Public Works
Manly Hydraulics Laboratory

NSW COASTAL RAINFALL ANNUAL SUMMARY
2012-2013

Report MHL2220
September 2013

prepared for
NSW Office of Environment and Heritage

Office of Environment & Heritage

A division of the Department of Finance and Services

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Cover photograph: Sterland, Macquarie-Tuggerah Lakes

Document Control

Issue/ Revision	Author	Reviewer	Approved for Issue	
			Name	Date
Draft 23/9/13	Sarah Darvill, MHL	Erin Alley, MHL	Ed Couriel, MHL	27/9/13
Final 24/9/13				

Report No. MHL2220
PW Report No. 13048
ISBN 978 0 7347 4472 2
MHL File No. EDP8-2172
First published September 2013

Manly Hydraulics Laboratory is Quality System Certified to AS/NZS ISO 9001:2008.

Foreword

Manly Hydraulics Laboratory (MHL) is a business group within NSW Public Works, a division of the Department of Finance and Services. The NSW rainfall database has been developed to support a number of NSW Office of Environment and Heritage (OEH) programs associated with coastal, floodplain and estuary management. The monitoring service is available to local government and other organisations, both in Australia and overseas.

This annual summary presents the results of rainfall measurements obtained by the automatic rainfall recording stations along the coastal estuaries and rivers of New South Wales over the period 1 July 2012 to 30 June 2013, and catalogues data collected in NSW by Manly Hydraulics Laboratory.

This summary has been prepared to provide ready access to Manly Hydraulics Laboratory's rainfall database and the data analysis capabilities at the Laboratory.

Requests for further information should be directed to:

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Manly Hydraulics Laboratory	WWW	:	http://www.mhl.nsw.gov.au/
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Summary

This report contains:

- a brief description of the coastal rainfall measurement program
- guidelines on how to use this report
- information on how to access the database
- a review of significant program developments and rainfall events in 2012-2013
- a list of all stations for which MHL collected rainfall data in 2012-2013 (Table 5.1)
- the annual data summaries for each site
- Appendix A detailing the rainfall data available
- Appendix B outlining some of the data analysis suites and presentation formats available from MHL
- Appendix C a list of publications which may be of interest

Contents

1. Rainfall Measurement Program

This report presents the twenty-eighth year of data collected by Manly Hydraulics Laboratory. The network of recorders and the associated analysis routines enable MHL to provide an efficient service in accessing rainfall data. As well as real time rainfall information at over 120 stations in NSW, a significant historical database of rainfall data can be made available on request.

The present program is based on a network of automatic rainfall recording stations installed at various coastal sites (see Station Location Maps). The network consists of 72 permanent stations funded by OEH, and over 50 short-term client-based project sites featuring distinctive, site-specific systems of rainfall monitoring and logging. The system utilises 0.2 mm, 0.5 mm and 1.0 mm tipping buckets and data loggers, shown in Figure 1.

Rainfall data is transferred to the NSW Data Collection Warehouse, Data Centre 1 at Ultimo and to MHL's data server using a variety of telemetry techniques including internet protocol (IP), landline telephone, cellular networks and Event-reporting Radio Telemetry System (ERTS). The incoming raw data is then immediately available to external users to view on-line as schematised in Figure 2.

The data is stored in a database and subjected to a quality assurance process which involves several control steps to ensure data quality is maintained. Computer programs are used to further format and analyse data.

The database is backed up daily and data archived to magnetic tape as a security measure at regular intervals. A complete mirrored backup database is also kept at Data Centre 1.

2. How to Use This Report

This report aims to streamline access to the Laboratory's services and to the rainfall database.

The NSW coastline has been divided into geographic regions based on river systems. 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 data collected and stored on-line is included in Appendix A.

Once a choice has been made of the period for which information is required, data and services can be obtained in a variety of formats, according to their intended use.

The following options, which are outlined in Appendix B, are available:

Tabulated Output

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

Graphical Plots

- hourly, daily, monthly and yearly hyetographs
- intensity-frequency-duration curves.

3. How to Access the Data

The Laboratory provides a full on-line data access service via the Internet for its clients, and a restricted service for the general public.

Typically the last seven days of data are available on-line in a non-quality controlled form to aid the fastest possible access to data records. The on-line 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 upon request.

The MHL website has been updated in association with an updated database and data warehouse capability via Data Centre 1. The new website was launched in March 2012 and includes updated functionality, data access and availability of rainfall time-series plots.

4. Significant Events and Developments 2012-2013

In the 2012-2013 fiscal year, the maximum recorded rainfall intensities for 11 durations between 5 minutes and 72 hours occurred at five different sites across the OEH rainfall network (Table 4.1). To determine the significance of a rainfall event, the intensities are compared against the Annual Exceedance Probability (AEP), where the AEP is the probability of an event occurring in any one year. An event with a 1% AEP (or the 100-year flood) is an event that has a 1% chance of being equalled or exceeded in any one year.

A summary of rainfall events during 2012-2013 on the NSW east coast is provided in Table 4.2.

The maximum recorded rainfall for durations of 5 minutes to 72 hours at each station for 2012-2013 is presented in Table 4.3.

Table 4.1 Maximum Recorded Intensities for all Stations 2012-2013

Duration	Station	Date	Rainfall (mm)	Rainfall (mm/hr)	AEP (%)
5min	Huonbrook	18/12/2012	13.0	156.0	~39
	Wooli Caravan Park	24/03/2013	13.0	156.0	~18
10min	South Boambee	17/11/2012	24.0	144.0	~18
20min	South Boambee	17/11/2012	43.5	130.5	~5
30min	South Boambee	17/11/2012	56.0	112.0	~5
60min	South Boambee	17/11/2012	66.5	66.5	~10
3hrs	Perry Drive	17/11/2012	89.0	29.7	~18
6hrs	North Bonville	24/05/2013	141.5	23.6	~18
12hrs	Huonbrook	28/01/2013	267.0	22.3	~5
24hrs	Huonbrook	28/01/2013	497.5	20.7	~2
48hrs	Huonbrook	29/01/2013	708.0	14.8	~2
72hrs	Huonbrook	29/01/2013	840.5	11.7	~2

Table 4.2 lists significant rainfall events that occurred in the 2012-2013 fiscal year. 100 mm of rain falling in a 24-hour period has been deemed a suitable significant rain event by OEH.

Table 4.2 2012-2013 Summary of Rainfall Events

Month	Summary of Rainfall Events
July 2011	No events exceeding 100 mm in 24 hours occurred this month
August 2011	No events exceeding 100 mm in 24 hours occurred this month
September 2011	No events exceeding 100 mm in 24 hours occurred this month
October 2011	No events exceeding 100 mm in 24 hours occurred this month
November 2011	Daily rainfall exceeding 100 mm in 24 hours occurred at seven sites in the Coffs region - Perry Drive, Shepards Lane, Red Hill, Newports Creek, Middle Boambee, South Boambee, North Bonville
December 2011	No events exceeding 100 mm in 24 hours occurred this month
January 2012	Daily rainfall exceeding 100 mm in 24 hours occurred at 55 sites across the network from Cudgera in the north to Yellow Rock Road in Wollongong
February 2012	Daily rainfall exceeding 100 mm in 24 hours occurred at 21 sites in the Mid-North Coast and Wollongong regions
March 2012	Daily rainfall exceeding 100 mm in 24 hours occurred at six sites in the Camden Haven and Karuah regions - Logans Crossing, Mount George, Nabiac, Tuncurry, Tiona, Bulahdelah
April 2012	Daily rainfall exceeding 100 mm in 24 hours occurred at Barlows Bay
May 2012	Daily rainfall exceeding 100 mm in 24 hours occurred at 13 sites in the Mid-North Coast region
June 2012	Daily rainfall exceeding 100 mm in 24 hours occurred at four sites in the Wollongong region - Mount Pleasant, Dombarton Loop, Nurrewin, Clover Hill

4.1 Southern Oscillation Index

The Southern Oscillation Index (SOI) is a calculation of monthly or seasonal shifts in the air pressure between Darwin and Tahiti (source: Bureau of Meteorology). As well as affecting the temperature of the Pacific Ocean and the strength of Pacific Trade winds, the SOI also affects rainfall and can be used to predict whether higher or lower than average rainfall may occur in northern and eastern Australia.

A La Niña episode 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 have been coined El Niño events, and are associated with a reduction in rainfall over northern and eastern Australia. Even low to moderate El Niño events can lead to severe droughts in Australia. The SOI for the period July 1993 to June 2013 is graphically represented in Figure 3.

4.2 Data Provision

Rainfall data is provided to the public on behalf of the NSW Office of Environment and Heritage, via:

- OEH's and MHL's public Internet home pages, providing near real-time access to a limited sample of data. Other methods of disseminating data include e-mail and traditional written correspondence.
- Data is being provided for presentation on the NSW Government Water Information website.
- Currently MHL provides customised web addresses to OEH offices at:
  - Parramatta
  - Alstonville
  - Armidale
  - Tweed Region
  - Kempsey
  - Coffs Harbour
  - Hunter
  - South Coast
- A number of State Emergency Service offices receive environmental data via Web pages:
  - Bulahdelah
  - Manning
  - Karuah Valley
  - Camden Haven
  - Wollongong
  - Pacific Palms
  - Lower Hunter
  - Ulladulla
  - Coffs Harbour
  - Lismore Tweed
  - Byron Bay
  - Southern Shoalhaven
- In excess of 300 individual, hard copy data requests have been issued in 2012-2013.
- This year in excess of 130,000 public and customer Internet pages will be served by MHL per month.
- MHL has approximately 70,000 visitors to its website monthly.
- In excess of 1,600,000 individual, webpage hits have been recorded in 2012-2013.
- A Web interface has been developed for OEH to access MHL's 'quality assured' database.

- A Web-based data request system has been established where electronic requests can be submitted via MHL's homepage at http://mhl.nsw.gov.au/DataRequest .
- Data access also continues to assist the Bureau of Meteorology, local government authorities, State Emergency Service, NSW Police, Sydney Catchment Authority, NSW Surf Life Saving Association, universities, the NSW court system, private consultancies, NSW Maritime and the Natural Resources Commission.
- Community groups such as the Manly and Pittwater Coastal Environment Centres, the Wetlands Centre, Australia (at Shortland) and Kooragang Island Rehabilitation Scheme continue to receive environmental data from MHL.

Table 4.3 2012-2013 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	21/01/2013 7.0	21/01/2013 14.0	21/01/2013 24.5	21/01/2013 31.0	21/01/2013 37.0	21/01/2013 50.0	27/01/2013 85.5	28/01/2013 133.5	28/01/2013 178.0	29/01/2013 241.0	29/01/2013 285.5	1669.5
Main Arm	18/02/2013 7.0	21/12/2012 11.0	21/12/2012 19.5	21/12/2012 21.5	28/01/2013 26.0	27/01/2013 59.5	27/01/2013 113.5	28/01/2013 196.0	28/01/2013 315.0	29/01/2013 462.0	29/01/2013 530.0	2117.5
Huonbrook	18/12/2012 13.0	18/12/2012 22.0	18/12/2012 27.0	18/12/2012 30.0	18/12/2012 36.0	27/01/2013 70.5	28/01/2013 137.0	28/01/2013 267.0	28/01/2013 497.5	29/01/2013 708.0	29/01/2013 840.5	2735.0
Myocum	18/12/2012 10.5	18/12/2012 20.0	18/12/2012 32.5	18/12/2012 46.5	18/12/2012 73.0	19/12/2012 90.0	19/12/2012 90.0	28/01/2013 118.0	28/01/2013 156.0	28/01/2013 191.0	29/01/2013 206.5	1968.0
Lake Ainsworth	4/04/2013 8.5	17/11/2012 12.5	22/02/2013 21.0	22/02/2013 27.0	22/02/2013 34.0	22/02/2013 52.0	22/02/2013 61.0	28/01/2013 99.5	28/01/2013 147.0	28/01/2013 211.0	29/01/2013 242.0	1648.5
Wooli Caravan Park	24/03/2013 13.0	24/03/2013 21.5	24/03/2013 31.0	17/11/2012 34.0	2/03/2013 45.0	2/03/2013 60.0	2/03/2013 76.5	28/01/2013 124.5	28/01/2013 193.5	28/01/2013 287.0	29/01/2013 312.0	1710.0
Perry Drive	17/11/2012 10.0	17/11/2012 19.0	17/11/2012 35.0	17/11/2012 48.0	17/11/2012 60.5	17/11/2012 89.0	18/11/2012 136.5	24/05/2013 179.0	28/01/2013 264.0	29/01/2013 403.5	29/01/2013 447.5	2017.0
Shepards Lane	17/11/2012 8.5	17/11/2012 16.0	17/11/2012 28.0	17/11/2012 34.5	17/11/2012 43.5	24/05/2013 75.0	24/05/2013 115.5	24/05/2013 165.5	28/01/2013 270.5	29/01/2013 423.5	29/01/2013 473.5	2024.0
Red Hill	14/10/2012 9.5	3/04/2013 15.5	18/09/2012 21.0	18/09/2012 23.0	17/11/2012 29.0	17/11/2012 57.5	24/05/2013 95.0	24/05/2013 156.0	28/01/2013 265.5	29/01/2013 405.5	29/01/2013 449.0	1960.0
Newports Creek	17/11/2012 9.0	17/11/2012 16.5	17/11/2012 25.0	17/11/2012 31.5	17/11/2012 49.5	24/05/2013 75.5	17/11/2012 131.5	24/05/2013 186.5	28/01/2013 275.5	29/01/2013 391.0	29/01/2013 424.0	2079.5
Middle Boambee	3/04/2013 11.0	17/11/2012 20.5	17/11/2012 33.5	17/11/2012 43.0	17/11/2012 53.0	24/05/2013 84.0	24/05/2013 137.0	24/05/2013 208.5	28/01/2013 288.5	29/01/2013 401.5	29/01/2013 434.5	2167.0
South Boambee	17/11/2012 12.5	17/11/2012 24.0	17/11/2012 43.5	17/11/2012 56.0	17/11/2012 66.5	17/11/2012 82.0	17/11/2012 135.0	24/05/2013 198.5	24/05/2013 252.5	29/01/2013 317.5	29/01/2013 343.0	1871.5
North Bonville	17/02/2013 11.5	17/02/2013 21.0	17/11/2012 32.0	17/11/2012 40.0	17/11/2012 48.0	24/05/2013 81.5	24/05/2013 141.5	24/05/2013 219.5	24/05/2013 284.0	28/01/2013 305.0	29/01/2013 334.0	2031.0
Kooroowi	5/12/2012 7.5	1/02/2013 13.5	1/02/2013 20.0	1/02/2013 24.0	1/02/2013 37.0	1/02/2013 60.0	22/02/2013 110.0	22/02/2013 167.5	22/02/2013 218.5	22/02/2013 252.0	23/02/2013 289.5	1442.0

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	
Stuarts Island Downstream	24/05/2013 6.5	9/11/2012 9.5	24/05/2013 17.5	24/05/2013 24.5	24/05/2013 40.5	24/05/2013 74.0	24/05/2013 115.0	24/05/2013 185.5	24/05/2013 283.0	24/05/2013 291.5	24/05/2013 297.5	1315.0
Utungun	12/06/2013 9.0	12/06/2013 11.0	12/06/2013 14.0	12/06/2013 17.0	22/02/2013 22.5	24/05/2013 53.5	22/02/2013 90.0	22/02/2013 141.5	23/02/2013 189.5	23/02/2013 236.0	23/02/2013 280.0	1364.5
Aldavilla Downstream	12/02/2013 8.0	12/02/2013 13.0	12/02/2013 16.0	12/02/2013 16.0	24/05/2013 23.0	24/05/2013 57.0	24/05/2013 77.0	24/05/2013 101.0	24/05/2013 137.0	28/01/2013 178.0	29/01/2013 193.0	747.0
Green Valley	8/11/2012 11.0	8/11/2012 21.0	8/11/2012 30.0	24/05/2013 32.0	24/05/2013 48.0	23/02/2013 82.5	23/02/2013 92.5	22/02/2013 121.0	23/02/2013 195.0	23/02/2013 257.5	29/01/2013 293.0	1374.5
Telegraph Point	17/02/2013 7.5	17/02/2013 13.5	23/02/2013 21.0	23/02/2013 23.5	23/02/2013 42.5	23/02/2013 85.5	24/05/2013 108.0	24/05/2013 136.0	23/02/2013 211.5	28/01/2013 263.5	29/01/2013 317.0	1593.0
Logans Crossing	10/11/2012 12.5	10/11/2012 24.0	10/11/2012 30.5	10/11/2012 31.0	2/03/2013 35.5	2/03/2013 74.0	2/03/2013 120.0	2/03/2013 155.5	3/03/2013 183.0	3/03/2013 315.5	4/03/2013 335.0	1735.5
Mount George	9/11/2012 9.0	25/11/2012 17.0	25/11/2012 26.0	25/11/2012 30.0	25/11/2012 39.0	25/11/2012 42.0	2/03/2013 52.5	2/03/2013 89.0	2/03/2013 151.5	2/03/2013 216.5	3/03/2013 273.0	1467.0
Nabiac	23/02/2013 8.0	23/02/2013 10.5	26/01/2013 14.0	23/05/2013 16.0	23/05/2013 26.0	2/03/2013 45.0	2/03/2013 75.5	2/03/2013 117.5	2/03/2013 175.5	3/03/2013 225.5	3/03/2013 232.0	1219.5
Tuncurry	1/03/2013 8.0	1/03/2013 13.5	1/03/2013 23.0	1/03/2013 29.0	1/03/2013 45.5	2/03/2013 77.0	2/03/2013 120.0	2/03/2013 162.5	2/03/2013 281.0	3/03/2013 315.5	3/03/2013 322.5	1307.0
Tiona[2]	22/12/2012 7.5	22/12/2012 12.0	12/02/2013 17.0	22/12/2012 17.5	12/02/2013 24.5	2/03/2013 37.0	28/01/2013 64.5	28/01/2013 100.5	29/01/2013 132.5	29/01/2013 207.5	29/01/2013 214.0	1103.5
Tarbuck Bay	23/02/2013 6.5	1/02/2013 11.5	23/02/2013 18.0	23/02/2013 22.5	23/02/2013 34.5	28/01/2013 50.0	27/01/2013 81.5	28/01/2013 131.0	29/01/2013 172.0	29/01/2013 303.5	29/01/2013 318.0	1694.5
Bulahdelah	23/02/2013 6.0	3/04/2013 11.5	3/04/2013 18.5	3/04/2013 21.0	3/04/2013 26.5	3/04/2013 50.5	28/01/2013 65.0	1/03/2013 104.5	2/03/2013 167.0	2/03/2013 216.0	3/03/2013 222.5	1442.5
Gostwyck	12/02/2013 6.0	12/02/2013 11.0	12/02/2013 17.0	12/02/2013 19.5	12/02/2013 21.0	23/02/2013 25.0	23/02/2013 35.5	23/02/2013 59.0	23/02/2013 87.0	2/03/2013 115.0	3/03/2013 121.5	872.5
Seaham	11/12/2012 5.0	11/12/2012 9.0	11/12/2012 13.0	1/03/2013 15.5	1/03/2013 22.0	1/03/2013 47.5	1/03/2013 77.5	1/03/2013 92.0	2/03/2013 113.5	2/03/2013 136.0	3/03/2013 141.0	834.0
Belmore Bridge	1/02/2013 5.0	23/05/2013 6.0	4/04/2013 8.0	4/04/2013 9.0	2/02/2013 11.0	25/12/2012 20.5	1/03/2013 37.5	28/01/2013 51.0	29/01/2013 73.0	29/01/2013 111.0	29/01/2013 111.5	706.0

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	
Hexham Bridge[2]	3/04/2013 5.5	3/04/2013 10.5	1/03/2013 14.0	1/03/2013 19.0	1/03/2013 28.5	1/03/2013 43.5	1/03/2013 72.5	1/03/2013 88.5	2/03/2013 110.5	2/03/2013 139.0	3/03/2013 141.0	920.5
Barnsley	1/02/2013 8.0	1/02/2013 13.5	9/04/2013 16.5	9/04/2013 18.0	1/03/2013 19.5	28/01/2013 34.5	1/03/2013 62.5	28/01/2013 92.5	1/03/2013 119.0	2/03/2013 164.0	3/03/2013 171.0	1024.5
Martinsville[2]	1/02/2013 6.5	1/02/2013 9.5	1/02/2013 12.5	23/02/2013 18.0	8/11/2012 24.0	28/01/2013 40.0	28/01/2013 71.0	28/01/2013 134.5	29/01/2013 181.5	29/01/2013 230.5	29/01/2013 236.5	986.0
Mandalong	1/02/2013 6.5	1/02/2013 10.0	23/06/2013 13.5	23/06/2013 16.0	23/06/2013 26.0	8/11/2012 38.0	28/01/2013 68.0	28/01/2013 113.5	29/01/2013 148.5	29/01/2013 198.5	29/01/2013 201.5	1157.0
Wyee	23/05/2013 10.5	23/05/2013 20.0	23/05/2013 29.5	23/05/2013 30.5	23/05/2013 31.0	23/05/2013 42.0	28/01/2013 64.0	28/01/2013 101.0	29/01/2013 133.0	29/01/2013 176.0	30/01/2013 179.0	1231.5
Whitemans Ridge	1/02/2013 8.5	1/02/2013 14.5	1/02/2013 19.5	1/02/2013 20.0	1/02/2013 23.0	28/01/2013 30.5	28/01/2013 54.0	28/01/2013 95.5	29/01/2013 140.5	29/01/2013 179.0	30/01/2013 187.0	1039.5
Yarramalong	1/02/2013 14.5	1/02/2013 26.0	1/02/2013 39.5	1/02/2013 42.0	1/02/2013 45.0	1/02/2013 51.0	23/02/2013 70.0	28/01/2013 118.0	29/01/2013 160.0	29/01/2013 217.0	30/01/2013 222.5	1106.0
Kulnura[2]	1/02/2013 8.5	1/02/2013 15.0	1/02/2013 26.0	1/02/2013 28.5	1/02/2013 32.0	1/02/2013 40.5	23/02/2013 71.0	28/01/2013 108.5	29/01/2013 156.0	29/01/2013 201.5	29/01/2013 208.5	960.0
Toukley	23/02/2013 10.0	23/02/2013 12.5	27/01/2013 15.5	23/02/2013 19.0	23/02/2013 26.5	23/02/2013 39.0	28/01/2013 59.0	28/01/2013 104.5	29/01/2013 134.5	29/01/2013 187.0	30/01/2013 196.0	903.0
Hamlyn Terrace	1/02/2013 8.5	1/02/2013 13.5	1/02/2013 20.5	1/02/2013 27.5	1/02/2013 33.5	23/05/2013 48.0	28/01/2013 63.5	28/01/2013 105.0	29/01/2013 148.0	29/01/2013 202.0	30/01/2013 214.0	1300.5
Mardi Dam	1/02/2013 9.0	1/02/2013 16.0	1/02/2013 26.0	1/02/2013 27.5	1/02/2013 31.5	23/02/2013 40.5	28/01/2013 64.0	28/01/2013 106.0	29/01/2013 162.0	29/01/2013 223.5	29/01/2013 241.0	1186.5
Sterland	1/02/2013 10.5	1/02/2013 18.0	1/02/2013 23.5	1/02/2013 25.0	1/02/2013 28.0	23/02/2013 40.5	23/02/2013 65.5	23/02/2013 95.5	23/02/2013 125.0	23/02/2013 161.0	23/02/2013 195.5	1287.5
Kangy Angy	1/02/2013 7.0	1/02/2013 13.5	1/02/2013 19.5	1/02/2013 23.0	12/02/2013 30.0	27/01/2013 39.5	28/01/2013 62.0	28/01/2013 105.5	29/01/2013 162.0	29/01/2013 231.5	29/01/2013 252.5	1291.5
Berkeley Vale	1/02/2013 8.0	1/02/2013 13.0	1/02/2013 17.0	1/02/2013 18.0	1/02/2013 22.5	28/01/2013 32.5	28/01/2013 55.0	28/01/2013 93.5	29/01/2013 150.0	29/01/2013 207.0	29/01/2013 225.5	1247.0
Bateau Bay	20/04/2013 11.0	20/04/2013 15.0	20/04/2013 18.5	20/04/2013 20.0	20/04/2013 25.5	11/02/2013 46.5	23/06/2013 54.5	29/01/2013 74.5	29/01/2013 117.0	29/01/2013 178.0	30/01/2013 197.0	1286.5

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	
Lisarow	17/09/2012 8.0	17/09/2012 13.5	17/09/2012 18.5	12/02/2013 22.5	12/02/2013 31.5	27/01/2013 43.0	28/01/2013 60.0	28/01/2013 108.0	29/01/2013 161.5	29/01/2013 239.0	29/01/2013 254.5	1444.0
Strickland	11/12/2012 5.0	12/02/2013 8.0	12/02/2013 13.0	12/02/2013 16.5	12/02/2013 30.0	12/02/2013 42.5	28/01/2013 56.5	29/01/2013 96.5	29/01/2013 112.0	29/01/2013 176.0	29/01/2013 189.5	1306.5
Narara	19/11/2012 4.5	12/02/2013 8.0	12/02/2013 12.5	12/02/2013 14.0	12/02/2013 22.5	28/01/2013 42.5	28/01/2013 70.0	28/01/2013 122.5	29/01/2013 175.5	29/01/2013 236.5	30/01/2013 247.0	1402.0
Mount Elliot	12/02/2013 8.0	12/02/2013 14.5	12/02/2013 25.0	12/02/2013 30.5	12/02/2013 42.5	12/02/2013 56.5	12/02/2013 61.5	28/01/2013 99.5	29/01/2013 161.5	29/01/2013 239.5	29/01/2013 262.5	1546.5
Wyoming	25/12/2012 5.5	1/04/2013 9.0	12/02/2013 13.0	12/02/2013 16.0	12/02/2013 25.0	28/01/2013 42.0	28/01/2013 67.0	28/01/2013 120.5	29/01/2013 187.0	29/01/2013 250.5	29/01/2013 262.0	1008.0
Kincumber	16/11/2012 7.5	12/02/2013 12.0	12/02/2013 22.0	12/02/2013 26.0	12/02/2013 32.5	12/02/2013 63.0	12/02/2013 77.0	24/06/2013 88.5	29/01/2013 138.5	29/01/2013 225.0	30/01/2013 235.0	1599.0
Webbs Creek	23/05/2013 4.8	23/05/2013 7.6	23/02/2013 10.4	23/02/2013 14.8	23/02/2013 23.2	23/02/2013 34.6	23/02/2013 56.8	23/02/2013 77.6	29/01/2013 101.2	23/02/2013 134.4	24/02/2013 141.6	949.0
Colo Junction	28/11/2012 5.4	28/11/2012 9.8	28/11/2012 14.6	28/11/2012 15.4	20/04/2013 18.0	20/04/2013 29.0	23/02/2013 38.4	28/01/2013 72.0	29/01/2013 99.0	29/01/2013 122.4	29/01/2013 123.0	816.4
Sackville D/S	23/02/2013 4.6	23/02/2013 7.6	20/04/2013 11.0	20/04/2013 12.8	23/02/2013 19.4	23/02/2013 27.4	23/02/2013 39.8	28/01/2013 71.4	29/01/2013 97.0	29/01/2013 118.6	29/01/2013 119.6	725.8
Kelso Creek	5/10/2012 11.5	5/10/2012 11.5	23/02/2013 15.5	23/02/2013 19.5	24/02/2013 22.5	24/02/2013 25.5	29/01/2013 38.5	29/01/2013 67.0	29/01/2013 96.0	29/01/2013 108.5	29/01/2013 111.0	771.0
Rixons Pass	24/02/2013 11.0	24/02/2013 18.0	24/02/2013 25.5	24/02/2013 34.5	24/02/2013 41.5	29/01/2013 58.0	29/01/2013 83.0	29/01/2013 124.0	29/01/2013 164.0	29/01/2013 196.0	26/06/2013 207.0	1371.0
Russell Vale	24/02/2013 8.5	24/02/2013 11.0	24/02/2013 16.5	24/02/2013 21.0	29/01/2013 27.0	29/01/2013 54.0	29/01/2013 80.5	29/01/2013 118.0	29/01/2013 154.5	29/01/2013 186.5	26/06/2013 209.0	1335.0
Mount Pleasant	20/04/2013 6.5	26/06/2013 10.5	20/04/2013 14.0	24/02/2013 18.0	29/01/2013 29.0	29/01/2013 59.5	29/01/2013 89.5	29/01/2013 129.5	29/01/2013 169.5	29/01/2013 213.0	30/01/2013 224.0	1410.0
Mount Kembla	27/11/2012 7.0	27/11/2012 10.5	22/01/2013 17.0	12/10/2012 21.5	12/10/2012 36.5	29/01/2013 52.5	29/01/2013 77.5	29/01/2013 109.0	29/01/2013 137.5	29/01/2013 180.0	26/06/2013 201.0	1201.0
Dombarton Loop	23/05/2013 7.5	24/02/2013 10.0	25/06/2013 15.0	24/02/2013 20.5	24/02/2013 38.5	24/02/2013 53.0	29/01/2013 67.5	29/01/2013 103.0	25/06/2013 142.0	25/06/2013 207.0	26/06/2013 261.5	1288.0

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	
Wongawilli	23/05/2013 7.0	23/05/2013 12.0	24/02/2013 13.5	24/02/2013 15.0	24/02/2013 26.5	29/01/2013 42.5	29/01/2013 61.5	29/01/2013 87.0	25/06/2013 113.5	25/06/2013 163.0	26/06/2013 208.0	987.5
Port Kembla	27/01/2013 7.0	27/01/2013 11.0	27/01/2013 19.5	27/01/2013 24.5	27/01/2013 39.5	27/01/2013 54.5	29/01/2013 70.5	29/01/2013 95.5	29/01/2013 128.0	29/01/2013 190.5	29/01/2013 199.0	1116.0
Darkes Road	27/11/2012 7.0	27/11/2012 12.5	27/11/2012 15.5	27/11/2012 16.0	29/01/2013 23.5	29/01/2013 47.0	29/01/2013 70.5	29/01/2013 97.0	29/01/2013 122.5	25/06/2013 151.5	26/06/2013 190.0	973.0
Cleveland Road	27/11/2012 7.5	27/11/2012 9.5	27/11/2012 11.5	29/01/2013 13.5	24/02/2013 24.0	29/01/2013 46.5	29/01/2013 71.0	29/01/2013 101.0	29/01/2013 126.5	25/06/2013 157.5	26/06/2013 202.0	986.5
Huntley Colliery	30/11/2012 6.0	24/02/2013 11.0	24/02/2013 20.5	24/02/2013 23.5	24/02/2013 34.0	29/01/2013 47.5	29/01/2013 77.5	29/01/2013 121.5	29/01/2013 155.0	29/01/2013 180.5	26/06/2013 208.5	1139.0
Upper Calderwood[2]	24/02/2013 8.0	24/02/2013 15.0	24/02/2013 24.0	24/02/2013 29.0	24/02/2013 36.5	29/01/2013 53.5	29/01/2013 86.0	29/01/2013 138.5	29/01/2013 183.5	29/01/2013 209.5	29/01/2013 236.5	981.5
Little Lake	24/02/2013 7.5	24/02/2013 12.5	24/02/2013 19.5	24/02/2013 21.0	12/10/2012 31.0	29/01/2013 46.5	29/01/2013 69.0	29/01/2013 94.0	29/01/2013 117.0	29/01/2013 138.5	25/06/2013 152.5	999.0
North Macquarie	24/02/2013 8.0	24/02/2013 11.5	24/02/2013 20.5	24/02/2013 27.0	24/02/2013 36.0	24/02/2013 45.0	12/10/2012 62.5	24/02/2013 83.0	24/02/2013 127.5	25/06/2013 159.5	26/06/2013 204.5	860.5
Clover Hill	23/02/2013 6.5	23/02/2013 10.5	24/02/2013 17.0	23/02/2013 20.5	23/02/2013 29.5	29/01/2013 56.0	29/01/2013 90.0	29/01/2013 134.5	29/01/2013 185.0	26/06/2013 240.5	26/06/2013 299.5	1514.0
Nurrewin	30/11/2012 6.5	30/11/2012 10.0	23/02/2013 14.0	23/02/2013 18.5	24/02/2013 33.0	29/01/2013 56.0	29/01/2013 87.5	23/02/2013 139.0	24/02/2013 211.0	24/02/2013 227.5	26/06/2013 268.0	1390.0
Yellow Rock Road	24/02/2013 9.0	24/02/2013 18.0	24/02/2013 28.0	24/02/2013 33.0	24/02/2013 38.5	24/02/2013 48.5	12/10/2012 72.0	29/01/2013 106.5	29/01/2013 139.5	25/06/2013 177.5	26/06/2013 227.0	1213.0
Barlows Bay	24/02/2013 7.5	24/02/2013 14.0	24/06/2013 23.5	24/06/2013 26.0	24/06/2013 30.0	20/04/2013 53.0	20/04/2013 78.5	20/04/2013 106.5	20/04/2013 117.0	20/04/2013 120.0	20/04/2013 120.0	806.0
Regatta Point	15/04/2013 7.5	15/04/2013 10.0	18/11/2012 12.0	20/04/2013 14.0	20/04/2013 20.0	20/04/2013 44.5	20/04/2013 72.0	20/04/2013 91.0	20/04/2013 101.0	20/04/2013 105.0	20/04/2013 105.0	709.0

[1] Dates listed refer to the time that the recorded maximum rainfall ends
[2] Some measure of data loss occurred at these sites. See individual plots for further details

5. Index of Figures

Table 5.1 Index of Figures

Region	Short Name	Station No.	MGA	Easting	Northing	Figure
Station Locality Map						4
Tweed	Cudgera	558046	56	549668	6859164	5
Brunswick	Main Arm	558053	56	542469	6847276	6
Brunswick	Huonbrook	558049	56	538665	6840760	7
Brunswick	Myocum	558036	56	550528	6837390	8
Station Locality Map						9
Richmond	Lake Ainsworth	203455	56	557863	6816160	10
Station Locality Map						11
Bellinger	Wooli Caravan Park	205463	56	524551	6697797	12
Station Locality Map						13
Bellinger	Perry Drive	559019	56	510149	6650415	14
Bellinger	Shepards Lane	559017	56	508200	6650890	15
Bellinger	Red Hill	559016	56	506655	6649689	16
Bellinger	Newports Creek	559051	56	505893	6646681	17
Bellinger	Middle Boambee	559048	56	504720	6645291	18
Bellinger	South Boambee	559049	56	504818	6643568	19
Bellinger	North Bonville	559050	56	500593	6641143	20
Bellinger	Kooroowi	205440	56	482965	6629668	21
Station Locality Map						22
Nambucca	Stuarts Island Downstream	205466	56	499502	6608568	23
Nambucca	Utungun	205414	56	485797	6600327	24
Station Locality Map						25
Macleay	Aldavilla Downstream	206459	56	479318	6561231	26
Hastings	Green Valley	207406	56	486422	6540269	27
Hastings	Telegraph Point	207415	56	481049	6534532	28
Station Locality Map						29
Camden Haven	Logans Crossing	207428	56	470912	6502301	30
Manning	Mount George	208440	56	419224	6472247	31
Station Locality Map						32
Karuah	Nabiac	209404	56	436821	6446458	33
Karuah	Tuncurry	209401	56	450591	6442284	34
Karuah	Tiona	209403	56	454412	6425971	35
Karuah	Tarbuck Bay	209465	56	451230	6418348	36
Karuah	Bulahdelah	209460	56	425463	6413372	37

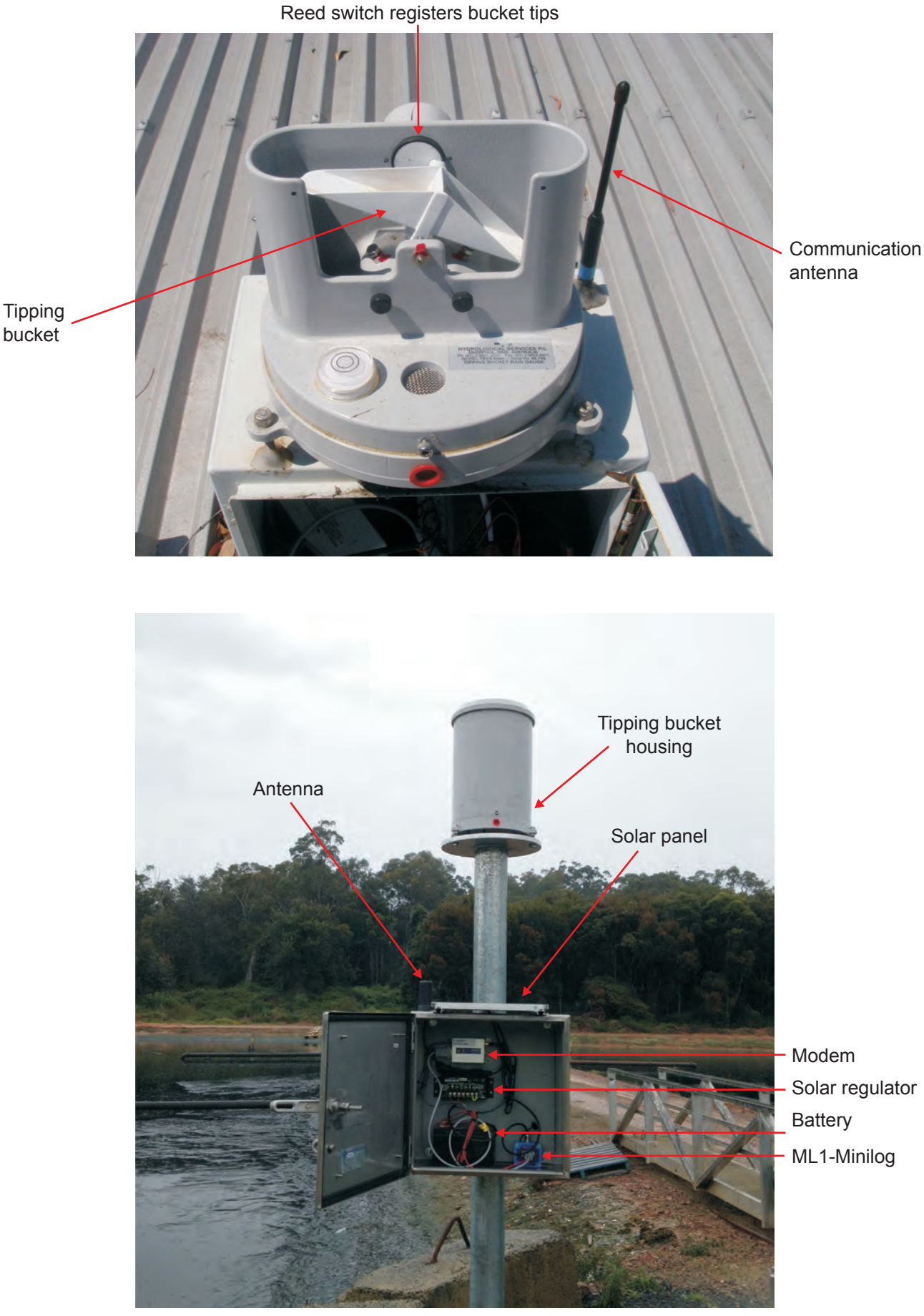
Region	Short Name	Station No.	MGA	Easting	Northing	Figure
Station Locality Map						38
Hunter	Gostwyck	210402	56	369104	6396070	39
Hunter	Seaham	210462	56	381105	6385316	40
Hunter	Belmore Bridge	210458	56	364435	6377790	41
Hunter	Hexham Bridge	210448	56	376768	6367608	42
Station Locality Map						43
Macquarie-Tuggerah Lakes	Barnsley	561067	56	367910	6355832	44
Macquarie-Tuggerah Lakes	Martinsville	561083	56	351245	6341595	45
Macquarie-Tuggerah Lakes	Mandalong	561081	56	355224	6335165	46
Macquarie-Tuggerah Lakes	Wyee	561097	56	358609	6328268	47
Station Locality Map						48
Macquarie-Tuggerah Lakes	Whitemans Ridge	561026	56	343664	6324896	49
Macquarie-Tuggerah Lakes	Yarramalong (S)	561137	56	338871	6322384	50
Macquarie-Tuggerah Lakes	Kulnura	561078	56	333767	6321516	51
Macquarie-Tuggerah Lakes	Toukley	211401	56	362602	6318536	52
Macquarie-Tuggerah Lakes	Hamlyn Terrace	561133	56	357399	6319854	53
Macquarie-Tuggerah Lakes	Mardi Dam	561082	56	351036	6314557	54
Macquarie-Tuggerah Lakes	Sterland	567138	56	342434	6315398	55
Macquarie-Tuggerah Lakes	Kangy Angy	561132	56	350168	6310609	56
Macquarie-Tuggerah Lakes	Berkeley Vale	561134	56	353191	6309376	57
Macquarie-Tuggerah Lakes	Bateau Bay	561069	56	358100	6305651	58
Macquarie-Tuggerah Lakes	Lisarow	561079	56	348927	6305252	59
Hawkesbury	Strickland	561136	56	345370	6305548	60
Hawkesbury	Narara	561085	56	344531	6303941	61
Hawkesbury	Mount Elliot	561084	56	350645	6302922	62
Hawkesbury	Wyoming	561098	56	346487	6302051	63
Hawkesbury	Kincumber	561077	56	350391	6294474	64
Station Locality Map						65
Hawkesbury	Webbs Creek	212408	56	312346	6303935	66
Hawkesbury	Colo Junction	212407	56	303218	6298170	67
Hawkesbury	Sackville Downstream	212438	56	302831	6291440	68
Station Locality Map						69
Sydney Coastal	Kelso Creek	213430	56	313763	6241029	70
Station Locality Map						71
Wollongong Coastal	Rixons Pass	568317	56	305280	6196896	72
Wollongong Coastal	Russell Vale	568318	56	306378	6196138	73
Wollongong Coastal	Mount Pleasant	568229	56	303305	6191991	74
Wollongong Coastal	Mount Kembla	568314	56	299550	6186447	75
Wollongong Coastal	Dombarton Loop	568307	56	294718	6185611	76
Wollongong Coastal	Wongawilli	568320	56	293261	6182391	77
Wollongong Coastal	Port Kembla	568316	56	306636	6182721	78
Wollongong Coastal	Darkes Road	568309	56	297450	6182478	79
Wollongong Coastal	Cleveland Road	568308	56	295799	6179730	80
Wollongong Coastal	Huntley Colliery	568311	56	290680	6178916	81
Wollongong Coastal	Upper Calderwood	568319	56	288750	6175161	82
Wollongong Coastal	Little Lake	214466	56	304089	6173338	83
Wollongong Coastal	Nurrewin	568228	56	284569	6173438	84

