NSW GOVERNMENT

Manly Hydraulics Laboratory

NSW COASTAL RAINFALL ANNUAL SUMMARY
2020–2021

Report MHL2857
April 2022

Prepared for:

NSW Department of Planning, Industry and Environment
Biodiversity and Conservation Division

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Foreword

Manly Hydraulics Laboratory (MHL) is a business unit within the Water Group of the NSW Department of Planning, Industry and Environment. The NSW rainfall database has been developed to support a number of programs associated with coastal, floodplain and estuary management for the Biodiversity and Conservation Division of the NSW Department of Planning, Industry and Environment.

This annual summary presents rainfall station measurements collected by MHL along NSW coastal estuaries and rivers from 1 July 2020 to 30 June 2021. It provides ready access to MHL's rainfall database and data analysis capabilities.

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Executive summary

The *NSW Coastal Rainfall Annual Summary 2020–2021* presents rainfall station measurements collected by MHL along NSW coastal estuaries and rivers from 1 July 2020 to 30 June 2021. It provides ready access to MHL's rainfall database and data analysis capabilities.

The overall data capture across the network was 97.7% (for data processed to within ±10% of calibration). The target recovery rate of 95% and above is achieved for the 2020–2021 reporting period.

This report contains:

- a brief description of the coastal rainfall monitoring program
- guidelines on how to use this report and access the database
- a review of significant program developments and rainfall events in 2020–2021
- a list of all stations for which MHL collected rainfall data in 2020–2021 (**Table 5**)
- the annual data summaries for each station
- **Appendix A**, which details the rainfall data available
- **Appendix B**, a list of publications which may be of interest.

Contents

TABLES

1 Rainfall monitoring program

This report presents the thirty-fifth year of NSW coastal rainfall data collected by Manly Hydraulics Laboratory (MHL). The network of automatic recorders and the associated analysis routines enable efficient delivery of near real time rainfall data from stations across NSW. Extracts from the historical database of rainfall data can also be made available on request (refer to **Appendix A**).

The present program is based on a network of automatic rainfall recording stations installed at various coastal sites (see Section 4 **Station Location Maps**). The network consists of 73 permanent stations funded by the NSW Department of Planning, Industry and Environment's Biodiversity and Conservation Division (BCD). The network supplements the coverage provided by the Bureau of Meteorology (BoM), other agencies and local government rainfall networks. The system utilises 0.2 mm, 0.5 mm and 1.0 mm tipping buckets and data loggers.

Rainfall data is transferred to MHL's databases, located in the NSW Government Data Centre, using a variety of telemetry techniques including internet protocols (IP), landline telephone, cellular networks and event-reporting radio telemetry system (ERTS). The incoming raw data is then made available in near real time to external users to view online.

Data is stored in a database and subject to a quality assurance process which involves several control steps to maintain data quality as well as assignment of data quality codes. Computer programs are used to further format and analyse data.

Data is backed up daily and archived to offline storage at regular intervals.

2 How to use this report and access the database

The NSW coastline is divided into geographic regions based on river systems to present water monitoring information. Location maps display the station locations and the annual plots confirm the availability and suitability of data for the particular period of interest. A list of rainfall station data collected and stored online is included in **Appendix A**.

2.1 Data request

Once a choice has been made for the period of information required, data and services can be obtained in a variety of formats, according to their intended use. All data presented in this report are in Australian Eastern Standard Time (AEST). Allowance for daylight saving time needs to be made by the user of the data if required.

Available rainfall products include:

Tabulated output

- daily totals
- intensity/duration tables
- time of tips of rain gauge or short period fixed time step data.

Graphical plots

- hourly, daily, monthly and yearly hyetographs (a graphical representation of rainfall distribution over a period of time)
- intensity-frequency-duration curves (ARR1987 and ARR2019).

2.2 Access data online

MHL provides a full online data access service via the internet for its clients, and a limited service for the general public at http://www.mhl.nsw.gov.au/.

Typically, the last seven days of data are available online in a non-quality controlled form to aid the fastest possible access to data records. The online service for clients can provide access to all data catalogued in **Appendix A**.

Quality controlled data may be ordered via the MHL web page (http://www.mhl.nsw.gov.au), by emailing data-request@mhl.nsw.gov.au, or via customised decision support tools that can be provided on request.

2.3 Rainfall data provision

Rainfall data is provided to the public on behalf of BCD via the following methods:

- MHL's public internet home pages, providing near real time access to a limited sample of data/email correspondence and File Transfer Protocol (FTP).
- MHL provides BCD, NSW State Emergency Service (SES) and BoM officers access to near real time environmental data and our 'quality assured' historical database through the BCD information portal, which is password-protected.
- NSW SES officers also receive automated notifications from flood warning systems in NSW.
- A web-based data request system is available where electronic requests can be submitted via MHL's homepage at http://www.mhl.nsw.gov.au under the data request menu.

Data access also continues to assist the BoM, local government authorities, SES, NSW Police, WaterNSW, NSW Surf Life Saving Association, universities, the NSW court system, private consultancies, Transport for NSW and the Natural Resources Commission.

3 Significant events and developments

In the 2020–2021 fiscal year, the maximum recorded rainfall intensities for 11 durations between 5 minutes and 72 hours occurred at five different stations across the BCD rainfall network (**Table 1**). To determine the significance of a rainfall event, the intensities are compared against the Annual Exceedance Probability (AEP) provided by BoM, where the AEP is the probability of an event occurring in any one year at a particular duration. An event with a 1% AEP (or the 100-year rainfall) is an event that has a 1% chance of being equalled or exceeded in any one year.

Table 2 provides a summary of rainfall events for each month during 2020–2021 on the NSW east coast. 100 mm of rain falling in a 24-hour period is adopted to define a significant rain event.

Table 3 presents the maximum recorded rainfall for durations of 5 minutes to 72 hours at each station.

Table 1 Maximum recorded intensities for all stations

Duration	Station	Date	Rainfall (mm)	Rainfall (mm/hr)	AEP (%)
5min	Mount Elliot	18/03/2021	17.0	204.0	10
10min	Stuarts Island Downstream	19/03/2021	27.0	162.0	20
20min	Stuarts Island Downstream	19/03/2021	45.5	136.5	10
30min	Tarbuck Bay	26/10/2021	62.5	225.0	5
60min	Tarbuck Bay	26/10/2021	103.5	103.5	20
3hrs	Tarbuck Bay	26/10/2021	144.0	48.0	10
6hrs	Utungun	19/03/2021	234.0	39.0	1
12hrs	Utungun	19/03/2021	289.0	24.1	1
24hrs	Logans Crossing	20/03/2021	438.0	18.3	1
48hrs	Logans Crossing	20/03/2021	557.5	11.6	1
72hrs	Logans Crossing	20/03/2021	700.5	9.7	1

Table 2 2020–2021 Summary of rainfall events

Month	Summary of rainfall events
July 2020	Daily rainfall exceeding 100 mm in 24 hours occurred at one station in the Tweed River region, one station in the Bellinger River region, one station in the Hunter River region, 12 stations in the Macquarie-Tuggerah Lakes region, one station in the Hawkesbury River region, six stations in Wollongong Coastal region and one station in the South Coast region.
August 2020	Daily rainfall exceeding 100 mm in 24 hours occurred at seven stations in Wollongong Coastal region.
September 2020	No events exceeding 100 mm in 24 hours.
October 2020	Daily rainfall exceeding 100 mm in 24 hours occurred at one station in the Karuah River region, one station in the Hunter River region and 13 stations in the Macquarie-Tuggerah Lakes region.
November 2020	No events exceeding 100 mm in 24 hours.
December 2020	Daily rainfall exceeding 100 mm in 24 hours occurred at four stations in the Tweed River region, one station in the Richmond River region, eight stations in the Bellinger River region, two stations in the Nambucca River region, and three stations in the Macleay River region.
January 2021	Daily rainfall exceeding 100 mm in 24 hours occurred at one station in the Bellinger River region.
February 2021	Daily rainfall exceeding 100 mm in 24 hours occurred at two stations in Tweed River region.
March 2021	Daily rainfall exceeding 100 mm in 24 hours occurred at four stations in the Tweed River region, one station in the Richmond River region, eight stations in the Bellinger River region, two stations in the Nambucca River region, three stations in the Macleay River region, two stations in the Camden Haven region, 5 stations in the Karuah River region, one station in the Hunter River region, 18 stations in the Macquarie-Tuggerah Lakes region, two stations in the Sydney Coastal region, two stations in Wollongong Coastal region and two stations in the South Coast region.
April 2021	Daily rainfall exceeding 100 mm in 24 hours occurred at one station in Tweed River region.
May 2021	Daily rainfall exceeding 100 mm in 24 hours occurred at seven stations in Wollongong Coastal region.
June 2021	Daily rainfall exceeding 100 mm in 24 hours occurred at two stations in Karuah River region.

Table 3 2020–2021 Maximum recorded rainfall (mm)

Station	Duration											Total yearly rainfall
	5 min	10 min	20 min	30 min	60 min	3 hrs	6 hrs	12 hrs	24 hrs	48 hrs	72 hrs	
Cudgera	25/10/2020 11.5	25/10/2020 15.5	29/10/2020 19.5	29/10/2020 25.5	23/03/2021 48.0	23/03/2021 69.0	12/12/2020 97.0	13/12/2020 141.5	13/12/2020 170.0	13/12/2020 232.5	23/03/2021 310.5	2197.5
Main Arm	12/12/2020 9.0	12/12/2020 15.0	12/12/2020 24.5	12/12/2020 32.0	12/12/2020 46.5	12/12/2020 78.5	13/12/2020 131.0	13/12/2020 221.0	13/12/2020 259.5	14/12/2020 372.0	15/12/2020 463.0	2519.5
Huonbrook	19/02/2020 8.5	19/02/2020 13.5	19/02/2020 26.5	19/02/2020 33.5	19/02/2020 37.0	12/12/2020 55.5	12/12/2020 91.0	13/12/2020 135.0	22/03/2021 187.5	23/03/2021 308.5	14/12/2020 383.0	2428.5
Myocum	12/12/2020 9.5	9/03/2021 15.5	9/03/2021 23.0	21/03/2021 31.5	21/03/2021 50.0	21/03/2021 90.0	21/03/2021 93.0	21/03/2021 118.0	12/12/2020 149.0	13/12/2020 203.5	14/12/2020 258.5	2062.0
Lake Ainsworth	11/03/2021 8.5	11/03/2021 16.5	11/03/2021 23.5	11/03/2021 26.0	26/07/2020 37.0	19/02/2020 58.0	12/12/2020 73.0	12/12/2020 111.0	12/12/2020 173.0	13/12/2020 214.0	14/12/2020 260.0	2008.5
Wooli Sportsground	25/02/2021 14.0	25/02/2021 23.0	25/02/2021 36.0	25/02/2021 45.5	25/02/2021 82.0	25/02/2021 137.5	25/02/2021 159.5	25/02/2021 161.5	22/03/2021 194.5	23/03/2021 265.5	23/03/2021 310.5	2038.0
Perry Drive	18/03/2020 8.5	18/03/2020 16.0	18/03/2020 24.0	18/03/2020 29.0	18/03/2020 34.0	18/03/2020 71.0	18/03/2020 99.0	12/12/2020 129.0	19/03/2021 174.0	22/03/2021 245.5	23/03/2021 291.5	2457.5
Shephards Lane	5/09/2020 15.0	5/09/2020 20.0	18/03/2020 22.5	18/03/2020 25.0	18/03/2020 31.0	18/03/2020 59.0	15/12/2021 97.5	15/12/2021 141.0	15/12/2021 203.0	16/12/2020 302.0	16/12/2020 350.5	2537.0
Red Hill	5/09/2020 11.0	5/09/2020 17.5	25/02/2021 27.5	25/02/2021 35.0	25/02/2021 45.5	25/02/2021 59.0	15/12/2021 89.0	15/12/2021 131.5	15/12/2021 200.0	15/12/2021 304.0	16/12/2020 353.0	2466.0
Newports Creek[1]	25/02/2021 9.5	25/02/2021 19.0	25/02/2021 31.0	25/02/2021 45.5	25/02/2021 65.0	25/02/2021 82.0	12/12/2020 86.0	12/12/2020 133.5	15/12/2020 173.5	16/12/2020 270.5	16/12/2020 313.0	2473.5
Middle Boambee[1]	25/02/2021 8.5	25/02/2021 16.0	25/02/2021 27.0	25/02/2021 42.5	25/02/2021 57.0	25/02/2021 80.0	12/12/2020 95.0	12/12/2020 145.0	15/12/2020 182.0	16/12/2020 277.0	16/12/2020 330.0	2339.5
North Bonville	14/03/2021 9.0	14/03/2021 17.5	14/03/2021 28.5	14/03/2021 28.5	1/01/2021 35.5	12/12/2020 59.0	12/12/2020 102.0	12/12/2020 161.0	12/12/2020 180.0	15/12/2020 278.0	14/12/2020 332.5	2555.5
Kooroowi Sharabel[1]	28/02/2020 11.0	28/02/2020 2.0	19/03/2021 25.0	19/03/2021 35.5	19/03/2021 56.5	19/03/2021 111.0	19/03/2021 131.5	19/03/2021 147.5	15/12/2020 187.5	15/12/2020 265.0	14/12/2020 288.5	2128.0
Stuarts Island Downstream	19/03/2021 15.0	19/03/2021 27.0	19/03/2021 45.5	19/03/2021 60.0	19/03/2021 91.0	19/03/2021 139.5	19/03/2021 167.0	18/03/2021 181.5	19/03/2021 294.5	19/03/2021 421.5	19/03/2021 448.0	2229.5
Utungun	19/03/2021 10.0	19/03/2021 18.5	19/03/2021 32.0	19/03/2021 41.5	19/03/2021 76.0	19/03/2021 132.5	19/03/2021 234.0	19/03/2021 289.0	19/03/2021 353.5	19/03/2021 513.5	21/03/2021 579.0	2205.0
Aldavilla Downstream	28/10/2020 11.0	28/10/2020 21.0	28/10/2020 34.0	19/03/2021 46.0	19/03/2021 53.0	18/03/2021 108.0	18/03/2021 148.0	19/03/2021 193.0	19/03/2021 245.0	19/03/2021 431.0	21/03/2021 475.0	1829.0

Station	Duration											Total yearly rainfall
	5 min	10 min	20 min	30 min	60 min	3 hrs	6 hrs	12 hrs	24 hrs	48 hrs	72 hrs	
Green Valley	13/11/2020 13.5	13/11/2020 18.5	11/03/2021 21.0	1/01/2021 30.5	15/12/2020 34.0	15/12/2020 80.5	15/12/2020 135.5	15/12/2020 165.0	19/03/2021 197.5	20/03/2021 297.0	21/03/2021 414.5	2192.5
Telegraph Point	16/12/2020 7.0	20/02/2021 12.5	19/03/2021 20.0	19/03/2021 28.0	19/03/2021 36.5	19/03/2021 65.5	19/03/2021 111.0	19/03/2021 180.5	19/03/2021 237.5	20/03/2021 358.0	21/03/2021 463.5	2056.5
Logans Crossing[1]	29/10/2020 10.0	29/10/2020 19.0	29/10/2020 27.5	20/03/2021 33.5	20/03/2021 47.5	19/03/2021 77.5	19/03/2021 154.0	19/03/2021 260.5	20/03/2021 438.0	20/03/2021 557.5	21/03/2021 700.5	1637.0
Mount George[1]	30/01/2021 11.0	30/01/2021 18.0	30/01/2021 33.0	30/01/2021 36.0	30/01/2021 45.5	19/03/2021 60.0	19/03/2021 93.0	19/03/2021 123.5	19/03/2021 205.5	20/03/2021 259.5	21/03/2021 372.0	1674.0
Nabiac[1]	4/01/2021 9.0	4/01/2021 15.5	4/01/2021 23.0	18/12/2020 25.5	21/03/2021 41.5	21/03/2021 83.5	21/03/2021 99.5	21/03/2021 149.5	22/03/2021 186.5	21/03/2021 320.0	22/03/2021 412.5	1700.5
Tuncurry Downstream[1]	4/01/2021 11.0	4/01/2021 21.0	4/01/2021 33.0	4/01/2021 38.0	4/01/2021 39.5	21/03/2021 43.0	19/03/2021 54.0	15/12/2020 73.5	20/03/2021 111.0	20/03/2021 179.5	21/03/2021 250.5	1636.0
Pacific Palms Wharf[1]	18/02/2021 11.5	18/02/2021 17.5	12/03/2021 30.5	12/03/2021 43.0	12/03/2021 72.0	12/03/2021 103.0	18/03/2021 122.5	18/03/2021 165.0	18/03/2021 190.0	19/03/2021 266.5	21/03/2021 385.0	1380.0
Tarbuck Bay[1]	26/10/2020 14.0	26/10/2020 26.5	26/10/2020 44.5	26/10/2020 62.5	26/10/2020 103.5	26/10/2020 144.0	26/10/2020 184.5	26/10/2020 202.5	18/03/2021 254.0	19/03/2021 325.5	21/03/2021 452.0	2518.0
Bulahdelah	8/03/2021 10.0	8/03/2021 18.0	8/03/2021 30.5	8/03/2021 32.5	8/03/2021 33.5	18/03/2021 50.5	19/03/2021 71.0	20/03/2021 103.5	20/03/2021 147.5	20/03/2021 243.0	20/03/2021 322.0	1689.5
Gostwyck	1/12/2020 12.5	1/12/2020 17.0	1/12/2020 20.0	4/01/2021 25.5	26/10/2020 35.0	26/10/2020 69.0	26/10/2020 77.0	26/10/2020 54.0	20/03/2021 102.0	21/03/2021 121.5	20/03/2021 142.0	1222.0
Seaham	14/01/2021 6.5	14/01/2021 12.5	14/01/2021 14.0	4/01/2021 17.0	19/10/2020 23.5	14/03/2021 31.5	20/03/2021 44.5	20/03/2021 66.5	20/03/2021 80.0	20/03/2021 119.5	20/03/2021 153.5	1145.0
Belmore Bridge	5/11/2020 7.5	8/03/2021 14.0	8/03/2021 23.0	8/03/2021 26.5	8/03/2021 26.5	14/03/2021 37.5	14/03/2021 43.5	20/03/2021 53.5	20/03/2021 62.5	20/03/2021 101.0	20/03/2021 121.5	986.0
Hexham Bridge	14/03/2021 6.5	18/12/2020 10.5	18/12/2020 14.5	18/12/2020 16.5	26/07/2020 23.5	26/07/2020 57.5	26/07/2020 80.0	26/07/2020 104.0	26/07/2020 112.5	27/07/2020 123.0	20/03/2021 153.5	1193.5
Barnsley	13/11/2021 8.5	13/11/2021 12.5	18/10/2020 20.0	18/10/2020 23.0	18/10/2020 26.0	26/07/2020 55.5	26/07/2020 74.5	26/07/2020 94.5	26/07/2020 104.0	20/03/2021 130.0	21/03/2021 157.0	1245.0
Martinsville	12/07/2020 6.0	18/10/2020 9.5	13/02/2021 14.5	13/02/2021 19.5	13/02/2021 27.5	26/07/2020 50.0	26/07/2020 75.5	26/07/2020 103.0	27/07/2020 123.5	21/03/2021 197.5	21/03/2021 238.5	1586.5
Mandalong	31/01/2021 6.0	8/04/2021 11.0	8/04/2021 15.5	20/03/2021 16.0	13/02/2021 26.0	26/07/2020 57.5	26/07/2020 95.0	26/07/2020 117.0	18/03/2021 139.5	20/03/2021 192.0	21/03/2021 284.5	1601.0
Wyee	26/07/2020 7.5	26/07/2020 14.5	26/07/2020 27.0	26/07/2020 35.0	26/07/2020 52.0	26/07/2020 87.0	26/07/2020 132.5	26/07/2020 158.5	27/07/2020 170.5	20/03/2021 212.5	21/03/2021 320.5	1736.0

Station	Duration											Total yearly rainfall
	5 min	10 min	20 min	30 min	60 min	3 hrs	6 hrs	12 hrs	24 hrs	48 hrs	72 hrs	
Whitemans Ridge	4/01/2021 9.5	4/01/2021 16.0	20/03/2021 24.5	20/03/2021 35.0	20/03/2021 40.0	26/07/2020 64.0	26/07/2020 103.5	27/07/2020 128.5	27/07/2020 146.5	21/03/2021 250.0	4/01/2021 9.5	1711.0
Yarramalong	22/11/2020 6.5	22/11/2020 9.0	4/01/2021 15.0	4/01/2021 20.0	26/07/2020 28.0	26/07/2020 58.5	26/07/2020 89.5	21/03/2021 118.0	21/03/2021 161.5	21/03/2021 255.5	22/11/2020 6.5	1560.5
Kulnura	18/12/2020 6.5	18/12/2020 11.5	6/05/2021 19.0	6/05/2021 21.5	6/05/2021 30.5	26/07/2020 42.0	26/07/2020 74.0	27/07/2020 100.5	21/03/2021 139.0	21/03/2021 235.0	18/12/2020 6.5	1604.5
Toukley	12/07/2020 8.0	12/07/2020 13.5	12/07/2020 18.5	20/03/2021 21.5	20/03/2021 29.0	21/03/2021 43.5	21/03/2021 58.0	20/03/2021 86.0	21/03/2021 152.5	21/03/2021 249.0	12/07/2020 8.0	1223.0
Hamlyn Terrace	20/03/2021 6.5	26/07/2020 9.0	20/03/2021 17.5	20/03/2021 20.5	26/07/2020 30.0	26/07/2020 54.0	26/07/2020 84.5	26/07/2020 118.0	27/07/2020 132.5	21/03/2020 212.5	20/03/2021 6.5	1569.5
Mardi Dam	20/03/2021 7.0	24/10/2020 11.0	20/03/2021 13.5	20/03/2021 16.5	21/03/2021 25.0	26/07/2020 43.0	26/07/2020 68.0	26/07/2020 94.5	21/03/2021 138.0	21/03/2021 238.5	20/03/2021 7.0	1494.0
Sterland	18/10/2020 11.0	18/10/2020 12.5	20/03/2021 17.0	20/03/2021 26.0	20/03/2021 30.5	26/07/2020 53.5	21/03/2021 83.5	27/07/2020 108.0	21/03/2021 160.0	21/03/2021 290.5	18/10/2020 11.0	1755.0
Kangy Angy	4/01/2021 8.0	4/01/2021 12.0	4/01/2021 16.0	4/01/2021 16.5	25/10/2020 25.5	26/10/2020 53.5	26/07/2020 72.5	26/10/2020 122.5	26/10/2020 159.5	21/03/2020 256.5	4/01/2021 8.0	1649.0
Berkeley Vale	12/05/2021 9.5	12/05/2021 14.0	12/05/2021 17.5	12/05/2021 18.5	25/10/2020 30.5	26/10/2020 55.0	26/10/2020 78.0	26/10/2020 121.5	26/10/2020 156.0	21/03/2021 208.5	12/05/2021 9.5	1570.5
Bateau Bay	18/03/2021 9.0	3/03/2021 11.0	3/03/2021 17.0	3/03/2021 22.5	3/03/2021 38.0	25/10/2020 69.0	26/10/2020 88.5	26/10/2020 121.5	26/10/2020 150.5	27/10/2021 174.5	18/03/2021 9.0	1585.5
Lisarow	20/03/2021 8.0	18/10/2020 12.0	4/01/2021 16.5	4/01/2021 17.0	25/10/2020 38.0	26/10/2020 53.0	26/10/2020 74.0	26/10/2020 131.0	26/10/2020 171.5	21/03/2021 247.0	20/03/2021 8.0	1685.0
Strickland	20/03/2021 7.0	4/09/2020 11.0	4/01/2021 15.0	4/01/2021 16.0	21/03/2021 27.0	21/03/2021 51.0	21/03/2021 73.0	26/10/2020 96.5	21/03/2021 165.0	21/03/2021 289.5	20/03/2021 7.0	1632.0
Narara	18/10/2020 14.5	18/10/2020 18.5	18/10/2020 22.5	18/10/2020 24.0	21/03/2021 26.0	21/03/2021 44.5	21/03/2021 65.0	26/10/2020 104.0	21/03/2021 153.0	21/03/2021 275.5	18/10/2020 14.5	1644.0
Mount Elliot	18/03/2021 17.0	18/03/2021 21.0	18/03/2021 24.0	18/03/2021 28.0	25/10/2020 37.5	26/10/2020 75.5	26/10/2020 109.5	26/10/2020 170.0	26/10/2020 221.0	27/10/2021 269.5	18/03/2021 17.0	2220.0
Wyoming	4/01/2021 8.5	18/10/2020 15.5	18/10/2020 19.5	30/12/2020 21.5	30/12/2020 37.5	30/12/2020 54.5	26/10/2020 63.0	26/10/2020 109.5	26/10/2020 144.5	21/03/2021 237.0	4/01/2021 8.5	1631.0
Kincumber	4/09/2020 5.5	31/10/2020 8.5	18/03/2021 16.5	18/03/2021 23.0	25/10/2020 30.0	25/10/2020 61.0	26/10/2020 96.0	26/10/2020 121.5	26/10/2020 138.5	21/03/2021 205.0	4/09/2020 5.5	1541.0

Station	Duration											Total yearly rainfall
	5 min	10 min	20 min	30 min	60 min	3 hrs	6 hrs	12 hrs	24 hrs	48 hrs	72 hrs	
Webbs Creek	16/12/2020 6.0	16/12/2020 10.8	16/12/2020 16.8	16/12/2020 18.4	16/12/2020 23.2	16/12/2020 30.5	26/07/2020 50.0	20/03/2021 81.0	27/07/2020 101.5	21/03/2021 174.0	22/03/2021 206.5	1131.8
Colo Junction	1/12/2020 10.0	1/12/2020 13.0	20/11/2020 14.8	20/11/2020 15.6	24/10/2020 16.2	24/10/2020 23.0	26/07/2020 36.0	20/03/2021 54.5	22/03/2021 78.0	22/03/2021 137.5	22/03/2021 175.5	1032.0
Sackville Downstream	6/04/2021 9.6	6/04/2021 14.0	6/04/2021 18.6	6/04/2021 18.8	6/04/2021 19.2	26/07/2020 26.0	26/07/2020 41.5	20/03/2021 62.5	27/07/2020 89.0	22/03/2021 145.5	23/03/2021 187.0	1160.0
Curl Curl	29/12/2020 5.0	29/12/2020 10.0	29/12/2020 18.0	29/12/2020 26.5	30/12/2020 45.5	30/12/2020 71.5	30/12/2020 81.0	20/03/2021 115.5	20/03/2021 132.0	20/03/2021 165.0	21/03/2021 211.5	1288.5
Kelso Creek	4/01/2020 8.0	4/01/2020 11.5	4/01/2020 16.0	4/01/2020 17.0	4/01/2020 19.0	20/03/2021 37.0	20/03/2021 63.0	20/03/2021 99.0	21/03/2021 131.5	22/03/2021 167.5	23/03/2021 212.5	1008.5
Rixons Pass	31/10/2020 10.0	31/10/2020 13.5	8/08/2020 19.5	8/08/2020 24.5	8/08/2020 27.5	31/10/2020 37.5	7/05/2021 51.5	27/07/2020 80.0	27/07/2020 110.5	28/07/2020 163.5	28/07/2020 178.0	1592.5
Russell Vale	18/12/2020 7.5	18/12/2020 9.5	18/12/2020 10.0	8/08/2020 11.5	27/07/2020 17.0	27/07/2020 36.0	27/07/2020 45.5	27/07/2020 80.5	27/07/2020 110.0	28/07/2020 163.5	28/07/2020 177.0	1432.0
Mount Pleasant	31/10/2020 7.5	31/10/2020 11.5	31/10/2020 15.0	20/03/2021 20.0	31/10/2020 30.0	31/10/2020 58.0	27/07/2020 60.0	27/07/2020 100.0	27/07/2020 146.0	28/07/2020 209.5	28/07/2020 223.0	1896.5
Mount Kembla	31/10/2020 14.5	31/10/2020 22.5	31/10/2020 30.5	31/10/2020 37.0	31/10/2020 53.5	31/10/2020 80.5	31/10/2020 81.5	31/10/2020 83.5	27/07/2020 99.0	28/07/2020 131.5	23/03/2021 155.0	1576.5
Dombarton Loop	31/10/2020 14.0	31/10/2020 25.0	31/10/2020 40.5	31/10/2020 52.0	31/10/2020 59.5	31/10/2020 84.5	31/10/2020 87.0	31/10/2020 90.5	7/05/2021 137.5	7/05/2021 181.0	7/05/2021 211.0	1797.5
Wongawilli[1]	31/10/2020 6.5	31/10/2020 10.0	31/10/2020 18.5	31/10/2020 24.0	31/10/2020 27.5	31/10/2020 56.0	31/10/2020 58.5	7/08/2020 63.5	8/08/2020 99.5	9/08/2020 134.5	10/08/2020 172.0	1289.0
Port Kembla	25/03/2021 9.0	8/08/2020 10.5	8/08/2020 17.0	8/08/2020 24.0	8/08/2020 37.0	8/08/2020 51.5	8/08/2020 51.5	8/08/2020 75.5	8/08/2020 106.0	9/08/2020 141.0	10/08/2020 162.5	1252.5
Darkes Road	31/10/2020 11.0	31/10/2020 20.0	31/10/2020 30.0	31/10/2020 34.0	31/10/2020 39.5	31/10/2020 71.5	31/10/2020 72.0	31/10/2020 72.5	7/05/2021 87.5	7/05/2021 120.5	23/03/2021 147.0	1302.0
Cleveland Road	31/10/2020 12.0	31/10/2020 22.0	31/10/2020 32.0	31/10/2020 41.0	31/10/2020 46.5	31/10/2020 66.0	31/10/2020 67.5	8/08/2020 73.0	8/08/2020 97.0	9/08/2020 140.0	10/08/2020 171.5	1335.0
Huntley Colliery	8/08/2020 8.5	8/08/2020 13.0	1/02/2021 17.0	1/02/2021 22.0	31/10/2020 29.0	31/10/2020 42.5	7/08/2020 53.0	7/05/2021 79.5	7/05/2021 114.5	7/05/2021 174.0	10/08/2020 210.0	1585.0
Upper Calderwood	6/05/2021 7.5	4/01/2021 10.5	1/02/2021 17.5	1/02/2021 22.0	31/10/2020 32.0	31/10/2020 46.5	7/08/2020 56.5	8/08/2020 74.0	8/08/2020 102.5	9/08/2020 152.0	23/03/2021 192.0	1541.5
Little Lake	10/08/2020	9/08/2020	27/07/2020	8/08/2020	8/08/2020	8/08/2020	9/08/2020	8/08/2020	27/07/2020	9/08/2020	10/08/2020	1188.8

Station	Duration											Total yearly rainfall
	5 min	10 min	20 min	30 min	60 min	3 hrs	6 hrs	12 hrs	24 hrs	48 hrs	72 hrs	
Entrance	9.0	15.0	20.0	23.0	28.0	39.0	42.0	59.5	83.5	132.0	146.0	
Nurrewin	31/10/2020 11.0	31/10/2020 17.5	31/10/2020 28.0	31/10/2020 42.0	31/10/2020 50.5	31/10/2020 63.0	31/10/2020 81.0	19/03/2021 121.5	19/03/2021 156.5	20/03/2021 222.0	20/03/2021 322.0	2120.0
Clover Hill	31/10/2020 9.5	31/10/2020 18.0	31/10/2020 33.5	31/10/2020 43.5	31/10/2020 54.5	31/10/2020 65.5	31/10/2020 84.5	19/03/2021 107.5	19/03/2021 149.5	20/03/2021 224.0	20/03/2021 325.5	2146.5
North Macquarie	7/08/2020 6.5	3/01/2021 13.0	3/01/2021 20.0	3/01/2021 22.0	3/01/2021 36.0	7/08/2020 43.5	7/08/2020 63.5	8/08/2020 77.5	8/08/2020 111.0	9/08/2020 167.5	10/08/2020 204.0	1487.0
Yellow Rock Road[1]	31/10/2020 9.5	31/10/2020 16.0	31/10/2020 24.0	31/10/2020 29.0	31/10/2020 41.0	31/10/2020 55.5	8/08/2020 71.5	8/08/2020 90.0	8/08/2020 129.5	9/08/2020 200.5	23/03/2020 241.0	1704.5
Lake Conjola Downstream	5/01/2021 11.0	5/01/2021 15.0	5/01/2021 15.5	31/10/2020 16.0	27/07/2020 21.5	27/07/2020 49.0	27/07/2020 82.0	27/07/2020 124.5	28/07/2020 188.0	28/07/2020 263.5	28/07/2020 274.5	1278.5
Barlows Bay	30/01/2021 12.5	30/01/2021 21.5	30/01/2021 30.5	30/01/2021 32.0	30/01/2021 33.0	16/12/2020 57.0	23/03/2021 90.0	23/03/2021 142.5	23/03/2021 161.5	28/07/2020 187.5	28/07/2020 207.5	1575.5
Regatta Point	25/03/2021 12.5	25/03/2021 19.5	25/03/2021 25.5	25/03/2021 27.5	16/12/2021 36.0	16/12/2021 71.5	16/12/2021 89.5	23/03/2021 114.0	23/03/2021 139.5	28/07/2020 170.5	28/07/2020 187.0	1548.5

[1] Some measure of data loss occurred at these stations. See individual plots for further details.

Note – the date listed refers to the time that the recorded total rainfall ends.

3.1 Southern Oscillation Index

The Southern Oscillation Index (SOI) is a recognised component of eastern Australian climate drivers, based on a calculation of monthly or seasonal shifts in the air pressure between Darwin and Tahiti. It gives an indication of the development and intensity of La Niña and El Niño events (BoM 2021). A La Niña episode typically occurs when there are ongoing positive SOI values, and increases the probability of higher than average rainfall in northern and eastern Australia. Sustained negative SOI values often indicate El Niño events, which are associated with a reduction in rainfall over northern and eastern Australia. Even low to moderate El Niño events can be associated with severe droughts in Australia.

Figure 1 presents the SOI between July 2001 and June 2021 as a historical reference for interested readers. Additional climate driver records and updates can be found at http://www.bom.gov.au/climate/enso/.

3.2 Data capture performance

Rainfall data presented by MHL is collected and analysed through a quality assurance process in accordance with MHL's internal standards and work instructions. Field verification of each rainfall gauge is performed by delivering a known volume of water in a controlled flow directly into the catch of the rain gauge using a field calibration device. The total number and rate of tips of the tipping bucket and the data recorded on the logger are then compared with the known volume. The percentage difference between the known volume and the recorded tips is used to assign a quality code to the data. Other observations such as any blockages in the rain gauge catch and comparison with nearby rainfall stations are also taken into consideration. **Table 4** presents definitions of the various quality codes.

During 2020–2021, the overall data capture across the network, for data with a quality code of 105 or better, was 97.7%. **Table 5** *Index of figures* provides data capture percentages for each rainfall region. Missing or 208 quality coded data can result in gaps in the data record. This can be caused by a range of reasons, such as equipment damage or failure, power failure, or site specific environmental issues.

Automatic recorded rainfall data is recorded to a resolution equal to the size of the tipping bucket (0.2 mm, 0.5 mm or 1.0 mm). Each record or tip of the bucket is triggered when the tipping bucket is filled, which may occur over a period of time.

Table 4 MHL data quality code descriptions

Quality code		Rainfall*
5	Records processed to	±3% of calibration
55	Records processed to	±5% of calibration
100	Data from previous MHL database, processed to	±3% of calibration
105	Records processed to	±10% of calibration
208	Records processed to greater than	<-10% or >10% of calibration
150	Uncoded – data not yet quality controlled	Raw data from the instrument with only preliminary quality checks performed
1, 204, 205, 206, 207, 255	Data loss/data missing	

* A quality code is assigned based on infield status verification checks.

4 Rainfall monitoring summary

This section documents locality maps and quality assured rainfall monitoring summaries for each station. **Table 5** provides indexes to the figures presented. The rainfall plots shown in Figure 2 to Figure 90 are presented as daily rainfall totals from midnight to midnight.

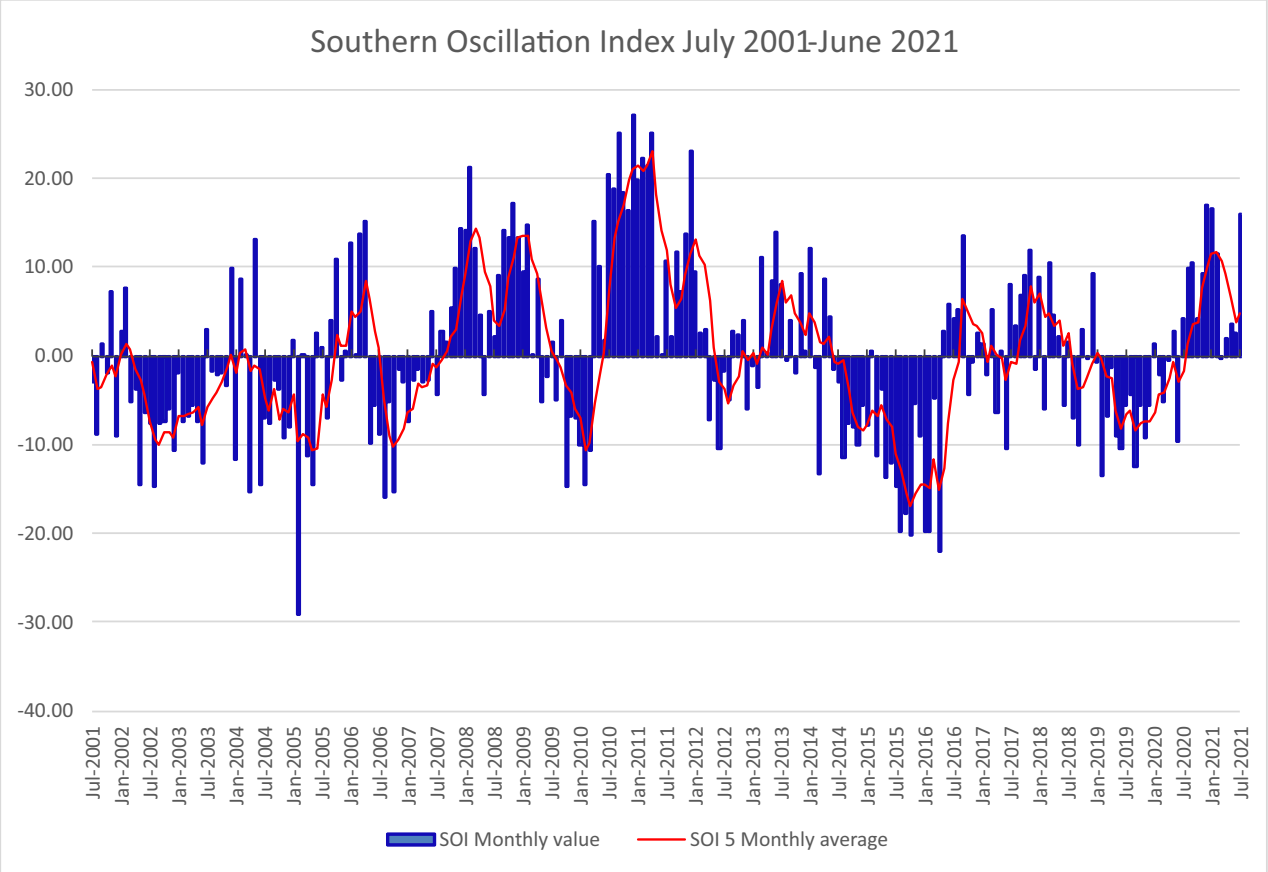
Table 5 Index of figures

	Figure
Southern Oscillation Index, June 2001–June 2021	1

Region	Station short name	Station no.	MGA	Easting	Northing	Capture %	Figure
Station Locality Map	Tweed River and Brunswick River Regions					100.0%	2
Tweed	Cudgera	558046	56	549668	6859164		3
Brunswick	Main Arm	558053	56	542469	6847276		4
Brunswick	Huonbrook	558049	56	537723	6841573		5
Brunswick	Myocum	558036	56	550528	6837390		6
Station Locality Map	Richmond River Region					100.0%	7
Richmond	Lake Ainsworth	203455	56	557863	6816160		8
Station Locality Map	Bellinger River Region (North)					100.0%	9
Bellinger	Wooli Sportsground	559071	56	525712	6696894		10
Station Locality Map	Bellinger River Region (South)					94.9%	11
Bellinger	Perry Drive	559019	56	510142	6650416		12
Bellinger	Shephards Lane	559017	56	508196	6650884		13
Bellinger	Red Hill	559016	56	506635	6649672		14
Bellinger	Newports Creek	559051	56	505893	6646680		15
Bellinger	Middle Boambee	559048	56	504720	6645291		16
Bellinger	North Bonville	559050	56	500593	6641143		17
Bellinger	Kooroowi Sharabel	559008	56	482562	6629162		18
Station Locality Map	Nambucca River Region					100.0%	19
Nambucca	Stuarts Island Downstream	205466	56	499519	6608564		20
Nambucca	Utungun	205414	56	485800	6600344		21
Station Locality Map	Macleay River and Hastings River Regions					100.0%	22
Macleay	Aldavilla Downstream	206459	56	479318	6561231		23
Hastings	Green Valley	207406	56	486416	6540068		24
Hastings	Telegraph Point	207415	56	481082	6534512		25

Region	Station short name	Station no.	MGA	Easting	Northing	Capture %	Figure
Station Locality Map	Camden Haven Region					74.6%	**26**
Camden Haven	Logans Crossing	207428	56	470913	6502295		27
Manning	Mount George	208440	56	419229	6472262		28
Station Locality Map	Karuah River Region					84.9%	**29**
Karuah	Nabiac	209404	56	436831	6446432		30
Karuah	Tuncurry Downstream	209401D	56	450368	6441819		31
Karuah	Pacific Palms Wharf	209406	56	455401	6422551		32
Karuah	Tarbuck Bay	209465	56	451548	6417906		33
Karuah	Bulahdelah	209460	56	425442	6413407		34
Station Locality Map	Hunter River Region					100.0%	**35**
Hunter	Gostwyck	210402	56	369088	6396074		36
Hunter	Seaham	210462	56	381105	6385316		37
Hunter	Belmore Bridge	210458	56	364492	6377780		38
Hunter	Hexham Bridge	210448	56	376568	6368156		39
Station Locality Map	Macquarie-Tuggerah Lakes (North) Region					100.0%	**40**
Macquarie-Tuggerah Lakes	Barnsley	561067	56	367906	6355834		41
Macquarie-Tuggerah Lakes	Martinsville	561083	56	351239	6341583		42
Macquarie-Tuggerah Lakes	Mandalong	561081	56	355224	6335165		43
Macquarie-Tuggerah Lakes	Wyee	561097	56	358608	6328268		44
Station Locality Map	Macquarie-Tuggerah Lakes (South), Brisbane Water Regions					100.0%	**45**
Macquarie-Tuggerah Lakes	Whitemans Ridge	561026	56	343653	6324899		46
Macquarie-Tuggerah Lakes	Yarramalong	561137	56	338869	6322377		47
Macquarie-Tuggerah Lakes	Kulnura	561078	56	333796	6321517		48
Macquarie-Tuggerah Lakes	Toukley	211401	56	362599	6318531		49
Macquarie-Tuggerah Lakes	Hamlyn Terrace	561133	56	357399	6319854		50
Macquarie-Tuggerah Lakes	Mardi Dam	561082	56	351038	6314555		51
Macquarie-Tuggerah Lakes	Sterland	567138	56	342433	6315335		52
Macquarie-Tuggerah Lakes	Kangy Angy	561132	56	350168	6310609		53
Macquarie-Tuggerah Lakes	Berkeley Vale	561134	56	353191	6309376		54
Macquarie-Tuggerah Lakes	Bateau Bay	561069	56	358098	6305653		55
Macquarie-Tuggerah Lakes	Lisarow	561079	56	348900	6305317		56
Macquarie-Tuggerah Lakes	Strickland	561136	56	345377	6305541		57
Brisbane Water	Narara	561085	56	344310	6304220		58
Brisbane Water	Mount Elliot	561084	56	350646	6302980		59
Brisbane Water	Wyoming	561098	56	346415	6302026		60
Brisbane Water	Kincumber	561077	56	350387	6294461		61
Station Locality Map	Hawkesbury River Region					100.0%	**62**
Hawkesbury	Webbs Creek	212408	56	312331	6303939		63
Hawkesbury	Colo Junction	212407	56	303223	6298183		64
Hawkesbury	Sackville Downstream	212438	56	302769	6291566		65

Region	Station short name	Station no.	MGA	Easting	Northing	Capture %	Figure
Station Locality Map	Sydney Coastal Region					100.0%	**66**
Sydney Coastal	Curl Curl	213426	56	342094	6262459		67
Sydney Coastal	Kelso Creek	213430	56	313782	6241020		68
Station Locality Map	Wollongong Coastal Region					99.6%	**69**
Wollongong Coastal	Rixons Pass	568317	56	305281	6196889		70
Wollongong Coastal	Russell Vale	568318	56	306377	6196135		71
Wollongong Coastal	Mount Pleasant	568229	56	303026	6191630		72
Wollongong Coastal	Mount Kembla	568314	56	299550	6186441		73
Wollongong Coastal	Dombarton Loop	568307	56	294719	6185605		74
Wollongong Coastal	Wongawilli	568320	56	293261	6182388		75
Wollongong Coastal	Port Kembla	568316	56	306636	6182719		76
Wollongong Coastal	Darkes Road	568309	56	297450	6182477		77
Wollongong Coastal	Cleveland Road	568308	56	295800	6179726		78
Wollongong Coastal	Huntley Colliery	568311	56	290648	6178905		79
Wollongong Coastal	Upper Calderwood	568319	56	288750	6175160		80
Wollongong Coastal	Little Lake Entrance	214467	56	304250	6173571		81
Wollongong Coastal	Nurrewin	568228	56	284567	6173437		82
Wollongong Coastal	Clover Hill	568310	56	284233	6172392		83
Wollongong Coastal	North Macquarie	568315	56	291440	6171492		84
Wollongong Coastal	Yellow Rock Road	568321	56	292886	6167649		85
Station Locality Map	South Coast (North) Region					100.0%	**86**
South Coast	Lake Conjola Downstream	216420	56	272446	6094316		87
Station Locality Map	South Coast (Mid) Region					100.0%	**88**
South Coast	Barlows Bay	218415	56	239464	5988955		89
South Coast	Regatta Point	219405	56	236881	5971060		90



NSW GOVERNMENT

SOUTHERN OSCILLATION INDEX
JULY 2001–JUNE 2021

Manly Hydraulics Laboratory

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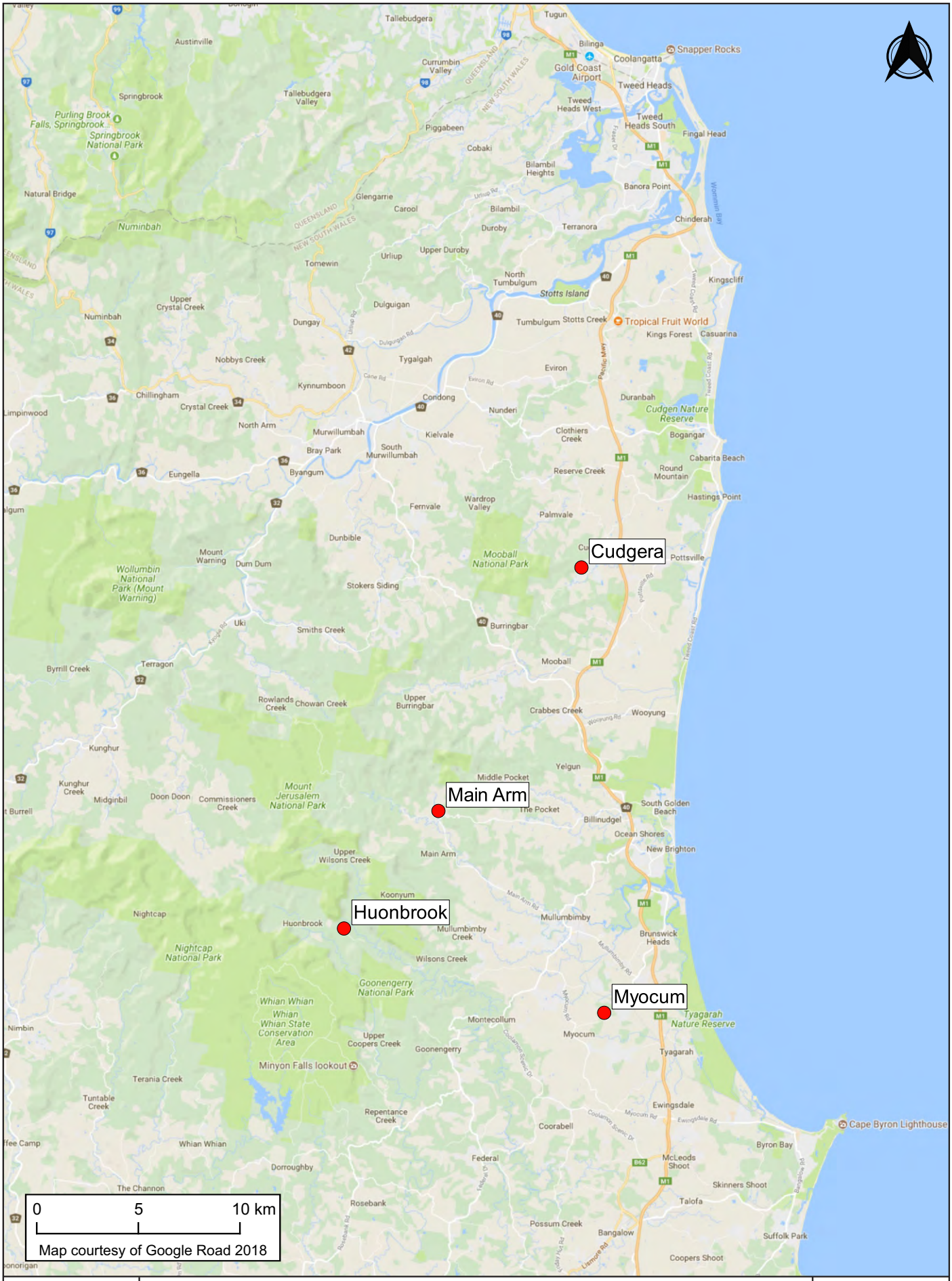
Figure

1

DRAWING 2857-01.cdr



NSW GOVERNMENT

RAINFALL STATION LOCATIONS
TWEED RIVER AND BRUNSWICK RIVER REGIONS

Manly Hydraulics Laboratory

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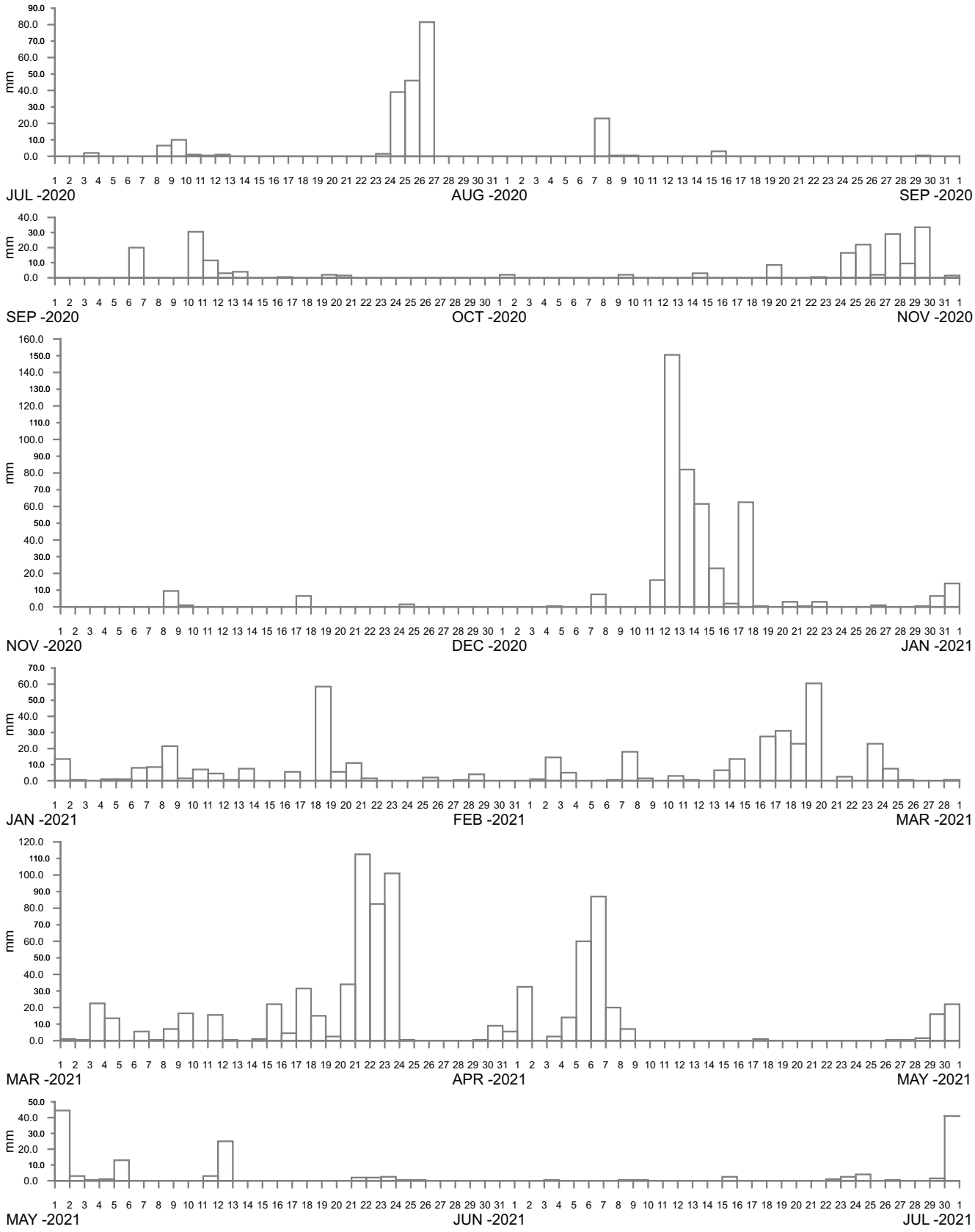
Figure 2

