NSW GOVERNMENT

Manly Hydraulics Laboratory

NSW COASTAL FLOOD SUMMARY
FEBRUARY 2020

Report MHL2752
July 2020

Prepared for:

NSW GOVERNMENT | Planning, Industry & Environment

Climate Change and Sustainability Division

Additional data provided by:

Australian Government Bureau of Meteorology

WaterNSW

lismore city council

Shoalhaven City Council

ballina shire council

Byron Shire Council

northern beaches council

CANTERBURY BANKSTOWN

Sydney WATER

Cover Photograph: Narrabeen Lagoon entrance near Narrabeen Lagoon bridge. Photo courtesy of Northern Beaches Council.

NSW COASTAL FLOOD SUMMARY
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Foreword

New South Wales (NSW) government's professional specialist advisor, Manly Hydraulics Laboratory (MHL) was commissioned by the NSW Department of Planning, Industry and Environment, Climate Change and Sustainability Division (CCSD) to summarise the February 2020 flood event on the coast of New South Wales. The areas of focus for this flood report include the Orara River, Wilsons River, Tuggerah Lakes, Hawkesbury River and South Creek, Narrabeen Lagoon, Georges River, Lower Shoalhaven River, St Georges Basin and Lake Conjola regions. CCSD manages an extensive data network in the NSW coastal zone. MHL operates and maintains the coastal data network via an annual agreement with CCSD.

Additional flood data is provided by the Bureau of Meteorology (BoM), WaterNSW, Lismore City Council, Ballina Shire Council, Byron Shire Council, Canterbury-Bankstown Council, Northern Beaches Council, Sydney Water and Shoalhaven City Council.

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 CCSD 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).

Executive summary

In February 2020, heavy rain occurred in the first half of the month due to two low-pressure troughs, one over eastern NSW and another off the coast of NSW. These low-pressure troughs caused prolonged and heavy rainfall over the NSW coast, resulting in major flooding on numerous rivers including the Orara, Hawkesbury-Nepean and Georges rivers. February 2020 is the wettest February since 2012, the wettest month since September 2016, and the month with recorded total rainfall that is 104% above the long-term average. The highest daily rainfall during February 2020 occurred on 10 February 2020 for most areas of the NSW coast.

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, the Bureau of Meteorology (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 data to users 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.

During the February 2020 flood event, based on the SES flood height classifications, *moderate* floods were experienced by: Glenreagh in the Orara River region, Long Jetty in the Tuggerah Lake region, Windsor in the Hawkesbury River and South Creek region, and Terara and Nowra Bridge in the Lower Shoalhaven region. *Major* floods were recorded at North Richmond in the Hawkesbury River and South Creek region and Milperra in the Georges River region.

This report presents a select group of wave, water level and rainfall hydrometric data collected from 01 February to 29 February 2020 along the NSW coast. This report incorporates water level and rainfall data provided by the BoM, WaterNSW, Lismore City Council, Ballina Shire Council, Byron Shire Council, Canterbury-Bankstown Council, Northern Beaches Council, Sydney Water and Shoalhaven City Council. Data presentation was undertaken by MHL for the NSW Department of Planning, Industry and Environment, Climate Change and Sustainability Division (CCSD).

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1 Introduction

In February 2020, heavy rain occurred in the first half of the month due to a low-pressure trough over eastern NSW and another low-pressure trough off the coast of NSW, which brought warm moist air from the Tasman Sea. The warm moist air developed showers and thunderstorms, and the presence of the second low-pressure trough reinforced the weather system and prolonged the heavy rainfall. **Figure 1.1** to **Figure 1.6** display the mean sea level pressure (MSLP) maps and radar images showing the movement of the low-pressure troughs over NSW from 08 February to 13 February 2020. The heavy rainfall that occurred within this period caused major flooding on numerous rivers including the Orara, Hawkesbury-Nepean and Georges rivers. This flood event made February 2020 to be the wettest February since 2012, the wettest month since September 2016, and the month with recorded total rainfall that is 104% above the long-term average. **Figure 1.7** shows the rainfall analysis map of NSW which presents the total rainfall recorded across NSW for February 2020. Highest daily rainfall during February 2020 occurred on 10 February 2020 for most areas of the NSW coast and the station with the highest monthly total for February 2020 was at Tweed Heads with a rainfall total of 952 mm (Bureau of Meteorology, 2020).

Figure 1.8 to **Figure 1.12** present wind roses for Grafton (058161), Lismore (058214), Norah Head (061366), Richmond (067105), Terry Hills (066059), Bankstown (066137), Nowra (068072), Jervis Bay (068264), and Ulladulla (069138) automatic weather stations (AWS) for February 2020, where the strongest winds blew from east to southeast. On Sunday, 09 February 2020, south-easterly winds with maximum wind gust speeds of 89 km/h were recorded by the Norah Head AWS.

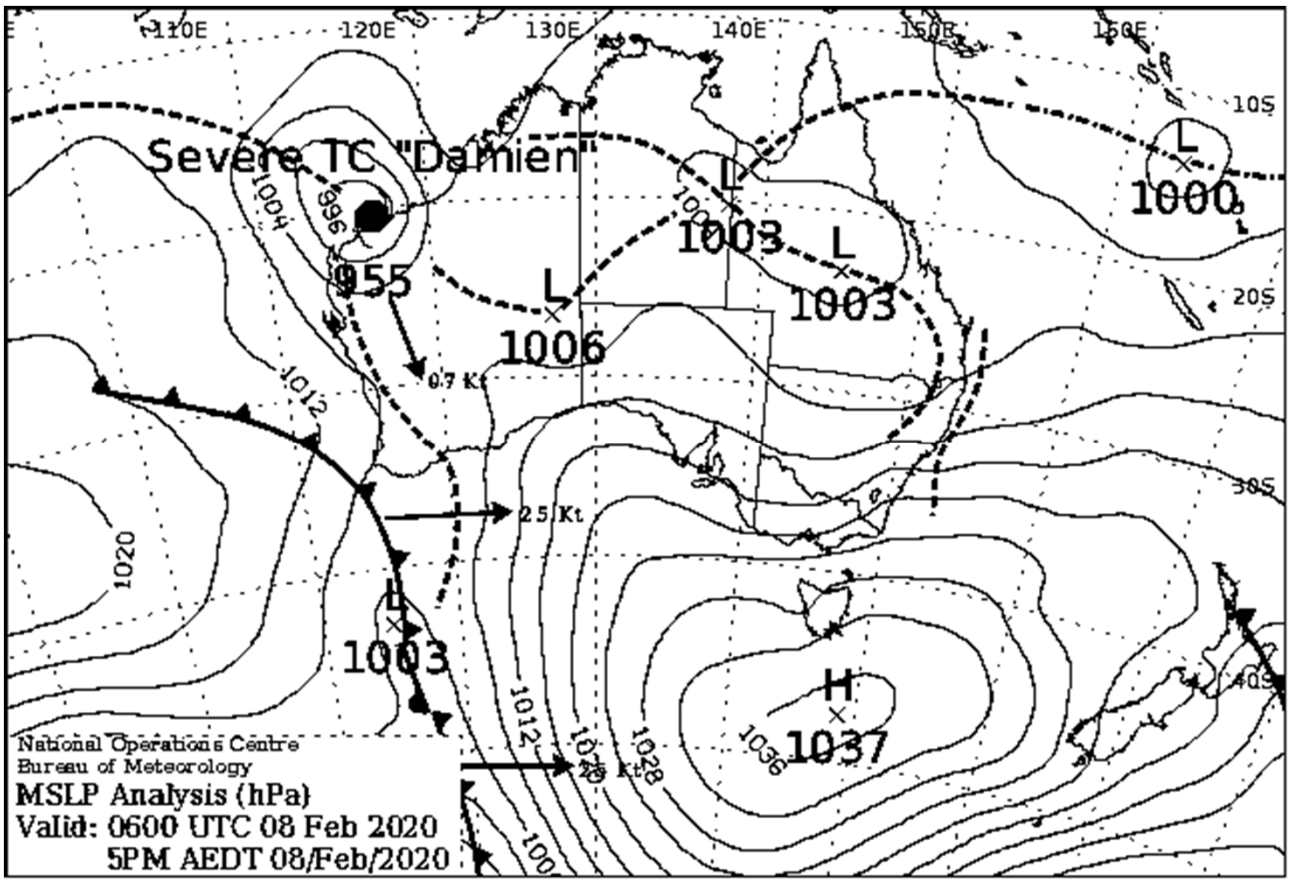
During the flood event, the monitoring networks of water level recorders and rainfall gauges operated by MHL, on behalf of CCSD, were used extensively by the BoM, the SES and the local councils to generate flood warnings, emergency response and delivery of flood related services. Wave, water level and rainfall data captured during the flood event are summarised in the subsequent sections of this report. Estuary and ocean conditions are summarised in Section 2, where entrance conditions and joint peak analysis are discussed; water level and rainfall data are summarised by river region in Sections 4 to 12. Station performance during the event is summarised in Appendix A. Photographs taken during the event are presented in Appendix B.

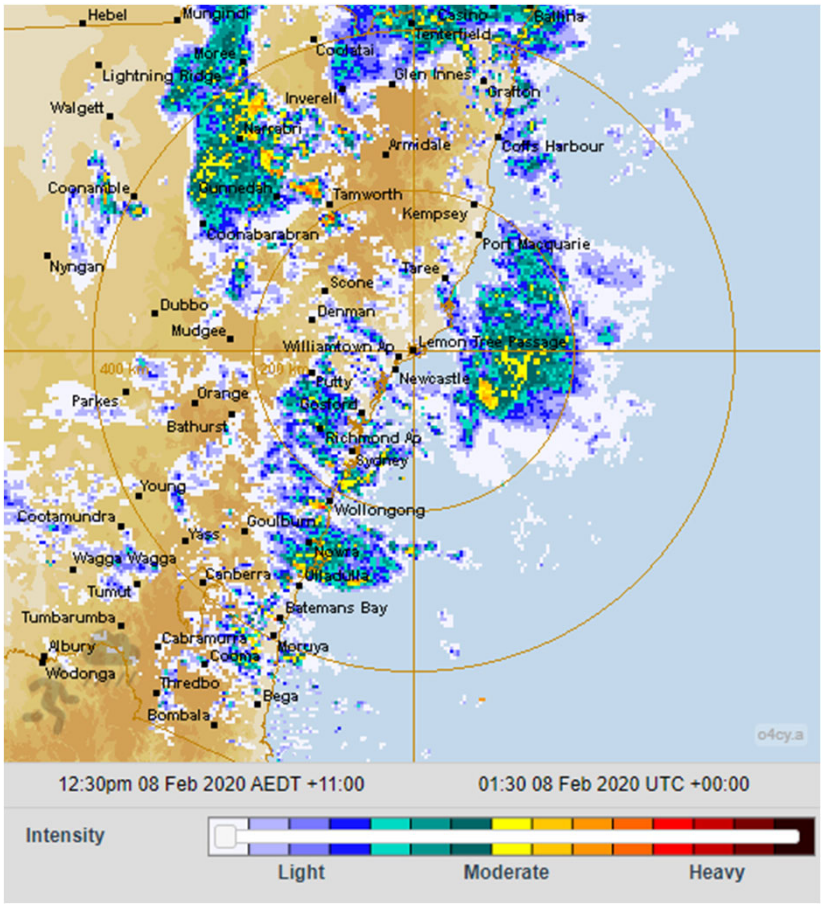
CCSD commissioned MHL to prepare this report to summarise the February 2020 flood event, which includes supplementary flood data provided from the BoM, WaterNSW, Lismore City Council, Ballina Shire Council, Byron Shire Council, Canterbury-Bankstown Council, Northern Beaches Council, Sydney Water and Shoalhaven City Council.

Rainfall intensity frequency duration (IFD) curves have been generated using the Australian Rainfall and Runoff 1987 (ARR1987) format in millimetres per hour. In addition, IFD curves have been generated using the latest IFD format, Australian Rainfall and Runoff 2019 (ARR2019), with results in millimetres per hour (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 five of the rainfall stations supplied by the BoM are affected by a loss of resolution, possibly caused by interruptions to

radio signals during the event for three stations and only hourly data could be provided for two stations. 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 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 WaterNSW's and Sydney Water water level gauges from local gauge datum to Australian Height Datum (AHD).





Source: Australian Bureau of Meteorology, 2020; radar image archived by theweatherchaser.com

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MEAN SEA LEVEL PRESSURE AND RADAR IMAGES
08 FEBRUARY 2020

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Figure
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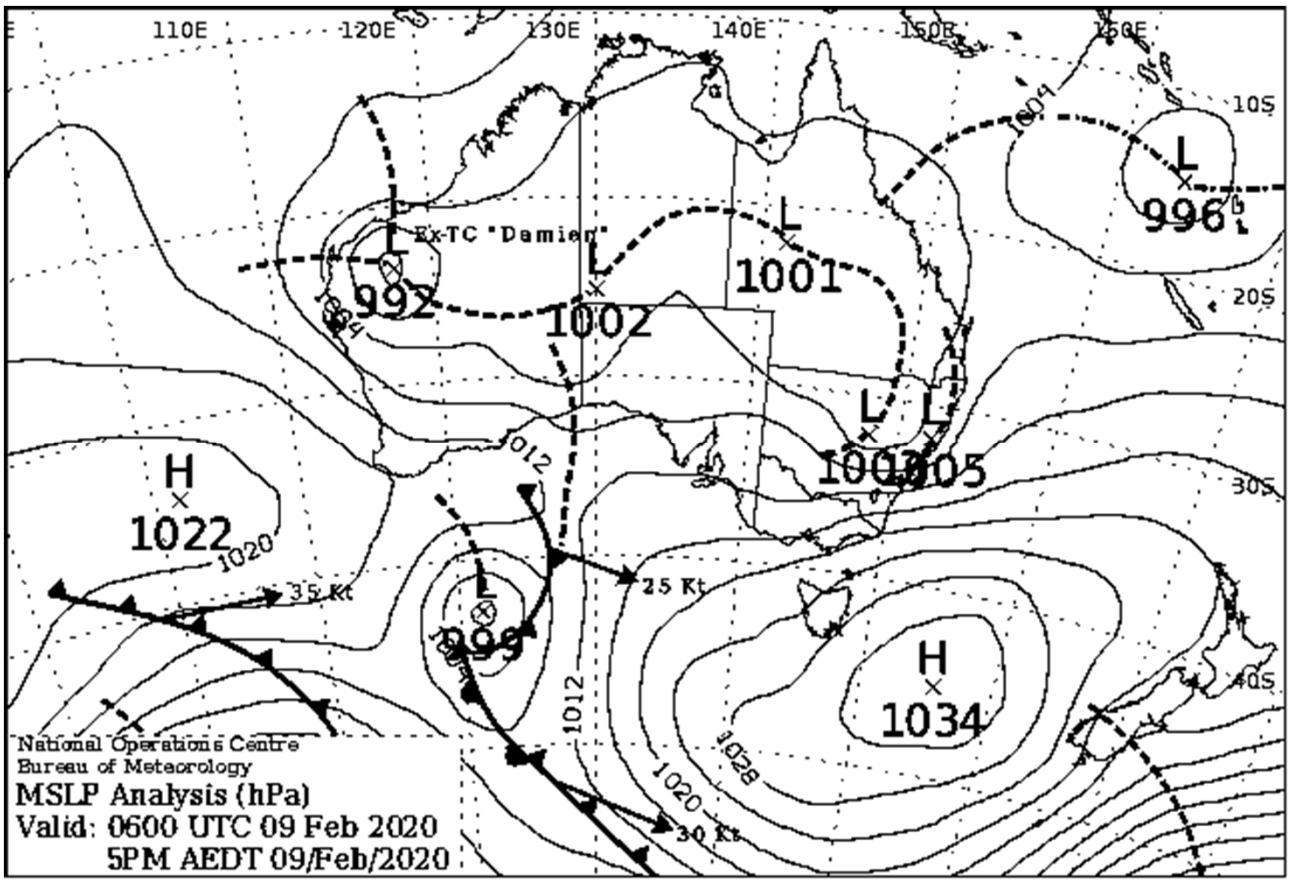

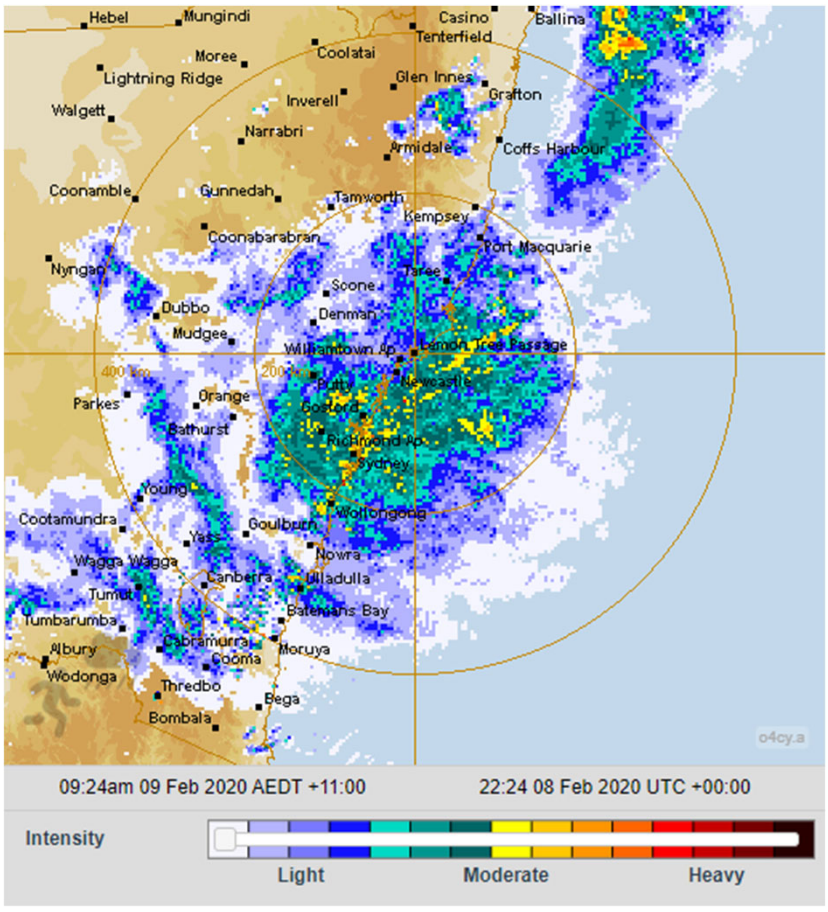

Source: Australian Bureau of Meteorology, 2020; radar image archived by theweatherchaser.com

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MEAN SEA LEVEL PRESSURE AND RADAR IMAGES
09 FEBRUARY 2020

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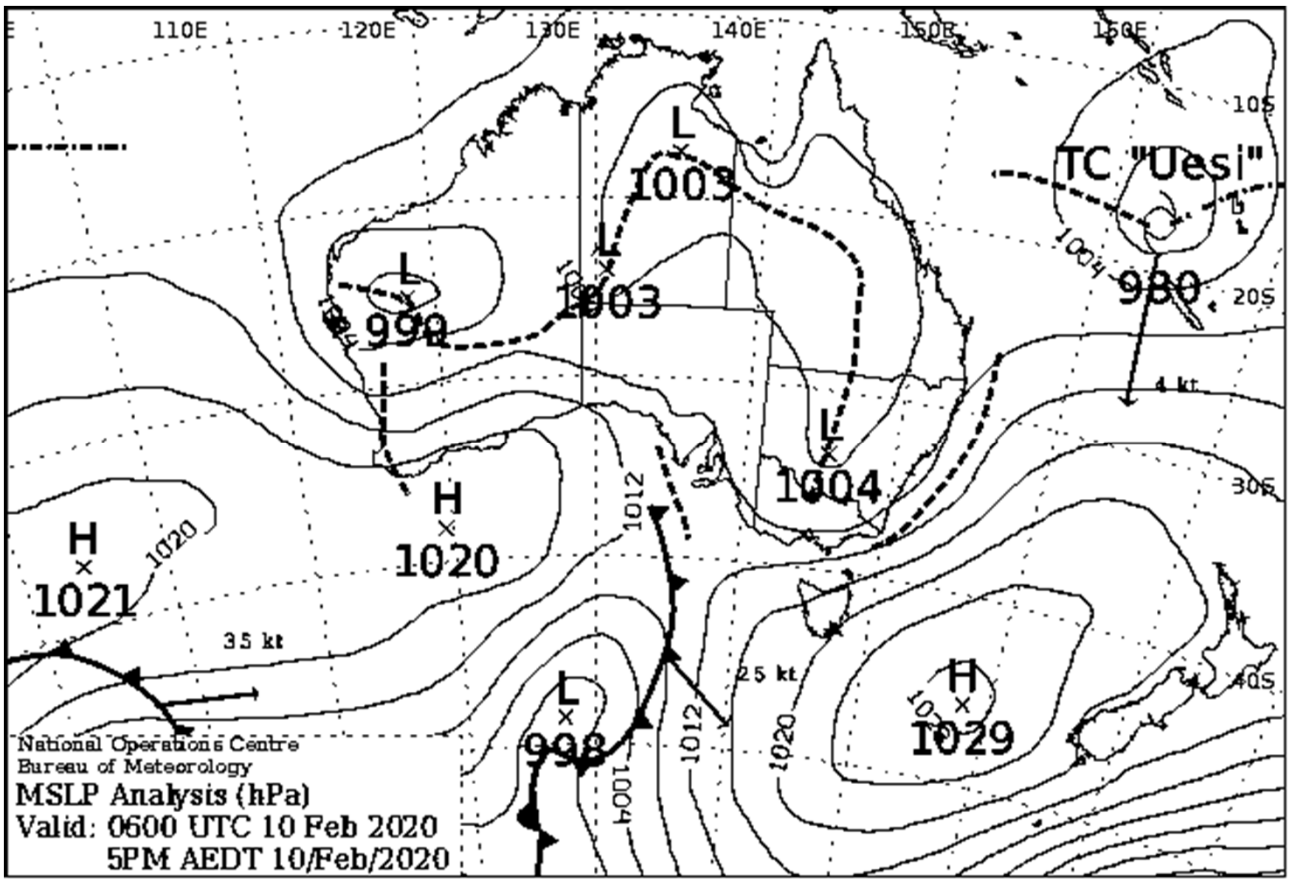

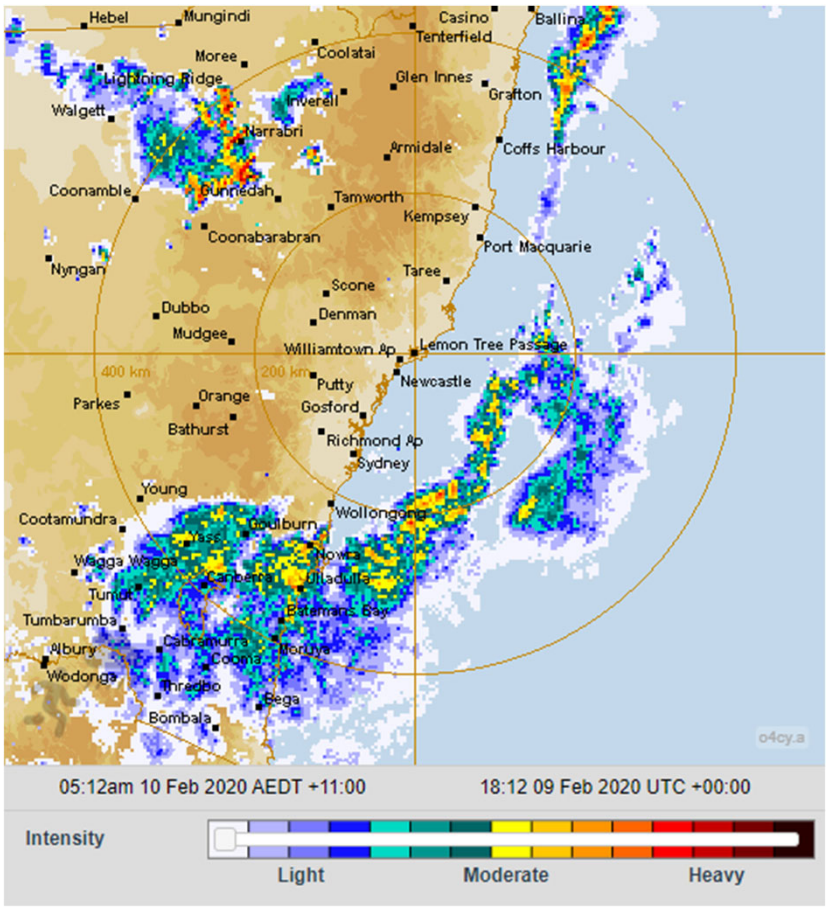

Source: Australian Bureau of Meteorology, 2020; radar image archived by theweatherchaser.com

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MEAN SEA LEVEL PRESSURE AND RADAR IMAGES
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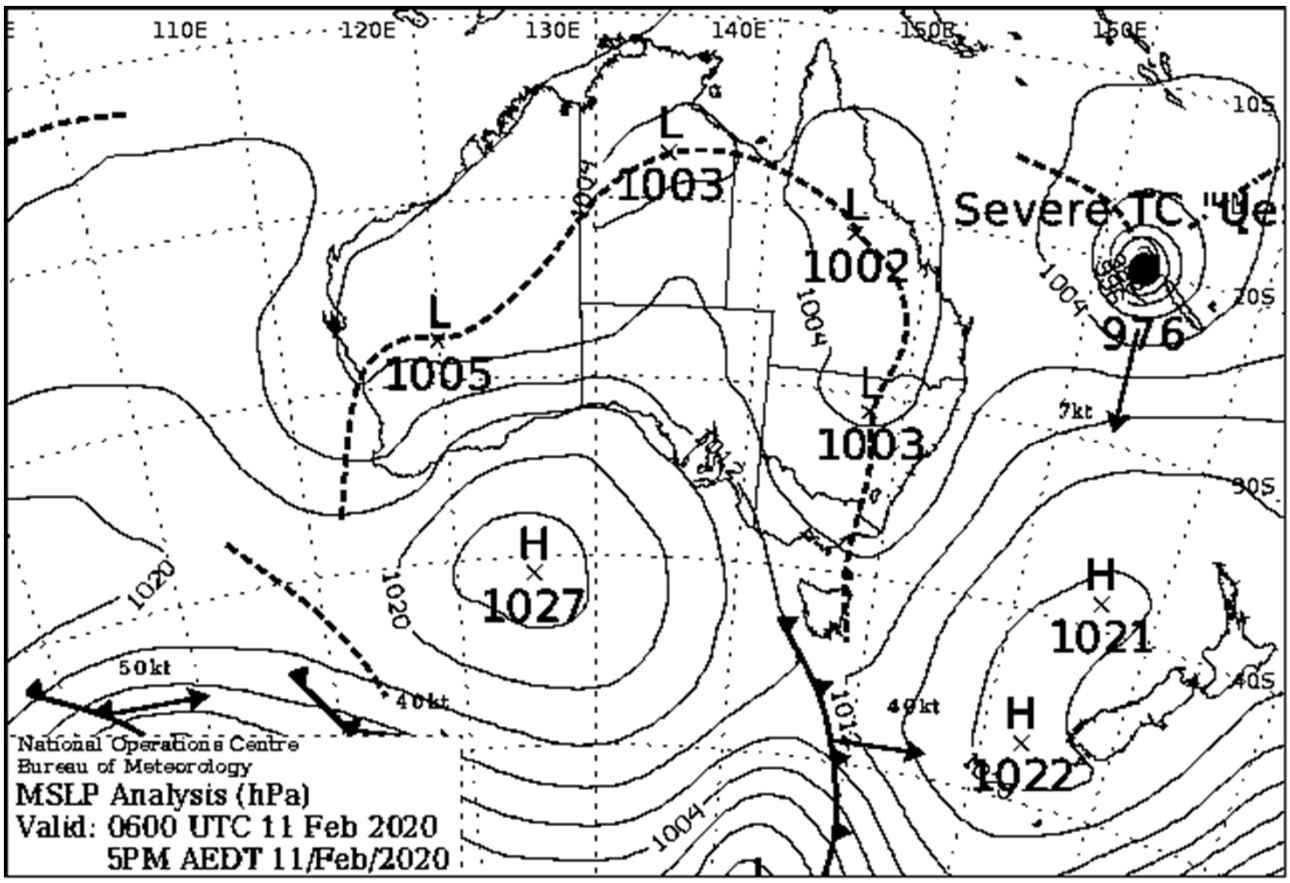

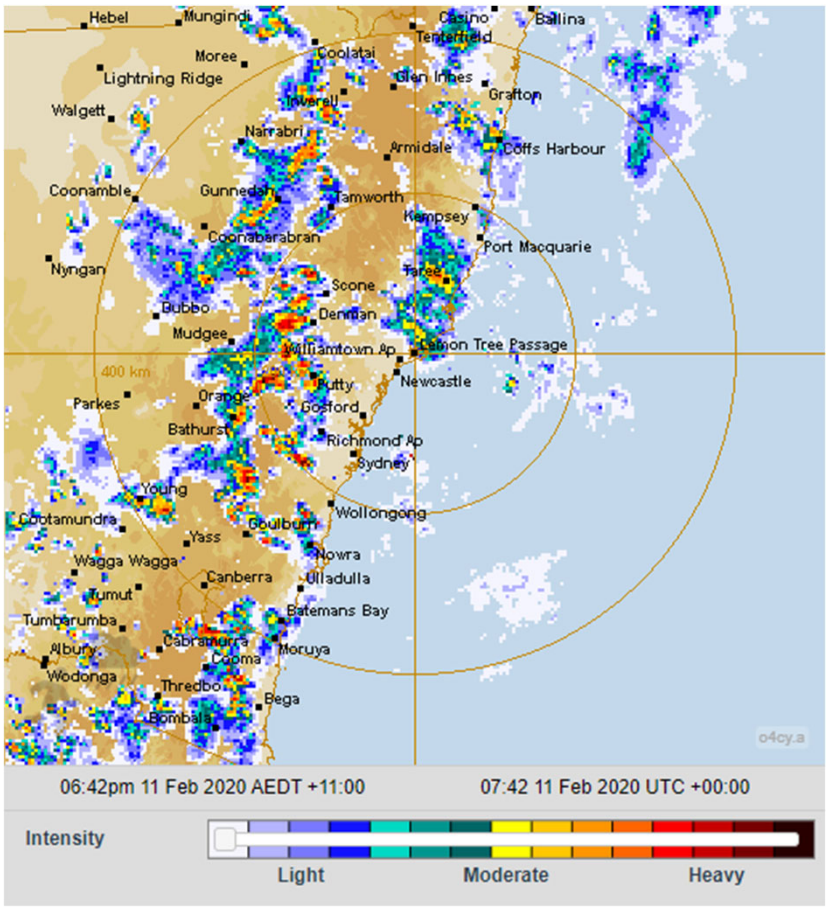

Source: Australian Bureau of Meteorology, 2020; radar image archived by theweatherchaser.com

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MEAN SEA LEVEL PRESSURE AND RADAR IMAGES
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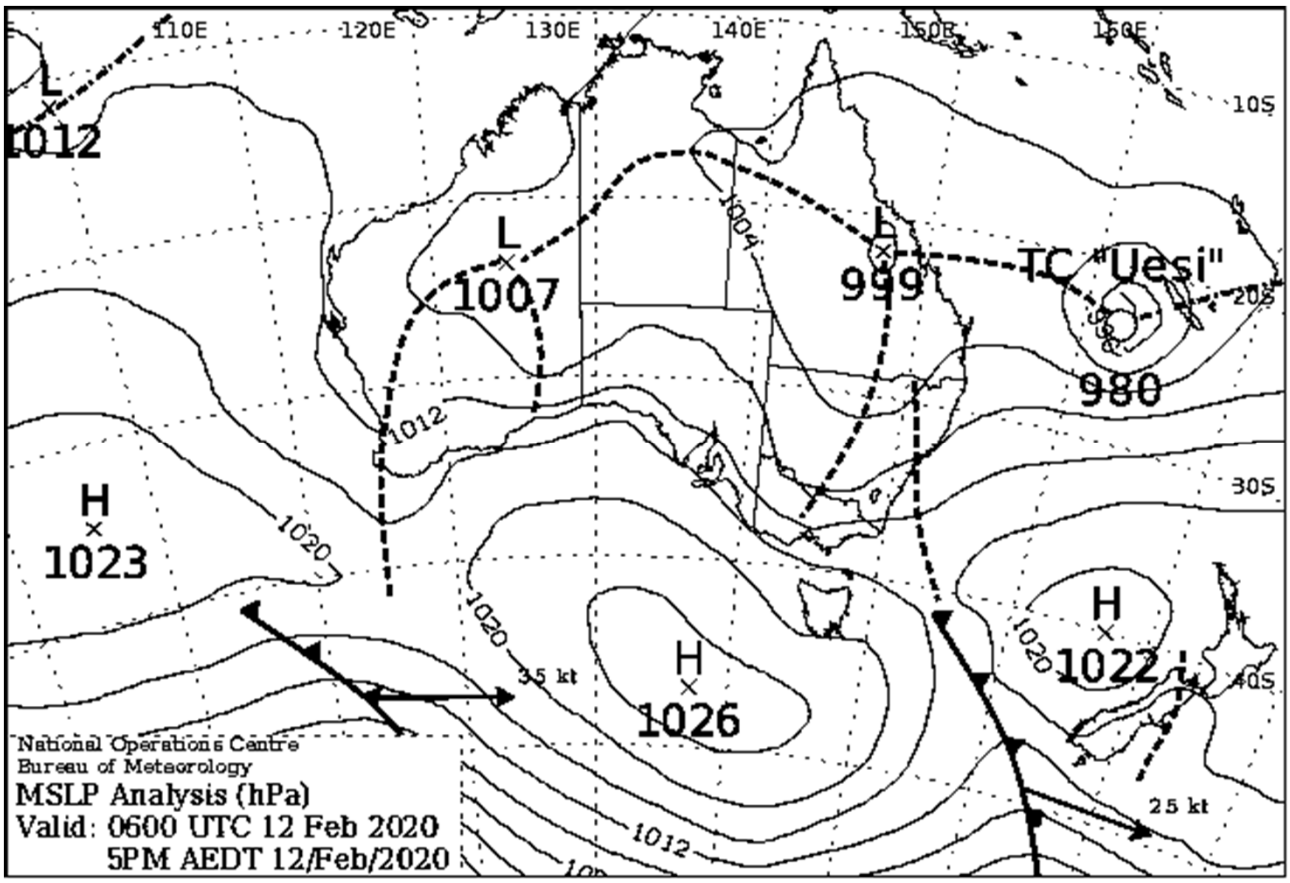

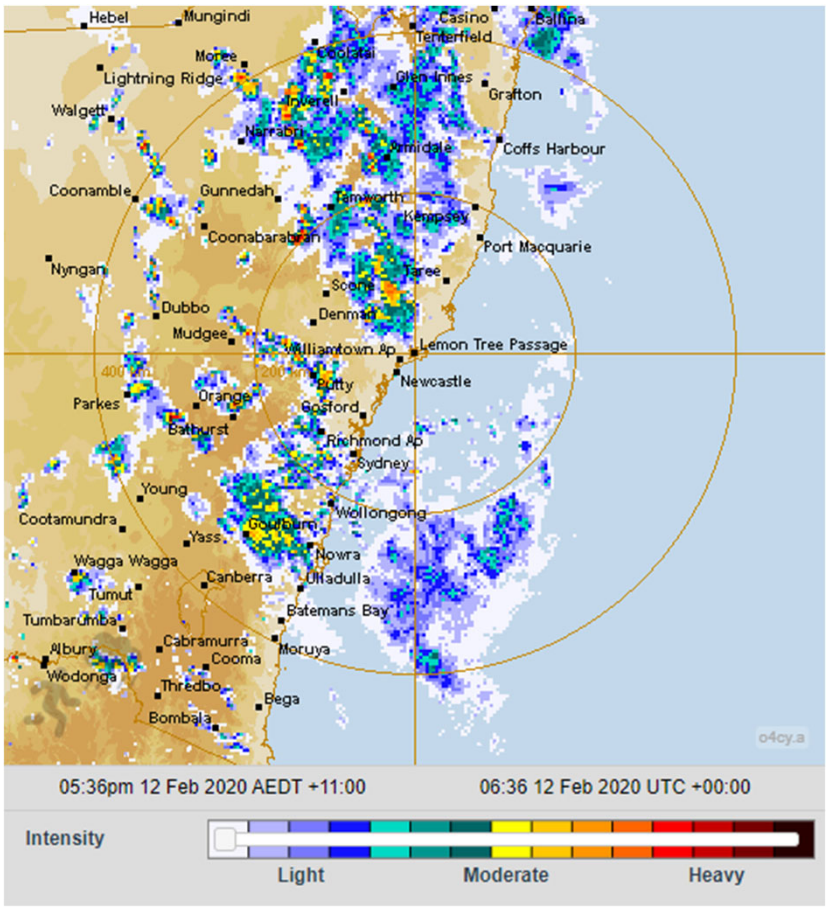

Source: Australian Bureau of Meteorology, 2020; radar image archived by theweatherchaser.com

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MEAN SEA LEVEL PRESSURE AND RADAR IMAGES
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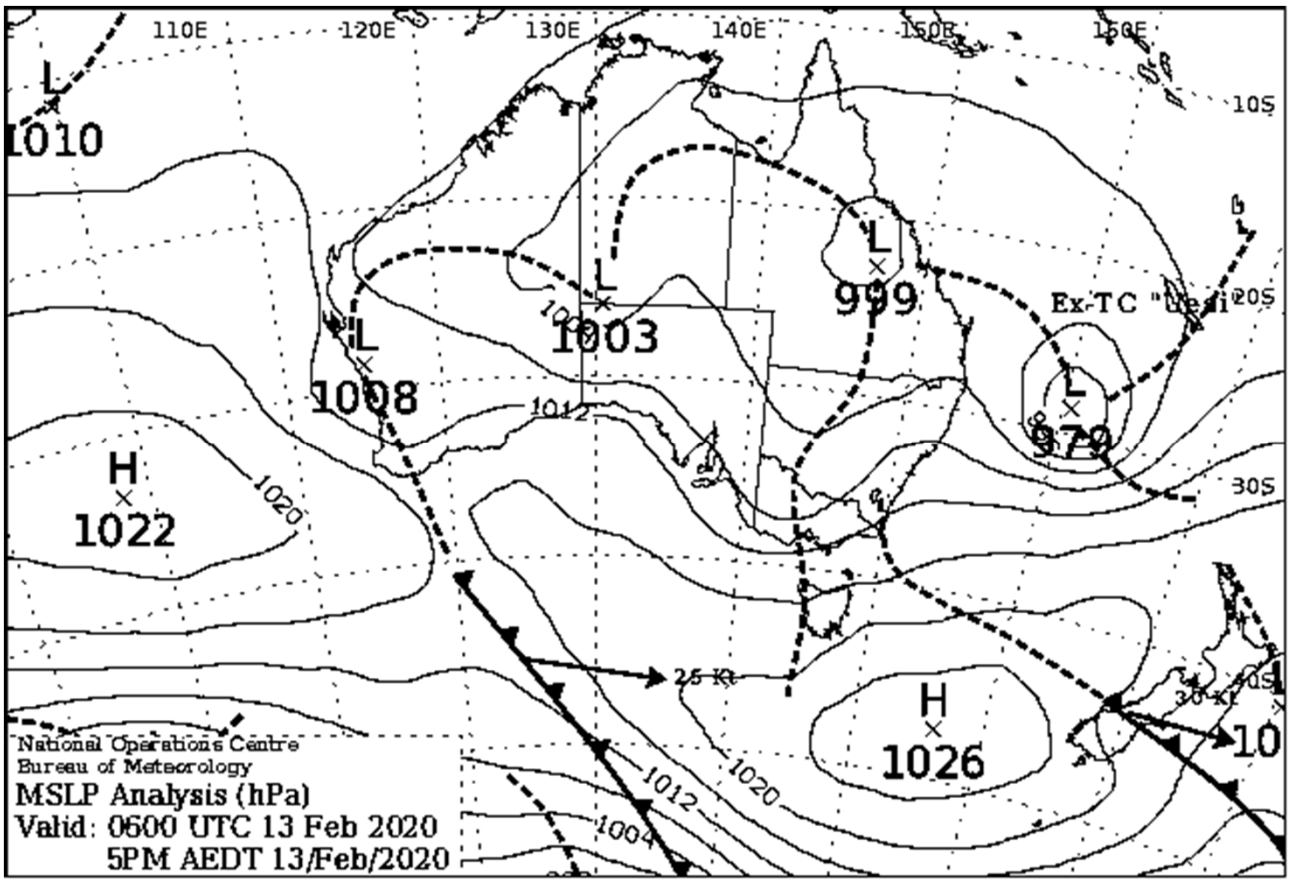

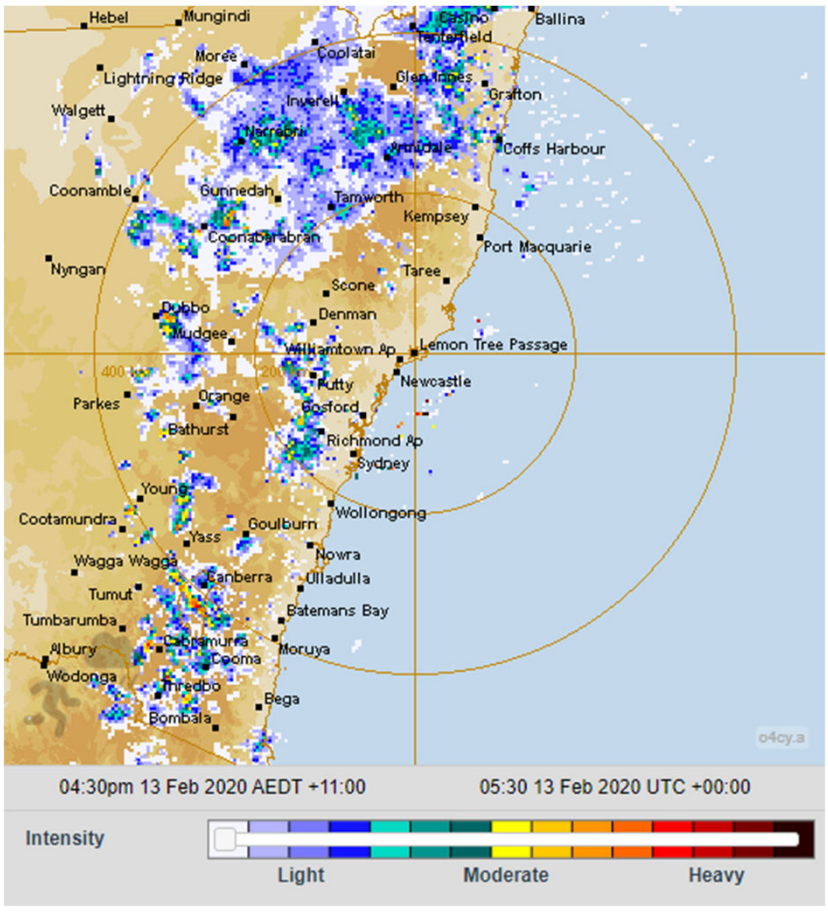

Source: Australian Bureau of Meteorology, 2020; radar image archived by theweatherchaser.com

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MEAN SEA LEVEL PRESSURE AND RADAR IMAGES
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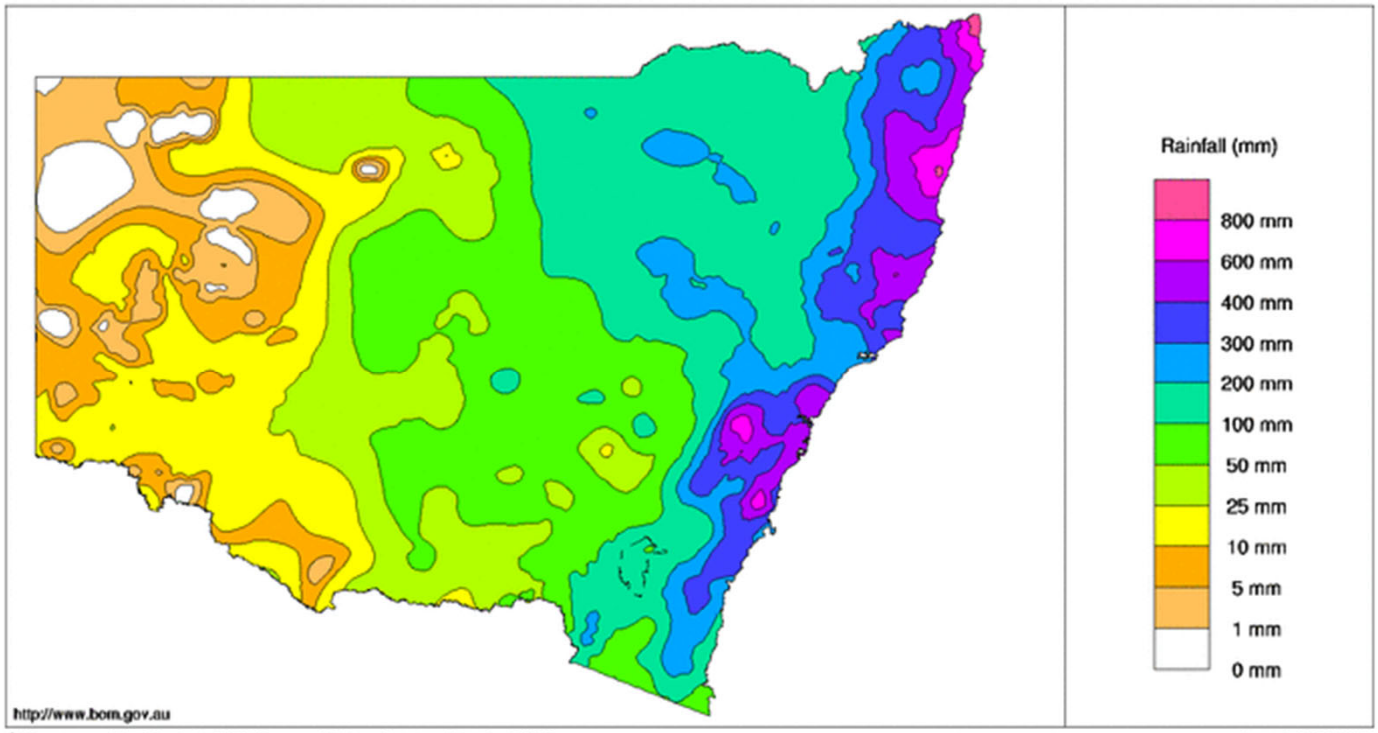

Source: Australian Bureau of Meteorology, 2020

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NEW SOUTH WALES RAINFALL ANALYSIS
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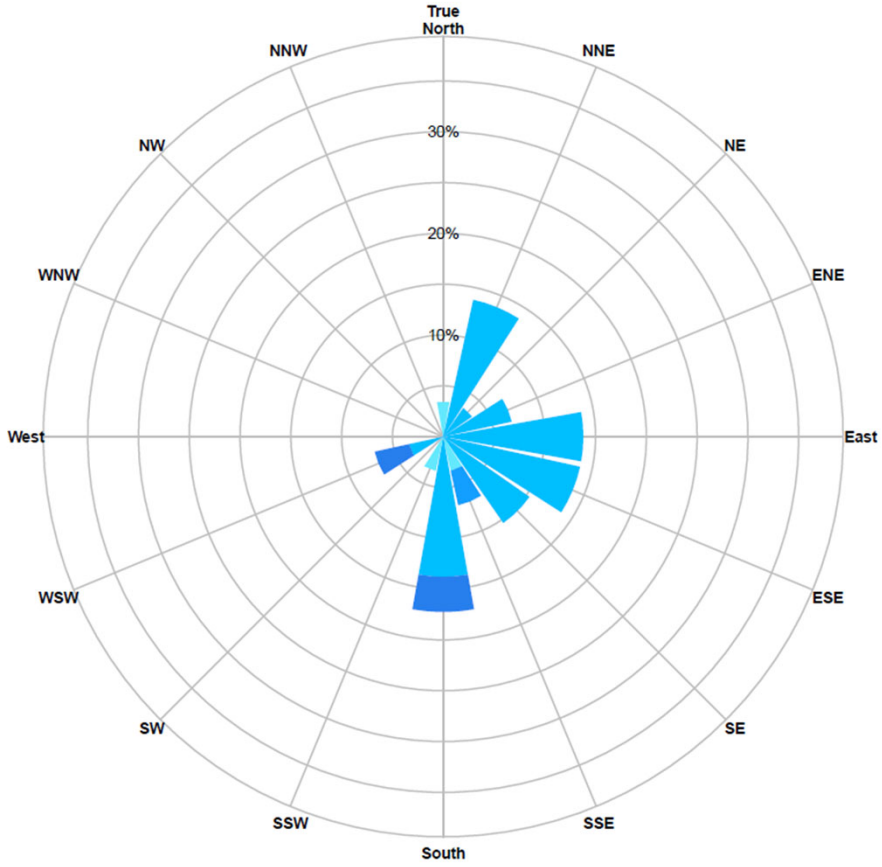
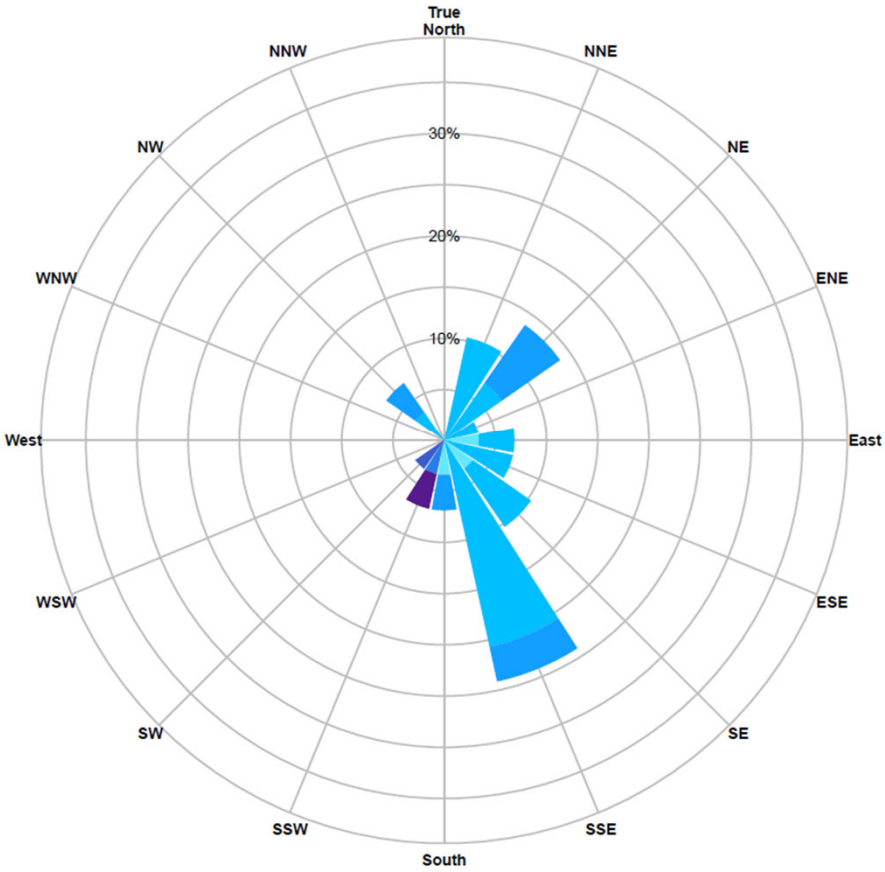


Wind Speed vs. Direction Rose
Site: Grafton Airport AWS
Start: 01 February 2020
Finish: 29 February 2020
Record Length (days): 28
N° of Records: 29



Wind Speed vs. Direction Rose
Site: Lismore Airport AWS
Start: 01 February 2020
Finish: 29 February 2020
Record Length (days): 28
N° of Records: 29

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, 2020

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WIND ROSE FROM GRAFTON AIRPORT AWS AND LISMORE AIRPORT AWS 01-29 FEBRUARY 2020

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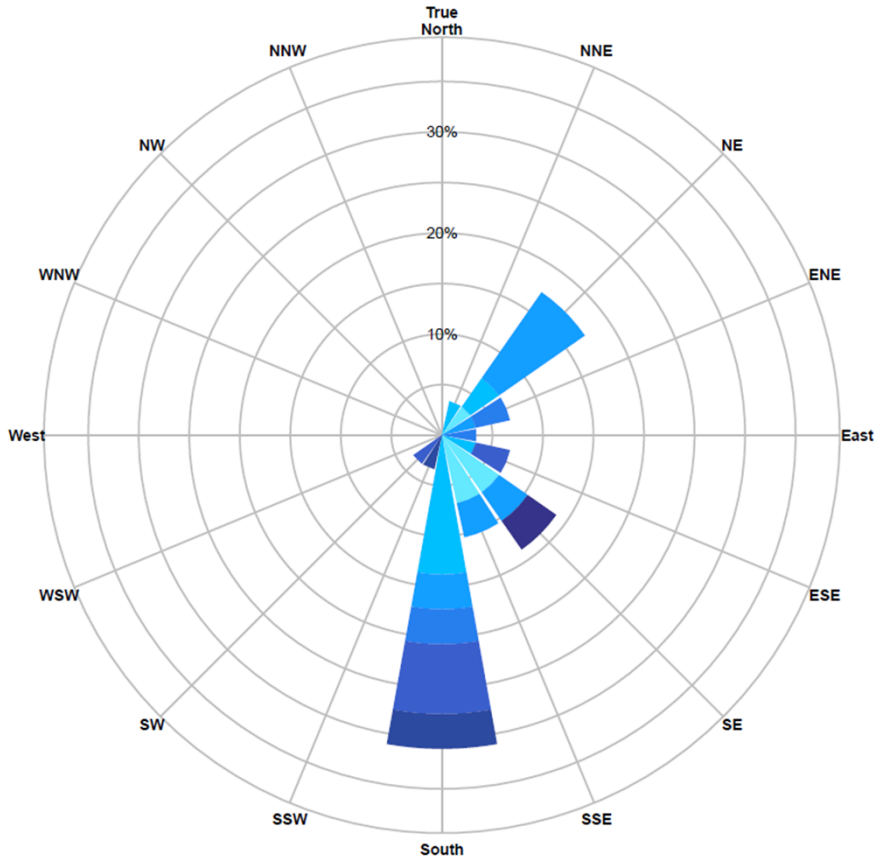
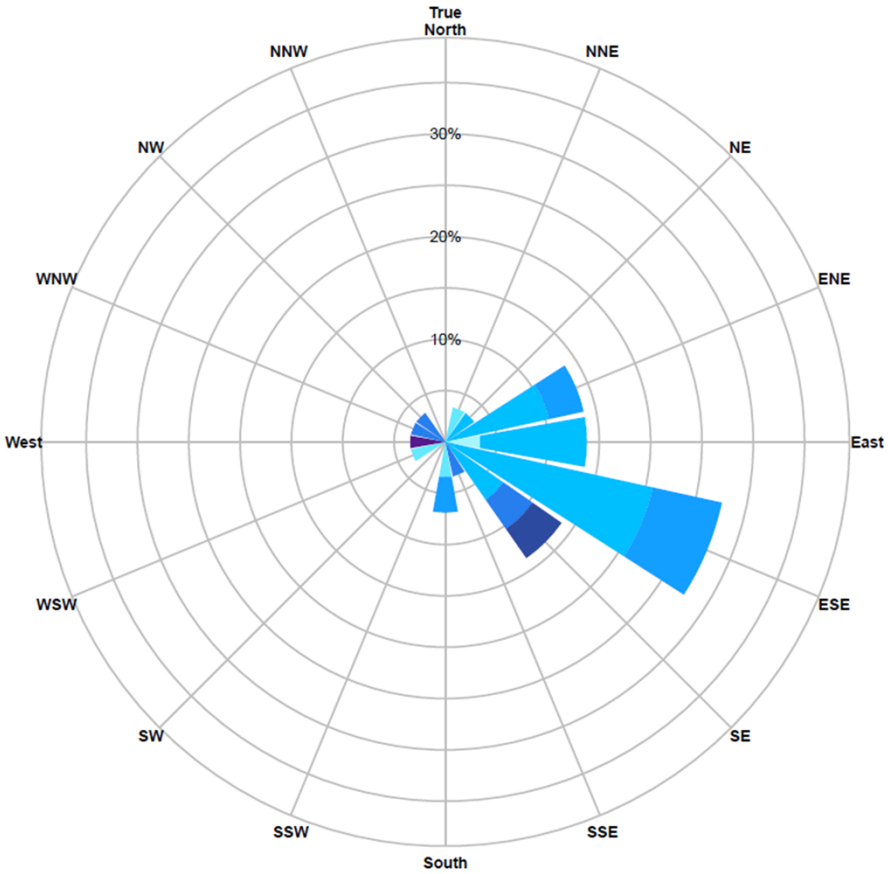


Wind Speed vs. Direction Rose
Site: Norah Head AWS
Start: 01 February 2020
Finish: 29 February 2020
Record Length (days): 28
N° of Records: 29



Wind Speed vs. Direction Rose
Site: Richmond RAAF
Start: 01 February 2020
Finish: 29 February 2020
Record Length (days): 28
N° of Records: 29

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, 2020

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WIND ROSE FROM NORAH HEAD AWS AND RICHMOND RAAF STATION 01-29 FEBRUARY 2020

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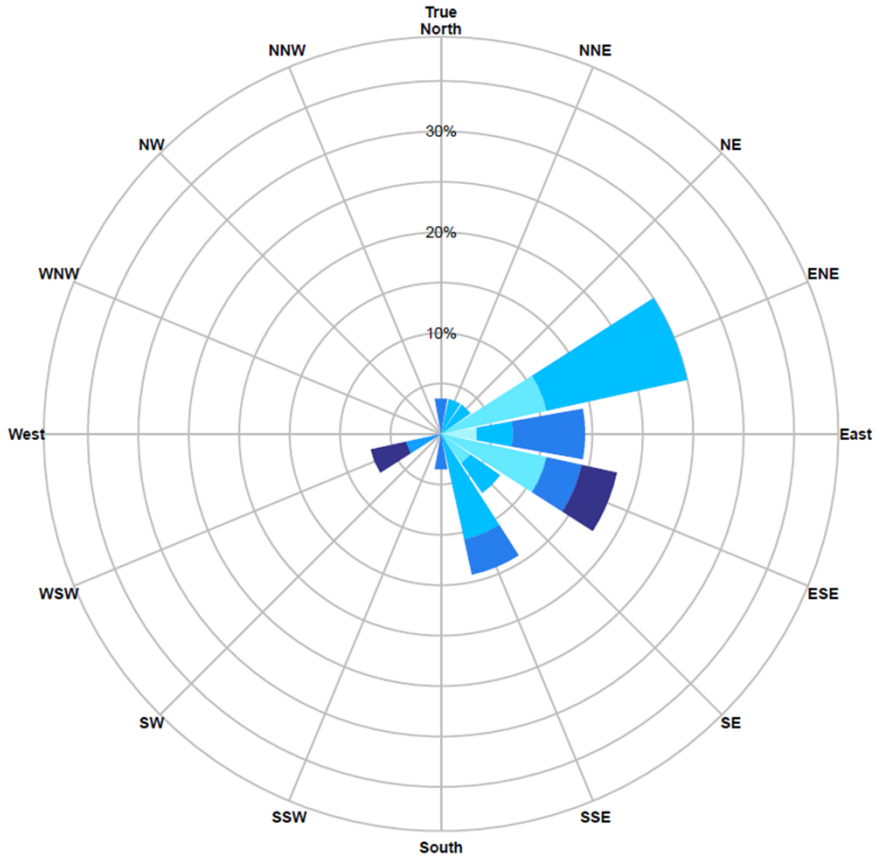
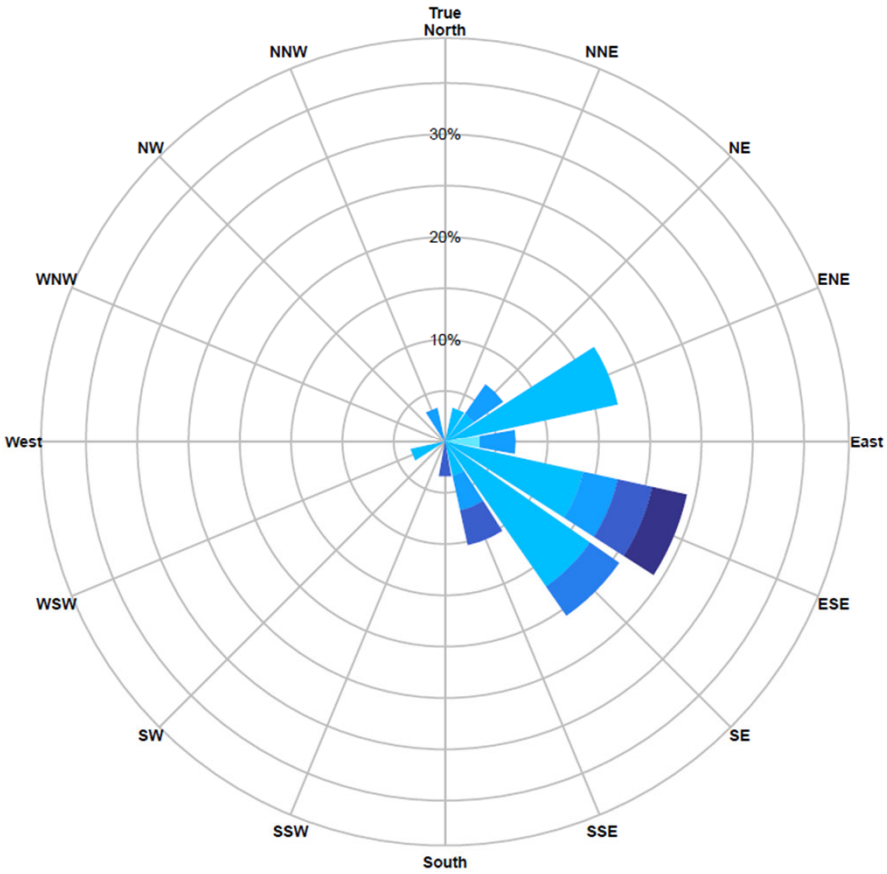


Wind Speed vs. Direction Rose
Site: Terrey Hills AWS
Start: 01 February 2020
Finish: 29 February 2020
Record Length (days): 28
N° of Records: 28



Wind Speed vs. Direction Rose
Site: Bankstown Airport AWS
Start: 01 February 2020
Finish: 29 February 2020
Record Length (days): 28
N° of Records: 29

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, 2020

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WIND ROSE FROM TERRY HILLS AWS AND BANKSTOWN AIRPORT AWS 01-29 FEBRUARY 2020

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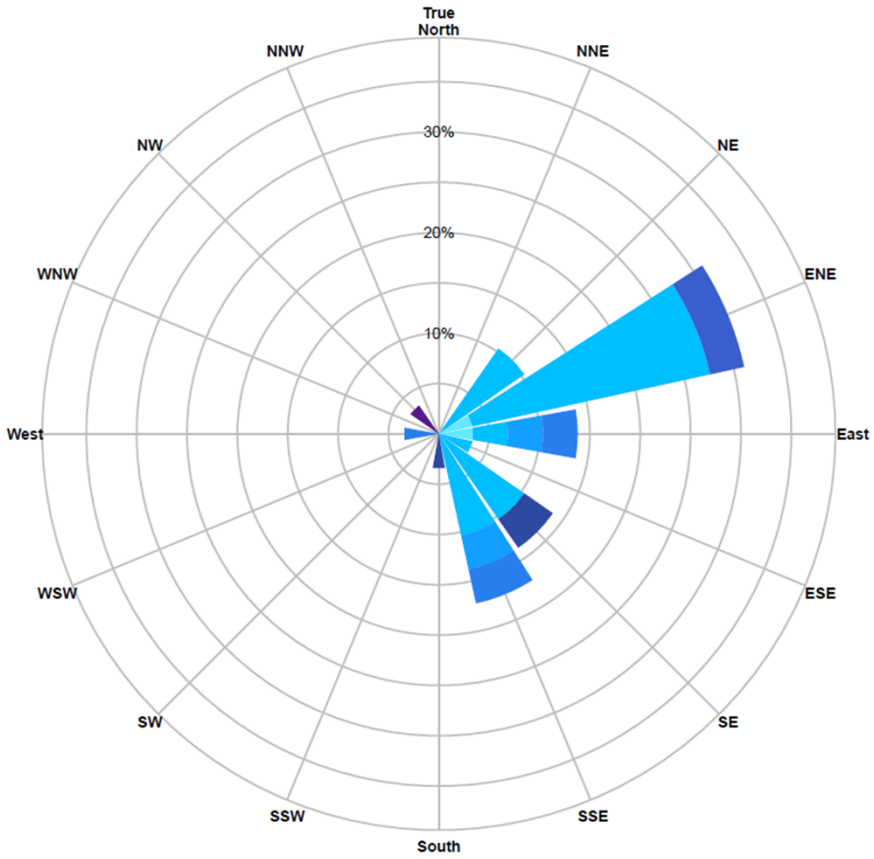
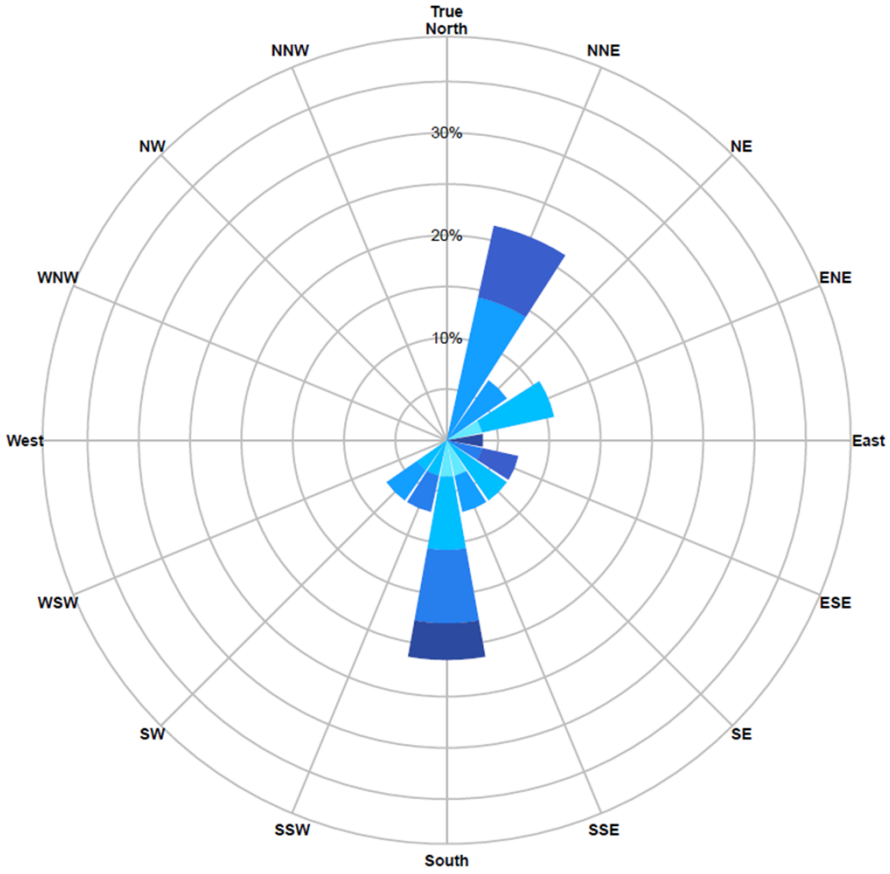


Wind Speed vs. Direction Rose
Site: Nowra RAN Air Station AWS
Start: 01 February 2020
Finish: 29 February 2020
Record Length (days): 28
N° of Records: 29



Wind Speed vs. Direction Rose
Site: Jervis Bay Airfield AWS
Start: 01 February 2020
Finish: 29 February 2020
Record Length (days): 28
N° of Records: 28

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, 2020

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WIND ROSE FROM NOWRA RAN AIR STATION AWS AND JERVIS BAY AIRFIELD AWS 01-29 FEBRUARY 2020

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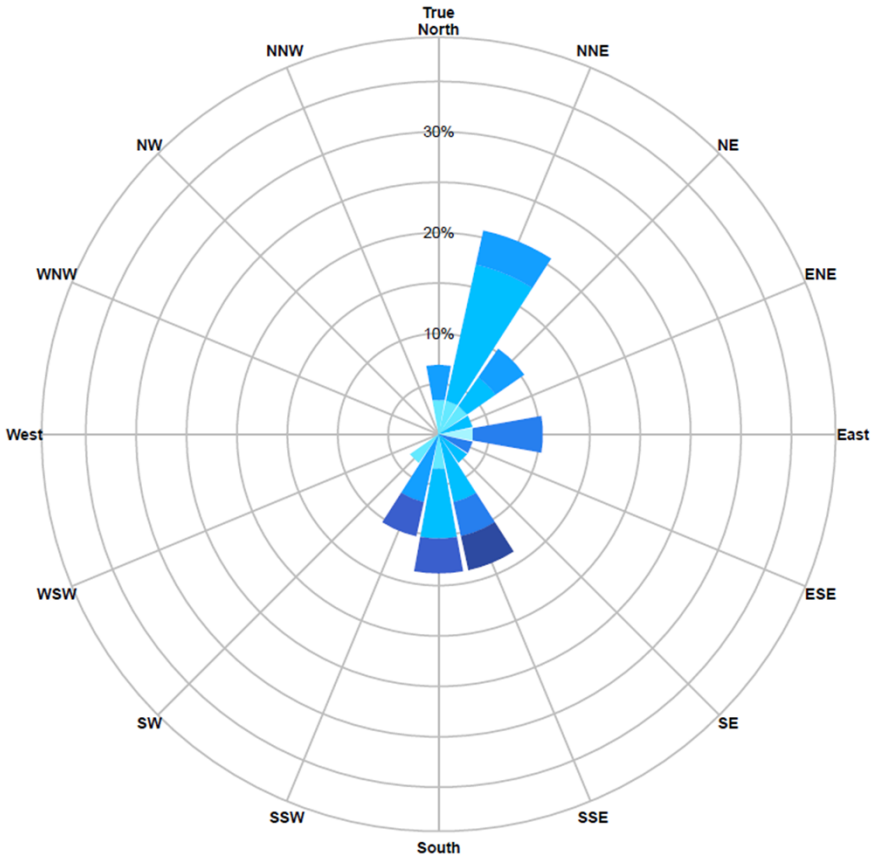

Wind Speed vs. Direction Rose
Site: Ulladulla AWS
Start: 01 February 2020
Finish: 29 February 2020
Record Length (days): 28
N° of Records: 29

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, 2020

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WIND ROSE FROM ULLADULLA AWS 01-29 FEBRUARY 2020

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Figure
1.12

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2 Estuary and ocean conditions

2.1 Offshore wave data

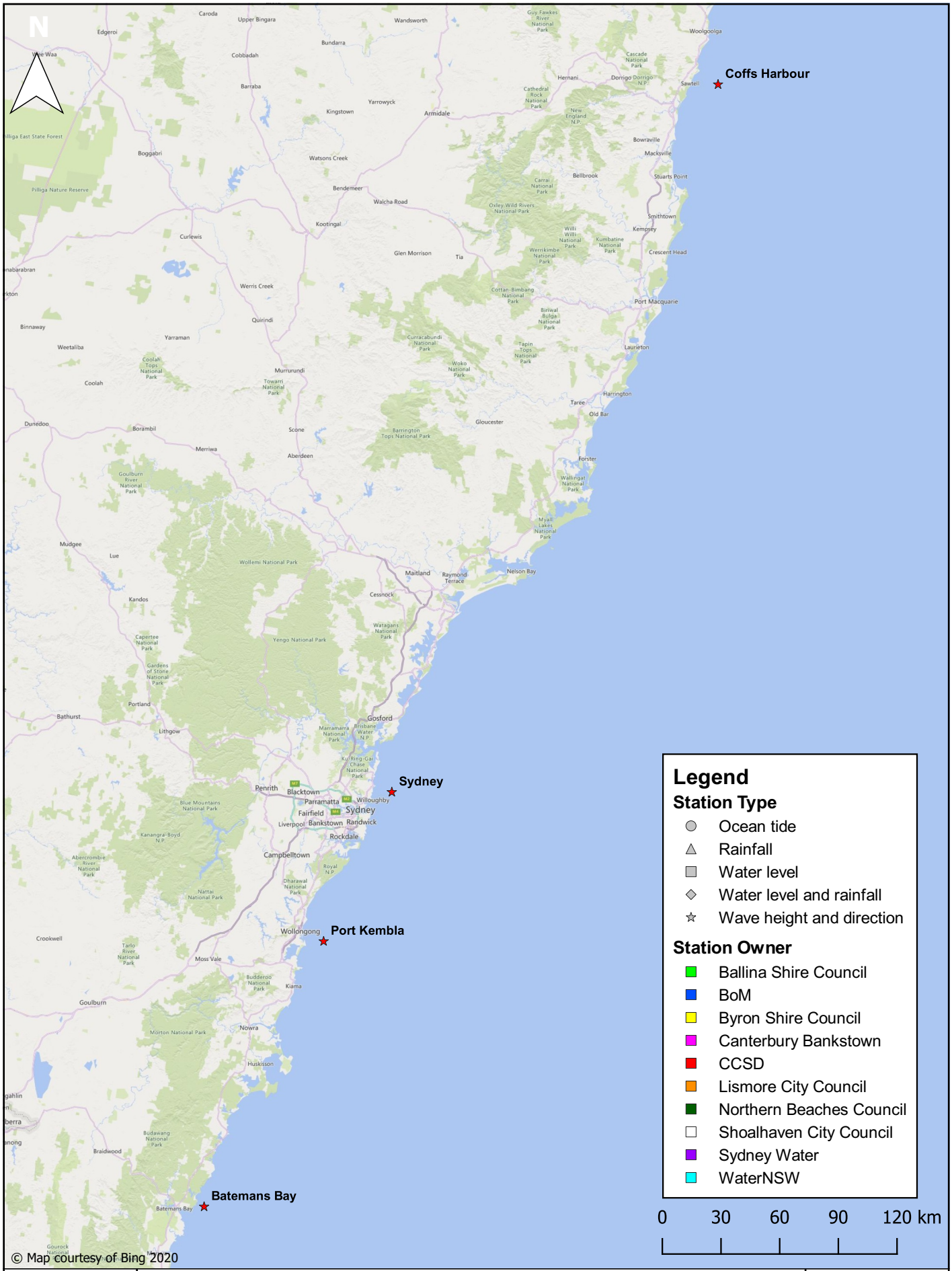
Ocean wave conditions along the NSW coast have been monitored by the NSW Waverider buoy network, a network of seven Waverider stations operated by MHL on behalf of CCSD. Wave data have been collected since 1974 when the first Waverider buoy was deployed by MHL off Port Kembla. Meteorological conditions during the February 2020 flood event also generated significant storm wave activity along the NSW coast from Crowdy Head to Batemans Bay.

A summary of the ocean wave conditions recorded by the Coffs Harbour, Crowdy Head, Sydney, Port Kembla, and Batemans Bay Waverider buoys for the February 2020 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** to **Figure 2.6**.

Table 2.1 Ocean wave storm summary 01-29 February 2020

Wave conditions	Coffs Harbour	Crowdy Head	Sydney	Port Kembla	Batemans Bay
Peak significant wave height (m)	3.56	4.94	6.53	6.24	5.00
Date and time of peak significant wave height (hrs AEST)	14/02/2020 21:00	09/02/2020 18:00	09/02/2020 13:00	09/02/2020 15:00	09/02/2020 22:00
Peak maximum wave height (m)	7.02	9.28	13.93	11.79	9.50
Spectral peak wave period at storm peak (secs)	8.9	11.5	10.8	11.5	12.1
Wave direction at storm peak (ºTN)	161	98	111	114	113
Storm duration for Hsig greater than 3m (hrs)	22	53	58	65	75
Storm duration for Hsig greater than 4m (hrs)	0	8	20	16	16
Average Recurrence Interval for storm peak Hsig (years)	< 1.0	< 1.0	2.2	2.5	1.0

For all Waverider stations, the peak significant wave height (H_{sig}) ranged from 3.56 m to 6.53 m while the peak maximum individual wave height (H_{max}) ranged from 7.02 m to 13.93 m. The highest peak H_{sig} and peak H_{max} were recorded by the Sydney Waverider buoy. Based on over 30 years of wave data recorded at the Sydney Waverider buoy station, the Average Recurrence Interval (ARI) for the 6.53 m peak H_{sig} is 2.2 years.



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WAVE STATIONS

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Figure
2.1

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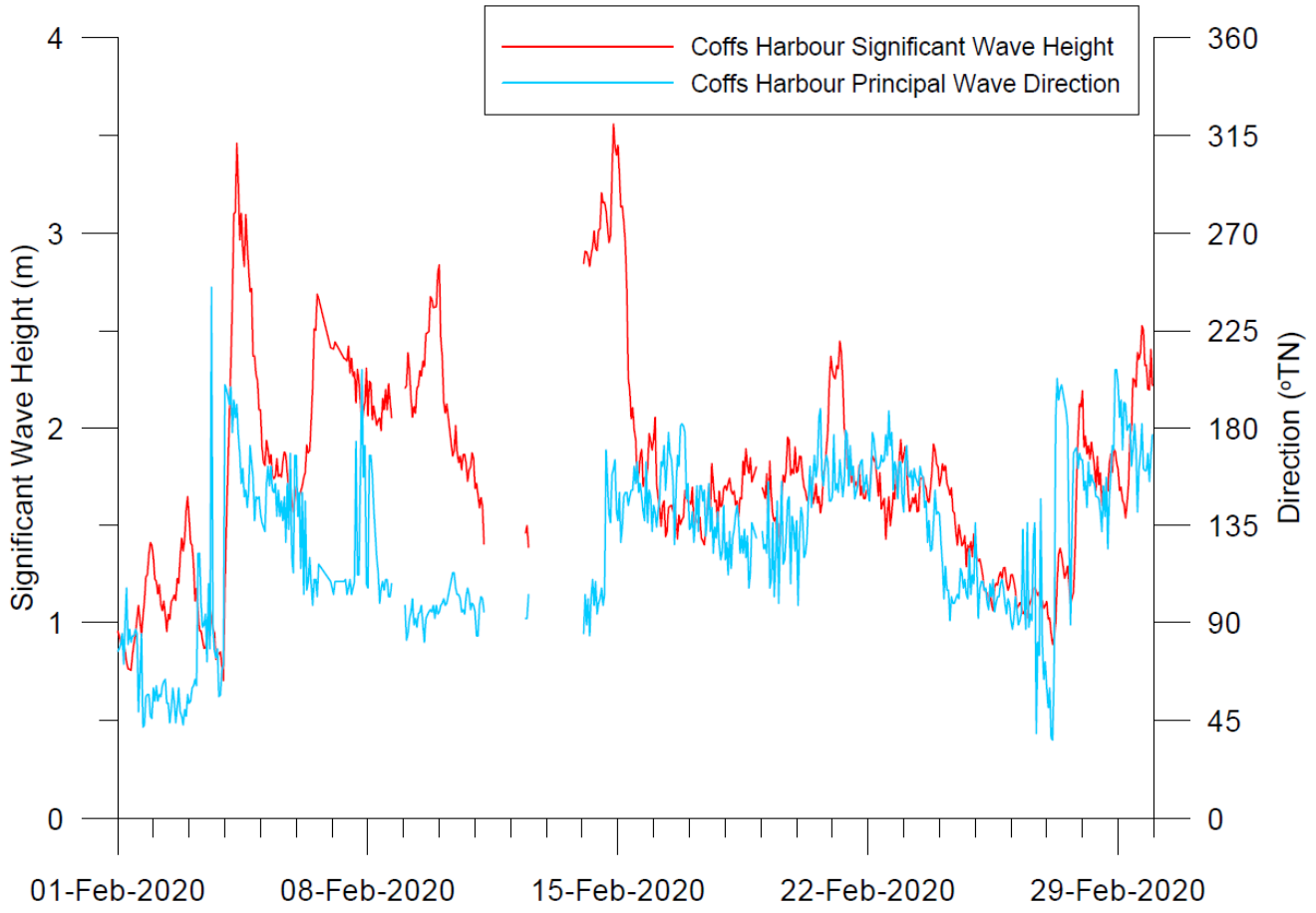
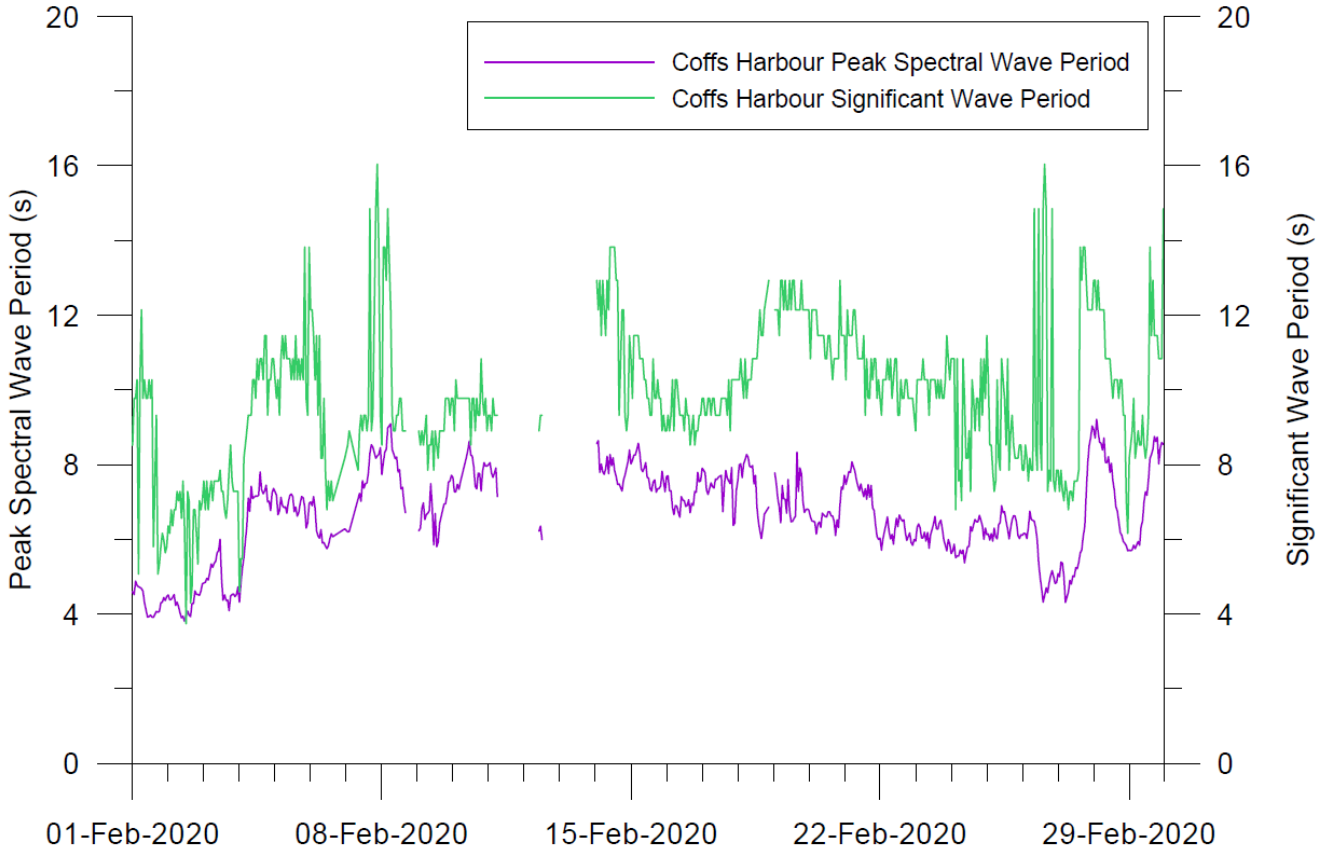




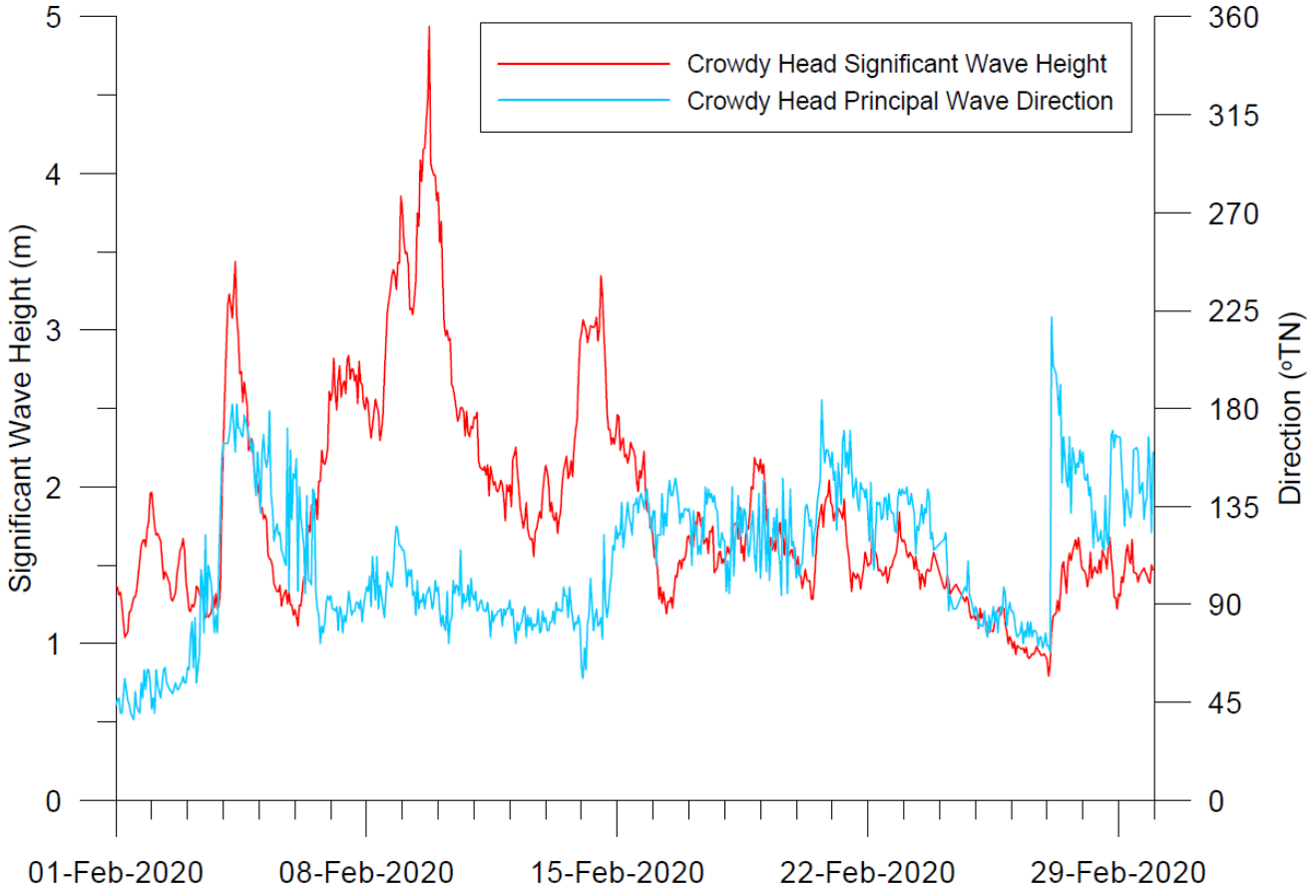
NSW GOVERNMENT

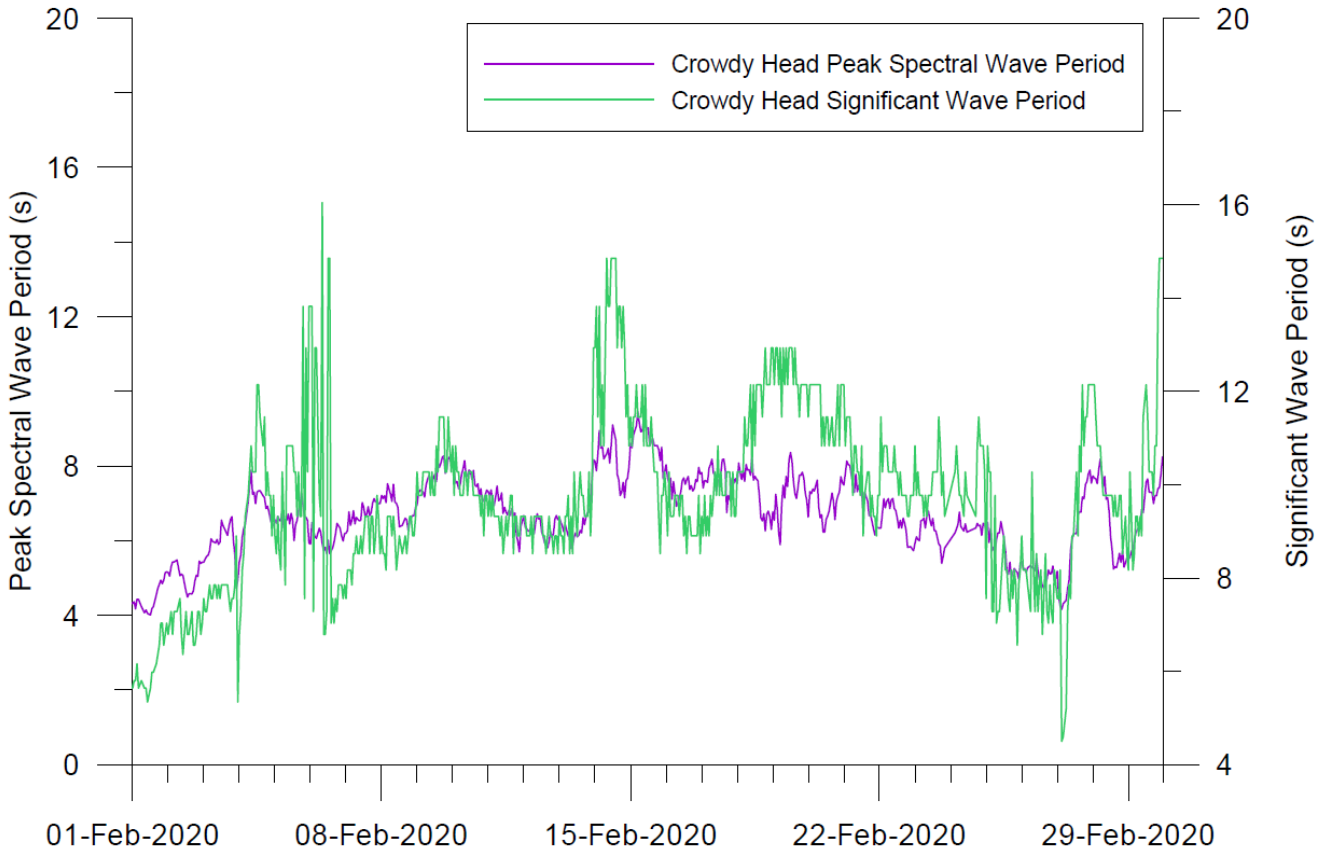
COFFS HARBOUR WAVERIDER BUOY
WAVE HEIGHT, DIRECTION AND PERIOD
01-29 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
2.2

Figures_MHL2752.pptx





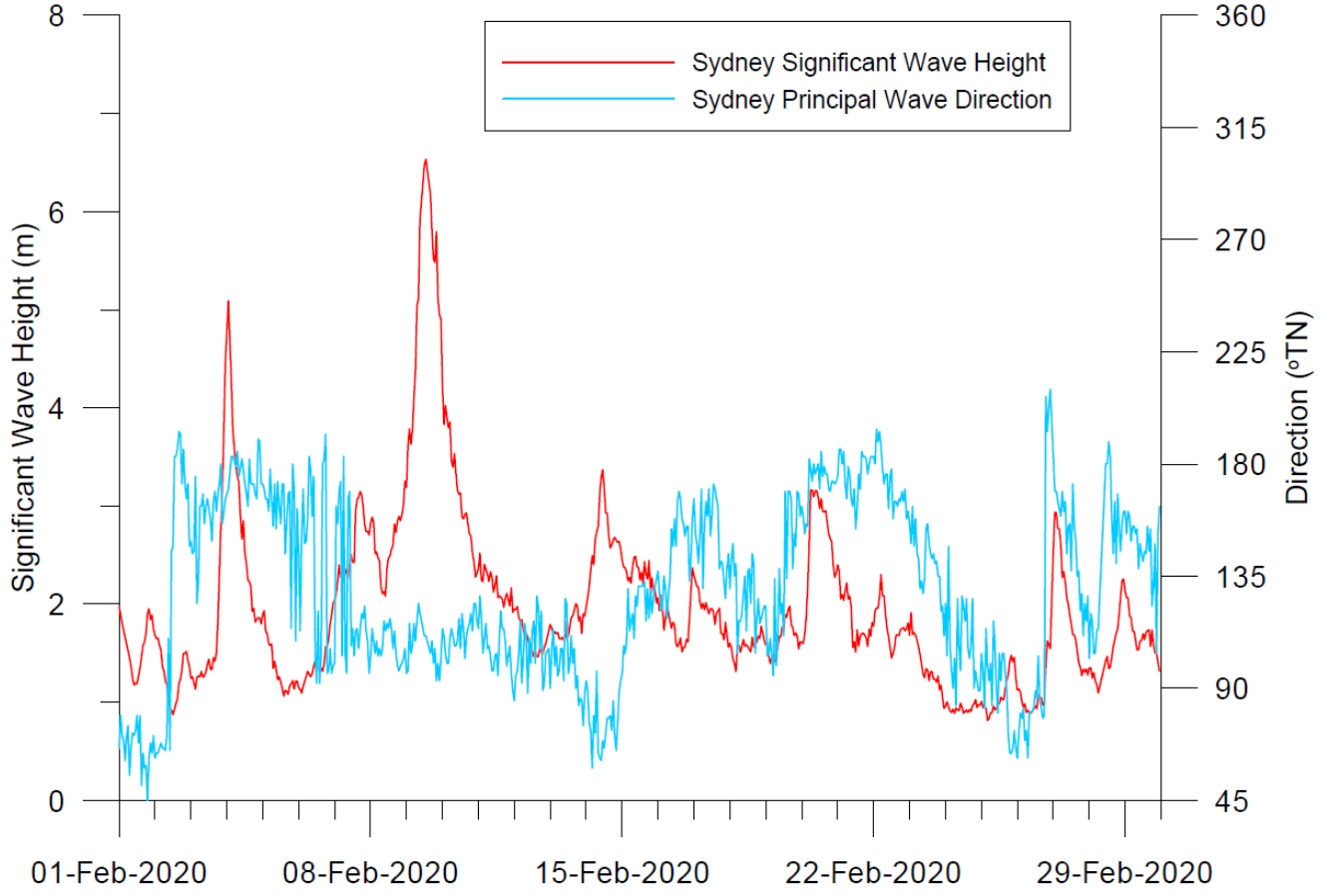
NSW GOVERNMENT

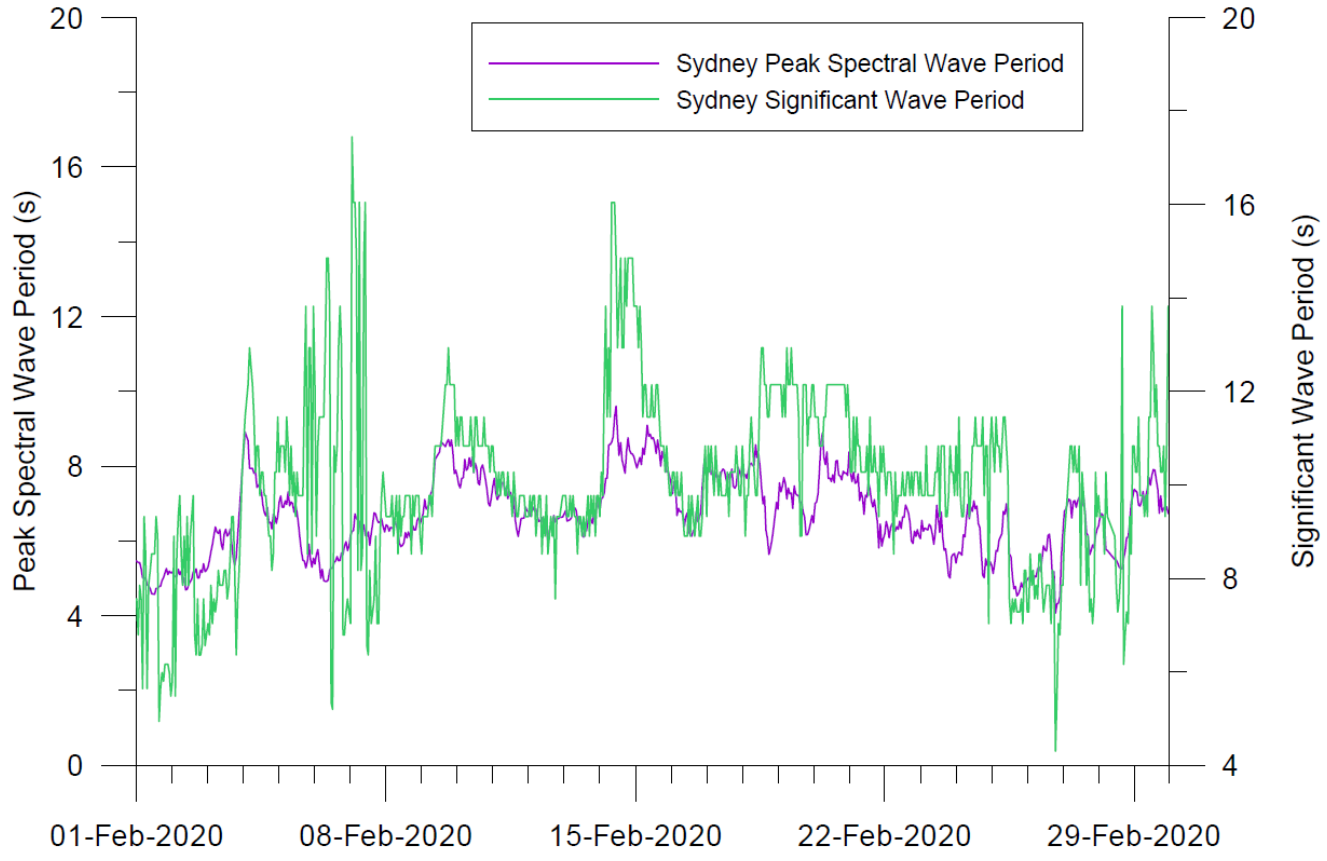
CROWDY HEAD WAVERIDER BUOY
WAVE HEIGHT, DIRECTION AND PERIOD
01-29 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
2.3

Figures_MHL2752.pptx





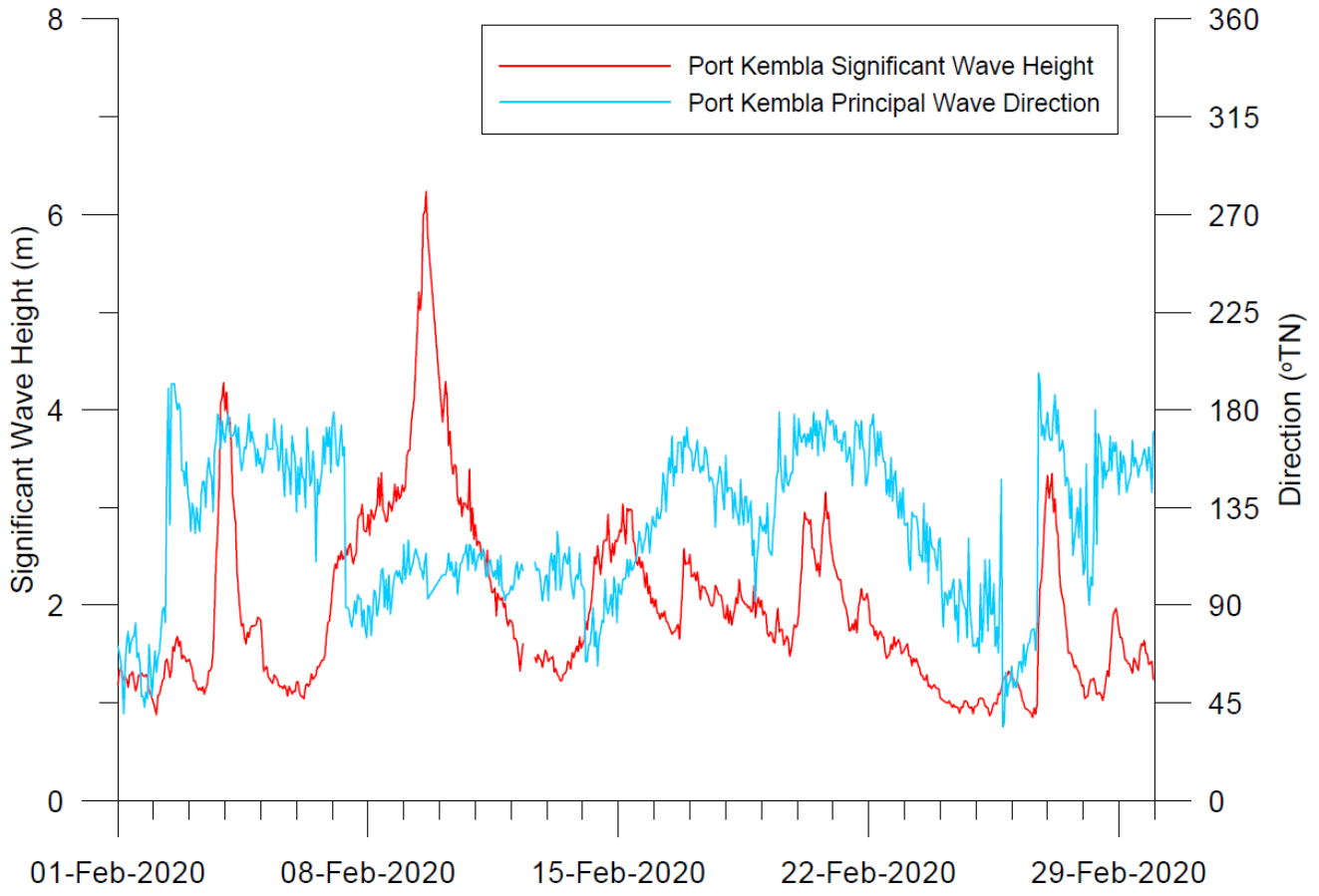
NSW GOVERNMENT

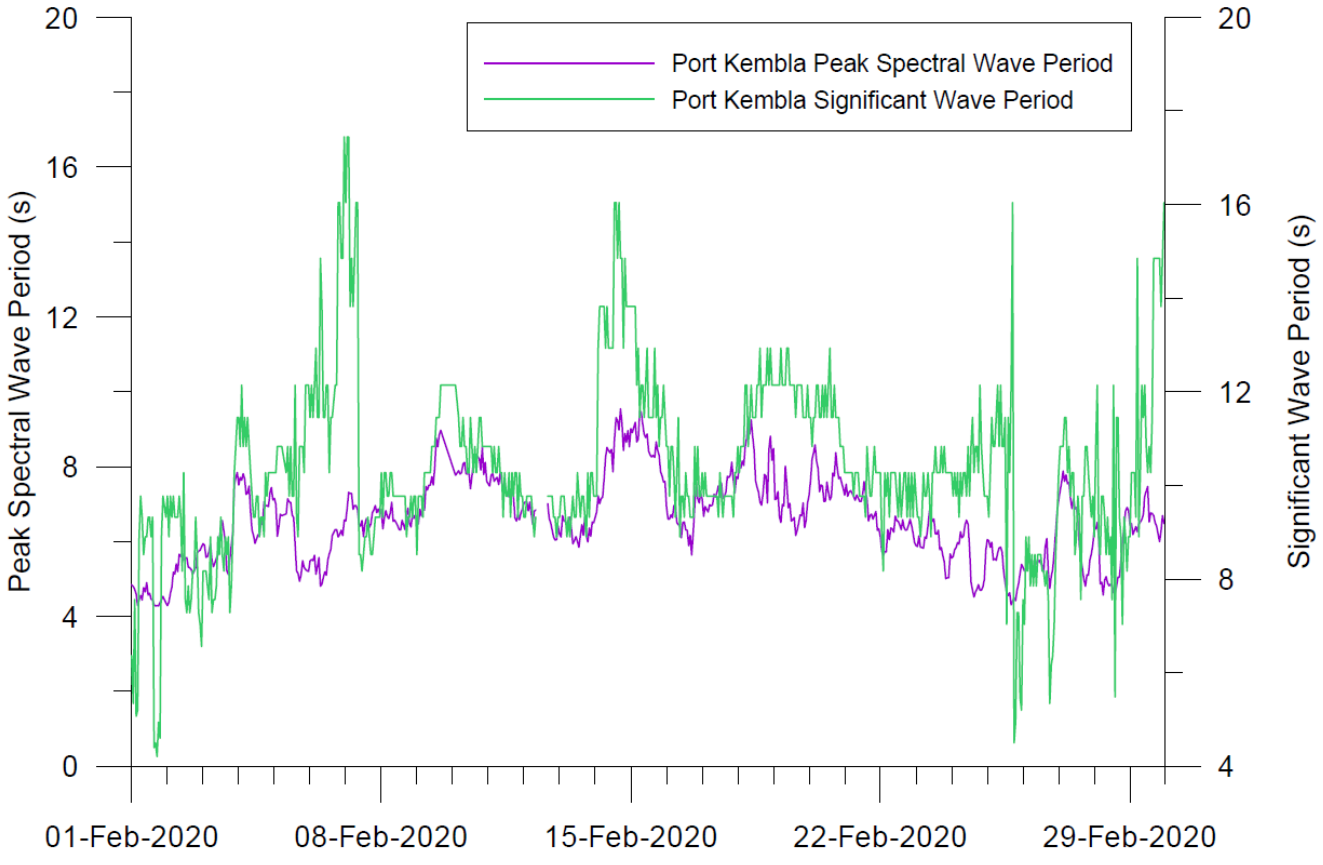
SYDNEY WAVERIDER BUOY
WAVE HEIGHT, DIRECTION AND PERIOD
01-29 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
2.4

Figures_MHL2752.pptx





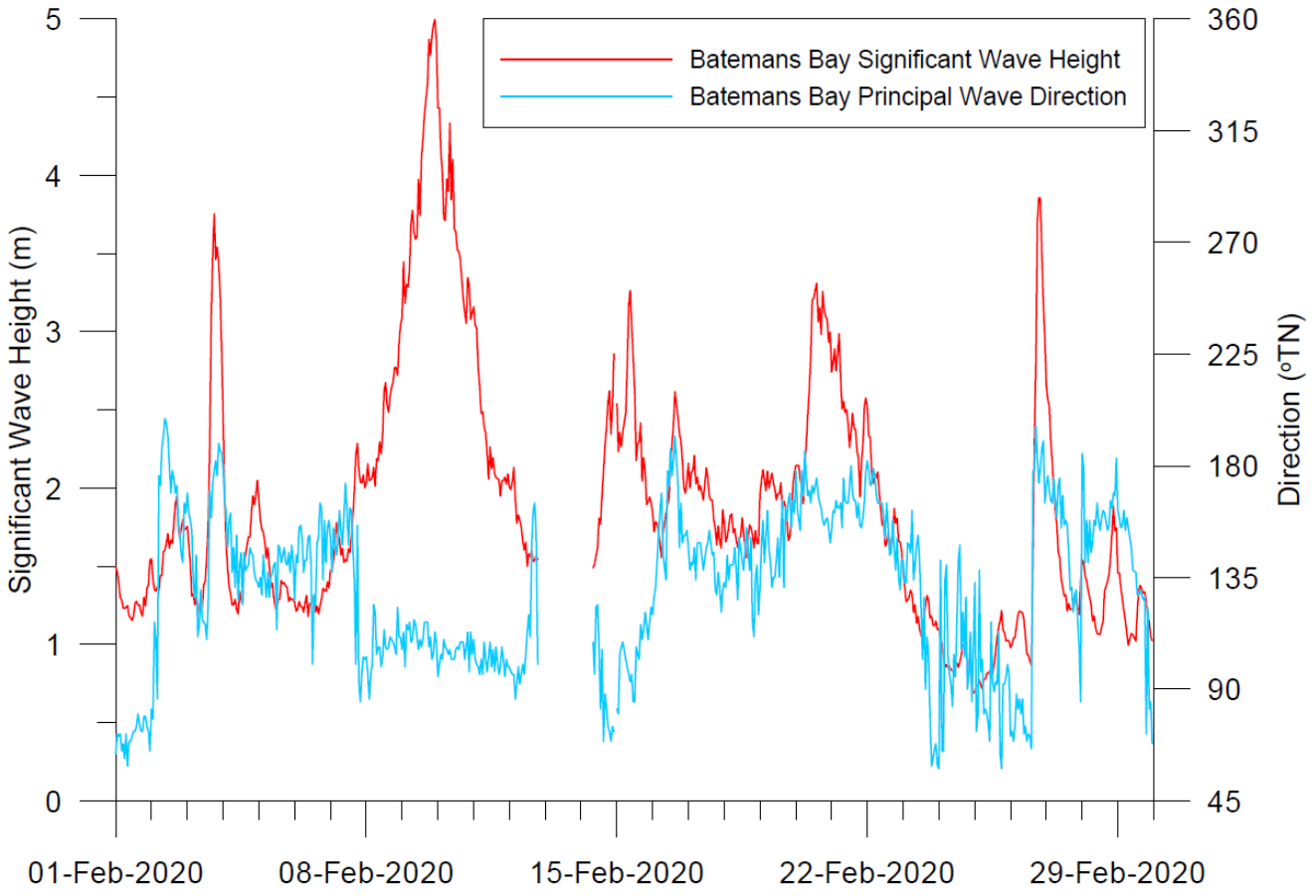
NSW GOVERNMENT

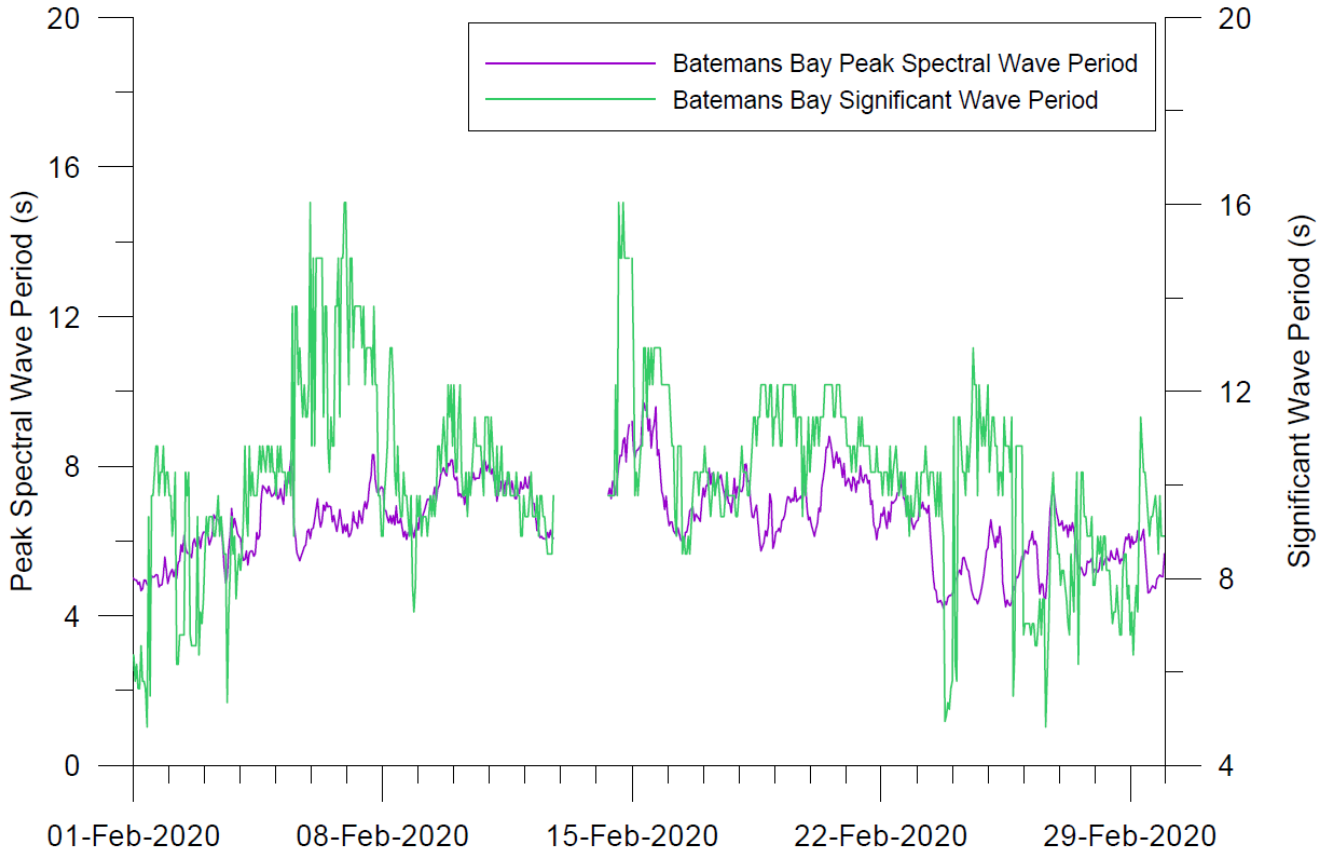
PORT KEMBLA WAVERIDER BUOY
WAVE HEIGHT, DIRECTION AND PERIOD
01-29 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
2.5

Figures_MHL2752.pptx





NSW GOVERNMENT

BATESMAN BAY WAVERIDER BUOY
WAVE HEIGHT, DIRECTION AND PERIOD
01-29 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
2.6

Figures_MHL2752.pptx

2.2 Estuary entrance conditions

Tuggerah Lake, Narrabeen Lagoon, Lake Conjola and St Georges Basin are intermittently closed and open lakes and lagoons (ICOLLs), that were affected by the February 2020 flood event. Local councils are managing the entrances of these ICOLLs and undertaking artificial opening according to their Estuary and Floodplain management plans.

A summary table of entrance conditions and management during the February 2020 flood event is shown in **Table 2.2**.

Table 2.2 Entrance management during February 2020 flood event

Entrance management	Tuggerah Lake	Narrabeen Lagoon	Lake Conjola	St Georges Basin
Local Council	Central Coast Council	Northern Beaches Council	Shoalhaven City Council	Shoalhaven City Council
Entrance condition prior to flood event	Open	Closed	Closed	Open
Mechanical opening of entrance for flood mitigation purposes	No	Yes	Yes	No
If yes, opening date & time (AEST)	n/a	07/02/2020 16:55	10/02/2020 11:25	n/a
Trigger of opening (water level in AHD, if any)	n/a	1.0-1.3 m AHD	*GET READY* at 0.8 m AHD and *EMERGENCY* opening at 1.2 m AHD	n/a
Flood Peak (peak in m AHD) (time in AEST)	Long Jetty (211418) 10/02/2020 19:30 and 11/2/2020 16:00 1.67 m AHD	Ocean Street Bridge (213408D) 09/02/2020 17:00 1.79 m AHD	Lake Conjola DS (216420D) 10/02/2020 11:00 2.04 m AHD	Island Point (216415) 10/02/2020 15:15 0.80 m AHD

2.2.1 Tuggerah Lake

Central Coast Council has maintained a recurrent dredging program for The Entrance channel with dredging being delivered every two to three years. Dredging is undertaken when one or more of the following triggers are reached according to Tuggerah Lakes Estuary Management Plan (BIO-ANALYSIS Pty Ltd, 2006).

One of the triggers for dredging is when the throat of the channel (near the southern tip of the sand spit) at The Entrance reduces to an estimated width of less than 15 metres measured at mid tide level. Another trigger is when the flood tide sand shoals threaten to block the ebb tide dominant channel along the north-eastern side of The Entrance area and/or the flood tide shoals threaten to block the main channel east of the bridge.

Recent dredging carried out in 2018 was primarily triggered by the sand shoals that threatened to block the ebb tide dominant channel along the north-eastern side of The Entrance.

Prior to the February 2020 flood event, The Entrance channel was open and water from the estuary continued to flow and exit the channel, measuring approximately 40 m wide at the narrowest part at mid tide. During the event, Tuggerah Lake at Long Jetty measured a peak water level of 1.67m AHD at 19:30 AEST on 10 February 2020. The water started to recede in the morning of 11 February 2020, but it rose back to peak level (1.67m AHD) in the afternoon due to high tide ocean inflows.

The flood flow was concentrated along the southern part of the channel at the beginning of the flood. As a result, some of the southern side embankment large concrete blocks were dislodged by the fast-flowing waters, eroding this foreshore. The Council conducted works at Karagi sandspit at The Entrance North on 11 February 2020 at 15:00 AEST, an hour before the peak water level was recorded. This was done to encourage realignment of the channel at The Entrance back to the northern side of the rock shelf, in order to relieve erosion and to help protect public infrastructure along the southern foreshore at The Entrance, such as the lifeguard tower, beach accesses and other infrastructure. **Figure 2.7** shows satellite images of The Entrance channel on 10 February and 13 February 2020.

The groyne wall on The Entrance Beach was installed at the south side of channel by the NSW Government in 2017 and designed to keep sand on The Entrance Beach. The groyne appears to have been successful in keeping sand on The Entrance Beach but may have created a sand deficit to the north of the groyne wall. This could have influenced the channel to flow further to the south in this rainfall event, which is a different natural flow path than has previously been observed. This is the first significant rainfall event since installation of the groyne wall and has allowed observation of the impacts on the direction of water flow at the channel at The Entrance (Central Coast Council, 2020).

Council are proposing further studies on the potential impacts of the groyne on the channel behaviour. Additionally, a review of the dredging plan for The Entrance is also proposed, taking into account climatic change conditions.

10 February 2020

13 February 2020

Images courtesy of Planet.com

NSW GOVERNMENT

SATELLITE IMAGES OF
THE ENTRANCE CHANNEL ON
10 FEBRUARY AND 13 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
2.7

Figures_MHL2752.pptx

2.2.2 Narrabeen Lagoon

Northern Beaches Council mechanically opens the lagoon entrance in accordance with its Lagoon Entrance Management Operational Management Standard 455 at triggering water levels between approximately 1.0 m and 1.3 m AHD (Cardno Pty Ltd, 2019).

In addition, there is larger-scale excavation of the entrance and flood tide delta approximately every three to five years. This sand clearance every few years shifts the entrance from its equilibrium condition by creating a short-term improvement in the hydraulic efficiency of the entrance channel.

The recent major sand removal and excavation works at Narrabeen Lagoon entrance was conducted in late 2018. Since then, Narrabeen Lagoon entrance was kept open till early October 2019.

Prior to the February 2020 flood event, Narrabeen Lagoon was closed for four months. During the flood, the water level at Ocean Street Bridge reached 1.0 m AHD at 15:30 AEST on Friday, 07 February 2020. The Council mechanically opened the entrance at 16:55 AEST on 07 February to mitigate the flood when the water level at Ocean Street Bridge was 1.09 m AHD. With heavy rainfall on 08 February, the Ocean Street Bridge water level station reached its peak level of 1.79 m AHD at 17:00 AEST on 09 February. **Figure 2.8** shows the Council mechanically opening the entrance of Narrabeen Lagoon and **Figure 2.9** shows satellite images of Narrabeen Lagoon entrance on 04 February and 10 February 2020.

Figure 2.8 Mechanical opening of Narrabeen Lagoon entrance on 07 February 2020, 17:37 AEST (Source: Northern Beaches Council)

04 February 2020

10 February 2020

Images courtesy of Planet.com

NSW GOVERNMENT

SATELLITE IMAGES OF
NARRABEEN LAGOON ENTRANCE ON
04 FEBRUARY AND 10 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
2.9

Figures_MHL2752.pptx

2.2.3 St Georges Basin

Dredging is not considered an effective floodplain risk management measure for the St Georges Basin as it provides only marginal hydraulic benefit, is expensive to implement, detrimentally affects the environment and is not a long-term solution (Webb, McKeown & Associates Pty Ltd, 2006).

The Sussex inlet channel was open before and during this February 2020 flood event. **Figure 2.10** shows the satellite image of Sussex Inlet on 10 February 2020.

Island Point reached a flood peak of 0.80 m AHD on 15:15 AEST on 10 February 2020.

Figure 2.10 Satellite image of Sussex Inlet entrance on 10 February 2020

2.2.4 Lake Conjola

Shoalhaven City Council has been working with the Lake Conjola Community Association and the NSW State Government to manage Lake Conjola and its entrance, following the latest closure of Lake Conjola entrance in April 2018 (Shoalhaven City Council, 2020).

Lake Conjola Interim Entrance Management Policy proposes a staged trigger approach for entrance management at Lake Conjola. The policy provides for artificial breakout of the entrance at defined trigger levels to relieve inundation to low-lying property during periods of entrance closure and subsequent sustained periods of elevated Lake levels (GHD Pty Ltd, 2013).

The entrance management policy specifies a *GET READY* and *EMERGENCY* opening level of 0.8 m and 1.2 m AHD, respectively. During the February 2020 flood event, the *GET READY* level of 0.8 m AHD was reached at 21:53 AEST on 09 February 2020. The emergency trigger level of 1.2 m AHD was reached on Monday, 10 February 2020 at 01:10 AEST due to significant rainfall. Lake Conjola was mechanically opened at approximately 10:25 AEST on 10 February, when the lake level was 2.0 m AHD. **Figure 2.11** shows the Council mechanically opening the entrance of Lake Conjola and **Figure 2.12** shows satellite images of Lake Conjola entrance on 02 February and 10 February 2020.

Council's District Engineer was onsite conducting a safety assessment, to ensure the lake entrance is opened to minimise the potential impact of expected high tides and to minimise the potential danger to operational staff. Lake Conjola had been opened before the next high tide reached its peak.

Based on the finished floor level survey that was undertaken as part of the Lake Conjola Flood Risk Management Study and Plan (BMT WBM, 2013) there are an estimated 34 habitable floors impacted by this flood event.

The lake level had fallen to the EMERGENCY LEVEL of 1.2 m by 15:10 AEST and GET READY level of 0.8 m by 19:30 AEST on 10 February. The lake level fell to 0.44 m AHD at 06:00 AEST on Tuesday, 11 February 2020 before starting to rise again with the high tide. The peak water level of 2.0 m AHD reached in Lake Conjola corresponds to a 10% AEP event from the Lake Conjola Flood Risk Management Study and Plan (BMT WBM Pty Ltd, 2013).