Region	Short Name	Station No.	MGA	Easting	Northing	Figure
Wollongong Coastal	Clover Hill	568310	56	284232	6172390	85
Wollongong Coastal	North Macquarie	568315	56	291440	6171495	86
Wollongong Coastal	Yellow Rock Road	568321	56	292886	6167651	87
Station Locality Map						88
South Coast	Barlows Bay	218415	56	239467	5988955	89
South Coast	Regatta Point	219405	56	236890	5971052	90

(S) – Indicates station is standalone (non-telemetered)

Table 5.2 Index of Appendix B Figures

Sample Rainfall Data Outputs	Figure
Daily and Monthly Rainfall Plots, North Bonville	B1
Intensity-Frequency-Duration, North Bonville, 21 January-21 March 2013	B2
Rain Gauge Tip Times, North Bonville	B3



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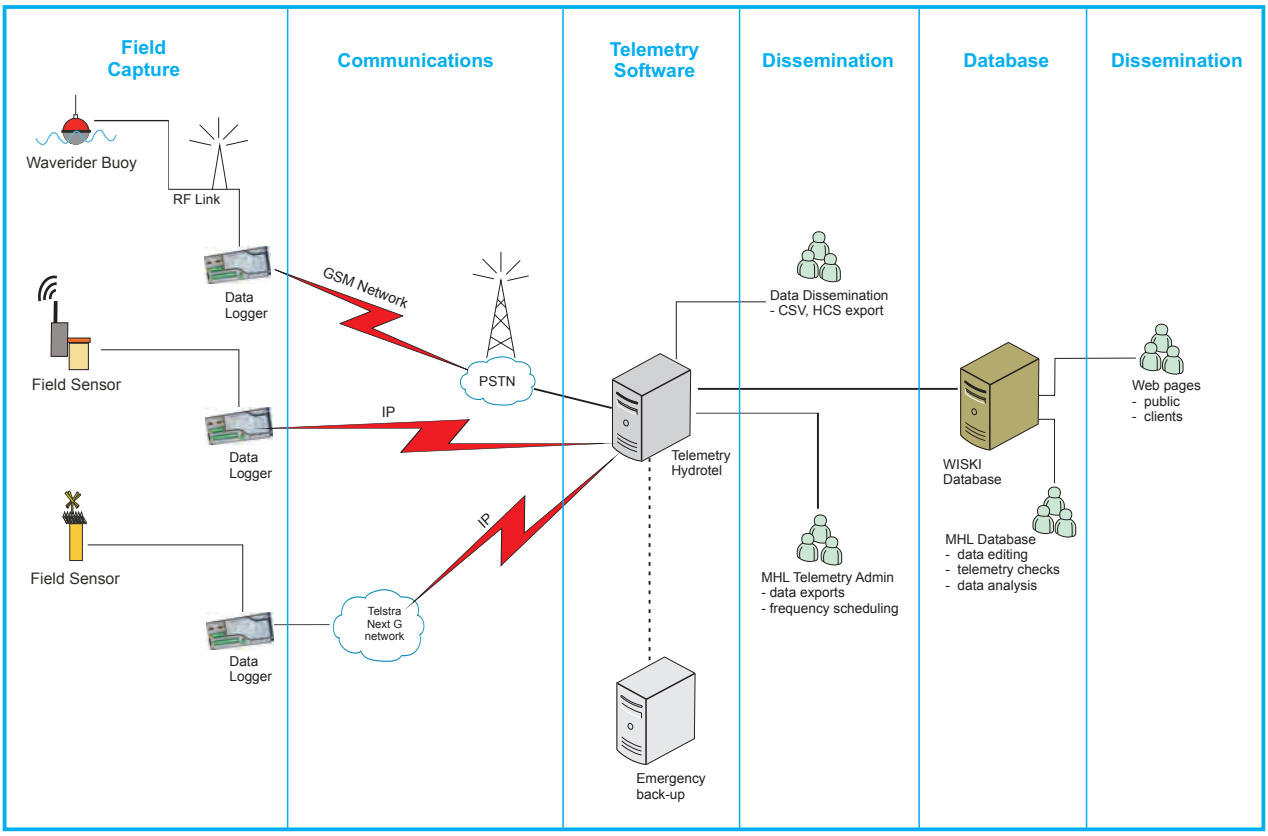
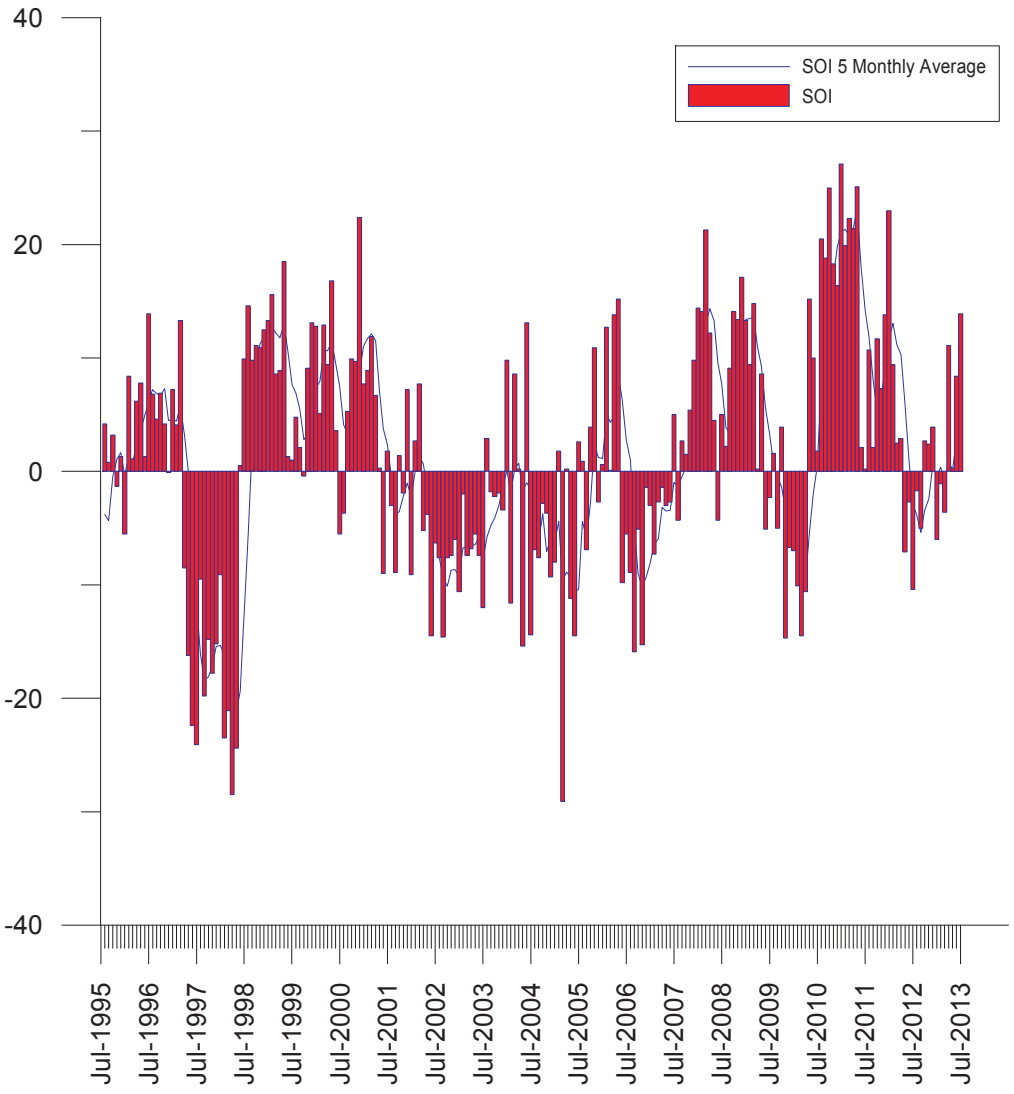
TYPICAL PLUVIOMETER STATION

MHL Report 2220

Figure 1

DRAWING 2220-01.cdr


Field Capture
Communications
Telemetry Software
Dissemination
Database
Dissemination
Waverider Buoy
RF Link
Data Logger
GSM Network
PSTN
Field Sensor
IP
Data Logger
Field Sensor
IP
Telstra Next G network
Data Logger
Telemetry Hydrotel
Emergency back-up
Data Dissemination
- CSV, HCS export
MHL Telemetry Admin
- data exports
- frequency scheduling
WISKI Database
MHL Database
- data editing
- telemetry checks
- data analysis
Web pages
- public
- clients



Source: Bureau of Meteorology

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Public Works
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SOUTHERN OSCILLATION INDEX
JUNE 1994-JUNE 2013

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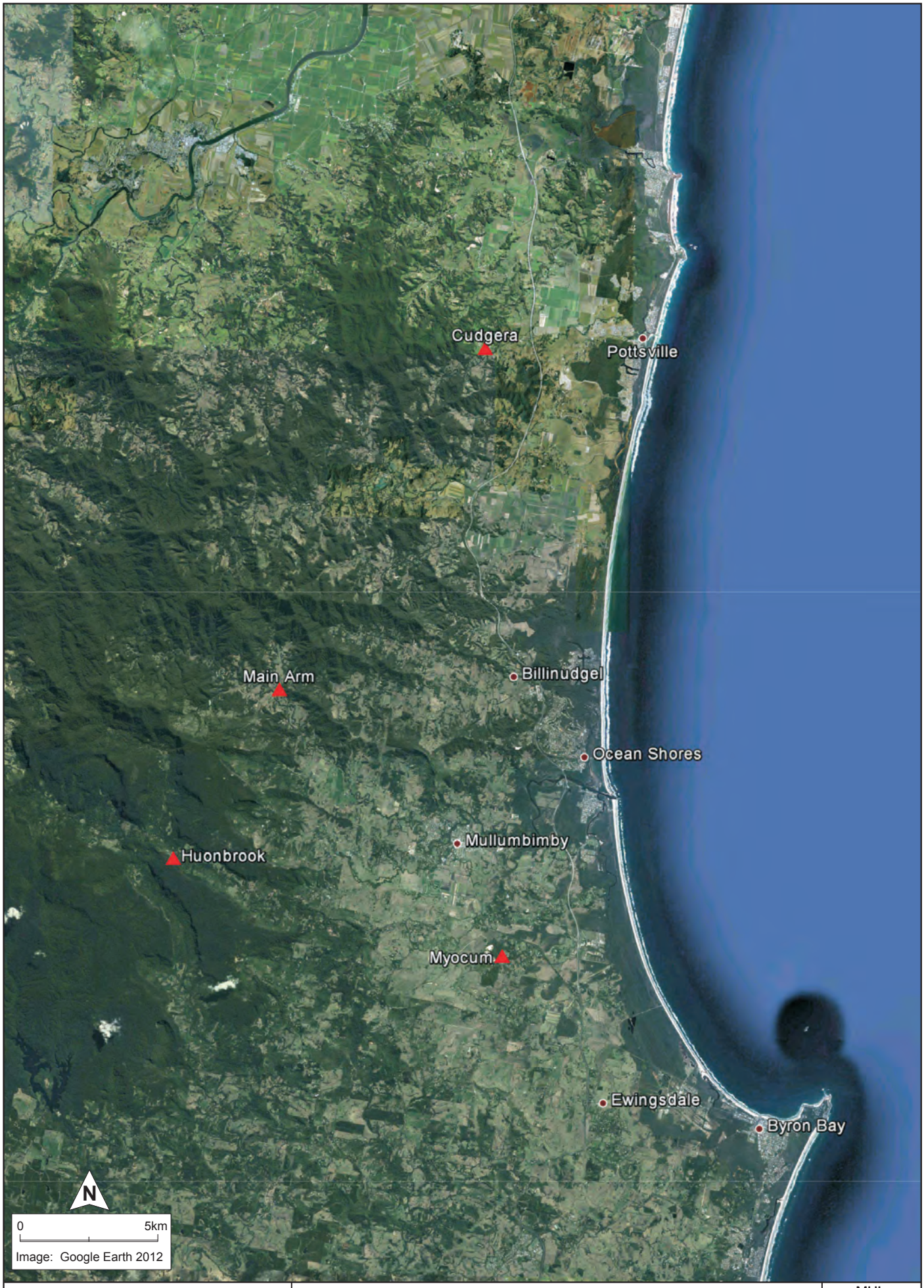
Figure 3

DRAWING 2220-03.cdr



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RAINFALL STATION LOCATIONS
TWEED RIVER AND BRUNSWICK RIVER REGIONS

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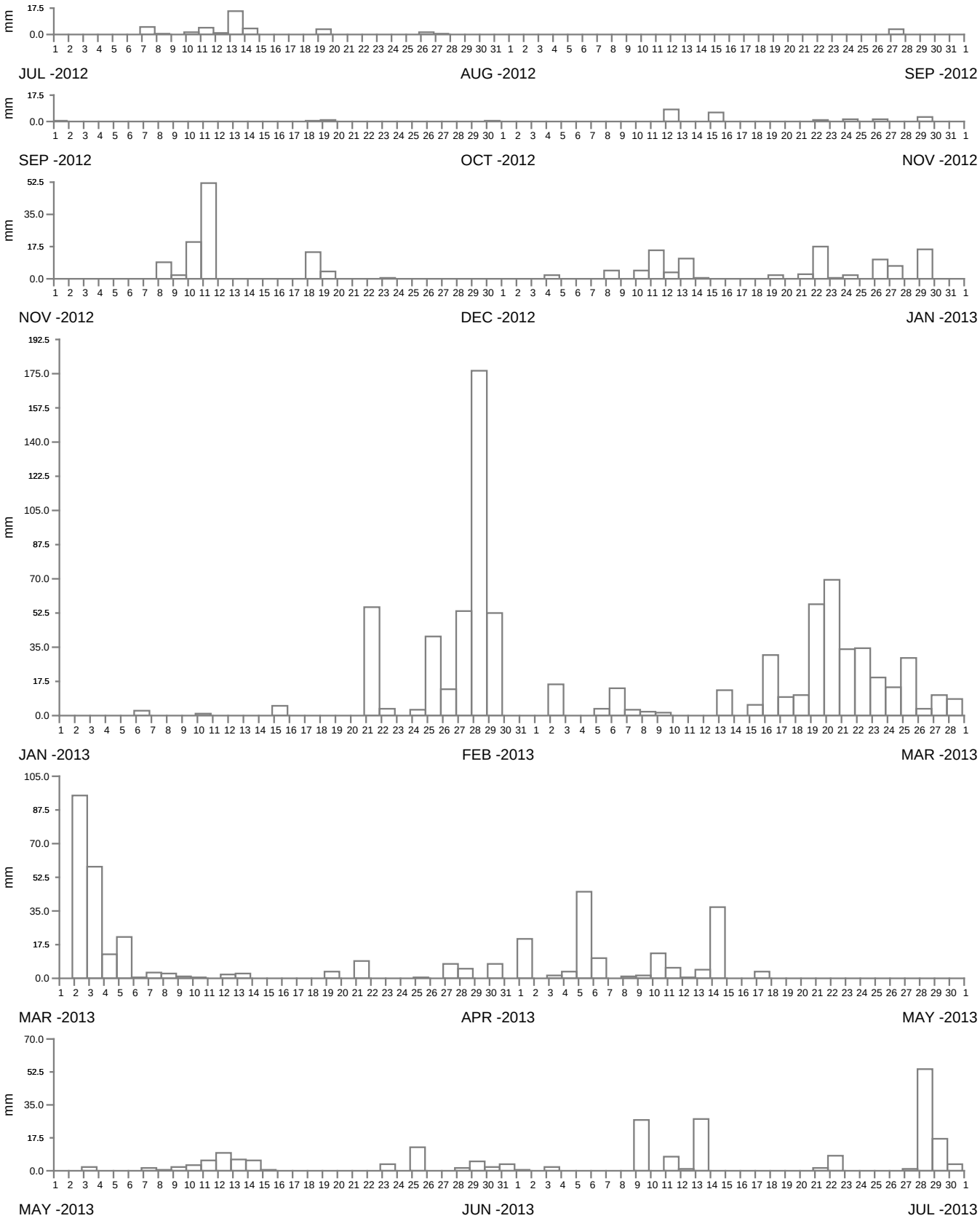
Figure 4

DRAWING 2220-04.cdr



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

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CUDGERA AT CABBAGE GUM ROAD
2012-2013

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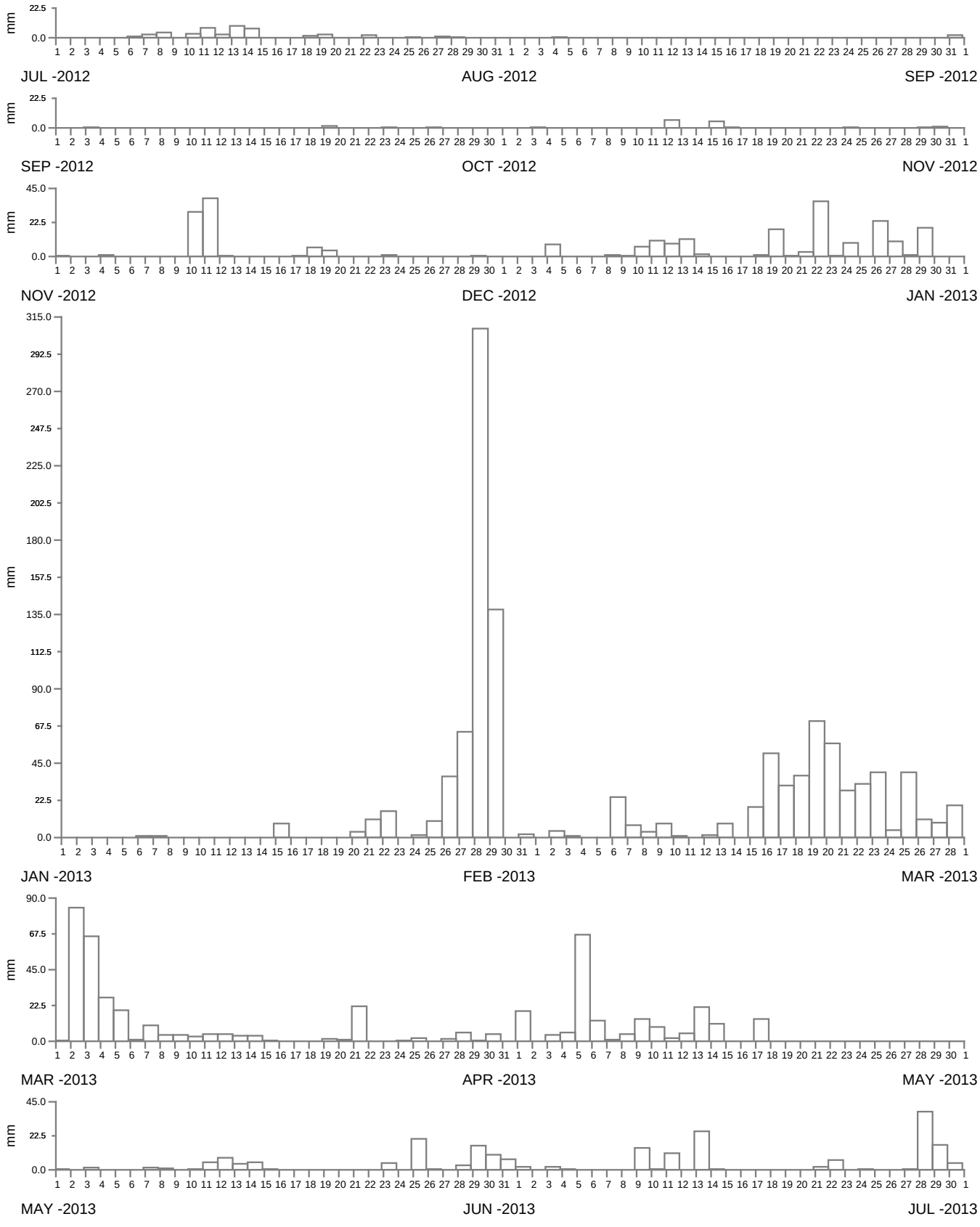
Figure 5

DRAWING 2220-5



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

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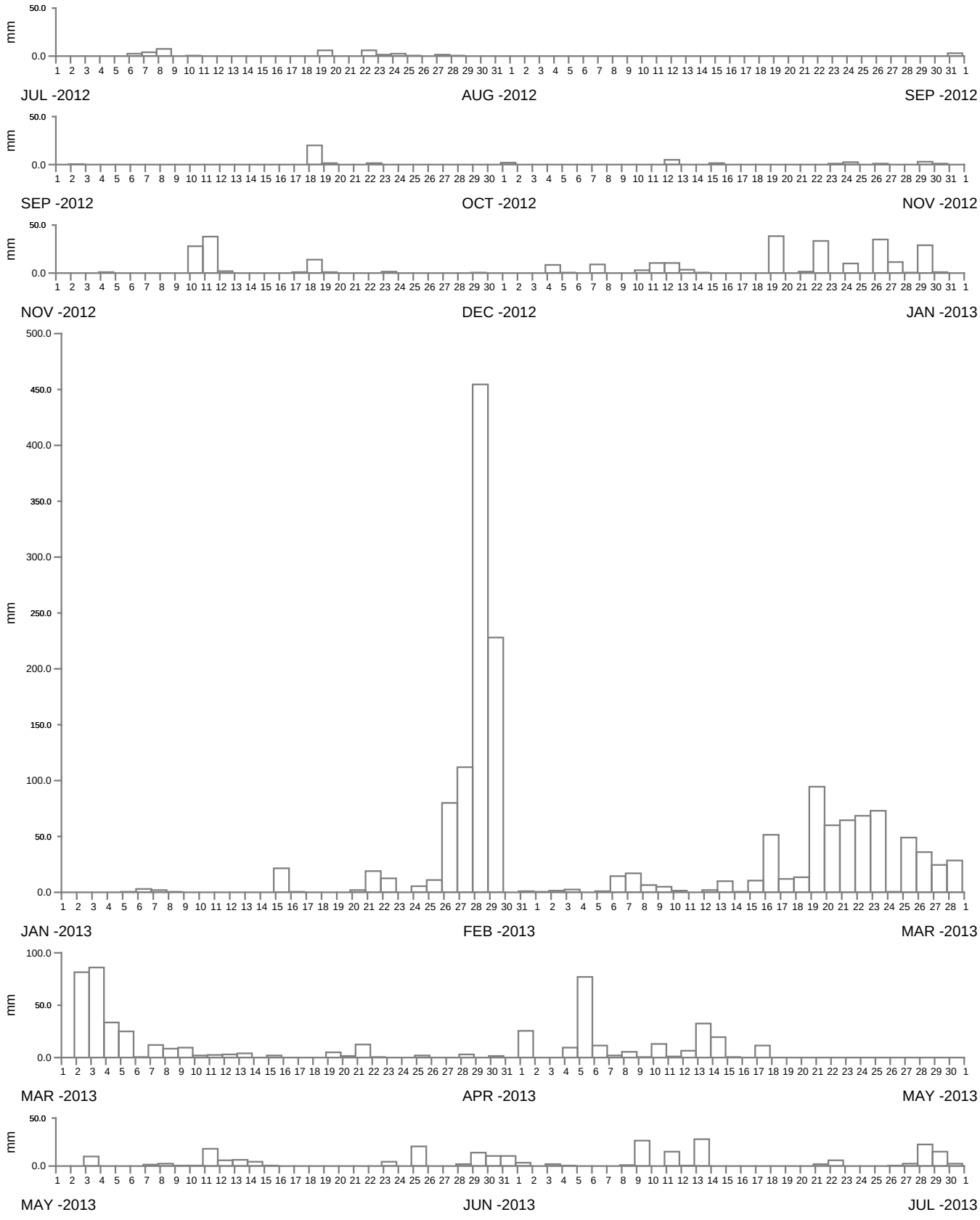
MAIN ARM AT MAIN ARM ROAD
2012-2013

MHL Report 2220

Figure 6

DRAWING 2220-6



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

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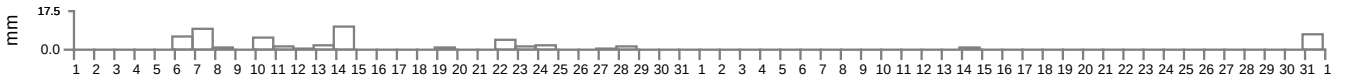
HUONBROOK AT WILSONS CREEK ROAD
2012-2013

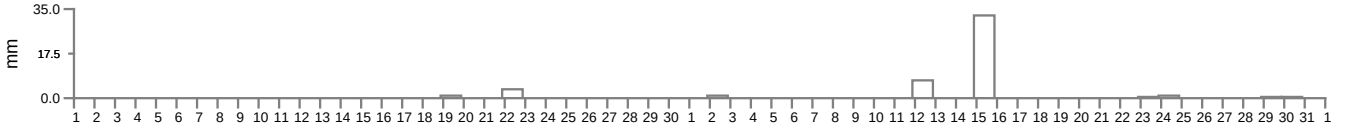
MHL Report 2220

Figure 7

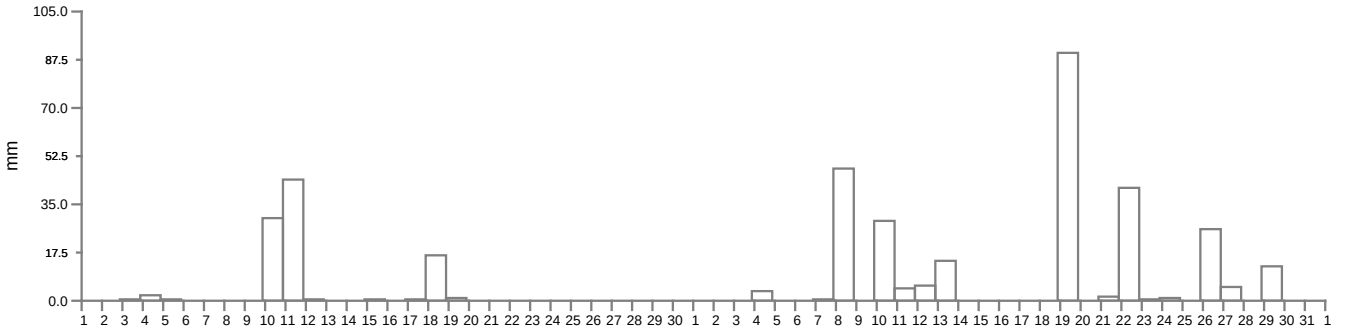
DRAWING 2220-7



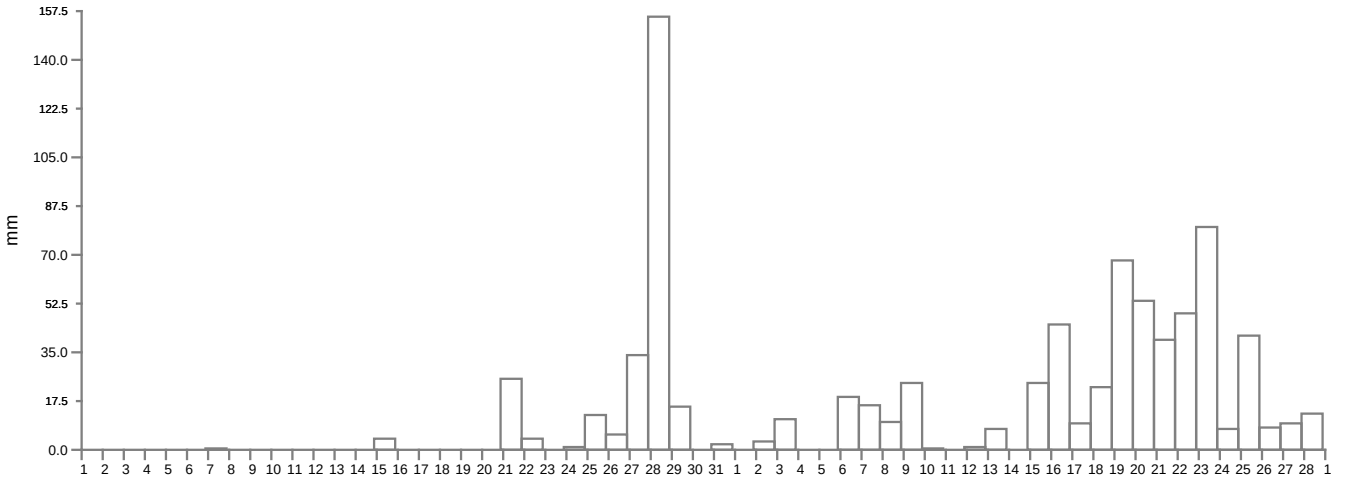
JUL -2012 AUG -2012 SEP -2012



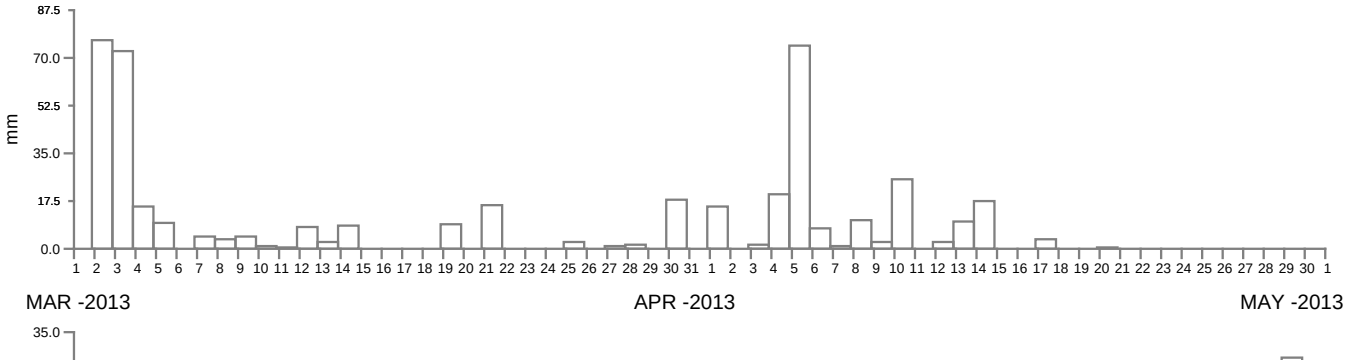
SEP -2012 OCT -2012 NOV -2012



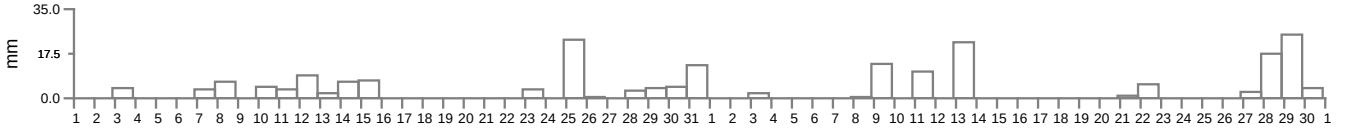
NOV -2012 DEC -2012 JAN -2013



JAN -2013 FEB -2013 MAR -2013



MAR -2013 APR -2013 MAY -2013



MAY -2013 JUN -2013 JUL -2013

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

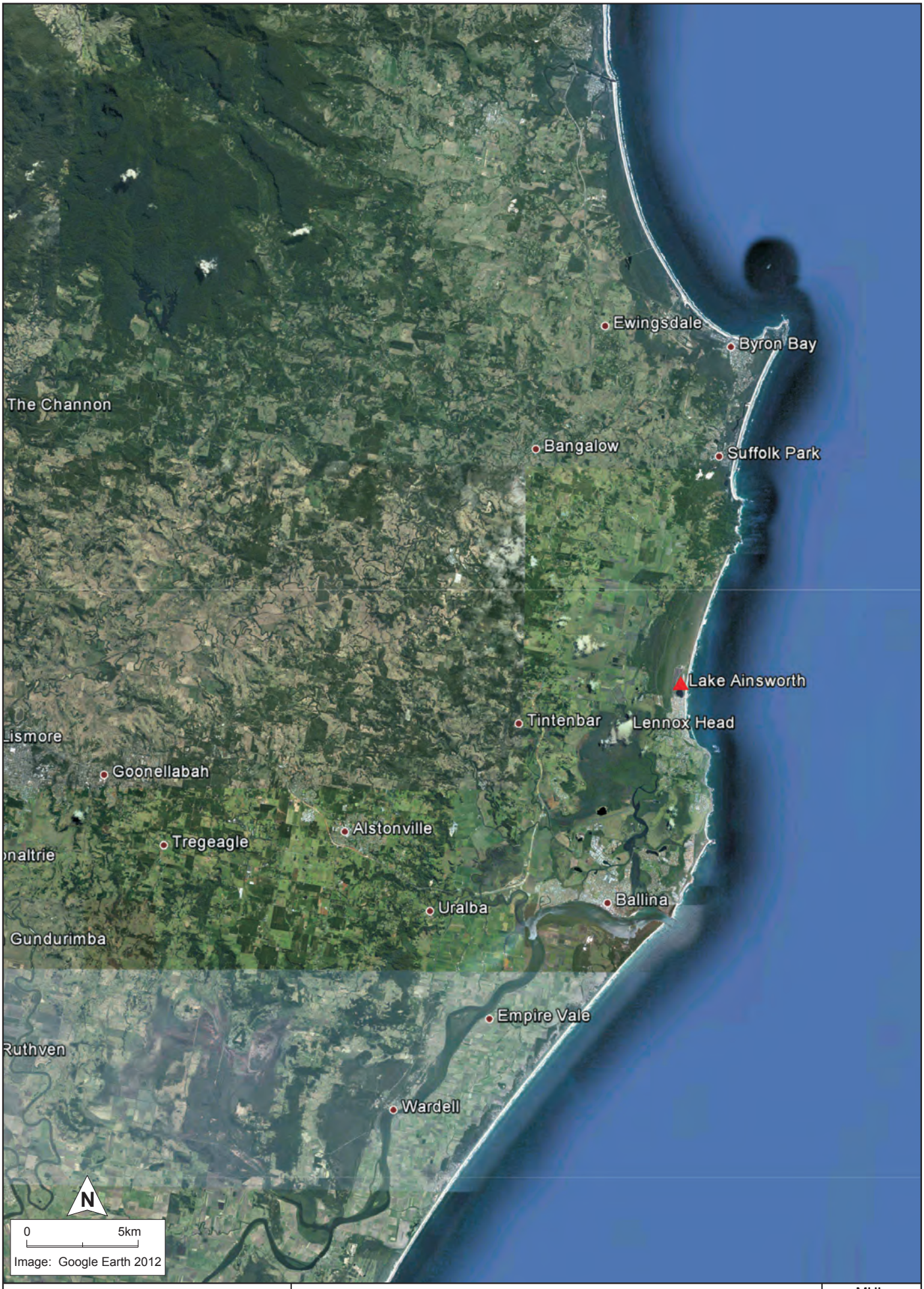
Public Works
Manly Hydraulics Laboratory

MYOCUM AT KINGSVALE ROAD
2012-2013

MHL Report 2220

Figure 8

DRAWING 2220-8



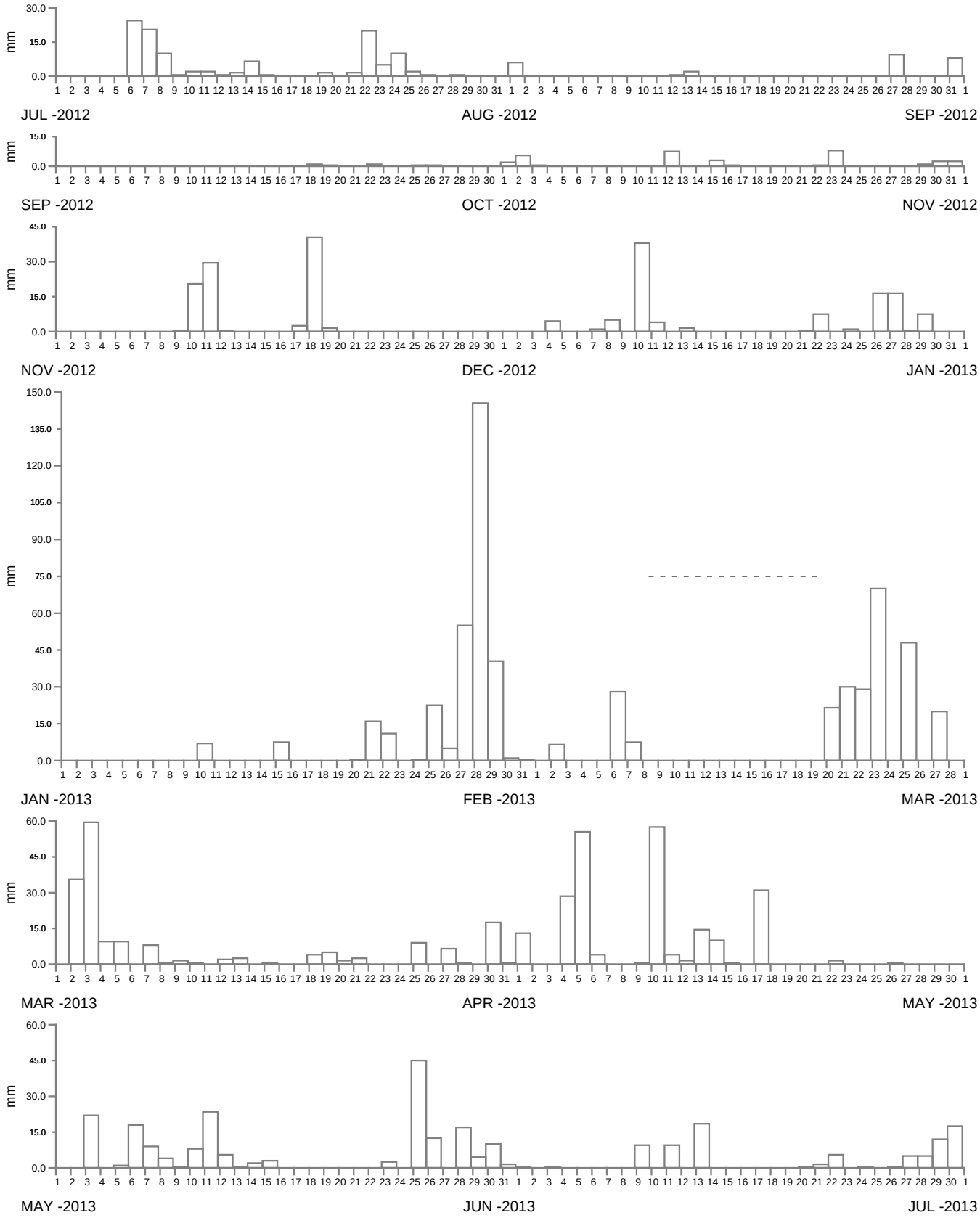
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
RICHMOND RIVER REGION

MHL Report 2220

Figure 9

DRAWING 2220-09.cdr



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

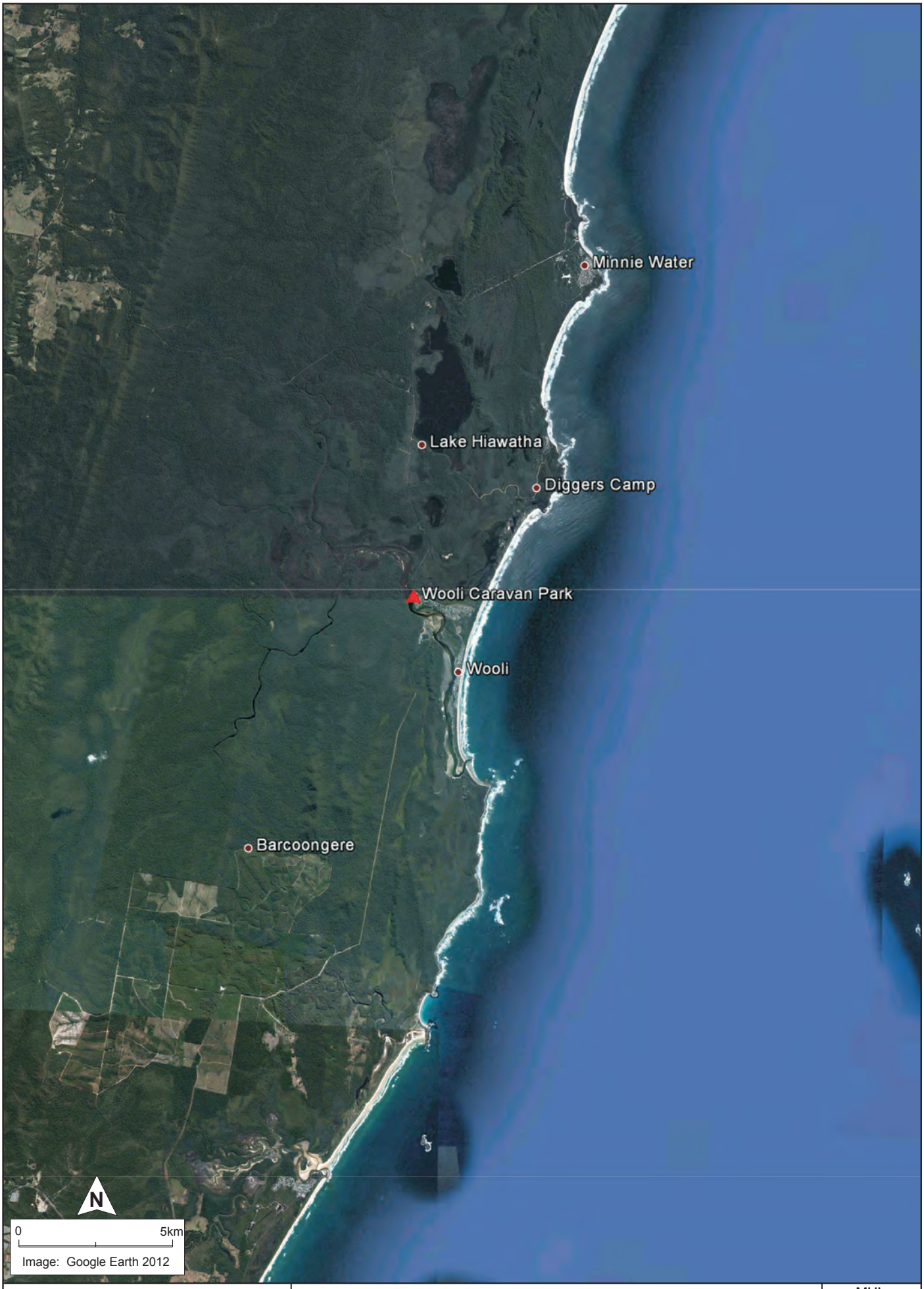
Public Works
Manly Hydraulics Laboratory