DRAWING 2857-02.cdr



---------- DATA LOSS

NSW GOVERNMENT

CUDGERA AT CABBAGE GUM ROAD
2020–2021

Manly Hydraulics Laboratory

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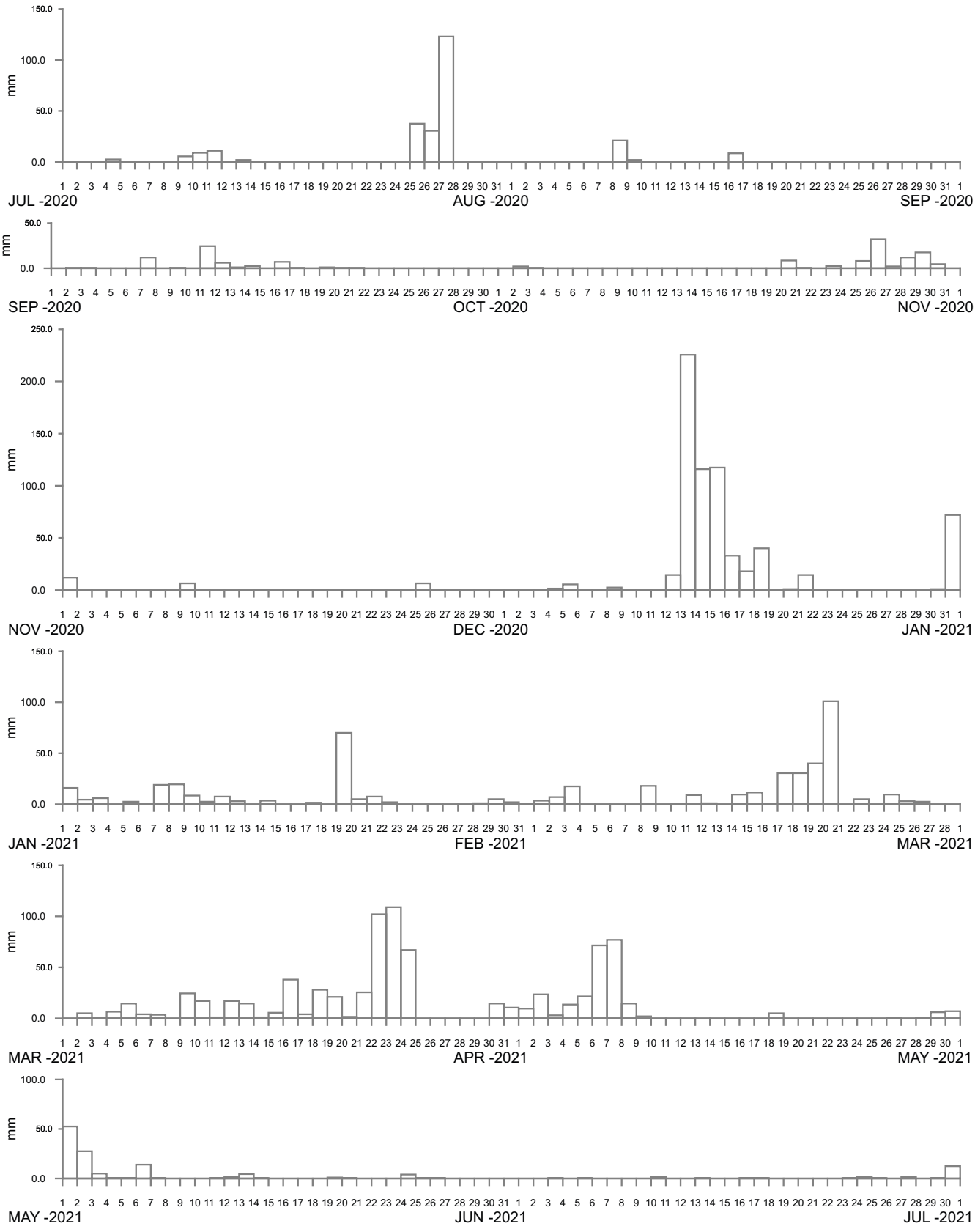
Figure 3

DRAWING 2857-03.cdr



NSW GOVERNMENT

MAIN ARM AT MAIN ARM ROAD
2020–2021

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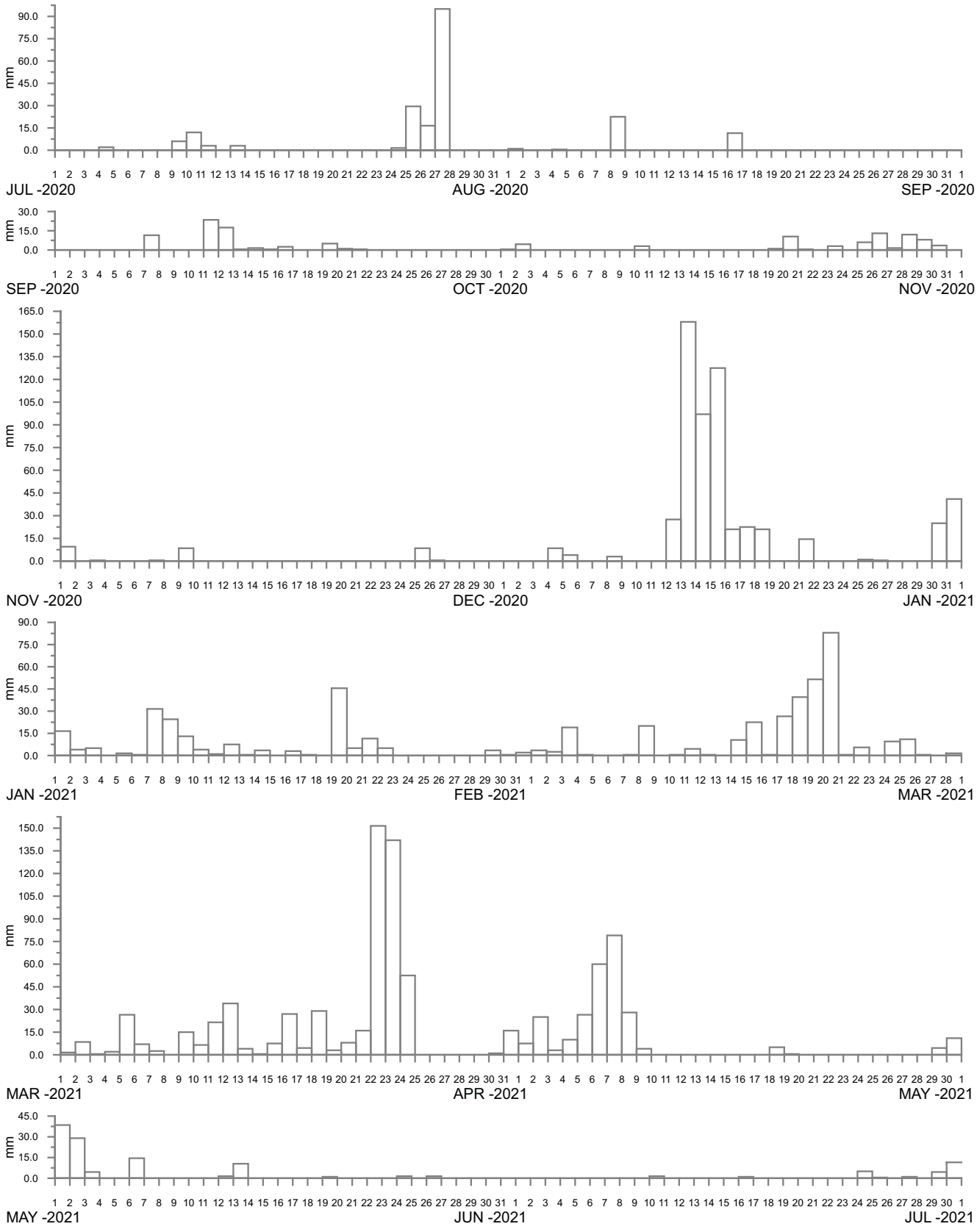
Figure

4

DRAWING 2857-04.cdr



---------- DATA LOSS

NSW GOVERNMENT

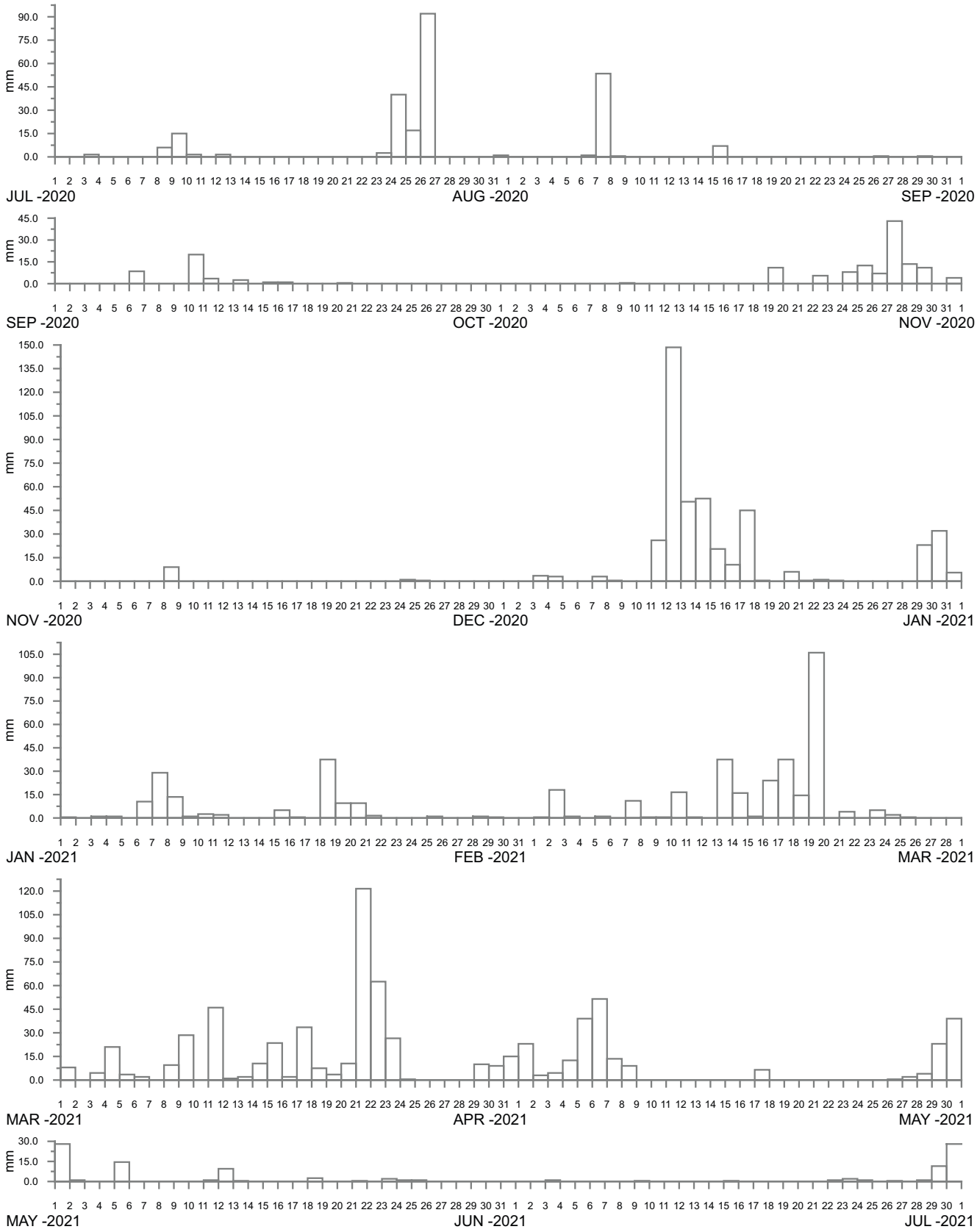
HUONBROOK AT WILSONS CREEK ROAD
2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 5

DRAWING 2857-05.cdr



---------- DATA LOSS

NSW GOVERNMENT

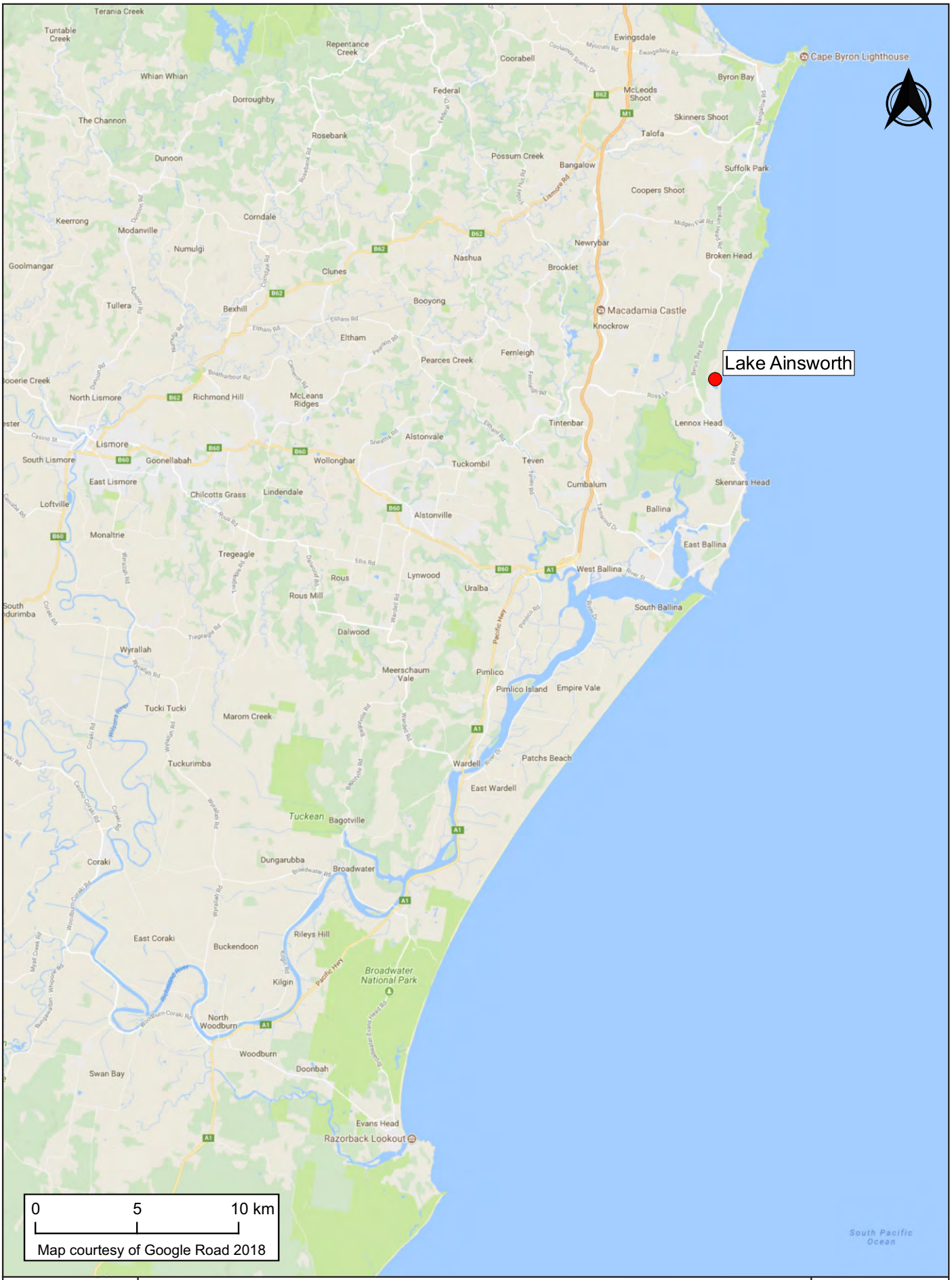
MYOCUM AT KINGSVALE ROAD
2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 6

DRAWING 2857-06.cdr



NSW GOVERNMENT

RAINFALL STATION LOCATIONS
RICHMOND RIVER REGION

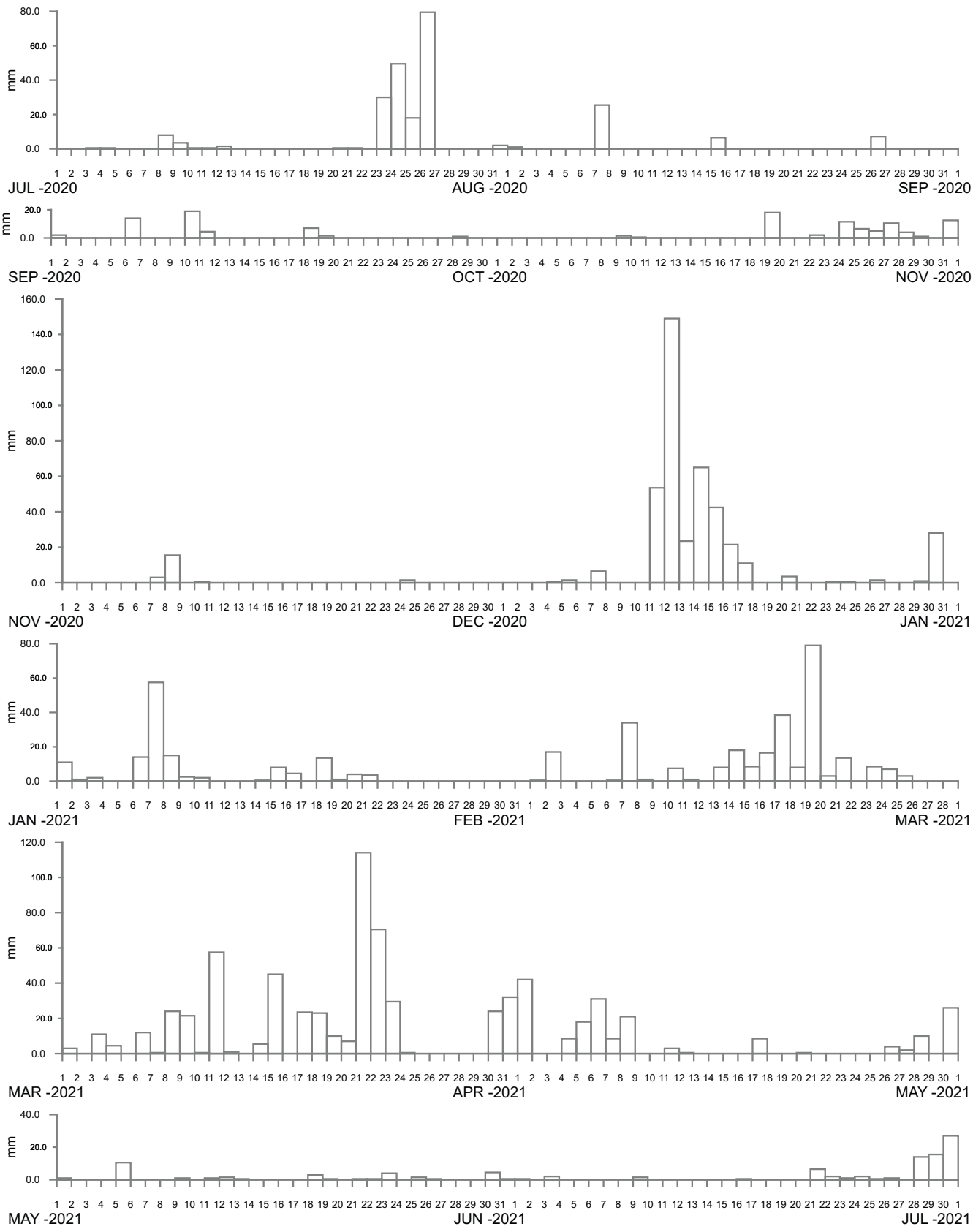
Manly Hydraulics Laboratory

Report MHL2857

Figure

7

DRAWING 2857-07.cdr



---------- DATA LOSS

NSW GOVERNMENT

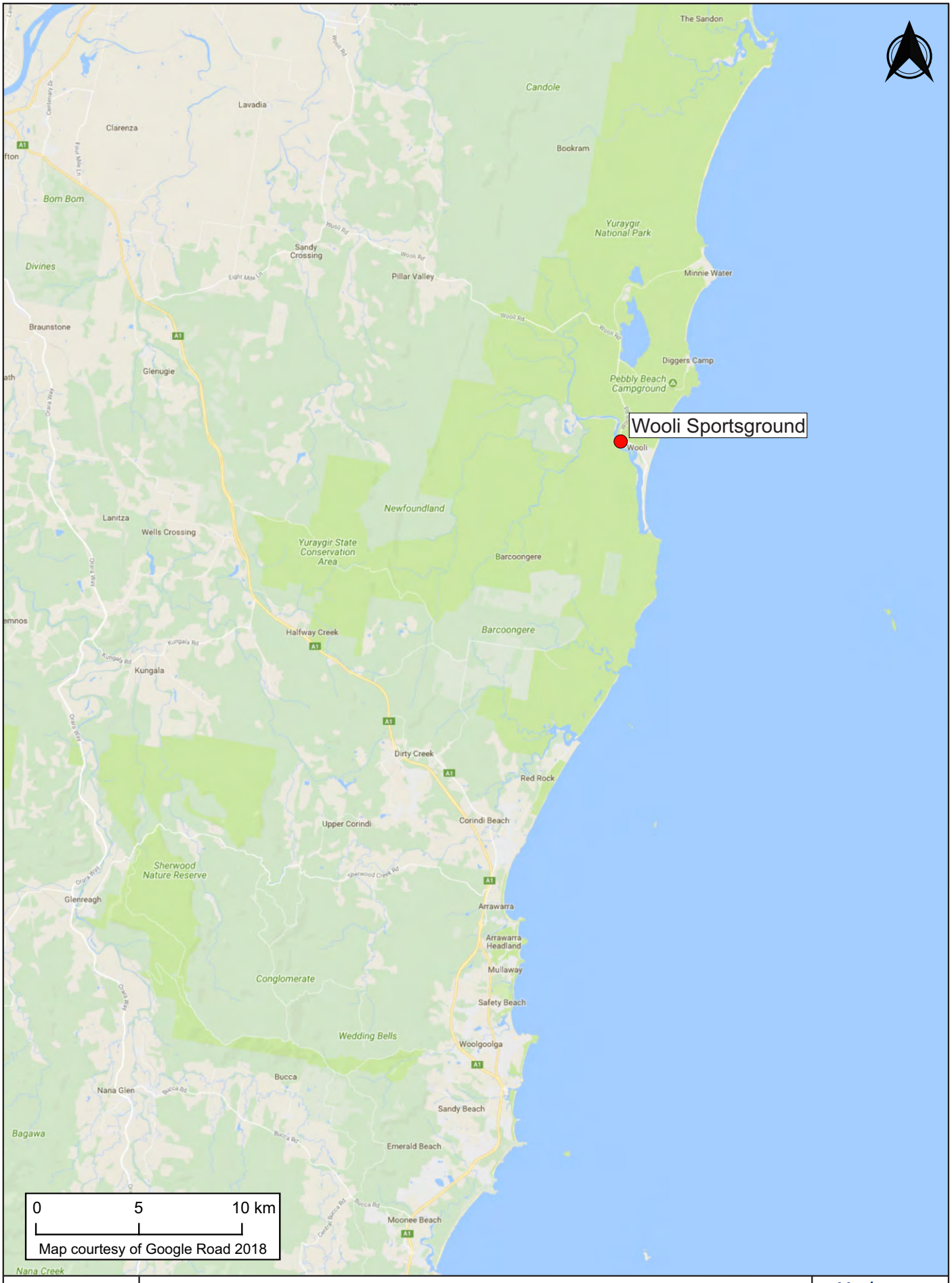
LAKE AINSWORTH AT LENNOX HEAD
2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 8

DRAWING 2857-08.cdr



NSW GOVERNMENT

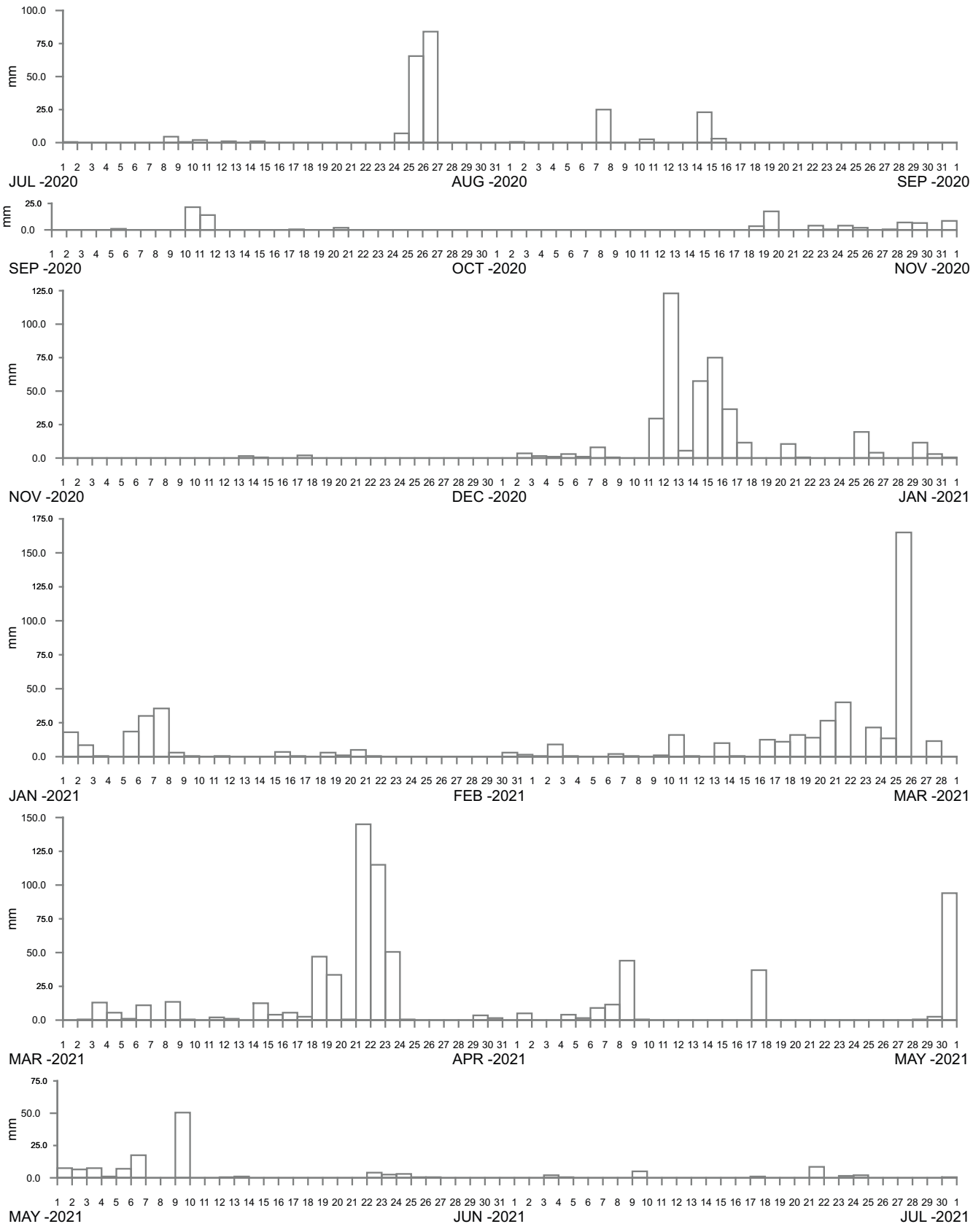
RAINFALL STATION LOCATIONS
BELLINGER RIVER REGION (NORTH)

Manly Hydraulics Laboratory

Report MHL2857

Figure 9

DRAWING 2857-09.cdr



---------- DATA LOSS

NSW GOVERNMENT

WOOLI SPORTSGROUND AT WOOLI RIVER
2020–2021

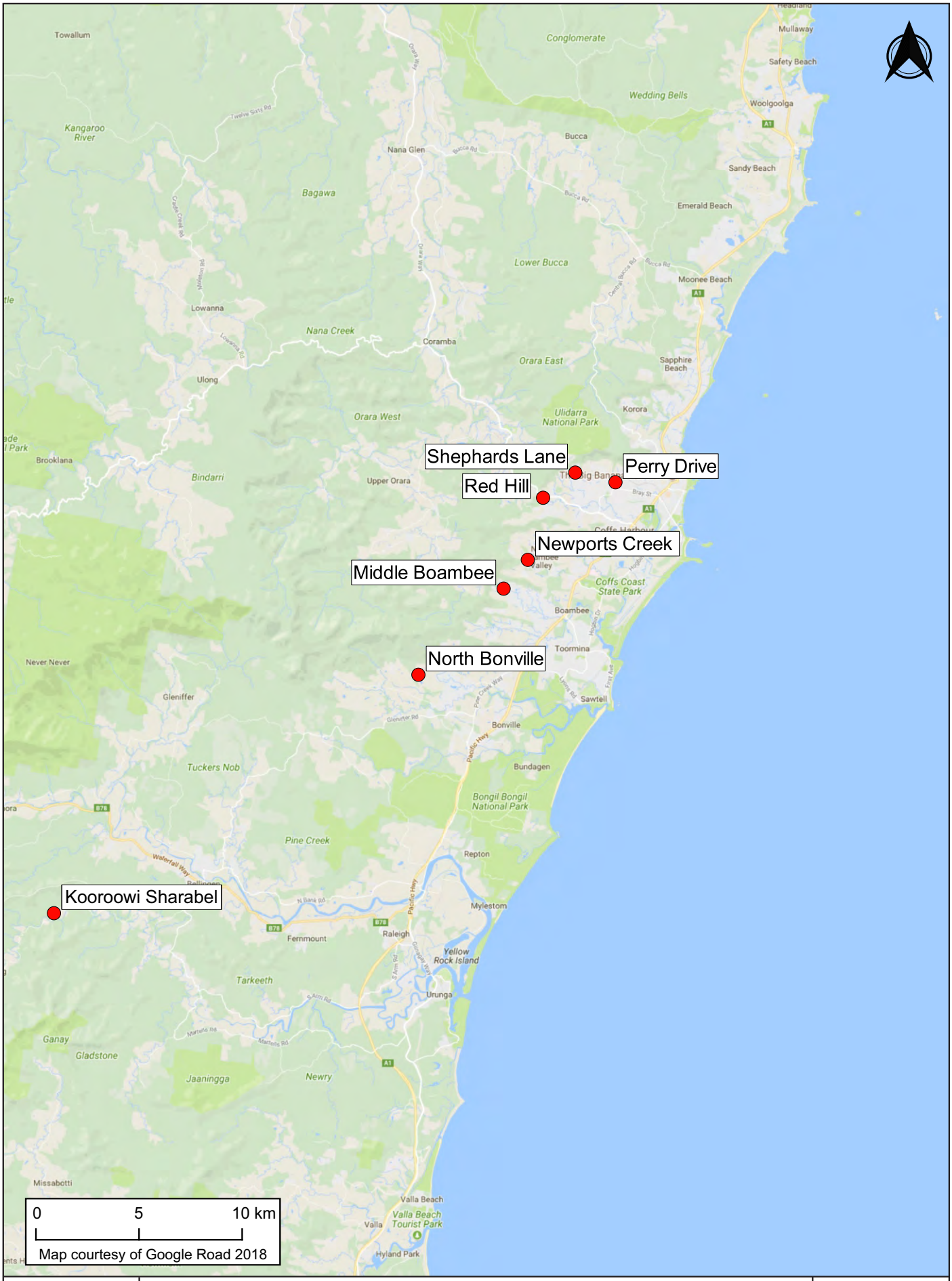
Manly Hydraulics Laboratory

Report MHL2857

Figure

10

DRAWING 2857-10.cdr



NSW GOVERNMENT

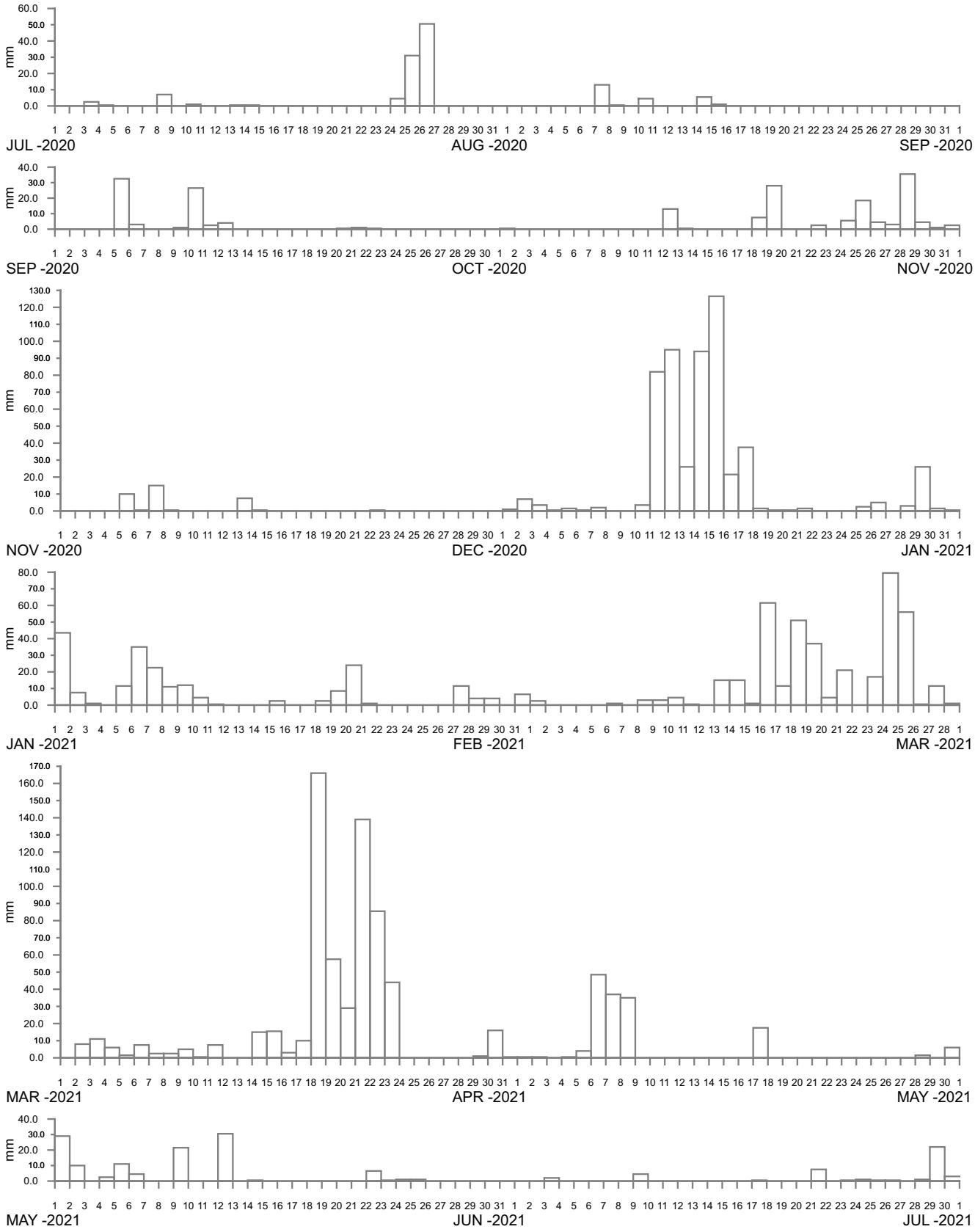
RAINFALL STATION LOCATIONS
BELLINGER RIVER REGION (SOUTH)

Manly Hydraulics Laboratory

Report MHL2857

Figure 11

DRAWING 2857-11.cdr



---------- DATA LOSS

NSW GOVERNMENT

PERRY DRIVE AT COFFS HARBOUR
2020–2021

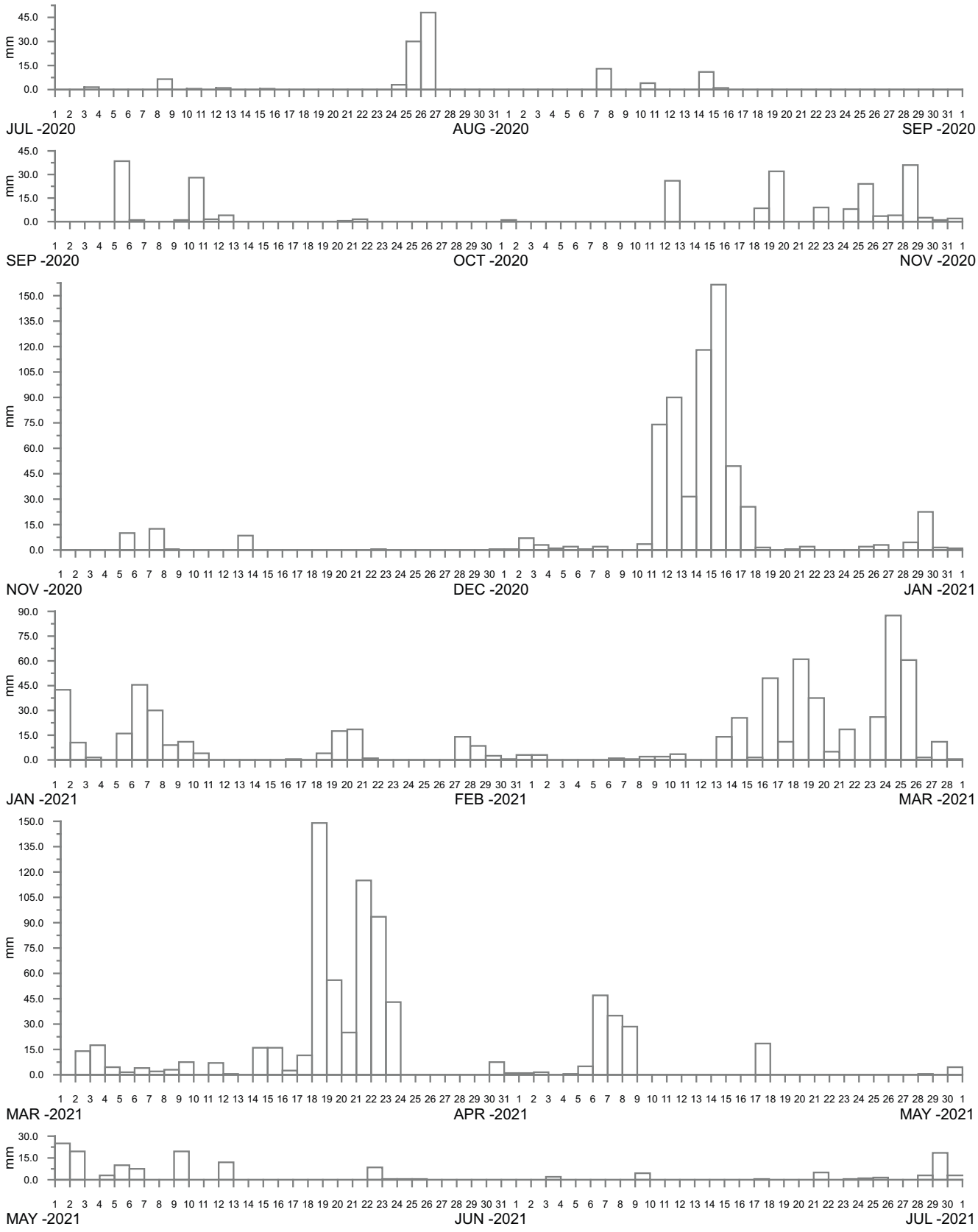
Manly Hydraulics Laboratory

Report MHL2857

Figure

12

DRAWING 2857-12.cdr



---------- DATA LOSS

NSW GOVERNMENT

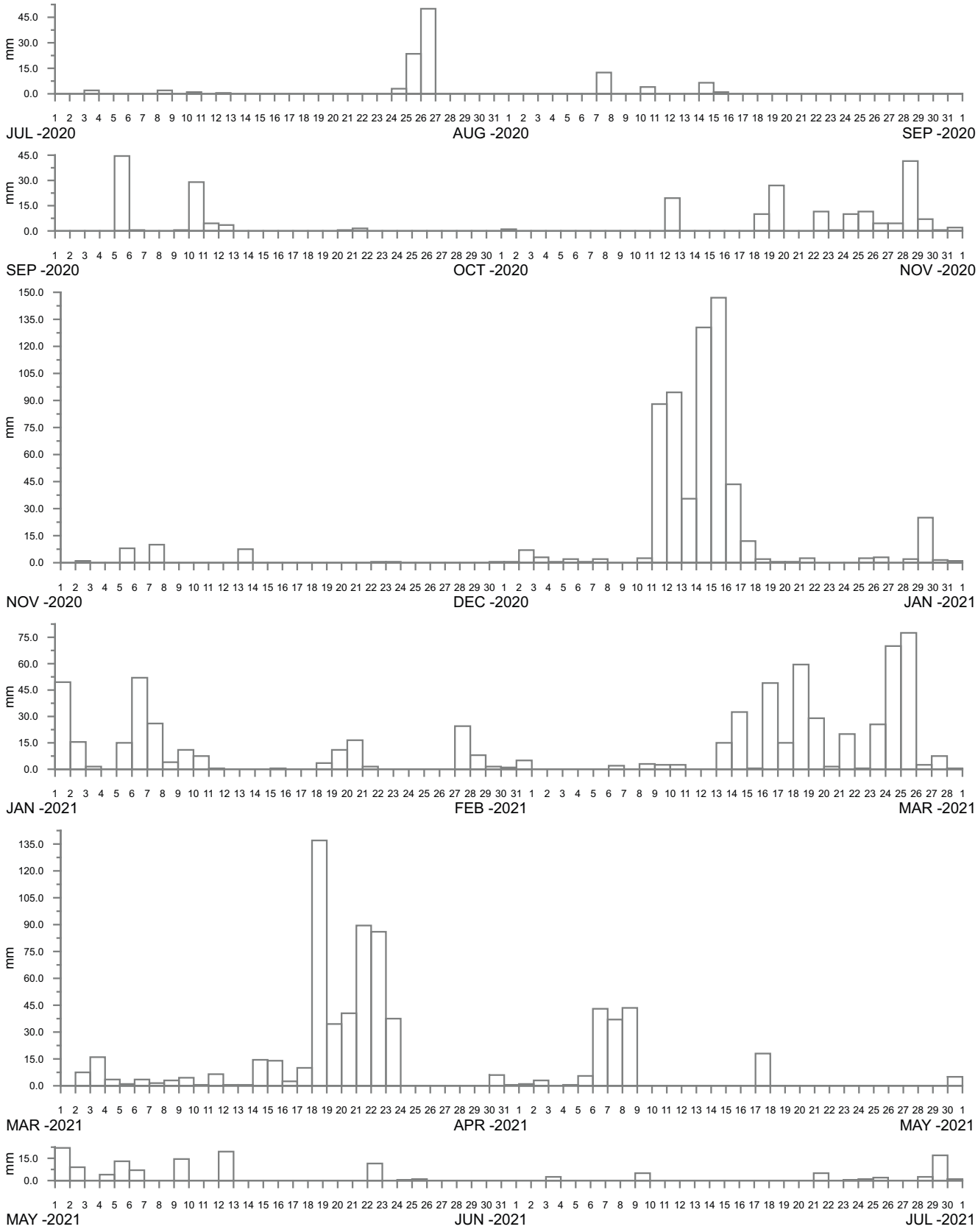
SHEPHARDS LANE AT COFFS HARBOUR
2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 13