Figure 2.11 Mechanical opening of Lake Conjola entrance on 10 February 2020

02 February 2020

10 February 2020

Images courtesy of Planet.com

NSW GOVERNMENT

SATELLITE IMAGES OF
LAKE CONJOLA ENTRANCE ON
02 FEBRUARY AND 10 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
2.12

Figures_MHL2752.pptx

2.3 Entrance and ocean conditions joint peak analysis

The timing of peak tides, rainfall, and wave conditions all influence flood levels in NSW's ICOLLs. To understand the impact each of these factors has on the peak flood level in the estuary, the magnitude and timing of these peaks must be investigated together. The peak of the tide as recorded by the Sydney (Middle Harbour) tide gauge was 1.06 m AHD at 08:30 AEST on 09 February and 1.01 m AHD at 09:00 AEST on 10 February (**Figure 2.13**). Both of these peaks are well below the 1:1 year level of 1.21 m, and therefore do not constitute 'extreme' values. Peak tides of this magnitude can still influence the overall flood level in ICOLLs, however, and will be investigated further below.

The following sections provide comment on the influence of tides, waves, and entrance condition on the peak flood levels in Tuggerah Lakes, Narrabeen Lagoon, St Georges Basin, and Lake Conjola. **Figure 2.14** and **Figure 2.15** show the ICOLLs water levels for the period 06-17 February 2020.

2.3.1 Tuggerah Lake

The lake level peaked at 16:00 AEST on Tuesday, 11 February 2020 at 1.67 m AHD (Long Jetty (211418)), however, the flood waters remained relatively steady after reaching 1.66 m nearly 24 hours (2 tidal cycles) before at 16:45 AEST on 10 February. Long Jetty water level, Sydney ocean tide and Sydney wave data indicate no significant impact on the peak flood level within the lake by either tide or wave conditions. While there may have been some initial inflow of water into the lake system in the first half of Sunday, 09 February 2020 when levels in Tuggerah Lake were still low, the peak water levels within the lake occurred two days after the highest high tide and highest significant wave height.

2.3.2 Narrabeen Lagoon

The flood in Narrabeen Lagoon peaked at 2.097 m AHD at 16:45 AEST on Sunday, 09 February 2020 (Narrabeen Bridge (213422). The entrance had been open two days prior on 07 February in preparation for the predicted storm. The rising of the tide around 06:00 AEST on 09 February in conjunction with the large waves occurring at that time caused lagoon levels to rise around 0.5 m, which formed the beginning of the rising limb of the flood. It is likely that this inflow contributed to the peak flood height.

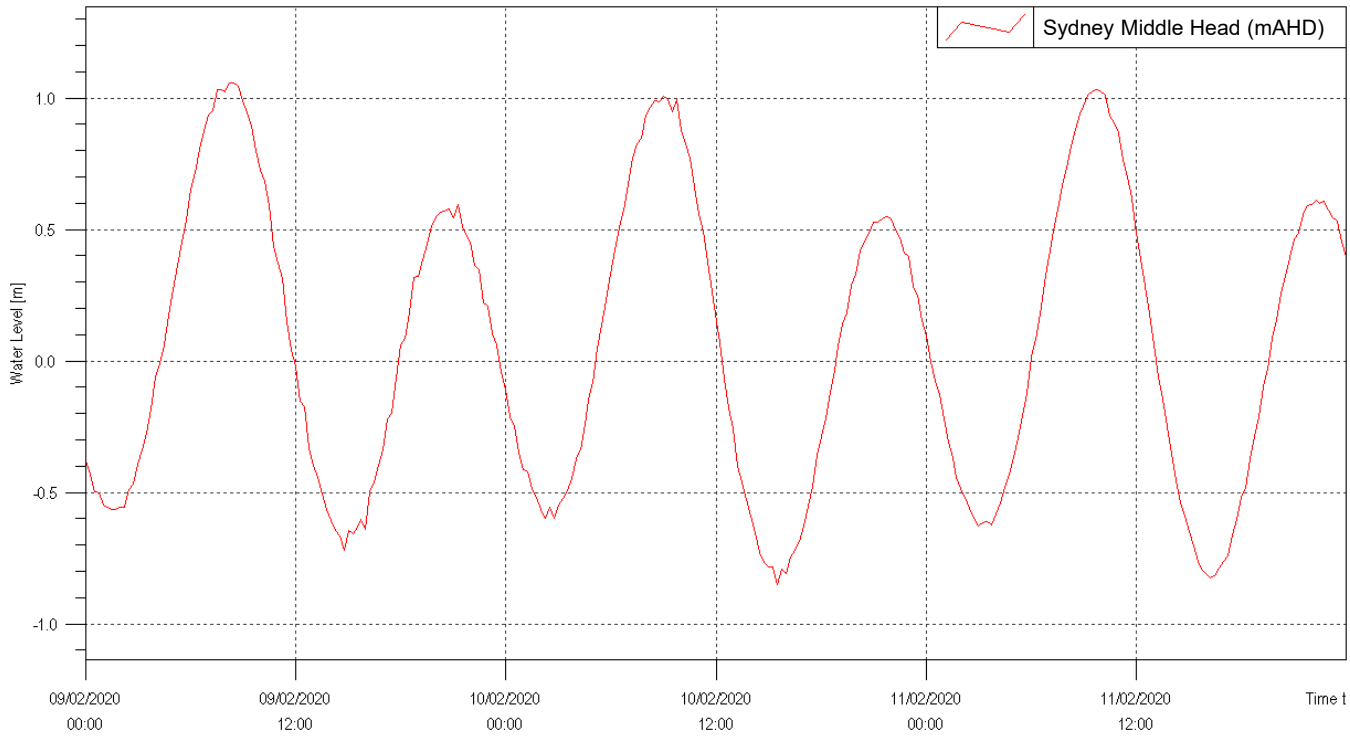
2.3.3 St Georges Basin

The flood levels in St Georges Basin reached their peak of 0.78 m AHD at 15:15 AEST on Monday, 10 February 2020 (Island Point (216415)). The rising limb of the flood coincided with the rising tide around 06:00 AEST that morning which allowed additional flows to enter the channel at Sussex Inlet. It is likely that this had some minor impact on the overall flood levels in the lake.

2.3.4 Lake Conjola

Lake Conjola reached its peak flood level of 2.04 m AHD at 11:00 AEST on Monday, 10

February 2020 (Lake Conjola DS (216420D)). The entrance was closed until this point and there was therefore no influence of the wave or tides on the peak flood level.



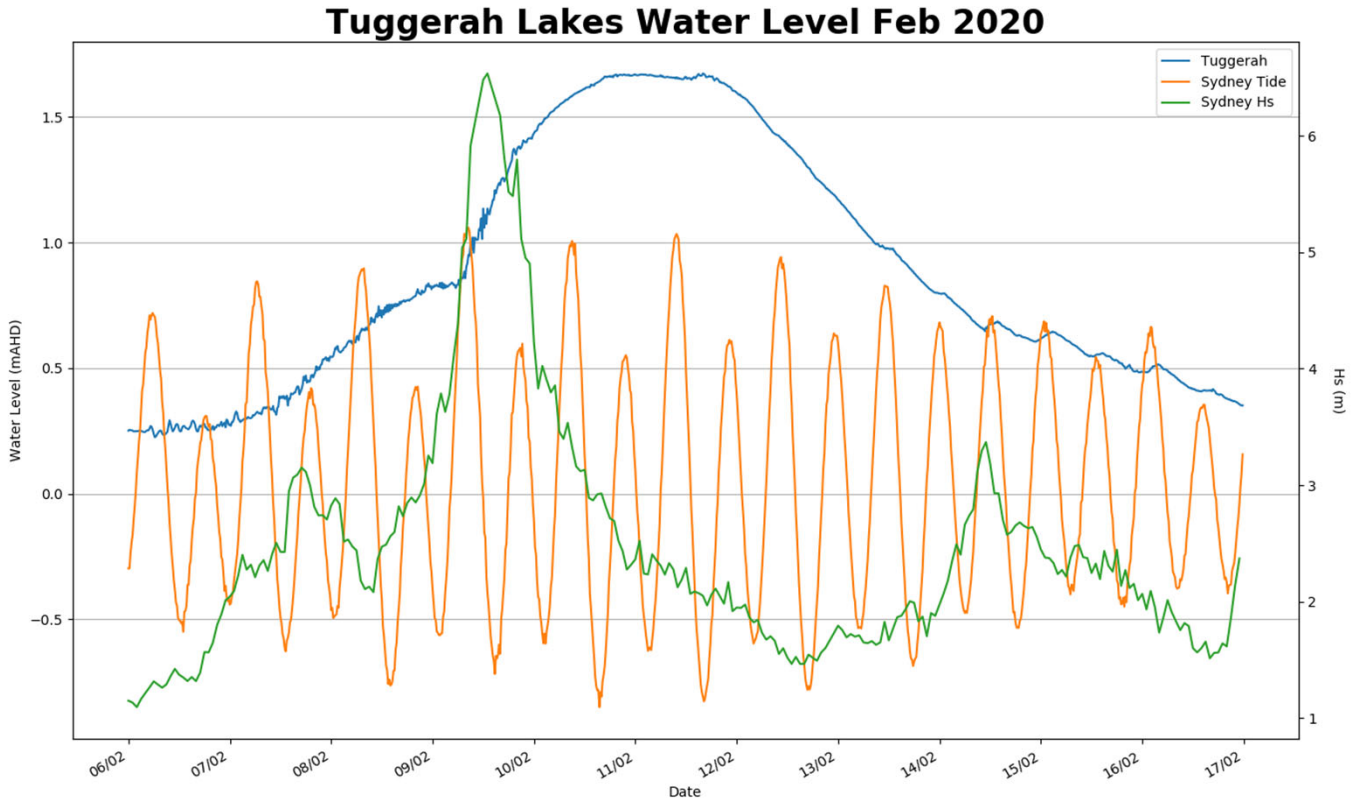
NSW GOVERNMENT

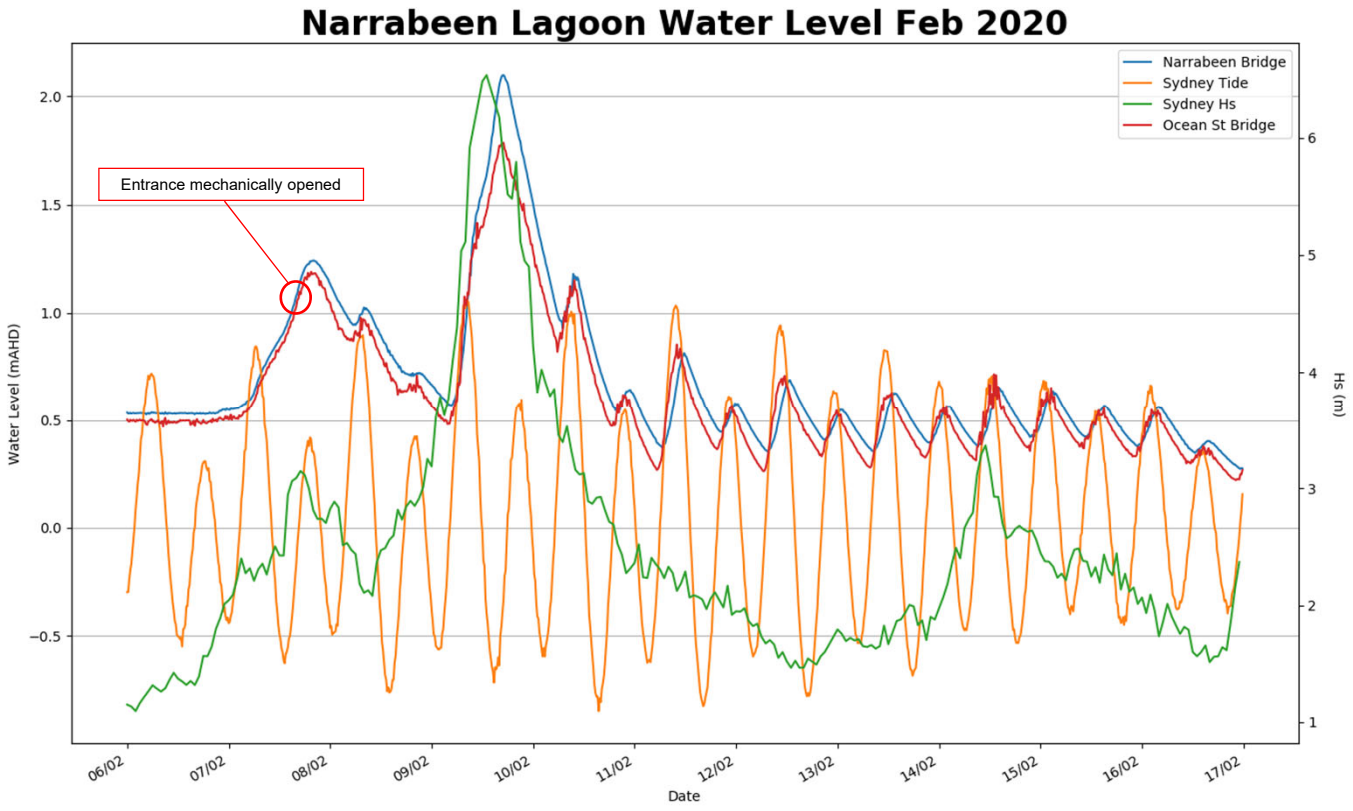
SYDNEY (MIDDLE HEAD) TIDE GAUGE PERIOD
09-11 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
2.13

Figures_MHL2752.pptx





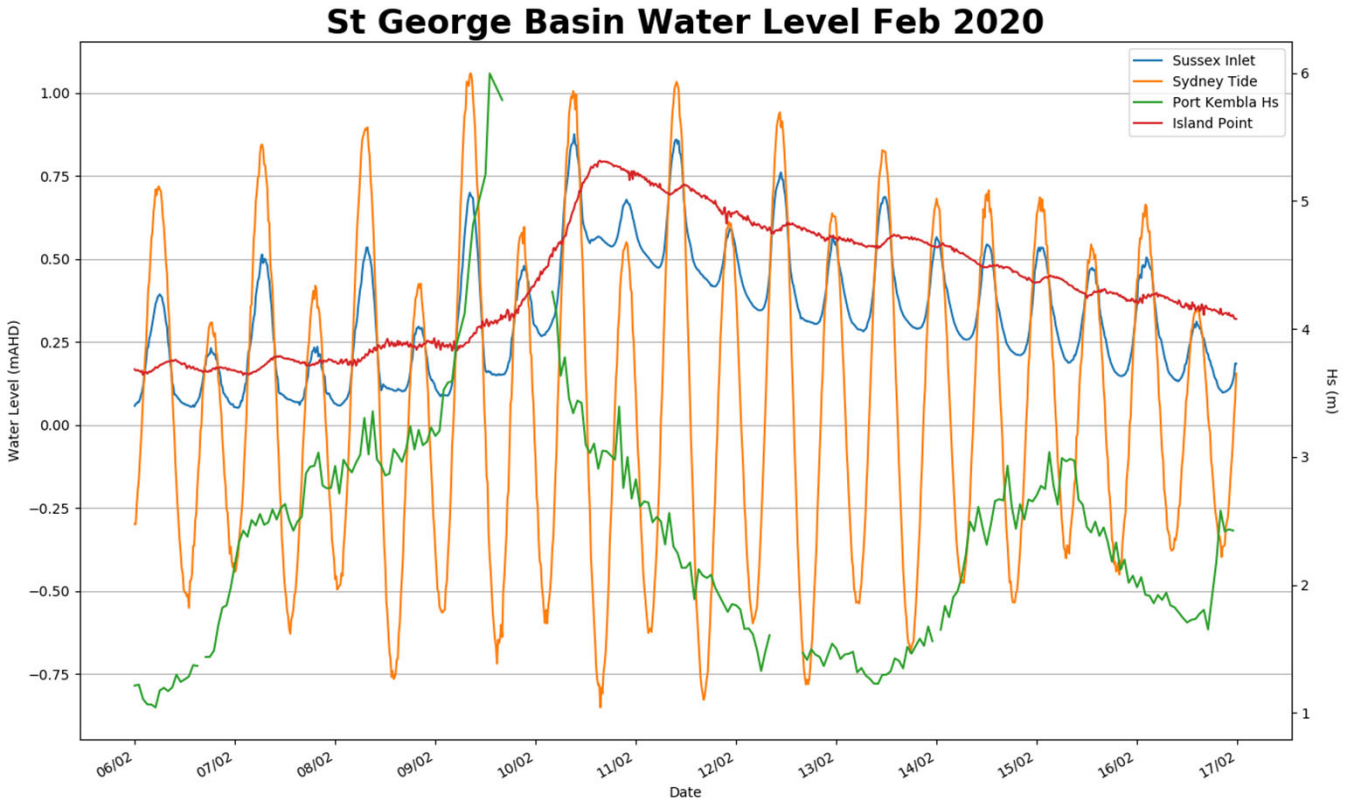
NSW GOVERNMENT

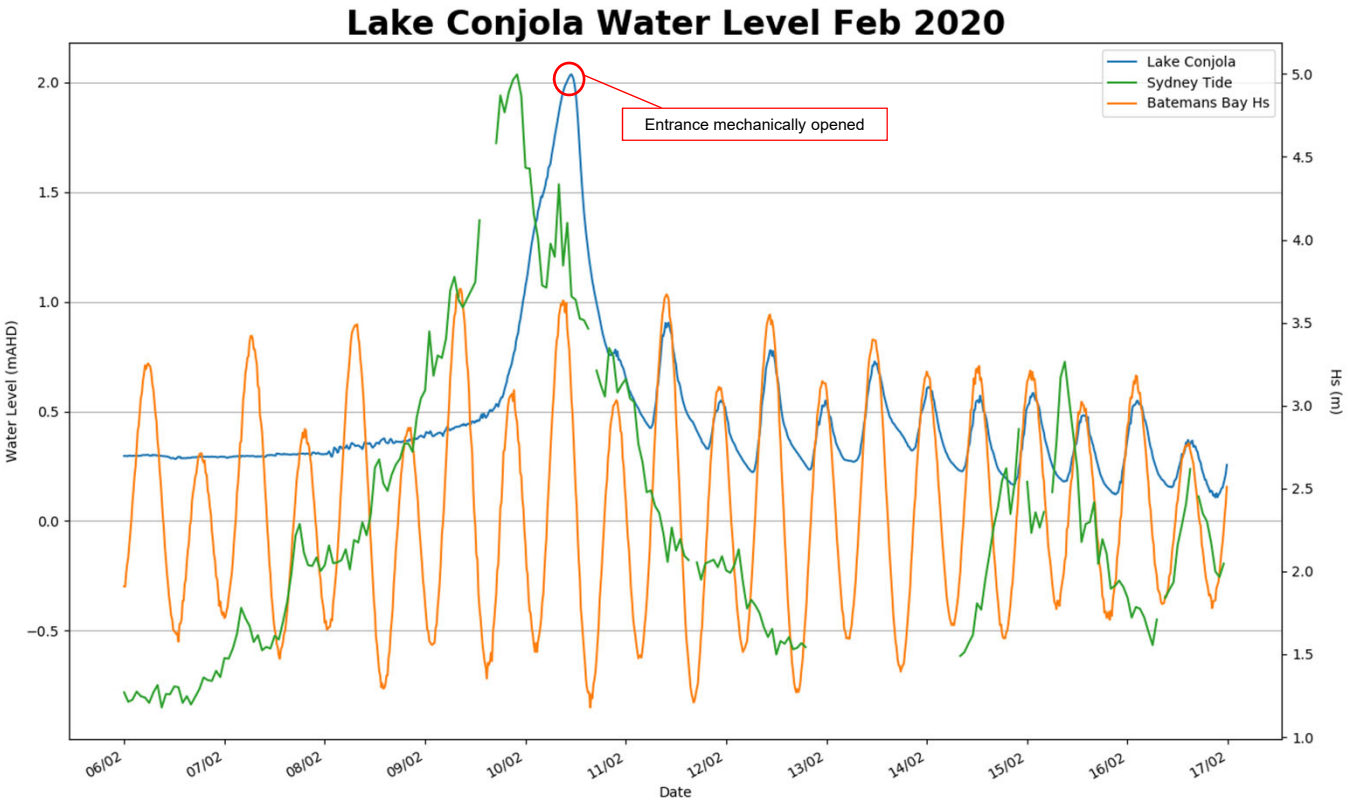
ICOLL WATER LEVELS 06-17 FEBRUARY 2020
TUGGERAH LAKES (TOP)
NARRABEEN LAGOON (BOTTOM)

Manly Hydraulics Laboratory

Report MHL2752
Figure
2.14

Figures_MHL2752.pptx





NSW GOVERNMENT

ICOLL WATER LEVELS 06-17 FEBRUARY 2020
ST GEORGES BASIN (TOP)
LAKE CONJOLA (BOTTOM)

Manly Hydraulics Laboratory

Report MHL2752
Figure
2.15

Figures_MHL2752.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 coast region including MHL on behalf of CCSD, BoM, WaterNSW, Lismore City Council, Ballina Shire Council, Byron Shire Council, Canterbury-Bankstown Council, Northern Beaches Council, Sydney Water and Shoalhaven City Council. In this report, there are 133 stations presented and **Table 3.1** provides the number of stations operated by individual agencies. 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.

Table 3.1 Water level, rainfall and wave station summary

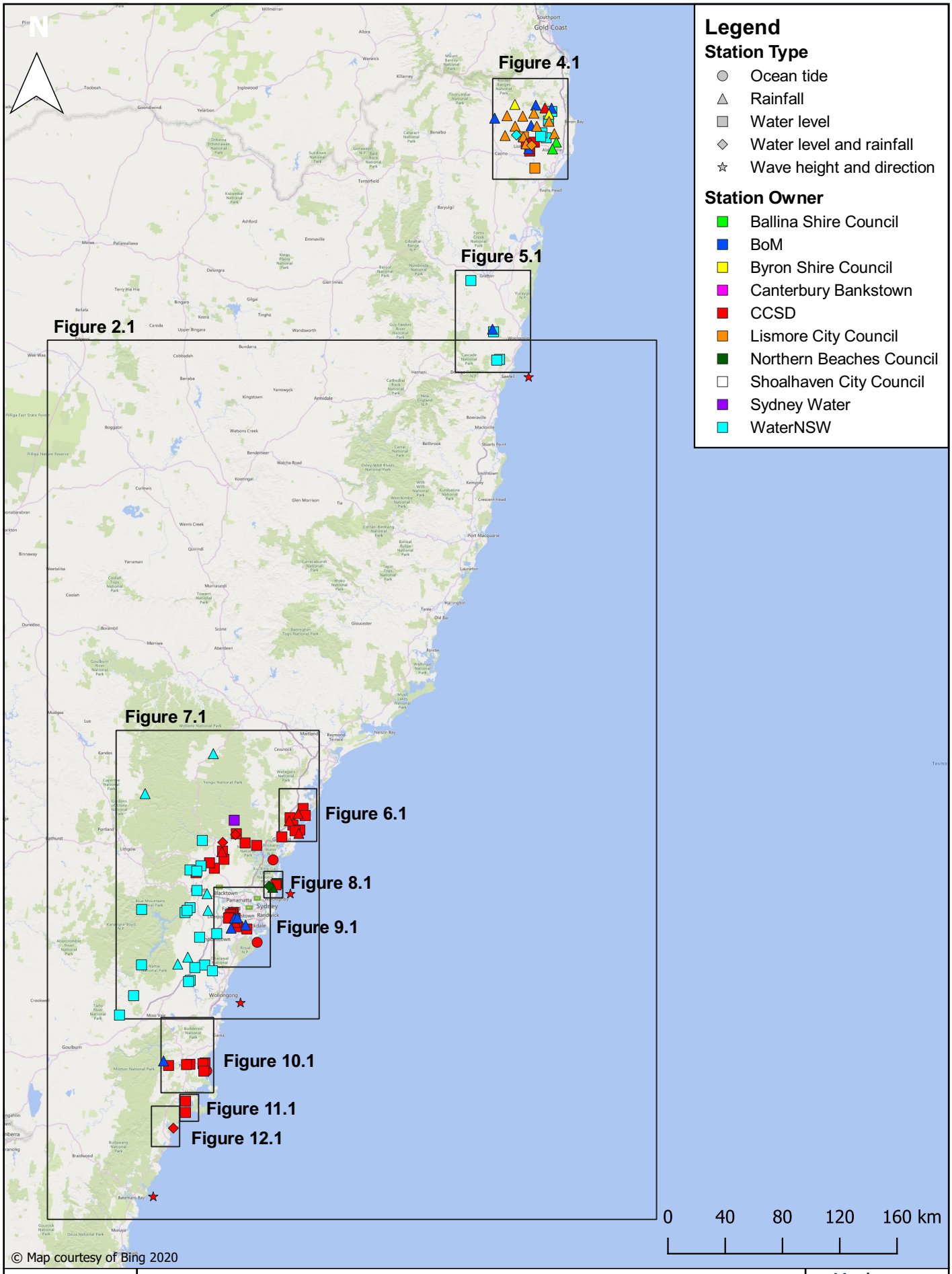
Agency^	Station type		
	Water level	Rainfall	Wave
Ballina Shire Council	0	2	0
BoM	0	13	0
Byron Shire Council	0	2	0
Canterbury-Bankstown Council	1	0	0
CCSD	38	10	4
Lismore City Council	4	12	0
Northern Beaches Council	2	2	0
Shoalhaven City Council	0	9	0
Sydney Water	1	0	0
WaterNSW	31	9	0

^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** – Wilsons River region
- **Figure 5.1** – Orara River region
- **Figure 6.1** – Tuggerah Lake region
- **Figure 7.1** – Hawkesbury River and South Creek region
- **Figure 8.1** – Narrabeen Lagoon region
- **Figure 9.1** – Georges River region
- **Figure 10.1** – Lower Shoalhaven region
- **Figure 11.1** – St Georges Basin region
- **Figure 12.1** – Lake Conjola region



NSW GOVERNMENT

OVERALL VIEW OF STATIONS

Manly Hydraulics Laboratory

Report MHL2752
Figure
3.1

Figures_MHL2752.qgs

4 Wilsons River region

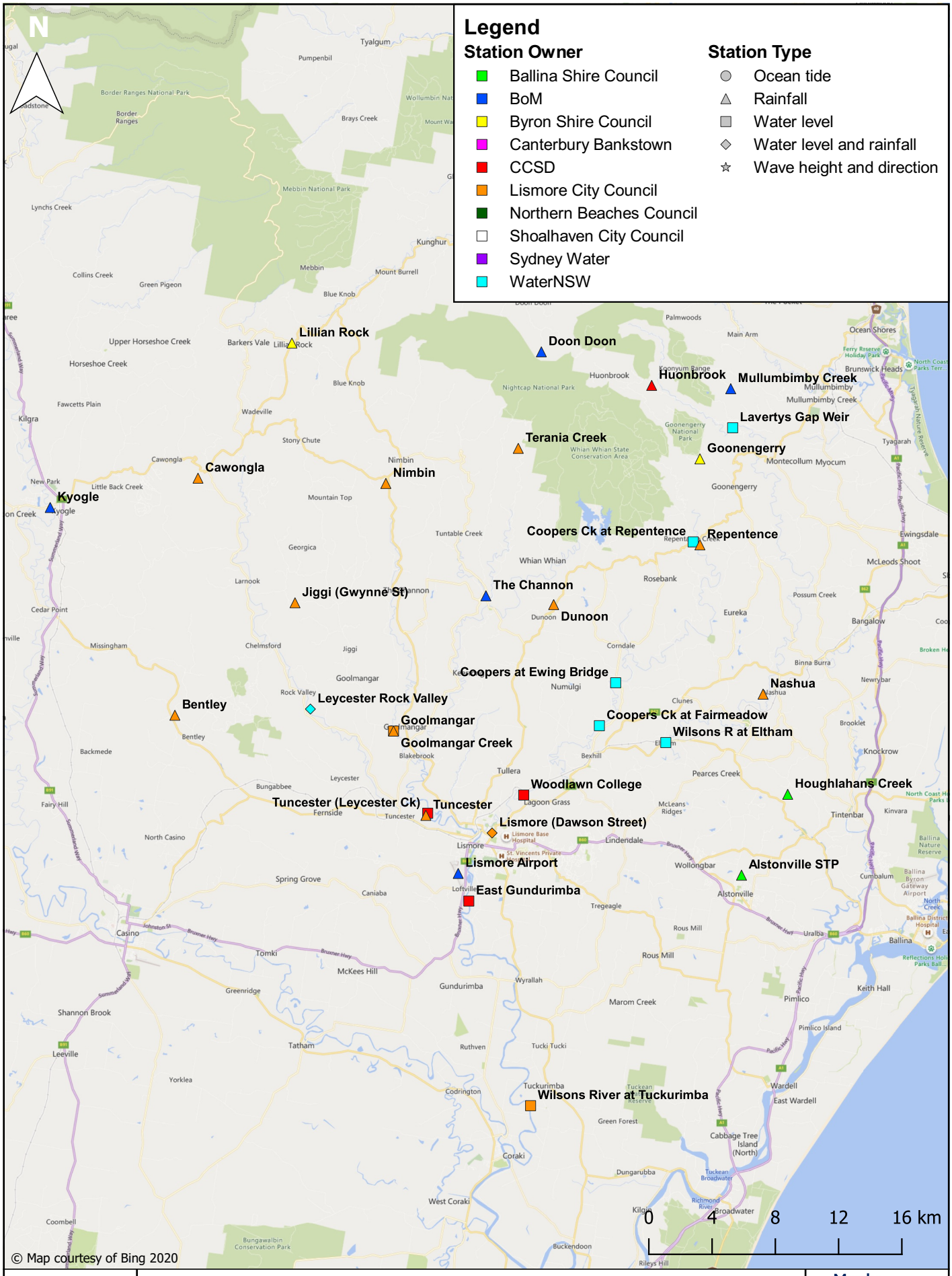
4.1 Wilsons River region – water level

The peak observed water levels for the Wilsons River region are listed in **Table 4.1**. The locations of water level stations within the Wilsons River region are shown in **Figure 4.1**. The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 4.2** to **Figure 4.19**.

Table 4.1 Wilsons River region flood peaks

Station name	Station number	Owner	Datum	Level (m)
Lavertys Gap Weir	203062	WaterNSW	Local Datum	2.55
Coopers Creek at Repentence	203002	WaterNSW	Local Datum	4.17
Coopers Creek at Ewing Bridge	203024	WaterNSW	Local Datum	8.96
Leycester Rock Valley	203010	WaterNSW	Local Datum	7.97
Coopers Creek at Fairmeadow	203060	WaterNSW	Local Datum	8.90
Wilsons River at Eltham	203014	WaterNSW	Local Datum	8.83
Goolmangar Creek	558075	Lismore City Council	Local Datum	10.33
Woodlawn College	203402	CCSD	AHD	8.26
Tuncester (Leycester Ck)	203443	CCSD	AHD	8.48
Lismore (Dawson Street)	558087	Lismore City Council	Local Datum	5.35
East Gundurimba	203427	CCSD	AHD	6.89
Wilsons River at Tuckurimba	558076	Lismore City Council	Local Datum	5.53

There are no SES flood classifications for the stations listed in **Table 4.1**. There is a classification for 203904 (58176) Lismore but this water level data was unable to be provided by the BoM.



NSW GOVERNMENT

WILSONS RIVER STATIONS

Manly Hydraulics Laboratory

Report MHL2752
Figure
4.1

Figures_MHL2752.qgs

4.2 Wilsons River region – rainfall

The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 4.2** to **Figure 4.19**. 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 4.2** to **Table 4.5** for the period 01 to 29 February 2020. The rainfall intensities are displayed graphically in **Figure 4.20** to **Figure 4.41**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 4.2 Wilsons River region daily rainfall totals

Date	Lismore (Dawson Street) 558087 (mm)	Lismore Airport 58214 (mm)	Leycester Rock Valley 203010 (mm)	Mullumbimby Creek 558008 (mm)
	Lismore City Council	BoM	WaterNSW	Byron Shire Council
01/02/2020	0.0	0.0	-	0.0
02/02/2020	0.0	0.0	-	0.0
03/02/2020	0.0	0.0	-	0.0
04/02/2020	27.0	10.0	-	26.0
05/02/2020	3.0	4.0	2.5	3.0
06/02/2020	10.0	12.0	10.5	6.0
07/02/2020	109.0	72.0	88.5	117.0
08/02/2020	2.0	12.0	4.0	13.0
09/02/2020	55.0	34.0	31.5	69.0
10/02/2020	6.0	3.0	7.5	30.0
11/02/2020	8.0	9.0	23.0	19.0
12/02/2020	0.0	3.0	1.0	51.0
13/02/2020	95.0	73.0	70.0	167.0
14/02/2020	64.0	85.0	87.0	36.0
15/02/2020	1.0	1.0	1.5	1.0
16/02/2020	0.0	0.0	0.0	0.0
17/02/2020	0.0	1.0	0.5	24.0
18/02/2020	5.0	0.0	12.0	50.0
19/02/2020	0.0	0.0	0.0	1.0
20/02/2020	0.0	0.0	0.0	0.0
21/02/2020	0.0	0.0	0.0	0.0
22/02/2020	6.0	3.0	5.5	9.0
23/02/2020	2.0	4.0	1.0	0.0
24/02/2020	10.0	10.0	8.0	9.0
25/02/2020	21.0	24.0	25.0	13.0
26/02/2020	0.0	2.0	3.0	1.0
27/02/2020	6.0	15.0	16.5	34.0
28/02/2020	0.0	0.0	0.0	2.0
29/02/0202	8.0	22.0	-	1.0
01/03/2020	0.0	4.0	-	0.0

Table 4.3 Wilsons River region daily rainfall totals (cont.)

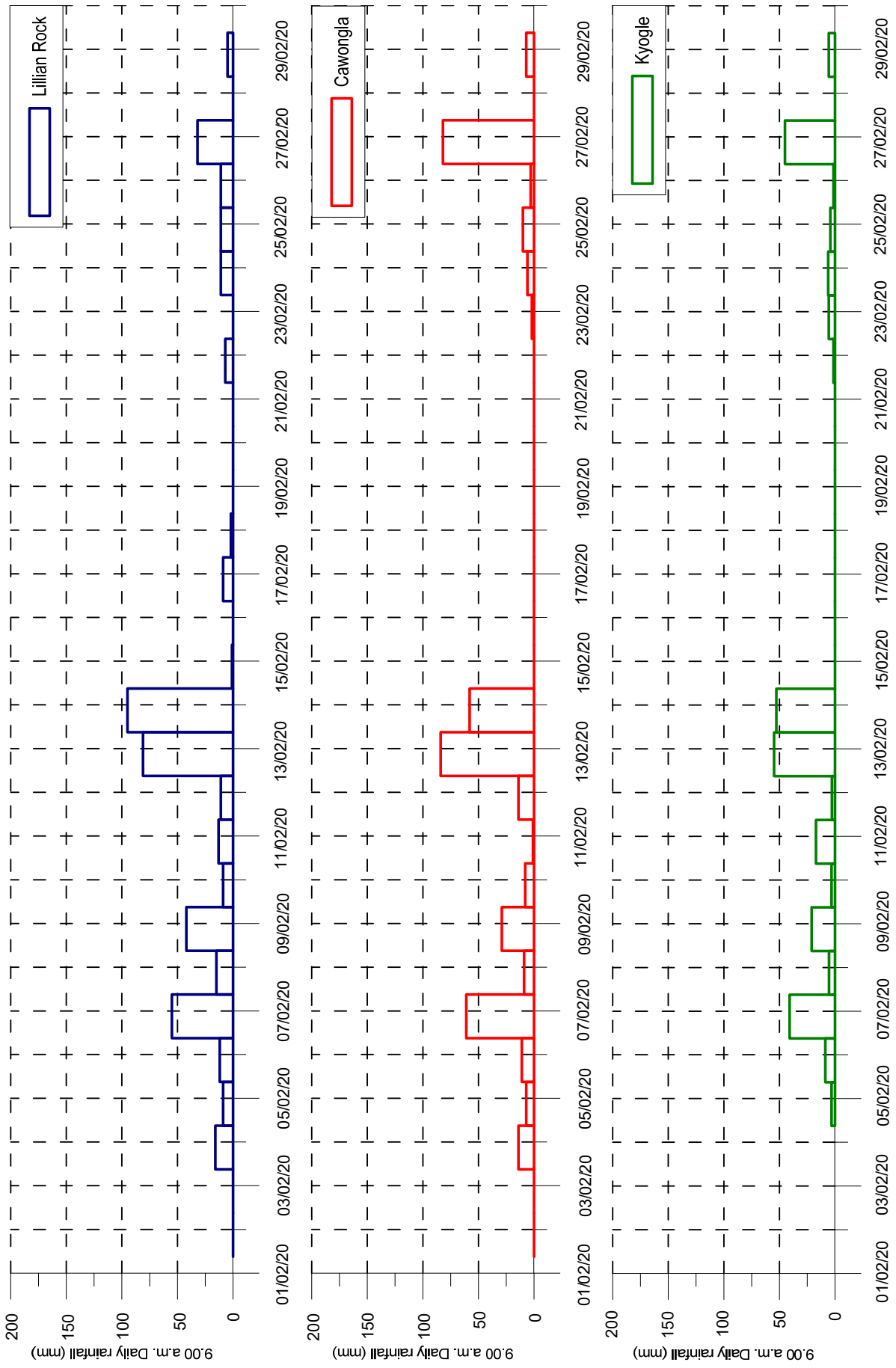
Date	Doon Doon 58019 (mm)	Huonbrook 558049 (mm)	Lillian Rock 58148 (mm)	Terania Creek 558078 (mm)	Goonengerry 558033 (mm)	Cawongla 558024 (mm)
	BoM	CCSD	BoM	Lismore City Council	Byron Shire Council	Lismore City Council
01/02/2020	0.0	-	0.0	0.0	0.0	0.0
02/02/2020	0.0	-	0.0	0.0	0.0	0.0
03/02/2020	0.0	0.0	0.0	0.0	0.0	0.0
04/02/2020	50.0	27.5	16.0	29.0	27.0	14.0
05/02/2020	16.0	13.0	9.0	24.0	14.0	7.0
06/02/2020	9.0	9.0	12.0	13.0	13.0	11.0
07/02/2020	108.0	115.5	55.0	98.0	142.0	61.0
08/02/2020	11.0	8.5	15.0	15.0	11.0	9.0
09/02/2020	44.0	60.5	42.0	33.0	73.0	29.0
10/02/2020	27.0	17.5	9.0	25.0	32.0	8.0
11/02/2020	24.0	54.5	13.0	6.0	30.0	1.0
12/02/2020	3.0	5.0	11.0	17.0	24.0	14.0
13/02/2020	157.0	187.0	81.0	153.0	193.0	84.0
14/02/2020	80.0	63.5	95.0	74.0	54.0	58.0
15/02/2020	1.0	0.0	1.0	2.0	1.0	0.0
16/02/2020	0.0	0.0	0.0	0.0	0.0	0.0
17/02/2020	28.0	23.5	9.0	13.0	9.0	0.0
18/02/2020	1.0	0.0	2.0	0.0	16.0	0.0
19/02/2020	0.0	0.5	0.0	0.0	0.0	0.0
20/02/2020	0.0	0.0	0.0	0.0	0.0	0.0
21/02/2020	0.0	0.0	0.0	0.0	0.0	0.0
22/02/2020	9.0	6.5	7.0	11.0	4.0	0.0
23/02/2020	0.0	0.0	0.0	0.0	0.0	2.0
24/02/2020	8.0	11.5	11.0	18.0	17.0	6.0
25/02/2020	6.0	9.5	11.0	6.0	17.0	10.0
26/02/2020	3.0	0.5	11.0	3.0	2.0	3.0
27/02/2020	30.0	24.0	32.0	47.0	33.0	82.0
28/02/2020	0.0	1.0	0.0	0.0	3.0	0.0
29/02/0202	6.0	3.5	5.0	5.0	5.0	7.0
01/03/2020	0.0	1.0	1.0	4.0	4.0	0.0

Table 4.4 Wilsons River region daily rainfall totals (cont.)

Date	Kyogle 558002 (mm)	Repentence 558000 (mm)	The Channon 58147 (mm)	Jiggi (Gwynne St) 558086 (mm)	Dunoon 558031 (mm)	Bentley 58202 (mm)
	BoM	Lismore City Council	BoM	Lismore City Council	Lismore City Council	Lismore City Council
01/02/2020	-	0.0	0.0	0.0	0.0	0.0
02/02/2020	-	0.0	0.0	0.0	0.0	0.0
03/02/2020	-	0.0	0.0	0.0	0.0	0.0
04/02/2020	-	35.0	28.0	20.0	41.0	10.0
05/02/2020	3.2	8.0	8.0	6.0	7.0	4.0
06/02/2020	8.8	11.0	11.0	13.0	11.0	12.0
07/02/2020	40.8	142.0	112.0	68.0	113.0	72.0
08/02/2020	5.4	4.0	2.0	6.0	3.0	12.0
09/02/2020	21.0	64.0	33.0	27.0	40.0	34.0
10/02/2020	3.2	19.0	13.0	9.0	20.0	3.0
11/02/2020	17.2	24.0	9.0	4.0	5.0	9.0
12/02/2020	2.8	13.0	11.0	2.0	3.0	3.0
13/02/2020	54.8	140.0	105.0	95.0	118.0	73.0
14/02/2020	52.8	61.0	63.0	71.0	69.0	85.0
15/02/2020	0.0	0.0	1.0	0.0	1.0	1.0
16/02/2020	0.0	0.0	0.0	0.0	0.0	0.0
17/02/2020	0.0	29.0	5.0	1.0	3.0	1.0
18/02/2020	0.0	4.0	2.0	3.0	2.0	0.0
19/02/2020	0.0	0.0	0.0	0.0	0.0	0.0
20/02/2020	0.0	0.0	0.0	0.0	0.0	0.0
21/02/2020	0.0	0.0	0.0	0.0	0.0	0.0
22/02/2020	1.4	7.0	8.0	5.0	7.0	3.0
23/02/2020	5.6	0.0	1.0	2.0	1.0	4.0
24/02/2020	6.2	22.0	8.0	8.0	11.0	10.0
25/02/2020	4.2	9.0	9.0	14.0	9.0	24.0
26/02/2020	1.4	4.0	0.0	0.0	0.0	2.0
27/02/2020	45.0	49.0	25.0	25.0	19.0	15.0
28/02/2020	0.0	-	0.0	1.0	1.0	0.0
29/02/0202	5.6	-	1.0	6.0	2.0	22.0
01/03/2020	-	-	2.0	0.0	2.0	4.0

Table 4.5 Wilsons River region daily rainfall totals (cont.)

Date	Nashua 58162 (mm)	Goolmangar 558075 (mm)	Tuncester 58201 (mm)	Houghlahans Creek 558069 (mm)	Alstonville STP 558072 (mm)
	Lismore City Council	Lismore City Council	Lismore City Council	Ballina Shire Council	Ballina Shire Council
01/02/2020	1.0	0.0	0.0	0.0	0.0
02/02/2020	0.0	0.0	0.0	0.0	0.0
03/02/2020	0.0	0.0	0.0	0.0	0.0
04/02/2020	26.0	10.0	18.0	41.0	37.4
05/02/2020	6.0	3.0	2.0	5.0	6.0
06/02/2020	5.0	10.0	9.0	30.0	13.2
07/02/2020	123.0	105.0	102.0	185.0	173.4
08/02/2020	31.0	2.0	2.0	15.0	21.4
09/02/2020	87.0	42.0	43.0	75.0	80.8
10/02/2020	20.0	11.0	12.0	25.0	16.2
11/02/2020	30.0	19.0	17.0	11.0	10.4
12/02/2020	3.0	1.0	0.0	6.0	3.8
13/02/2020	117.0	86.0	66.0	126.0	104.0
14/02/2020	27.0	90.0	117.0	18.0	7.8
15/02/2020	1.0	1.0	3.0	0.0	1.8
16/02/2020	0.0	0.0	0.0	0.0	0.2
17/02/2020	9.0	1.0	0.0	17.0	0.6
18/02/2020	1.0	5.0	10.0	4.0	6.4
19/02/2020	0.0	0.0	0.0	0.0	0.0
20/02/2020	0.0	0.0	0.0	0.0	0.0
21/02/2020	0.0	0.0	0.0	0.0	0.0
22/02/2020	12.0	10.0	4.0	16.0	14.4
23/02/2020	1.0	2.0	3.0	2.0	0.6
24/02/2020	12.0	9.0	7.0	8.0	6.6
25/02/2020	26.0	20.0	29.0	27.0	43.2
26/02/2020	1.0	9.0	7.0	0.0	1.2
27/02/2020	27.0	16.0	2.0	21.0	42.0
28/02/2020	0.0	1.0	0.0	0.0	0.2
29/02/0202	0.0	6.0	5.0	6.0	4.8
01/03/2020	1.0	0.0	0.0	0.0	0.0



NSW GOVERNMENT

WILSONS RIVER REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

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Figure
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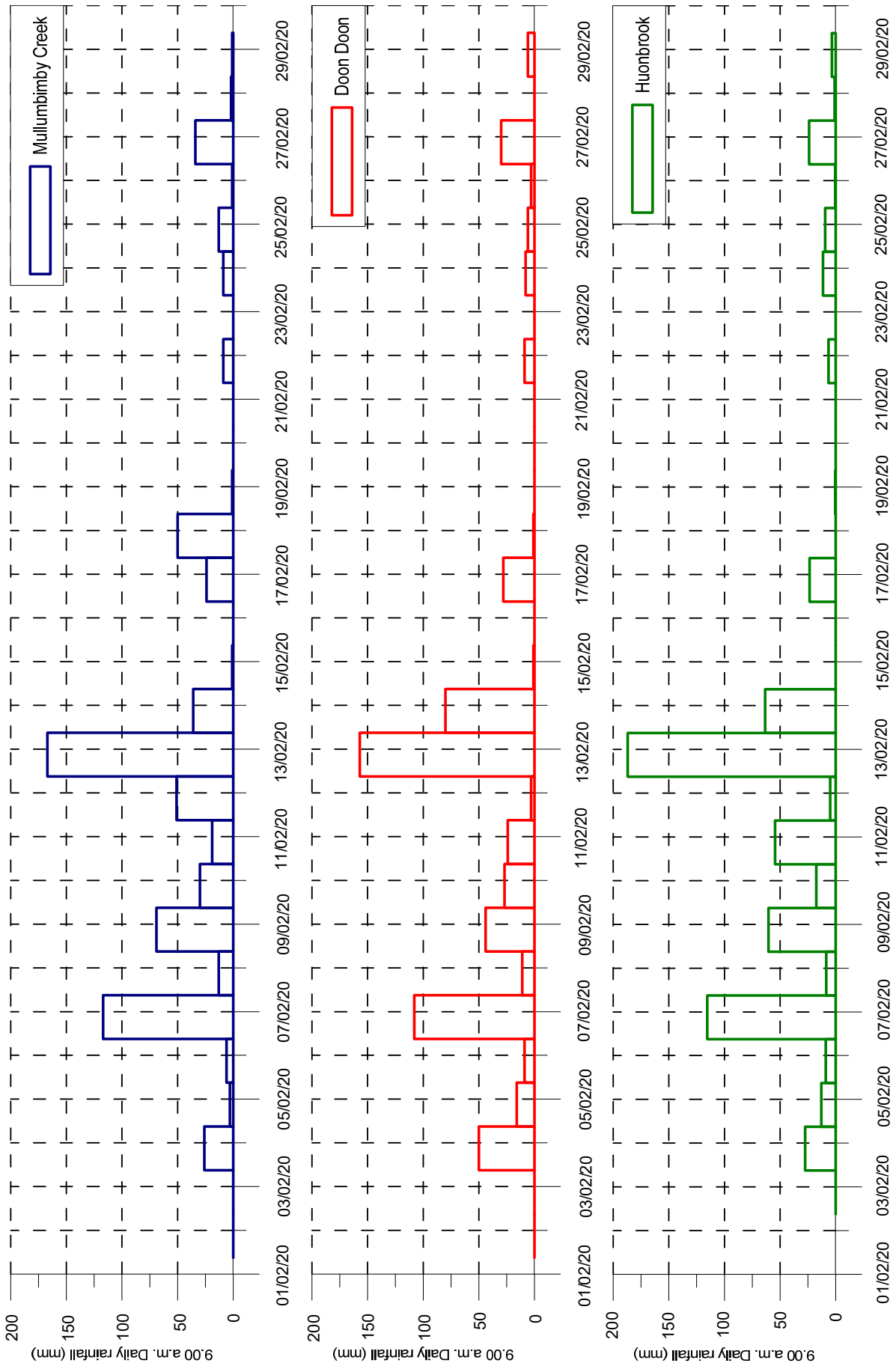

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Figure
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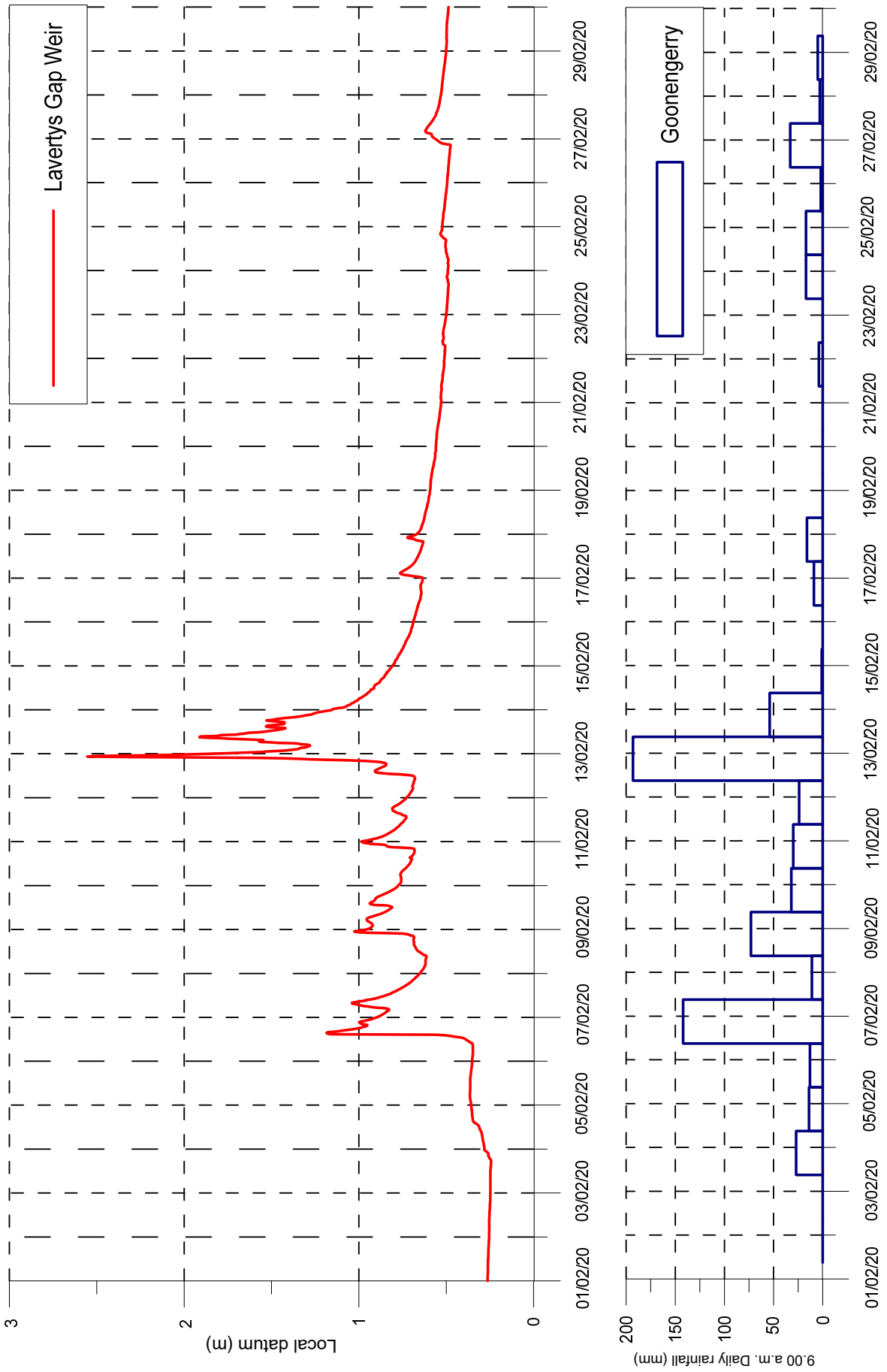

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WATER LEVEL AND RAINFALL DATA
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Figure
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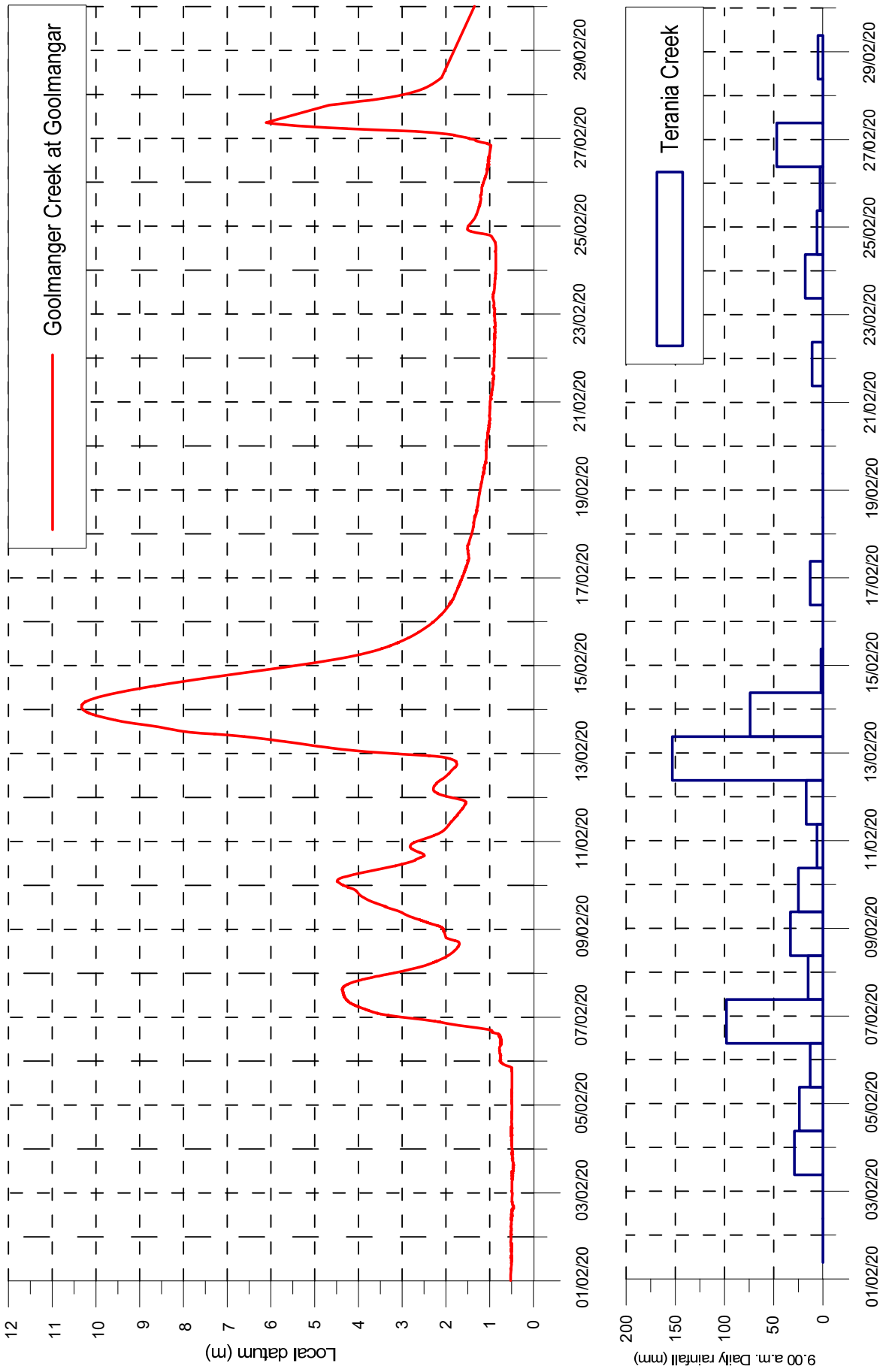

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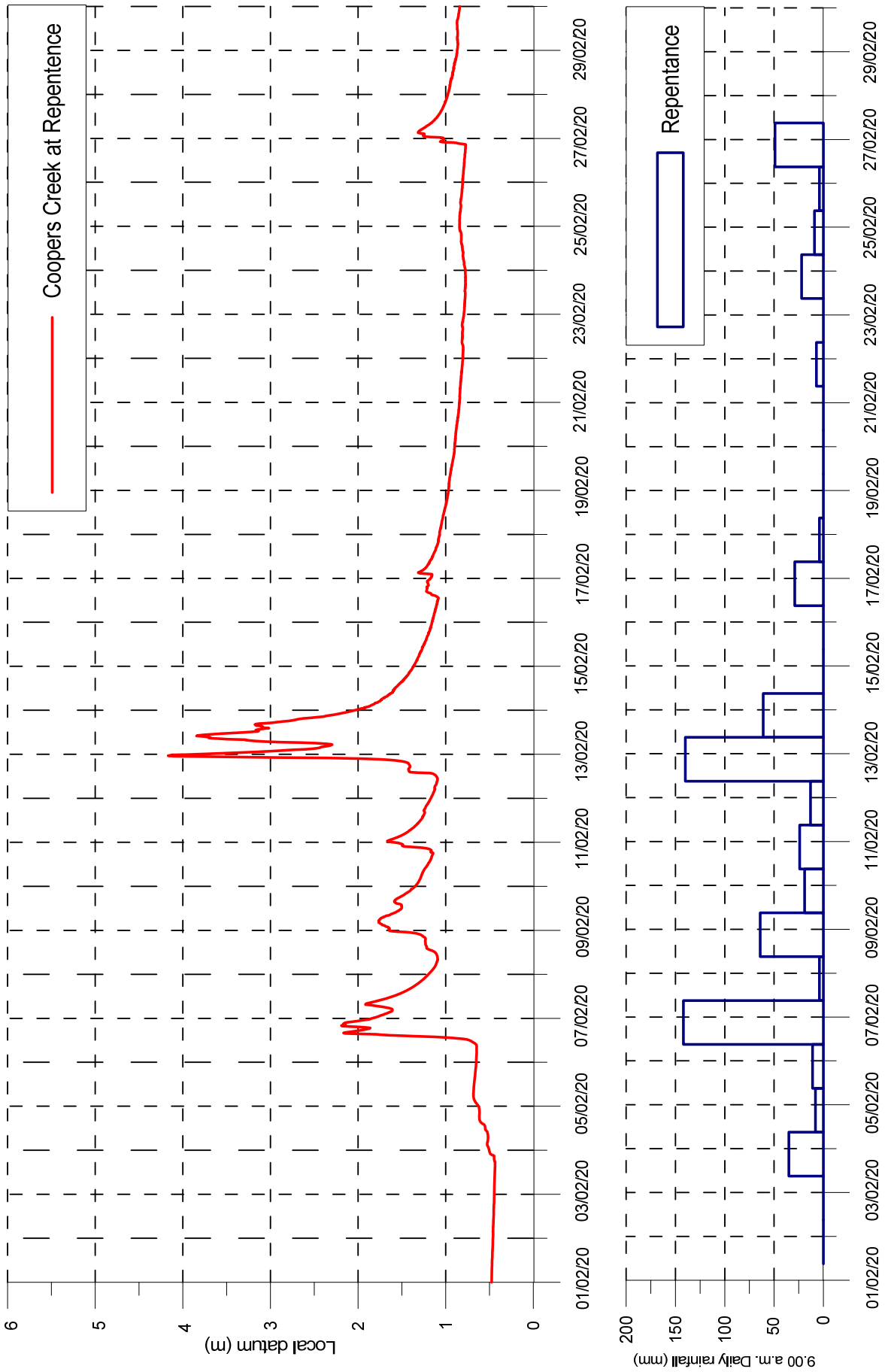

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Figure
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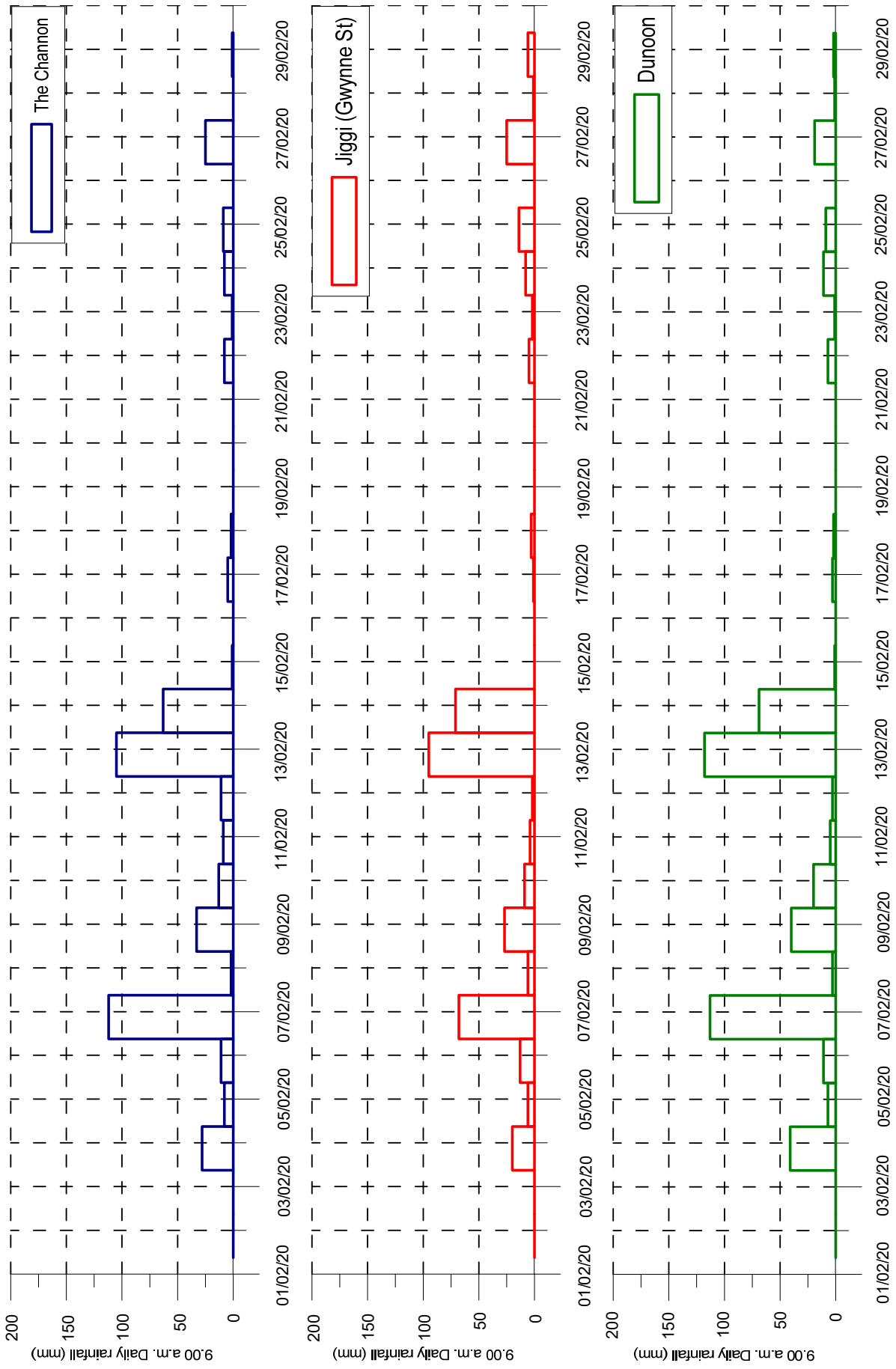

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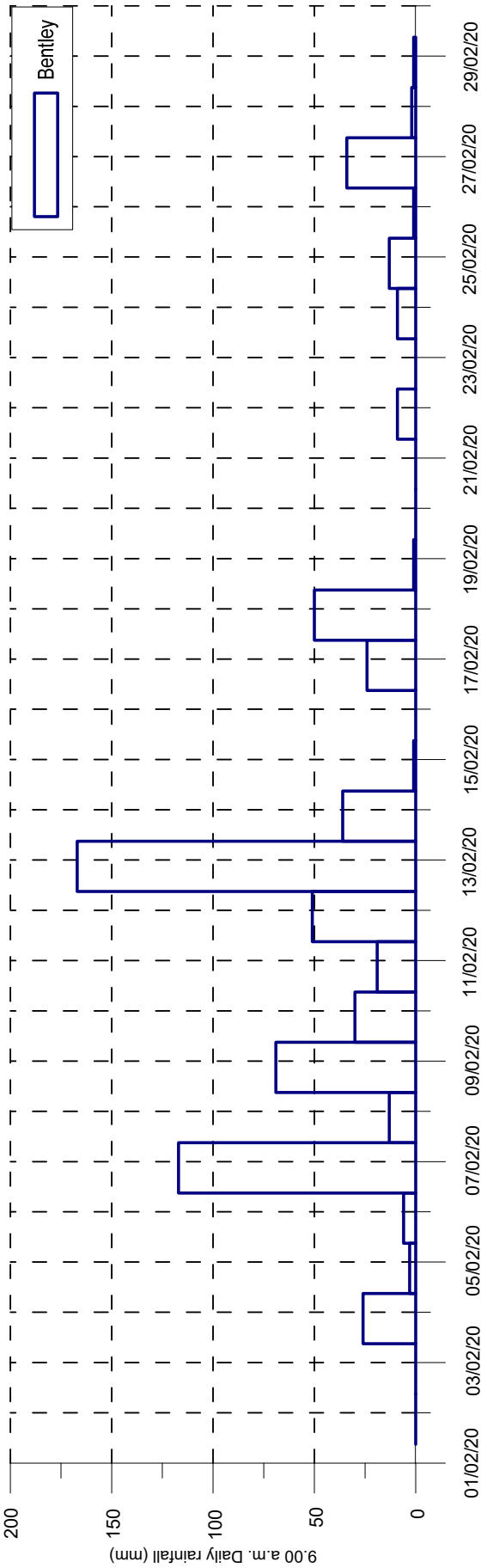

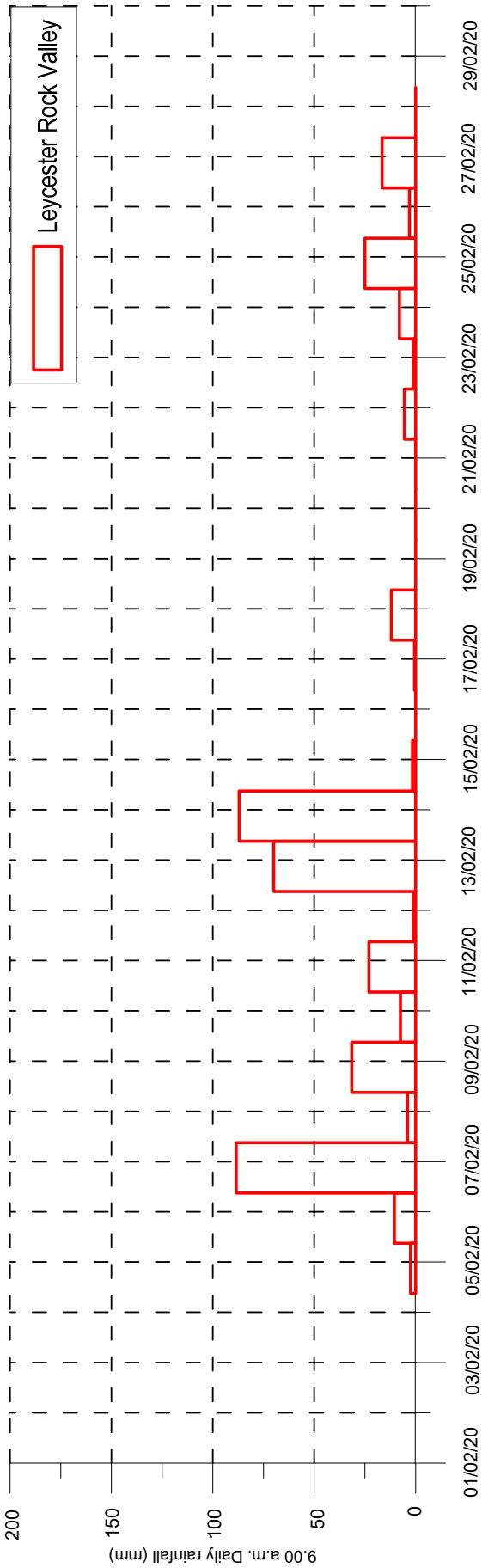

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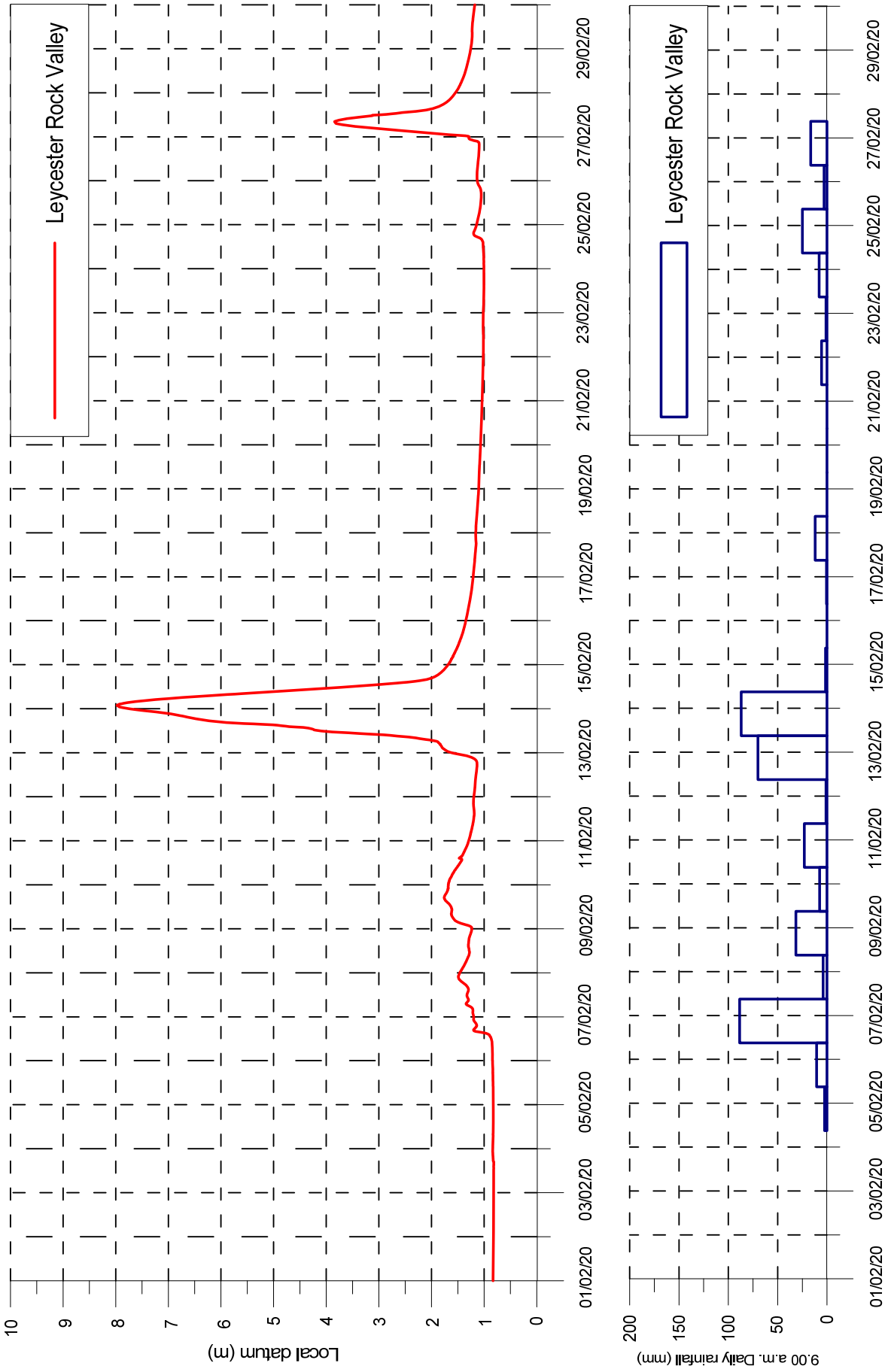

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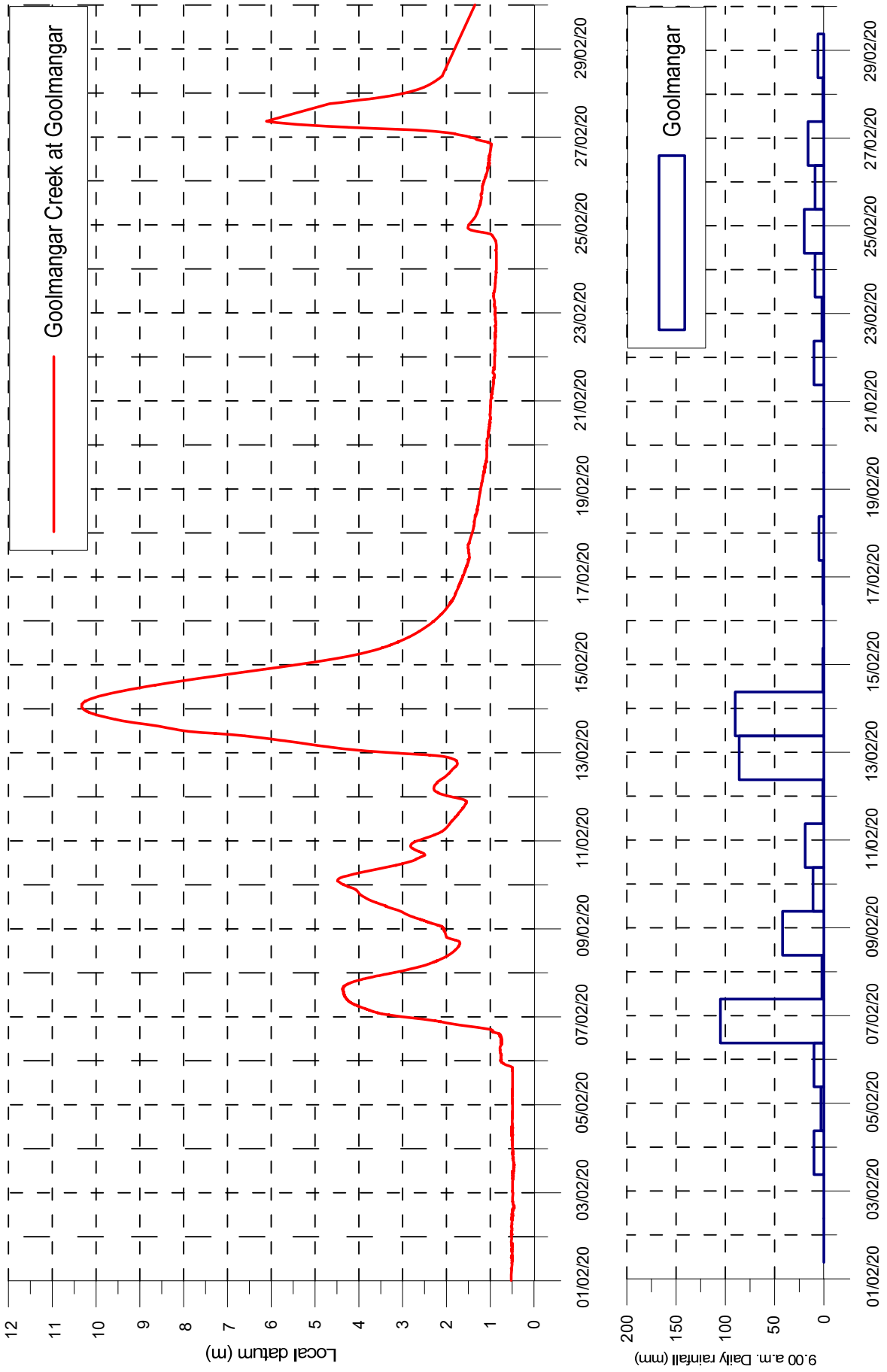

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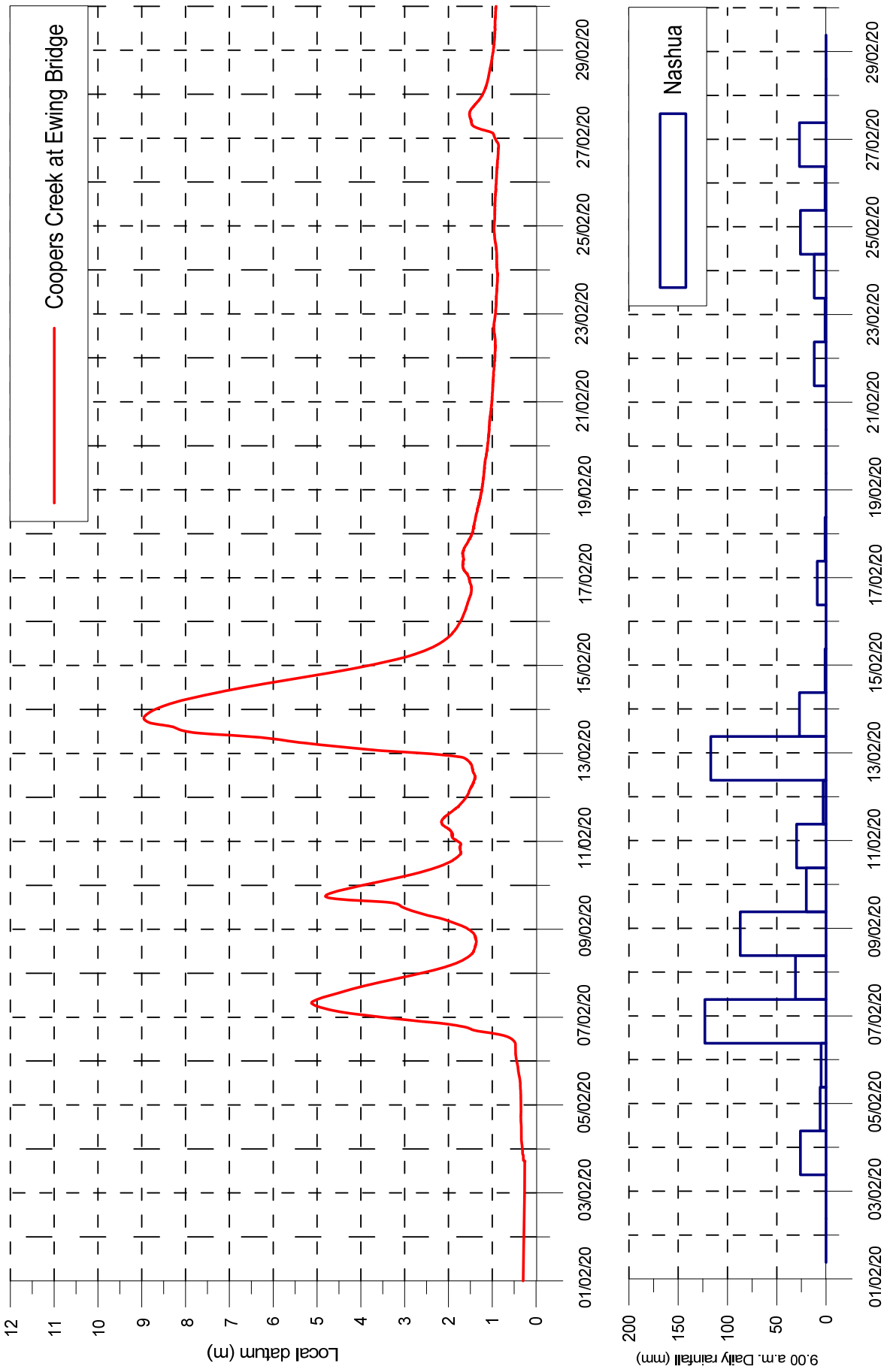

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WATER LEVEL AND RAINFALL DATA
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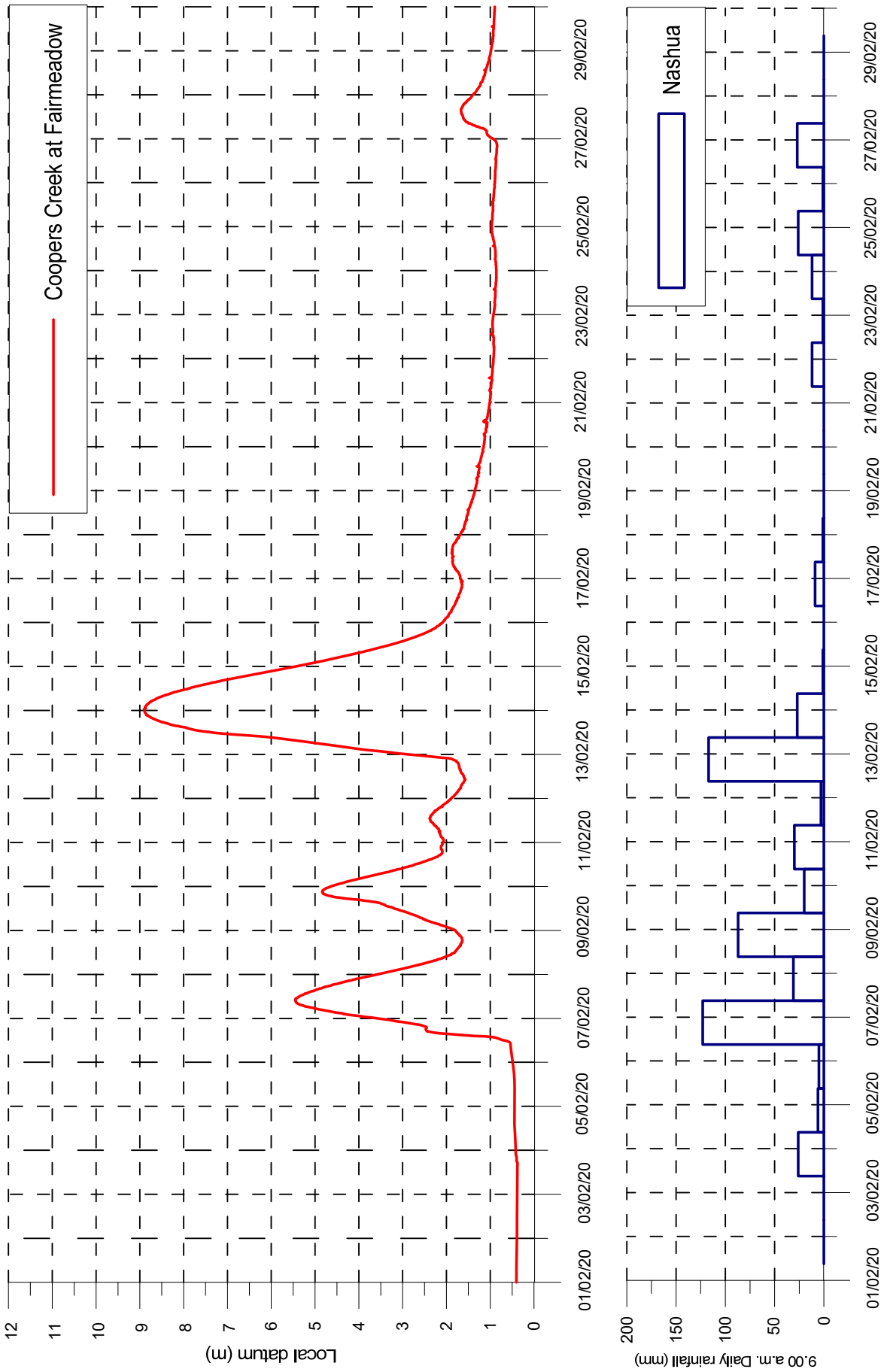

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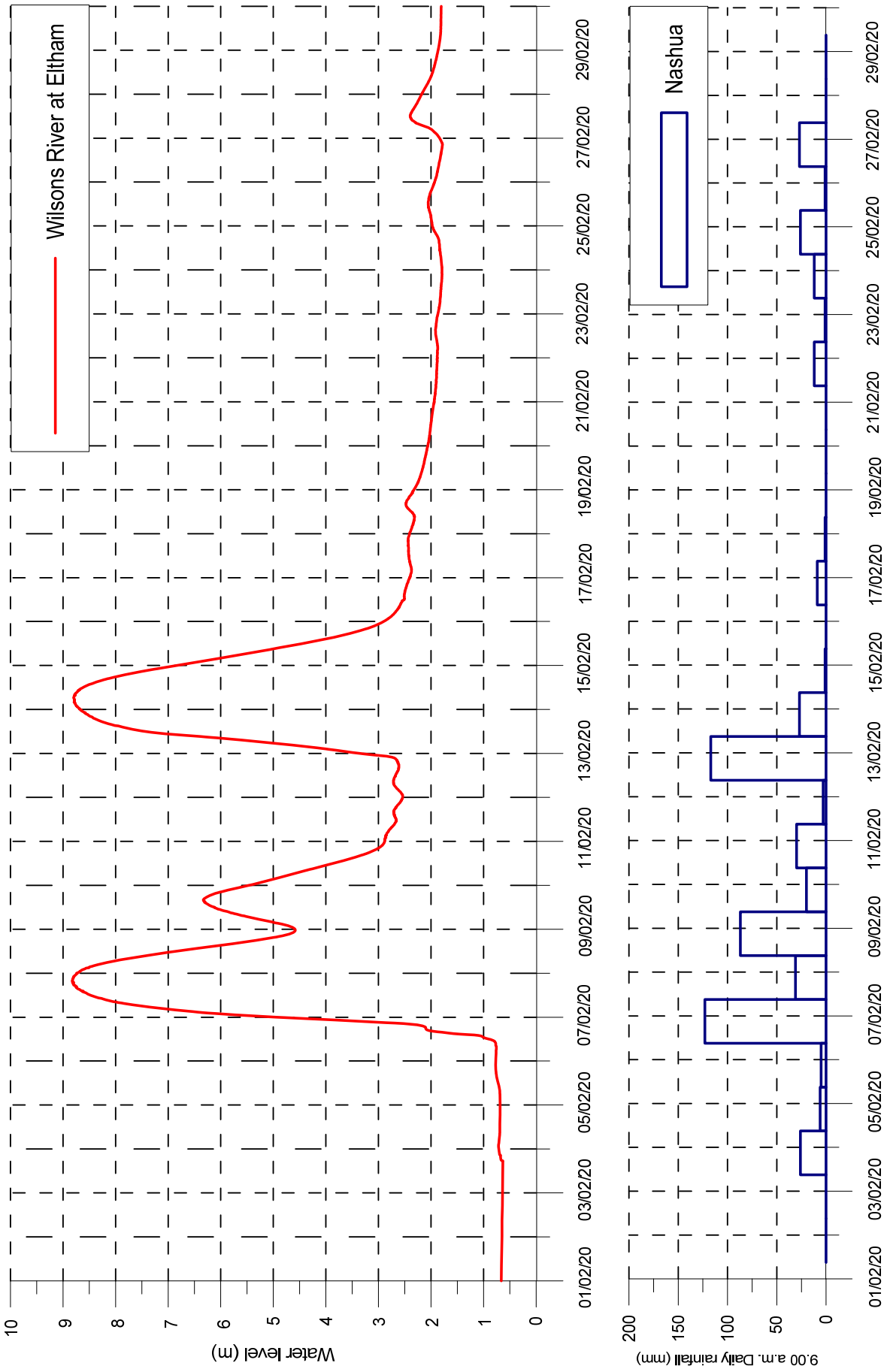

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WATER LEVEL AND RAINFALL DATA
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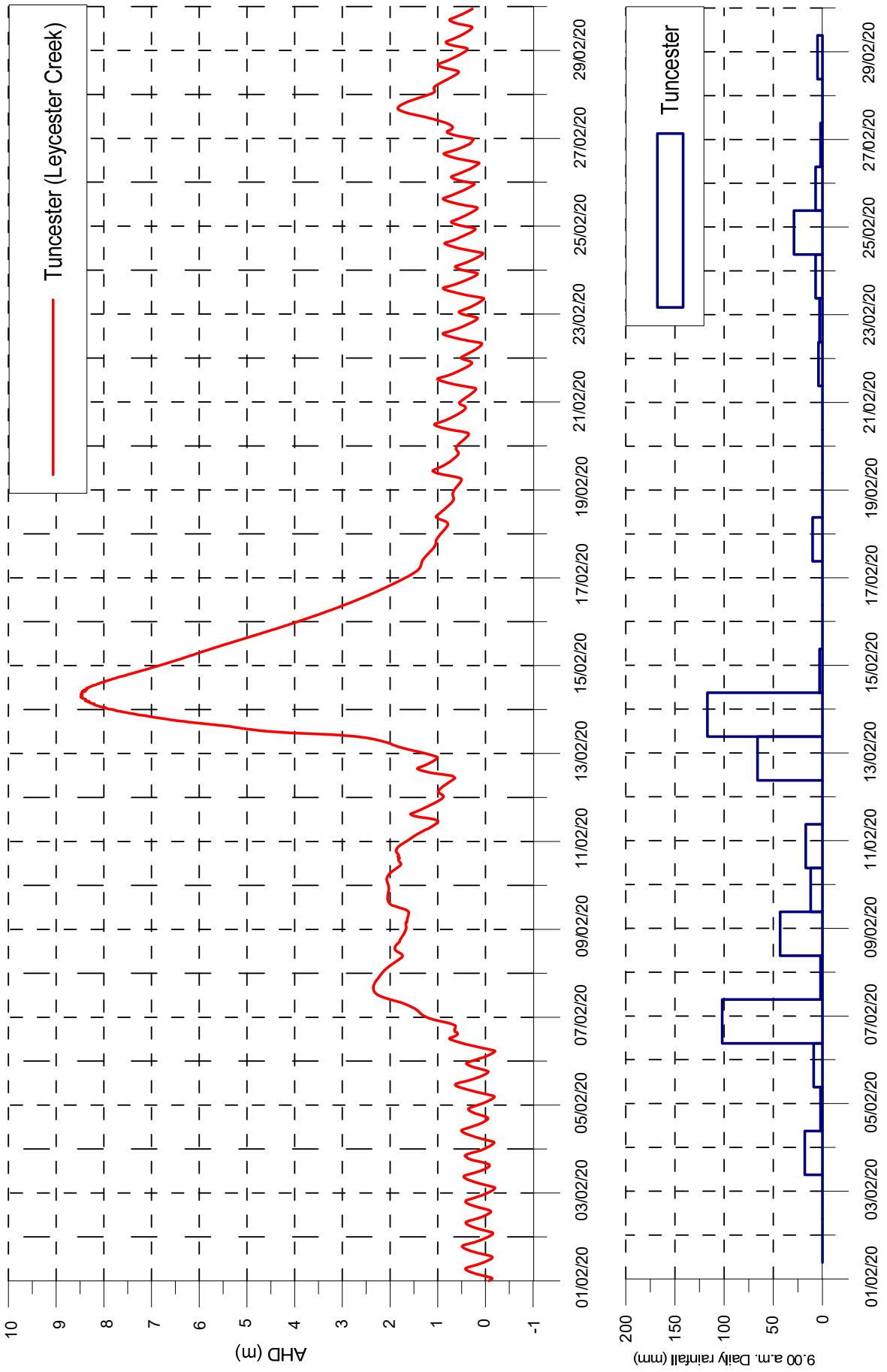

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Figure
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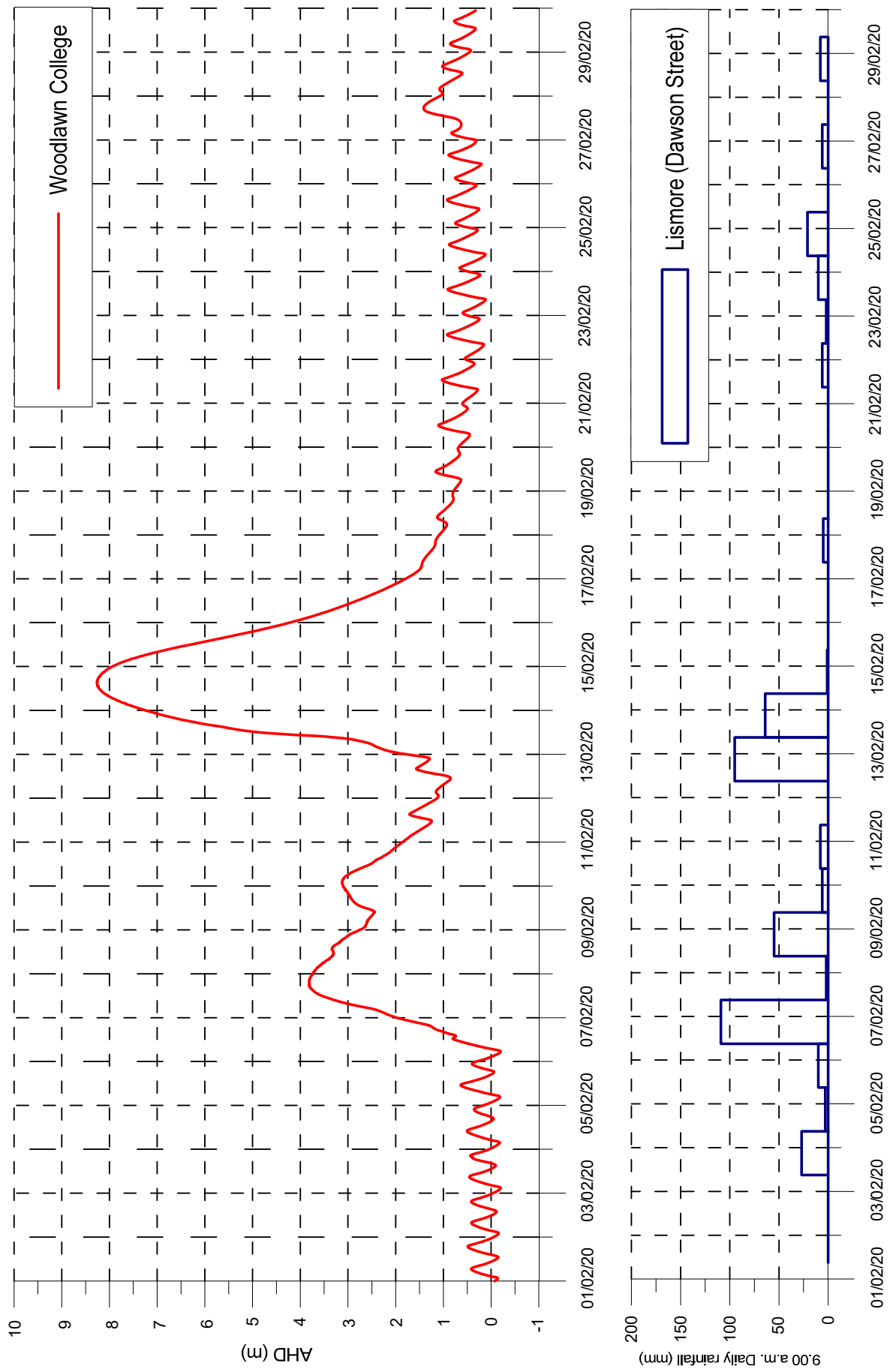

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WATER LEVEL AND RAINFALL DATA
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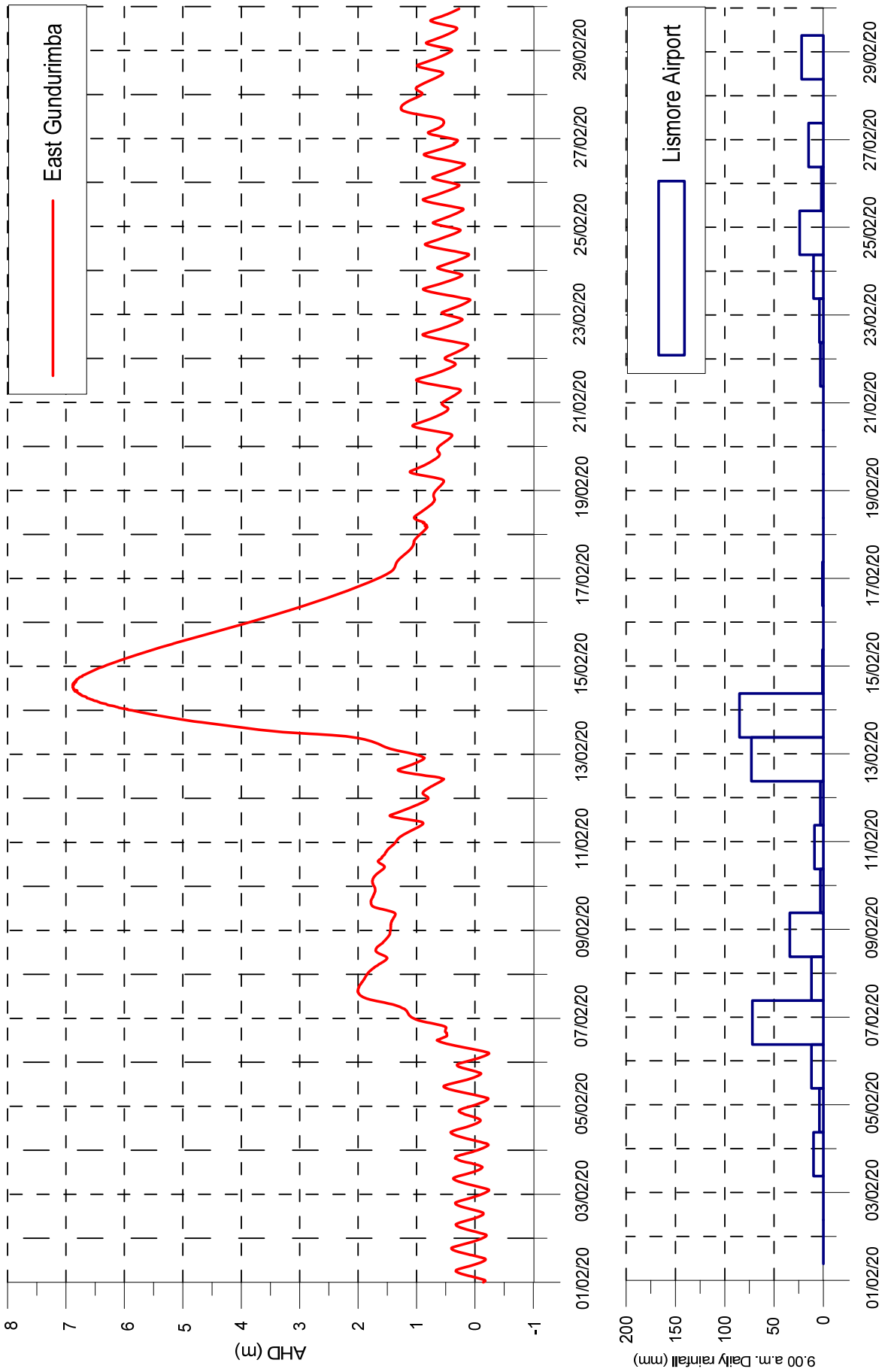

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WATER LEVEL AND RAINFALL DATA
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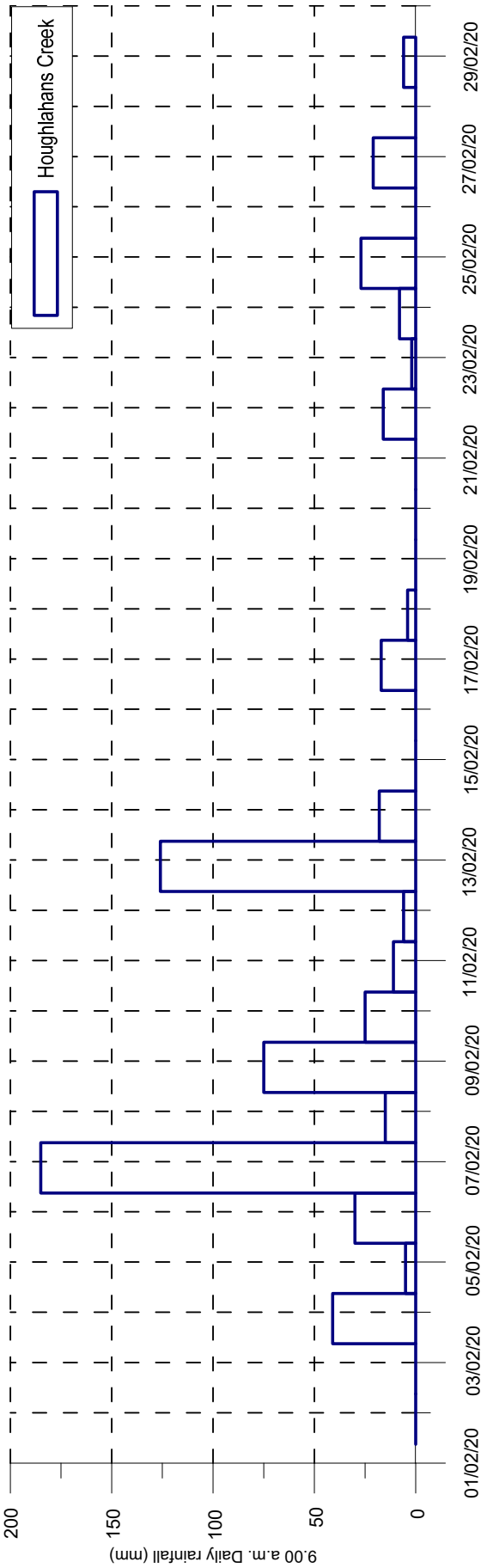

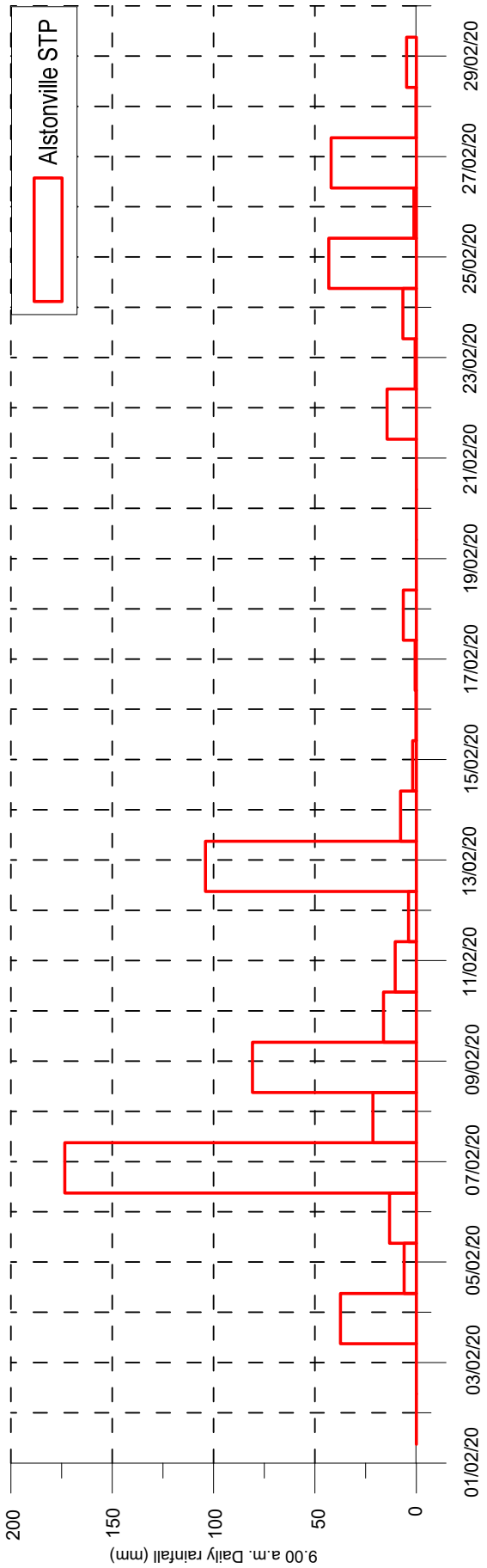

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WILSONS RIVER REGION
WATER LEVEL AND RAINFALL DATA
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WILSONS RIVER REGION
WATER LEVEL AND RAINFALL DATA
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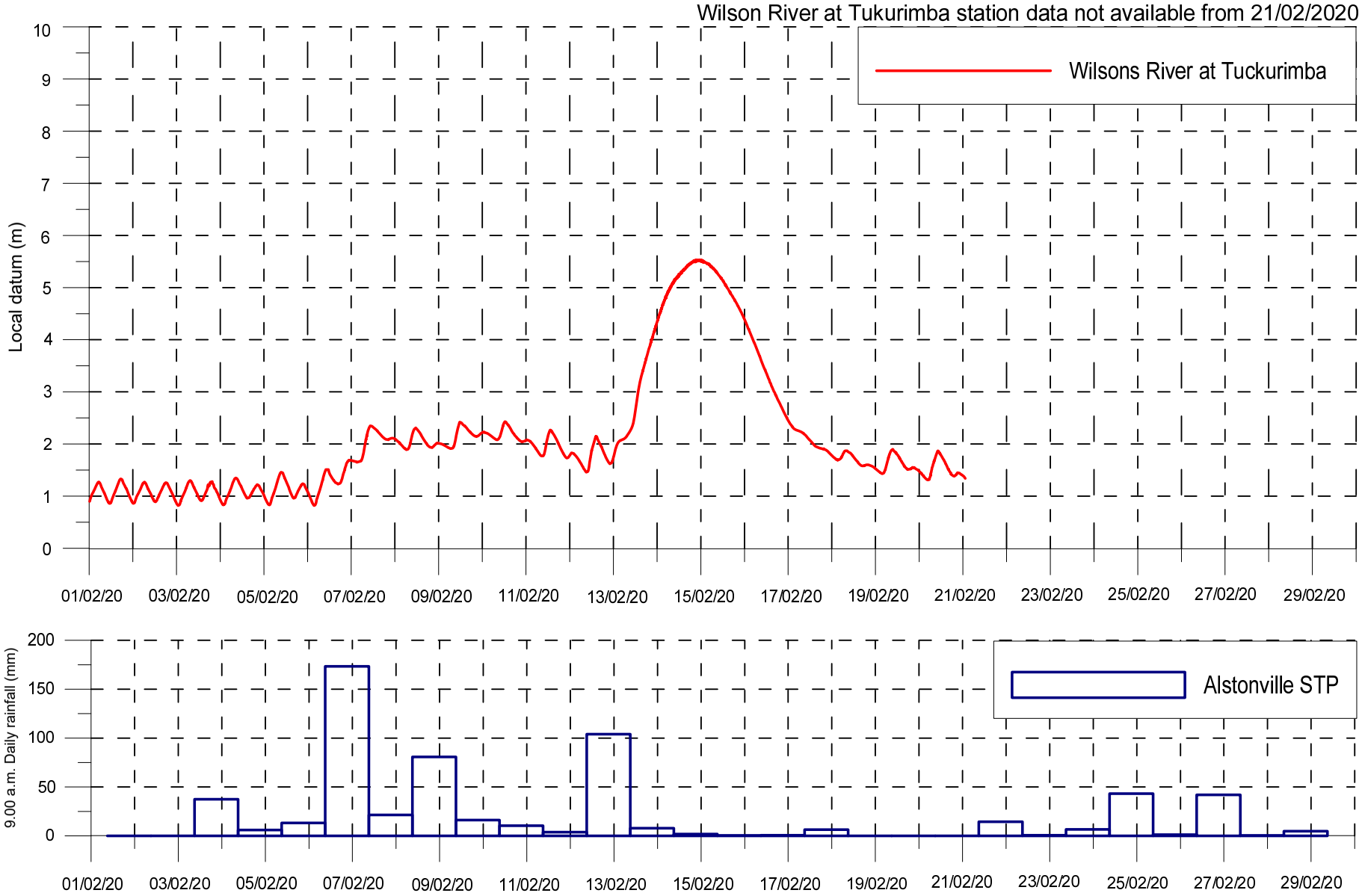

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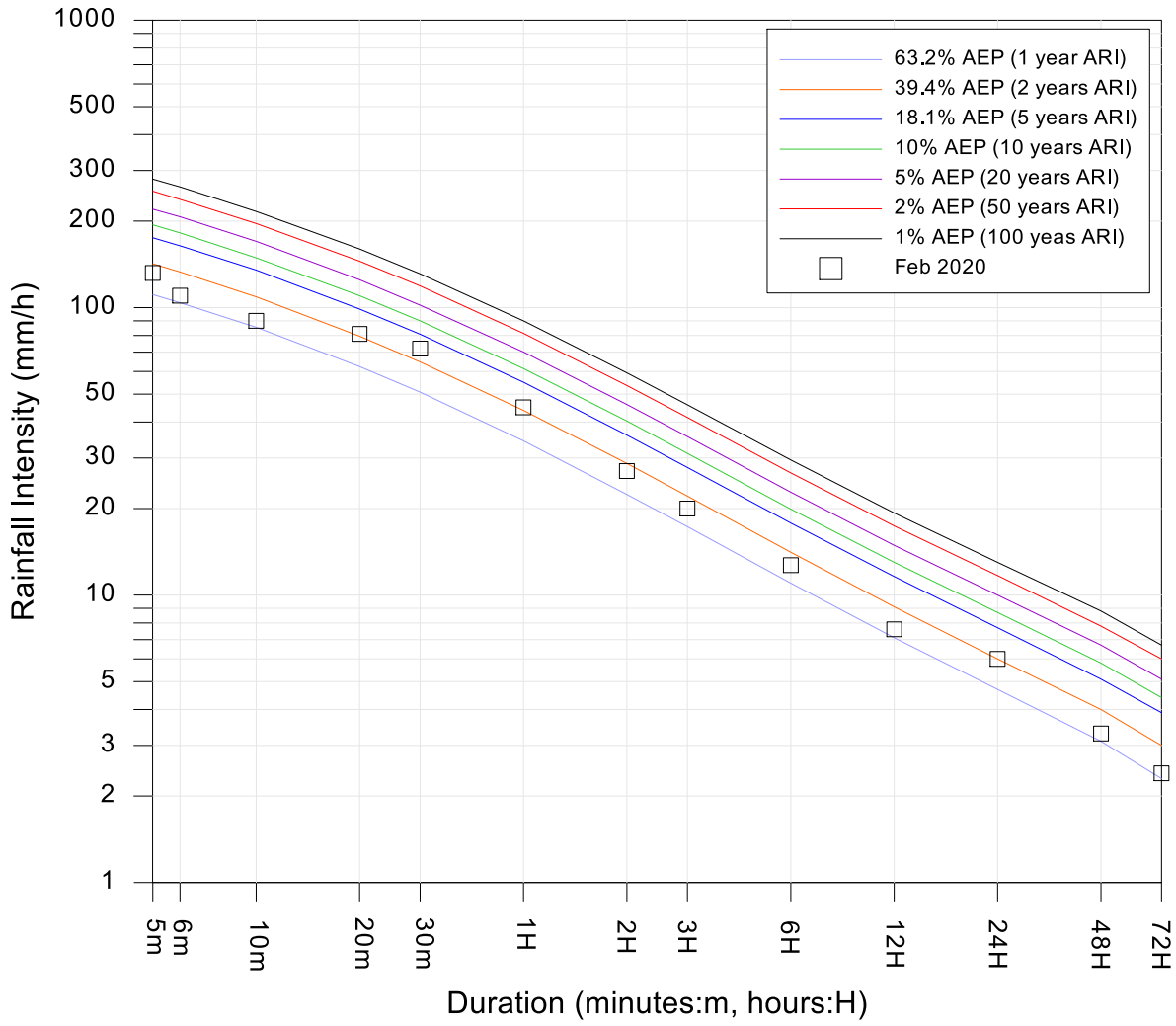
Figure 4.19

Figures_MHL2752.pptx

Site Owner: Lismore City Council
Latitude: -28.807 Longitude:153.282

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	132	10:14 13 Feb 2020
6m	110	10:25 13 Feb 2020
10m	90	10:25 13 Feb 2020
20m	81	10:25 13 Feb 2020
30m	72	10:25 13 Feb 2020
1H	45	10:39 13 Feb 2020
2H	27	10:28 13 Feb 2020
3H	20	10:26 13 Feb 2020
6H	12.7	11:27 13 Feb 2020
12H	7.6	15:20 13 Feb 2020
24H	6	10:26 13 Feb 2020
48H	3.3	10:03 14 Feb 2020
72H	2.4	04:03 09 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Lismore (Dawson Street) (558087)
Intensity-Frequency-Duration
1 - 29 February 2020

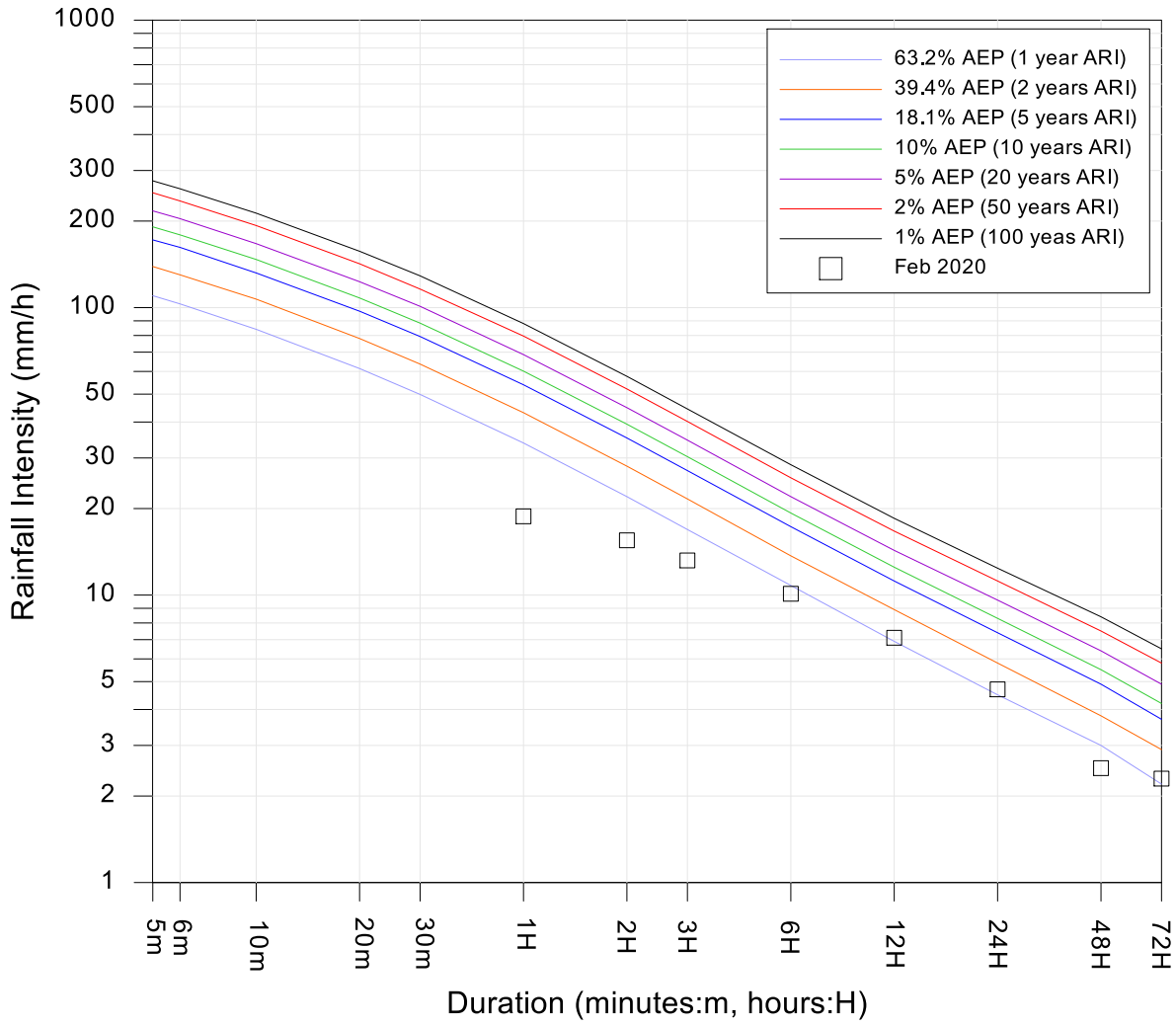
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.20

IFD558087_Figure .pdf

Site Owner: BoM
Latitude: -28.83 Longitude:153.26

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	18.8	14:13 06 Feb 2020
2H	15.5	15:13 06 Feb 2020
3H	13.2	14:03 06 Feb 2020
6H	10.1	15:59 06 Feb 2020
12H	7.1	22:29 06 Feb 2020
24H	4.7	07:59 07 Feb 2020
48H	2.5	17:29 07 Feb 2020
72H	2.3	09:59 09 Feb 2020

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

Lismore Airport (58214)
Intensity-Frequency-Duration
1 - 29 February 2020

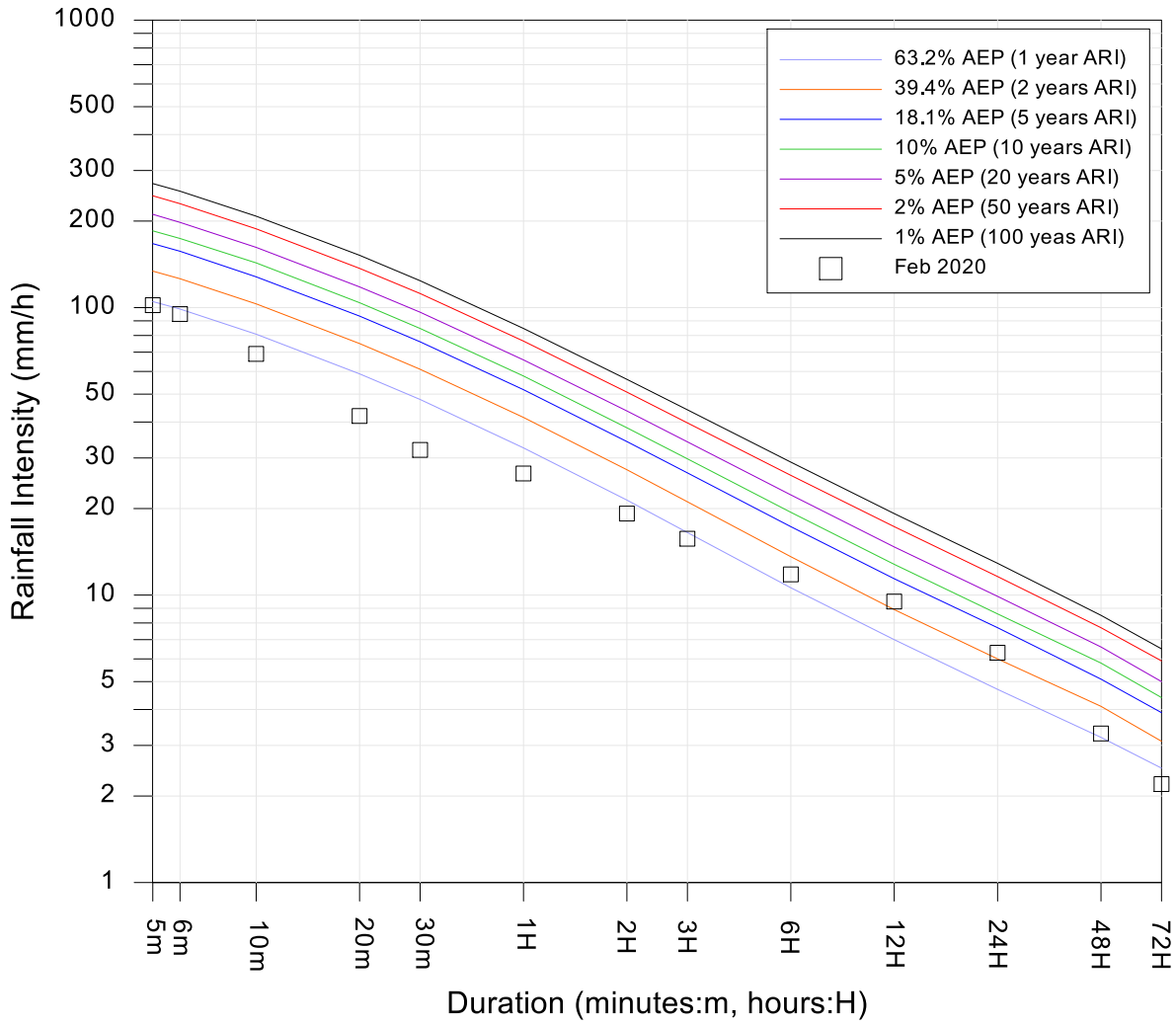
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.21

IFD58214_Figure .pdf

Site Owner: WaterNSW
Latitude: -28.7365 Longitude:153.164

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	102	17:16 03 Feb 2020
6m	95	17:16 03 Feb 2020
10m	69	17:19 03 Feb 2020
20m	42	15:15 13 Feb 2020
30m	32	15:32 13 Feb 2020
1H	26.5	15:50 13 Feb 2020
2H	19.2	11:05 13 Feb 2020
3H	15.7	11:04 13 Feb 2020
6H	11.8	15:37 13 Feb 2020
12H	9.5	17:17 13 Feb 2020
24H	6.3	16:55 13 Feb 2020
48H	3.3	08:42 14 Feb 2020
72H	2.2	16:21 13 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Leycester Rock Valley (203010)
Intensity-Frequency-Duration
1 - 29 February 2020