LENNOX HEAD AT LAKE AINSWORTH
2012-2013

MHL Report 2220

Figure 10

DRAWING 2220-10



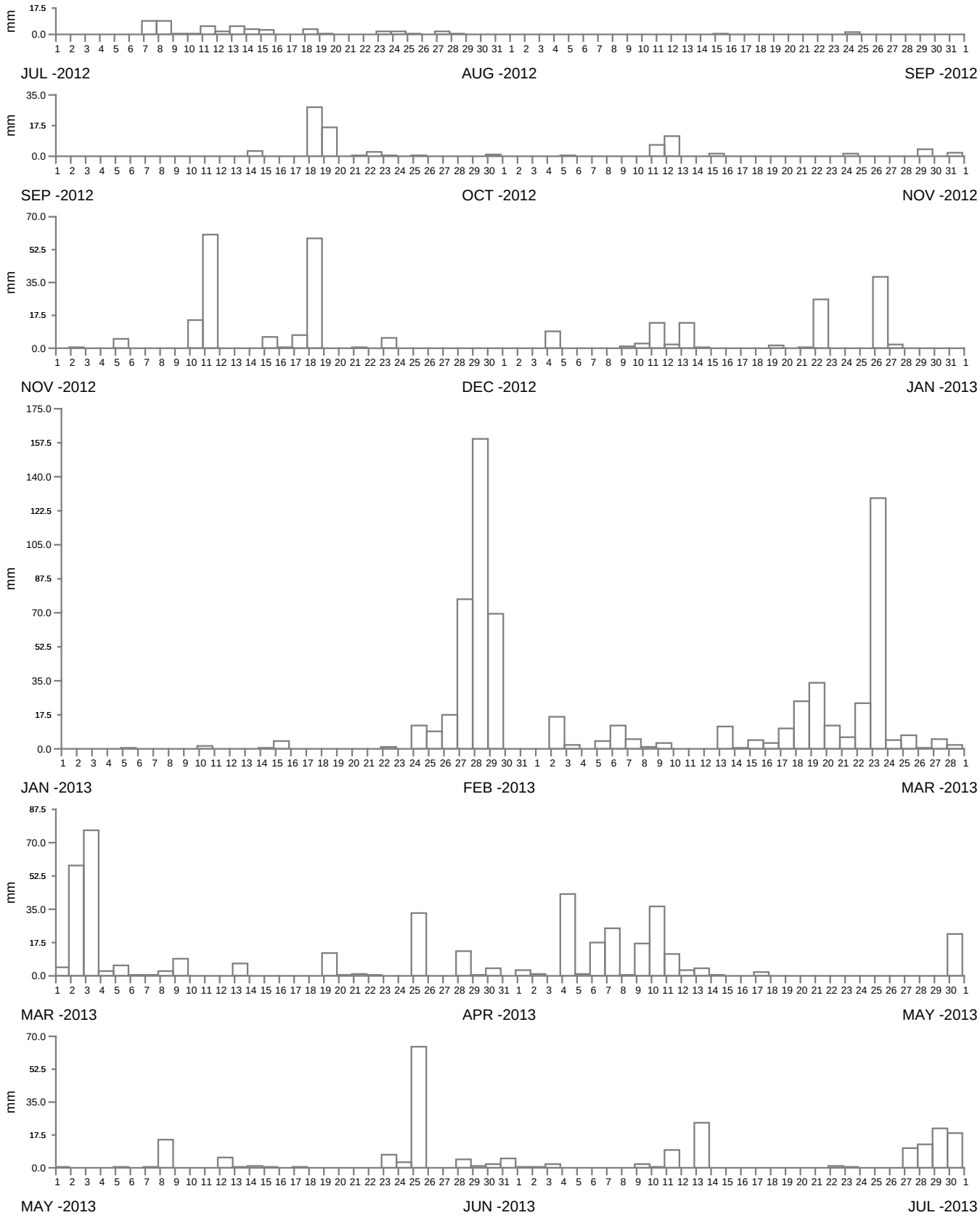
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
BELLINGER RIVER REGION (NORTH)

MHL
Report 2220

Figure
11

DRAWING 2220-11.cdr



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

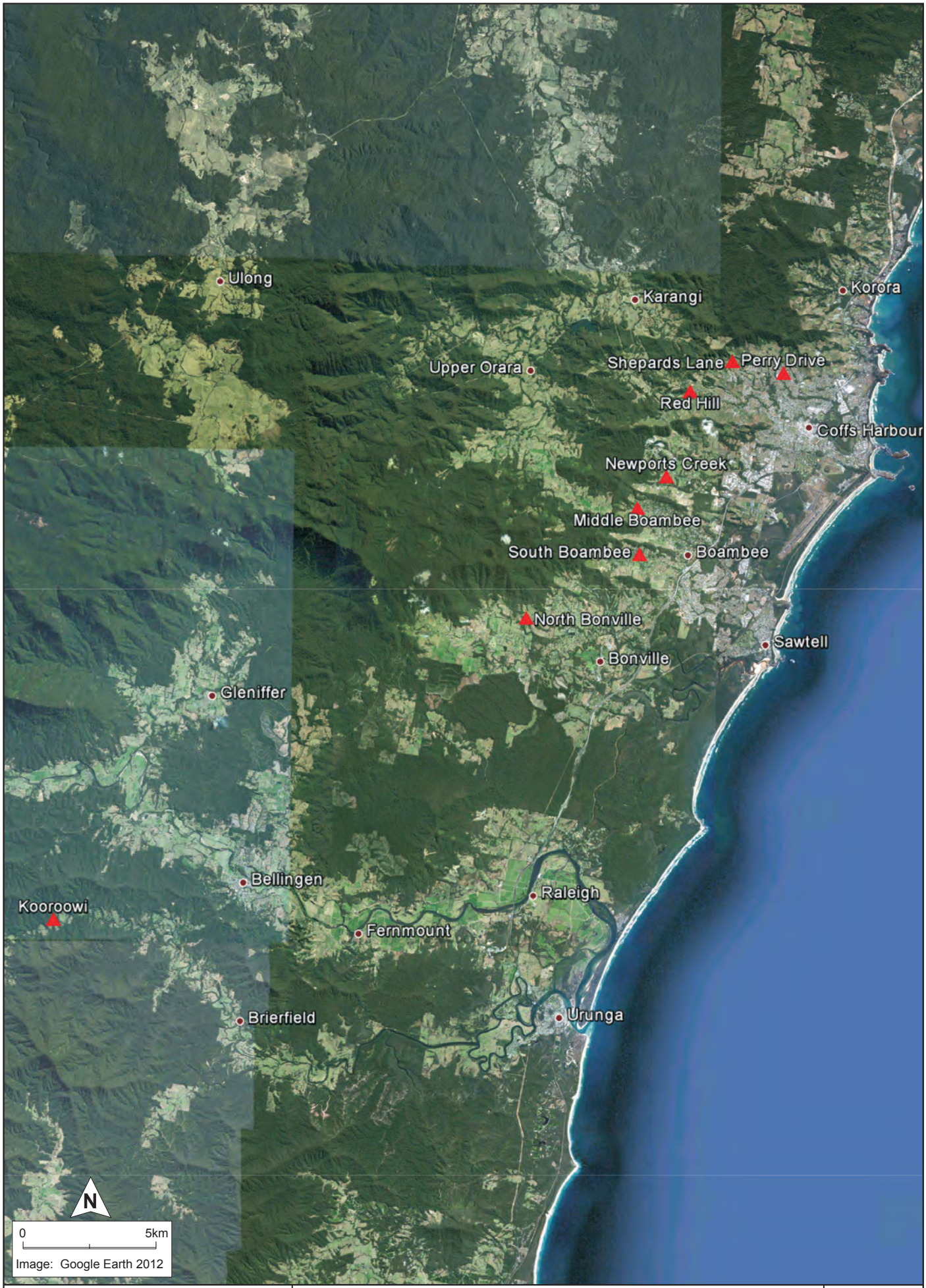
Public Works
Manly Hydraulics Laboratory

WOOLI RIVER AT WOOLI CARAVAN PARK
2012-2013

MHL Report 2220

Figure 12

DRAWING 2220-12



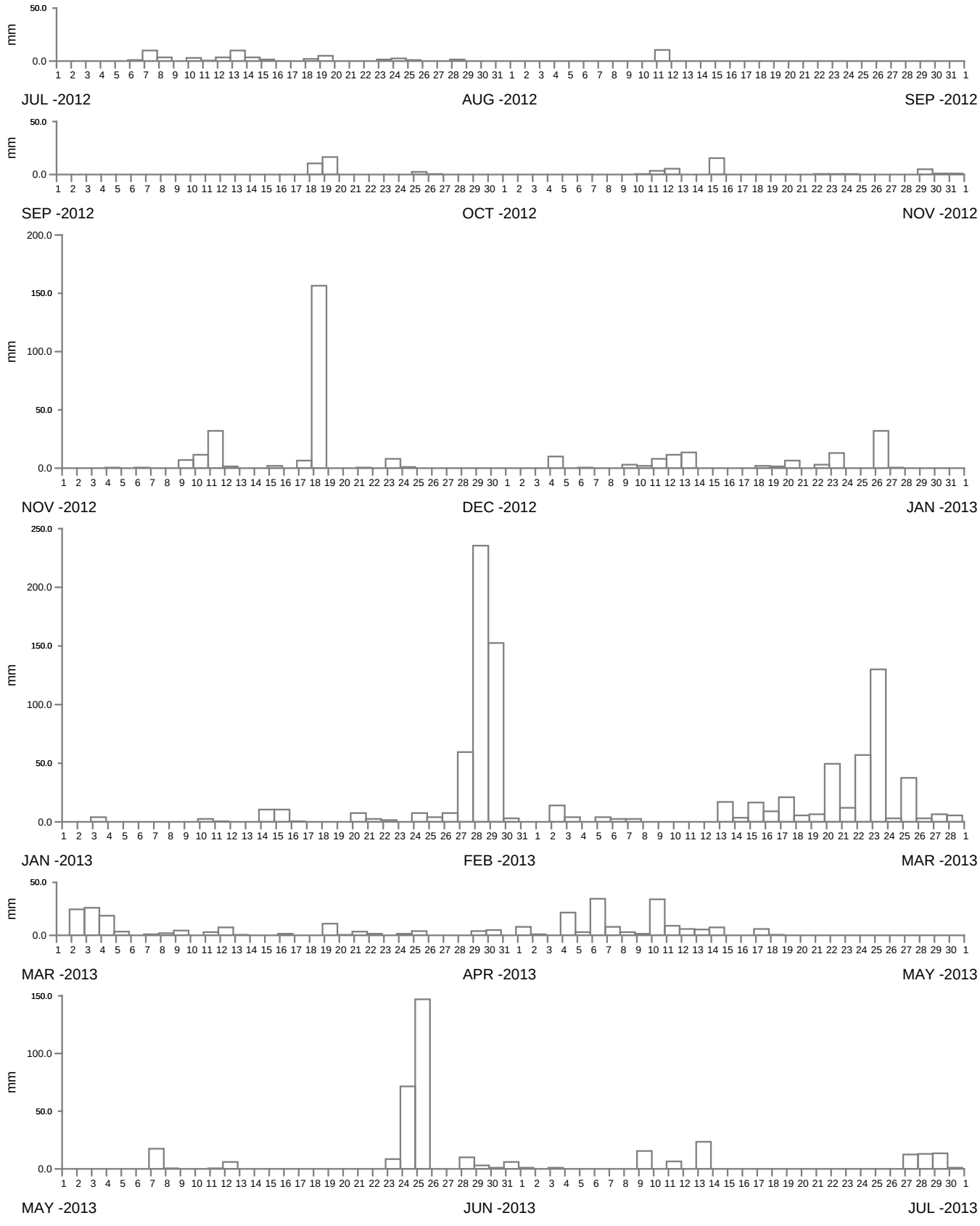
NSW GOVERNMENT
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
BELLINGER RIVER REGION

MHL Report 2220

Figure 13

DRAWING 2220-13.cdr



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

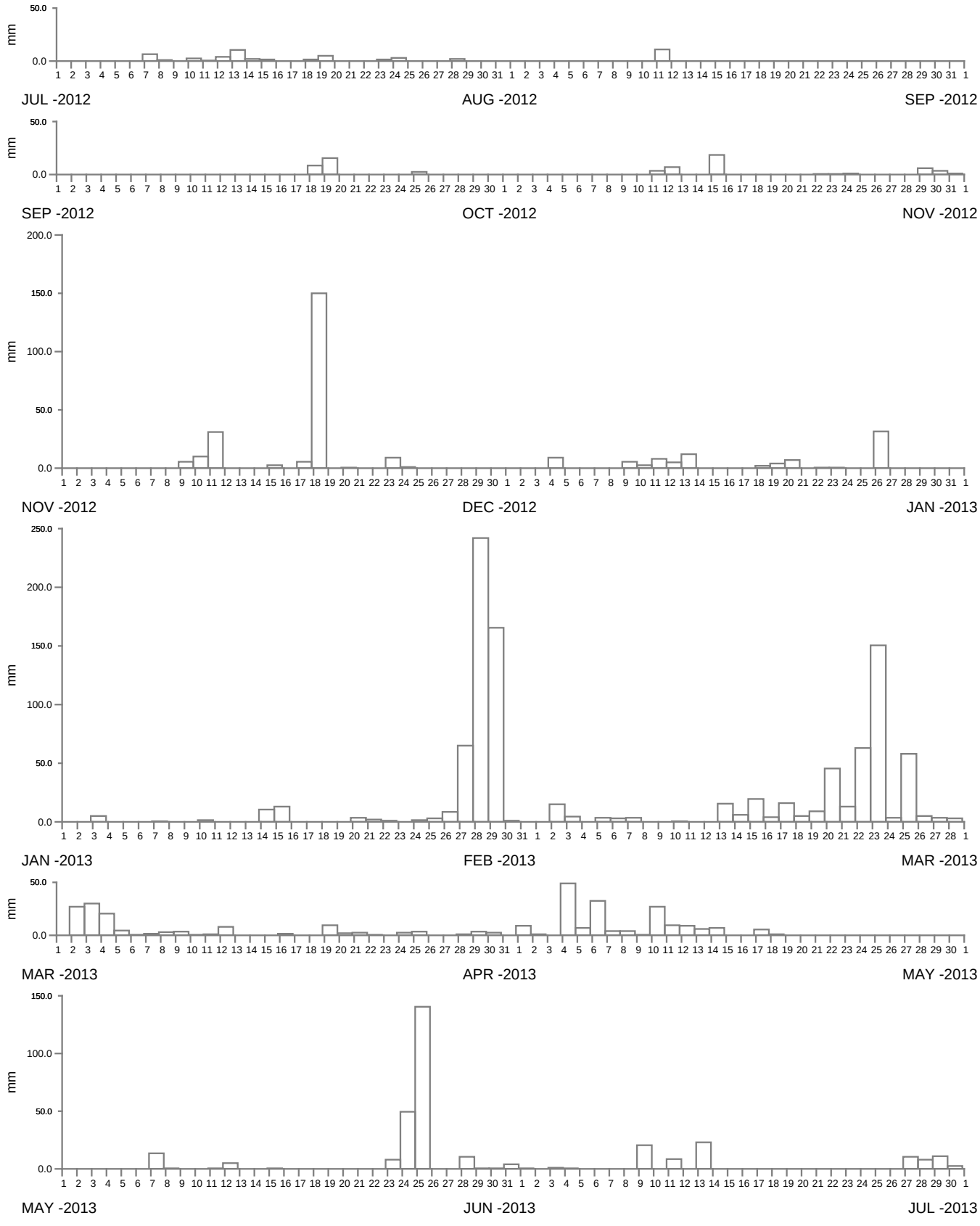
Public Works
Manly Hydraulics Laboratory

COFFS HARBOUR AT PERRY DRIVE
2012-2013

MHL Report 2220

Figure 14

DRAWING 2220-14



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

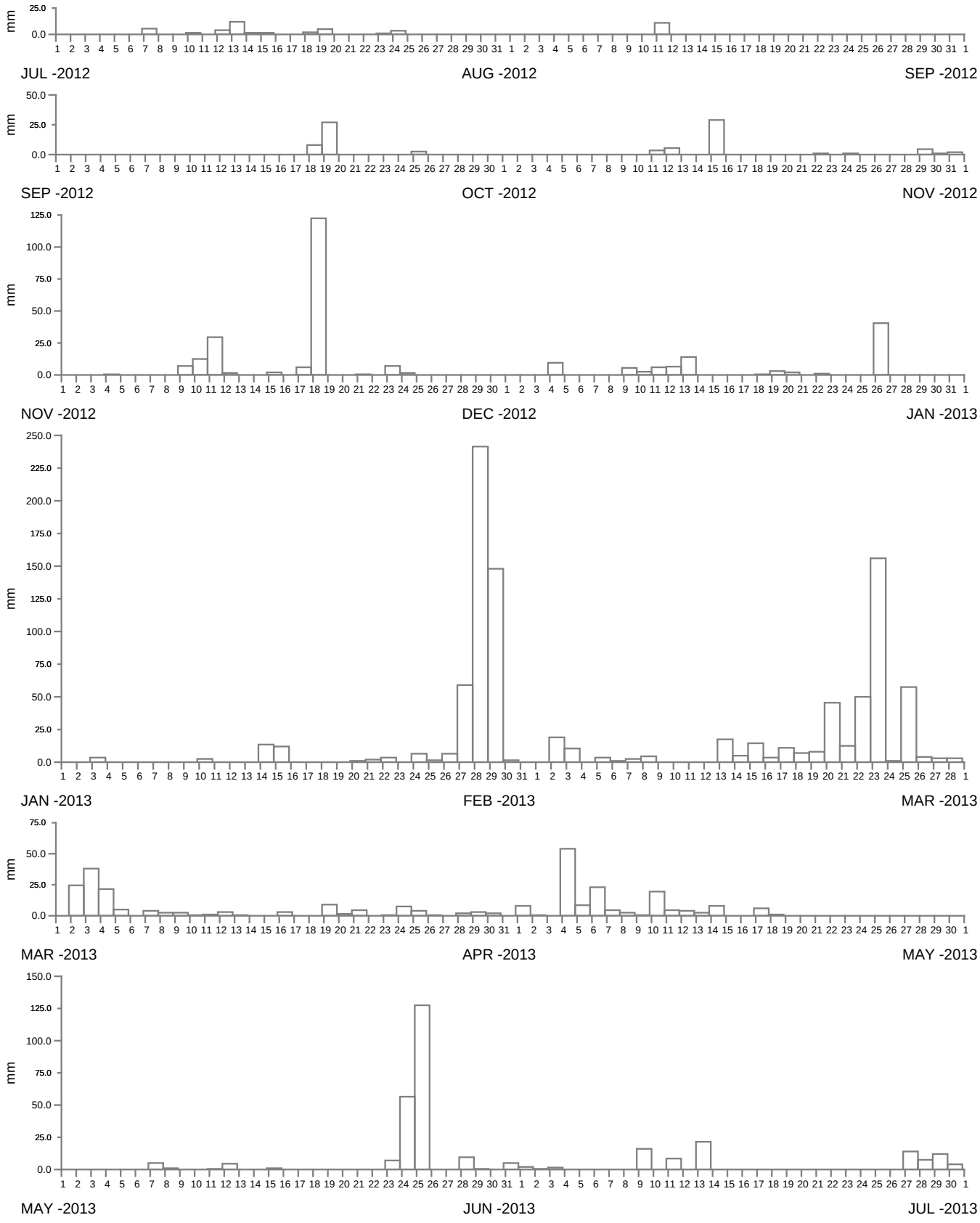
Public Works
Manly Hydraulics Laboratory

COFFS HARBOUR AT SHEPARDS LANE
2012-2013

MHL Report 2220

Figure 15

DRAWING 2220-15



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

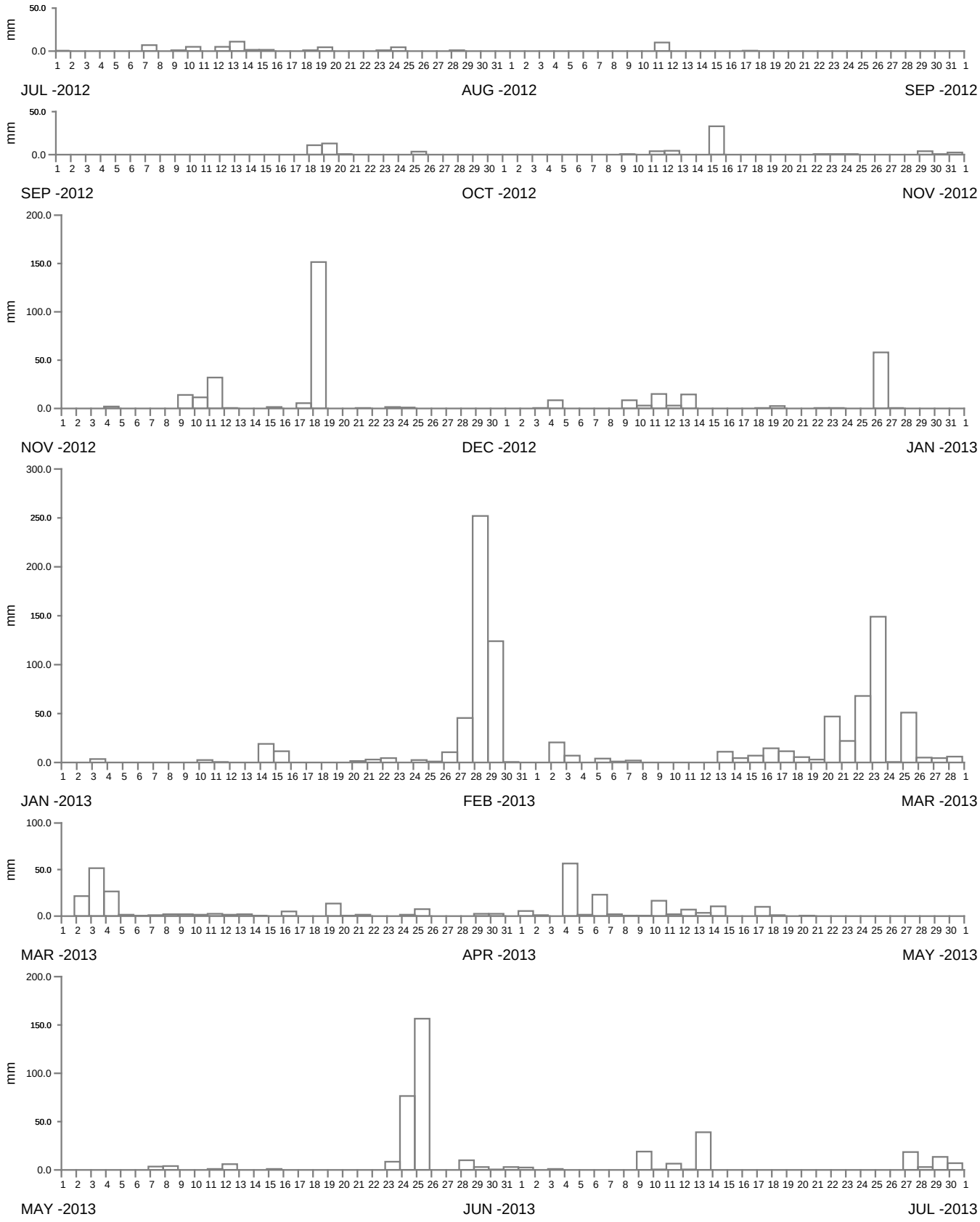
Public Works
Manly Hydraulics Laboratory

COFFS HARBOUR AT RED HILL
2012-2013

MHL Report 2220

Figure 16

DRAWING 2220-16



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

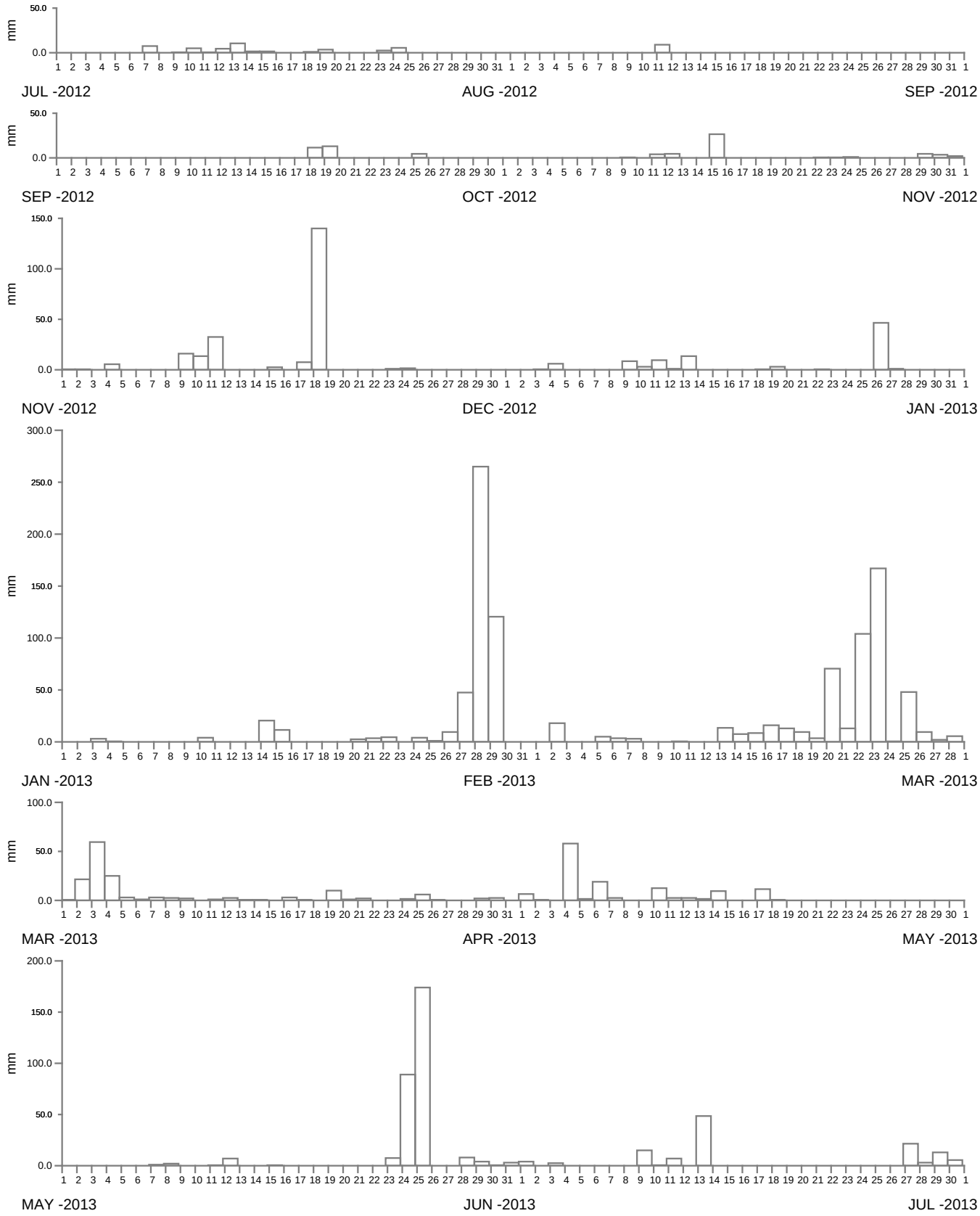
Public Works
Manly Hydraulics Laboratory

NEWPORTS CREEK AT ENGLANDS ROAD
2012-2013

MHL Report 2220

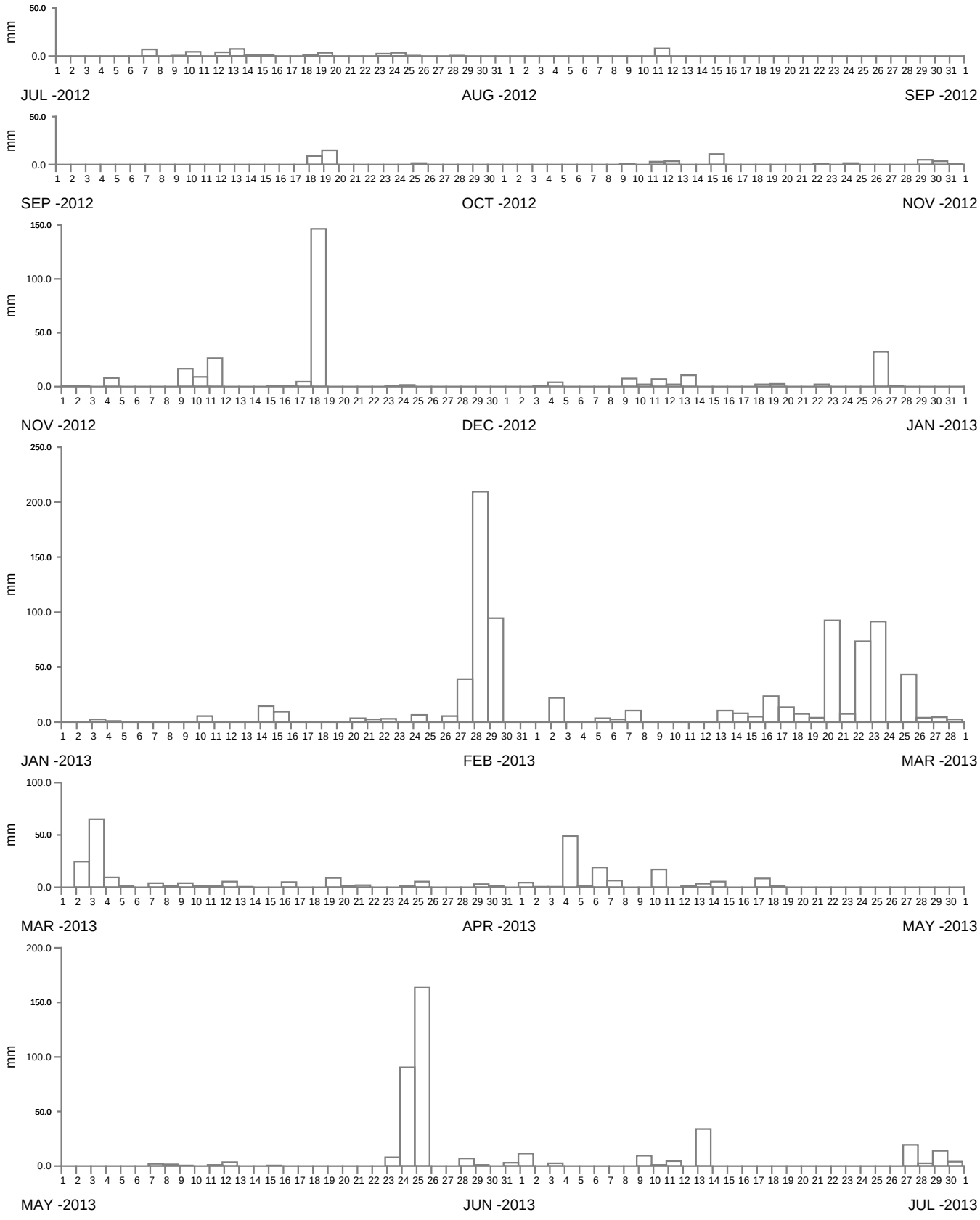
Figure 17

DRAWING 2220-17



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

NSW GOVERNMENT Public Works Manly Hydraulics Laboratory	MIDDLE BOAMBEE AT CEDARVALE ROAD 2012-2013	MHL Report 2220 Figure 18 DRAWING 2220-18



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

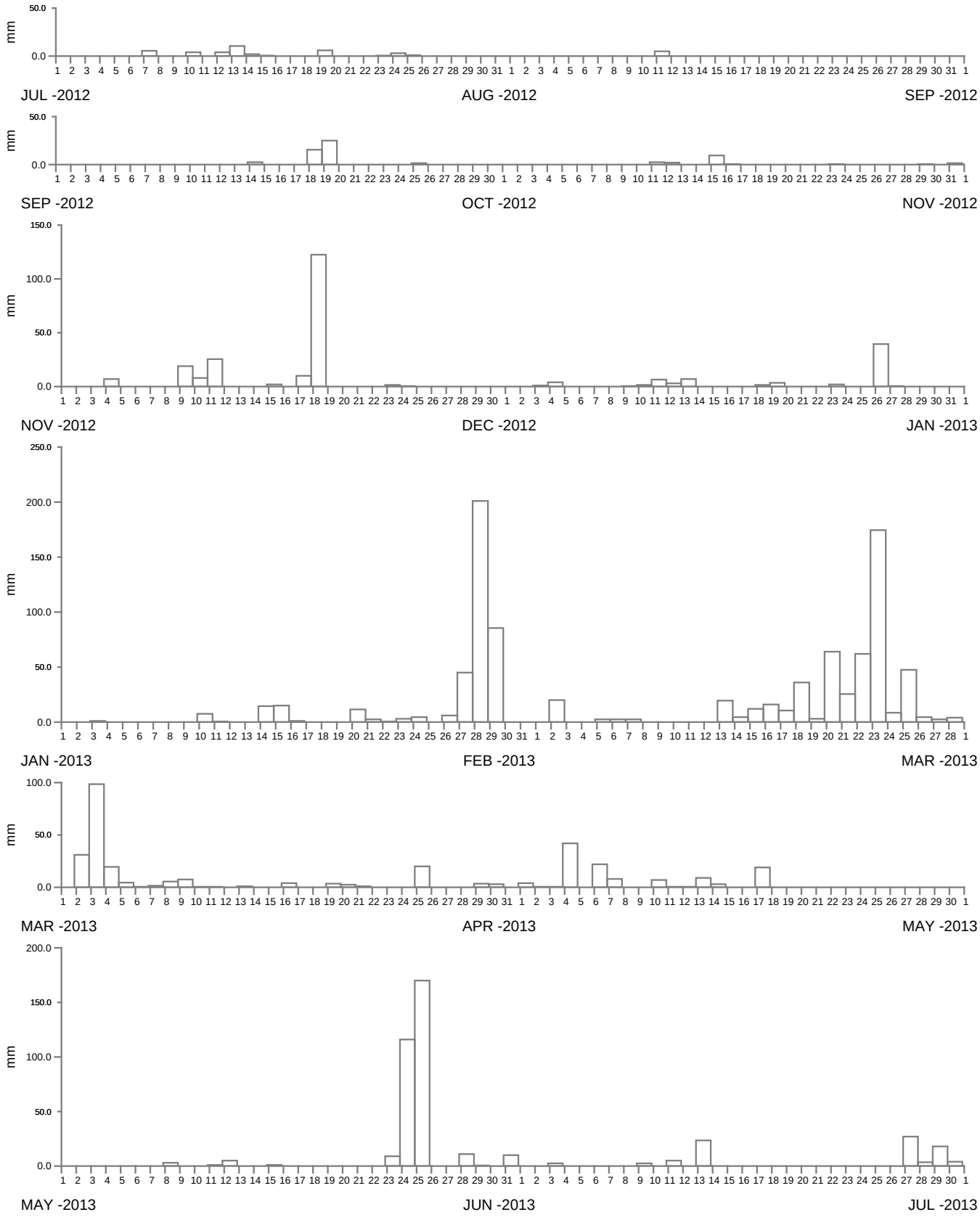
Public Works
Manly Hydraulics Laboratory

SOUTH BOAMBEE AT SOUTH BOAMBEE ROAD
2012-2013

MHL Report 2220

Figure 19

DRAWING 2220-19



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

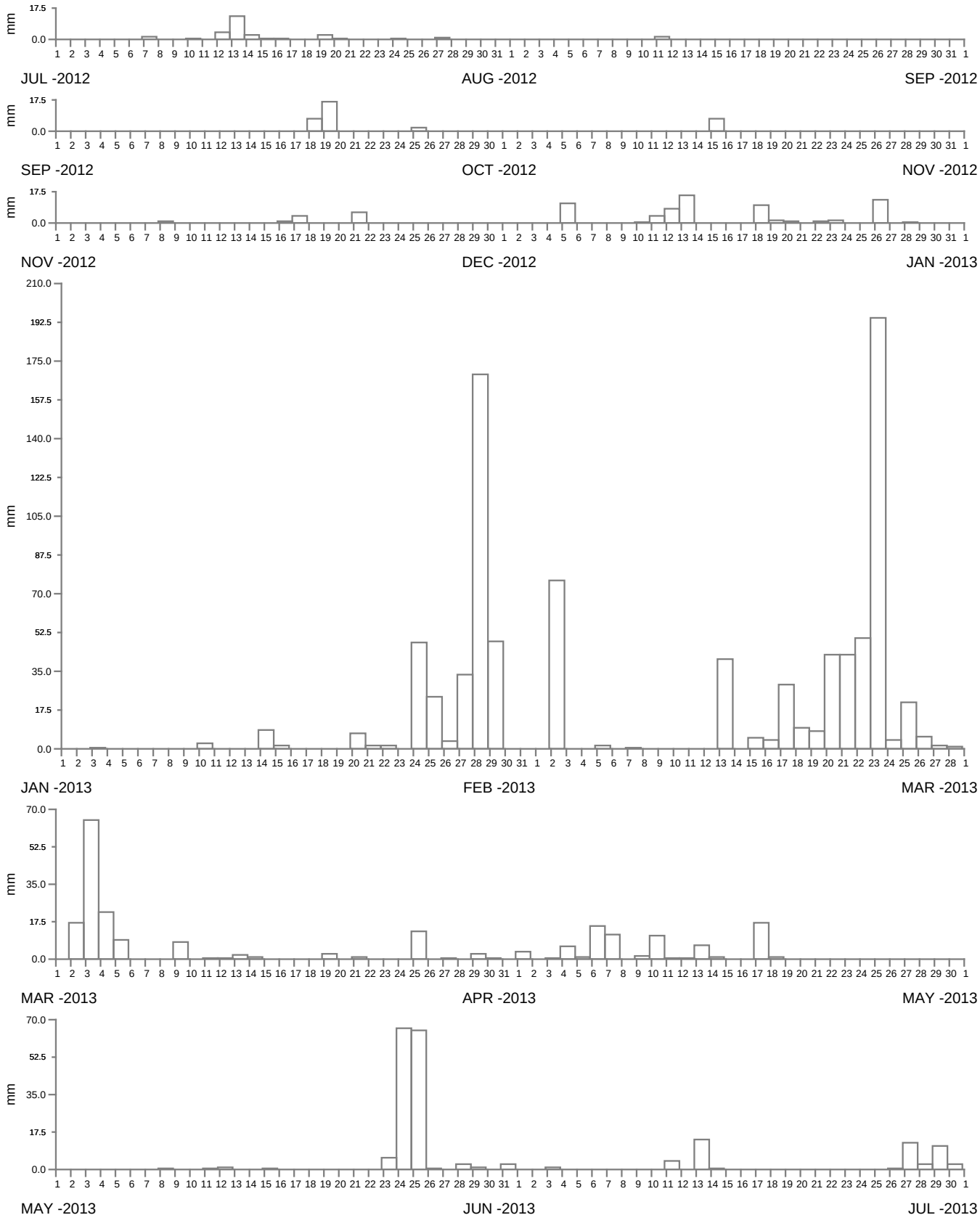
Public Works
Manly Hydraulics Laboratory

NORTH BONVILLE AT NORTH BONVILLE ROAD
2012-2013

MHL Report 2220

Figure 20

DRAWING 2220-20



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

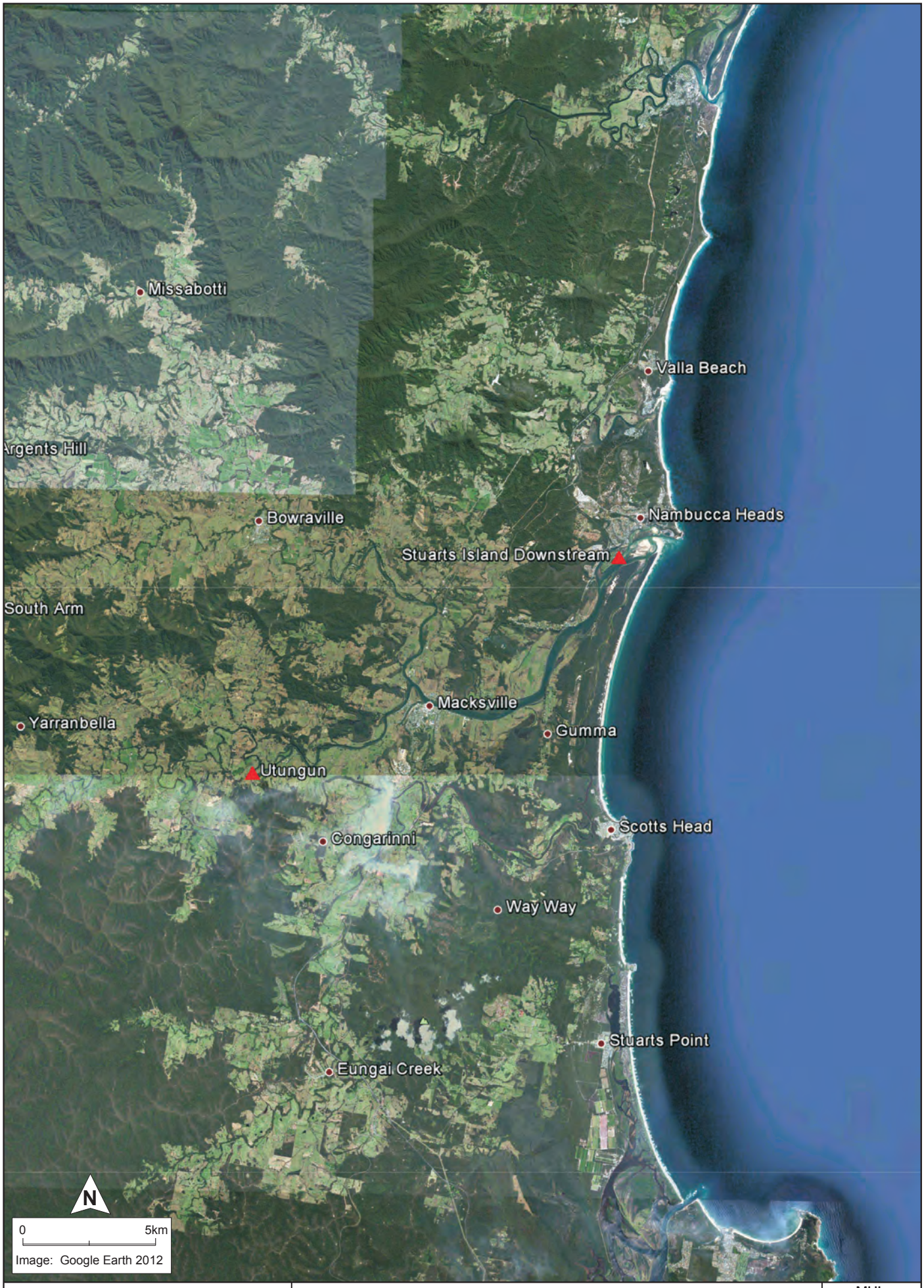
Public Works
Manly Hydraulics Laboratory