DRAWING 2857-13.cdr



---------- DATA LOSS

NSW GOVERNMENT

RED HILL AT COFFS HARBOUR
2020–2021

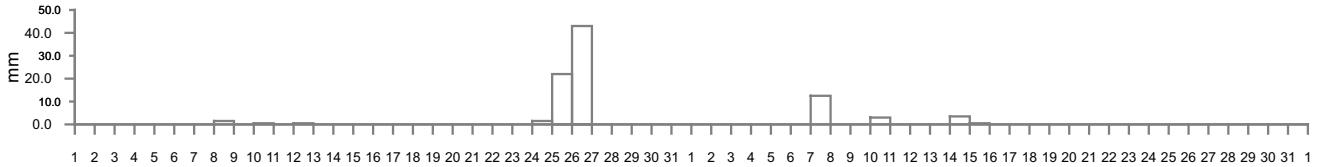
Manly Hydraulics Laboratory

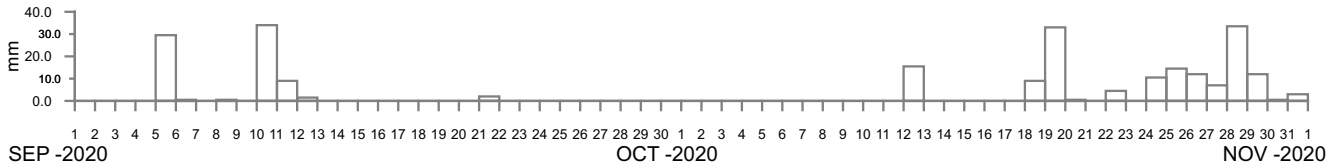
Report MHL2857

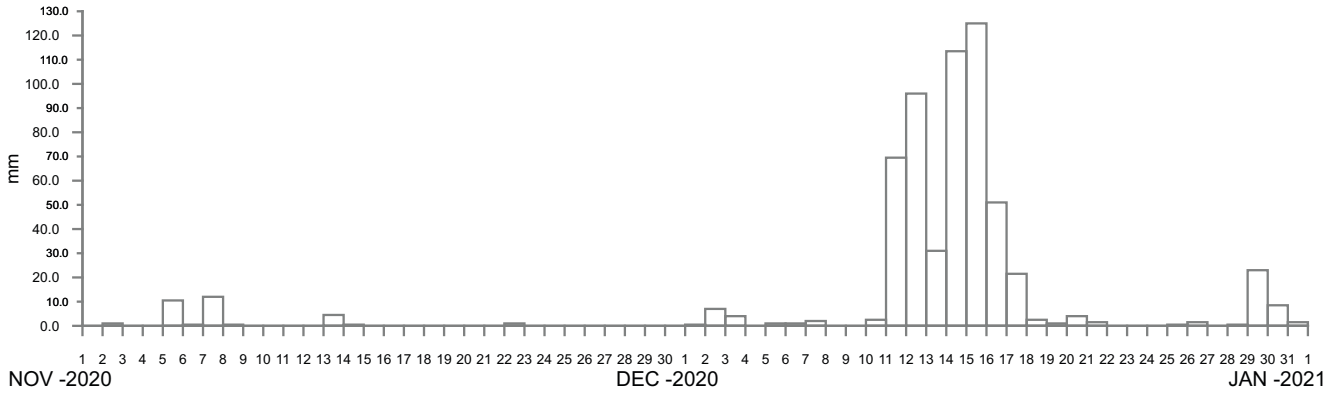
Figure

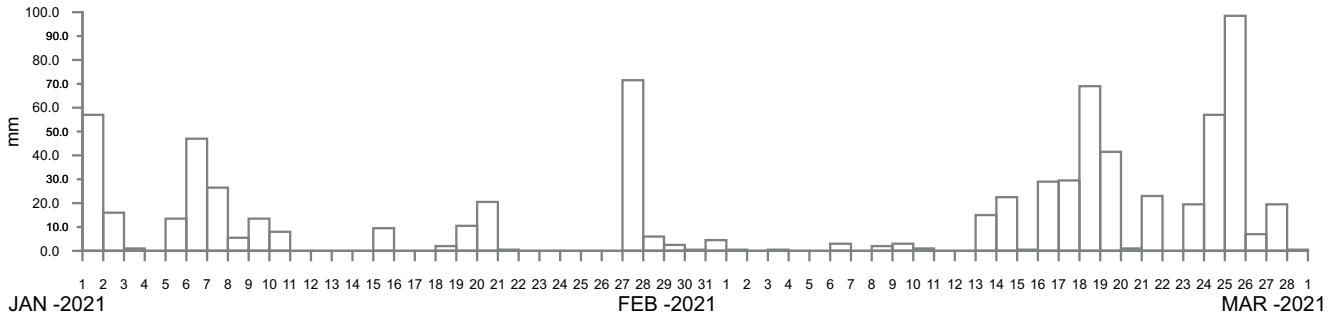
14

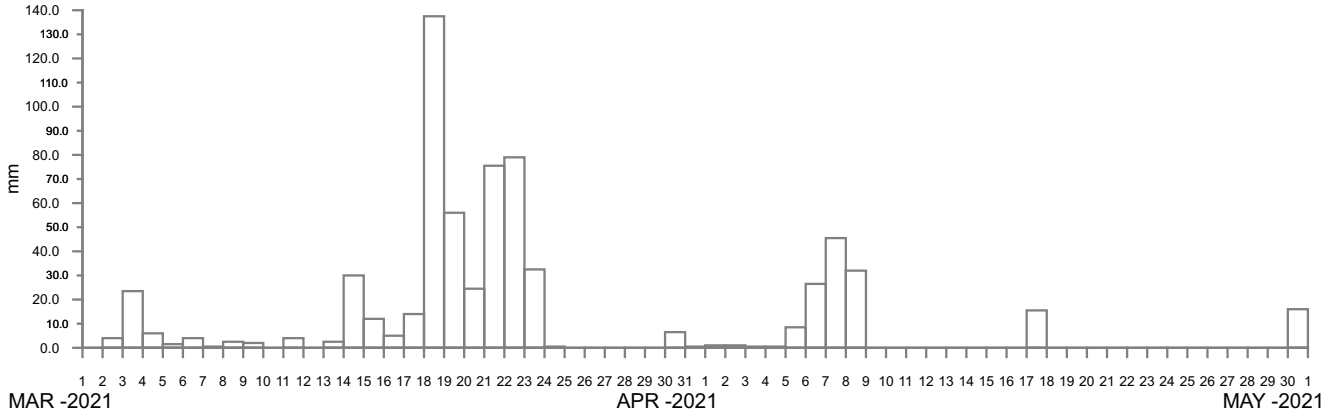
DRAWING 2857-14.cdr

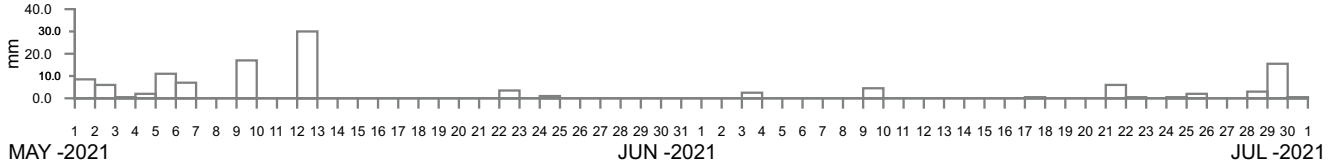












---------- DATA LOSS

NSW GOVERNMENT

NEWPORTS CREEK AT ENGLANDS ROAD
2020–2021

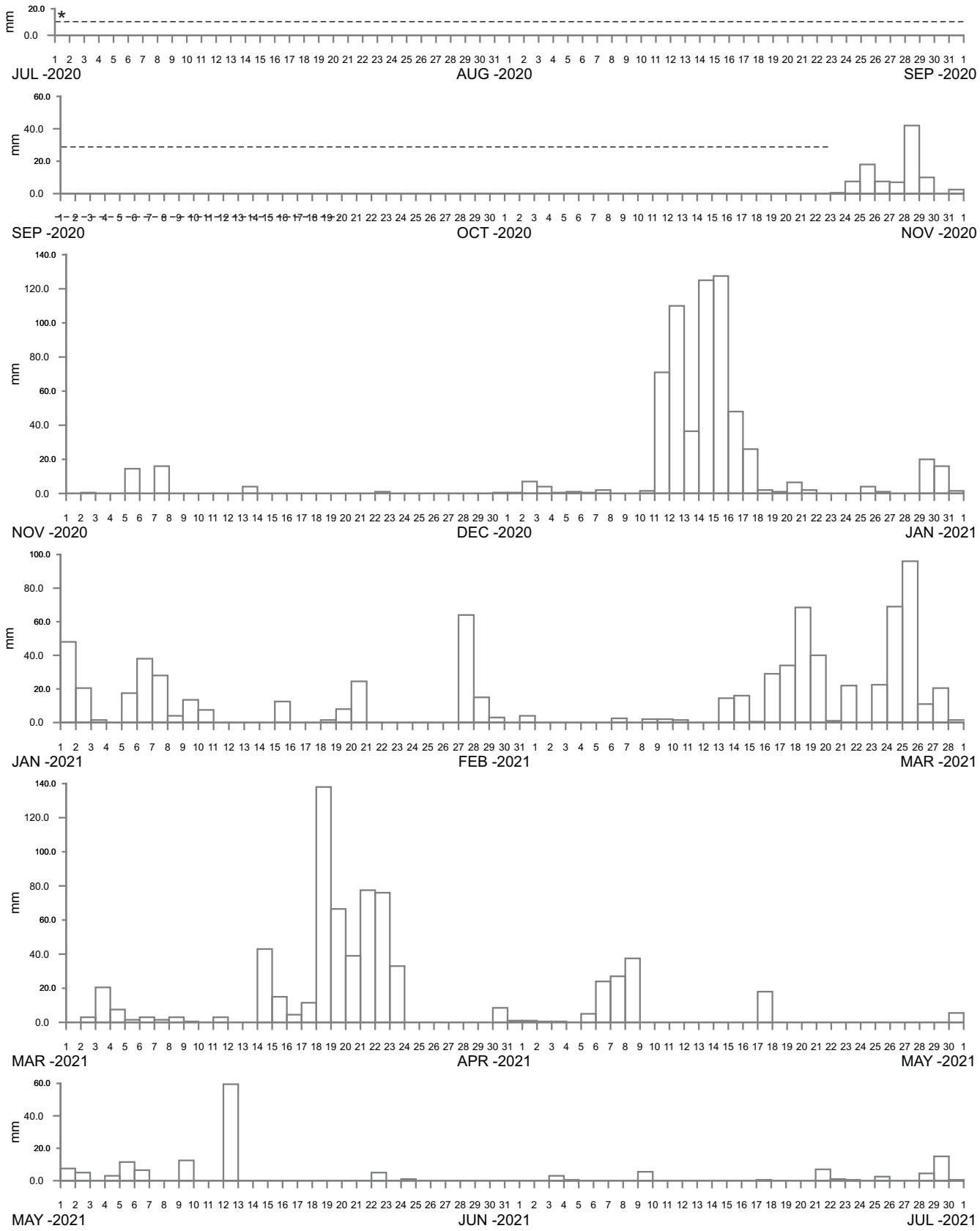
Manly Hydraulics Laboratory

Report MHL2857

Figure

15

DRAWING 2857-15.cdr



---------- DATA LOSS

*Data loss due to faulty logger or wiring

NSW GOVERNMENT

MIDDLE BOAMBEE AT CEDARVALE ROAD
2020–2021

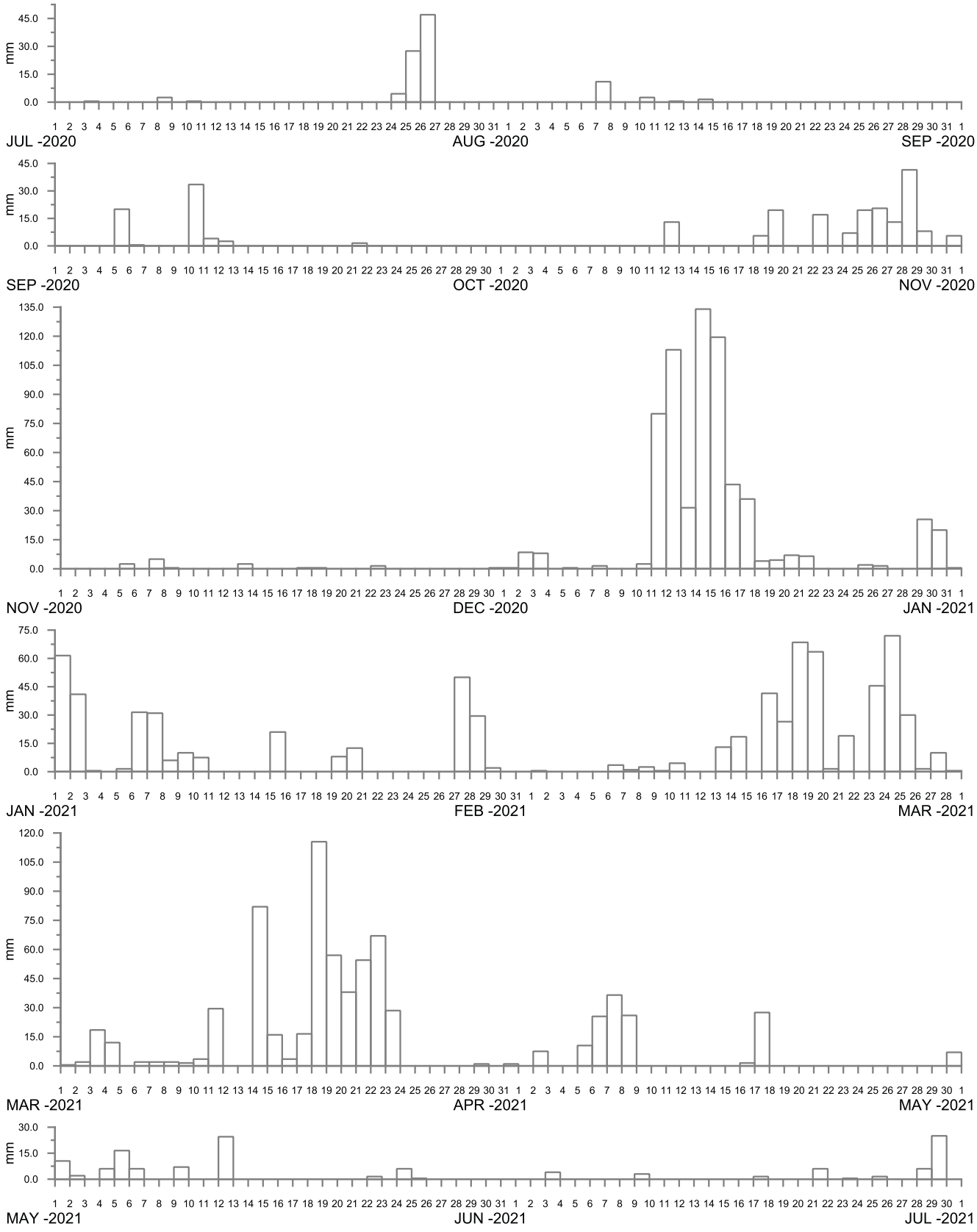
Manly Hydraulics Laboratory

Report MHL2857

Figure

16

DRAWING 2857-16.cdr



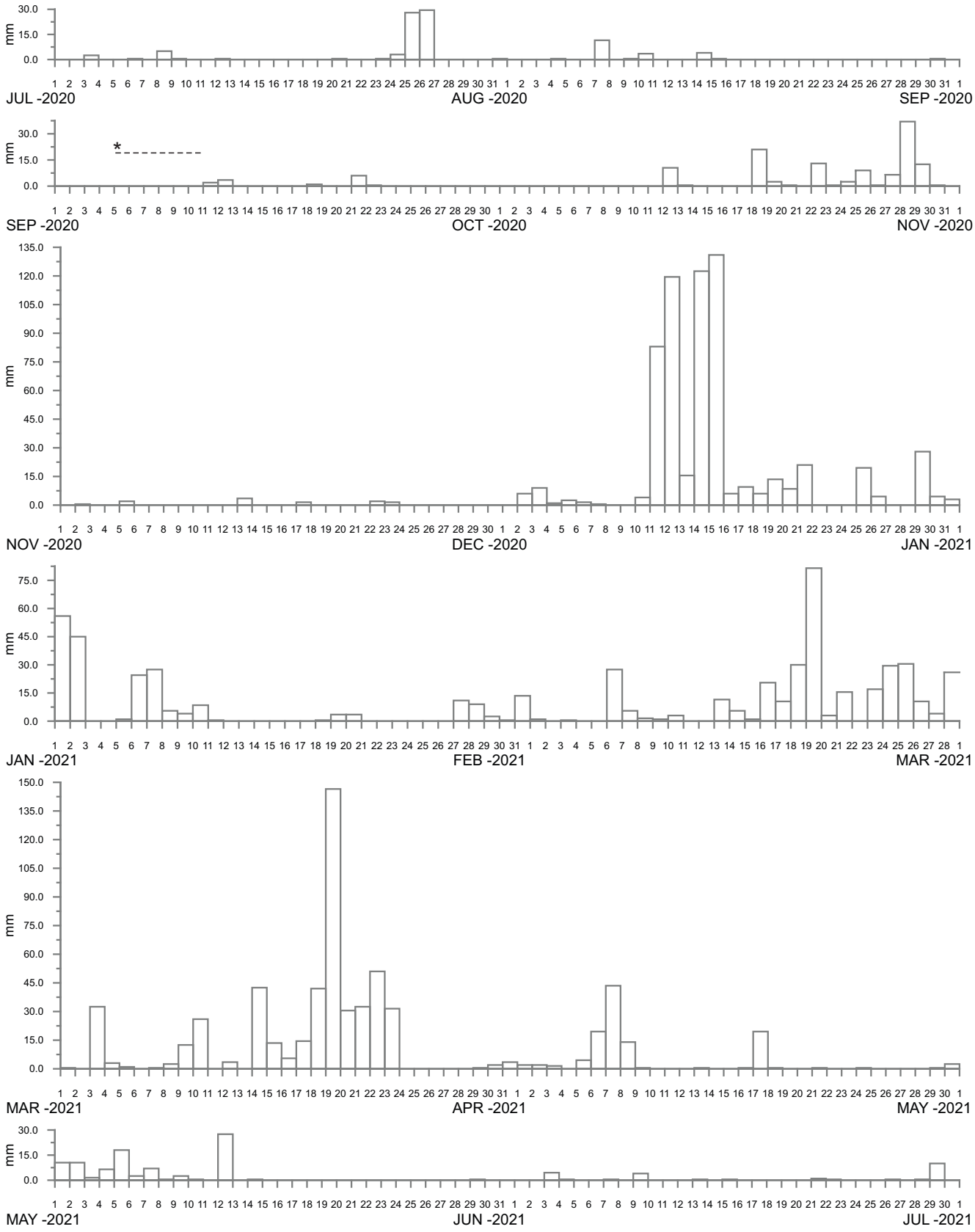
NORTH BONVILLE AT NORTH BONVILLE ROAD
2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 17

DRAWING 2857-17.cdr



---------- DATA LOSS

*Data loss due to low battery

NSW GOVERNMENT

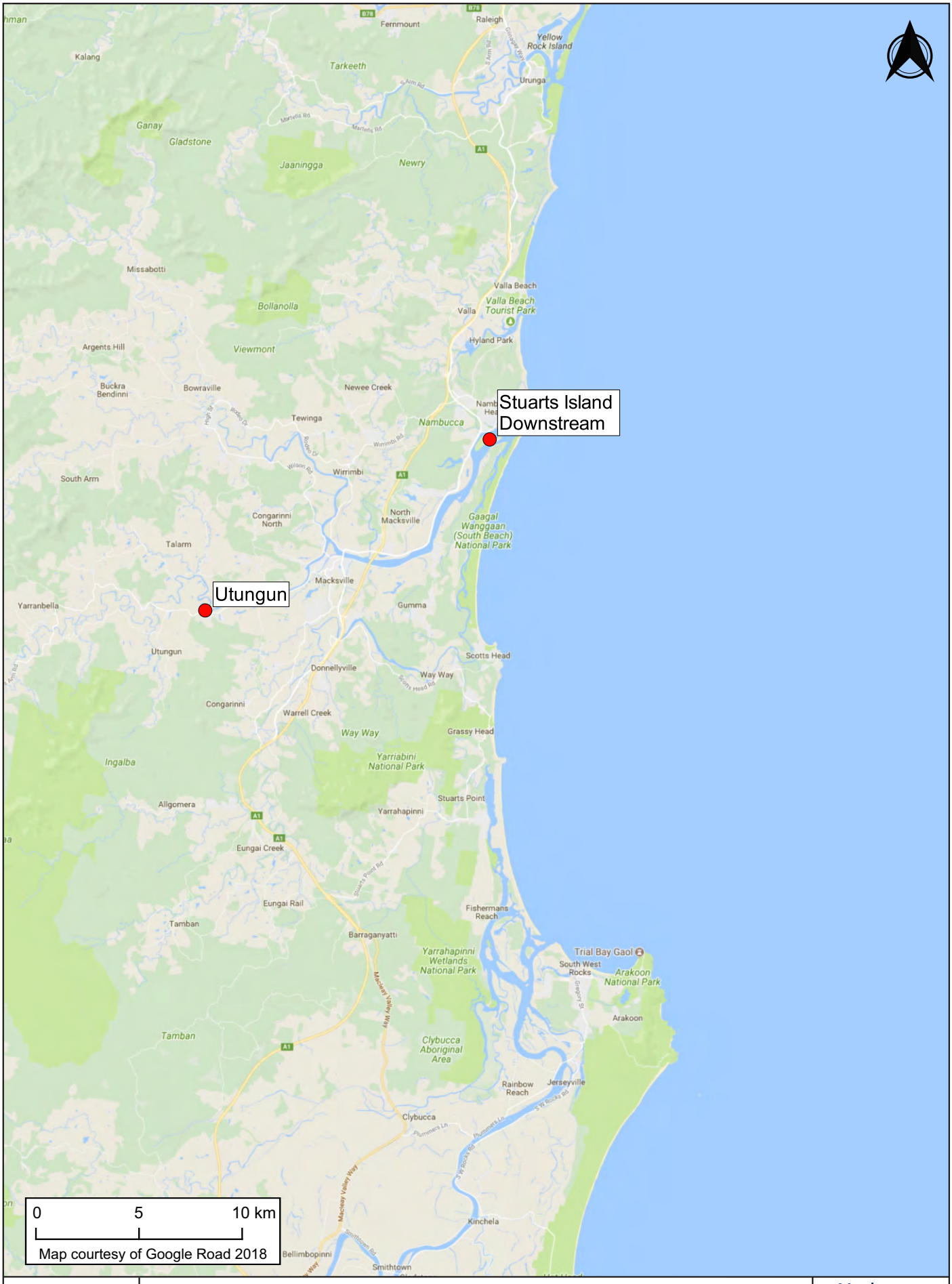
KOOROOWI SHARABEL AT KALANG RIVER 2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 18

DRAWING 2857-18.cdr



NSW GOVERNMENT

RAINFALL STATION LOCATIONS
NAMBUCCA RIVER REGION

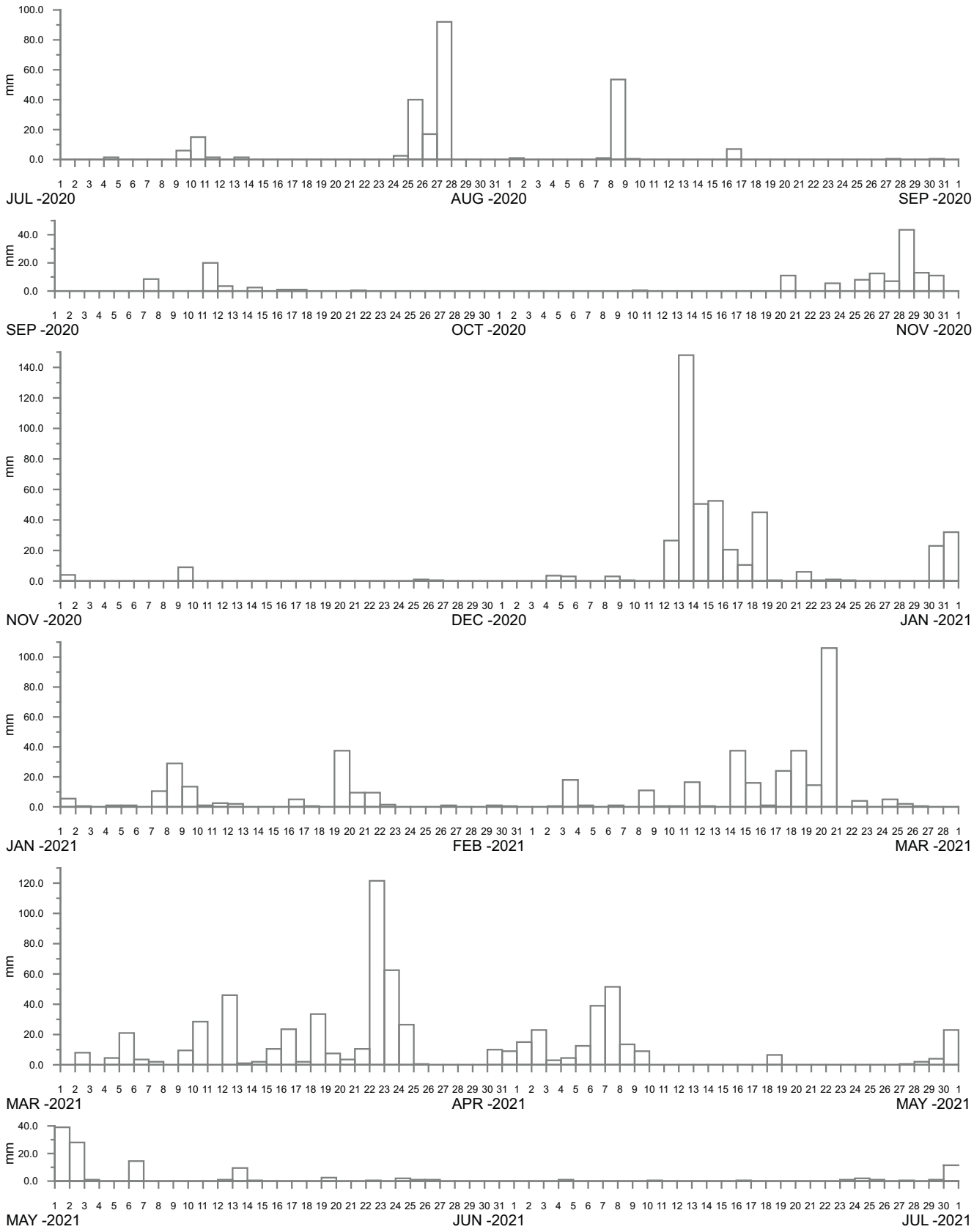
Manly Hydraulics Laboratory

Report MHL2857

Figure

19

DRAWING 2857-19.cdr



---------- DATA LOSS

NSW GOVERNMENT

MYOCUM AT KINGSVALE ROAD
2020–2021

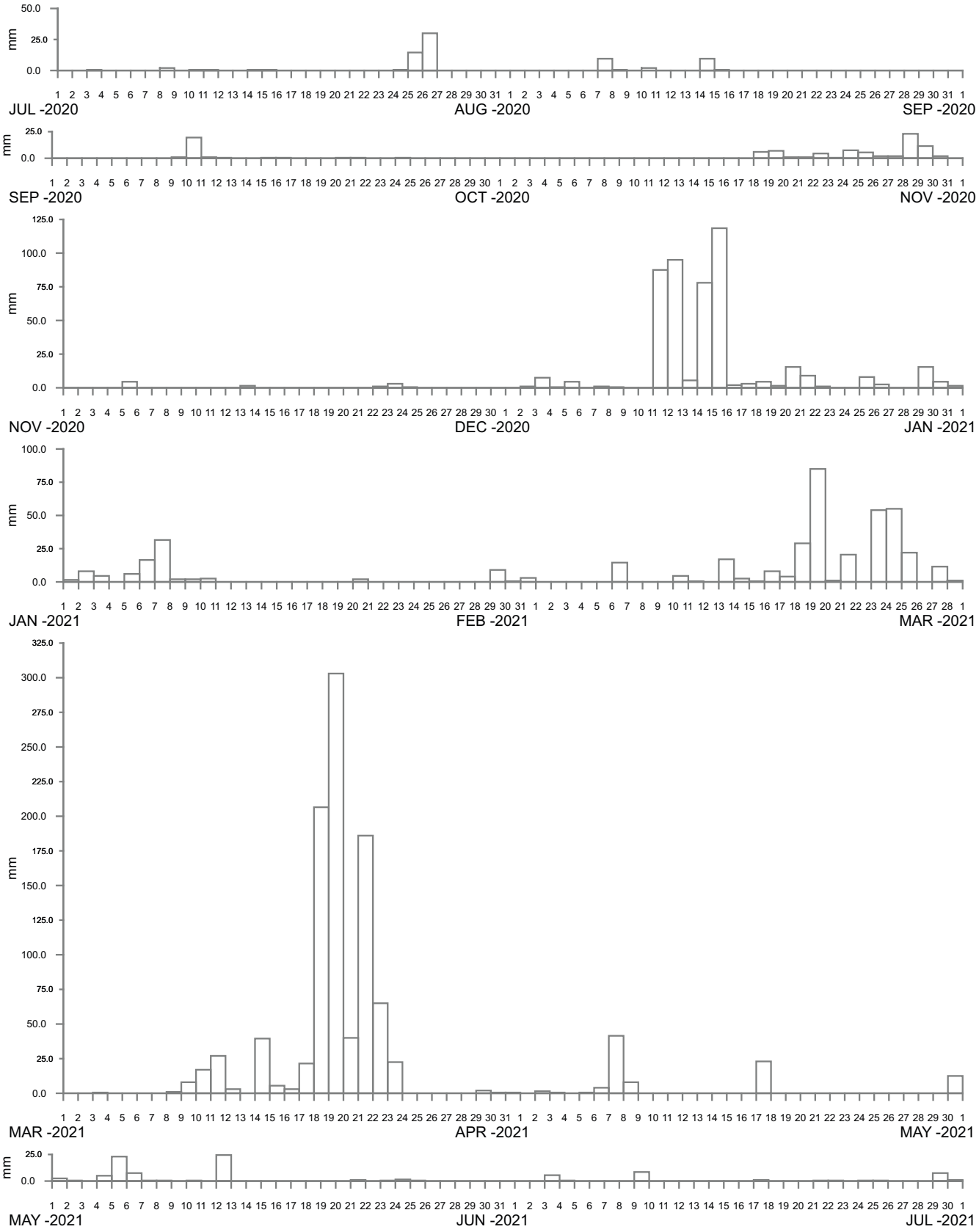
Manly Hydraulics Laboratory

Report MHL2857

Figure

20

DRAWING 2857-20.cdr



---------- DATA LOSS

NSW GOVERNMENT

UTUNGUN AT TAYLORS ARM
2020–2021

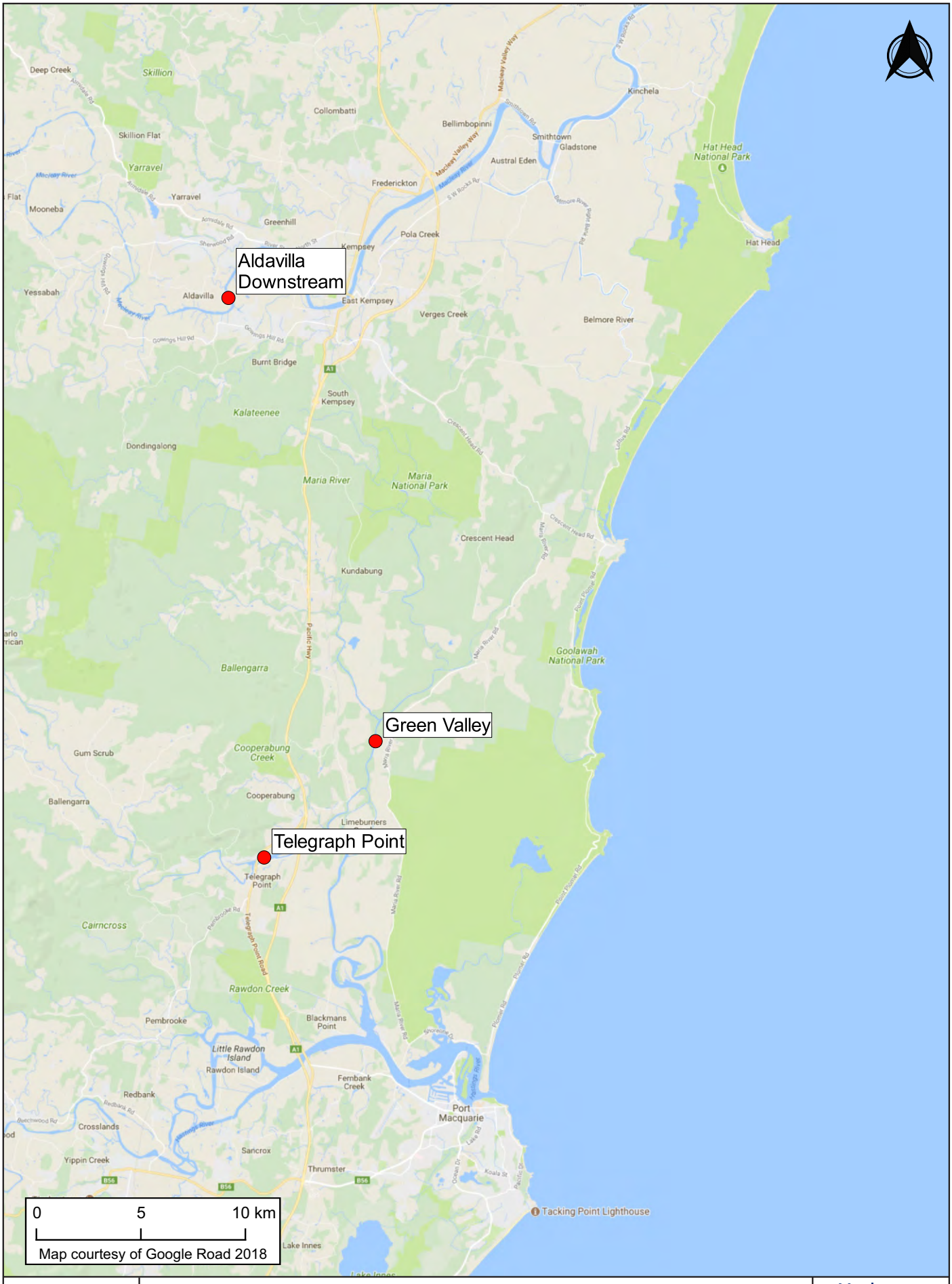
Manly Hydraulics Laboratory

Report MHL2857

Figure

21

DRAWING 2857-21.cdr



NSW GOVERNMENT

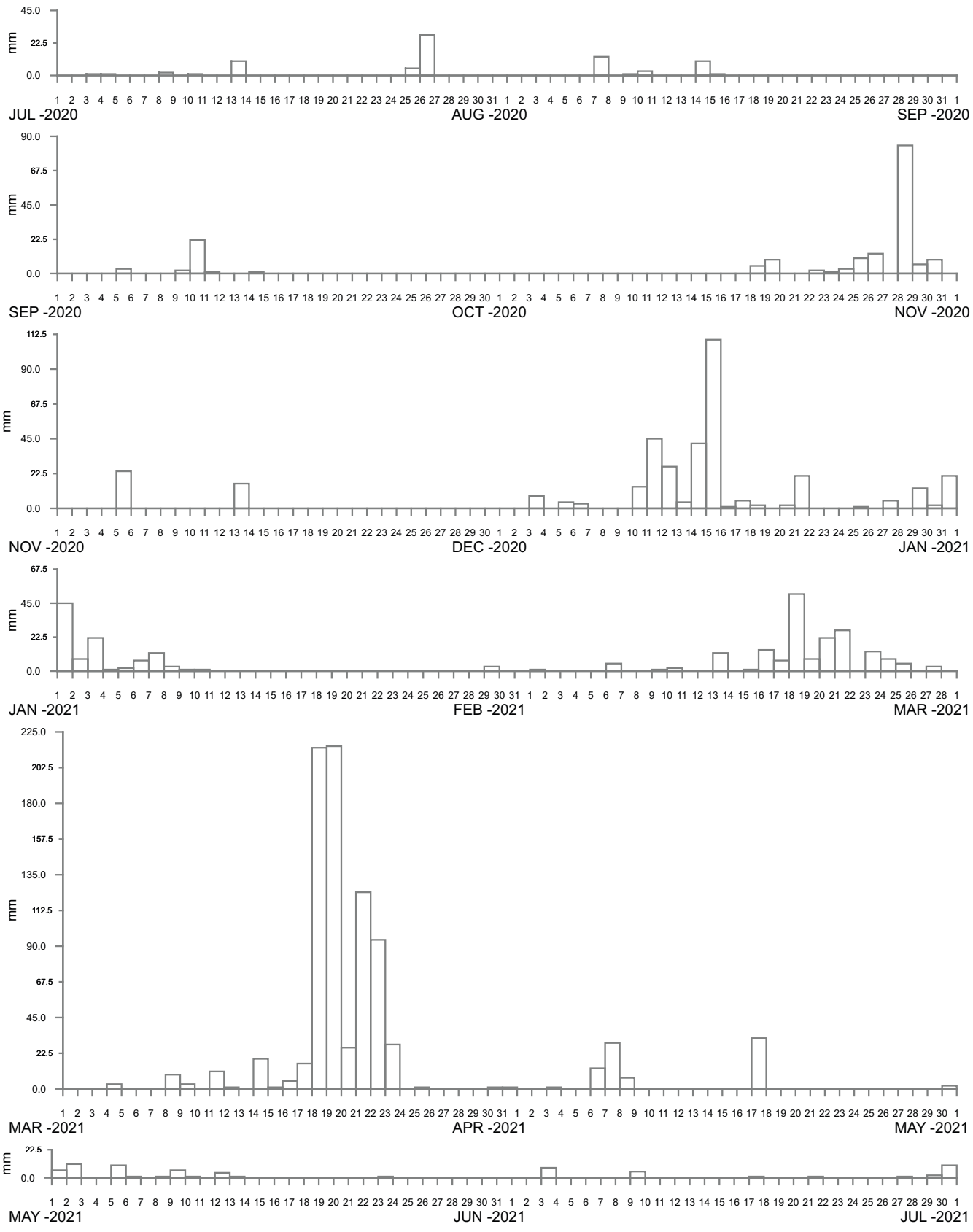
RAINFALL STATION LOCATIONS
MACLEAY RIVER AND HASTINGS RIVER REGIONS

Manly Hydraulics Laboratory

Report MHL2857

Figure 22

DRAWING 2857-22.cdr



NSW GOVERNMENT

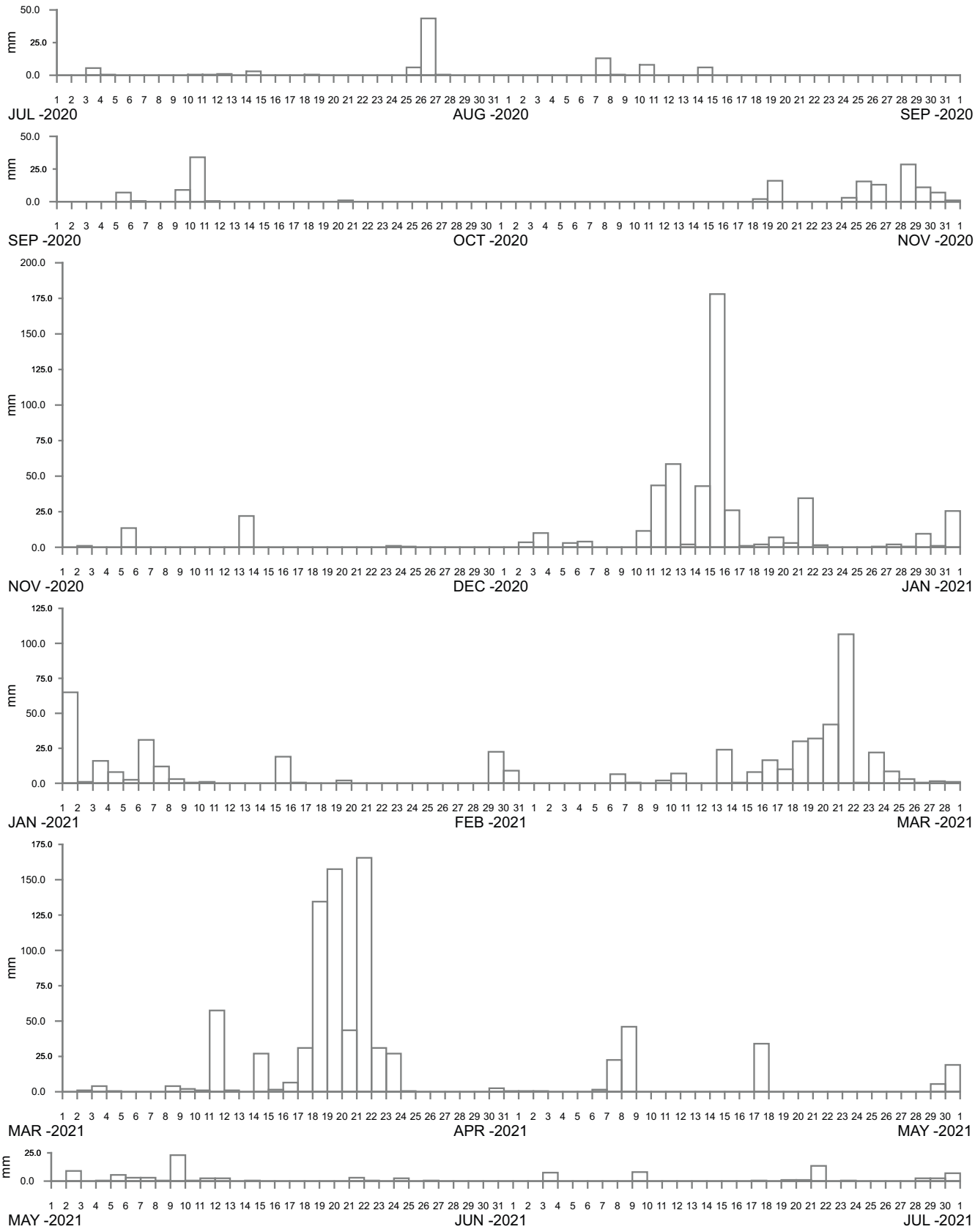
ALDAVILLA DOWNSTREAM AT MACLEAY RIVER 2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 23

DRAWING 2857-23.cdr



DATA LOSS

NSW GOVERNMENT

GREEN VALLEY AT MARIA RIVER
2020–2021

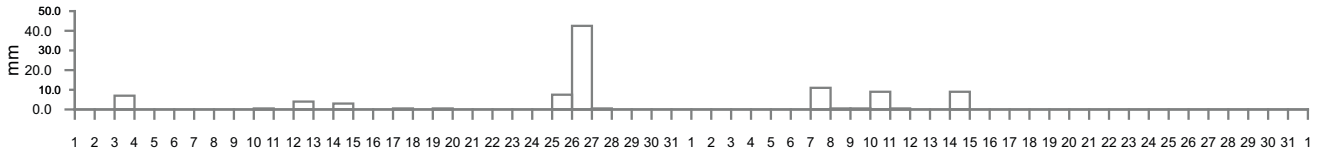
Manly Hydraulics Laboratory

Report MHL2857

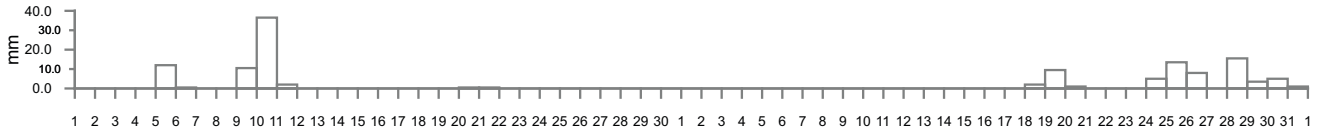
Figure

24

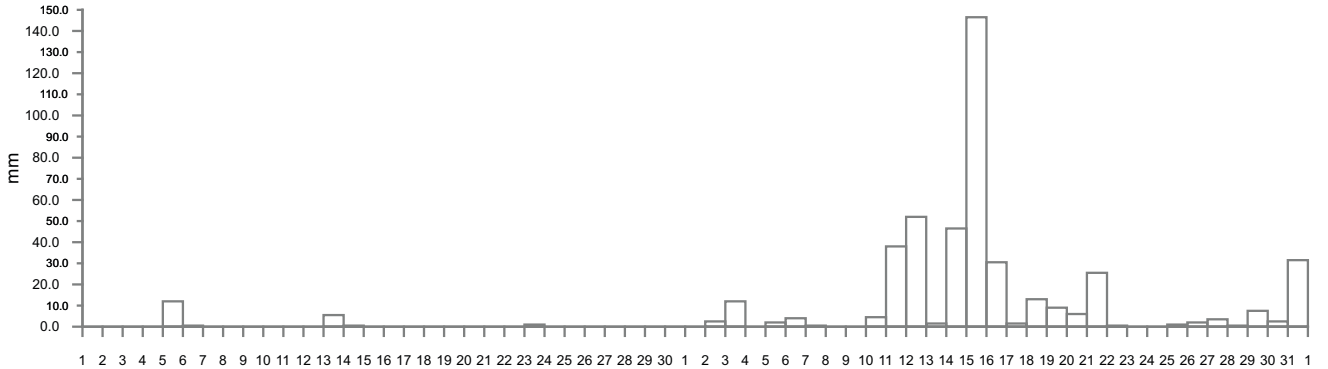
DRAWING 2857-24.cdr



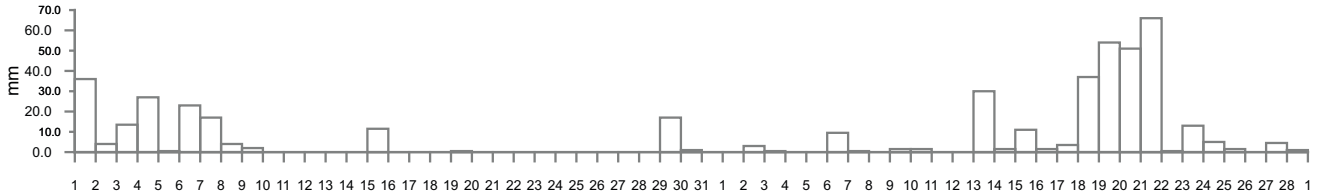
JUL -2020 AUG -2020 SEP -2020



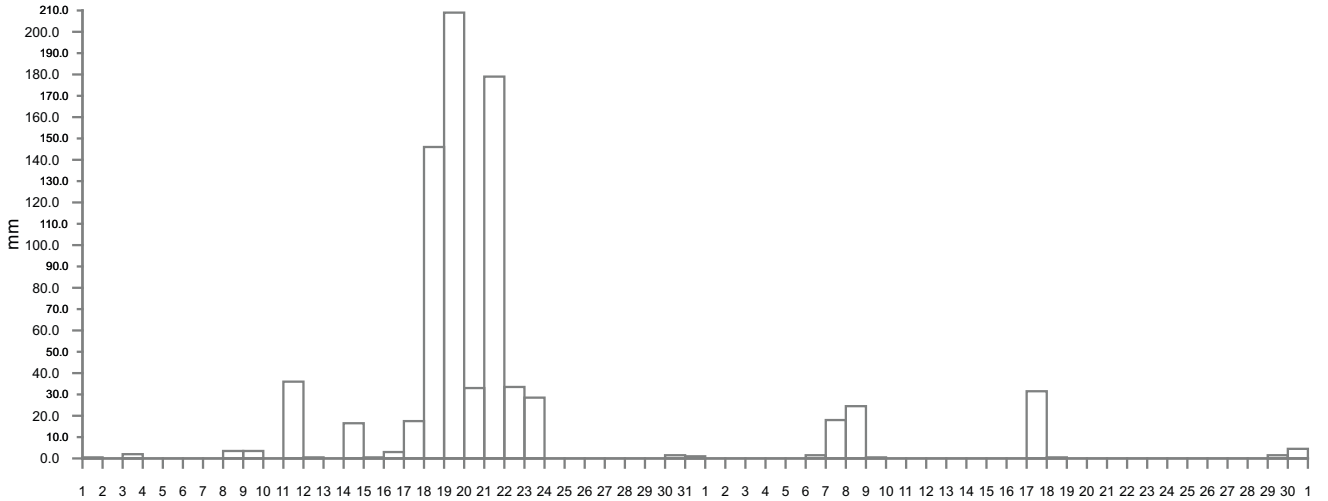
SEP -2020 OCT -2020 NOV -2020



NOV -2020 DEC -2020 JAN -2021



JAN -2021 FEB -2021 MAR -2021



MAR -2021 APR -2021 MAY -2021

MAY -2021 JUN -2021 JUL -2021

---------- DATA LOSS

NSW GOVERNMENT

TELEGRAPH POINT AT WILSONS RIVER
2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure

25

DRAWING 2857-25.cdr

NSW GOVERNMENT

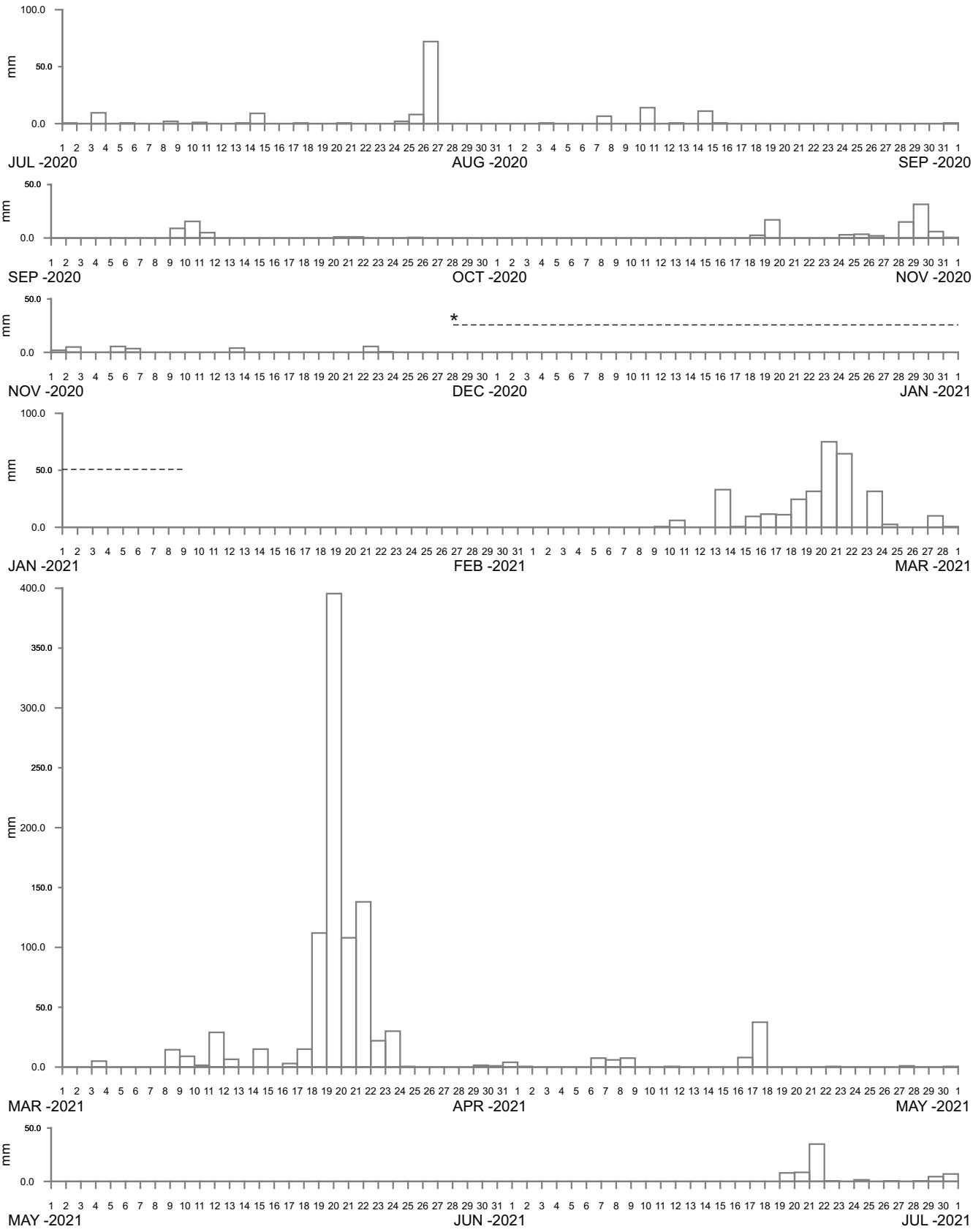
RAINFALL STATION LOCATIONS
CAMDEN HAVEN REGION

Manly Hydraulics Laboratory

Report MHL2857

Figure 26

DRAWING 2857-26.cdr



---------- DATA LOSS

*Data loss due to faulty logger or wiring

NSW GOVERNMENT

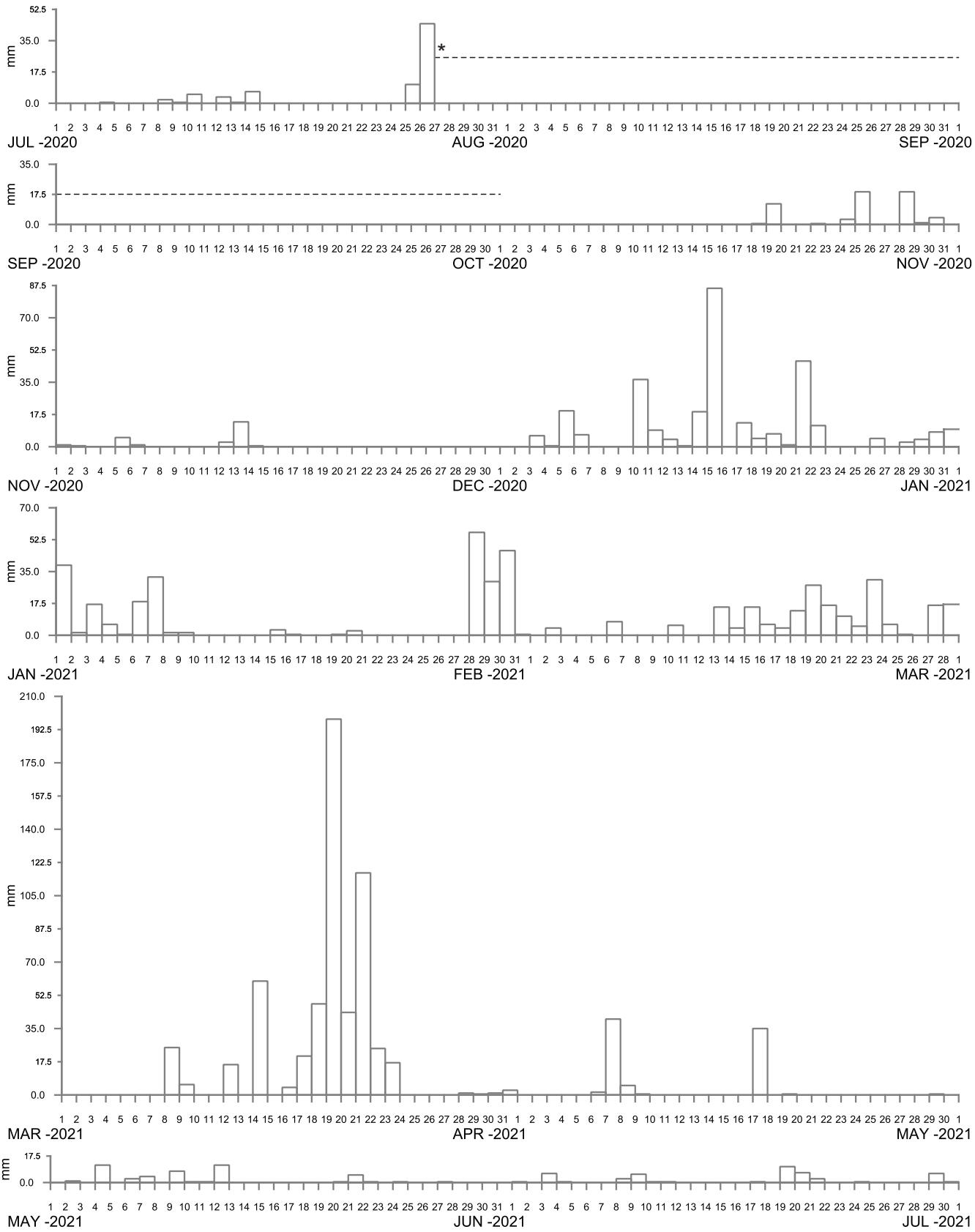
LOGANS CROSSING AT CAMDEN HAVEN
2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 27

DRAWING 2857-27.cdr



---------- DATA LOSS

*Data loss due to faulty logger

NSW GOVERNMENT

MOUNT GEORGE AT MANNING RIVER
2020–2021

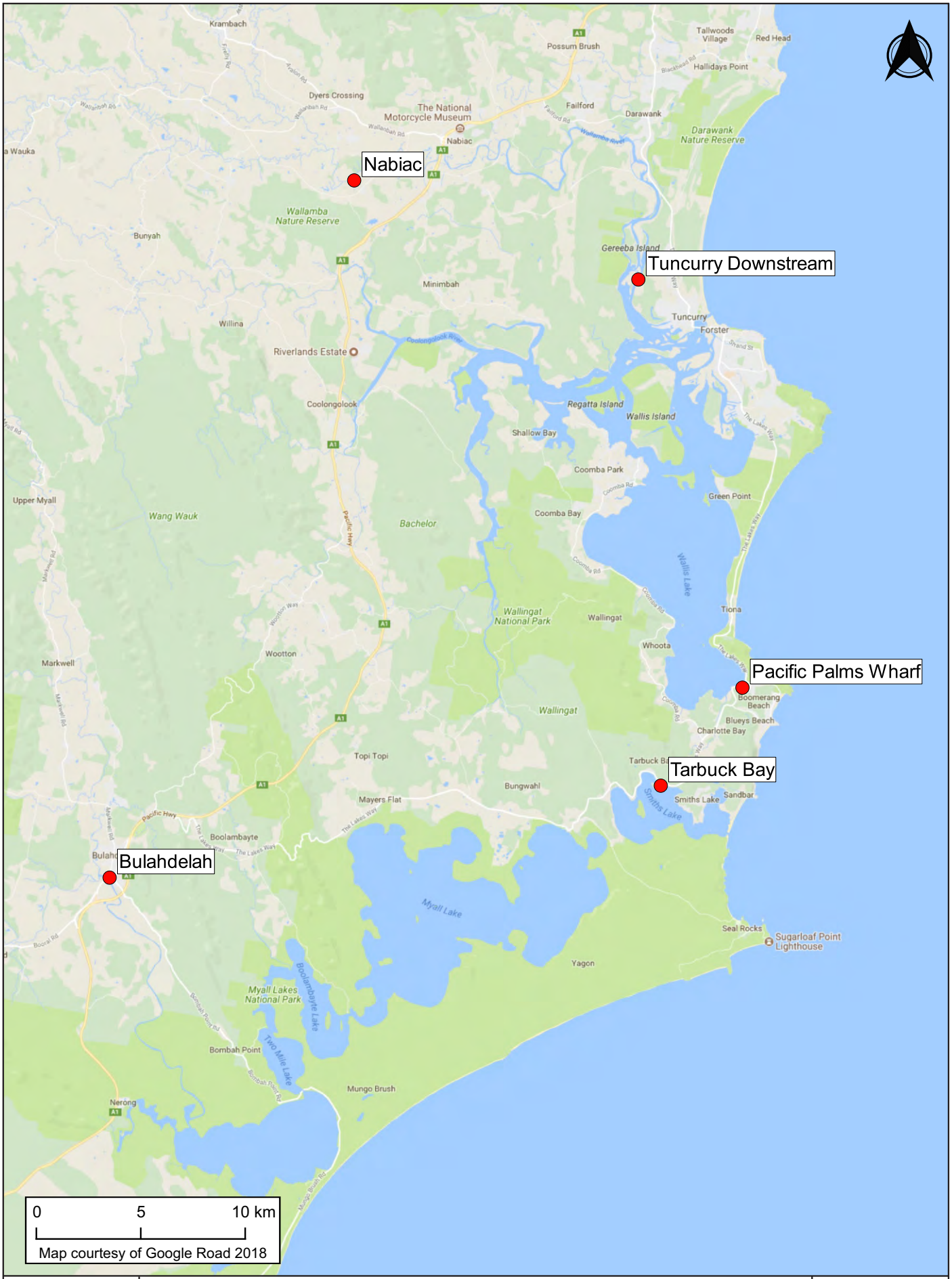
Manly Hydraulics Laboratory

Report MHL2857

Figure

28

DRAWING 2857-28.cdr



NSW GOVERNMENT

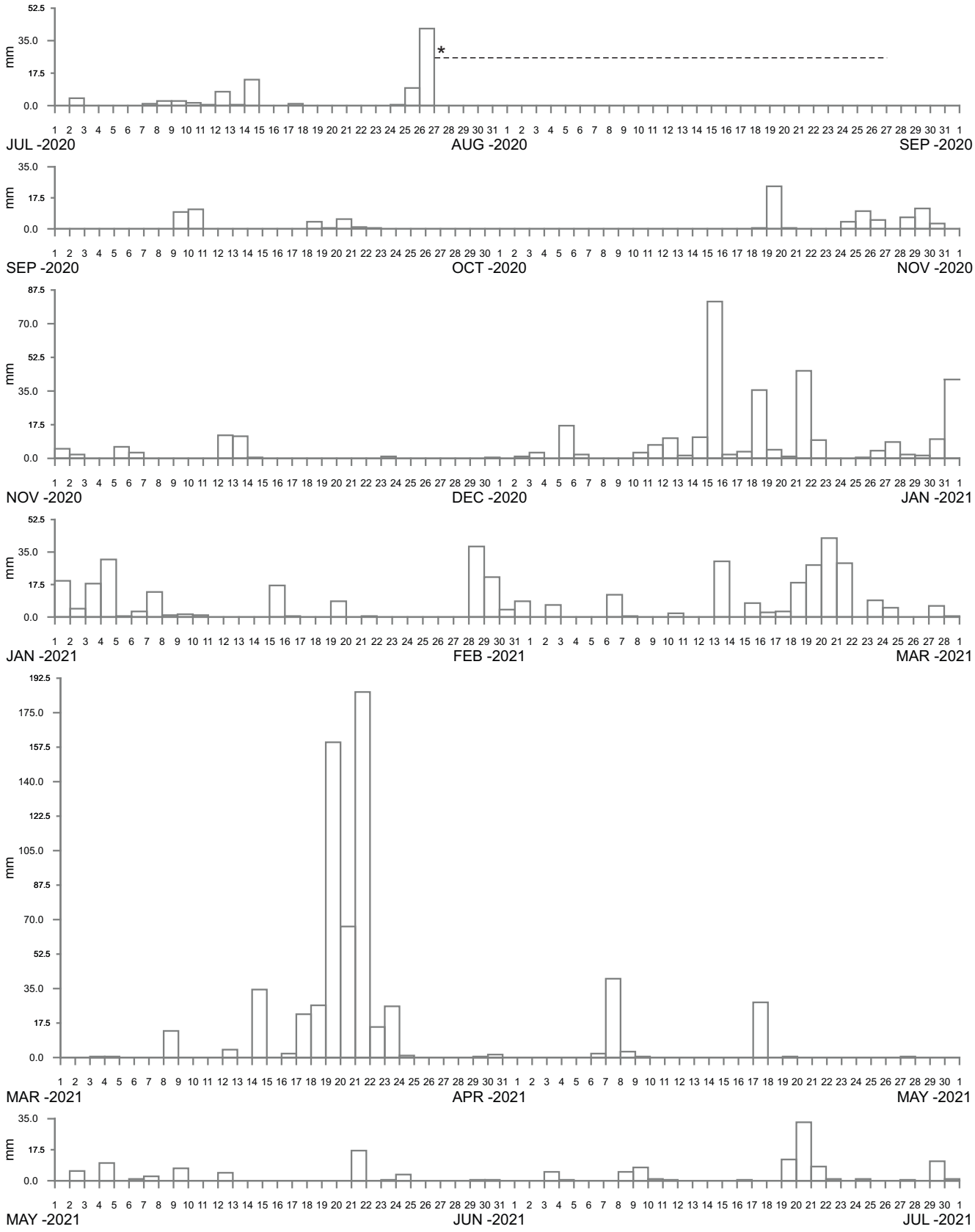
RAINFALL STATION LOCATIONS
KARUAH RIVER REGION