Manly Hydraulics Laboratory

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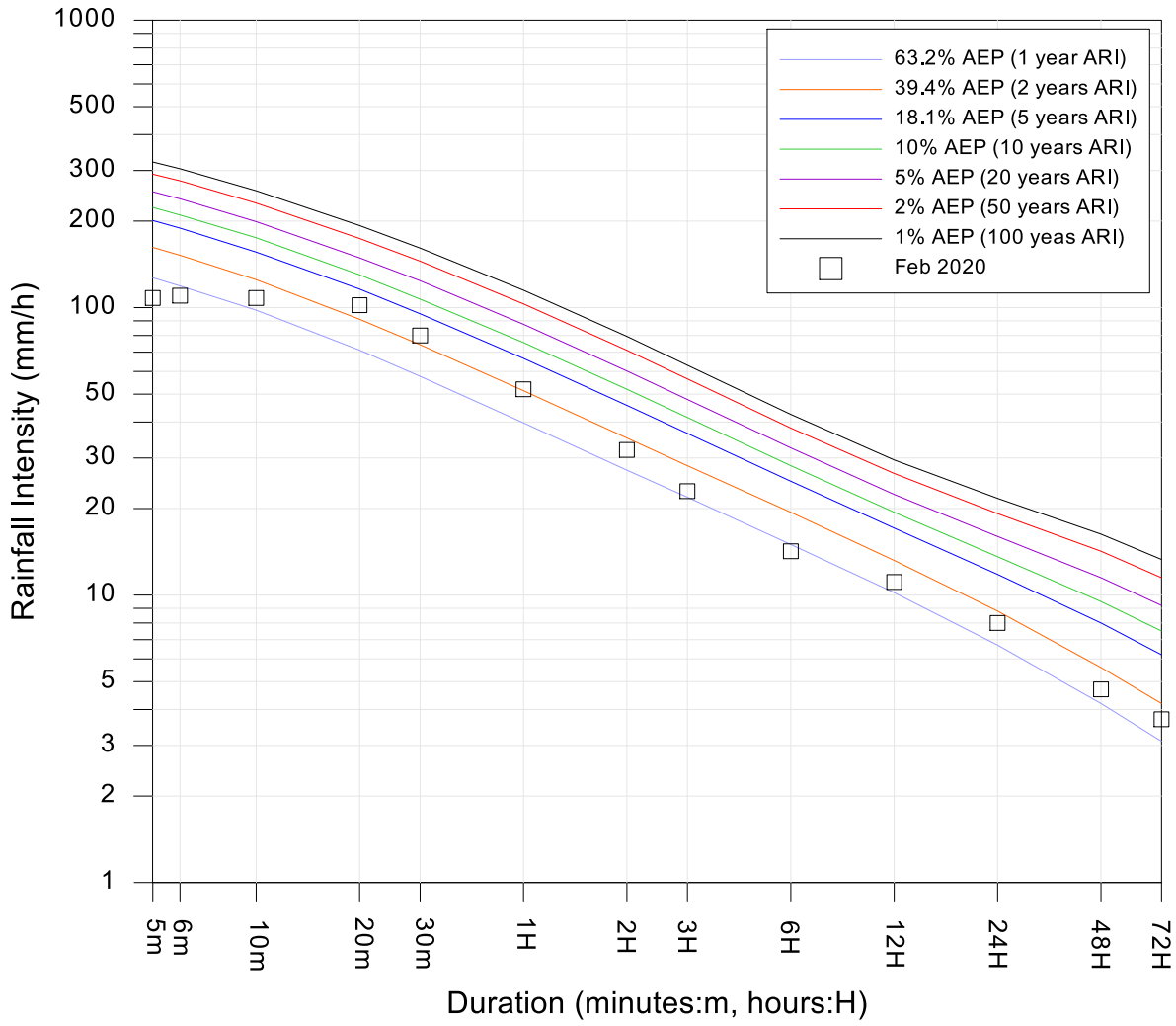
Figure
4.22

IFD203010_Figure .pdf

Site Owner: Byron Shire Council
Latitude: -28.554 Longitude:153.437

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	108	20:18 17 Feb 2020
6m	110	20:11 17 Feb 2020
10m	108	20:11 17 Feb 2020
20m	102	20:20 17 Feb 2020
30m	80	20:30 17 Feb 2020
1H	52	21:59 12 Feb 2020
2H	32	22:46 12 Feb 2020
3H	23	22:00 12 Feb 2020
6H	14.2	23:21 12 Feb 2020
12H	11.1	08:46 13 Feb 2020
24H	8	16:32 13 Feb 2020
48H	4.7	13:04 13 Feb 2020
72H	3.7	18:25 13 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Mullumbimby Creek (558008)
Intensity-Frequency-Duration
1 - 29 February 2020

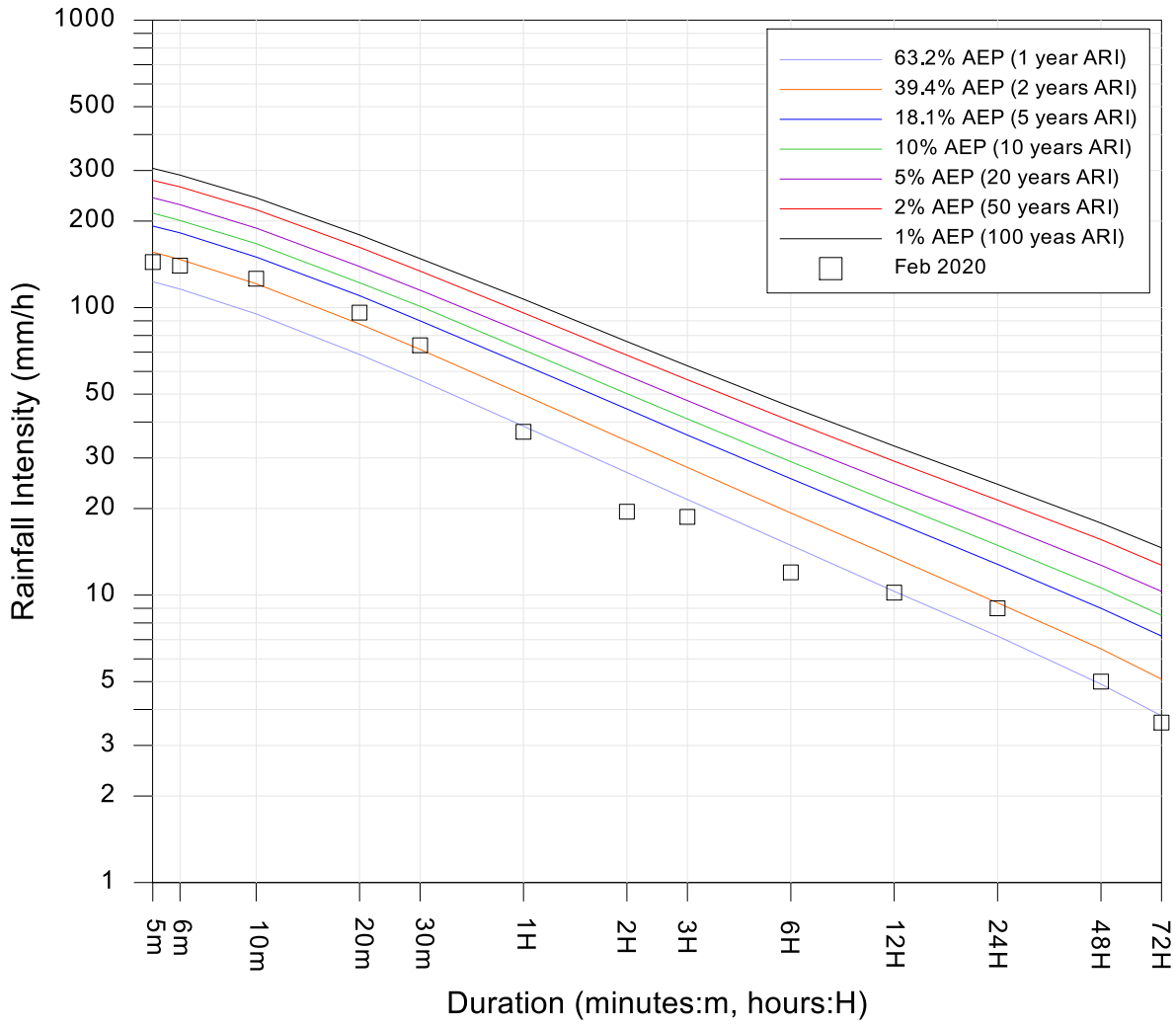
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.23

IFD558008_Figure .pdf

Site Owner: BoM
Latitude: -28.533 Longitude:153.314

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	144	18:06 03 Feb 2020
6m	140	18:07 03 Feb 2020
10m	126	18:07 03 Feb 2020
20m	96	18:16 03 Feb 2020
30m	74	18:25 03 Feb 2020
1H	37	18:55 03 Feb 2020
2H	19.5	21:34 12 Feb 2020
3H	18.7	22:03 12 Feb 2020
6H	12	00:08 13 Feb 2020
12H	10.2	14:59 13 Feb 2020
24H	9	17:22 13 Feb 2020
48H	5	06:52 14 Feb 2020
72H	3.6	17:14 13 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Doon Doon (McCabes Rd) (58019)
Intensity-Frequency-Duration
1 - 29 February 2020

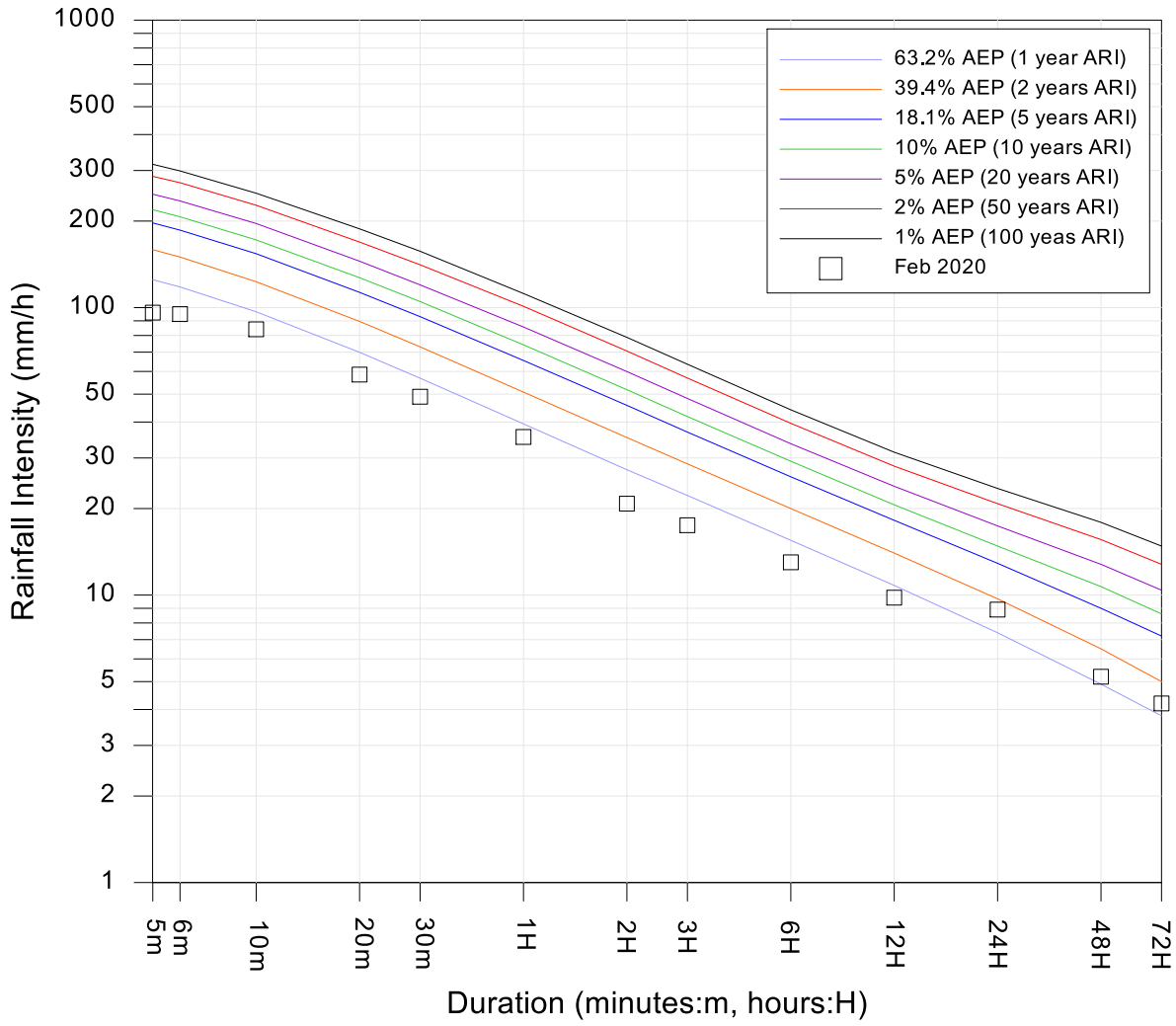
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.24

IFD58019_Figure .pdf

Site Owner: CCSD
Latitude: -28.5521 Longitude:153.386

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	96	09:58 12 Feb 2020
6m	95	09:58 12 Feb 2020
10m	84	09:58 12 Feb 2020
20m	58.5	10:04 12 Feb 2020
30m	49	18:21 10 Feb 2020
1H	35.5	18:28 10 Feb 2020
2H	20.8	22:50 12 Feb 2020
3H	17.5	22:01 12 Feb 2020
6H	13	22:42 12 Feb 2020
12H	9.8	16:41 13 Feb 2020
24H	8.9	16:42 13 Feb 2020
48H	5.2	07:10 14 Feb 2020
72H	4.2	17:28 13 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Huonbrook (558049)
Intensity-Frequency-Duration
1 - 29 February 2020

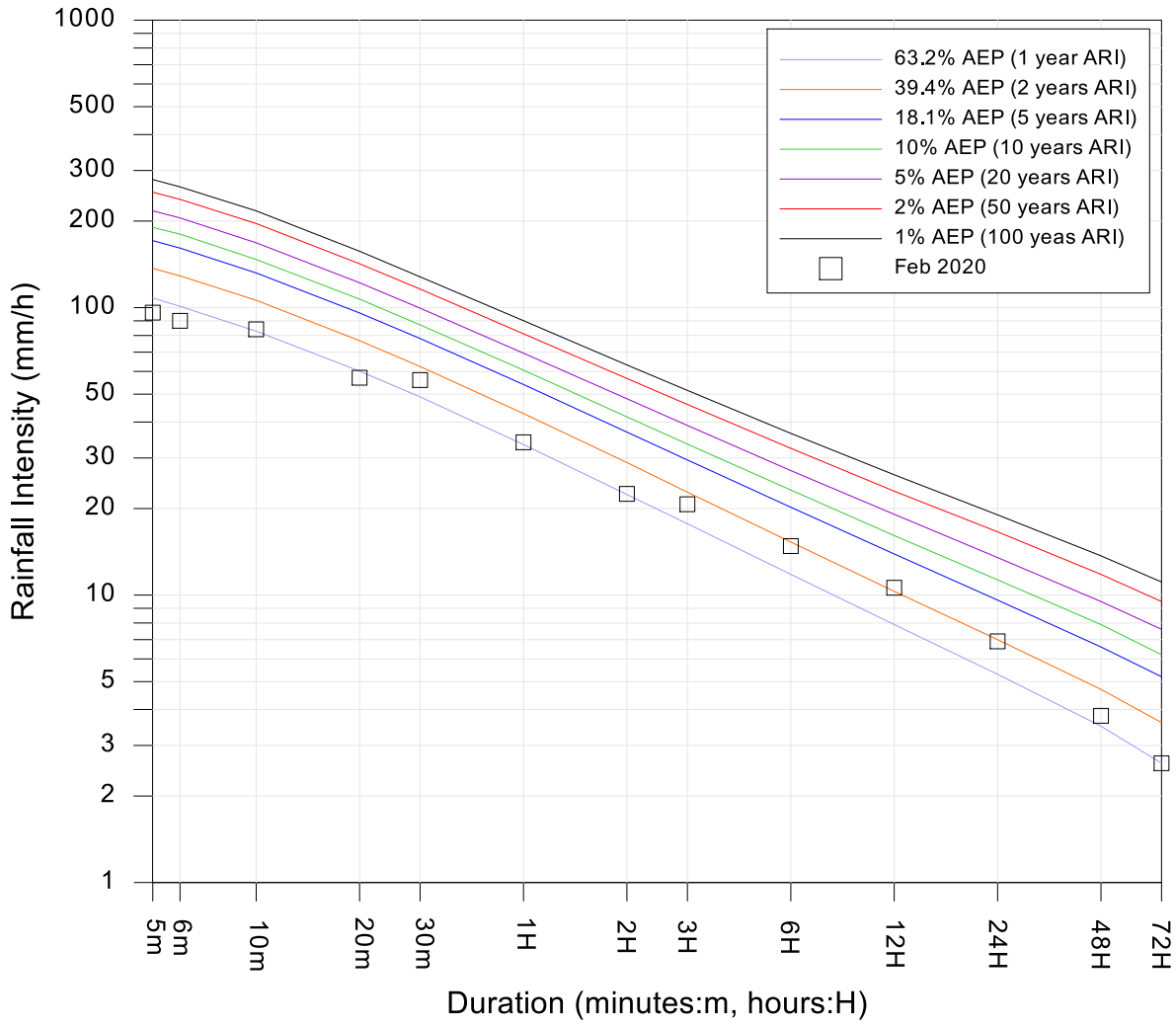
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.25

IFD558049_Figure .pdf

Site Owner: BoM
Latitude: -28.528 Longitude:153.152

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	96	22:03 26 Feb 2020
6m	90	22:02 26 Feb 2020
10m	84	14:51 13 Feb 2020
20m	57	15:01 13 Feb 2020
30m	56	15:11 13 Feb 2020
1H	34	15:12 13 Feb 2020
2H	22.5	15:38 13 Feb 2020
3H	20.7	15:34 13 Feb 2020
6H	14.8	18:24 13 Feb 2020
12H	10.6	17:24 13 Feb 2020
24H	6.9	18:19 13 Feb 2020
48H	3.8	08:38 14 Feb 2020
72H	2.6	14:38 14 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Lillian Rock (Williams Rd) (58148)
Intensity-Frequency-Duration
1 - 29 February 2020

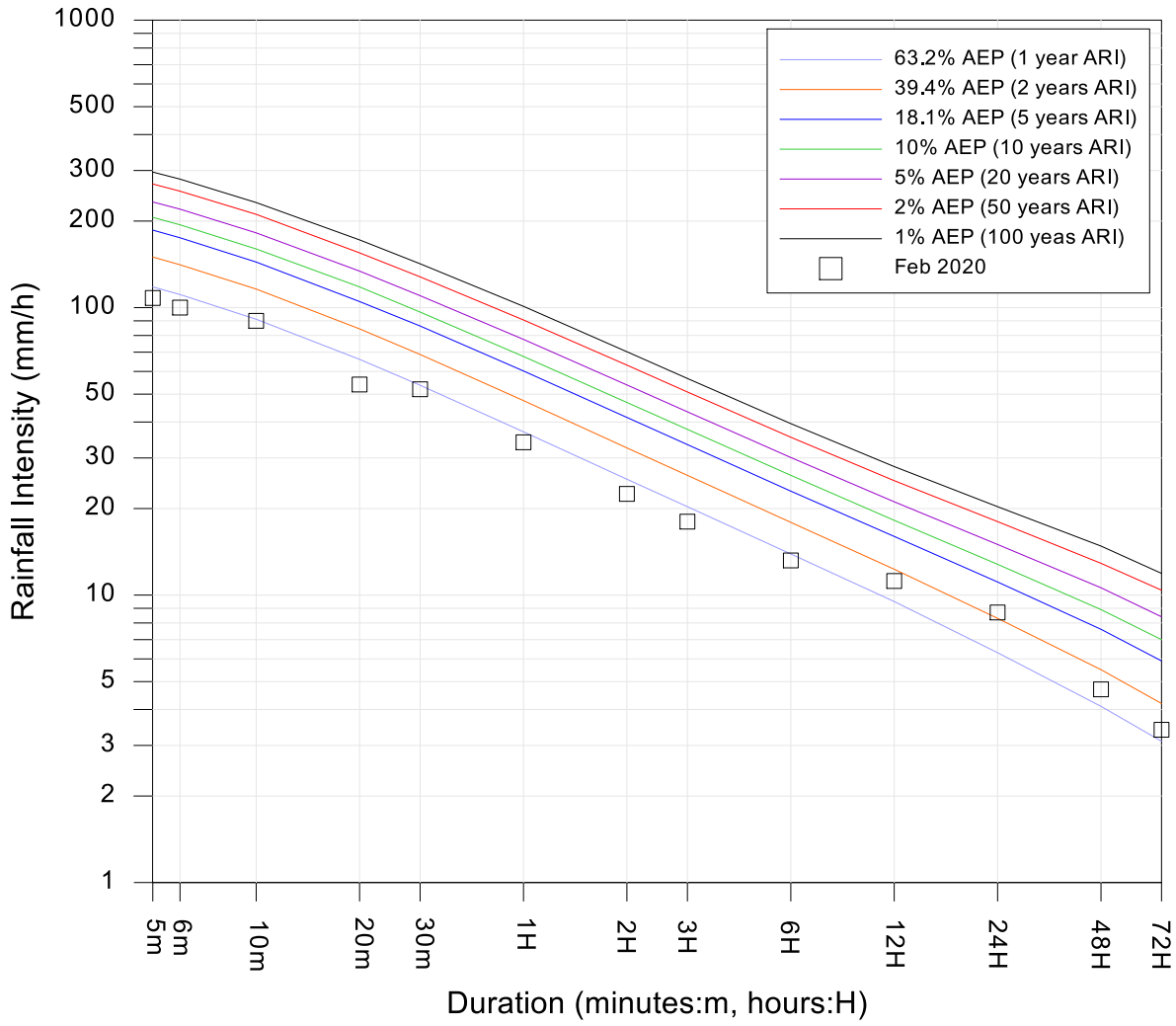
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.26

IFD58148_Figure .pdf

Site Owner: Lismore City Council
Latitude: -28.588 Longitude:153.299

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	108	20:32 26 Feb 2020
6m	100	20:33 26 Feb 2020
10m	90	17:53 03 Feb 2020
20m	54	20:49 26 Feb 2020
30m	52	20:53 26 Feb 2020
1H	34	21:23 26 Feb 2020
2H	22.5	22:23 26 Feb 2020
3H	18	08:01 13 Feb 2020
6H	13.2	08:24 13 Feb 2020
12H	11.2	16:46 13 Feb 2020
24H	8.7	16:58 13 Feb 2020
48H	4.7	09:56 14 Feb 2020
72H	3.4	16:44 13 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Terania Creek (558078)
Intensity-Frequency-Duration
1 - 29 February 2020

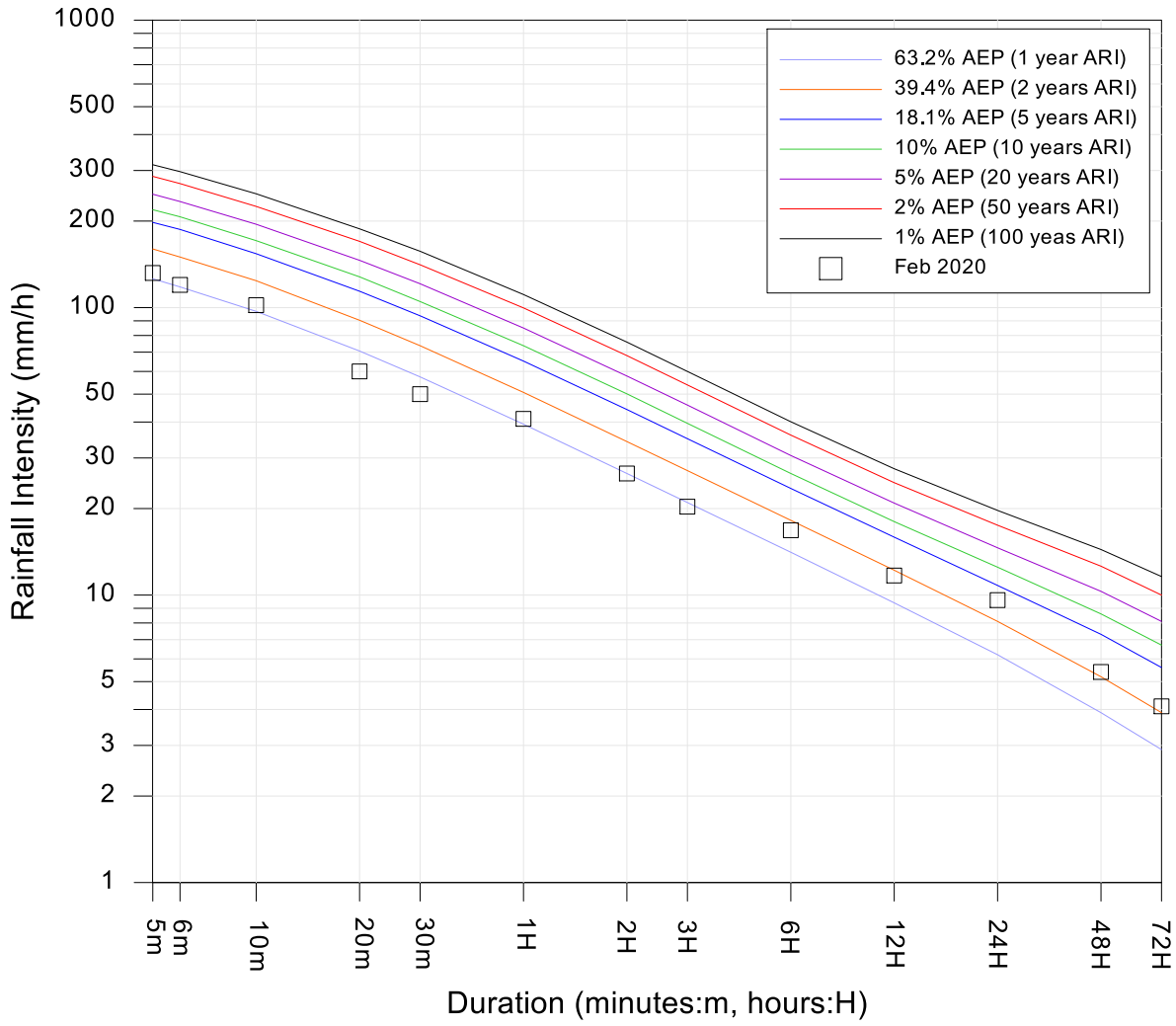
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.27

IFD558078_Figure .pdf

Site Owner: Byron Shire Council
Latitude: -28.594 Longitude:153.417

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	132	21:55 12 Feb 2020
6m	120	21:57 12 Feb 2020
10m	102	21:58 12 Feb 2020
20m	60	22:08 12 Feb 2020
30m	50	21:59 12 Feb 2020
1H	41	22:07 12 Feb 2020
2H	26.5	22:33 12 Feb 2020
3H	20.3	22:00 12 Feb 2020
6H	16.8	10:27 13 Feb 2020
12H	11.7	09:07 13 Feb 2020
24H	9.6	16:58 13 Feb 2020
48H	5.4	04:38 14 Feb 2020
72H	4.1	18:00 13 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Goonengerry (Alert) (558033)
Intensity-Frequency-Duration
1 - 29 February 2020

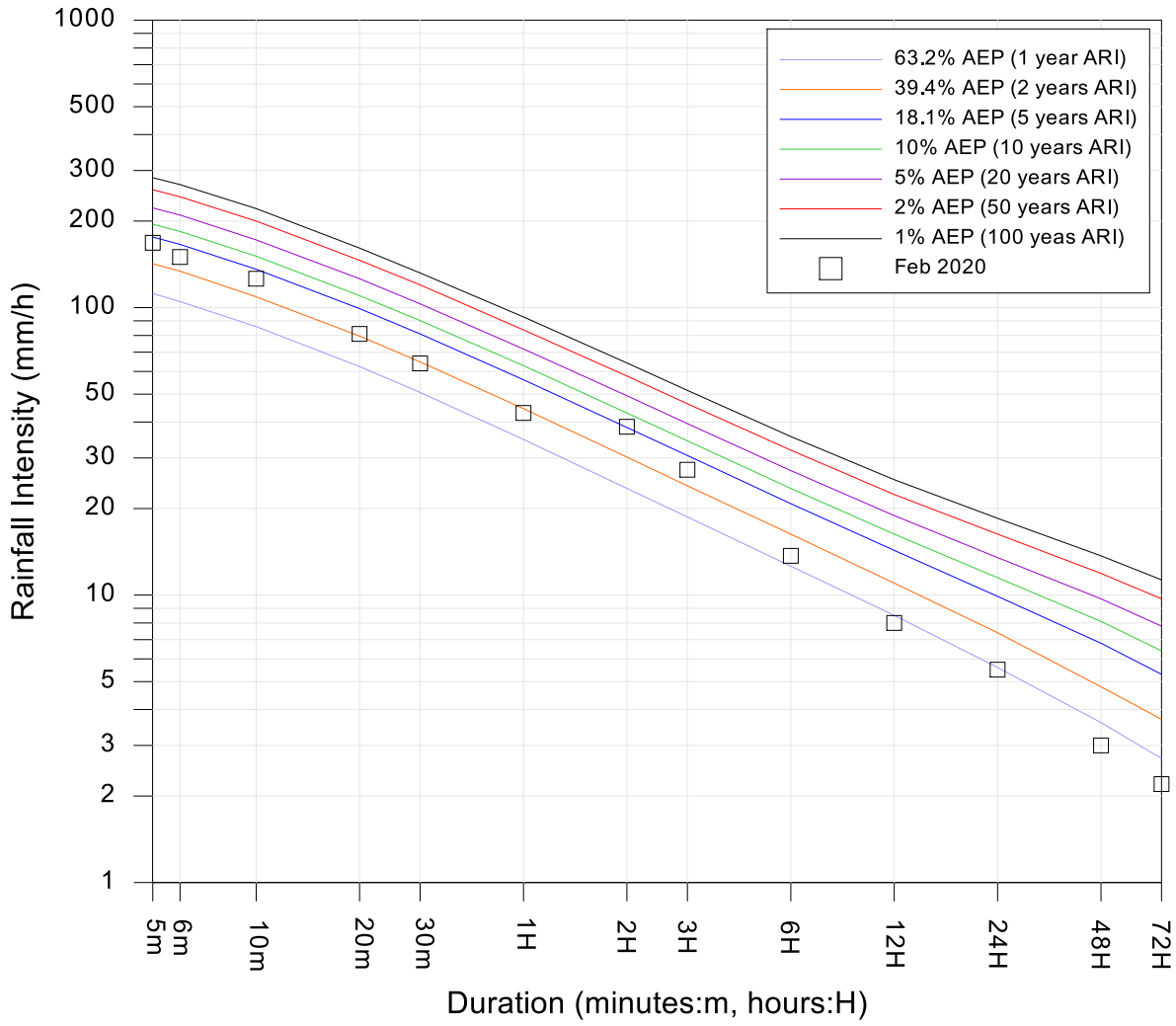
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.28

IFD558033_Figure .pdf

Site Owner: Lismore City Council
Latitude: -28.605 Longitude:153.091

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	168	21:48 26 Feb 2020
6m	150	21:49 26 Feb 2020
10m	126	20:34 26 Feb 2020
20m	81	20:40 26 Feb 2020
30m	64	21:56 26 Feb 2020
1H	43	22:13 26 Feb 2020
2H	38.5	22:13 26 Feb 2020
3H	27.3	22:59 26 Feb 2020
6H	13.7	01:59 27 Feb 2020
12H	8	17:13 13 Feb 2020
24H	5.5	17:17 13 Feb 2020
48H	3	09:06 14 Feb 2020
72H	2.2	15:06 14 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Cawongla (Alert) (558024)
Intensity-Frequency-Duration
1 - 29 February 2020

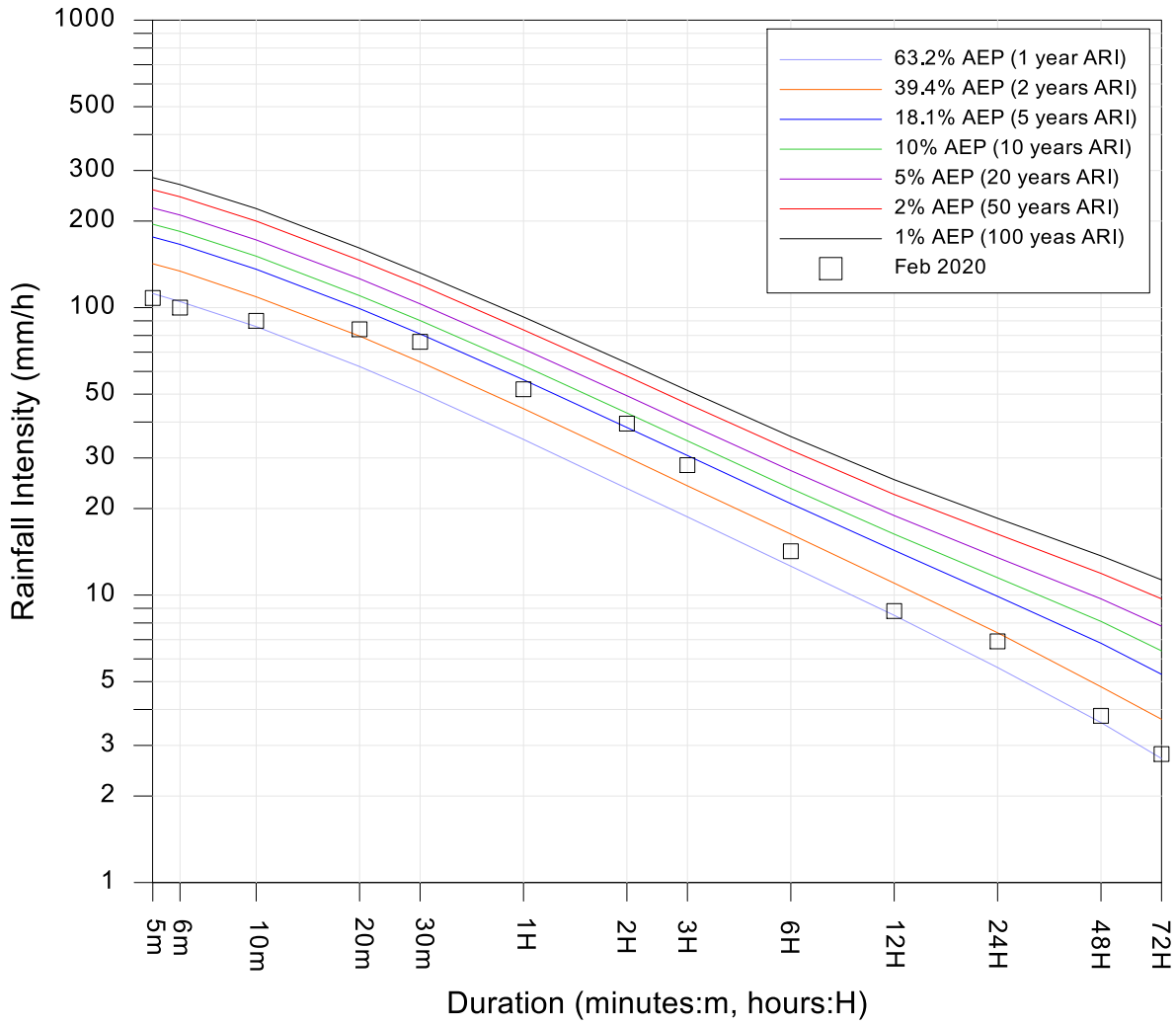
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.29

IFD558024_Figure .pdf

Site Owner: BoM
Latitude: -28.608 Longitude:153.213

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	108	21:52 26 Feb 2020
6m	100	21:53 26 Feb 2020
10m	90	21:55 26 Feb 2020
20m	84	22:05 26 Feb 2020
30m	76	22:08 26 Feb 2020
1H	52	22:26 26 Feb 2020
2H	39.5	22:09 26 Feb 2020
3H	28.3	22:56 26 Feb 2020
6H	14.2	01:56 27 Feb 2020
12H	8.8	17:13 13 Feb 2020
24H	6.9	16:44 13 Feb 2020
48H	3.8	14:59 13 Feb 2020
72H	2.8	14:38 14 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Nimbin (58180)
Intensity-Frequency-Duration
1 - 29 February 2020

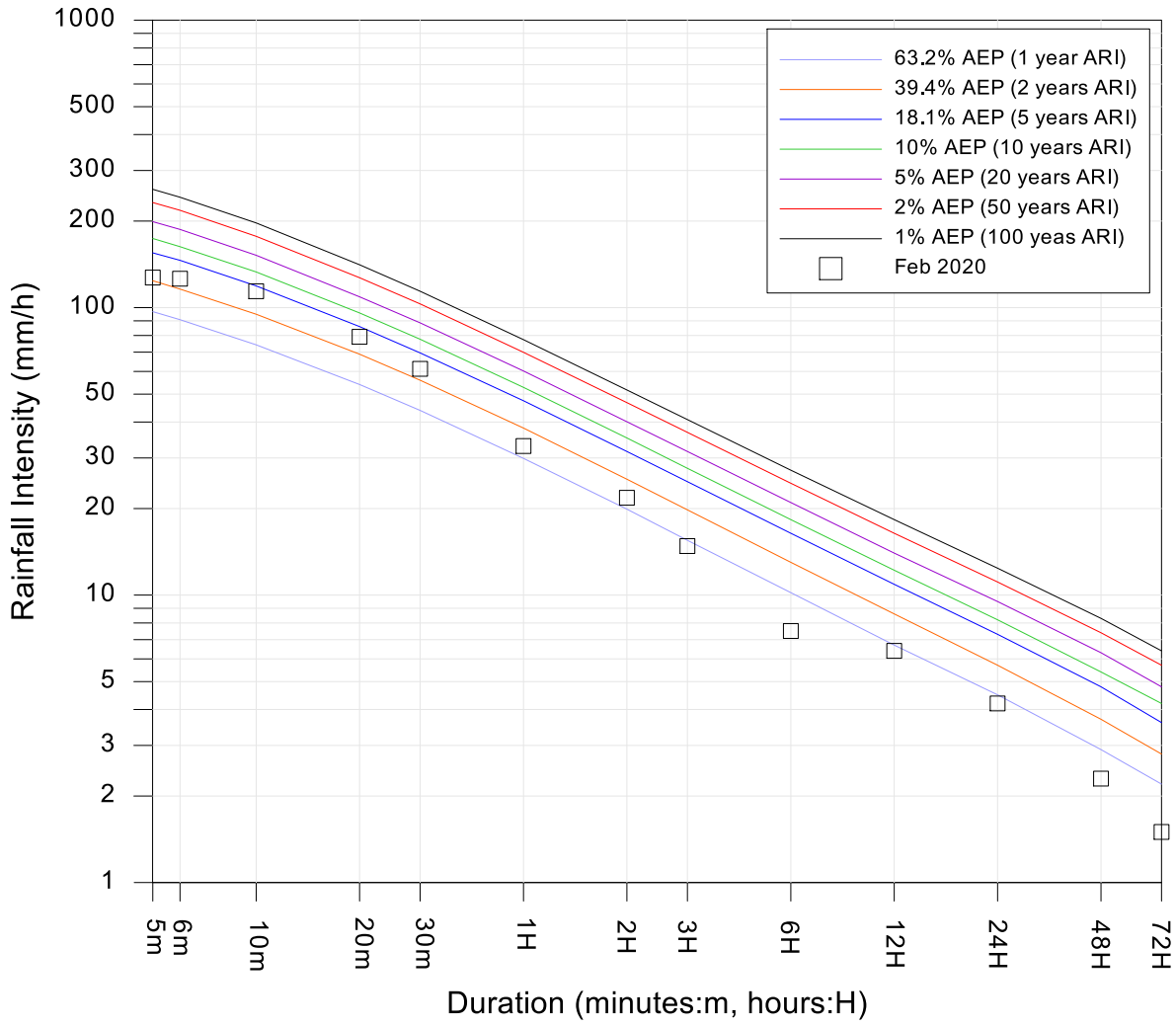
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.30

IFD58180_Figure .pdf

Site Owner: BoM
Latitude: -28.6217 Longitude:152.995

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	127.2	21:23 26 Feb 2020
6m	126	21:23 26 Feb 2020
10m	114	21:26 26 Feb 2020
20m	79.2	21:26 26 Feb 2020
30m	61.2	21:28 26 Feb 2020
1H	33	21:56 26 Feb 2020
2H	21.8	21:57 26 Feb 2020
3H	14.8	22:51 26 Feb 2020
6H	7.5	22:12 26 Feb 2020
12H	6.4	17:27 13 Feb 2020
24H	4.2	16:41 13 Feb 2020
48H	2.3	18:07 13 Feb 2020
72H	1.5	15:27 13 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Kyogle (Richmond River) (558002)
Intensity-Frequency-Duration
1 - 29 February 2020

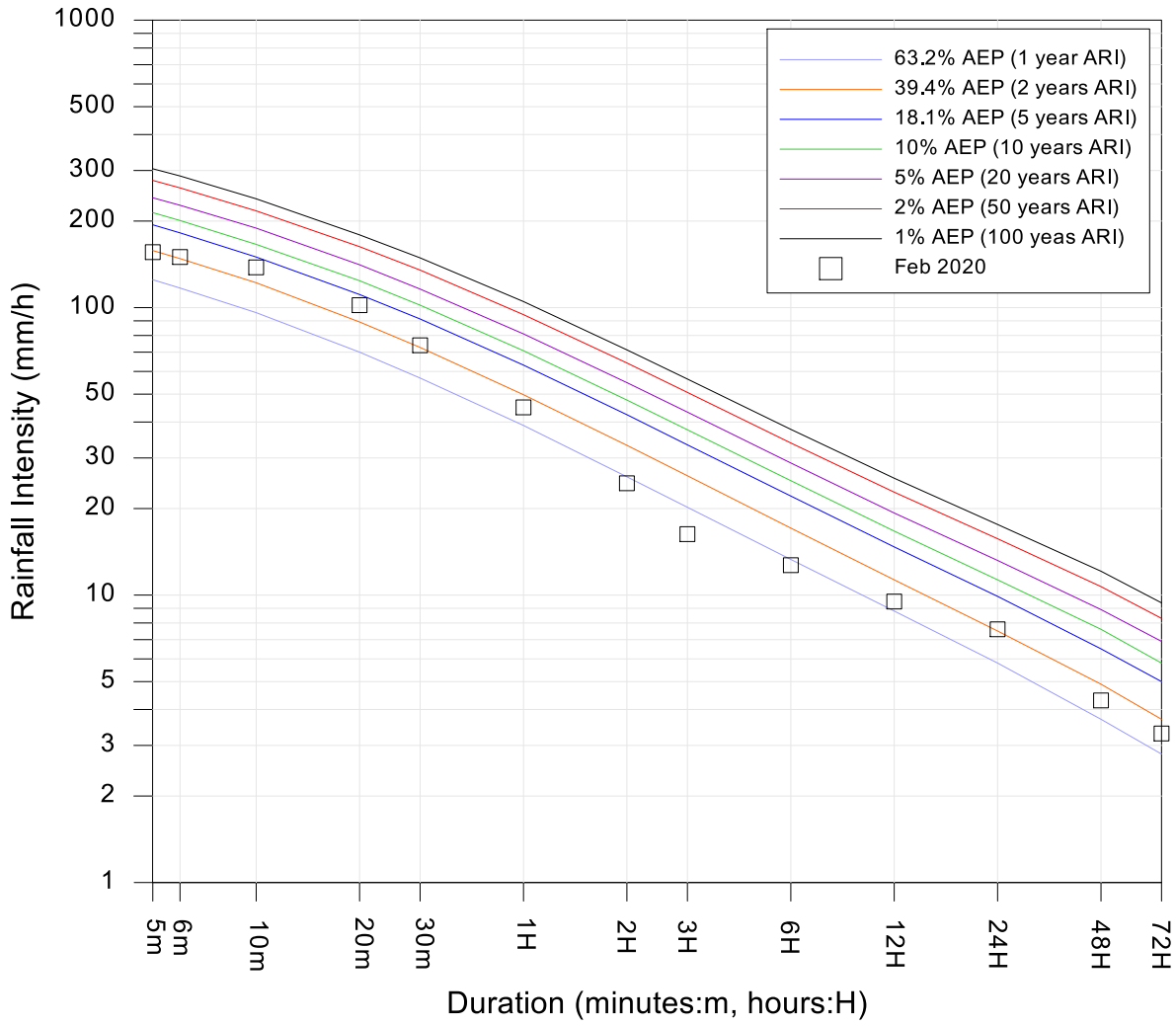
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.31

IFD558002_Figure .pdf

Site Owner: Lismore City Council
Latitude: -28.643 Longitude:153.417

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	156	20:53 26 Feb 2020
6m	150	20:53 26 Feb 2020
10m	138	20:56 26 Feb 2020
20m	102	21:03 26 Feb 2020
30m	74	21:13 26 Feb 2020
1H	45	21:43 26 Feb 2020
2H	24.5	22:24 26 Feb 2020
3H	16.3	23:24 26 Feb 2020
6H	12.7	15:20 06 Feb 2020
12H	9.5	16:36 13 Feb 2020
24H	7.6	15:18 13 Feb 2020
48H	4.3	04:58 14 Feb 2020
72H	3.3	17:57 13 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Repentence (Coopers Ck) (558000)
Intensity-Frequency-Duration
1 - 29 February 2020

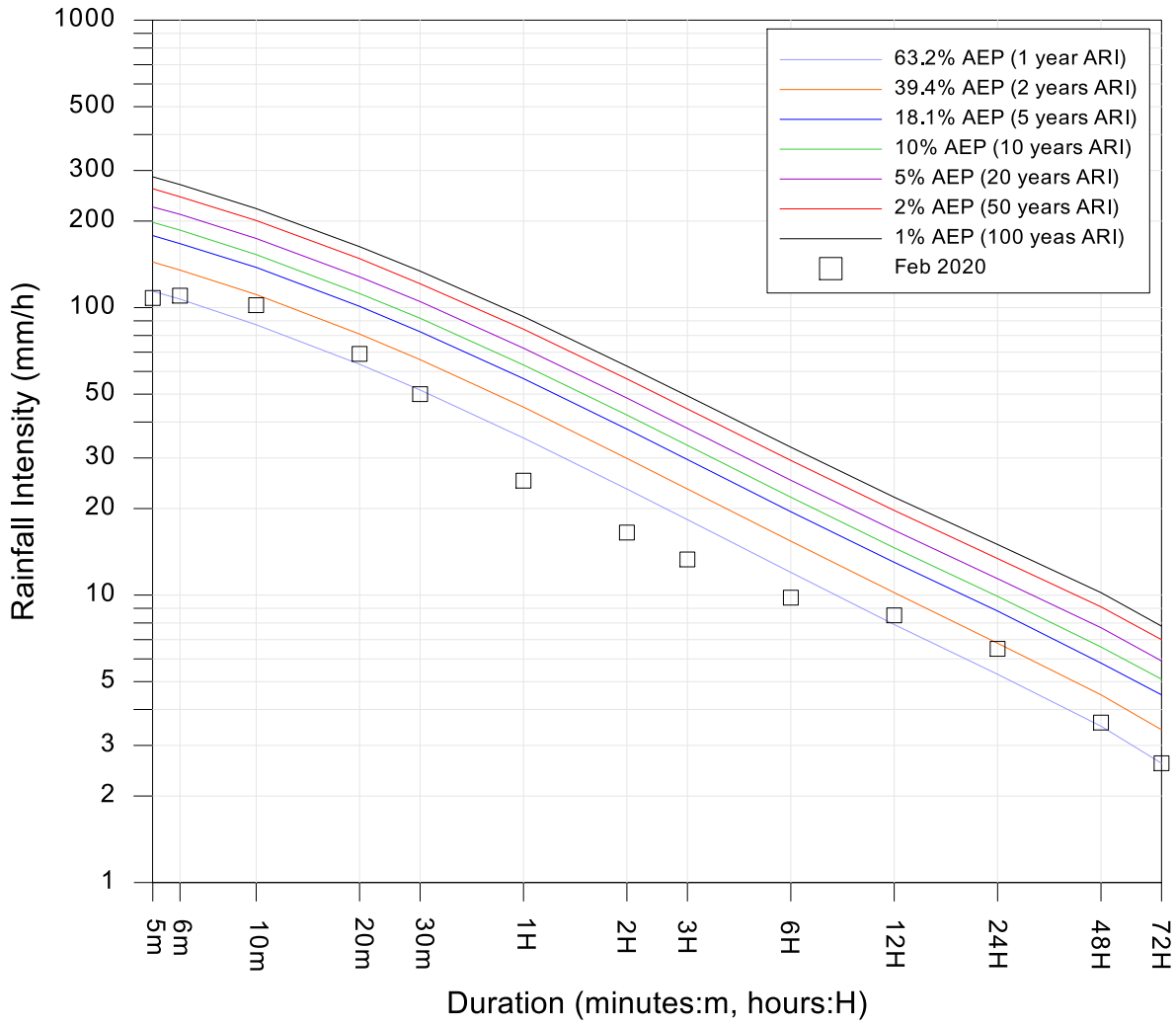
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.32

IFD558000_Figure .pdf

Site Owner: BoM
Latitude: -28.672 Longitude:153.278

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	108	14:43 13 Feb 2020
6m	110	14:42 13 Feb 2020
10m	102	14:42 13 Feb 2020
20m	69	14:50 13 Feb 2020
30m	50	15:00 13 Feb 2020
1H	25	15:30 13 Feb 2020
2H	16.5	14:49 13 Feb 2020
3H	13.3	13:17 06 Feb 2020
6H	9.8	15:01 13 Feb 2020
12H	8.5	15:00 13 Feb 2020
24H	6.5	16:57 13 Feb 2020
48H	3.6	15:03 13 Feb 2020
72H	2.6	16:05 13 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

The Channon (58147)
Intensity-Frequency-Duration
1 - 29 February 2020

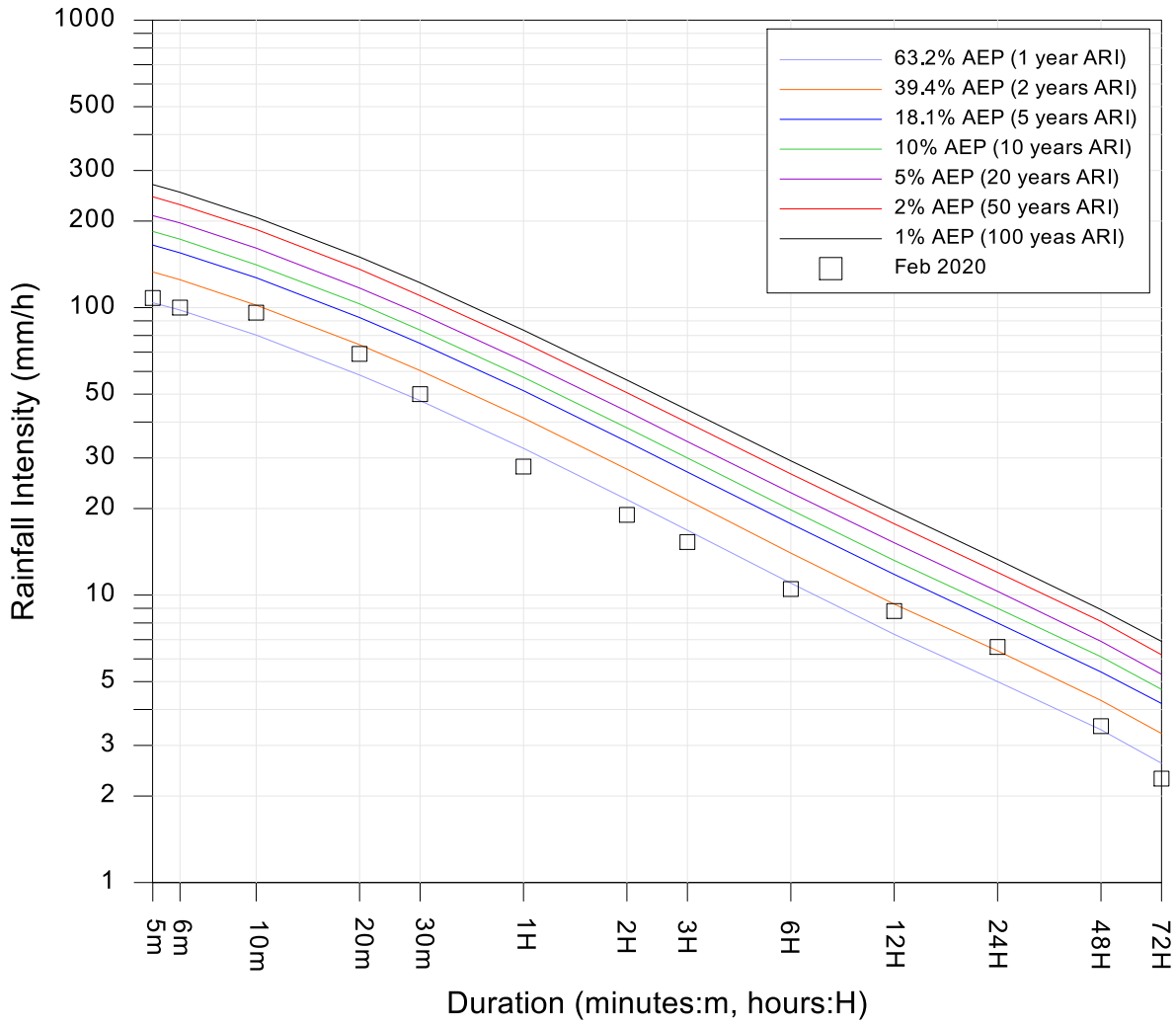
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.33

IFD58147_Figure .pdf

Site Owner: Lismore City Council
Latitude: -28.676 Longitude:153.154

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	108	14:53 13 Feb 2020
6m	100	14:58 13 Feb 2020
10m	96	15:00 13 Feb 2020
20m	69	15:08 13 Feb 2020
30m	50	15:18 13 Feb 2020
1H	28	15:48 13 Feb 2020
2H	19	15:03 13 Feb 2020
3H	15.3	16:03 13 Feb 2020
6H	10.5	15:27 13 Feb 2020
12H	8.8	15:16 13 Feb 2020
24H	6.6	16:12 13 Feb 2020
48H	3.5	07:10 14 Feb 2020
72H	2.3	13:10 14 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Jiggi (Gwynne St) (558086)
Intensity-Frequency-Duration
1 - 29 February 2020

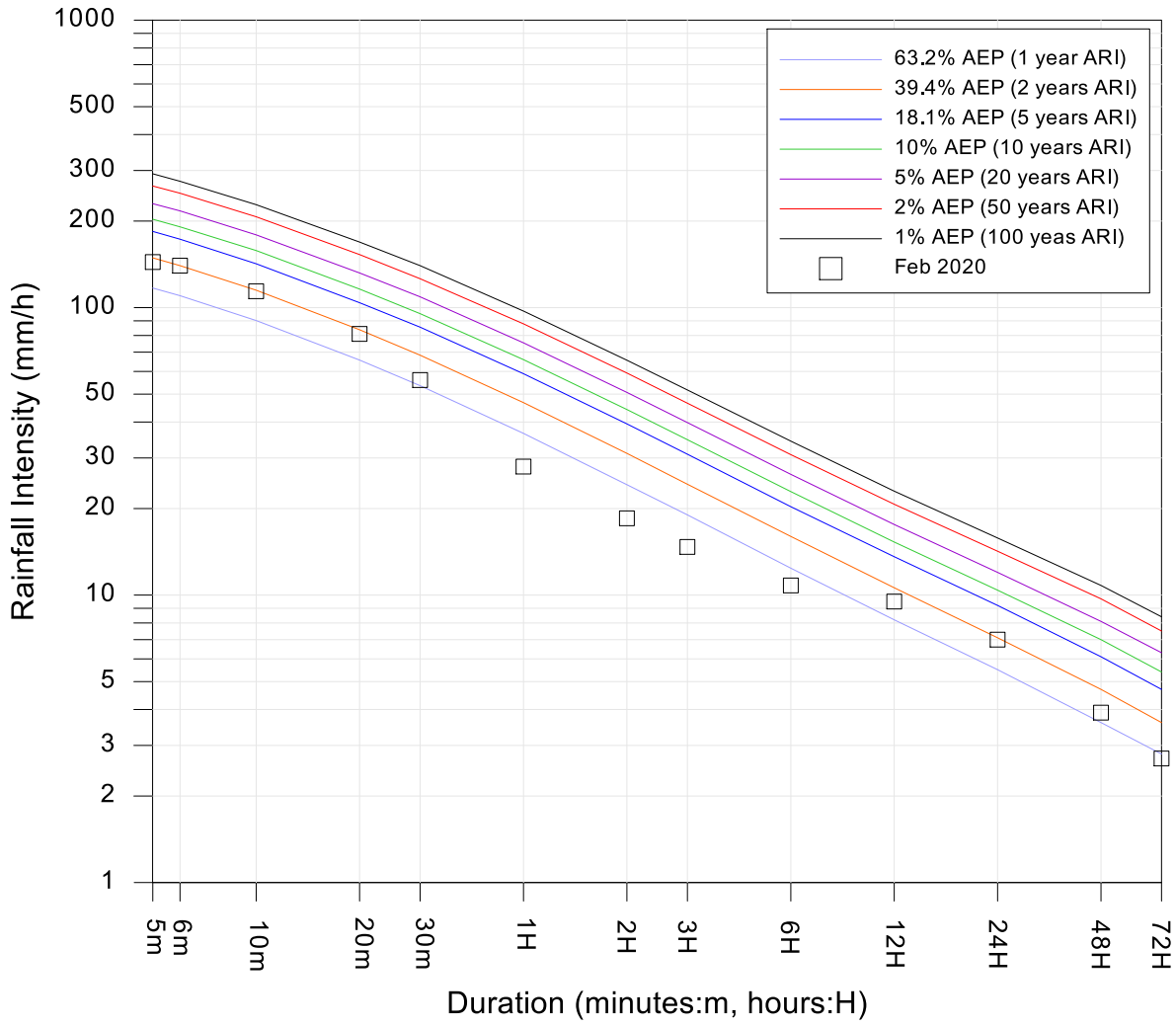
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.34

IFD558086_Figure .pdf

Site Owner: Lismore City Council
Latitude: -28.677 Longitude:153.322

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	144	17:44 03 Feb 2020
6m	140	17:44 03 Feb 2020
10m	114	17:45 03 Feb 2020
20m	81	14:40 13 Feb 2020
30m	56	14:50 13 Feb 2020
1H	28	15:20 13 Feb 2020
2H	18.5	14:42 13 Feb 2020
3H	14.7	09:58 13 Feb 2020
6H	10.8	11:13 13 Feb 2020
12H	9.5	16:52 13 Feb 2020
24H	7	16:41 13 Feb 2020
48H	3.9	10:04 14 Feb 2020
72H	2.7	16:56 13 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Dunoon (558031)
Intensity-Frequency-Duration
1 - 29 February 2020

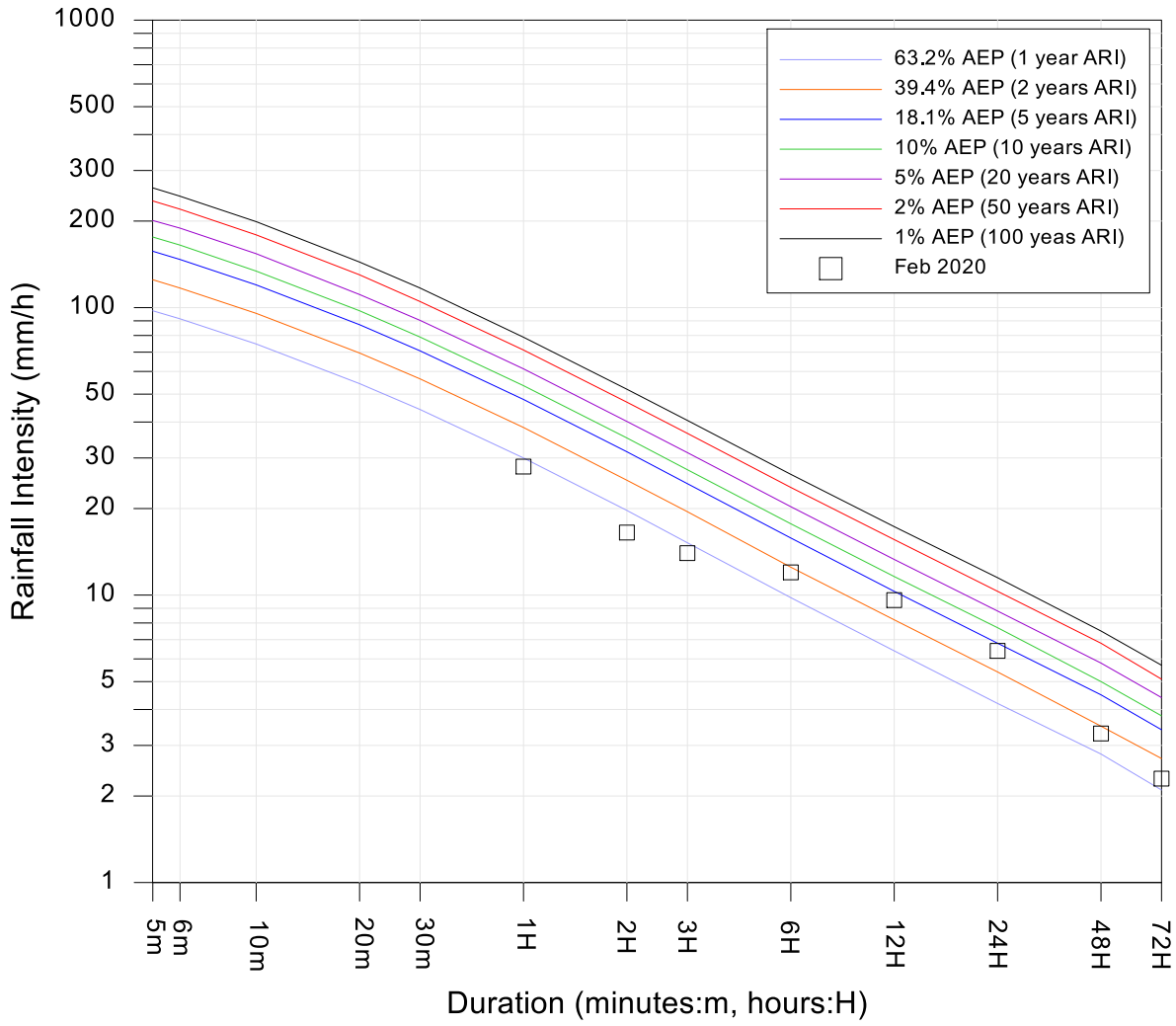
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.35

IFD558031_Figure .pdf

Site Owner: Lismore City Council
Latitude: -28.74 Longitude:153.076

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	28	16:08 13 Feb 2020
2H	16.5	17:08 13 Feb 2020
3H	14	16:15 13 Feb 2020
6H	12	15:47 13 Feb 2020
12H	9.6	17:32 13 Feb 2020
24H	6.4	17:35 13 Feb 2020
48H	3.3	18:35 13 Feb 2020
72H	2.3	15:55 13 Feb 2020

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

Bentley (58202)
Intensity-Frequency-Duration
1 - 29 February 2020

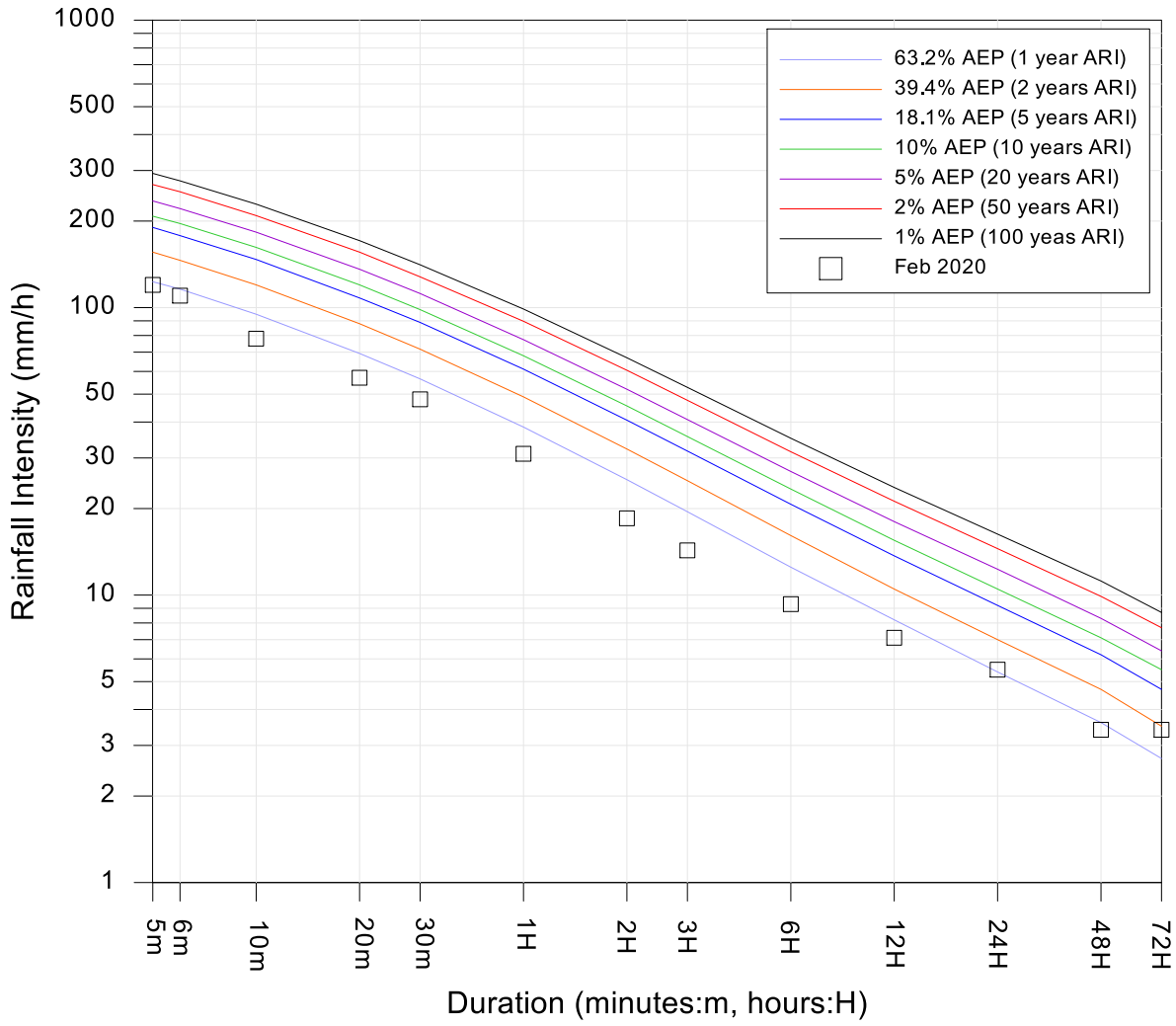
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.36

IFD58202_Figure .pdf

Site Owner: Lismore City Council
Latitude: -28.728 Longitude:153.458

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	120	21:42 12 Feb 2020
6m	110	21:42 12 Feb 2020
10m	78	21:23 26 Feb 2020
20m	57	18:28 10 Feb 2020
30m	48	18:30 10 Feb 2020
1H	31	22:23 12 Feb 2020
2H	18.5	23:06 12 Feb 2020
3H	14.3	22:41 12 Feb 2020
6H	9.3	10:39 13 Feb 2020
12H	7.1	09:35 13 Feb 2020
24H	5.5	13:48 07 Feb 2020
48H	3.4	11:42 08 Feb 2020
72H	3.4	13:48 09 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Nashua (Wilsons River) (58162)
Intensity-Frequency-Duration
1 - 29 February 2020

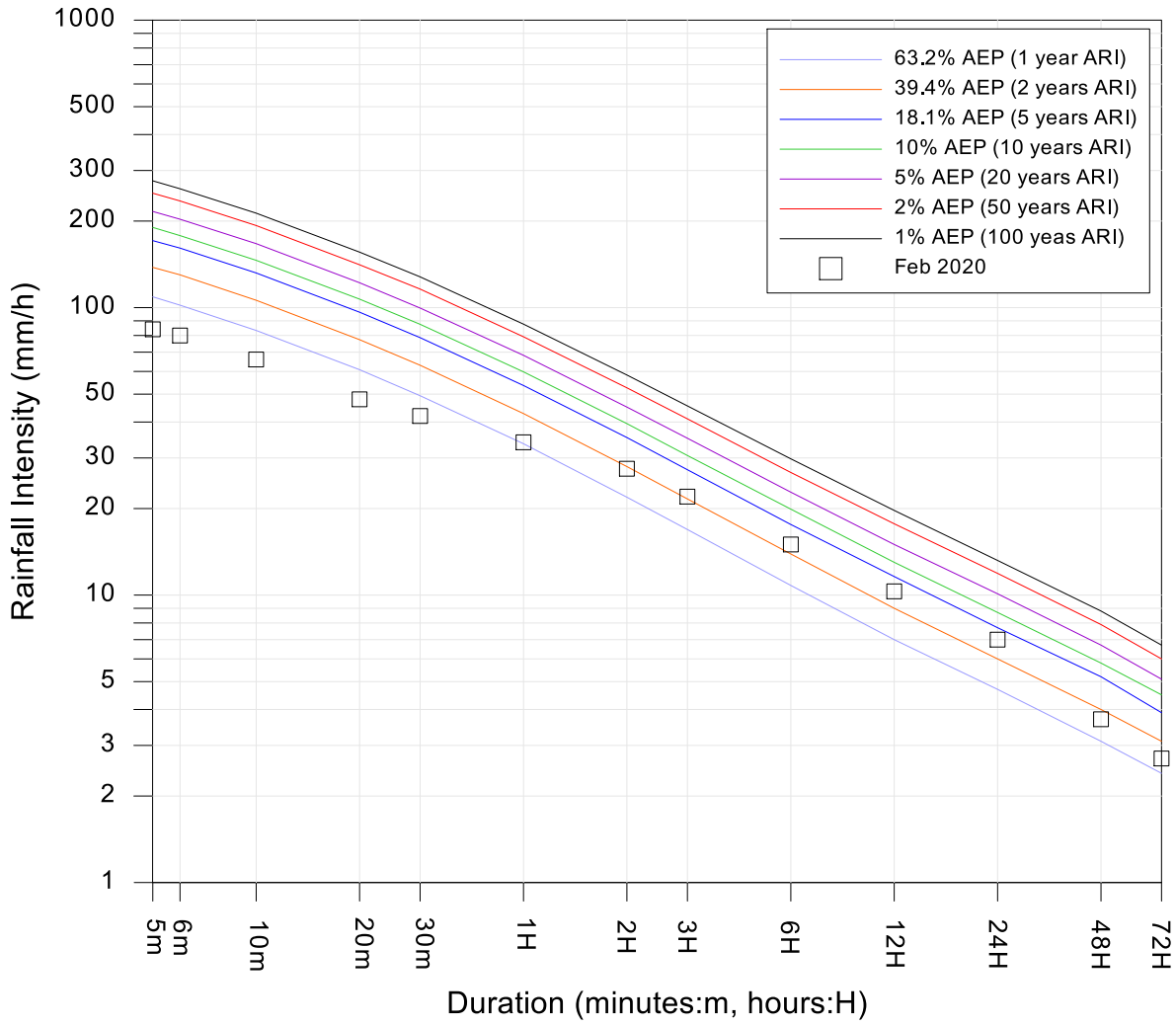
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.37

IFD58162_Figure .pdf

Site Owner: Lismore City Council
Latitude: -28.749 Longitude:153.218

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	84	20:16 26 Feb 2020
6m	80	20:17 26 Feb 2020
10m	66	20:19 26 Feb 2020
20m	48	10:43 13 Feb 2020
30m	42	10:53 13 Feb 2020
1H	34	10:52 13 Feb 2020
2H	27.5	11:05 13 Feb 2020
3H	22	10:59 13 Feb 2020
6H	15	11:11 13 Feb 2020
12H	10.3	17:05 13 Feb 2020
24H	7	16:05 13 Feb 2020
48H	3.7	06:18 14 Feb 2020
72H	2.7	16:06 13 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Goolmangar (558075)
Intensity-Frequency-Duration
1 - 29 February 2020

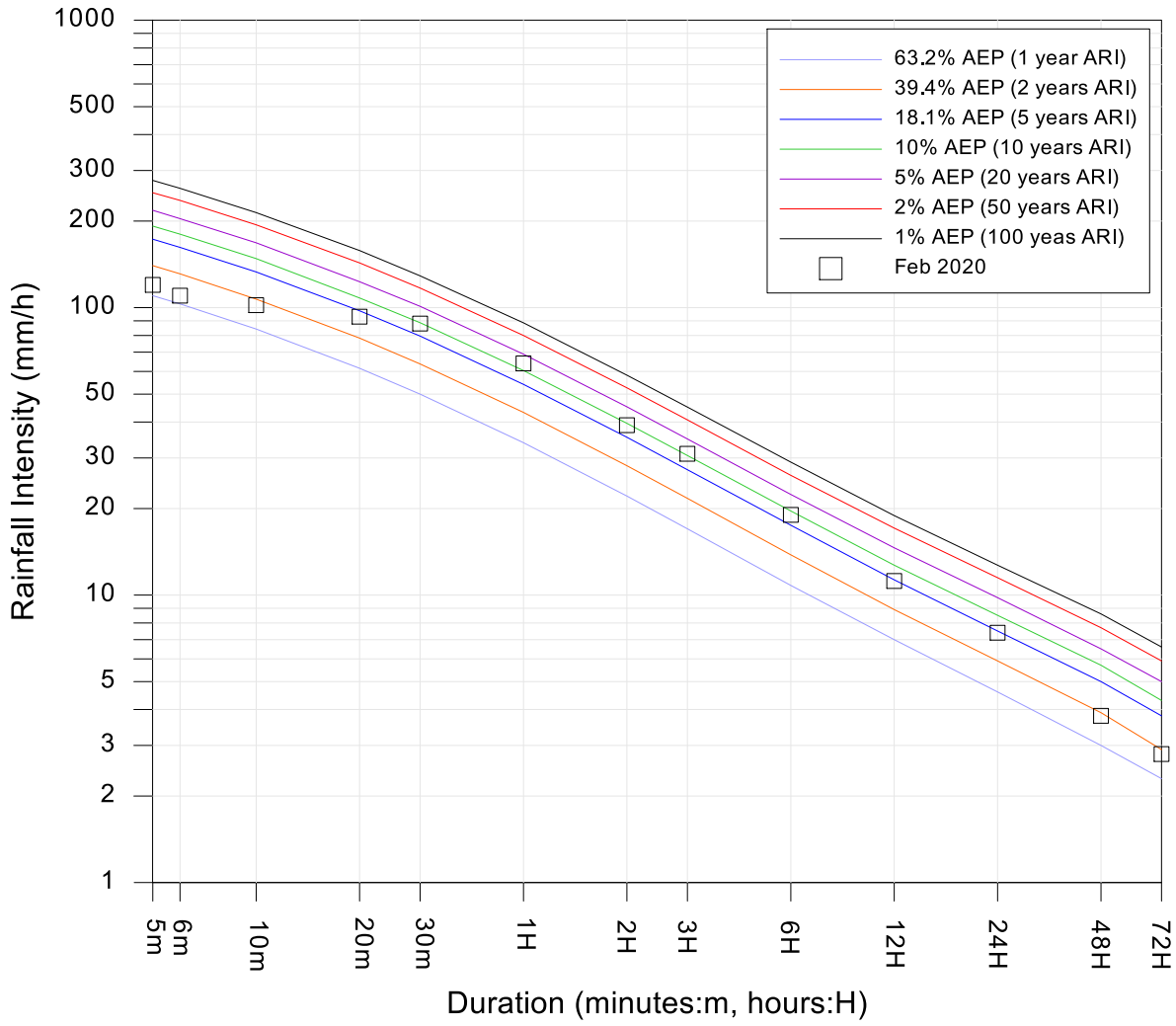
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.38

IFD558075_Figure .pdf

Site Owner: Lismore City Council
Latitude: -28.797 Longitude:153.239

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	120	11:14 13 Feb 2020
6m	110	11:15 13 Feb 2020
10m	102	11:17 13 Feb 2020
20m	93	11:29 13 Feb 2020
30m	88	11:34 13 Feb 2020
1H	64	11:44 13 Feb 2020
2H	39	11:44 13 Feb 2020
3H	31	12:32 13 Feb 2020
6H	19	12:40 13 Feb 2020
12H	11.2	18:15 13 Feb 2020
24H	7.4	18:15 13 Feb 2020
48H	3.8	11:41 14 Feb 2020
72H	2.8	17:29 13 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Tuncester (58201)
Intensity-Frequency-Duration
1 - 29 February 2020

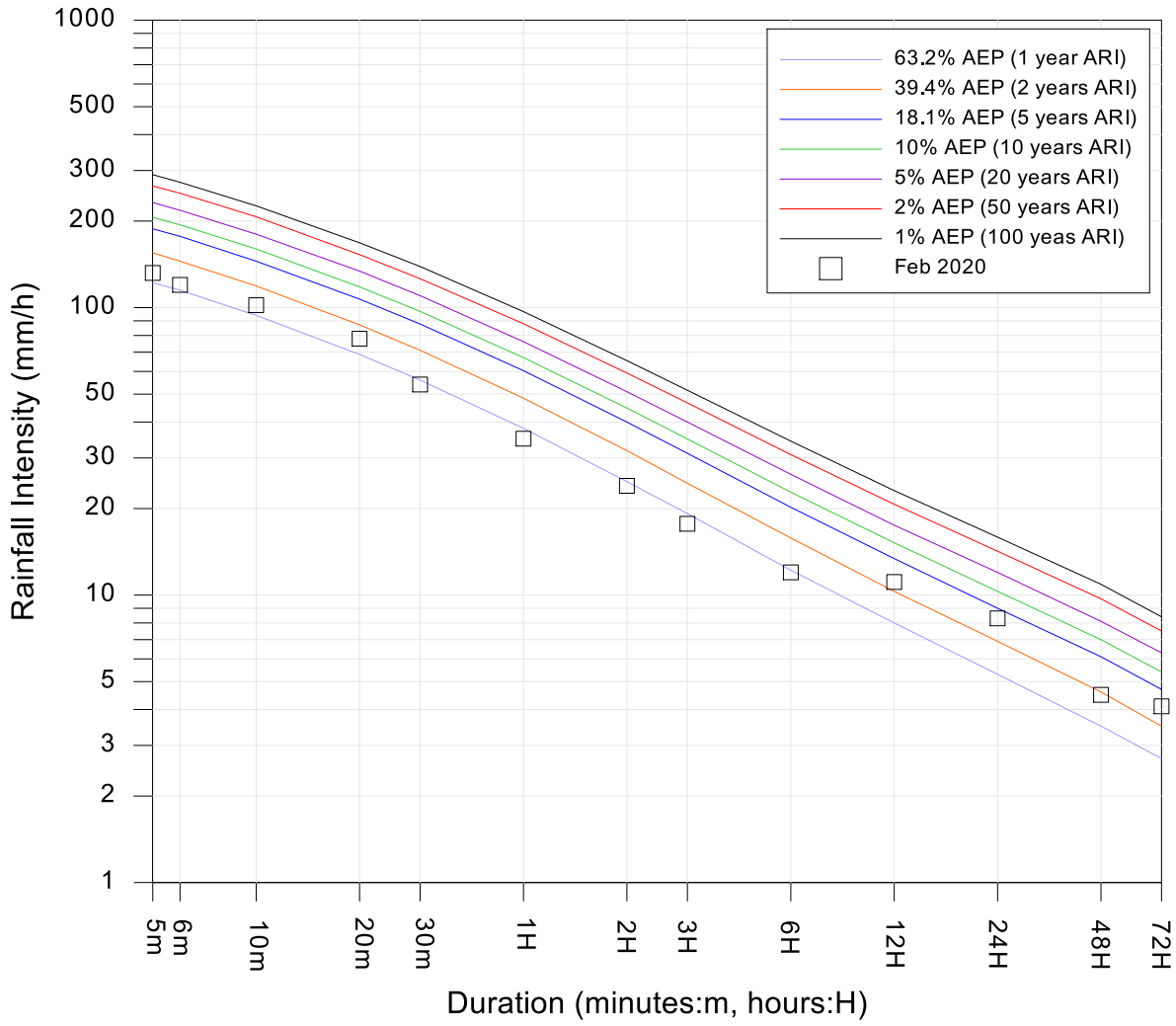
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.39

IFD58201_Figure .pdf

Site Owner: Ballina Shire Council
Latitude: -28.785 Longitude:153.474

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	132	17:47 03 Feb 2020
6m	120	17:48 03 Feb 2020
10m	102	17:48 03 Feb 2020
20m	78	09:47 12 Feb 2020
30m	54	09:57 12 Feb 2020
1H	35	14:41 06 Feb 2020
2H	24	15:19 06 Feb 2020
3H	17.7	15:33 06 Feb 2020
6H	12	15:33 06 Feb 2020
12H	11.1	00:11 07 Feb 2020
24H	8.3	07:49 07 Feb 2020
48H	4.5	12:04 07 Feb 2020
72H	4.1	04:45 09 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Houghlahans Creek (558069)
Intensity-Frequency-Duration
1 - 29 February 2020

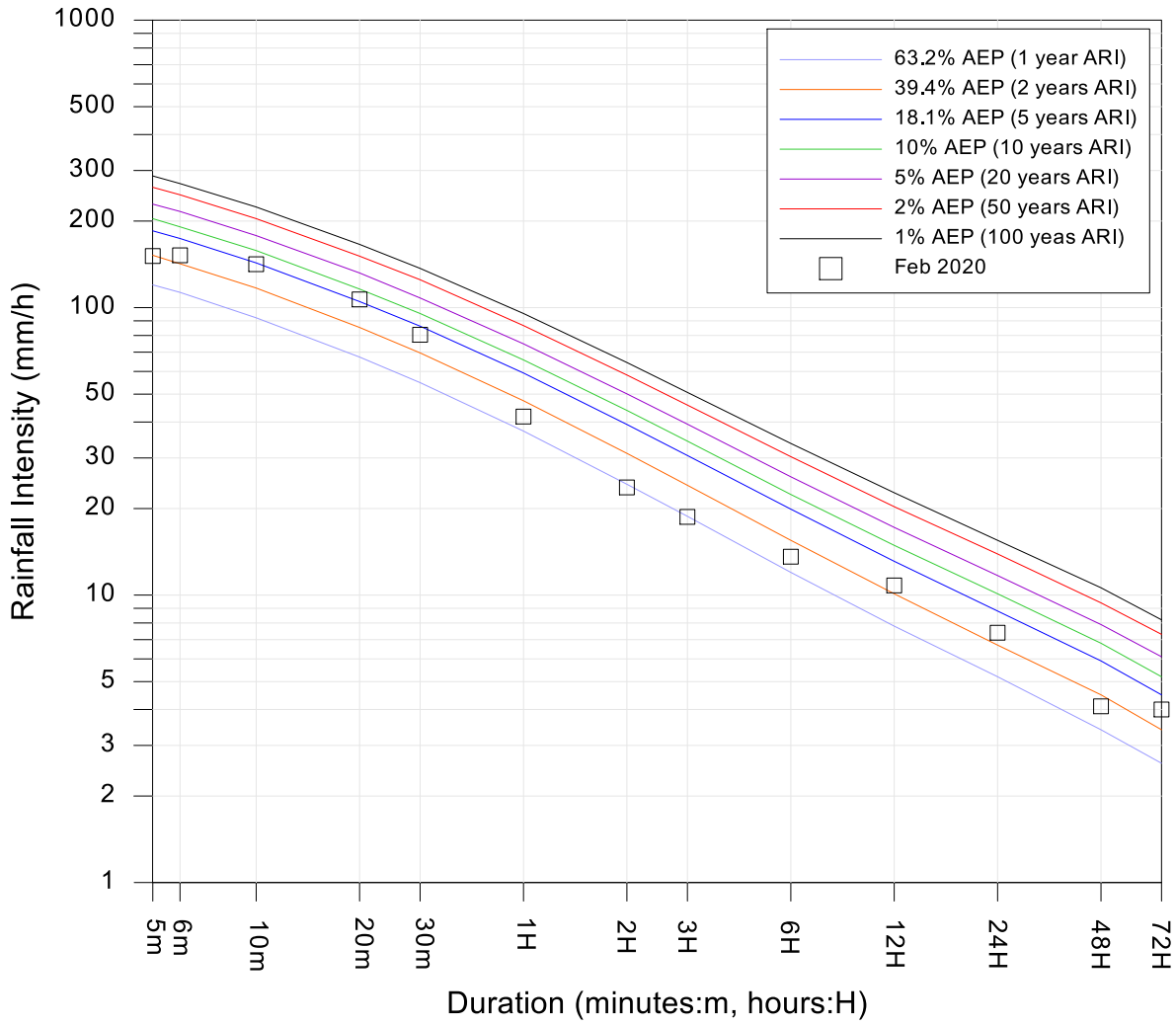
Manly Hydraulics Laboratory

Report MHL2752
Figure
4.40

IFD558069_Figure .pdf

Site Owner: Ballina Shire Council
Latitude: -28.831 Longitude:153.444

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	151.2	21:05 26 Feb 2020
6m	152	21:05 26 Feb 2020
10m	141.6	21:09 26 Feb 2020
20m	106.8	21:17 26 Feb 2020
30m	80.4	21:27 26 Feb 2020
1H	41.8	21:57 26 Feb 2020
2H	23.7	15:35 06 Feb 2020
3H	18.7	15:35 06 Feb 2020
6H	13.6	15:43 06 Feb 2020
12H	10.8	23:52 06 Feb 2020
24H	7.4	08:27 07 Feb 2020
48H	4.1	07:07 08 Feb 2020
72H	4	03:47 09 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Alstonville STP (558072)
Intensity-Frequency-Duration
1 - 29 February 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
4.41

IFD558072_Figure .pdf

5 Orara River region

5.1 Orara River region – water level

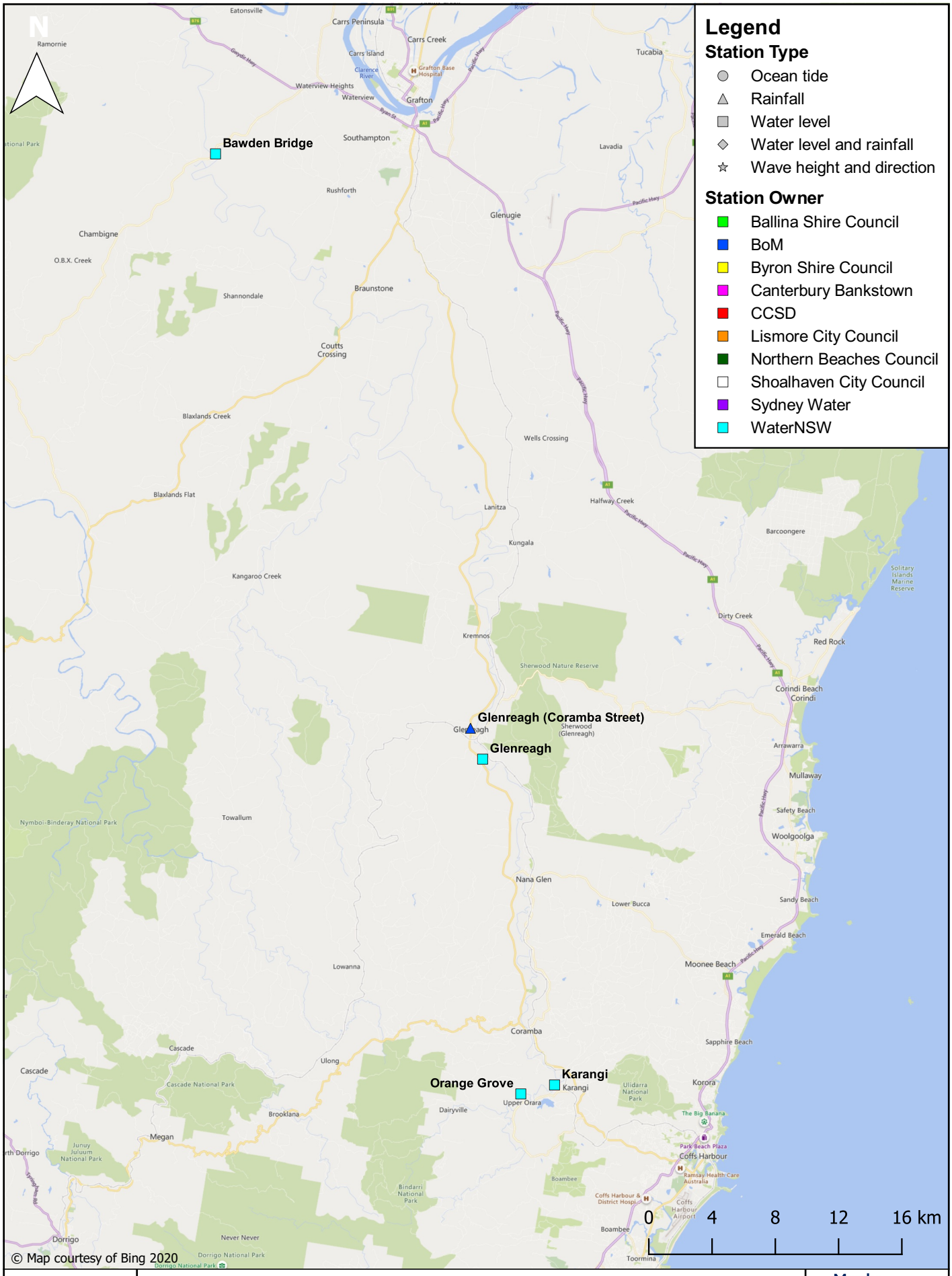
The peak observed water levels for the Orara River region are listed in **Table 5.1**. **Table 5.2** lists the SES flood classification for Glenreagh. The locations of water level stations within the Orara River region are shown in **Figure 5.1**. The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 5.2** to **Figure 5.5**.

Table 5.1 Orara River region flood peaks

Station name	Station number	Owner	Datum	Level (m)
Bawden Bridge	204041	WaterNSW	Local Datum	17.22
Glenreagh	204906	WaterNSW	Local Datum	10.64
Karangi	204025	WaterNSW	Local Datum	6.18
Orange Grove	204068	WaterNSW	Local Datum	6.72

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 AHD)				
Glenreagh	204906	5.0	9.0	13.0	10.64	Moderate



NSW GOVERNMENT

ORARA RIVER STATIONS

Manly Hydraulics Laboratory

Report MHL2752
Figure
5.1

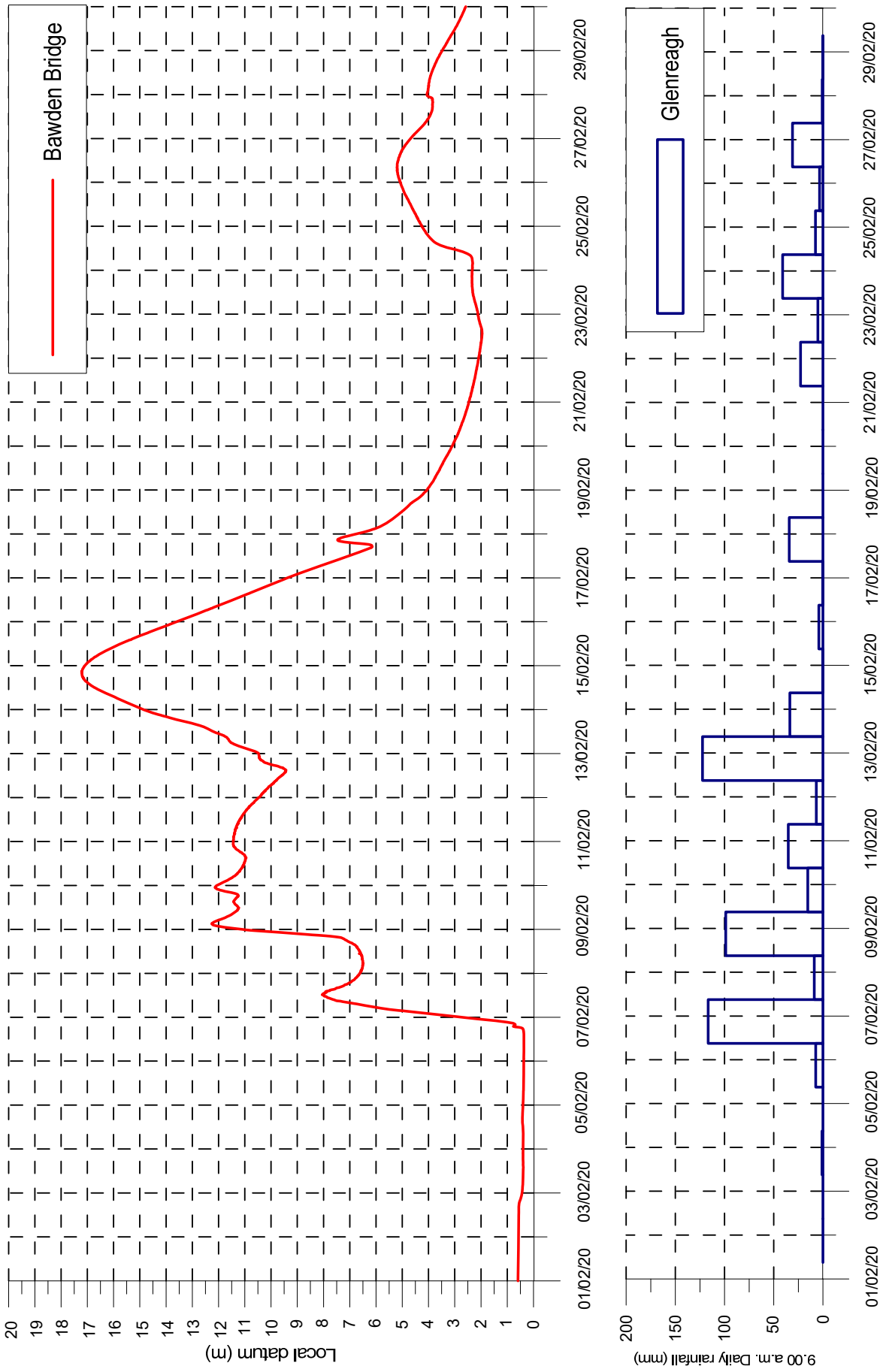
Figures_MHL2752.qgs

5.2 Orara River region – rainfall

The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 5.2** to **Figure 5.5**. 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 5.3** for the period 01 to 29 February 2020. The rainfall intensities are displayed graphically in **Figure 5.6**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 5.3 Orara River region daily rainfall totals

Date	Glenreagh (Coramba St) 59054 (mm)
	BoM
01/02/2020	0.0
02/02/2020	0.0
03/02/2020	0.0
04/02/2020	1.0
05/02/2020	0.0
06/02/2020	7.4
07/02/2020	116.6
08/02/2020	8.8
09/02/2020	98.8
10/02/2020	15.4
11/02/2020	35.2
12/02/2020	6.8
13/02/2020	122.4
14/02/2020	33.6
15/02/2020	0.2
16/02/2020	4.2
17/02/2020	0.2
18/02/2020	34.2
19/02/2020	0.0
20/02/2020	0.0
21/02/2020	0.0
22/02/2020	22.8
23/02/2020	5.2
24/02/2020	41.0
25/02/2020	7.6
26/02/2020	3.4
27/02/2020	31.0
28/02/2020	0.8
29/02/0202	0.2
01/03/2020	0.0



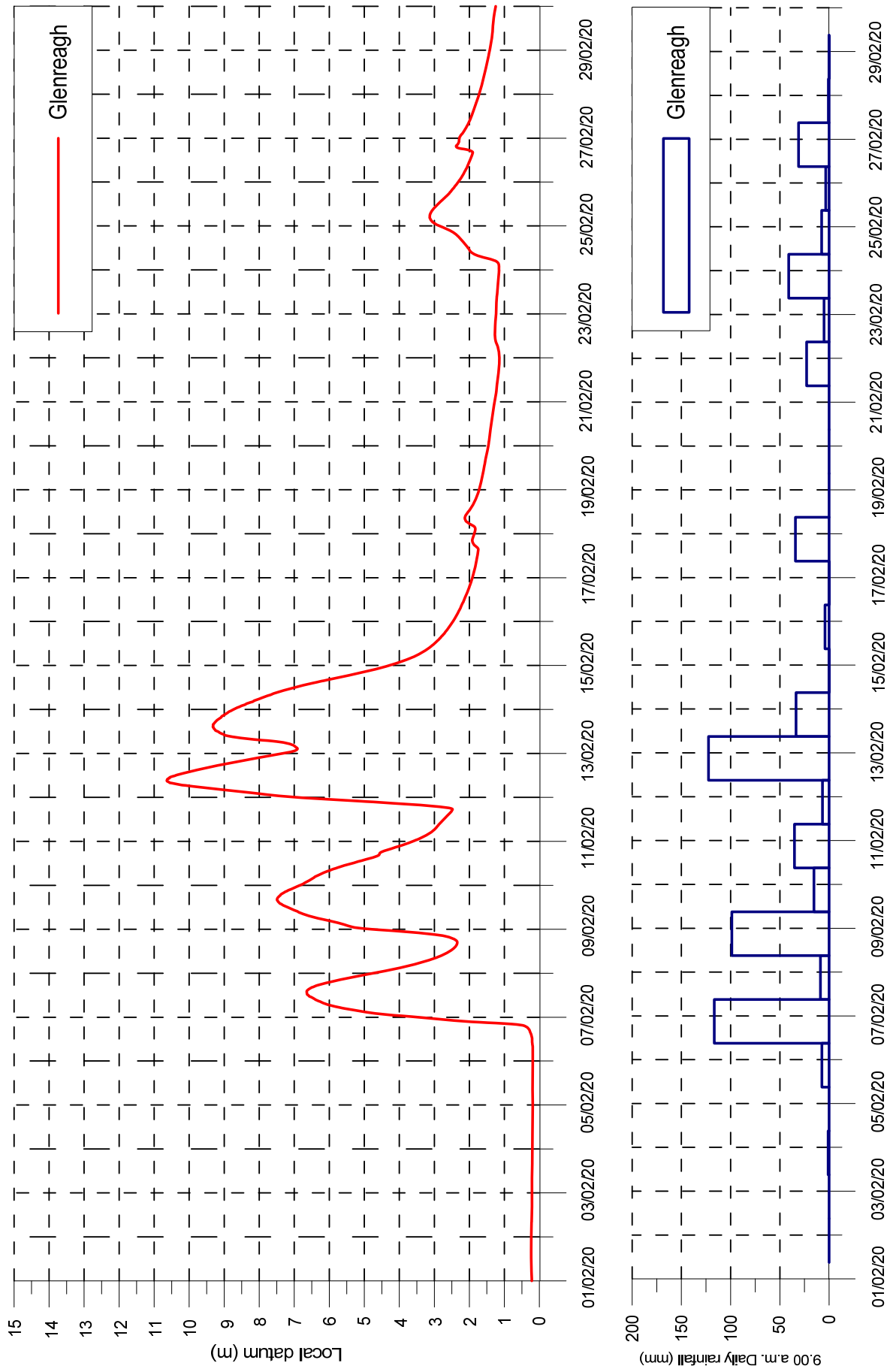
NSW GOVERNMENT

ORARA RIVER REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
5.2

Figures_MHL2752.pptx



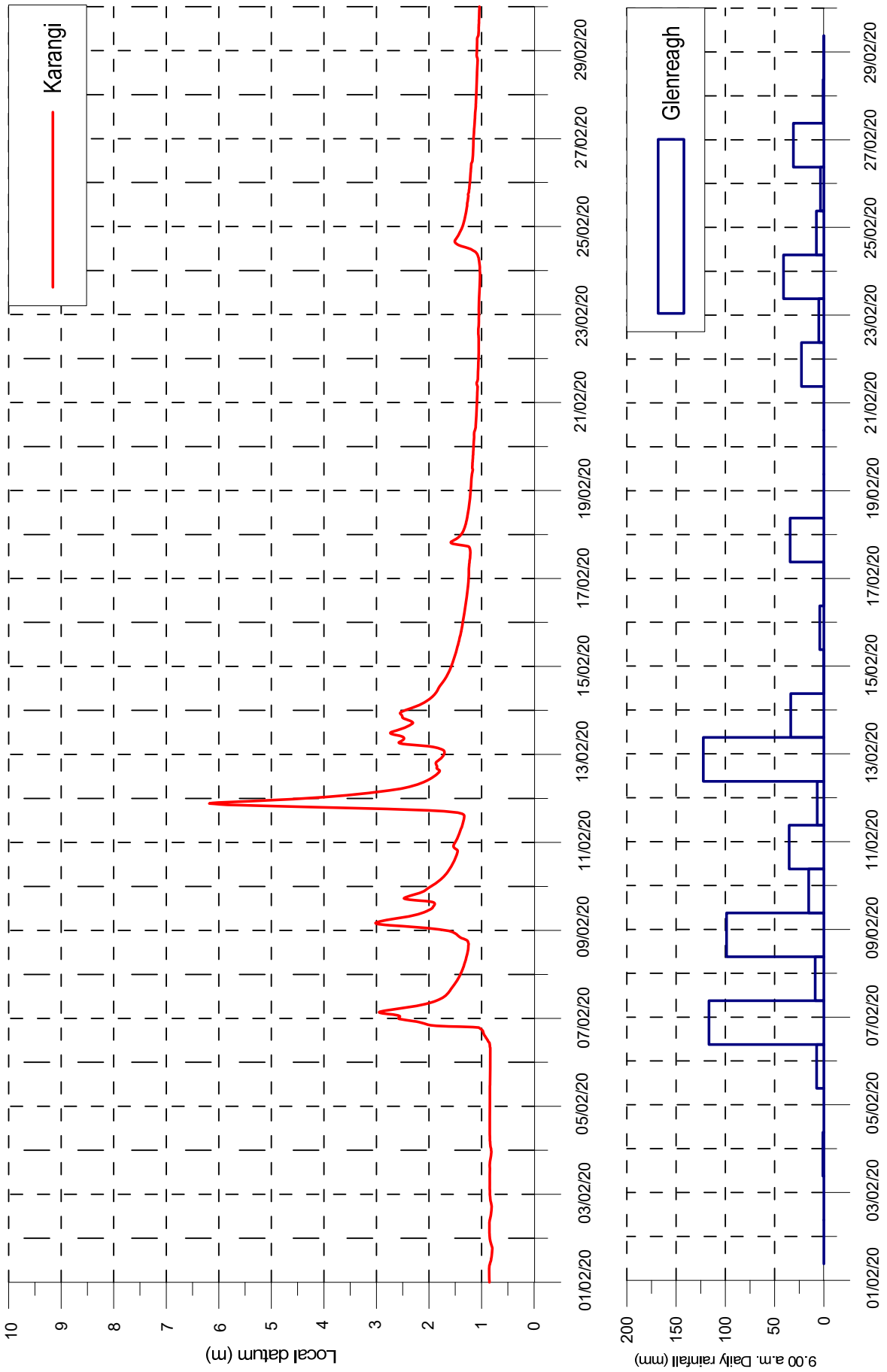
NSW GOVERNMENT

ORARA RIVER REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
5.3

Figures_MHL2752.pptx



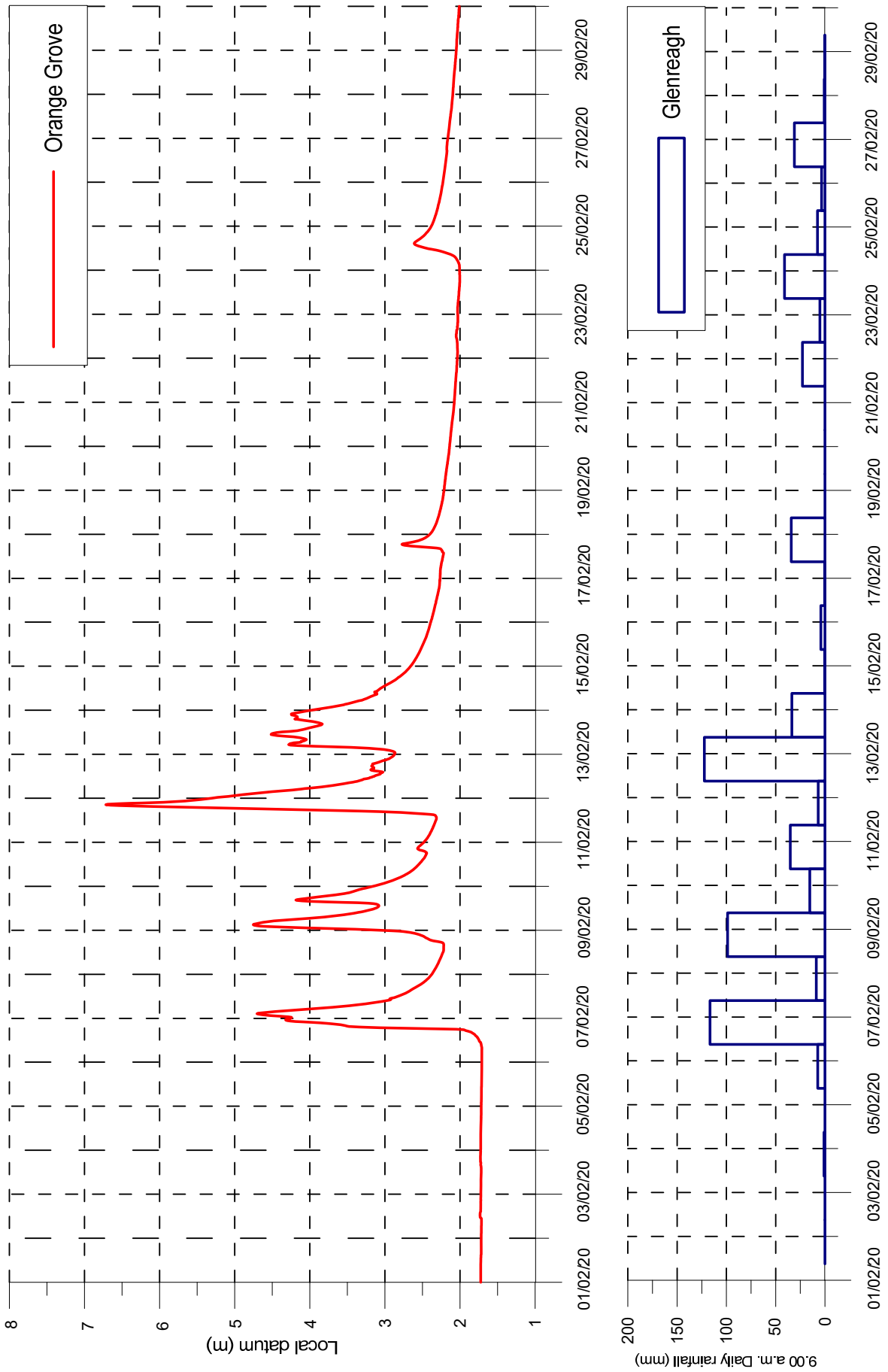
NSW GOVERNMENT

ORARA RIVER REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
5.4

Figures_MHL2752.pptx



NSW GOVERNMENT

ORARA RIVER REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

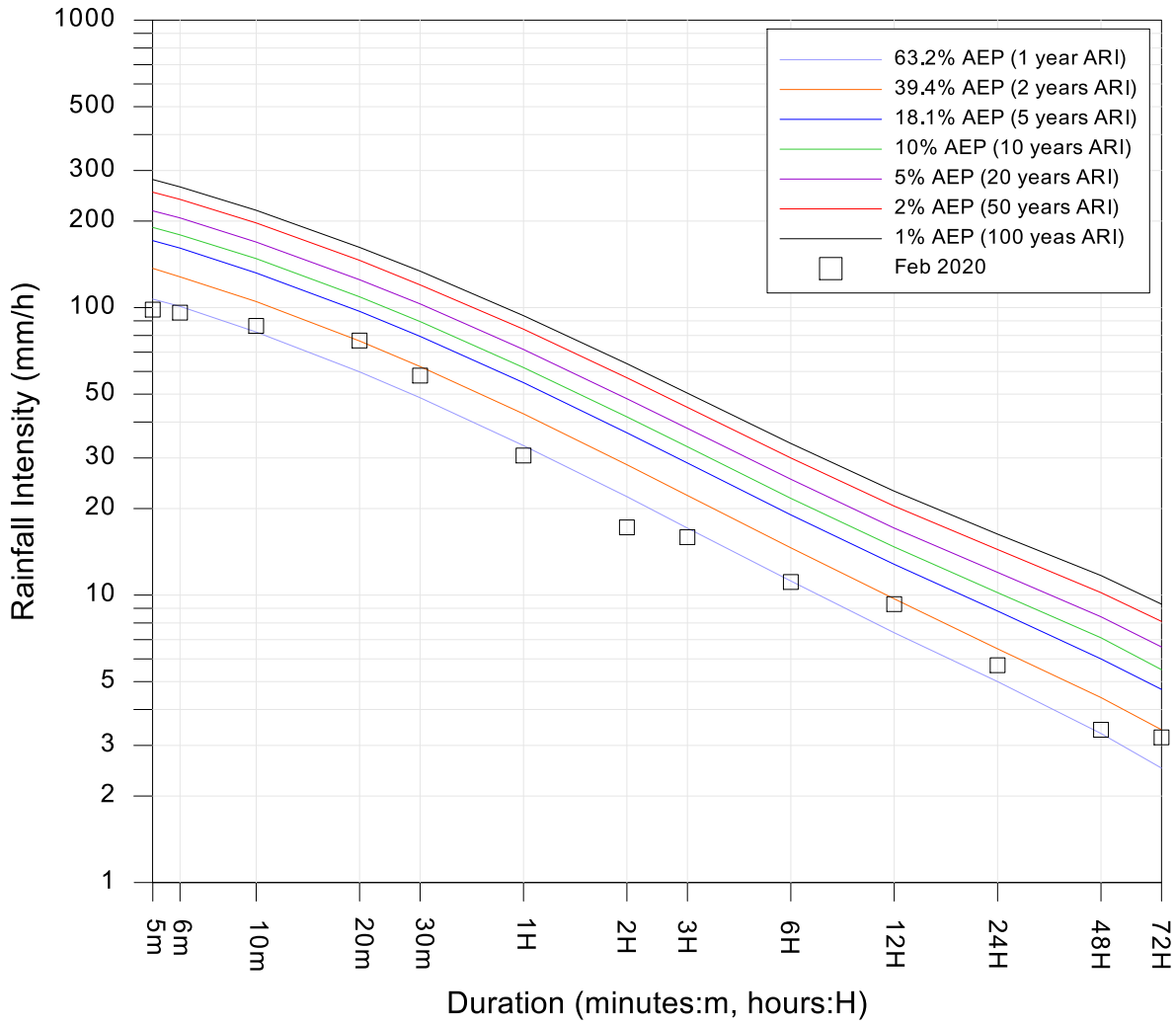
Manly Hydraulics Laboratory

Report MHL2752
Figure
5.5

Figures_MHL2752.pptx

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	98.4	16:15 26 Feb 2020
6m	96	16:15 26 Feb 2020
10m	86.4	15:39 10 Feb 2020
20m	76.8	15:47 10 Feb 2020
30m	58	15:53 10 Feb 2020
1H	30.6	16:23 10 Feb 2020
2H	17.2	17:24 10 Feb 2020
3H	15.9	23:15 08 Feb 2020
6H	11.1	09:17 13 Feb 2020
12H	9.3	11:11 13 Feb 2020
24H	5.7	22:14 13 Feb 2020
48H	3.4	21:17 13 Feb 2020
72H	3.2	06:02 09 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Glenreagh (Coramba Street) (59054)
Intensity-Frequency-Duration
1 - 29 February 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
5.6

IFD59054_Figure .pdf

6 Tuggerah Lake region

6.1 Tuggerah Lake region – water level

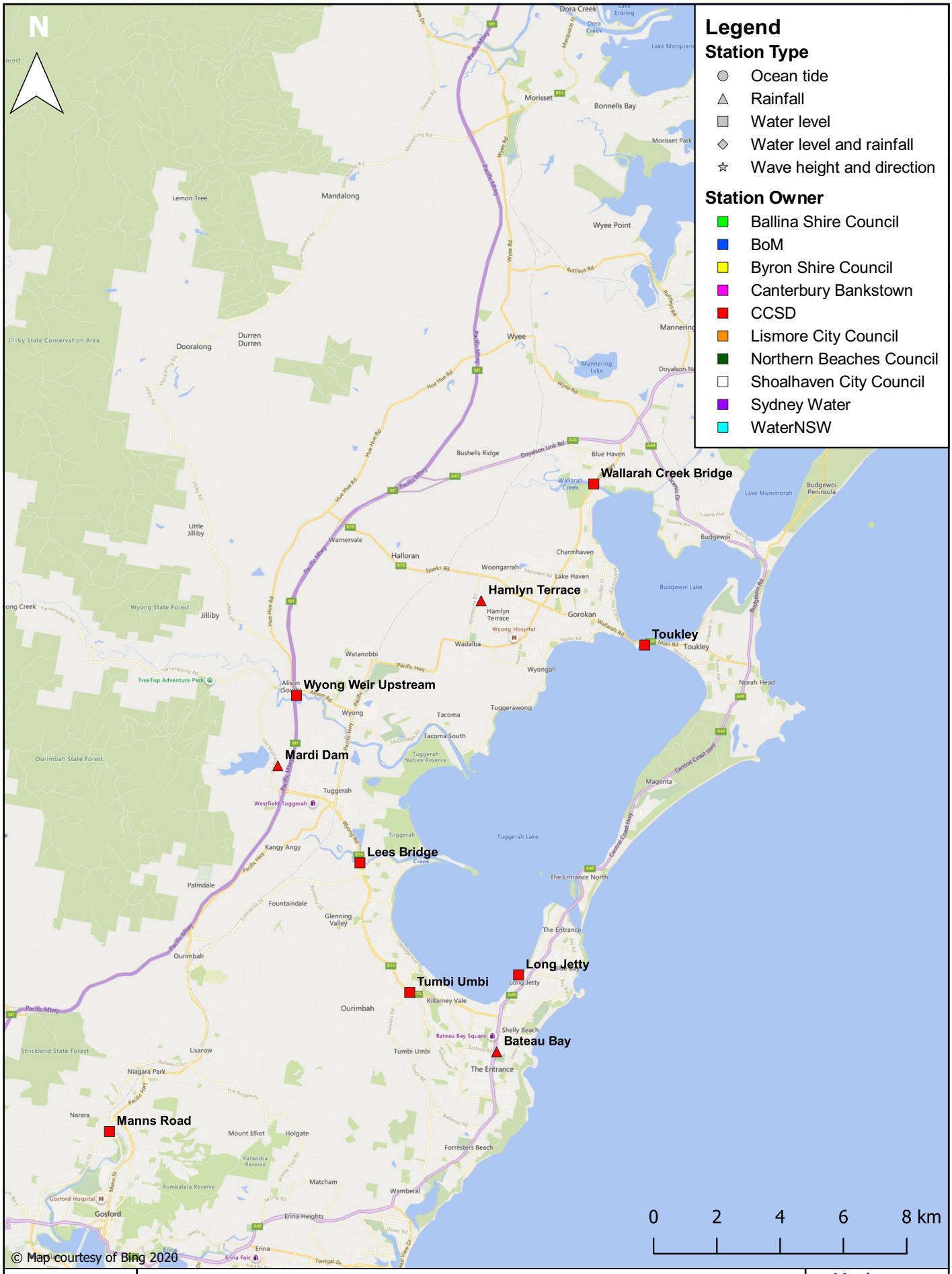
The peak observed water levels for the Tuggerah Lake region are listed in **Table 6.1**. **Table 6.2** lists the SES flood classification for Long Jetty. The locations of water level stations within the Tuggerah Lake region are shown in **Figure 6.1**. The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 6.2** to **Figure 6.4**.

Table 6.1 Tuggerah Lake region flood peaks

Station name	Station number	Owner	Datum	Level (m)
Wallarah Creek Bridge	211420	CCSD	AHD	1.65
Toukley	211401	CCSD	AHD	1.66
Wyong Weir Upstream	211417	CCSD	AHD	5.45
Lees Bridge	211425	CCSD	AHD	2.69
Long Jetty	211418	CCSD	AHD	1.67
Tumbi Umbi	211419	CCSD	AHD	1.88
Manns Road	211435	CCSD	AHD	2.92

Table 6.2 SES flood classification for Long Jetty

Station name	Station number	Flood Classification			Flood Peak (m)	Flood Event Classification
		Minor	Moderate	Major		
		Water Level (m AHD)				
Long Jetty	211418	0.9	1.8	2.2	1.67	Minor



NSW GOVERNMENT

TUGGERAH LAKE STATIONS

Manly Hydraulics Laboratory

Report MHL2752
Figure
6.1

Figures_MHL2752.qgs

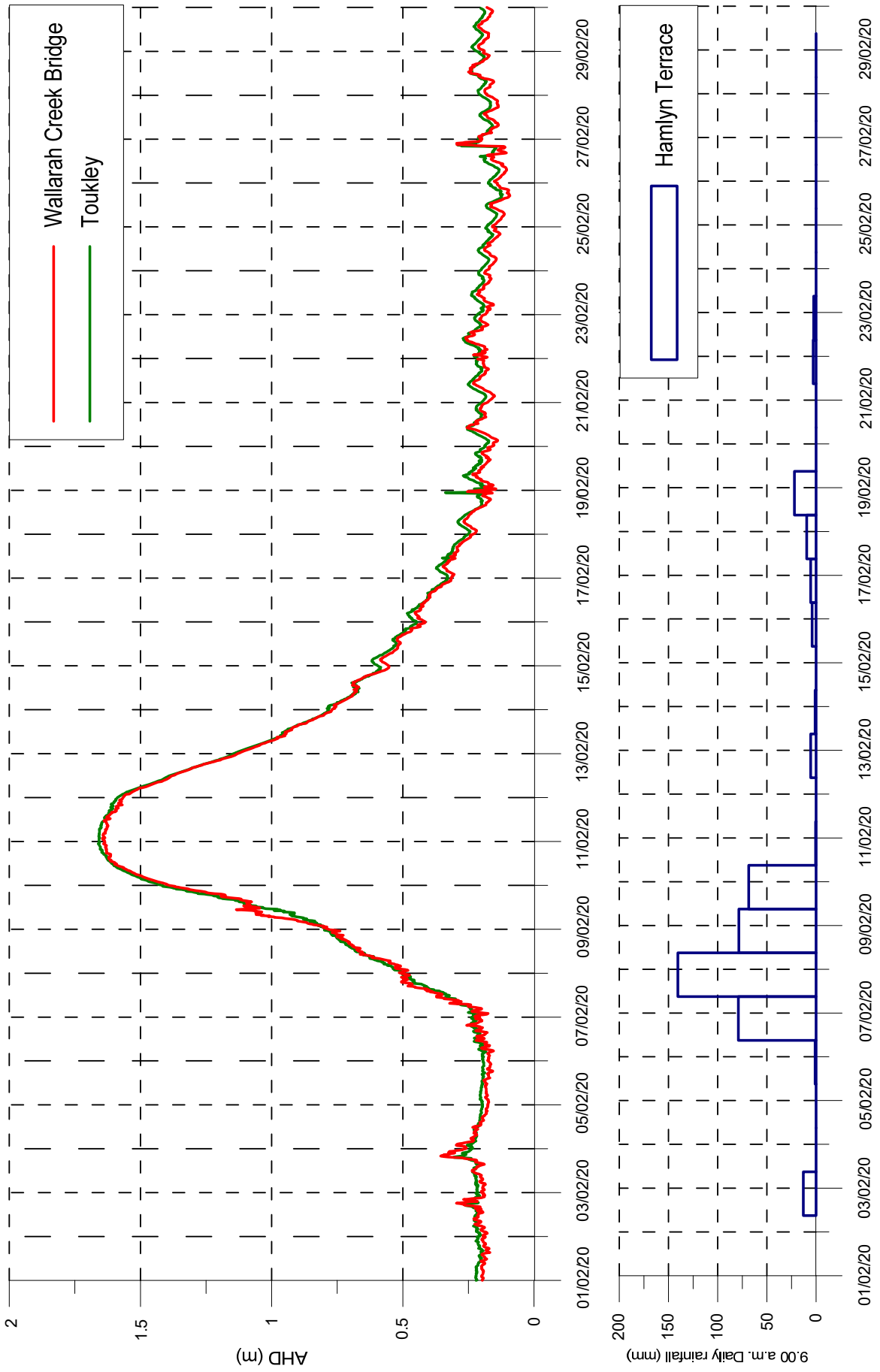
6.2 Tuggerah Lake region – rainfall

The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 6.2** to **Figure 6.4**. 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 6.3** for the period 01 to 29 February 2020. The rainfall intensities are displayed graphically in **Figure 6.5** to **Figure 6.7**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 6.3 Tuggerah Lake region daily rainfall totals

Date	Toukley* 211401 (mm)	Hamlyn Terrace 561133 (mm)	Bateau Bay 561069 (mm)	Mardi Dam 561082 (mm)
	CCSD	CCSD	CCSD	CCSD
01/02/2020	0.0	0.0	0.0	0.0
02/02/2020	0.0	0.0	0.0	0.0
03/02/2020	16.5	13.0	2.0	6.5
04/02/2020	4.5	0.0	0.5	0.0
05/02/2020	0.0	0.0	0.0	0.0
06/02/2020	0.0	1.0	3.0	1.5
07/02/2020	-	79.0	62.0	80.0
08/02/2020	-	140.5	153.5	177.0
09/02/2020	-	78.5	47.0	85.0
10/02/2020	-	68.5	74.0	70.0
11/02/2020	-	0.5	0.0	0.5
12/02/2020	0.0	0.0	0.0	0.0
13/02/2020	7.5	5.5	3.0	2.0
14/02/2020	0.0	1.0	7.0	1.5
15/02/2020	0.0	0.0	0.0	0.0
16/02/2020	4.0	4.0	7.0	4.0
17/02/2020	1.0	5.5	0.0	0.0
18/02/2020	6.5	9.5	3.0	13.5
19/02/2020	13.5	22.0	18.5	15.5
20/02/2020	0.0	0.0	0.0	0.0
21/02/2020	0.0	0.0	0.0	0.0
22/02/2020	3.5	3.0	54.5	21.5
23/02/2020	3.0	2.5	3.0	1.0
24/02/2020	0.0	0.0	0.0	0.0
25/02/2020	0.0	0.0	0.0	0.0
26/02/2020	0.0	0.0	0.0	0.0
27/02/2020	0.0	0.0	5.5	0.0
28/02/2020	0.0	0.0	0.0	0.0
29/02/0202	0.0	0.0	0.0	0.0

*Toukley rainfall station lost data during the February 2020 flood event due to excess tips being recorded.