KALANG RIVER AT KOOROOWI
2012-2013

MHL Report 2220

Figure 21

DRAWING 2220-21



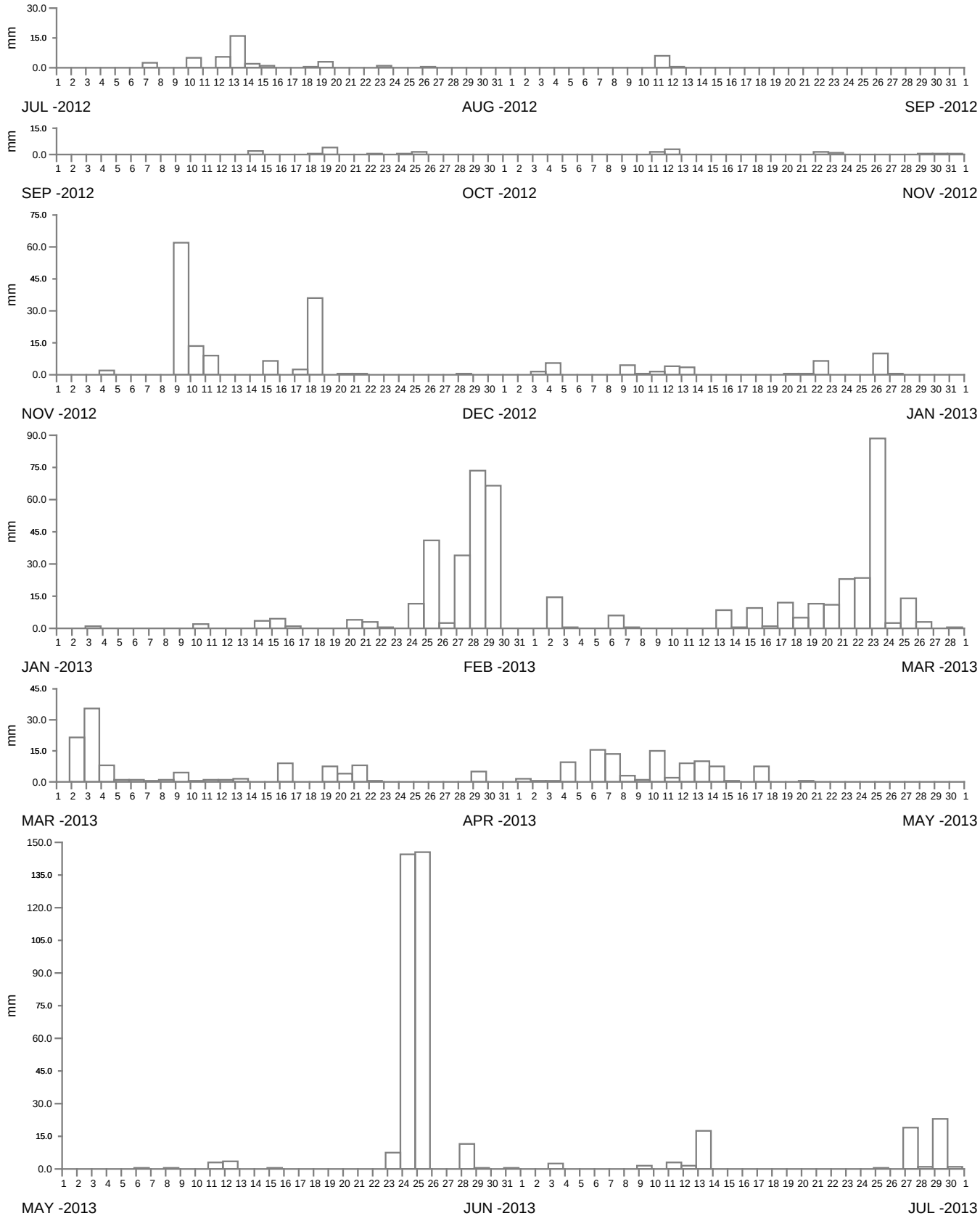
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
NAMBUCCA RIVER REGION

MHL Report 2220

Figure 22

DRAWING 2220-22.cdr

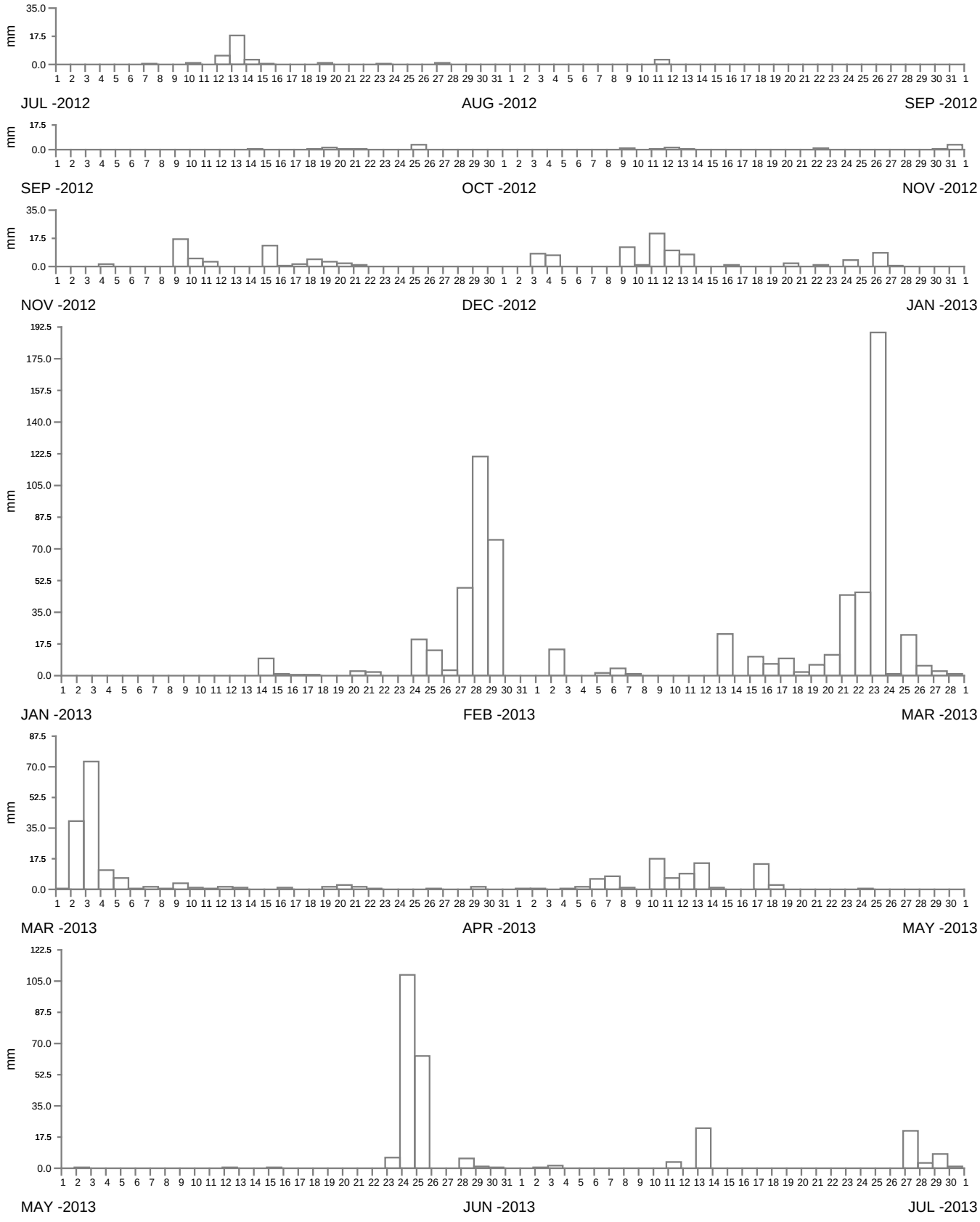


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

NAMBUCCA RIVER AT STUARTS ISLAND DOWNSTREAM
2012-2013

MHL Report 2220
Figure 23
DRAWING 2220-23



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

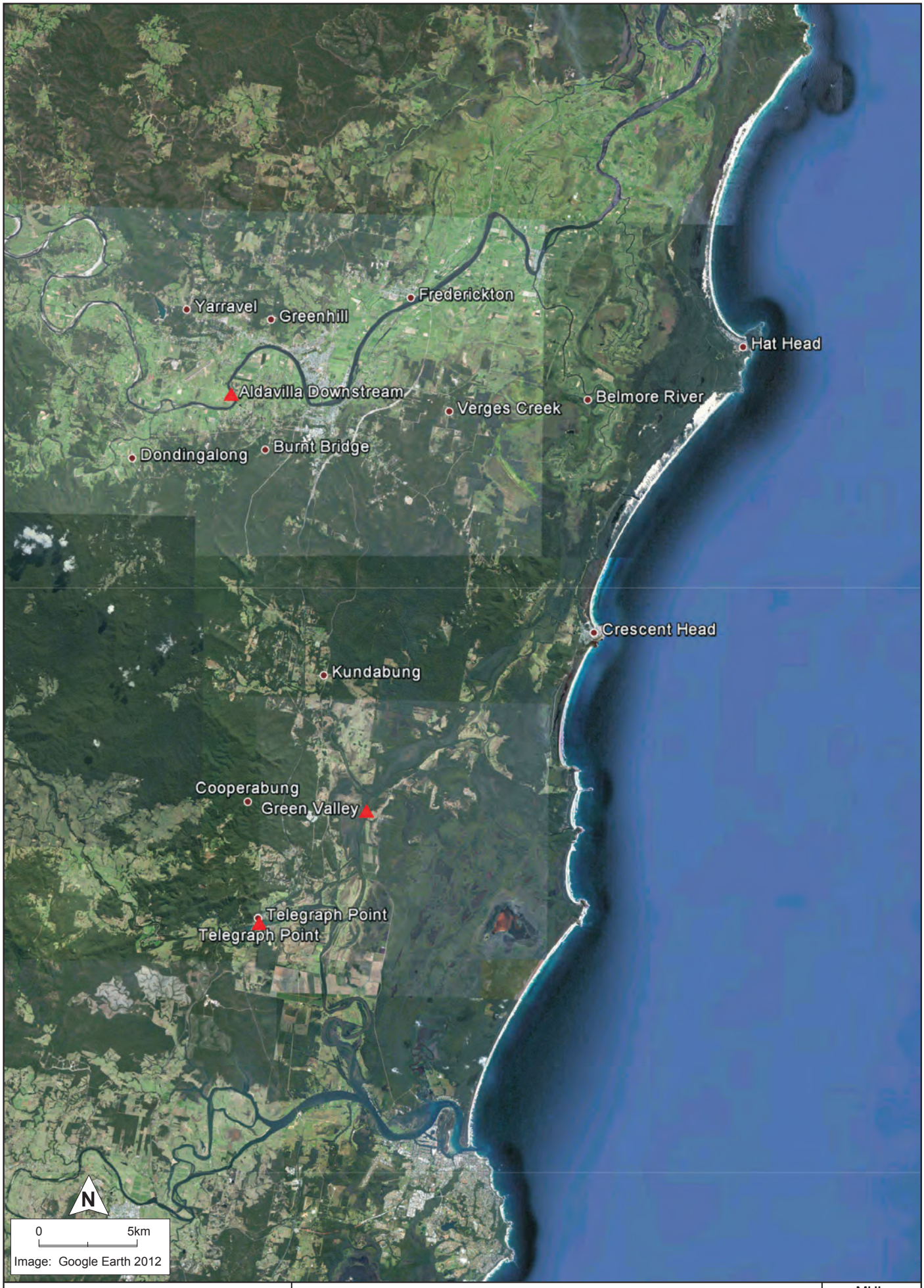
Public Works
Manly Hydraulics Laboratory

NAMBUCCA RIVER AT UTUNGUN
2012-2013

MHL Report 2220

Figure 24

DRAWING 2220-24



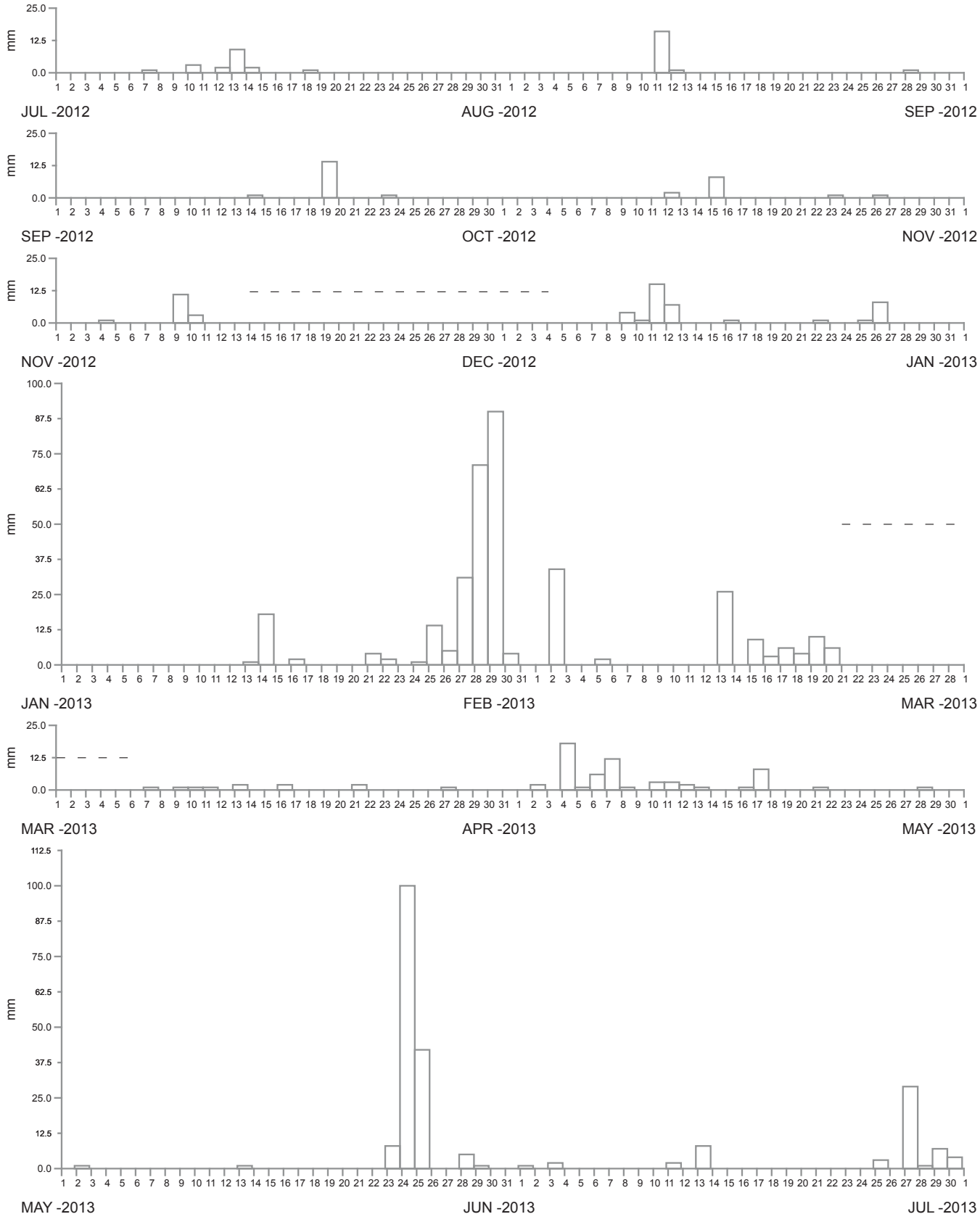
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
MACLEAY RIVER AND HASTINGS RIVER REGIONS

MHL Report 2220

Figure 25

DRAWING 2220-25.cdr



DATA LOSS

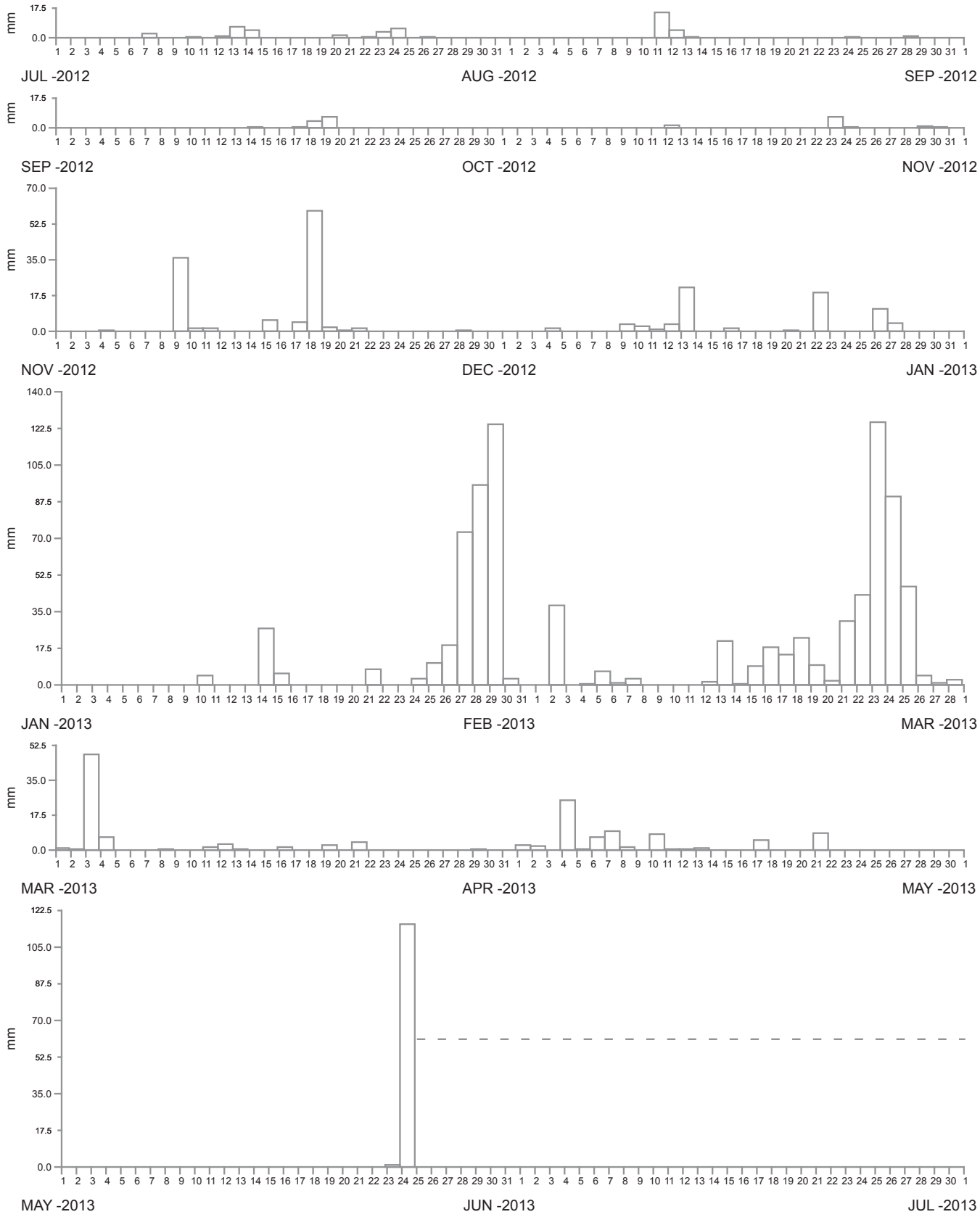
Public Works
Manly Hydraulics Laboratory

MACLEAY RIVER AT ALDAVILLA DOWNSTREAM
2012-2013

MHL Report 2220

Figure 26

DRAWING 2220-26



DATA LOSS

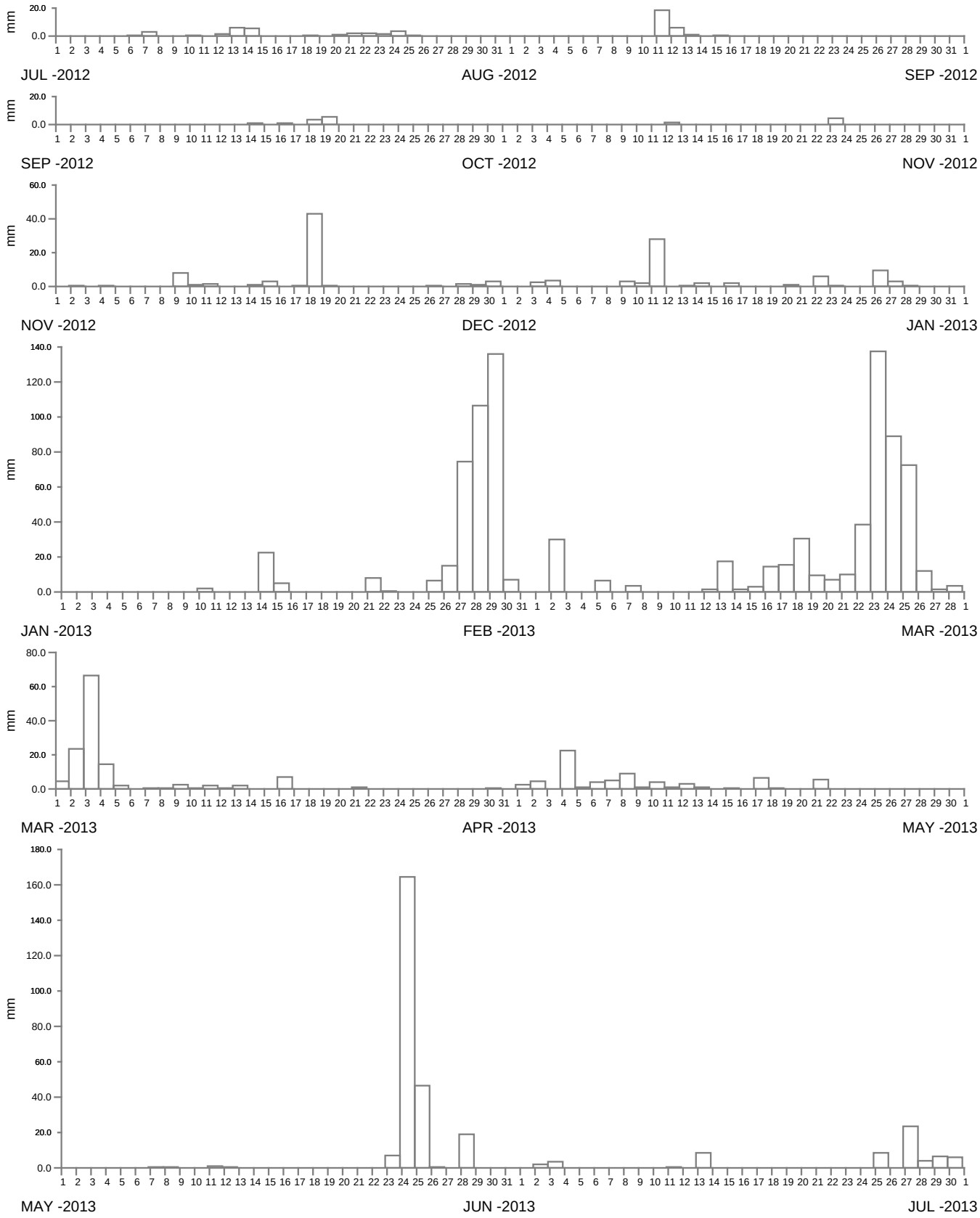
Public Works
Manly Hydraulics Laboratory

MARIA RIVER AT GREEN VALLEY
2012-2013

MHL Report 2220

Figure 27

DRAWING 2220-27



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

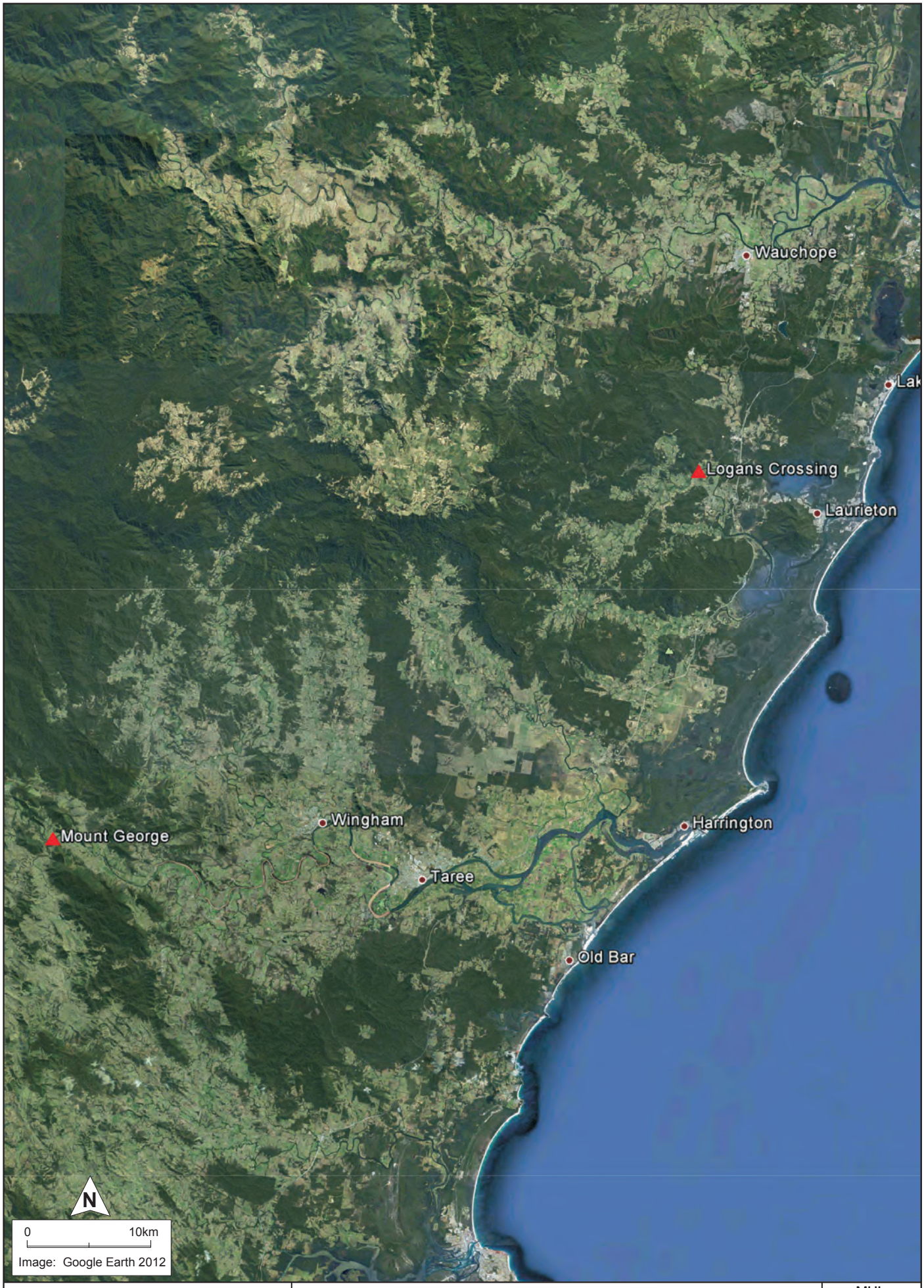
Public Works
Manly Hydraulics Laboratory

WILSONS RIVER AT TELEGRAPH POINT
2012-2013

MHL Report 2220

Figure 28

DRAWING 2220-28



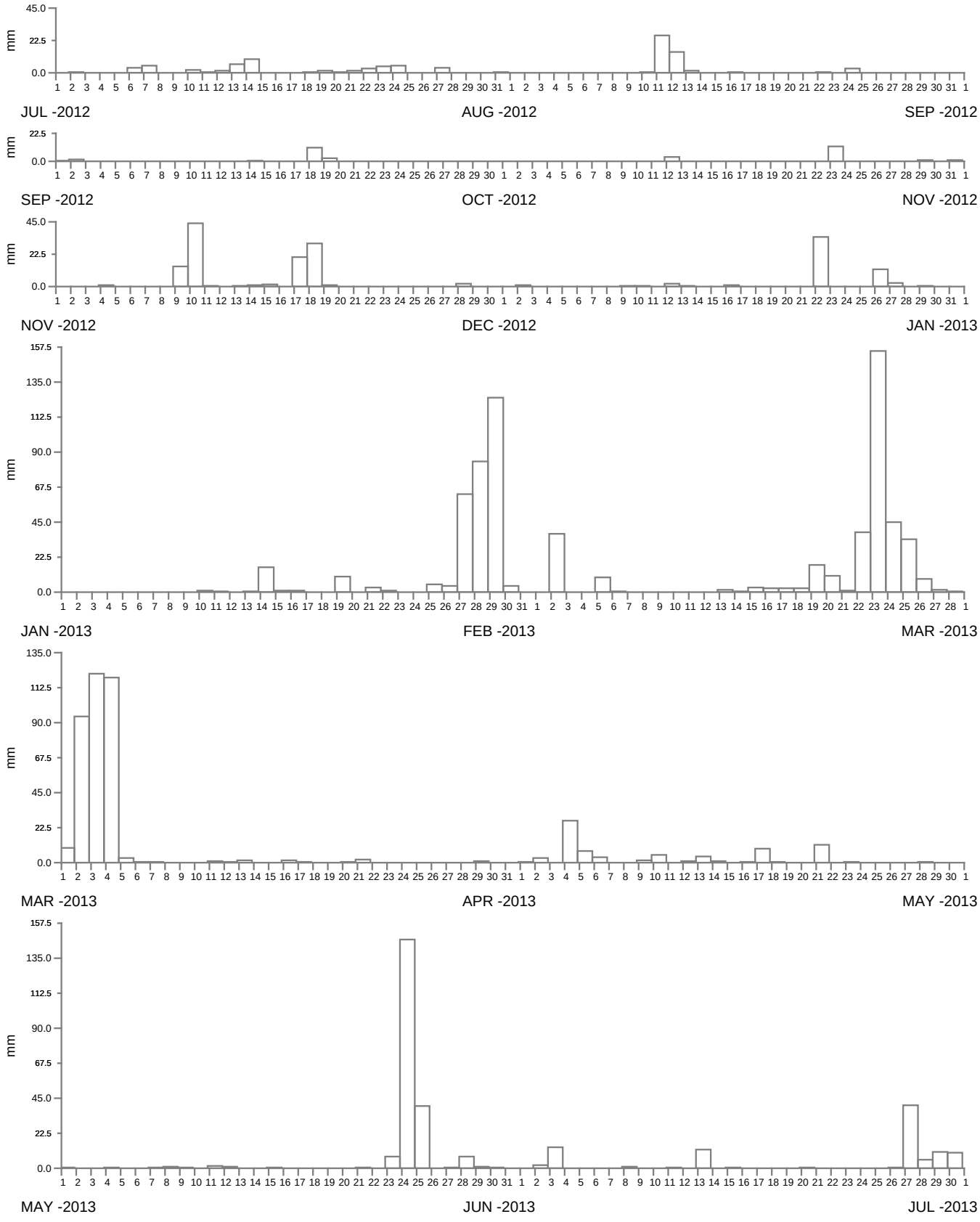
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
CAMDEN HAVEN REGION

MHL Report 2220

Figure 29

DRAWING 2220-29.cdr



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

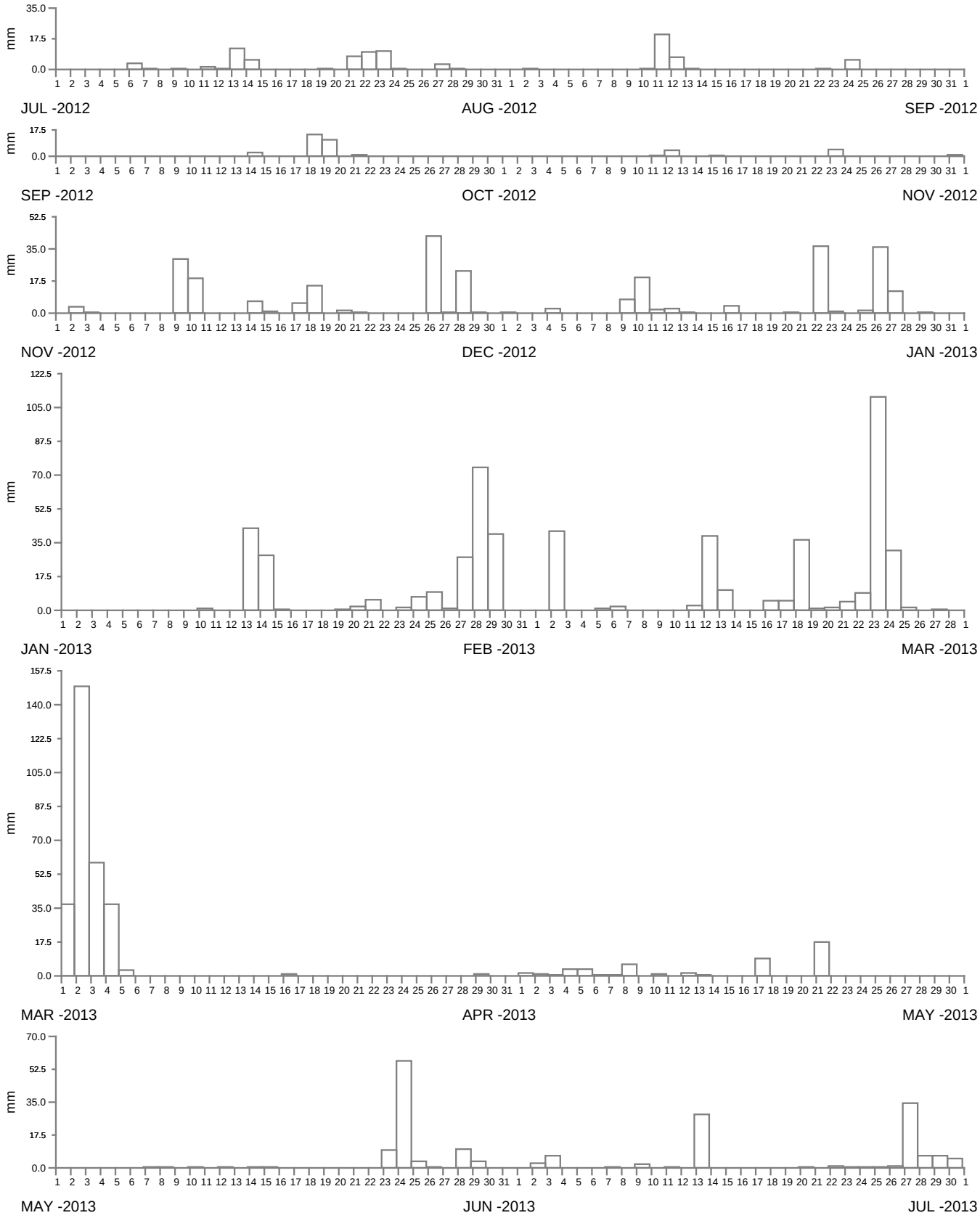
Public Works
Manly Hydraulics Laboratory

CAMDEN HAVEN AT LOGANS CROSSING
2012-2013

MHL Report 2220

Figure 30

DRAWING 2220-30



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

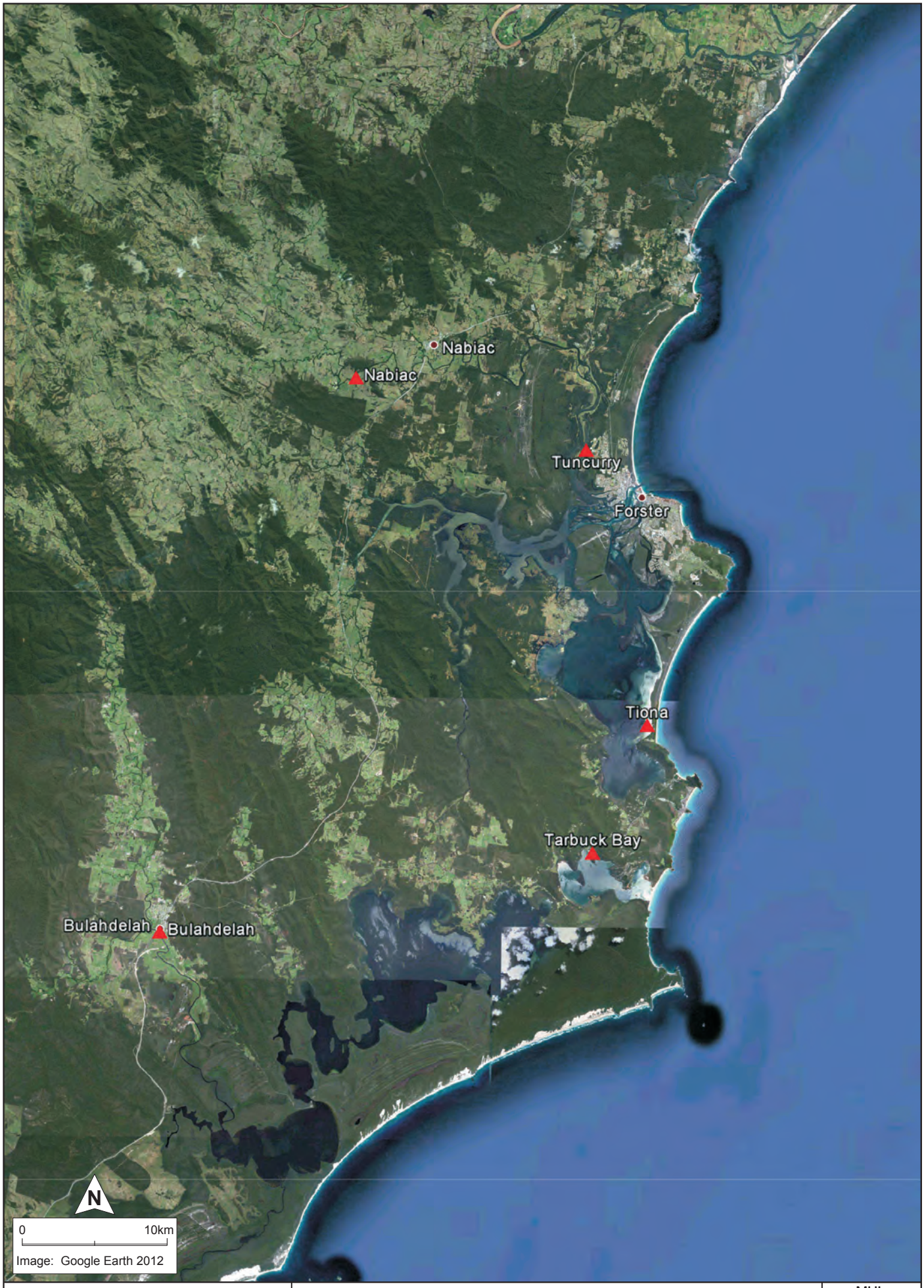
Public Works
Manly Hydraulics Laboratory

MANNING RIVER AT MT GEORGE
2012-2013

MHL Report 2220

Figure 31

DRAWING 2220-31



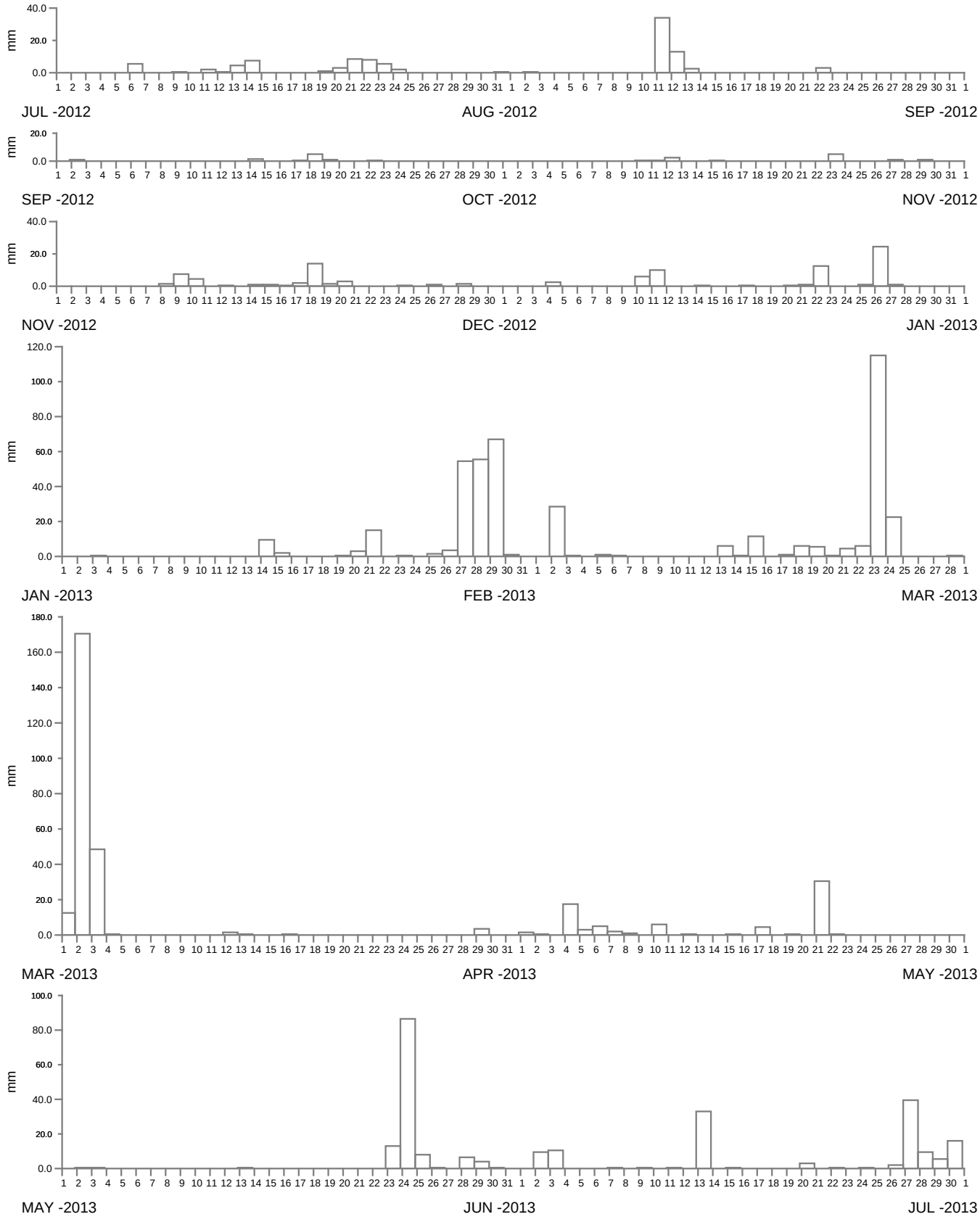
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
KARUAH RIVER REGION