Manly Hydraulics Laboratory

Report MHL2857

Figure 29

DRAWING 2857-29.cdr



---------- DATA LOSS

*Data loss due to faulty wiring

NSW GOVERNMENT

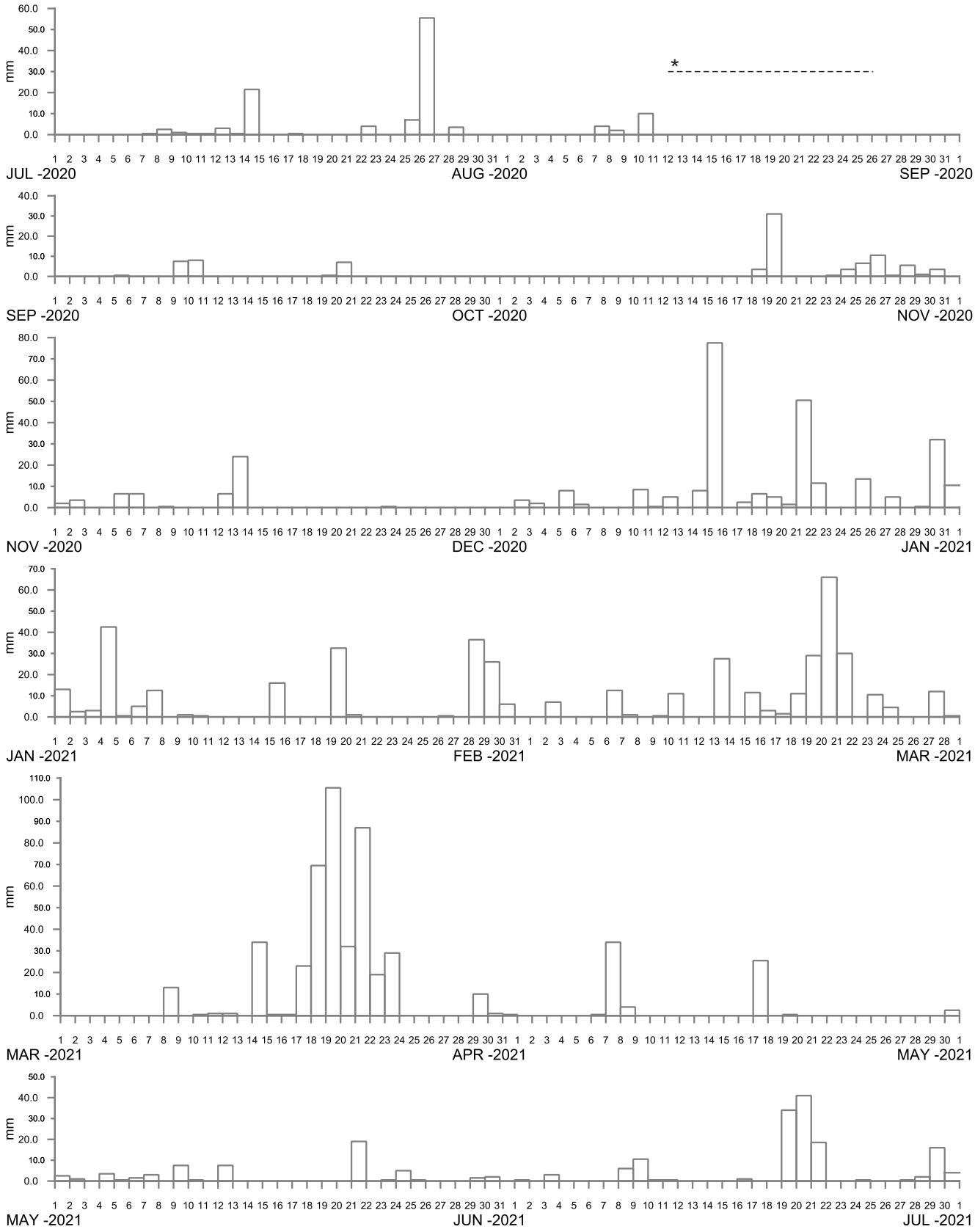
NABIAC AT WALLAMBA RIVER
2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 30

DRAWING 2857-30.cdr



---------- DATA LOSS

*Data loss due to program error

NSW GOVERNMENT

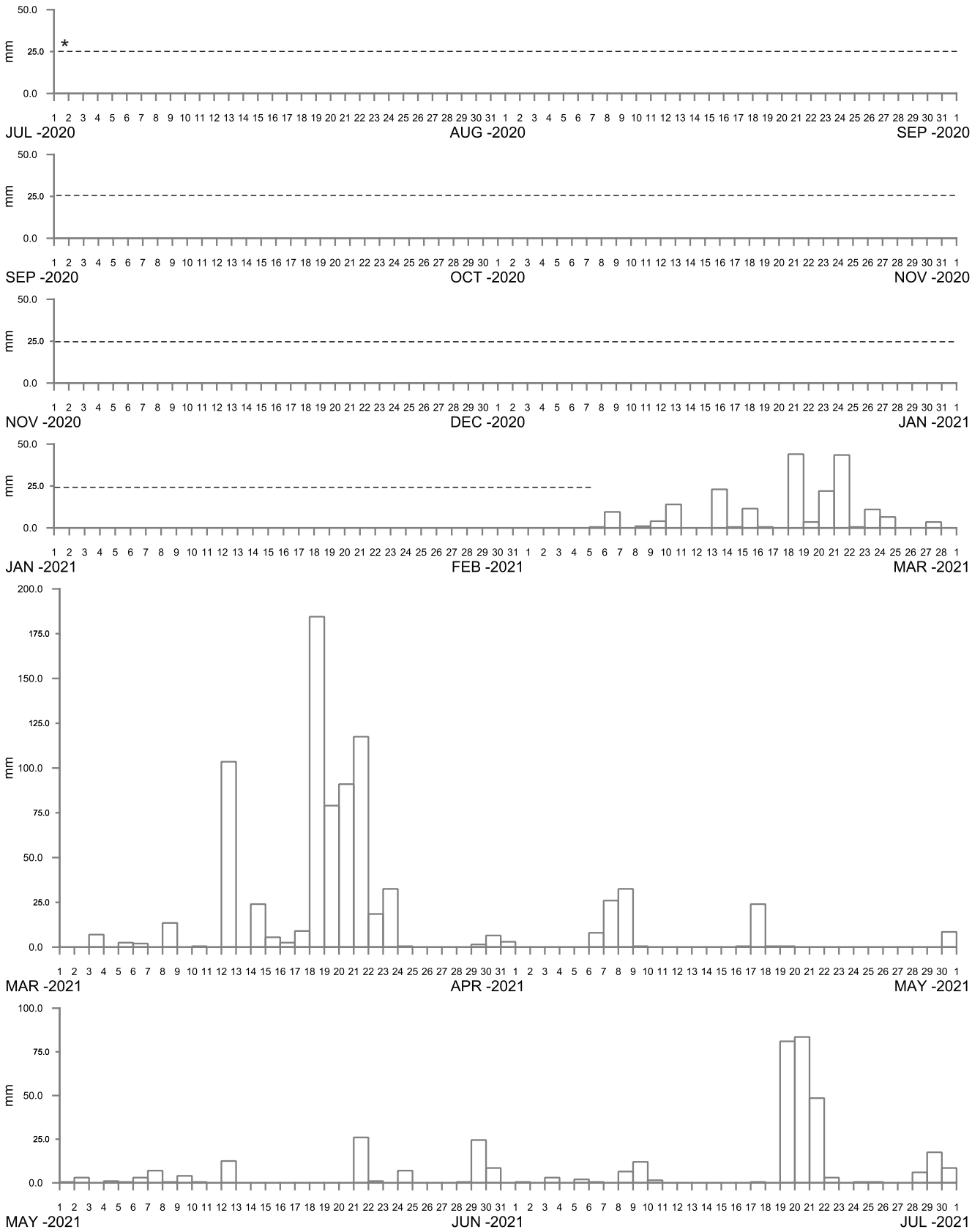
TUNCURRY DOWNSTREAM AT WALLAMBA RIVER 2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 31

DRAWING 2857-31.cdr



---------- DATA LOSS

*Tipping bucket did not meet the specified tolerance during the 6-monthly calibration

NSW GOVERNMENT

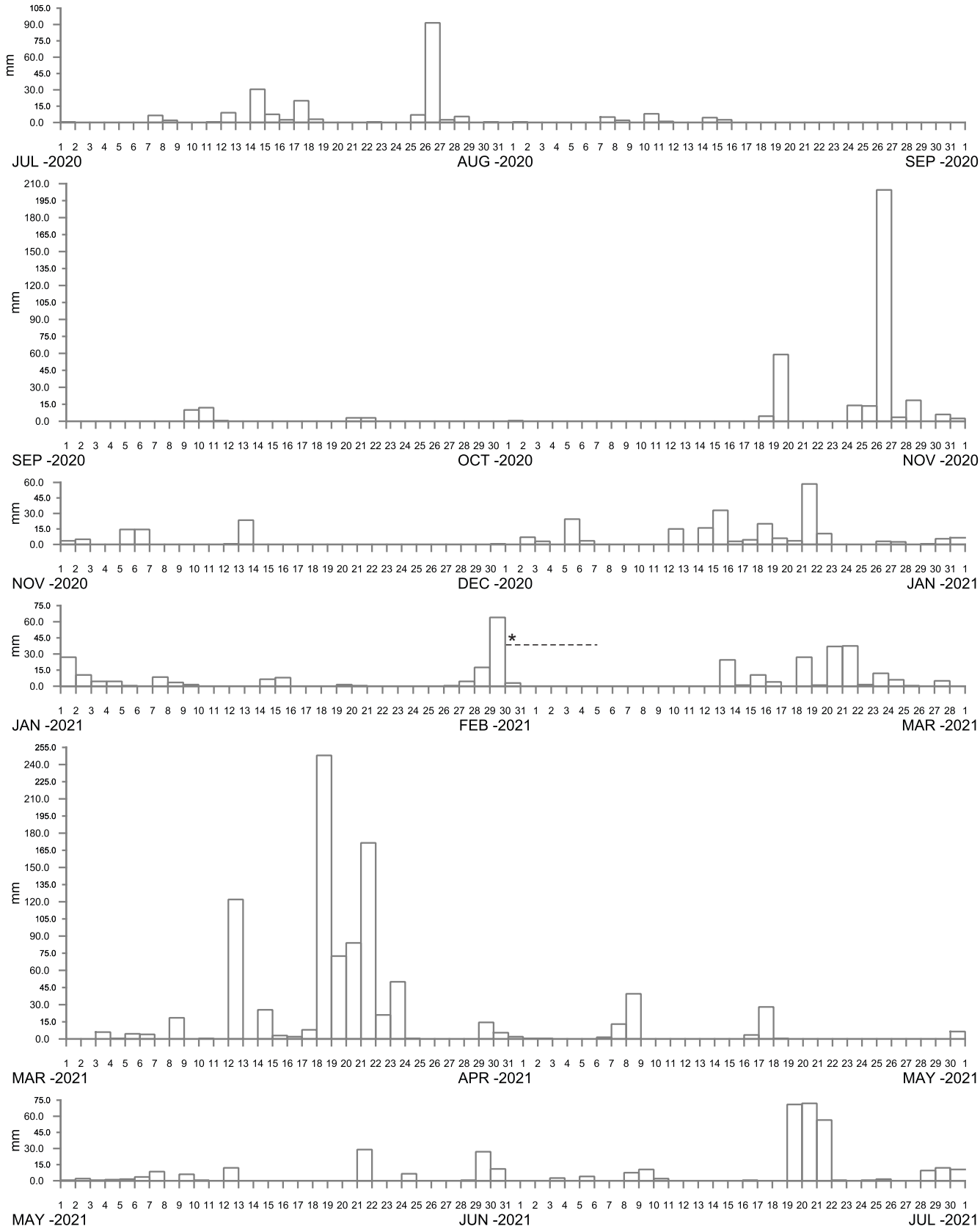
PACIFIC PALMS WHARF AT WALLIS LAKES 2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 32

DRAWING 2857-32.cdr



---------- DATA LOSS

Data loss due to faulty logger

NSW GOVERNMENT

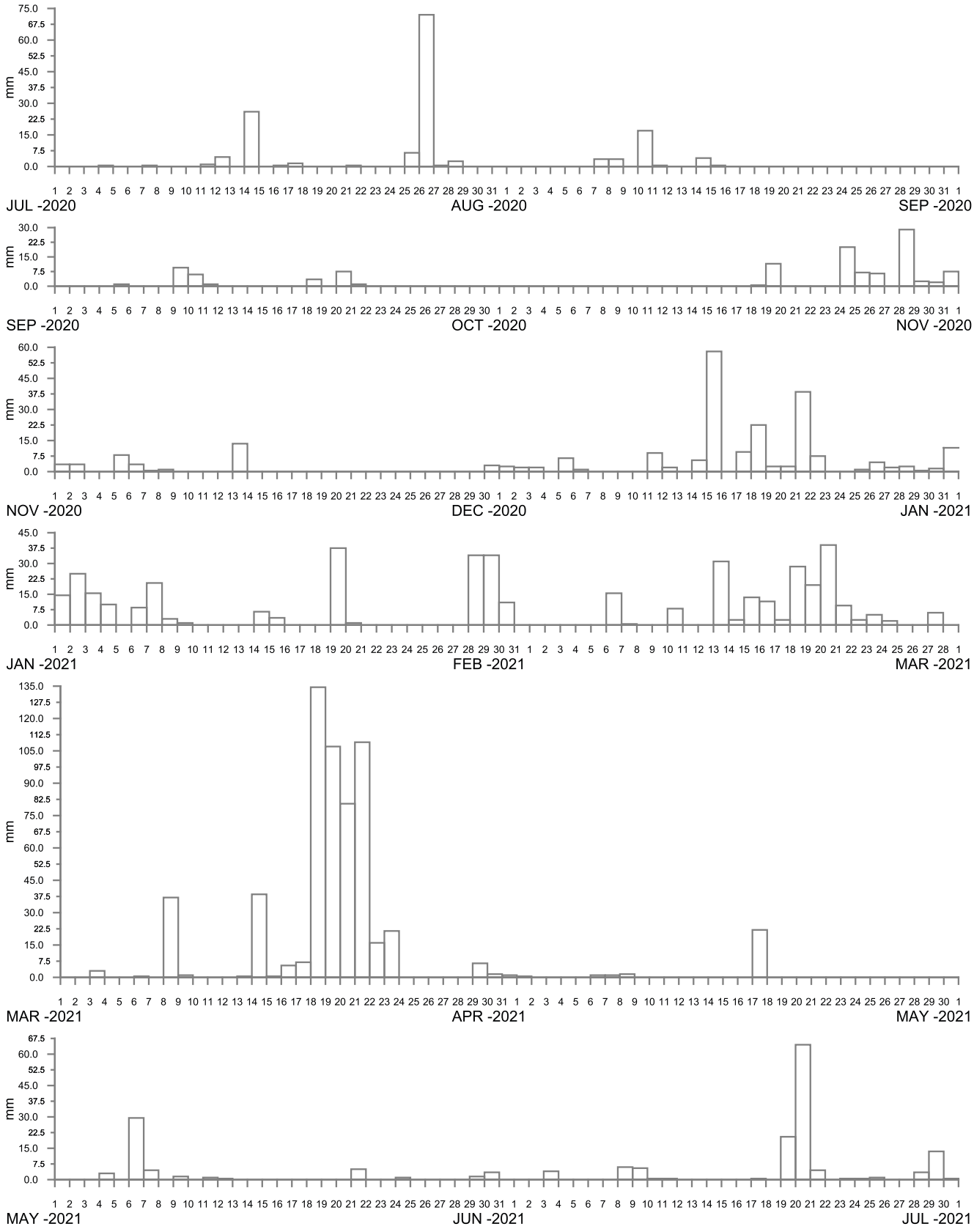
TARBUCK BAY AT SMITHS LAKE
2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 33

DRAWING 2857-33.cdr



---------- DATA LOSS

NSW GOVERNMENT

BULAHDELAH AT MYALL RIVER
2020–2021

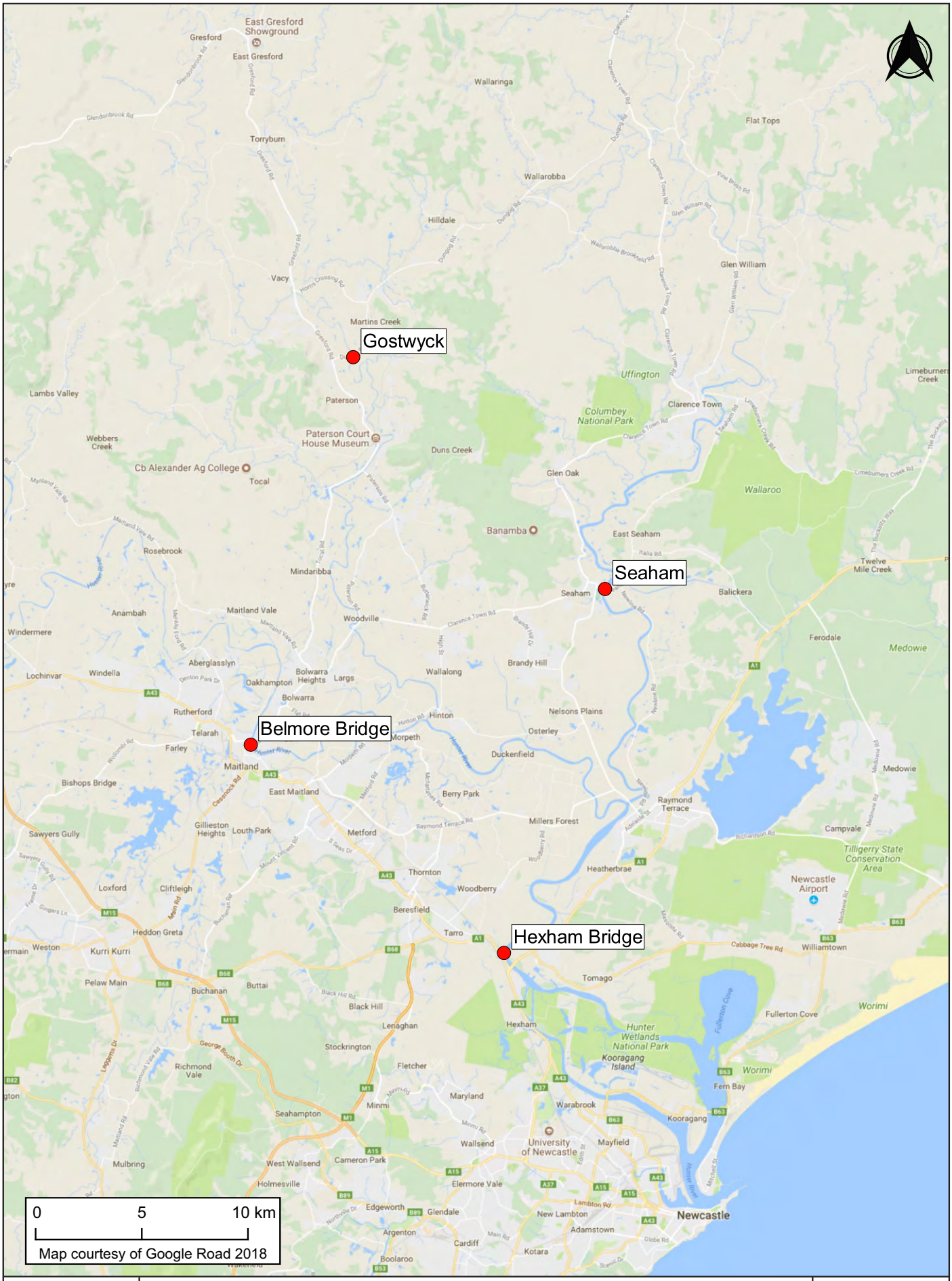
Manly Hydraulics Laboratory

Report MHL2857

Figure

34

DRAWING 2857-34.cdr



NSW GOVERNMENT

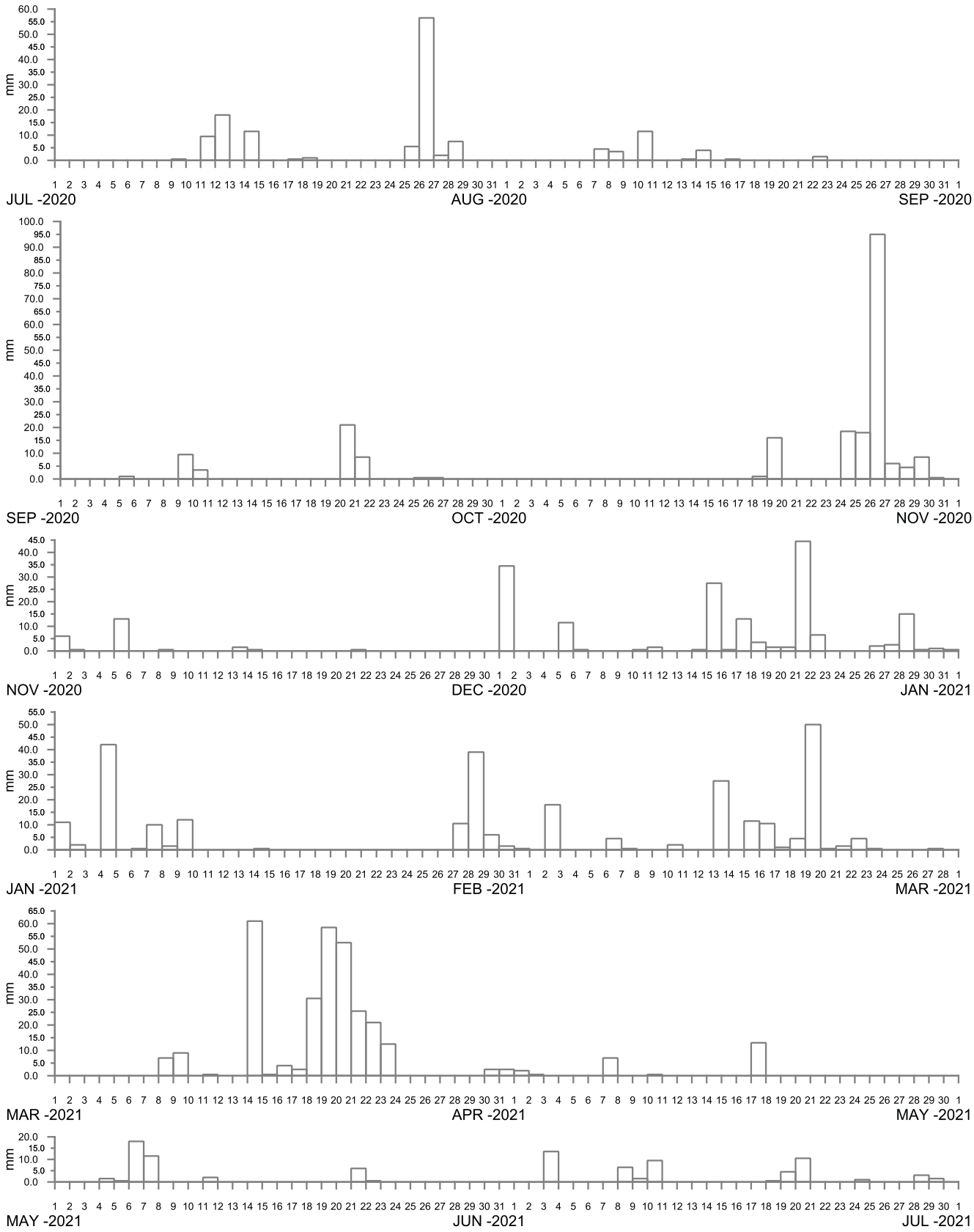
RAINFALL STATION LOCATIONS
HUNTER RIVER REGION