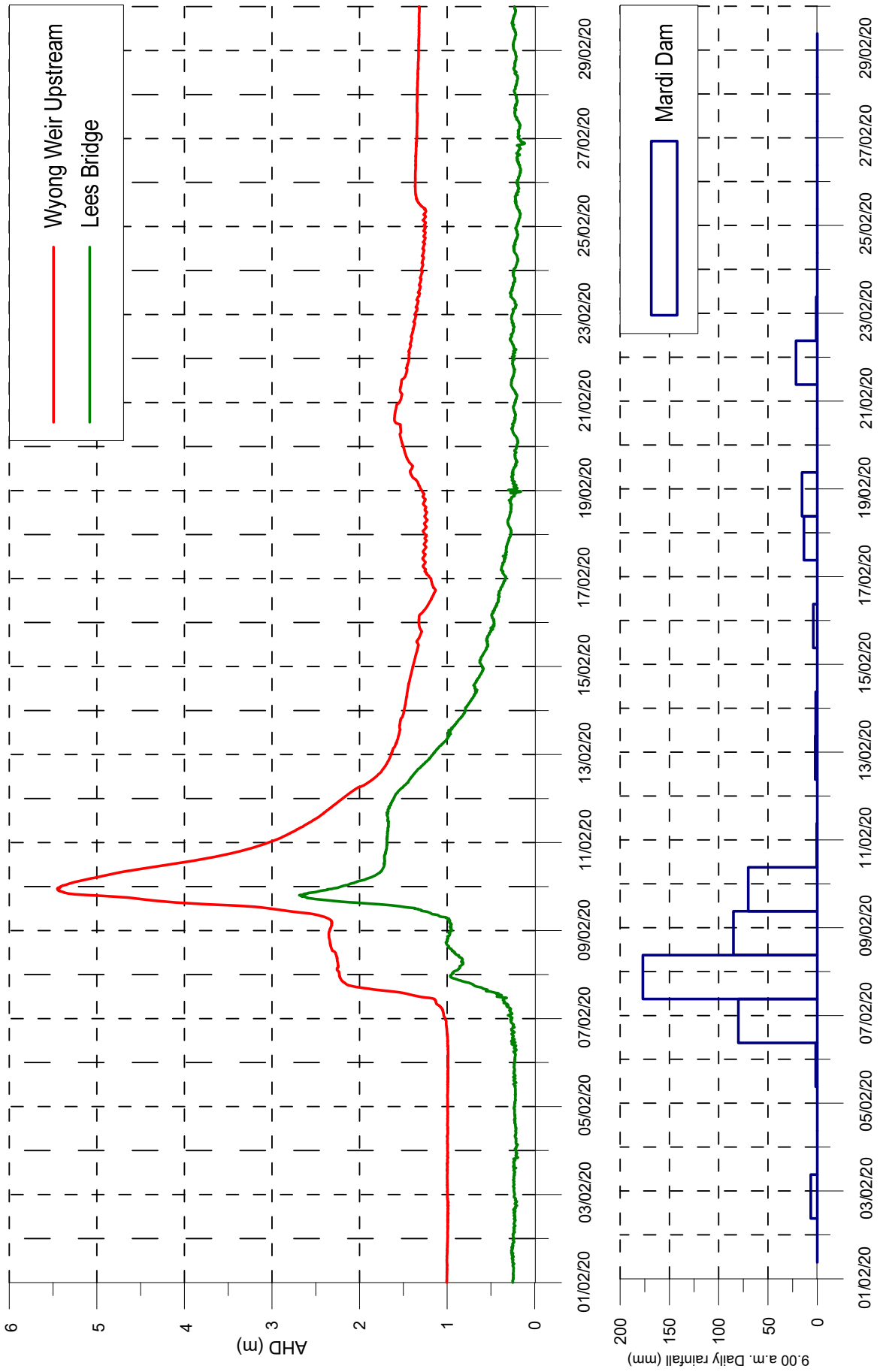
NSW GOVERNMENT

TUGGERAH LAKE REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
6.2

Figures_MHL2752.pptx



NSW GOVERNMENT

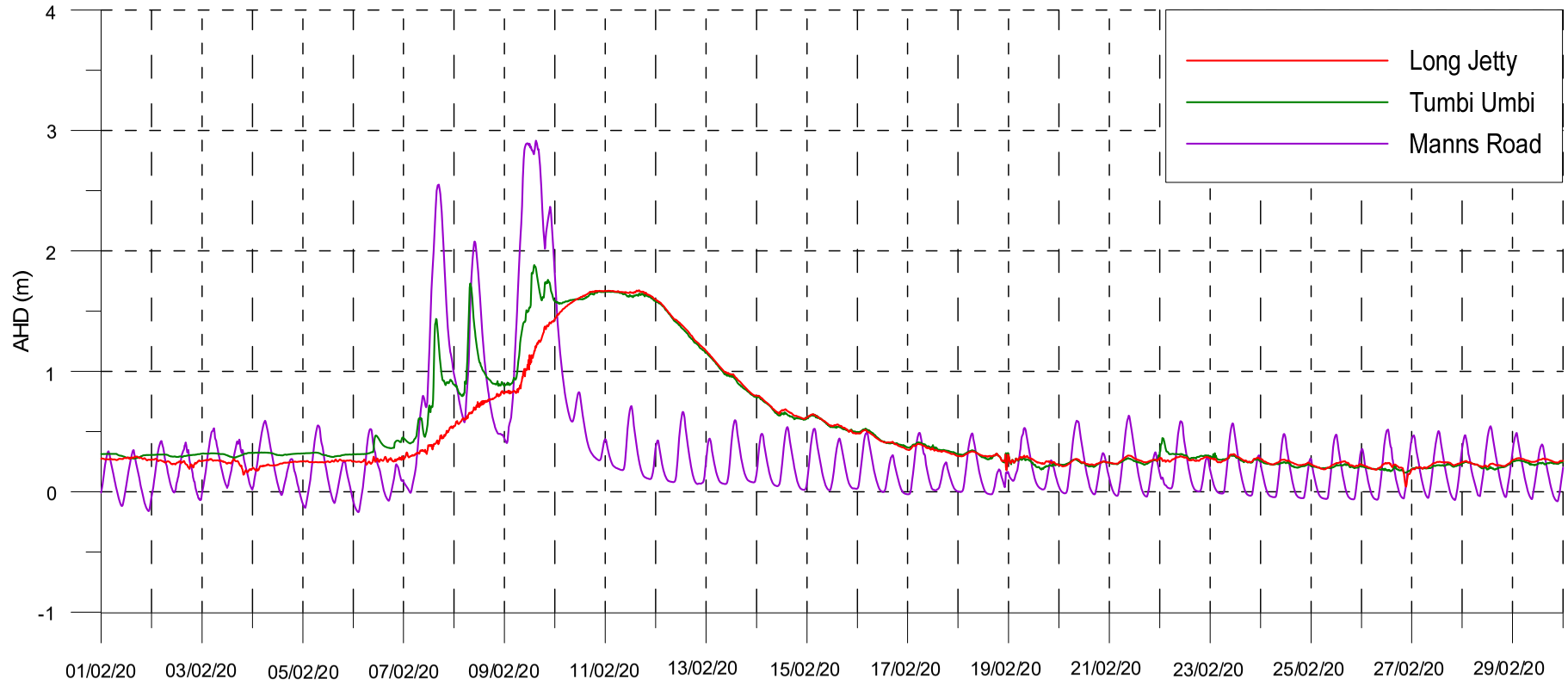
TUGGERAH LAKE REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

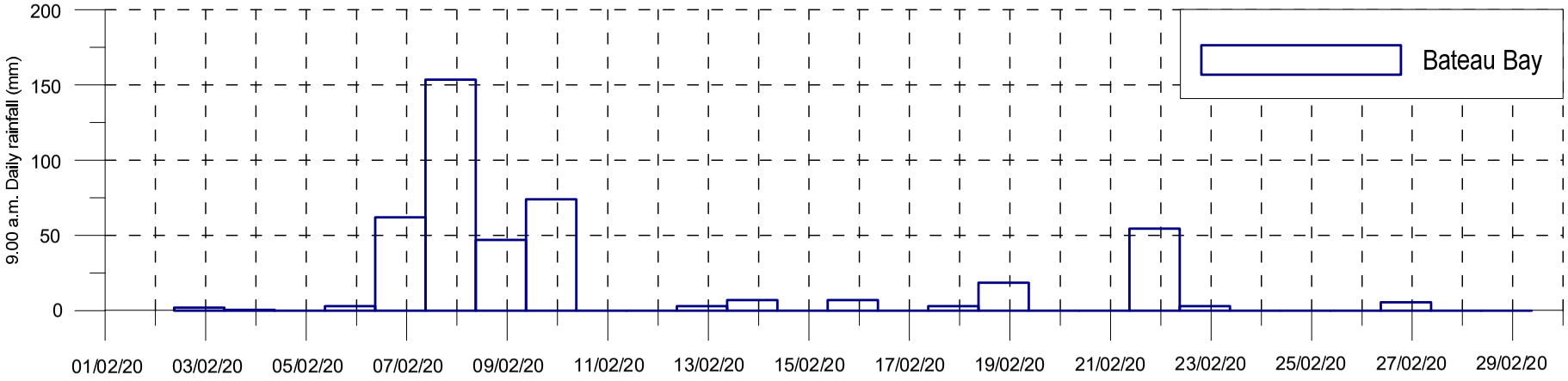
Manly Hydraulics Laboratory

Report MHL2752
Figure
6.3

Figures_MHL2752.pptx

TUGGERAH LAKE REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020





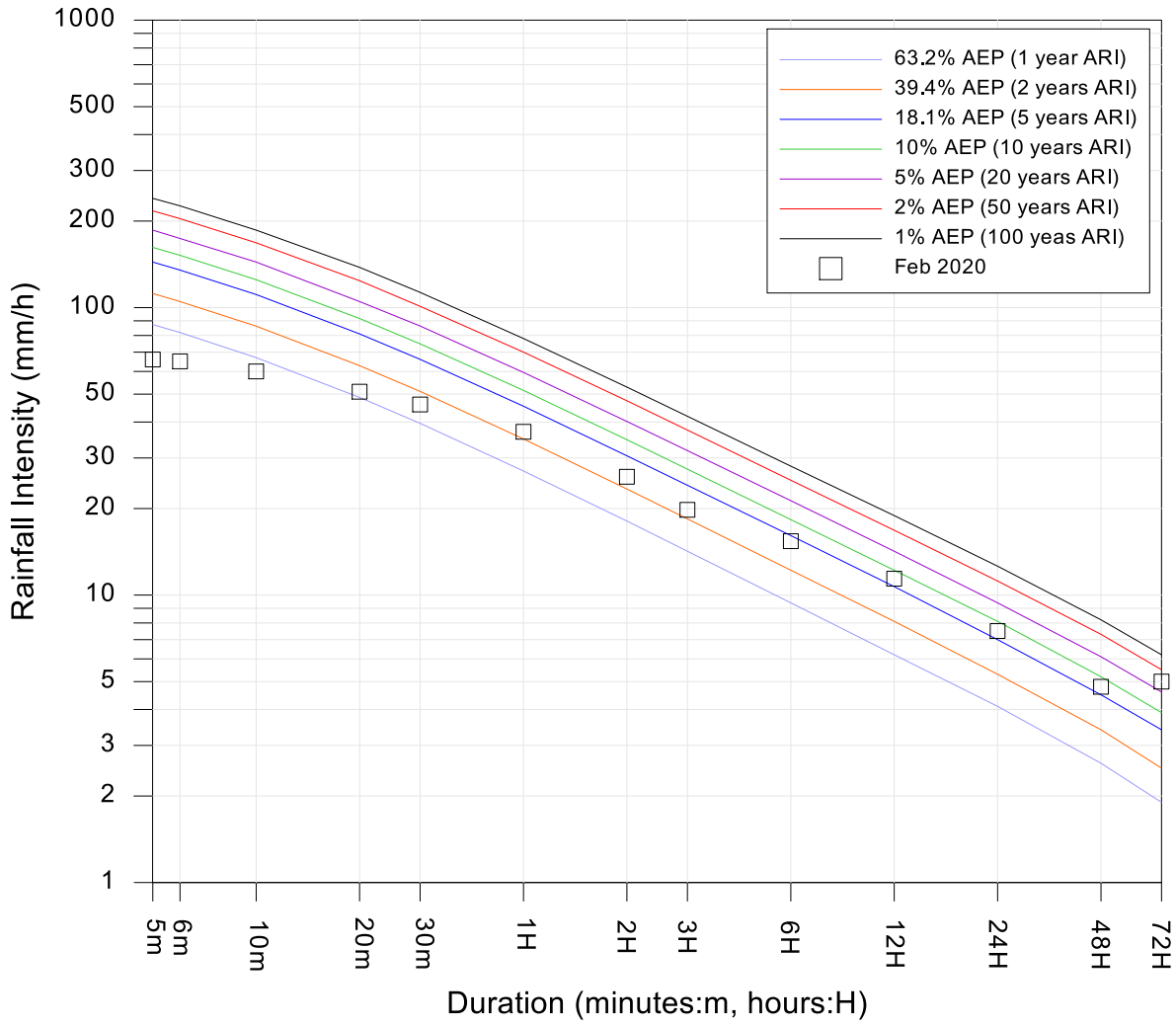
Manly Hydraulics Laboratory

Report MHL2752
Figure 6.4

Figures_MHL2752.pptx

Site Owner: CCSD
Latitude: -33.2509 Longitude:151.469

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	66	22:44 18 Feb 2020
6m	65	22:45 18 Feb 2020
10m	60	22:45 18 Feb 2020
20m	51	11:02 07 Feb 2020
30m	46	11:10 07 Feb 2020
1H	37	11:24 07 Feb 2020
2H	25.8	11:37 07 Feb 2020
3H	19.8	12:26 07 Feb 2020
6H	15.4	11:32 07 Feb 2020
12H	11.4	17:04 07 Feb 2020
24H	7.5	19:23 07 Feb 2020
48H	4.8	10:18 09 Feb 2020
72H	5	19:23 09 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Hamlyn Terrace (561133)
Intensity-Frequency-Duration
1 - 29 February 2020

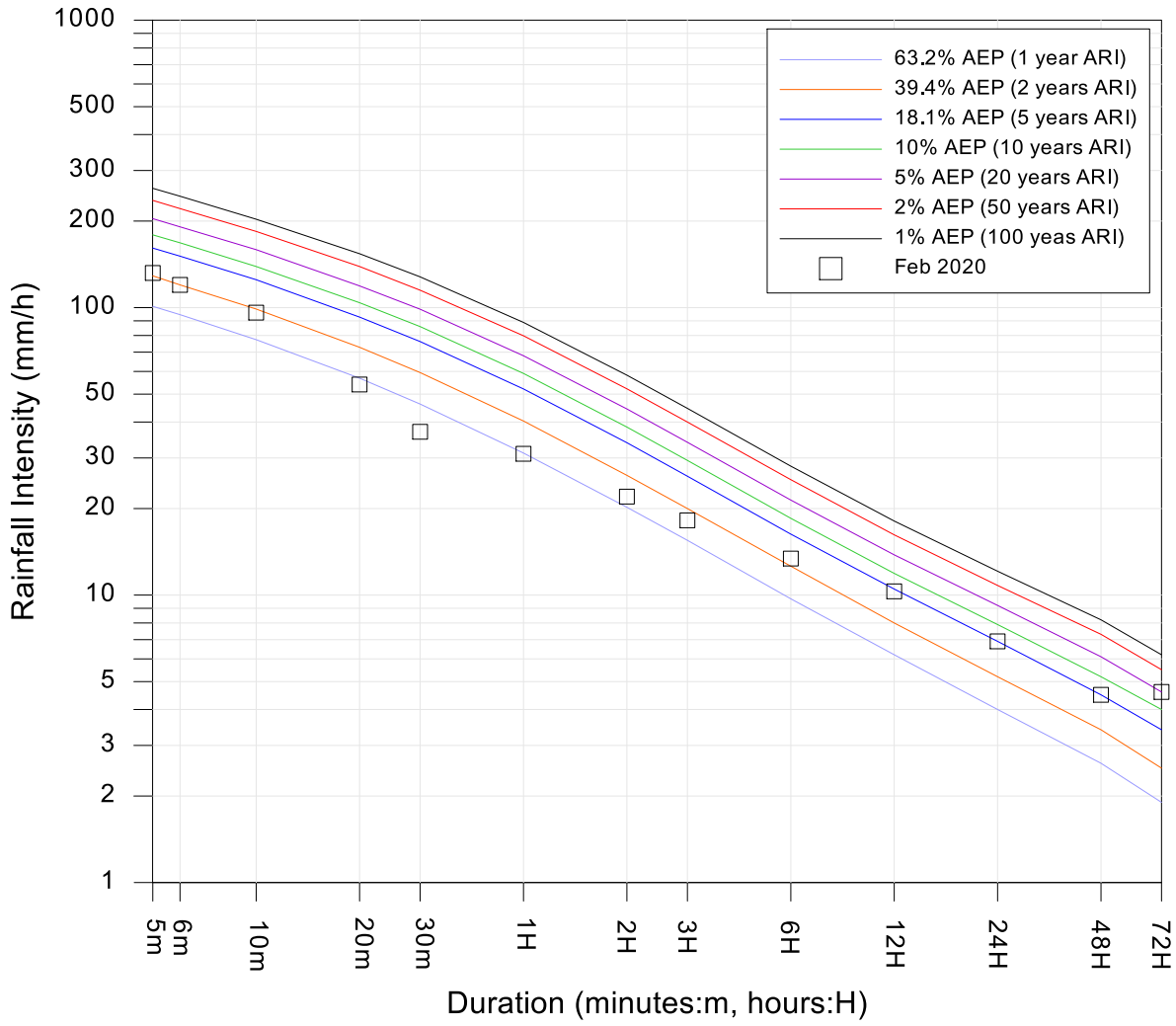
Manly Hydraulics Laboratory

Report MHL2752
Figure
6.5

IFD561133_Figure .pdf

Site Owner: CCSD
Latitude: -33.379 Longitude:151.474

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	132	22:32 18 Feb 2020
6m	120	22:33 18 Feb 2020
10m	96	22:34 18 Feb 2020
20m	54	22:40 18 Feb 2020
30m	37	22:50 18 Feb 2020
1H	31	15:01 07 Feb 2020
2H	22	15:44 07 Feb 2020
3H	18.2	07:39 08 Feb 2020
6H	13.4	15:54 07 Feb 2020
12H	10.3	16:07 07 Feb 2020
24H	6.9	07:16 08 Feb 2020
48H	4.5	08:07 08 Feb 2020
72H	4.6	19:18 09 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Bateau Bay (561069)
Intensity-Frequency-Duration
1 - 29 February 2020

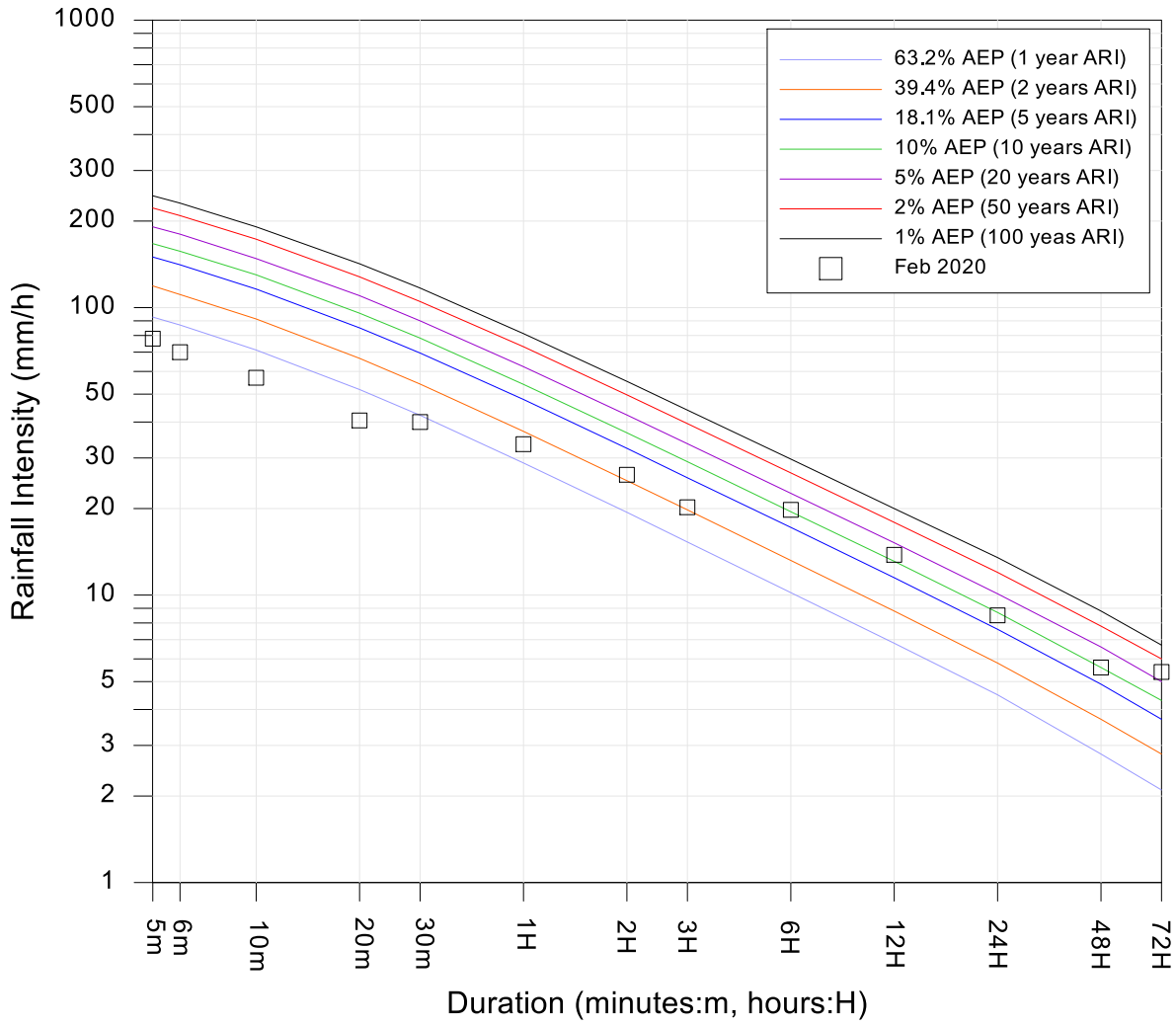
Manly Hydraulics Laboratory

Report MHL2752
Figure
6.6

IFD561069_Figure .pdf

Site Owner: CCSD
Latitude: -33.2978 Longitude:151.4

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	78	10:45 17 Feb 2020
6m	70	10:47 17 Feb 2020
10m	57	22:25 18 Feb 2020
20m	40.5	11:26 07 Feb 2020
30m	40	11:25 07 Feb 2020
1H	33.5	14:59 07 Feb 2020
2H	26.2	15:52 07 Feb 2020
3H	20.2	15:25 07 Feb 2020
6H	19.8	15:49 07 Feb 2020
12H	13.8	17:11 07 Feb 2020
24H	8.5	23:12 07 Feb 2020
48H	5.6	10:20 09 Feb 2020
72H	5.4	19:32 09 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Mardi Dam (561082)
Intensity-Frequency-Duration
1 - 29 February 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
6.7

IFD561082_Figure .pdf

7 Hawkesbury River and South Creek region

7.1 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 7.1**. **Table 7.2** 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 7.1**. The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 7.2** to **Figure 7.25**.

Table 7.1 Hawkesbury River and South Creek region flood peaks

Station name	Station number	Owner	Datum	Level (m)
Patonga	212440	CCSD	AHD	1.19
Spencer	212431	CCSD	AHD	1.51
Gunderman Caravan Park	212429	CCSD	AHD	1.77
Wisemans Ferry	212460	CCSD	AHD	2.18
St Albans	212228	Sydney Water	Local Datum	5.20
Webbs Creek	212408	CCSD	AHD	2.40
Leets Vale	212461	WaterNSW	AHD	2.96
Colo Junction	212407	CCSD	AHD	4.73
Upper Colo	212290	WaterNSW	Local Datum	15.74
Sackville	212406	CCSD	AHD	5.78*
Ebenezer	212427	CCSD	AHD	7.53
Windsor	212426	CCSD	AHD	9.28
Freemans Reach	212410	CCSD	AHD	11.26
North Richmond (WPS)	212200	WaterNSW	Local Datum	11.56
Grose Wold	212291	WaterNSW	Local Datum	10.95
Yarramundi	2122001	WaterNSW	Local Datum	12.74
Castlereagh	212404	CCSD	AHD	13.38
Cattai Creek at Murphys Bridge	212059	WaterNSW	Local Datum	8.04
Ropes Creek at Debrincat Ave	212049	WaterNSW	Local Datum	4.53
Penrith	212201	WaterNSW	Local Datum	6.11
Wallacia Weir	212202	WaterNSW	Local Datum	7.32
Warragamba Weir	212241	WaterNSW	Local Datum	7.39
Warragamba Dam	212243	WaterNSW	Local Datum	111.80
Kelpie Point	212250	WaterNSW	Local Datum	6.57
Camden Weir	212216	WaterNSW	Local Datum	7.86
Jooriland	212270	WaterNSW	Local Datum	5.89
Broughtons Pass	212233	WaterNSW	Local Datum	1.32
Pheasants Nest	212203	WaterNSW	Local Datum	2.64
Cataract Dam	212232	WaterNSW	Local Datum	286.38
Avon Dam Road	212204	WaterNSW	Local Datum	15.78
Nepean Dam	212205	WaterNSW	Local Datum	318.50
Golden Valley	212271	WaterNSW	Local Datum	4.14
Greenstead	212009	WaterNSW	Local Datum	2.25

* Debris line survey used to estimate flood peak, station lost data during flood event.

Table 7.2 SES flood classifications for Webbs Creek, Colo Junction, Sackville, Windsor, Wallacia Weir, Penrith and North Richmond

Station name	Station number	Flood Classification			Flood Peak (m)	Flood Event Classification
		Minor	Moderate	Major		
		Water Level (m AHD)				
Webbs Creek	212408	N/A	3.5	4.2	2.40	Minor
Colo Junction	212407	4.6	6.1	7.6	4.73	Minor
Sackville	212406	4.6	7.3	9.7	5.78	Minor
Windsor	212426	5.8	7.0	12.2	9.28	Moderate
Wallacia Weir	212202	5.0	8.7	11.0	7.32	Minor
Penrith	212201	3.9	7.9	10.4	6.11	Minor
North Richmond (WPS)	212200	3.8	7.9	10.5	11.56	Major

NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK STATIONS

Manly Hydraulics Laboratory

Report MHL2752
Figure
7.1

Figures_MHL2752.qgs

7.2 Hawkesbury River and South Creek region – rainfall

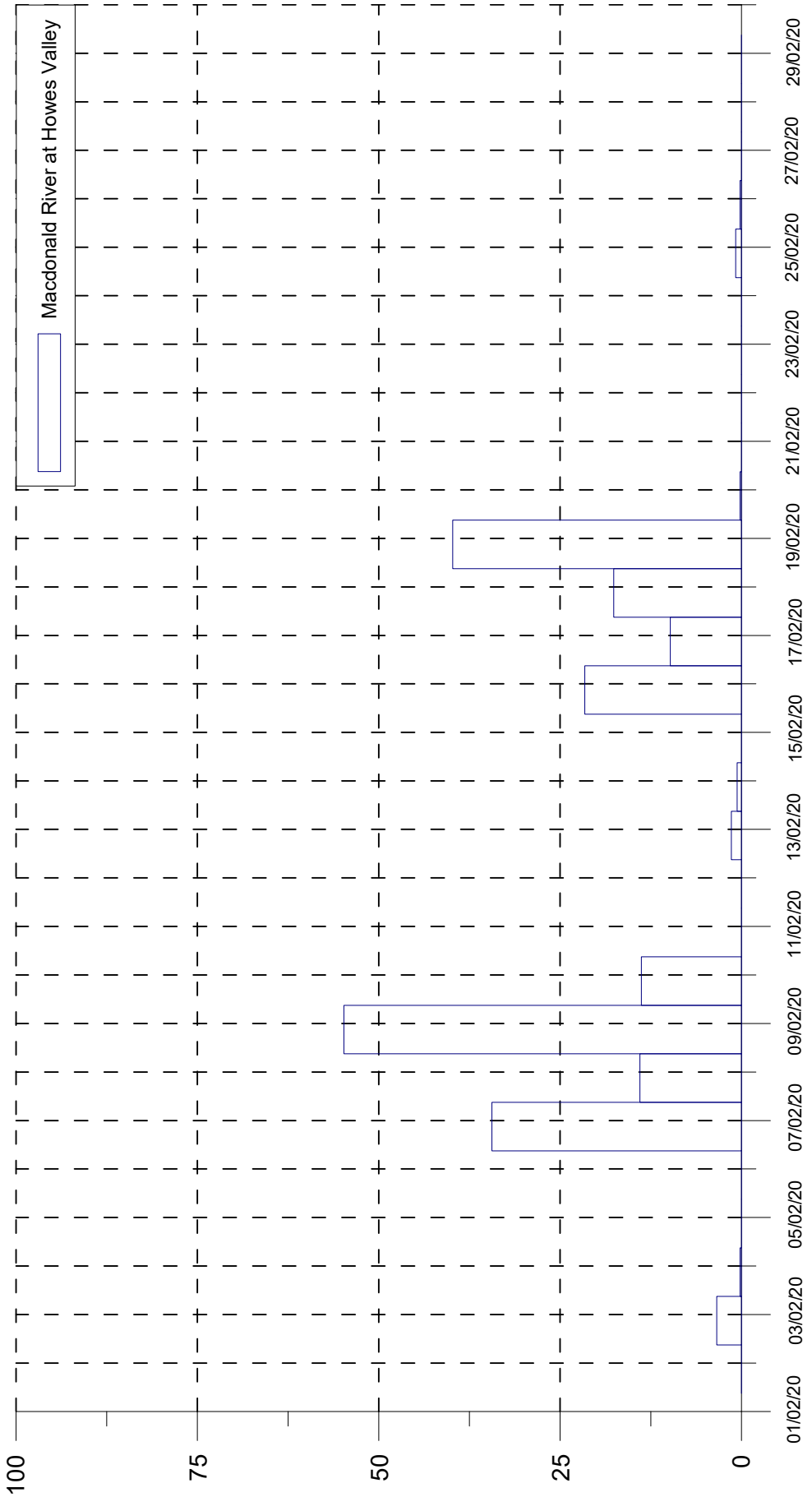
The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 7.2** to **Figure 7.25**. 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 7.3** and **Table 7.4** for the period 01 to 29 February 2020. The rainfall intensities are displayed graphically in **Figure 7.26** to **Figure 7.34**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 7.3 Hawkesbury River and South Creek region daily rainfall totals

Date	Webbs Creek 212408 (mm)	Colo Junction 212407 (mm)	Sackville DS 212438 (mm)	Macdonald River at Howes Valley 212021 (mm)	Capertree River at Glen Davis 212018 (mm)	Bilpin (Fern Grove) 63118 (mm)
	CCSD	CCSD	CCSD	WaterNSW	WaterNSW	BoM
01/02/2020	0.0	0.0	0.0	-	-	0.0
02/02/2020	0.0	0.0	0.0	0.0	-	0.0
03/02/2020	1.8	3.2	12.2	3.4	-	19.8
04/02/2020	0.2	0.2	0.2	0.2	0.0	1.4
05/02/2020	0.0	0.0	0.0	0.0	0.0	0.0
06/02/2020	0.4	0.2	1.2	0.0	0.0	3.4
07/02/2020	60.0	38.2	35.4	34.4	23.0	80.8
08/02/2020	67.8	62.8	44.4	14.0	3.0	65.4
09/02/2020	80.8	65.4	59.6	54.8	42.5	145.0
10/02/2020	55.8	61.4	65.2	13.8	28.0	156.6
11/02/2020	1.0	1.4	0.6	0.0	0.5	1.8
12/02/2020	4.2	0.8	0.2	0.0	13.5	0.8
13/02/2020	2.6	32.0	19.6	1.4	2.0	34.6
14/02/2020	5.4	20.4	8.0	0.6	6.5	22.0
15/02/2020	0.2	0.0	0.0	0.0	0.0	0.0
16/02/2020	8.6	11.4	9.6	21.6	0.0	23.0
17/02/2020	15.6	0.2	0.2	9.8	9.5	3.6
18/02/2020	11.4	9.6	8.8	17.6	6.0	19.6
19/02/2020	12.6	10.4	8.2	39.8	24.0	9.4
20/02/2020	0.2	0.0	0.0	0.2	0.0	0.0
21/02/2020	0.0	0.0	0.0	0.0	0.0	0.0
22/02/2020	19.6	2.2	2.8	0.0	0.5	0.0
23/02/2020	1.0	0.0	0.2	0.0	0.0	11.4
24/02/2020	0.0	0.2	0.2	0.0	-	4.2
25/02/2020	0.0	0.0	0.0	0.8	-	0.0
26/02/2020	0.0	0.0	0.0	0.2	-	0.0
27/02/2020	1.0	3.8	11.4	0.0	-	6.4
28/02/2020	0.0	0.0	0.2	0.0	-	0.0
29/02/0202	0.0	0.0	0.0	0.0	-	0.0

Table 7.4 Hawkesbury River and South Creek region daily rainfall totals (cont.)

Date	Faulconbridge (St Georges Cres) 63028 (mm)	Blackheath (Wombat St) 63295 (mm)	South Creek at Great Western Hwy 212048 (mm)	South Creek at Elizabeth Dr 212320 (mm)	Lake Nerrigorang at Thirlmere Lakes 212063 (mm)	Stonequarry Creek at Picton 212053 (mm)
	BoM	BoM	WaterNSW	WaterNSW	WaterNSW	WaterNSW
01/02/2020	0.0	0.0	-	-	-	-
02/02/2020	0.0	0.0	-	0.0	-	-
03/02/2020	13.2	5.0	-	27.6	-	-
04/02/2020	0.2	1.0	0.5	0.3	0.2	0.0
05/02/2020	0.0	0.0	0.0	0.0	0.0	0.0
06/02/2020	0.6	2.0	1.0	0.8	7.4	4.5
07/02/2020	39.8	48.0	39.0	43.0	37.2	32.0
08/02/2020	33.6	64.0	33.0	36.2	41.0	77.0
09/02/2020	165.6	159.0	99.0	98.6	60.2	42.0
10/02/2020	227.2	156.0	97.0	121.4	177.0	153.5
11/02/2020	5.2	4.0	0.0	0.0	1.6	0.0
12/02/2020	1.4	5.0	0.0	0.0	0.0	0.0
13/02/2020	29.8	38.0	29.0	19.3	16.4	28.5
14/02/2020	28.0	29.0	5.0	5.6	1.8	2.5
15/02/2020	0.0	0.0	0.0	0.0	0.0	0.0
16/02/2020	10.2	35.0	10.0	10.2	11.2	10.5
17/02/2020	1.2	3.0	0.0	0.0	2.8	3.0
18/02/2020	3.0	9.0	8.5	11.7	0.8	1.0
19/02/2020	6.8	9.0	14.0	19.1	0.2	0.0
20/02/2020	0.0	0.0	0.0	0.2	0.0	0.0
21/02/2020	0.0	0.0	0.0	0.0	0.0	0.0
22/02/2020	5.0	11.0	0.0	0.0	0.0	0.5
23/02/2020	1.8	5.0	-	0.9	3.2	3.0
24/02/2020	0.0	0.0	-	0.0	0.0	0.0
25/02/2020	0.0	0.0	-	0.0	0.0	0.0
26/02/2020	0.0	0.0	-	0.0	0.0	0.0
27/02/2020	1.2	0.0	-	0.0	-	3.5
28/02/2020	0.0	0.0	-	0.0	-	-
29/02/0202	0.0	0.0	-	0.0	-	-



NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

Manly Hydraulics Laboratory

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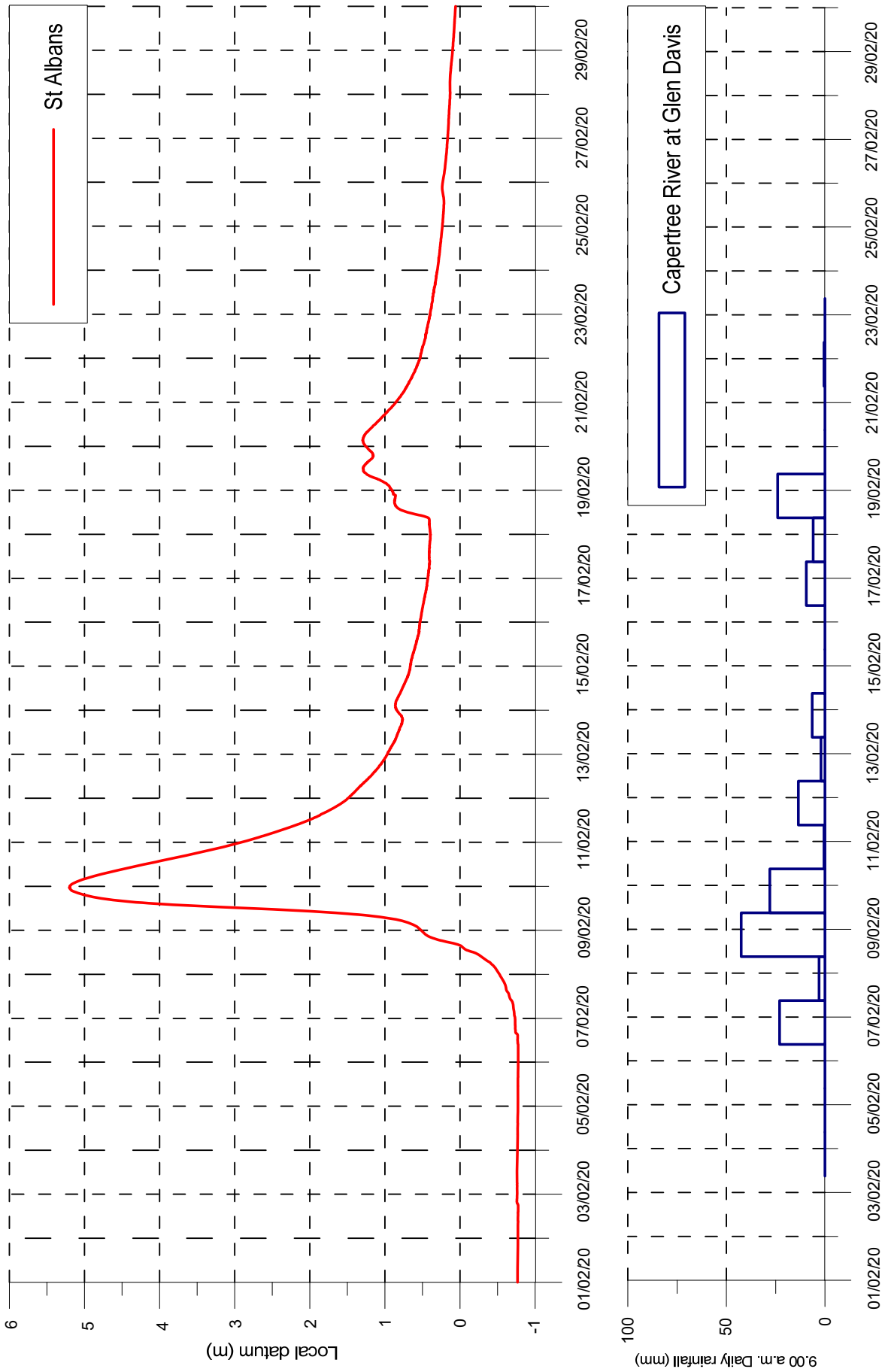
Figure
7.2

Figures_MHL2752.pptx



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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
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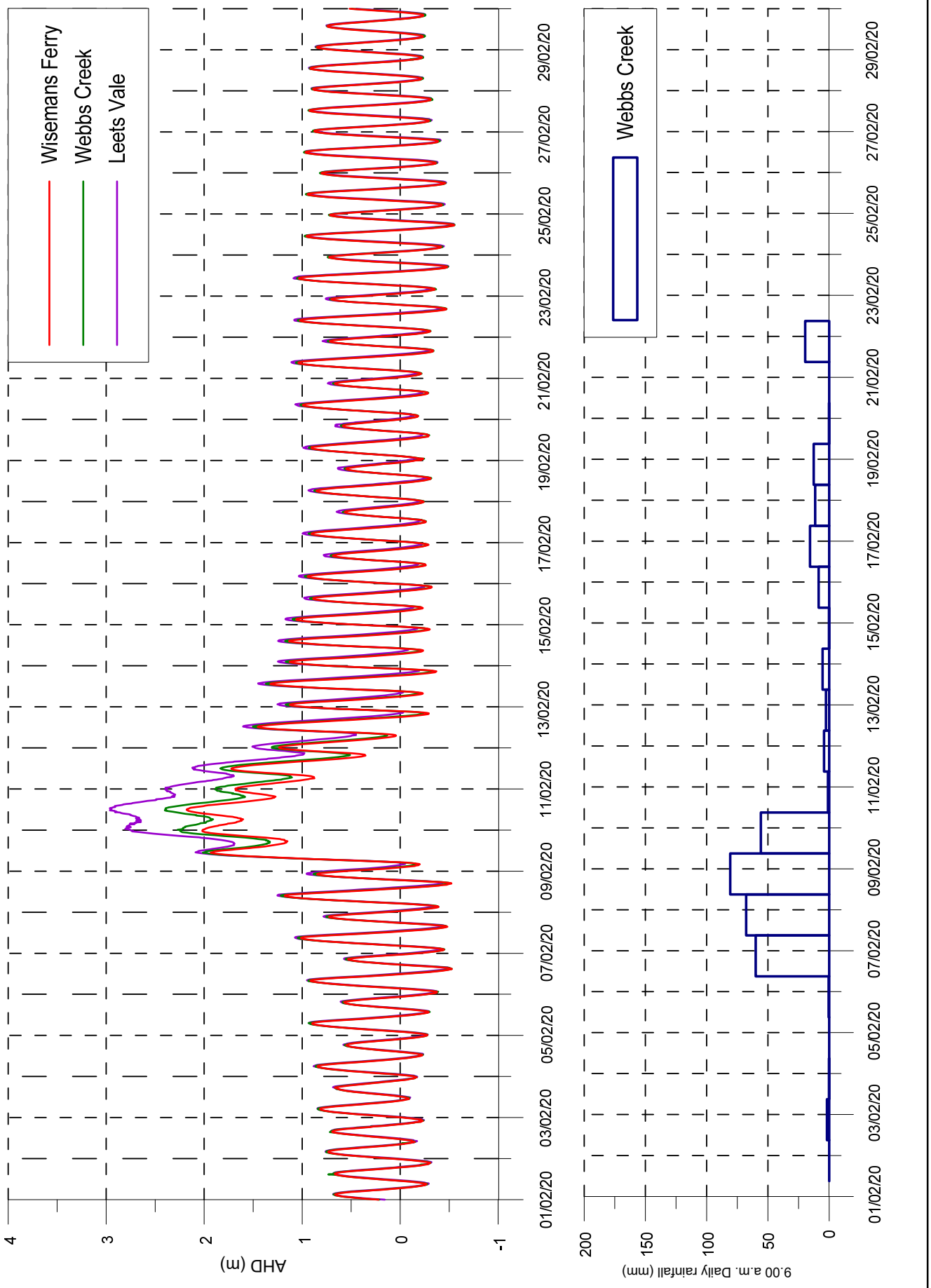
Figure
7.3

Figures_MHL2752.pptx



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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
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HAWKESBURY RIVER AND SOUTH CREEK REGION
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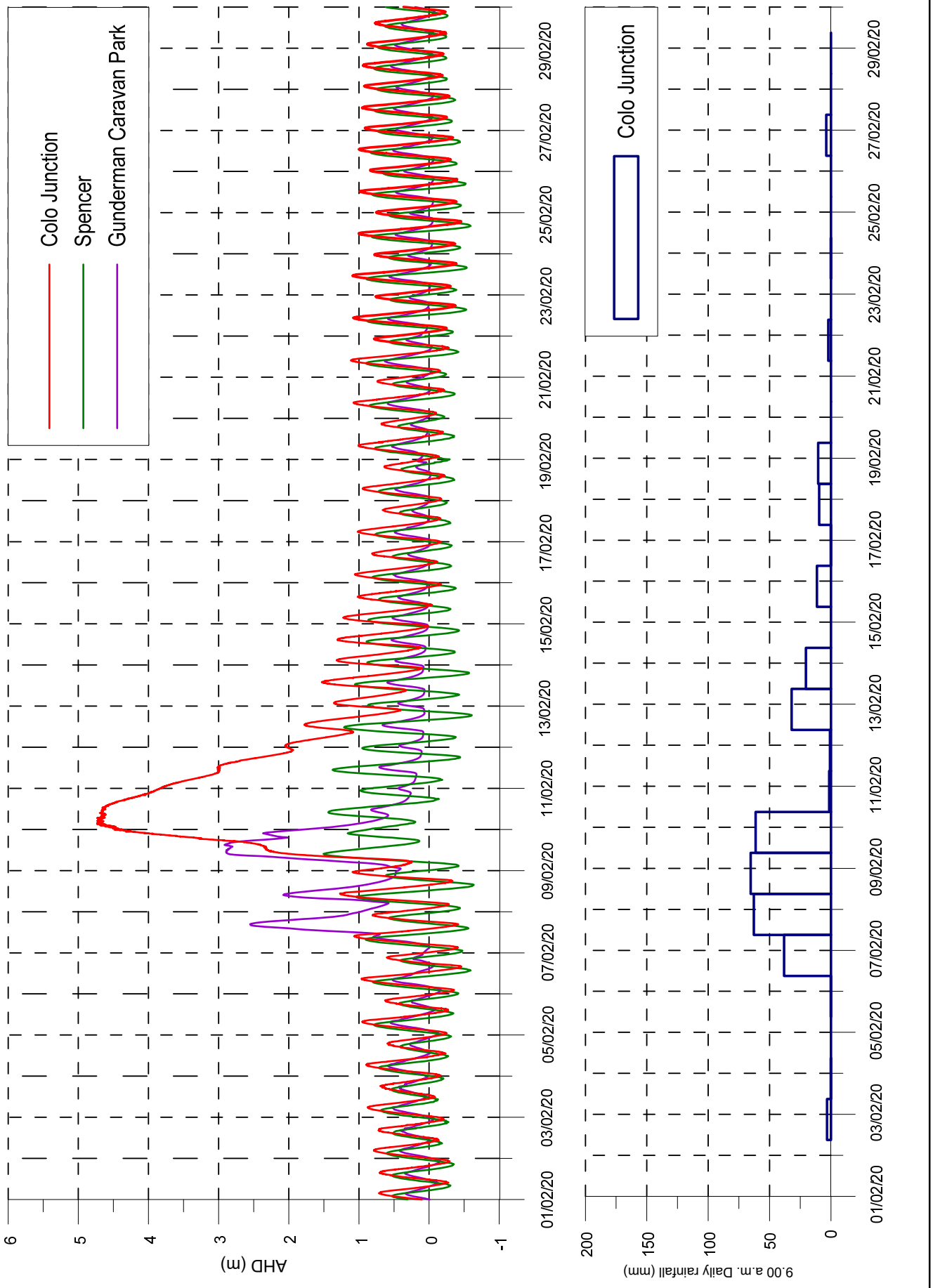
Figure
7.5

Figures_MHL2752.pptx



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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

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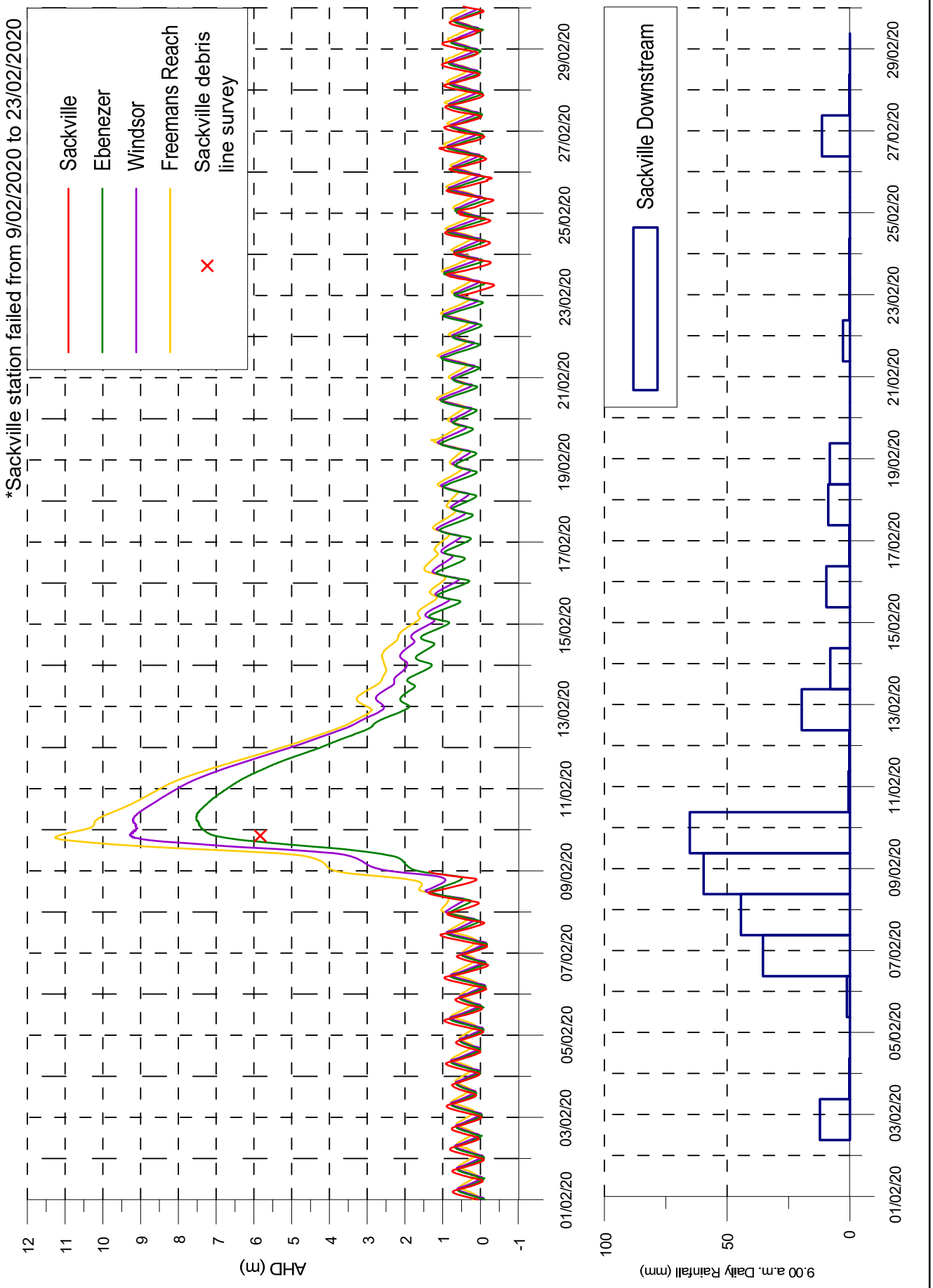
Figure
7.6

Figures_MHL2752.pptx



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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

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Figure
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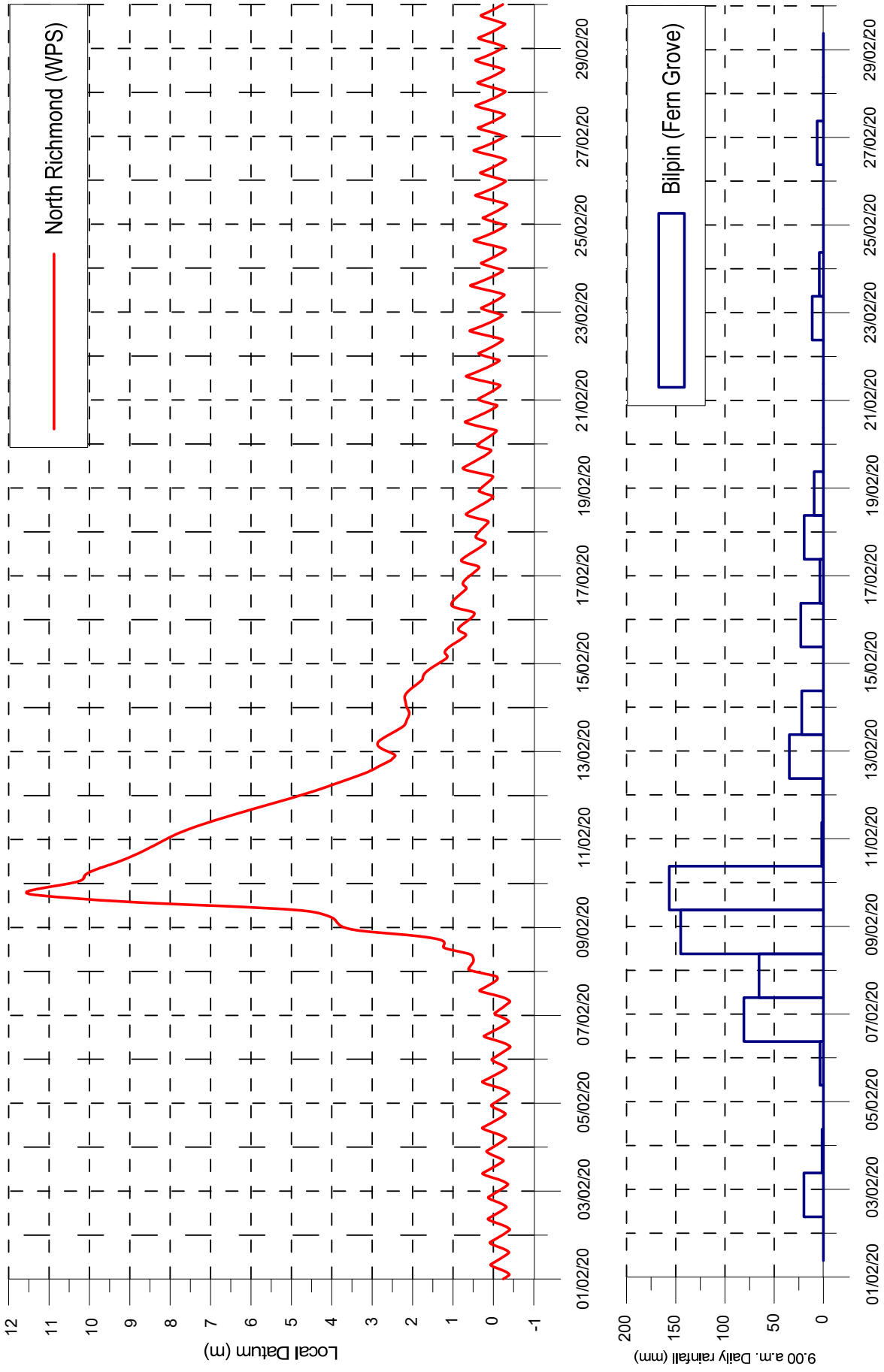

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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

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Figure
7.8

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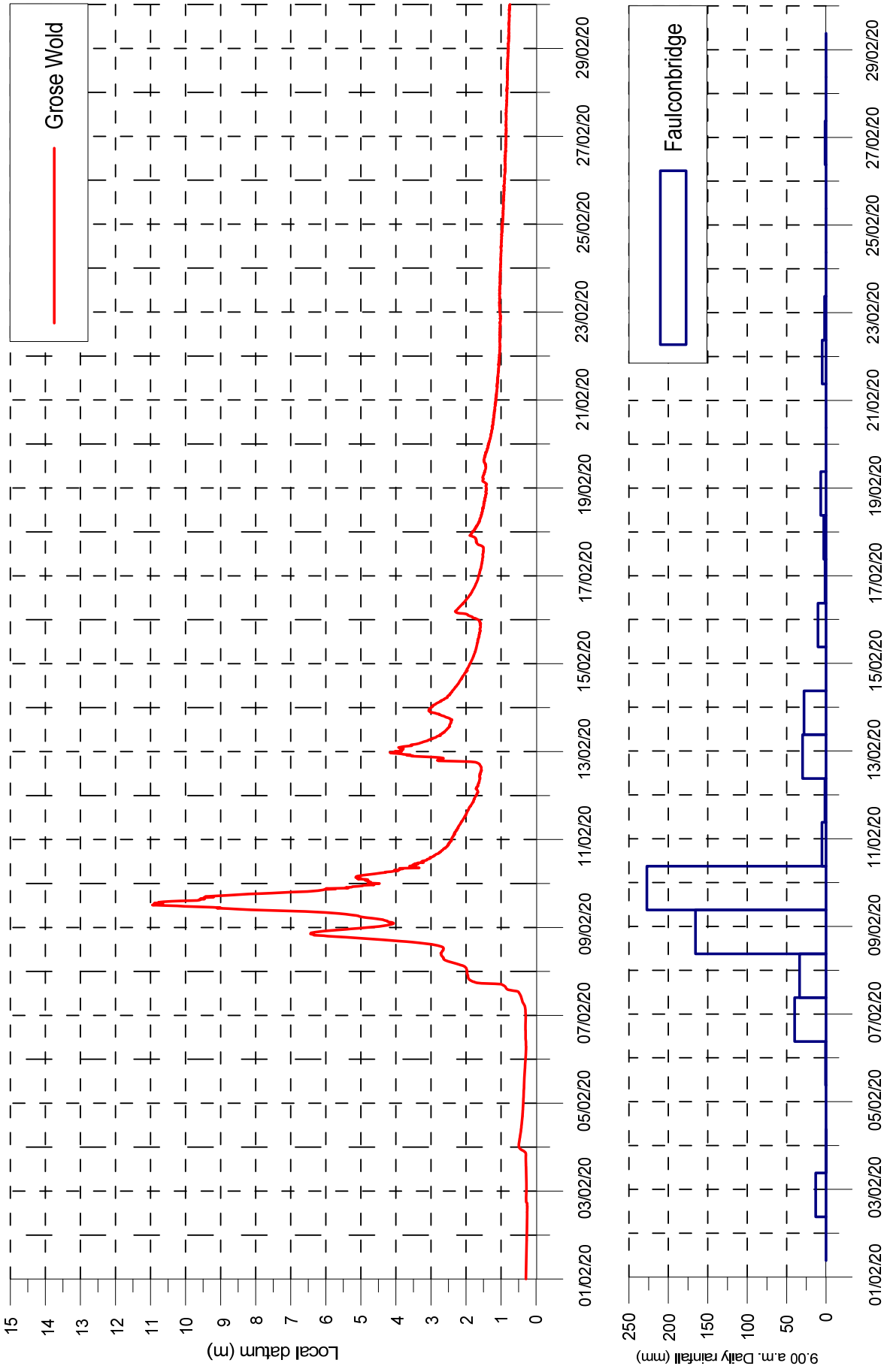

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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

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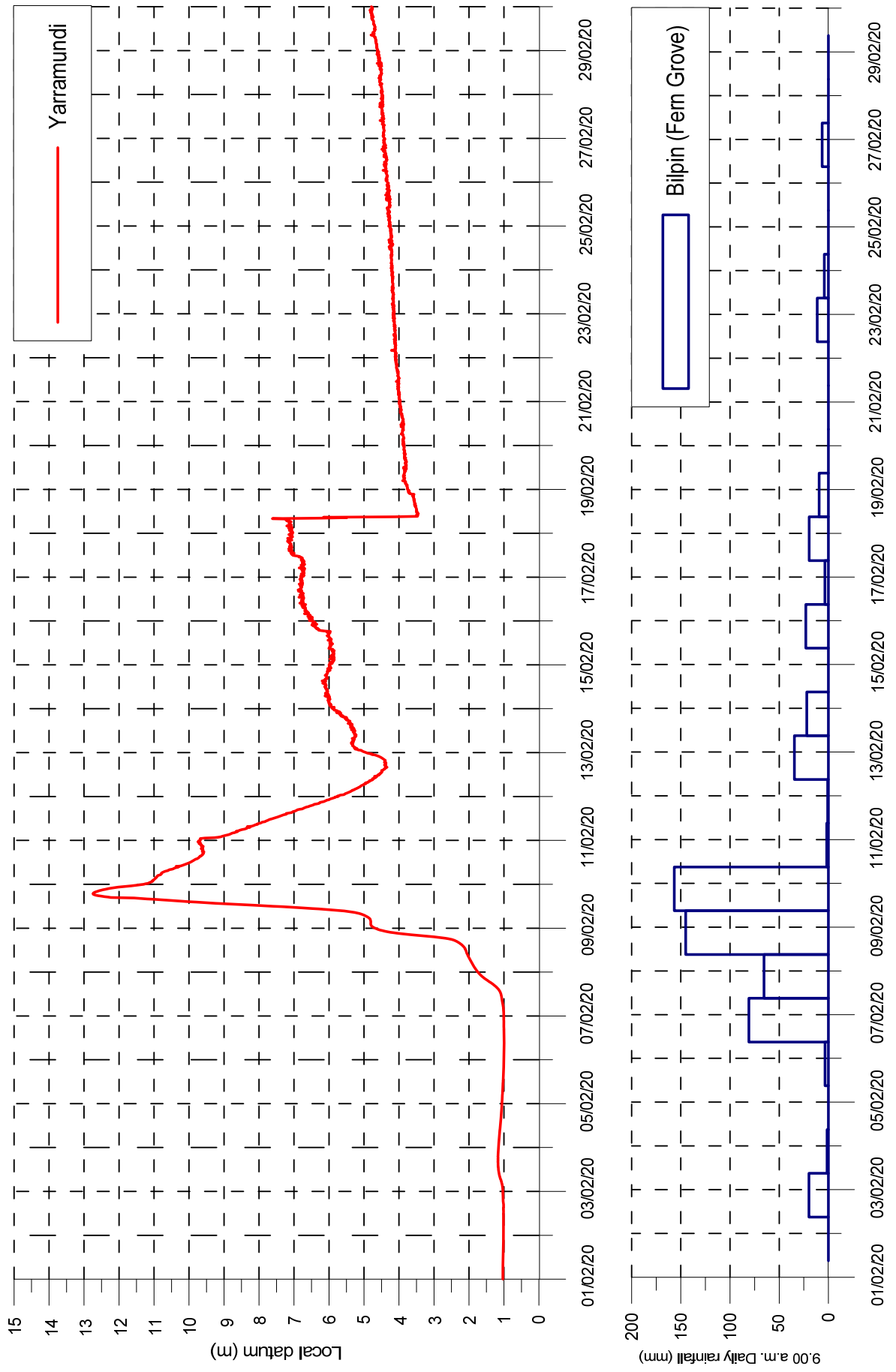

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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

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7.10

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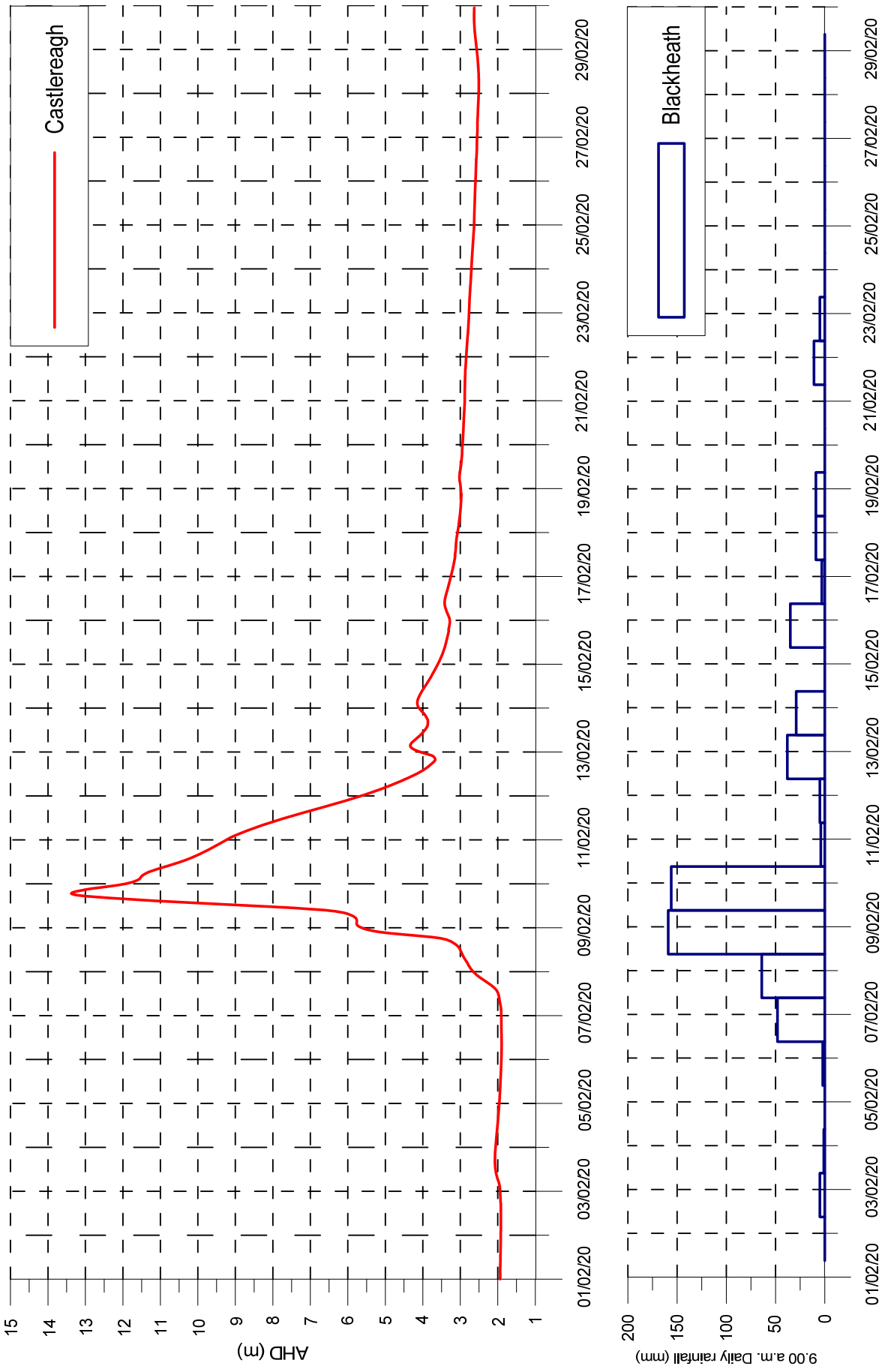

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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

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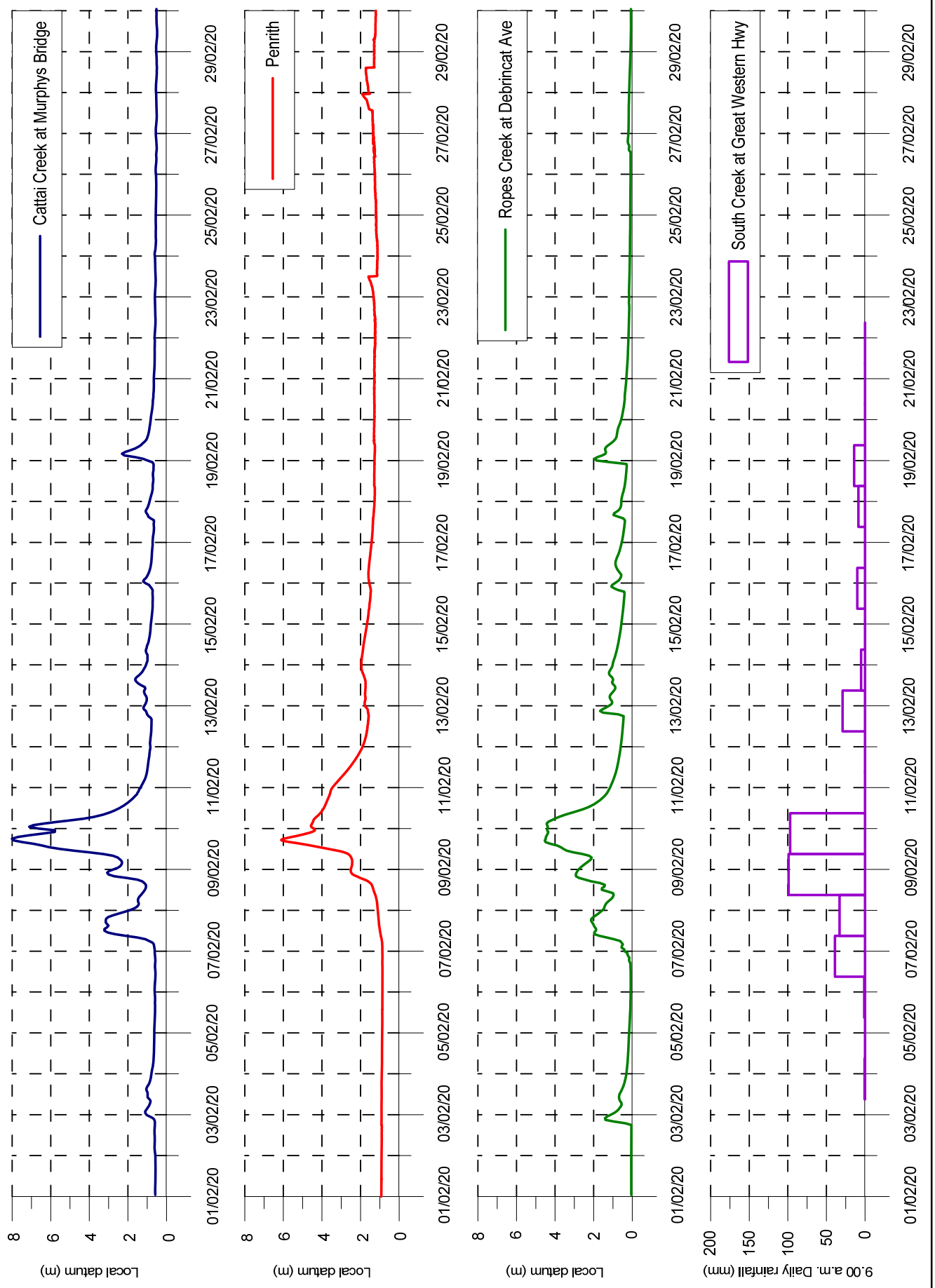

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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
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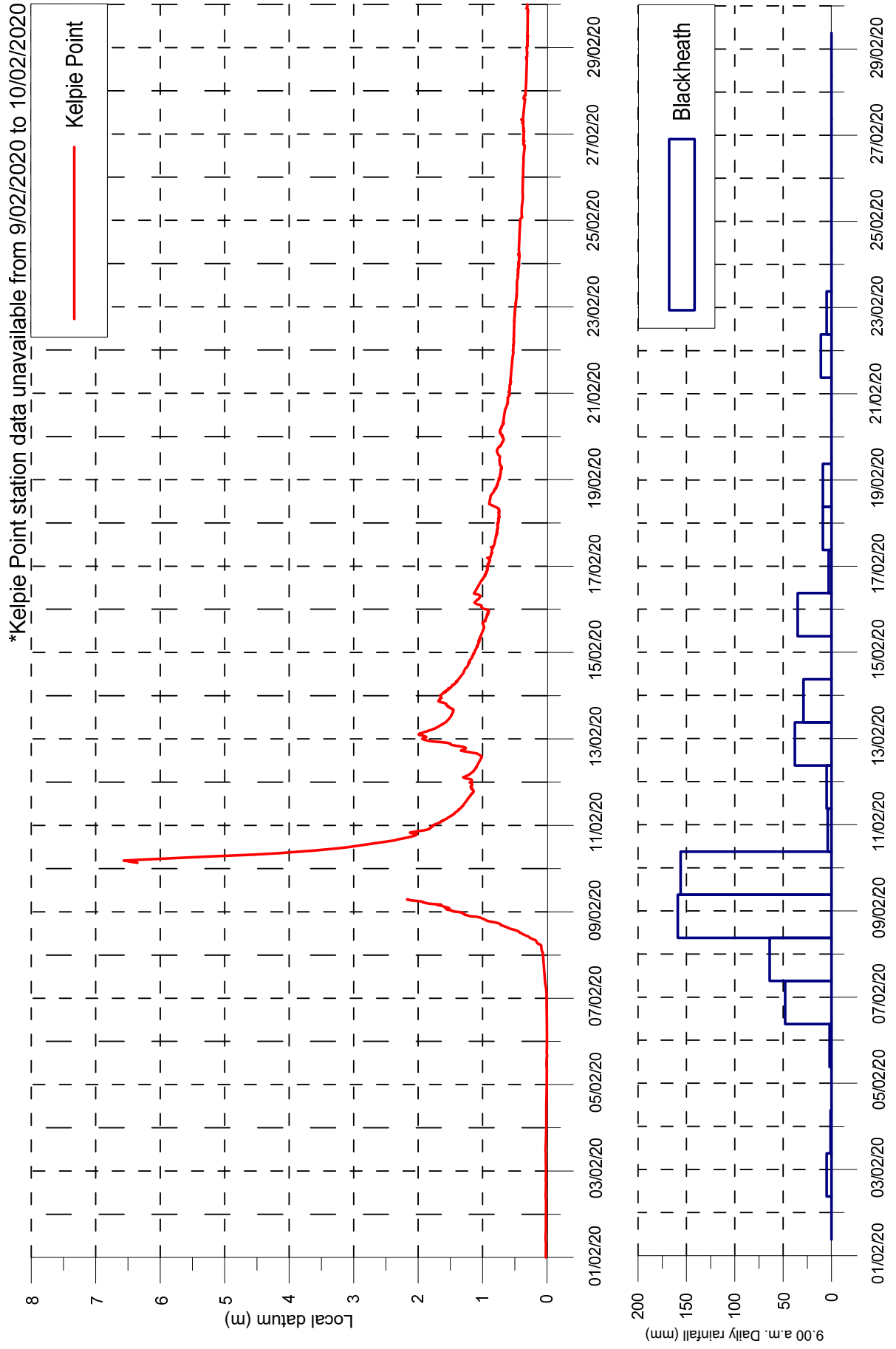

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WATER LEVEL AND RAINFALL DATA
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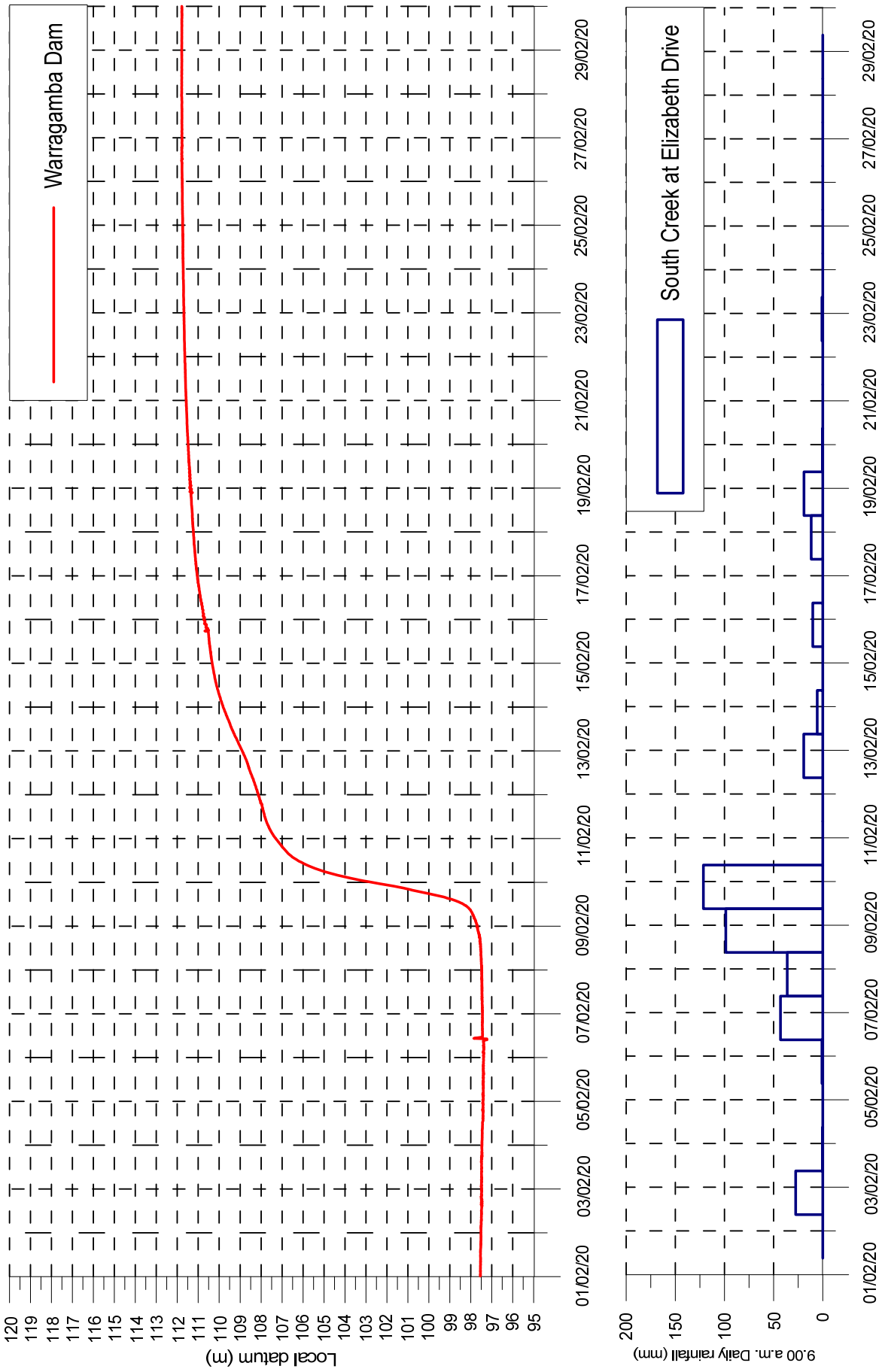

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WATER LEVEL AND RAINFALL DATA
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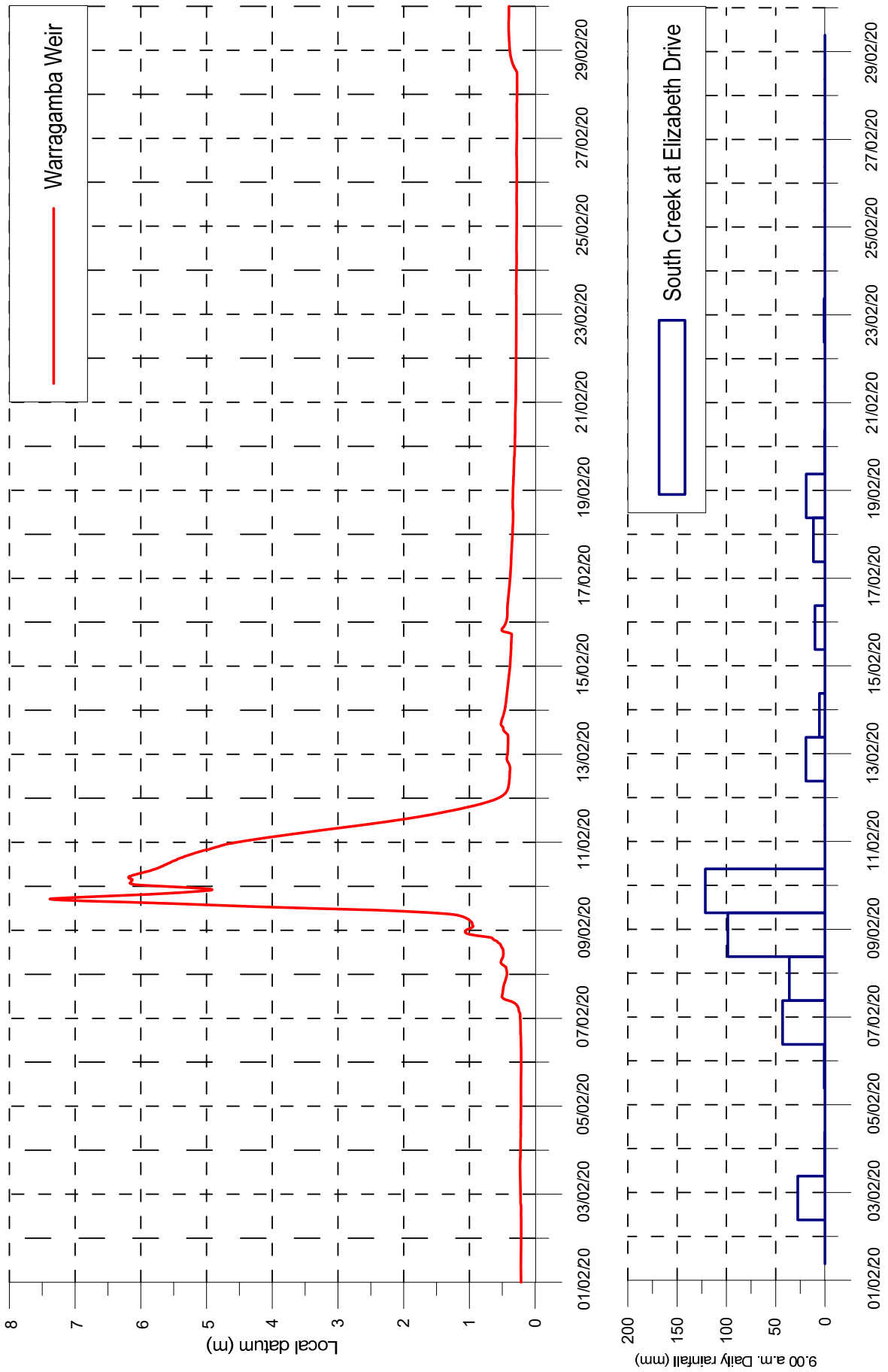

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WATER LEVEL AND RAINFALL DATA
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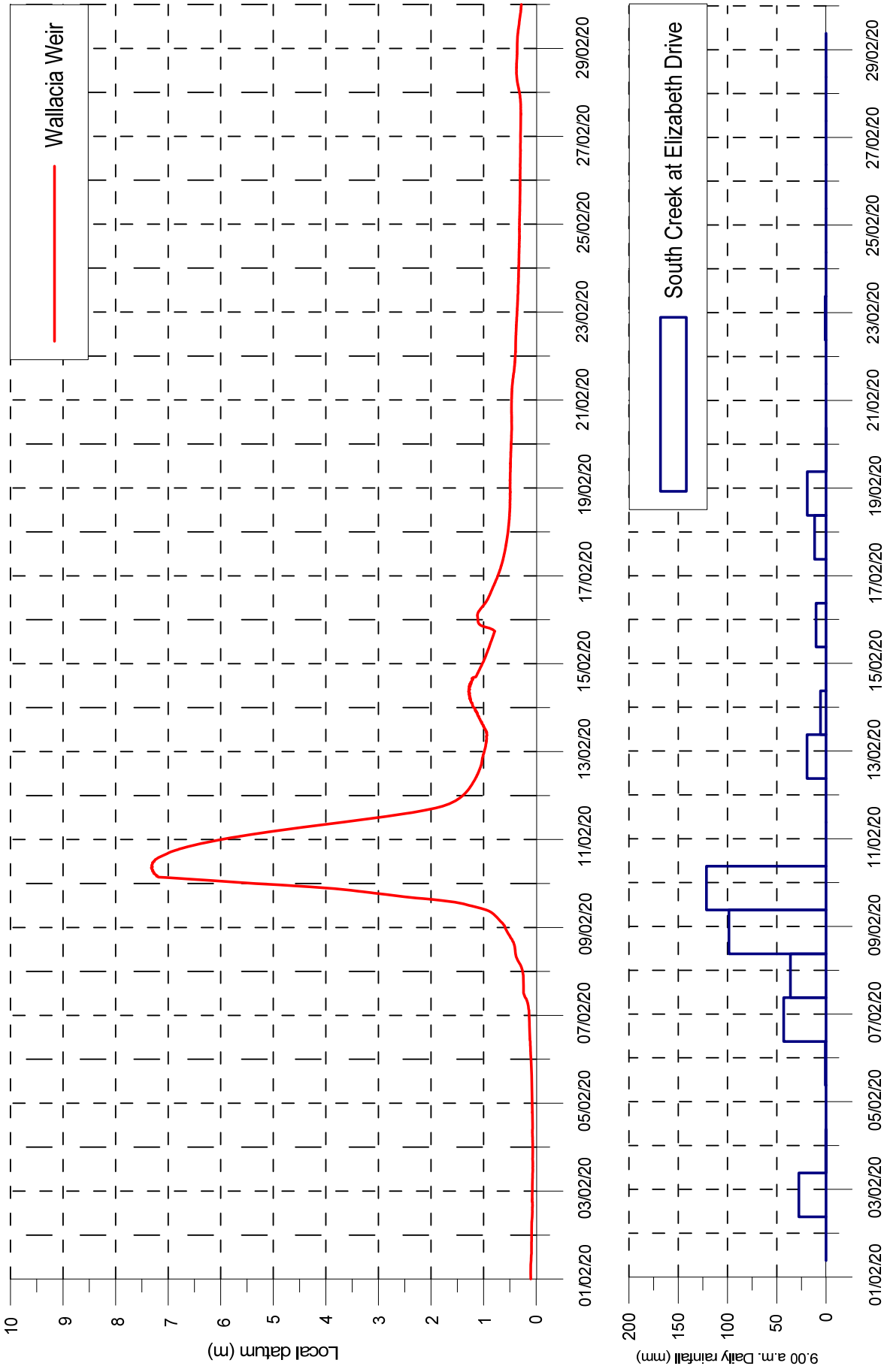

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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

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Figure
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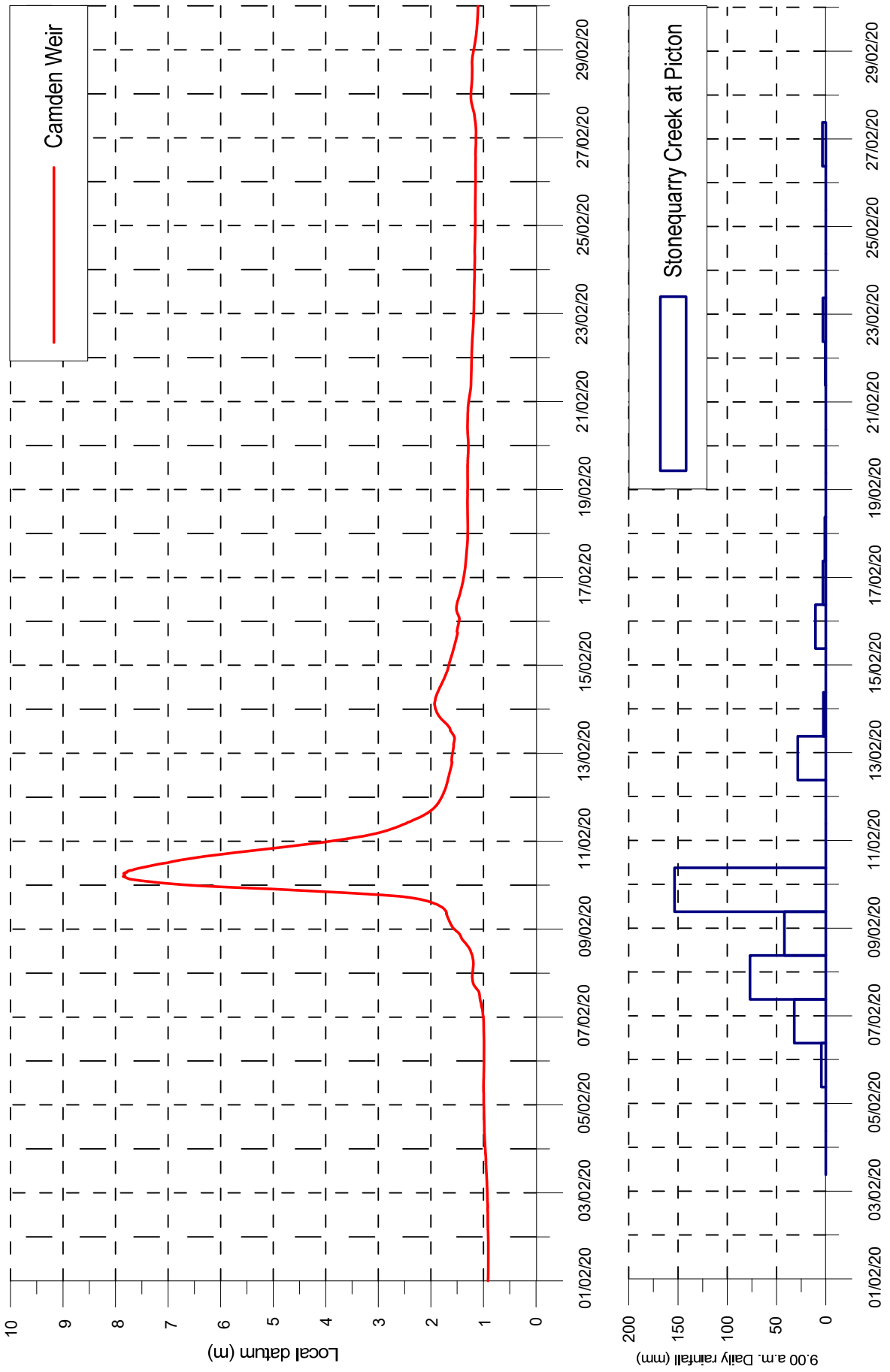

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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

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Figure
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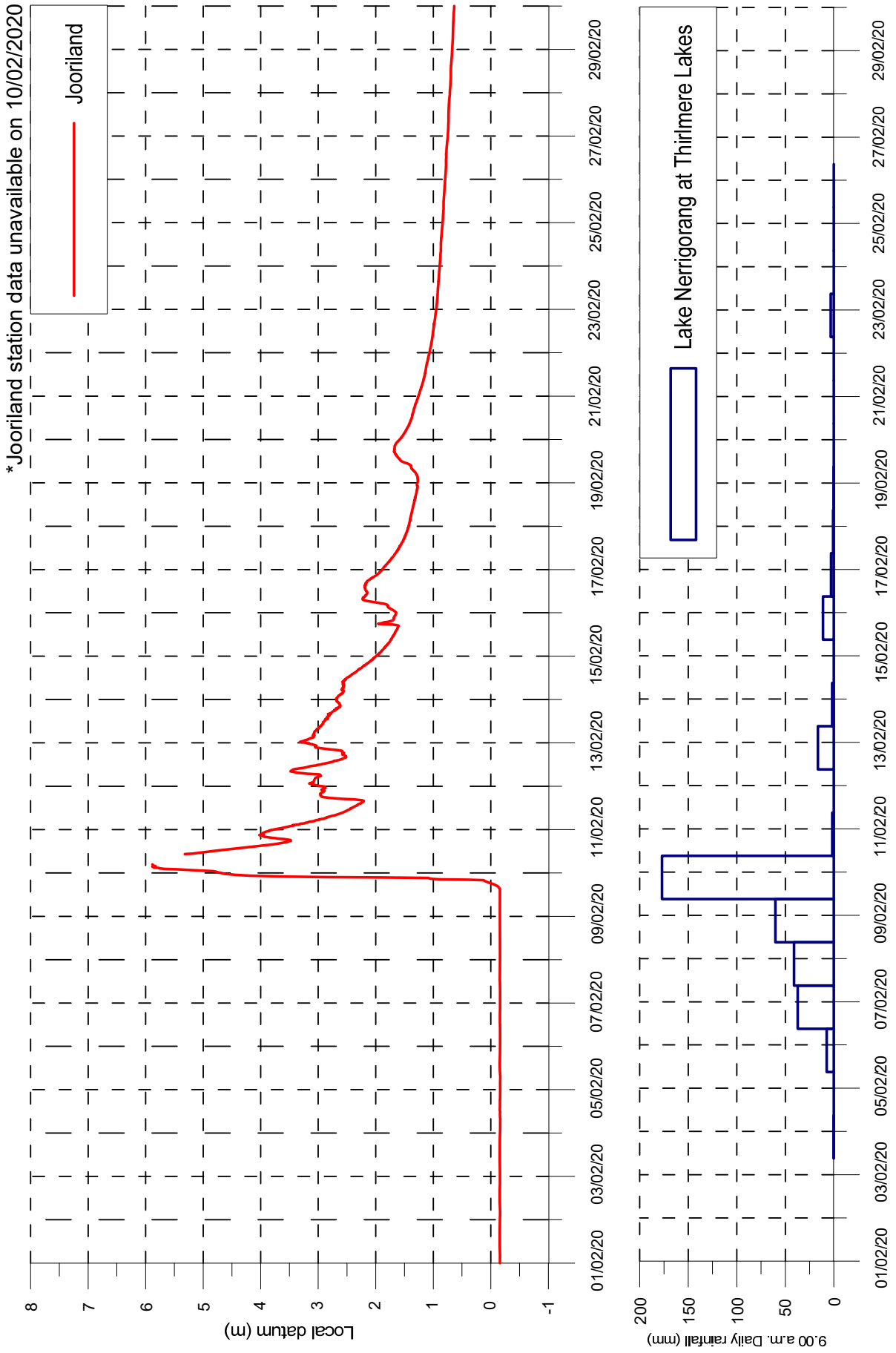

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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
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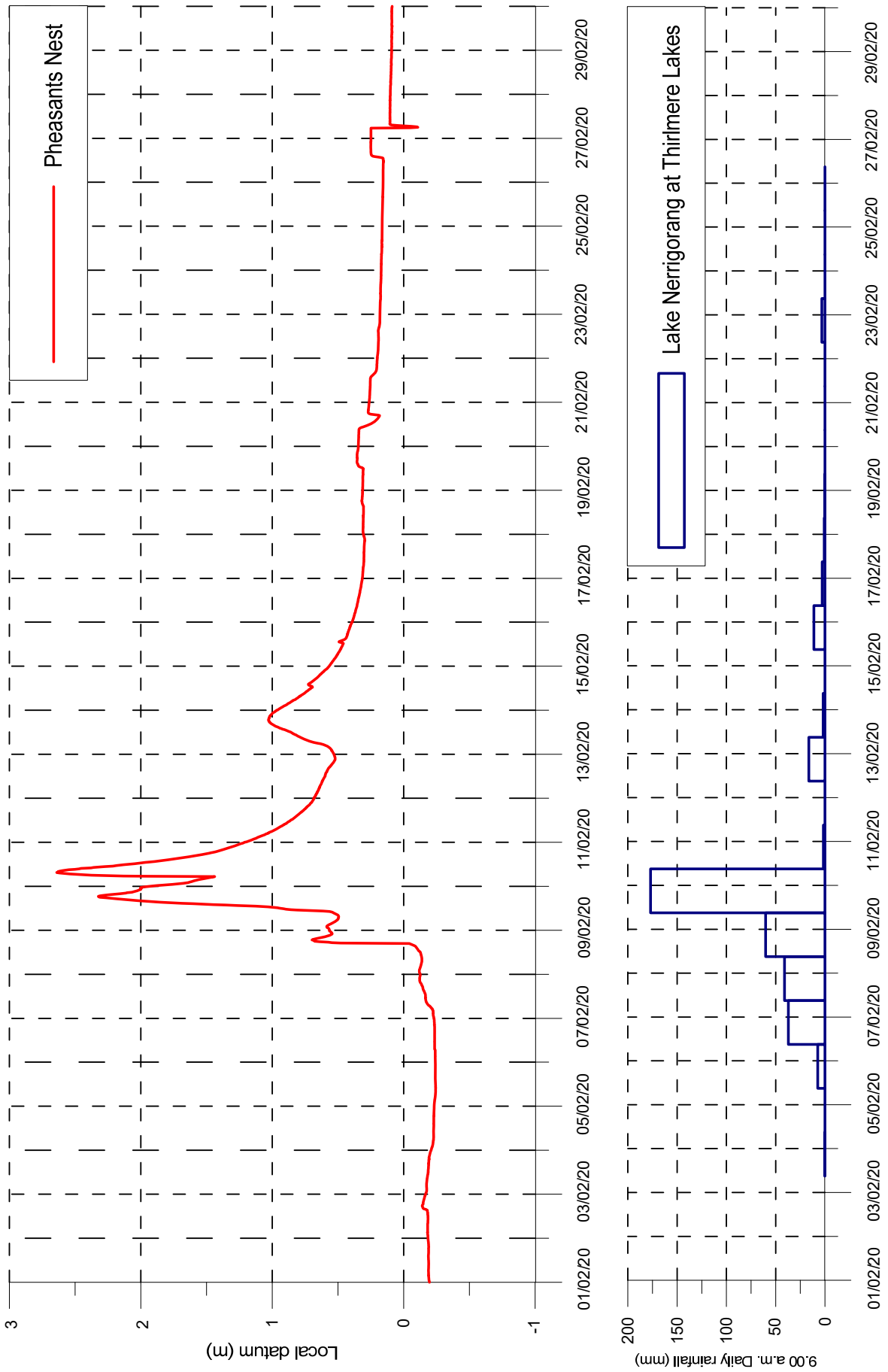

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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
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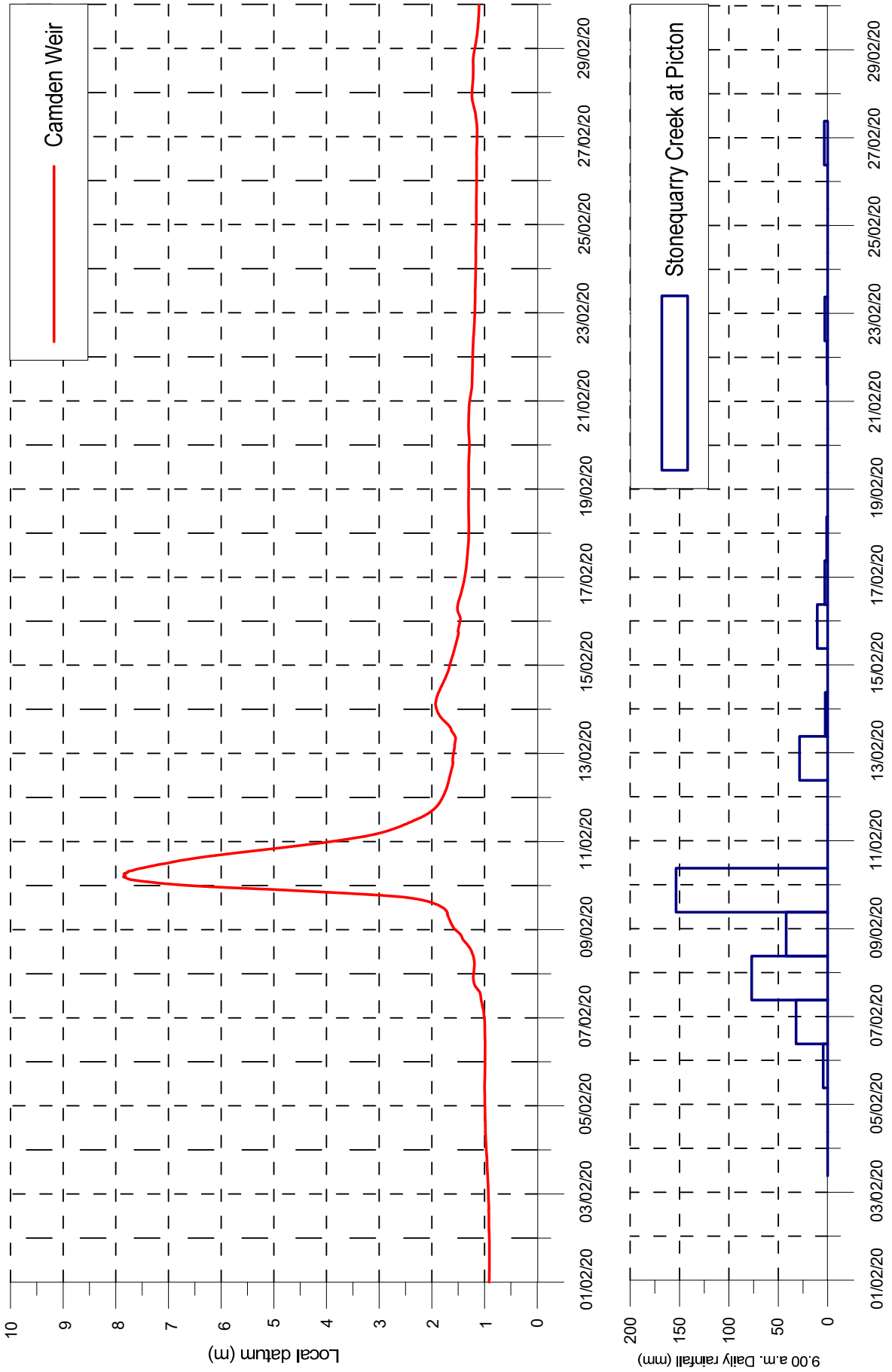

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WATER LEVEL AND RAINFALL DATA
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Figure
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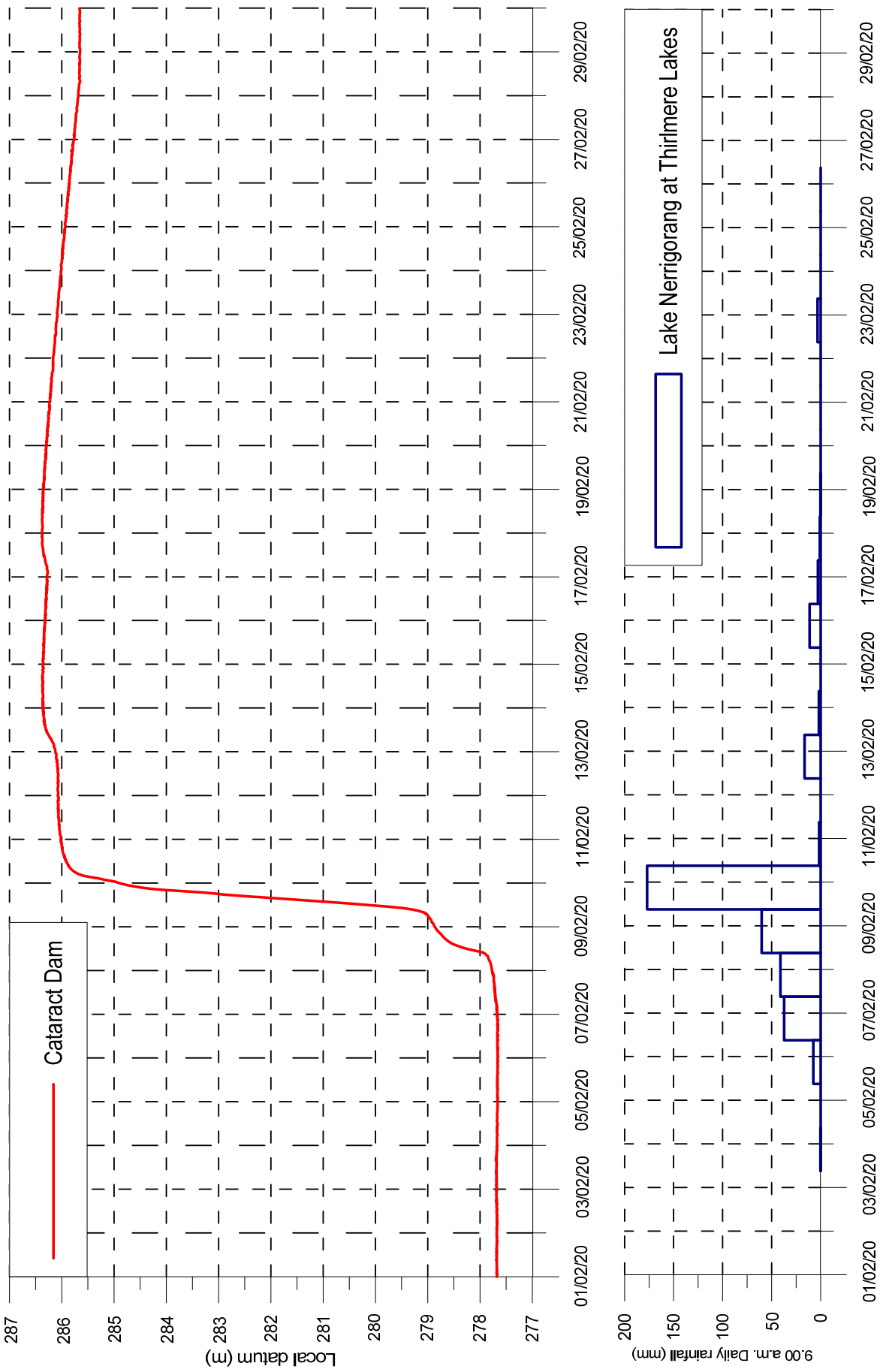

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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

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Figure
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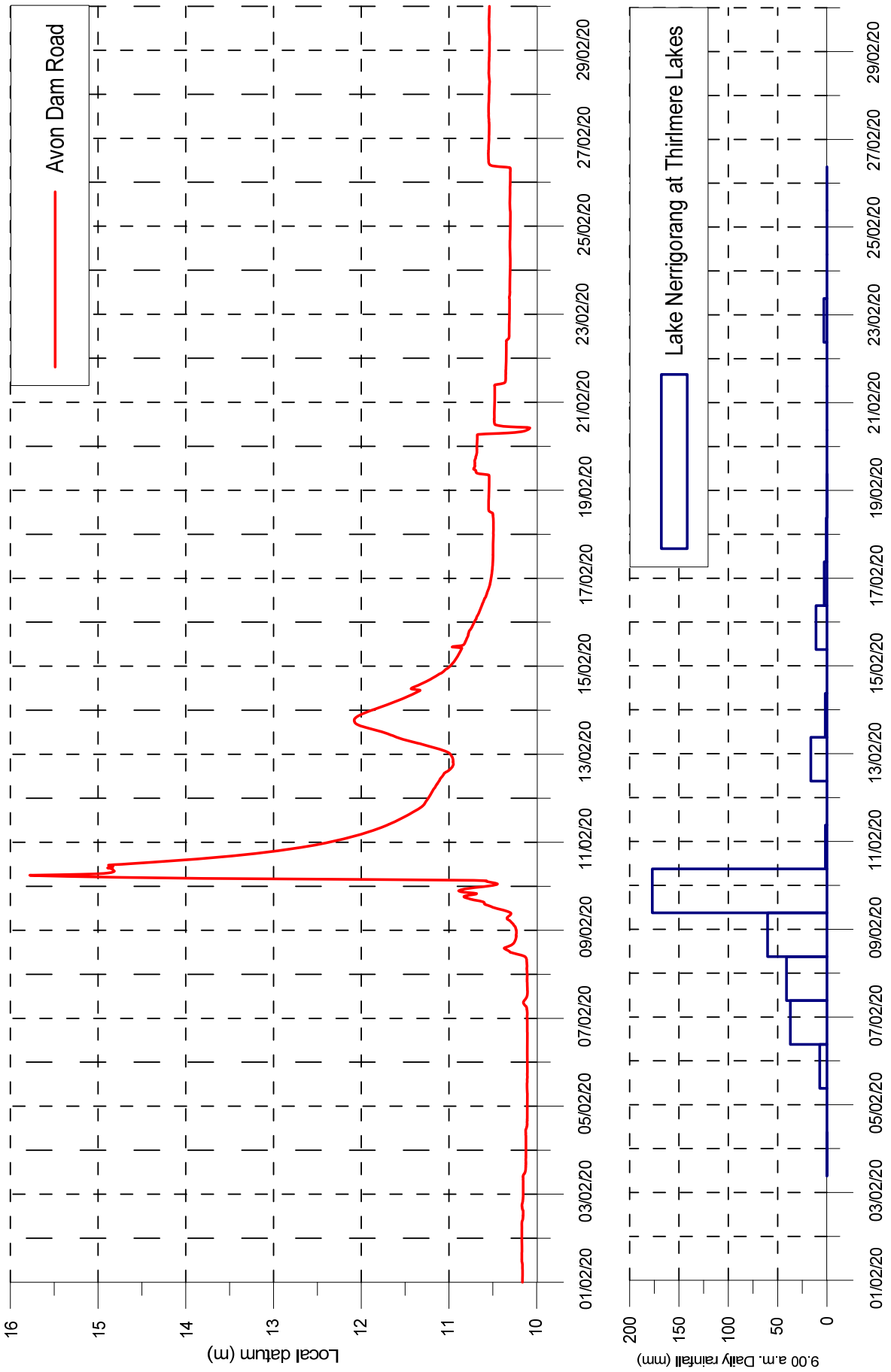

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WATER LEVEL AND RAINFALL DATA
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Figure
7.22

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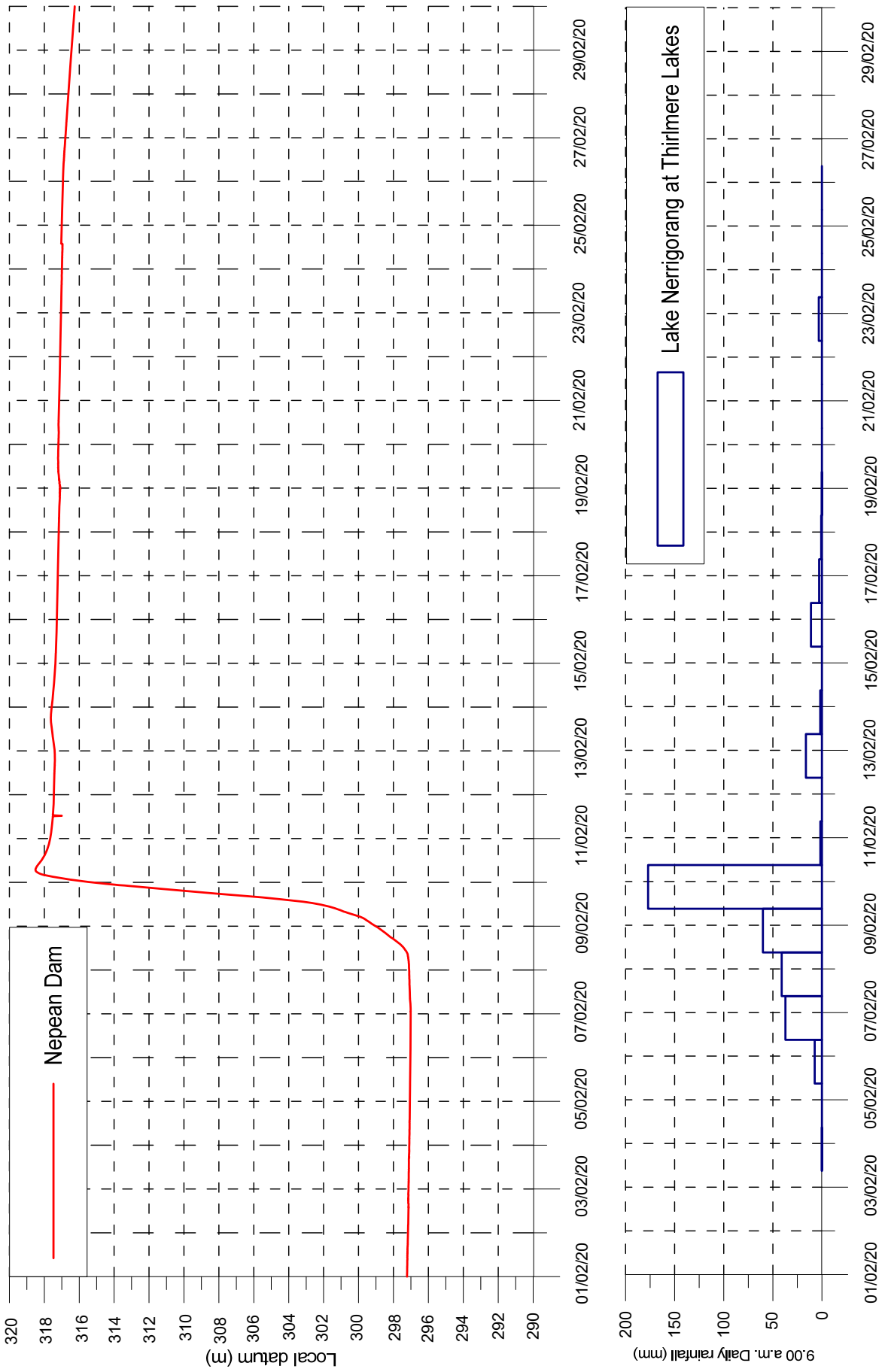

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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
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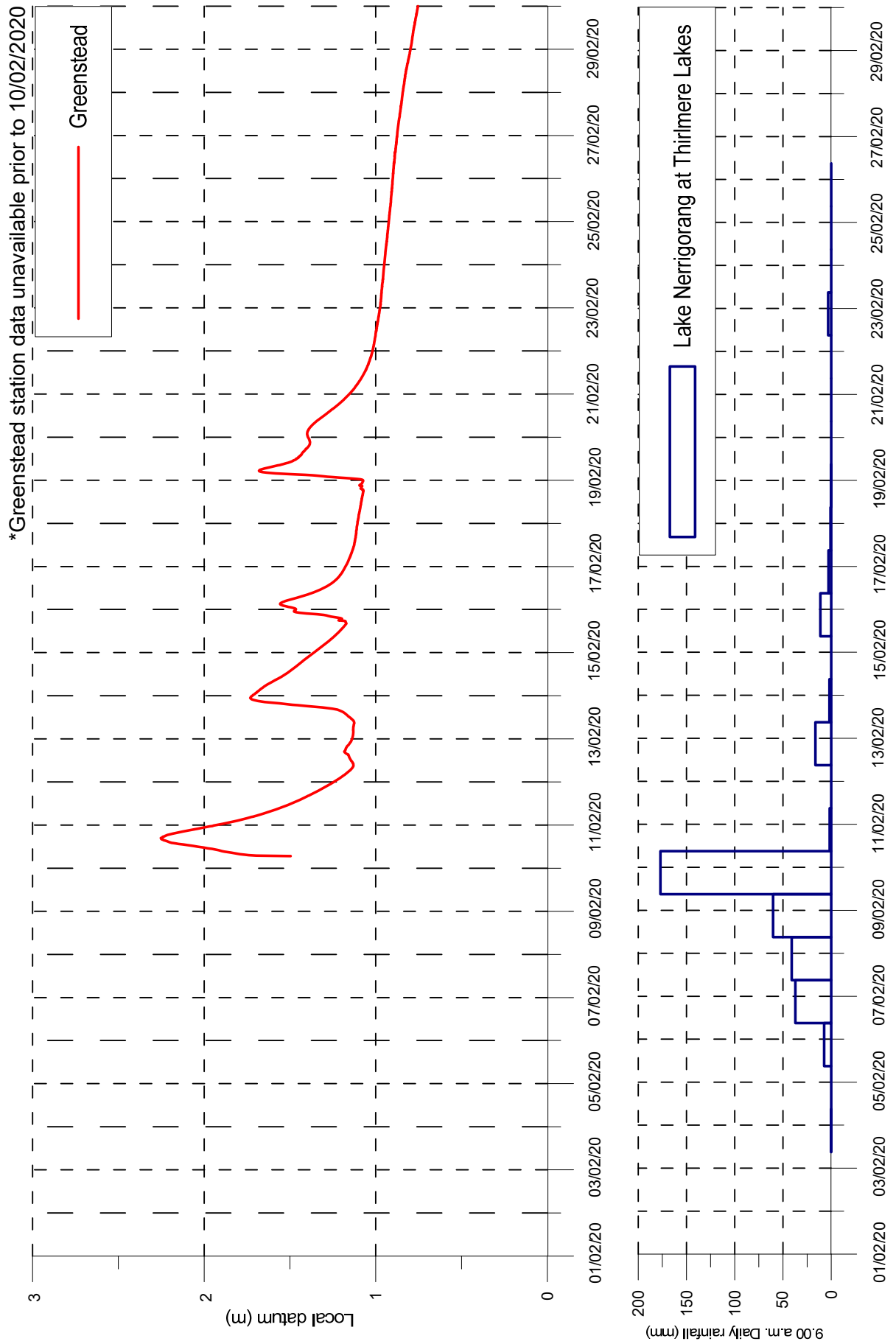
Figure
7.23

Figures_MHL2752.pptx



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HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
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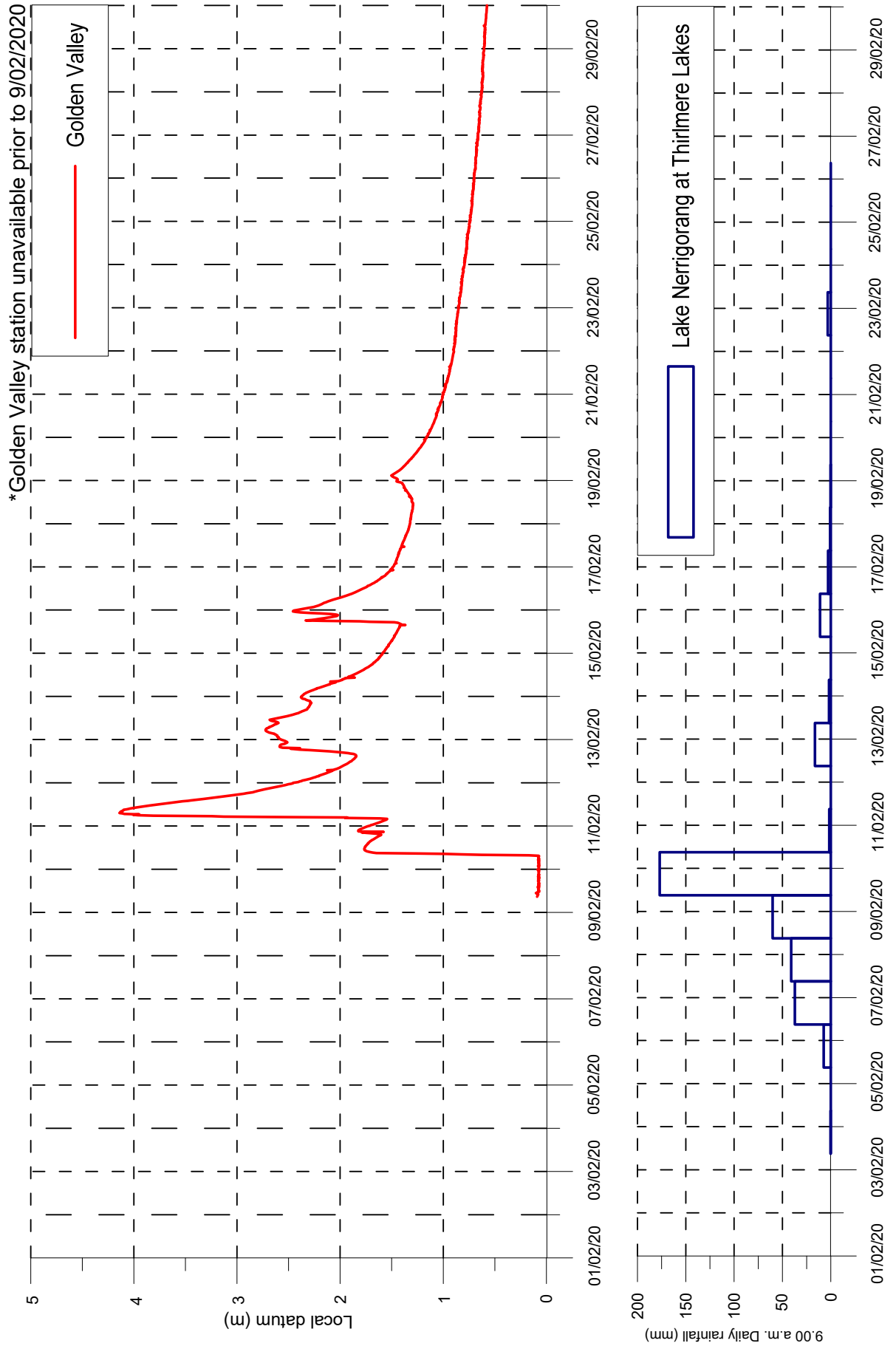
Figure
7.24

Figures_MHL2752.pptx



NSW GOVERNMENT

HAWKESBURY RIVER AND SOUTH CREEK REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

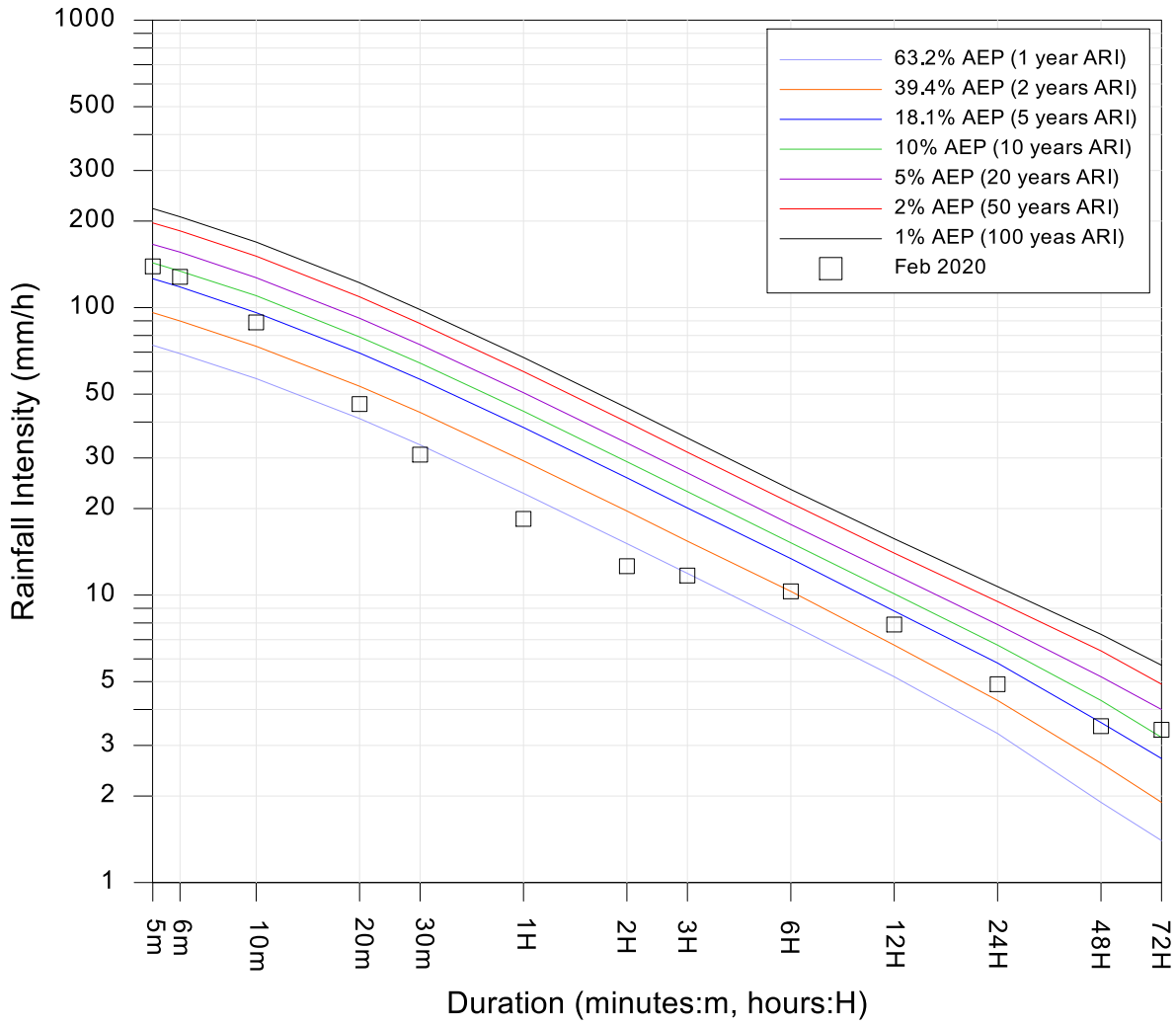
Manly Hydraulics Laboratory

Report MHL2752
Figure
7.25

Figures_MHL2752.pptx

Site Owner: CCSD
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	139.2	07:05 17 Feb 2020
6m	128	07:06 17 Feb 2020
10m	88.8	07:09 17 Feb 2020
20m	46.2	07:19 17 Feb 2020
30m	30.8	07:29 17 Feb 2020
1H	18.4	06:41 08 Feb 2020
2H	12.6	11:00 09 Feb 2020
3H	11.7	11:04 09 Feb 2020
6H	10.3	11:19 09 Feb 2020
12H	7.9	15:24 09 Feb 2020
24H	4.9	21:42 09 Feb 2020
48H	3.5	14:22 09 Feb 2020
72H	3.4	15:35 09 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Webbs Creek (212408)
Intensity-Frequency-Duration
1 - 29 February 2020