MHL
Report 2220

Figure
32

DRAWING 2220-32.cdr



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

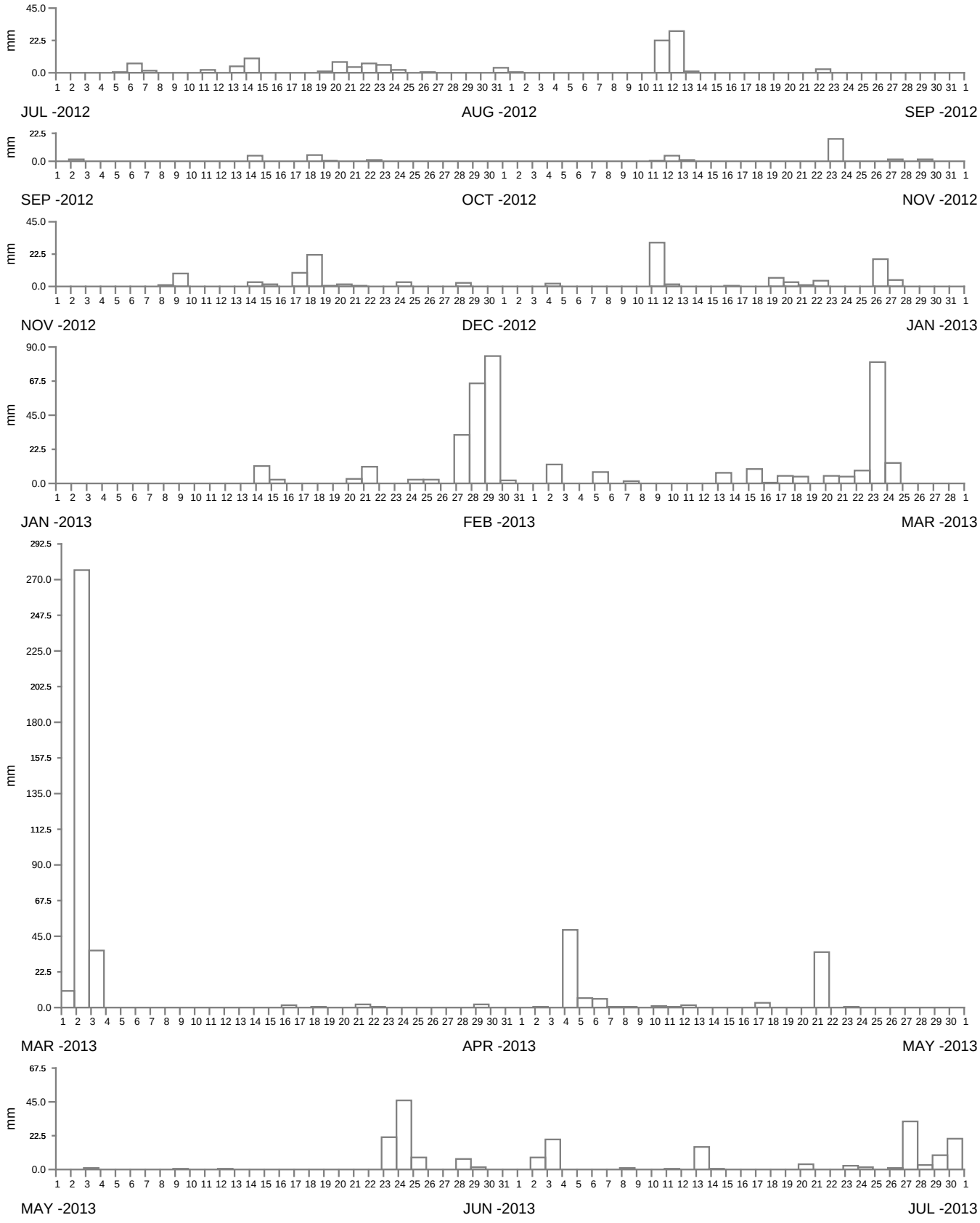
Public Works
Manly Hydraulics Laboratory

WALLAMBA RIVER AT NABIAC
2012-2013

MHL Report 2220

Figure 33

DRAWING 2220-33



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

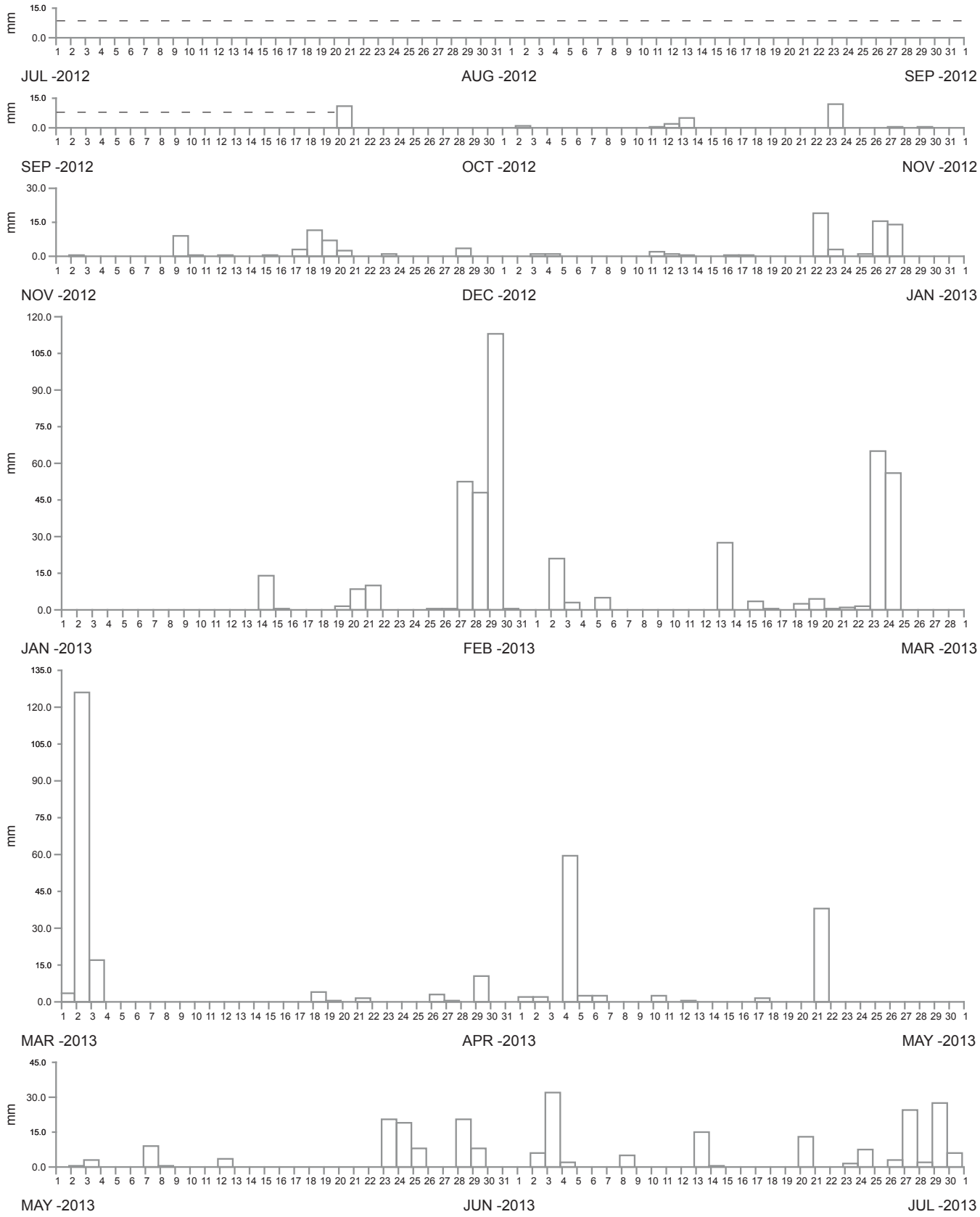
Public Works
Manly Hydraulics Laboratory

WALLAMBA RIVER AT TUNCURRY
2012-2013

MHL Report 2220

Figure 34

DRAWING 2220-34



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

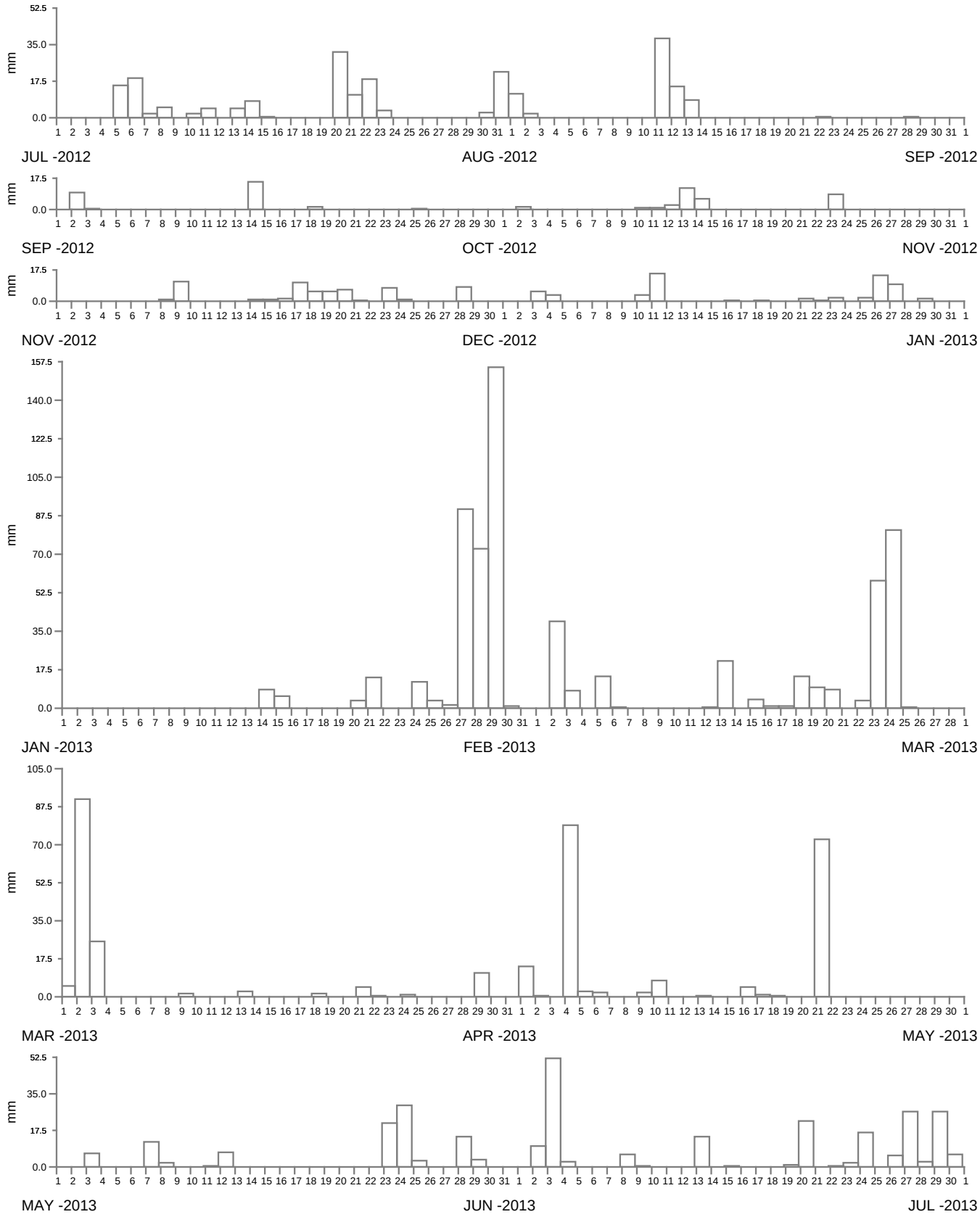
Public Works
Manly Hydraulics Laboratory

WALLIS LAKE AT TIONA
2012-2013

MHL Report 2220

Figure 35

DRAWING 2220-35



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

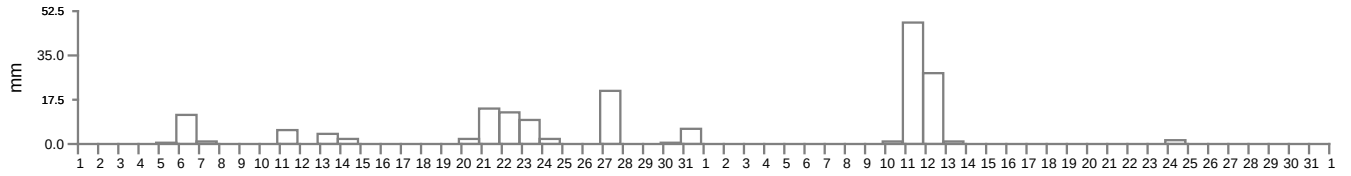
Public Works
Manly Hydraulics Laboratory

SMITHS LAKE AT TARBUCK BAY
2012-2013

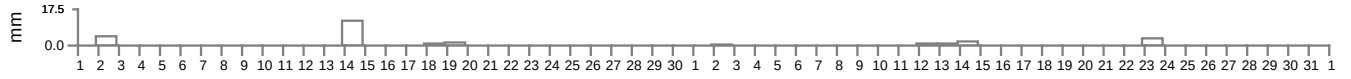
MHL Report 2220

Figure 36

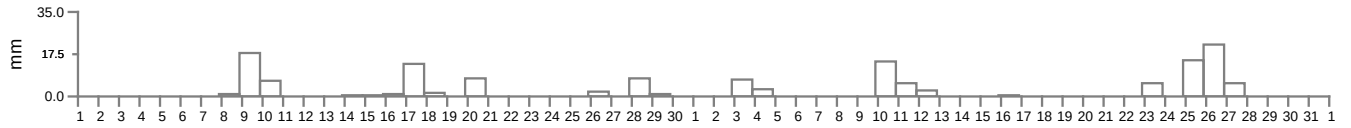
DRAWING 2220-36



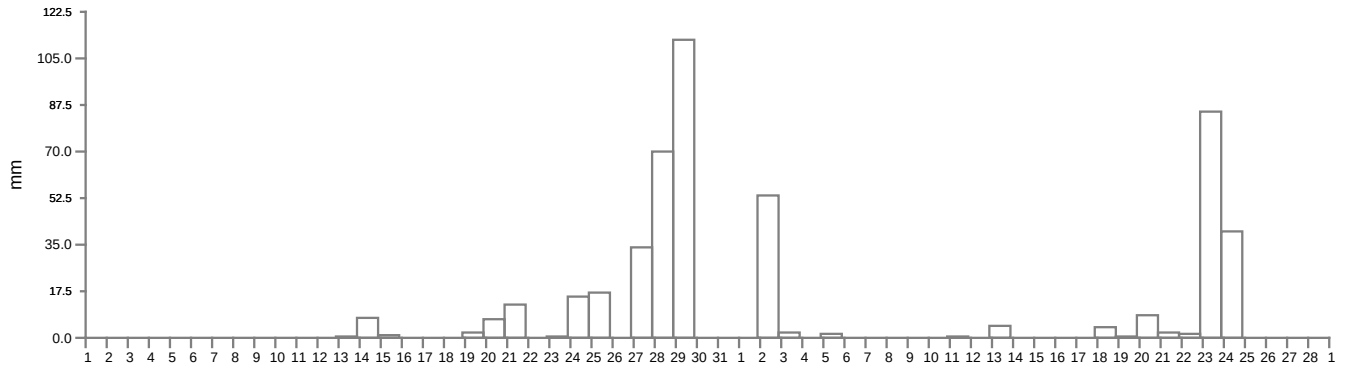
JUL -2012 AUG -2012 SEP -2012



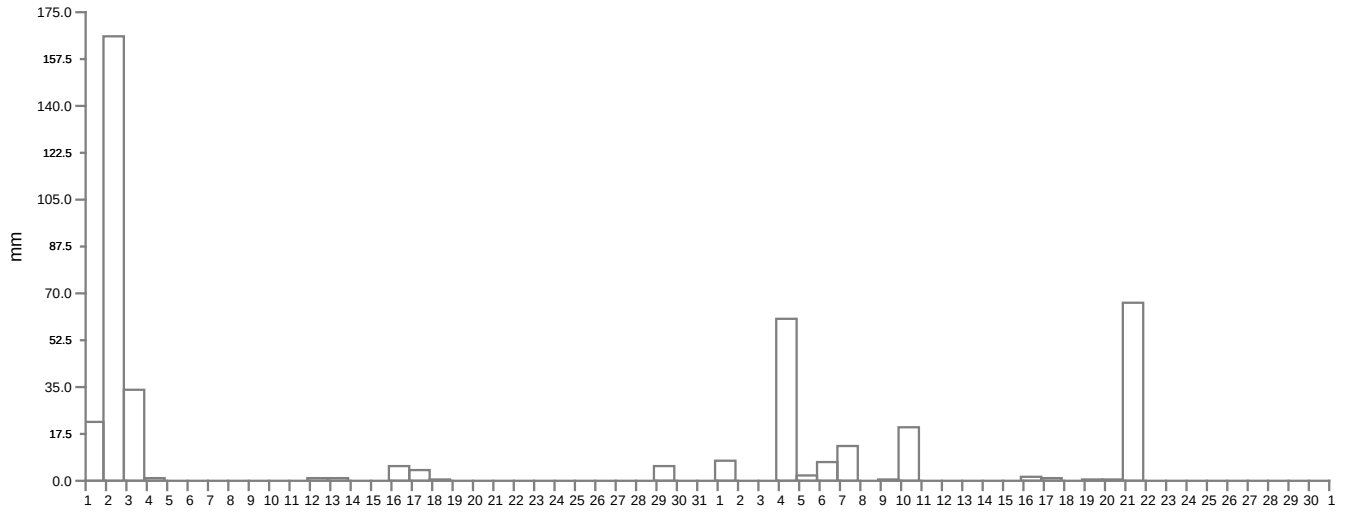
SEP -2012 OCT -2012 NOV -2012



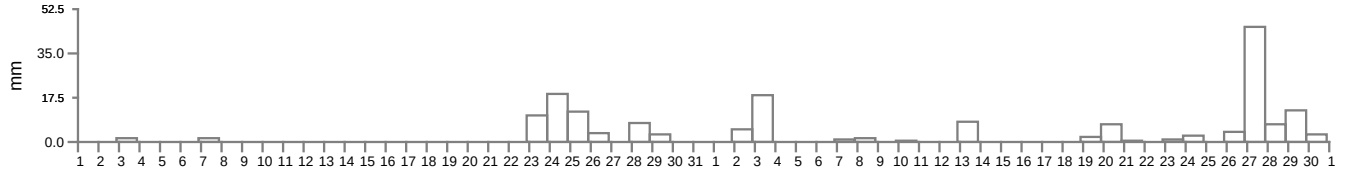
NOV -2012 DEC -2012 JAN -2013



JAN -2013 FEB -2013 MAR -2013



MAR -2013 APR -2013 MAY -2013



MAY -2013 JUN -2013 JUL -2013

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

Public Works
Manly Hydraulics Laboratory

MYALL RIVER AT BULAHDELAH
2012-2013

MHL Report 2220

Figure 37

DRAWING 2220-37

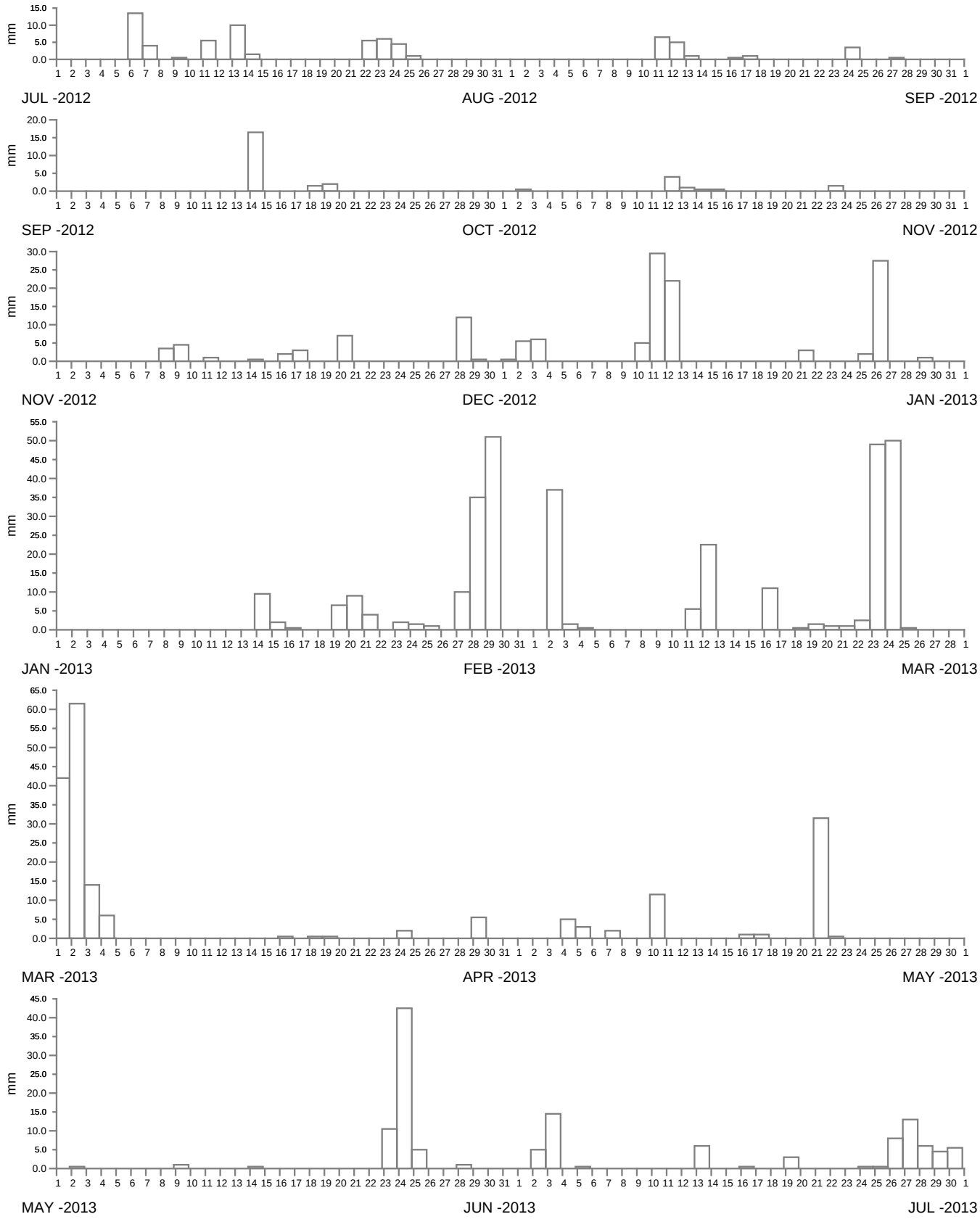
NSW GOVERNMENT
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
HUNTER RIVER (NORTH) REGION

MHL Report 2220

Figure 38

DRAWING 2220-38.cdr



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

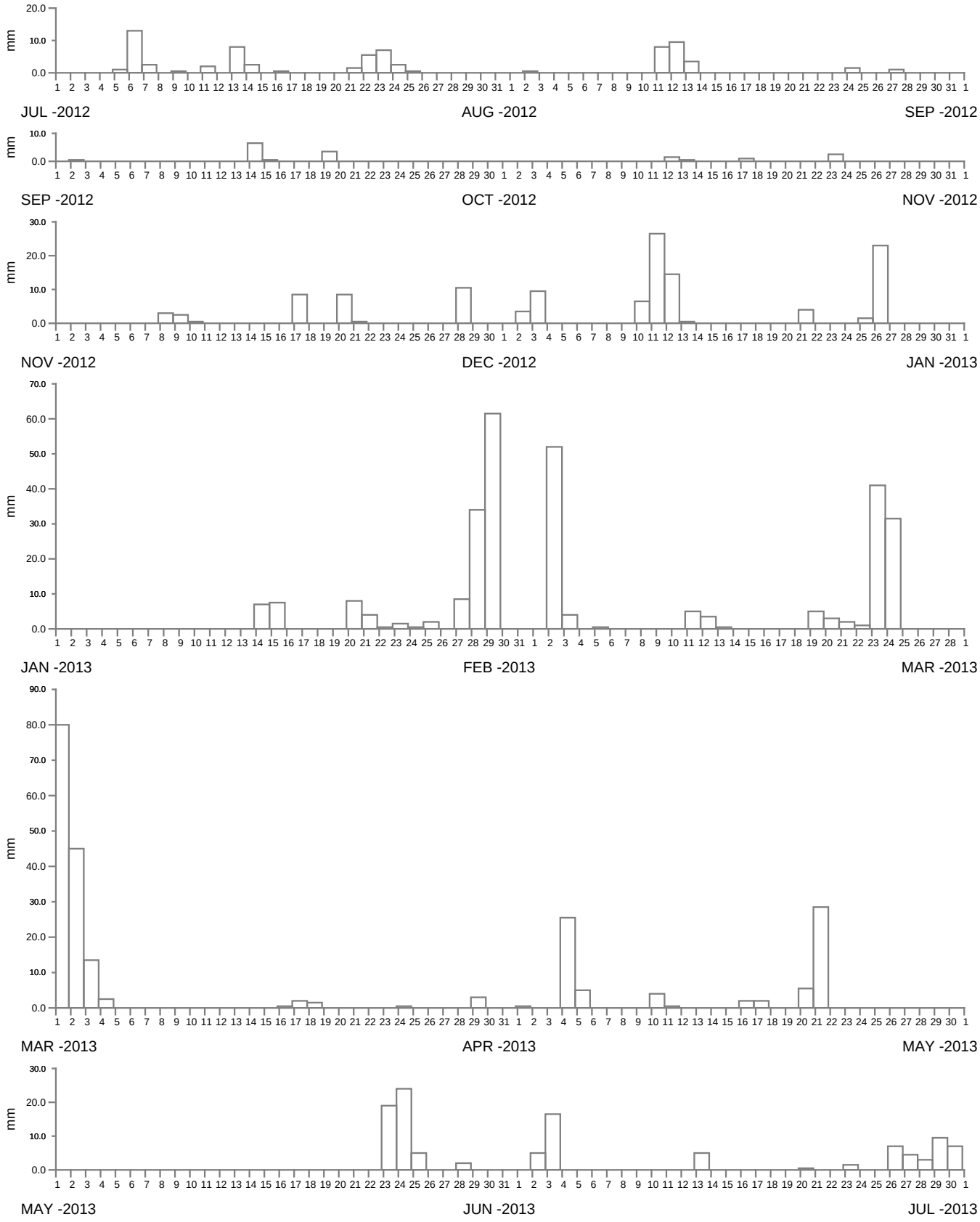
Public Works
Manly Hydraulics Laboratory

PATERSON RIVER AT GOSTWYCK
2012-2013

MHL Report 2220

Figure 39

DRAWING 2220-39



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

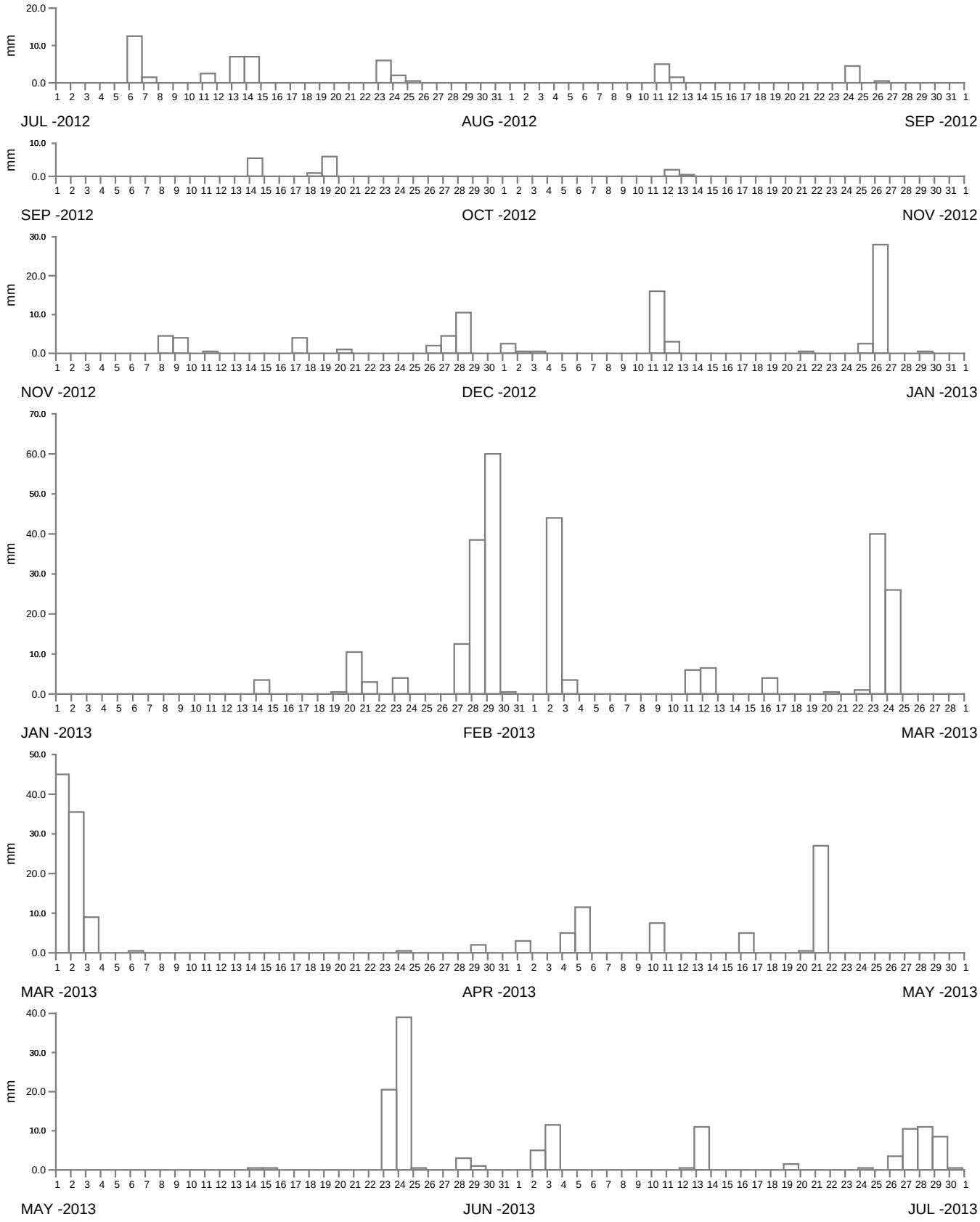
Public Works
Manly Hydraulics Laboratory

WILLIAMS RIVER AT SEAHAM
2012-2013

MHL Report 2220

Figure 40

DRAWING 2220-40



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

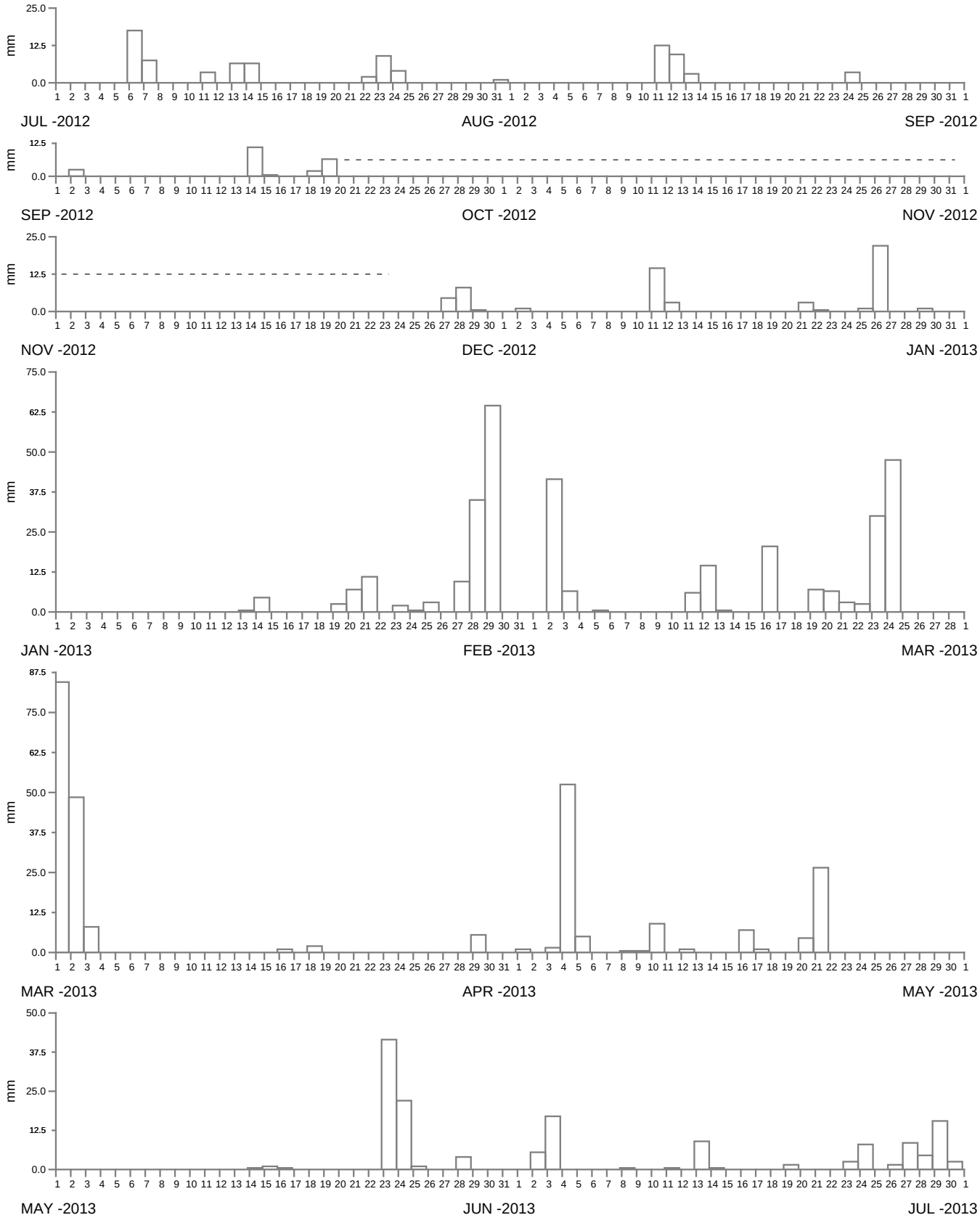
Public Works
Manly Hydraulics Laboratory

HUNTER RIVER AT BELMORE BRIDGE
2012-2013

MHL Report 2220

Figure 41

DRAWING 2220-41

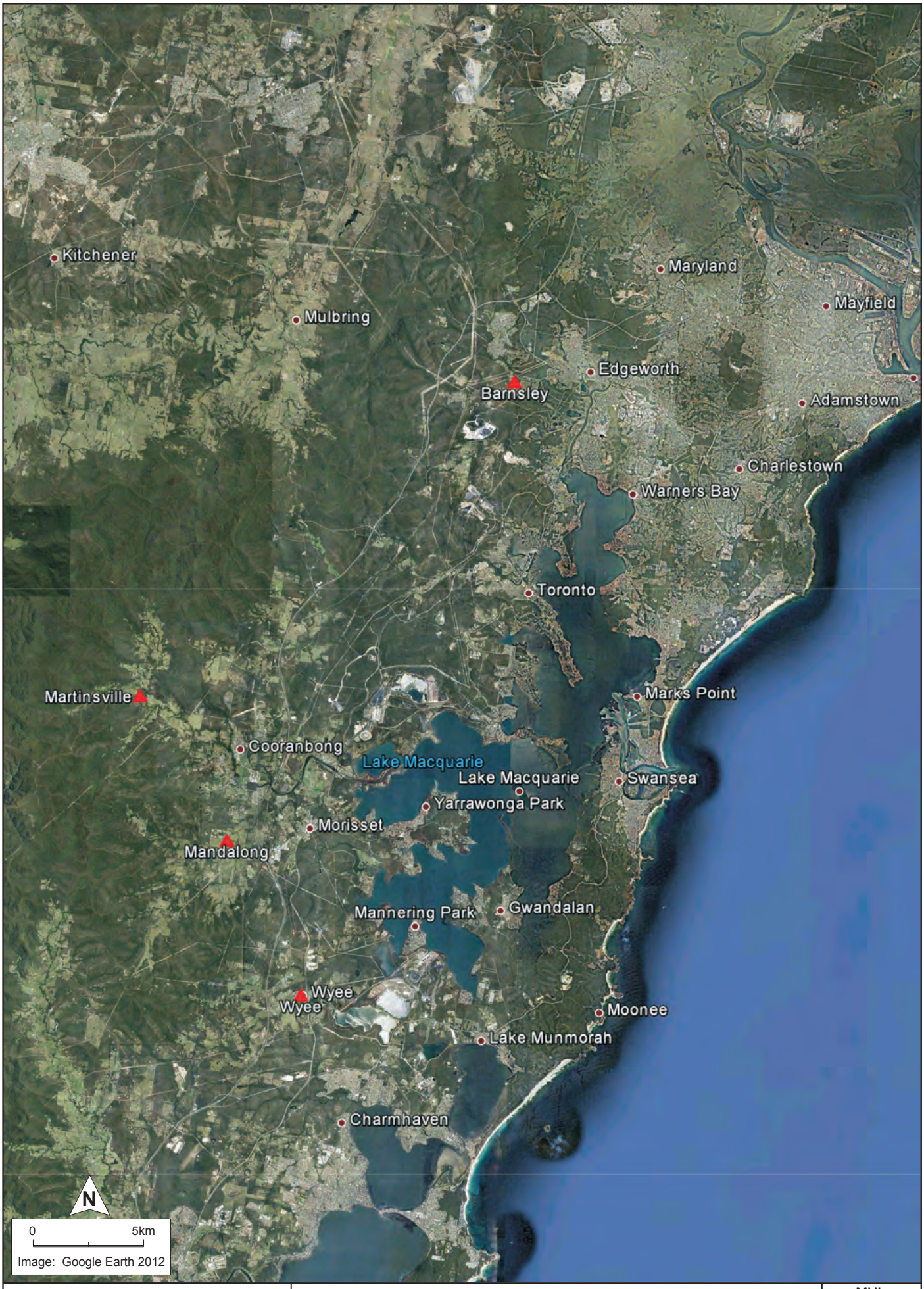


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

HUNTER RIVER AT HEXHAM BRIDGE
2012-2013

MHL Report 2220
Figure 42
DRAWING 2220-42



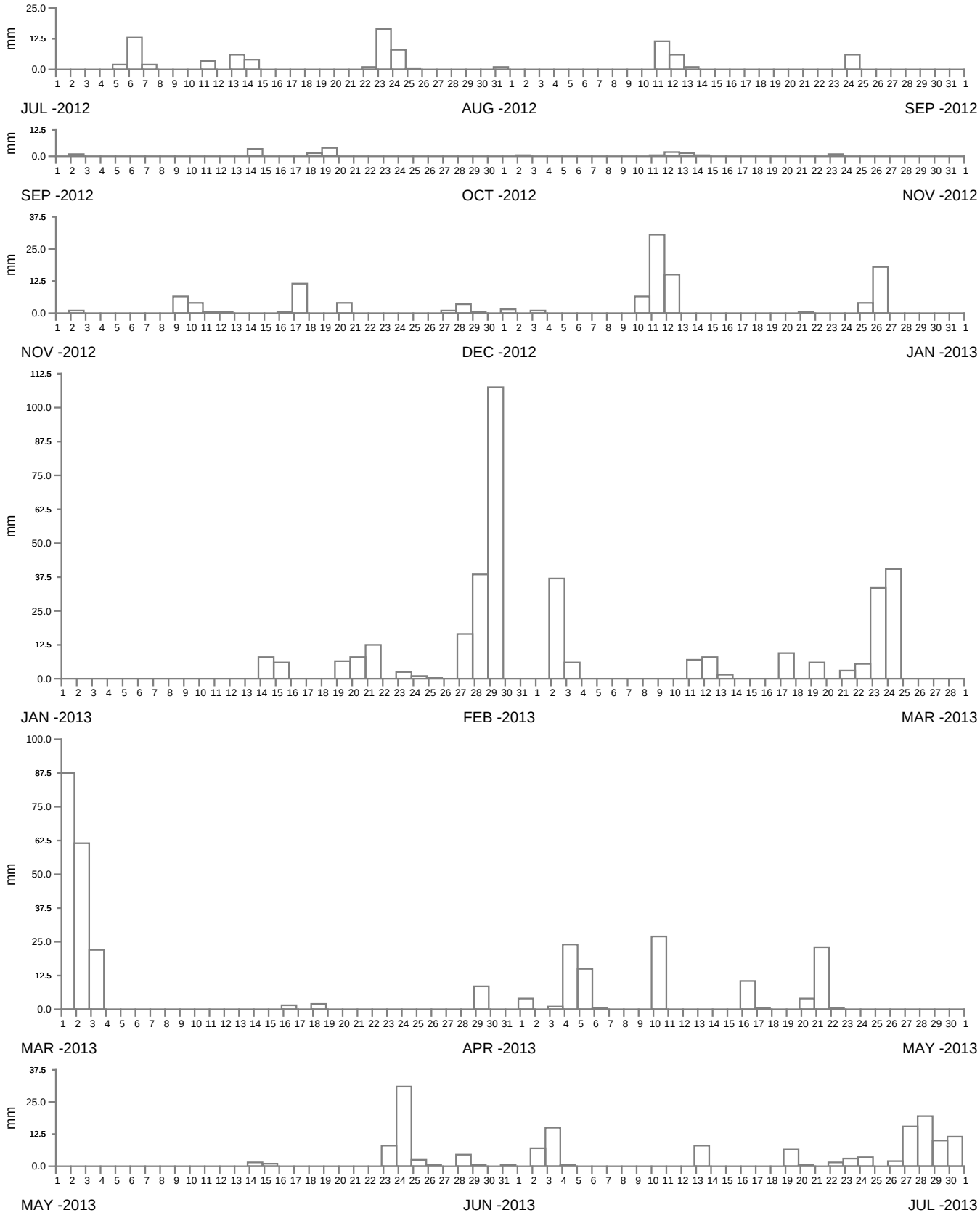
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
MACQUARIE-TUGGERAH LAKES (NORTH) REGION

