
48H	4	02:33 22 Mar 2021
72H	3.3	02:21 23 Mar 2021
96H	2.8	15:35 23 Mar 2021
120H	2.4	16:35 23 Mar 2021
144H	2.1	17:07 23 Mar 2021
168H	1.9	17:00 23 Mar 2021

Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

FAULCONBRIDGE (GREAT WESTERN HWY) (63081)
INTENSITY-FREQUENCY-DURATION
MARCH 2021

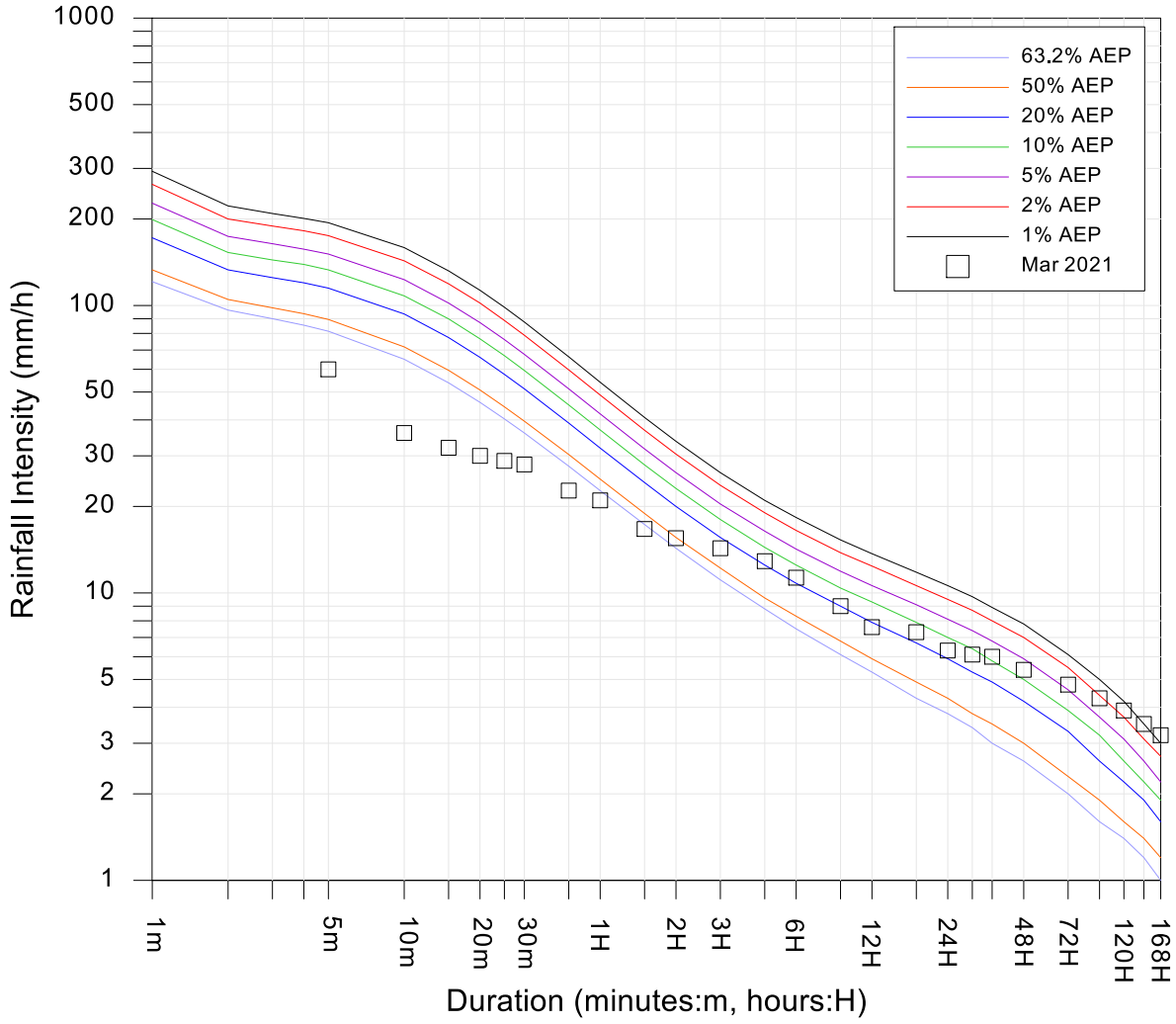
Manly Hydraulics Laboratory

Report MHL2809
Figure
C45

IFD_63081_Figure C45.pdf

Site Owner: BoM
Latitude: -33.63 Longitude:150.28

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	-	-
2m	-	-
3m	-	-
4m	-	-
5m	60	23:18 21 Mar 2021
10m	36	23:23 21 Mar 2021
15m	32	02:59 19 Mar 2021
20m	30	03:14 19 Mar 2021
25m	28.8	03:17 19 Mar 2021
30m	28	03:17 19 Mar 2021
45m	22.7	06:54 21 Mar 2021
1H	21	07:07 21 Mar 2021
1.5H	16.7	07:28 21 Mar 2021
2H	15.5	03:19 19 Mar 2021
3H	14.3	03:23 19 Mar 2021
5H	12.9	03:32 19 Mar 2021
6H	11.3	03:50 19 Mar 2021
9H	9	04:59 19 Mar 2021
12H	7.6	14:05 21 Mar 2021
18H	7.3	13:15 21 Mar 2021
24H	6.3	17:53 21 Mar 2021
30H	6.1	12:51 21 Mar 2021
36H	6	14:46 21 Mar 2021
48H	5.4	02:46 22 Mar 2021
72H	4.8	21:29 21 Mar 2021
96H	4.3	19:59 22 Mar 2021
120H	3.9	13:01 23 Mar 2021
144H	3.5	13:50 23 Mar 2021
168H	3.2	14:59 23 Mar 2021

Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

BLACKHEATH (WOMBAT ST) (63295) INTENSITY-FREQUENCY-DURATION MARCH 2021

Manly Hydraulics Laboratory

Report MHL2809
Figure
C46

IFD_63295_Figure C46.pdf

Appendix D WaterNSW and Sydney Water water level station local datum to AHD conversion