Manly Hydraulics Laboratory

Report MHL2857

Figure 35

DRAWING 2857-35.cdr



---------- DATA LOSS

NSW GOVERNMENT

GOSTWYCK AT PATERSON RIVER
2020–2021

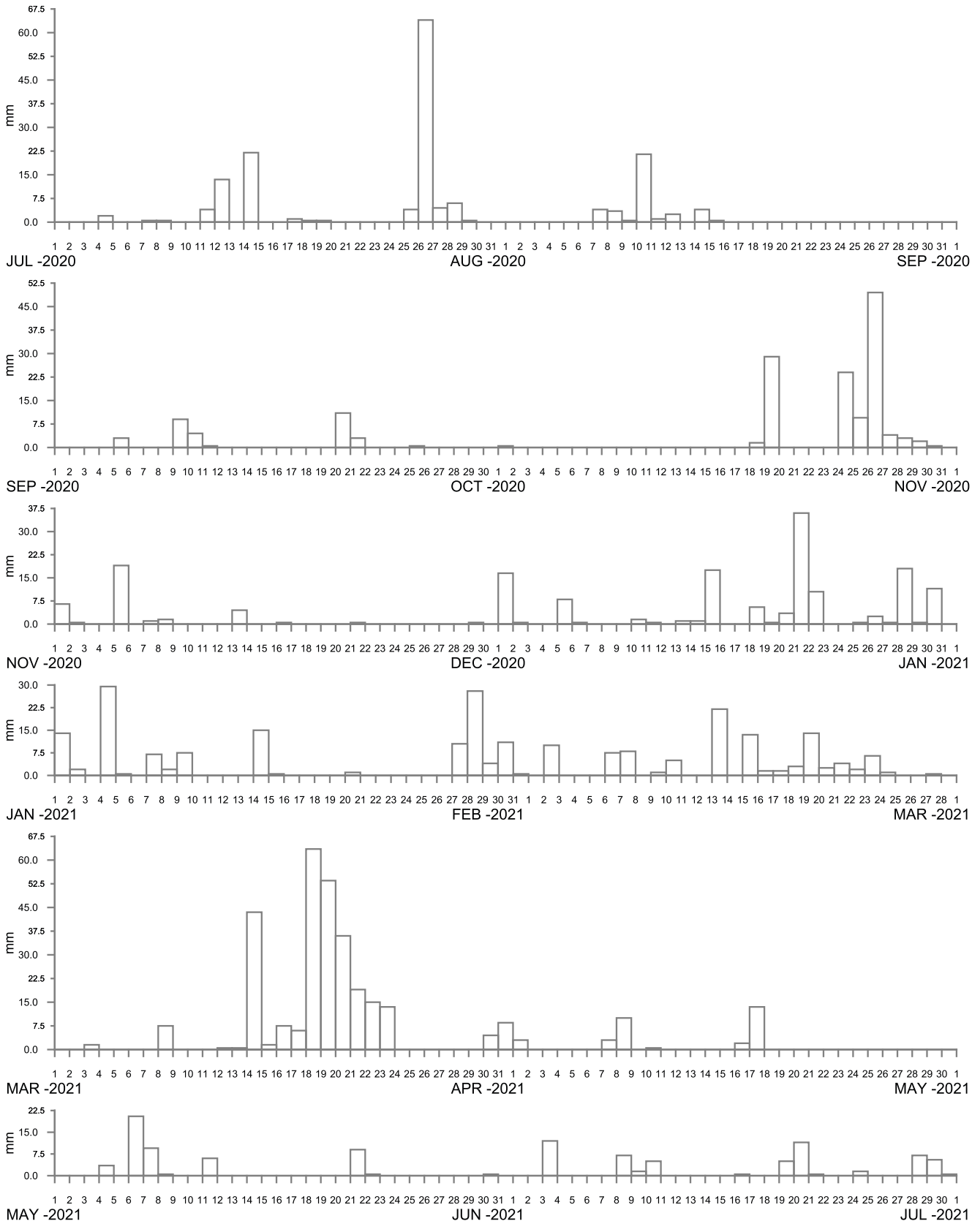
Manly Hydraulics Laboratory

Report MHL2857

Figure

36

DRAWING 2857-36.cdr



---------- DATA LOSS

NSW GOVERNMENT

SEAHAM AT WILLIAMS RIVER
2020–2021

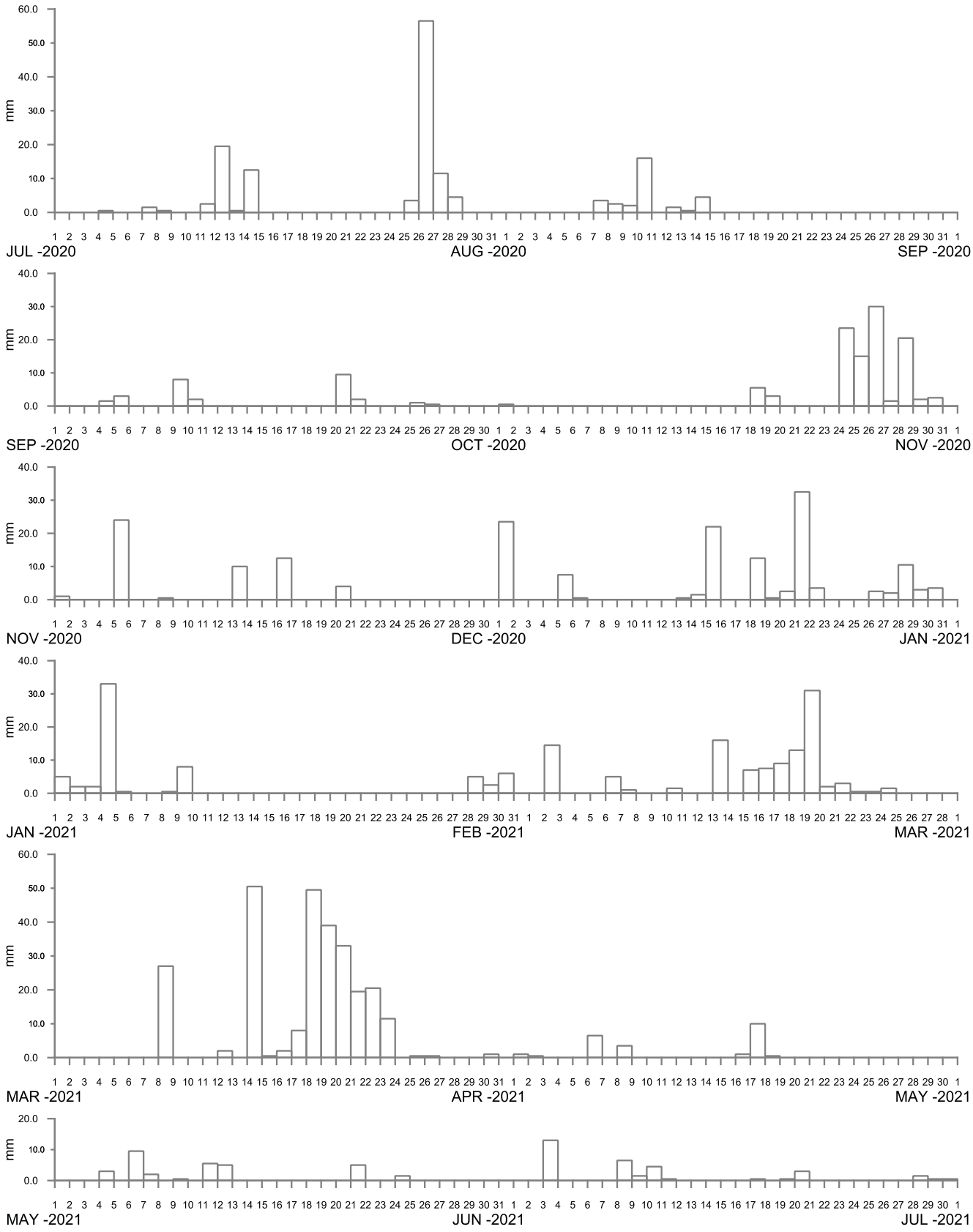
Manly Hydraulics Laboratory

Report MHL2857

Figure

37

DRAWING 2857-37.cdr



---------- DATA LOSS

NSW GOVERNMENT

BELMORE BRIDGE AT HUNTER RIVER
2020–2021

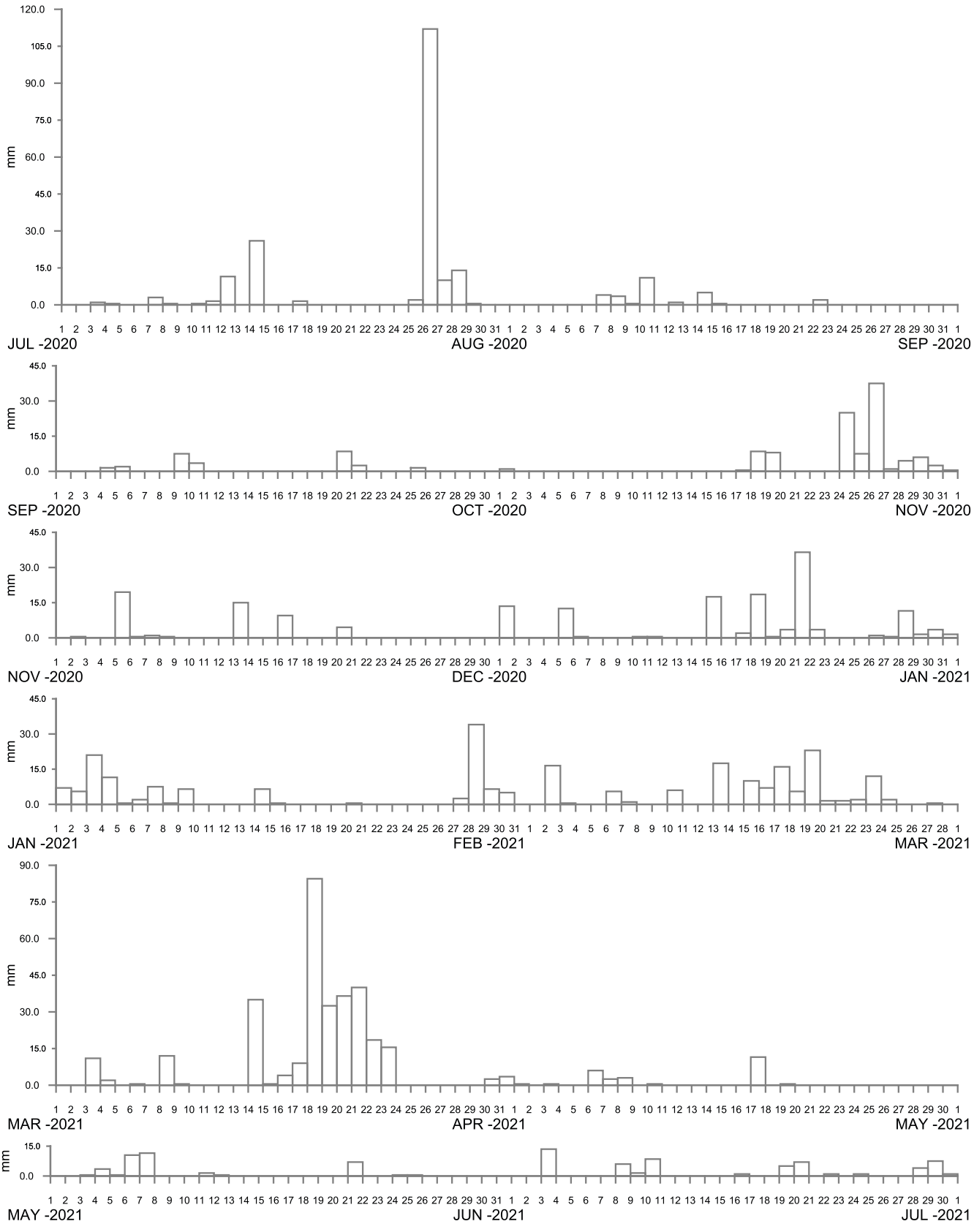
Manly Hydraulics Laboratory

Report MHL2857

Figure

38

DRAWING 2857-38.cdr



---------- DATA LOSS

NSW GOVERNMENT

HEXHAM BRIDGE AT HUNTER RIVER
2020–2021

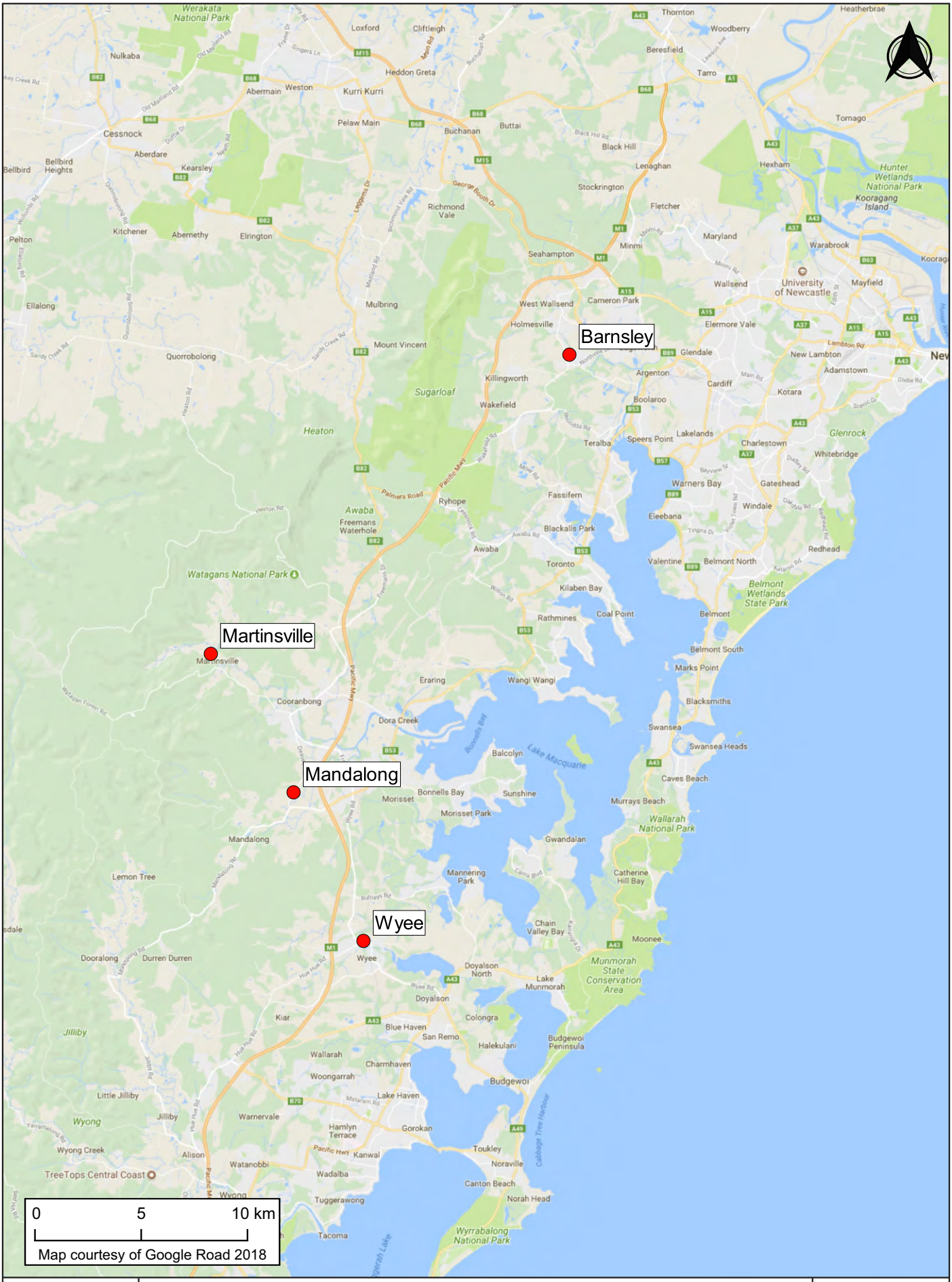
Manly Hydraulics Laboratory

Report MHL2857

Figure

39

DRAWING 2857-39.cdr



NSW GOVERNMENT

RAINFALL STATION LOCATIONS
MACQUARIE-TUGGERAH LAKES (NORTH) REGION

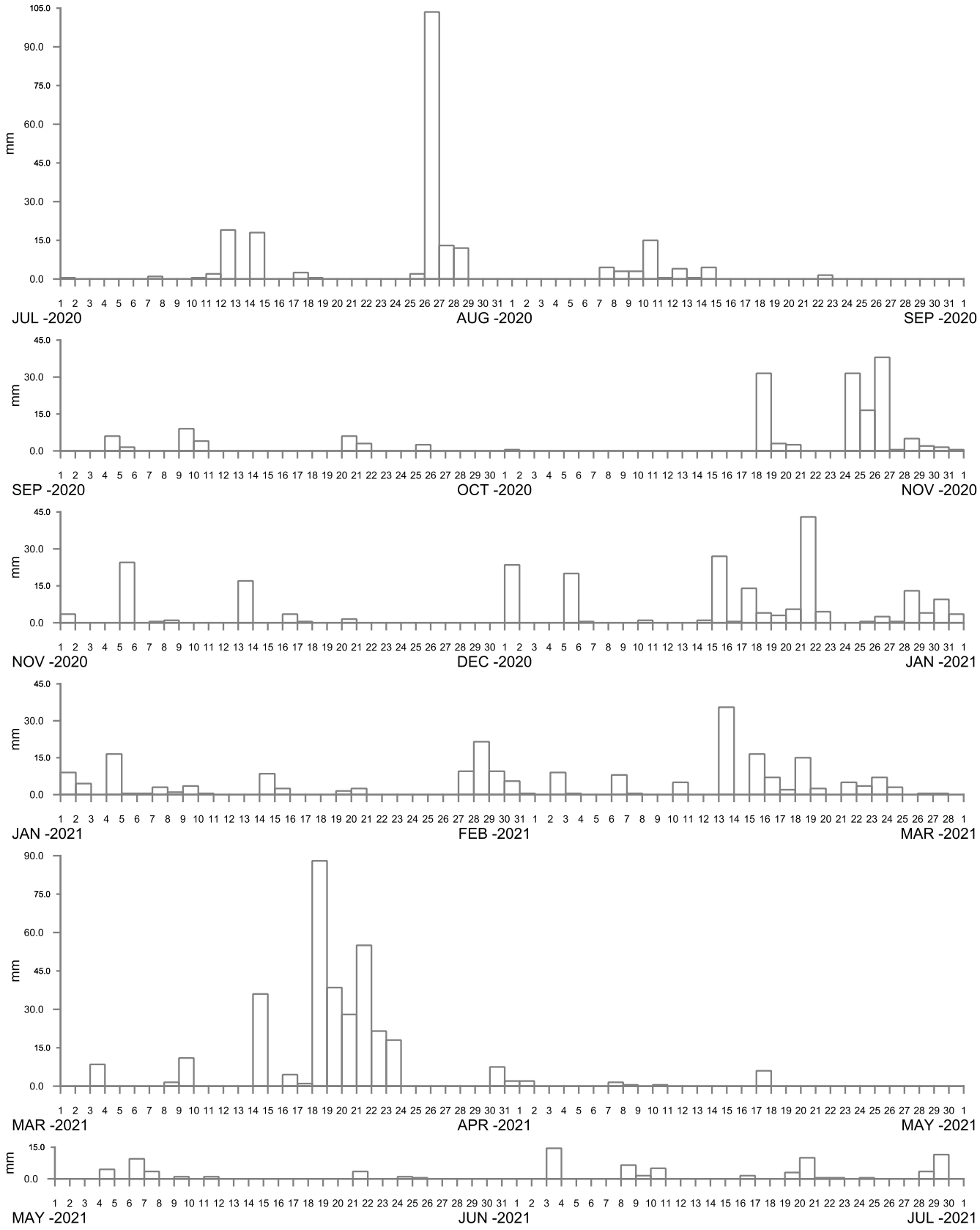
Manly Hydraulics Laboratory

Report MHL2857

Figure

40

DRAWING 2857-40.cdr



DATA LOSS

NSW GOVERNMENT

BARNSLEY AT JOHNSON AVENUE
2020–2021

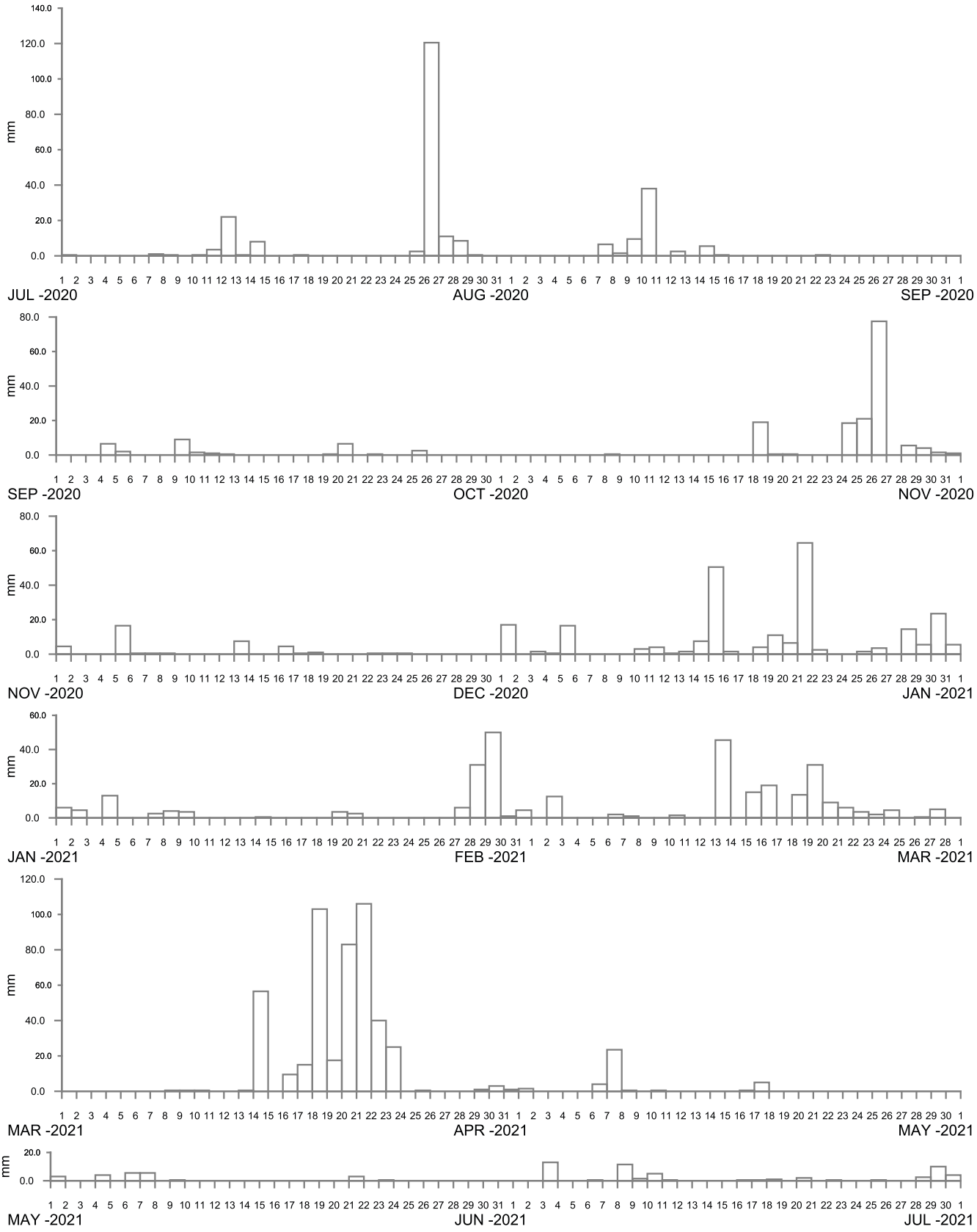
Manly Hydraulics Laboratory

Report MHL2857

Figure

41

DRAWING 2857-41.cdr



---------- DATA LOSS

NSW GOVERNMENT

MARTINSVILLE AT MARTINSVILLE ROAD
2020–2021

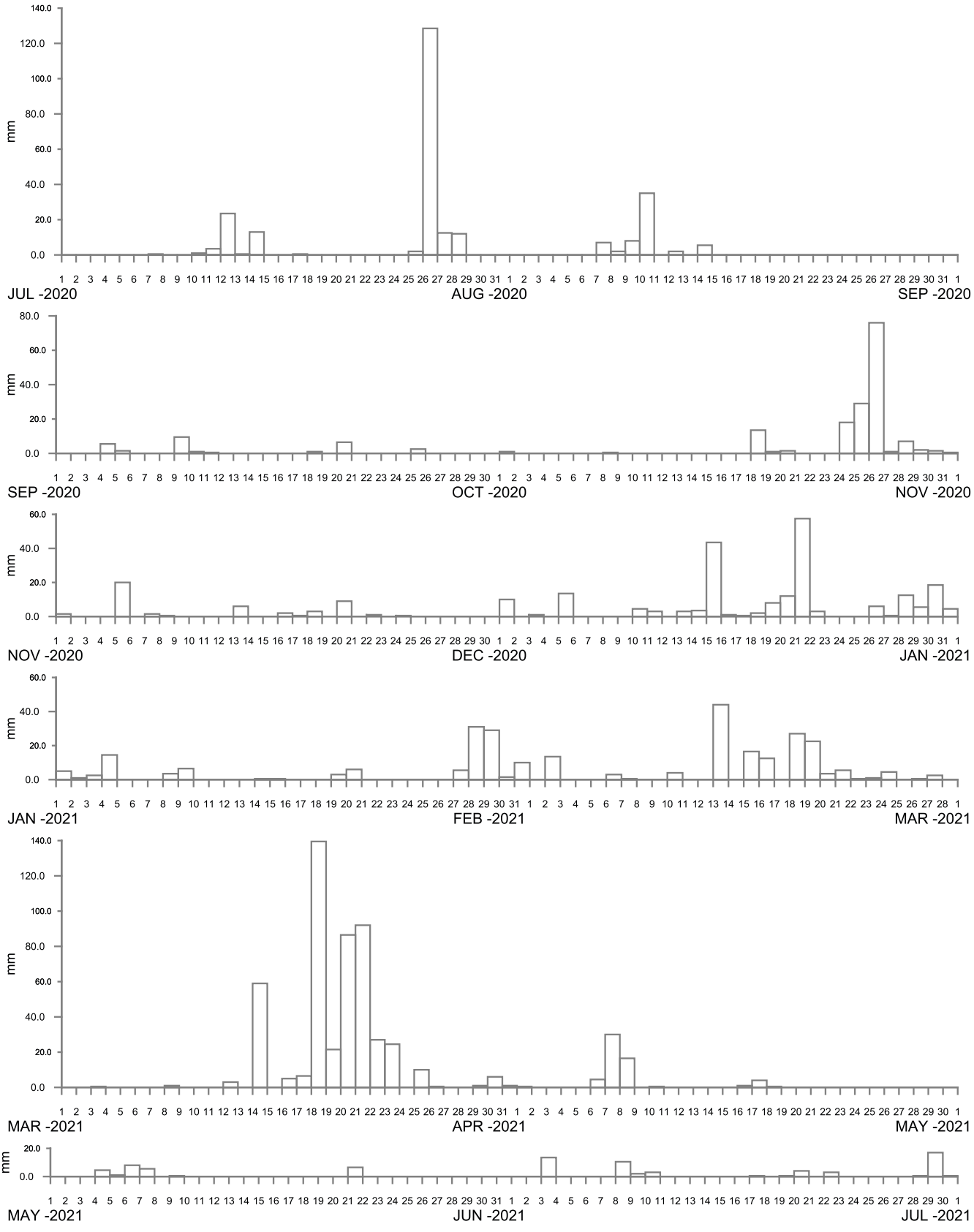
Manly Hydraulics Laboratory

Report MHL2857

Figure

42

DRAWING 2857-42.cdr



DATA LOSS

NSW GOVERNMENT

MANDALONG AT DEAVES ROAD
2020–2021

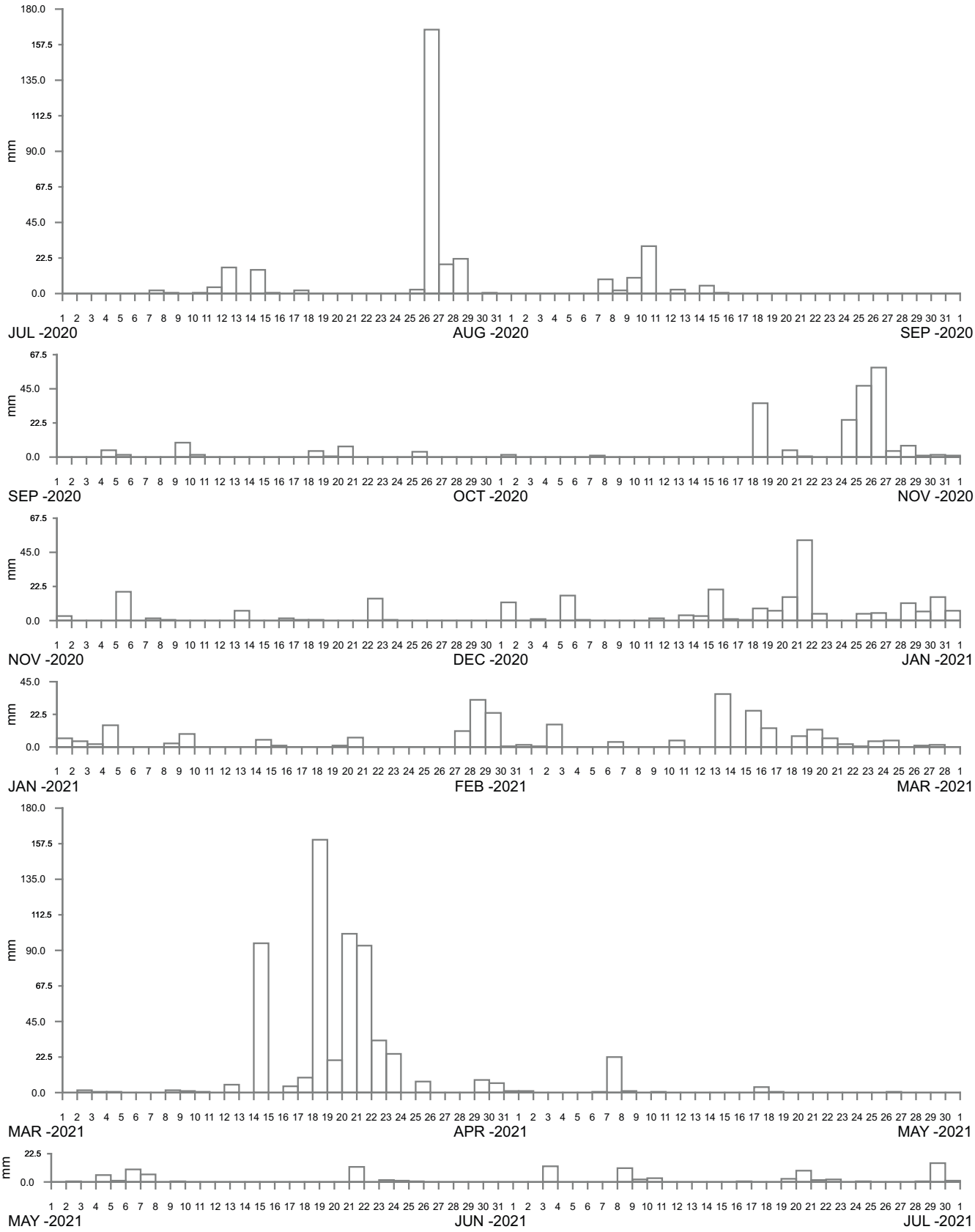
Manly Hydraulics Laboratory

Report MHL2857

Figure

43

DRAWING 2857-43.cdr



DATA LOSS

NSW GOVERNMENT

WYEE AT COLLUNGRA STREET
2020–2021

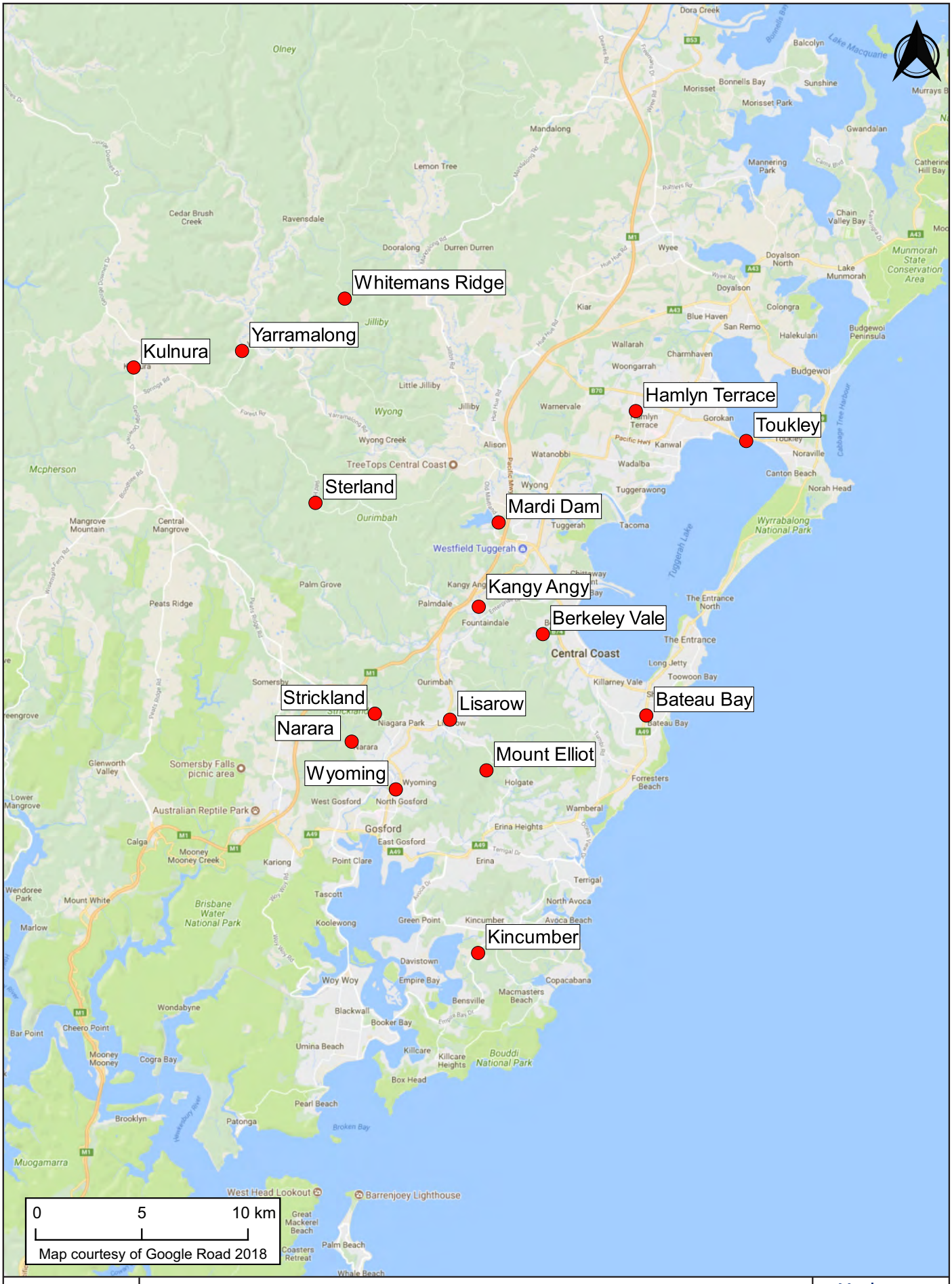
Manly Hydraulics Laboratory

Report MHL2857

Figure

44

DRAWING 2857-44.cdr



NSW GOVERNMENT

RAINFALL STATION LOCATIONS MACQUARIE-TUGGERAH LAKES (SOUTH) AND BRISBANE WATER REGIONS

Manly Hydraulics Laboratory

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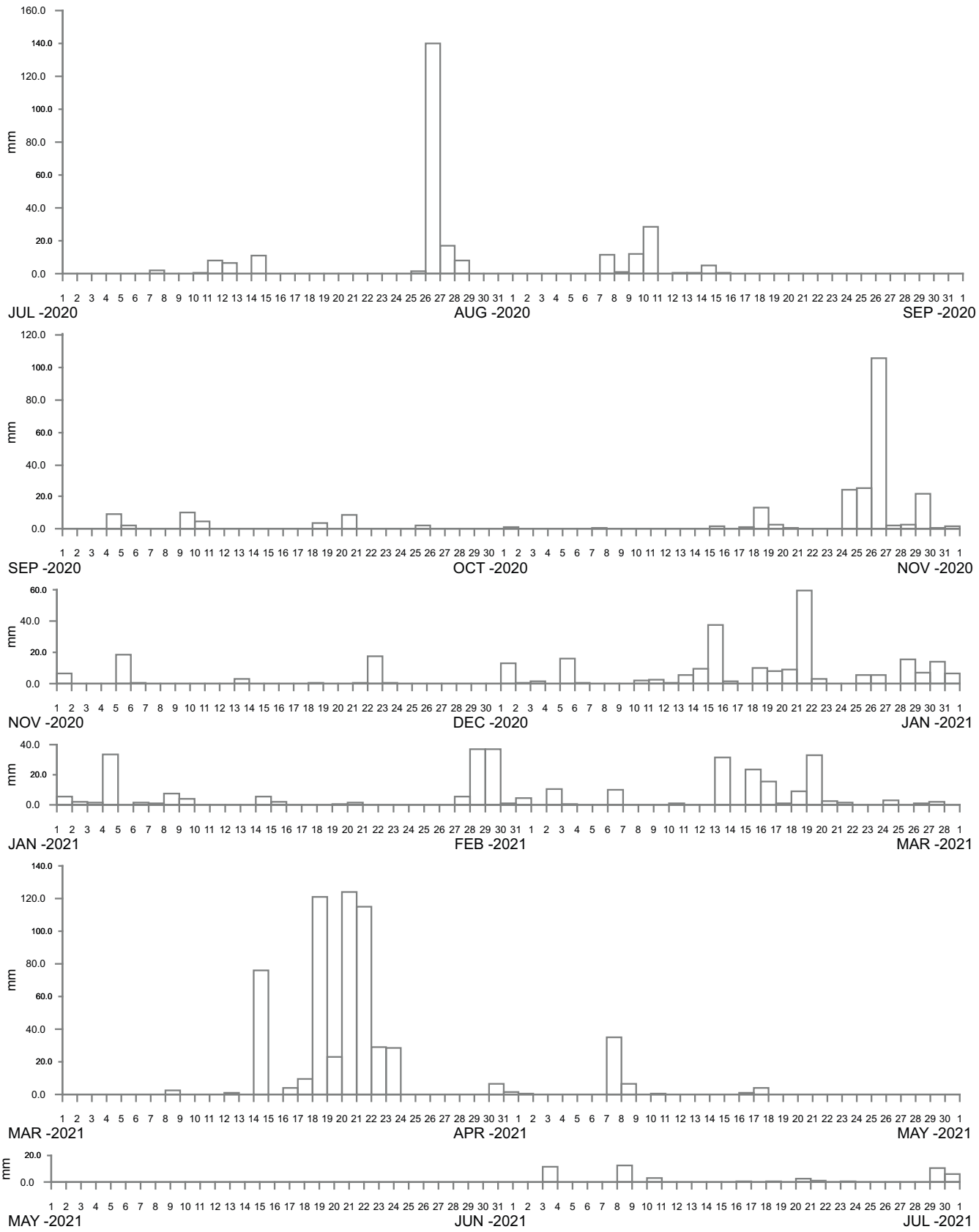
Figure 45

DRAWING 2857-45.cdr



---------- DATA LOSS

NSW GOVERNMENT

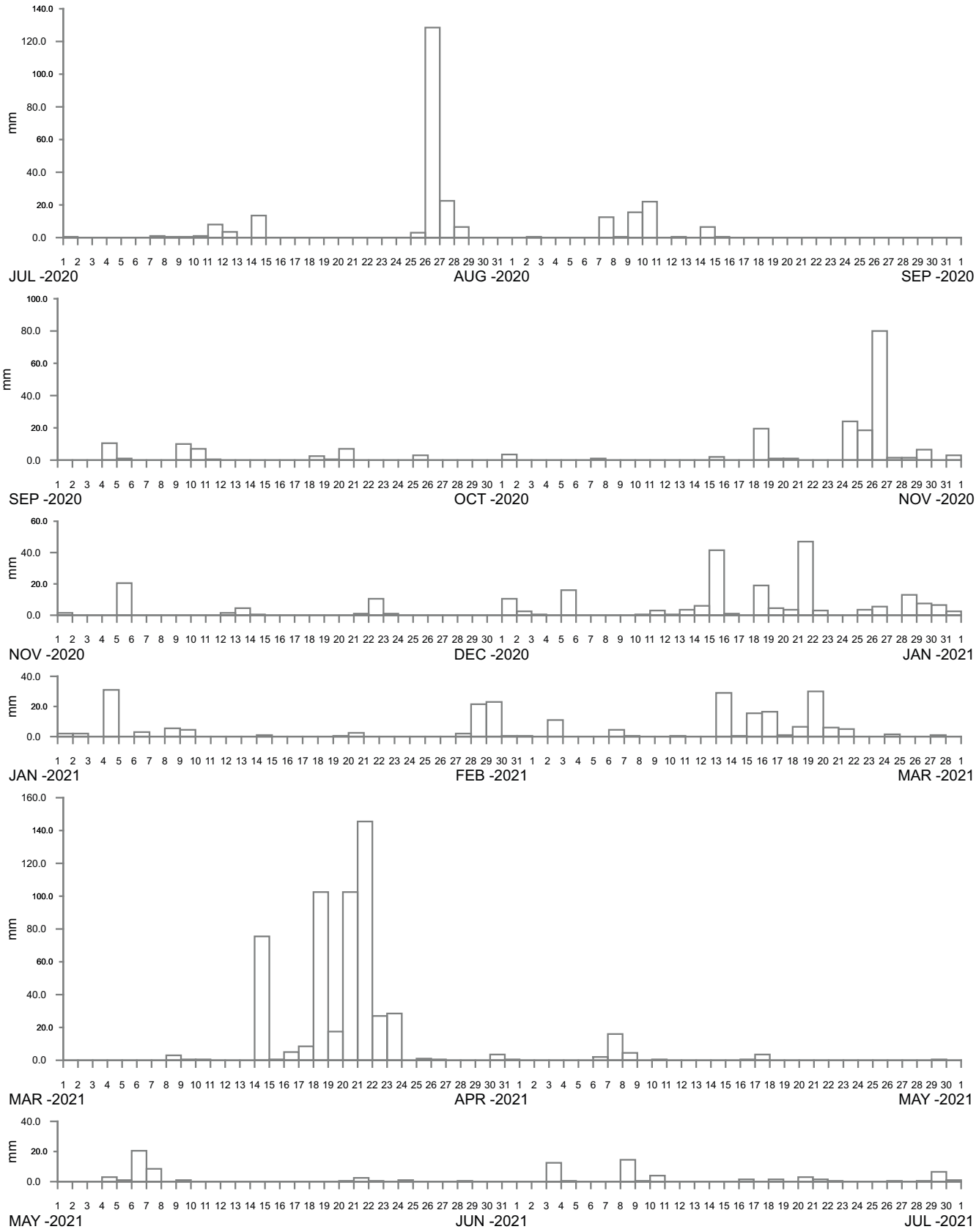
WHITEMANS RIDGE AT WATAGANS FOREST DRIVE 2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 46

DRAWING 2857-46.cdr



DATA LOSS

NSW GOVERNMENT

YARRAMALONG AT BUMBLE HILL ROAD
2020–2021

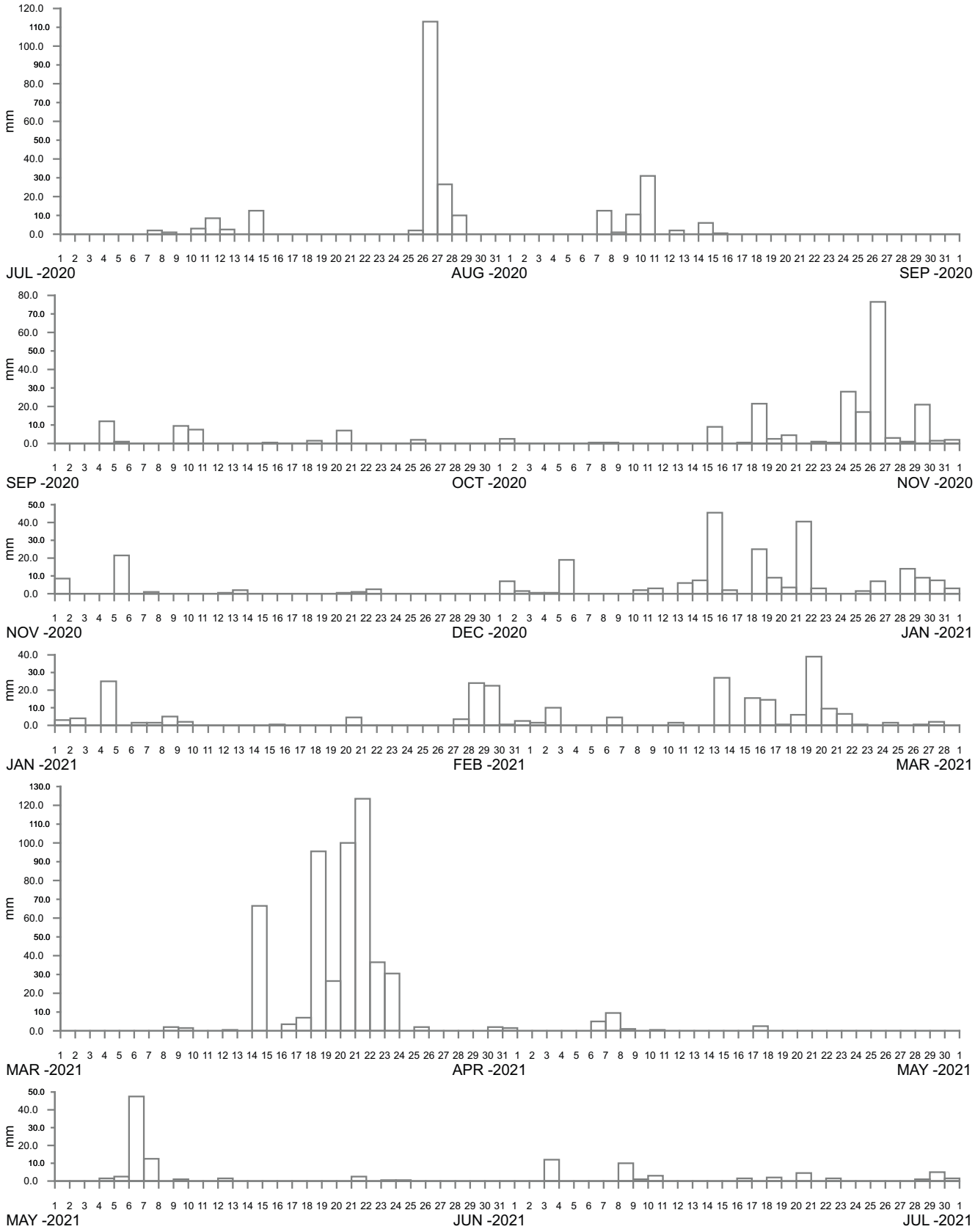
Manly Hydraulics Laboratory

Report MHL2857

Figure

47

DRAWING 2857-47.cdr



---------- DATA LOSS

NSW GOVERNMENT

KULNURA AT GEORGE DOWNS DRIVE
2020–2021

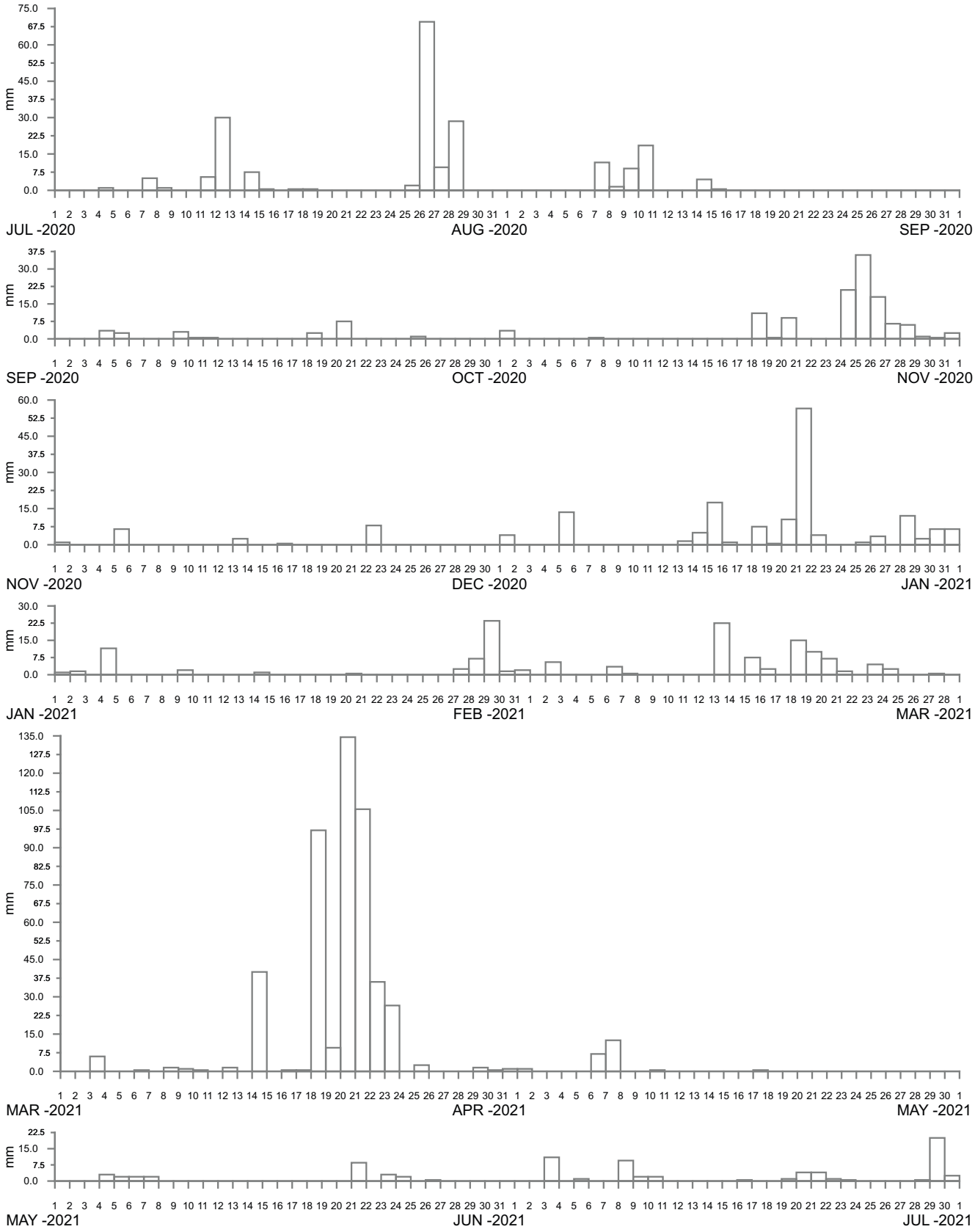
Manly Hydraulics Laboratory

Report MHL2857

Figure

48

DRAWING 2857-48.cdr



---------- DATA LOSS

NSW GOVERNMENT

TOUKLEY AT TUGGERAH LAKE
2020–2021

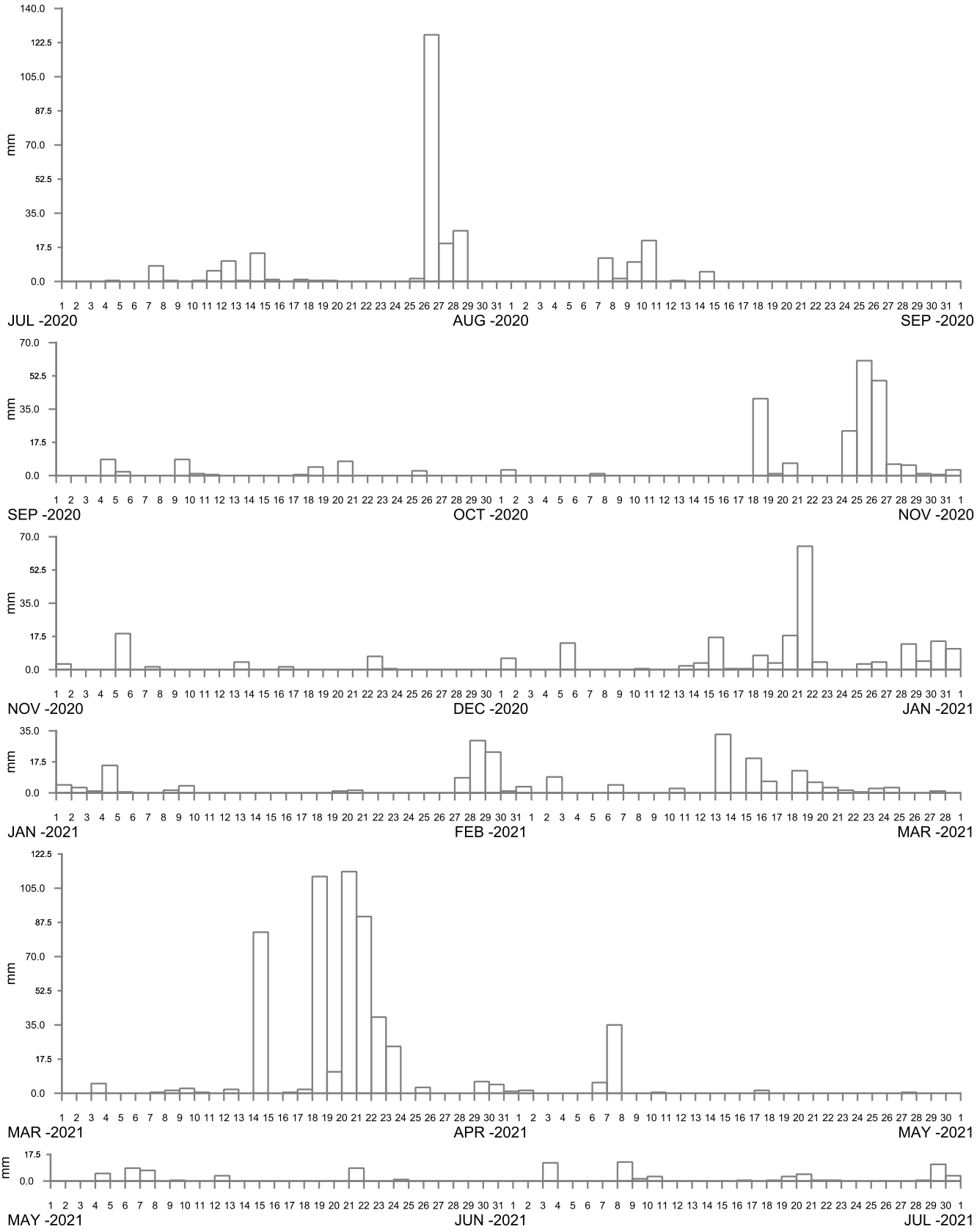
Manly Hydraulics Laboratory

Report MHL2857

Figure

49

DRAWING 2857-49.cdr



---------- DATA LOSS

NSW GOVERNMENT

HAMLYN TERRACE AT WARNERVALE ROAD
2020–2021

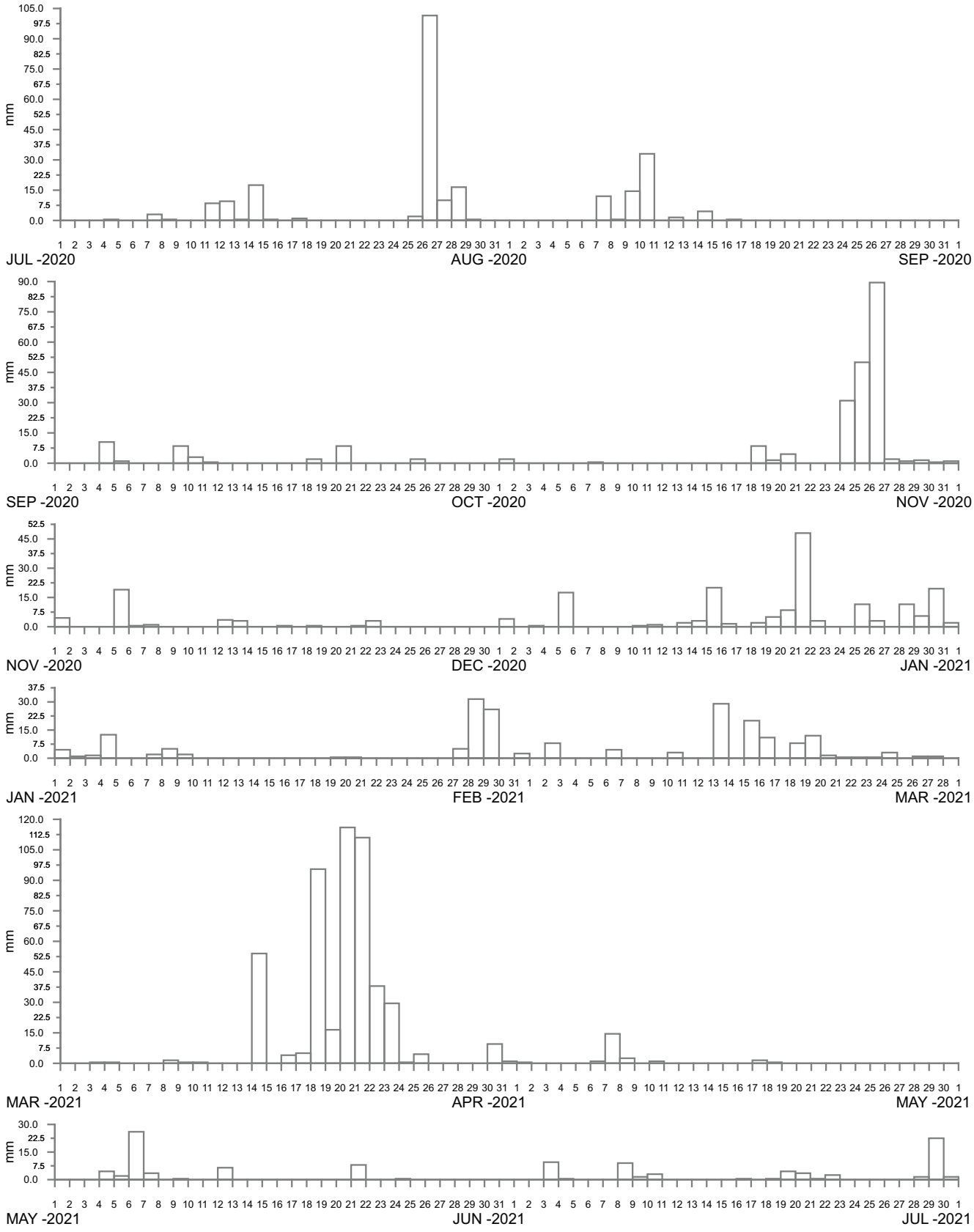
Manly Hydraulics Laboratory

Report MHL2857

Figure

50

DRAWING 2857-50.cdr



---------- DATA LOSS

NSW GOVERNMENT

MARDI DAM AT OLD MAITLAND ROAD
2020–2021

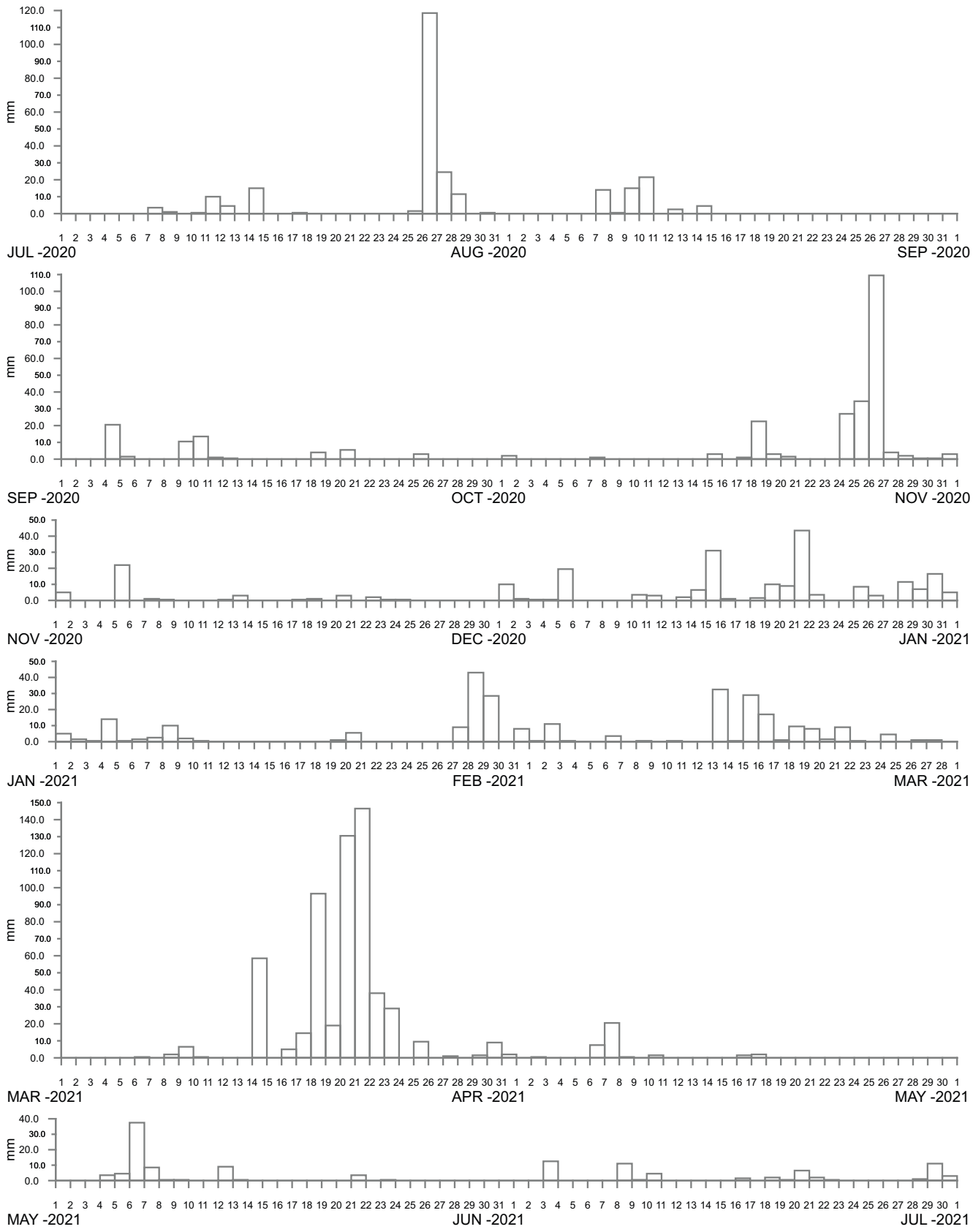
Manly Hydraulics Laboratory

Report MHL2857

Figure

51

DRAWING 2857-51.cdr



---------- DATA LOSS

NSW GOVERNMENT

STERLAND AT RED HILL FOREST ROAD
2020–2021

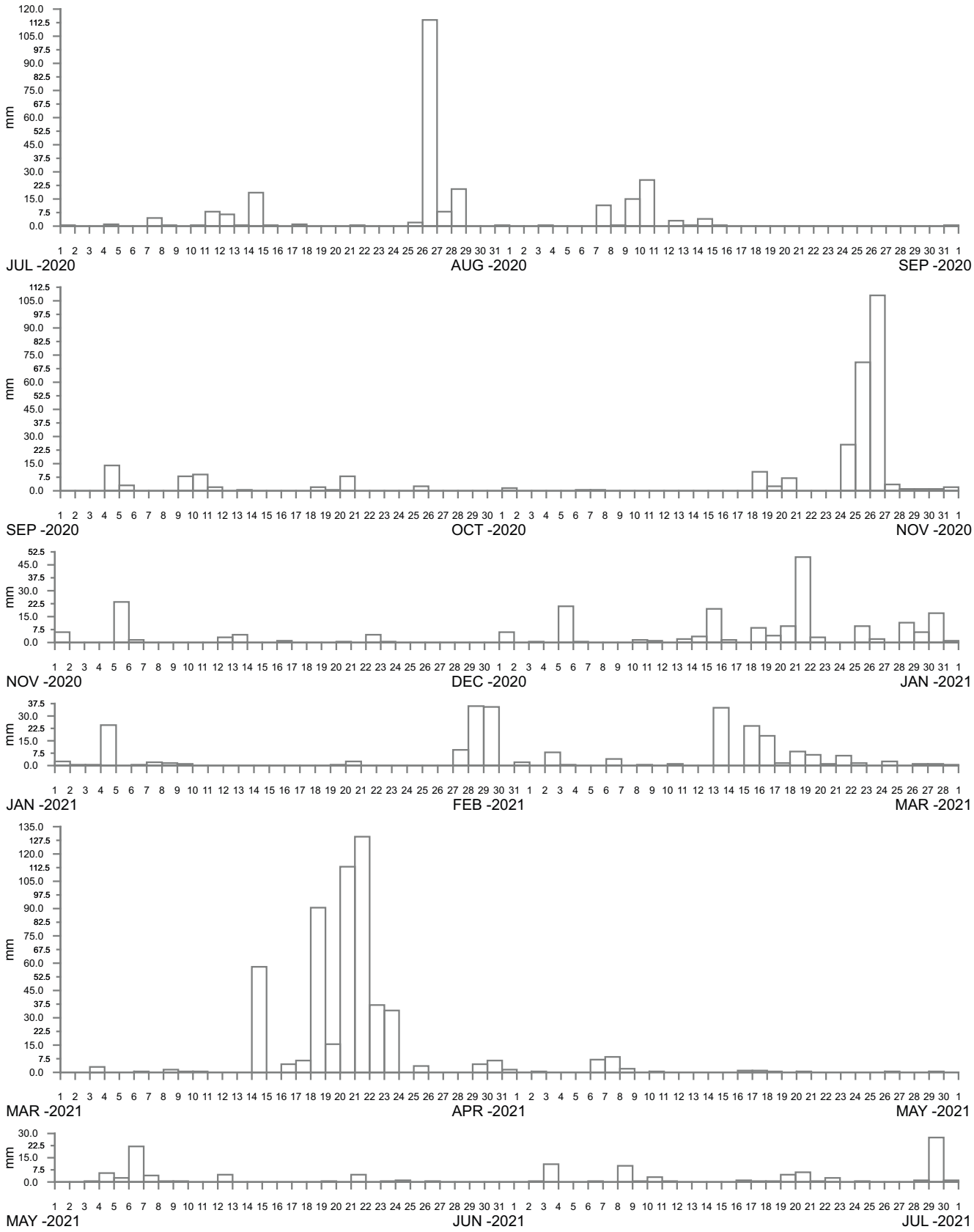
Manly Hydraulics Laboratory

Report MHL2857

Figure

52

DRAWING 2857-52.cdr



---------- DATA LOSS

NSW GOVERNMENT

KANGY ANGY AT ORCHARD ROAD
2020–2021

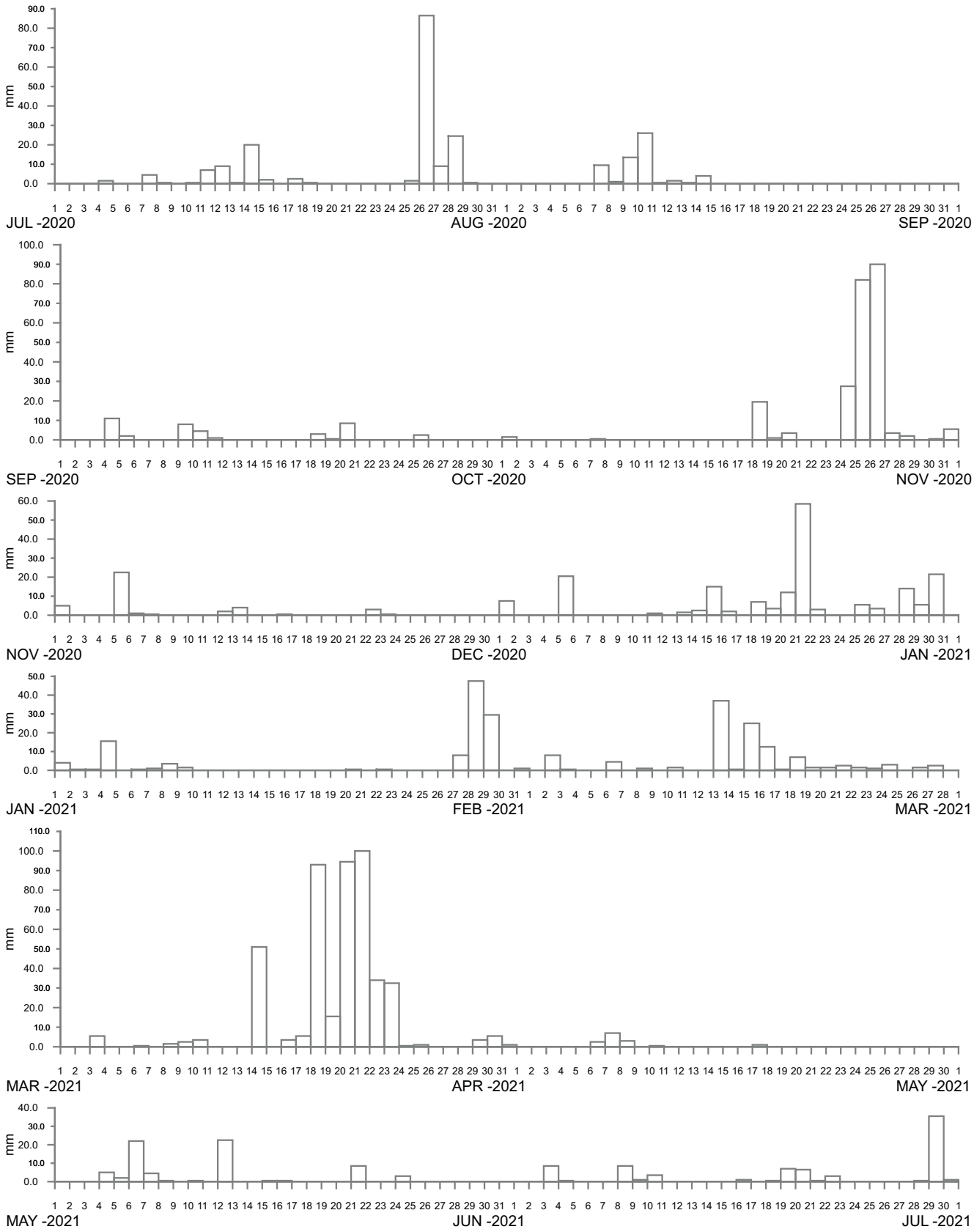
Manly Hydraulics Laboratory

Report MHL2857

Figure

53

DRAWING 2857-53.cdr



---------- DATA LOSS

NSW GOVERNMENT

BERKELEY VALE AT BERKELEY VALE ROAD
2020–2021

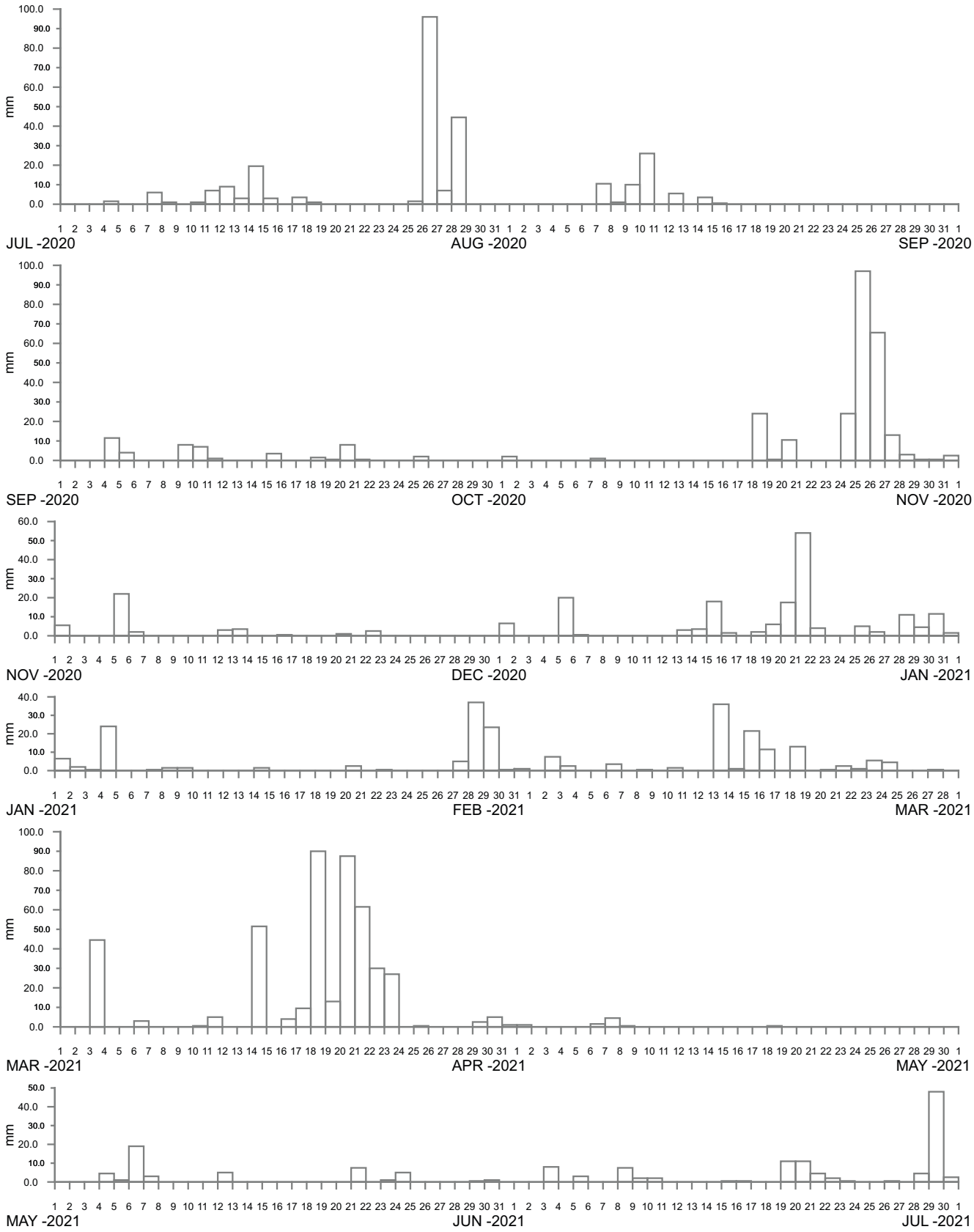
Manly Hydraulics Laboratory

Report MHL2857

Figure

54

DRAWING 2857-54.cdr



---------- DATA LOSS

NSW GOVERNMENT

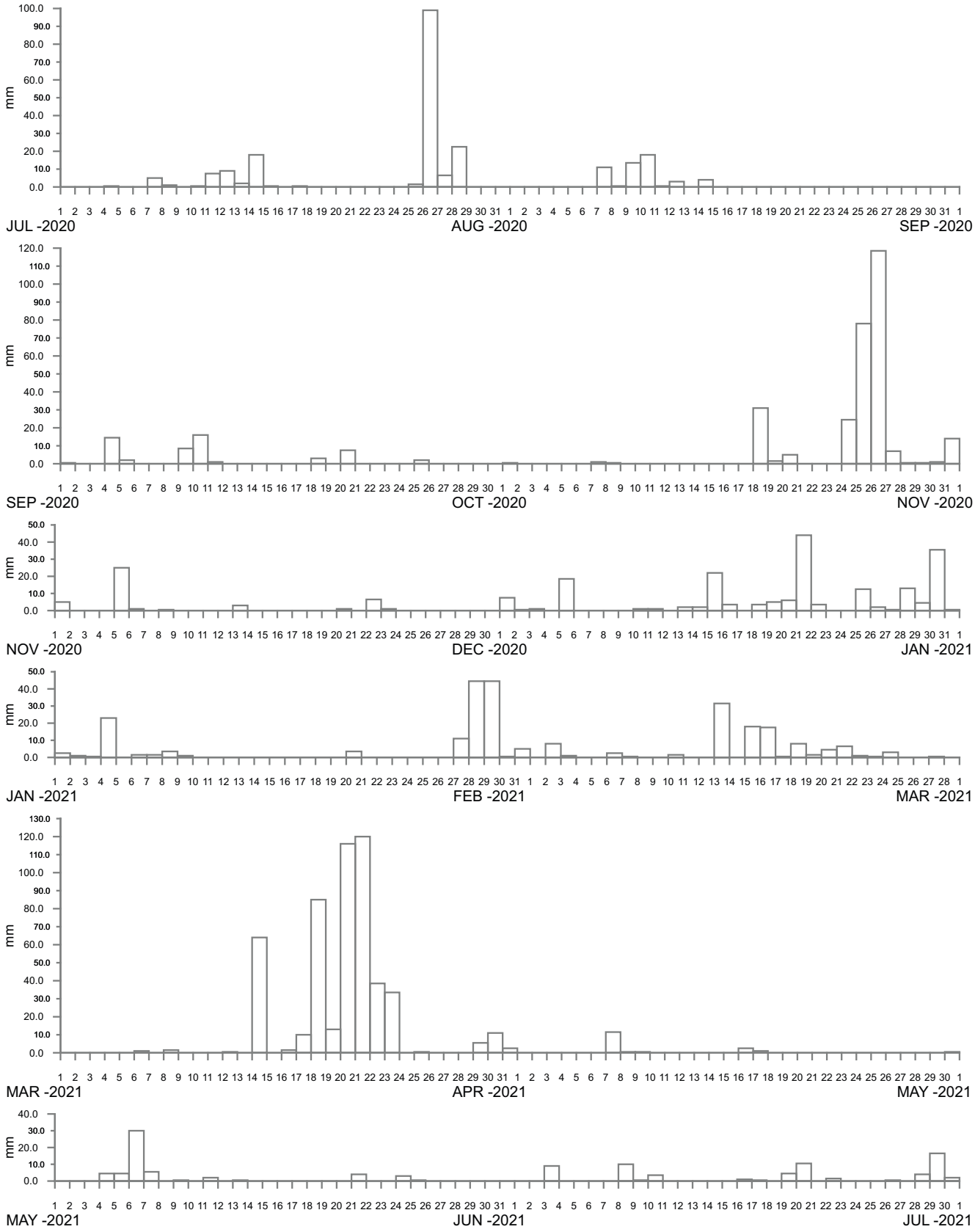
BATEAU BAY AT SEWAGE TREATMENT WORKS 2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 55