MHL Report 2220

Figure 43

DRAWING 2220-43.cdr



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

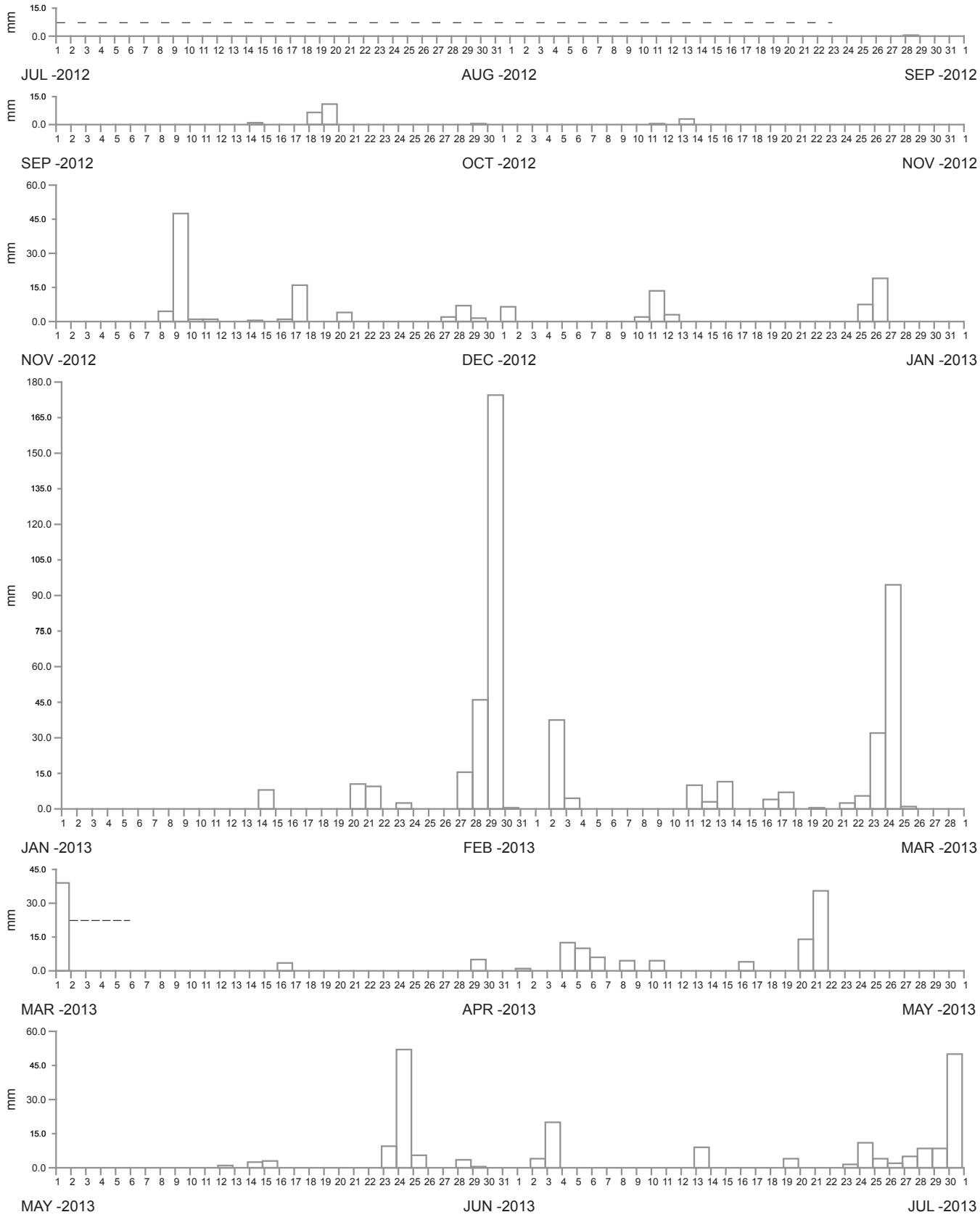
Public Works
Manly Hydraulics Laboratory

BARNSLEY AT JOHNSON AVENUE
2012-2013

MHL Report 2220

Figure 44

DRAWING 2220-44



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

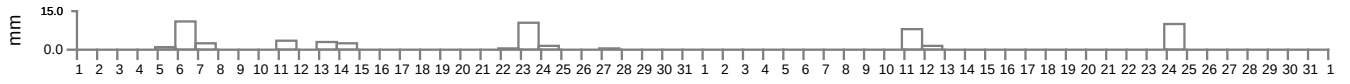
Public Works
Manly Hydraulics Laboratory

MARTINSVILLE AT MARTINSVILLE ROAD
2012-2013

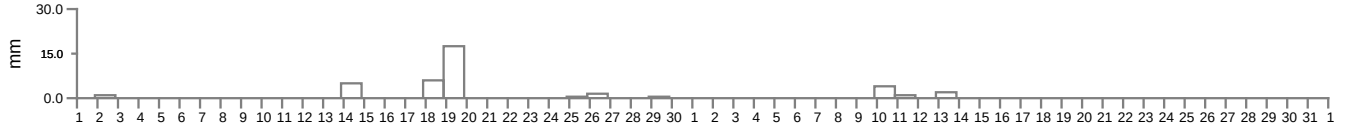
MHL Report 2220

Figure 45

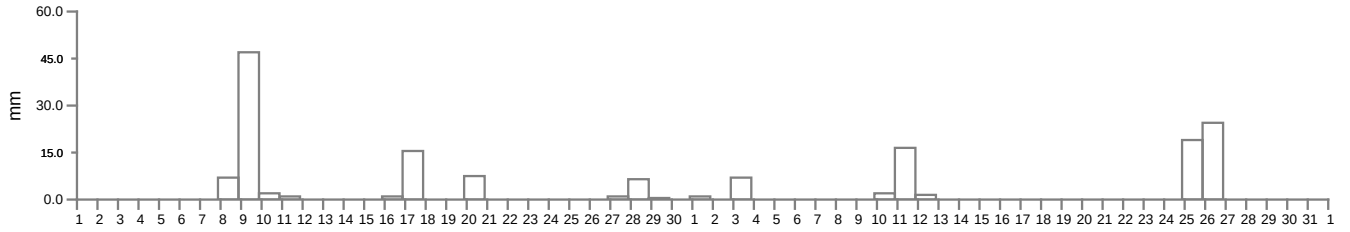
DRAWING 2220-45



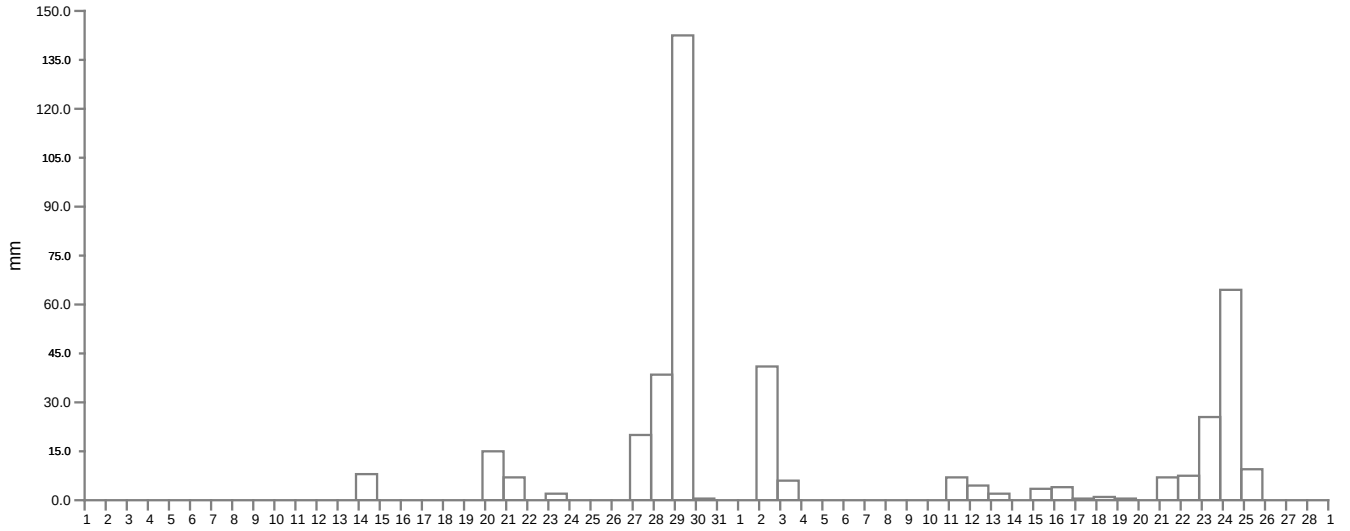
JUL -2012 AUG -2012 SEP -2012



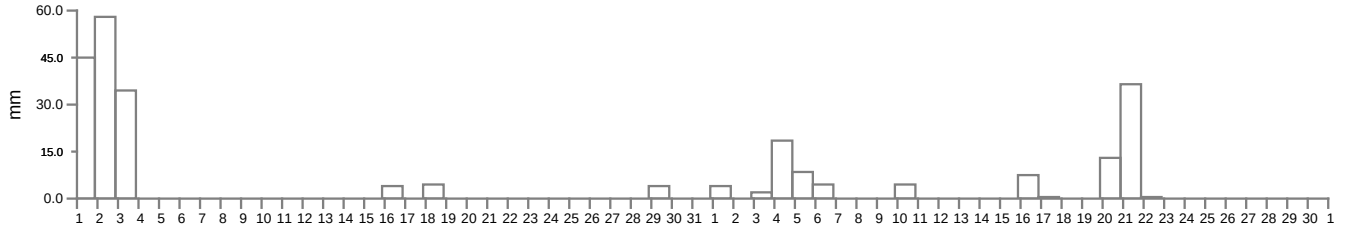
SEP -2012 OCT -2012 NOV -2012



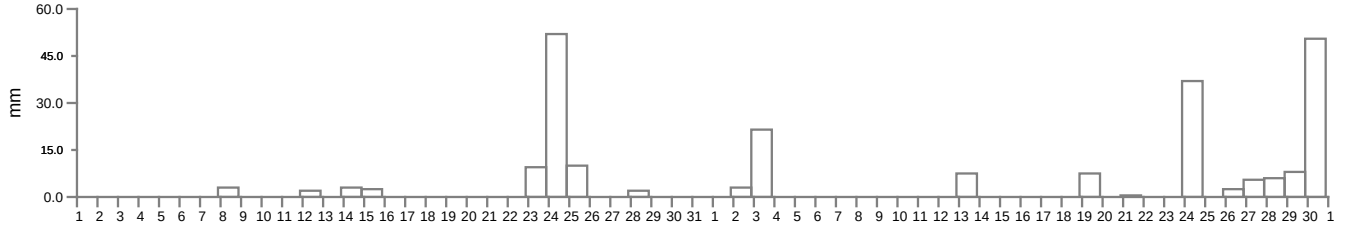
NOV -2012 DEC -2012 JAN -2013



JAN -2013 FEB -2013 MAR -2013



MAR -2013 APR -2013 MAY -2013



MAY -2013 JUN -2013 JUL -2013

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

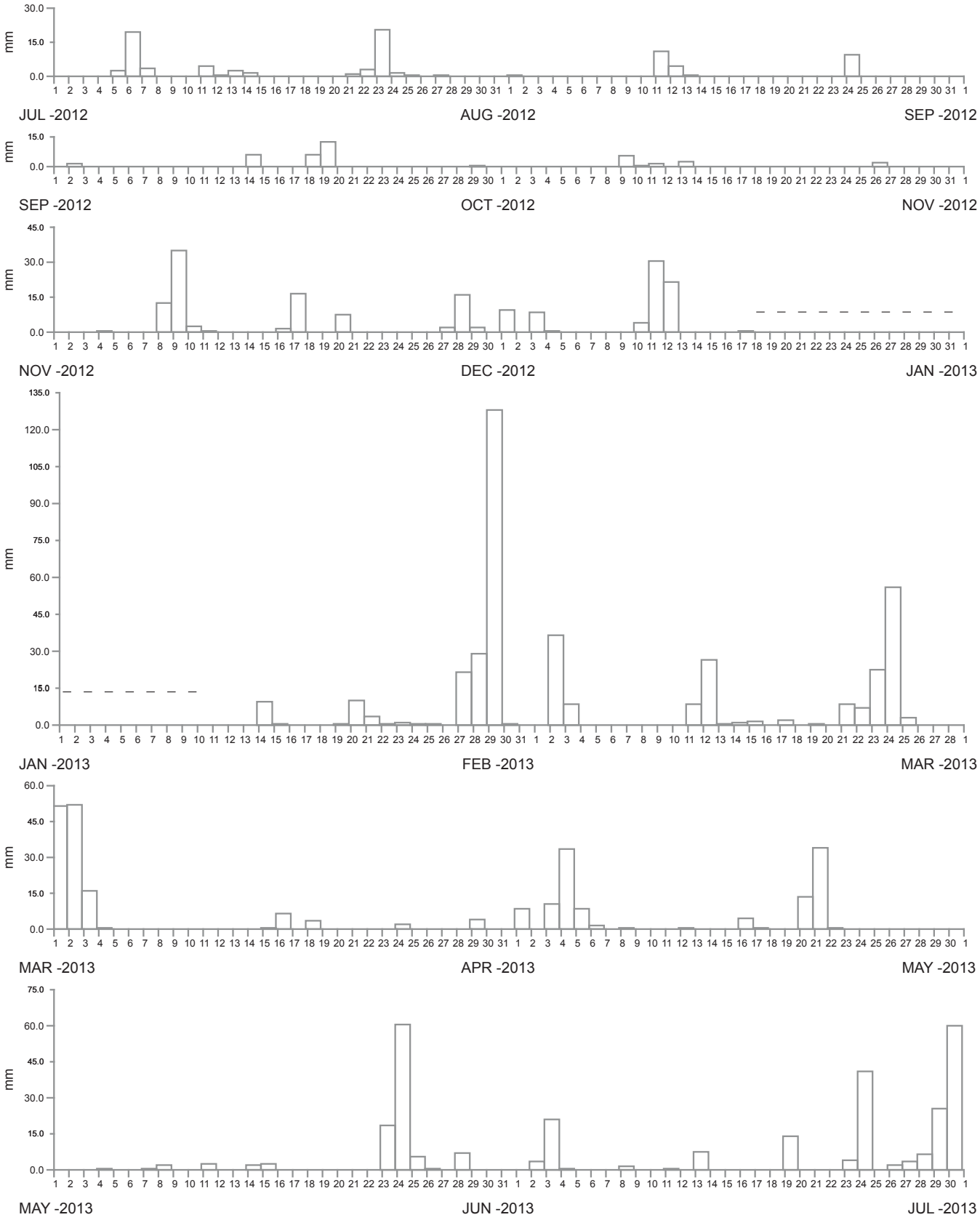
Public Works
Manly Hydraulics Laboratory

MANDALONG AT DEAVES ROAD
2012-2013

MHL Report 2220

Figure 46

DRAWING 2220-46



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

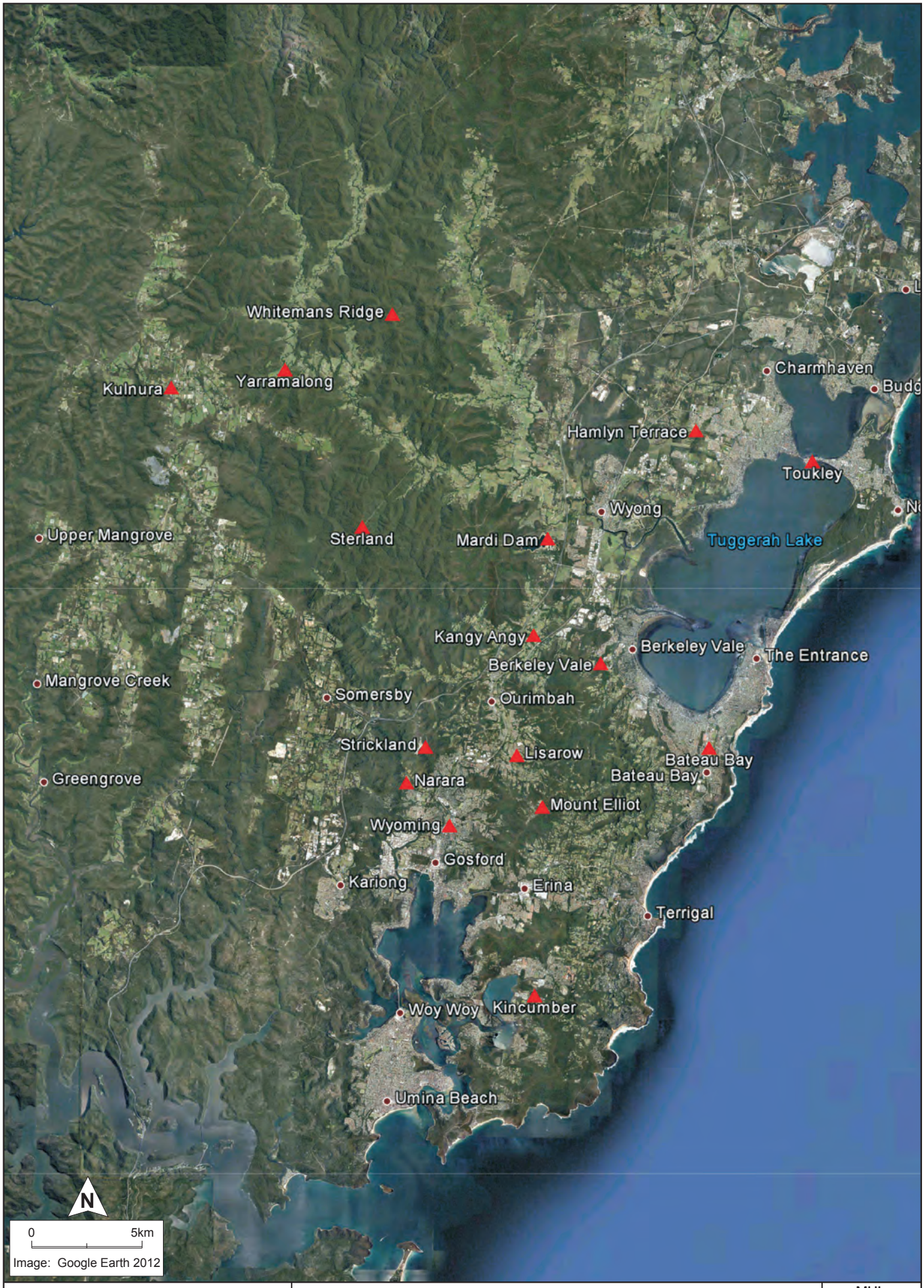
Public Works
Manly Hydraulics Laboratory

WYEE AT COLLUNGRA STREET
2012-2013

MHL Report 2220

Figure 47

DRAWING 2220-47



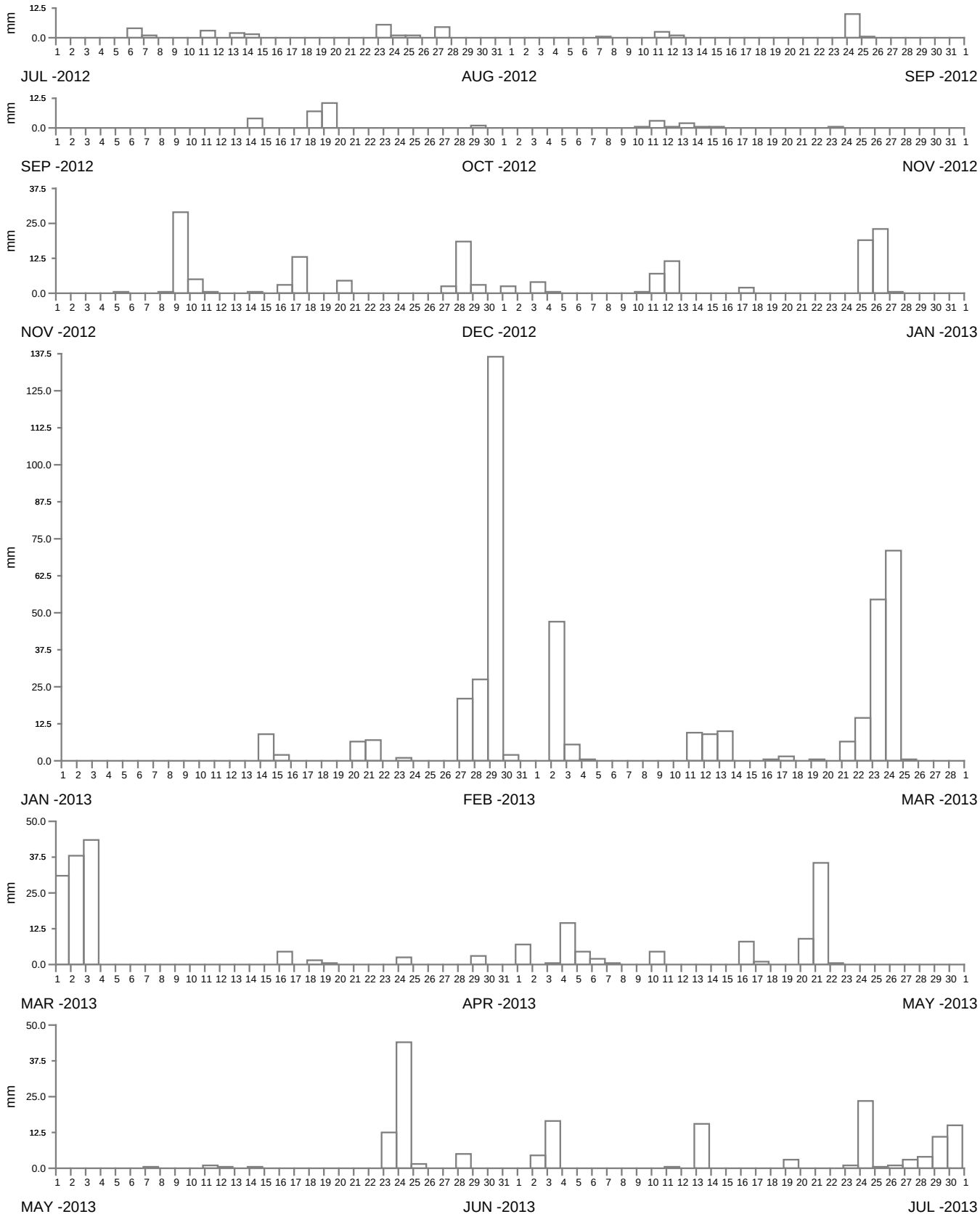
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS MACQUARIE-TUGGERAH LAKES (SOUTH) AND HAWKESBURY RIVER REGIONS

MHL Report 2220

Figure 48

DRAWING 2220-48.cdr



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

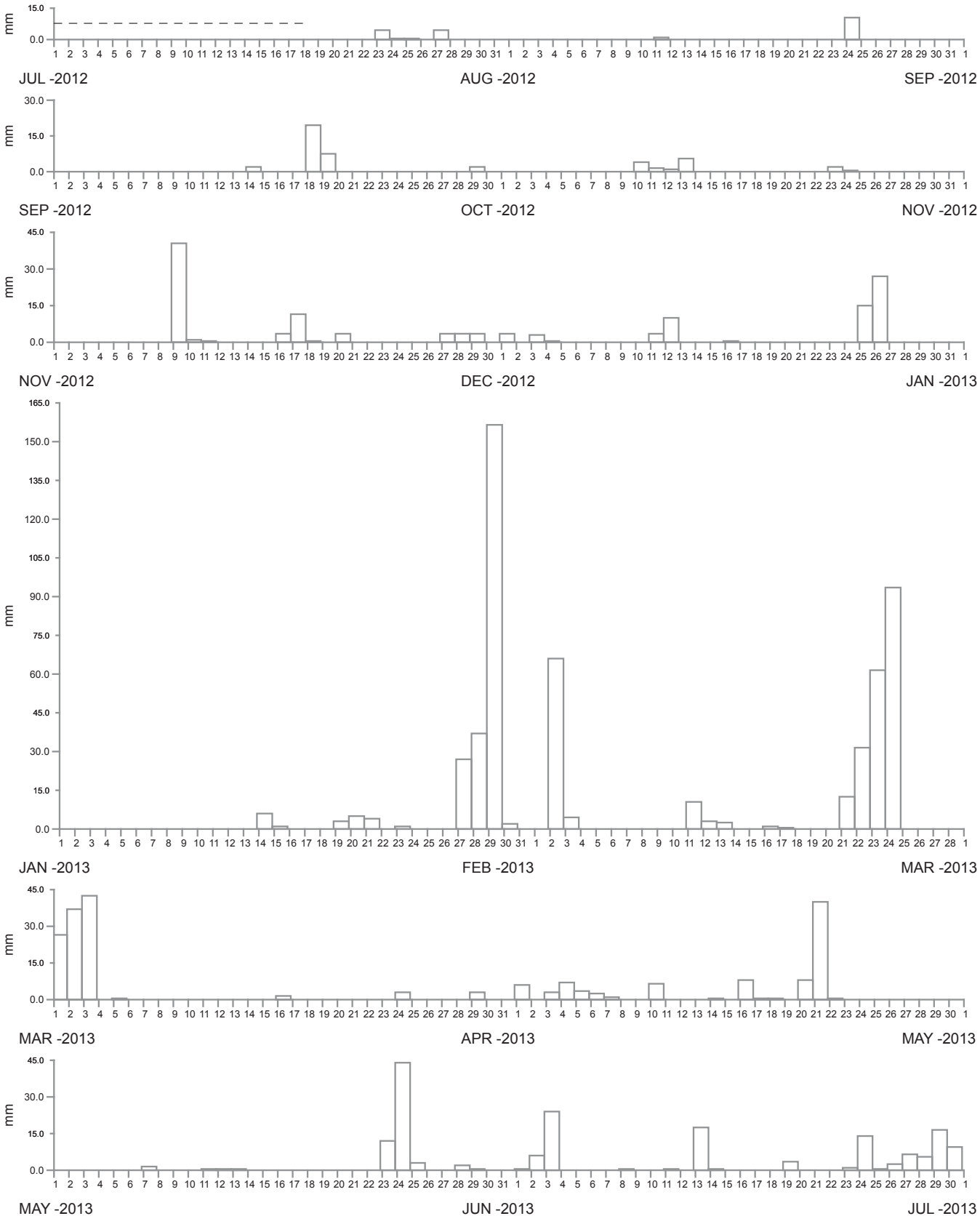
Public Works
Manly Hydraulics Laboratory

WHITEMANS RIDGE AT WATAGANS FOREST DRIVE
2012-2013

MHL Report 2220

Figure 49

DRAWING 2220-49



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

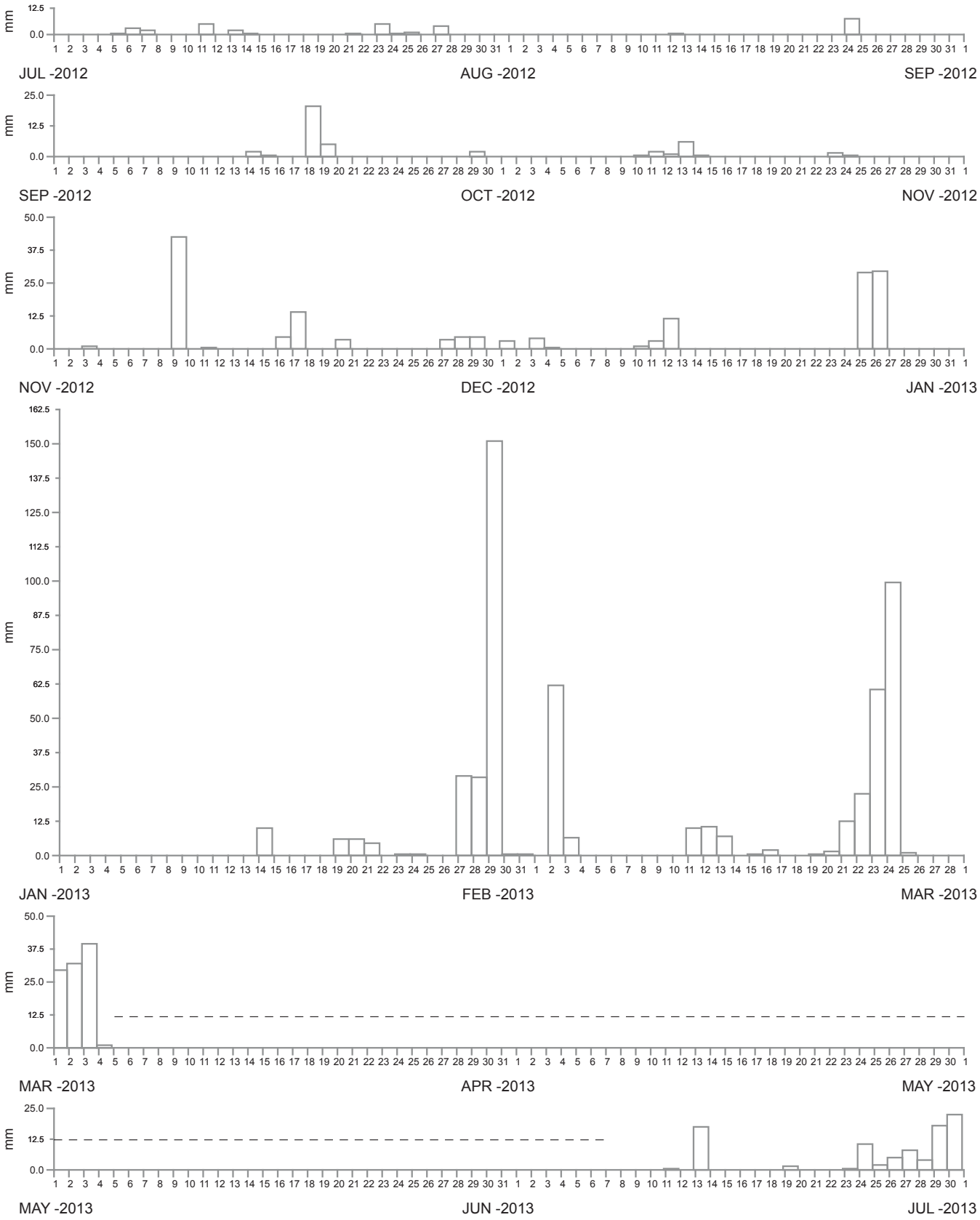
Public Works
Manly Hydraulics Laboratory

YARRAMALONG AT BUMBLE HILL ROAD
2012-2013

MHL Report 2220

Figure 50

DRAWING 2220-50



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

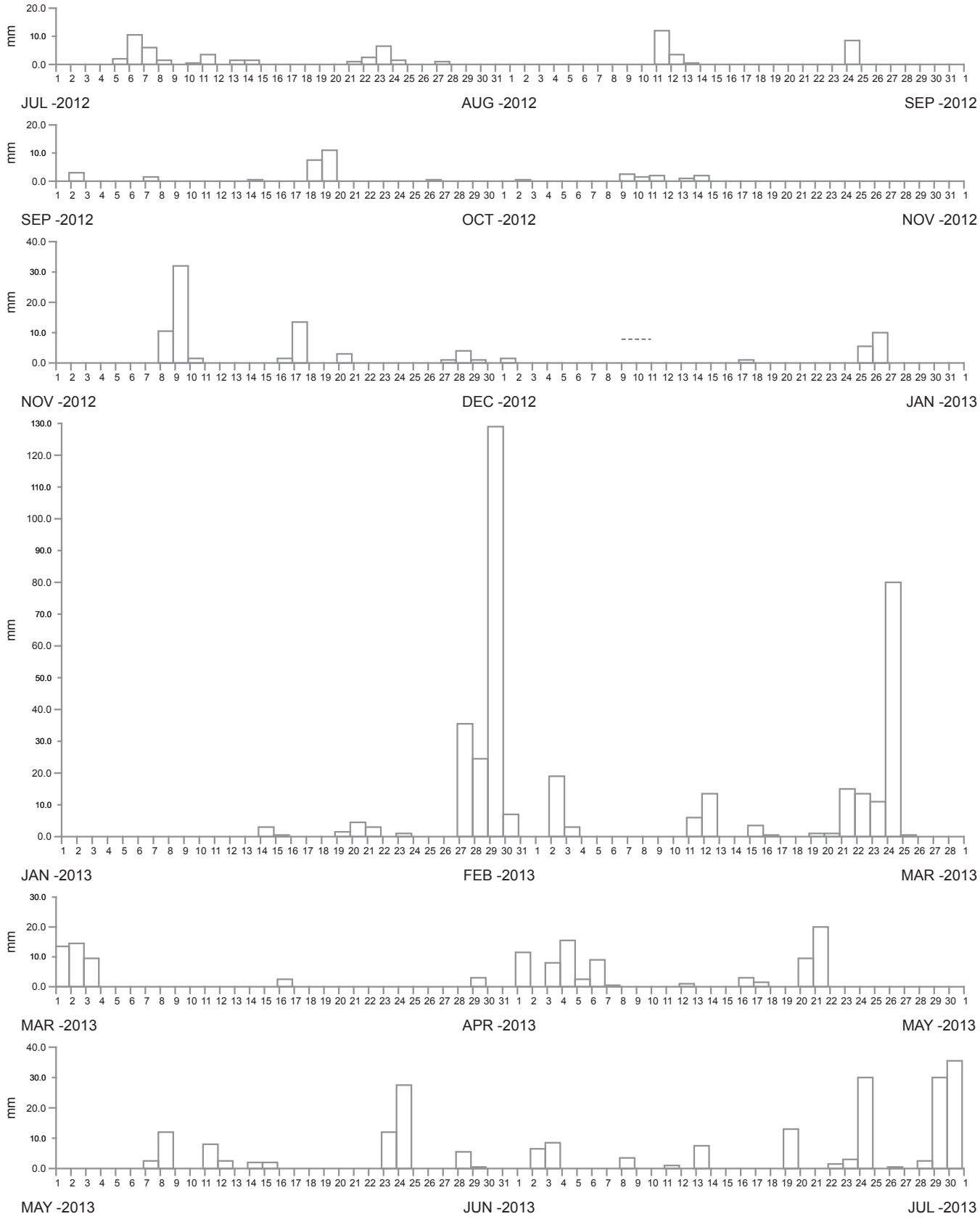
Public Works
Manly Hydraulics Laboratory

KULNURA AT GEORGE DOWNS DRIVE
2012-2013

MHL Report 2220

Figure 51

DRAWING 2220-51

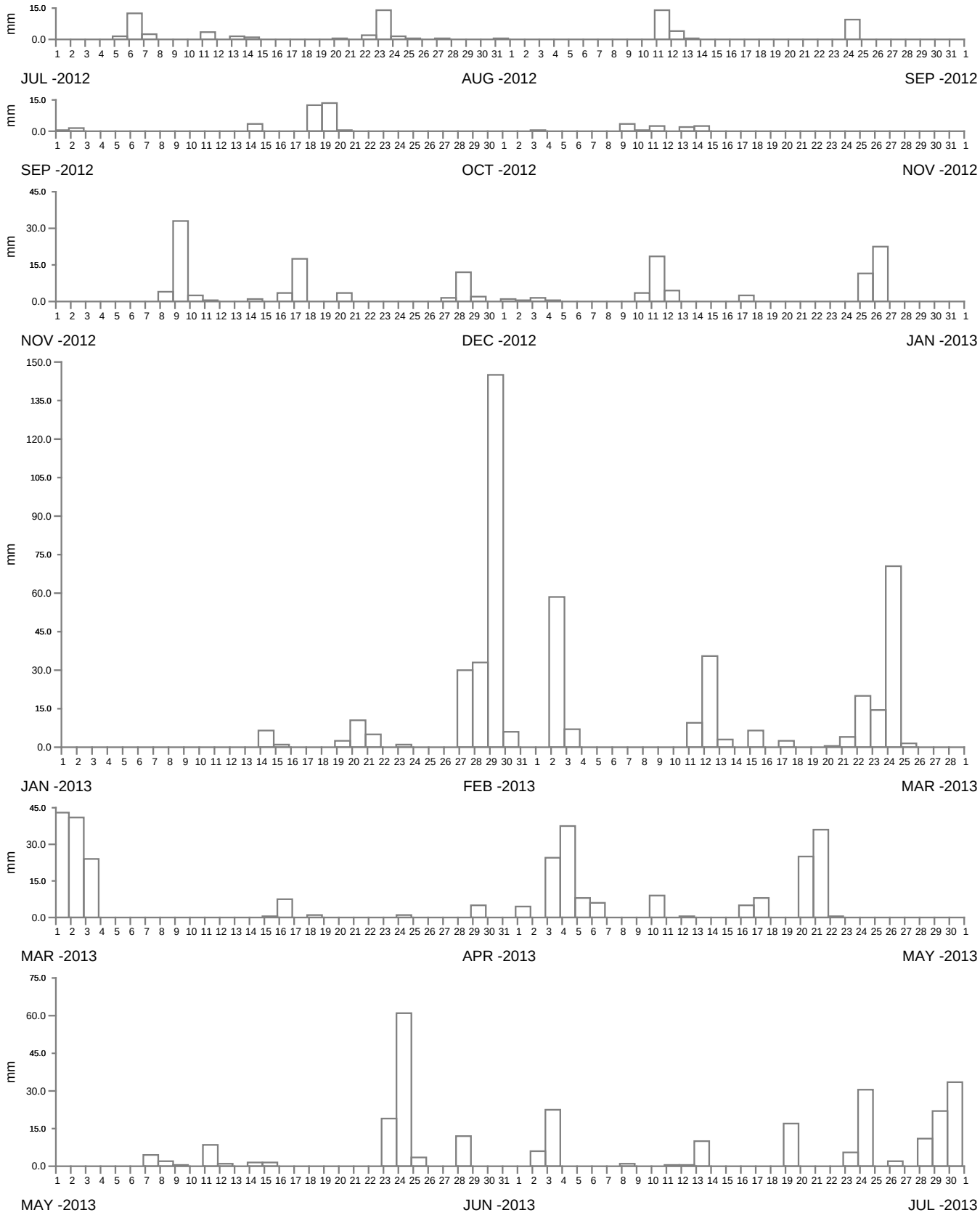


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

TUGGERAH LAKE AT TOUKLEY
2012-2013

MHL Report 2220
Figure 52
DRAWING 2220-52



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

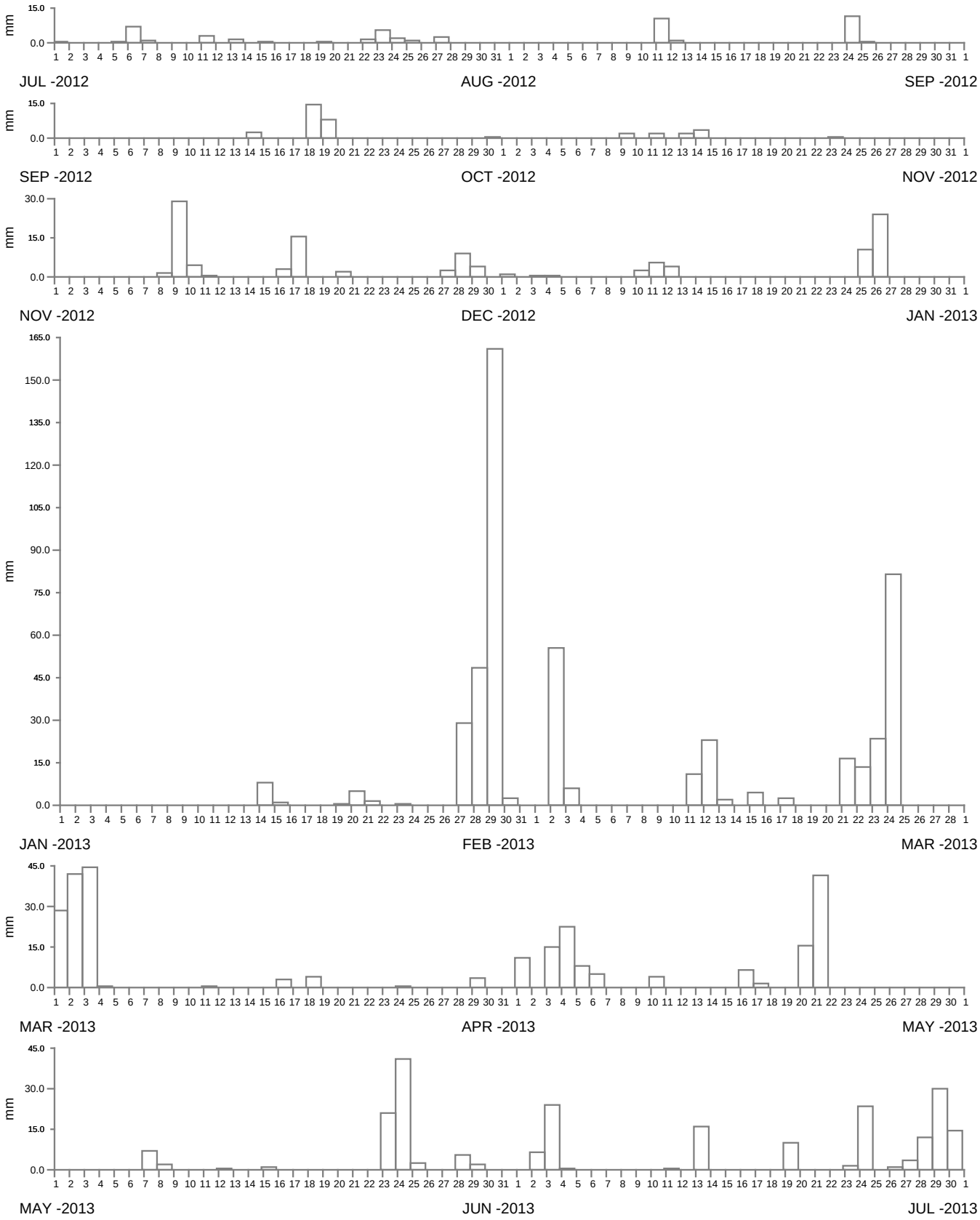
Public Works
Manly Hydraulics Laboratory