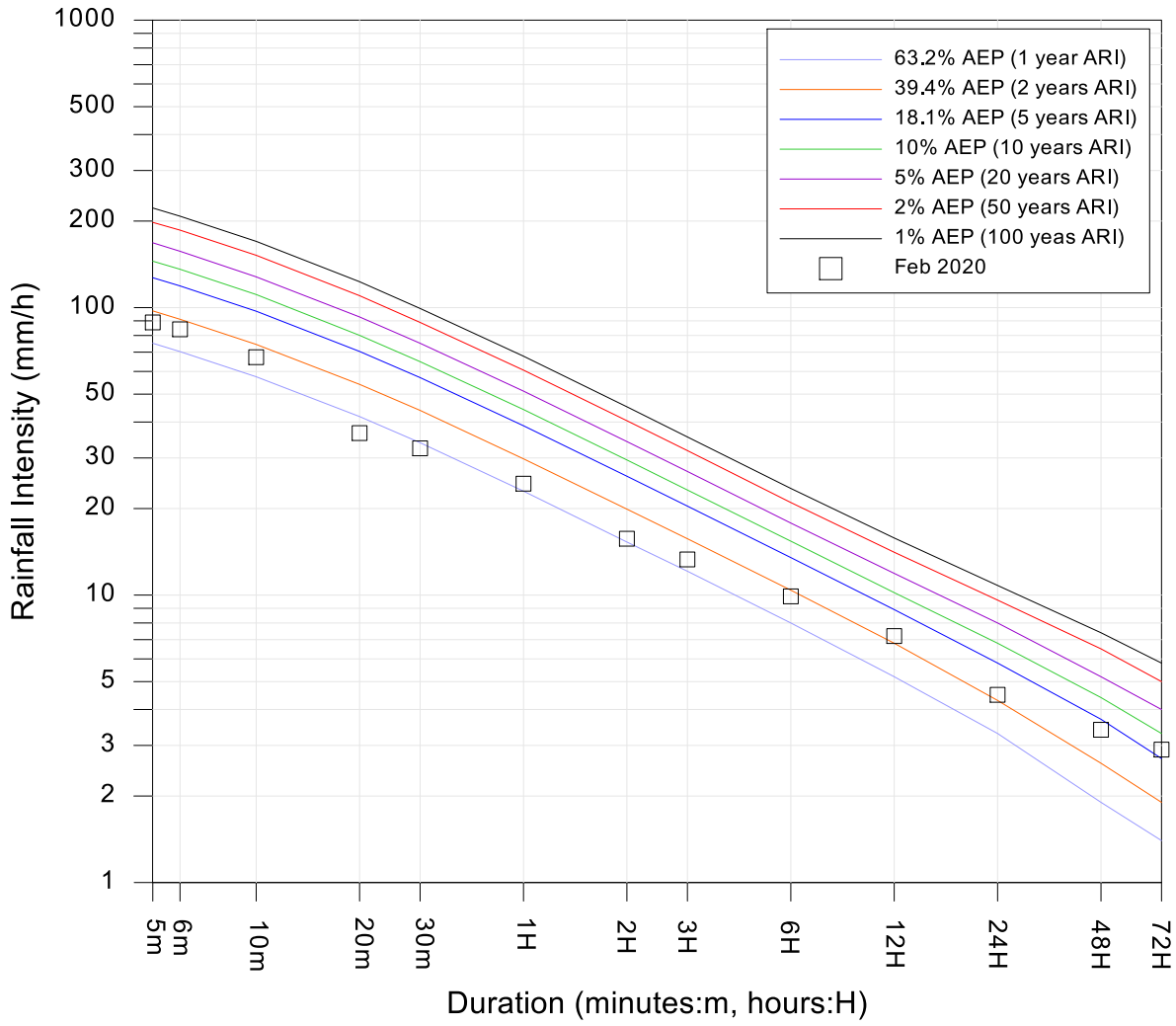
Manly Hydraulics Laboratory

Report MHL2752
Figure
7.26

IFD212408_Figure .pdf

Site Owner: CCSD
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	88.8	14:14 12 Feb 2020
6m	84	14:15 12 Feb 2020
10m	67.2	14:16 12 Feb 2020
20m	36.6	14:25 12 Feb 2020
30m	32.4	07:03 08 Feb 2020
1H	24.4	07:25 08 Feb 2020
2H	15.7	11:32 09 Feb 2020
3H	13.3	11:45 09 Feb 2020
6H	9.9	11:37 09 Feb 2020
12H	7.2	14:24 09 Feb 2020
24H	4.5	22:19 09 Feb 2020
48H	3.4	21:25 09 Feb 2020
72H	2.9	23:19 09 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Colo Junction (212407)
Intensity-Frequency-Duration
1 - 29 February 2020

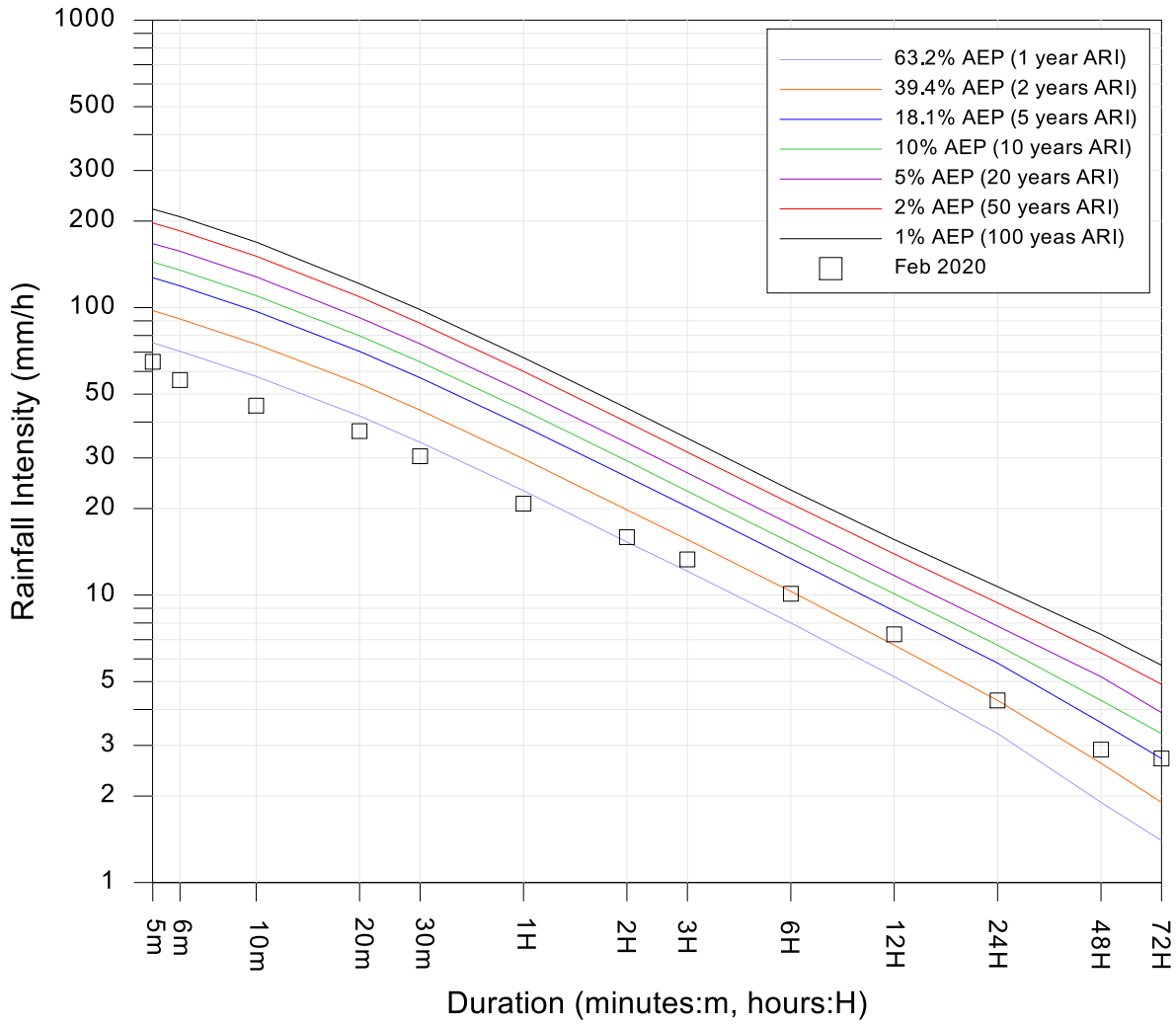
Manly Hydraulics Laboratory

Report MHL2752
Figure
7.27

IFD212407_Figure .pdf

Site Owner: CCSD
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	64.8	12:58 26 Feb 2020
6m	56	12:59 26 Feb 2020
10m	45.6	13:26 12 Feb 2020
20m	37.2	13:27 12 Feb 2020
30m	30.4	13:33 12 Feb 2020
1H	20.8	11:25 09 Feb 2020
2H	15.9	11:39 09 Feb 2020
3H	13.3	11:42 09 Feb 2020
6H	10.1	11:50 09 Feb 2020
12H	7.3	15:45 09 Feb 2020
24H	4.3	23:30 09 Feb 2020
48H	2.9	21:55 09 Feb 2020
72H	2.7	23:49 09 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Sackville Downstream (212438)
Intensity-Frequency-Duration
1 - 29 February 2020

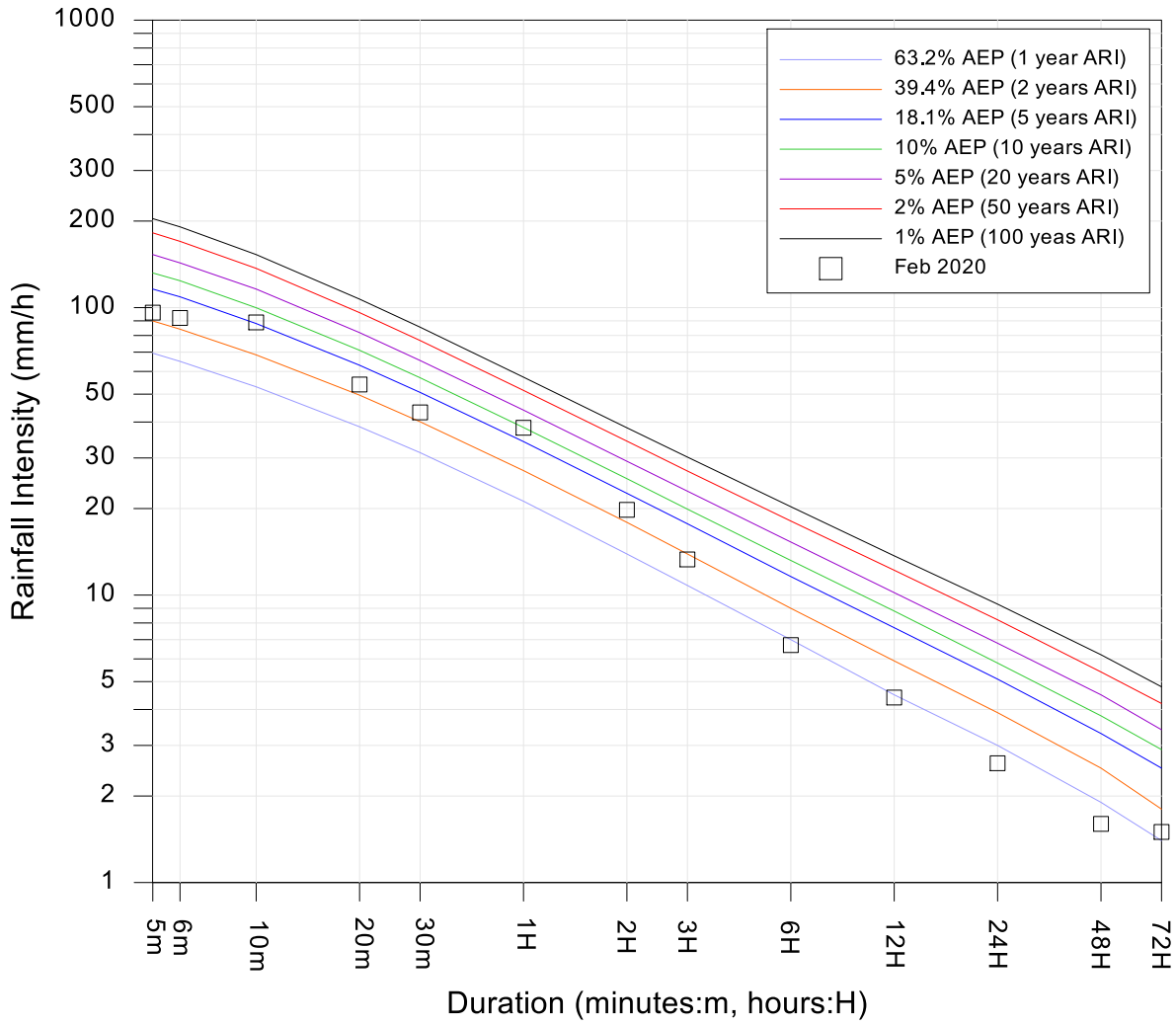
Manly Hydraulics Laboratory

Report MHL2752
Figure
7.28

IFD212438_Figure .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	96	23:02 18 Feb 2020
6m	92	23:01 18 Feb 2020
10m	88.8	23:02 18 Feb 2020
20m	54	23:09 18 Feb 2020
30m	43.2	23:19 18 Feb 2020
1H	38.2	23:51 18 Feb 2020
2H	19.8	00:48 19 Feb 2020
3H	13.3	01:48 19 Feb 2020
6H	6.7	09:45 09 Feb 2020
12H	4.4	14:12 09 Feb 2020
24H	2.6	16:43 09 Feb 2020
48H	1.6	15:21 09 Feb 2020
72H	1.5	12:41 09 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Macdonald River at Howes Valley (212021)
Intensity-Frequency-Duration
1 - 29 February 2020

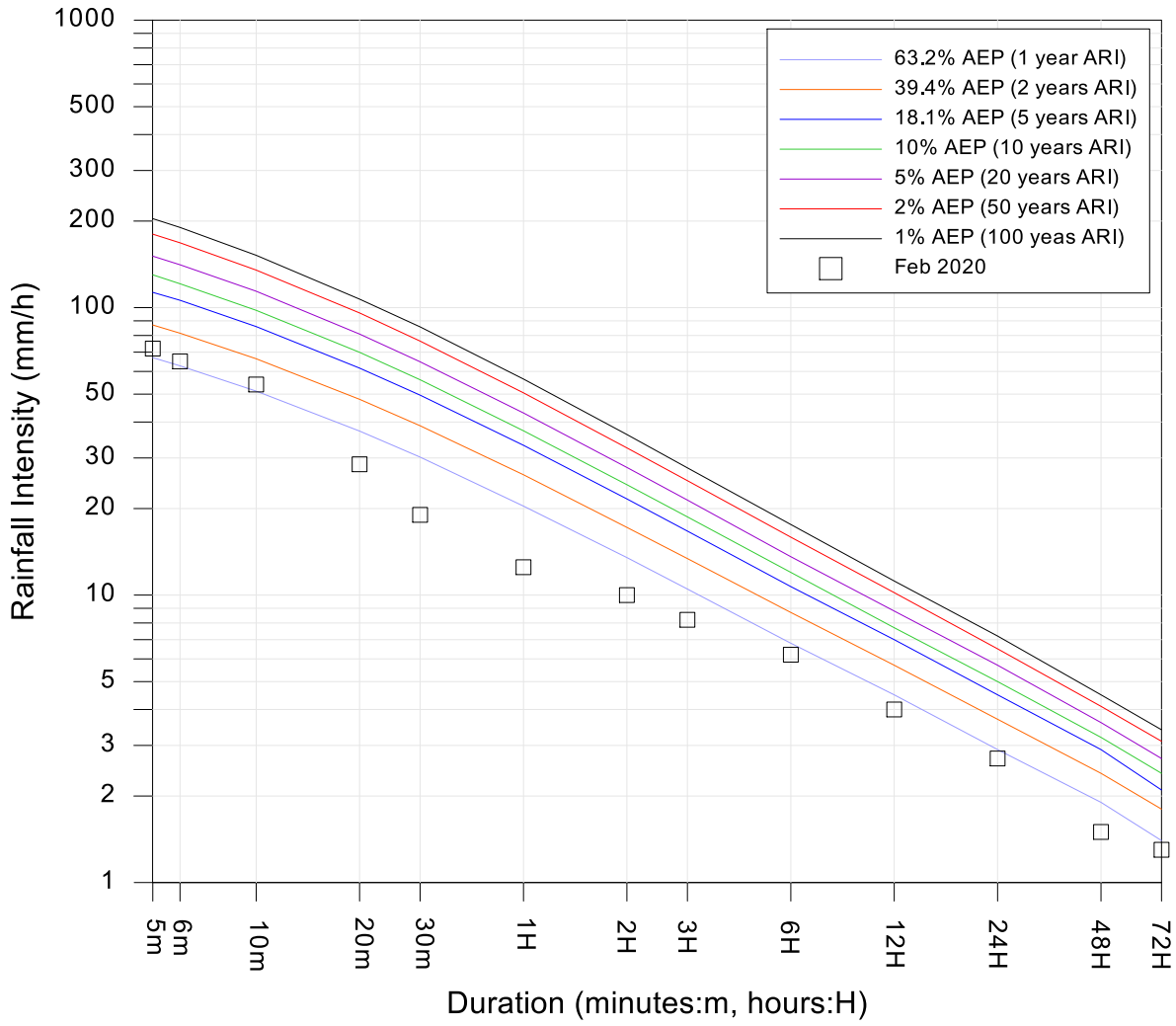
Manly Hydraulics Laboratory

Report MHL2752
Figure
7.29

IFD212021_Figure .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	72	22:59 18 Feb 2020
6m	65	23:00 18 Feb 2020
10m	54	23:02 18 Feb 2020
20m	28.5	23:06 18 Feb 2020
30m	19	23:16 18 Feb 2020
1H	12.5	21:21 18 Feb 2020
2H	10	11:22 09 Feb 2020
3H	8.2	11:44 09 Feb 2020
6H	6.2	11:45 09 Feb 2020
12H	4	14:28 09 Feb 2020
24H	2.7	11:40 09 Feb 2020
48H	1.5	01:20 10 Feb 2020
72H	1.3	13:21 09 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Capertree River at Glen Davis (212018)
Intensity-Frequency-Duration
1 - 29 February 2020

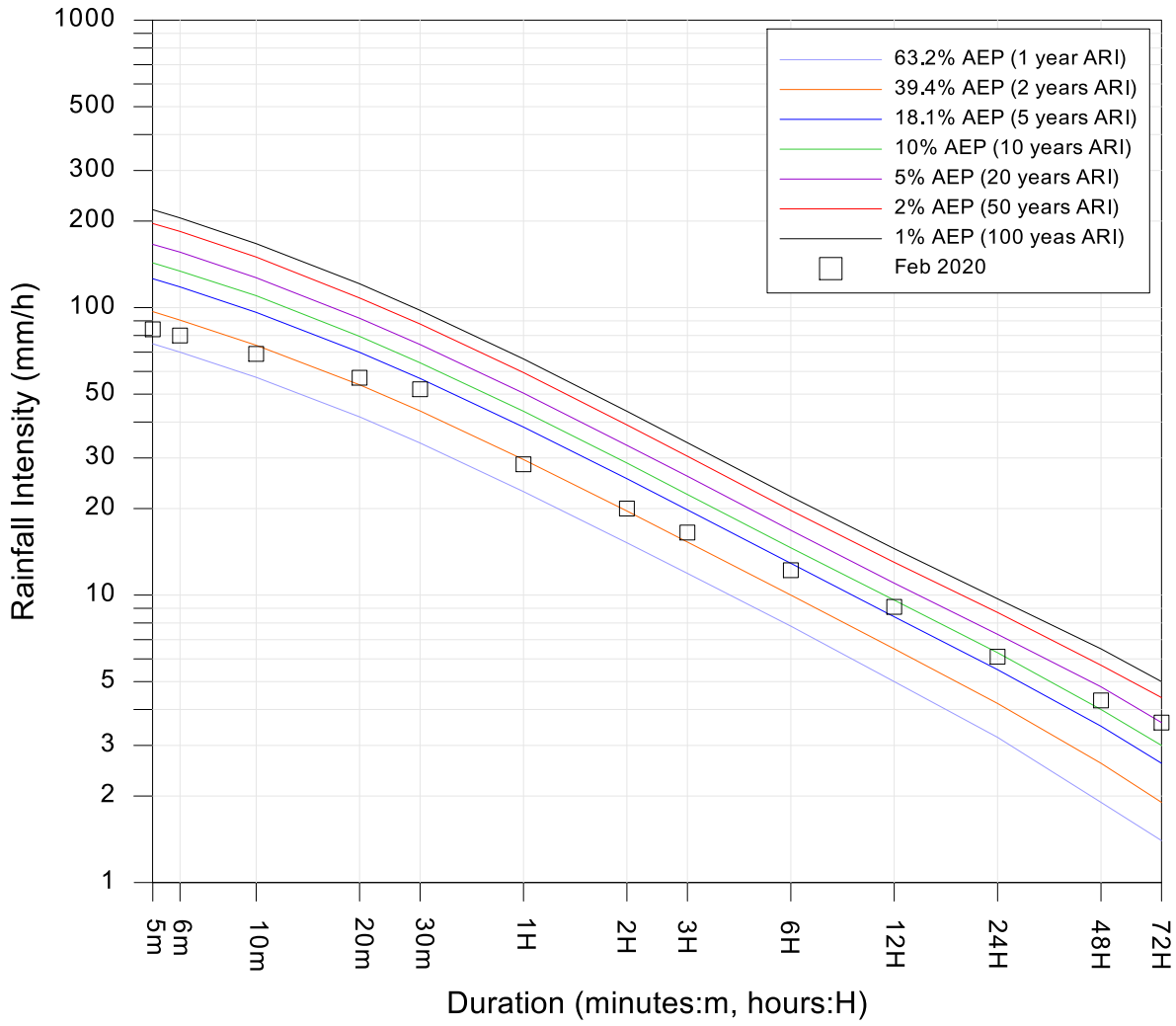
Manly Hydraulics Laboratory

Report MHL2752
Figure
7.30

IFD212018_Figure .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	84	11:43 17 Feb 2020
6m	80	17:56 02 Feb 2020
10m	69	17:58 02 Feb 2020
20m	57	18:09 02 Feb 2020
30m	52	18:18 02 Feb 2020
1H	28.5	18:46 02 Feb 2020
2H	20	15:06 09 Feb 2020
3H	16.5	15:10 09 Feb 2020
6H	12.2	15:09 09 Feb 2020
12H	9.1	16:53 09 Feb 2020
24H	6.1	15:09 09 Feb 2020
48H	4.3	23:52 09 Feb 2020
72H	3.6	21:44 09 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

South Creek at Great Western Hwy (212048)
Intensity-Frequency-Duration
1 - 29 February 2020

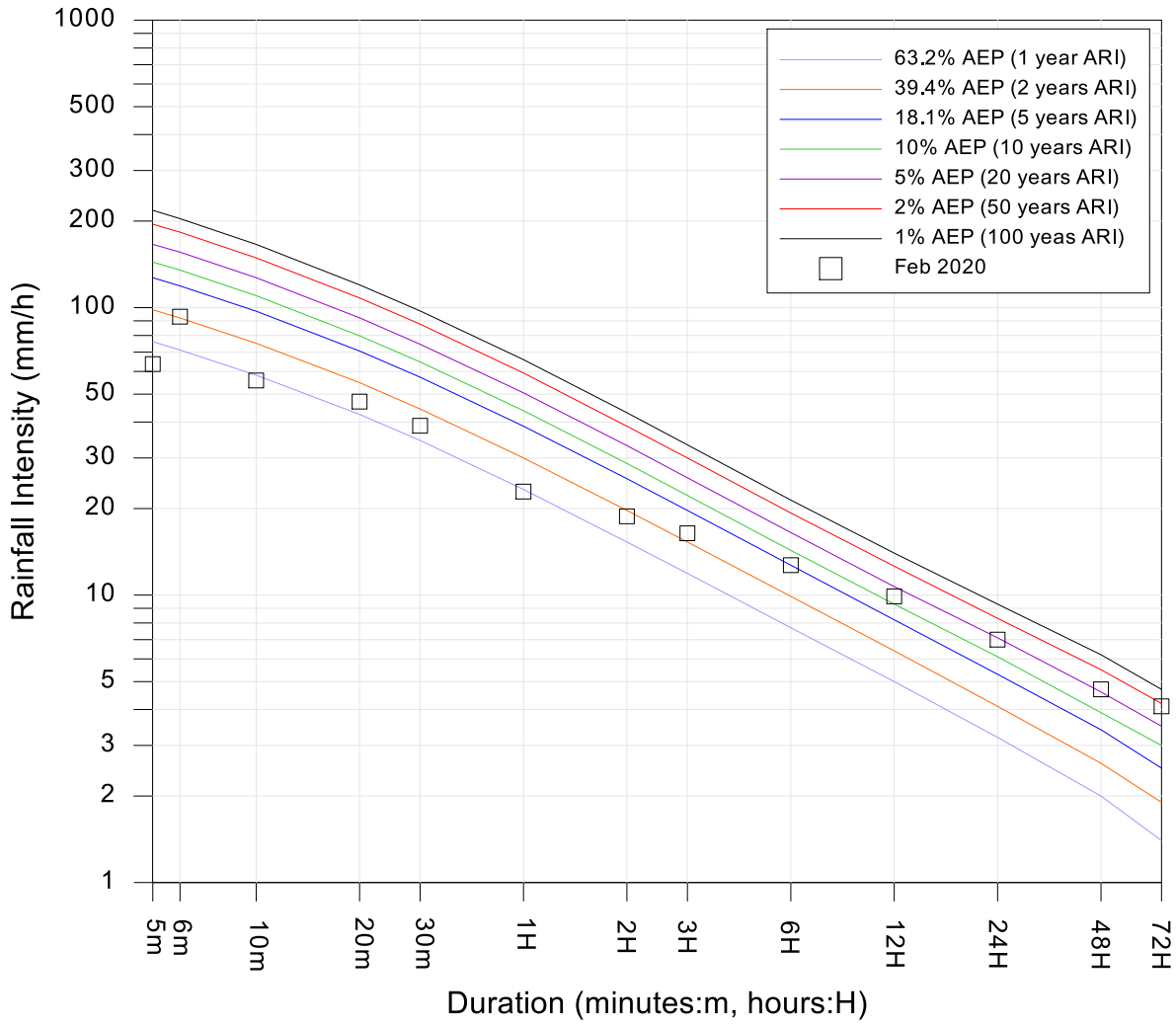
Manly Hydraulics Laboratory

Report MHL2752
Figure
7.31

IFD212048_Figure .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	63.6	18:14 02 Feb 2020
6m	93	21:35 18 Feb 2020
10m	55.8	21:39 18 Feb 2020
20m	47.1	21:39 18 Feb 2020
30m	38.8	18:24 02 Feb 2020
1H	22.9	18:49 02 Feb 2020
2H	18.8	14:59 09 Feb 2020
3H	16.4	14:59 09 Feb 2020
6H	12.7	15:09 09 Feb 2020
12H	9.9	17:09 09 Feb 2020
24H	7	21:19 09 Feb 2020
48H	4.7	00:04 10 Feb 2020
72H	4.1	01:29 10 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

South Creek at Elizabeth Dr (212320)
Intensity-Frequency-Duration
1 - 29 February 2020

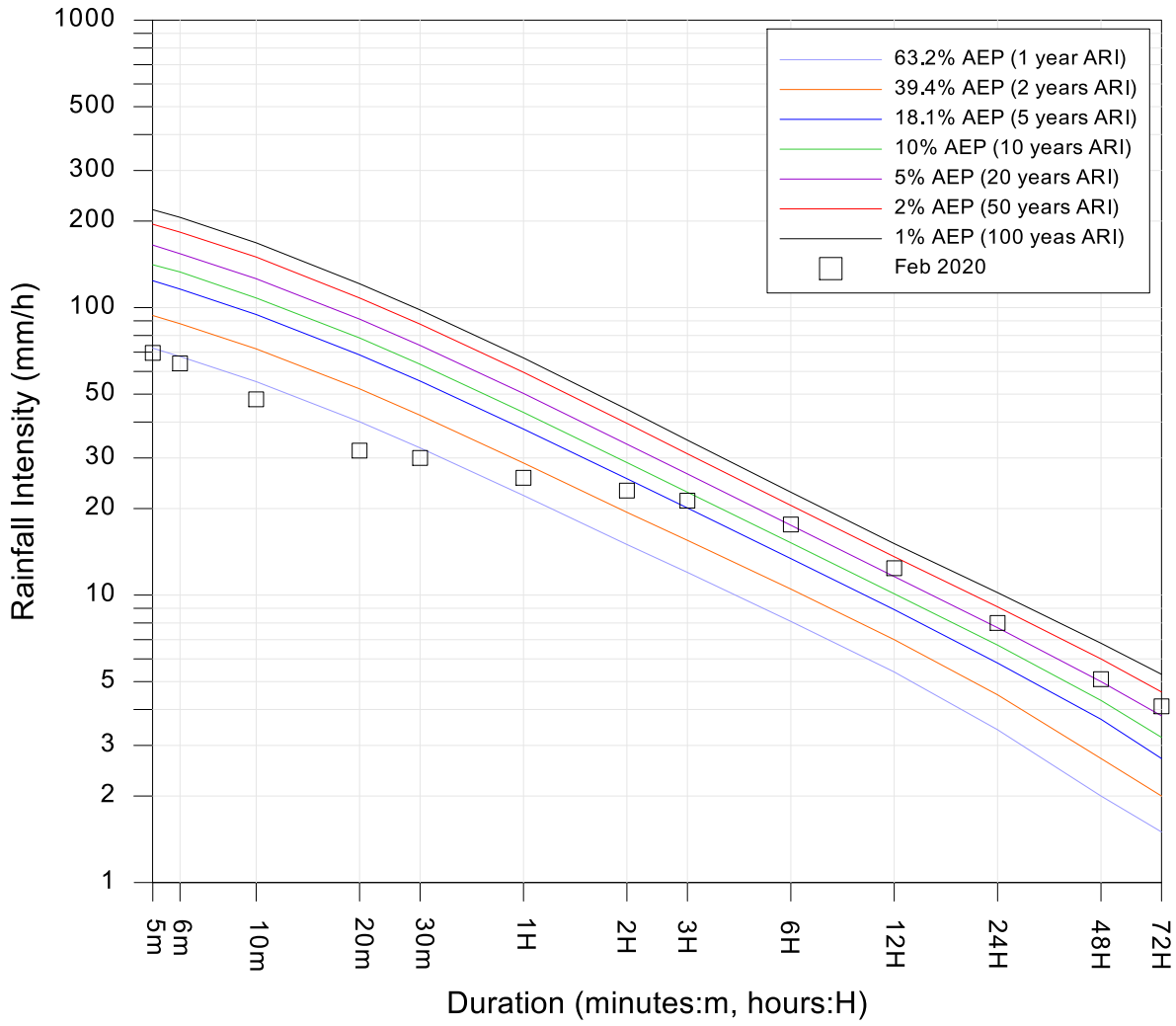
Manly Hydraulics Laboratory

Report MHL2752
Figure
7.32

IFD212320_Figure .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	69.6	14:59 02 Feb 2020
6m	64	15:00 02 Feb 2020
10m	48	01:29 10 Feb 2020
20m	31.8	01:36 10 Feb 2020
30m	30	17:56 09 Feb 2020
1H	25.6	18:10 09 Feb 2020
2H	23.1	18:04 09 Feb 2020
3H	21.3	18:40 09 Feb 2020
6H	17.6	21:34 09 Feb 2020
12H	12.4	02:06 10 Feb 2020
24H	8	02:12 10 Feb 2020
48H	5.1	02:04 10 Feb 2020
72H	4.1	02:25 10 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Lake Nerrigorang at Thirlmere Lakes (212063)
Intensity-Frequency-Duration
1 - 29 February 2020

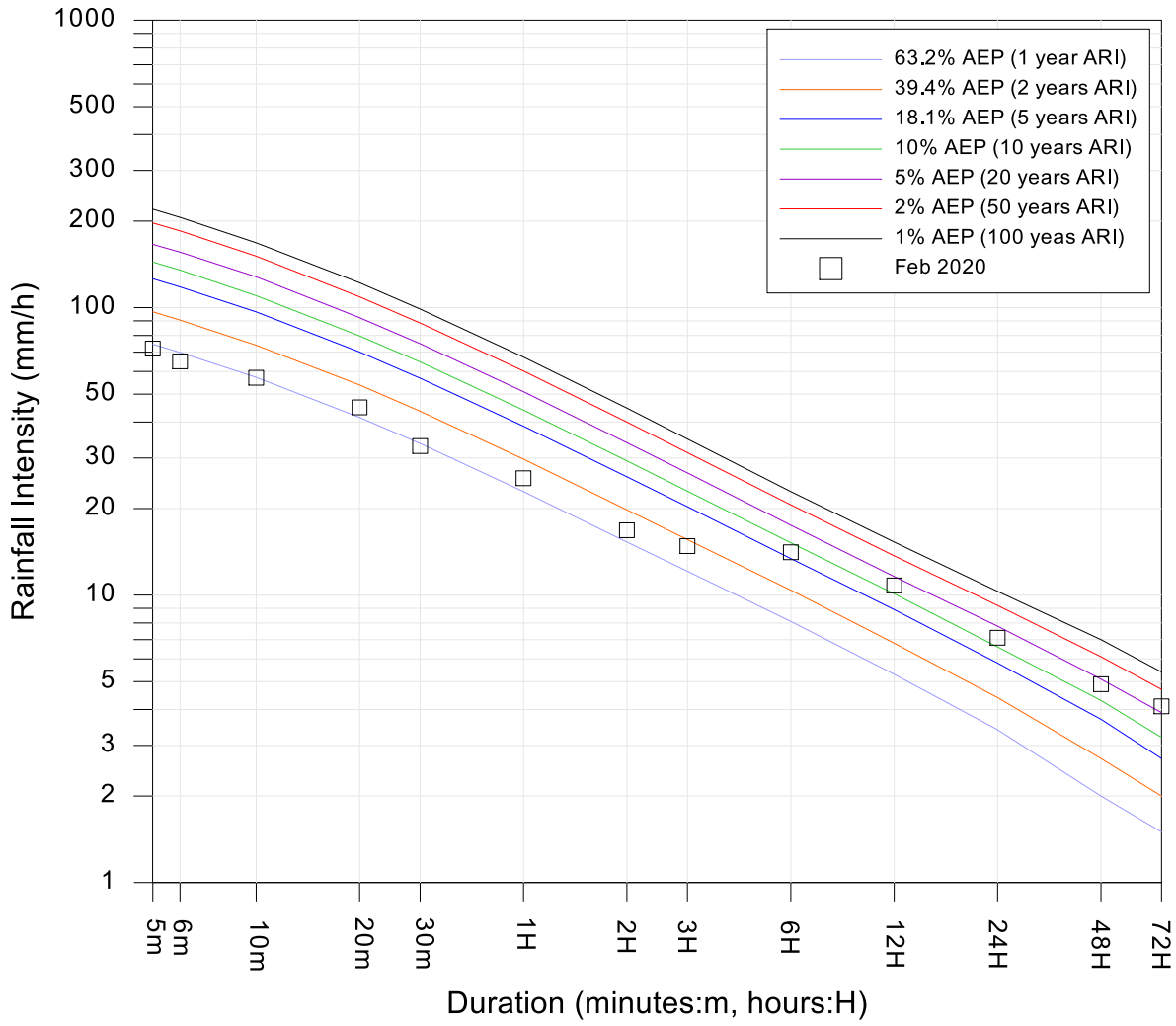
Manly Hydraulics Laboratory

Report MHL2752
Figure
7.33

IFD212063_Figure .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	72	01:11 10 Feb 2020
6m	65	01:12 10 Feb 2020
10m	57	01:16 10 Feb 2020
20m	45	01:19 10 Feb 2020
30m	33	01:27 10 Feb 2020
1H	25.5	07:13 08 Feb 2020
2H	16.8	08:11 08 Feb 2020
3H	14.8	18:54 09 Feb 2020
6H	14.1	21:27 09 Feb 2020
12H	10.8	01:25 10 Feb 2020
24H	7.1	01:55 10 Feb 2020
48H	4.9	04:20 10 Feb 2020
72H	4.1	01:35 10 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Stonequarry Creek at Picton (212053)
Intensity-Frequency-Duration
1 - 29 February 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
7.34

IFD212053_Figure .pdf

8 Narrabeen Lagoon region

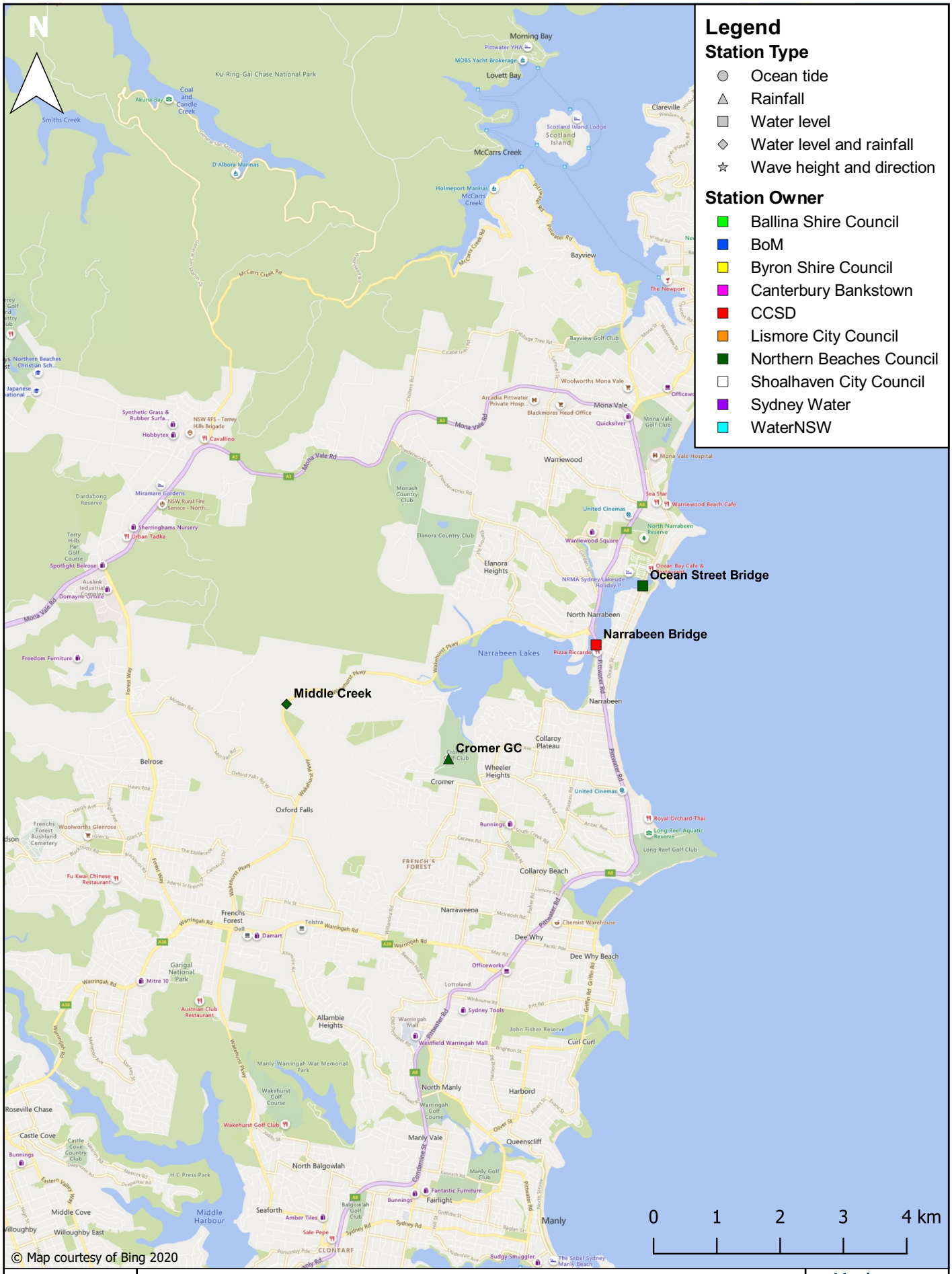
8.1 Narrabeen Lagoon region – water level

The peak observed water levels for the Narrabeen Lagoon region are listed in **Table 8.1**. The locations of water level stations within the Narrabeen Lagoon region are shown in **Figure 8.1**. The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 8.2** to **Figure 8.3**.

Table 8.1 Narrabeen Lagoon region flood peaks

Station name	Station number	Owner	Datum	Level (m)
Ocean Street Bridge	213408D	Northern Beaches Council	AHD	1.79
Narrabeen Bridge	213422	CCSD	AHD	2.10
Middle Creek	213421	Northern Beaches Council	AHD	4.62

There are no SES flood classifications for Narrabeen Lagoon.



NSW GOVERNMENT

NARRABEEN LAGOON STATIONS

Manly Hydraulics Laboratory

Report MHL2752
Figure
8.1

Figures_MHL2752.qgs

8.2 Narrabeen Lagoon region – rainfall

The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 8.2** to **Figure 8.3**. 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 8.2** for the period 01 to 29 February 2020. The rainfall intensities are displayed graphically in **Figure 8.4** to **Figure 8.5**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 8.2 Narrabeen Lagoon region daily rainfall totals

Date	Middle Creek 213421 (mm)	Cromer GC 5Cromer01 (mm)
	Northern Beaches Council	Northern Beaches Council
01/02/2020	0.0	0.0
02/02/2020	0.0	0.0
03/02/2020	7.0	7.5
04/02/2020	1.0	1.0
05/02/2020	0.0	0.0
06/02/2020	2.0	2.5
07/02/2020	85.0	86.5
08/02/2020	74.5	50.5
09/02/2020	91.5	69.5
10/02/2020	180.0	143.5
11/02/2020	0.0	0.0
12/02/2020	0.0	0.0
13/02/2020	4.0	7.5
14/02/2020	12.5	9.0
15/02/2020	0.0	0.0
16/02/2020	1.5	1.5
17/02/2020	0.0	0.0
18/02/2020	0.0	0.0
19/02/2020	8.5	9.5
20/02/2020	0.0	0.0
21/02/2020	0.0	0.0
22/02/2020	18.5	33.0
23/02/2020	0.5	0.0
24/02/2020	1.0	0.0
25/02/2020	0.0	0.0
26/02/2020	0.0	0.0
27/02/2020	0.0	0.0
28/02/2020	0.0	0.0
29/02/0202	0.0	0.0

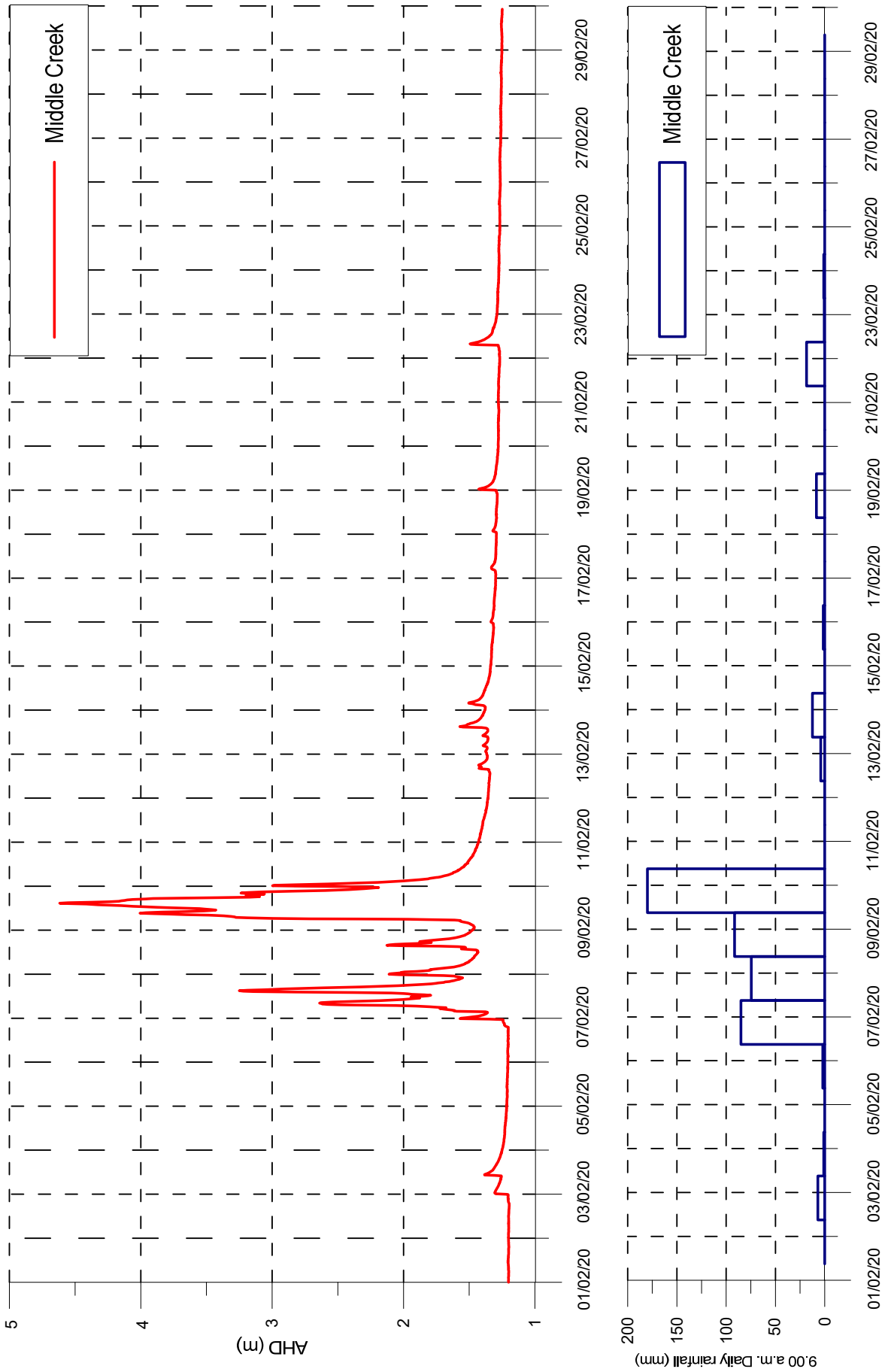
NSW GOVERNMENT

NARRABEEN LAGOON REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
8.2

Figures_MHL2752.pptx



NSW GOVERNMENT

NARRABEEN LAGOON REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

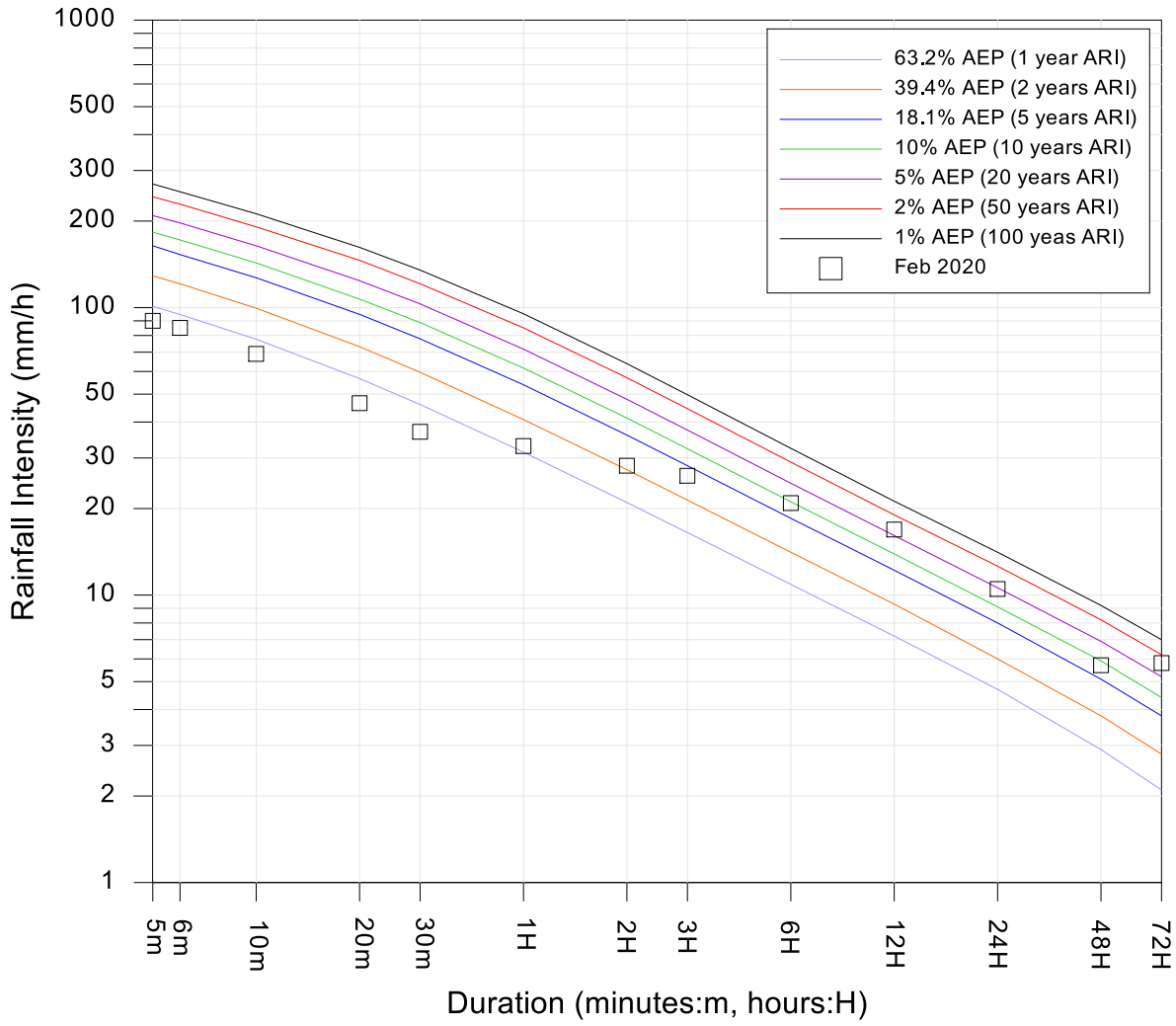
Manly Hydraulics Laboratory

Report MHL2752
Figure
8.3

Figures_MHL2752.pptx

Site Owner: Northern Beaches Council
Latitude: -33.7206 Longitude:151.244

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	90	15:07 09 Feb 2020
6m	85	15:08 09 Feb 2020
10m	69	15:09 09 Feb 2020
20m	46.5	15:12 09 Feb 2020
30m	37	14:15 09 Feb 2020
1H	33	14:16 09 Feb 2020
2H	28.2	14:18 09 Feb 2020
3H	26	14:20 09 Feb 2020
6H	20.9	16:07 09 Feb 2020
12H	16.9	16:30 09 Feb 2020
24H	10.5	00:59 10 Feb 2020
48H	5.7	01:03 10 Feb 2020
72H	5.8	20:37 09 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Middle Creek (213421)
Intensity-Frequency-Duration
1 - 29 February 2020

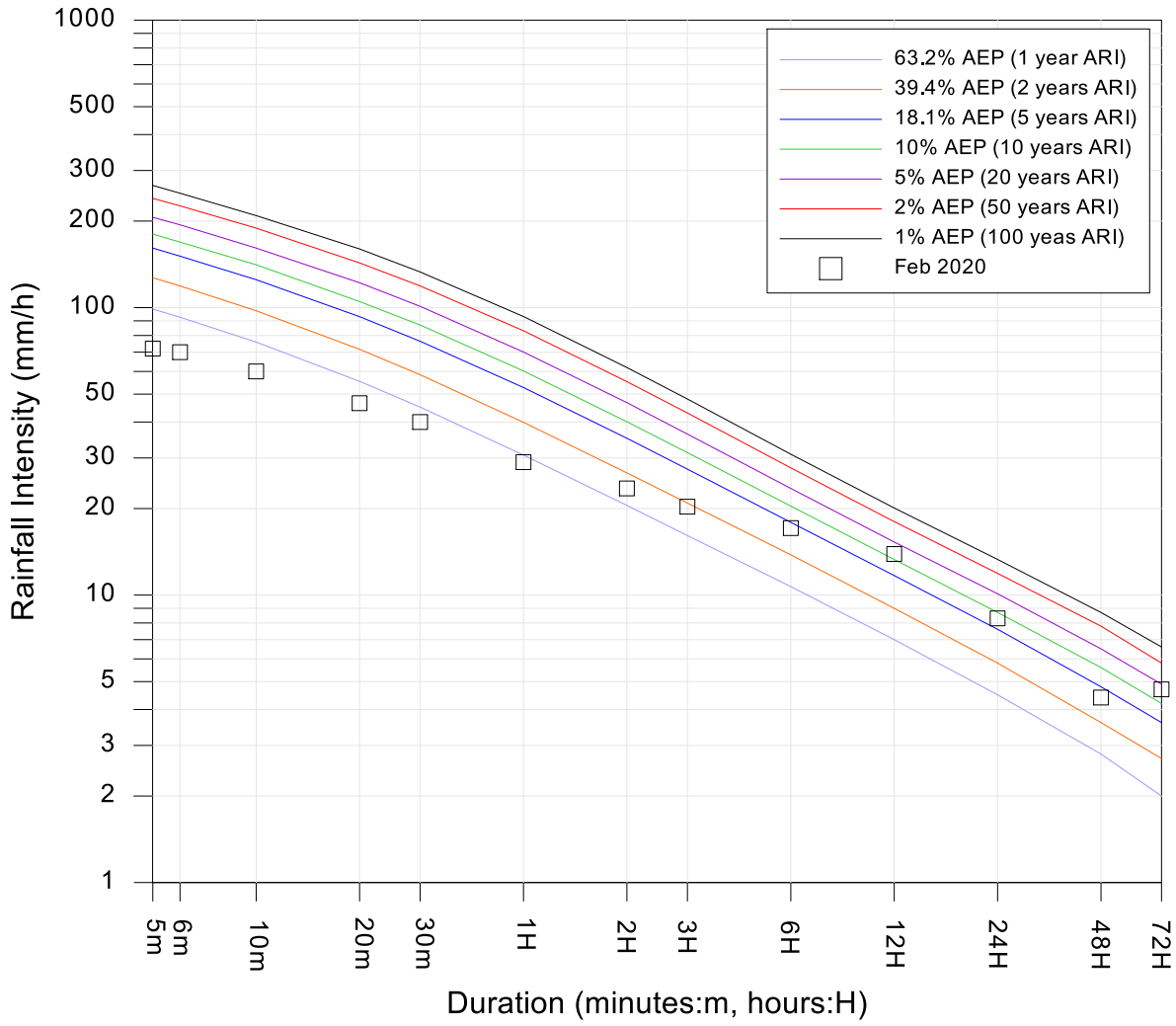
Manly Hydraulics Laboratory

Report MHL2752
Figure
8.4

IFD213421_Figure .pdf

Site Owner: Northern Beaches Council
Latitude: -33.7284 Longitude:151.272

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	72	04:37 22 Feb 2020
6m	70	04:37 22 Feb 2020
10m	60	04:40 22 Feb 2020
20m	46.5	04:39 22 Feb 2020
30m	40	04:43 22 Feb 2020
1H	29	14:23 09 Feb 2020
2H	23.5	14:25 09 Feb 2020
3H	20.3	15:45 09 Feb 2020
6H	17.1	16:36 09 Feb 2020
12H	13.9	16:40 09 Feb 2020
24H	8.3	00:05 10 Feb 2020
48H	4.4	23:56 09 Feb 2020
72H	4.7	21:09 09 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Cromer Golf Club (5Cromer01)
Intensity-Frequency-Duration
1 - 29 February 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
8.5

IFD5Cromer01_Figure .pdf

9 Georges River region

9.1 Georges River region – water level

The peak observed water levels for the Georges River region are listed in **Table 9.1**. **Table 9.2** lists the SES flood classifications for Milperra and Liverpool Weir. The locations of water level stations within the Georges River region are shown in **Figure 9.1**. The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 9.2** to **Figure 9.6**.

Table 9.1 Georges River region flood peaks

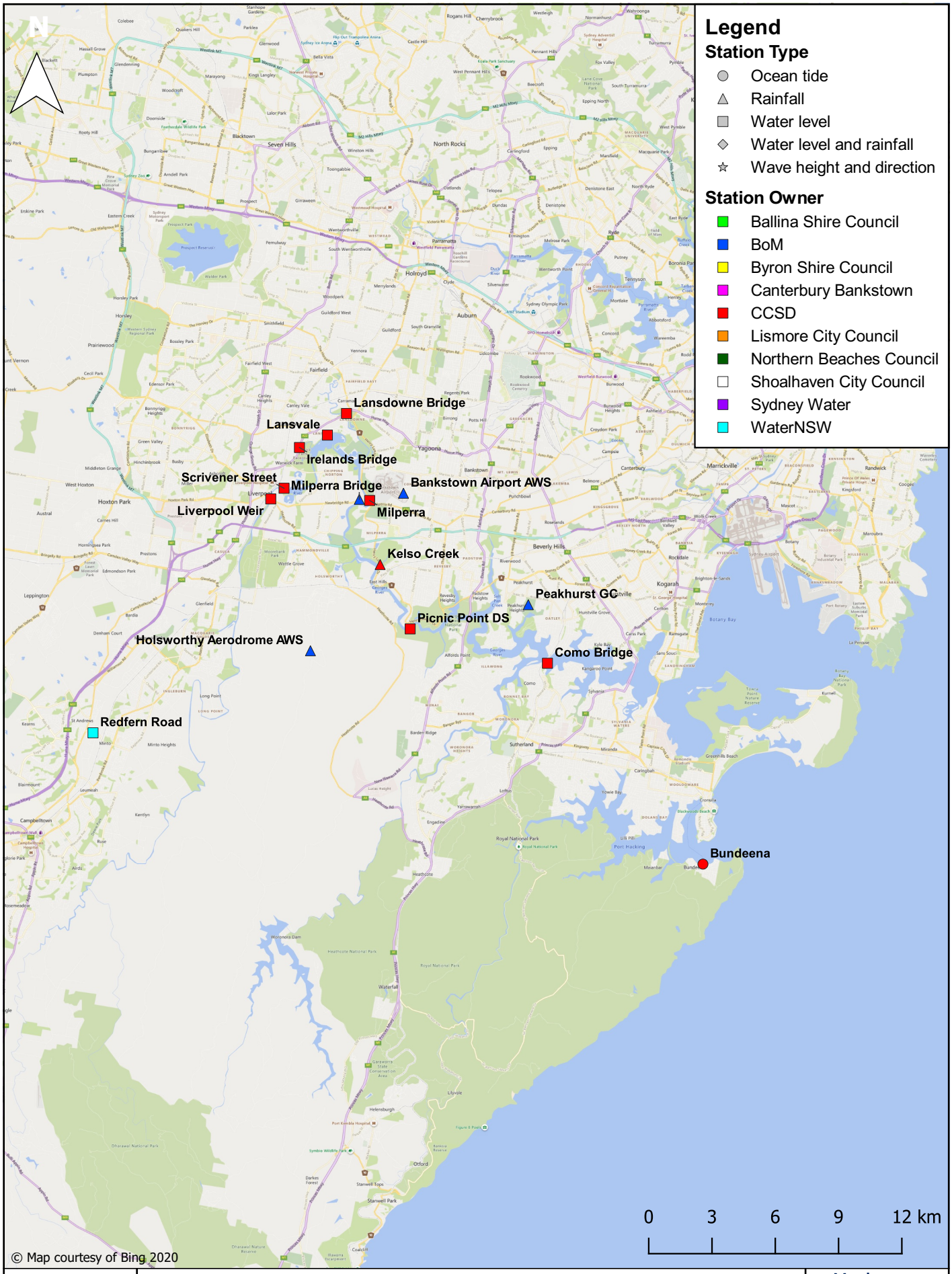
Station name	Station number	Owner	Datum	Level (m)
Picnic Point DS	213410D	CCSD	AHD	2.28
Como Bridge	213425	CCSD	AHD	1.23
Milperra	213405	CCSD	AHD	4.58
Lansdowne Bridge	213402	CCSD	AHD	4.45*
Lansvale	213401	CCSD	AHD	5.53
Irelands Bridge	213407	CCSD	AHD	5.75
Scrivener Street	213404	CCSD	AHD	6.52
Liverpool Weir	213400	CCSD	AHD	7.99*
Bundeena	214452	CCSD	AHD	1.10
Kelso Creek DS Levee	213903	Canterbury-Bankstown Council	Local Datum	3.64
Redfern Road	213013	WaterNSW	Local Datum	2.06

*Debris line survey used as an estimate for flood peak, station lost data during flood event.

Table 9.2 SES flood classifications for Milperra and Liverpool Weir

Station name	Station number	Flood Classification			Flood Peak (m)	Flood Event Classification
		Minor	Moderate	Major		
		Water Level (m AHD)				
Milperra	213405	2.0	3.3	4.2	4.58	Major
Liverpool Weir	213400	2.0	3.0	4.5	7.99*	Major

*Debris line survey used as an estimate for flood peak, station lost data during flood event.



NSW GOVERNMENT

GEORGES RIVER STATIONS

Manly Hydraulics Laboratory

Report MHL2752
Figure
9.1

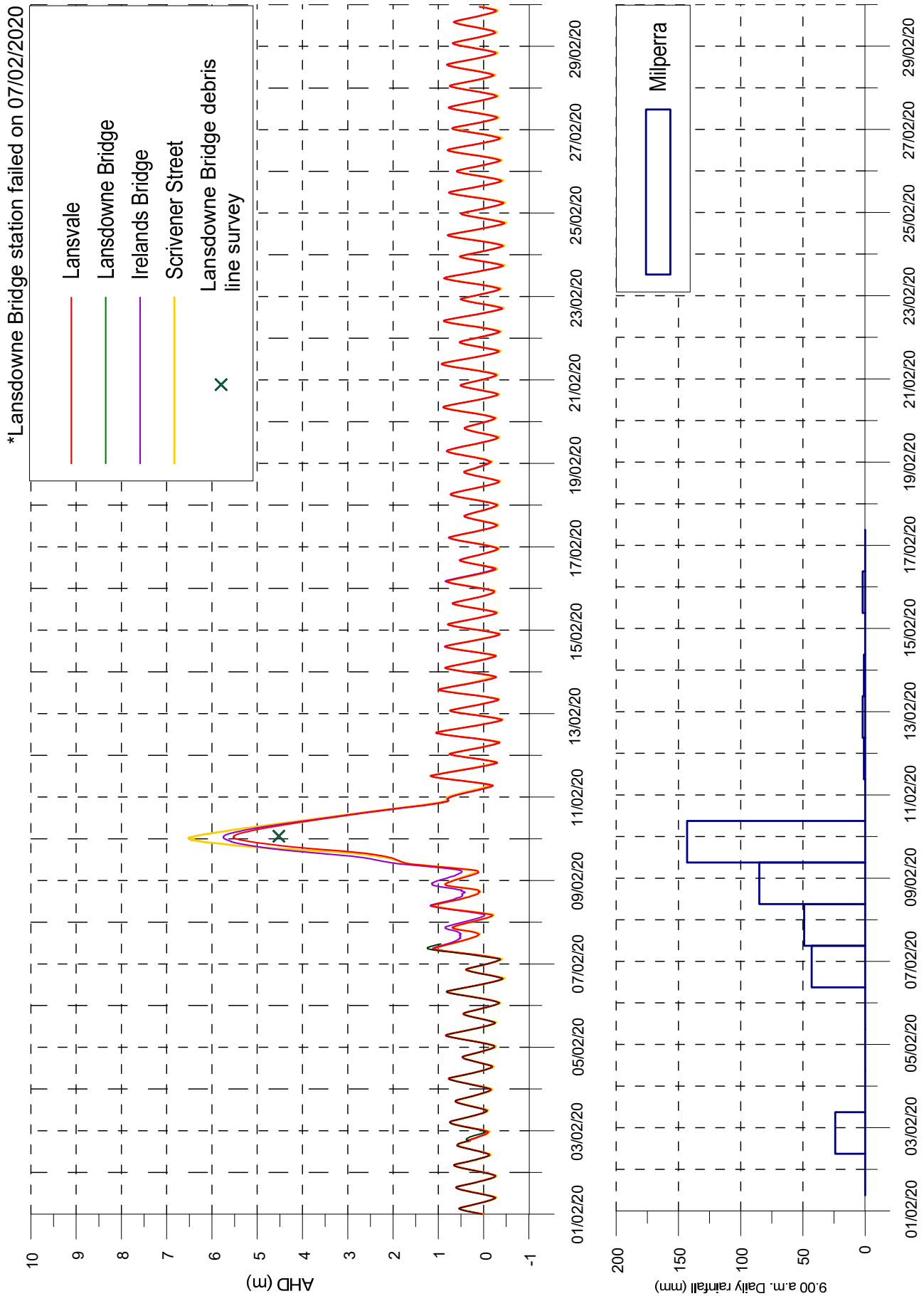
Figures_MHL2752.qgs

9.2 Georges River region – rainfall

The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 9.2** to **Figure 9.6**. 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 9.3** for the period 01 to 29 February 2020. The rainfall intensities are displayed graphically in **Figure 9.7** to **Figure 9.11**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 9.3 Georges River region daily rainfall totals

Date	Kelso Creek 213430 (mm)	Milperra Bridge 66168 (mm)	Bankstown Airport AWS 66137 (mm)	Holsworthy Aerodrome AWS 66161 (mm)	Peakhurst GC 66148 (mm)
	CCSD	BoM	BoM	BoM	BoM
01/02/2020	0.0	0.0	-	-	-
02/02/2020	0.0	0.0	-	-	-
03/02/2020	19.5	24.0	-	-	-
04/02/2020	0.0	0.0	0.4	0.0	0.4
05/02/2020	0.0	0.0	0.0	0.0	0.0
06/02/2020	0.5	0.0	2.4	0.2	2.4
07/02/2020	43.5	43.0	50.2	38.4	50.2
08/02/2020	45.0	49.0	44.2	46.0	44.2
09/02/2020	88.5	85.0	81.8	68.2	81.8
10/02/2020	156.5	143.0	145.0	170.8	145.0
11/02/2020	0.0	0.0	0.0	0.0	0.0
12/02/2020	0.0	1.0	0.0	0.0	0.0
13/02/2020	6.0	2.0	2.2	8.4	2.2
14/02/2020	1.5	1.0	1.2	2.8	1.2
15/02/2020	0.0	0.0	0.0	0.0	0.0
16/02/2020	2.0	2.0	2.4	2.8	2.4
17/02/2020	0.0	0.0	0.0	0.0	0.0
18/02/2020	0.0	-	0.0	0.0	0.0
19/02/2020	13.0	-	12.4	10.4	12.4
20/02/2020	0.0	-	0.0	0.2	0.0
21/02/2020	0.0	-	0.0	0.0	0.0
22/02/2020	0.0	-	0.0	0.0	0.0
23/02/2020	1.0	-	0.8	0.4	0.8
24/02/2020	0.0	-	0.0	0.0	0.0
25/02/2020	0.0	-	0.0	0.2	0.0
26/02/2020	0.0	-	0.0	0.0	0.0
27/02/2020	0.0	-	0.0	0.0	0.0
28/02/2020	0.0	-	-	0.0	-
29/02/0202	0.0	-	-	-	-



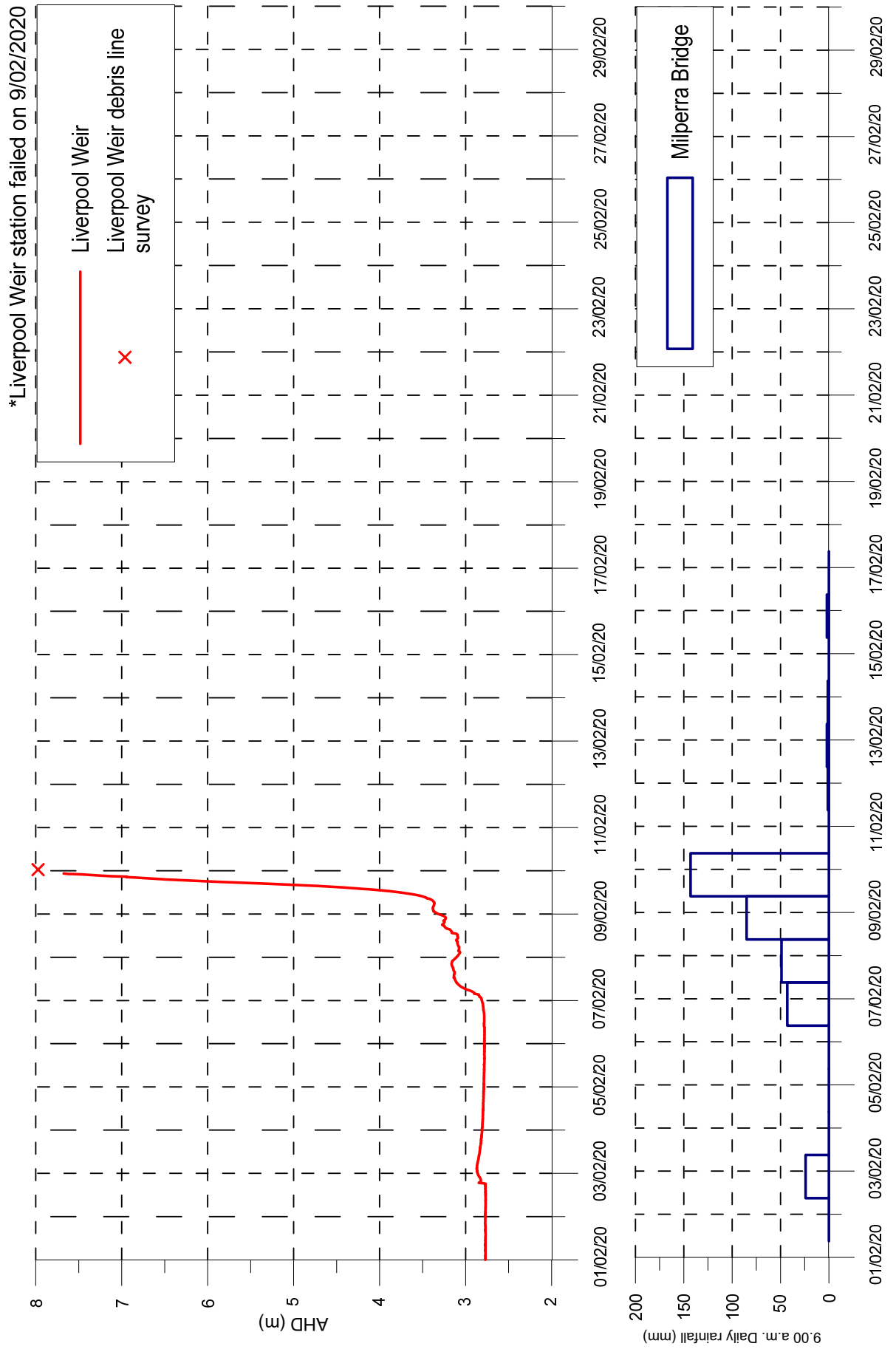
NSW GOVERNMENT

GEORGES RIVER REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
9.2

Figures_MHL2752.pptx



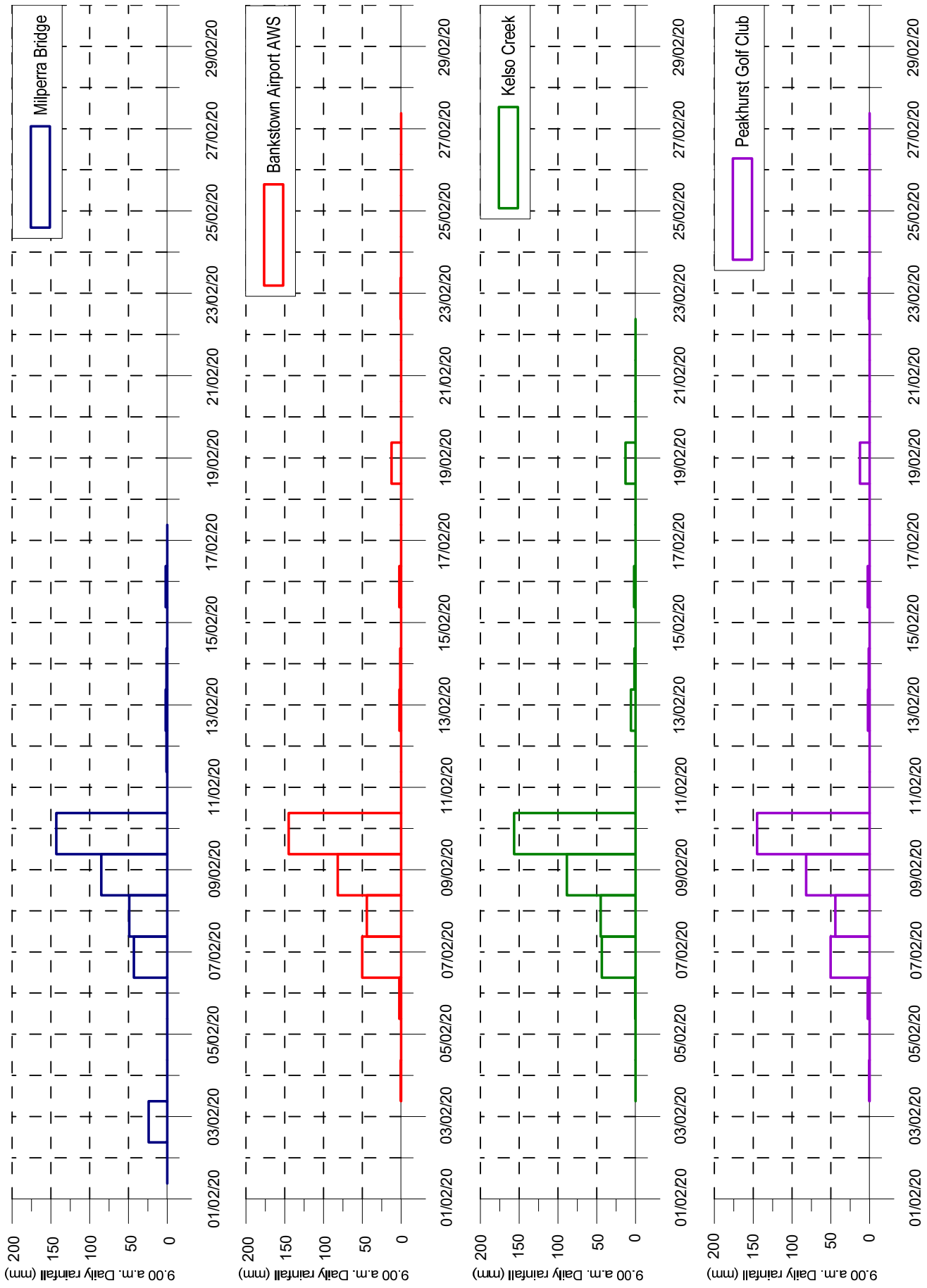
NSW GOVERNMENT

GEORGES RIVER REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
9.3

Figures_MHL2752.pptx



NSW GOVERNMENT

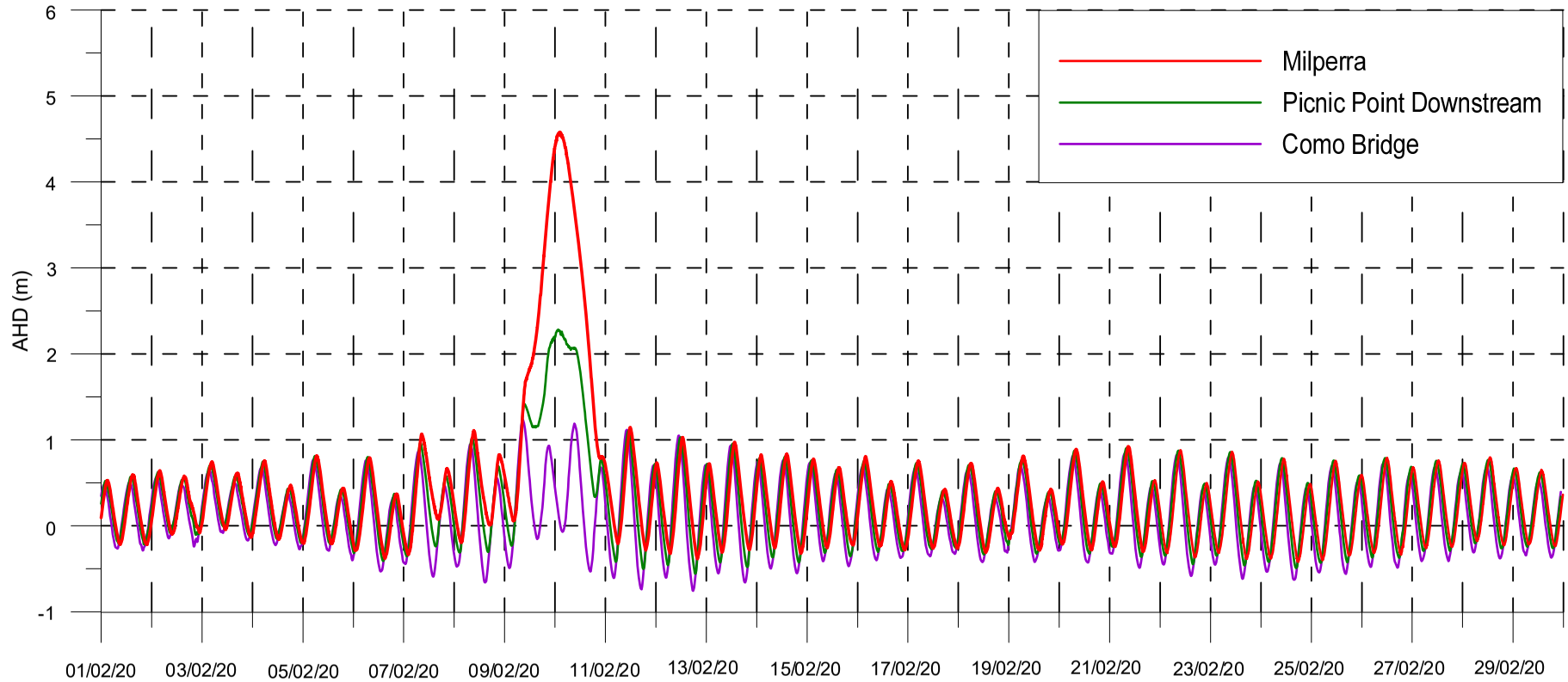
GEORGES RIVER REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

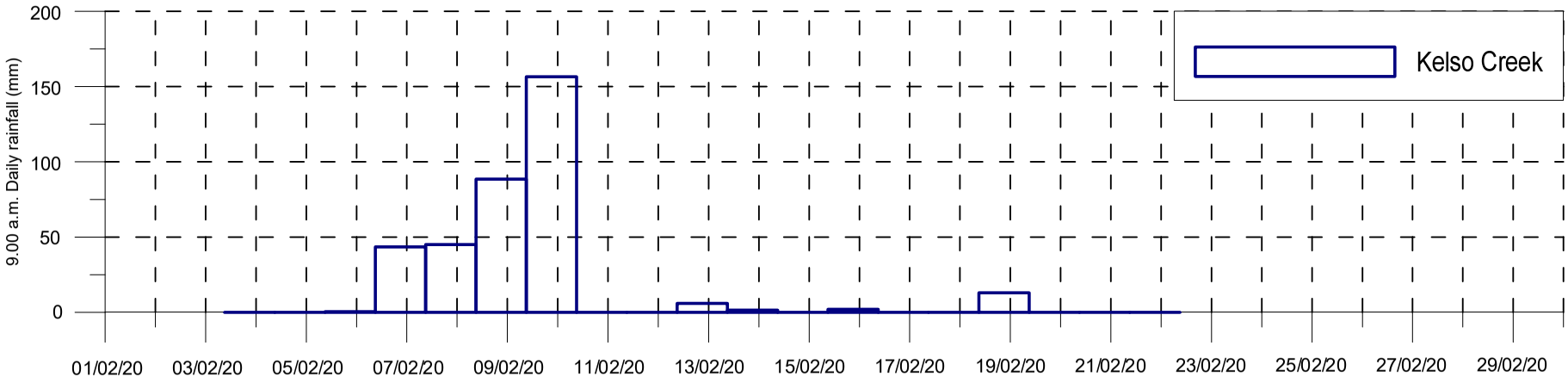
Manly Hydraulics Laboratory

Report MHL2752
Figure
9.4

Figures_MHL2752.pptx

GEORGES RIVER REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020



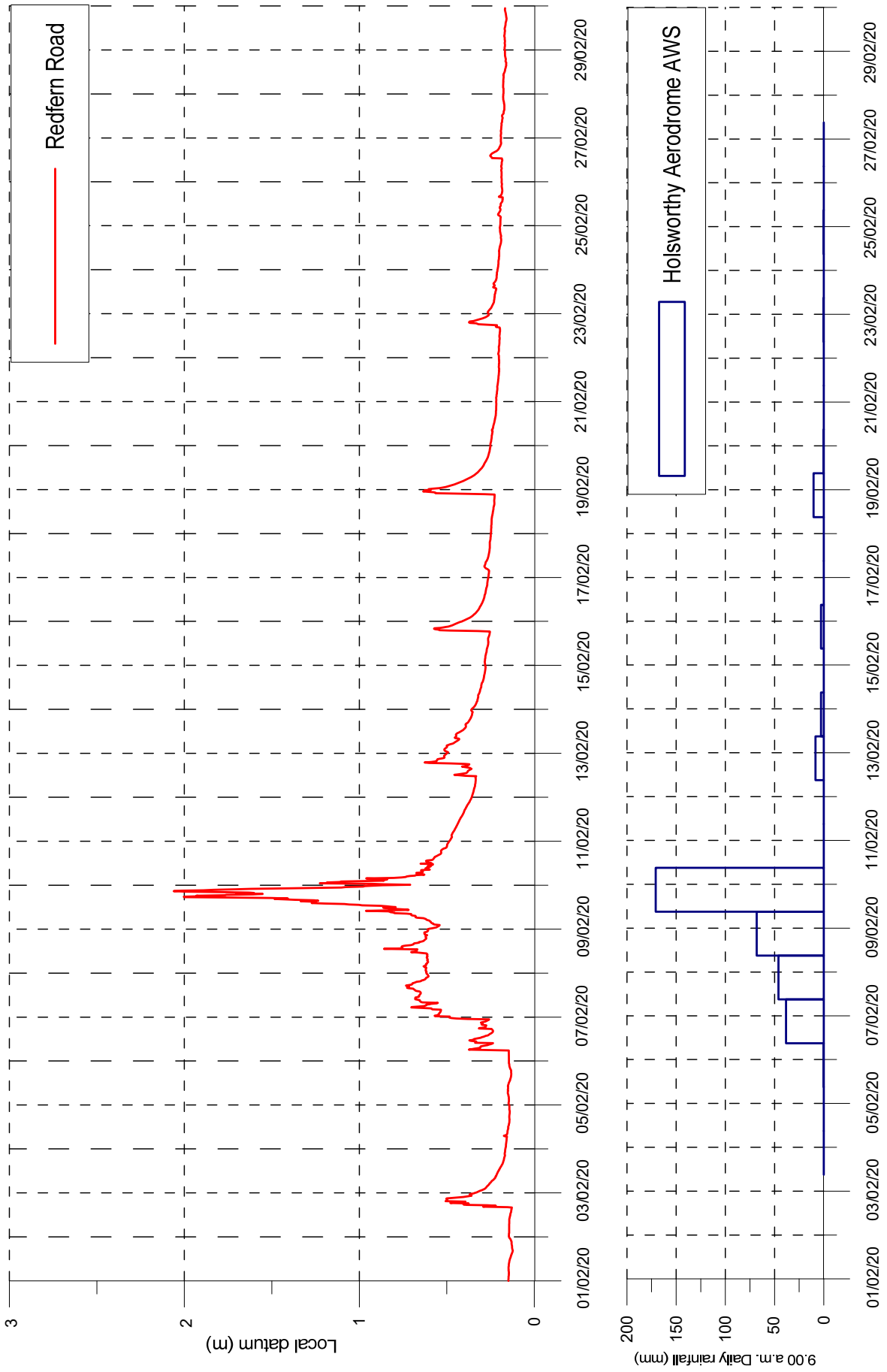


Manly Hydraulics Laboratory

Report MHL2752

Figure 9.5

Figures_MHL2752.pptx



NSW GOVERNMENT

GEORGES RIVER REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

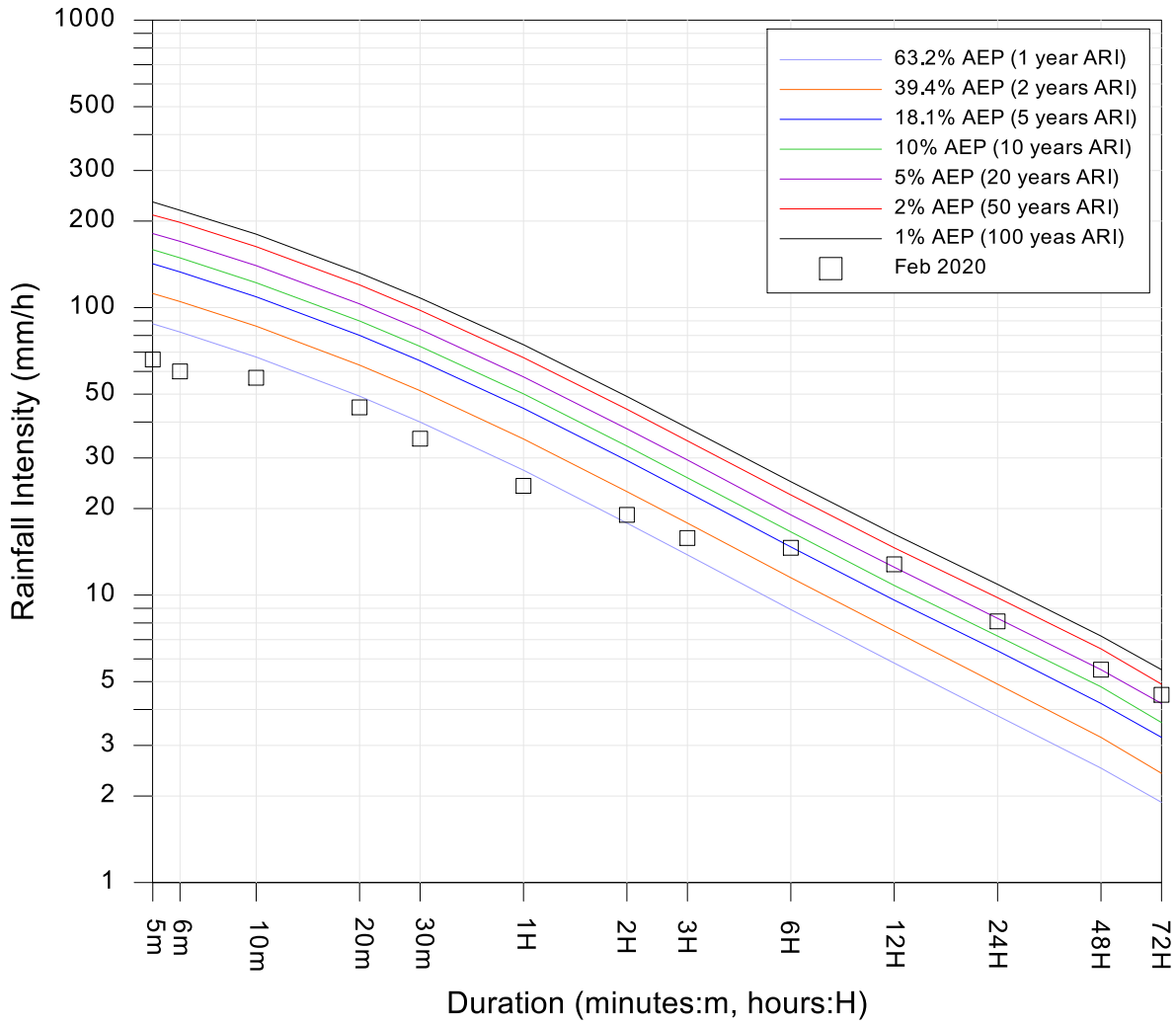
Manly Hydraulics Laboratory

Report MHL2752
Figure
9.6

Figures_MHL2752.pptx

Site Owner: CCSD
Latitude: -33.9549 Longitude:150.985

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	66	18:35 02 Feb 2020
6m	60	18:38 02 Feb 2020
10m	57	18:42 02 Feb 2020
20m	45	18:48 02 Feb 2020
30m	35	13:17 08 Feb 2020
1H	24	19:18 09 Feb 2020
2H	19	17:13 09 Feb 2020
3H	15.8	18:43 09 Feb 2020
6H	14.6	19:15 09 Feb 2020
12H	12.8	20:04 09 Feb 2020
24H	8.1	00:39 10 Feb 2020
48H	5.5	00:52 10 Feb 2020
72H	4.5	00:27 10 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Kelso Creek (213430)
Intensity-Frequency-Duration
1 - 29 February 2020

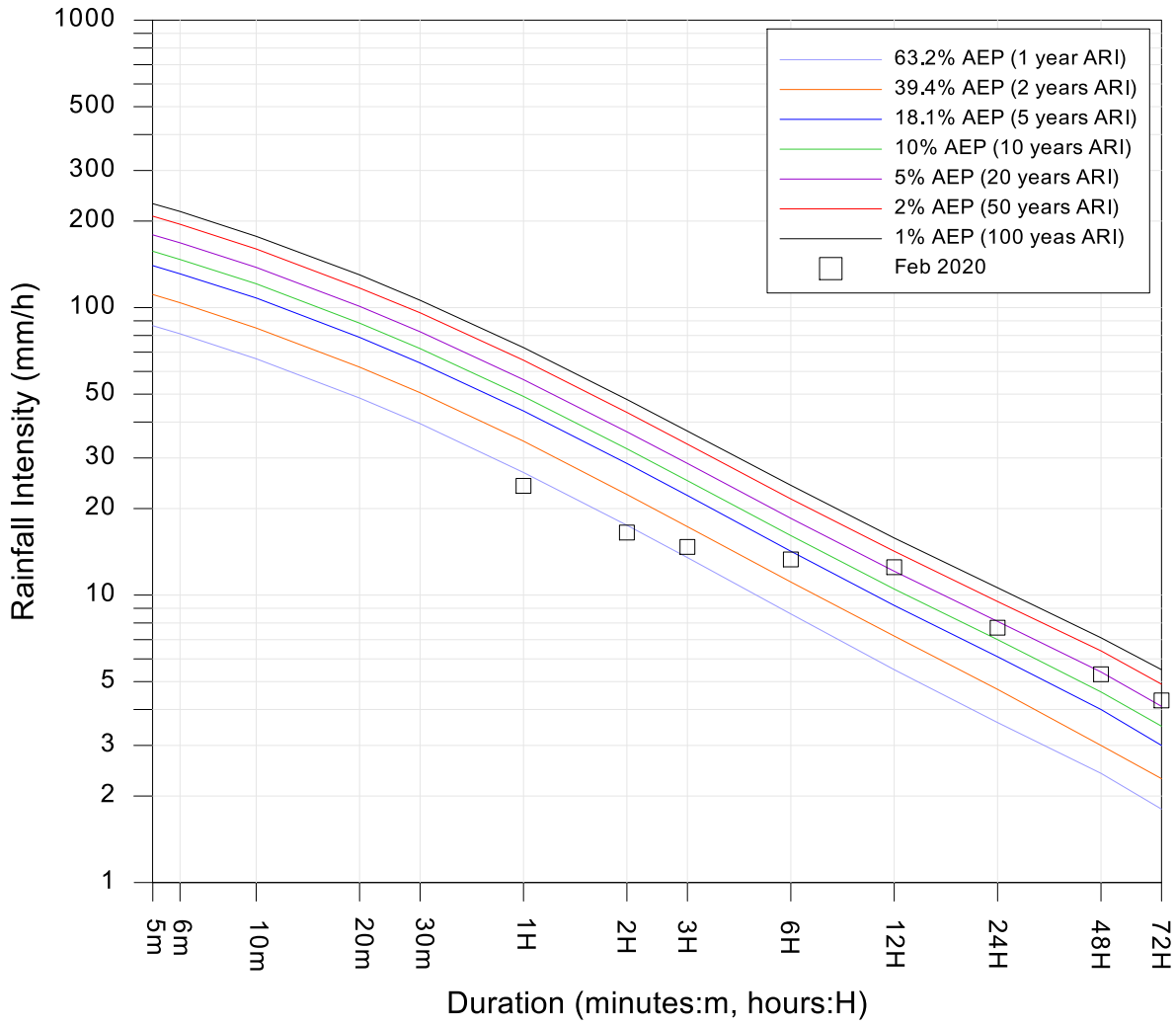
Manly Hydraulics Laboratory

Report MHL2752
Figure
9.7

IFD213430_Figure .pdf

Site Owner: BoM
Latitude: -33.927 Longitude:150.974

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	24	14:08 09 Feb 2020
2H	16.5	16:30 09 Feb 2020
3H	14.7	16:08 09 Feb 2020
6H	13.3	19:08 09 Feb 2020
12H	12.5	19:56 09 Feb 2020
24H	7.7	01:13 10 Feb 2020
48H	5.3	00:24 10 Feb 2020
72H	4.3	00:35 10 Feb 2020

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

Milperra Bridge (66168)
Intensity-Frequency-Duration
1 - 29 February 2020

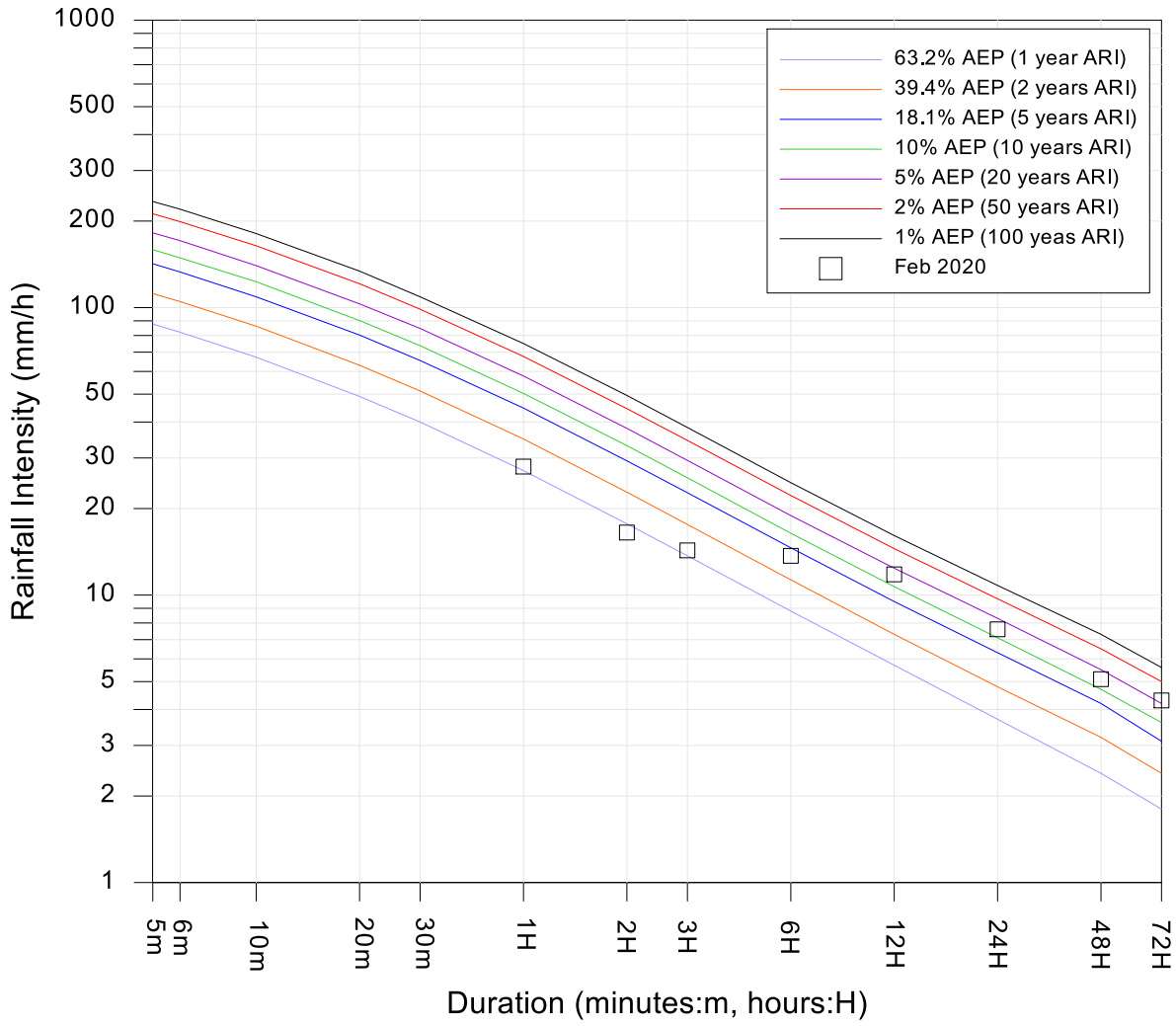
Manly Hydraulics Laboratory

Report MHL2752
Figure
9.8

IFD66168_Figure .pdf

Site Owner: BoM
Latitude: -33.9244 Longitude:150.997

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	28	19:59 02 Feb 2020
2H	16.5	17:59 09 Feb 2020
3H	14.3	17:59 09 Feb 2020
6H	13.7	17:59 09 Feb 2020
12H	11.8	20:59 09 Feb 2020
24H	7.6	01:59 10 Feb 2020
48H	5.1	01:59 10 Feb 2020
72H	4.3	01:59 10 Feb 2020

Only hourly data could be provided by BoM. IFD results for durations of less than 1 hour have been removed.

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Bankstown Airport AWS (66137)
Intensity-Frequency-Duration
1 - 29 February 2020

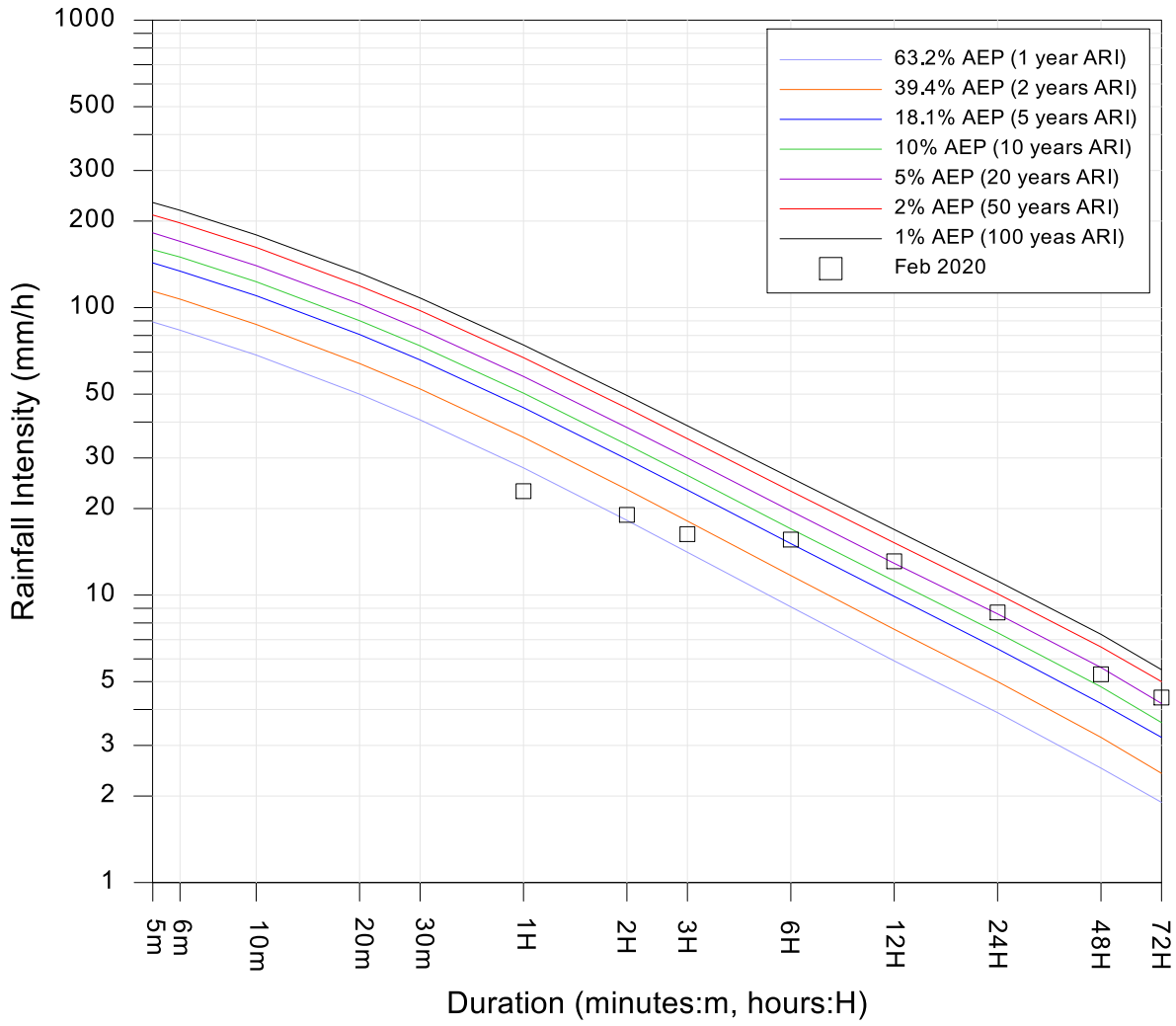
Manly Hydraulics Laboratory

Report MHL2752
Figure
9.9

IFD66137_Figure .pdf

Site Owner: BoM
Latitude: -33.9917 Longitude:150.949

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	23	20:59 09 Feb 2020
2H	19	20:59 09 Feb 2020
3H	16.3	20:59 09 Feb 2020
6H	15.6	21:59 09 Feb 2020
12H	13.1	21:59 09 Feb 2020
24H	8.7	01:59 10 Feb 2020
48H	5.3	01:59 10 Feb 2020
72H	4.4	01:59 10 Feb 2020

Only hourly data could be provided by BoM. IFD results for durations of less than 1 hour have been removed.

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Holsworthy Aerodrome AWS (66161)
Intensity-Frequency-Duration
1 - 29 February 2020

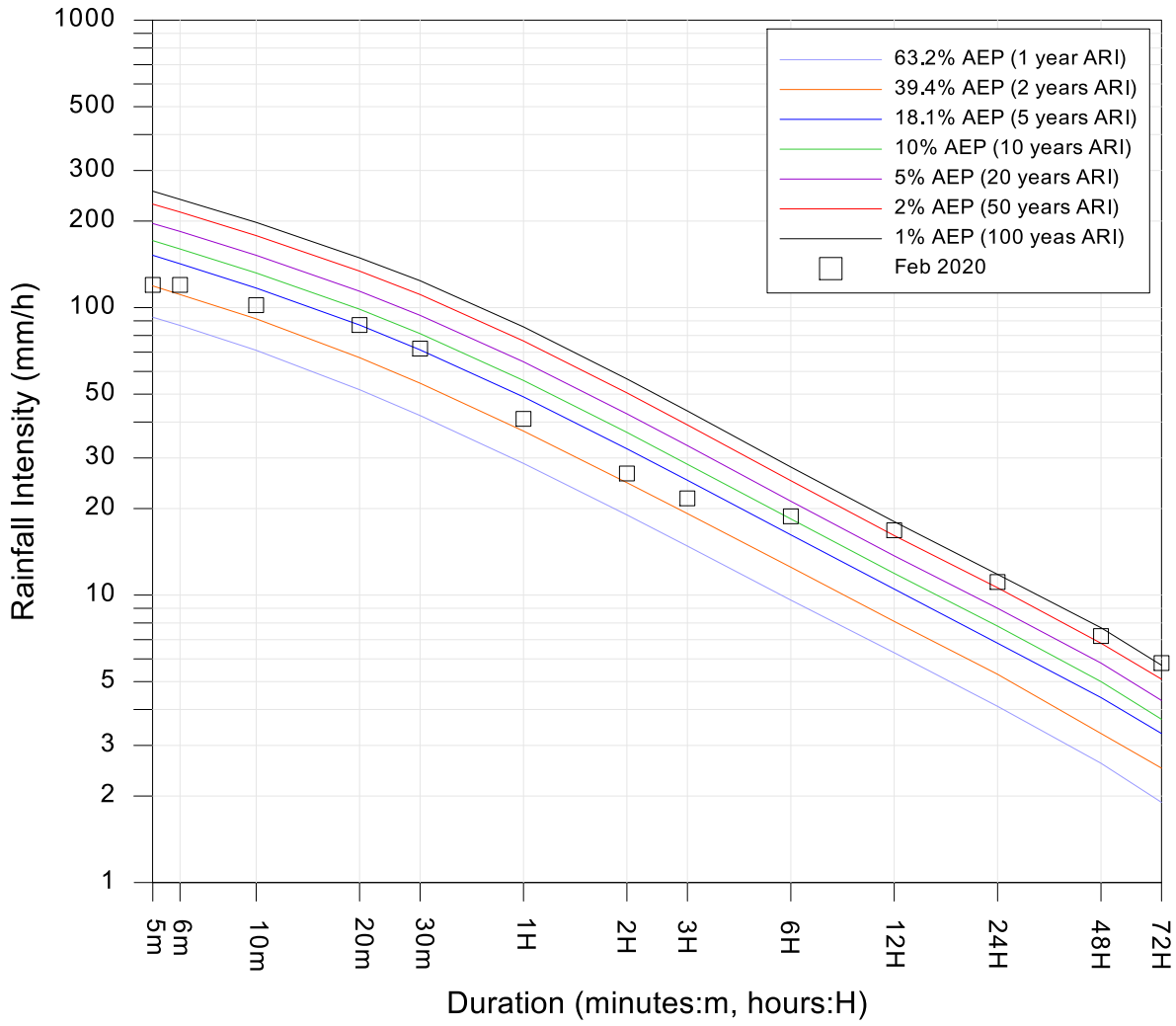
Manly Hydraulics Laboratory

Report MHL2752
Figure
9.10

IFD66161_Figure .pdf

Site Owner: BoM
Latitude: -33.972 Longitude:151.061

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	120	18:32 02 Feb 2020
6m	120	18:30 02 Feb 2020
10m	102	18:32 02 Feb 2020
20m	87	18:36 02 Feb 2020
30m	72	18:46 02 Feb 2020
1H	41	19:14 02 Feb 2020
2H	26.5	20:11 09 Feb 2020
3H	21.7	20:08 09 Feb 2020
6H	18.8	18:57 09 Feb 2020
12H	16.8	19:59 09 Feb 2020
24H	11.1	00:53 10 Feb 2020
48H	7.2	00:38 10 Feb 2020
72H	5.8	00:58 10 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Peakhurst Golf Club (66148)
Intensity-Frequency-Duration
1 - 29 February 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
9.11

IFD66148_Figure .pdf

10 Lower Shoalhaven region

10.1 Lower Shoalhaven region – water level

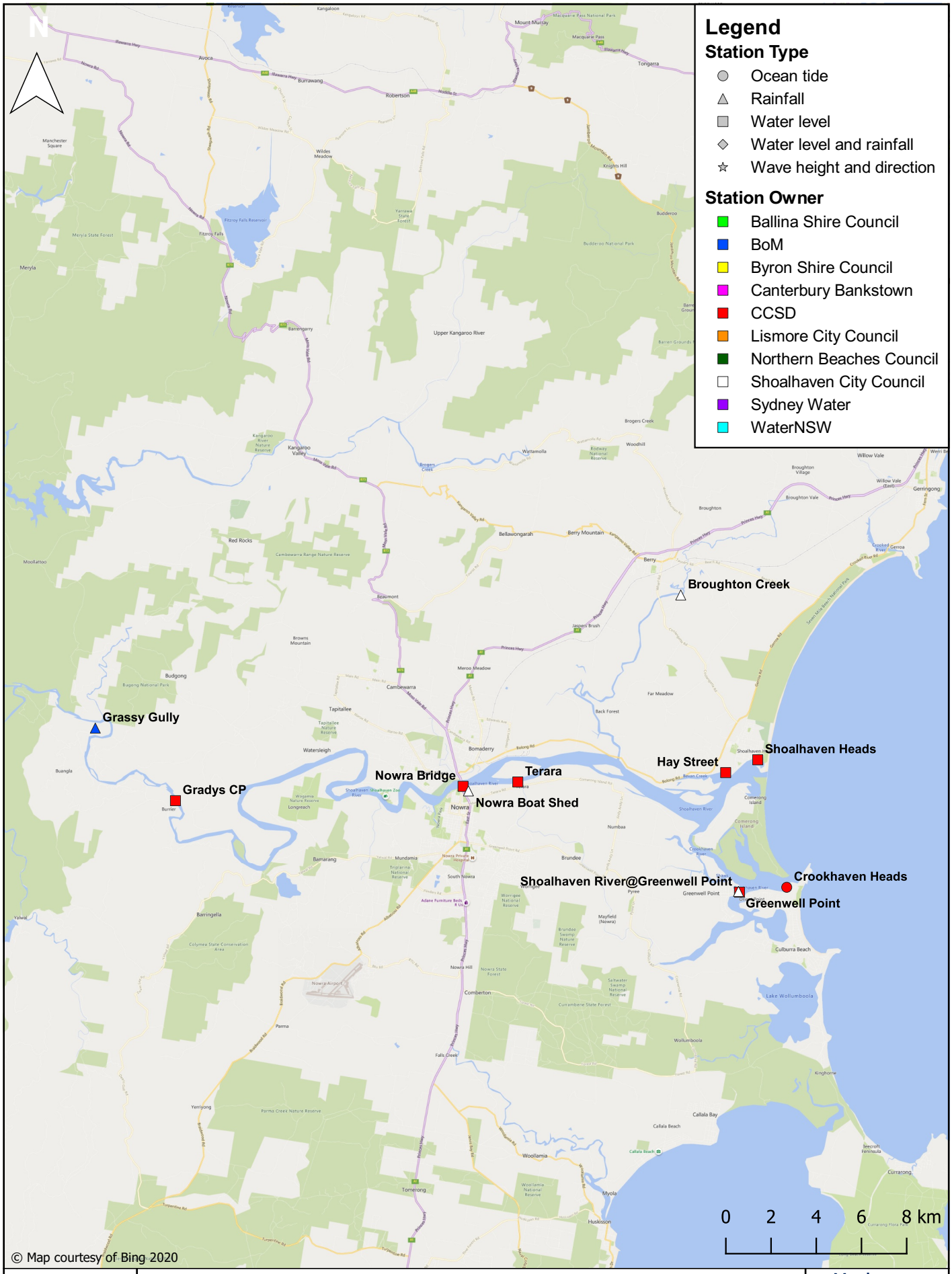
The peak observed water levels for the Lower Shoalhaven region are listed in **Table 10.1**. **Table 10.2** lists the SES flood classifications for Terara and Nowra Bridge. The locations of water level stations within the Lower Shoalhaven region are shown in **Figure 10.1**. The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 10.2** to **Figure 10.4**.