DRAWING 2857-55.cdr



---------- DATA LOSS

NSW GOVERNMENT

LISAROW AT FAGANS ROAD
2020–2021

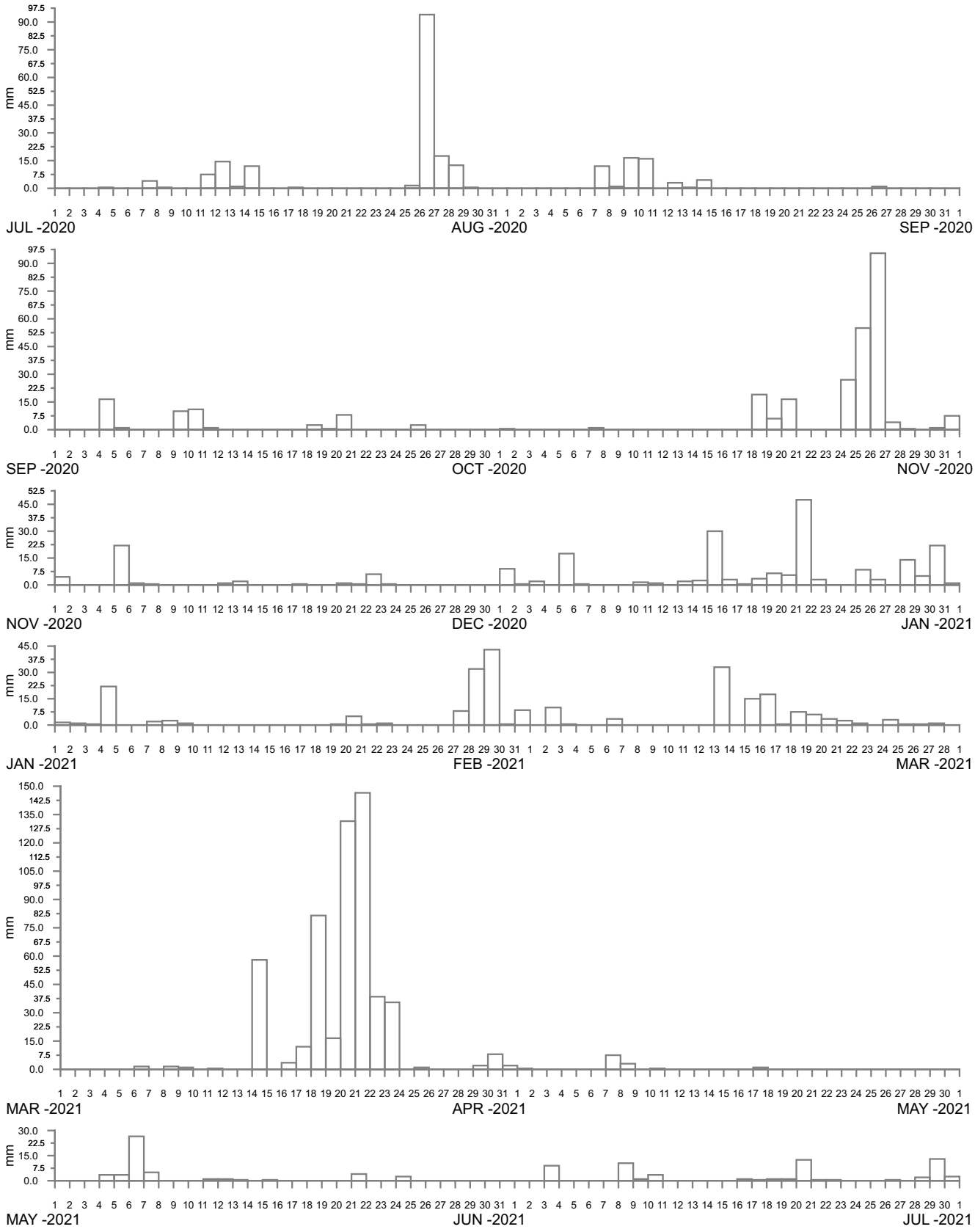
Manly Hydraulics Laboratory

Report MHL2857

Figure

56

DRAWING 2857-56.cdr



---------- DATA LOSS

NSW GOVERNMENT

STRICKLAND AT MANGROVE ROAD
2020–2021

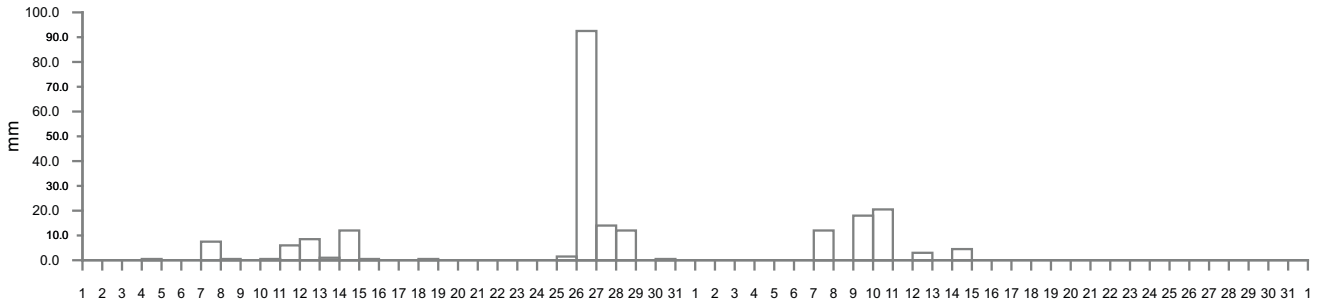
Manly Hydraulics Laboratory

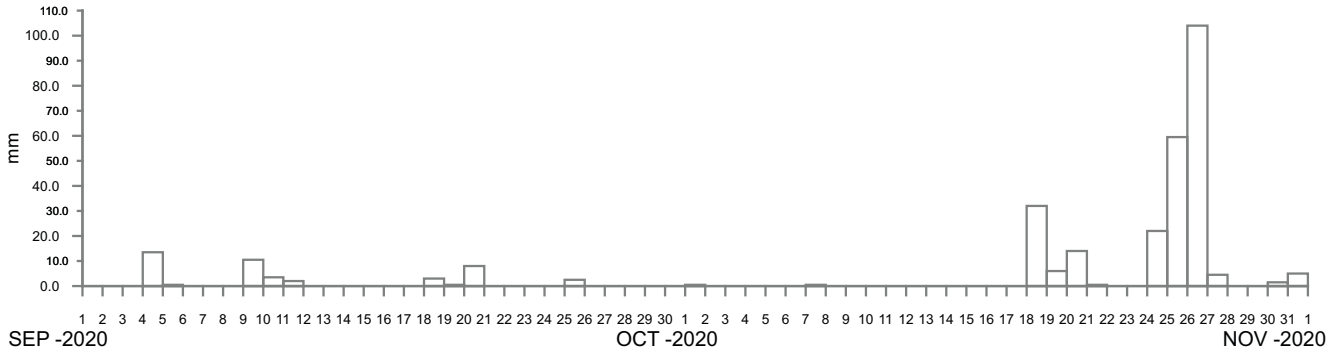
Report MHL2857

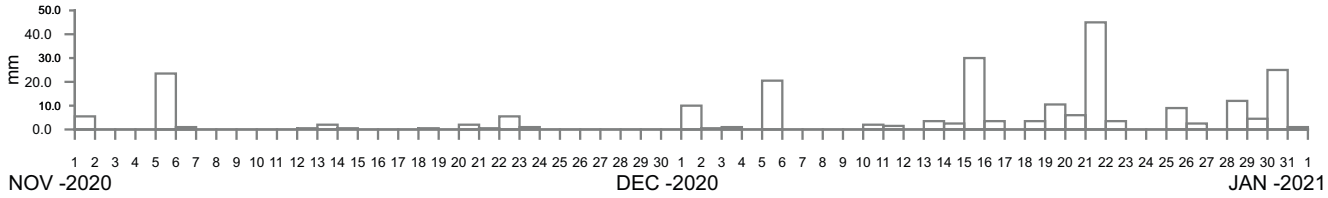
Figure

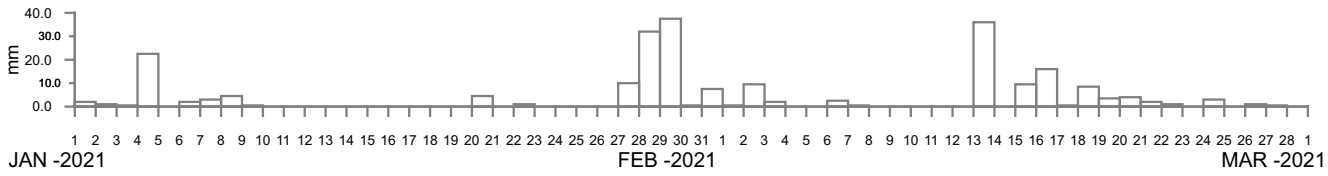
57

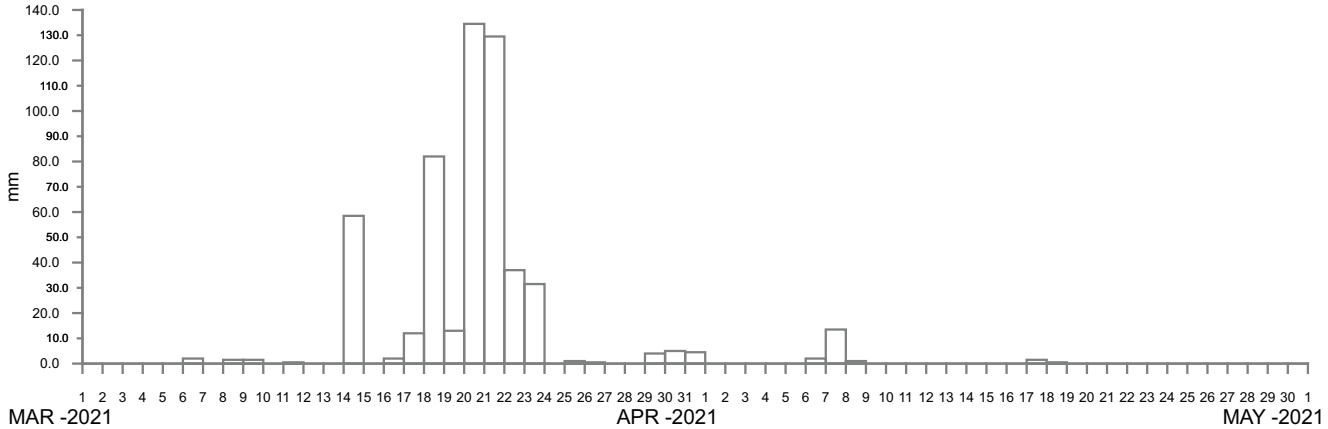
DRAWING 2857-57.cdr

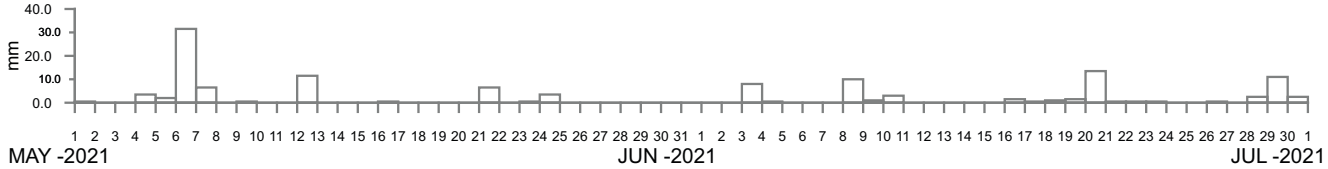












---------- DATA LOSS

NSW GOVERNMENT

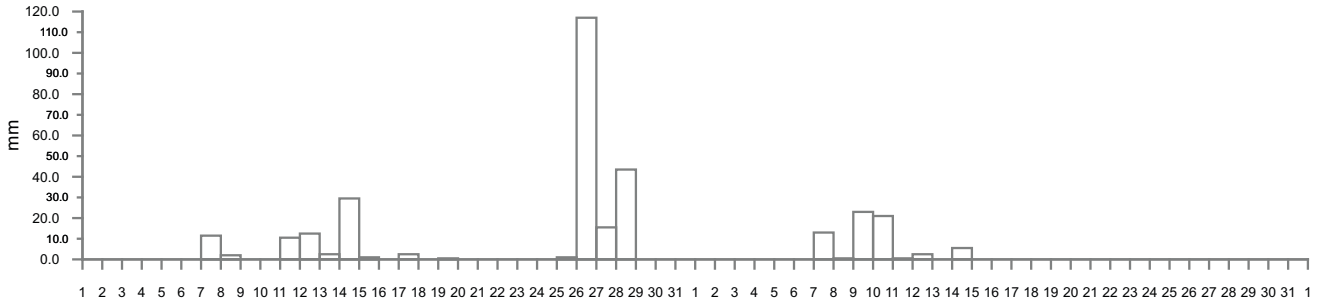
NARARA AT RESEARCH ROAD
2020–2021

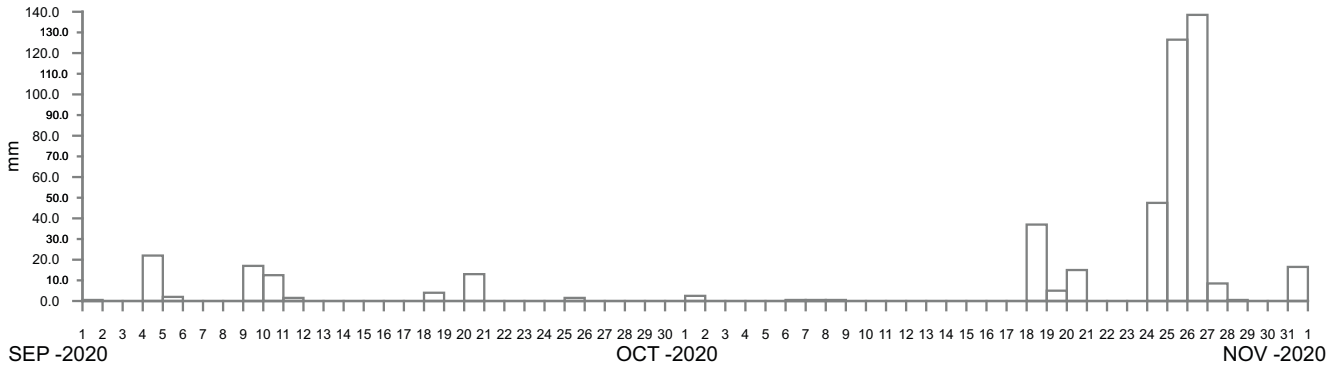
Manly Hydraulics Laboratory

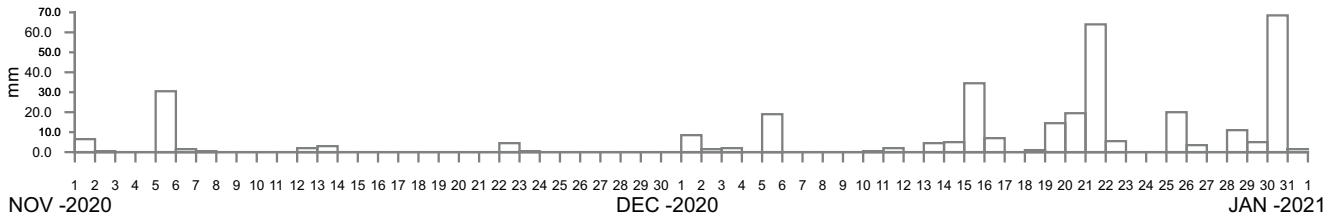
Report MHL2857

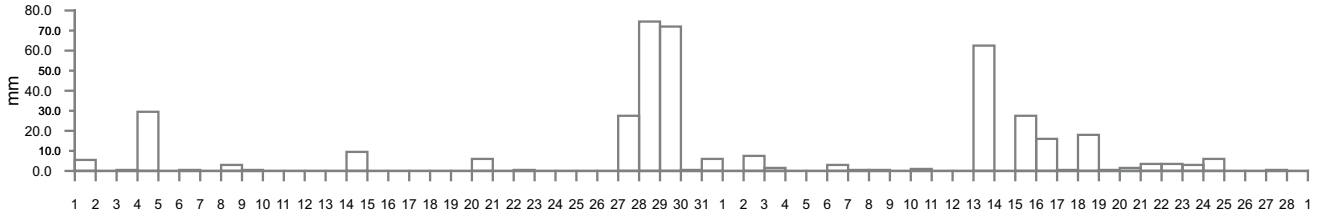
Figure 58

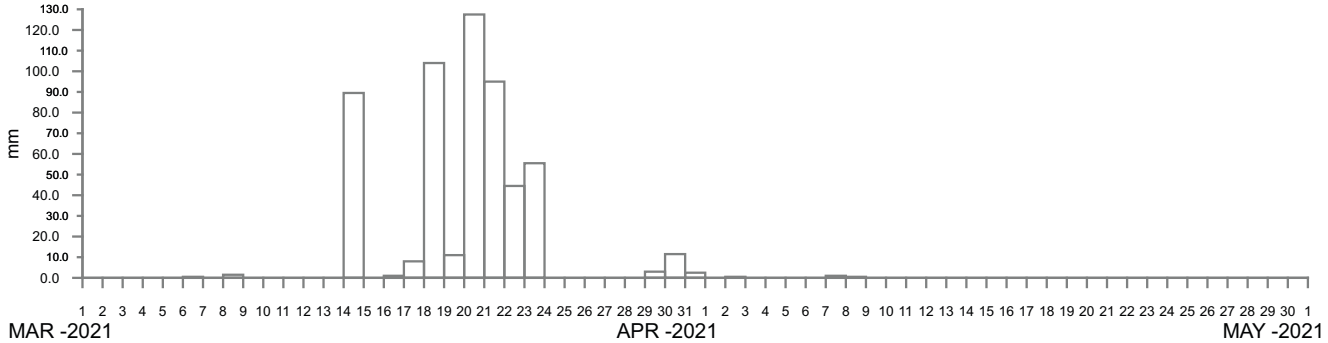
DRAWING 2857-58.cdr

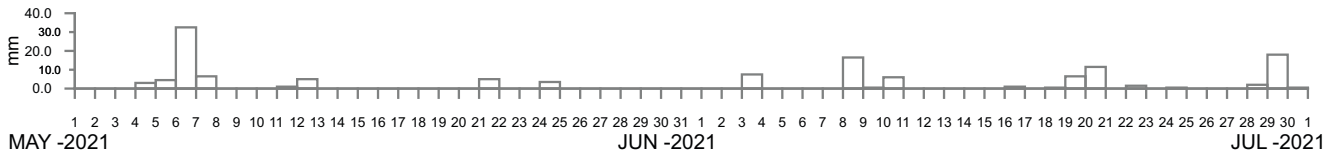












DATA LOSS

NSW GOVERNMENT

MOUNT ELLIOT AT TOOMEYS ROAD
2020–2021

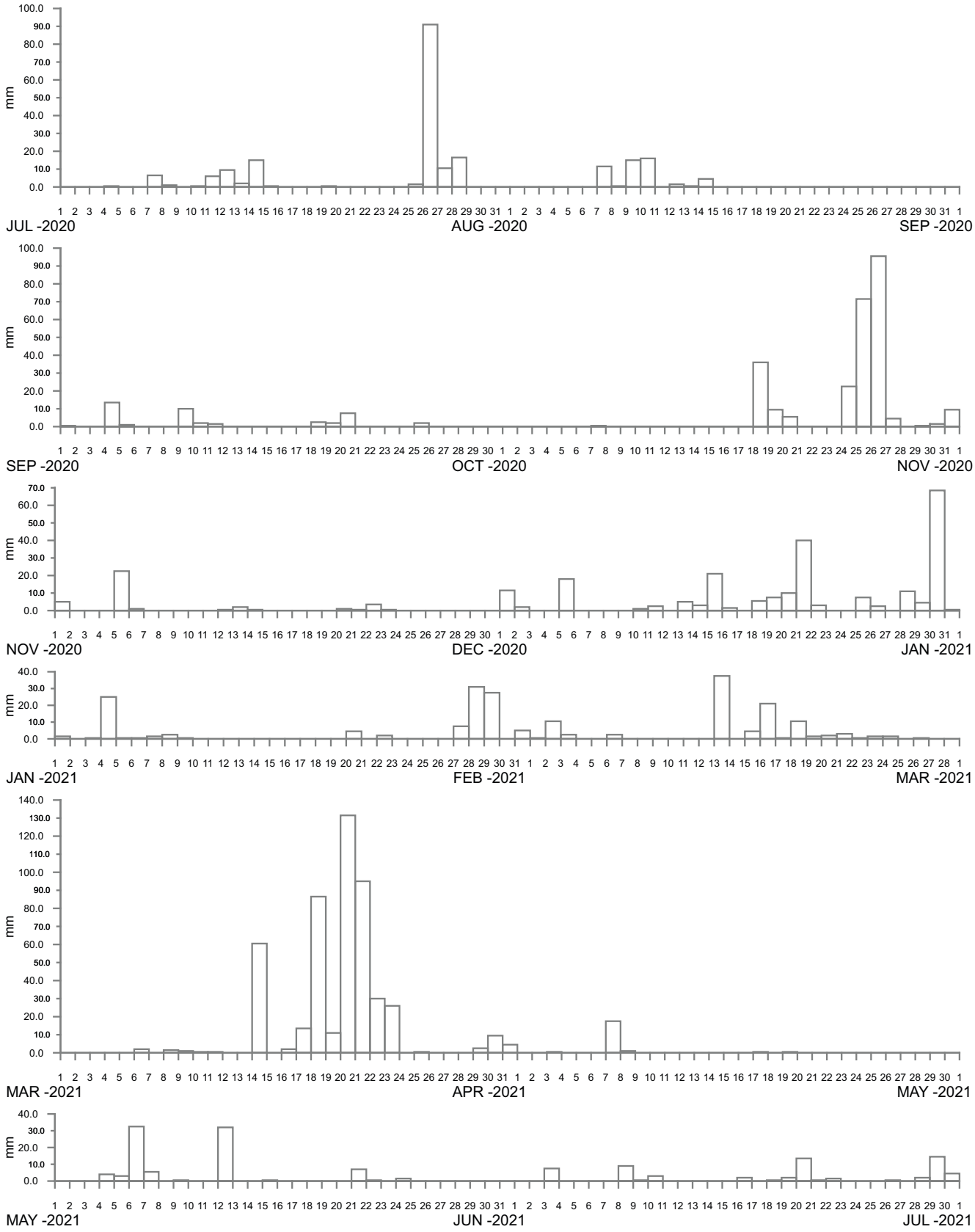
Manly Hydraulics Laboratory

Report MHL2857

Figure

59

DRAWING 2857-59.cdr



---------- DATA LOSS

NSW GOVERNMENT

WYOMING AT LAYCOCK STREET
2020–2021

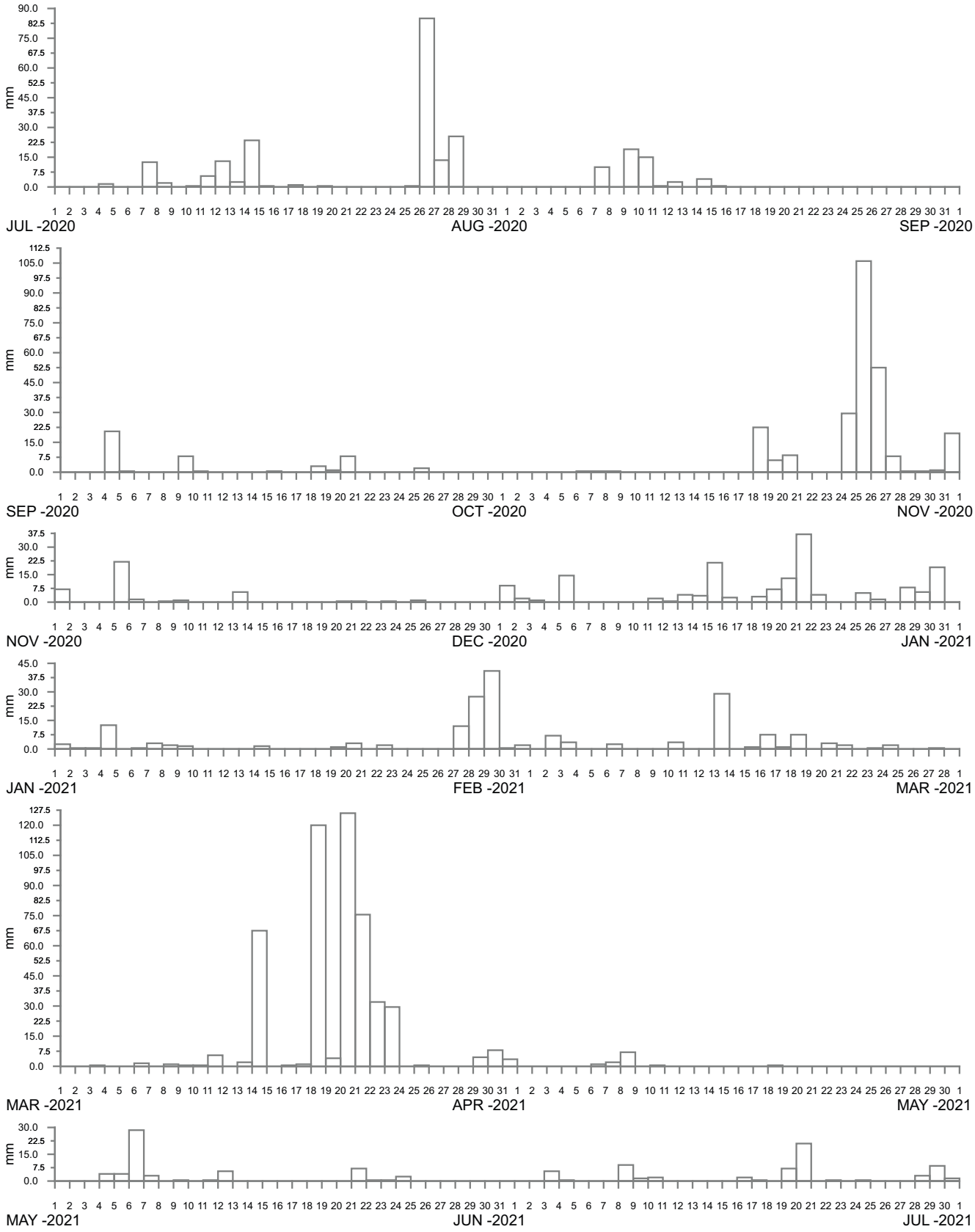
Manly Hydraulics Laboratory

Report MHL2857

Figure

60

DRAWING 2857-60.cdr



---------- DATA LOSS

NSW GOVERNMENT

KINCUMBER AT DOYLE STREET
2020–2021

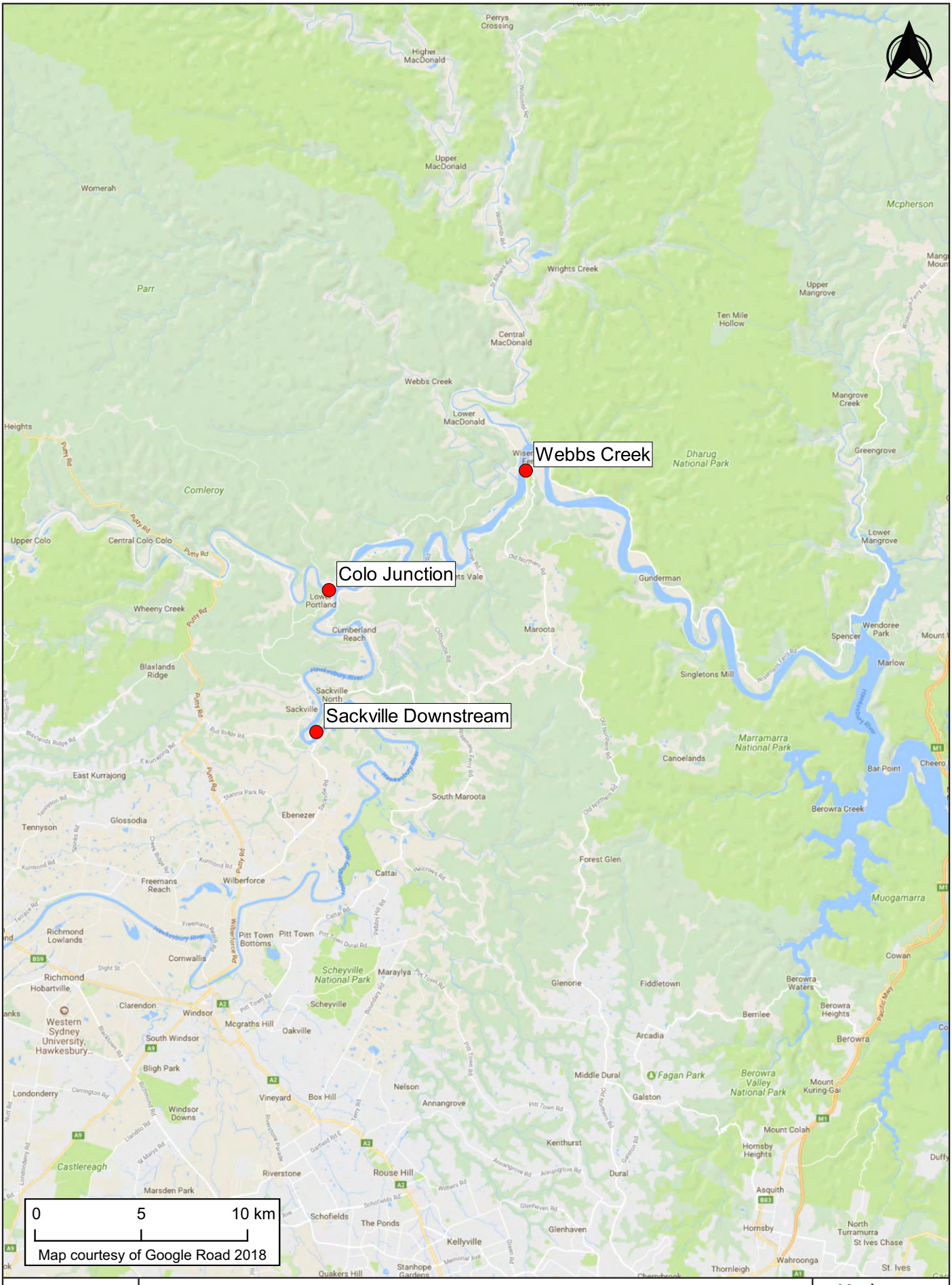
Manly Hydraulics Laboratory

Report MHL2857

Figure

61

DRAWING 2857-61.cdr



NSW GOVERNMENT

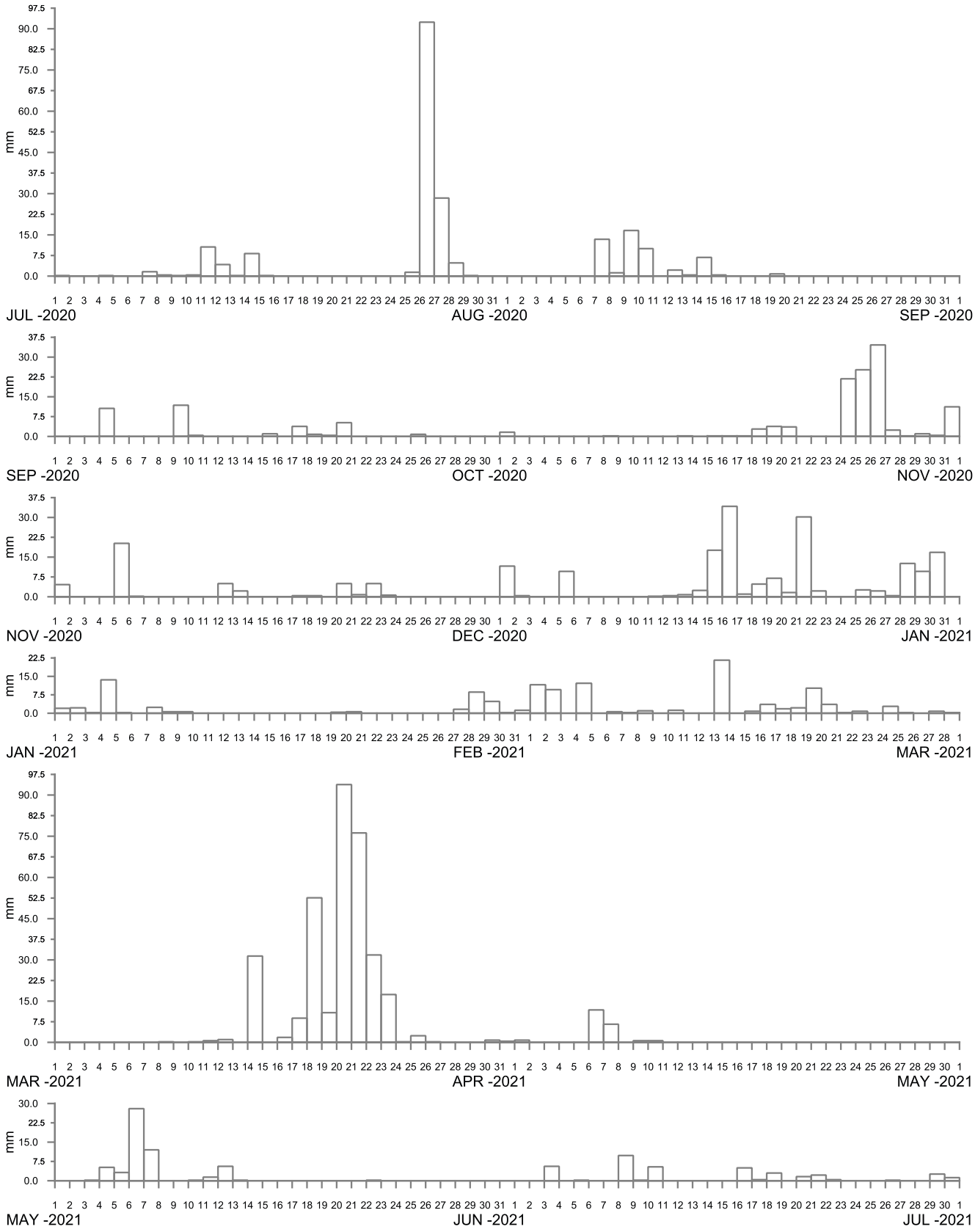
RAINFALL STATION LOCATIONS
HAWKESBURY RIVER REGION

Manly Hydraulics Laboratory

Report MHL2857

Figure 62

DRAWING 2857-62.cdr



---------- DATA LOSS

NSW GOVERNMENT

WEBBS CREEK AT HAWKESBURY RIVER
2020–2021

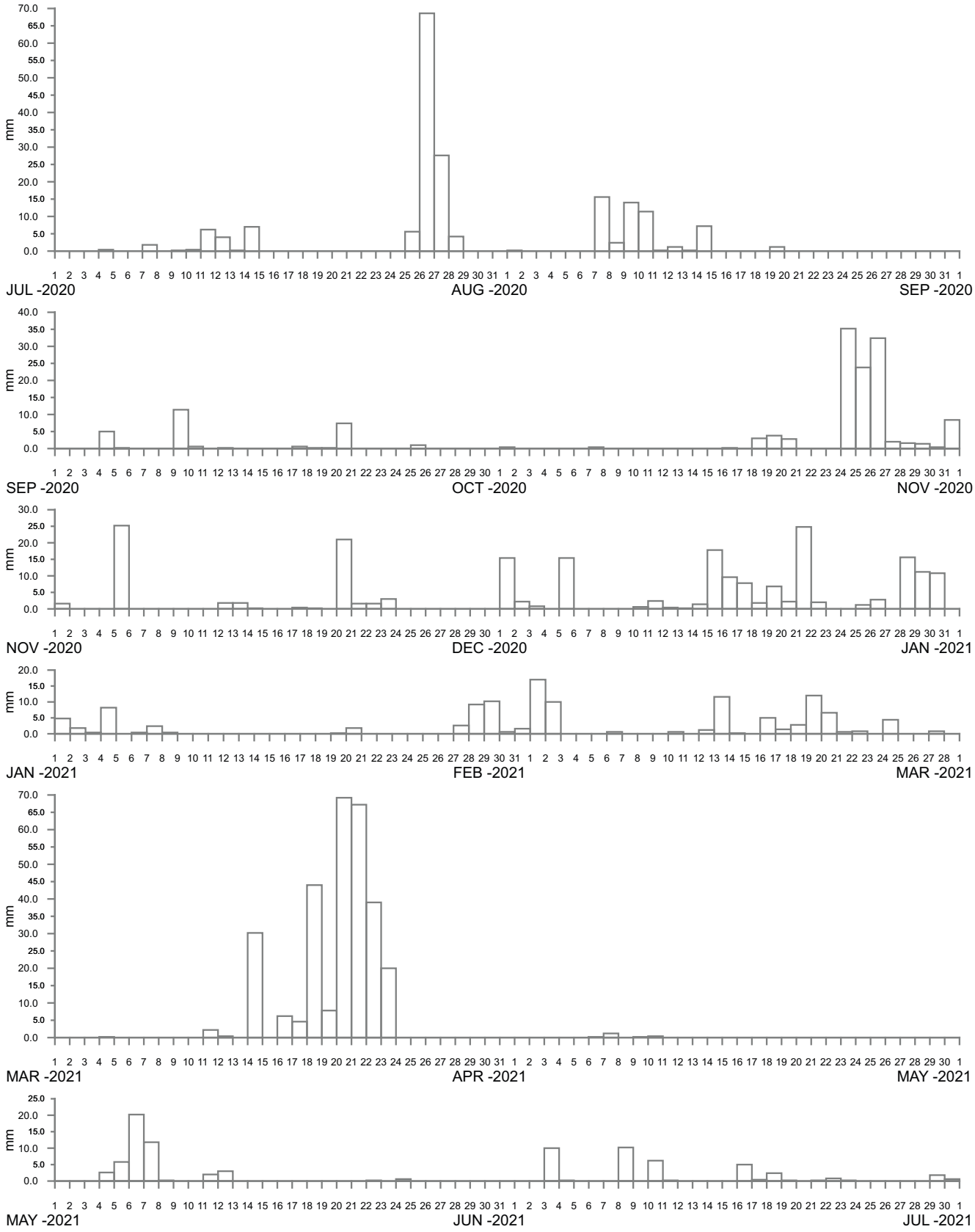
Manly Hydraulics Laboratory

Report MHL2857

Figure

63

DRAWING 2857-63.cdr



---------- DATA LOSS

NSW GOVERNMENT

COLO JUNCTION AT HAWKESBURY RIVER
2020–2021

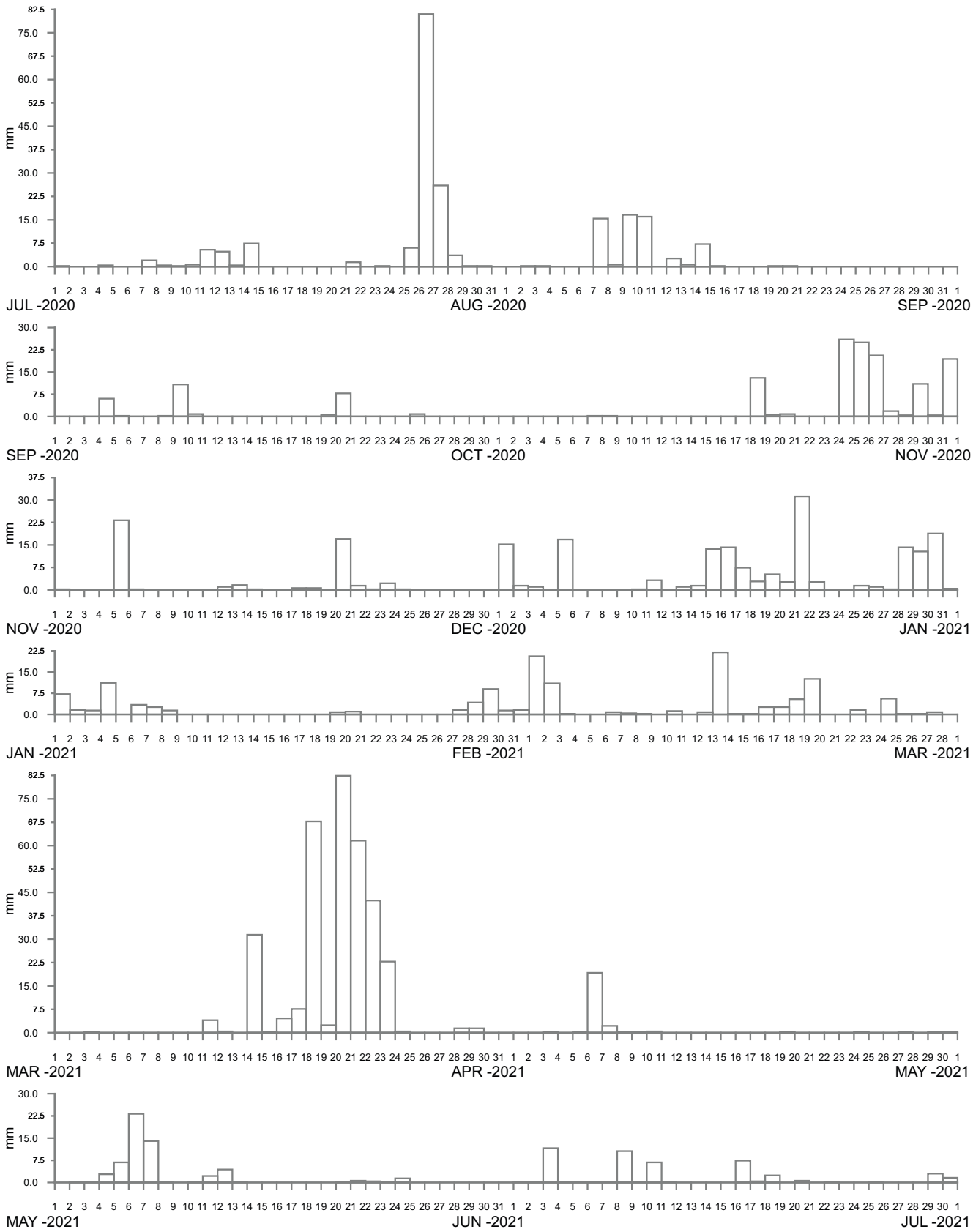
Manly Hydraulics Laboratory

Report MHL2857

Figure

64

DRAWING 2857-64.cdr



---------- DATA LOSS

NSW GOVERNMENT

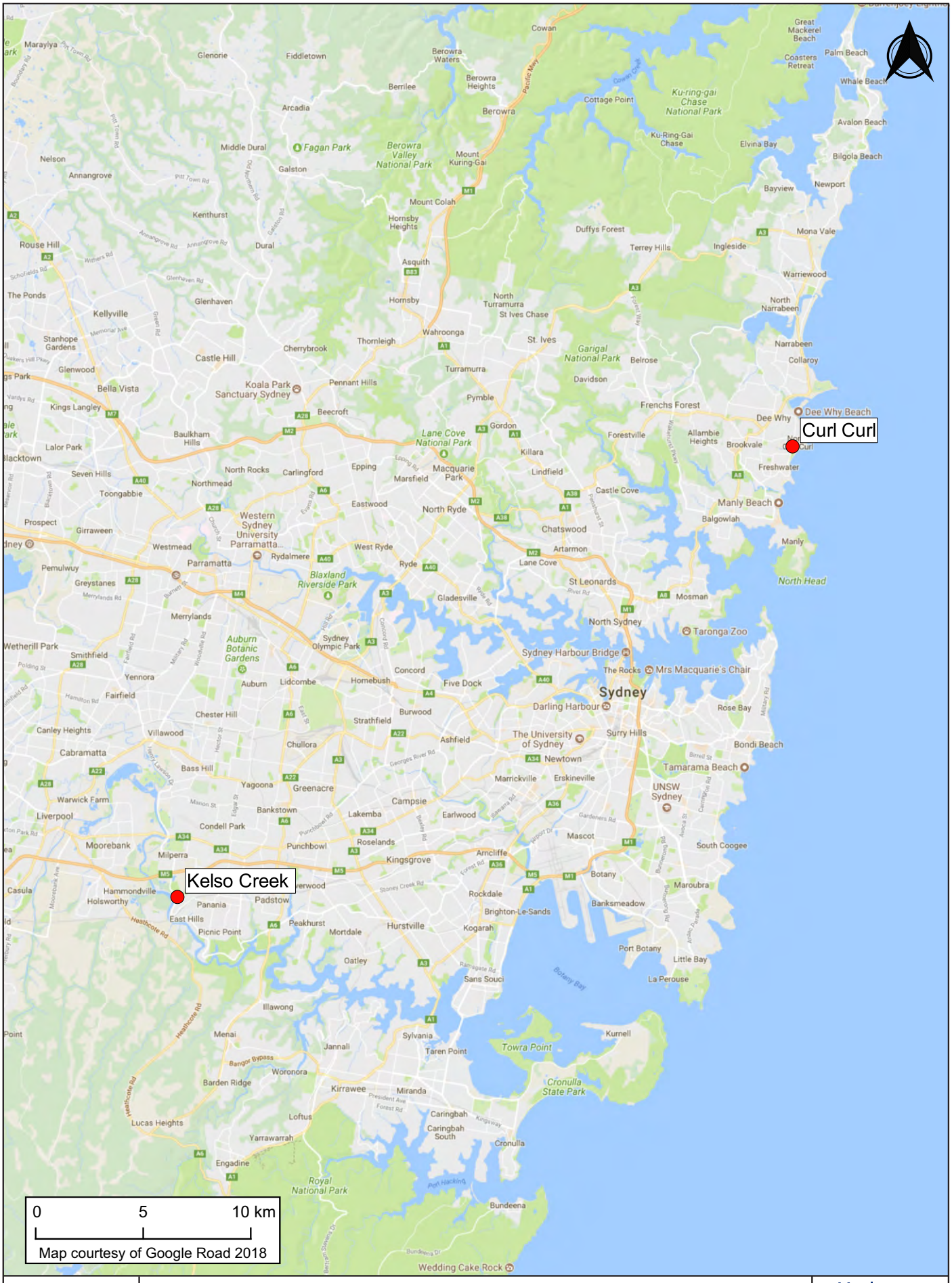
SACKVILLE DOWNSTREAM AT HAWKESBURY RIVER 2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 65

DRAWING 2857-65.cdr



NSW GOVERNMENT

RAINFALL STATION LOCATIONS
SYDNEY COASTAL REGION

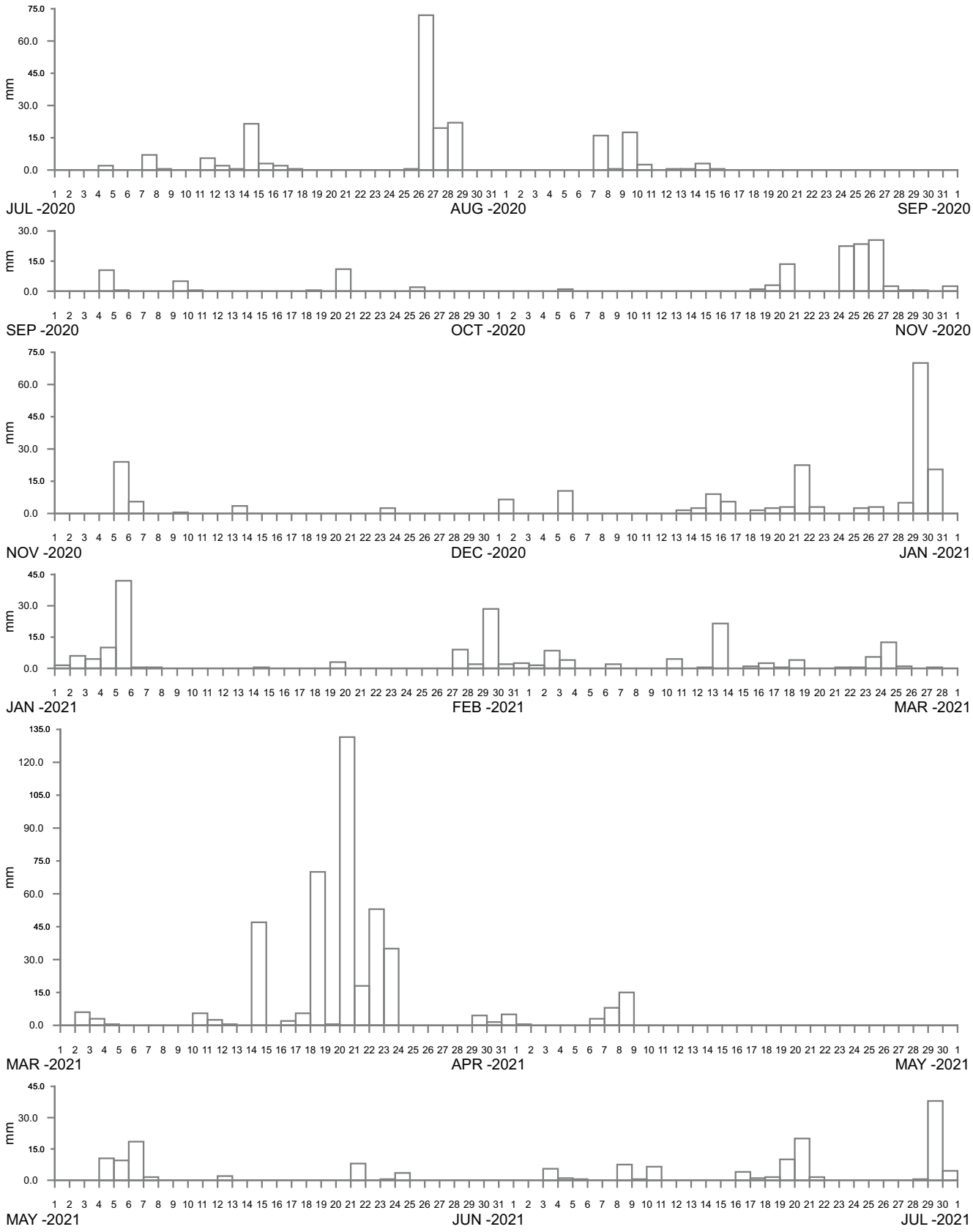
Manly Hydraulics Laboratory

Report MHL2857

Figure

66

DRAWING 2857-66.cdr



---------- DATA LOSS

NSW GOVERNMENT

CURL CURL AT CURL CURL LAGOON
2020–2021

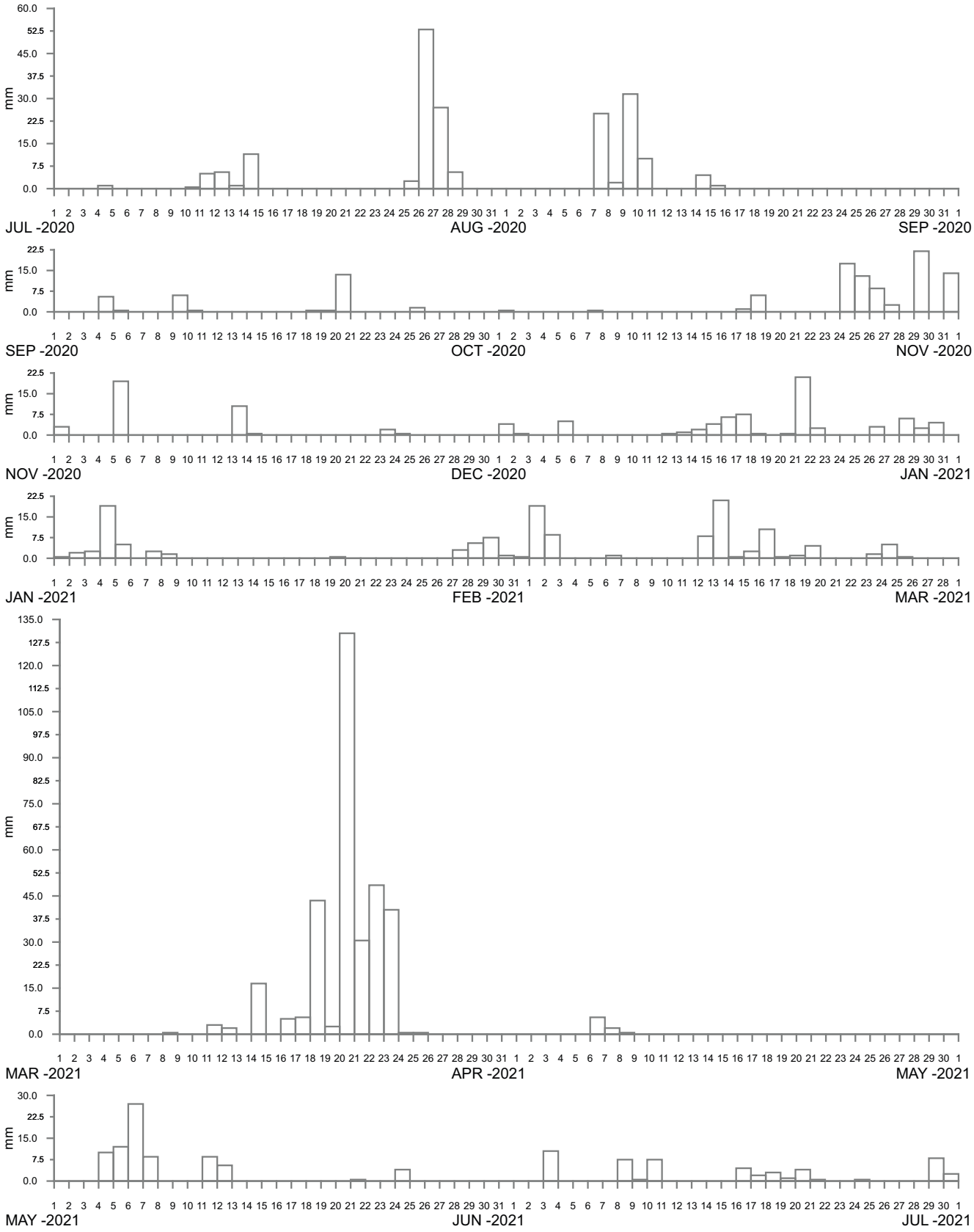
Manly Hydraulics Laboratory

Report MHL2857

Figure

67

DRAWING 2857-67.cdr



---------- DATA LOSS

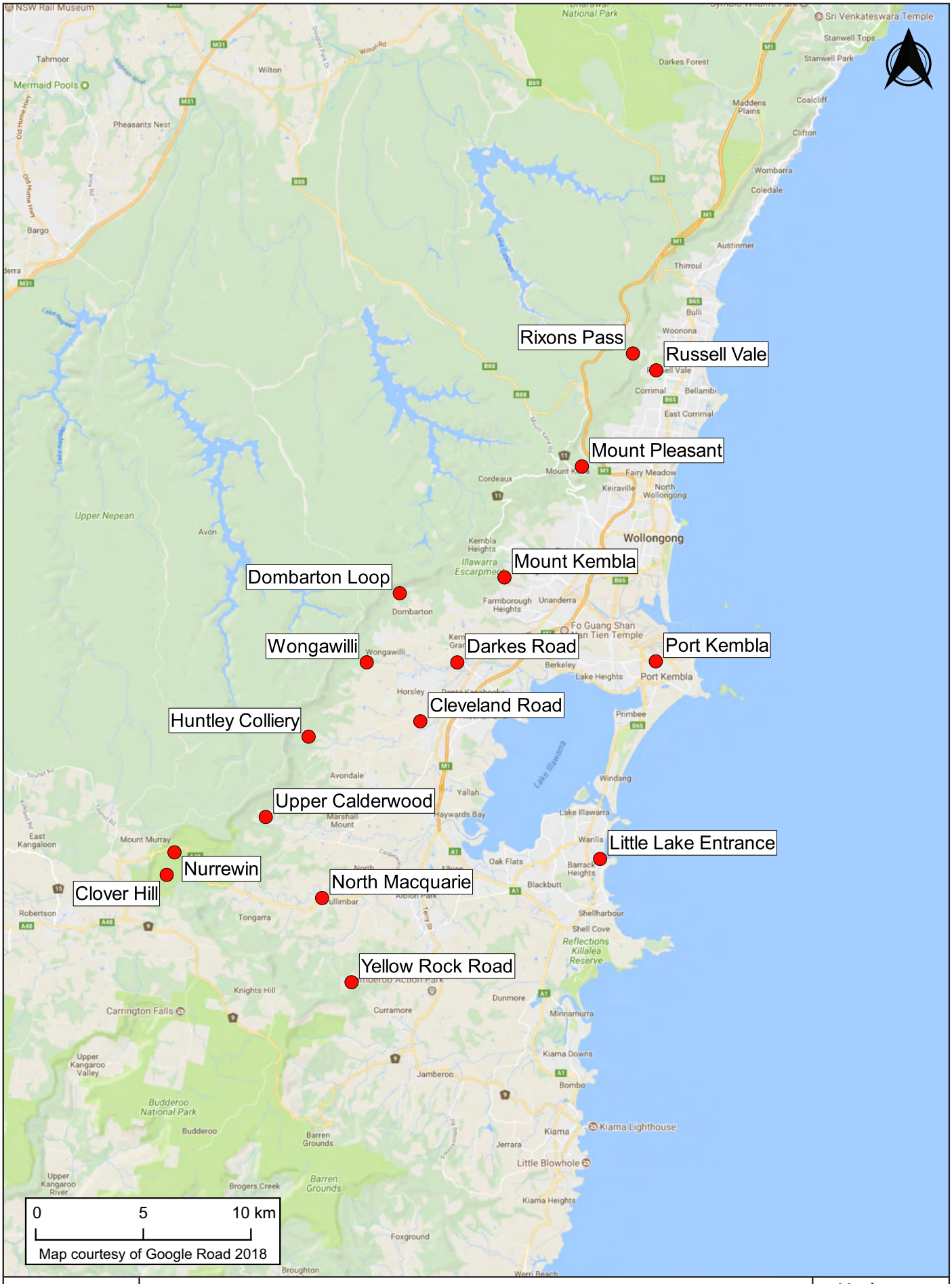
KELSO CREEK AT KELSO CREEK
2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 68