Appendix D provides the conversion from local gauge datum to Australian Height Datum for stations managed by WaterNSW and Sydney Water (St Albans).

Table D-1 WaterNSW and Sydney Water station conversion to AHD

Station name	Station number	Conversion to datum (m)	Datum
Orara River at Karangi	204025	98.864	AHD
Orara River at Orange Grove	204068	105.734	AHD
Orara River at Glenreagh	204906	53.1	AHD
Orara River at Bawden Bridge	204041	1.86	AHD
Nambucca River (North Arm) U/S Bowraville	205015	4.950	AHD
Macleay River at D/S Georges	206024	122.153	AHD
Hastings River @ Ellenborough (Kindee Bridge)	207004	44.955	AHD
Gloucester River at Gloucester	208020	84.848	AHD
Williams River at Dungog	210903	41.231	AHD
Williams River at Glen Martin	210010	0.825	AHD
Wollombi Brook	210004	47.755	AHD
Camden Weir	212216	55.278	AHD
Wallacia Weir	212202	26.596	AHD
Penrith	212201	14.139	AHD
Cattai Creek at Murphys Bridge	212059	20.270	AHD
Ropes Creek at Debrincat Ave	212049	23.962	AHD
North Richmond (WPS)	212200	0.529	AHD
Avon Dam Road	212204	239.983	AHD
Broughtons Pass	212233	130.614	AHD
Cataract Dam	212232	289.87	AHD
Golden Valley	212271	547.784	AHD
Greenstead	212009	28.935	AHD
Grose River	212291	19.528	Assumed datum
Jooriland	212270	130.909	AHD
Kelpie Point	212250	25.591	AHD
Nepean Dam	212205	317.172	AHD
Pheasants Nest	212203	133.518	AHD
St Albans	212010	2.760	AHD
Upper Colo	212290	1.468	AHD
Warragamba Dam	212243	116.720	AHD
Warragamba Weir	212241	16.533	Standard datum
Yarramundi	2122001	0.926	AHD
Redfern Road	213013	37.613	AHD

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