Table 10.1 Lower Shoalhaven region flood peaks

Station name	Station number	Owner	Datum	Level (m)
Shoalhaven Heads	215470	CCSD	AHD	1.94
Hay Street	215415	CCSD	AHD	2.23
Terara	215420	CCSD	AHD	3.43
Nowra Bridge	215411	CCSD	AHD	3.64
Gradys Caravan Park	215430	CCSD	AHD	12.08
Greenwell Point	215417	CCSD	AHD	1.46
Crookhaven Heads	215408	CCSD	AHD	1.26

Table 10.2 SES flood classifications for Terara and Nowra Bridge

Station name	Station number	Flood Classification			Flood Peak (m)	Flood Event Classification
		Minor	Moderate	Major		
		Water Level (m AHD)				
Terara	215420	2.2	3.0	3.9	3.43	Moderate
Nowra Bridge	215411	2.3	3.3	4.3	3.64	Moderate



NSW GOVERNMENT

LOWER SHOALHAVEN STATIONS

Manly Hydraulics Laboratory

Report MHL2752
Figure
10.1

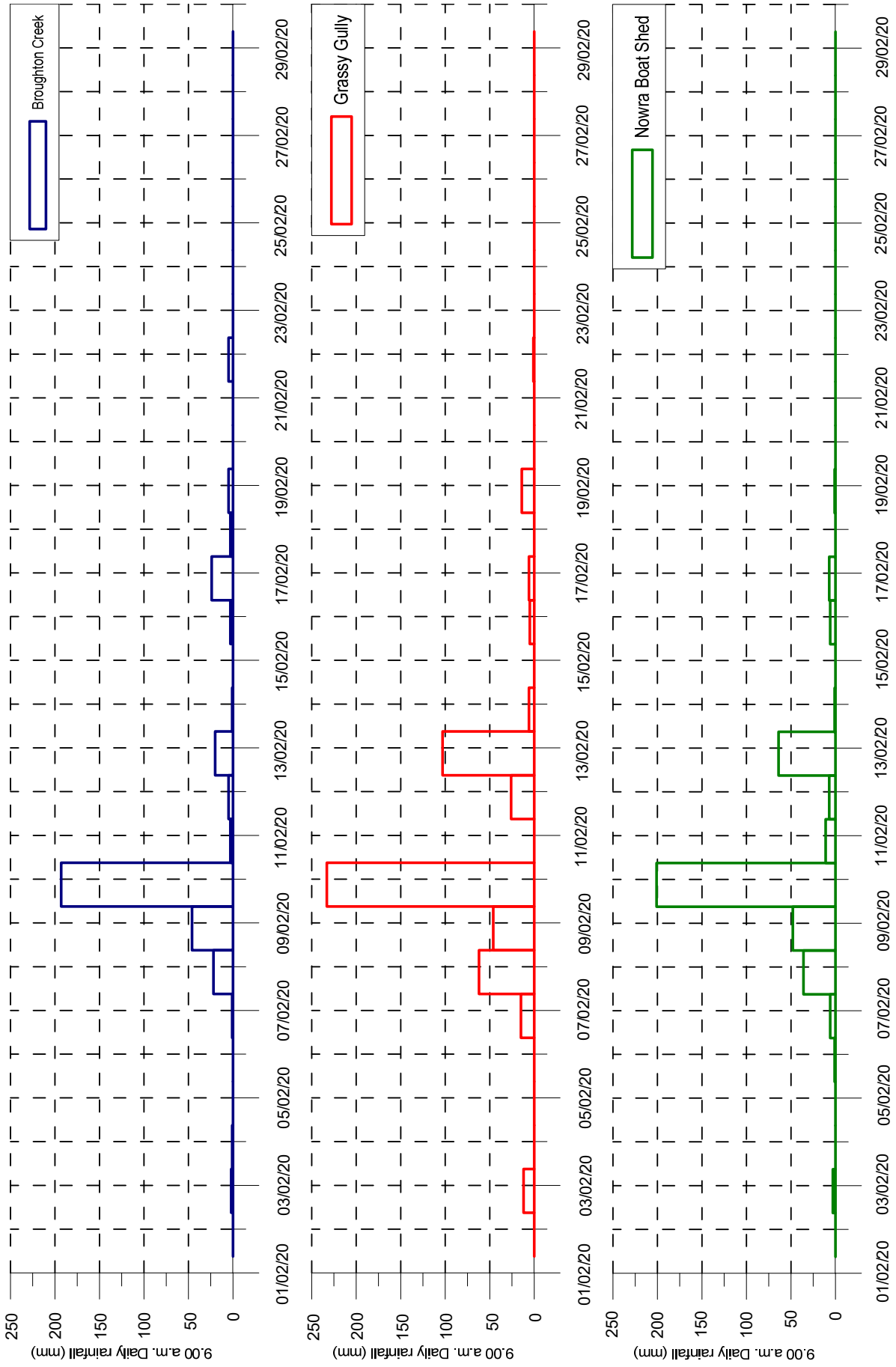
Figures_MHL2752.qgs

10.2 Lower Shoalhaven region – rainfall

The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 10.2** to **Figure 10.4**. 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 10.3** for the period 01 to 29 February 2020. The rainfall intensities are displayed graphically in **Figure 10.5** to **Figure 10.8**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 10.3 Lower Shoalhaven region daily rainfall totals

Date	Greenwell Point 568180 (mm)	Broughton Creek 568226 (mm)	Nowra Boat Shed 68213 (mm)	Grassy Gully 68233 (mm)
	Shoalhaven City Council	Shoalhaven City Council	Shoalhaven City Council	BoM
01/02/2020	-	-	-	-
02/02/2020	-	0.0	0.0	0.0
03/02/2020	-	2.0	3.0	12.0
04/02/2020	-	1.0	0.0	0.0
05/02/2020	-	0.0	0.0	0.0
06/02/2020	-	0.0	1.0	0.0
07/02/2020	1.0	1.0	6.0	15.0
08/02/2020	31.0	22.0	36.0	62.0
09/02/2020	31.0	46.0	48.0	46.0
10/02/2020	107.0	193.0	201.0	233.0
11/02/2020	7.0	3.0	11.0	0.0
12/02/2020	5.0	5.0	7.0	26.0
13/02/2020	29.0	20.0	64.0	103.0
14/02/2020	0.0	1.0	1.0	6.0
15/02/2020	0.0	0.0	0.0	0.0
16/02/2020	10.0	3.0	6.0	5.0
17/02/2020	6.0	24.0	7.0	6.0
18/02/2020	0.0	3.0	0.0	0.0
19/02/2020	10.0	5.0	1.0	14.0
20/02/2020	1.0	0.0	0.0	0.0
21/02/2020	0.0	0.0	0.0	0.0
22/02/2020	0.0	5.0	0.0	1.0
23/02/2020	0.0	0.0	0.0	0.0
24/02/2020	0.0	0.0	0.0	0.0
25/02/2020	0.0	0.0	0.0	0.0
26/02/2020	0.0	0.0	0.0	0.0
27/02/2020	0.0	0.0	0.0	0.0
28/02/2020	1.0	0.0	0.0	0.0
29/02/0202	0.0	0.0	0.0	0.0



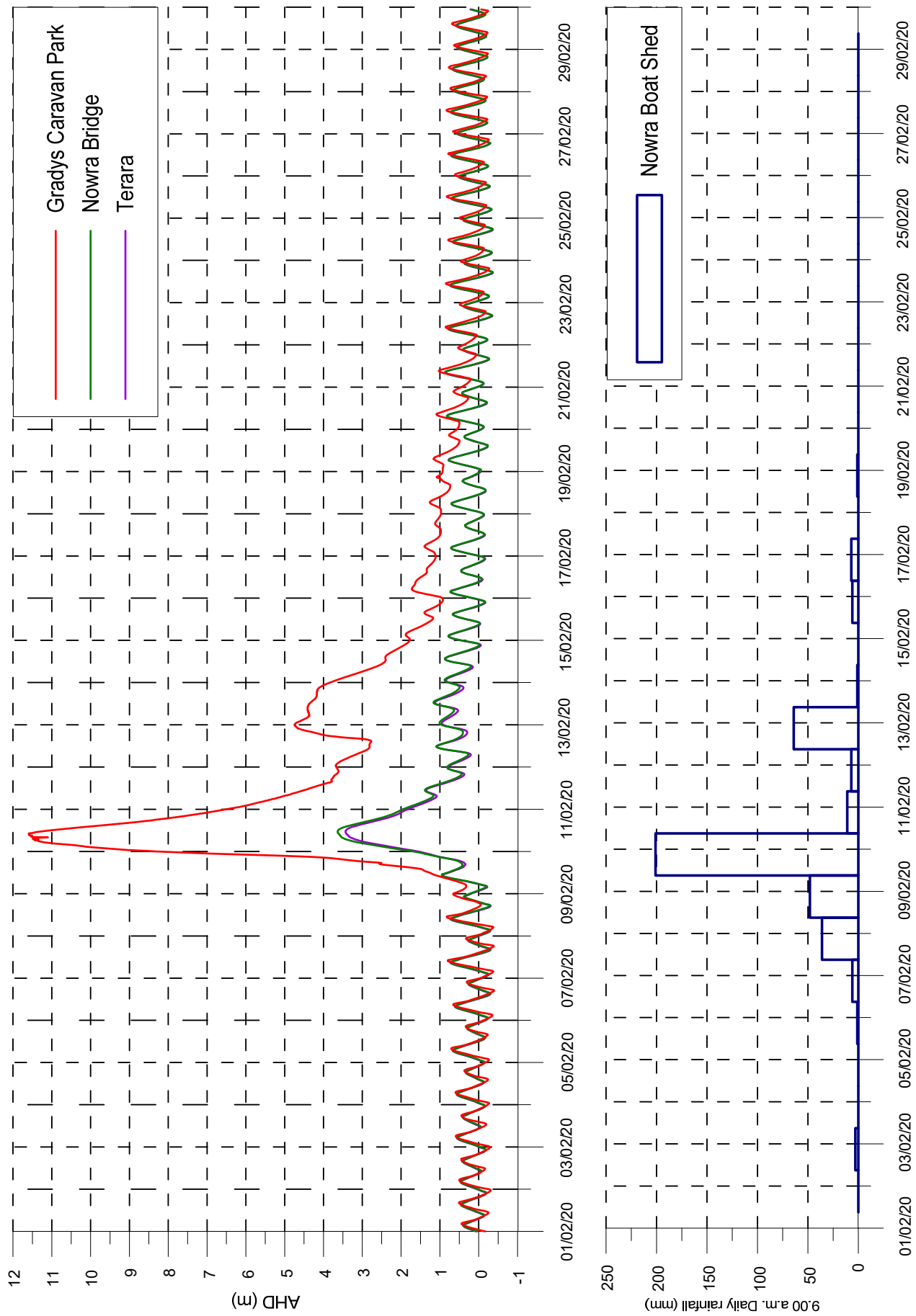
NSW GOVERNMENT

LOWER SHOALHAVEN REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
10.2

Figures_MHL2752.pptx



NSW GOVERNMENT

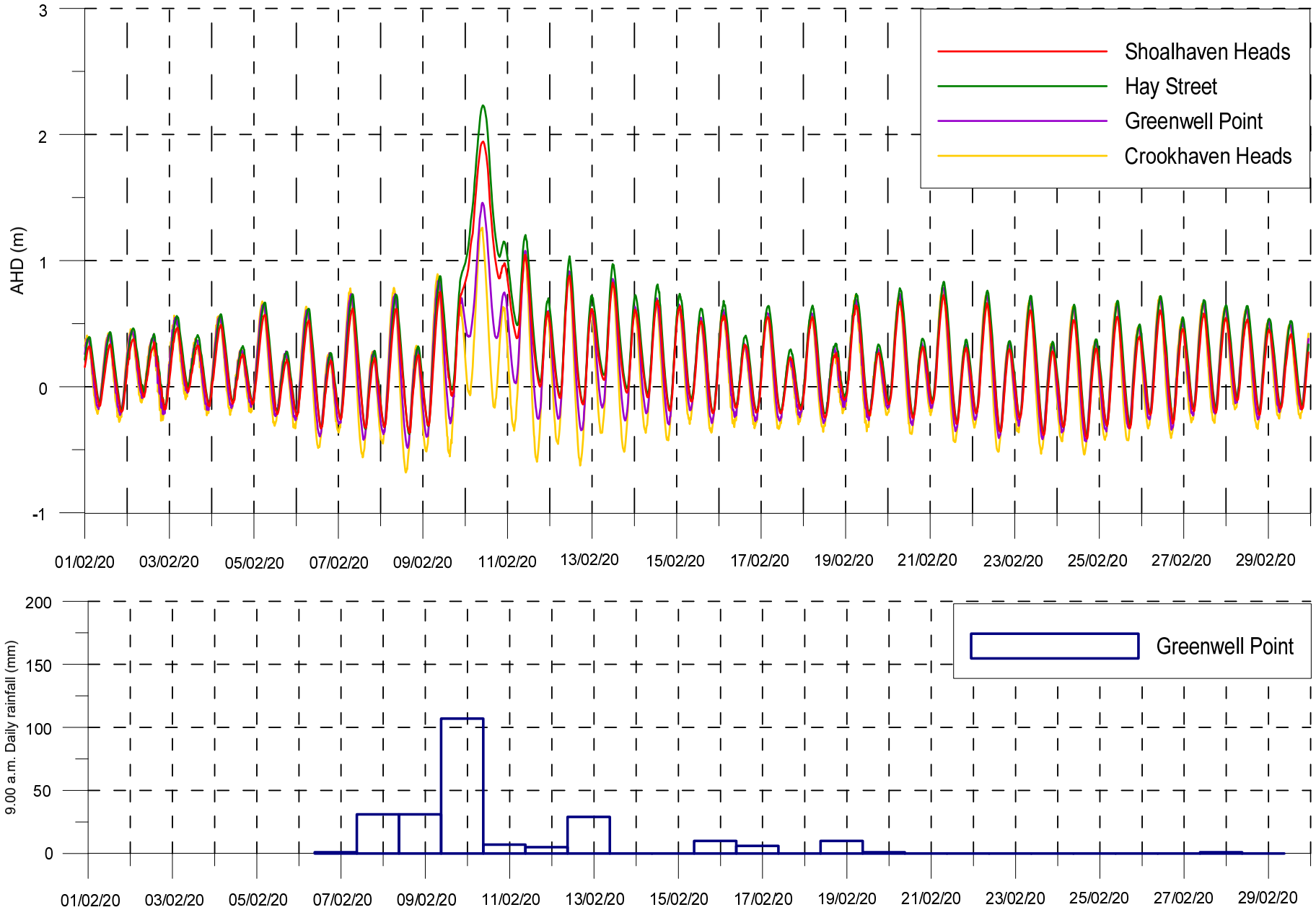
LOWER SHOALHAVEN REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
10.3

Figures_MHL2752.pptx

LOWER SHOALHAVEN REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020



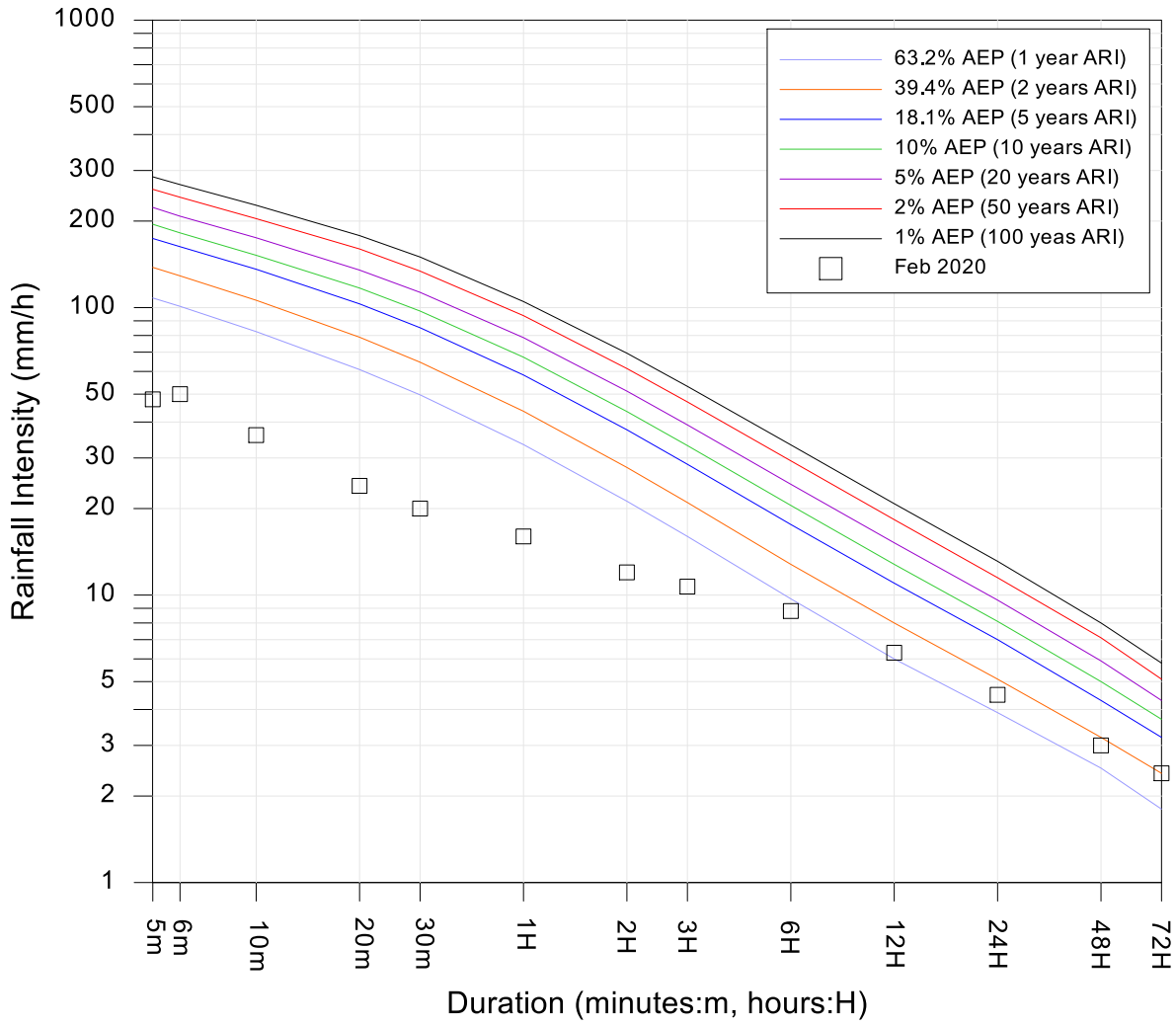
Manly Hydraulics Laboratory

Report MHL2752
Figure 10.4

Figures_MHL2752.pptx

Site Owner: Shoalhaven City Council
Latitude: -34.907 Longitude:150.736

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	48	20:44 18 Feb 2020
6m	50	15:21 12 Feb 2020
10m	36	15:25 12 Feb 2020
20m	24	15:35 12 Feb 2020
30m	20	15:42 12 Feb 2020
1H	16	04:24 10 Feb 2020
2H	12	16:47 09 Feb 2020
3H	10.7	17:21 09 Feb 2020
6H	8.8	17:44 09 Feb 2020
12H	6.3	22:35 09 Feb 2020
24H	4.5	07:53 10 Feb 2020
48H	3	07:01 10 Feb 2020
72H	2.4	15:25 10 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Greenwell Point (568180)
Intensity-Frequency-Duration
1 - 29 February 2020

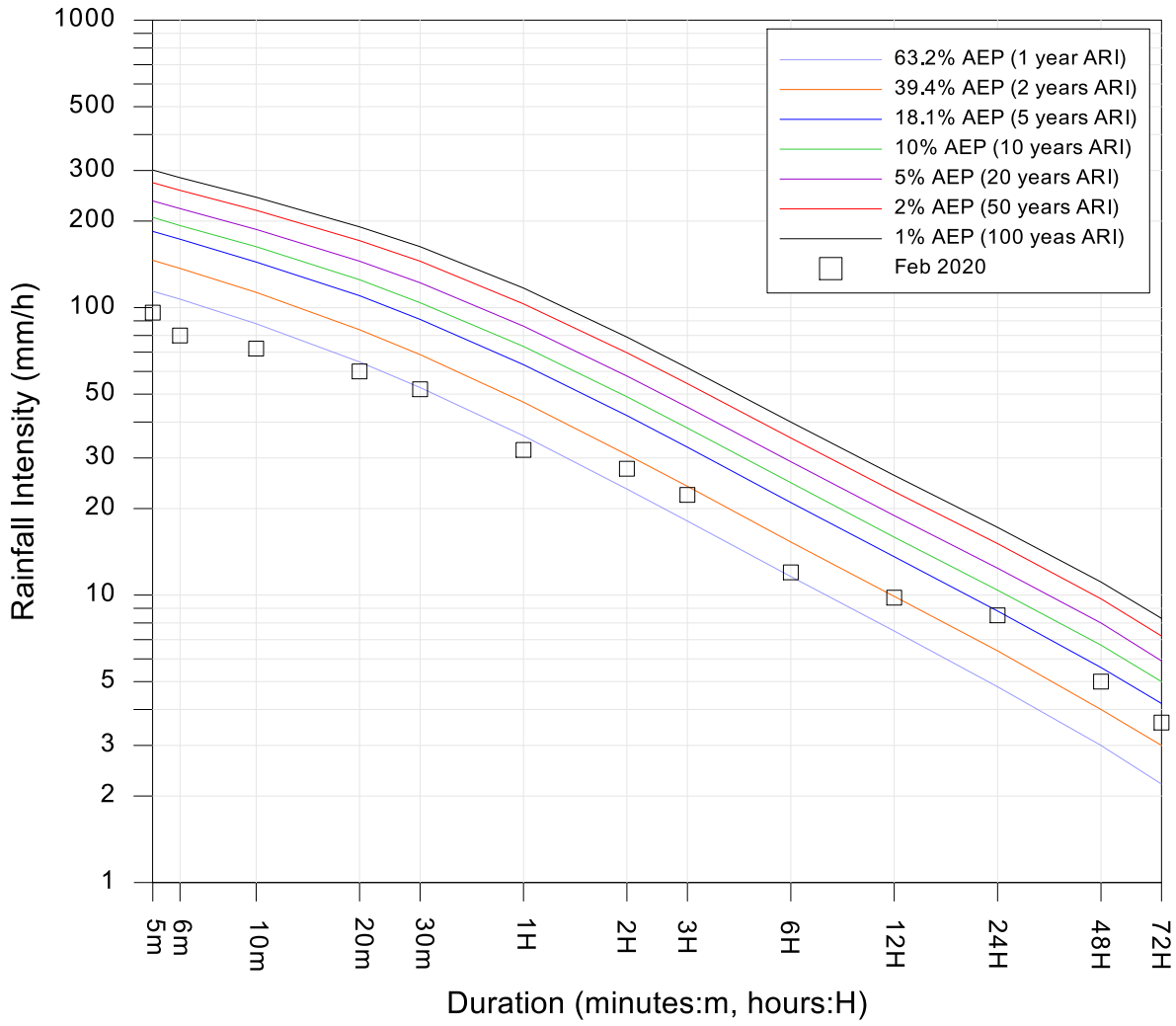
Manly Hydraulics Laboratory

Report MHL2752
Figure
10.5

IFD568180_Figure .pdf

Site Owner: Shoalhaven City Council
Latitude: -34.789 Longitude:150.708

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	96	05:32 10 Feb 2020
6m	80	05:33 10 Feb 2020
10m	72	04:32 10 Feb 2020
20m	60	04:38 10 Feb 2020
30m	52	04:38 10 Feb 2020
1H	32	04:33 10 Feb 2020
2H	27.5	05:33 10 Feb 2020
3H	22.3	05:34 10 Feb 2020
6H	12	07:23 10 Feb 2020
12H	9.8	05:47 10 Feb 2020
24H	8.5	06:18 10 Feb 2020
48H	5	06:12 10 Feb 2020
72H	3.6	16:51 10 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Broughton Creek (568226)
Intensity-Frequency-Duration
1 - 29 February 2020

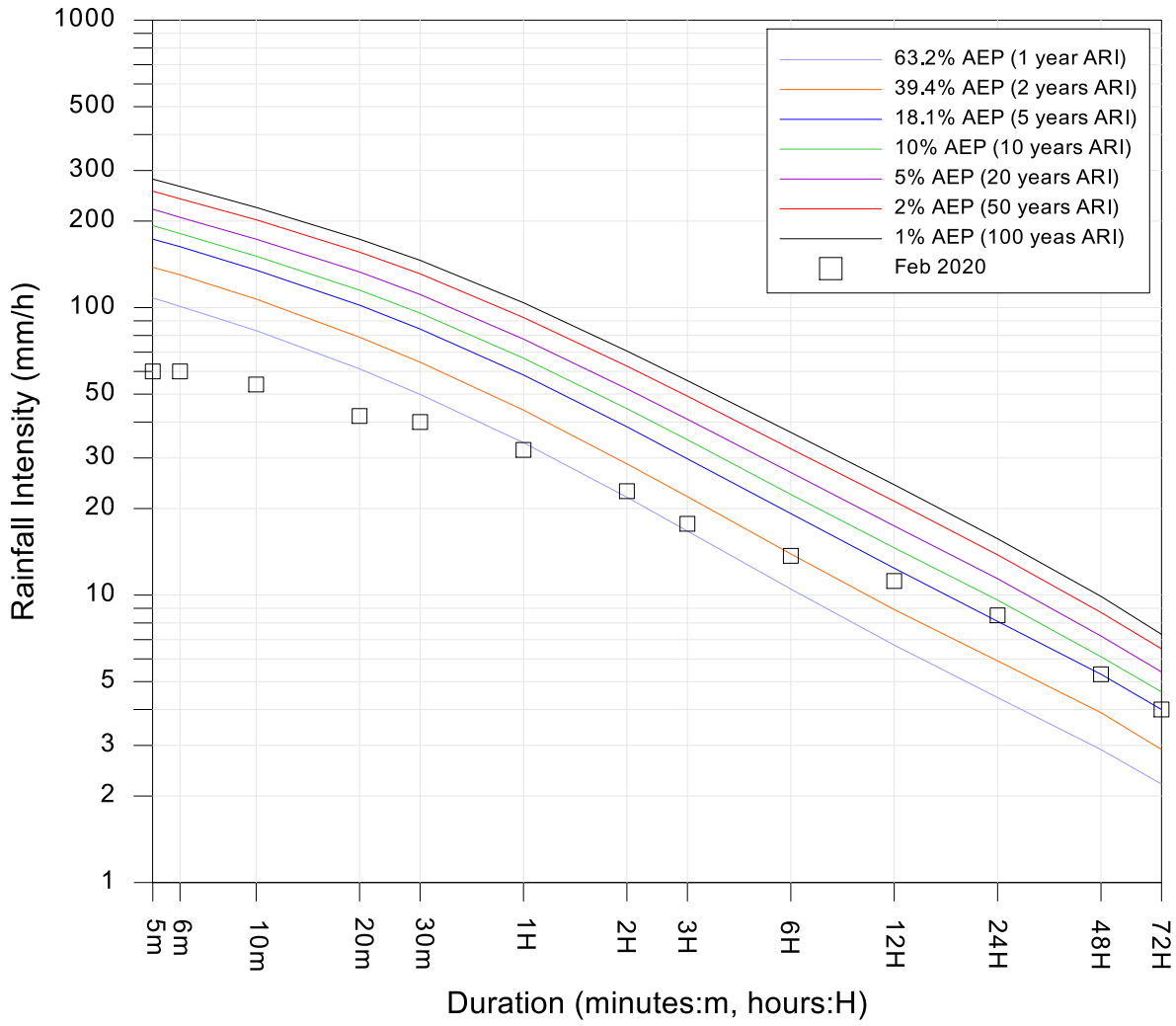
Manly Hydraulics Laboratory

Report MHL2752
Figure
10.6

IFD568226_Figure .pdf

Site Owner: Shoalhaven City Council
Latitude: -34.867 Longitude:150.605

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	60	16:12 12 Feb 2020
6m	60	16:12 12 Feb 2020
10m	54	15:47 12 Feb 2020
20m	42	16:13 12 Feb 2020
30m	40	16:12 12 Feb 2020
1H	32	16:22 12 Feb 2020
2H	23	06:04 10 Feb 2020
3H	17.7	05:51 10 Feb 2020
6H	13.7	20:16 09 Feb 2020
12H	11.2	22:38 09 Feb 2020
24H	8.5	07:34 10 Feb 2020
48H	5.3	06:08 10 Feb 2020
72H	4	06:30 10 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Nowra Boat Shed (Shoalhaven River) (68213)
Intensity-Frequency-Duration
1 - 29 February 2020

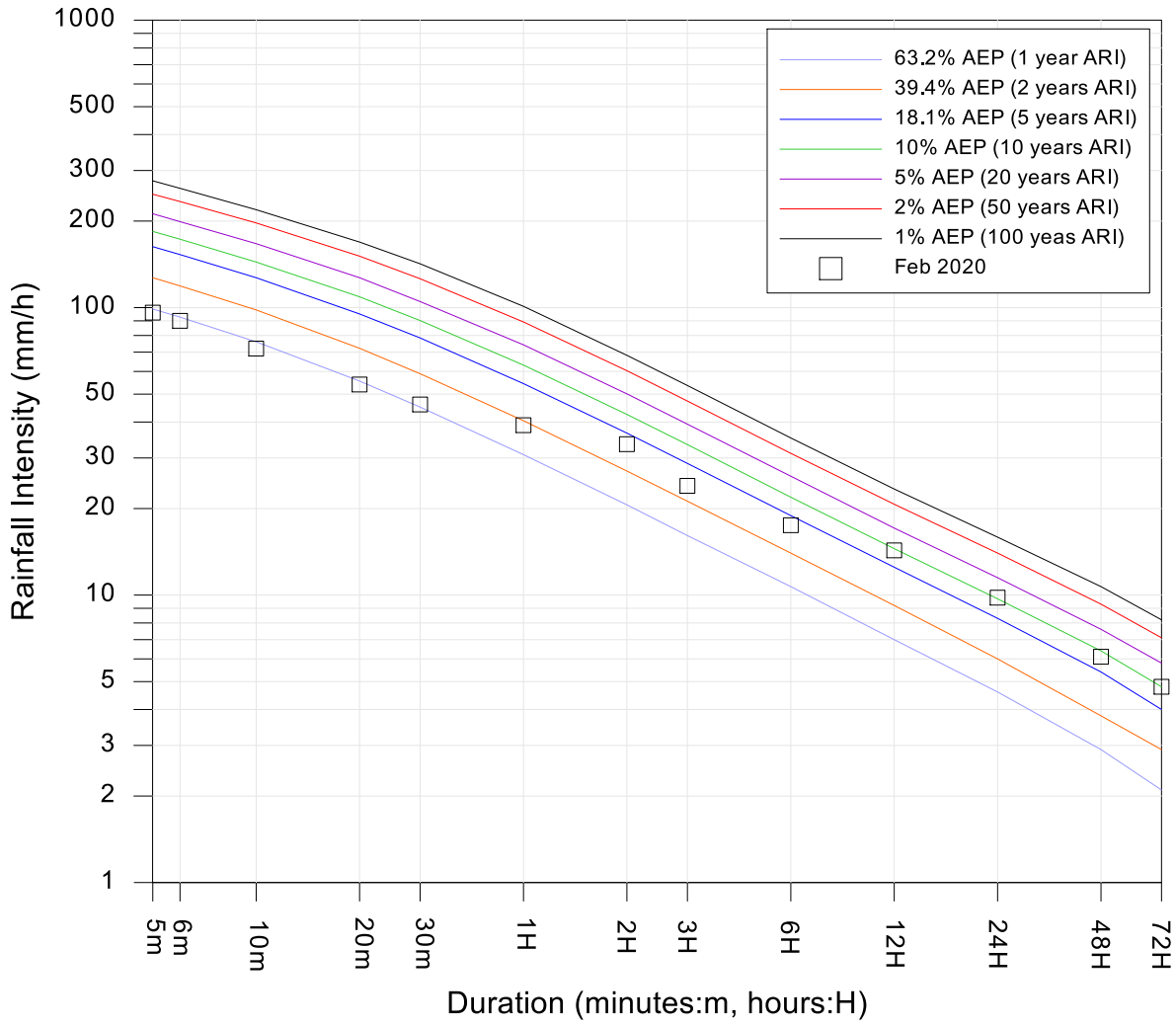
Manly Hydraulics Laboratory

Report MHL2752
Figure
10.7

IFD68213_Figure .pdf

Site Owner: BoM
Latitude: -34.842 Longitude:150.424

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	96	16:16 12 Feb 2020
6m	90	05:10 10 Feb 2020
10m	72	20:44 18 Feb 2020
20m	54	16:32 11 Feb 2020
30m	46	16:41 12 Feb 2020
1H	39	17:11 12 Feb 2020
2H	33.5	17:12 12 Feb 2020
3H	24	18:12 12 Feb 2020
6H	17.5	18:01 09 Feb 2020
12H	14.3	22:45 09 Feb 2020
24H	9.8	08:00 10 Feb 2020
48H	6.1	06:27 10 Feb 2020
72H	4.8	05:56 10 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Grassy Gully (68233)
Intensity-Frequency-Duration
1 - 29 February 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
10.8

IFD68233_Figure .pdf

11 St Georges Basin region

11.1 St Georges Basin region – water level

The peak observed water levels for the St Georges Basin region are listed in **Table 11.1**. **Table 11.2** lists the SES flood classifications for Island Point and Sussex Inlet. The locations of water level stations within the St Georges Basin region are shown in **Figure 11.1**. The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 11.2** to **Figure 11.3**.

Table 11.1 St Georges Basin region flood peaks

Station name	Station number	Owner	Datum	Level (m)
Island Point	216415	CCSD	AHD	0.80
Sussex Inlet	216412	CCSD	AHD	0.88

Table 11.2 SES flood classifications for Island Point and Sussex Inlet

Station name	Station number	Flood Classification			Flood Peak (m)	Flood Event Classification
		Minor	Moderate	Major		
		Water Level (m AHD)				
Island Point	216415	1.2	1.5	1.8	0.80	Minor
Sussex Inlet	216412	0.9	1.2	1.8	0.88	Minor

NSW GOVERNMENT

ST GEORGES BASIN STATIONS

Manly Hydraulics Laboratory

Report MHL2752
Figure
11.1

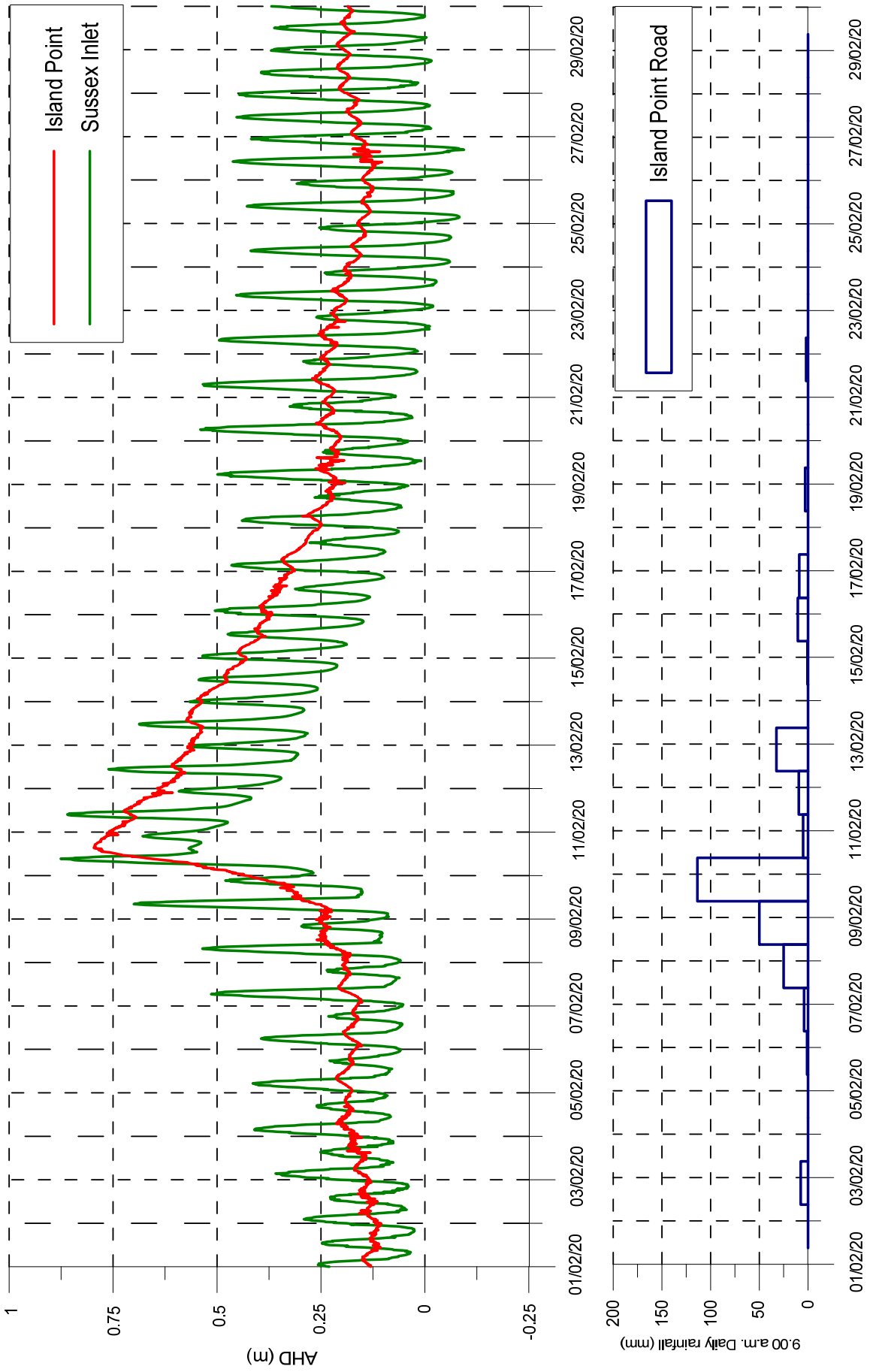
Figures_MHL2752.qgs

11.2 St Georges Basin region – rainfall

The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 11.2** to **Figure 11.3**. 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 11.3** for the period 01 to 29 February 2020. The rainfall intensities are displayed graphically in **Figure 11.4** to **Figure 11.6**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 11.3 St Georges Basin region daily rainfall totals

Date	Island Point Road 568200 (mm) Shoalhaven City Council	Tomerong Creek 568202 (mm) Shoalhaven City Council	Jerrawangla 568204 (mm) Shoalhaven City Council
01/02/2020	-	-	-
02/02/2020	0.0	0.0	0.0
03/02/2020	7.5	9.0	11.0
04/02/2020	0.0	0.0	0.0
05/02/2020	0.0	0.0	0.0
06/02/2020	1.0	2.0	1.4
07/02/2020	4.0	3.0	1.4
08/02/2020	25.0	42.0	47.8
09/02/2020	50.0	61.0	74.0
10/02/2020	113.5	138.0	180.4
11/02/2020	5.0	6.0	32.6
12/02/2020	9.5	5.0	4.8
13/02/2020	32.5	40.0	1.4
14/02/2020	0.0	3.0	4.0
15/02/2020	0.5	0.0	1.8
16/02/2020	10.5	14.0	1.0
17/02/2020	9.0	18.0	4.0
18/02/2020	0.0	0.0	10.0
19/02/2020	3.0	7.0	5.6
20/02/2020	0.0	0.0	2.4
21/02/2020	0.0	0.0	1.4
22/02/2020	2.0	4.0	1.0
23/02/2020	0.0	0.0	1.2
24/02/2020	0.0	0.0	1.0
25/02/2020	0.0	0.0	0.8
26/02/2020	0.0	0.0	0.2
27/02/2020	0.0	0.0	0.0
28/02/2020	0.0	0.0	0.0
29/02/0202	0.0	0.0	0.0



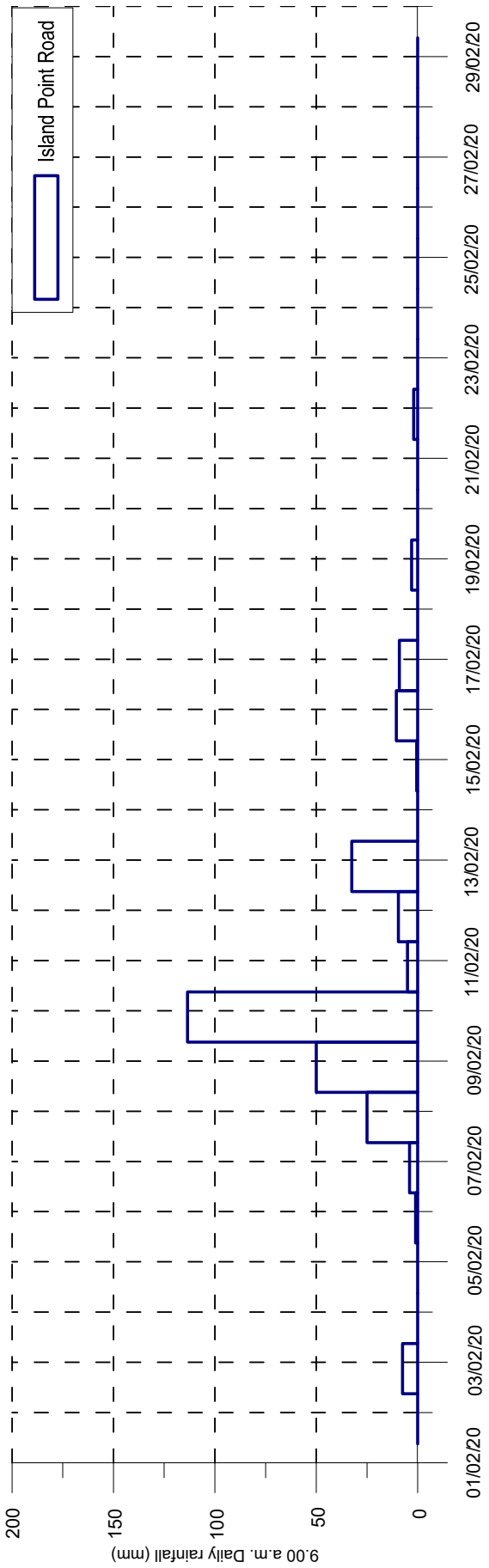
NSW GOVERNMENT

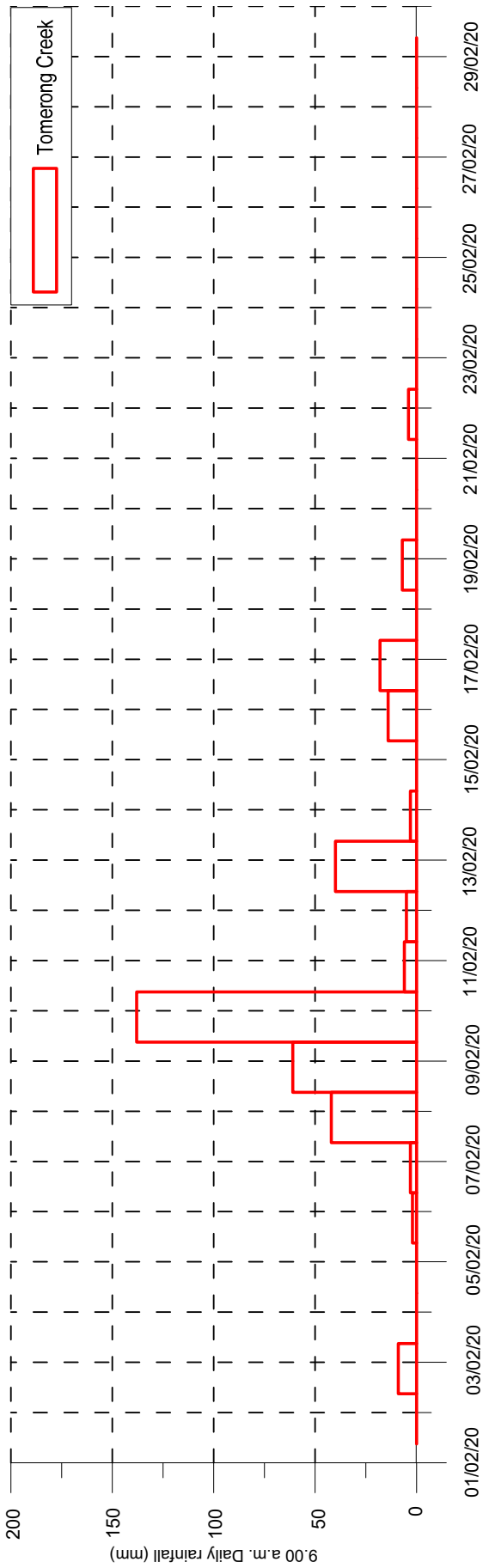
ST GEORGES BASIN REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
11.2

Figures_MHL2752.pptx





NSW GOVERNMENT

ST GEORGES BASIN REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

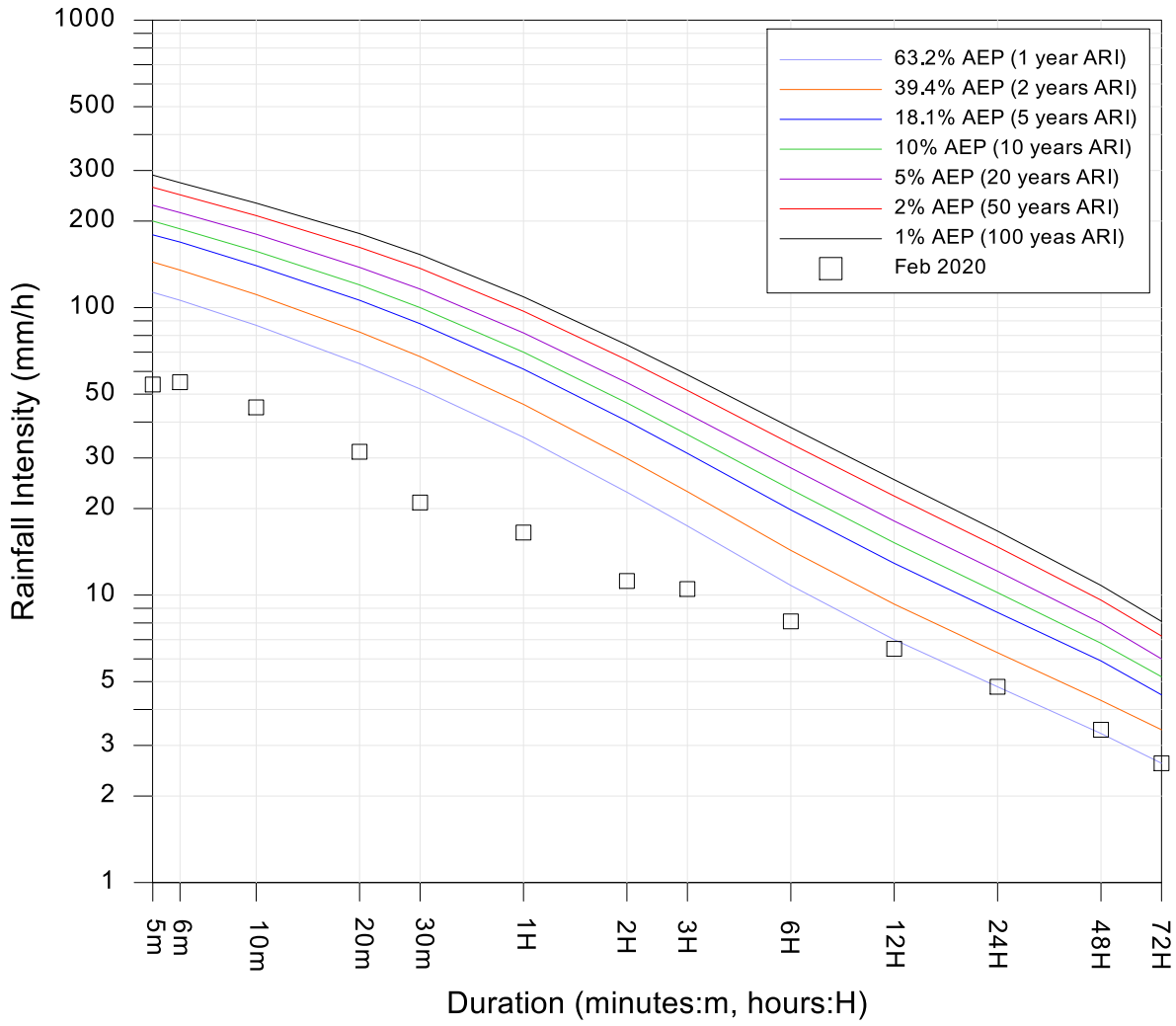
Manly Hydraulics Laboratory

Report MHL2752
Figure
11.3

Figures_MHL2752.pptx

Site Owner: Shoalhaven City Council
Latitude: -35.099 Longitude:150.594

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	54	15:02 08 Feb 2020
6m	55	15:02 08 Feb 2020
10m	45	15:04 08 Feb 2020
20m	31.5	15:06 08 Feb 2020
30m	21	15:16 08 Feb 2020
1H	16.5	04:54 10 Feb 2020
2H	11.2	05:30 10 Feb 2020
3H	10.5	15:03 08 Feb 2020
6H	8.1	20:48 09 Feb 2020
12H	6.5	23:21 09 Feb 2020
24H	4.8	05:53 10 Feb 2020
48H	3.4	09:14 10 Feb 2020
72H	2.6	08:35 10 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Island Point Road (568200)
Intensity-Frequency-Duration
1 - 29 February 2020

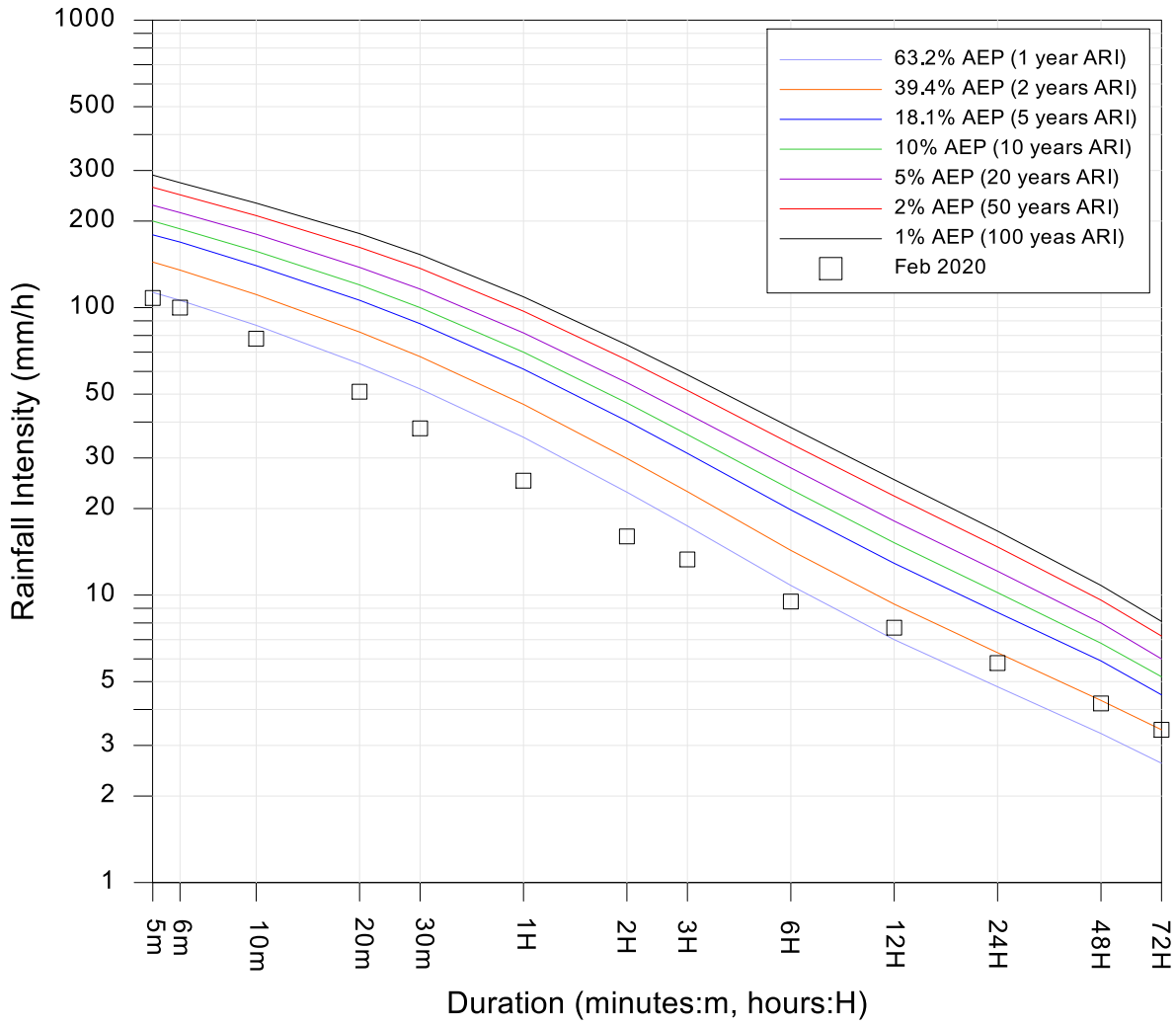
Manly Hydraulics Laboratory

Report MHL2752
Figure
11.4

IFD568200_Figure .pdf

Site Owner: Shoalhaven City Council
Latitude: -35.06 Longitude:150.582

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	108	04:13 10 Feb 2020
6m	100	11:49 08 Feb 2020
10m	78	04:18 10 Feb 2020
20m	51	04:28 10 Feb 2020
30m	38	04:38 10 Feb 2020
1H	25	05:08 10 Feb 2020
2H	16	05:22 10 Feb 2020
3H	13.3	05:21 10 Feb 2020
6H	9.5	20:35 09 Feb 2020
12H	7.7	23:53 09 Feb 2020
24H	5.8	07:30 10 Feb 2020
48H	4.2	07:48 10 Feb 2020
72H	3.4	06:55 10 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Tomerong Creek (568202)
Intensity-Frequency-Duration
1 - 29 February 2020

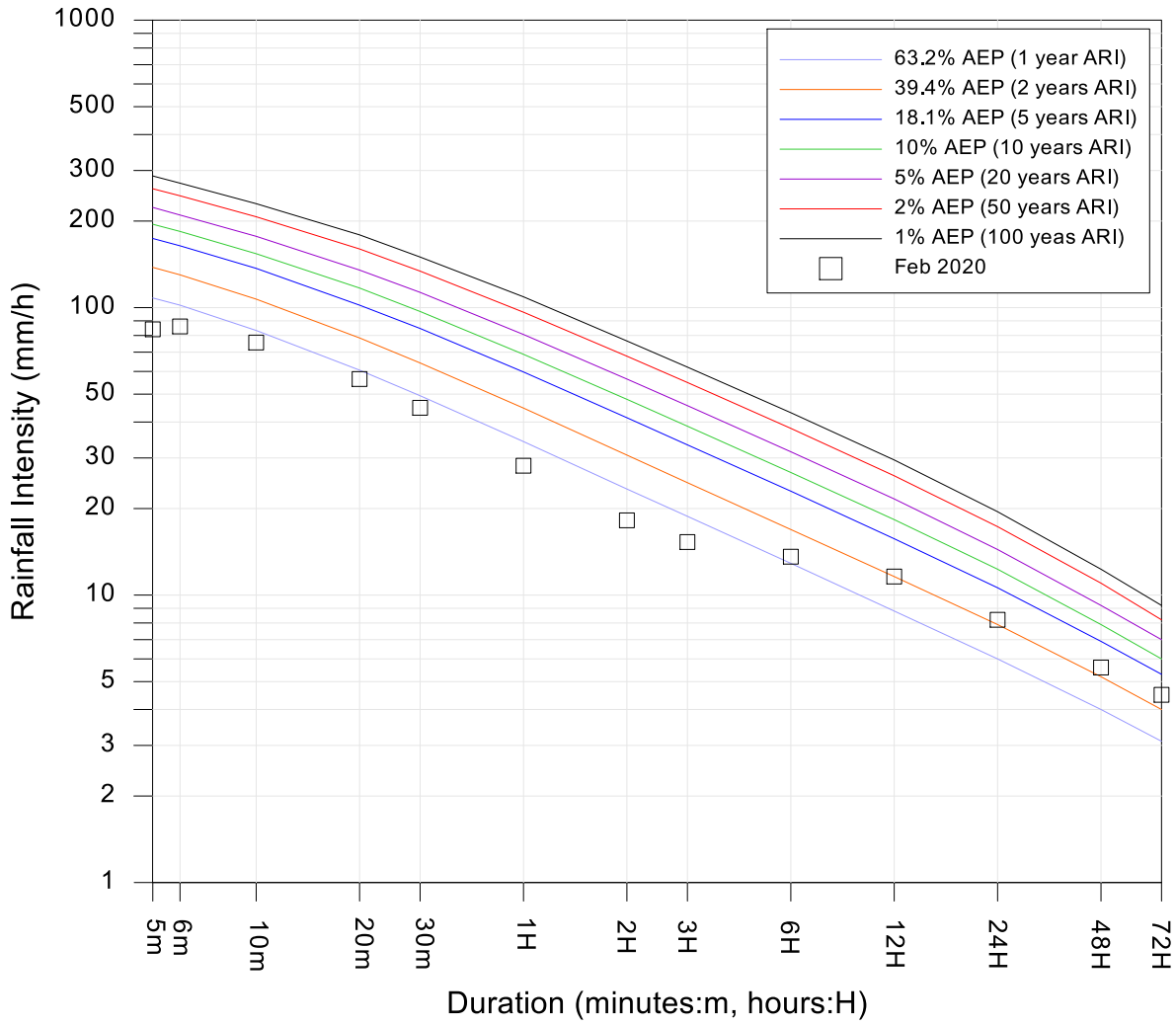
Manly Hydraulics Laboratory

Report MHL2752
Figure
11.5

IFD568202_Figure .pdf

Site Owner: Shoalhaven City Council
Latitude: -35.146 Longitude:150.446

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	84	12:31 08 Feb 2020
6m	86	12:32 08 Feb 2020
10m	75.6	12:32 08 Feb 2020
20m	56.4	12:41 08 Feb 2020
30m	44.8	12:52 08 Feb 2020
1H	28.2	13:20 08 Feb 2020
2H	18.2	14:20 08 Feb 2020
3H	15.3	20:01 09 Feb 2020
6H	13.6	21:18 09 Feb 2020
12H	11.6	01:08 10 Feb 2020
24H	8.2	12:19 10 Feb 2020
48H	5.6	12:20 10 Feb 2020
72H	4.5	16:22 10 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Jerrawangla (568204)
Intensity-Frequency-Duration
1 - 29 February 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
11.6

IFD568204_Figure .pdf

12 Lake Conjola region

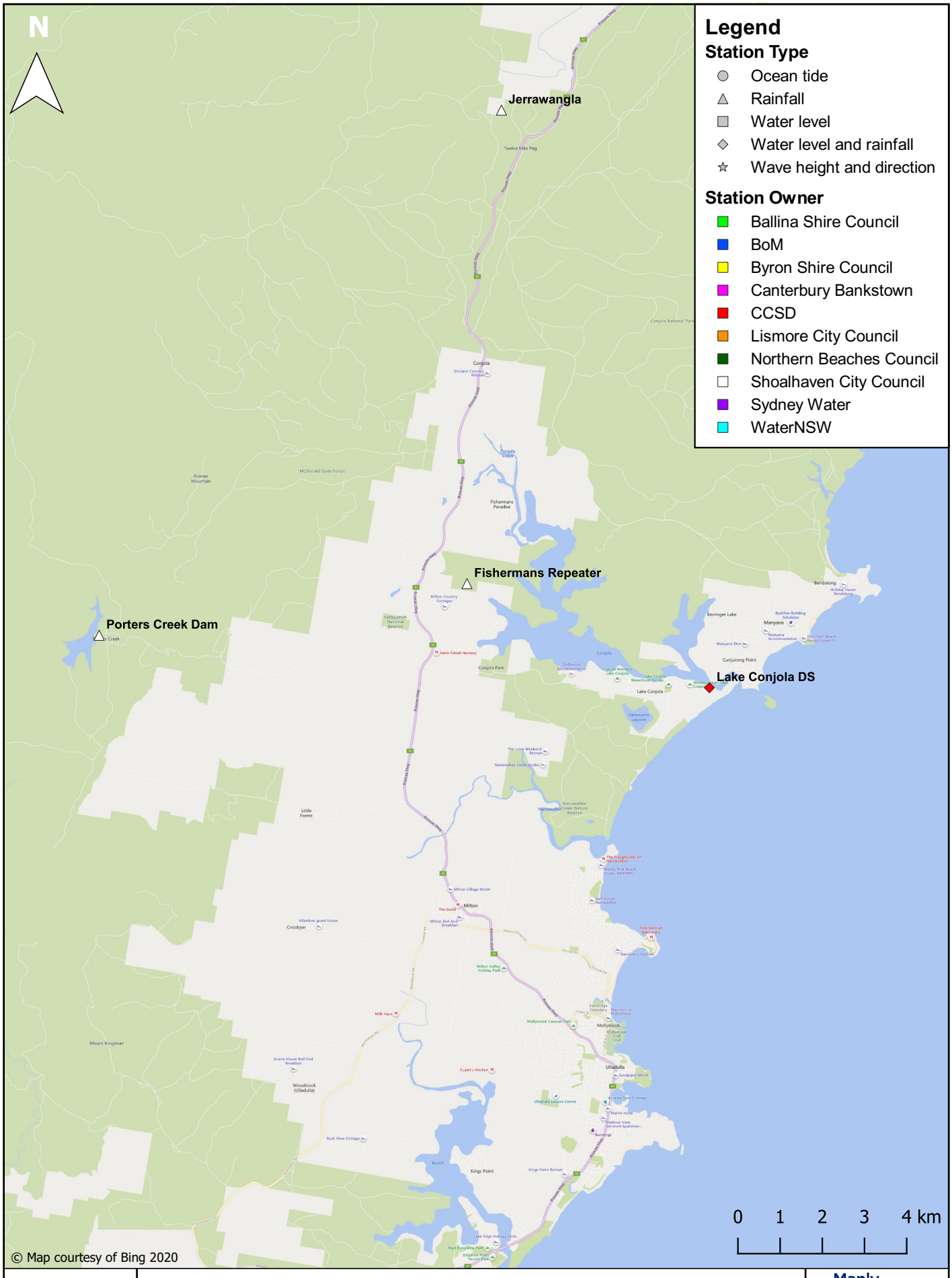
12.1 Lake Conjola region – water level

The peak observed water levels for the Lake Conjola region are listed in **Table 12.1**. The locations of water level stations within the Lake Conjola region are shown in **Figure 12.1**. The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 12.2** to **Figure 12.3**.

Table 12.1 Lake Conjola region flood peaks

Station name	Station number	Owner	Datum	Level (m)
Lake Conjola DS	216420D	CCSD	AHD	2.04

There are no SES flood classifications for Lake Conjola.



NSW GOVERNMENT

LAKE CONJOLA STATIONS

Manly Hydraulics Laboratory

Report MHL2752
Figure
12.1

Figures_MHL2752.qgs

12.2 Lake Conjola region – rainfall

The water level and rainfall data for the period 01 to 29 February 2020 are displayed graphically in **Figure 12.2** to **Figure 12.3**. 24-hour rainfall totals up until 9:00 a.m. are displayed in **Table 12.2** for the period 01 to 29 February 2020. The rainfall intensities are displayed graphically in **Figure 12.4** to **Figure 12.6**, in ARR1987 format. Appendix C provides ARR2019 format.

Table 12.2 Lake Conjola region daily rainfall totals

Date	Lake Conjola DS 216420D (mm)	Fishermans Repeater 568201 (mm)	Porters Creek Dam 568212 (mm)
	CCSD	Shoalhaven City Council	Shoalhaven City Council
01/02/2020	-	-	-
02/02/2020	0.0	0.0	0.0
03/02/2020	4.5	3.0	2.0
04/02/2020	0.0	0.0	0.0
05/02/2020	0.0	0.0	0.0
06/02/2020	0.0	0.0	1.0
07/02/2020	5.0	1.0	2.0
08/02/2020	48.5	53.0	55.0
09/02/2020	28.0	60.0	93.0
10/02/2020	60.5	146.0	282.0
11/02/2020	16.0	6.0	17.0
12/02/2020	2.5	2.0	11.0
13/02/2020	29.5	43.0	61.0
14/02/2020	0.5	14.0	26.0
15/02/2020	0.0	0.0	0.0
16/02/2020	5.0	10.0	13.0
17/02/2020	10.5	14.0	18.0
18/02/2020	0.0	0.0	2.0
19/02/2020	0.0	0.0	0.0
20/02/2020	2.5	1.0	0.0
21/02/2020	0.0	0.0	0.0
22/02/2020	0.5	2.0	5.0
23/02/2020	0.0	0.0	1.0
24/02/2020	0.0	0.0	0.0
25/02/2020	0.0	0.0	0.0
26/02/2020	0.0	0.0	0.0
27/02/2020	0.0	0.0	0.0
28/02/2020	0.0	0.0	0.0
29/02/0202	0.0	0.0	0.0

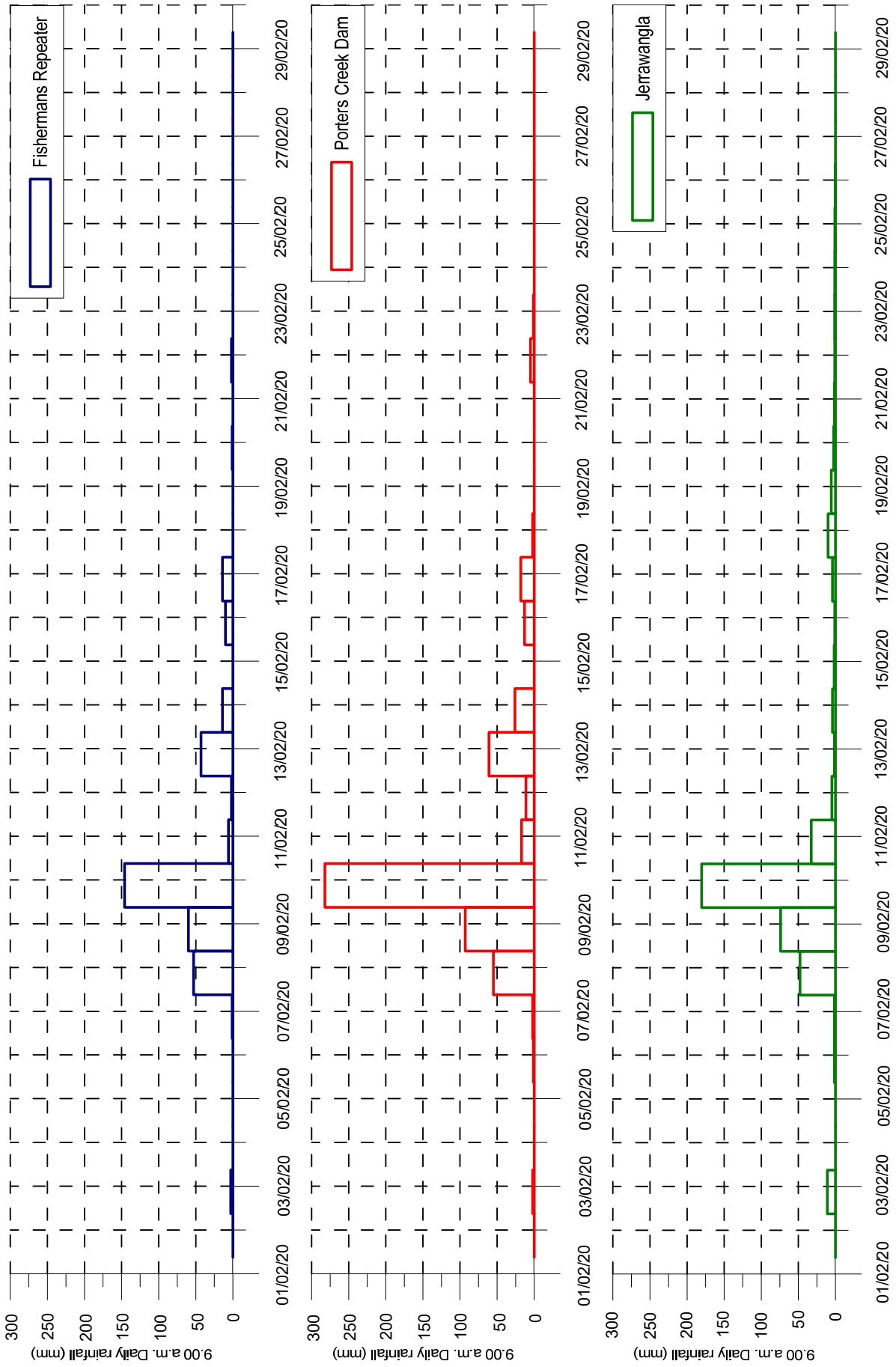
NSW GOVERNMENT

LAKE CONJOLA REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
12.2

Figures_MHL2752.pptx



NSW GOVERNMENT

LAKE CONJOLA REGION
WATER LEVEL AND RAINFALL DATA
1 – 29 FEBRUARY 2020

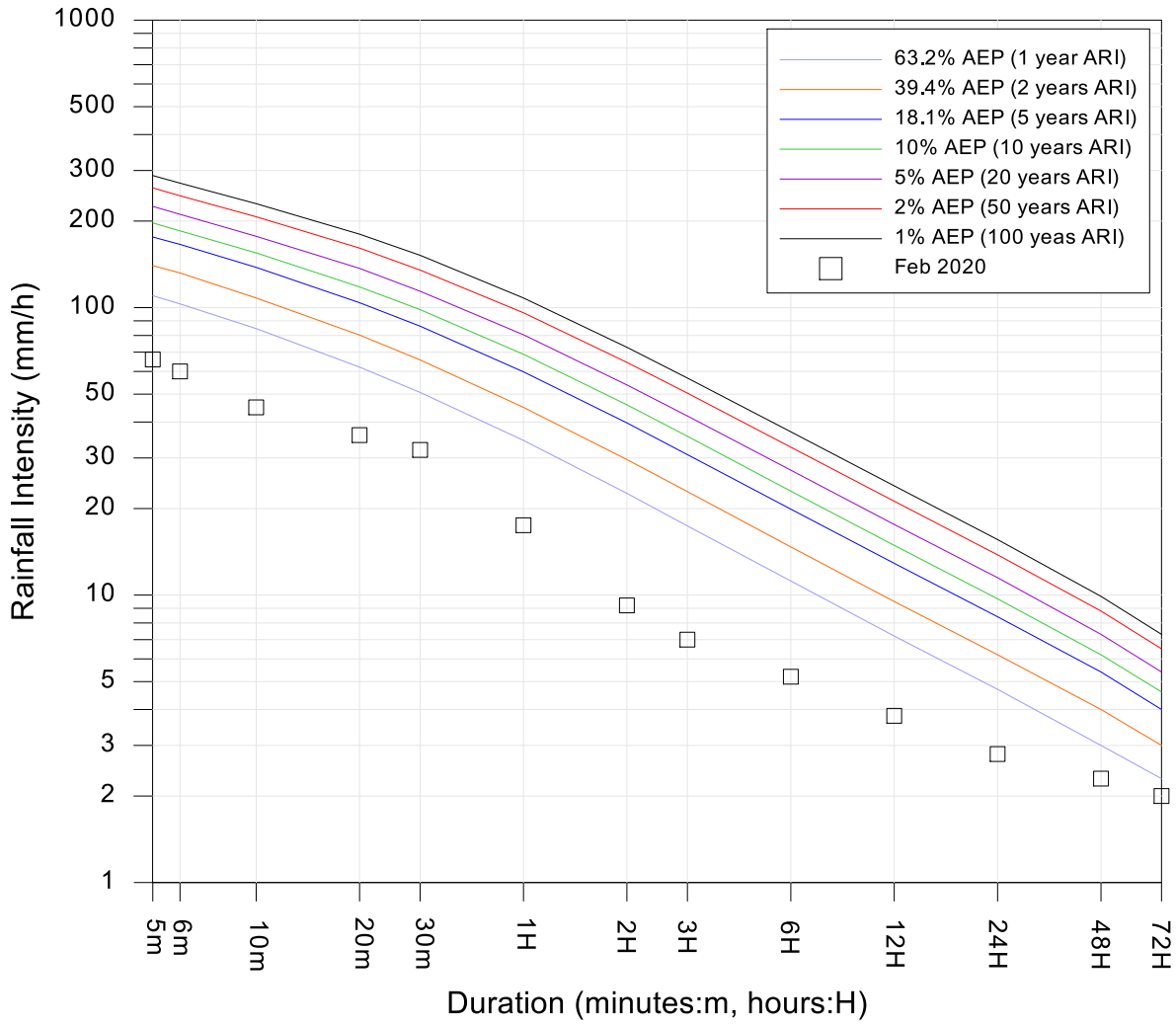
Manly Hydraulics Laboratory

Report MHL2752
Figure
12.3

Figures_MHL2752.pptx

Site Owner: CCSD
Latitude: -35.2692 Longitude:150.5

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	66	05:12 08 Feb 2020
6m	60	05:12 08 Feb 2020
10m	45	05:32 08 Feb 2020
20m	36	05:29 08 Feb 2020
30m	32	05:37 08 Feb 2020
1H	17.5	06:06 08 Feb 2020
2H	9.2	06:01 08 Feb 2020
3H	7	05:42 08 Feb 2020
6H	5.2	06:15 08 Feb 2020
12H	3.8	13:17 08 Feb 2020
24H	2.8	04:28 10 Feb 2020
48H	2.3	05:06 10 Feb 2020
72H	2	16:47 10 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Lake Conjola Downstream (216420D)
Intensity-Frequency-Duration
1 - 29 February 2020

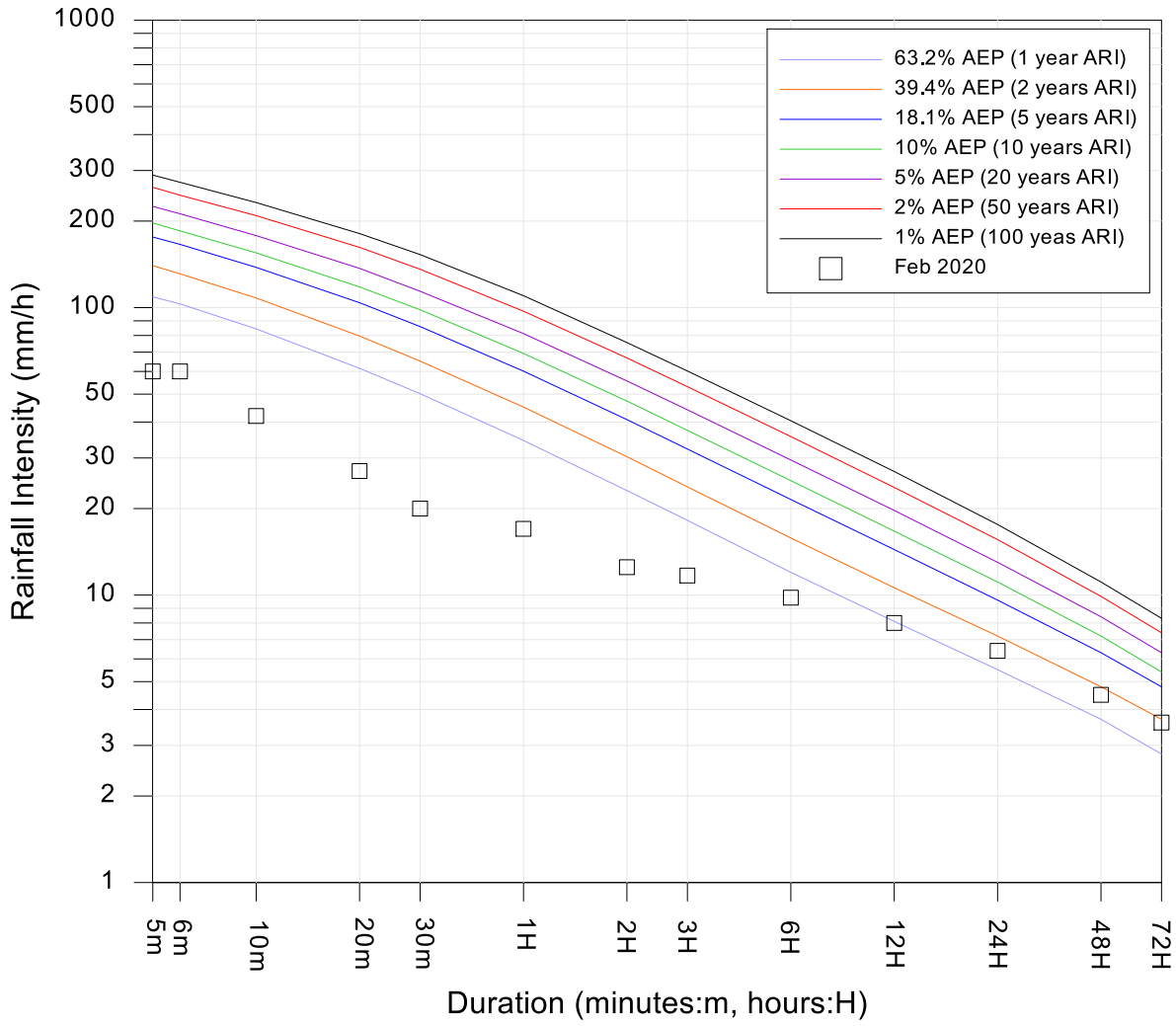
Manly Hydraulics Laboratory

Report MHL2752
Figure
12.4

IFD216420D_Figure .pdf

Site Owner: Shoalhaven City Council
Latitude: -35.247 Longitude:150.437

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	60	06:13 09 Feb 2020
6m	60	06:12 09 Feb 2020
10m	42	09:17 13 Feb 2020
20m	27	09:27 13 Feb 2020
30m	20	09:35 13 Feb 2020
1H	17	05:44 10 Feb 2020
2H	12.5	06:12 10 Feb 2020
3H	11.7	17:31 09 Feb 2020
6H	9.8	20:42 09 Feb 2020
12H	8	01:22 10 Feb 2020
24H	6.4	06:01 10 Feb 2020
48H	4.5	05:54 10 Feb 2020
72H	3.6	10:33 10 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Fishermans Repeater (568201)
Intensity-Frequency-Duration
1 - 29 February 2020

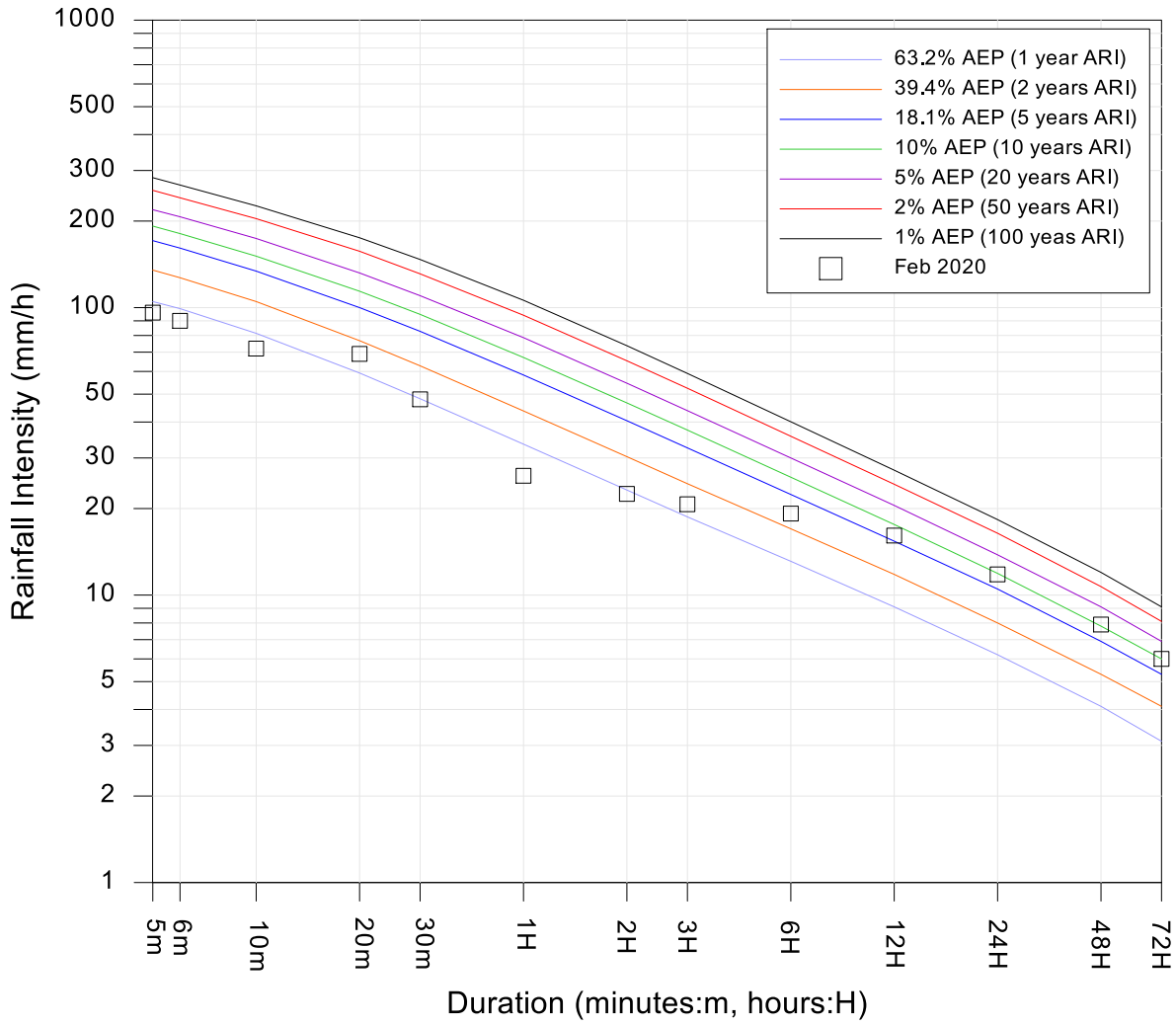
Manly Hydraulics Laboratory

Report MHL2752
Figure
12.5

IFD568201_Figure .pdf

Site Owner: Shoalhaven City Council
Latitude: -35.258 Longitude:150.341

AEP = Annual Exceedance Probability
ARI = Average Recurrence Interval



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
5m	96	15:19 08 Feb 2020
6m	90	15:20 08 Feb 2020
10m	72	20:22 12 Feb 2020
20m	69	20:23 12 Feb 2020
30m	48	20:30 12 Feb 2020
1H	26	20:24 12 Feb 2020
2H	22.5	18:36 09 Feb 2020
3H	20.7	19:01 09 Feb 2020
6H	19.2	20:34 09 Feb 2020
12H	16.1	01:06 10 Feb 2020
24H	11.8	08:35 10 Feb 2020
48H	7.9	08:04 10 Feb 2020
72H	6	01:18 11 Feb 2020

Reference: Australian Rainfall and Runoff (1987)

NSW GOVERNMENT

Porters Creek Dam (568212)
Intensity-Frequency-Duration
1 - 29 February 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
12.6

IFD568212_Figure .pdf

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Appendix A Station performance

This appendix 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 97% data recovery during the February 2020 flood event.

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	CCSD	-30.3727778	153.258889	N/A	88%	
Sydney	SYDDOW	Wave height and direction	CCSD	-33.825461	151.258533	N/A	100%	
Port Kembla	PTKMOW	Wave height and direction	CCSD	-34.4719444	151.021667	N/A	98%	
Batemans Bay	BATBOW	Wave height and direction	CCSD	-35.7030556	150.343889	N/A	93%	
Wilsons River								
Lismore	203904	Water level	Lismore City Council	-28.814	153.273	N/A	N/A	Data was requested from BoM but was not available.
Lismore (Dawson Street)	558087	Water level and rainfall	Lismore City Council	-28.807	153.282	Local datum	55%	Lost water level data during flood, 100% recovery for rainfall.
East Gundurimba	203427	Water level	CCSD	-28.8457095	153.266894	AHD	100%	
Woodlawn College	203402	Water level	CCSD	-28.7854118	153.302539	AHD	100%	
Wilsons River at Nashua	203902	Rainfall	Lismore City Council	-28.73	153.46	N/A	100%	Data was requested from BoM but was not available.
Wilsons River at Eltham	203014	Water level	WaterNSW	-28.755574	153.394827	Local datum	100%	
Wilsons River at Tuckurimba	558076	Water level	Lismore City Council	-28.962	153.307	Local datum	72%	Flood data captured.
Lismore Airport	58214	Rainfall	BoM	-28.83	153.26	N/A	100%	
Leycester Rock Valley	203010	Water level and rainfall	WaterNSW	-28.7365	153.164	Local datum	100%	
Coopers at Ewing Bridge	203024	Water level	WaterNSW	-28.721535	153.362272	Local datum	100%	Rainfall monitoring ceased at this station in 2000.
Coopers Creek at Fairmeadow	203060	Water level	WaterNSW	-28.745973	153.351676	Local datum	100%	
Coopers Creek at Repentence	203002	Water level	WaterNSW	-28.641292	153.412585	Local datum	100%	
Wilsons at Lavertys Gap Weir	203062	Water level	WaterNSW	-28.576278	153.438248	Local datum	100%	
Mullumbimby Creek	558008	Rainfall	Byron Shire Council	-28.554	153.437	N/A	100%	
Doon Doon (McCabes Rd)	58019	Rainfall	BoM	-28.533	153.314	N/A	100%	
Huonbrook	558049	Rainfall	CCSD	-28.5521229	153.385648	N/A	100%	
Lillian Rock (Williams Rd)	58148	Rainfall	BoM	-28.528	153.152	N/A	100%	
Terania Creek	558078	Rainfall	Lismore City Council	-28.588	153.299	N/A	100%	
Goonengerry (Alert)	558033	Rainfall	Byron Shire Council	-28.594	153.417	N/A	100%	
Cawongla (Alert)	558024	Rainfall	Lismore City Council	-28.605	153.091	N/A	100%	
Nimbin	58180	Rainfall	Lismore City Council	-28.608	153.213	N/A	100%	
Goolmangar Creek at Nimbin	203901	Water level	Lismore City Council	-28.608	153.213	N/A	N/A	Data was requested from BoM but was not available.

Station Name	Station code	Station Type	Owner	Latitude	Longitude	Datum	Data recovery %	Comment
Kyogle (Richmond River)	558002	Rainfall	BoM	-28.6217	152.995	N/A	100%	
Repentence (Coopers Ck)	558000	Rainfall	Lismore City Council	-28.643	153.417	N/A	100%	
The Channon	58147	Rainfall	BoM	-28.672	153.278	N/A	100%	
Jiggi (Gwynne St)	558086	Rainfall	Lismore City Council	-28.676	153.154	N/A	100%	
Dunoon	558031	Rainfall	Lismore City Council	-28.677	153.322	N/A	100%	
Bentley	58202	Rainfall	Lismore City Council	-28.74	153.076	N/A	100%	
Back Creek at Bentley	203009	Water level	Lismore City Council	-28.74	153.076	N/A	N/A	Data was requested from BoM but was not available.
Goolmangar	558075	Rainfall	Lismore City Council	-28.749	153.218	N/A	100%	
Goolmangar Creek at Goolmangar	558075	Water level	Lismore City Council	-28.749	153.218	Local datum	100%	
Tuncester (Leycester Ck)	203443	Water level	CCSD	-28.7957547	153.240196	AHD	100%	
Tuncester	58201	Rainfall	Lismore City Council	-28.797	153.239	N/A	100%	
Houghlahans Creek	558069	Rainfall	Ballina Shire Council	-28.785	153.474	N/A	100%	
Alstonville STP	558072	Rainfall	Ballina Shire Council	-28.831	153.444	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%	Rainfall data not available from WaterNSW
Coramba (Glenfiddich)	59009	Rainfall	BoM	-30.24	153.02	N/A	N/A	Data was requested from BoM but was not available.
Nana Glen (Cowling Close)	59139	Rainfall	BoM	-30.1	153	N/A	N/A	Data was requested from BoM but was not available.
Glenreagh (Coramba Street)	59054	Rainfall	BoM	-30.05	152.978	N/A	100%	
Lower Bucca	59006	Rainfall	BoM	-30.16	153.1	N/A	N/A	Data was requested from BoM but was not available.
Tuggerah Lake								
Wallarah Creek Bridge	211420	Water level	CCSD	-33.2176896	151.50749	AHD	100%	
Toukley	211401	Water level and rainfall	CCSD	-33.2634954	151.524811	AHD	100%	Lost rainfall data due to excess tips being recorded.
Wyong Weir Upstream	211417	Water level	CCSD	-33.2778438	151.40643	AHD	100%	
Lees Bridge	211425	Water level	CCSD	-33.3253759	151.427996	AHD	100%	
Long Jetty	211418	Water level	CCSD	-33.3572424	151.481942	AHD	100%	
Tumbi Umbi	211419	Water level	CCSD	-33.3621863	151.444928	AHD	100%	

Station Name	Station code	Station Type	Owner	Latitude	Longitude	Datum	Data recovery %	Comment
Manns Road	211435	Water level	CCSD	-33.4016731	151.342821	AHD	99%	
Hamlyn Terrace	561133	Rainfall	CCSD	-33.2508914	151.469207	NA	100%	
Bateau Bay	561069	Rainfall	CCSD	-33.3790299	151.474479	NA	100%	
Mardi Dam	561082	Rainfall	CCSD	-33.2978104	151.400074	NA	100%	
Hawkesbury River and South Creek								
Patonga	212440	Ocean tide	CCSD	-33.550983	151.274619	AHD	100%	
Spencer	212431	Water level	CCSD	-33.4571377	151.146841	AHD	100%	
Gunderman Caravan Park	212429	Water level	CCSD	-33.4408555	151.057566	AHD	100%	
Wisemans Ferry	212460	Water level	CCSD	-33.3818915	150.989258	AHD	100%	
Webbs Creek	212408	Water level and rainfall	CCSD	-33.3874602	150.982336	AHD	100%	
Leets Vale	212461	Water level	WaterNSW	-33.42878000	150.94755000	AHD	100%	
Colo Junction	212407	Water level and rainfall	CCSD	-33.43769000	150.88315000	AHD	100%	
Sackville	212406	Water level	CCSD	-33.4933311	150.881645	AHD	51%	Water level data loss due to bank collapse during flood event.
Sackville Downstream	212438	Rainfall	CCSD	-33.4972712	150.876877	NA	100%	
Ebenezer	212427	Water level	CCSD	-33.5474673	150.893085	AHD	100%	
Windsor	212426	Water level	CCSD	-33.6049282	150.818411	AHD	100%	
Freemans Reach	212410	Water level	CCSD	-33.5698675	150.780742	AHD	100%	
Castlereagh	212404	Water level	CCSD	-33.6343526	150.676534	AHD	100%	
Menangle Bridge	212904	Water level	BoM	-34.118	150.744	N/A	N/A	Data was requested from BoM but was not available.
Camden Weir	212216	Water level	WaterNSW	-34.05	150.704	Local datum	100%	
Wallacia Weir	212202	Water level	WaterNSW	-33.86111111	150.63027778	Local datum	100%	
Cattai Creek at Murphys Bridge	212059	Water level	WaterNSW	−33.659066670	150.9308	Local datum	100%	
Ropes Creek at Debrincat Ave	212049	Water level	WaterNSW	−33.752900000	150.792633	Local datum	100%	
Penrith	212201	Water level	WaterNSW	-33.74677778	150.6825	Local datum	100%	
North Richmond (WPS)	212200	Water level	WaterNSW	-33.5893013	150.714031	Local datum	100%	
Avon Dam Road	212204	Water level	WaterNSW	-34.3272286	150.63108	Local datum	100%	
Broughtons Pass	212233	Water level	WaterNSW	-34.2288446	150.743091	Local datum	100%	
Cataract Dam	212232	Water level	WaterNSW	-34.2655837	150.803553	Local datum	100%	
Cedar Ford	212260	Water level	WaterNSW	-33.9480556	150.243056	N/A	N/A	Station burnt out in December 2019 bushfires.
Golden Valley	212271	Water level	WaterNSW	-34.5491667	150.081945	Local datum	69%	Captured flood peak data.
Greenstead	212009	Water level	WaterNSW	-34.4247222	150.191389	Local datum	66%	Captured flood peak data.
Grose Wold	212291	Water level	WaterNSW	-33.61527778	150.62916667	Local datum	100%	
Bilpin (Fern Grove)	63118	Rainfall	BoM	-33.52	150.49	N/A	100%	Daily rainfall totals only - not suitable for IFD analysis.
Faulconbridge (St Georges Crescent)	63028	Rainfall	BoM	-33.69	150.53	N/A	100%	Daily rainfall totals only - not suitable for IFD analysis.
Blackheath (Wombat St)	63295	Rainfall	BoM	-33.63	150.28	N/A	100%	Daily rainfall totals only - not suitable for IFD analysis.
Jooriland	212270	Water level	WaterNSW	-34.2276592	150.252792	Local datum	100%	
Kelpie Point	212250	Water level	WaterNSW	-33.8712419	150.254014	Local datum	100%	

Station Name	Station code	Station Type	Owner	Latitude	Longitude	Datum	Data recovery %	Comment
Nepean Dam	212205	Water level	WaterNSW	-34.3350462	150.617666	Local datum	100%	
Pheasants Nest	212203	Water level	WaterNSW	-34.2452532	150.667003	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	150.72527778	Local datum	unknown	May not have recorded accurately and the peak was significantly higher than the recorded peak.
Warragamba Dam	212243	Water level	WaterNSW	-33.8911111	150.591111	Local datum	100%	
Warragamba Weir	212241	Water level	WaterNSW	-33.87694444	150.60638889	Local datum	100%	
Yarramundi	2122001	Water level	WaterNSW	-33.6236111	150.6825	Local datum	100%	
Macdonald River at Howes Valley	212021	Rainfall	WaterNSW	-32.861096	150.810589	N/A	100%	
Capertree River at Glen Davis	212018	Rainfall	WaterNSW	-33.121	150.2806	N/A	100%	
Farmers Creek at Mount Walker	212256	Rainfall	WaterNSW	-33.497674	150.098527	N/A	N/A	Station decommissioned in Nov 2019.
Greaves Creek at Greaves Creek Dam	212285	Rainfall	WaterNSW	-33.6547227	150.308889	N/A	N/A	Station decommissioned in Nov 2019.
South Creek at Great Western Hwy	212048	Rainfall	WaterNSW	-33.7692333	150.761567	N/A	100%	
South Creek at Elizabeth Dr	212320	Rainfall	WaterNSW	-33.8773833	150.768467	N/A	100%	
Nattai River at the Causeway	212280	Rainfall	WaterNSW	-34.1455558	150.424725	N/A	N/A	Station decommissioned in Nov 2019
Lake Nerrigorang at Thirlmere Lakes	212063	Rainfall	WaterNSW	-34.2228932	150.534317	N/A	100%	
Stonequarry Creek at Picton	212053	Rainfall	WaterNSW	-34.1777	150.6124	N/A	100%	
Narrabeen Lagoon								
Ocean Street Bridge	213408D	Water level	Northern Beaches Council	-33.703792	151.304752	AHD	100%	
Narrabeen Bridge	213422	Water level	CCSD	-33.7121797	151.296782	AHD	99%	
Middle Creek	213421	Water level and rainfall	Northern Beaches Council	-33.7205917	151.243947	Local datum	100%	
Cromer Golf Club	5Cromer01	Rainfall	Northern Beaches Council	-33.7283667	151.271594	N/A	100%	
Georges River								
Picnic Point Downstream	213410D	Water level	CCSD	-33.9823467	151.000185	AHD	99%	
Como Bridge	213425	Water level	CCSD	-33.997001	151.070859	AHD	100%	
Milperra	213405	Water level	CCSD	-33.9275169	150.979325	AHD	100%	
Lansdowne Bridge	213402	Water level	CCSD	-33.8903425	150.967412	AHD	22%	Water level data loss due to bank collapse
Lansvale	213401	Water level	CCSD	-33.8995935	150.957579	AHD	100%	
Irelands Bridge	213407	Water level	CCSD	-33.9048815	150.9432	AHD	100%	
Scrivener Street	213404	Water level	CCSD	-33.9222864	150.935265	AHD	100%	
Liverpool Weir	213400	Water level	CCSD	-33.926851	150.928416	AHD	68%	Water level data loss due to bank collapse
Bundeena	214452	Ocean tide	CCSD	-34.082683	151.1509	AHD	100%	
Kelso Creek	213430	Rainfall	CCSD	-33.9548547	150.984738	N/A	100%	
Kelso Creek DS Levee	213903	Water level	Canterbury Bankstown	-33.9548547	150.984738	AHD	99%	

Station Name	Station code	Station Type	Owner	Latitude	Longitude	Datum	Data recovery %	Comment
Redfern Road	213013	Water level	WaterNSW	-34.0267	150.836917	Local datum	100%	
Milperra Bridge	66168	Rainfall	BoM	-33.927	150.974	N/A	100%	
Bankstown Airport AWS	66137	Rainfall	BoM	-33.924415	150.996735	N/A	100%	
Holsworthy Aerodrome AWS	66161	Rainfall	BoM	-33.991689	150.94884	N/A	100%	
Peakhurst Golf Club	66148	Rainfall	BoM	-33.972	151.061	N/A	100%	
Abbotsbury (Fairfield City Farm)	67114	Rainfall	BoM	-33.867	150.861	N/A	N/A	Station failed prior to flood event.
Lower Shoalhaven								
Shoalhaven Heads	215470	Water level	CCSD	-34.8546143	150.745343	AHD	100%	
Hay Street	215415	Water level	CCSD	-34.859716	150.729794	AHD	100%	
Terara	215420	Water level	CCSD	-34.8634522	150.628957	AHD	100%	
Nowra Bridge	215411	Water level	CCSD	-34.8651668	150.602396	AHD	100%	
Gradys Caravan Park	215430	Water level	CCSD	-34.8708801	150.462879	AHD	100%	Uncertainty on the flood peak and falling limb is >±50mm post data quality control due to bank scouring movement of the orifice in the water column.
Greenwell Point	215417	Water level	CCSD	-34.9072785	150.736484	AHD	100%	
Greenwell Point	568180	Rainfall	Shoalhaven City Council	-34.907	150.736	N/A	100%	
Broughton Creek	568226	Rainfall	Shoalhaven City Council	-34.789	150.708	N/A	100%	
Nowra Boat Shed (Shoalhaven River)	68213	Rainfall	Shoalhaven City Council	-34.867	150.605	N/A	100%	
Greenwell Point Bowling Club	68080	Rainfall	BoM	-34.915704	150.730642	N/A	100%	Daily rainfall totals only - not suitable for IFD analysis
Nowra Treatment Works	68048	Rainfall	BoM	-34.87	150.62	N/A	100%	Daily rainfall totals only - not suitable for IFD analysis
Grassy Gully	68233	Rainfall	Shoalhaven City Council	-34.842	150.424	N/A	100%	
Crookhaven Heads	215408	Ocean tide	CCSD	-34.9053403	150.759397	AHD	100%	
St Georges Basin								
Island Point	216415	Water level	CCSD	-35.0973777	150.59467	AHD	100%	
Sussex Inlet	216412	Water level	CCSD	-35.1694766	150.594249	AHD	100%	
Island Point Road	568200	Rainfall	Shoalhaven City Council	-35.099	150.594	N/A	100%	
Tomerong Creek	568202	Rainfall	Shoalhaven City Council	-35.06	150.582	N/A	100%	
Jerrawangla	568204	Rainfall	Shoalhaven City Council	-35.146	150.446	N/A	100%	
Sanctuary Point (Salinas St)	68088	Rainfall	BoM	-35.092797	150.62244	N/A	N/A	Daily rainfall totals only - not suitable for IFD analysis.
Sussex Inlet Bowling Club	68204	Rainfall	BoM	-35.170339	150.590539	N/A	N/A	Daily rainfall totals only - not suitable for IFD analysis.
Lake Conjola								
Lake Conjola Downstream	216420D	Water level and rainfall	CCSD	-35.269177	150.500266	AHD	100%	
Fishermans Repeater	568201	Rainfall	Shoalhaven City Council	-35.247	150.437	N/A	100%	

Station Name	Station code	Station Type	Owner	Latitude	Longitude	Datum	Data recovery %	Comment
Porters Creek Dam	568212	Rainfall	Shoalhaven City Council	-35.258	150.341	N/A	100%	
Milton	69016	Rainfall	BoM	-35.32	150.44	N/A	N/A	Daily rainfall totals only - not suitable for IFD analysis.
Bendalong STP	68229	Rainfall	BoM	-35.243914	150.50962	N/A	N/A	Daily rainfall totals only - not suitable for IFD analysis.

Appendix B Flood photographs February 2020 event

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

Wyong River at Wyong Weir Upstream, 3:13 p.m. (AEDT) 10 February 2020 3.88 m AHD

Tuggerah Lake at Toukley, 9:51 a.m. (AEDT) 11 February 2020 1.65 m AHD

Wallarah Creek at Wallarah Creek Bridge, 9:18 a.m. (AEDT) 11 February 2020 1.63 m AHD

Yarramalong at Bumble Hill Road, 1:37 p.m. (AEDT) 10 February 2020


Nepean River at Castlereagh, 12:16 p.m. (AEDT) 26 February 2020 2.58 m AHD (post flood)


Hawkesbury River at Colo Junction, 3:58 p.m. (AEDT) 27 February 2020 0.63 m AHD (post flood)

Hawkesbury River at Freemans Reach, 11:18 a.m. (AEDT) 26 February 2020 0.26 m AHD (post flood)

Narrabeen Lagoon at Middle Creek, 1:15 p.m. (AEDT) 03 March 2020 1.24 m local datum (post flood)

Middle Creek at Oxford Falls Causeway, 12:07 p.m. (AEDT) 07 February 2020 0.45 m local datum

Prospect Creek at Lansdowne Bridge, 1:22 p.m. (AEDT) 19 February 2020 (post flood)

Georges River at Liverpool Weir, 11:42 a.m. (AEDT) 10 February 2020

Georges River at Milperra, 1:32 p.m. (AEDT) 10 February 2020 3.01 m AHD

Georges River at Scrivener Street, 12:42 p.m. (AEDT) 10 February 2020 3.64 m AHD

Shoalhaven River at Nowra Bridge, 12:22 p.m. (AEDT) 10 February 2020 3.64 m AHD

Appendix C 2019 Intensity-frequency-duration

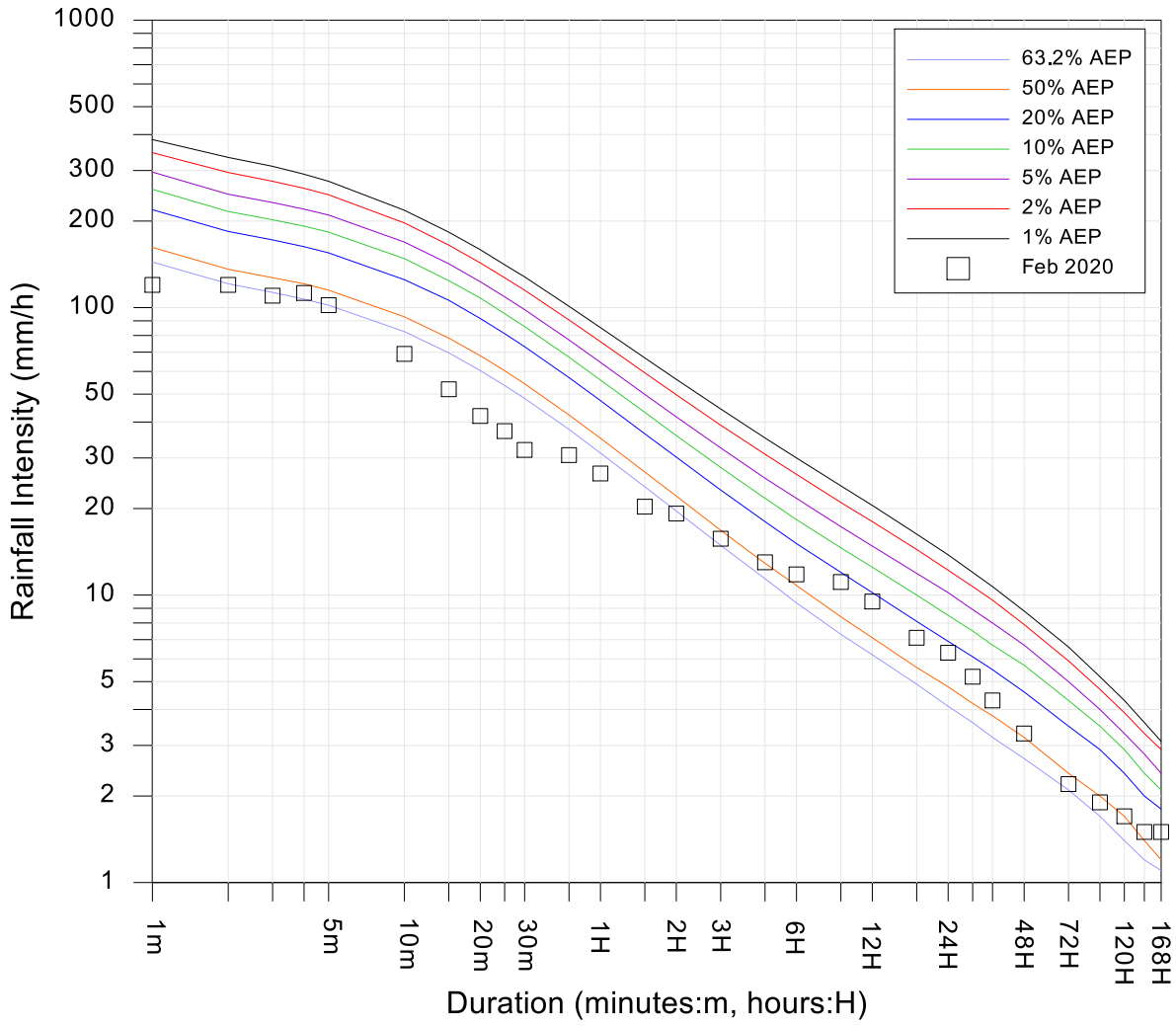
This appendix displays the rainfall intensities in the ARR2019 format. Refer to **Table C.1** for a reference list of the 2019 intensity-frequency-duration (IFD) curves. Stations are ordered from north to south.

Table C.1 2019 IFD figure reference list

Figure reference	Station	Figure reference	Station
C01	Glenreagh (Coramba Street)	C27	Webbs Creek
C02	Lismore (Dawson Street)	C28	Colo Junction
C03	Lismore Airport	C29	Sackville Downstream
C04	Leycester Rock Valley	C30	Macdonald River at Howes Valley
C05	Mullumbimby Creek	C31	Capertree River at Glen Davis
C06	Doon Doon (McCabes Rd)	C32	South Creek at Great Western Hwy
C07	Huonbrook	C33	South Creek at Elizabeth Dr
C08	Lillian Rock (Williams Rd)	C34	Lake Nerrigorang at Thirlmere Lakes
C09	Terania Creek	C35	Stonequarry Creek at Picton
C10	Goonengerry (Alert)	C36	Middle Creek
C11	Cawongla (Alert)	C37	Cromer Golf Club
C12	Nimbin	C38	Kelso Creek
C13	Kyogle (Richmond River)	C39	Milperra Bridge
C14	Repentence (Coopers Ck)	C40	Bankstown Airport AWS
C15	The Channon	C41	Holsworthy Aerodrome AWS
C16	Jiggi (Gwynne St)	C42	Peakhurst Golf Club
C17	Dunoon	C43	Greenwell Point
C18	Bentley	C44	Broughton Creek
C19	Nashua (Wilsons River)	C45	Nowra Boat Shed (Shoalhaven River)
C20	Goolmangar	C46	Grassy Gully
C21	Tuncester	C47	Island Point Road
C22	Houghlahans Creek	C48	Tomerong Creek
C23	Alstonville STP	C49	Jerrawangla
C24	Hamlyn Terrace	C50	Lake Conjola Downstream
C25	Bateau Bay	C51	Fishermans Repeater
C26	Mardi Dam	C52	Porters Creek Dam

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	108	15:37 10 Feb 2020
2m	102	16:15 26 Feb 2020
3m	104	16:14 26 Feb 2020
4m	102	16:15 26 Feb 2020
5m	98.4	16:15 26 Feb 2020
10m	86.4	15:39 10 Feb 2020
15m	85.6	15:42 10 Feb 2020
20m	76.8	15:47 10 Feb 2020
25m	68.2	15:49 10 Feb 2020
30m	58	15:53 10 Feb 2020
45m	40	16:08 10 Feb 2020
1H	30.6	16:23 10 Feb 2020
1.5H	21.3	16:53 10 Feb 2020
2H	17.2	17:24 10 Feb 2020
3H	15.9	23:15 08 Feb 2020
5H	13.5	08:57 13 Feb 2020
6H	11.1	09:17 13 Feb 2020
9H	10.7	09:18 13 Feb 2020
12H	9.3	11:11 13 Feb 2020
18H	6.8	16:20 13 Feb 2020
24H	5.7	22:14 13 Feb 2020
30H	4.9	19:05 13 Feb 2020
36H	4.3	01:05 14 Feb 2020
48H	3.4	21:17 13 Feb 2020
72H	3.2	06:02 09 Feb 2020
96H	2.6	04:38 10 Feb 2020
120H	2.4	11:41 13 Feb 2020
144H	2.2	23:52 13 Feb 2020
168H	2.5	12:20 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Glenreagh (Coramba Street) (59054)
Intensity-Frequency-Duration
1 - 29 February 2020

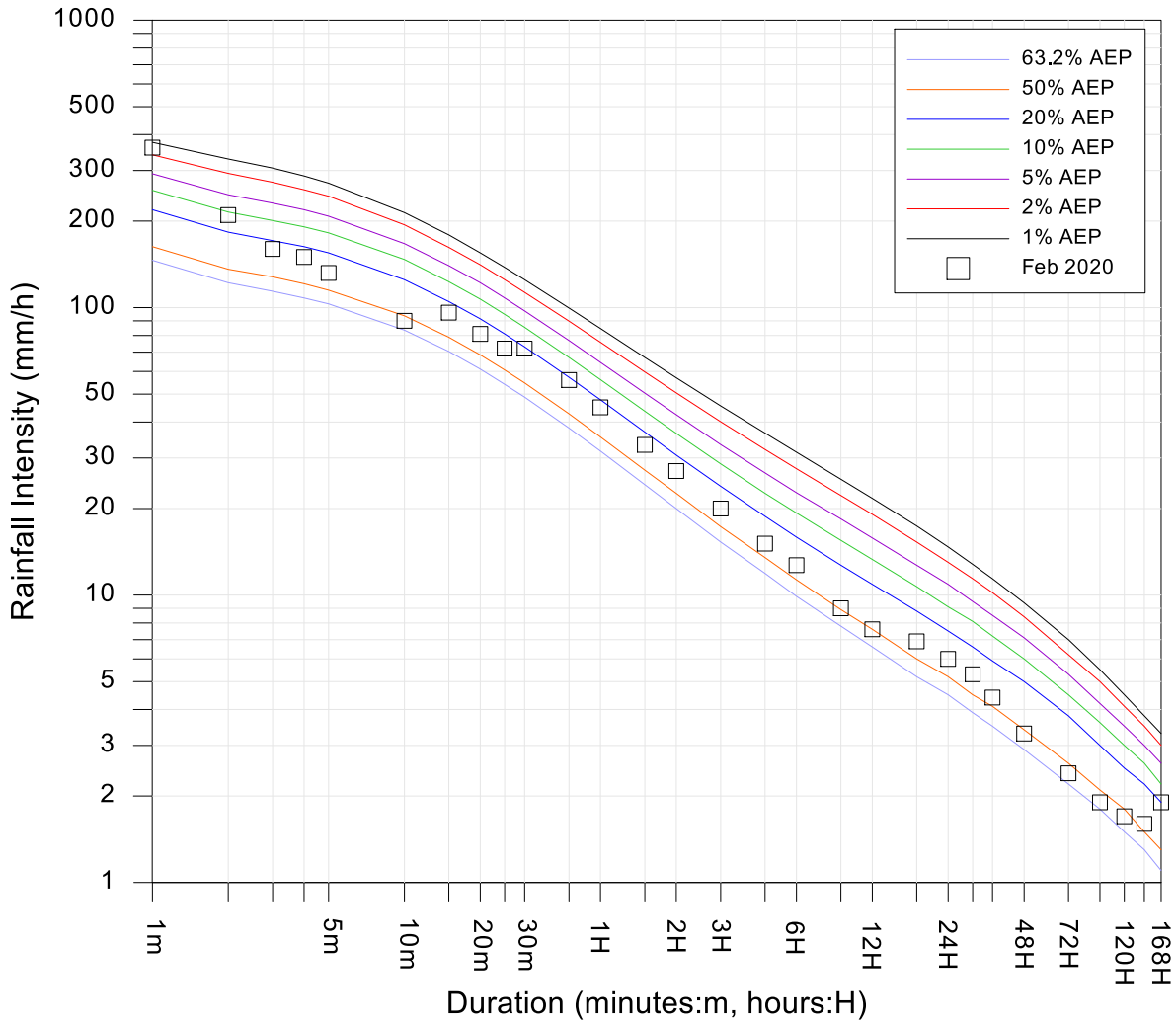
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.1

IFD_59054_FigureC.1.pdf

Site Owner: Lismore City Council
Latitude: -28.807 Longitude:153.282

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	360	02:49 29 Feb 2020
2m	210	10:11 13 Feb 2020
3m	160	10:13 13 Feb 2020
4m	150	10:13 13 Feb 2020
5m	132	10:14 13 Feb 2020
10m	90	10:25 13 Feb 2020
15m	96	10:25 13 Feb 2020
20m	81	10:25 13 Feb 2020
25m	72	10:26 13 Feb 2020
30m	72	10:25 13 Feb 2020
45m	56	10:27 13 Feb 2020
1H	45	10:39 13 Feb 2020
1.5H	33.3	10:30 13 Feb 2020
2H	27	10:28 13 Feb 2020
3H	20	10:26 13 Feb 2020
5H	15.1	10:29 13 Feb 2020
6H	12.7	11:27 13 Feb 2020
9H	9	14:52 13 Feb 2020
12H	7.6	15:20 13 Feb 2020
18H	6.9	11:15 13 Feb 2020
24H	6	10:26 13 Feb 2020
30H	5.3	16:03 13 Feb 2020
36H	4.4	22:03 13 Feb 2020
48H	3.3	10:03 14 Feb 2020
72H	2.4	04:03 09 Feb 2020
96H	1.9	19:03 09 Feb 2020
120H	1.7	16:49 13 Feb 2020
144H	1.6	07:03 14 Feb 2020
168H	1.9	10:28 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Lismore (Dawson Street) (558087)
Intensity-Frequency-Duration
1 - 29 February 2020

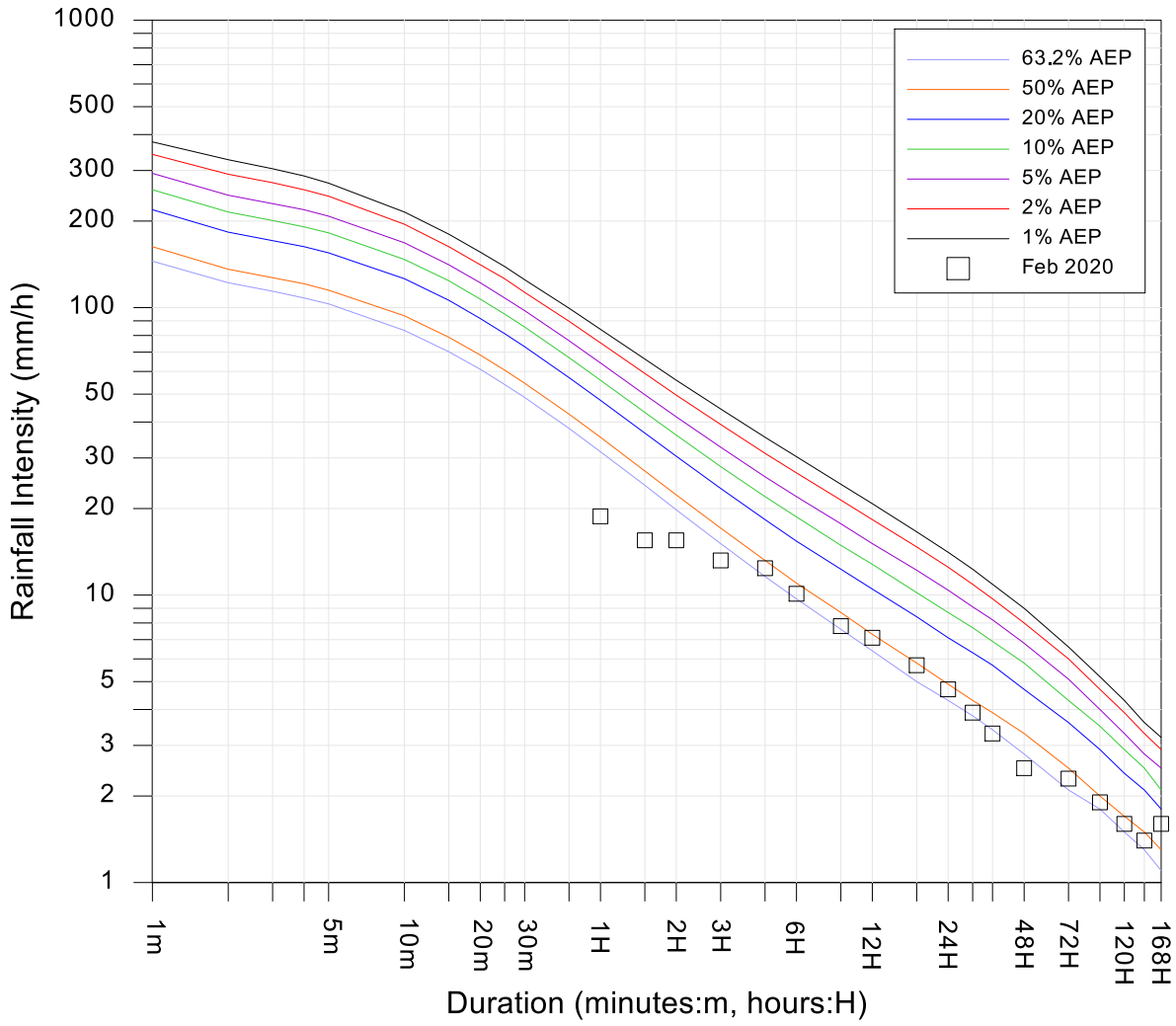
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.2

IFD_558087_FigureC.2.pdf

Site Owner: BoM
Latitude: -28.83 Longitude:153.26

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	18.8	14:13 06 Feb 2020
1.5H	15.5	14:43 06 Feb 2020
2H	15.5	15:13 06 Feb 2020
3H	13.2	14:03 06 Feb 2020
5H	12.4	15:12 06 Feb 2020
6H	10.1	15:59 06 Feb 2020
9H	7.8	20:59 06 Feb 2020
12H	7.1	22:29 06 Feb 2020
18H	5.7	04:42 07 Feb 2020
24H	4.7	07:59 07 Feb 2020
30H	3.9	08:59 07 Feb 2020
36H	3.3	08:59 07 Feb 2020
48H	2.5	17:29 07 Feb 2020
72H	2.3	09:59 09 Feb 2020
96H	1.9	17:29 09 Feb 2020
120H	1.6	18:29 10 Feb 2020
144H	1.4	17:07 09 Feb 2020
168H	1.6	10:29 13 Feb 2020

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

Lismore Airport (58214)
Intensity-Frequency-Duration
1 - 29 February 2020

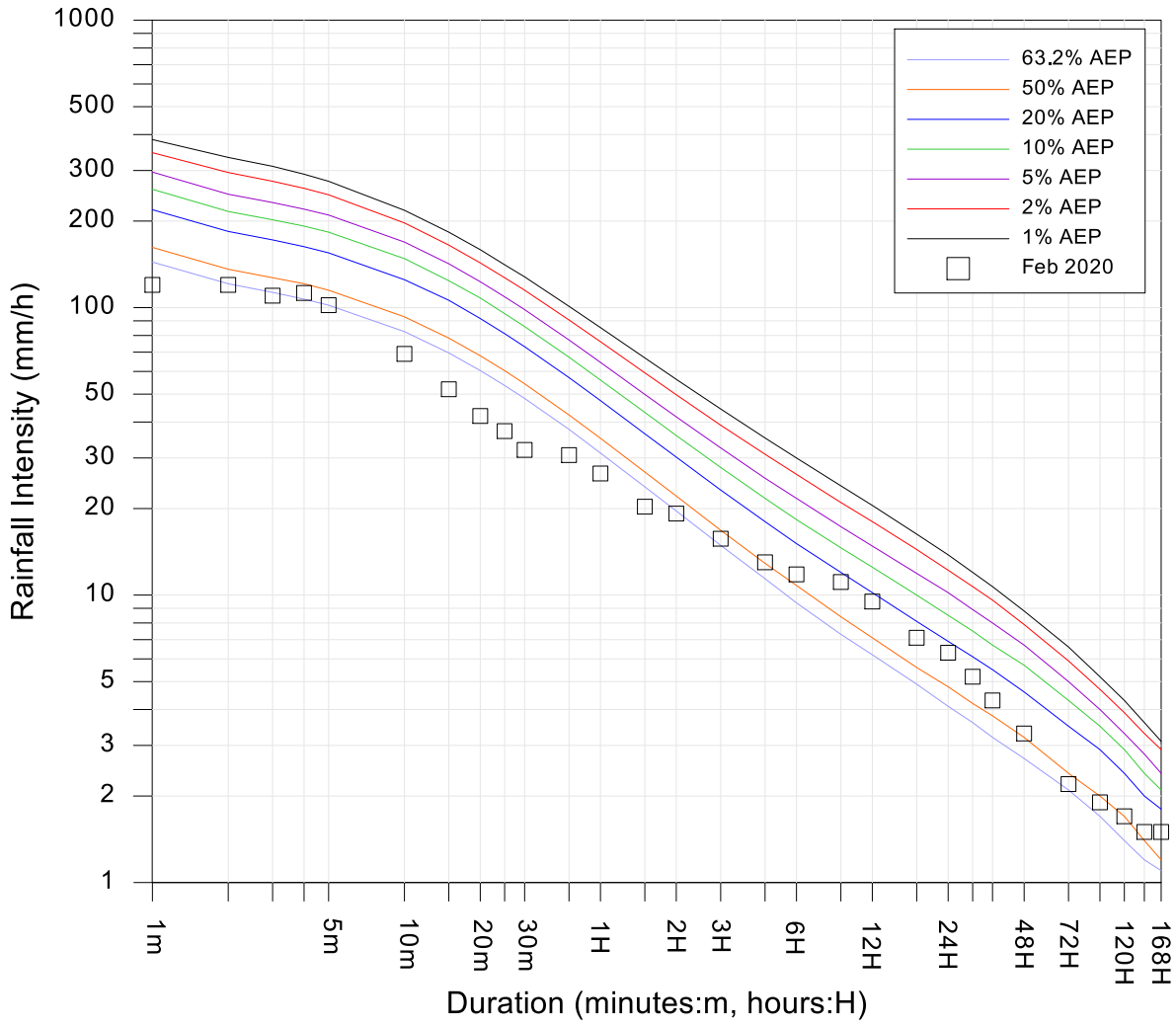
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.3

IFD_58214_FigureC.3.pdf

Site Owner: WaterNSW
Latitude: -28.7365 Longitude:153.164

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	120	15:30 13 Feb 2020
2m	120	17:14 03 Feb 2020
3m	110	17:16 03 Feb 2020
4m	112.5	17:16 03 Feb 2020
5m	102	17:16 03 Feb 2020
10m	69	17:19 03 Feb 2020
15m	52	15:12 13 Feb 2020
20m	42	15:15 13 Feb 2020
25m	37.2	15:15 13 Feb 2020
30m	32	15:32 13 Feb 2020
45m	30.7	15:43 13 Feb 2020
1H	26.5	15:50 13 Feb 2020
1.5H	20.3	11:05 13 Feb 2020
2H	19.2	11:05 13 Feb 2020
3H	15.7	11:04 13 Feb 2020
5H	13	11:49 13 Feb 2020
6H	11.8	15:37 13 Feb 2020
9H	11.1	16:19 13 Feb 2020
12H	9.5	17:17 13 Feb 2020
18H	7.1	16:02 13 Feb 2020
24H	6.3	16:55 13 Feb 2020
30H	5.2	16:46 13 Feb 2020
36H	4.3	20:42 13 Feb 2020
48H	3.3	08:42 14 Feb 2020
72H	2.2	16:21 13 Feb 2020
96H	1.9	05:58 14 Feb 2020
120H	1.7	16:30 13 Feb 2020
144H	1.5	04:30 14 Feb 2020
168H	1.5	11:11 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Leycester Rock Valley (203010)
Intensity-Frequency-Duration
1 - 29 February 2020

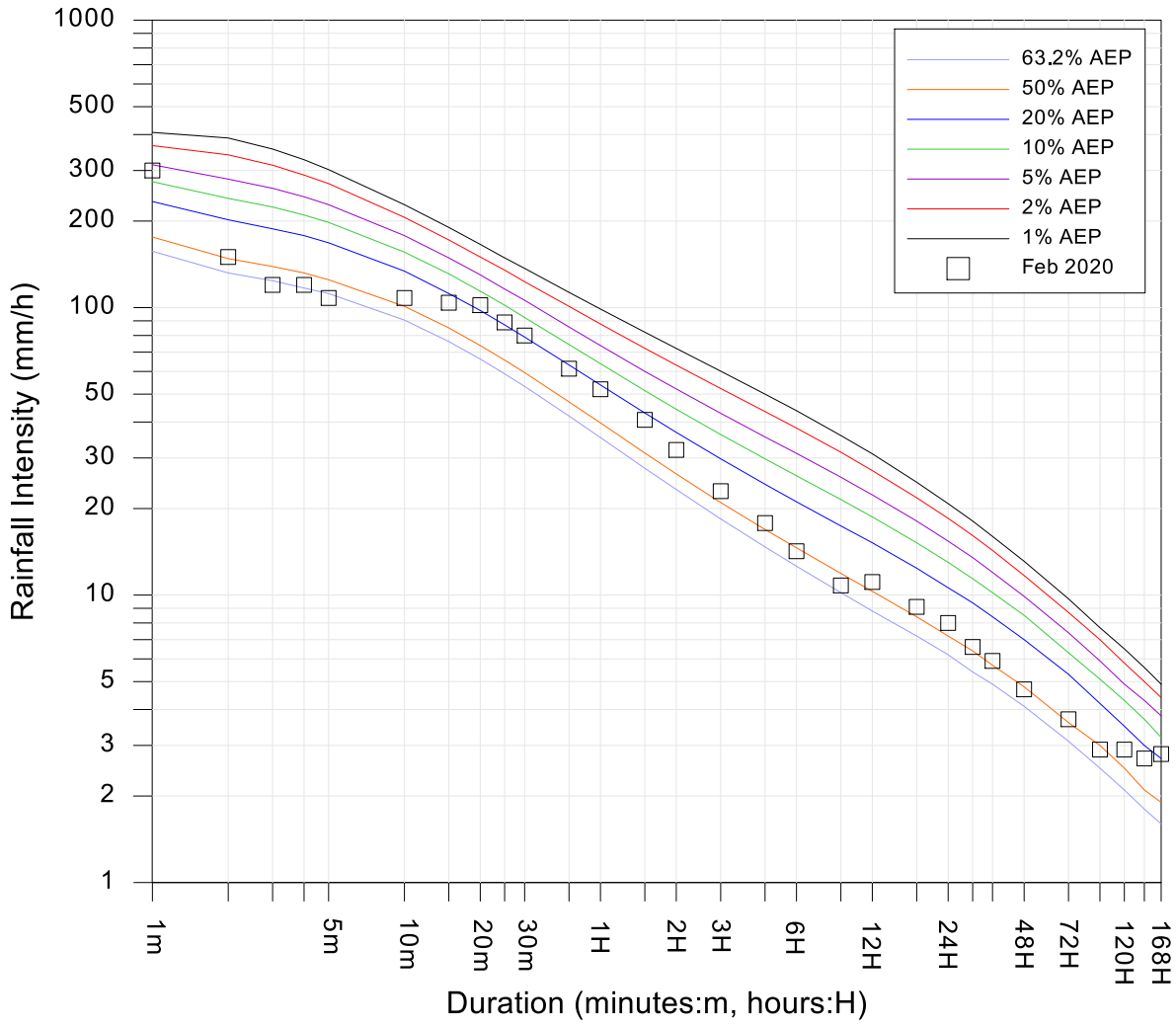
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.4

IFD_203010_FigureC.4.pdf

Site Owner: Byron Shire Council
Latitude: -28.554 Longitude:153.437

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	300	22:39 26 Feb 2020
2m	150	22:40 26 Feb 2020
3m	120	20:20 17 Feb 2020
4m	120	20:11 17 Feb 2020
5m	108	20:18 17 Feb 2020
10m	108	20:11 17 Feb 2020
15m	104	20:18 17 Feb 2020
20m	102	20:20 17 Feb 2020
25m	88.8	20:23 17 Feb 2020
30m	80	20:30 17 Feb 2020
45m	61.3	20:45 17 Feb 2020
1H	52	21:59 12 Feb 2020
1.5H	40.7	22:16 12 Feb 2020
2H	32	22:46 12 Feb 2020
3H	23	22:00 12 Feb 2020
5H	17.8	23:20 12 Feb 2020
6H	14.2	23:21 12 Feb 2020
9H	10.8	05:46 13 Feb 2020
12H	11.1	08:46 13 Feb 2020
18H	9.1	11:00 13 Feb 2020
24H	8	16:32 13 Feb 2020
30H	6.6	16:42 13 Feb 2020
36H	5.9	16:39 13 Feb 2020
48H	4.7	13:04 13 Feb 2020
72H	3.7	18:25 13 Feb 2020
96H	2.9	21:28 13 Feb 2020
120H	2.9	16:48 13 Feb 2020
144H	2.7	02:38 14 Feb 2020
168H	2.8	09:35 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Mullumbimby Creek (558008)
Intensity-Frequency-Duration
1 - 29 February 2020

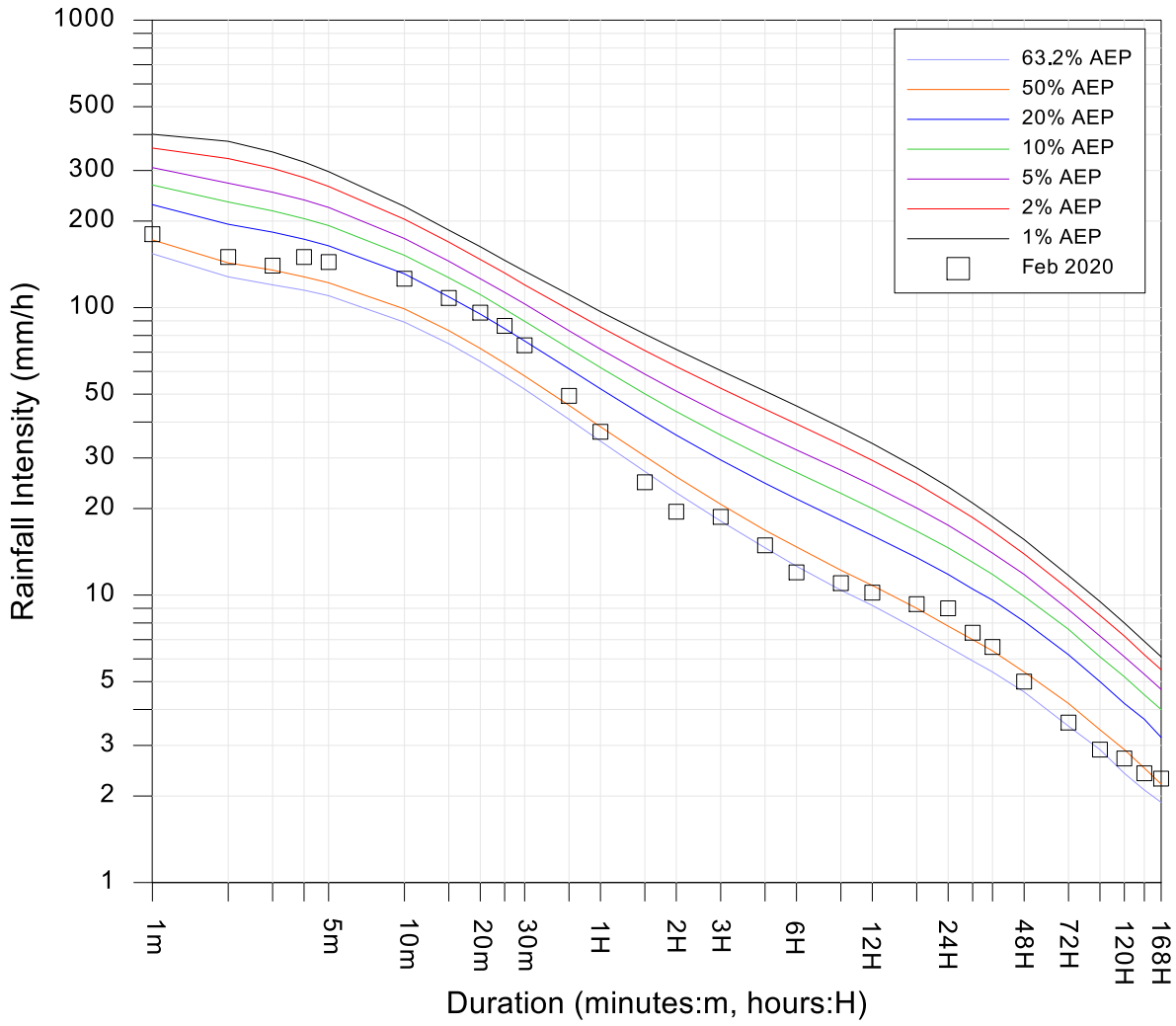
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.5