DRAWING 2857-68.cdr



NSW GOVERNMENT

RAINFALL STATION LOCATIONS
WOLLONGONG COASTAL REGION

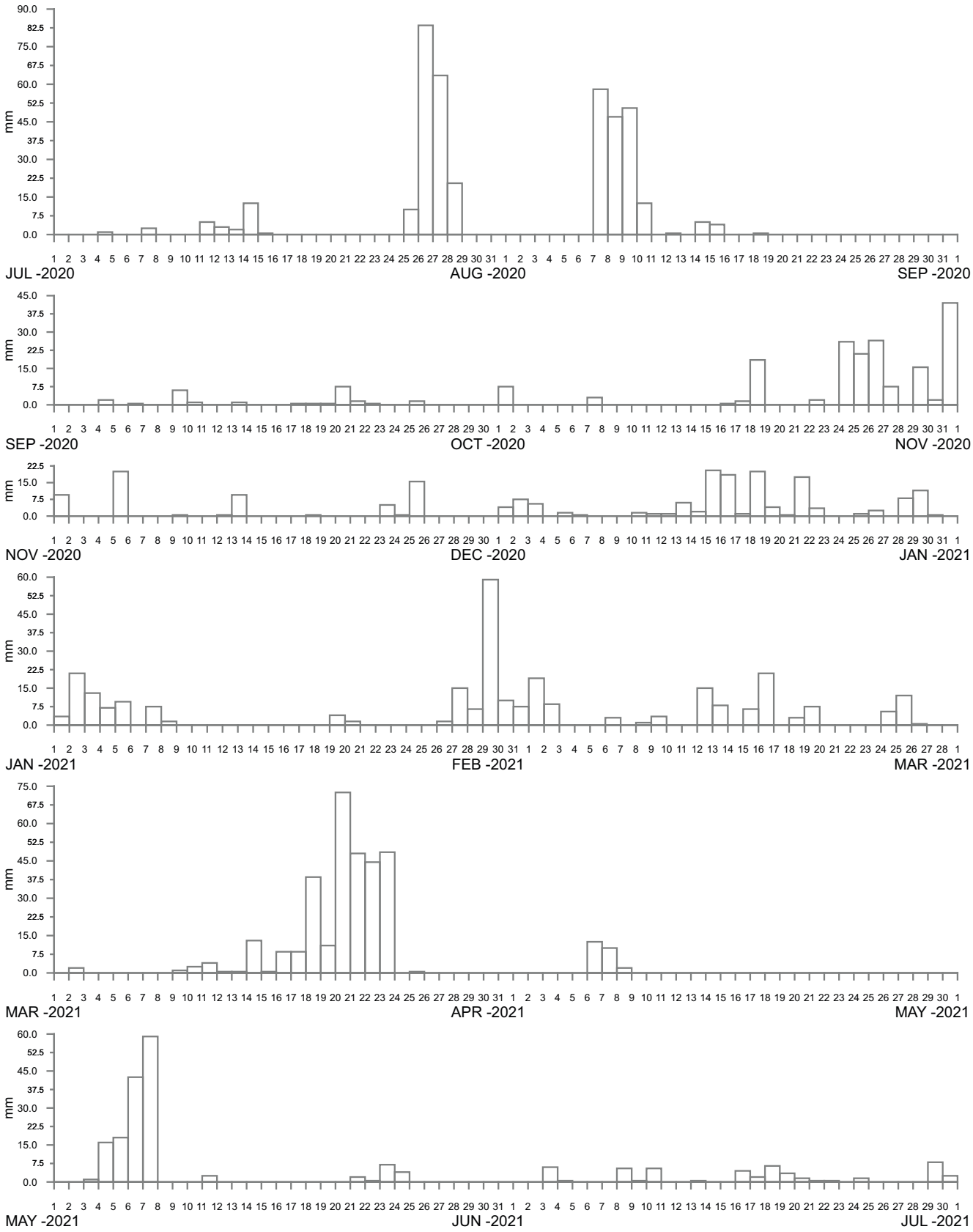
Manly Hydraulics Laboratory

Report MHL2857

Figure

69

DRAWING 2857-69.cdr



---------- DATA LOSS

NSW GOVERNMENT

RIXONS PASS AT RIXONS PASS ROAD
2020–2021

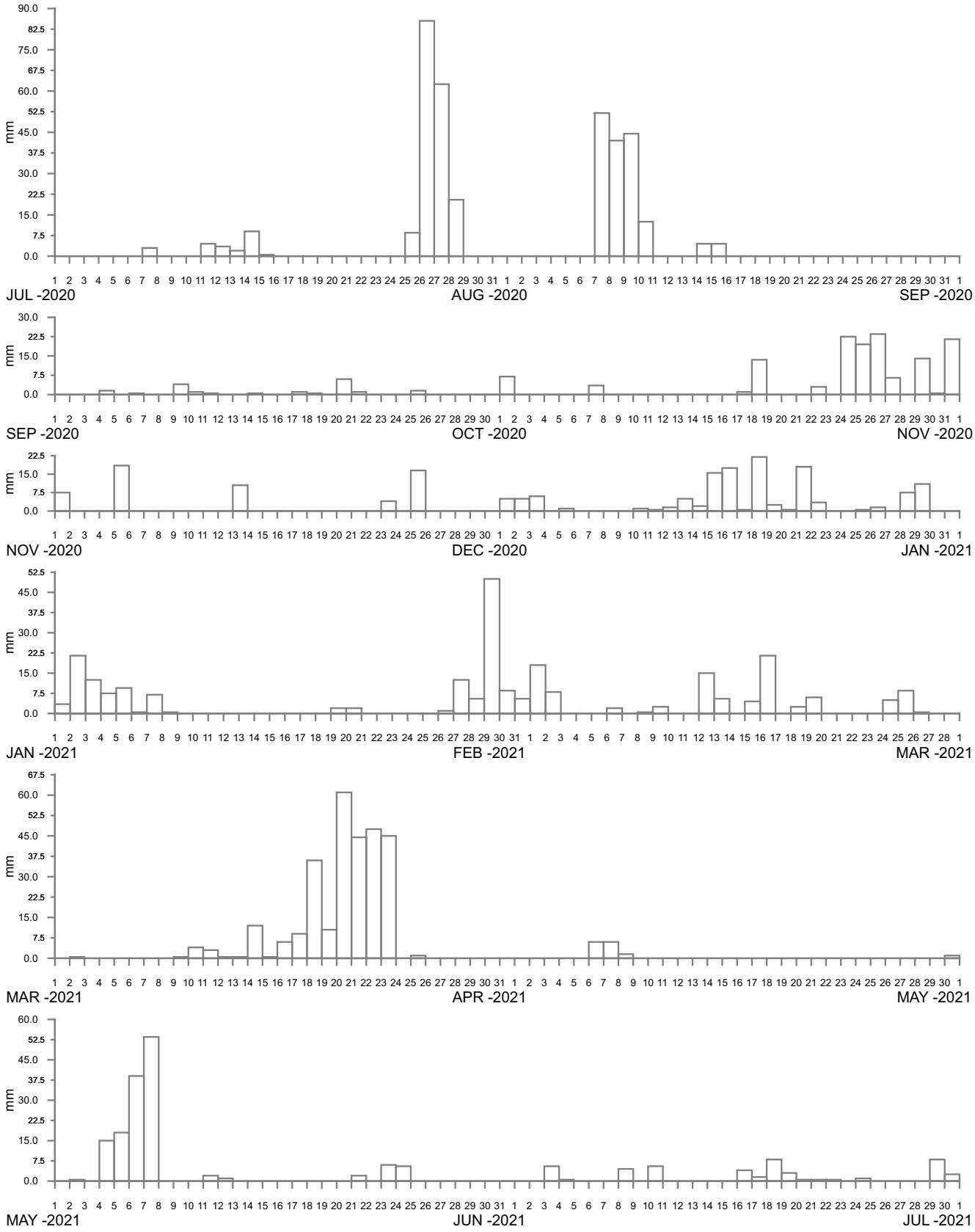
Manly Hydraulics Laboratory

Report MHL2857

Figure

70

DRAWING 2857-70.cdr



---------- DATA LOSS

NSW GOVERNMENT

RUSSELL VALE AT WHITING CRESCENT
2020–2021

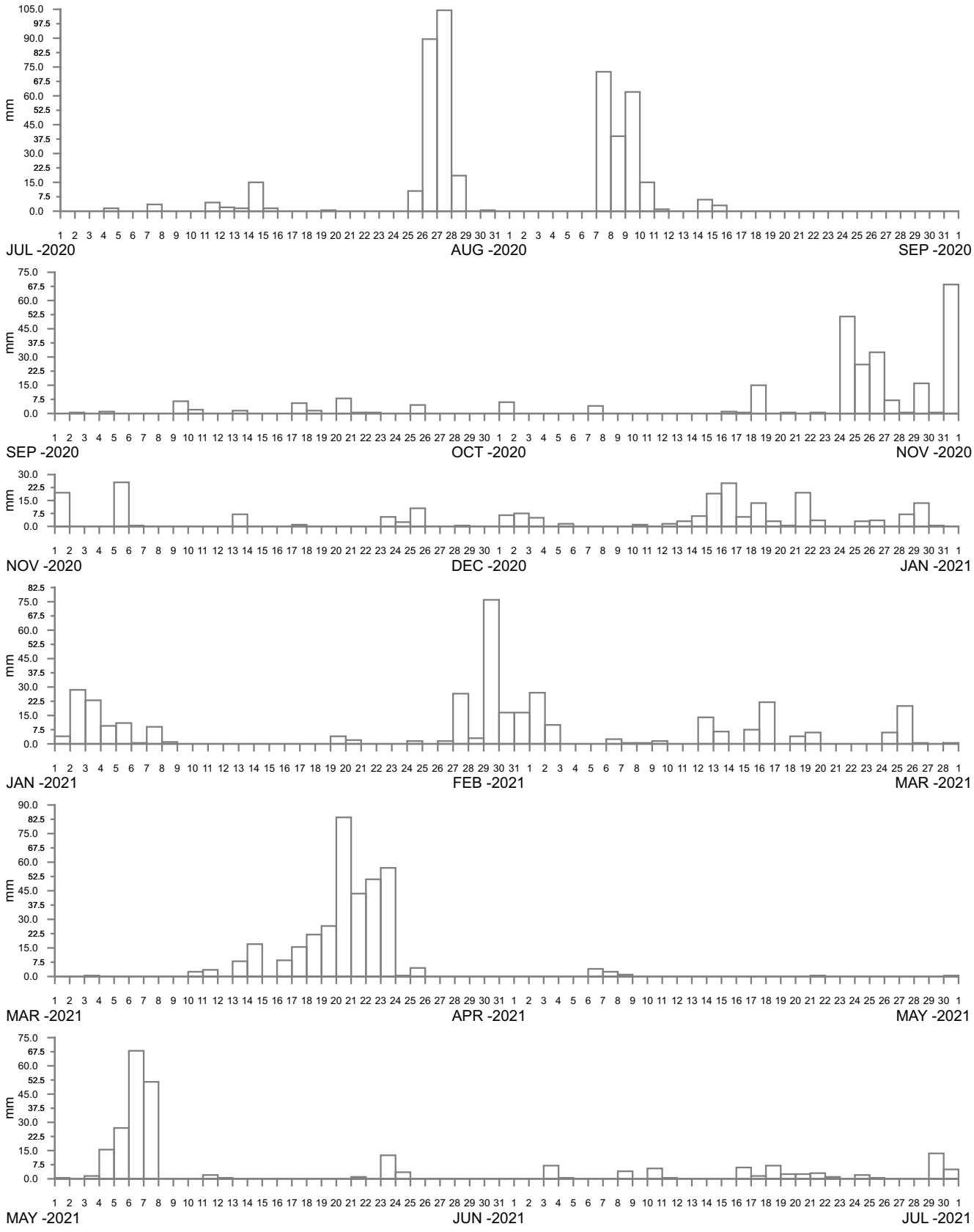
Manly Hydraulics Laboratory

Report MHL2857

Figure

71

DRAWING 2857-71.cdr



---------- DATA LOSS

NSW GOVERNMENT

MOUNT PLEASANT AT PARRISH AVENUE
2020–2021

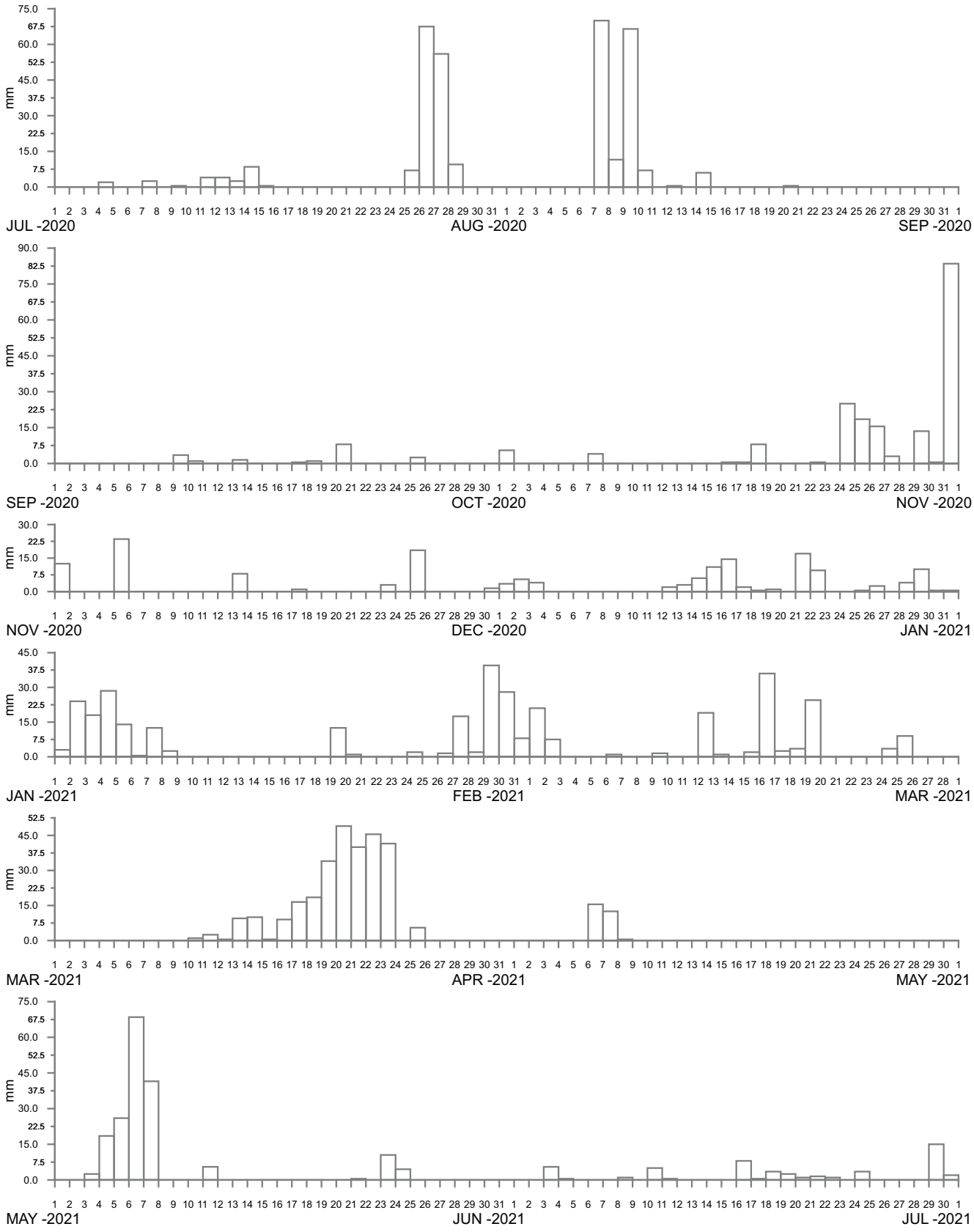
Manly Hydraulics Laboratory

Report MHL2857

Figure

72

DRAWING 2857-72.cdr



---------- DATA LOSS

NSW GOVERNMENT

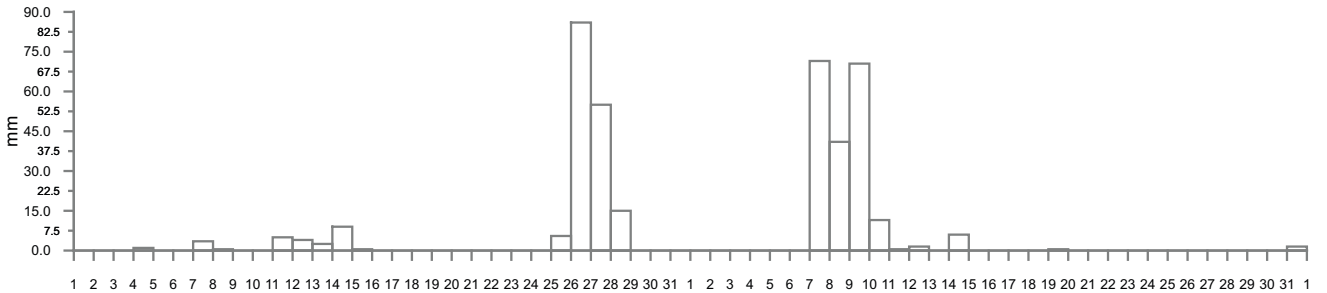
MOUNT KEMBLA AT STAFF ROAD
2020–2021

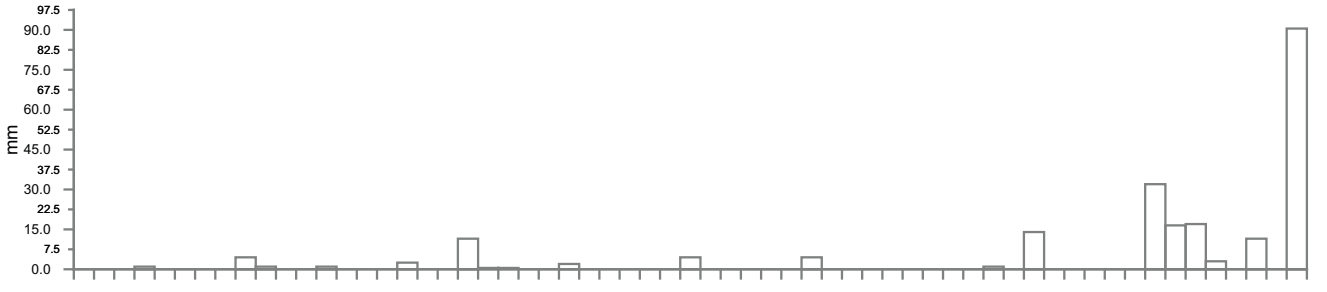
Manly Hydraulics Laboratory

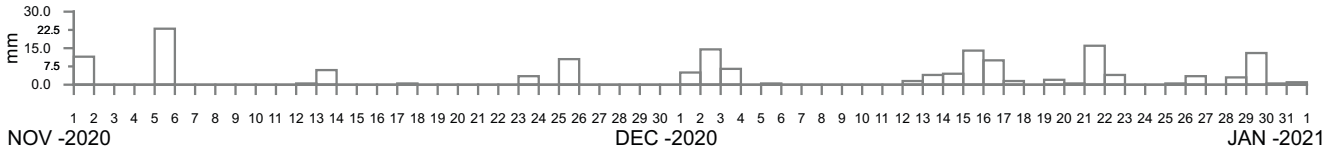
Report MHL2857

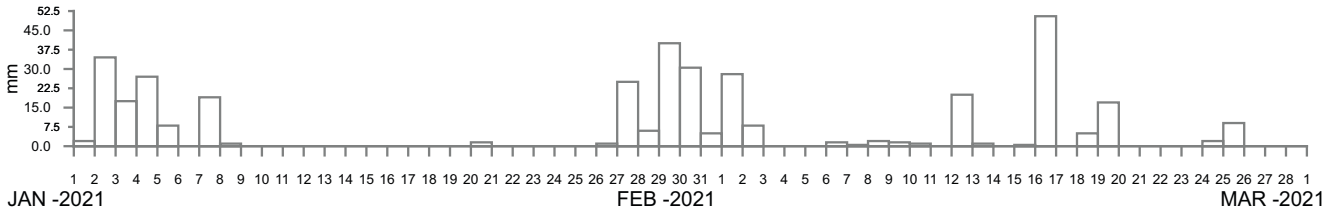
Figure 73

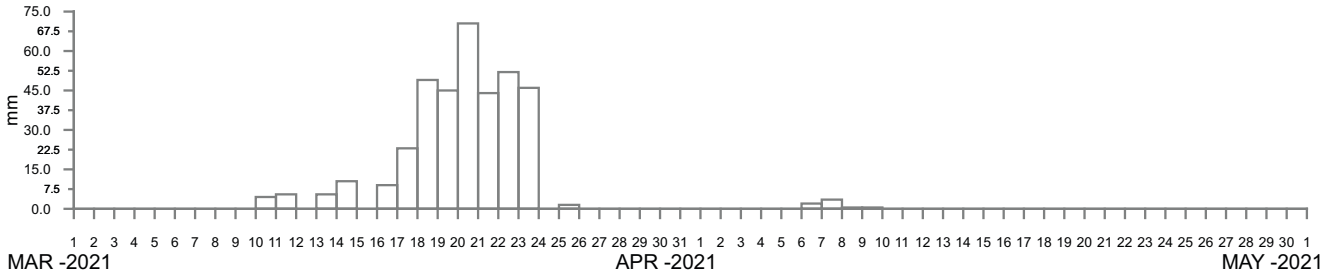
DRAWING 2857-73.cdr

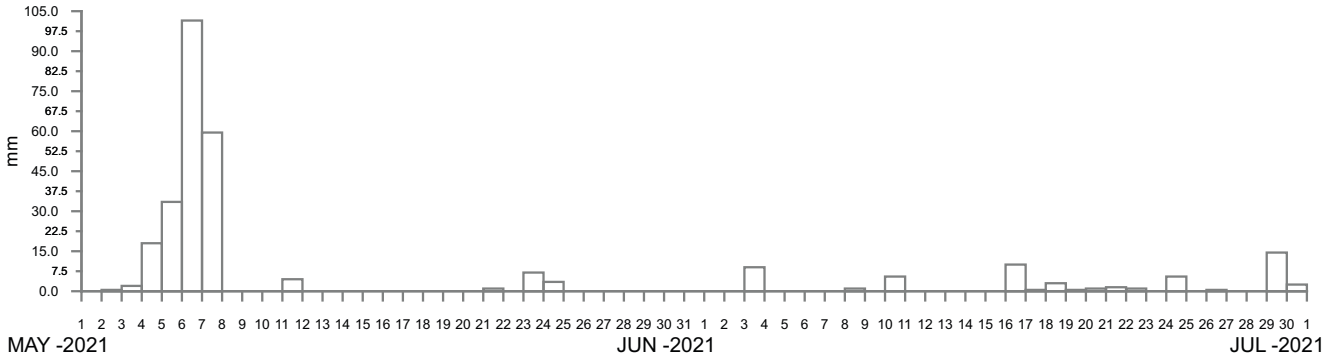












---------- DATA LOSS

NSW GOVERNMENT

DOMBARTON LOOP AT PAYNES ROAD
2020–2021

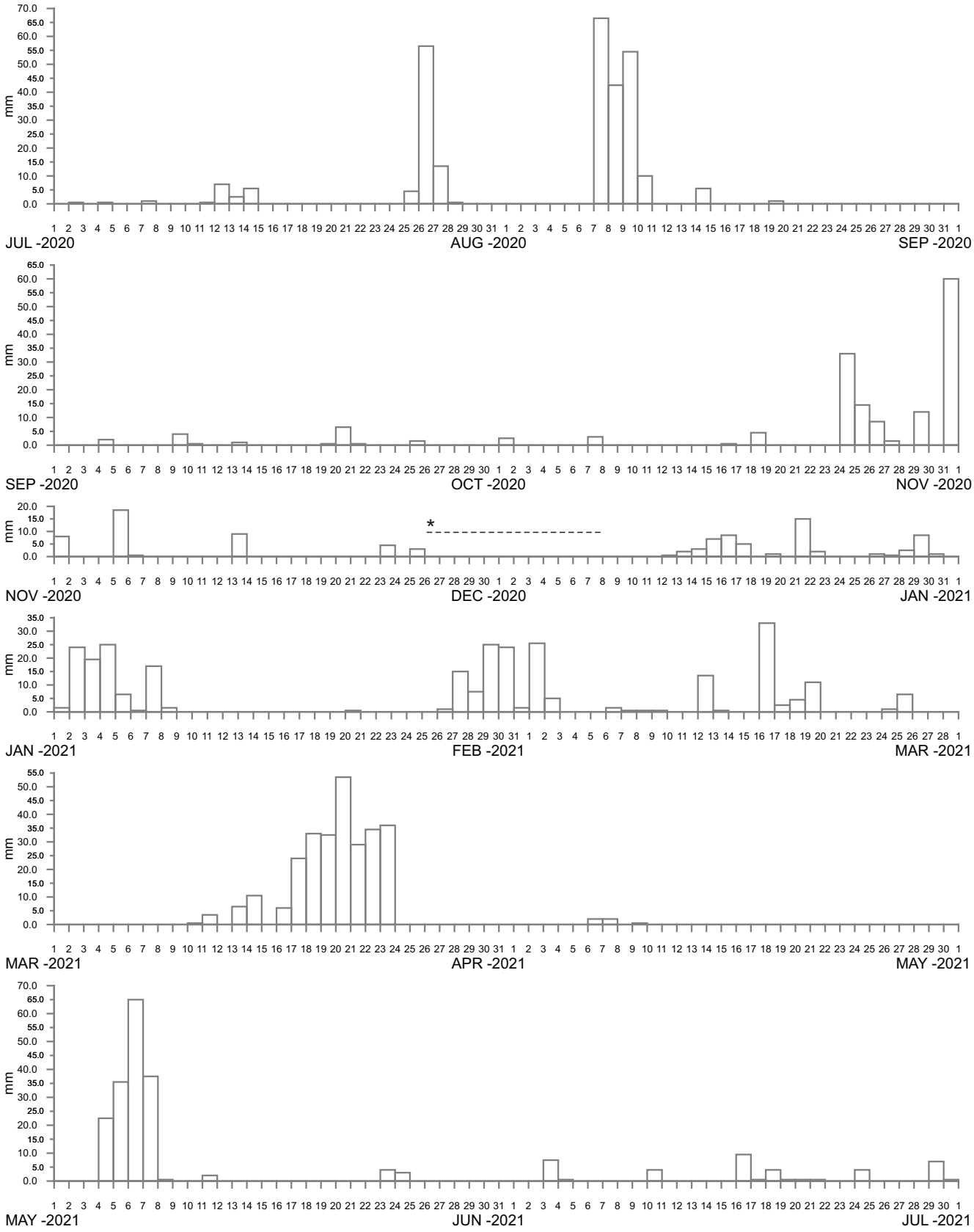
Manly Hydraulics Laboratory

Report MHL2857

Figure

74

DRAWING 2857-74.cdr



---------- DATA LOSS

*Data loss due to faulty logger

NSW GOVERNMENT

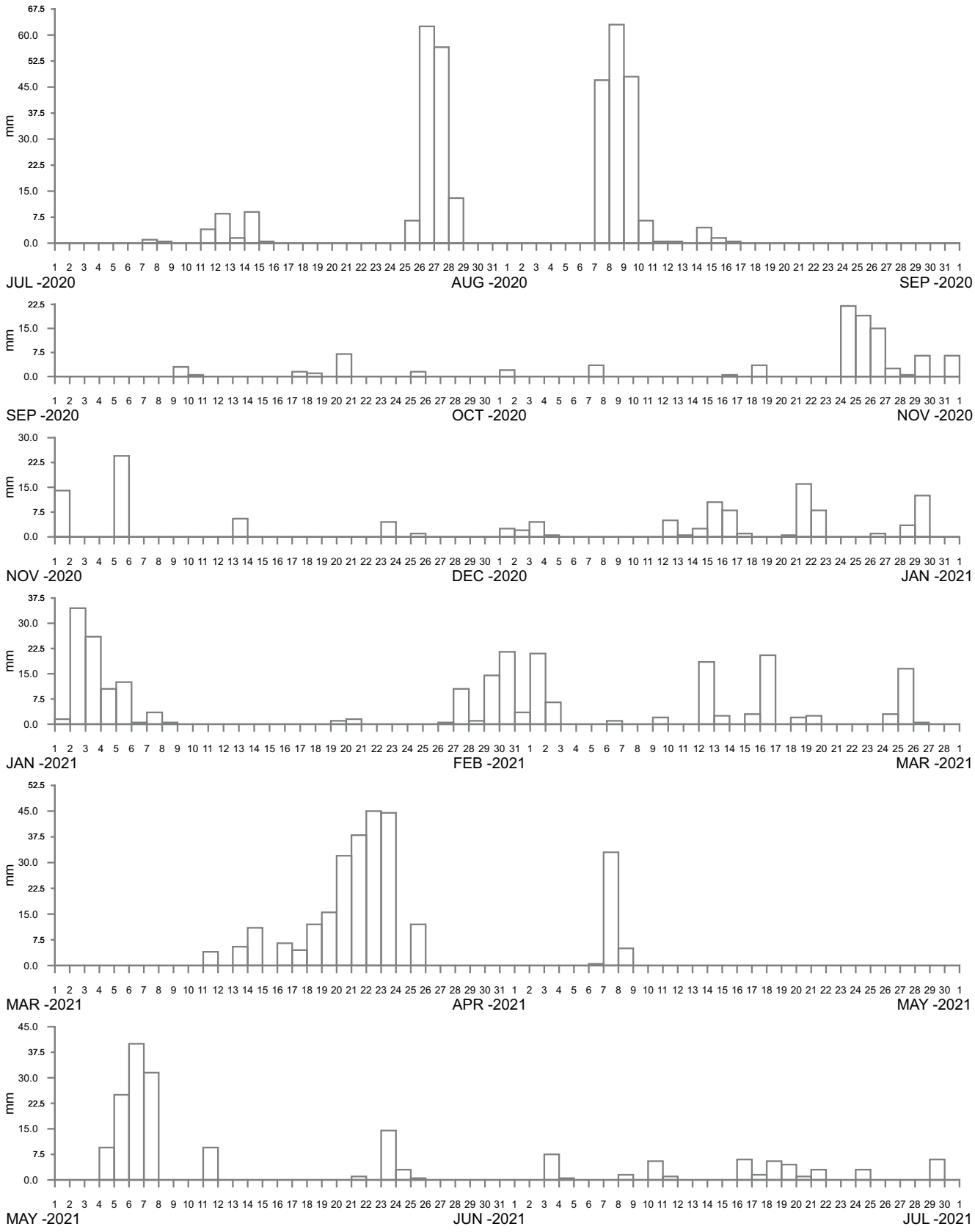
WONGAWILLI AT JERSEY FARM ROAD
2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 75

DRAWING 2857-75.cdr



---------- DATA LOSS

NSW GOVERNMENT

PORT KEMBLA AT FIVE ISLANDS ROAD
2020–2021

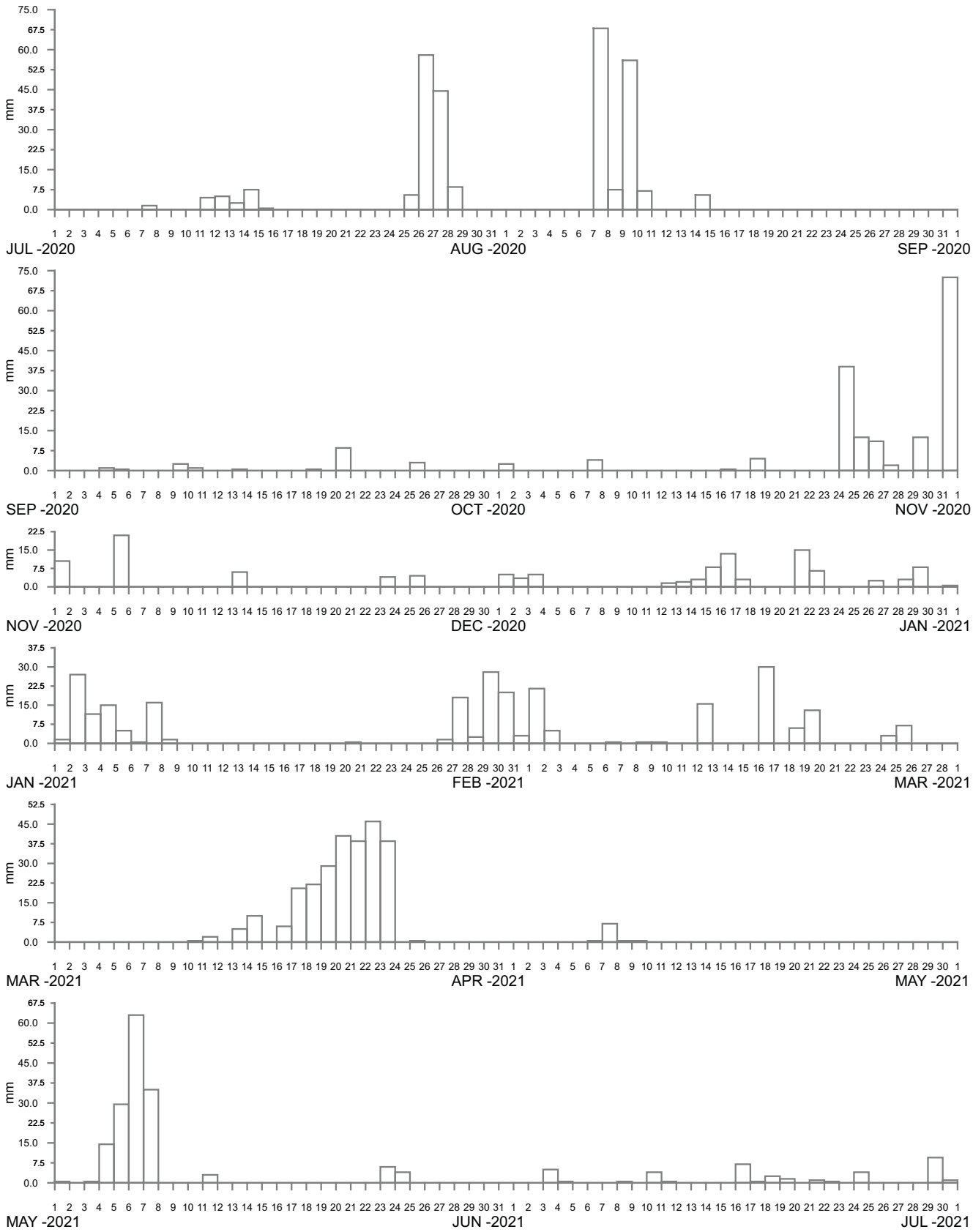
Manly Hydraulics Laboratory

Report MHL2857

Figure

76

DRAWING 2857-76.cdr



---------- DATA LOSS

NSW GOVERNMENT

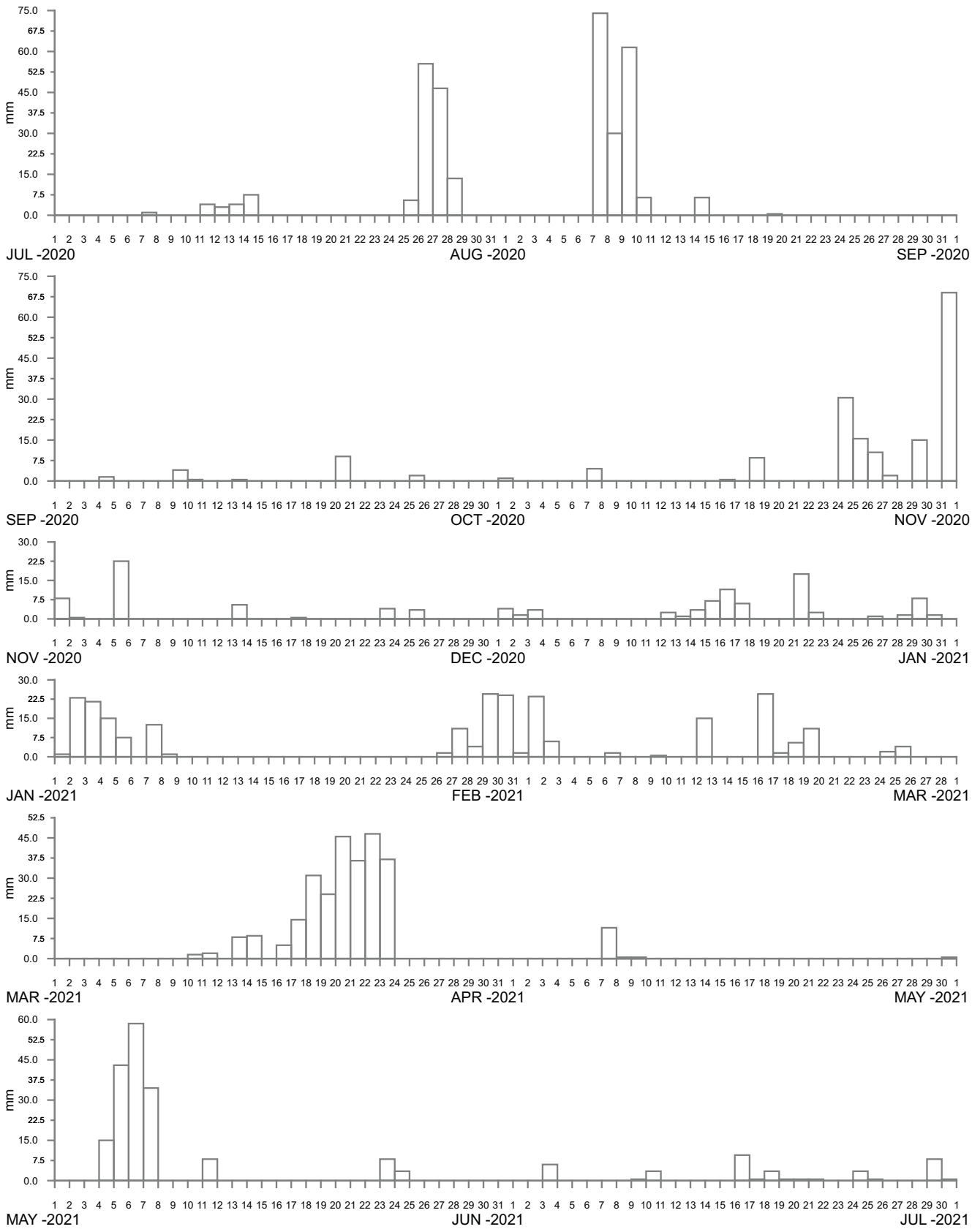
DARKES ROAD AT DAPTO
2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 77

DRAWING 2857-77.cdr



---------- DATA LOSS

NSW GOVERNMENT

CLEVELAND ROAD AT CLEVELAND ROAD
2020–2021

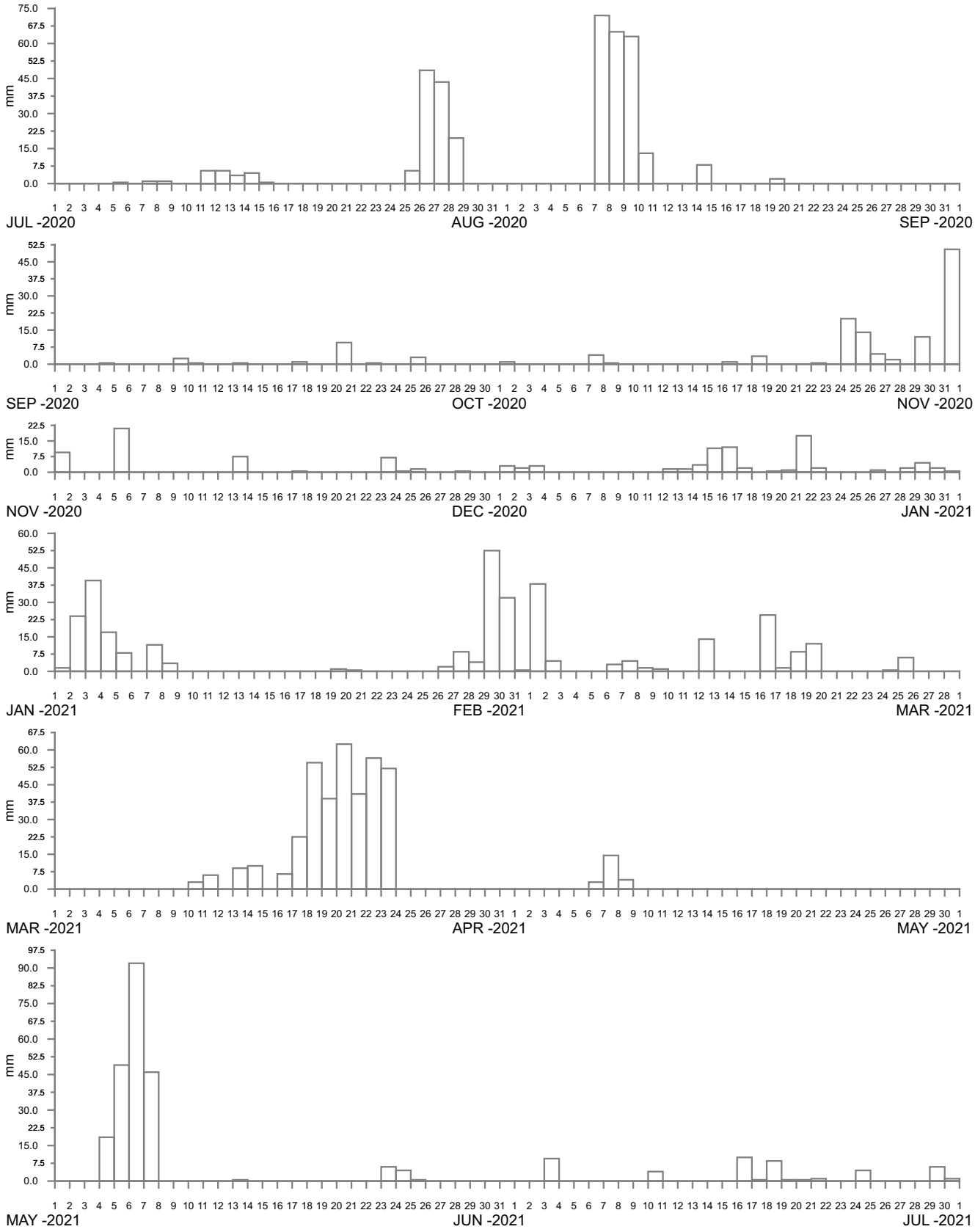
Manly Hydraulics Laboratory

Report MHL2857

Figure

78

DRAWING 2857-78.cdr



---------- DATA LOSS

NSW GOVERNMENT

HUNTLEY COLLIERY AT AVONDALE ROAD
2020–2021

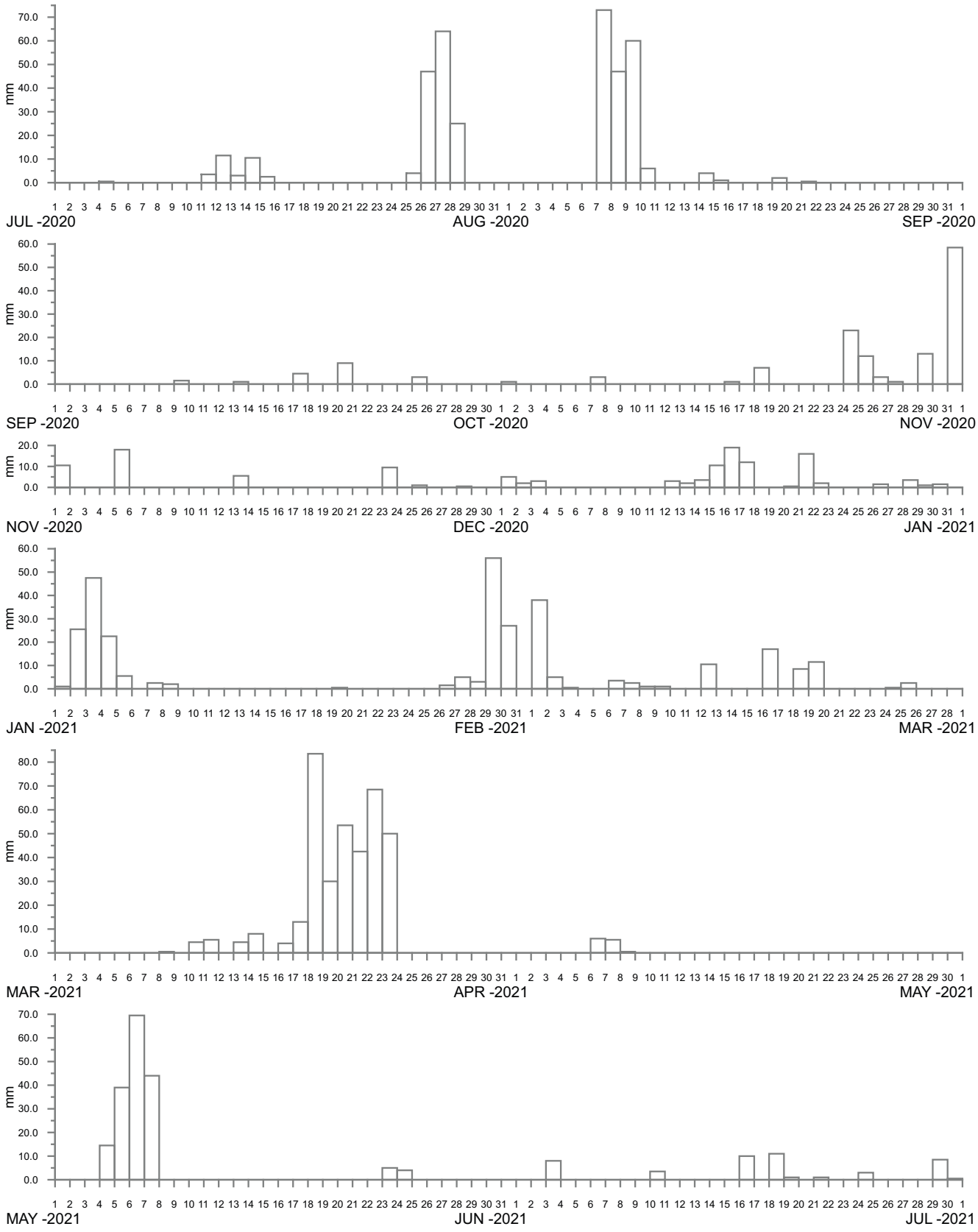
Manly Hydraulics Laboratory

Report MHL2857

Figure

79

DRAWING 2857-79.cdr



---------- DATA LOSS

NSW GOVERNMENT

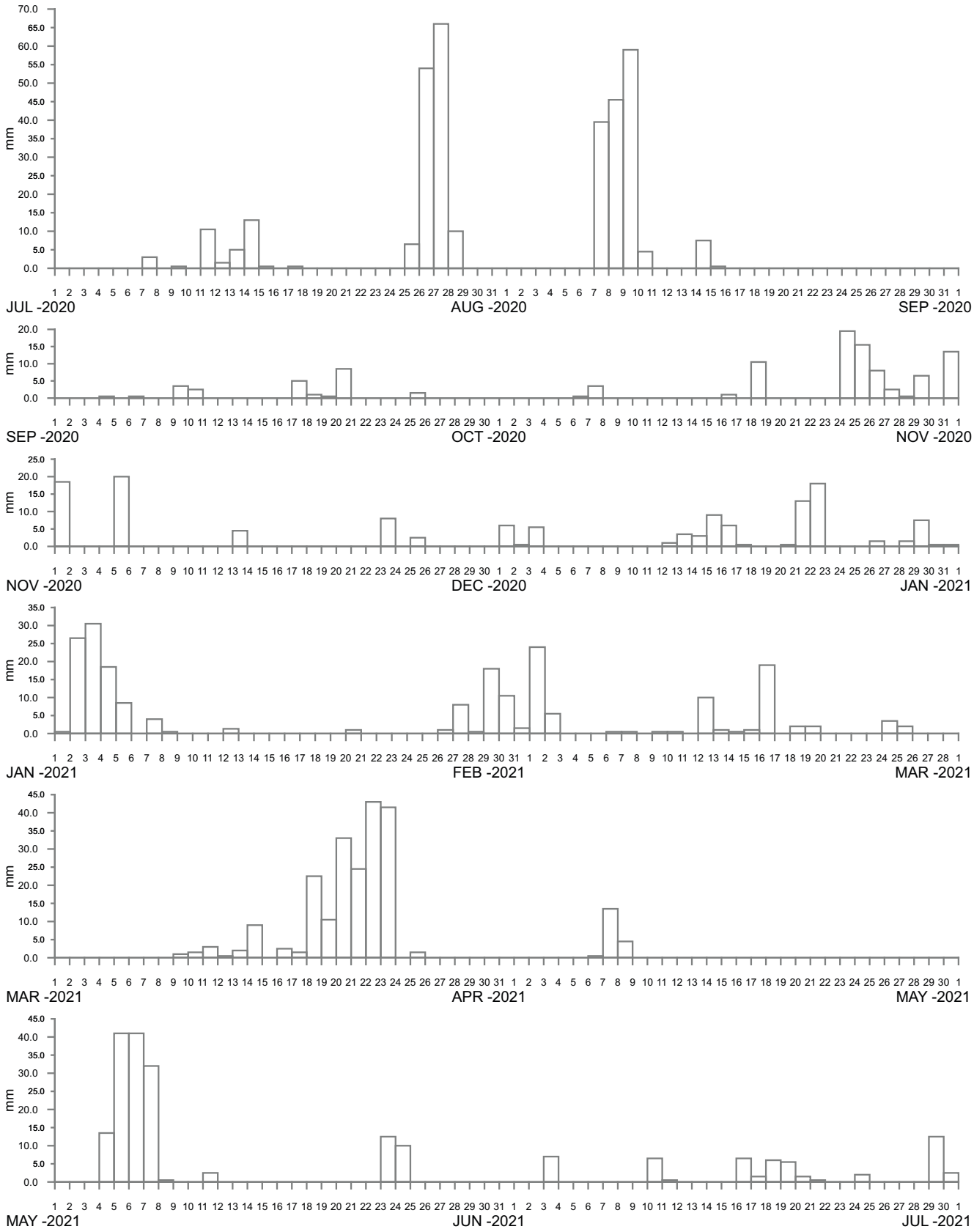
UPPER CALDERWOOD AT CALDERWOOD ROAD 2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 80