HAMLYN TERRACE AT WARNERVALE ROAD
2012-2013

MHL Report 2220

Figure 53

DRAWING 2220-53

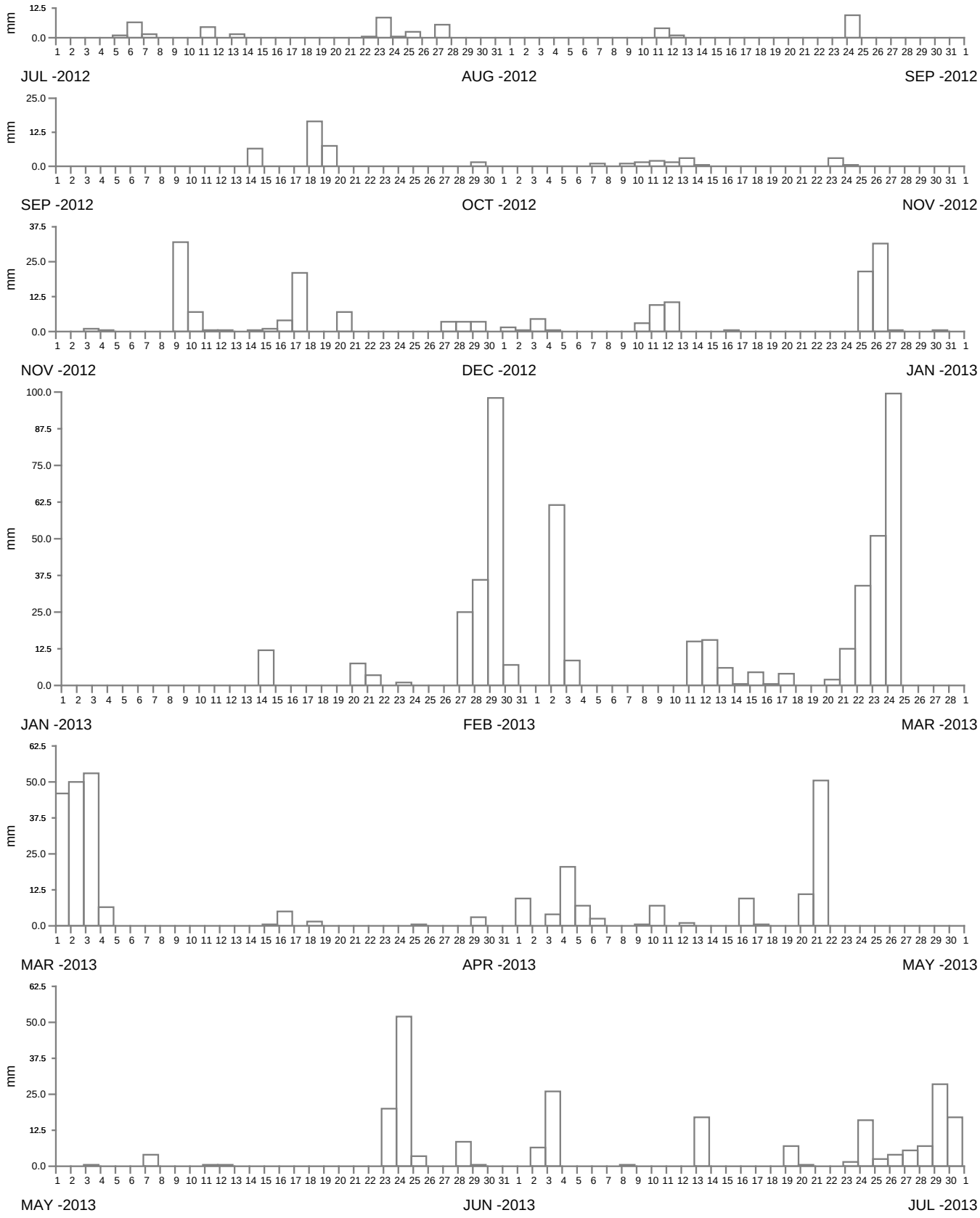


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

MARDI DAM AT OLD MAITLAND ROAD
2012-2013

MHL Report 2220
Figure 54
DRAWING 2220-54



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

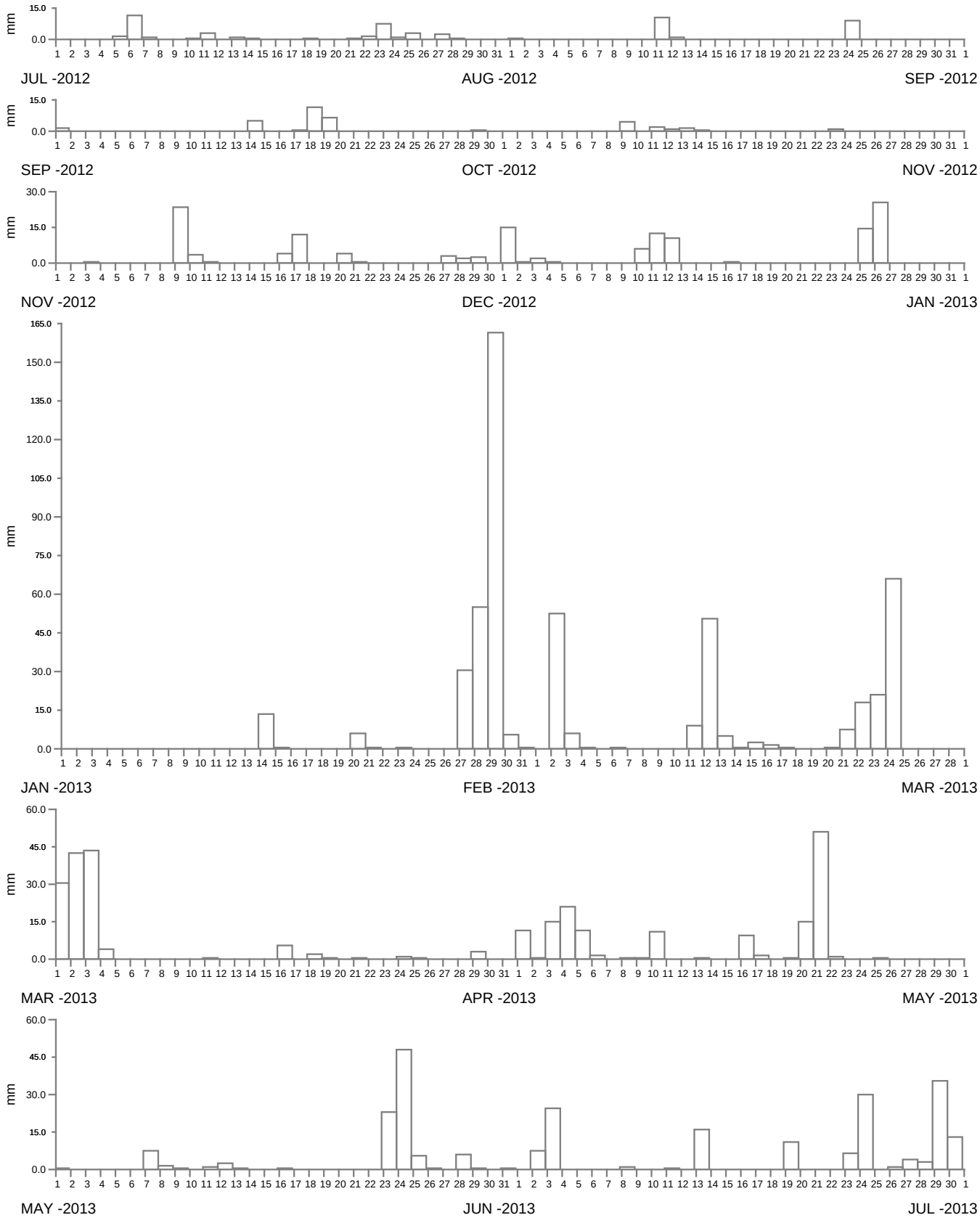
Public Works
Manly Hydraulics Laboratory

STERLAND AT RED HILL FOREST ROAD
2012-2013

MHL Report 2220

Figure 55

DRAWING 2220-55



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

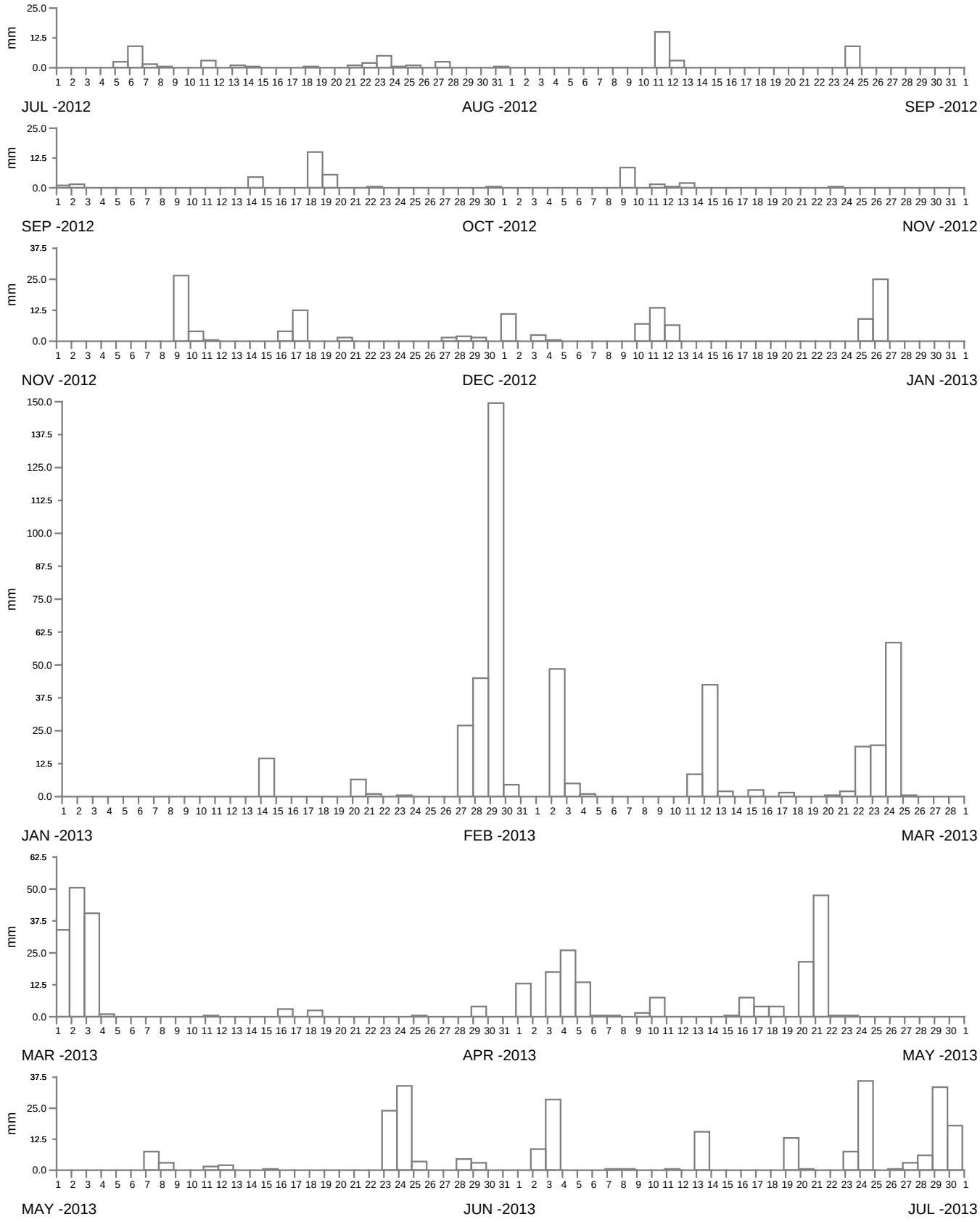
Public Works
Manly Hydraulics Laboratory

KANGY ANGY AT ORCHARD ROAD
2012-2013

MHL Report 2220

Figure 56

DRAWING 2220-56



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

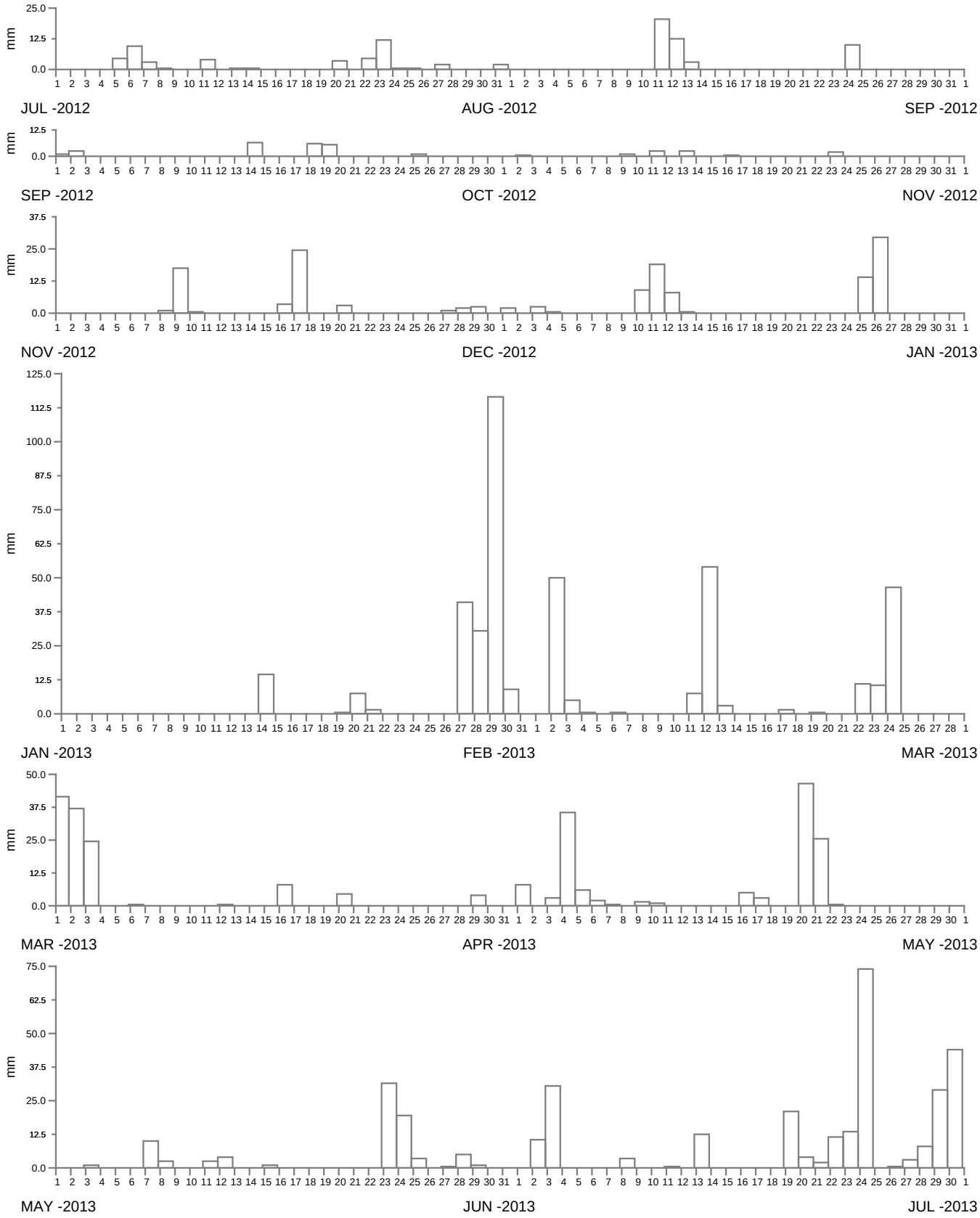
Public Works
Manly Hydraulics Laboratory

BERKELEY VALE AT BERKELEY VALE ROAD
2012-2013

MHL Report 2220

Figure 57

DRAWING 2220-57



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

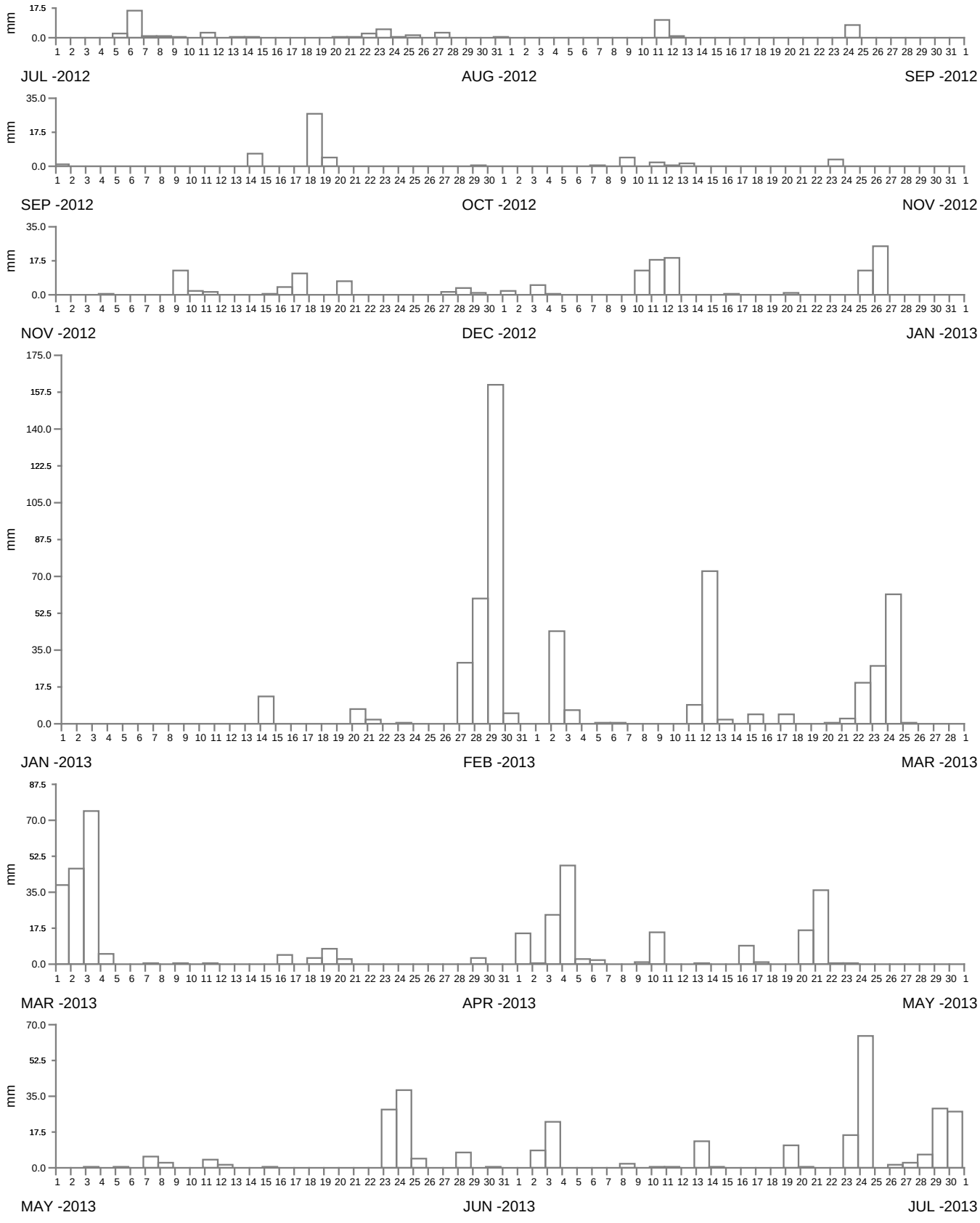
Public Works
Manly Hydraulics Laboratory

BATEAU BAY AT SEWERAGE TREATMENT WORKS
2012-2013

MHL Report 2220

Figure 58

DRAWING 2220-58



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

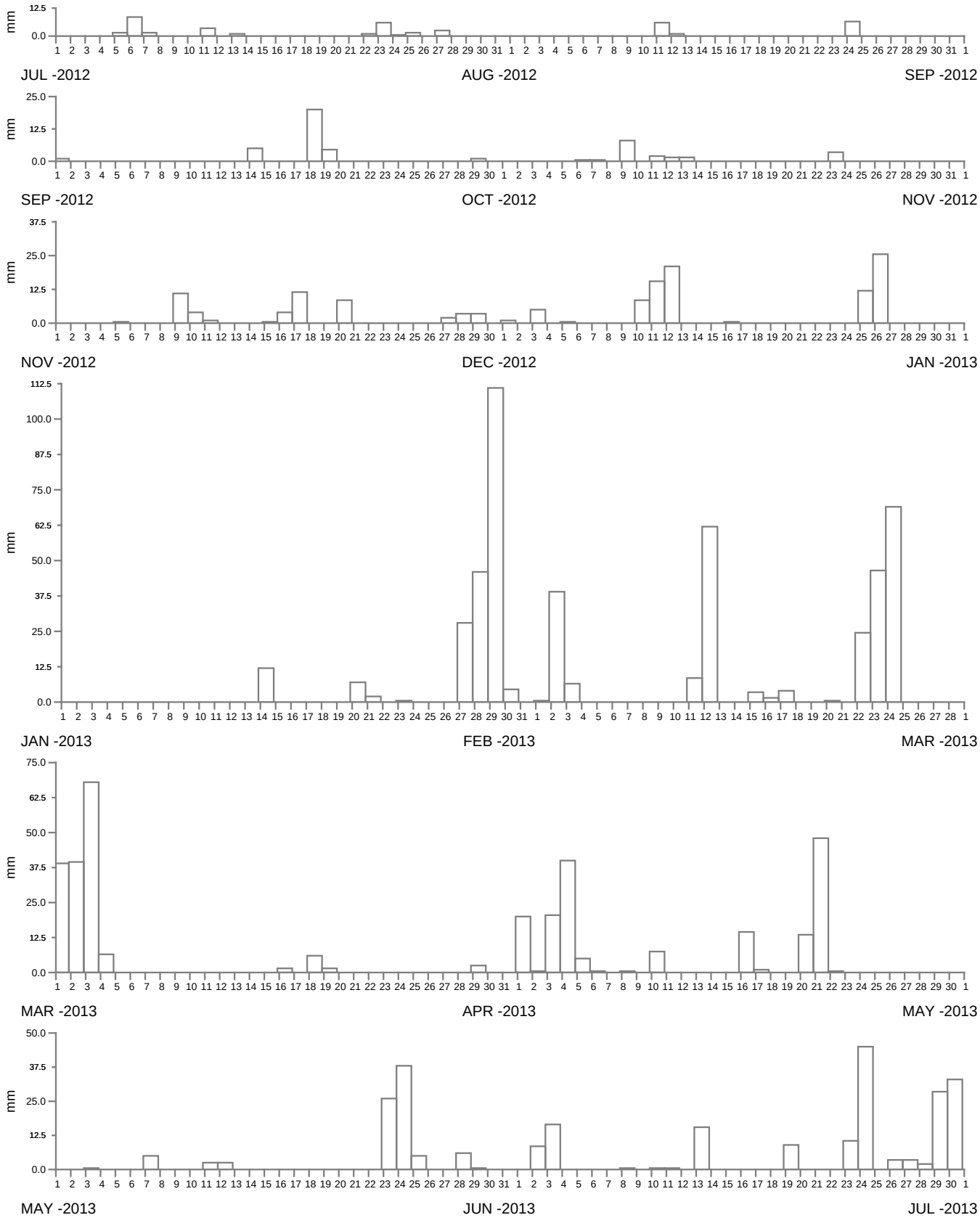
Public Works
Manly Hydraulics Laboratory

LISAROW AT FAGANS ROAD
2012-2013

MHL Report 2220

Figure 59

DRAWING 2220-59



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

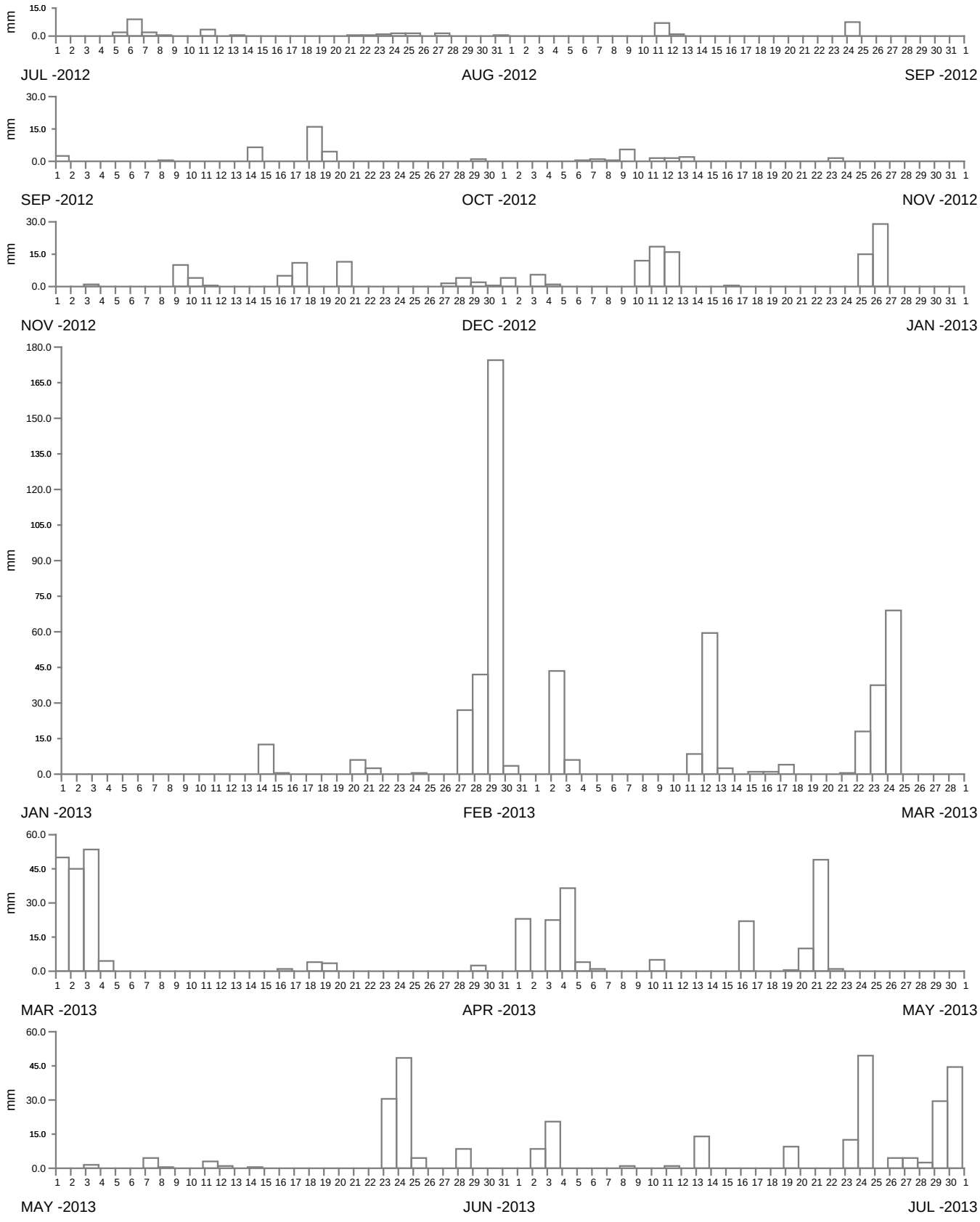
Public Works
Manly Hydraulics Laboratory

STRICKLAND AT MANGROVE ROAD
2012-2013

MHL Report 2220

Figure 60

DRAWING 2220-60



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

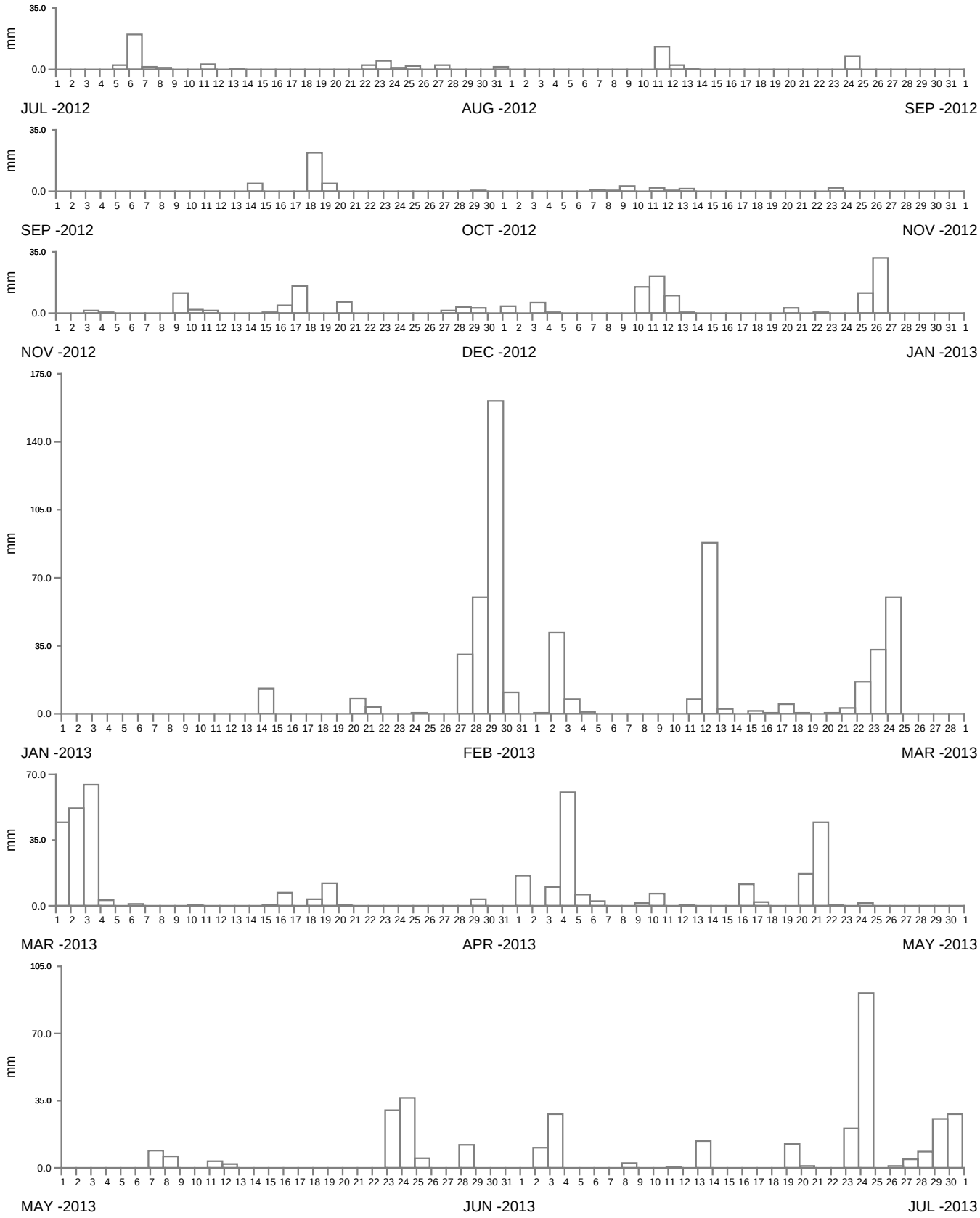
Public Works
Manly Hydraulics Laboratory

NARARA AT RESEARCH ROAD
2012-2013

MHL Report 2220

Figure 61

DRAWING 2220-61



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

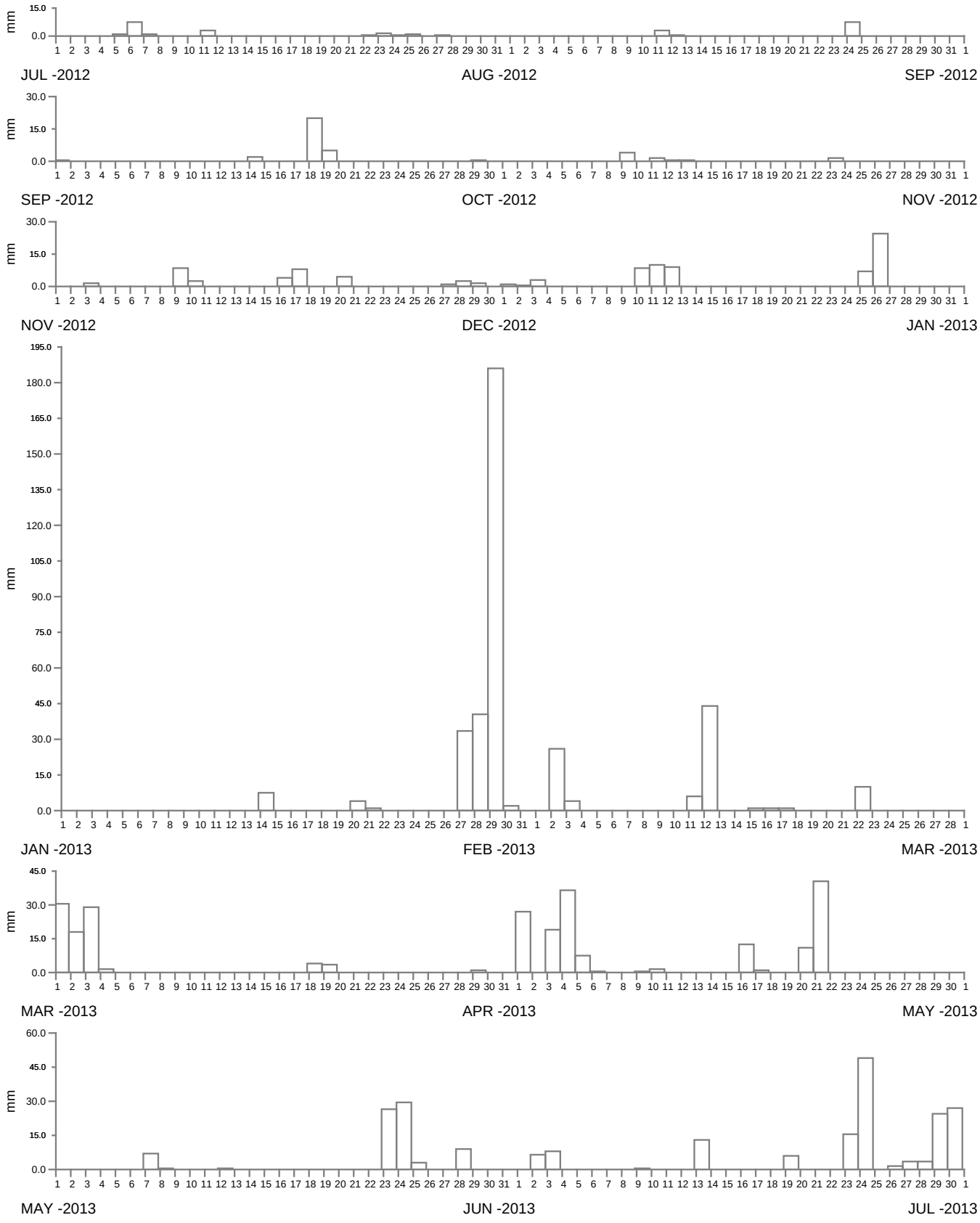
Public Works
Manly Hydraulics Laboratory

MOUNT ELLIOT AT TOOMEYS ROAD
2012-2013

MHL Report 2220

Figure 62

DRAWING 2220-62



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

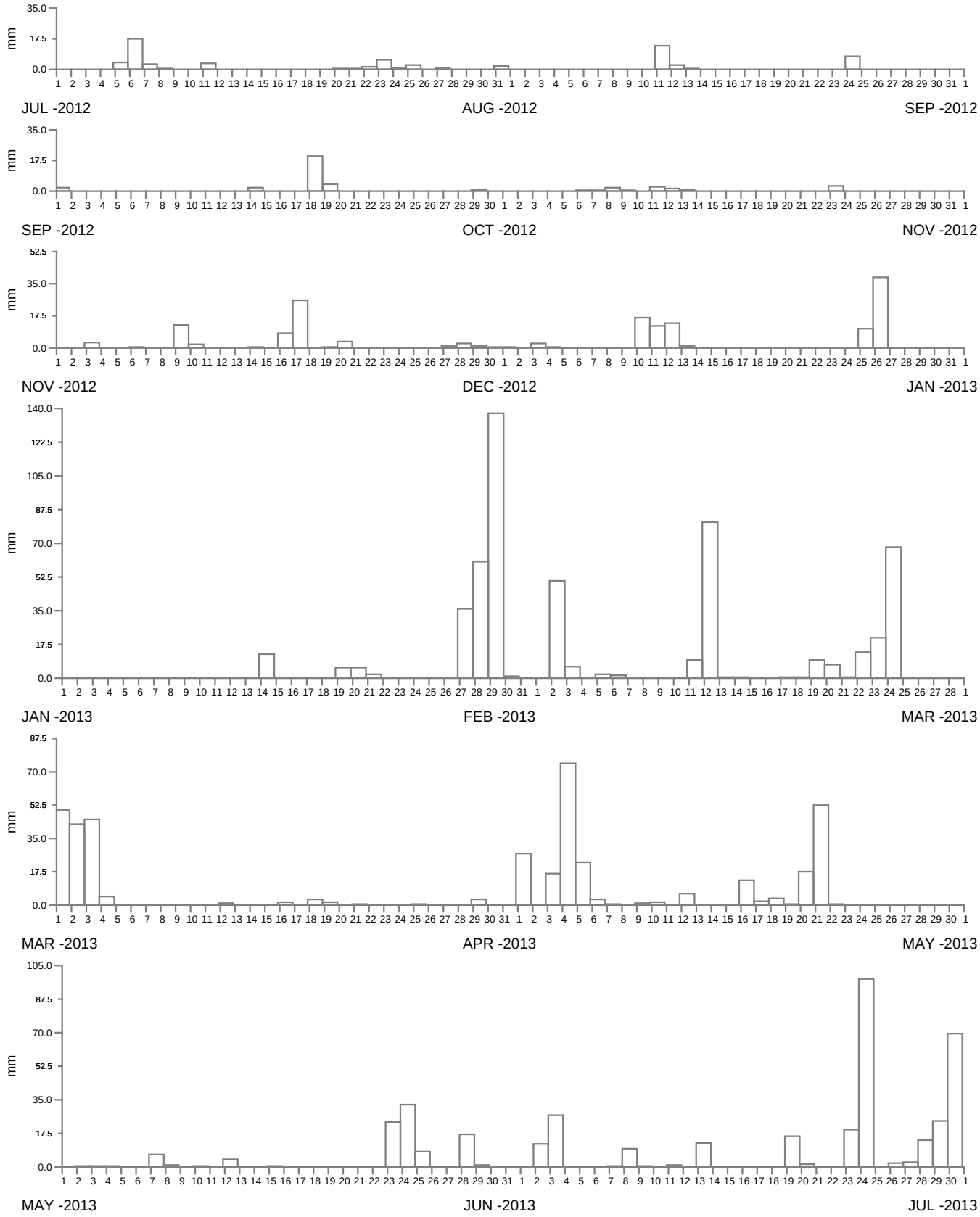
Public Works
Manly Hydraulics Laboratory

WYOMING AT LAYCOCK STREET
2012-2013

MHL Report 2220

Figure 63

DRAWING 2220-63

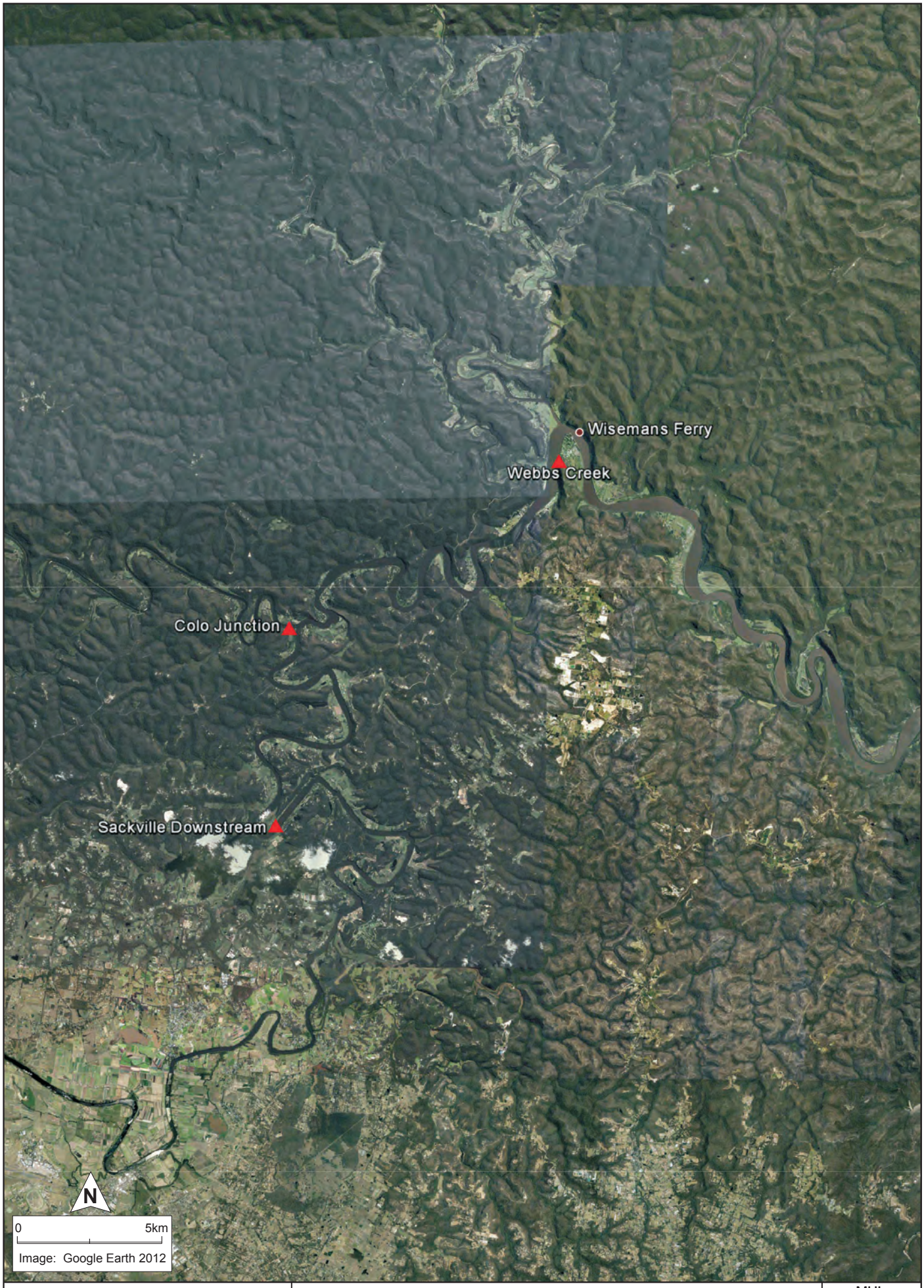


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

KINCUMBER AT DOYLE STREET
2012-2013

MHL Report 2220
Figure 64
DRAWING 2220-64



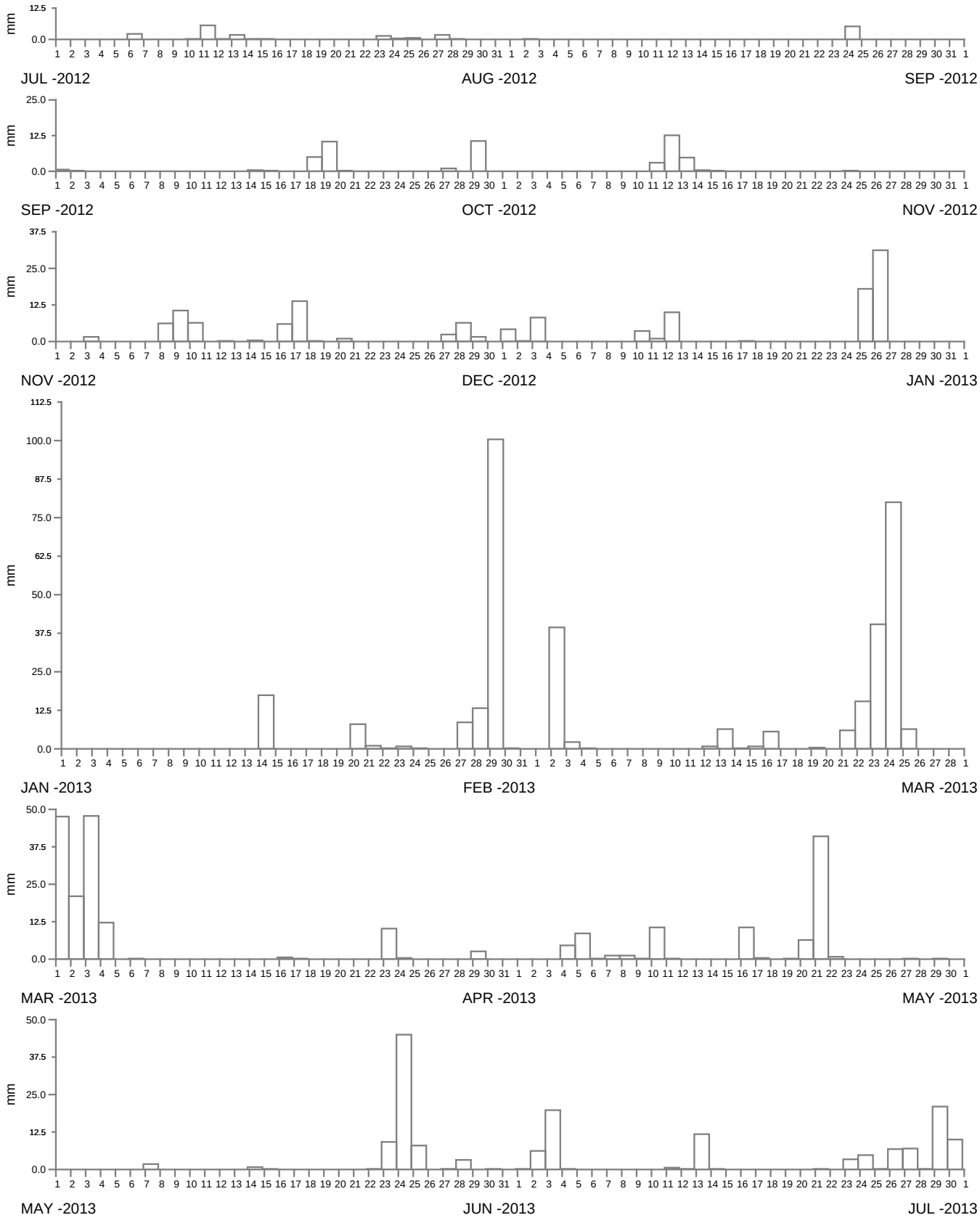
NSW GOVERNMENT
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
HAWKESBURY RIVER (MID) REGION