IFD_558008_FigureC.5.pdf

Site Owner: BoM
Latitude: -28.533 Longitude:153.314

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	180	11:44 06 Feb 2020
2m	150	18:06 03 Feb 2020
3m	140	18:07 03 Feb 2020
4m	150	18:05 03 Feb 2020
5m	144	18:06 03 Feb 2020
10m	126	18:07 03 Feb 2020
15m	108	18:12 03 Feb 2020
20m	96	18:16 03 Feb 2020
25m	86.4	18:20 03 Feb 2020
30m	74	18:25 03 Feb 2020
45m	49.3	18:40 03 Feb 2020
1H	37	18:55 03 Feb 2020
1.5H	24.7	19:25 03 Feb 2020
2H	19.5	21:34 12 Feb 2020
3H	18.7	22:03 12 Feb 2020
5H	14.9	23:22 12 Feb 2020
6H	12	00:08 13 Feb 2020
9H	11	14:57 13 Feb 2020
12H	10.2	14:59 13 Feb 2020
18H	9.3	13:07 13 Feb 2020
24H	9	17:22 13 Feb 2020
30H	7.4	17:33 13 Feb 2020
36H	6.6	21:43 13 Feb 2020
48H	5	06:52 14 Feb 2020
72H	3.6	17:14 13 Feb 2020
96H	2.9	23:53 13 Feb 2020
120H	2.7	18:47 13 Feb 2020
144H	2.4	03:41 14 Feb 2020
168H	2.3	17:35 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Doon Doon (McCabes Rd) (58019)
Intensity-Frequency-Duration
1 - 29 February 2020

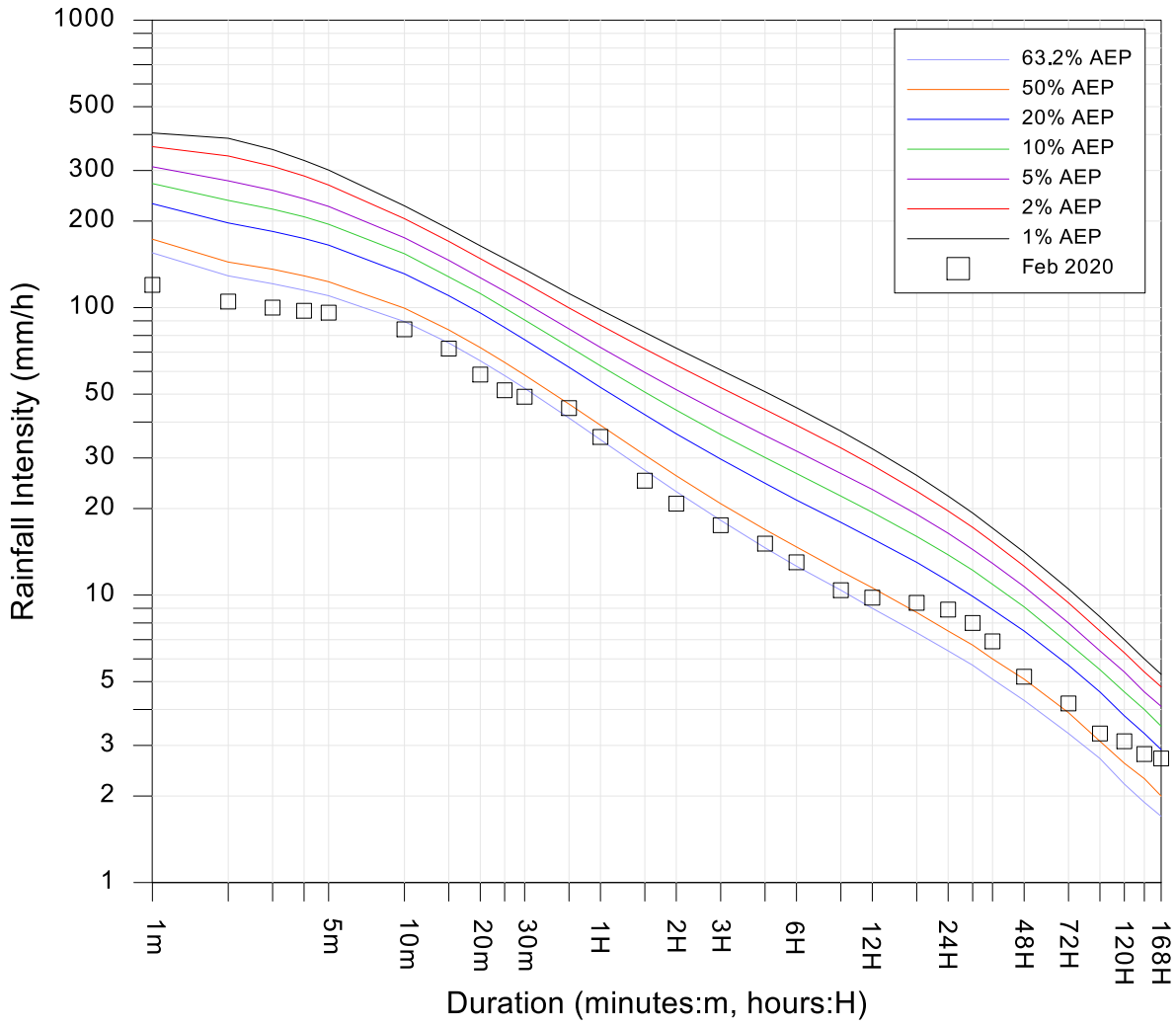
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.6

IFD_58019_FigureC.6.pdf

Site Owner: CCSD
Latitude: -28.5521 Longitude:153.386

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	120	20:45 26 Feb 2020
2m	105	13:50 16 Feb 2020
3m	100	13:50 16 Feb 2020
4m	97.5	09:57 12 Feb 2020
5m	96	09:58 12 Feb 2020
10m	84	09:58 12 Feb 2020
15m	72	09:59 12 Feb 2020
20m	58.5	10:04 12 Feb 2020
25m	51.6	18:05 10 Feb 2020
30m	49	18:21 10 Feb 2020
45m	44.7	18:23 10 Feb 2020
1H	35.5	18:28 10 Feb 2020
1.5H	25	22:22 12 Feb 2020
2H	20.8	22:50 12 Feb 2020
3H	17.5	22:01 12 Feb 2020
5H	15.1	22:59 12 Feb 2020
6H	13	22:42 12 Feb 2020
9H	10.4	14:26 13 Feb 2020
12H	9.8	16:41 13 Feb 2020
18H	9.4	10:42 13 Feb 2020
24H	8.9	16:42 13 Feb 2020
30H	8	15:41 13 Feb 2020
36H	6.9	19:10 13 Feb 2020
48H	5.2	07:10 14 Feb 2020
72H	4.2	17:28 13 Feb 2020
96H	3.3	21:49 13 Feb 2020
120H	3.1	16:56 13 Feb 2020
144H	2.8	03:35 14 Feb 2020
168H	2.7	10:40 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Huonbrook (558049)
Intensity-Frequency-Duration
1 - 29 February 2020

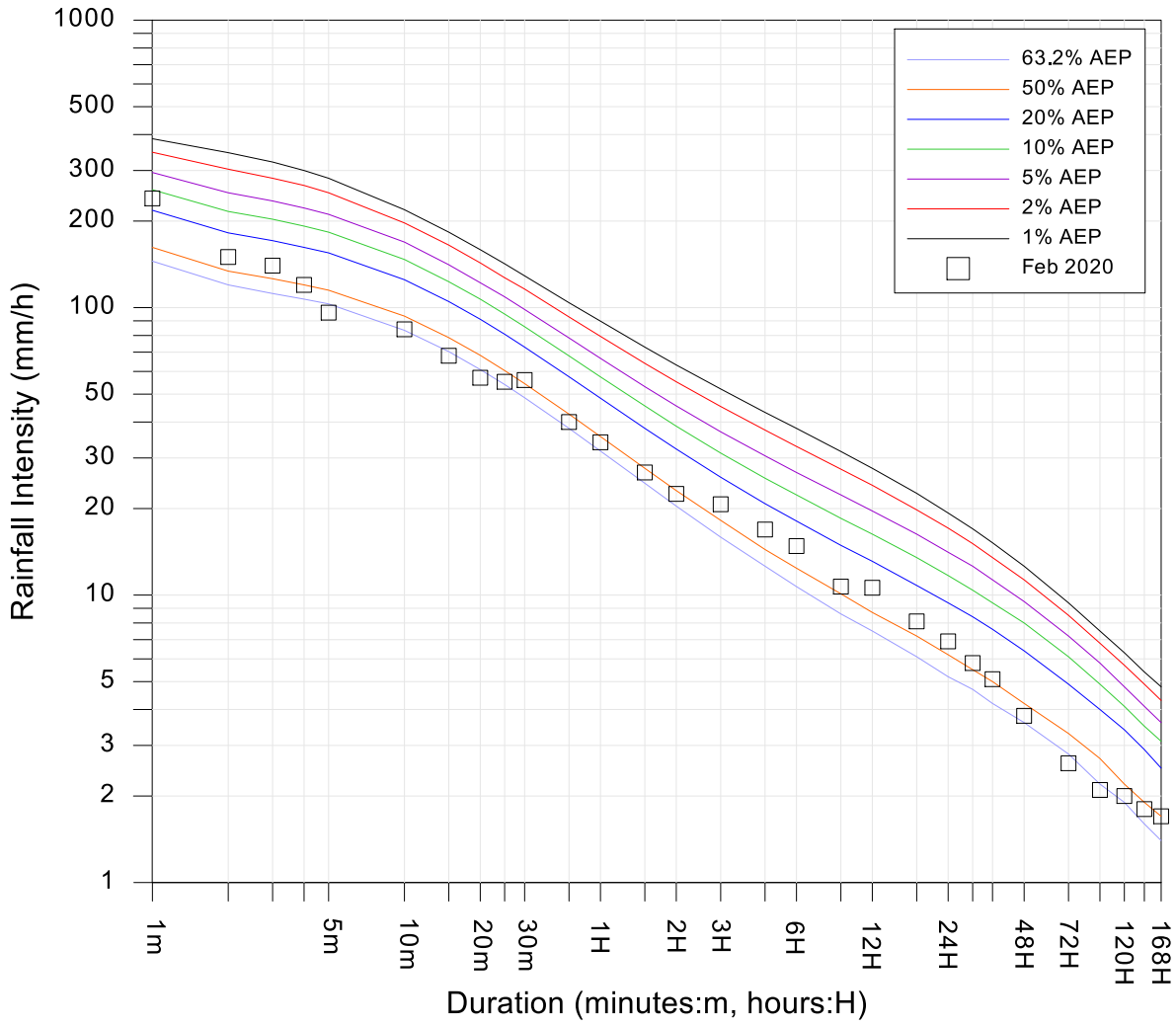
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.7

IFD_558049_FigureC.7.pdf

Site Owner: BoM
Latitude: -28.528 Longitude:153.152

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	240	02:38 24 Feb 2020
2m	150	22:02 26 Feb 2020
3m	140	22:02 26 Feb 2020
4m	120	22:02 26 Feb 2020
5m	96	22:03 26 Feb 2020
10m	84	14:51 13 Feb 2020
15m	68	14:56 13 Feb 2020
20m	57	15:01 13 Feb 2020
25m	55.2	15:06 13 Feb 2020
30m	56	15:11 13 Feb 2020
45m	40	15:26 13 Feb 2020
1H	34	15:12 13 Feb 2020
1.5H	26.7	15:38 13 Feb 2020
2H	22.5	15:38 13 Feb 2020
3H	20.7	15:34 13 Feb 2020
5H	16.9	17:22 13 Feb 2020
6H	14.8	18:24 13 Feb 2020
9H	10.7	16:25 13 Feb 2020
12H	10.6	17:24 13 Feb 2020
18H	8.1	20:38 13 Feb 2020
24H	6.9	18:19 13 Feb 2020
30H	5.8	20:38 13 Feb 2020
36H	5.1	20:38 13 Feb 2020
48H	3.8	08:38 14 Feb 2020
72H	2.6	14:38 14 Feb 2020
96H	2.1	20:38 13 Feb 2020
120H	2	18:08 13 Feb 2020
144H	1.8	02:38 14 Feb 2020
168H	1.7	18:06 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Lillian Rock (Williams Rd) (58148)
Intensity-Frequency-Duration
1 - 29 February 2020

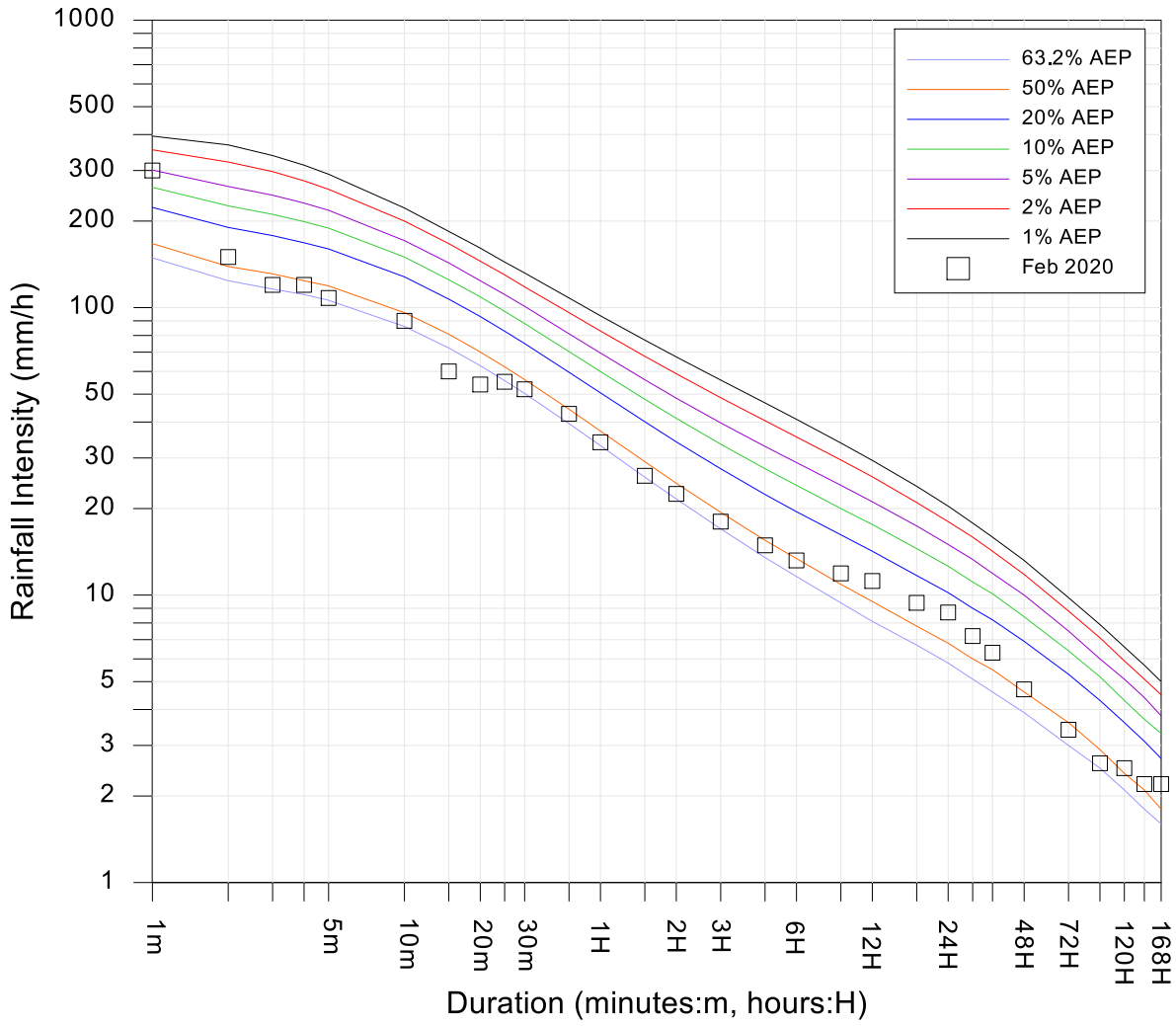
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.8

IFD_58148_FigureC.8.pdf

Site Owner: Lismore City Council
Latitude: -28.588 Longitude:153.299

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	300	04:25 29 Feb 2020
2m	150	04:26 29 Feb 2020
3m	120	20:32 26 Feb 2020
4m	120	14:21 13 Feb 2020
5m	108	20:32 26 Feb 2020
10m	90	17:53 03 Feb 2020
15m	60	20:40 26 Feb 2020
20m	54	20:49 26 Feb 2020
25m	55.2	20:48 26 Feb 2020
30m	52	20:53 26 Feb 2020
45m	42.7	21:08 26 Feb 2020
1H	34	21:23 26 Feb 2020
1.5H	26	21:53 26 Feb 2020
2H	22.5	22:23 26 Feb 2020
3H	18	08:01 13 Feb 2020
5H	14.9	09:16 13 Feb 2020
6H	13.2	08:24 13 Feb 2020
9H	11.9	14:29 13 Feb 2020
12H	11.2	16:46 13 Feb 2020
18H	9.4	14:51 13 Feb 2020
24H	8.7	16:58 13 Feb 2020
30H	7.2	16:56 13 Feb 2020
36H	6.3	21:56 13 Feb 2020
48H	4.7	09:56 14 Feb 2020
72H	3.4	16:44 13 Feb 2020
96H	2.6	16:44 14 Feb 2020
120H	2.5	18:06 13 Feb 2020
144H	2.2	04:00 14 Feb 2020
168H	2.2	16:59 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Terania Creek (558078)
Intensity-Frequency-Duration
1 - 29 February 2020

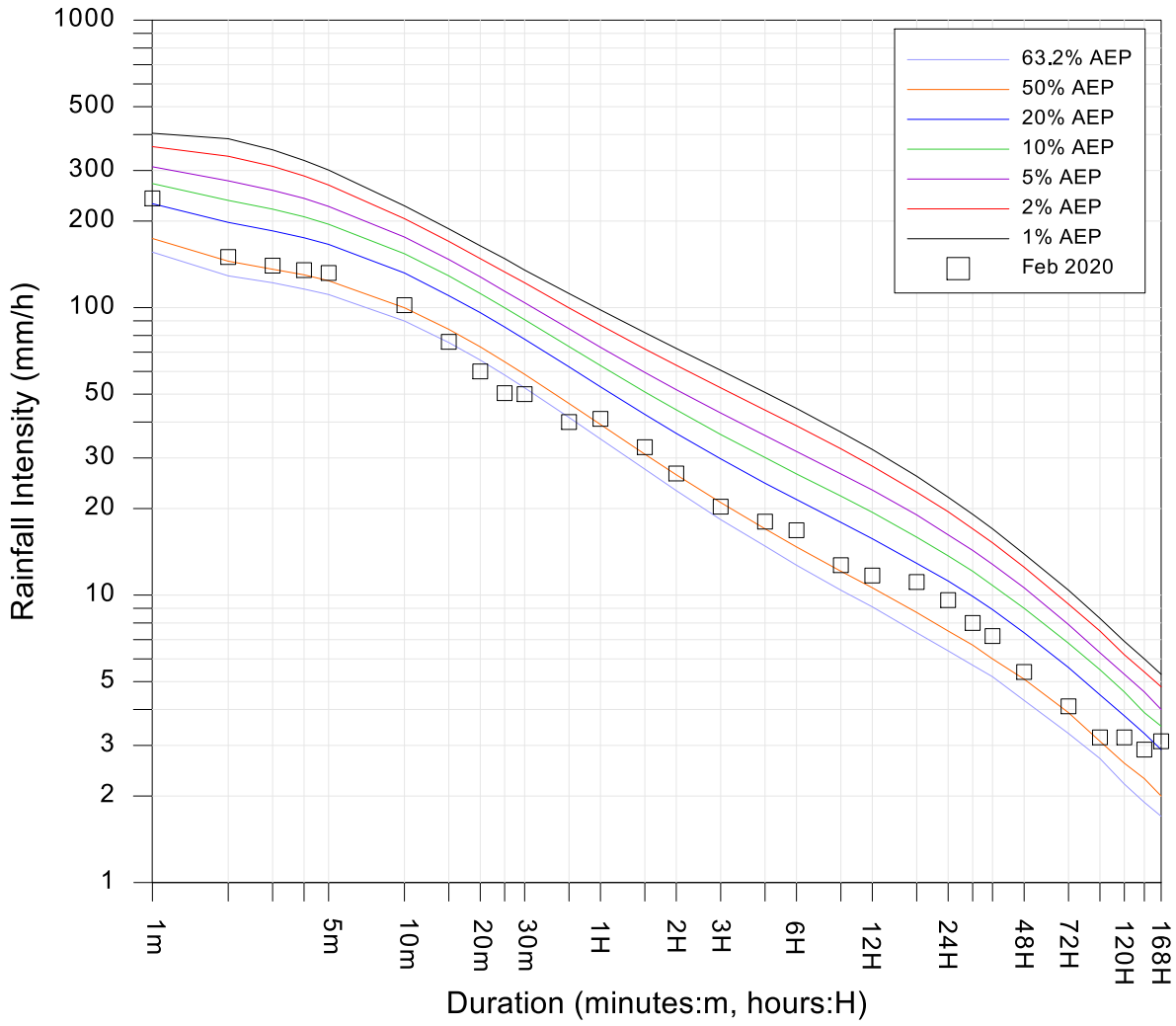
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.9

IFD_558078_FigureC.9.pdf

Site Owner: Byron Shire Council
Latitude: -28.594 Longitude:153.417

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	240	21:55 12 Feb 2020
2m	150	21:53 12 Feb 2020
3m	140	21:57 12 Feb 2020
4m	135	21:55 12 Feb 2020
5m	132	21:55 12 Feb 2020
10m	102	21:58 12 Feb 2020
15m	76	22:03 12 Feb 2020
20m	60	22:08 12 Feb 2020
25m	50.4	21:09 26 Feb 2020
30m	50	21:59 12 Feb 2020
45m	40	21:57 12 Feb 2020
1H	41	22:07 12 Feb 2020
1.5H	32.7	22:07 12 Feb 2020
2H	26.5	22:33 12 Feb 2020
3H	20.3	22:00 12 Feb 2020
5H	18	09:17 13 Feb 2020
6H	16.8	10:27 13 Feb 2020
9H	12.7	13:39 13 Feb 2020
12H	11.7	09:07 13 Feb 2020
18H	11.1	10:58 13 Feb 2020
24H	9.6	16:58 13 Feb 2020
30H	8	16:40 13 Feb 2020
36H	7.2	16:38 13 Feb 2020
48H	5.4	04:38 14 Feb 2020
72H	4.1	18:00 13 Feb 2020
96H	3.2	21:12 13 Feb 2020
120H	3.2	16:58 13 Feb 2020
144H	2.9	02:46 14 Feb 2020
168H	3.1	09:41 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Goonengerry (Alert) (558033)
Intensity-Frequency-Duration
1 - 29 February 2020

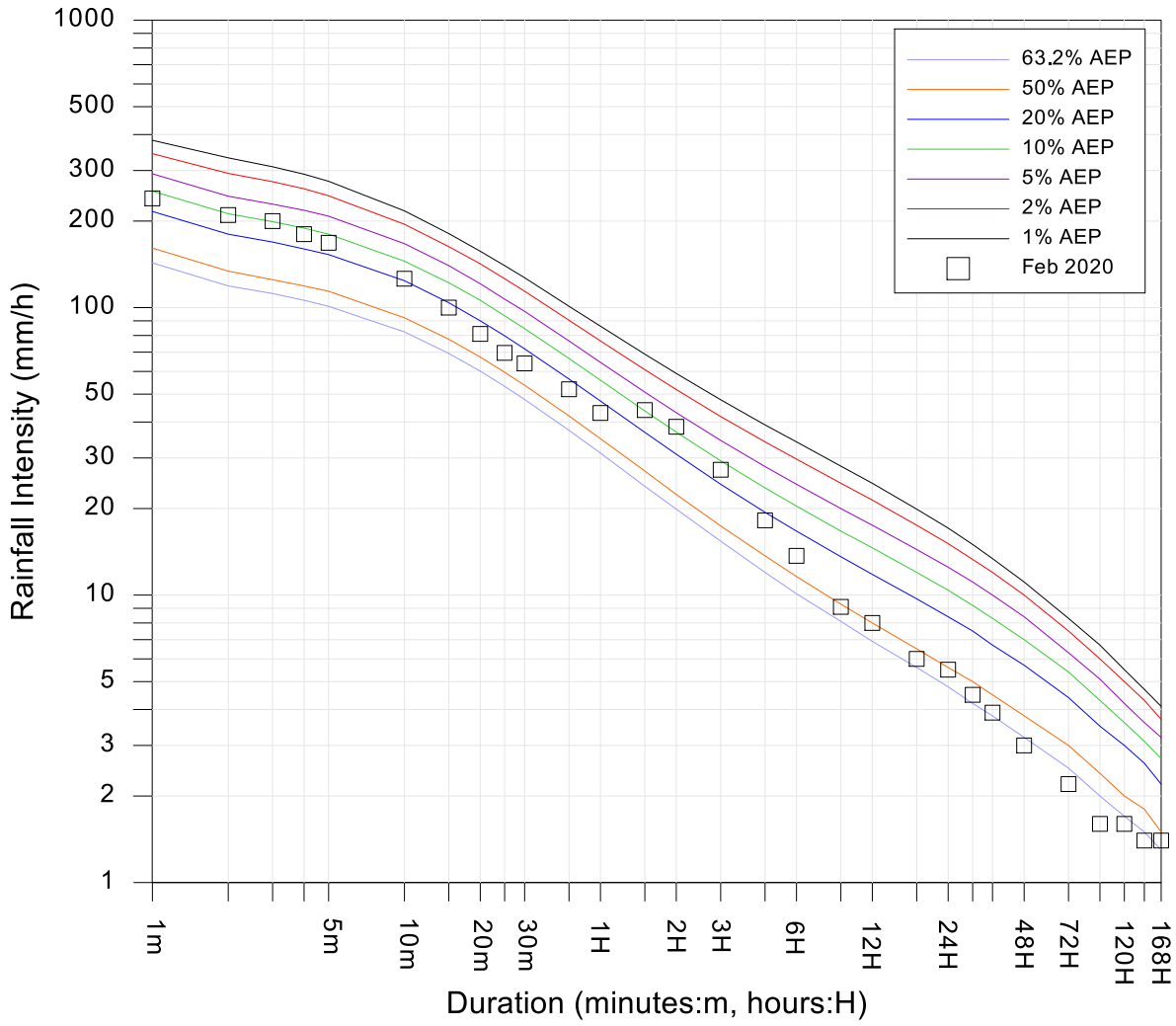
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.10.

IFD_558033_FigureC.10..pdf

Site Owner: Lismore City Council
Latitude: -28.605 Longitude:153.091

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	240	21:44 26 Feb 2020
2m	210	20:26 26 Feb 2020
3m	200	20:27 26 Feb 2020
4m	180	21:47 26 Feb 2020
5m	168	21:48 26 Feb 2020
10m	126	20:34 26 Feb 2020
15m	100	20:36 26 Feb 2020
20m	81	20:40 26 Feb 2020
25m	69.6	21:49 26 Feb 2020
30m	64	21:56 26 Feb 2020
45m	52	21:58 26 Feb 2020
1H	43	22:13 26 Feb 2020
1.5H	44	21:54 26 Feb 2020
2H	38.5	22:13 26 Feb 2020
3H	27.3	22:59 26 Feb 2020
5H	18.2	00:29 27 Feb 2020
6H	13.7	01:59 27 Feb 2020
9H	9.1	04:59 27 Feb 2020
12H	8	17:13 13 Feb 2020
18H	6	16:41 13 Feb 2020
24H	5.5	17:17 13 Feb 2020
30H	4.5	22:30 13 Feb 2020
36H	3.9	21:06 13 Feb 2020
48H	3	09:06 14 Feb 2020
72H	2.2	15:06 14 Feb 2020
96H	1.6	16:18 14 Feb 2020
120H	1.6	18:44 13 Feb 2020
144H	1.4	07:26 14 Feb 2020
168H	1.4	17:10 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Cawongla (Alert) (558024)
Intensity-Frequency-Duration
1 - 29 February 2020

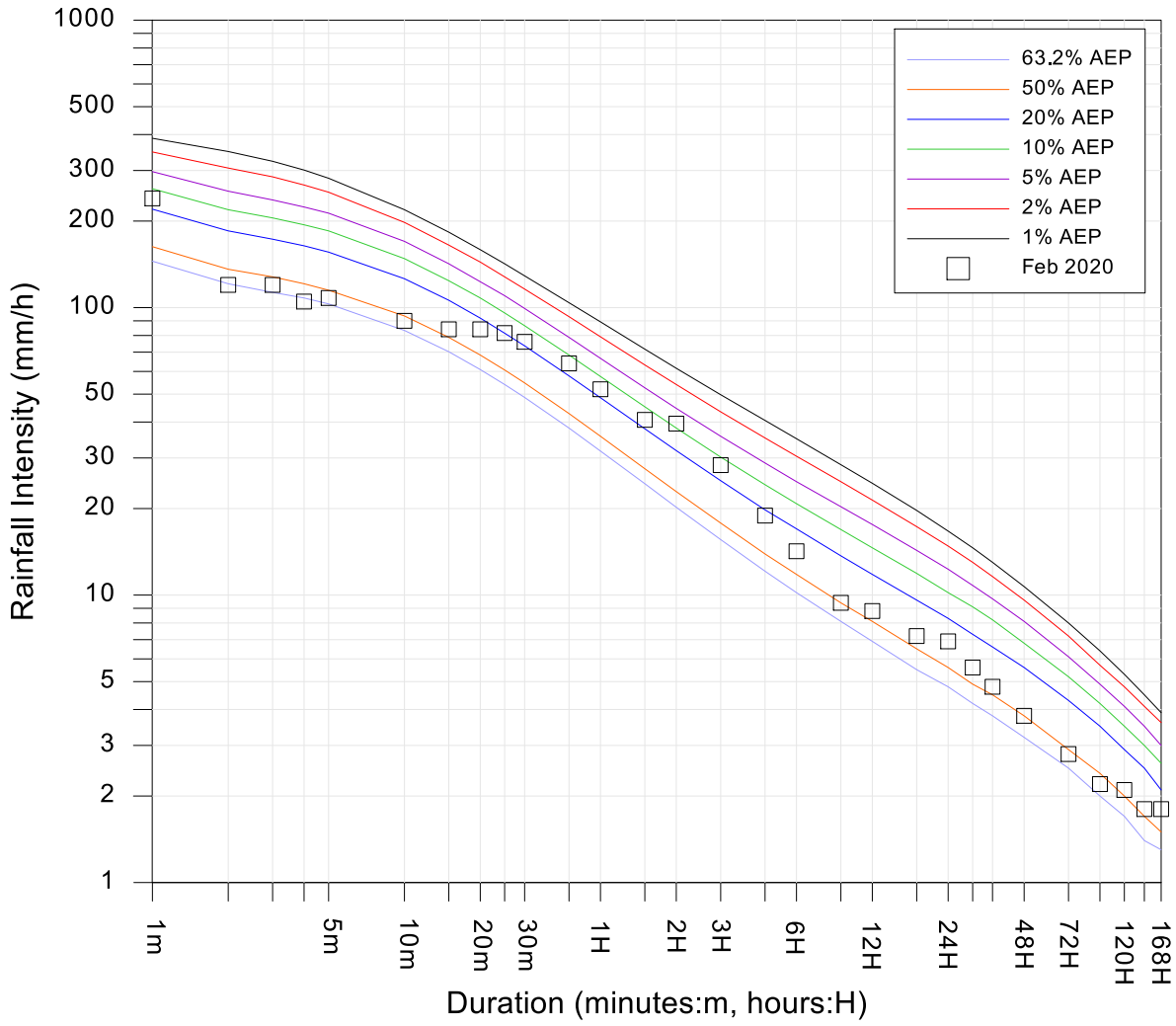
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.11

IFD_558024_FigureC.11.pdf

Site Owner: BoM
Latitude: -28.608 Longitude:153.213

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	240	14:35 13 Feb 2020
2m	120	22:01 26 Feb 2020
3m	120	21:50 26 Feb 2020
4m	105	22:03 26 Feb 2020
5m	108	21:52 26 Feb 2020
10m	90	21:55 26 Feb 2020
15m	84	22:02 26 Feb 2020
20m	84	22:05 26 Feb 2020
25m	81.6	22:08 26 Feb 2020
30m	76	22:08 26 Feb 2020
45m	64	22:11 26 Feb 2020
1H	52	22:26 26 Feb 2020
1.5H	40.7	22:09 26 Feb 2020
2H	39.5	22:09 26 Feb 2020
3H	28.3	22:56 26 Feb 2020
5H	18.9	00:26 27 Feb 2020
6H	14.2	01:56 27 Feb 2020
9H	9.4	04:56 27 Feb 2020
12H	8.8	17:13 13 Feb 2020
18H	7.2	16:46 13 Feb 2020
24H	6.9	16:44 13 Feb 2020
30H	5.6	20:38 13 Feb 2020
36H	4.8	20:38 13 Feb 2020
48H	3.8	14:59 13 Feb 2020
72H	2.8	14:38 14 Feb 2020
96H	2.2	11:38 14 Feb 2020
120H	2.1	20:41 13 Feb 2020
144H	1.8	02:38 14 Feb 2020
168H	1.8	17:08 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Nimbin (58180)
Intensity-Frequency-Duration
1 - 29 February 2020

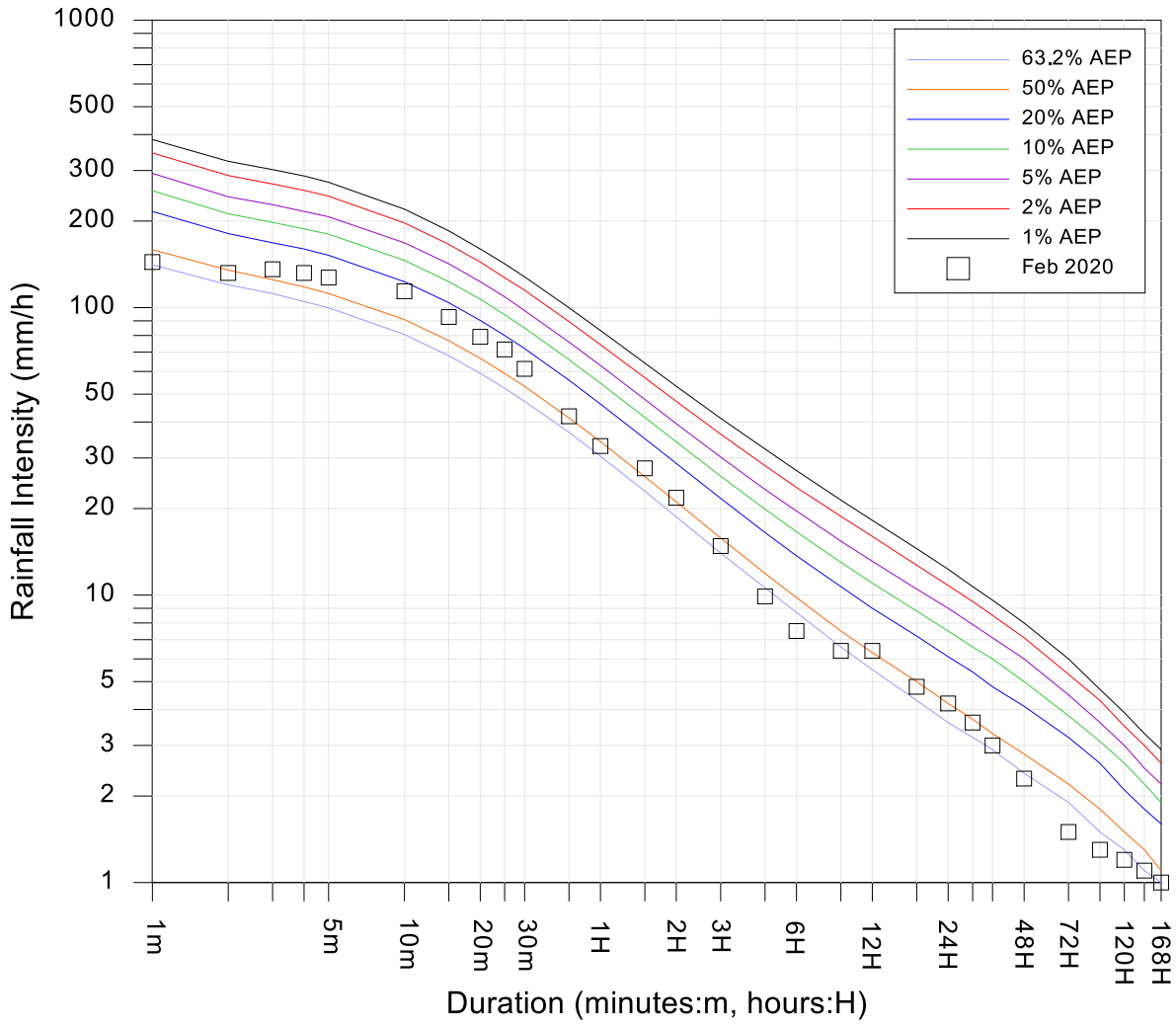
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.12

IFD_58180_FigureC.12.pdf

Site Owner: BoM
Latitude: -28.6217 Longitude:152.995

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	144	21:22 26 Feb 2020
2m	132	21:21 26 Feb 2020
3m	136	21:22 26 Feb 2020
4m	132	21:23 26 Feb 2020
5m	127.2	21:23 26 Feb 2020
10m	114	21:26 26 Feb 2020
15m	92.8	21:26 26 Feb 2020
20m	79.2	21:26 26 Feb 2020
25m	71.5	21:28 26 Feb 2020
30m	61.2	21:28 26 Feb 2020
45m	41.9	21:37 26 Feb 2020
1H	33	21:56 26 Feb 2020
1.5H	27.6	21:27 26 Feb 2020
2H	21.8	21:57 26 Feb 2020
3H	14.8	22:51 26 Feb 2020
5H	9.9	00:21 27 Feb 2020
6H	7.5	22:12 26 Feb 2020
9H	6.4	16:57 13 Feb 2020
12H	6.4	17:27 13 Feb 2020
18H	4.8	18:11 13 Feb 2020
24H	4.2	16:41 13 Feb 2020
30H	3.6	18:33 13 Feb 2020
36H	3	04:41 14 Feb 2020
48H	2.3	18:07 13 Feb 2020
72H	1.5	15:27 13 Feb 2020
96H	1.3	13:54 14 Feb 2020
120H	1.2	18:30 13 Feb 2020
144H	1.1	06:12 14 Feb 2020
168H	1	17:40 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Kyogle (Richmond River) (558002)
Intensity-Frequency-Duration
1 - 29 February 2020

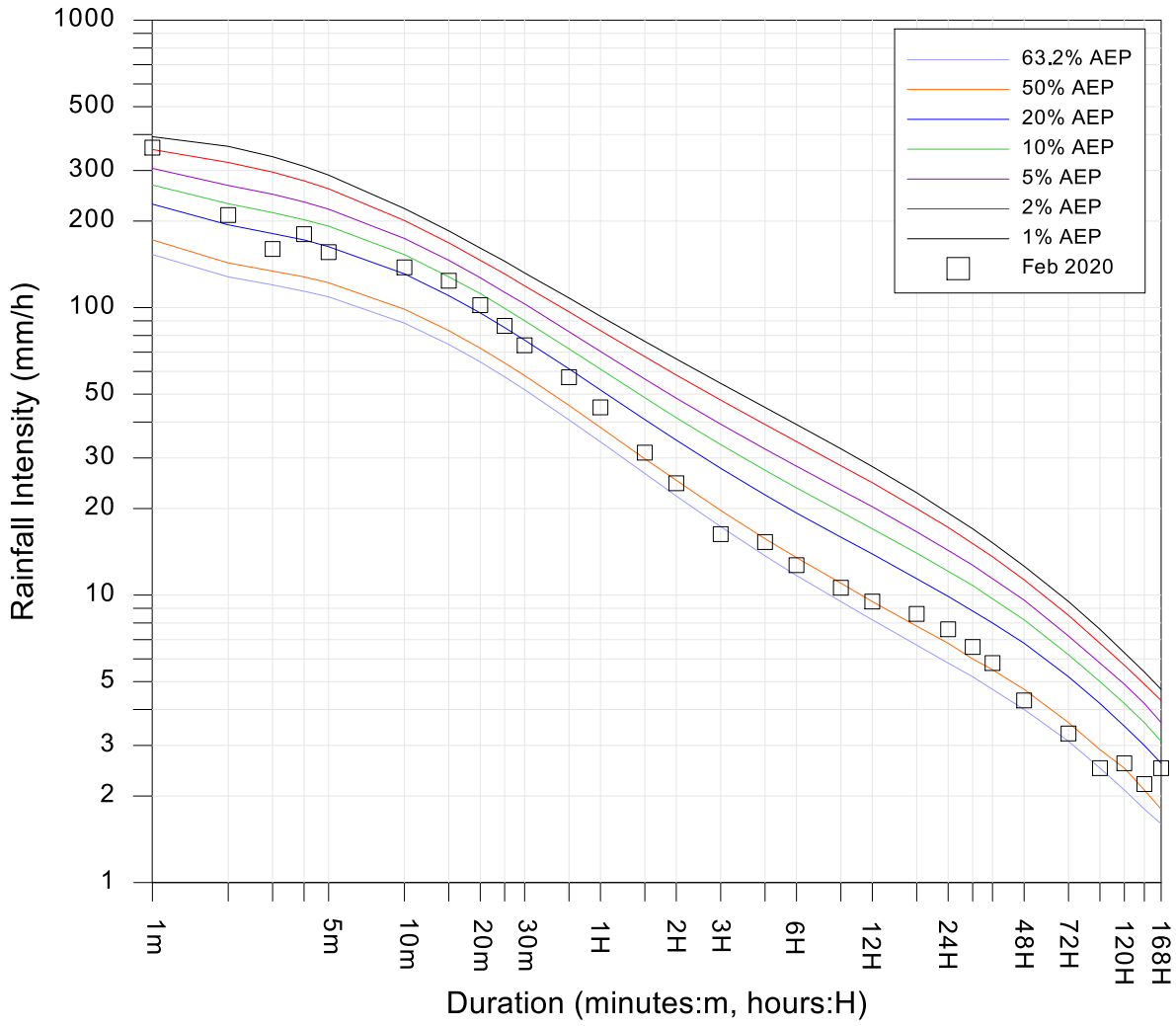
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.13

IFD_558002_FigureC.13.pdf

Site Owner: Lismore City Council
Latitude: -28.643 Longitude:153.417

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	360	20:53 26 Feb 2020
2m	210	20:54 26 Feb 2020
3m	160	20:55 26 Feb 2020
4m	180	20:50 26 Feb 2020
5m	156	20:53 26 Feb 2020
10m	138	20:56 26 Feb 2020
15m	124	20:59 26 Feb 2020
20m	102	21:03 26 Feb 2020
25m	86.4	21:08 26 Feb 2020
30m	74	21:13 26 Feb 2020
45m	57.3	21:28 26 Feb 2020
1H	45	21:43 26 Feb 2020
1.5H	31.3	22:13 26 Feb 2020
2H	24.5	22:24 26 Feb 2020
3H	16.3	23:24 26 Feb 2020
5H	15.3	14:24 06 Feb 2020
6H	12.7	15:20 06 Feb 2020
9H	10.6	18:56 06 Feb 2020
12H	9.5	16:36 13 Feb 2020
18H	8.6	14:37 13 Feb 2020
24H	7.6	15:18 13 Feb 2020
30H	6.6	16:30 13 Feb 2020
36H	5.8	16:58 13 Feb 2020
48H	4.3	04:58 14 Feb 2020
72H	3.3	17:57 13 Feb 2020
96H	2.5	21:55 13 Feb 2020
120H	2.6	16:31 13 Feb 2020
144H	2.2	00:10 14 Feb 2020
168H	2.5	09:20 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Repentence (Coopers Ck) (558000)
Intensity-Frequency-Duration
1 - 29 February 2020

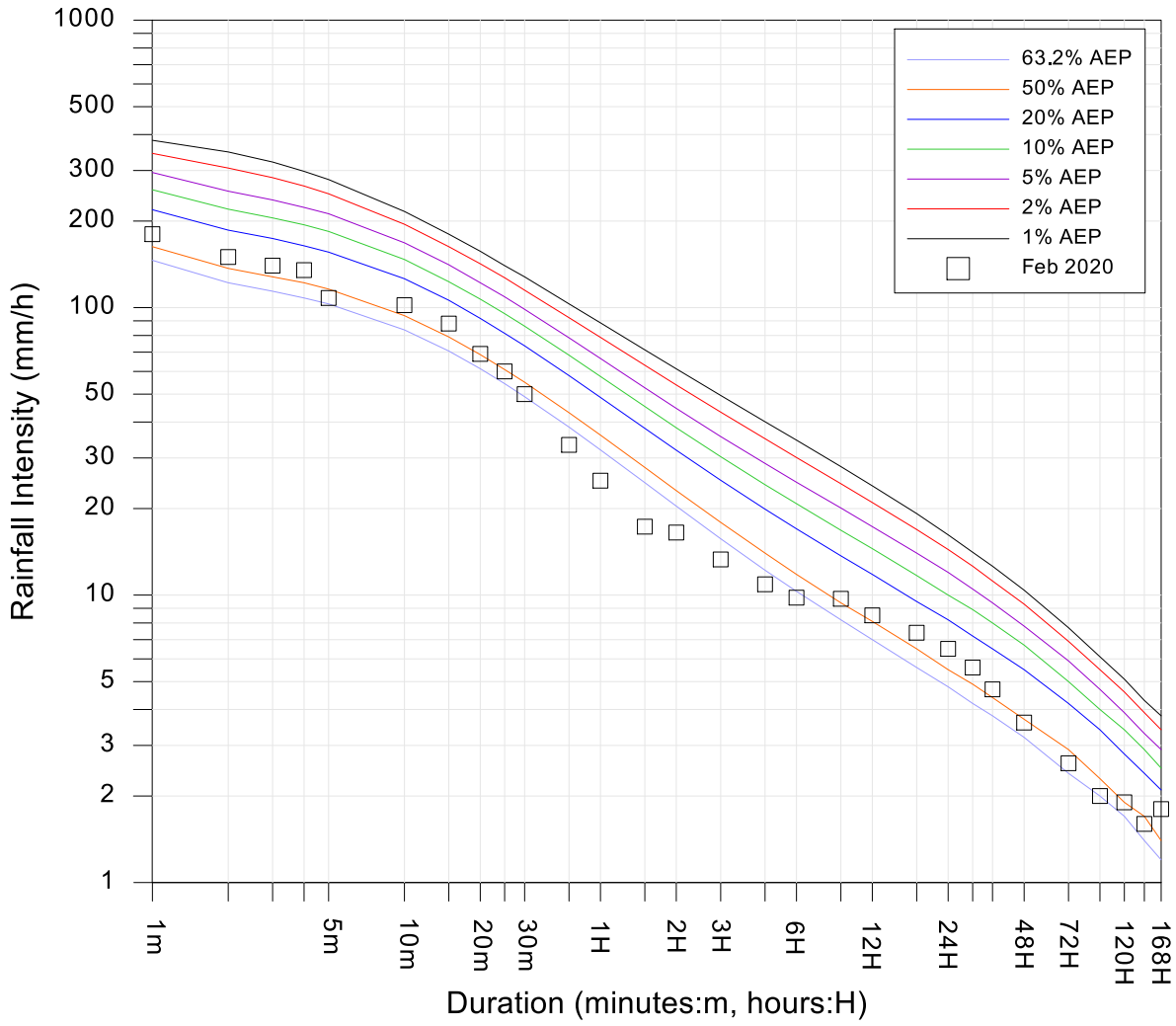
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.14

IFD_558000_FigureC.14.pdf

Site Owner: BoM
Latitude: -28.672 Longitude:153.278

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	180	14:40 13 Feb 2020
2m	150	14:41 13 Feb 2020
3m	140	14:42 13 Feb 2020
4m	135	14:42 13 Feb 2020
5m	108	14:43 13 Feb 2020
10m	102	14:42 13 Feb 2020
15m	88	14:45 13 Feb 2020
20m	69	14:50 13 Feb 2020
25m	60	14:55 13 Feb 2020
30m	50	15:00 13 Feb 2020
45m	33.3	15:15 13 Feb 2020
1H	25	15:30 13 Feb 2020
1.5H	17.3	16:00 13 Feb 2020
2H	16.5	14:49 13 Feb 2020
3H	13.3	13:17 06 Feb 2020
5H	10.9	14:43 06 Feb 2020
6H	9.8	15:01 13 Feb 2020
9H	9.7	14:56 13 Feb 2020
12H	8.5	15:00 13 Feb 2020
18H	7.4	14:57 13 Feb 2020
24H	6.5	16:57 13 Feb 2020
30H	5.6	16:19 13 Feb 2020
36H	4.7	22:15 13 Feb 2020
48H	3.6	15:03 13 Feb 2020
72H	2.6	16:05 13 Feb 2020
96H	2	16:05 14 Feb 2020
120H	1.9	17:26 13 Feb 2020
144H	1.6	04:27 14 Feb 2020
168H	1.8	10:13 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

The Channon (58147)
Intensity-Frequency-Duration
1 - 29 February 2020

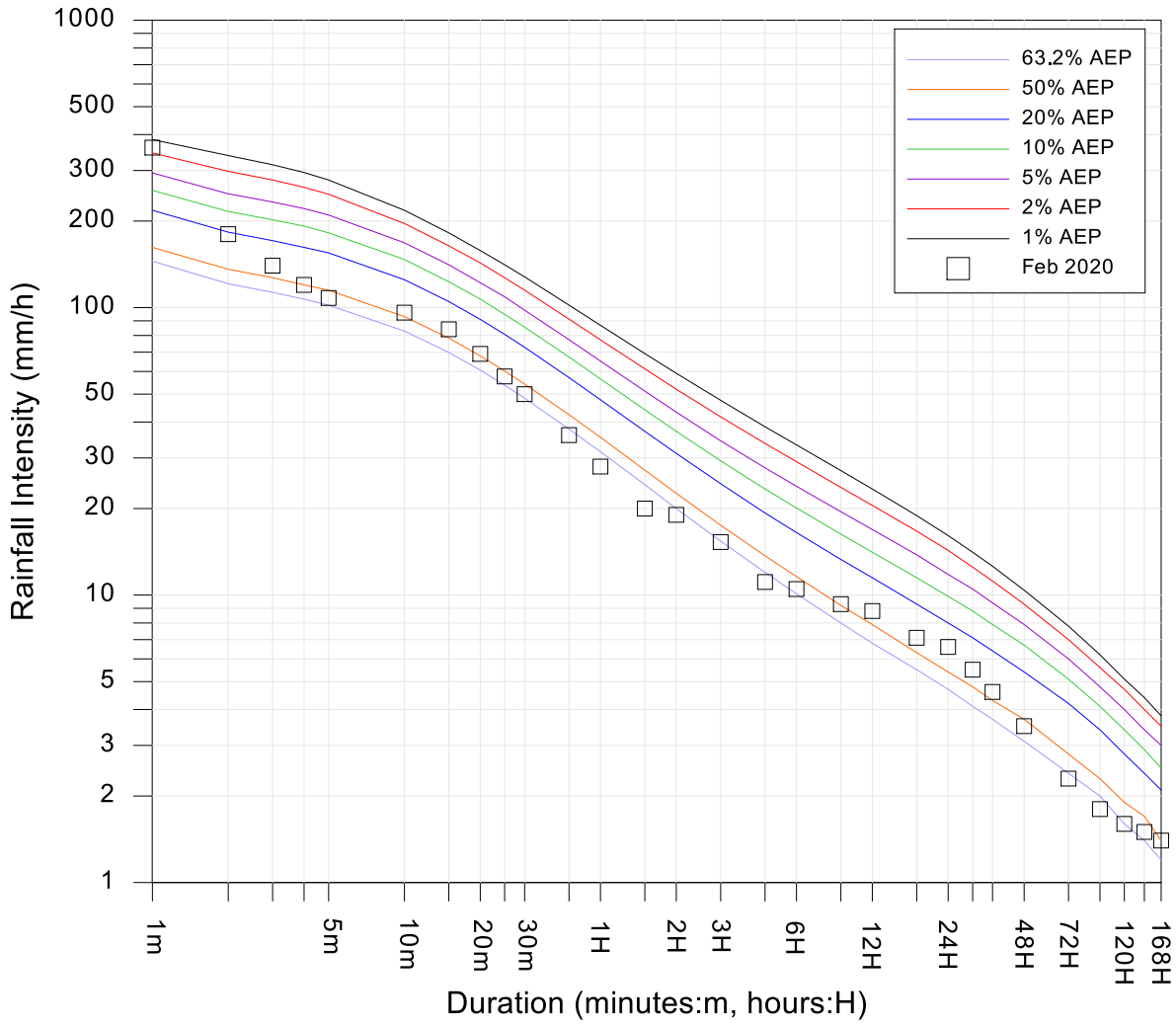
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.15

IFD_58147_FigureC.15.pdf

Site Owner: Lismore City Council
Latitude: -28.676 Longitude:153.154

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	360	01:33 29 Feb 2020
2m	180	01:34 29 Feb 2020
3m	140	14:53 13 Feb 2020
4m	120	14:53 13 Feb 2020
5m	108	14:53 13 Feb 2020
10m	96	15:00 13 Feb 2020
15m	84	15:03 13 Feb 2020
20m	69	15:08 13 Feb 2020
25m	57.6	15:13 13 Feb 2020
30m	50	15:18 13 Feb 2020
45m	36	15:33 13 Feb 2020
1H	28	15:48 13 Feb 2020
1.5H	20	16:18 13 Feb 2020
2H	19	15:03 13 Feb 2020
3H	15.3	16:03 13 Feb 2020
5H	11.1	17:33 13 Feb 2020
6H	10.5	15:27 13 Feb 2020
9H	9.3	15:27 13 Feb 2020
12H	8.8	15:16 13 Feb 2020
18H	7.1	16:12 13 Feb 2020
24H	6.6	16:12 13 Feb 2020
30H	5.5	19:10 13 Feb 2020
36H	4.6	19:10 13 Feb 2020
48H	3.5	07:10 14 Feb 2020
72H	2.3	13:10 14 Feb 2020
96H	1.8	13:10 14 Feb 2020
120H	1.6	19:10 13 Feb 2020
144H	1.5	16:37 13 Feb 2020
168H	1.4	16:53 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Jiggi (Gwynne St) (558086)
Intensity-Frequency-Duration
1 - 29 February 2020

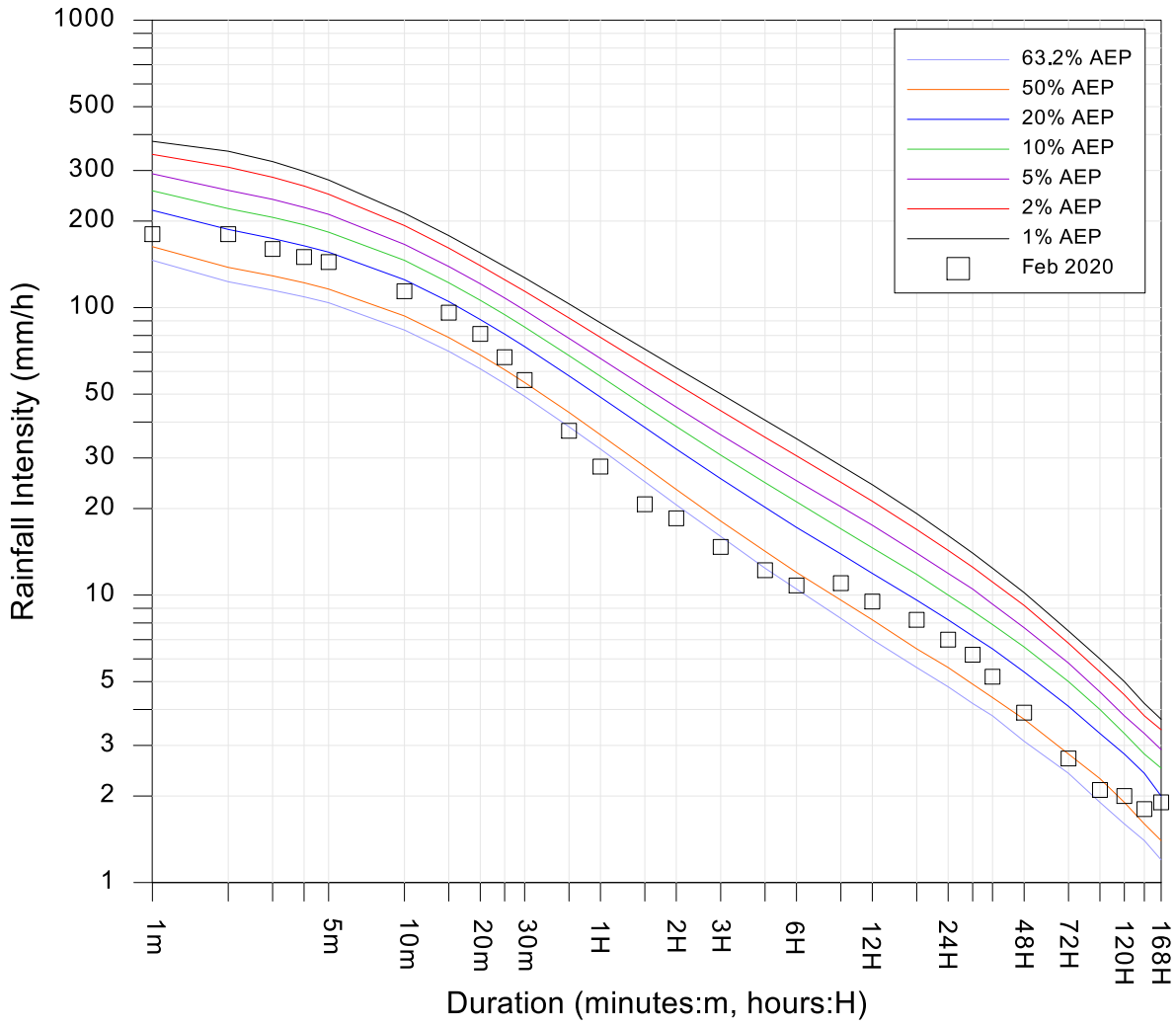
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.16

IFD_558086_FigureC.16.pdf

Site Owner: Lismore City Council
Latitude: -28.677 Longitude:153.322

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	180	20:42 26 Feb 2020
2m	180	17:43 03 Feb 2020
3m	160	17:44 03 Feb 2020
4m	150	17:44 03 Feb 2020
5m	144	17:44 03 Feb 2020
10m	114	17:45 03 Feb 2020
15m	96	14:38 13 Feb 2020
20m	81	14:40 13 Feb 2020
25m	67.2	14:45 13 Feb 2020
30m	56	14:50 13 Feb 2020
45m	37.3	15:05 13 Feb 2020
1H	28	15:20 13 Feb 2020
1.5H	20.7	22:20 12 Feb 2020
2H	18.5	14:42 13 Feb 2020
3H	14.7	09:58 13 Feb 2020
5H	12.2	09:55 13 Feb 2020
6H	10.8	11:13 13 Feb 2020
9H	11	14:45 13 Feb 2020
12H	9.5	16:52 13 Feb 2020
18H	8.2	14:50 13 Feb 2020
24H	7	16:41 13 Feb 2020
30H	6.2	16:04 13 Feb 2020
36H	5.2	22:04 13 Feb 2020
48H	3.9	10:04 14 Feb 2020
72H	2.7	16:56 13 Feb 2020
96H	2.1	00:20 14 Feb 2020
120H	2	17:45 13 Feb 2020
144H	1.8	22:10 13 Feb 2020
168H	1.9	10:03 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Dunoon (558031)
Intensity-Frequency-Duration
1 - 29 February 2020

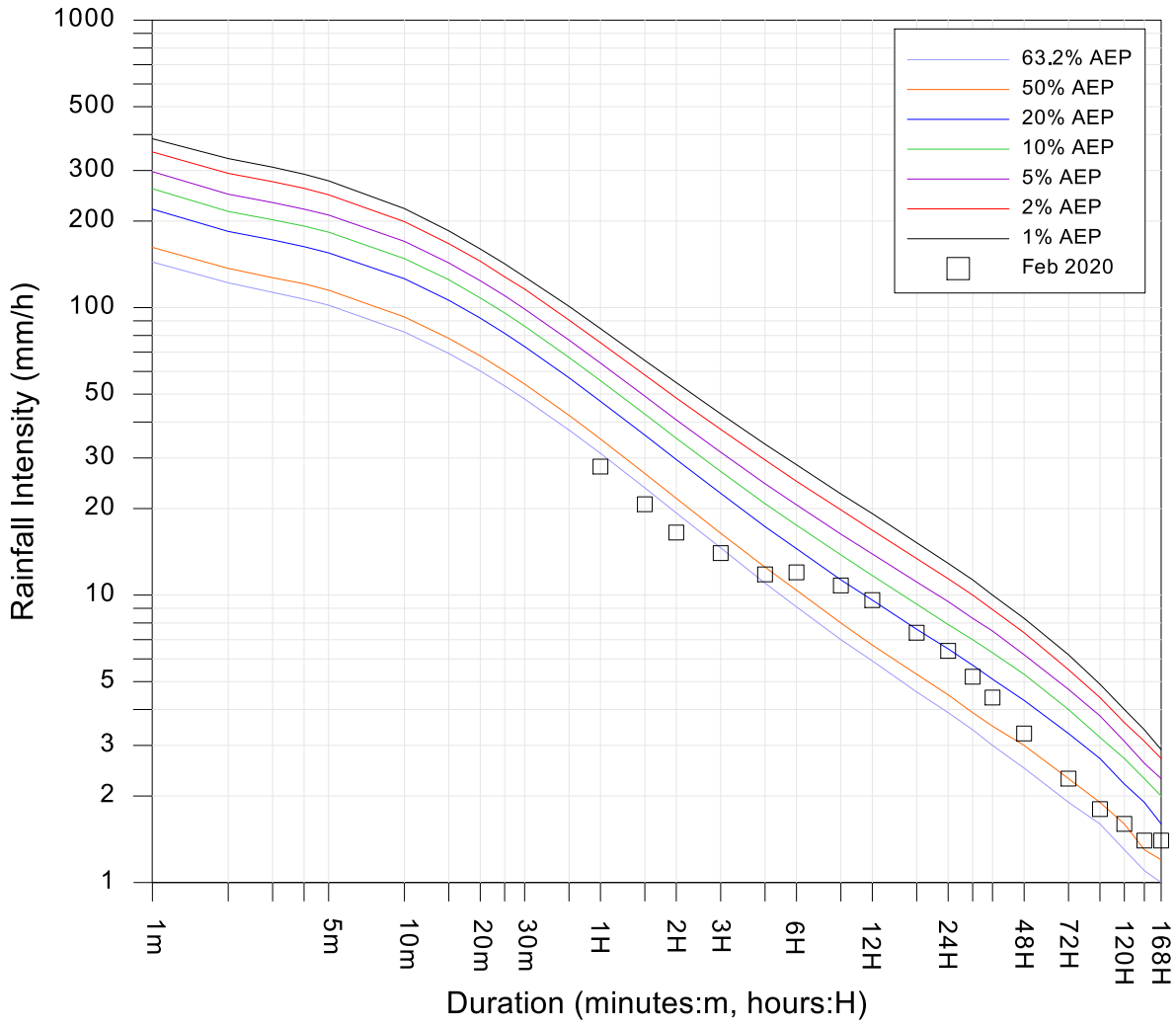
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.17

IFD_558031_FigureC.17.pdf

Site Owner: Lismore City Council
Latitude: -28.74 Longitude:153.076

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	28	16:08 13 Feb 2020
1.5H	20.7	16:38 13 Feb 2020
2H	16.5	17:08 13 Feb 2020
3H	14	16:15 13 Feb 2020
5H	11.8	12:16 13 Feb 2020
6H	12	15:47 13 Feb 2020
9H	10.8	16:46 13 Feb 2020
12H	9.6	17:32 13 Feb 2020
18H	7.4	15:53 13 Feb 2020
24H	6.4	17:35 13 Feb 2020
30H	5.2	22:29 13 Feb 2020
36H	4.4	22:08 13 Feb 2020
48H	3.3	18:35 13 Feb 2020
72H	2.3	15:55 13 Feb 2020
96H	1.8	13:21 14 Feb 2020
120H	1.6	19:30 13 Feb 2020
144H	1.4	09:11 14 Feb 2020
168H	1.4	17:33 13 Feb 2020

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

Bentley (58202)
Intensity-Frequency-Duration
1 - 29 February 2020

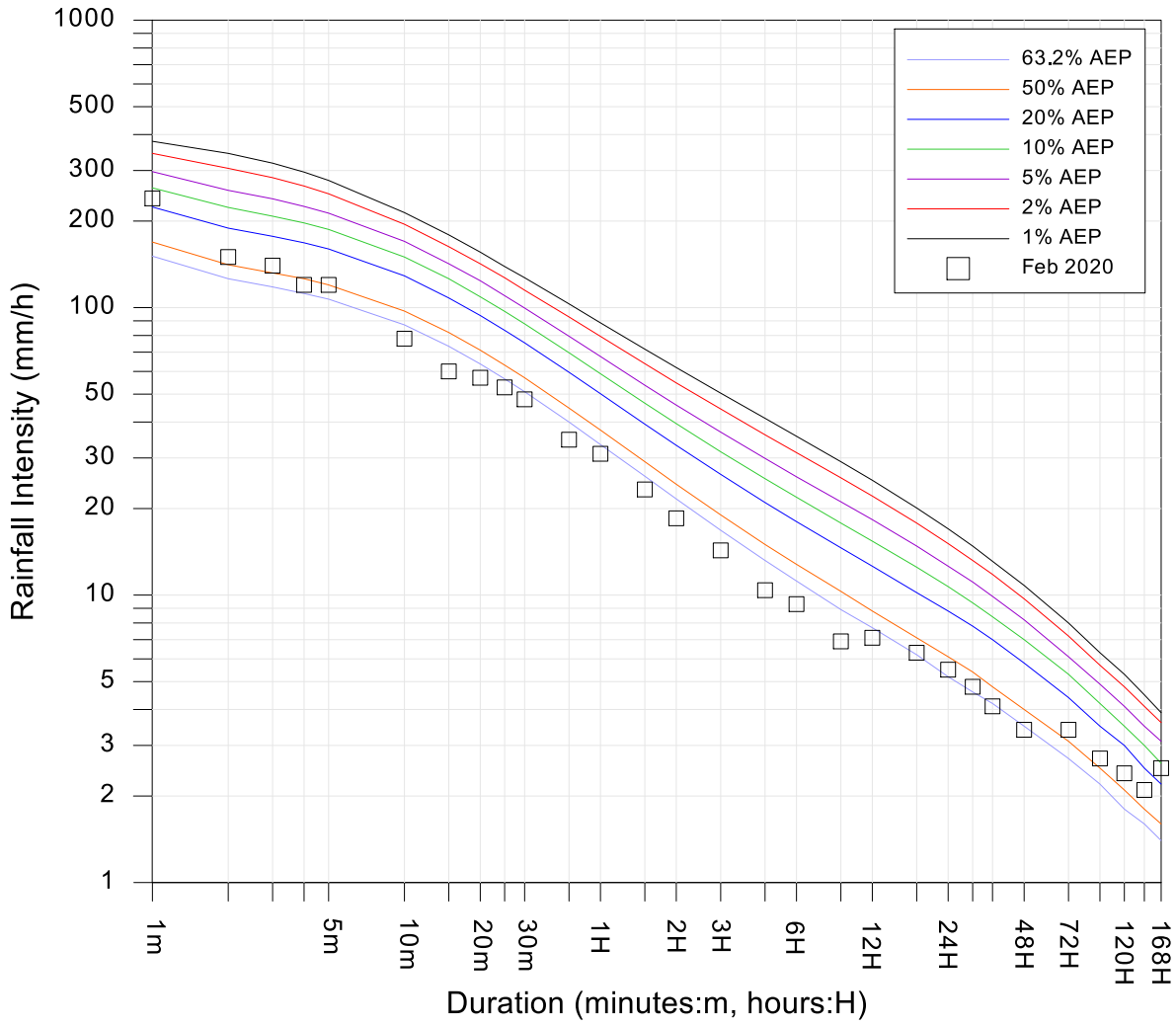
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.18

IFD_58202_FigureC.18.pdf

Site Owner: Lismore City Council
Latitude: -28.728 Longitude:153.458

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	240	03:13 04 Feb 2020
2m	150	21:39 12 Feb 2020
3m	140	21:40 12 Feb 2020
4m	120	21:41 12 Feb 2020
5m	120	21:42 12 Feb 2020
10m	78	21:23 26 Feb 2020
15m	60	13:50 24 Feb 2020
20m	57	18:28 10 Feb 2020
25m	52.8	18:30 10 Feb 2020
30m	48	18:30 10 Feb 2020
45m	34.7	18:37 10 Feb 2020
1H	31	22:23 12 Feb 2020
1.5H	23.3	22:52 12 Feb 2020
2H	18.5	23:06 12 Feb 2020
3H	14.3	22:41 12 Feb 2020
5H	10.4	23:06 12 Feb 2020
6H	9.3	10:39 13 Feb 2020
9H	6.9	06:22 13 Feb 2020
12H	7.1	09:35 13 Feb 2020
18H	6.3	10:29 13 Feb 2020
24H	5.5	13:48 07 Feb 2020
30H	4.8	15:25 07 Feb 2020
36H	4.1	14:22 07 Feb 2020
48H	3.4	11:42 08 Feb 2020
72H	3.4	13:48 09 Feb 2020
96H	2.7	02:22 10 Feb 2020
120H	2.4	22:11 10 Feb 2020
144H	2.1	22:43 12 Feb 2020
168H	2.5	10:26 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Nashua (Wilsons River) (58162)
Intensity-Frequency-Duration
1 - 29 February 2020

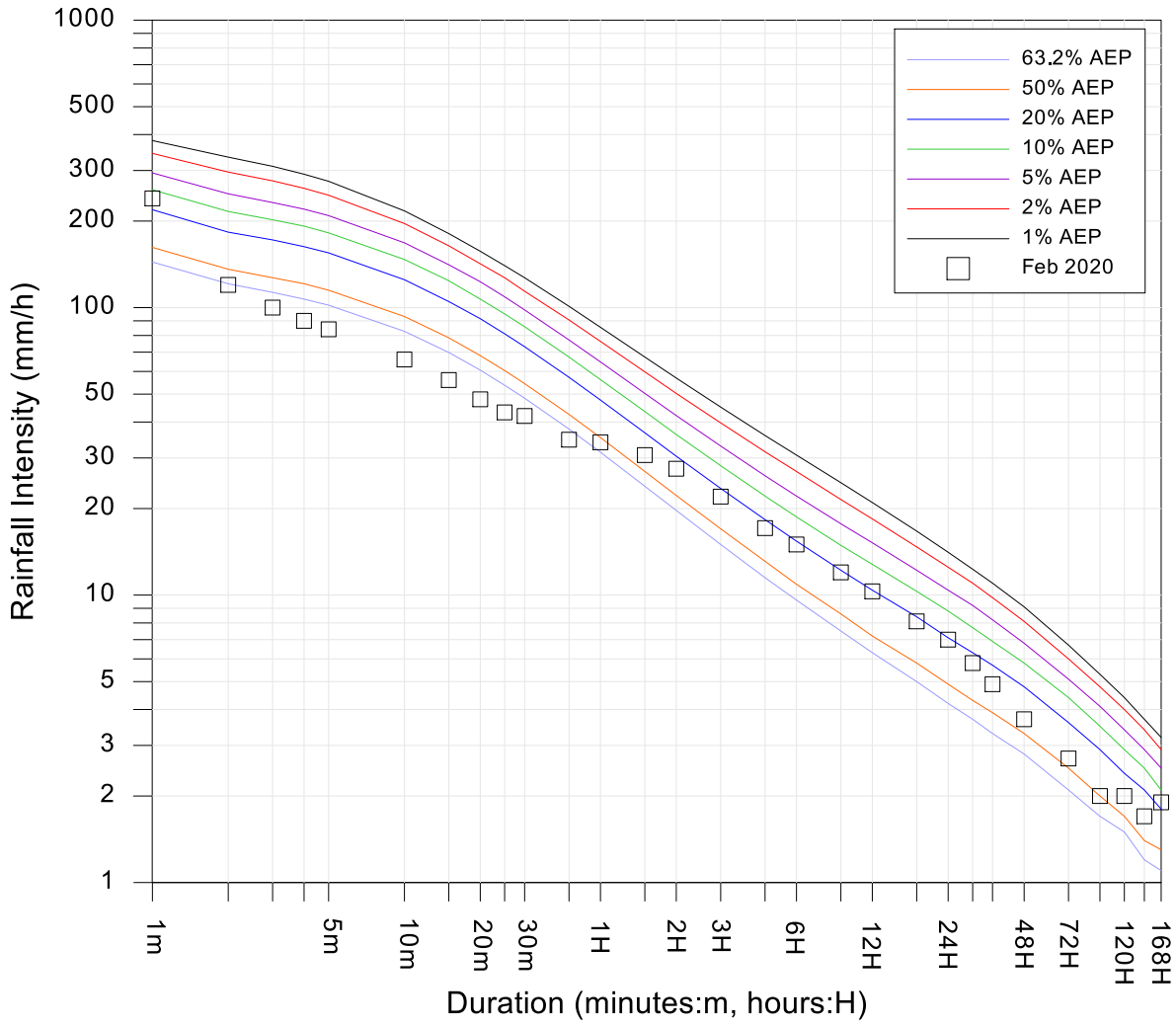
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.19

IFD_58162_FigureC.19.pdf

Site Owner: Lismore City Council
Latitude: -28.749 Longitude:153.218

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	240	13:15 13 Feb 2020
2m	120	20:12 26 Feb 2020
3m	100	20:12 26 Feb 2020
4m	90	20:15 26 Feb 2020
5m	84	20:16 26 Feb 2020
10m	66	20:19 26 Feb 2020
15m	56	15:33 13 Feb 2020
20m	48	10:43 13 Feb 2020
25m	43.2	13:14 06 Feb 2020
30m	42	10:53 13 Feb 2020
45m	34.7	11:00 13 Feb 2020
1H	34	10:52 13 Feb 2020
1.5H	30.7	10:59 13 Feb 2020
2H	27.5	11:05 13 Feb 2020
3H	22	10:59 13 Feb 2020
5H	17.1	12:03 13 Feb 2020
6H	15	11:11 13 Feb 2020
9H	12	16:28 13 Feb 2020
12H	10.3	17:05 13 Feb 2020
18H	8.1	15:32 13 Feb 2020
24H	7	16:05 13 Feb 2020
30H	5.8	17:03 13 Feb 2020
36H	4.9	18:18 13 Feb 2020
48H	3.7	06:18 14 Feb 2020
72H	2.7	16:06 13 Feb 2020
96H	2	12:18 14 Feb 2020
120H	2	16:41 13 Feb 2020
144H	1.7	06:18 14 Feb 2020
168H	1.9	11:01 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Goolmangar (558075)
Intensity-Frequency-Duration
1 - 29 February 2020

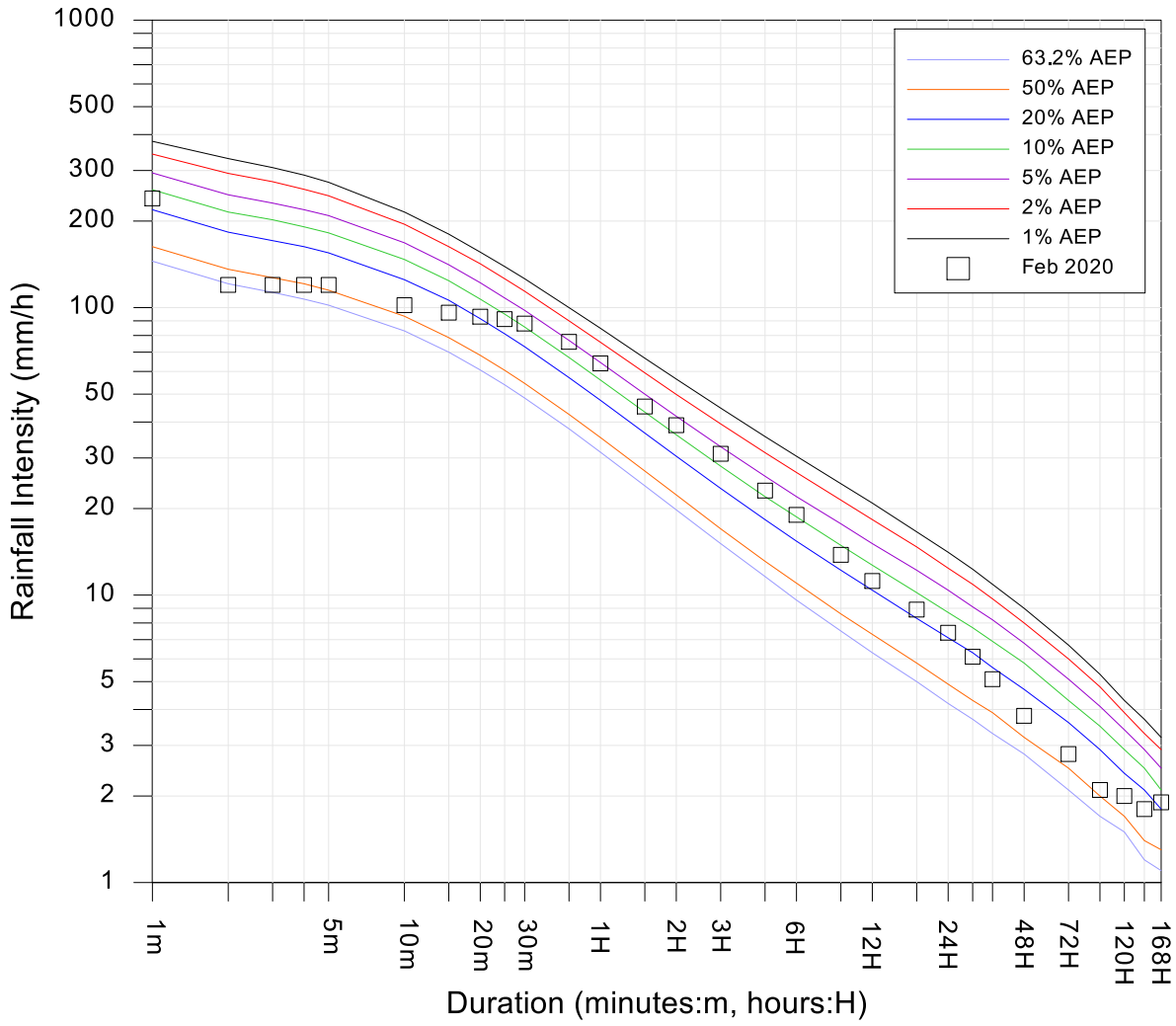
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.20.

IFD_558075_FigureC.20..pdf

Site Owner: Lismore City Council
Latitude: -28.797 Longitude:153.239

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	240	03:29 29 Feb 2020
2m	120	03:30 29 Feb 2020
3m	120	11:14 13 Feb 2020
4m	120	11:13 13 Feb 2020
5m	120	11:14 13 Feb 2020
10m	102	11:17 13 Feb 2020
15m	96	11:22 13 Feb 2020
20m	93	11:29 13 Feb 2020
25m	91.2	11:31 13 Feb 2020
30m	88	11:34 13 Feb 2020
45m	76	11:35 13 Feb 2020
1H	64	11:44 13 Feb 2020
1.5H	45.3	11:48 13 Feb 2020
2H	39	11:44 13 Feb 2020
3H	31	12:32 13 Feb 2020
5H	23.1	12:53 13 Feb 2020
6H	19	12:40 13 Feb 2020
9H	13.8	16:30 13 Feb 2020
12H	11.2	18:15 13 Feb 2020
18H	8.9	16:35 13 Feb 2020
24H	7.4	18:15 13 Feb 2020
30H	6.1	17:41 13 Feb 2020
36H	5.1	21:15 13 Feb 2020
48H	3.8	11:41 14 Feb 2020
72H	2.8	17:29 13 Feb 2020
96H	2.1	15:15 14 Feb 2020
120H	2	16:57 13 Feb 2020
144H	1.8	03:15 14 Feb 2020
168H	1.9	12:31 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Tuncester (58201)
Intensity-Frequency-Duration
1 - 29 February 2020

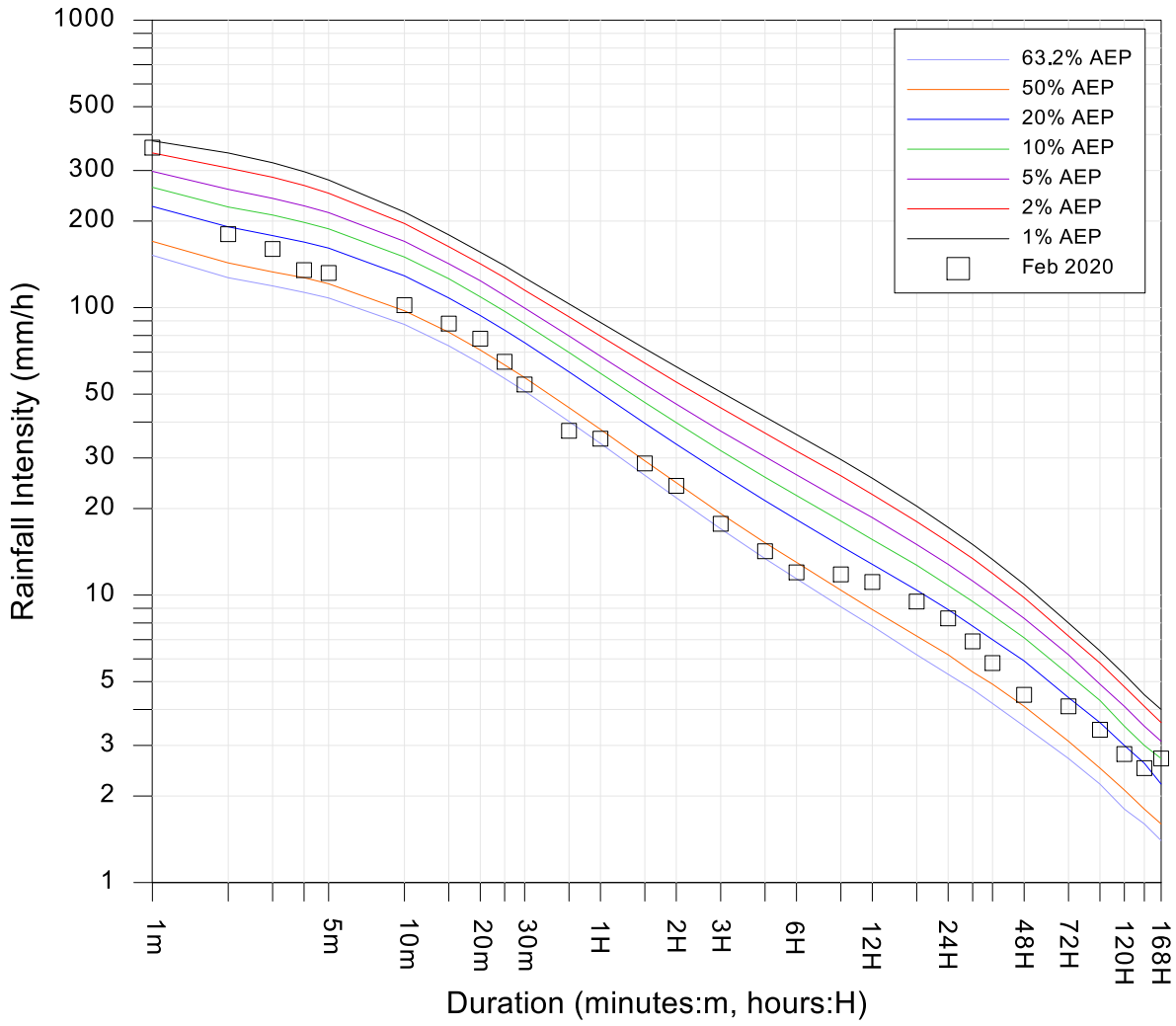
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.21

IFD_58201_FigureC.21.pdf

Site Owner: Ballina Shire Council
Latitude: -28.785 Longitude:153.474

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	360	09:05 28 Feb 2020
2m	180	09:06 28 Feb 2020
3m	160	17:45 03 Feb 2020
4m	135	17:46 03 Feb 2020
5m	132	17:47 03 Feb 2020
10m	102	17:48 03 Feb 2020
15m	88	09:43 12 Feb 2020
20m	78	09:47 12 Feb 2020
25m	64.8	09:52 12 Feb 2020
30m	54	09:57 12 Feb 2020
45m	37.3	10:12 12 Feb 2020
1H	35	14:41 06 Feb 2020
1.5H	28.7	15:11 06 Feb 2020
2H	24	15:19 06 Feb 2020
3H	17.7	15:33 06 Feb 2020
5H	14.2	17:31 06 Feb 2020
6H	12	15:33 06 Feb 2020
9H	11.8	21:33 06 Feb 2020
12H	11.1	00:11 07 Feb 2020
18H	9.5	00:04 07 Feb 2020
24H	8.3	07:49 07 Feb 2020
30H	6.9	10:45 07 Feb 2020
36H	5.8	07:34 07 Feb 2020
48H	4.5	12:04 07 Feb 2020
72H	4.1	04:45 09 Feb 2020
96H	3.4	21:04 09 Feb 2020
120H	2.8	19:34 10 Feb 2020
144H	2.5	15:04 09 Feb 2020
168H	2.7	07:56 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Houghlahans Creek (558069)
Intensity-Frequency-Duration
1 - 29 February 2020

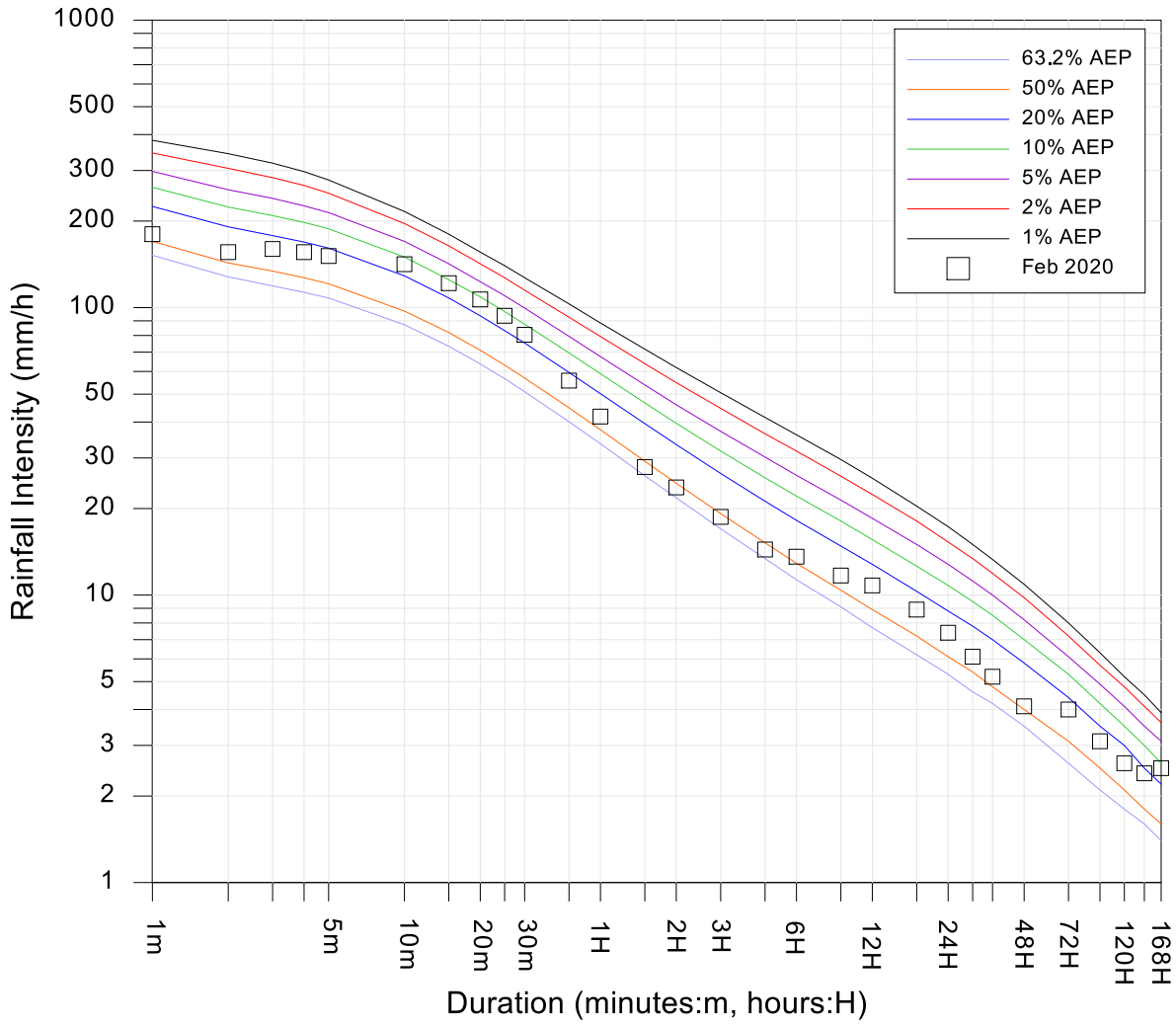
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.22

IFD_558069_FigureC.22.pdf

Site Owner: Ballina Shire Council
Latitude: -28.831 Longitude:153.444

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	180	21:03 26 Feb 2020
2m	156	21:06 26 Feb 2020
3m	160	21:05 26 Feb 2020
4m	156	21:06 26 Feb 2020
5m	151.2	21:05 26 Feb 2020
10m	141.6	21:09 26 Feb 2020
15m	121.6	21:12 26 Feb 2020
20m	106.8	21:17 26 Feb 2020
25m	93.6	21:22 26 Feb 2020
30m	80.4	21:27 26 Feb 2020
45m	55.7	21:42 26 Feb 2020
1H	41.8	21:57 26 Feb 2020
1.5H	27.9	15:29 06 Feb 2020
2H	23.7	15:35 06 Feb 2020
3H	18.7	15:35 06 Feb 2020
5H	14.4	16:50 06 Feb 2020
6H	13.6	15:43 06 Feb 2020
9H	11.7	21:26 06 Feb 2020
12H	10.8	23:52 06 Feb 2020
18H	8.9	23:56 06 Feb 2020
24H	7.4	08:27 07 Feb 2020
30H	6.1	09:09 07 Feb 2020
36H	5.2	10:20 07 Feb 2020
48H	4.1	07:07 08 Feb 2020
72H	4	03:47 09 Feb 2020
96H	3.1	21:46 09 Feb 2020
120H	2.6	20:22 10 Feb 2020
144H	2.4	17:25 09 Feb 2020
168H	2.5	07:48 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Alstonville STP (558072)
Intensity-Frequency-Duration
1 - 29 February 2020

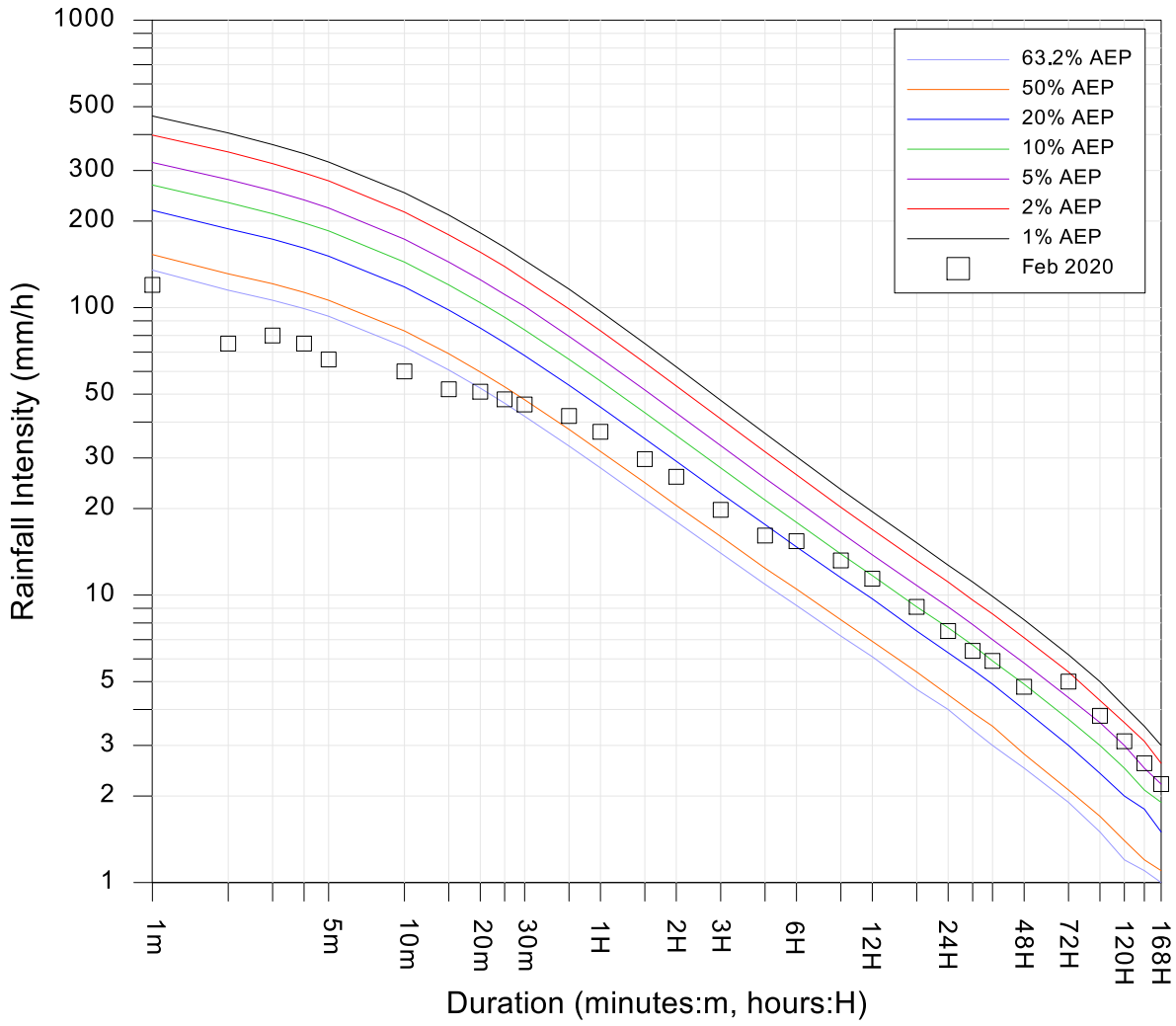
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.23

IFD_558072_FigureC.23.pdf

Site Owner: CCSD
Latitude: -33.2509 Longitude:151.469

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	120	00:35 07 Feb 2020
2m	75	22:43 18 Feb 2020
3m	80	22:42 18 Feb 2020
4m	75	22:43 18 Feb 2020
5m	66	22:44 18 Feb 2020
10m	60	22:45 18 Feb 2020
15m	52	11:02 07 Feb 2020
20m	51	11:02 07 Feb 2020
25m	48	11:07 07 Feb 2020
30m	46	11:10 07 Feb 2020
45m	42	11:10 07 Feb 2020
1H	37	11:24 07 Feb 2020
1.5H	29.7	11:33 07 Feb 2020
2H	25.8	11:37 07 Feb 2020
3H	19.8	12:26 07 Feb 2020
5H	16.1	11:27 07 Feb 2020
6H	15.4	11:32 07 Feb 2020
9H	13.2	14:22 07 Feb 2020
12H	11.4	17:04 07 Feb 2020
18H	9.1	18:33 07 Feb 2020
24H	7.5	19:23 07 Feb 2020
30H	6.4	10:28 08 Feb 2020
36H	5.9	10:21 08 Feb 2020
48H	4.8	10:18 09 Feb 2020
72H	5	19:23 09 Feb 2020
96H	3.8	08:37 10 Feb 2020
120H	3.1	08:37 11 Feb 2020
144H	2.6	08:37 12 Feb 2020
168H	2.2	20:57 09 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Hamlyn Terrace (561133)
Intensity-Frequency-Duration
1 - 29 February 2020

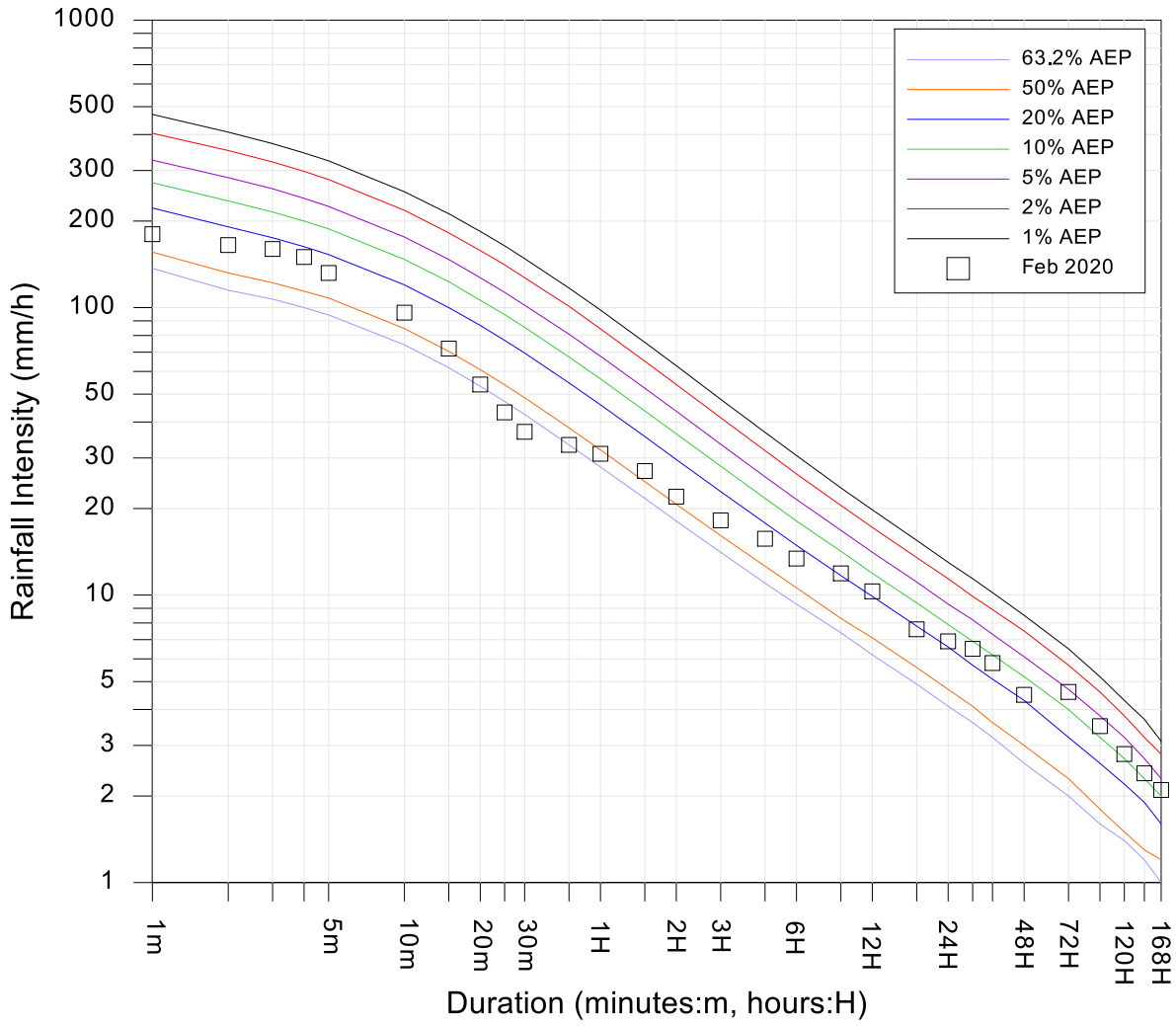
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.24

IFD_561133_FigureC.24.pdf

Site Owner: CCSD
Latitude: -33.379 Longitude:151.474

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	180	22:29 18 Feb 2020
2m	165	22:30 18 Feb 2020
3m	160	22:30 18 Feb 2020
4m	150	22:31 18 Feb 2020
5m	132	22:32 18 Feb 2020
10m	96	22:34 18 Feb 2020
15m	72	22:35 18 Feb 2020
20m	54	22:40 18 Feb 2020
25m	43.2	22:47 18 Feb 2020
30m	37	22:50 18 Feb 2020
45m	33.3	14:56 07 Feb 2020
1H	31	15:01 07 Feb 2020
1.5H	27	15:13 07 Feb 2020
2H	22	15:44 07 Feb 2020
3H	18.2	07:39 08 Feb 2020
5H	15.7	15:52 07 Feb 2020
6H	13.4	15:54 07 Feb 2020
9H	11.9	15:17 07 Feb 2020
12H	10.3	16:07 07 Feb 2020
18H	7.6	21:07 07 Feb 2020
24H	6.9	07:16 08 Feb 2020
30H	6.5	08:09 08 Feb 2020
36H	5.8	07:24 08 Feb 2020
48H	4.5	08:07 08 Feb 2020
72H	4.6	19:18 09 Feb 2020
96H	3.5	05:45 10 Feb 2020
120H	2.8	05:45 11 Feb 2020
144H	2.4	05:45 12 Feb 2020
168H	2.1	09:44 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Bateau Bay (561069)
Intensity-Frequency-Duration
1 - 29 February 2020

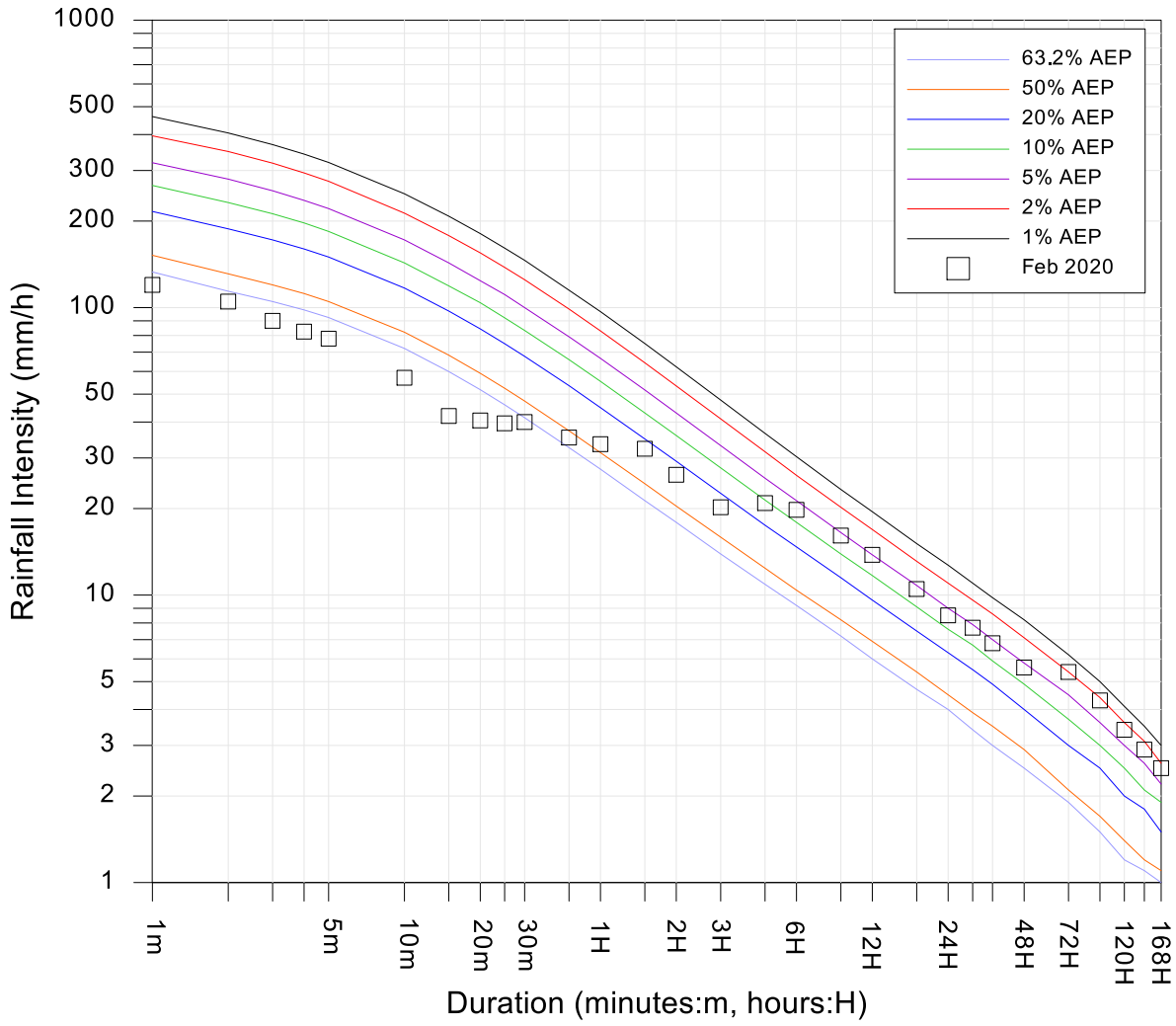
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.25

IFD_561069_FigureC.25.pdf

Site Owner: CCSD
Latitude: -33.2978 Longitude:151.4

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	120	10:43 17 Feb 2020
2m	105	10:44 17 Feb 2020
3m	90	10:45 17 Feb 2020
4m	82.5	10:45 17 Feb 2020
5m	78	10:45 17 Feb 2020
10m	57	22:25 18 Feb 2020
15m	42	22:29 18 Feb 2020
20m	40.5	11:26 07 Feb 2020
25m	39.6	11:27 07 Feb 2020
30m	40	11:25 07 Feb 2020
45m	35.3	11:39 07 Feb 2020
1H	33.5	14:59 07 Feb 2020
1.5H	32.3	15:21 07 Feb 2020
2H	26.2	15:52 07 Feb 2020
3H	20.2	15:25 07 Feb 2020
5H	20.9	15:23 07 Feb 2020
6H	19.8	15:49 07 Feb 2020
9H	16.1	15:43 07 Feb 2020
12H	13.8	17:11 07 Feb 2020
18H	10.5	23:11 07 Feb 2020
24H	8.5	23:12 07 Feb 2020
30H	7.7	11:11 08 Feb 2020
36H	6.8	11:12 08 Feb 2020
48H	5.6	10:20 09 Feb 2020
72H	5.4	19:32 09 Feb 2020
96H	4.3	07:15 10 Feb 2020
120H	3.4	07:15 11 Feb 2020
144H	2.9	07:15 12 Feb 2020
168H	2.5	07:15 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Mardi Dam (561082)
Intensity-Frequency-Duration
1 - 29 February 2020

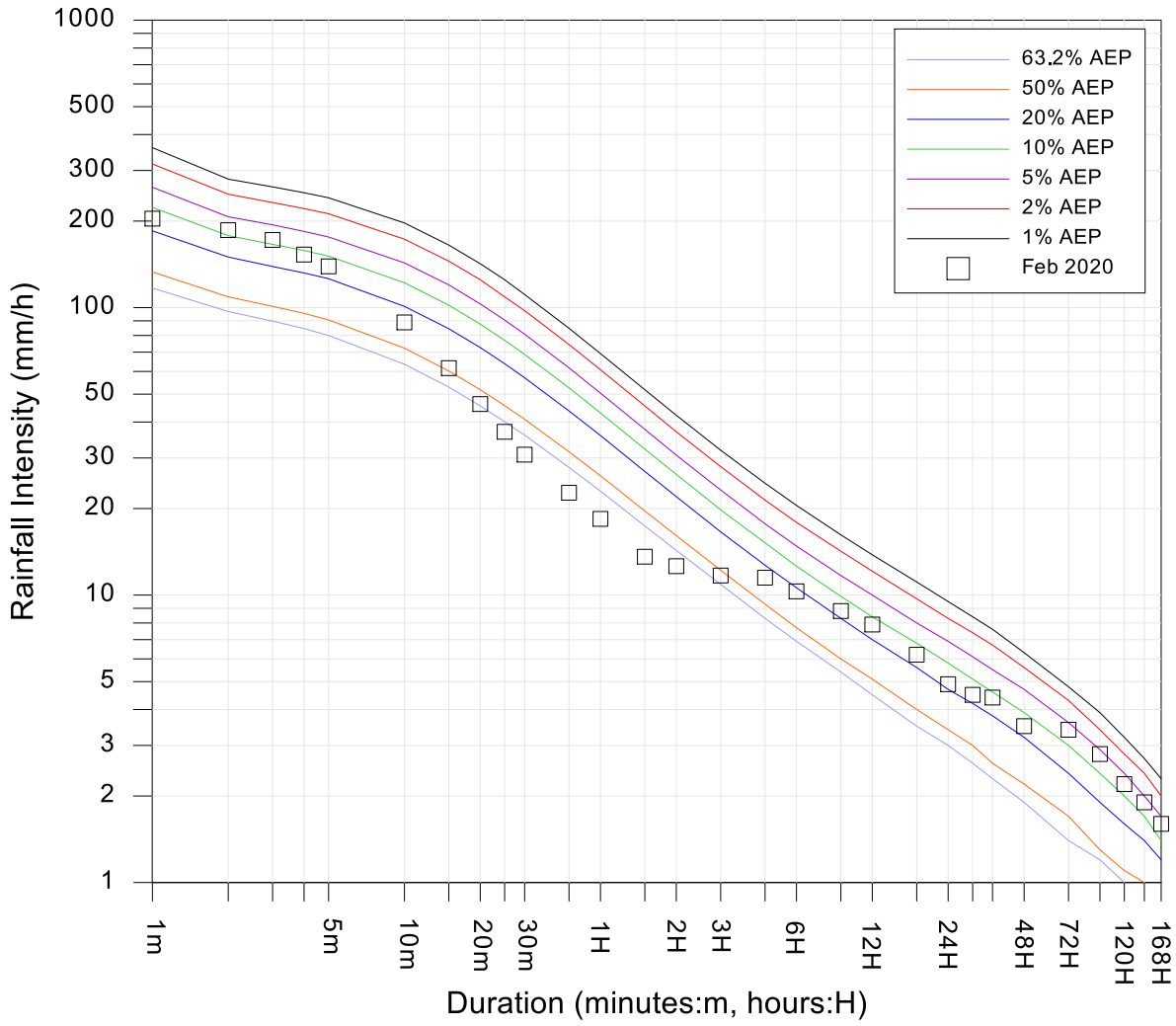
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.26

IFD_561082_FigureC.26.pdf

Site Owner: CCSD
Latitude: -33.3875 Longitude:150.982

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	204	07:02 17 Feb 2020
2m	186	07:02 17 Feb 2020
3m	172	07:03 17 Feb 2020
4m	153	07:04 17 Feb 2020
5m	139.2	07:05 17 Feb 2020
10m	88.8	07:09 17 Feb 2020
15m	61.6	07:14 17 Feb 2020
20m	46.2	07:19 17 Feb 2020
25m	37	07:24 17 Feb 2020
30m	30.8	07:29 17 Feb 2020
45m	22.7	06:33 08 Feb 2020
1H	18.4	06:41 08 Feb 2020
1.5H	13.6	07:16 08 Feb 2020
2H	12.6	11:00 09 Feb 2020
3H	11.7	11:04 09 Feb 2020
5H	11.5	11:08 09 Feb 2020
6H	10.3	11:19 09 Feb 2020
9H	8.8	14:25 09 Feb 2020
12H	7.9	15:24 09 Feb 2020
18H	6.2	15:42 09 Feb 2020
24H	4.9	21:42 09 Feb 2020
30H	4.5	11:46 09 Feb 2020
36H	4.4	17:17 09 Feb 2020
48H	3.5	14:22 09 Feb 2020
72H	3.4	15:35 09 Feb 2020
96H	2.8	08:55 10 Feb 2020
120H	2.2	08:55 11 Feb 2020
144H	1.9	08:55 12 Feb 2020
168H	1.6	11:09 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Webbs Creek (212408)
Intensity-Frequency-Duration
1 - 29 February 2020

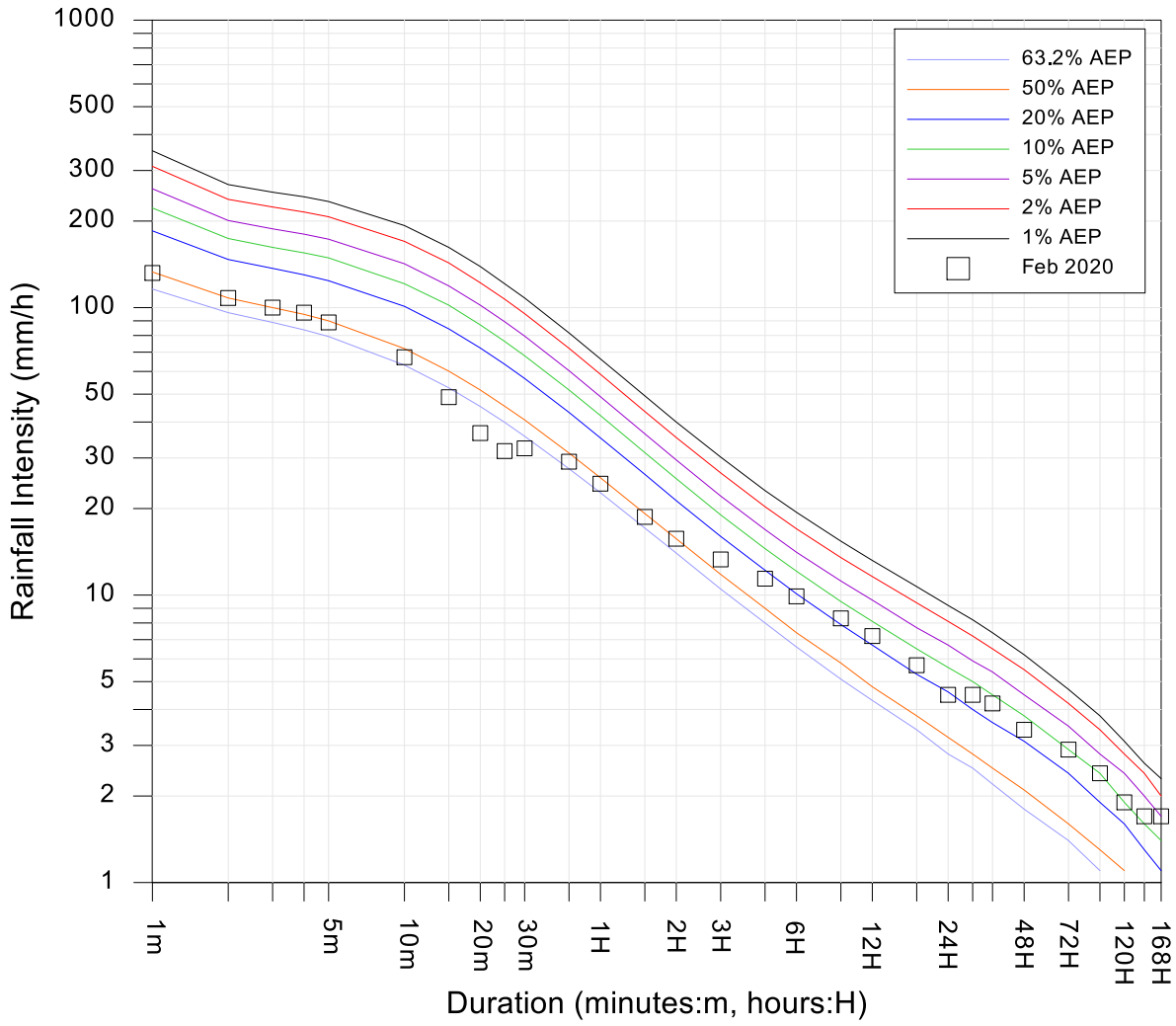
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.27

IFD_212408_FigureC.27.pdf

Site Owner: CCSD
Latitude: -33.4377 Longitude:150.883

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	132	14:10 12 Feb 2020
2m	108	14:11 12 Feb 2020
3m	100	14:12 12 Feb 2020
4m	96	14:13 12 Feb 2020
5m	88.8	14:14 12 Feb 2020
10m	67.2	14:16 12 Feb 2020
15m	48.8	14:20 12 Feb 2020
20m	36.6	14:25 12 Feb 2020
25m	31.7	06:58 08 Feb 2020
30m	32.4	07:03 08 Feb 2020
45m	29.1	07:18 08 Feb 2020
1H	24.4	07:25 08 Feb 2020
1.5H	18.7	14:40 12 Feb 2020
2H	15.7	11:32 09 Feb 2020
3H	13.3	11:45 09 Feb 2020
5H	11.4	11:21 09 Feb 2020
6H	9.9	11:37 09 Feb 2020
9H	8.3	14:43 09 Feb 2020
12H	7.2	14:24 09 Feb 2020
18H	5.7	17:14 09 Feb 2020
24H	4.5	22:19 09 Feb 2020
30H	4.5	12:19 09 Feb 2020
36H	4.2	17:59 09 Feb 2020
48H	3.4	21:25 09 Feb 2020
72H	2.9	23:19 09 Feb 2020
96H	2.4	08:57 10 Feb 2020
120H	1.9	08:57 11 Feb 2020
144H	1.7	14:51 12 Feb 2020
168H	1.7	11:39 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Colo Junction (212407)
Intensity-Frequency-Duration
1 - 29 February 2020

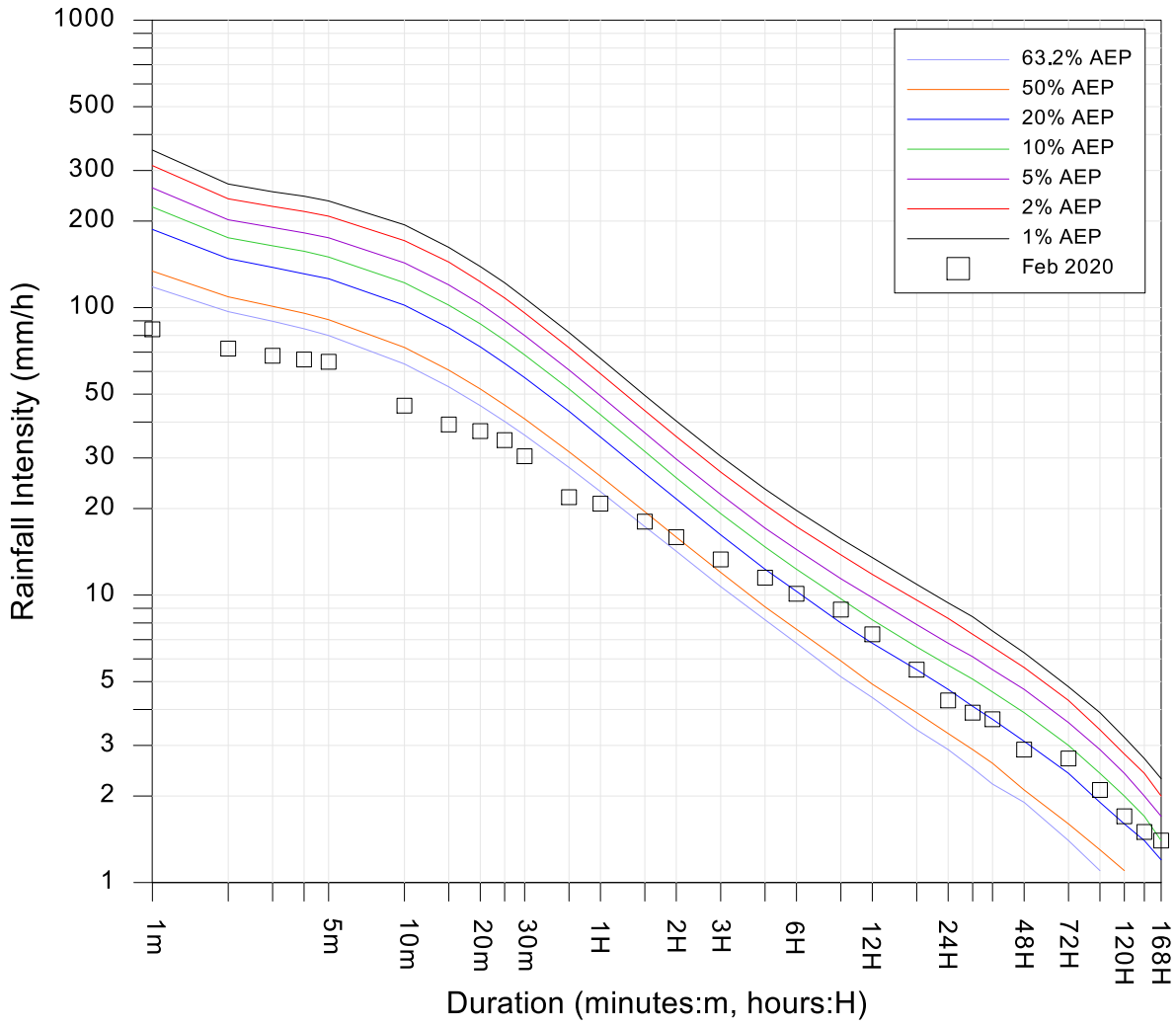
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.28

IFD_212407_FigureC.28.pdf

Site Owner: CCSD
Latitude: -33.4973 Longitude:150.877

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	84	12:56 26 Feb 2020
2m	72	12:57 26 Feb 2020
3m	68	12:58 26 Feb 2020
4m	66	12:58 26 Feb 2020
5m	64.8	12:58 26 Feb 2020
10m	45.6	13:26 12 Feb 2020
15m	39.2	13:31 12 Feb 2020
20m	37.2	13:27 12 Feb 2020
25m	34.6	13:30 12 Feb 2020
30m	30.4	13:33 12 Feb 2020
45m	21.9	11:20 09 Feb 2020
1H	20.8	11:25 09 Feb 2020
1.5H	18	11:25 09 Feb 2020
2H	15.9	11:39 09 Feb 2020
3H	13.3	11:42 09 Feb 2020
5H	11.5	11:32 09 Feb 2020
6H	10.1	11:50 09 Feb 2020
9H	8.9	15:12 09 Feb 2020
12H	7.3	15:45 09 Feb 2020
18H	5.5	16:19 09 Feb 2020
24H	4.3	23:30 09 Feb 2020
30H	3.9	15:13 09 Feb 2020
36H	3.7	18:06 09 Feb 2020
48H	2.9	21:55 09 Feb 2020
72H	2.7	23:49 09 Feb 2020
96H	2.1	07:49 10 Feb 2020
120H	1.7	07:49 11 Feb 2020
144H	1.5	14:45 12 Feb 2020
168H	1.4	11:34 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Sackville Downstream (212438)
Intensity-Frequency-Duration
1 - 29 February 2020

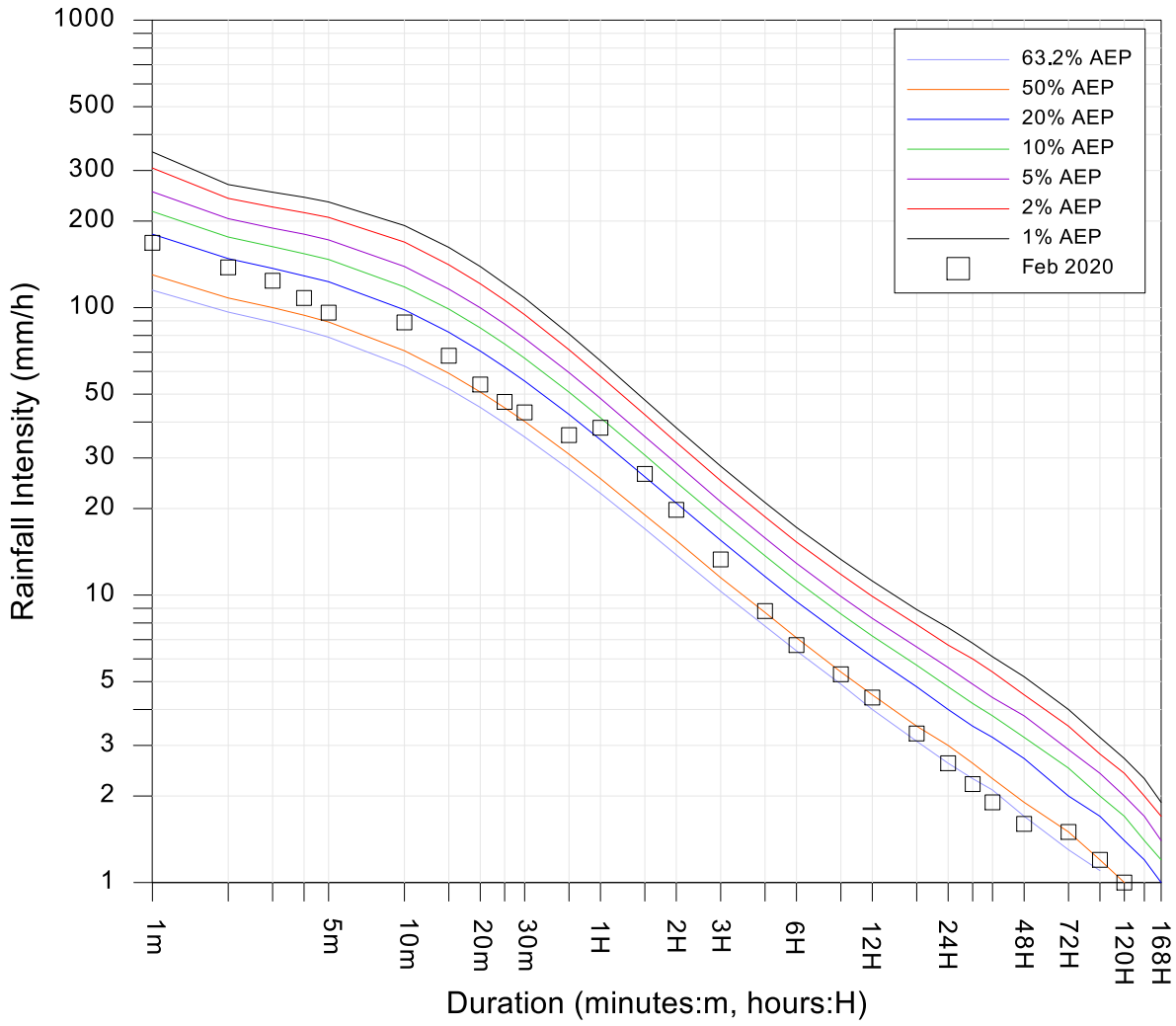
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.29

IFD_212438_FigureC.29.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	168	23:00 18 Feb 2020
2m	138	23:00 18 Feb 2020
3m	124	23:01 18 Feb 2020
4m	108	23:02 18 Feb 2020
5m	96	23:02 18 Feb 2020
10m	88.8	23:02 18 Feb 2020
15m	68	23:04 18 Feb 2020
20m	54	23:09 18 Feb 2020
25m	47	23:16 18 Feb 2020
30m	43.2	23:19 18 Feb 2020
45m	36	23:36 18 Feb 2020
1H	38.2	23:51 18 Feb 2020
1.5H	26.4	00:18 19 Feb 2020
2H	19.8	00:48 19 Feb 2020
3H	13.3	01:48 19 Feb 2020
5H	8.8	03:18 19 Feb 2020
6H	6.7	09:45 09 Feb 2020
9H	5.3	11:12 09 Feb 2020
12H	4.4	14:12 09 Feb 2020
18H	3.3	13:33 09 Feb 2020
24H	2.6	16:43 09 Feb 2020
30H	2.2	16:28 09 Feb 2020
36H	1.9	15:11 09 Feb 2020
48H	1.6	15:21 09 Feb 2020
72H	1.5	12:41 09 Feb 2020
96H	1.2	09:25 10 Feb 2020
120H	1	09:25 11 Feb 2020
144H	0.8	09:25 12 Feb 2020
168H	0.7	17:46 09 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Macdonald River at Howes Valley (212021)
Intensity-Frequency-Duration
1 - 29 February 2020

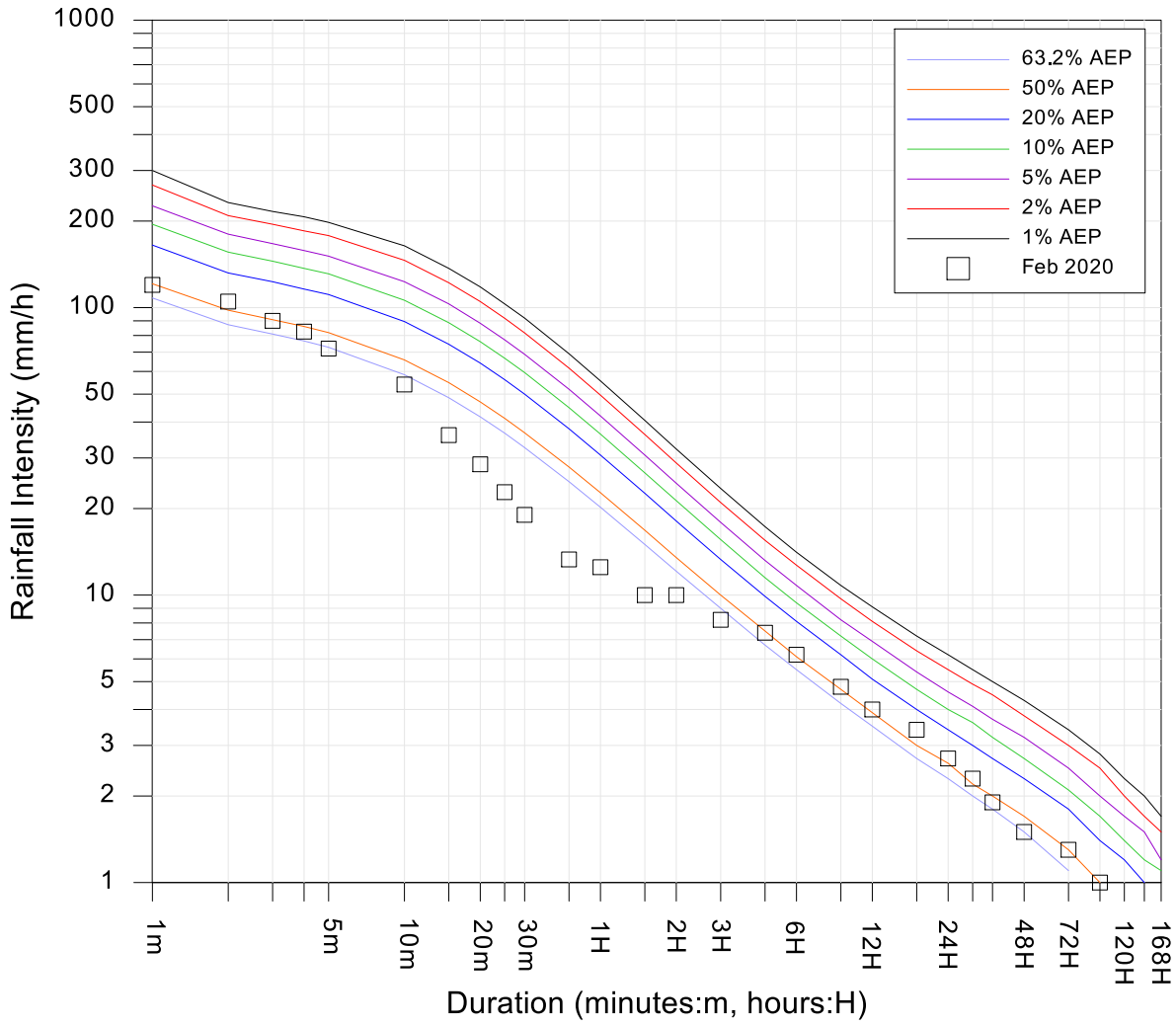
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.30.