DRAWING 2857-80.cdr



---------- DATA LOSS

NSW GOVERNMENT

LITTLE LAKE ENTRANCE AT LITTLE LAKE
2020–2021

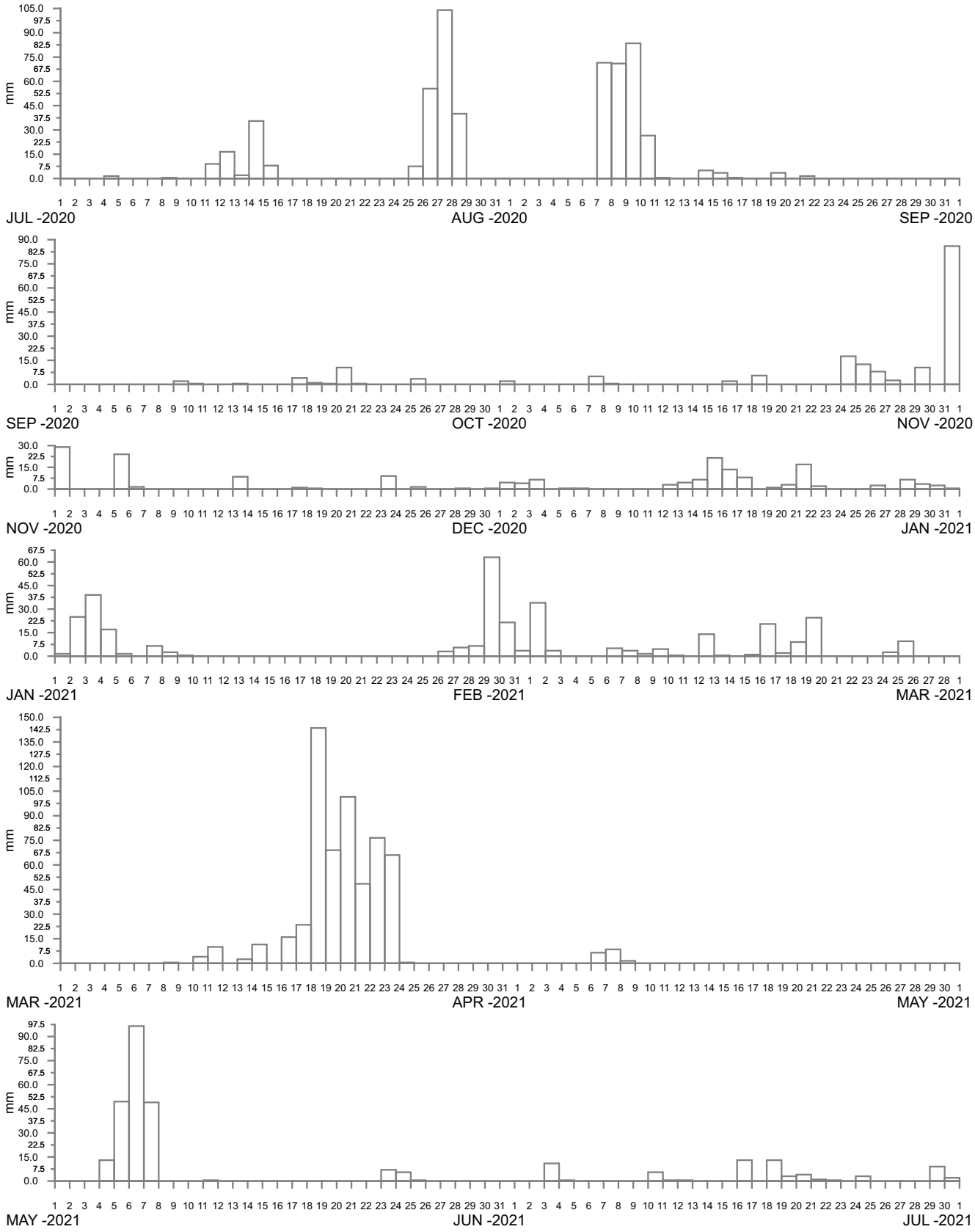
Manly Hydraulics Laboratory

Report MHL2857

Figure

81

DRAWING 2857-81.cdr



---------- DATA LOSS

NSW GOVERNMENT

NURREWIN AT ILLAWARRA HIGHWAY
2020–2021

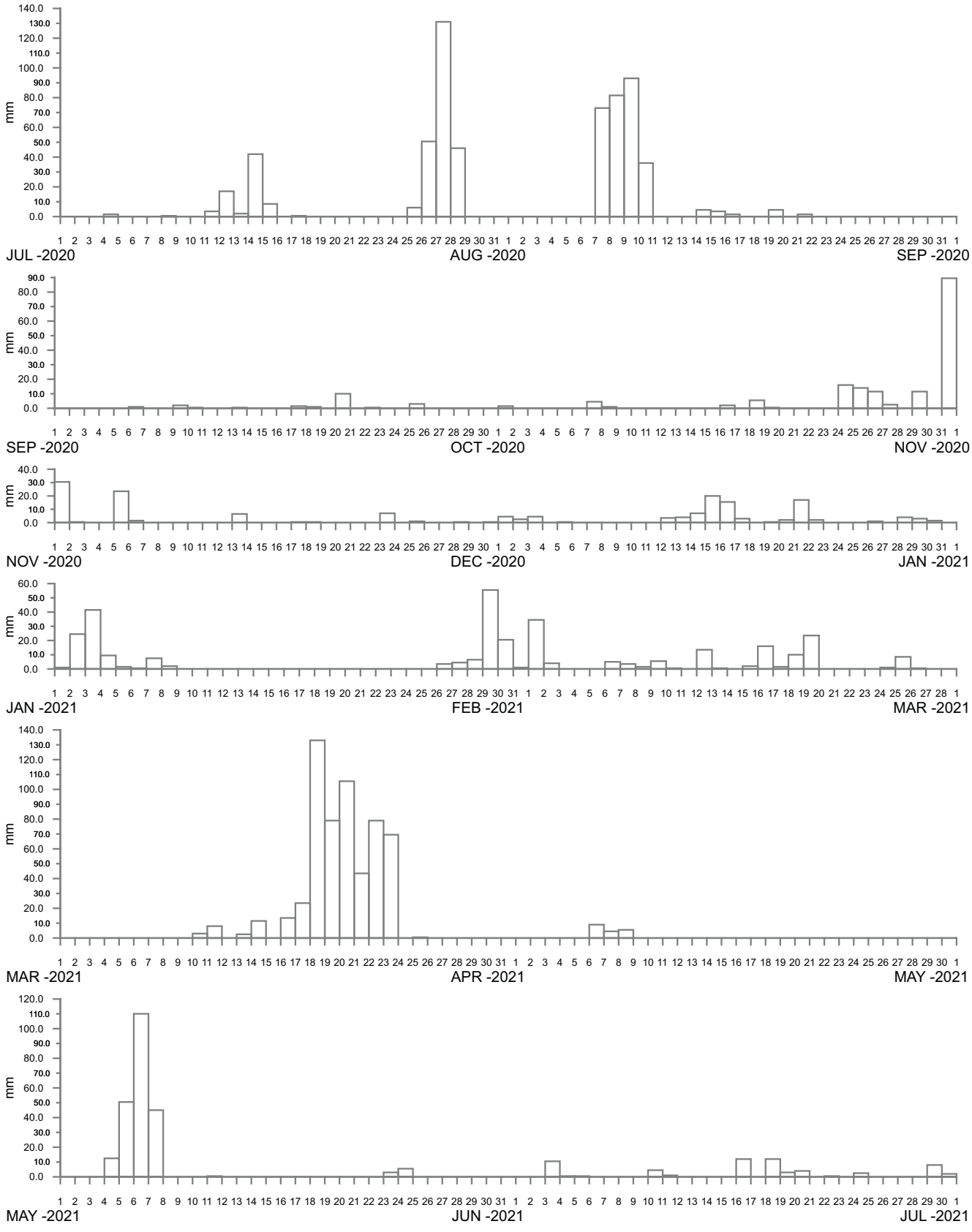
Manly Hydraulics Laboratory

Report MHL2857

Figure

82

DRAWING 2857-82.cdr



---------- DATA LOSS

NSW GOVERNMENT

CLOVER HILL AT CLOVER HILL ROAD
2020–2021

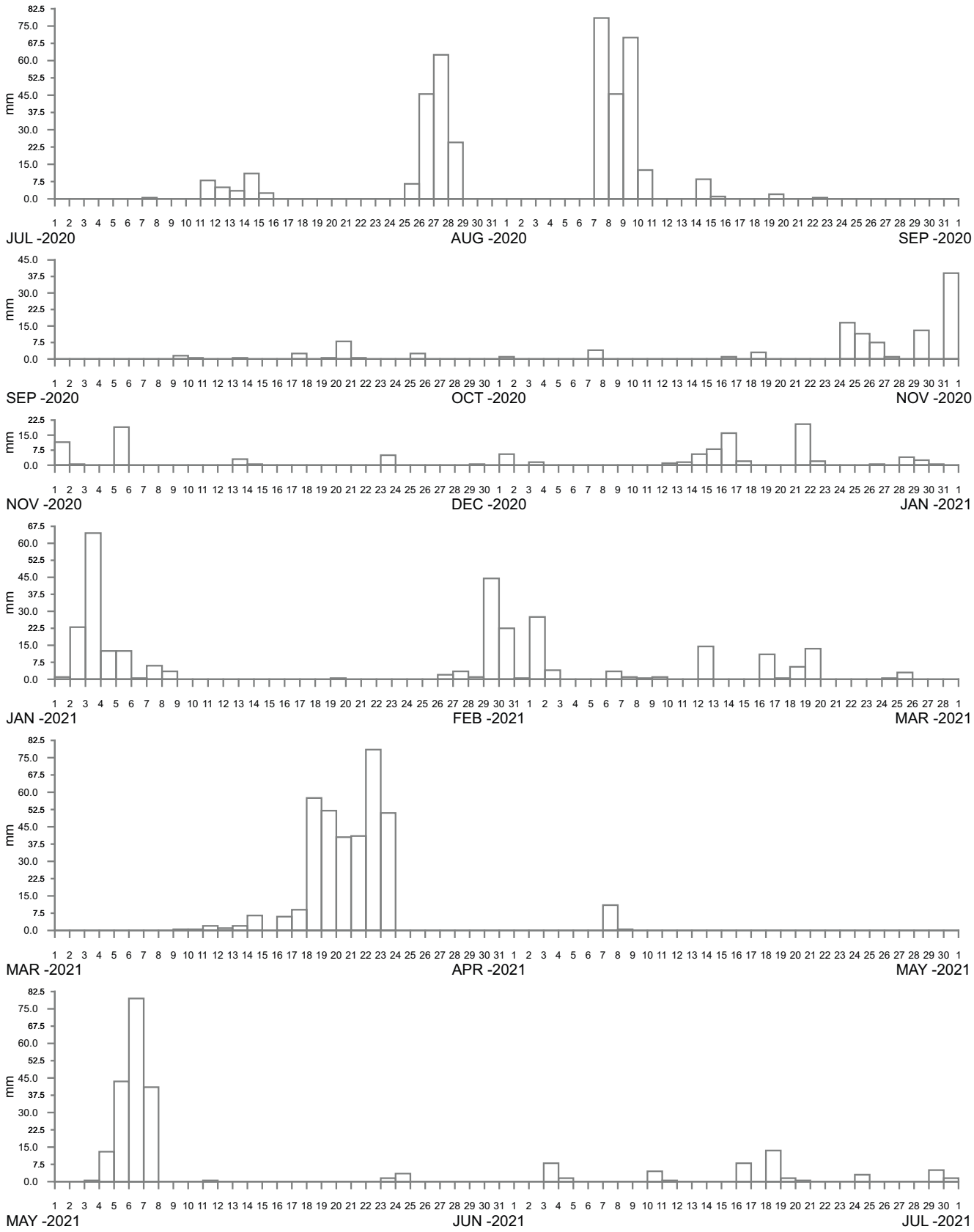
Manly Hydraulics Laboratory

Report MHL2857

Figure

83

DRAWING 2857-83.cdr



---------- DATA LOSS

NSW GOVERNMENT

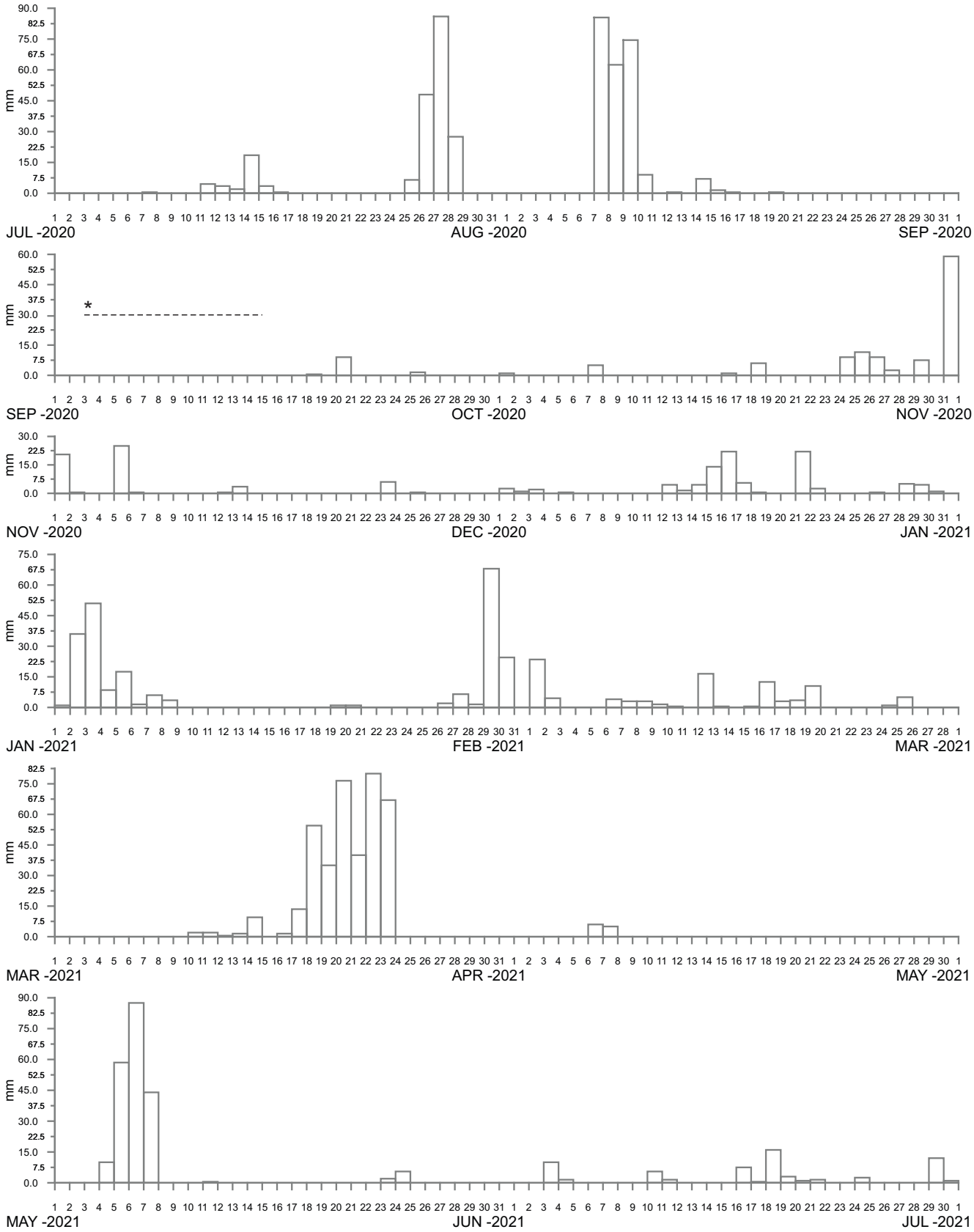
NORTH MACQUARIE AT NORTH MACQUARIE ROAD 2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 84

DRAWING 2857-84.cdr



---------- DATA LOSS

*Data loss due to faulty wiring

NSW GOVERNMENT

YELLOW ROCK ROAD AT YELLOW ROCK ROAD
2020–2021

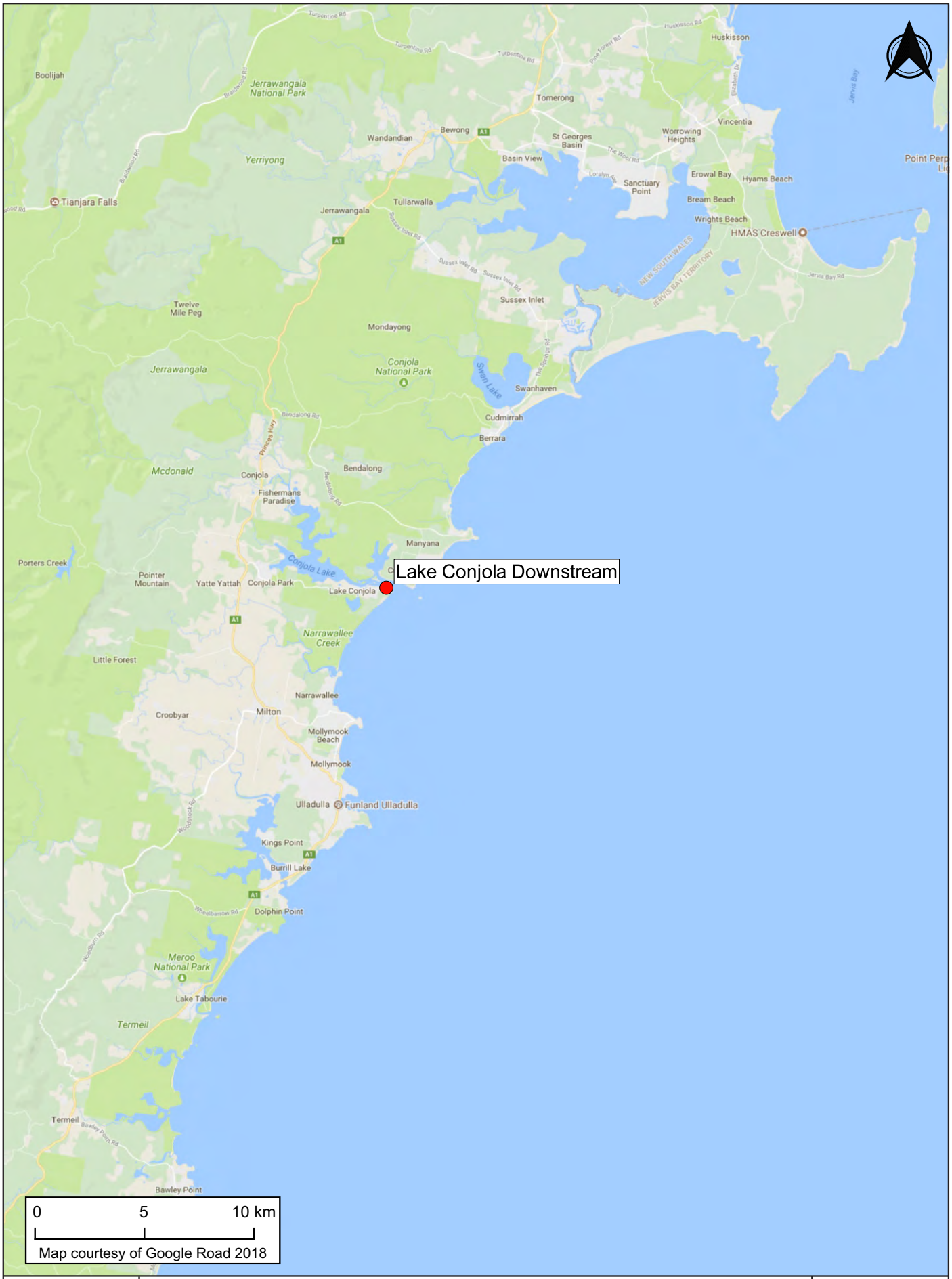
Manly Hydraulics Laboratory

Report MHL2857

Figure

85

DRAWING 2857-85.cdr



NSW GOVERNMENT

RAINFALL STATION LOCATIONS
SOUTH COAST (NORTH) REGION

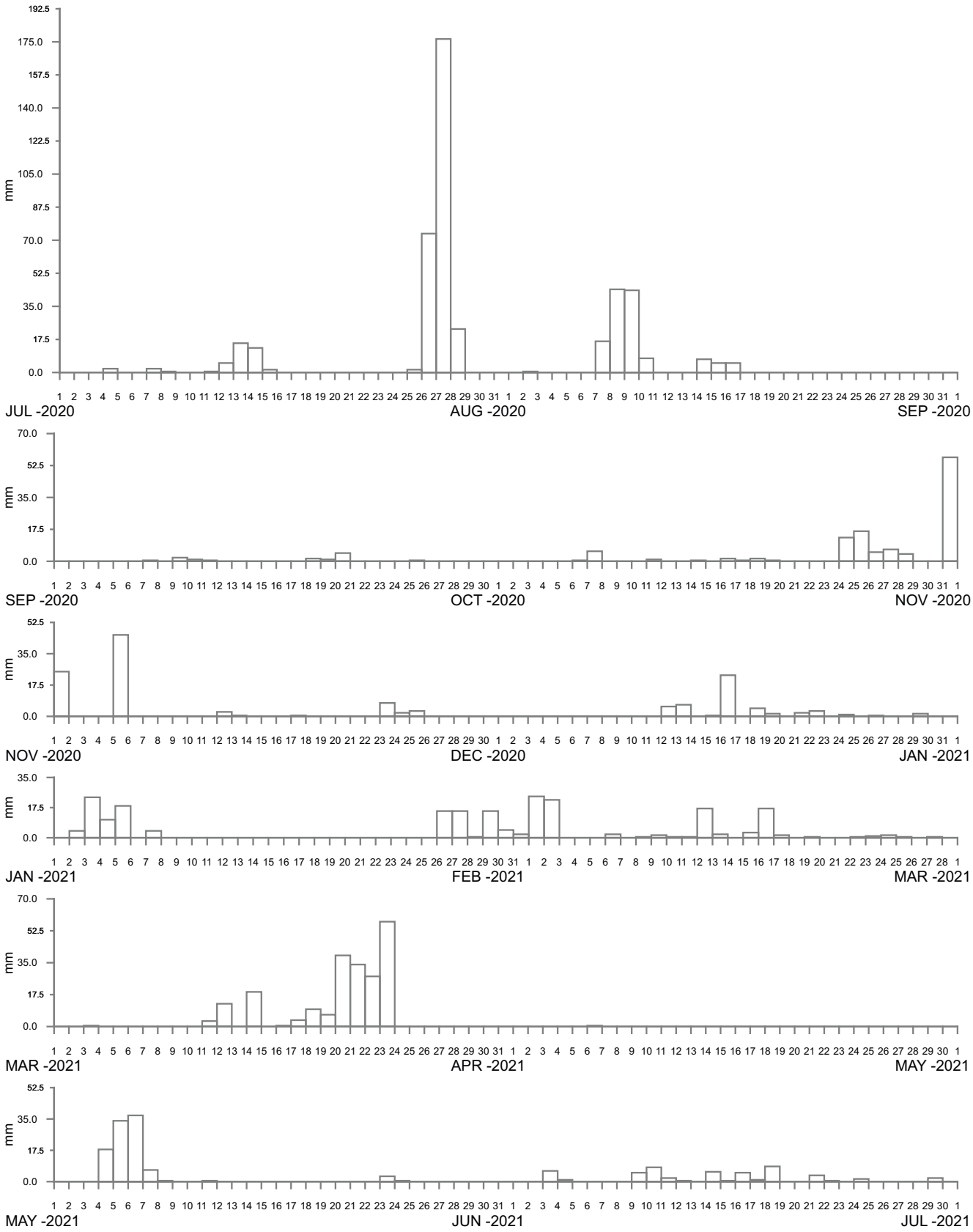
Manly Hydraulics Laboratory

Report MHL2857

Figure

86

DRAWING 2857-86.cdr



---------- DATA LOSS

NSW GOVERNMENT

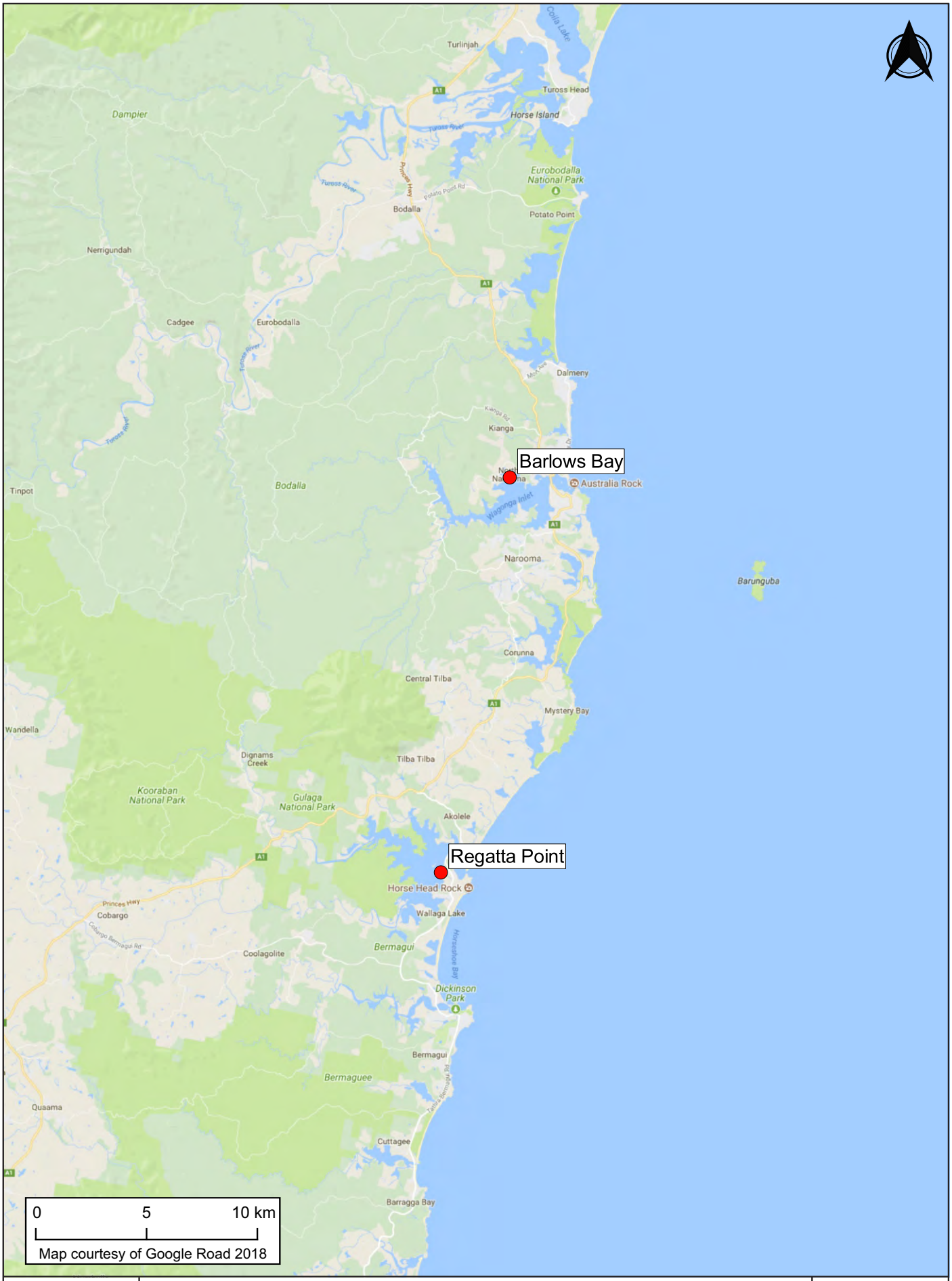
LAKE CONJOLA DOWNSTREAM AT CONJOLA LAKE 2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure 87

DRAWING 2857-87.cdr



NSW GOVERNMENT

RAINFALL STATION LOCATIONS
SOUTH COAST (MID) REGION

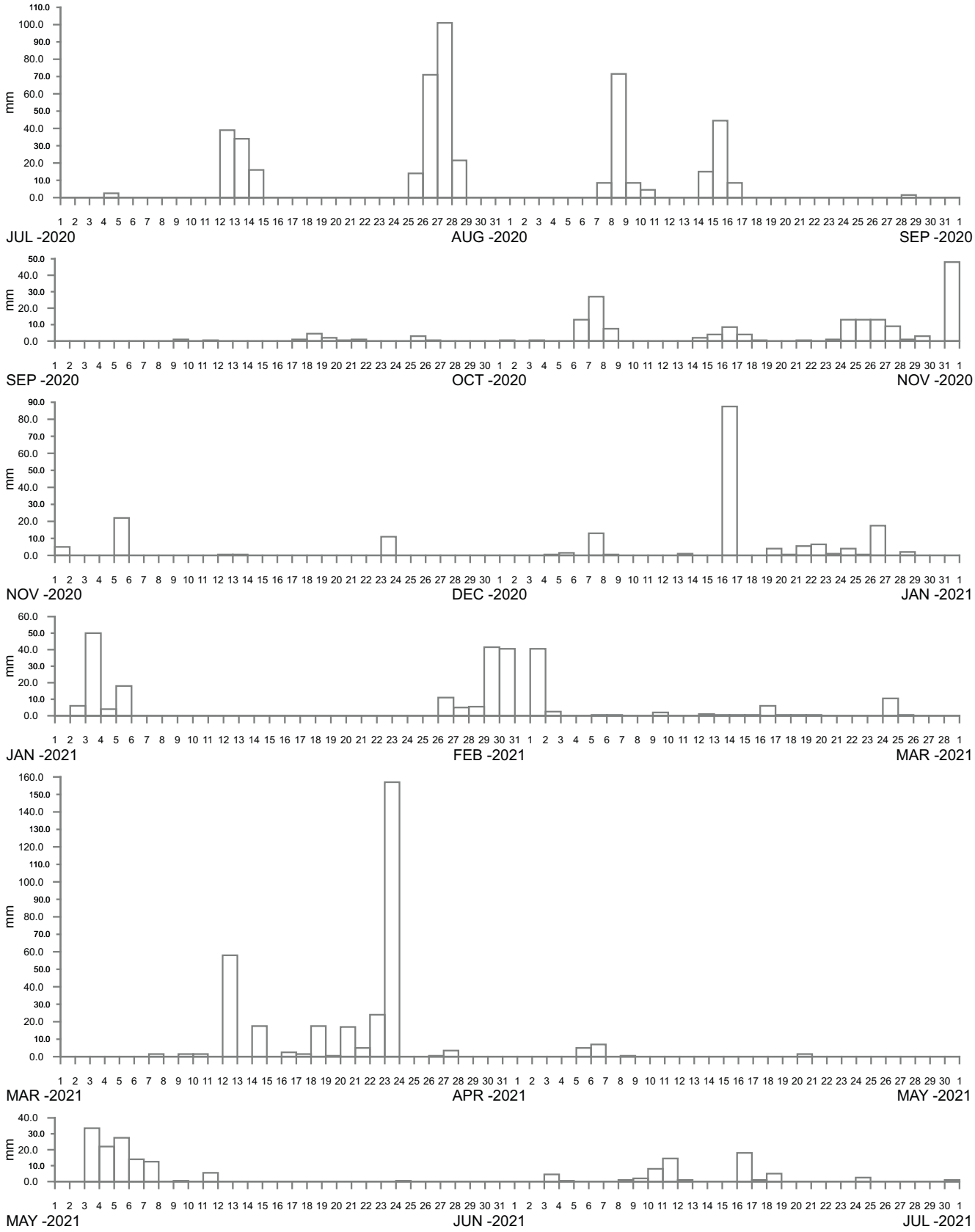
Manly Hydraulics Laboratory

Report MHL2857

Figure

88

DRAWING 2857-88.cdr



---------- DATA LOSS

NSW GOVERNMENT

BARLOWS BAY AT WAGONGA INLET
2020–2021

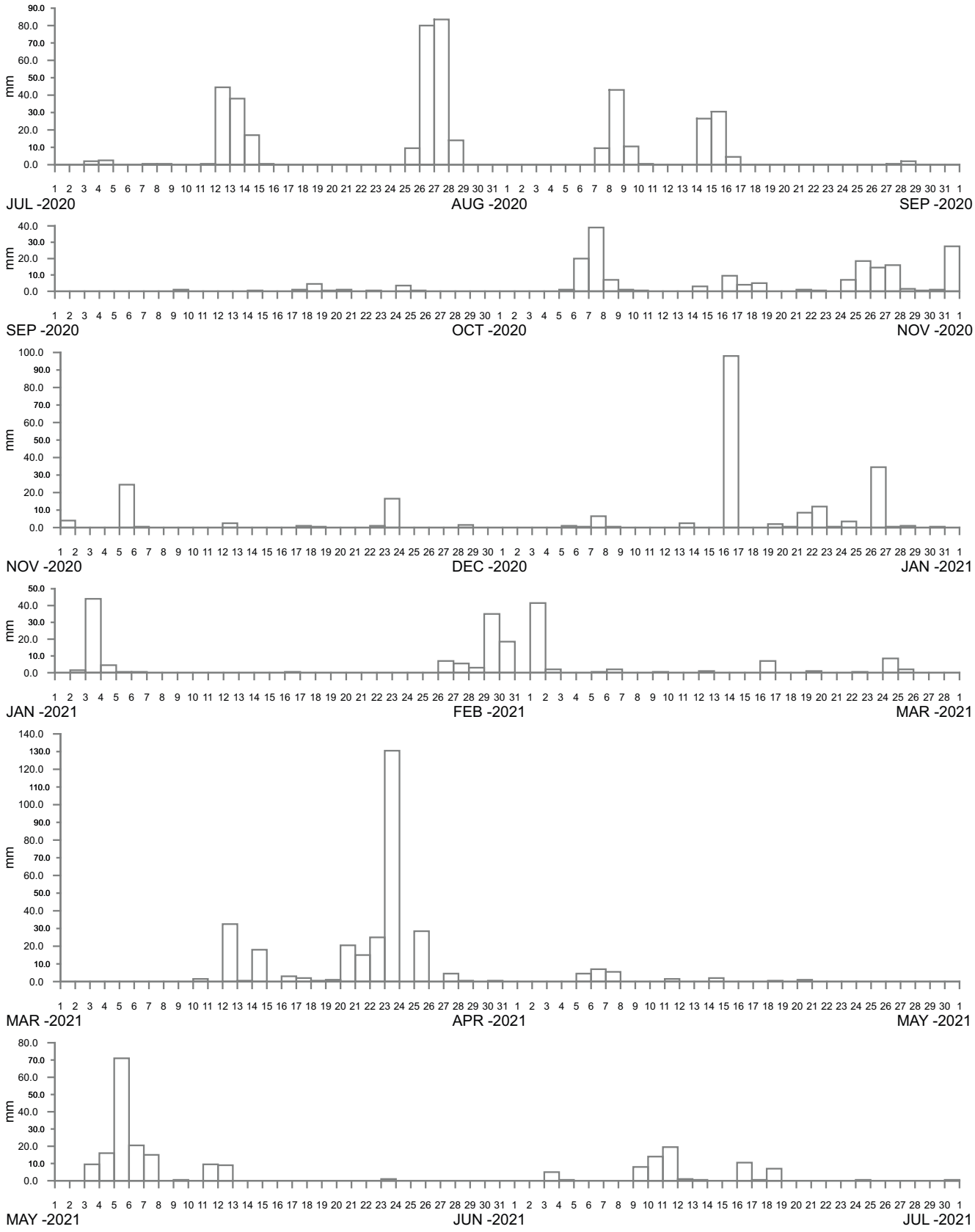
Manly Hydraulics Laboratory

Report MHL2857

Figure

89

DRAWING 2857-89.cdr



---------- DATA LOSS

NSW GOVERNMENT

REGATTA POINT AT WALLAGA LAKE
2020–2021

Manly Hydraulics Laboratory

Report MHL2857

Figure

90

DRAWING 2857-90.cdr

Appendix A Station data online

Table A1 Station data online

Region	Station	Period of data
Tweed	Cudgera	Aug 1983–ongoing
Brunswick	Main Arm	Sep 1983–ongoing
Brunswick	Huonbrook	May 1986–ongoing
Brunswick	Myocum	Feb 1986–ongoing
Richmond	Lake Ainsworth	Oct 1994–ongoing
Richmond	Empire Vale	May 1998–Jul 2000
Richmond	Wollongbar	Jul 1992–Jul 1994
Clarence	Yamba	Apr 2002–ongoing
Clarence	Wyndora	Jan 1990–Jun 1991
Clarence	Roberts Creek	May 1994–Jun 1996
Clarence	Shannon Creek	Nov 2000–May 2008
Bellinger	Wooli Caravan Park	Jun 1997–Apr 2012
Bellinger	Wooli Sportsground	Apr 2012–ongoing
Bellinger	Perry Drive	Dec 1998–ongoing
Bellinger	Shephards Lane	Dec 1998–ongoing
Bellinger	Red Hill	Nov 1998–ongoing
Bellinger	Newports Creek	Dec 1990–ongoing
Bellinger	Middle Boambee	Dec 1990–ongoing
Bellinger	South Boambee	Apr 1991–April 2015
Bellinger	North Bonville	Dec 1990–ongoing
Bellinger	Gleniffer	Aug 1993–Feb 2007
Bellinger	Bellinger Council	Apr 1993–Jun 2001
Bellinger	Kooroowi	May 1991–Jun 2012
Bellinger	Kooroowi Sharabel	Jun 2012–ongoing
Bellinger	Thora	Feb 1993–ongoing
Nambucca	Bowraville	Jun 1993–Oct 2001
Nambucca	Stuarts Island Downstream	Oct 1998–ongoing
Nambucca	Utungun	Nov 1991–ongoing
Macleay	Euroka Upstream	Jul 1990–June 2011
Macleay	Aldavilla Downstream	Dec 2011–ongoing
Maria	Green Valley	Sep 1994–ongoing
Hastings	Telegraph Point	Nov 1990–ongoing
Hastings	Lake Cathie	Aug 1993–Jun 2001
Hastings	Ellenborough	Jun 1991–Sep 1999
Camden Haven	Logans Crossing	Dec 1989–ongoing
Manning	Mount George	Mar 1991–ongoing
Karuah	Nabiac	Jun 1983–ongoing
Karuah	Tuncurry	Aug 2002– Feb 2018
Karuah	Tuncurry Downstream	Jun 2016-ongoing
Karuah	Tiona	Jun 2002–Sep 2015
Karuah	Pacific Palms Wharf	Oct 2013–ongoing
Karuah	Tarbuck Bay	May 1996–ongoing
Karuah	Bulahdelah	Aug 1996–ongoing
Hunter	Gostwyck	Oct 1999–ongoing
Hunter	Seaham	Sep 1999–ongoing

Region	Station	Period of data
Hunter	Hexham Bridge	May 1998–ongoing
Hunter	Belmore Bridge	Sep 1995–ongoing
Hunter	Cardiff	Mar 1991–Dec 1995
Macquarie-Tuggerah Lakes	Barnsley	Jan 1988–ongoing
Macquarie-Tuggerah Lakes	Fassifern	Jan 1992–Dec 1997
Macquarie-Tuggerah Lakes	Dora Creek	May 1992–Jul 1999
Macquarie-Tuggerah Lakes	Martinsville	Mar 1988–ongoing
Macquarie-Tuggerah Lakes	Mandalong	Dec 1988–ongoing
Macquarie-Tuggerah Lakes	Wyee	May 1992–ongoing
Macquarie-Tuggerah Lakes	Whitemans Ridge	Apr 1989–ongoing
Macquarie-Tuggerah Lakes	Yarramalong	Nov 1988–ongoing
Macquarie-Tuggerah Lakes	Kulnura	Jun 1989–ongoing
Macquarie-Tuggerah Lakes	Toukley	Feb 1985–ongoing
Macquarie-Tuggerah Lakes	Warnervale	Jan 1986–Apr 2010
Macquarie-Tuggerah lakes	Hamlyn Terrace	Mar 2010–ongoing
Macquarie-Tuggerah Lakes	Wyong Weir Upstream	Jan 1986–Apr 2008
Macquarie-Tuggerah Lakes	Wyong	Jan 1986–Apr 1991
Macquarie-Tuggerah Lakes	Kangy Angy	Aug 2010–ongoing
Macquarie-Tuggerah Lakes	Chittaway	Dec 1989–Aug 2010
Macquarie-Tuggerah Lakes	Berkeley Vale	Jun 1988–ongoing
Macquarie-Tuggerah Lakes	Mardi Dam	Oct 1988–ongoing
Macquarie-Tuggerah Lakes	Sterland	Apr 1989–ongoing
Macquarie-Tuggerah Lakes	Long Jetty	Sept 1992–Sept 1998
Macquarie-Tuggerah Lakes	Bateau Bay	Jan 1980–ongoing
Macquarie-Tuggerah Lakes	Lisarow	Apr 1989–ongoing
Brisbane Water	Strickland	Dec 1985–ongoing
Brisbane Water	Narara	Apr 1989–ongoing
Brisbane Water	Mount Elliot	Dec 1985–ongoing
Brisbane Water	Wyoming	Oct 1988–ongoing
Brisbane Water	Kincumber	May 1987–ongoing
Hawkesbury	Webbs Creek	Jul 1999–ongoing
Hawkesbury	Colo Junction	Jul 1999–ongoing
Hawkesbury	Sackville Downstream	Jun 1999–ongoing
Hawkesbury	Woy Woy	Jul 1991–Jul 1996
Hawkesbury	Brooklyn	Apr 1991–Dec 1995
Hawkesbury	Cowan	Jun 1991–Dec 1995
Hawkesbury	Penrith	Dec 1994–Jan 1995
Hawkesbury	Narellan Creek	Jan 1994–Sep 1996
Hawkesbury	Camden Life Centre	Mar 1994–Sep 1996
Hawkesbury	Mt Annan School	Feb 1994–Sep 1996
Blue Mountains	Mount Boyce	Nov 1992–Feb 1995
Blue Mountains	Clarence	Nov 1992–Feb 1995
Blue Mountains	Zig Zag	Nov 1992–Feb 1995
Sydney Coastal	Kuringai	Jan 1991–Sep 1996
Sydney Coastal	Wahroonga	Nov 1990–Dec 1995
Sydney Coastal	Beecroft	Sep 1992–Jul 1996
Sydney Coastal	Avalon	Jun 1994–ongoing
Sydney Coastal	Mona Vale	Jun 1994–ongoing
Sydney Coastal	Narrabeen Creek	May 1998–Sep 2010
Sydney Coastal	Middle Creek	Apr 1995–ongoing

Region	Station	Period of data
Sydney Coastal	Cromer	Mar 1994–ongoing
Sydney Coastal	Belrose	May 1994–ongoing
Sydney Coastal	Allambie	Jun 1999–ongoing
Sydney Coastal	Balgowlah	Aug 1999–Jul 2005
Sydney Coastal	Curl Curl	Feb 2014–ongoing
Sydney Coastal	North Manly	May 1995–ongoing
Sydney Coastal	Manly Dam	Nov 1995–ongoing
Sydney Coastal	Chatswood	Sep 1992–Jul 1996
Sydney Coastal	Denistone	Jan 1990–Jun 1996
Sydney Coastal	M4 Motorway	Jun 1993–Dec 1995
Sydney Coastal	Homebush Bay	Feb 1993–Mar 1994
Sydney Coastal	Kelso Creek	Nov 1996–ongoing
Wollongong Coastal	Bulli Pass	Jan 1983–Oct 1998
Wollongong Coastal	Rixons Pass	Jun 1985–ongoing
Wollongong Coastal	Russell Vale	Jul 1982–ongoing
Wollongong Coastal	Corrimal Colliery	Jun 1985–Dec 1993
Wollongong Coastal	Mount Pleasant	Jun 1997–ongoing
Wollongong Coastal	Mount Nebo	Nov 1982–Feb 1997
Wollongong Coastal	Mount Kembla	Jun 1985–ongoing
Wollongong Coastal	Dombarton Loop	Jun 1985–ongoing
Wollongong Coastal	Wongawilli	Jan 1983–ongoing
Wollongong Coastal	Port Kembla BHP	Jan 1993–ongoing
Wollongong Coastal	Port Kembla	Sep 1982–ongoing
Wollongong Coastal	Darkes Road	Feb 1994–ongoing
Wollongong Coastal	Cleveland Road	Jun 1985–ongoing
Wollongong Coastal	Huntley Colliery	Jan 1983–ongoing
Wollongong Coastal	Calderwood	Jan 1983–Jun 1985
Wollongong Coastal	Upper Calderwood	Jun 1985–ongoing
Wollongong Coastal	Little Lake	May 1992–Oct 2014
Wollongong Coastal	Little Lake Entrance	May 2014–ongoing
Wollongong Coastal	Airport	Jun 1991–Mar 1995
Wollongong Coastal	North Macquarie	Jul 1985–ongoing
Wollongong Coastal	Clover Hill	Dec 1985–ongoing
Wollongong Coastal	Nurrewin	Jan 2006–ongoing
Wollongong Coastal	Yellow Rock Road	Jan 1983–ongoing
Wollongong Coastal	Balgownie	Jul 1982–Jun 1987
Wollongong Coastal	Woonona	Jul 1982–Jun 1985
South Coast	Lake Wollumboola	Feb 1999–Oct 2000
South Coast	Lake Conjola Downstream	Jul 2016–ongoing
South Coast	Lake Conjola	Jan 1999–Jul 2017
South Coast	Barlows Bay (Narooma)	Jul 1999–ongoing
South Coast	Regatta Point	Jan 1999–ongoing
South Coast	Merimbula Wharf	Aug 1997–Sep 2001
South Coast	Agnew Wharf	Aug 1997–Jun 2000

Appendix B Publications of interest

Data reports

MHL annual coastal rainfall summaries available:

MHL Report Nos. 610 (90–91), .624 (91–92), 660 (92–93), 699 (93–94), 730 (94–95), 776 (95–96), 874 (96–97), 946 (97–98), 1015 (98–99), 1071 (99–00), 1131 (00–01), 1207 (01–02), 1278 (02–03), 1348 (03–04), 1424 (04–05), 1513 (05–06), 1765 (06–07), 1849 (07–08), 1934 (08–09), 2011 (09–10), 2090 (10–11), 2159 (11–12), 2220 (12–13), 2293 (13–14), 2385 (14–15), 2476 (15–16), 2575 (16–17), 2619 (17–18), 2694 (18–19), 2771 (19-20).

MHL annual estuary and river water levels summaries available:

MHL Report Nos. 555 (87–88), 564 (88–89), 582 (89–90), 601 (90–91), 625 (91–92), 659 (92–93), 698 (93–94), 731 (94–95), 778 (95–96), 875 (96–97), 947 (97–98), 1014 (98–99), 1070 (99–00), 1130 (00–01), 1206 (01–02), 1276 (02–03), 1346 (03–04), 1422 (04–05), 1511 (05–06), 1763 (06–07), 1847 (07–08), 1932 (08–09), 2009 (09–10), 2088 (10–11), 2157 (11–12), 2218 (12–13) 2291(13–14), 2383 (14–15), 2474 (15–16), 2573 (16–17), 2617 (17–18), 2692 (18–19), 2769 (19-20).

MHL annual ocean tide levels summaries available:

MHL Report Nos. 515 (86–87), 544 (87–88), 563 (88–89), 585 (89–90), 602 (90–91), 628 (91–92), 658 (92–93), 697 (93–94), 732 (94–95), 777 (95–96), 876 (96–97), 947 (97–98), 1013 (98–99), 1069 (99–00, 1129 (00–01), 1205 (01–02), 1277 (02–03), 1347 (03–04), 1423 (04–05), 1512 (05–06), 1764 (06–07), 1848 (07–08), 1933 (08–09), 2010 (09–10), 2089 (10–11), 2158 (11–12), 2219 (12–13) 2292 (13–14), 2384 (14–15), 2475 (15–16), 2574 (16–17), 2618 (17–18), 2693 (18–19) , 2770 (19-20).

MHL annual wave climate and coastal air pressure summaries available:

MHL Report Nos. 547 (87–88), 560 (88–89), 581 (89–90), 600 (90–91), 627 (91–92), 655 (92–93), 695 (93–94), 733 (94–95), 779 (95–96), 877 (96–97), 948 (97–98), 1016 (98–99), 1072 (99–00), 1132 (00–01), 1208 (01–02), 1279 (02–03), 1349 (03–04), 1425 (04–05), 1514 (05–06),1766 (06–07), 1850 (07–08), 1935 (08–09), 2012 (09–10), 2091 (10–11), 2160 (11–12), 2221 (12–13) 2294 (13–14), 2386 (14–15), 2477 (15–16), 2576 (16–17), 2620 (17–18), 2695 (18–19) , 2772 (19-20).

Flood reports

MHL flood reports:

- *New South Wales North Coast Flood Summary June 2005*, MHL Report No. 1426
- *Marshalls Creek Flood Event 30 June 2005,* MHL Report No. 1435
- *New South Wales North Coast January 2006 Flood Summary*, MHL Report No. 1469
- *New South Wales North Coast March 2006 Flood Summary*, MHL Report No. 1482
- *New South Wales Central Coast June 2007 Flood Summary*, MHL Report No. 1754

- *New South Wales Hunter Valley, Wallamba River and Myall River June 2007 Flood Summary*, MHL Report No. 1755
- *New South Wales Hawkesbury and Nepean June 2007 Flood Summary*, MHL Report No. 1756
- *New South Wales Tweed River January 2008 Flood Summary*, MHL Report No. 1801
- *New South Wales Richmond River January 2008 Flood Summary*, MHL Report No. 1802
- *New South Wales Clarence River January 2008 Flood Summary*, MHL Report No. 1803
- *New South Wales Coffs Harbour and Bellinger River Region January 2008 Flood Summary*, MHL Report No. 1804
- *New South Wales Coffs Harbour, Bellinger River and Nambucca River Regions February 2009 Flood Summary*, MHL Report No. 1908
- *New South Wales Coffs Harbour and Bellinger River Regions April 2009 Flood Summary*, MHL Report No. 1913
- *NSW Northern Rivers May 2009 Flood Report*, MHL Report No. 1965
- *NSW North Coast Flood Summary January–March 2013*, MHL Report No. 2202
- *NSW Hunter and Central Coast Flood Summary April–May 2015,* MHL Report No. 2364
- *NSW South Coast Flood Summary August 2015,* MHL Report No. 2397
- *NSW North Coast Flood Summary March 2017*, MHL Report No. 2535
- *NSW Coastal Flood Summary February 2020,* MHL Report No. 2752
- *NSW Coastal Flood Summary March 2021,* MHL Report No. 2752

Other references

Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors) 2019, *Australian Rainfall and Runoff: A Guide to Flood Estimation*, Commonwealth of Australia,

Bureau of Meteorology, *Climate Glossary – Southern Oscillation Index*, retrieved on 12 January 2021 from http://www.bom.gov.au/climate/glossary/soi.shtml

The Institution of Engineers, Australia 1987, *Australian Rainfall and Runoff: A Guide to Flood Estimation*, Institute of Engineers Australia

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