IFD_212021_FigureC.30..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	120	22:56 18 Feb 2020
2m	105	22:56 18 Feb 2020
3m	90	22:57 18 Feb 2020
4m	82.5	22:58 18 Feb 2020
5m	72	22:59 18 Feb 2020
10m	54	23:02 18 Feb 2020
15m	36	23:07 18 Feb 2020
20m	28.5	23:06 18 Feb 2020
25m	22.8	23:11 18 Feb 2020
30m	19	23:16 18 Feb 2020
45m	13.3	11:23 09 Feb 2020
1H	12.5	21:21 18 Feb 2020
1.5H	10	11:41 09 Feb 2020
2H	10	11:22 09 Feb 2020
3H	8.2	11:44 09 Feb 2020
5H	7.4	11:42 09 Feb 2020
6H	6.2	11:45 09 Feb 2020
9H	4.8	11:49 09 Feb 2020
12H	4	14:28 09 Feb 2020
18H	3.4	14:00 09 Feb 2020
24H	2.7	11:40 09 Feb 2020
30H	2.3	15:06 09 Feb 2020
36H	1.9	17:32 09 Feb 2020
48H	1.5	01:20 10 Feb 2020
72H	1.3	13:21 09 Feb 2020
96H	1	13:03 10 Feb 2020
120H	0.8	13:03 11 Feb 2020
144H	0.8	13:03 12 Feb 2020
168H	0.7	13:03 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Capertree River at Glen Davis (212018)
Intensity-Frequency-Duration
1 - 29 February 2020

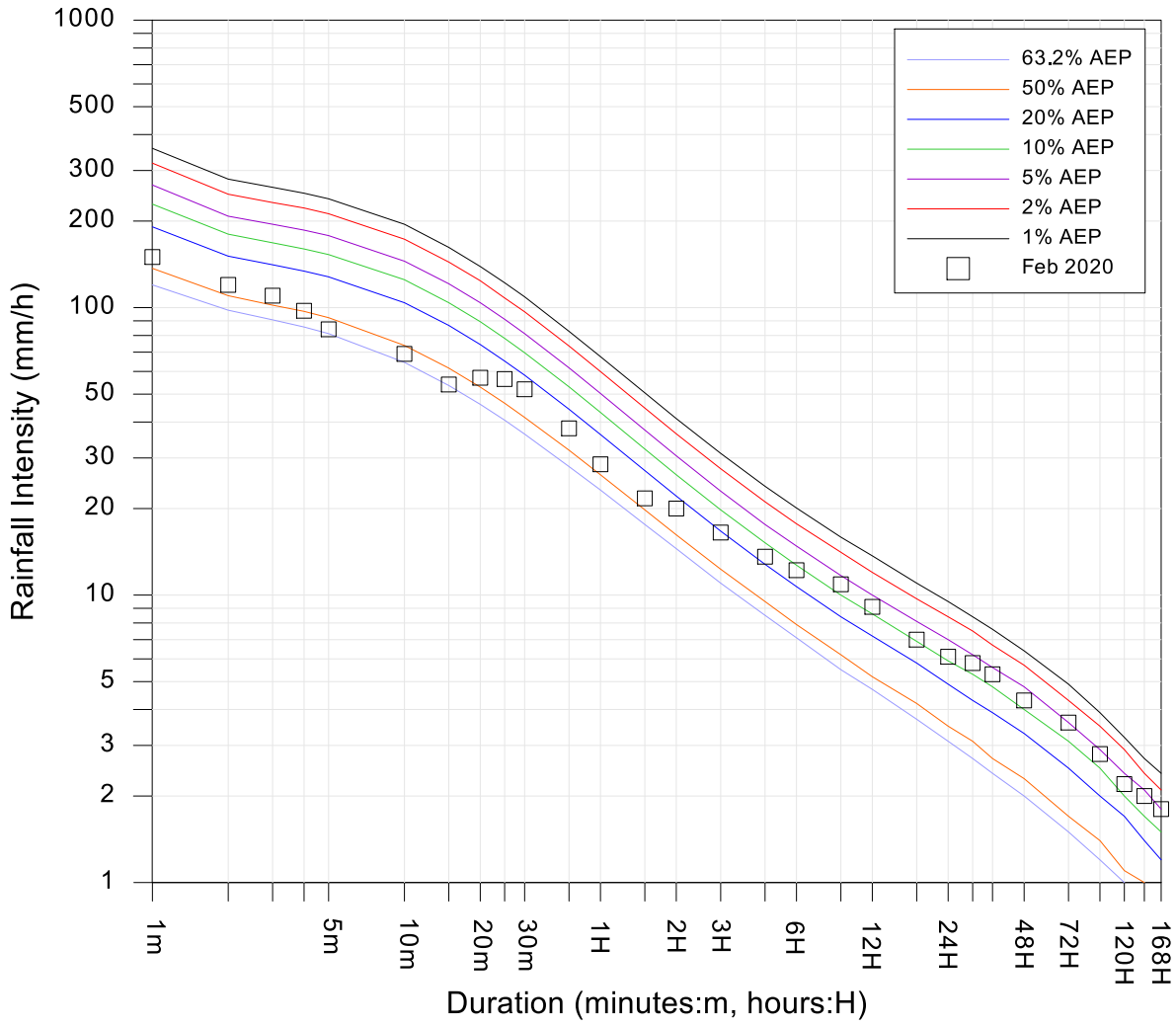
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.31

IFD_212018_FigureC.31.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	150	11:40 17 Feb 2020
2m	120	11:41 17 Feb 2020
3m	110	11:41 17 Feb 2020
4m	97.5	11:42 17 Feb 2020
5m	84	11:43 17 Feb 2020
10m	69	17:58 02 Feb 2020
15m	54	18:17 02 Feb 2020
20m	57	18:09 02 Feb 2020
25m	56.4	18:13 02 Feb 2020
30m	52	18:18 02 Feb 2020
45m	38	18:31 02 Feb 2020
1H	28.5	18:46 02 Feb 2020
1.5H	21.7	14:54 09 Feb 2020
2H	20	15:06 09 Feb 2020
3H	16.5	15:10 09 Feb 2020
5H	13.6	15:09 09 Feb 2020
6H	12.2	15:09 09 Feb 2020
9H	10.9	15:09 09 Feb 2020
12H	9.1	16:53 09 Feb 2020
18H	7	15:19 09 Feb 2020
24H	6.1	15:09 09 Feb 2020
30H	5.8	15:13 09 Feb 2020
36H	5.3	21:13 09 Feb 2020
48H	4.3	23:52 09 Feb 2020
72H	3.6	21:44 09 Feb 2020
96H	2.8	05:51 10 Feb 2020
120H	2.2	05:51 11 Feb 2020
144H	2	21:44 12 Feb 2020
168H	1.8	15:53 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

South Creek at Great Western Hwy (212048)
Intensity-Frequency-Duration
1 - 29 February 2020

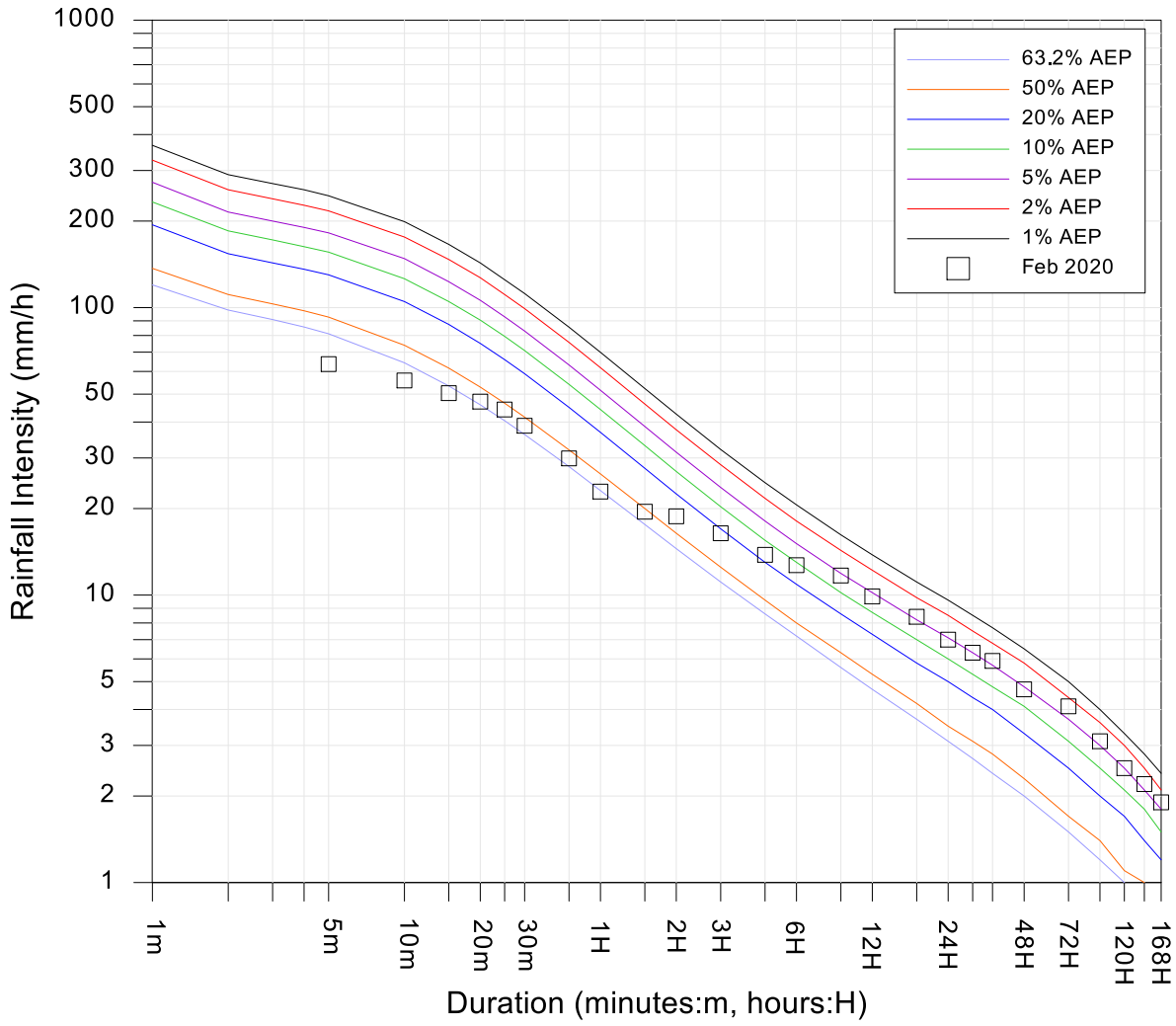
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.32

IFD_212048_FigureC.32.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	-	-
2m	-	-
3m	-	-
4m	-	-
5m	63.6	18:14 02 Feb 2020
10m	55.8	21:39 18 Feb 2020
15m	50.4	21:39 18 Feb 2020
20m	47.1	21:39 18 Feb 2020
25m	44.2	18:19 02 Feb 2020
30m	38.8	18:24 02 Feb 2020
45m	29.9	18:34 02 Feb 2020
1H	22.9	18:49 02 Feb 2020
1.5H	19.5	14:49 09 Feb 2020
2H	18.8	14:59 09 Feb 2020
3H	16.4	14:59 09 Feb 2020
5H	13.8	15:09 09 Feb 2020
6H	12.7	15:09 09 Feb 2020
9H	11.7	15:09 09 Feb 2020
12H	9.9	17:09 09 Feb 2020
18H	8.4	21:49 09 Feb 2020
24H	7	21:19 09 Feb 2020
30H	6.3	21:14 09 Feb 2020
36H	5.9	21:19 09 Feb 2020
48H	4.7	00:04 10 Feb 2020
72H	4.1	01:29 10 Feb 2020
96H	3.1	05:34 10 Feb 2020
120H	2.5	05:34 11 Feb 2020
144H	2.2	21:14 12 Feb 2020
168H	1.9	15:39 13 Feb 2020

Only 5 minute data could be provided by BoM. IFD results for durations of less than 5 minute have been removed.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

South Creek at Elizabeth Dr (212320)
Intensity-Frequency-Duration
1 - 29 February 2020

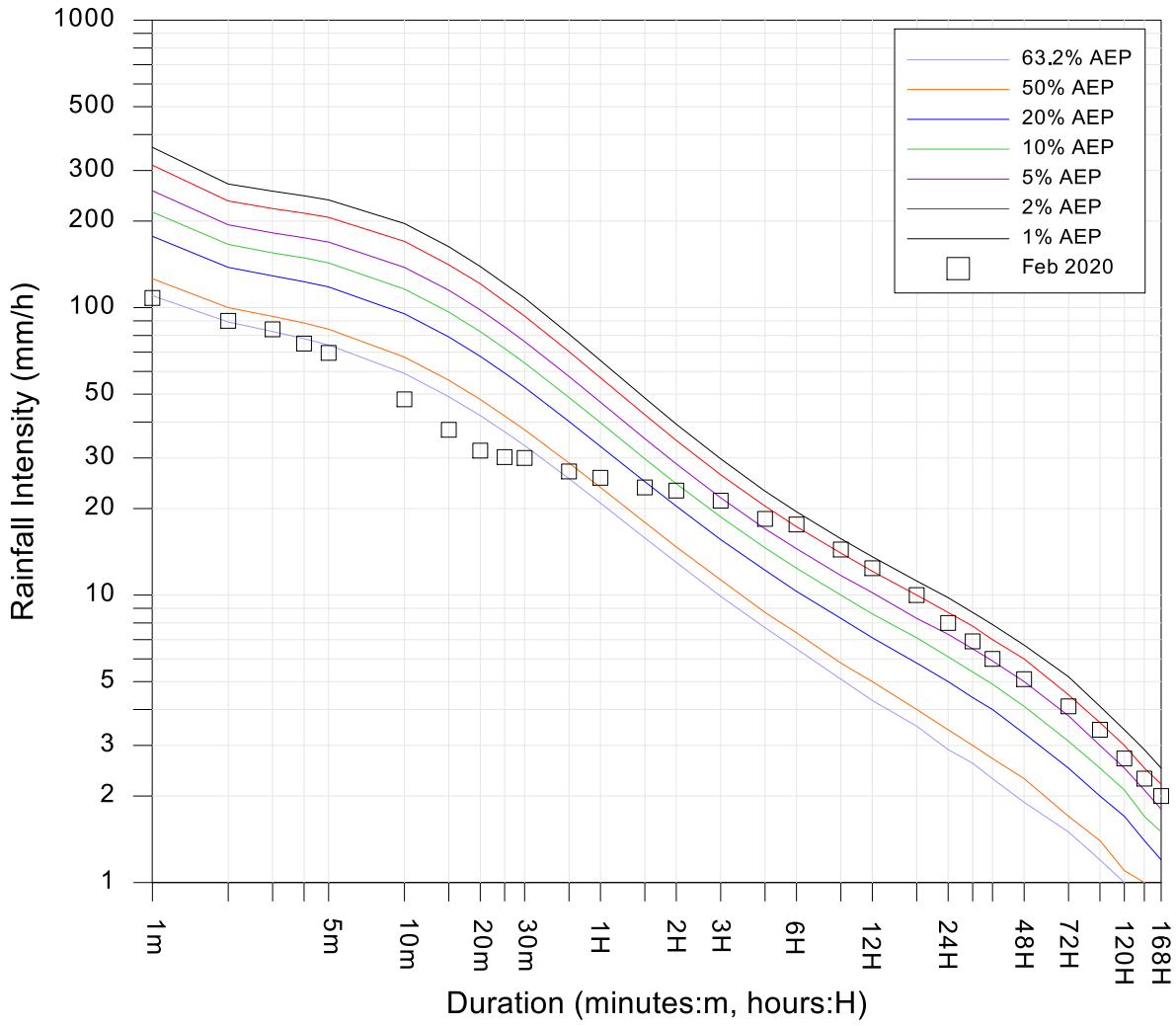
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.33

IFD_212320_FigureC.33.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	108	14:57 02 Feb 2020
2m	90	14:58 02 Feb 2020
3m	84	14:58 02 Feb 2020
4m	75	14:59 02 Feb 2020
5m	69.6	14:59 02 Feb 2020
10m	48	01:29 10 Feb 2020
15m	37.6	01:33 10 Feb 2020
20m	31.8	01:36 10 Feb 2020
25m	30.2	17:56 09 Feb 2020
30m	30	17:56 09 Feb 2020
45m	26.9	18:11 09 Feb 2020
1H	25.6	18:10 09 Feb 2020
1.5H	23.7	18:35 09 Feb 2020
2H	23.1	18:04 09 Feb 2020
3H	21.3	18:40 09 Feb 2020
5H	18.4	20:32 09 Feb 2020
6H	17.6	21:34 09 Feb 2020
9H	14.4	22:17 09 Feb 2020
12H	12.4	02:06 10 Feb 2020
18H	10	02:13 10 Feb 2020
24H	8	02:12 10 Feb 2020
30H	6.9	02:19 10 Feb 2020
36H	6	02:21 10 Feb 2020
48H	5.1	02:04 10 Feb 2020
72H	4.1	02:25 10 Feb 2020
96H	3.4	03:59 10 Feb 2020
120H	2.7	03:59 11 Feb 2020
144H	2.3	03:59 12 Feb 2020
168H	2	04:01 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Lake Nerrigorang at Thirlmere Lakes (212063)
Intensity-Frequency-Duration
1 - 29 February 2020

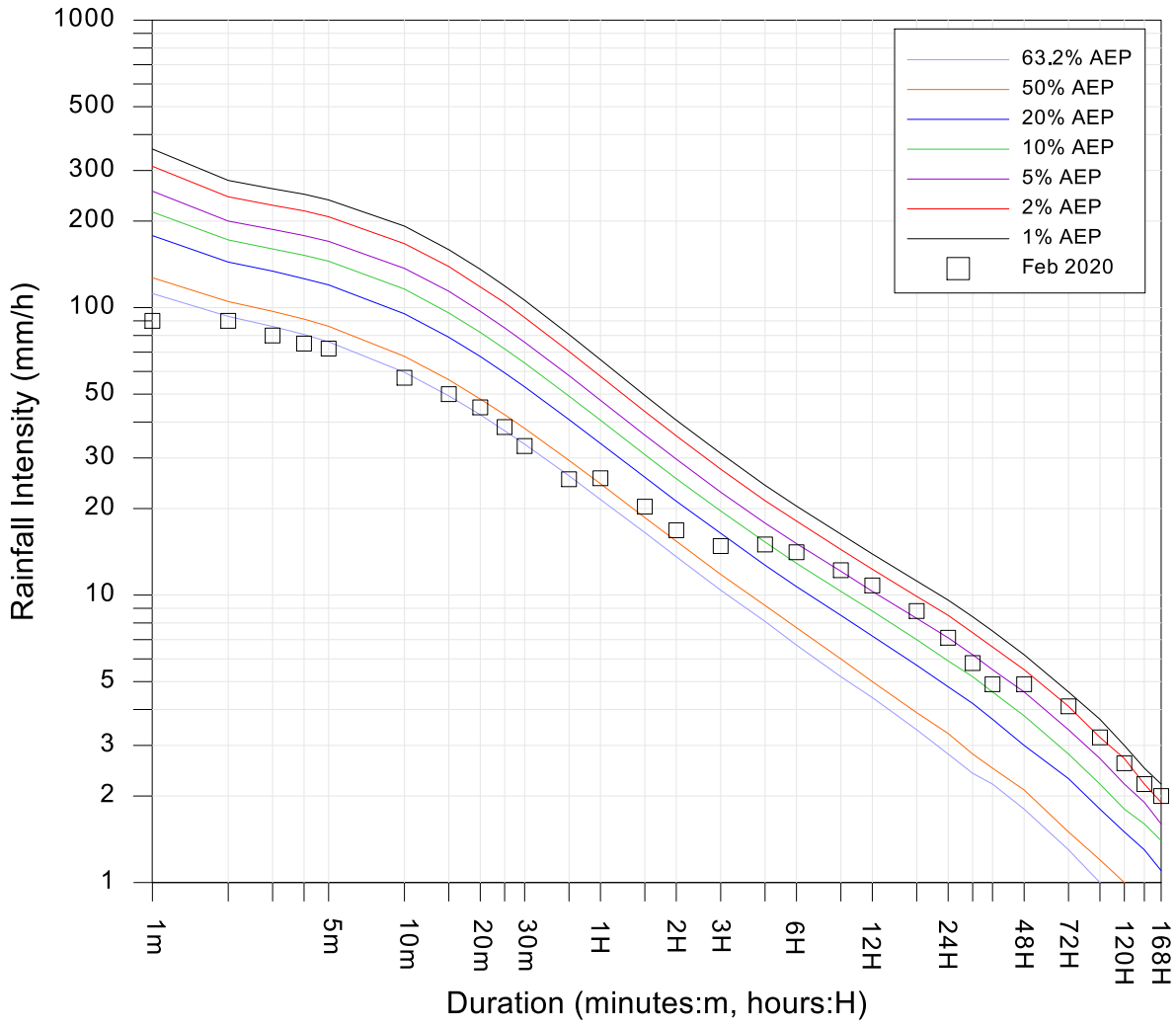
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.34

IFD_212063_FigureC.34.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	90	17:34 15 Feb 2020
2m	90	17:34 15 Feb 2020
3m	80	01:09 10 Feb 2020
4m	75	01:10 10 Feb 2020
5m	72	01:11 10 Feb 2020
10m	57	01:16 10 Feb 2020
15m	50	01:17 10 Feb 2020
20m	45	01:19 10 Feb 2020
25m	38.4	01:24 10 Feb 2020
30m	33	01:27 10 Feb 2020
45m	25.3	07:05 08 Feb 2020
1H	25.5	07:13 08 Feb 2020
1.5H	20.3	07:41 08 Feb 2020
2H	16.8	08:11 08 Feb 2020
3H	14.8	18:54 09 Feb 2020
5H	15	21:28 09 Feb 2020
6H	14.1	21:27 09 Feb 2020
9H	12.2	21:26 09 Feb 2020
12H	10.8	01:25 10 Feb 2020
18H	8.8	01:24 10 Feb 2020
24H	7.1	01:55 10 Feb 2020
30H	5.8	02:51 10 Feb 2020
36H	4.9	02:06 10 Feb 2020
48H	4.9	04:20 10 Feb 2020
72H	4.1	01:35 10 Feb 2020
96H	3.2	05:12 10 Feb 2020
120H	2.6	03:44 11 Feb 2020
144H	2.2	03:52 13 Feb 2020
168H	2	09:57 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Stonequarry Creek at Picton (212053)
Intensity-Frequency-Duration
1 - 29 February 2020

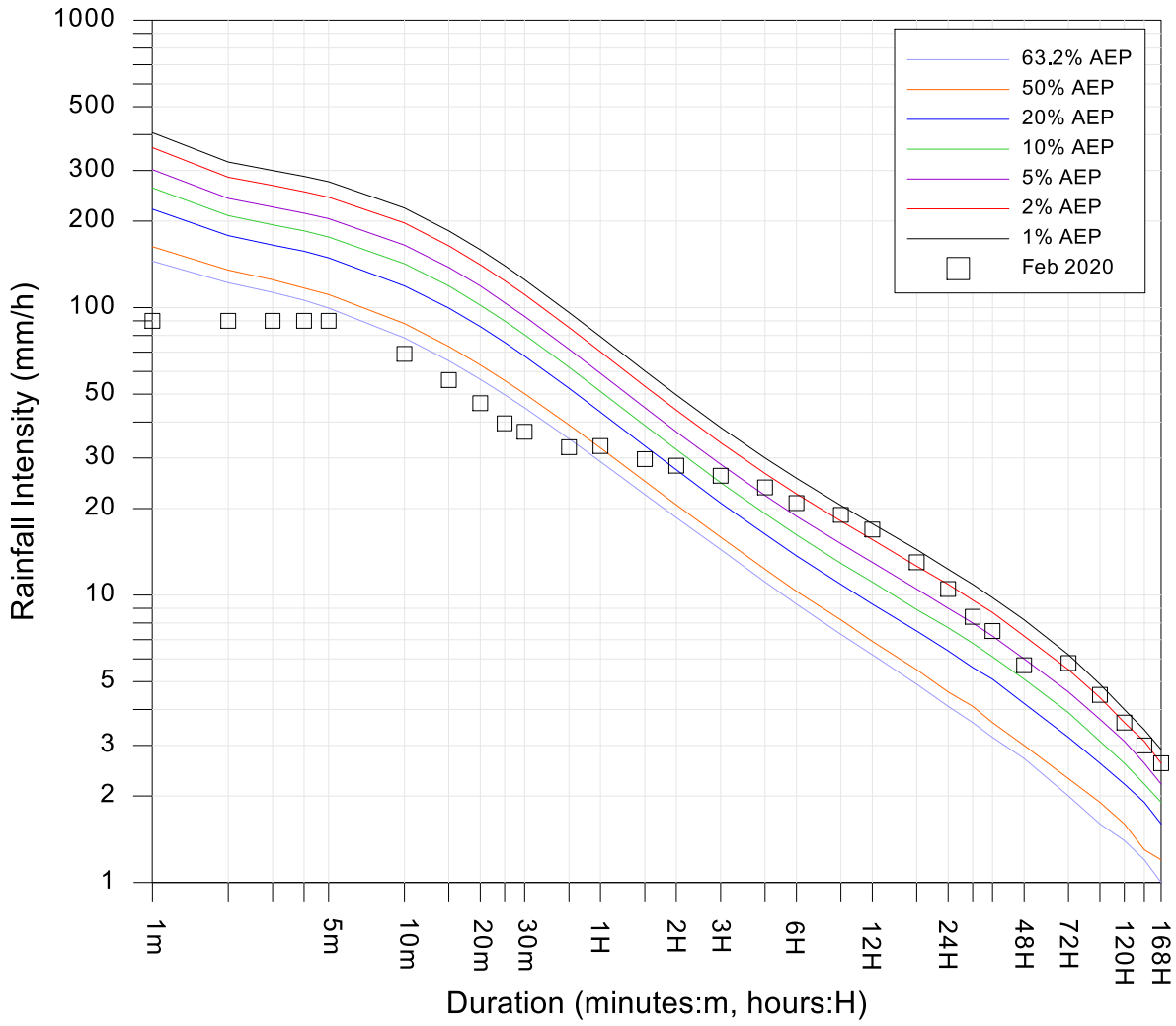
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.35

IFD_212053_FigureC.35.pdf

Site Owner: Northern Beaches Council
Latitude: -33.7206 Longitude:151.244

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	90	15:07 09 Feb 2020
2m	90	15:07 09 Feb 2020
3m	90	15:07 09 Feb 2020
4m	90	15:07 09 Feb 2020
5m	90	15:07 09 Feb 2020
10m	69	15:09 09 Feb 2020
15m	56	15:09 09 Feb 2020
20m	46.5	15:12 09 Feb 2020
25m	39.6	15:12 09 Feb 2020
30m	37	14:15 09 Feb 2020
45m	32.7	14:20 09 Feb 2020
1H	33	14:16 09 Feb 2020
1.5H	29.7	14:18 09 Feb 2020
2H	28.2	14:18 09 Feb 2020
3H	26	14:20 09 Feb 2020
5H	23.7	15:33 09 Feb 2020
6H	20.9	16:07 09 Feb 2020
9H	19	16:10 09 Feb 2020
12H	16.9	16:30 09 Feb 2020
18H	13	20:25 09 Feb 2020
24H	10.5	00:59 10 Feb 2020
30H	8.4	05:20 10 Feb 2020
36H	7.5	23:40 09 Feb 2020
48H	5.7	01:03 10 Feb 2020
72H	5.8	20:37 09 Feb 2020
96H	4.5	04:27 10 Feb 2020
120H	3.6	23:48 10 Feb 2020
144H	3	23:48 11 Feb 2020
168H	2.6	19:51 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Middle Creek (213421)
Intensity-Frequency-Duration
1 - 29 February 2020

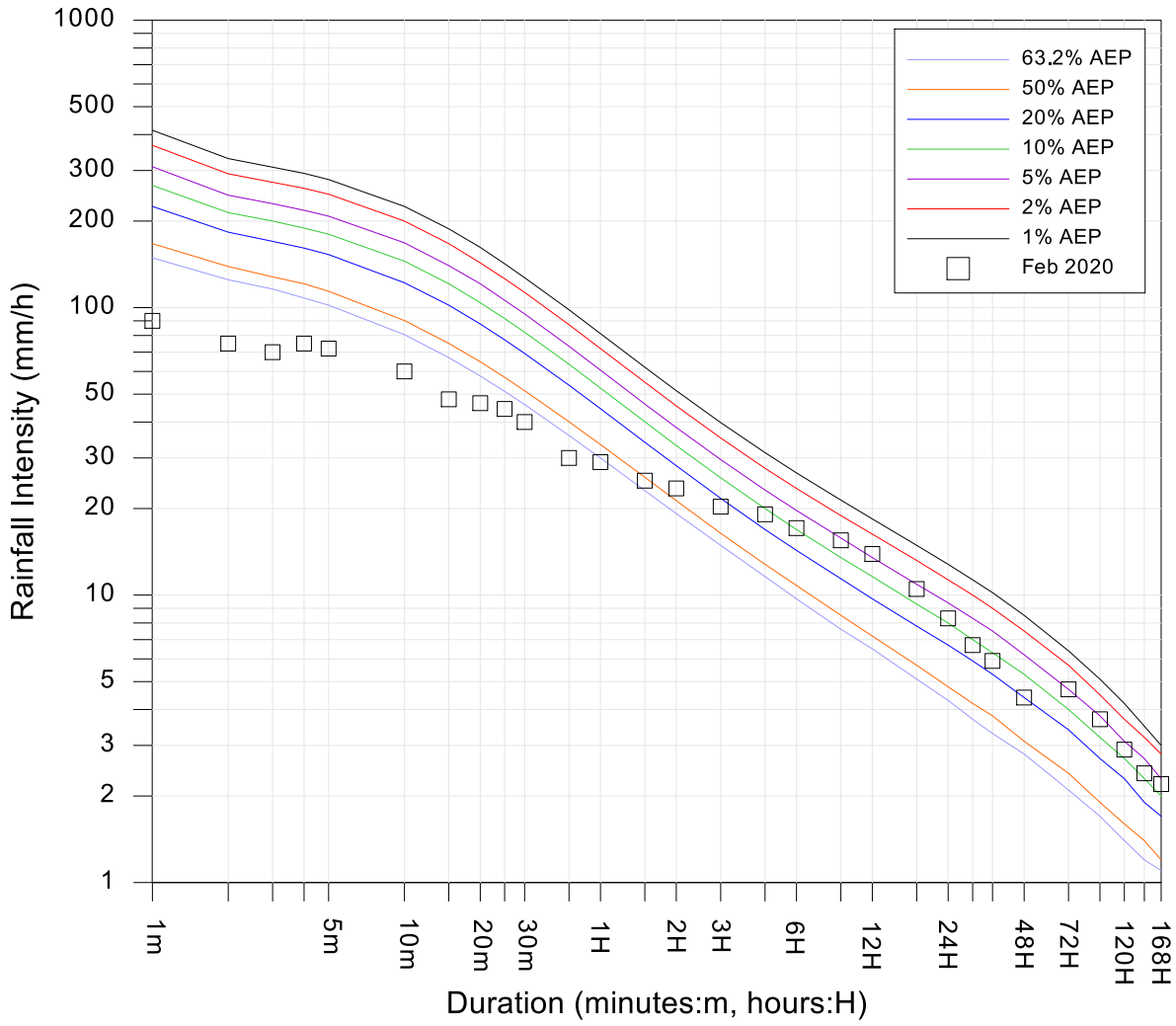
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.36

IFD_213421_FigureC.36.pdf

Site Owner: Northern Beaches Council
Latitude: -33.7284 Longitude:151.272

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	90	04:37 22 Feb 2020
2m	75	04:37 22 Feb 2020
3m	70	04:37 22 Feb 2020
4m	75	04:37 22 Feb 2020
5m	72	04:37 22 Feb 2020
10m	60	04:40 22 Feb 2020
15m	48	04:43 22 Feb 2020
20m	46.5	04:39 22 Feb 2020
25m	44.4	04:41 22 Feb 2020
30m	40	04:43 22 Feb 2020
45m	30	14:29 09 Feb 2020
1H	29	14:23 09 Feb 2020
1.5H	25	14:23 09 Feb 2020
2H	23.5	14:25 09 Feb 2020
3H	20.3	15:45 09 Feb 2020
5H	19.1	16:37 09 Feb 2020
6H	17.1	16:36 09 Feb 2020
9H	15.5	16:29 09 Feb 2020
12H	13.9	16:40 09 Feb 2020
18H	10.5	20:28 09 Feb 2020
24H	8.3	00:05 10 Feb 2020
30H	6.7	06:05 10 Feb 2020
36H	5.9	23:51 09 Feb 2020
48H	4.4	23:56 09 Feb 2020
72H	4.7	21:09 09 Feb 2020
96H	3.7	03:09 10 Feb 2020
120H	2.9	03:09 11 Feb 2020
144H	2.4	03:09 12 Feb 2020
168H	2.2	20:07 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Cromer Golf Club (5Cromer01)
Intensity-Frequency-Duration
1 - 29 February 2020

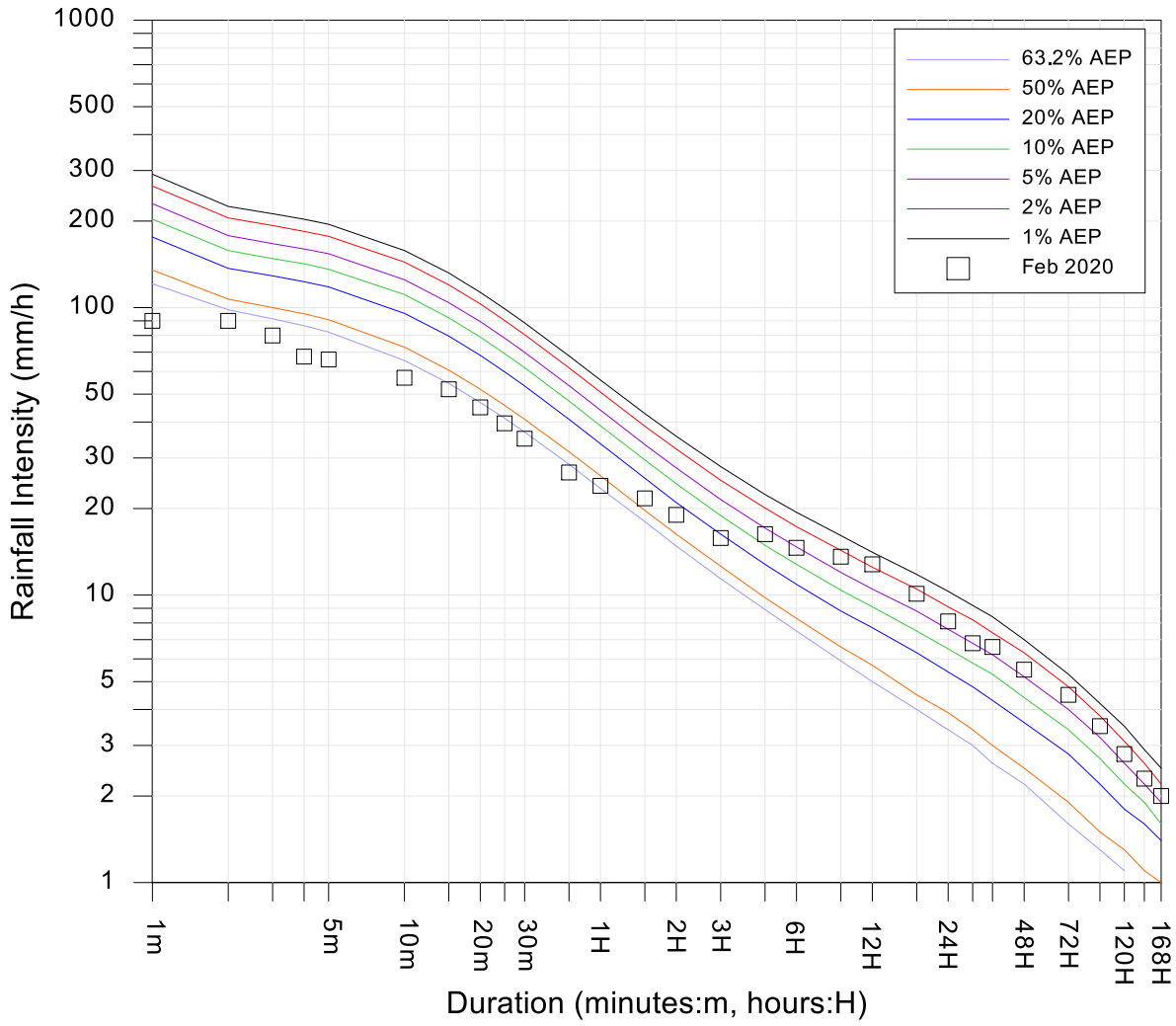
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.37

IFD_5Cromer01_FigureC.37.pdf

Site Owner: CCSD
Latitude: -33.9549 Longitude:150.985

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	90	19:12 09 Feb 2020
2m	90	19:12 09 Feb 2020
3m	80	19:13 09 Feb 2020
4m	67.5	19:14 09 Feb 2020
5m	66	18:35 02 Feb 2020
10m	57	18:42 02 Feb 2020
15m	52	18:45 02 Feb 2020
20m	45	18:48 02 Feb 2020
25m	39.6	18:48 02 Feb 2020
30m	35	13:17 08 Feb 2020
45m	26.7	19:15 09 Feb 2020
1H	24	19:18 09 Feb 2020
1.5H	21.7	16:52 09 Feb 2020
2H	19	17:13 09 Feb 2020
3H	15.8	18:43 09 Feb 2020
5H	16.3	20:04 09 Feb 2020
6H	14.6	19:15 09 Feb 2020
9H	13.6	20:13 09 Feb 2020
12H	12.8	20:04 09 Feb 2020
18H	10.1	21:05 09 Feb 2020
24H	8.1	00:39 10 Feb 2020
30H	6.8	00:39 10 Feb 2020
36H	6.6	20:43 09 Feb 2020
48H	5.5	00:52 10 Feb 2020
72H	4.5	00:27 10 Feb 2020
96H	3.5	04:25 10 Feb 2020
120H	2.8	04:25 11 Feb 2020
144H	2.3	16:46 12 Feb 2020
168H	2	09:02 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Kelso Creek (213430)
Intensity-Frequency-Duration
1 - 29 February 2020

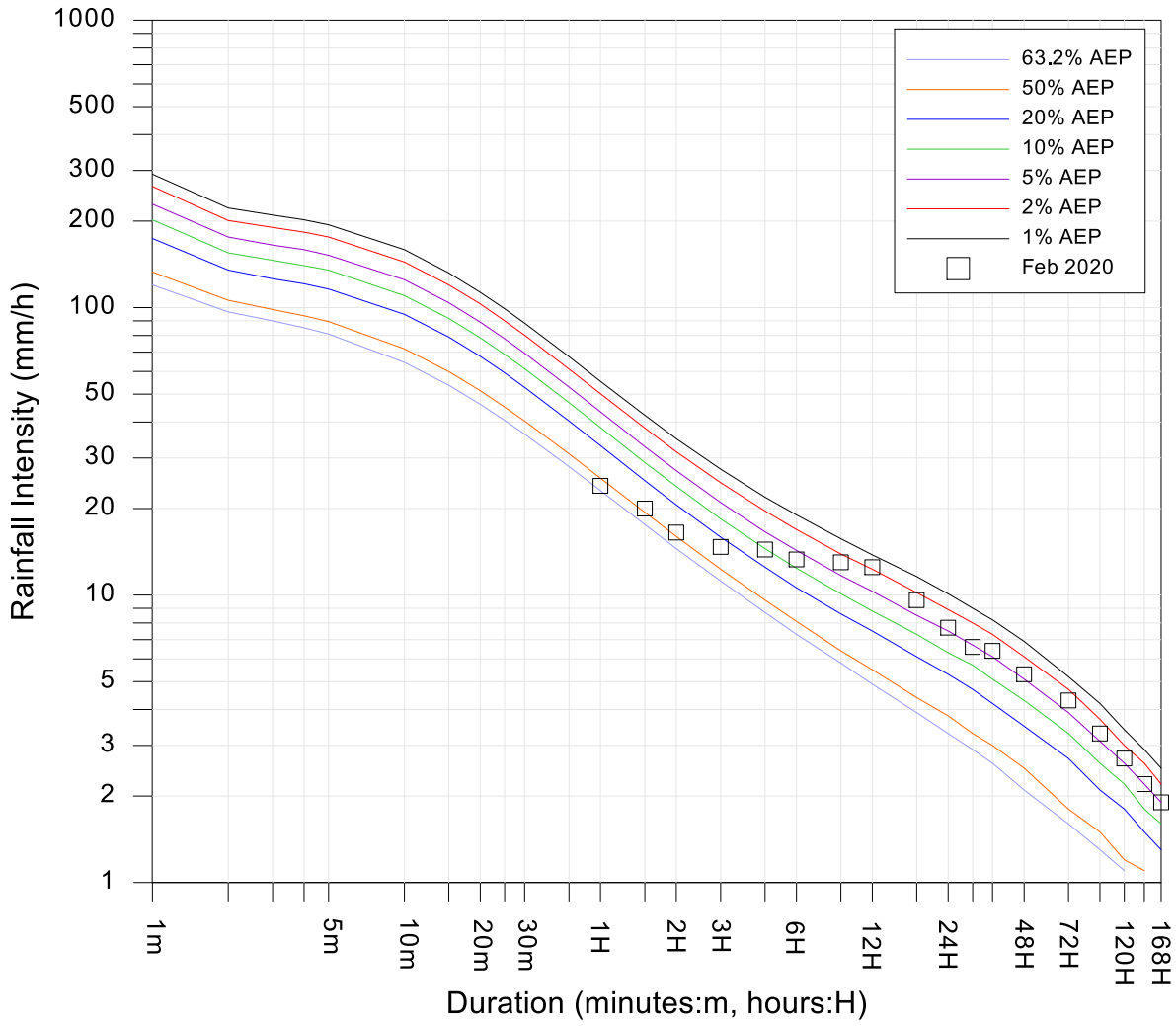
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.38

IFD_213430_FigureC.38.pdf

Site Owner: BoM
Latitude: -33.927 Longitude:150.974

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	24	14:08 09 Feb 2020
1.5H	20	14:38 09 Feb 2020
2H	16.5	16:30 09 Feb 2020
3H	14.7	16:08 09 Feb 2020
5H	14.4	17:38 09 Feb 2020
6H	13.3	19:08 09 Feb 2020
9H	13	16:56 09 Feb 2020
12H	12.5	19:56 09 Feb 2020
18H	9.6	20:52 09 Feb 2020
24H	7.7	01:13 10 Feb 2020
30H	6.6	21:30 09 Feb 2020
36H	6.4	20:30 09 Feb 2020
48H	5.3	00:24 10 Feb 2020
72H	4.3	00:35 10 Feb 2020
96H	3.3	09:10 10 Feb 2020
120H	2.7	21:38 11 Feb 2020
144H	2.2	09:10 12 Feb 2020
168H	1.9	21:38 13 Feb 2020

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

Milperra Bridge (66168)
Intensity-Frequency-Duration
1 - 29 February 2020

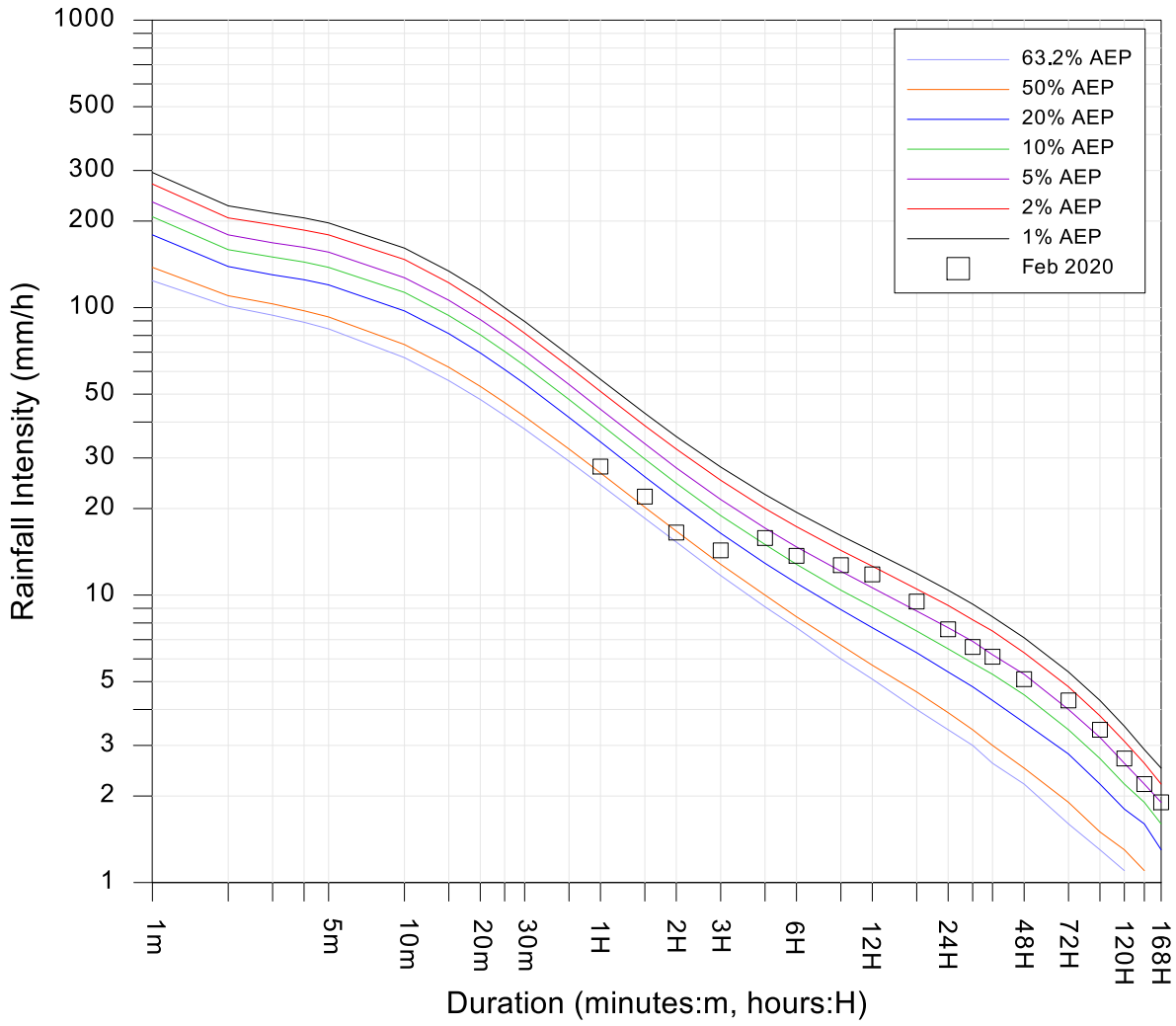
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.39

IFD_66168_FigureC.39.pdf

Site Owner: BoM
Latitude: -33.9244 Longitude:150.997

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	28	19:59 02 Feb 2020
1.5H	22	17:29 09 Feb 2020
2H	16.5	17:59 09 Feb 2020
3H	14.3	17:59 09 Feb 2020
5H	15.8	17:29 09 Feb 2020
6H	13.7	17:59 09 Feb 2020
9H	12.7	17:59 09 Feb 2020
12H	11.8	20:59 09 Feb 2020
18H	9.5	21:59 09 Feb 2020
24H	7.6	01:59 10 Feb 2020
30H	6.6	21:59 09 Feb 2020
36H	6.1	20:59 09 Feb 2020
48H	5.1	01:59 10 Feb 2020
72H	4.3	01:59 10 Feb 2020
96H	3.4	08:59 10 Feb 2020
120H	2.7	00:59 11 Feb 2020
144H	2.2	00:59 12 Feb 2020
168H	1.9	08:59 13 Feb 2020

Only hourly data could be provided by BoM. IFD results for durations of less than 1 hour have been removed.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Bankstown Airport AWS (66137)
Intensity-Frequency-Duration
1 - 29 February 2020

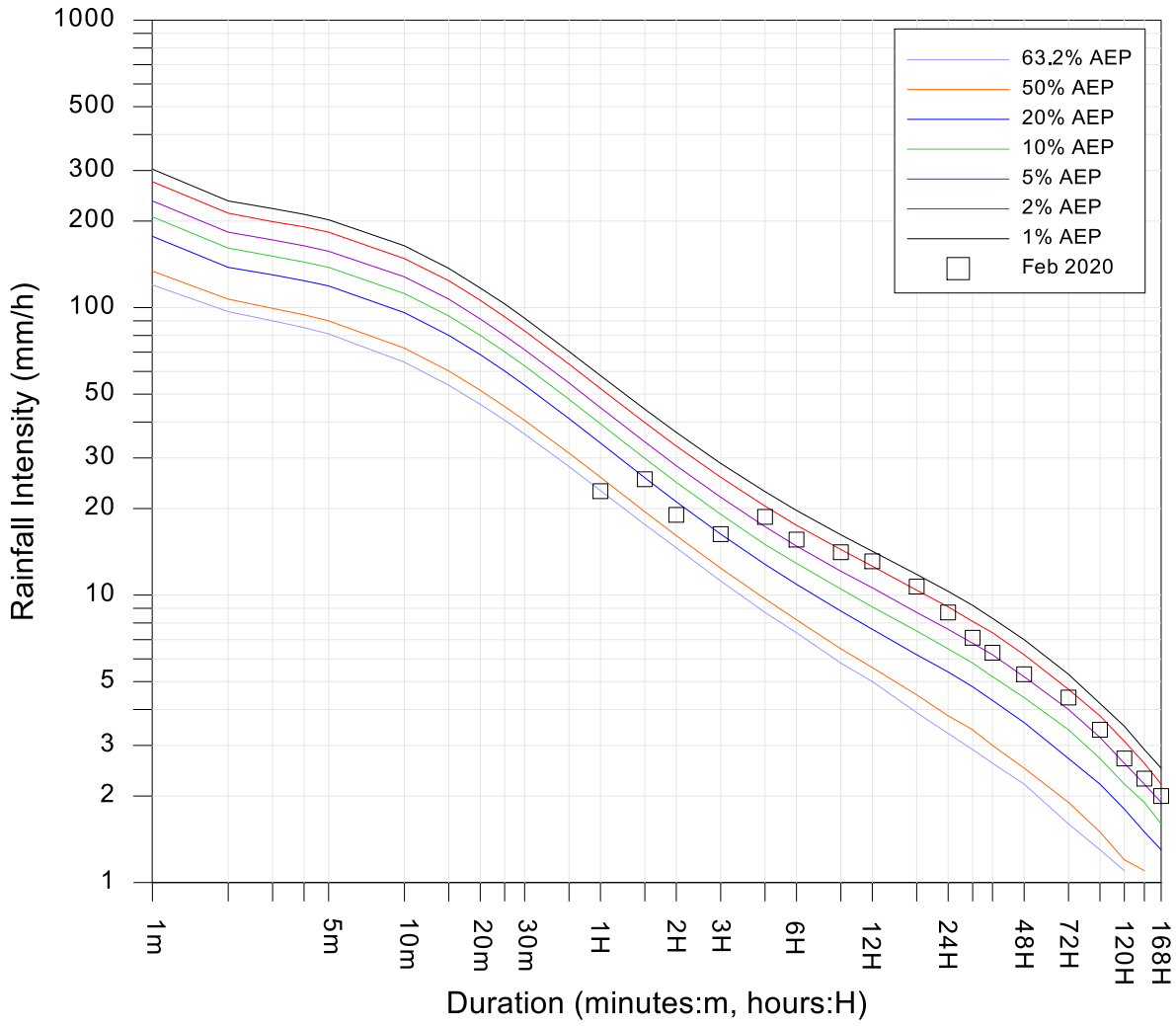
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.40.

IFD_66137_FigureC.40..pdf

Site Owner: BoM
Latitude: -33.9917 Longitude:150.949

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	23	20:59 09 Feb 2020
1.5H	25.3	20:29 09 Feb 2020
2H	19	20:59 09 Feb 2020
3H	16.3	20:59 09 Feb 2020
5H	18.7	20:29 09 Feb 2020
6H	15.6	21:59 09 Feb 2020
9H	14.1	21:59 09 Feb 2020
12H	13.1	21:59 09 Feb 2020
18H	10.7	21:59 09 Feb 2020
24H	8.7	01:59 10 Feb 2020
30H	7.1	01:59 10 Feb 2020
36H	6.3	01:59 10 Feb 2020
48H	5.3	01:59 10 Feb 2020
72H	4.4	01:59 10 Feb 2020
96H	3.4	04:59 10 Feb 2020
120H	2.7	04:59 11 Feb 2020
144H	2.3	21:59 12 Feb 2020
168H	2	15:59 13 Feb 2020

Only hourly data could be provided by BoM. IFD results for durations of less than 1 hour have been removed.

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Holsworthy Aerodrome AWS (66161)
Intensity-Frequency-Duration
1 - 29 February 2020

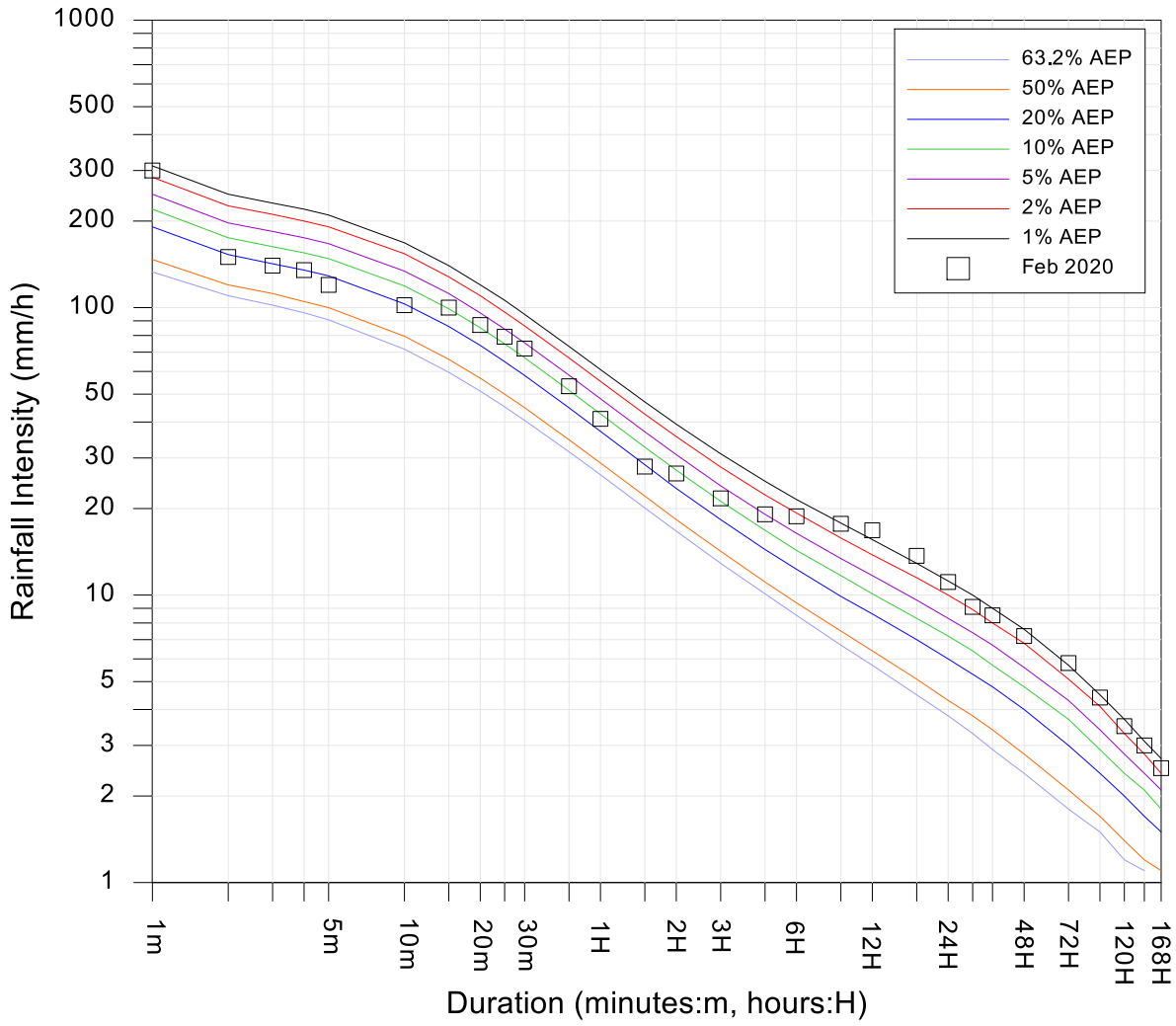
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.41

IFD_66161_FigureC.41.pdf

Site Owner: BoM
Latitude: -33.972 Longitude:151.061

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	300	12:30 09 Feb 2020
2m	150	18:29 09 Feb 2020
3m	140	18:30 09 Feb 2020
4m	135	18:31 02 Feb 2020
5m	120	18:32 02 Feb 2020
10m	102	18:32 02 Feb 2020
15m	100	18:31 02 Feb 2020
20m	87	18:36 02 Feb 2020
25m	79.2	18:41 02 Feb 2020
30m	72	18:46 02 Feb 2020
45m	53.3	19:01 02 Feb 2020
1H	41	19:14 02 Feb 2020
1.5H	28	19:17 09 Feb 2020
2H	26.5	20:11 09 Feb 2020
3H	21.7	20:08 09 Feb 2020
5H	19.1	20:12 09 Feb 2020
6H	18.8	18:57 09 Feb 2020
9H	17.7	20:48 09 Feb 2020
12H	16.8	19:59 09 Feb 2020
18H	13.7	00:11 10 Feb 2020
24H	11.1	00:53 10 Feb 2020
30H	9.1	00:32 10 Feb 2020
36H	8.5	00:23 10 Feb 2020
48H	7.2	00:38 10 Feb 2020
72H	5.8	00:58 10 Feb 2020
96H	4.4	16:26 10 Feb 2020
120H	3.5	16:26 11 Feb 2020
144H	3	21:46 12 Feb 2020
168H	2.5	16:26 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Peakhurst Golf Club (66148)
Intensity-Frequency-Duration
1 - 29 February 2020

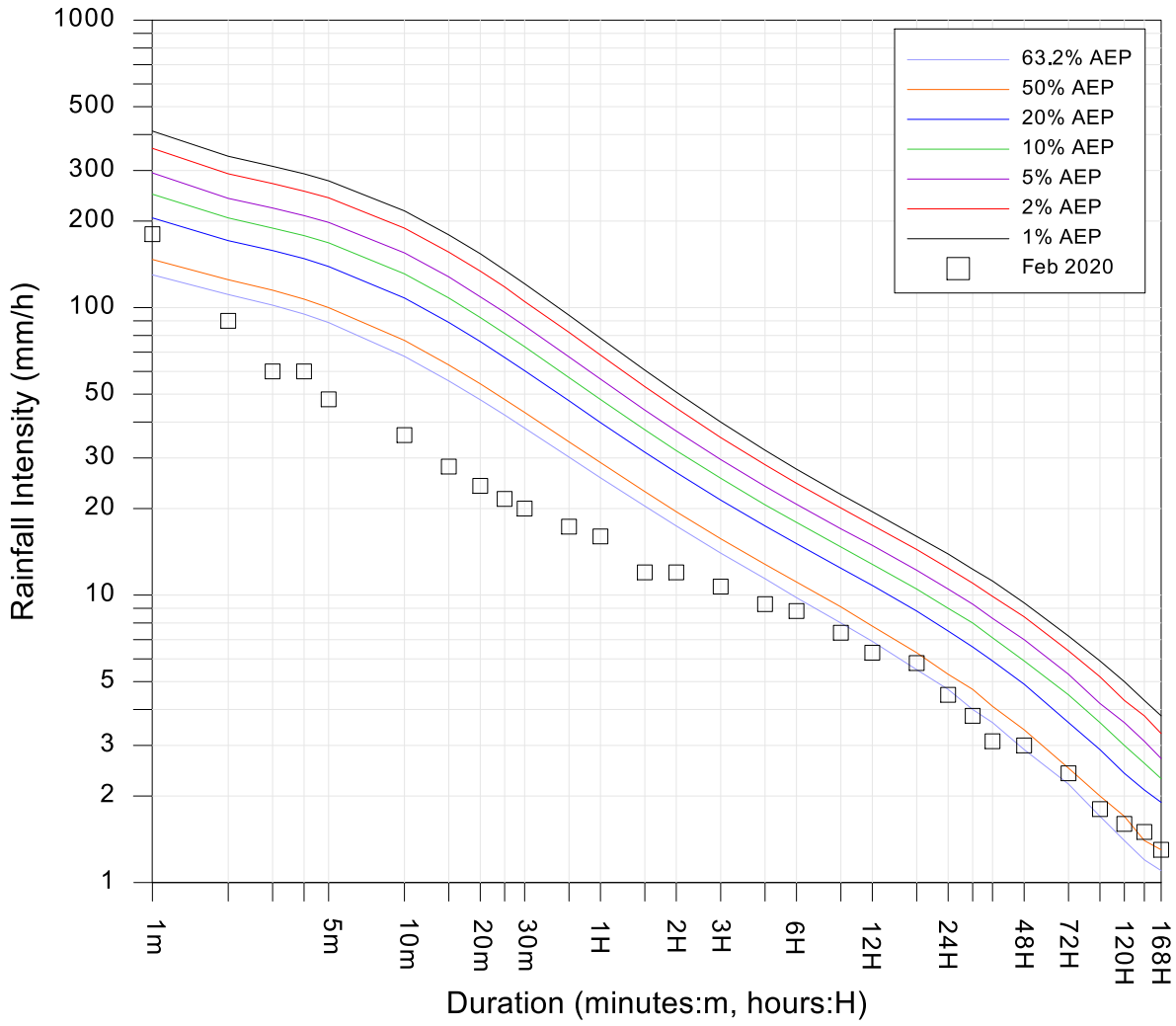
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.42

IFD_66148_FigureC.42.pdf

Site Owner: Shoalhaven City Council
Latitude: -34.907 Longitude:150.736

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	180	12:52 08 Feb 2020
2m	90	20:41 18 Feb 2020
3m	60	20:43 18 Feb 2020
4m	60	20:43 18 Feb 2020
5m	48	20:44 18 Feb 2020
10m	36	15:25 12 Feb 2020
15m	28	20:50 18 Feb 2020
20m	24	15:35 12 Feb 2020
25m	21.6	15:37 12 Feb 2020
30m	20	15:42 12 Feb 2020
45m	17.3	04:16 10 Feb 2020
1H	16	04:24 10 Feb 2020
1.5H	12	16:39 09 Feb 2020
2H	12	16:47 09 Feb 2020
3H	10.7	17:21 09 Feb 2020
5H	9.3	17:42 09 Feb 2020
6H	8.8	17:44 09 Feb 2020
9H	7.4	20:29 09 Feb 2020
12H	6.3	22:35 09 Feb 2020
18H	5.8	04:35 10 Feb 2020
24H	4.5	07:53 10 Feb 2020
30H	3.8	13:53 10 Feb 2020
36H	3.1	19:53 10 Feb 2020
48H	3	07:01 10 Feb 2020
72H	2.4	15:25 10 Feb 2020
96H	1.8	02:05 11 Feb 2020
120H	1.6	16:49 12 Feb 2020
144H	1.5	09:36 13 Feb 2020
168H	1.3	02:05 14 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Greenwell Point (568180)
Intensity-Frequency-Duration
1 - 29 February 2020

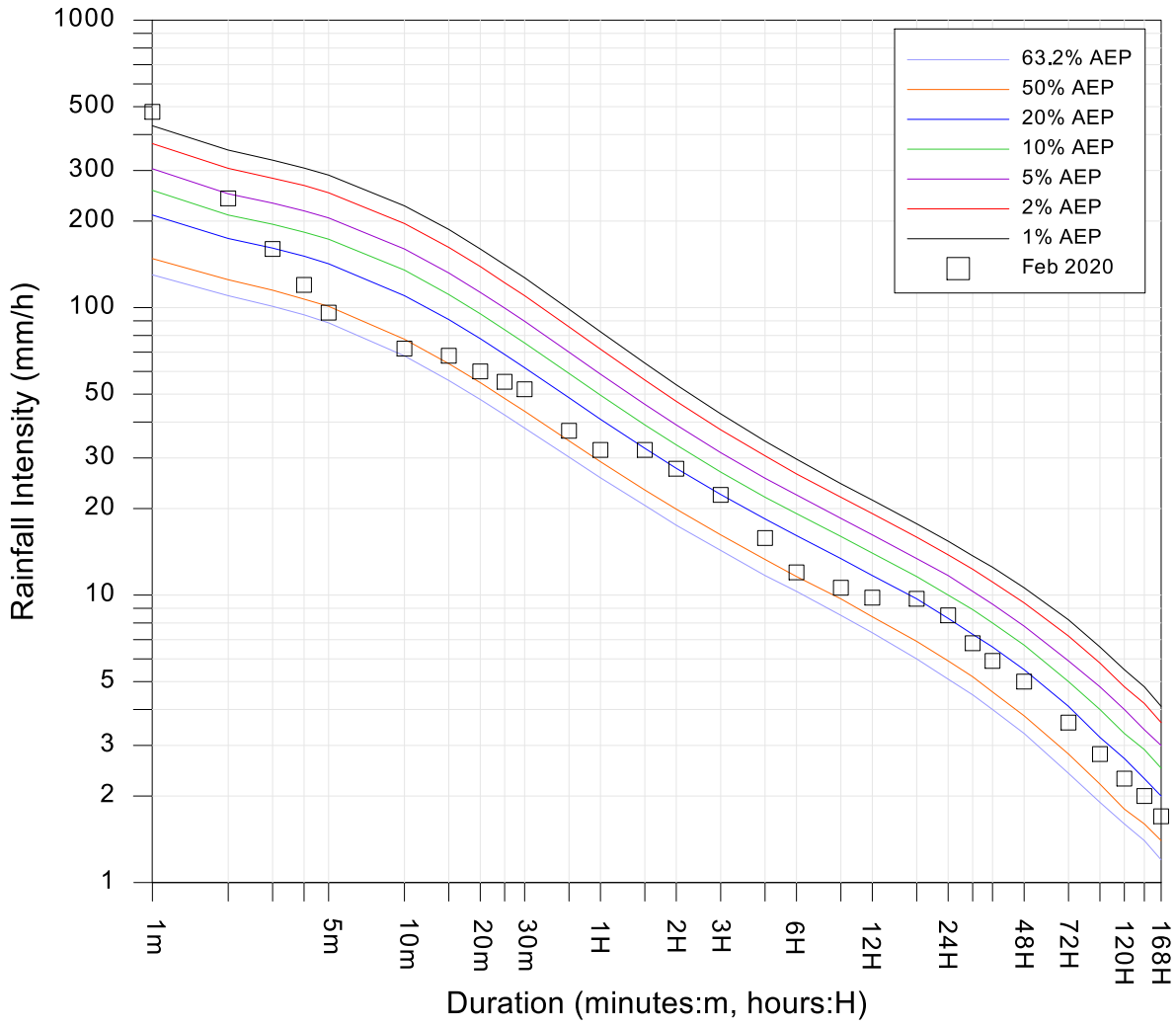
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.43

IFD_568180_FigureC.43.pdf

Site Owner: Shoalhaven City Council
Latitude: -34.789 Longitude:150.708

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	480	21:22 09 Feb 2020
2m	240	21:23 09 Feb 2020
3m	160	21:24 09 Feb 2020
4m	120	21:25 09 Feb 2020
5m	96	05:32 10 Feb 2020
10m	72	04:32 10 Feb 2020
15m	68	04:33 10 Feb 2020
20m	60	04:38 10 Feb 2020
25m	55.2	04:33 10 Feb 2020
30m	52	04:38 10 Feb 2020
45m	37.3	04:43 10 Feb 2020
1H	32	04:33 10 Feb 2020
1.5H	32	05:38 10 Feb 2020
2H	27.5	05:33 10 Feb 2020
3H	22.3	05:34 10 Feb 2020
5H	15.8	05:53 10 Feb 2020
6H	12	07:23 10 Feb 2020
9H	10.6	06:21 10 Feb 2020
12H	9.8	05:47 10 Feb 2020
18H	9.7	05:47 10 Feb 2020
24H	8.5	06:18 10 Feb 2020
30H	6.8	08:35 10 Feb 2020
36H	5.9	06:51 10 Feb 2020
48H	5	06:12 10 Feb 2020
72H	3.6	16:51 10 Feb 2020
96H	2.8	16:51 11 Feb 2020
120H	2.3	16:51 12 Feb 2020
144H	2	16:51 13 Feb 2020
168H	1.7	03:49 14 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Broughton Creek (568226)
Intensity-Frequency-Duration
1 - 29 February 2020

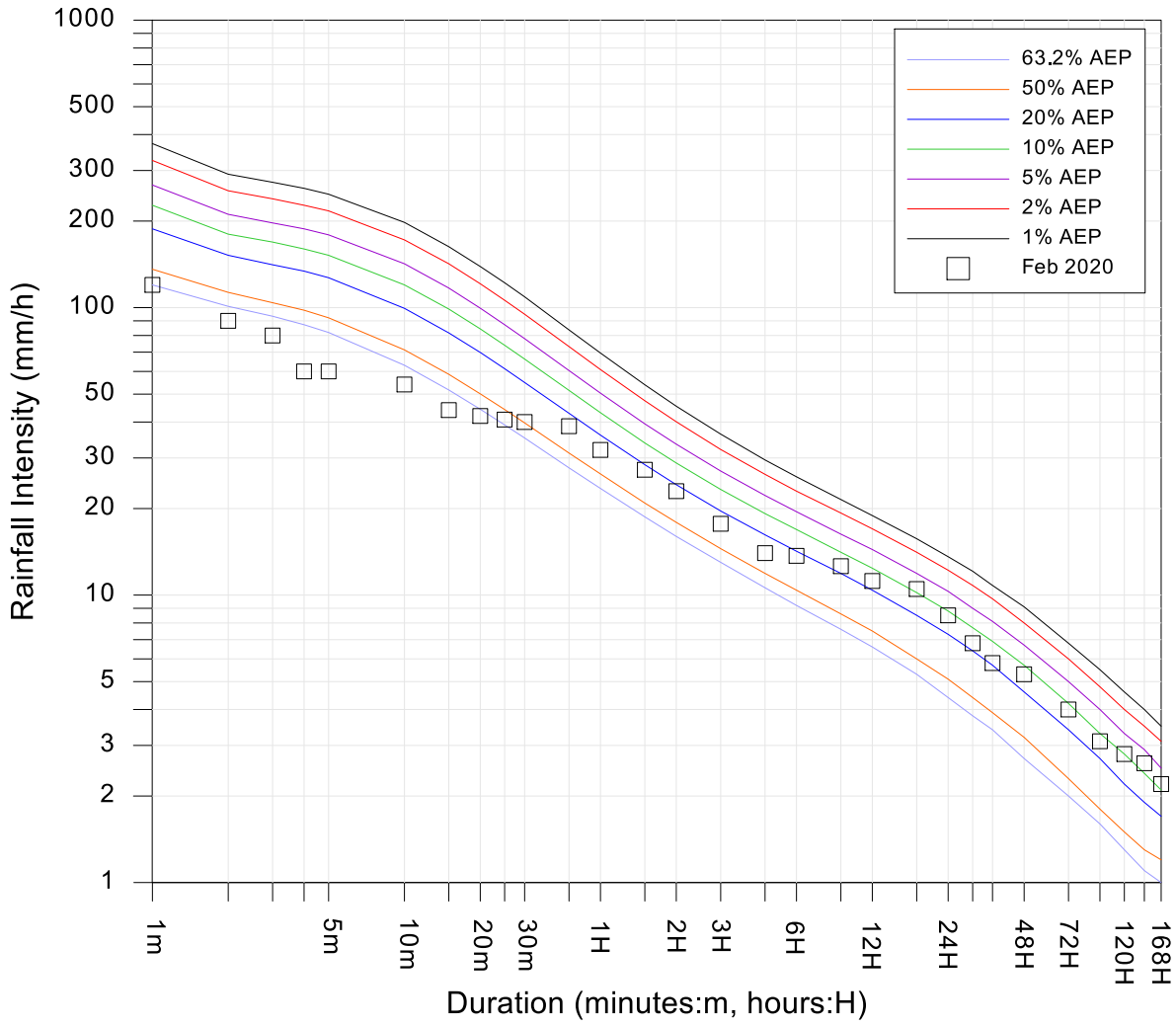
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.44

IFD_568226_FigureC.44.pdf

Site Owner: Shoalhaven City Council
Latitude: -34.867 Longitude:150.605

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	120	16:12 12 Feb 2020
2m	90	16:12 12 Feb 2020
3m	80	15:40 12 Feb 2020
4m	60	16:12 12 Feb 2020
5m	60	16:12 12 Feb 2020
10m	54	15:47 12 Feb 2020
15m	44	16:13 12 Feb 2020
20m	42	16:13 12 Feb 2020
25m	40.8	16:02 12 Feb 2020
30m	40	16:12 12 Feb 2020
45m	38.7	16:13 12 Feb 2020
1H	32	16:22 12 Feb 2020
1.5H	27.3	05:48 10 Feb 2020
2H	23	06:04 10 Feb 2020
3H	17.7	05:51 10 Feb 2020
5H	14	19:37 09 Feb 2020
6H	13.7	20:16 09 Feb 2020
9H	12.6	20:38 09 Feb 2020
12H	11.2	22:38 09 Feb 2020
18H	10.5	05:50 10 Feb 2020
24H	8.5	07:34 10 Feb 2020
30H	6.8	06:32 10 Feb 2020
36H	5.8	10:01 10 Feb 2020
48H	5.3	06:08 10 Feb 2020
72H	4	06:30 10 Feb 2020
96H	3.1	01:59 11 Feb 2020
120H	2.8	23:41 12 Feb 2020
144H	2.6	06:30 13 Feb 2020
168H	2.2	01:59 14 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Nowra Boat Shed (Shoalhaven River) (68213)
Intensity-Frequency-Duration
1 - 29 February 2020

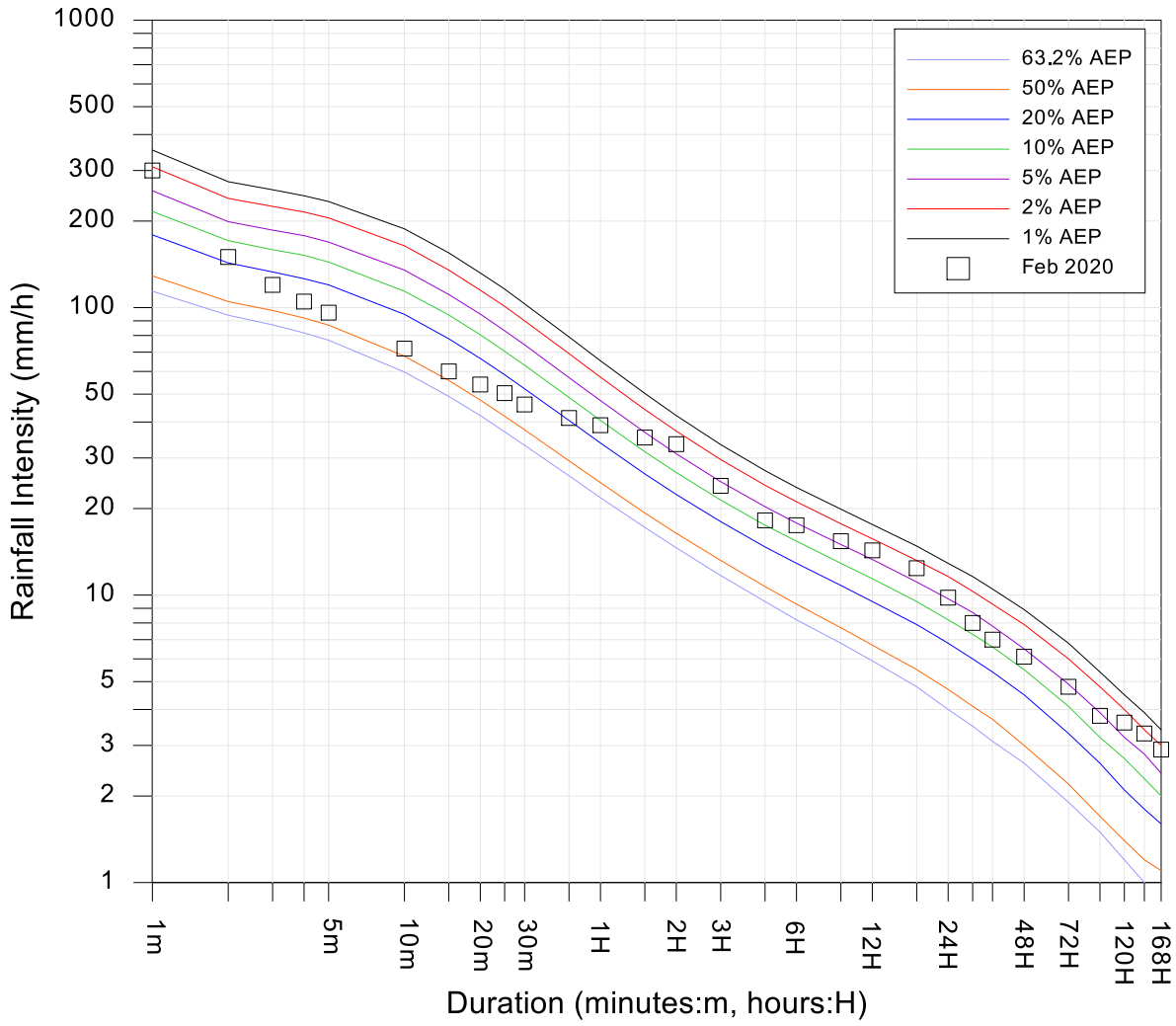
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.45

IFD_68213_FigureC.45.pdf

Site Owner: BoM
Latitude: -34.842 Longitude:150.424

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	300	22:06 09 Feb 2020
2m	150	22:07 09 Feb 2020
3m	120	16:16 12 Feb 2020
4m	105	05:08 10 Feb 2020
5m	96	16:16 12 Feb 2020
10m	72	20:44 18 Feb 2020
15m	60	16:29 11 Feb 2020
20m	54	16:32 11 Feb 2020
25m	50.4	16:36 12 Feb 2020
30m	46	16:41 12 Feb 2020
45m	41.3	16:58 12 Feb 2020
1H	39	17:11 12 Feb 2020
1.5H	35.3	16:52 12 Feb 2020
2H	33.5	17:12 12 Feb 2020
3H	24	18:12 12 Feb 2020
5H	18.2	18:49 09 Feb 2020
6H	17.5	18:01 09 Feb 2020
9H	15.4	21:18 09 Feb 2020
12H	14.3	22:45 09 Feb 2020
18H	12.4	05:40 10 Feb 2020
24H	9.8	08:00 10 Feb 2020
30H	8	05:28 10 Feb 2020
36H	7	06:01 10 Feb 2020
48H	6.1	06:27 10 Feb 2020
72H	4.8	05:56 10 Feb 2020
96H	3.8	08:00 13 Feb 2020
120H	3.6	00:09 13 Feb 2020
144H	3.3	05:56 13 Feb 2020
168H	2.9	12:29 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Grassy Gully (68233)
Intensity-Frequency-Duration
1 - 29 February 2020

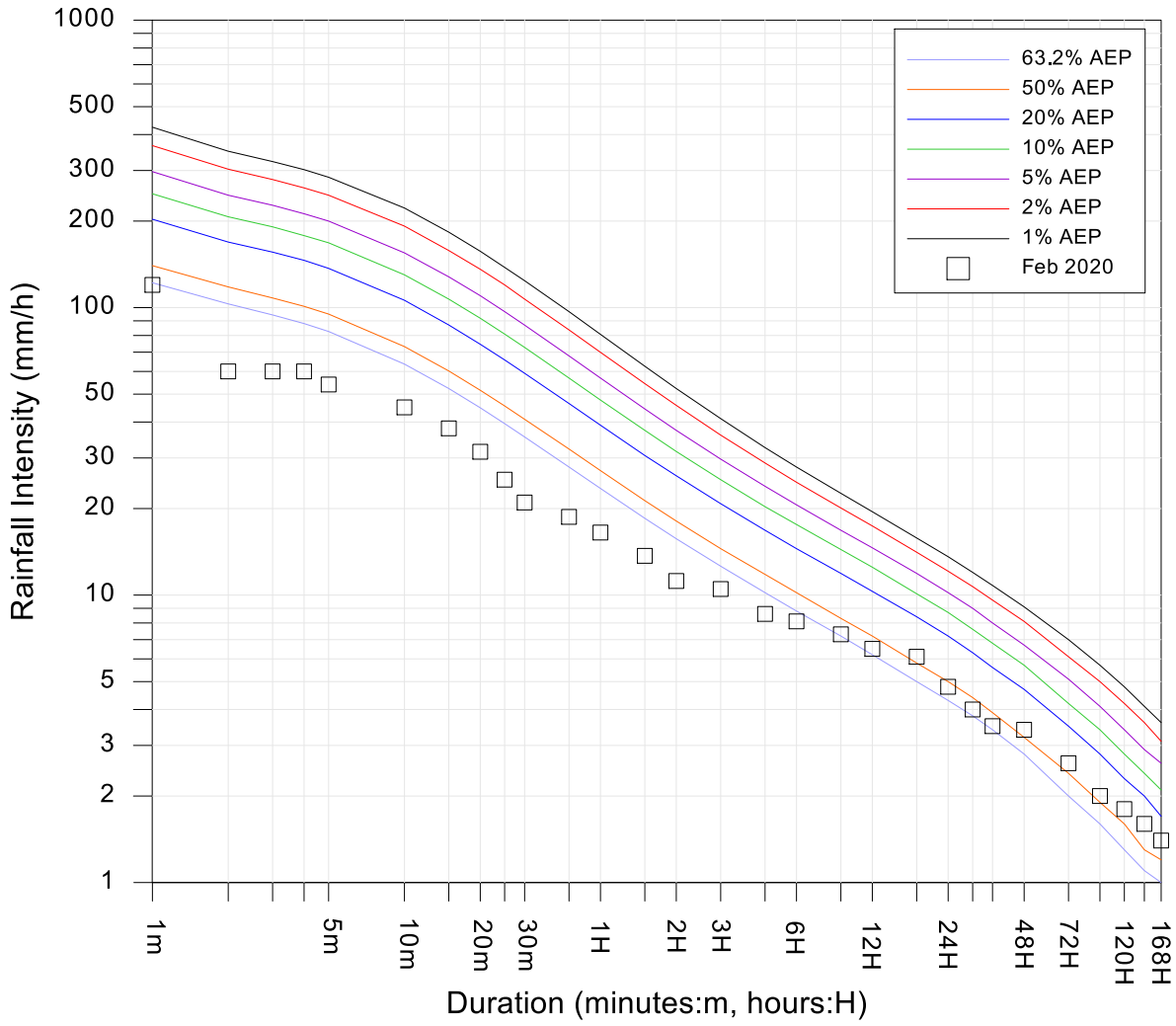
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.46

IFD_68233_FigureC.46.pdf

Site Owner: Shoalhaven City Council
Latitude: -35.099 Longitude:150.594

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	120	17:51 09 Feb 2020
2m	60	23:44 12 Feb 2020
3m	60	04:04 10 Feb 2020
4m	60	14:59 08 Feb 2020
5m	54	15:02 08 Feb 2020
10m	45	15:04 08 Feb 2020
15m	38	15:03 08 Feb 2020
20m	31.5	15:06 08 Feb 2020
25m	25.2	15:11 08 Feb 2020
30m	21	15:16 08 Feb 2020
45m	18.7	04:39 10 Feb 2020
1H	16.5	04:54 10 Feb 2020
1.5H	13.7	05:25 10 Feb 2020
2H	11.2	05:30 10 Feb 2020
3H	10.5	15:03 08 Feb 2020
5H	8.6	19:23 09 Feb 2020
6H	8.1	20:48 09 Feb 2020
9H	7.3	22:05 09 Feb 2020
12H	6.5	23:21 09 Feb 2020
18H	6.1	05:42 10 Feb 2020
24H	4.8	05:53 10 Feb 2020
30H	4	10:20 10 Feb 2020
36H	3.5	23:49 09 Feb 2020
48H	3.4	09:14 10 Feb 2020
72H	2.6	08:35 10 Feb 2020
96H	2	06:49 11 Feb 2020
120H	1.8	23:51 12 Feb 2020
144H	1.6	08:35 13 Feb 2020
168H	1.4	12:59 13 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Island Point Road (568200)
Intensity-Frequency-Duration
1 - 29 February 2020

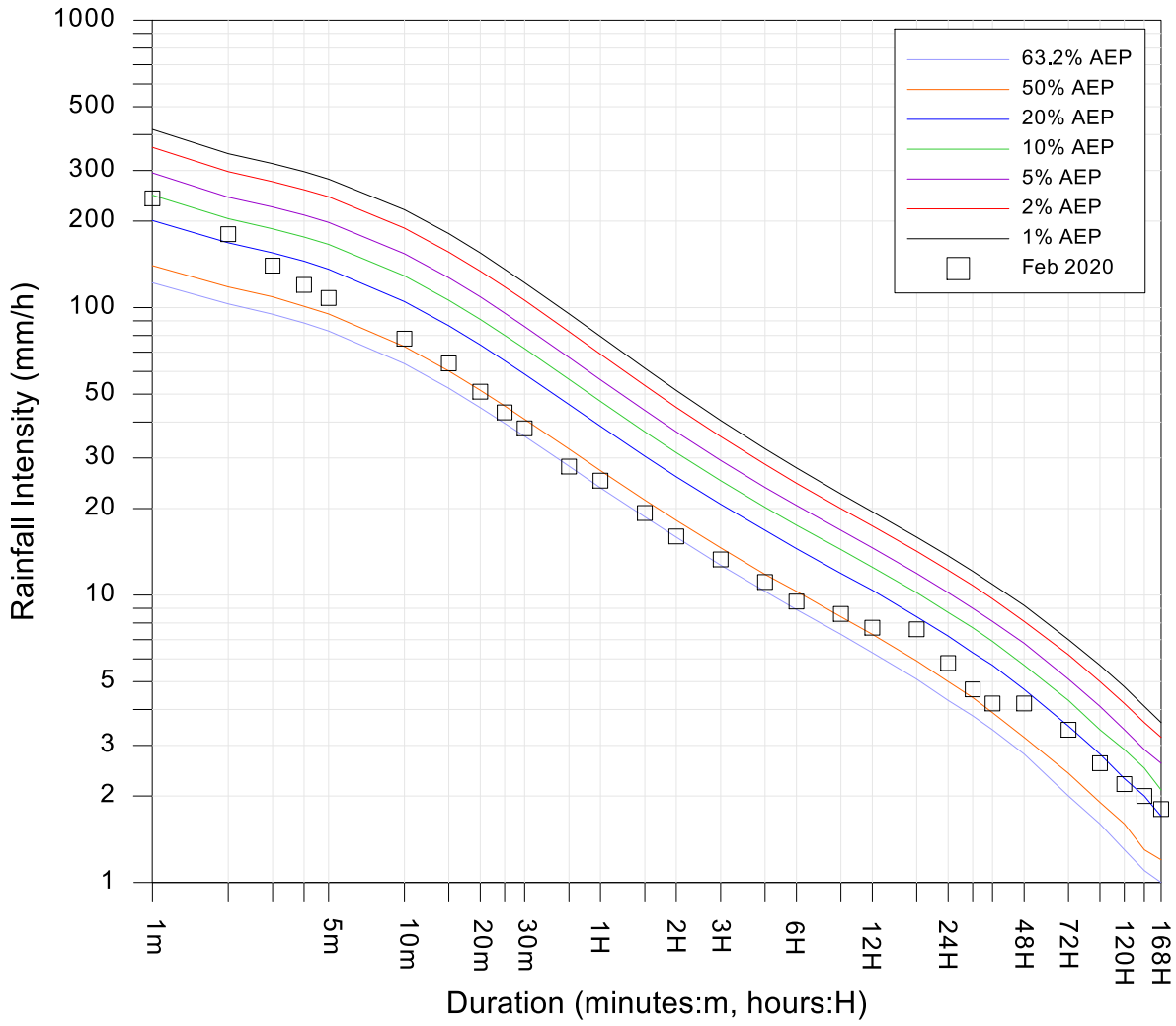
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.47

IFD_568200_FigureC.47.pdf

Site Owner: Shoalhaven City Council
Latitude: -35.06 Longitude:150.582

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	240	04:09 10 Feb 2020
2m	180	04:10 10 Feb 2020
3m	140	04:11 10 Feb 2020
4m	120	11:47 08 Feb 2020
5m	108	04:13 10 Feb 2020
10m	78	04:18 10 Feb 2020
15m	64	04:23 10 Feb 2020
20m	51	04:28 10 Feb 2020
25m	43.2	04:33 10 Feb 2020
30m	38	04:38 10 Feb 2020
45m	28	04:53 10 Feb 2020
1H	25	05:08 10 Feb 2020
1.5H	19.3	05:19 10 Feb 2020
2H	16	05:22 10 Feb 2020
3H	13.3	05:21 10 Feb 2020
5H	11.1	16:11 08 Feb 2020
6H	9.5	20:35 09 Feb 2020
9H	8.6	23:07 09 Feb 2020
12H	7.7	23:53 09 Feb 2020
18H	7.6	05:53 10 Feb 2020
24H	5.8	07:30 10 Feb 2020
30H	4.7	12:22 10 Feb 2020
36H	4.2	23:41 09 Feb 2020
48H	4.2	07:48 10 Feb 2020
72H	3.4	06:55 10 Feb 2020
96H	2.6	06:55 11 Feb 2020
120H	2.2	23:49 12 Feb 2020
144H	2	08:47 13 Feb 2020
168H	1.8	06:55 14 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Tomerong Creek (568202)
Intensity-Frequency-Duration
1 - 29 February 2020

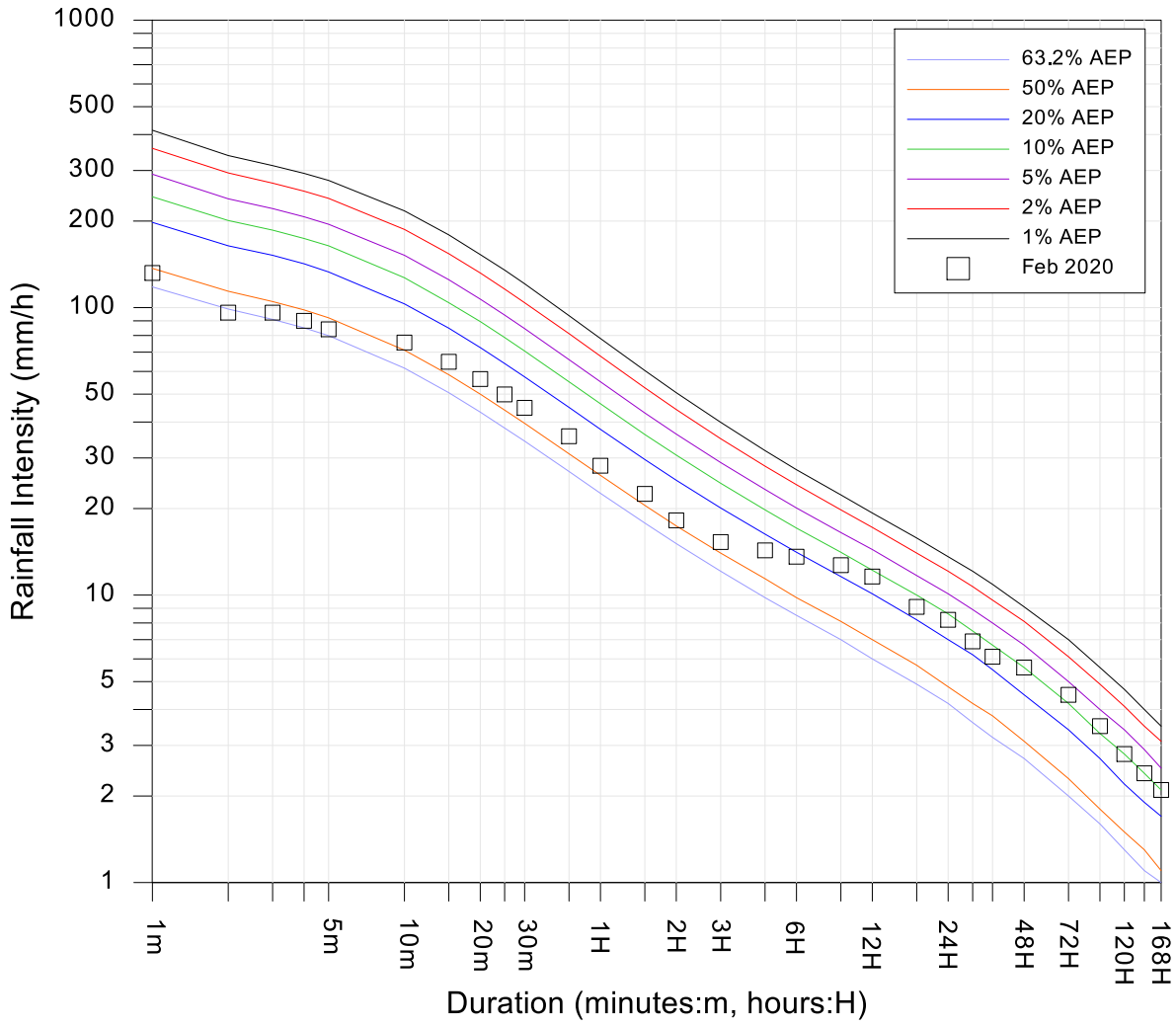
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.48

IFD_568202_FigureC.48.pdf

Site Owner: Shoalhaven City Council
Latitude: -35.146 Longitude:150.446

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	132	12:30 08 Feb 2020
2m	96	12:31 08 Feb 2020
3m	96	12:32 08 Feb 2020
4m	90	12:30 08 Feb 2020
5m	84	12:31 08 Feb 2020
10m	75.6	12:32 08 Feb 2020
15m	64.8	12:37 08 Feb 2020
20m	56.4	12:41 08 Feb 2020
25m	49.9	12:46 08 Feb 2020
30m	44.8	12:52 08 Feb 2020
45m	35.7	13:06 08 Feb 2020
1H	28.2	13:20 08 Feb 2020
1.5H	22.5	13:51 08 Feb 2020
2H	18.2	14:20 08 Feb 2020
3H	15.3	20:01 09 Feb 2020
5H	14.3	20:55 09 Feb 2020
6H	13.6	21:18 09 Feb 2020
9H	12.7	23:48 09 Feb 2020
12H	11.6	01:08 10 Feb 2020
18H	9.1	07:47 10 Feb 2020
24H	8.2	12:19 10 Feb 2020
30H	6.9	16:37 10 Feb 2020
36H	6.1	16:37 10 Feb 2020
48H	5.6	12:20 10 Feb 2020
72H	4.5	16:22 10 Feb 2020
96H	3.5	08:48 11 Feb 2020
120H	2.8	07:05 12 Feb 2020
144H	2.4	07:40 13 Feb 2020
168H	2.1	07:05 14 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Jerrawangla (568204)
Intensity-Frequency-Duration
1 - 29 February 2020

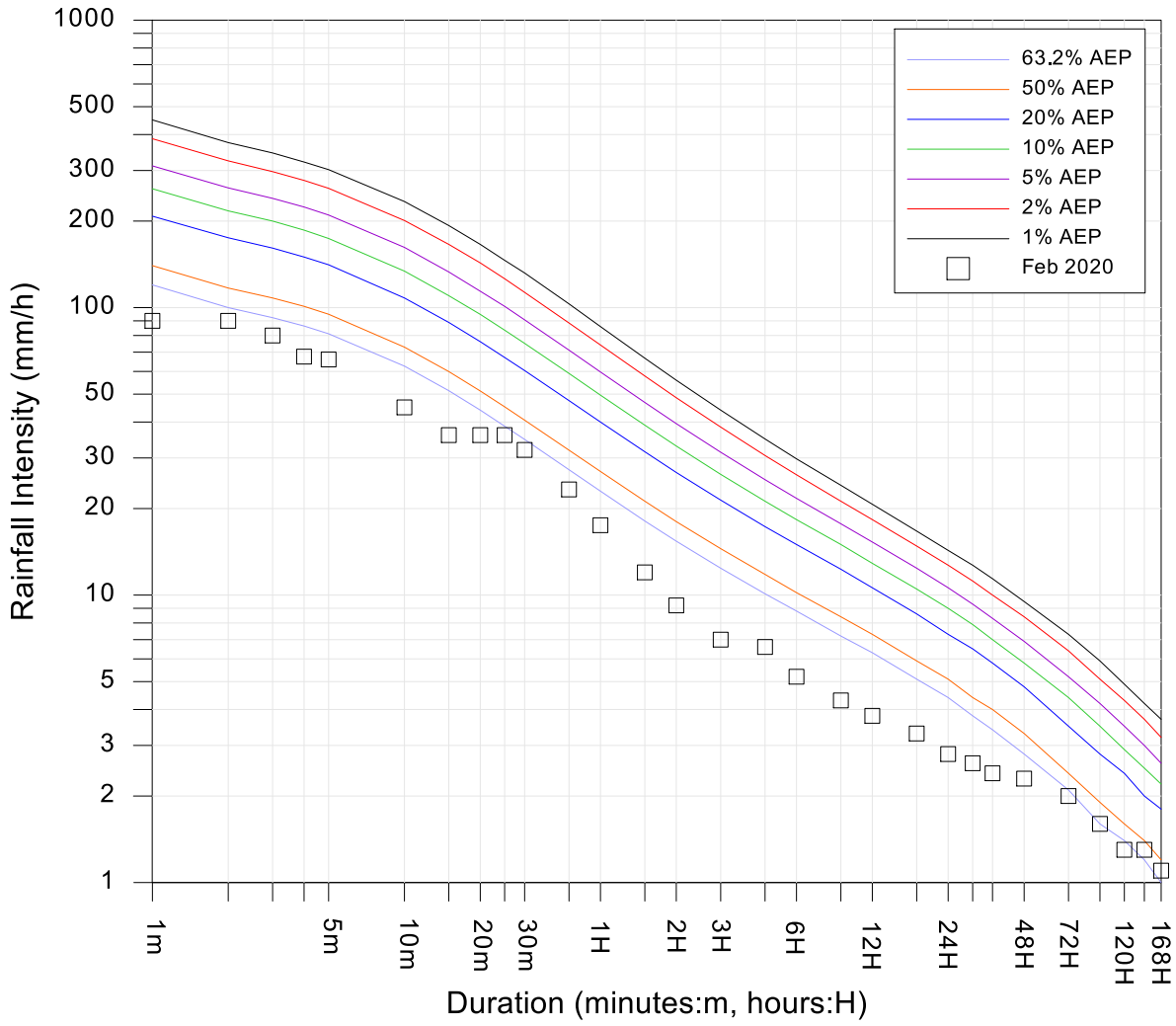
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.49

IFD_568204_FigureC.49.pdf

Site Owner: CCSD
Latitude: -35.2692 Longitude:150.5

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	90	05:24 08 Feb 2020
2m	90	05:11 08 Feb 2020
3m	80	05:12 08 Feb 2020
4m	67.5	05:12 08 Feb 2020
5m	66	05:12 08 Feb 2020
10m	45	05:32 08 Feb 2020
15m	36	05:37 08 Feb 2020
20m	36	05:29 08 Feb 2020
25m	36	05:31 08 Feb 2020
30m	32	05:37 08 Feb 2020
45m	23.3	05:51 08 Feb 2020
1H	17.5	06:06 08 Feb 2020
1.5H	12	05:52 08 Feb 2020
2H	9.2	06:01 08 Feb 2020
3H	7	05:42 08 Feb 2020
5H	6.6	05:47 08 Feb 2020
6H	5.2	06:15 08 Feb 2020
9H	4.3	21:08 09 Feb 2020
12H	3.8	13:17 08 Feb 2020
18H	3.3	05:12 10 Feb 2020
24H	2.8	04:28 10 Feb 2020
30H	2.6	14:11 10 Feb 2020
36H	2.4	15:43 10 Feb 2020
48H	2.3	05:06 10 Feb 2020
72H	2	16:47 10 Feb 2020
96H	1.6	03:12 11 Feb 2020
120H	1.3	03:12 12 Feb 2020
144H	1.3	08:47 13 Feb 2020
168H	1.1	03:12 14 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Lake Conjola Downstream (216420D)
Intensity-Frequency-Duration
1 - 29 February 2020

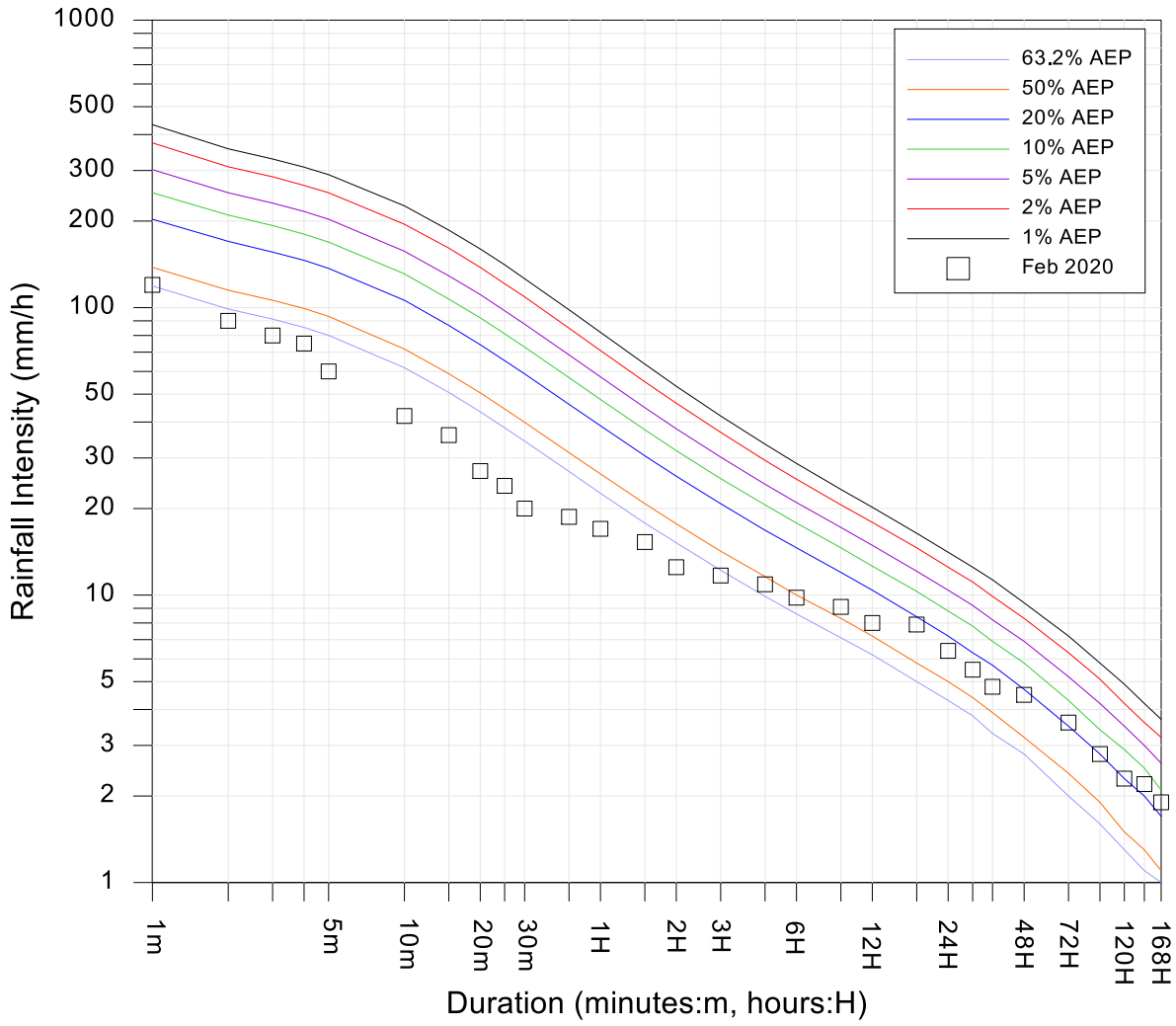
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.50.

IFD_216420D_FigureC.50..pdf

Site Owner: Shoalhaven City Council
Latitude: -35.247 Longitude:150.437

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	120	02:49 13 Feb 2020
2m	90	06:11 09 Feb 2020
3m	80	06:12 09 Feb 2020
4m	75	06:12 09 Feb 2020
5m	60	06:13 09 Feb 2020
10m	42	09:17 13 Feb 2020
15m	36	09:20 13 Feb 2020
20m	27	09:27 13 Feb 2020
25m	24	09:30 13 Feb 2020
30m	20	09:35 13 Feb 2020
45m	18.7	05:25 10 Feb 2020
1H	17	05:44 10 Feb 2020
1.5H	15.3	05:55 10 Feb 2020
2H	12.5	06:12 10 Feb 2020
3H	11.7	17:31 09 Feb 2020
5H	10.9	19:01 09 Feb 2020
6H	9.8	20:42 09 Feb 2020
9H	9.1	23:24 09 Feb 2020
12H	8	01:22 10 Feb 2020
18H	7.9	07:12 10 Feb 2020
24H	6.4	06:01 10 Feb 2020
30H	5.5	07:01 10 Feb 2020
36H	4.8	09:37 10 Feb 2020
48H	4.5	05:54 10 Feb 2020
72H	3.6	10:33 10 Feb 2020
96H	2.8	04:05 11 Feb 2020
120H	2.3	03:47 13 Feb 2020
144H	2.2	10:45 13 Feb 2020
168H	1.9	04:05 14 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Fishermans Repeater (568201)
Intensity-Frequency-Duration
1 - 29 February 2020

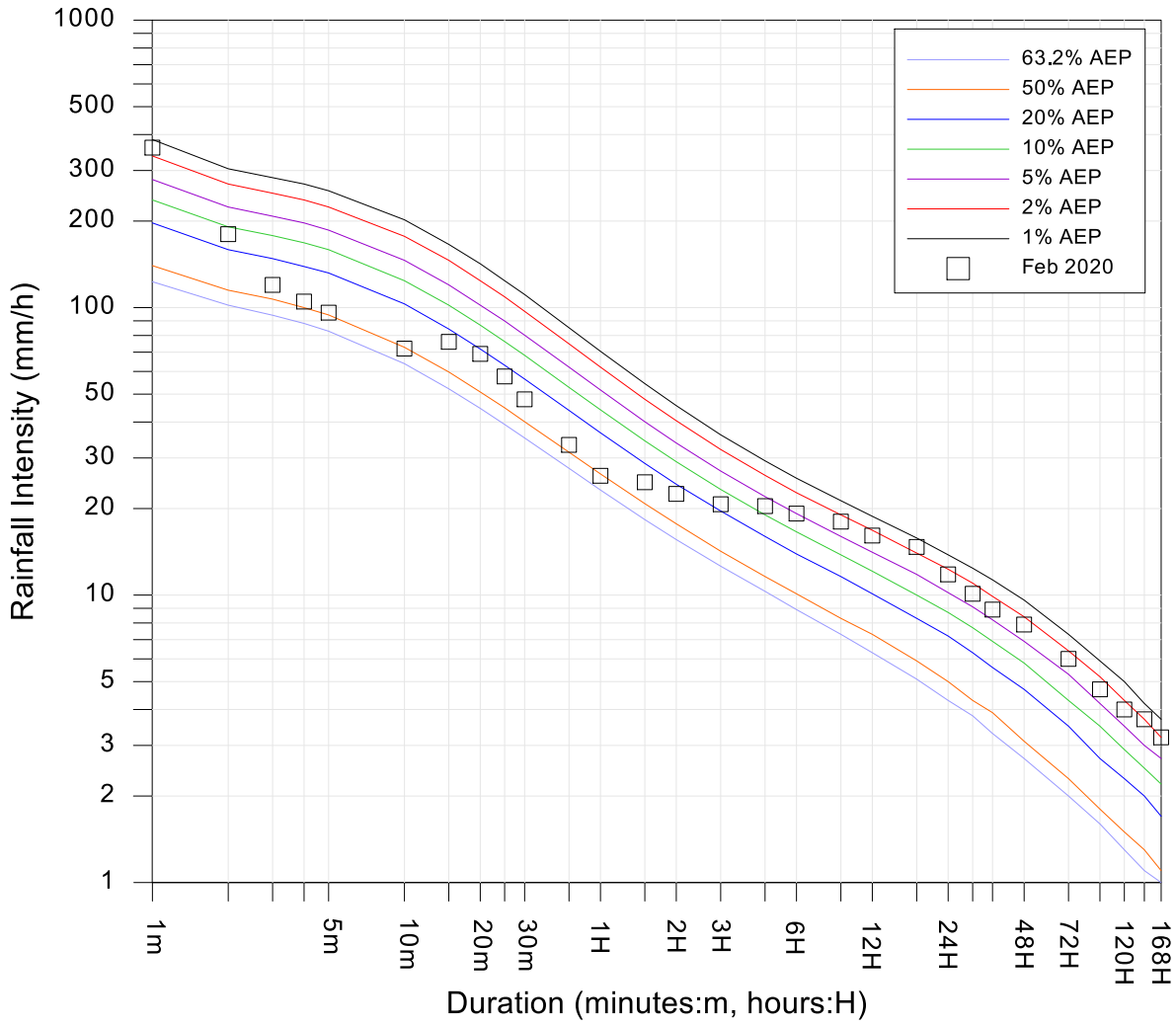
Manly Hydraulics Laboratory

Report MHL2752
Figure
C.51

IFD_568201_FigureC.51.pdf

Site Owner: Shoalhaven City Council
Latitude: -35.258 Longitude:150.341

AEP = Annual Exceedance Probability



Duration (minutes:m) (hours:H)	Rainfall Intensity (mm/hr)	Time/Date
1m	360	18:35 09 Feb 2020
2m	180	18:36 09 Feb 2020
3m	120	18:37 09 Feb 2020
4m	105	18:38 09 Feb 2020
5m	96	15:19 08 Feb 2020
10m	72	20:22 12 Feb 2020
15m	76	20:22 12 Feb 2020
20m	69	20:23 12 Feb 2020
25m	57.6	20:25 12 Feb 2020
30m	48	20:30 12 Feb 2020
45m	33.3	20:36 12 Feb 2020
1H	26	20:24 12 Feb 2020
1.5H	24.7	18:46 09 Feb 2020
2H	22.5	18:36 09 Feb 2020
3H	20.7	19:01 09 Feb 2020
5H	20.4	19:04 09 Feb 2020
6H	19.2	20:34 09 Feb 2020
9H	18	23:34 09 Feb 2020
12H	16.1	01:06 10 Feb 2020
18H	14.7	07:31 10 Feb 2020
24H	11.8	08:35 10 Feb 2020
30H	10.1	07:39 10 Feb 2020
36H	8.9	08:17 10 Feb 2020
48H	7.9	08:04 10 Feb 2020
72H	6	01:18 11 Feb 2020
96H	4.7	21:38 11 Feb 2020
120H	4	21:38 12 Feb 2020
144H	3.7	13:07 13 Feb 2020
168H	3.2	01:39 14 Feb 2020

Reference: Australian Rainfall and Runoff (2019)

NSW GOVERNMENT

Porters Creek Dam (568212)
Intensity-Frequency-Duration
1 - 29 February 2020

Manly Hydraulics Laboratory

Report MHL2752
Figure
C.52

IFD_568212_FigureC.52.pdf

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

Table D.1 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	Datum	Conversion to AHD (m)
Orara River at Karangi	204025	AHD	98.864
Orara River at Orange Grove	204068	AHD	105.734
Orara River at Glenreagh	204906	AHD	53.1
Orara River at Bawden Bridge	204041	AHD	1.86
Coopers Creek at Fairmeadow	203060	AHD	6.77
Coopers Creek at Repentance	203002	AHD	42.938
Coopers at Ewing Bridge (Corndale)	203024	AHD	9.588
Leycester Creek at Rock Valley	203010	AHD	13.196
Wilsons River at Lavertys Gap Weir	203062	AHD	72.65
Camden Weir	212216	AHD	55.278
Wallacia Weir	212202	AHD	26.596
Penrith	212201	AHD	14.139
Cattai Creek at Murphys Bridge	212059	AHD	20.270
Ropes Creek at Debrincat Ave	212049	AHD	23.962
North Richmond (WPS)	212200	AHD	0.529
Avon Dam Road	212204	AHD	239.983
Broughtons Pass	212233	AHD	130.614
Cataract Dam	212232	AHD	289.87
Golden Valley	212271	AHD	547.784
Greenstead	212009	AHD	28.935
Grose Wold	212291	Assumed datum	19.528
Jooriland	212270	AHD	130.909
Kelpie Point	212250	AHD	25.591
Nepean Dam	212205	AHD	317.172
Pheasants Nest	212203	AHD	133.518
St Albans	212010	AHD	2.760
Upper Colo	212290	AHD	1.468
Warragamba Dam	212243	AHD	116.691
Warragamba Weir	212241	Standard datum	16.533
Yarramundi	2122001	Assumed datum	43.844
Redfern Road	213013	AHD	37.613

110B King Street

Manly Vale NSW 2093