MHL Report 2220

Figure 65

DRAWING 2220-65.cdr



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

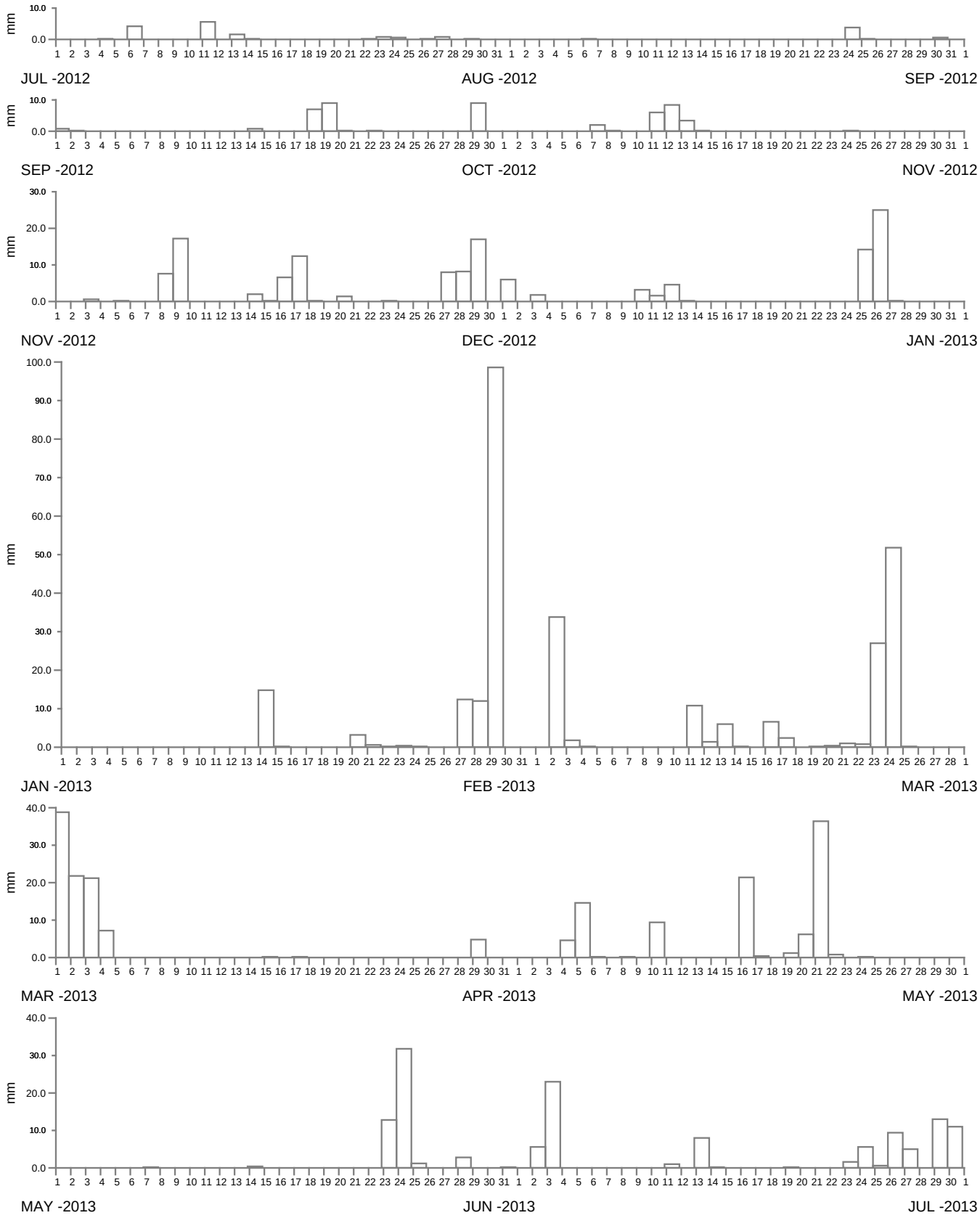
Public Works
Manly Hydraulics Laboratory

HAWKESBURY RIVER AT WEBBS CREEK
2012-2013

MHL Report 2220

Figure 66

DRAWING 2220-66



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

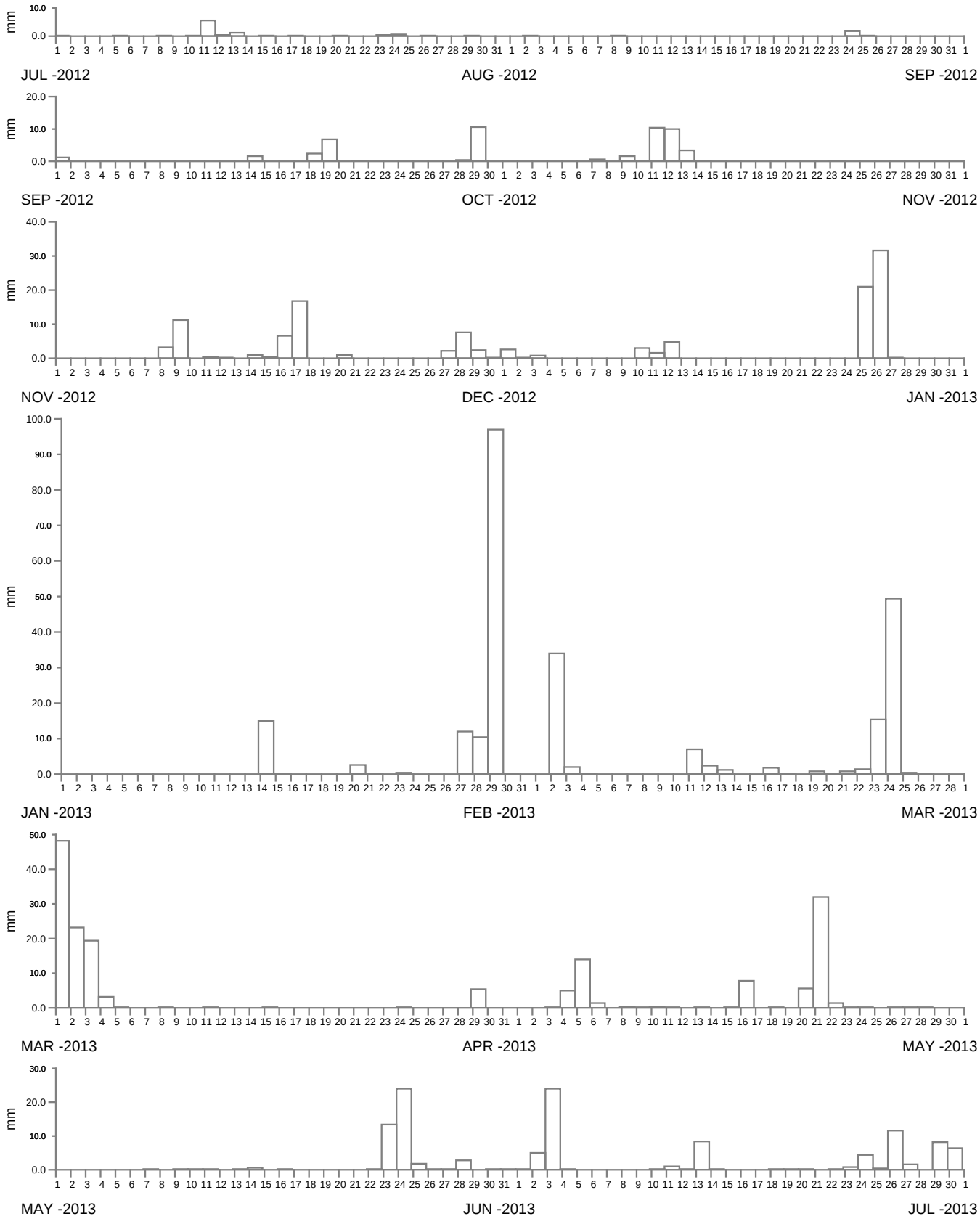
Public Works
Manly Hydraulics Laboratory

HAWKESBURY RIVER AT COLO JUNCTION
2012-2013

MHL Report 2220

Figure 67

DRAWING 2220-67



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

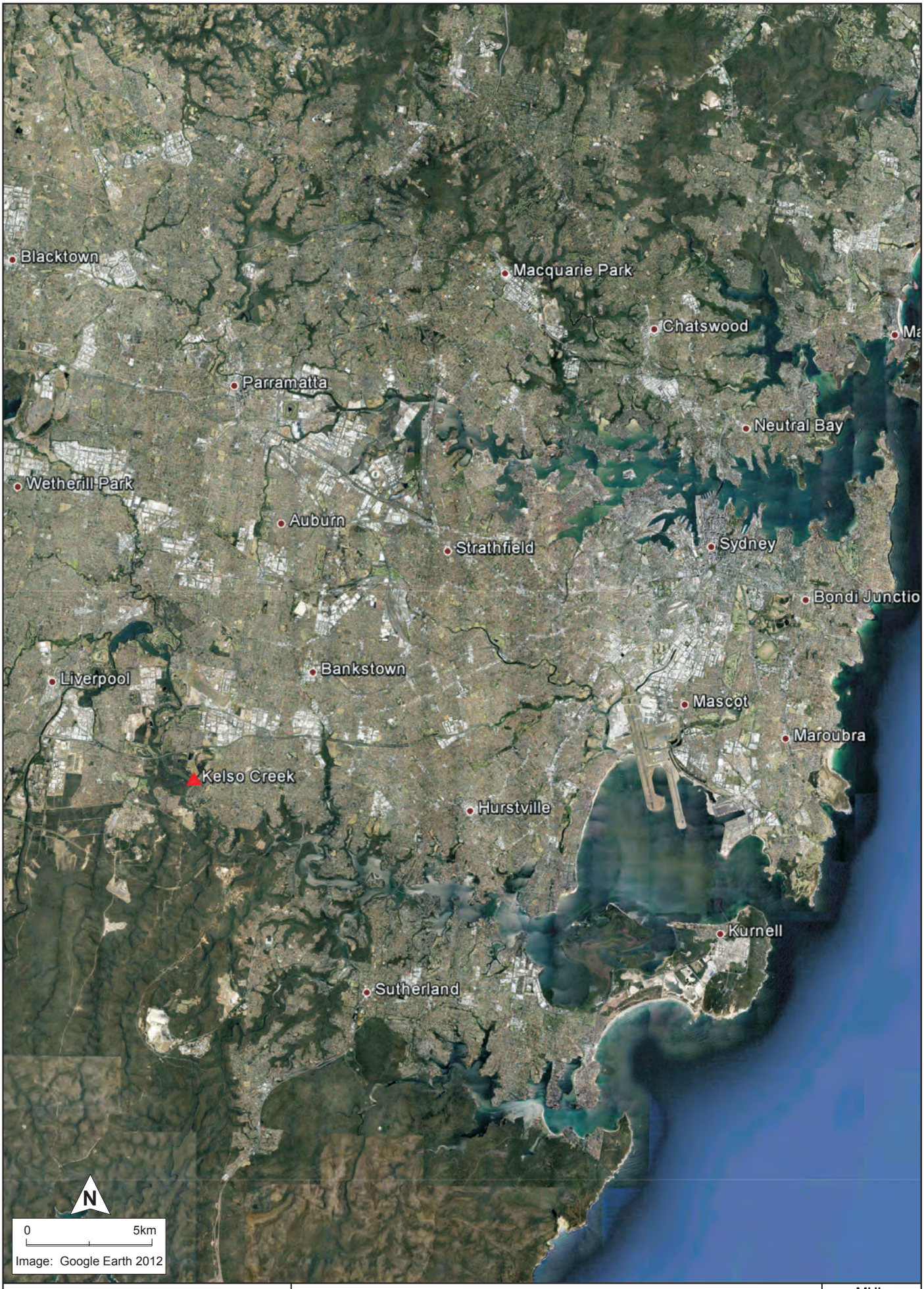
Public Works
Manly Hydraulics Laboratory

HAWKESBURY RIVER AT SACKVILLE DOWNSTREAM
2012-2013

MHL Report 2220

Figure 68

DRAWING 2220-68



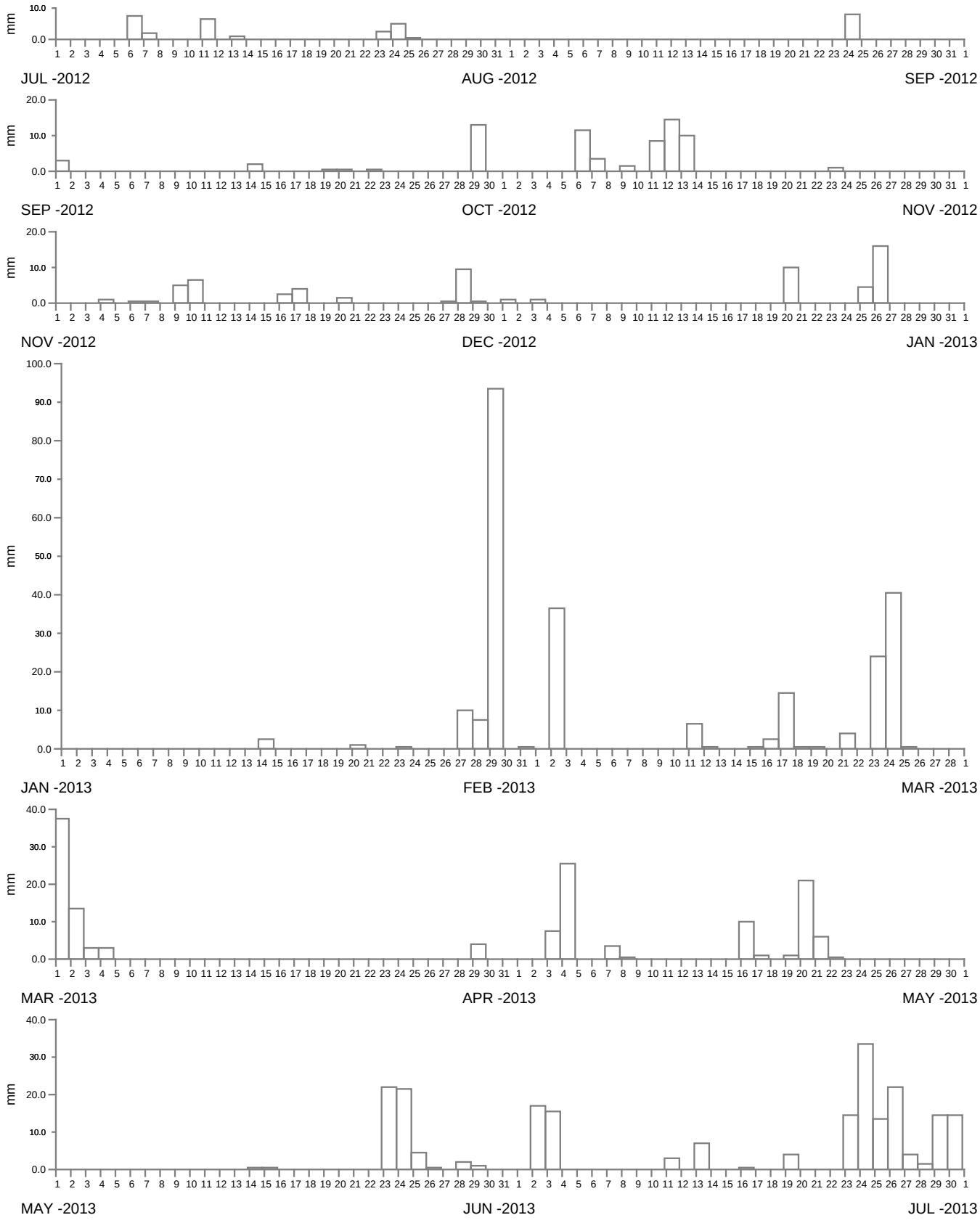
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
SYDNEY COASTAL REGION

MHL Report 2220

Figure 69

DRAWING 2220-69.cdr



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

Public Works
Manly Hydraulics Laboratory

KELSO CREEK AT KELSO CREEK
2012-2013

MHL Report 2220

Figure 70

DRAWING 2220-70

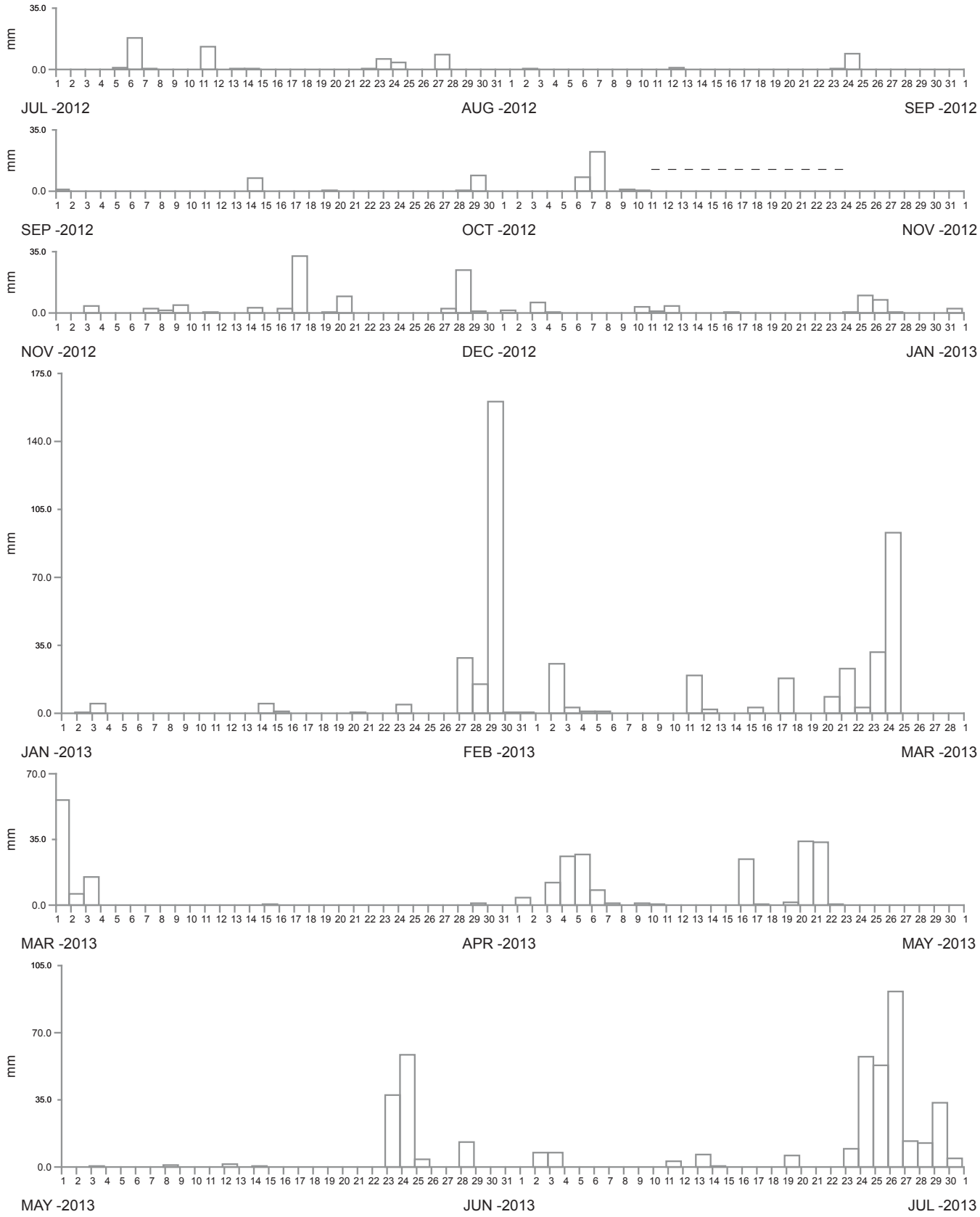
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
WOLLONGONG COASTAL REGION

MHL Report 2220

Figure 71

DRAWING 2220-71.cdr



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

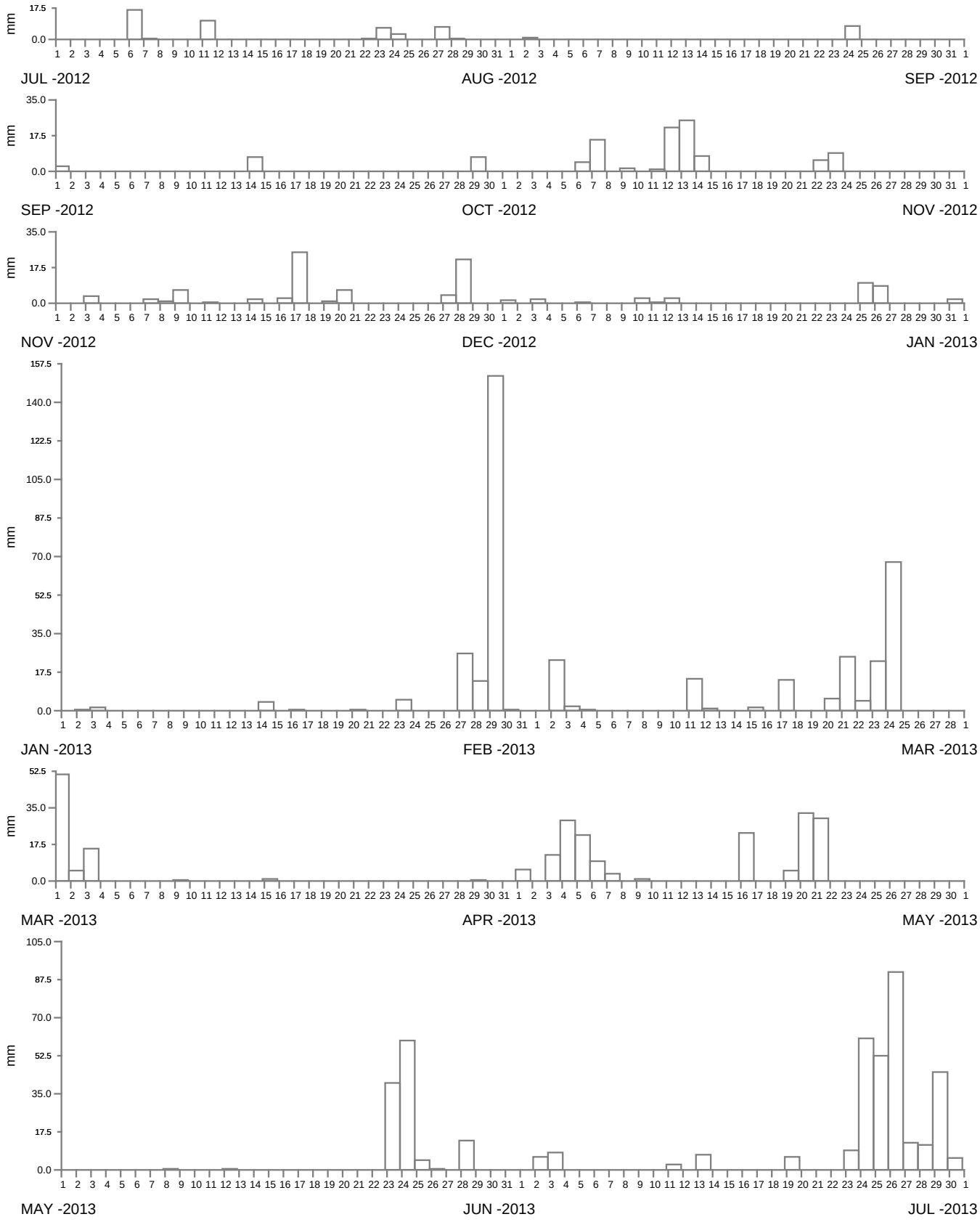
Public Works
Manly Hydraulics Laboratory

RIXONS PASS AT RIXONS PASS ROAD
2012-2013

MHL Report 2220

Figure 72

DRAWING 2220-72



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

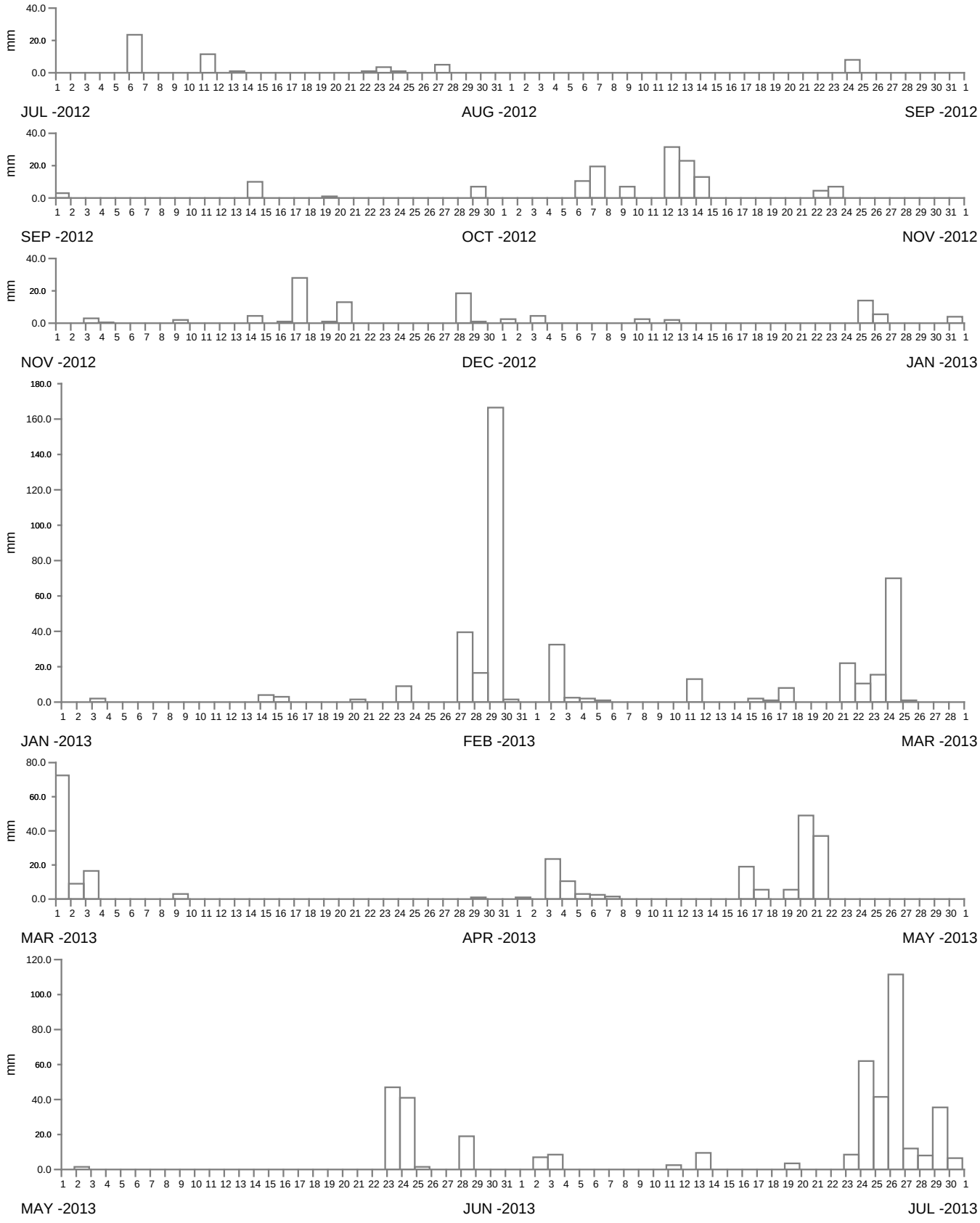
Public Works
Manly Hydraulics Laboratory

RUSSELL VALE AT WHITING CRESCENT
2012-2013

MHL Report 2220

Figure 73

DRAWING 2220-73



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

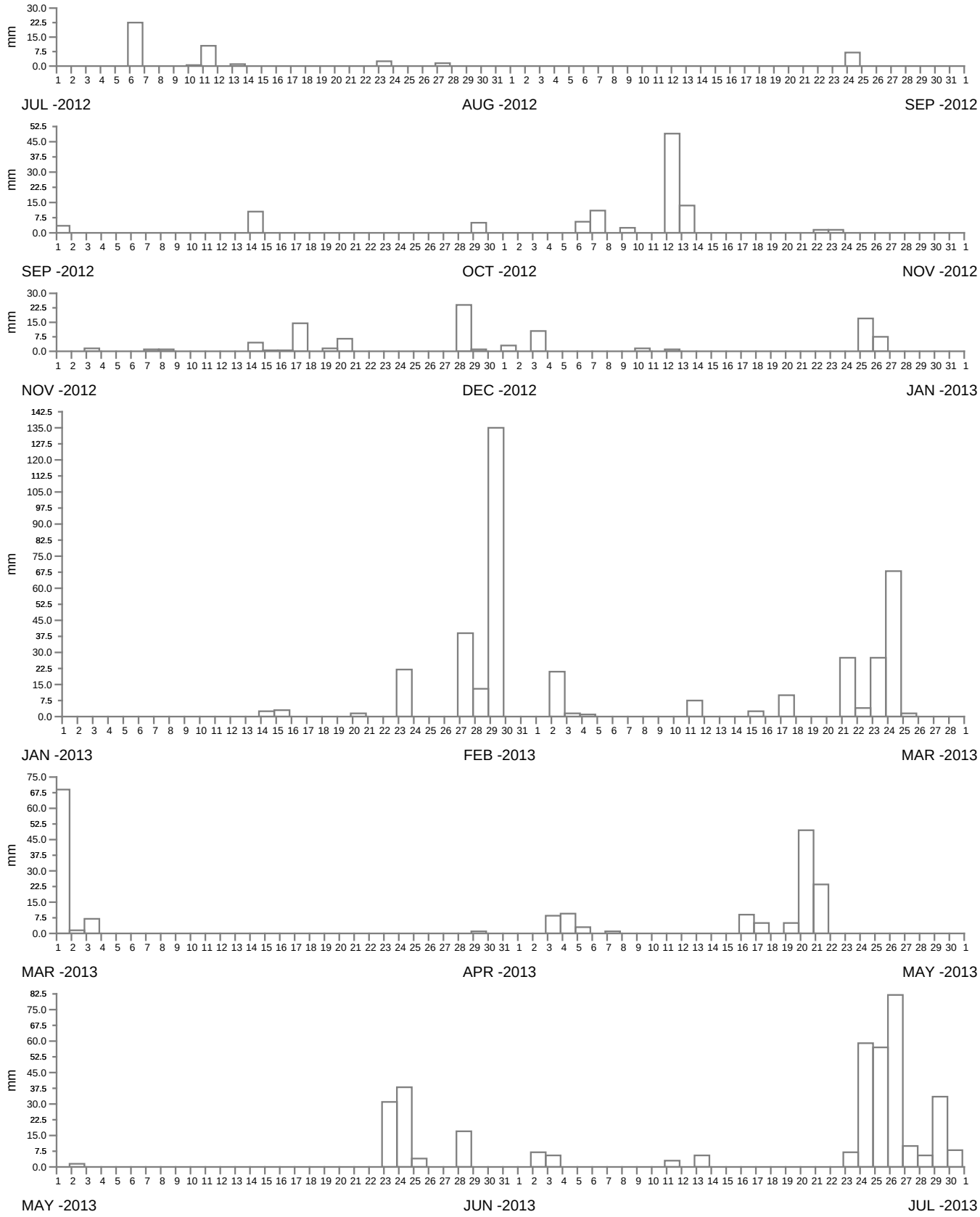
Public Works
Manly Hydraulics Laboratory

MOUNT PLEASANT AT PARRISH AVENUE
2012-2013

MHL Report 2220

Figure 74

DRAWING 2220-74



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

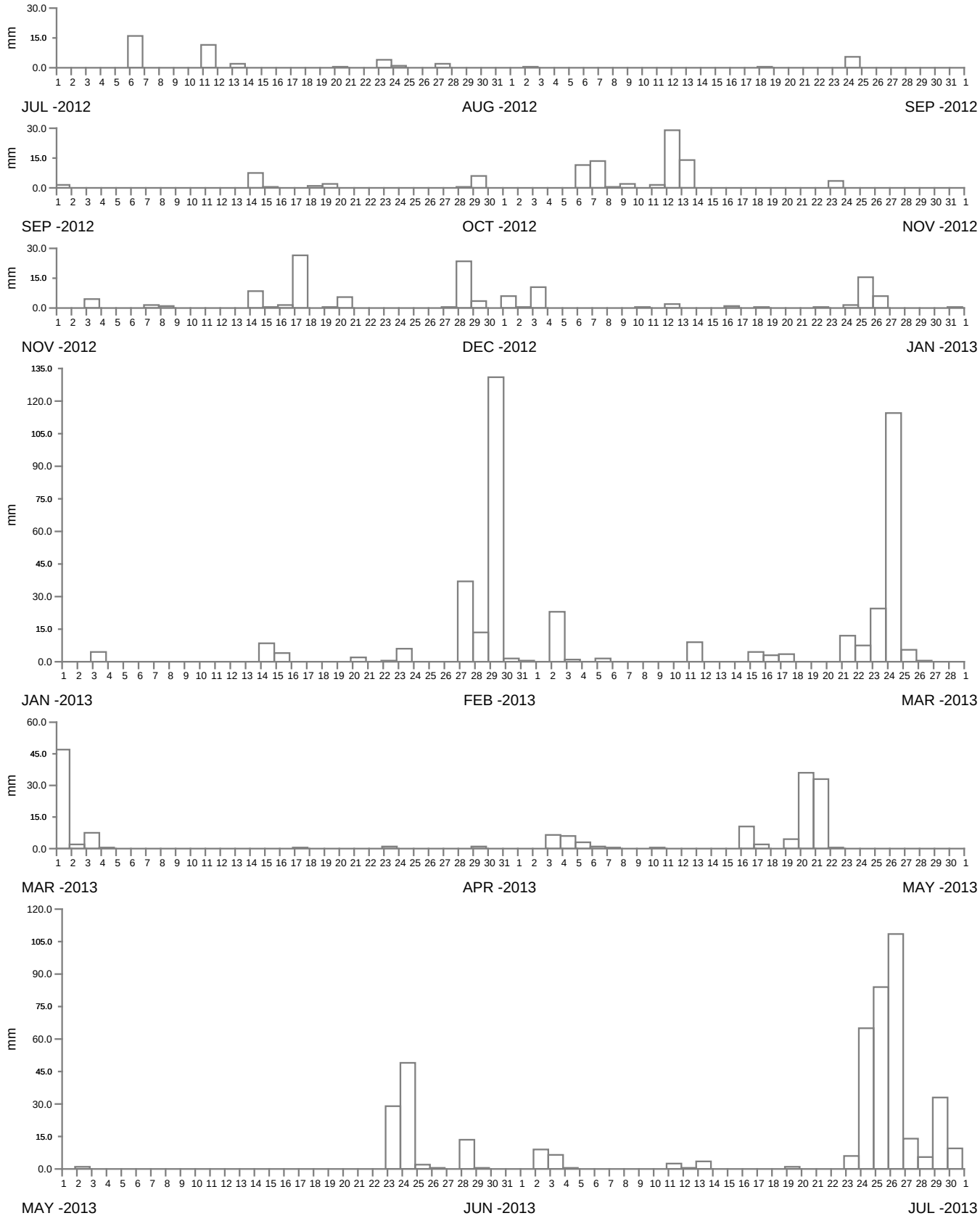
Public Works
Manly Hydraulics Laboratory

MOUNT KEMBLA AT STAFF ROAD
2012-2013

MHL Report 2220

Figure 75

DRAWING 2220-75



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

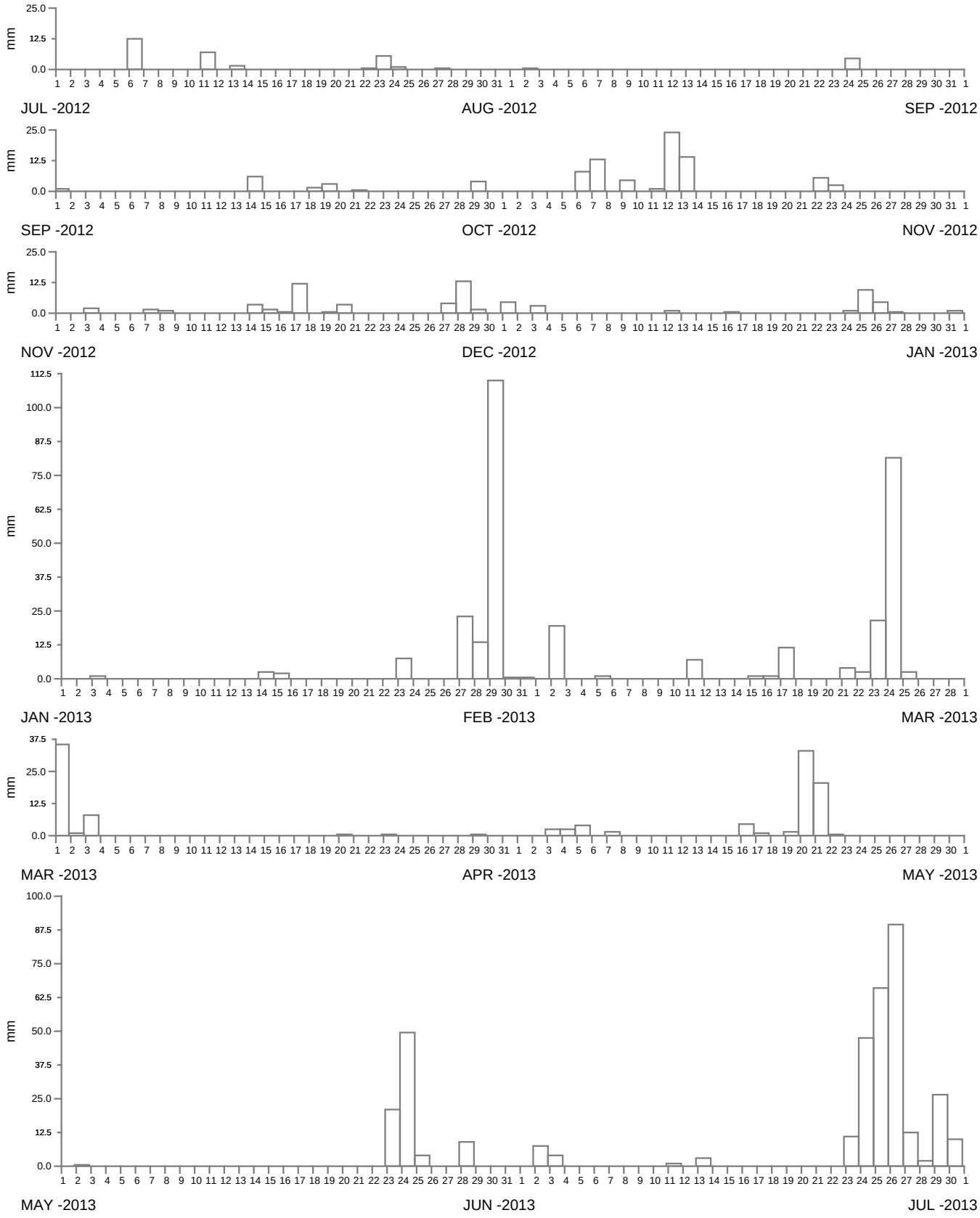
Public Works
Manly Hydraulics Laboratory

DOMBARTON LOOP AT PAYNES ROAD
2012-2013

MHL Report 2220

Figure 76

DRAWING 2220-76



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

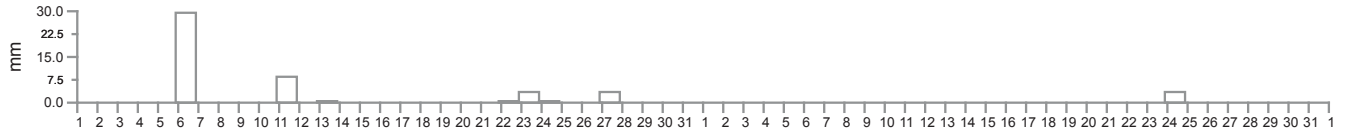
Public Works
Manly Hydraulics Laboratory

WONGAWILLI AT JERSEY FARM ROAD
2012-2013

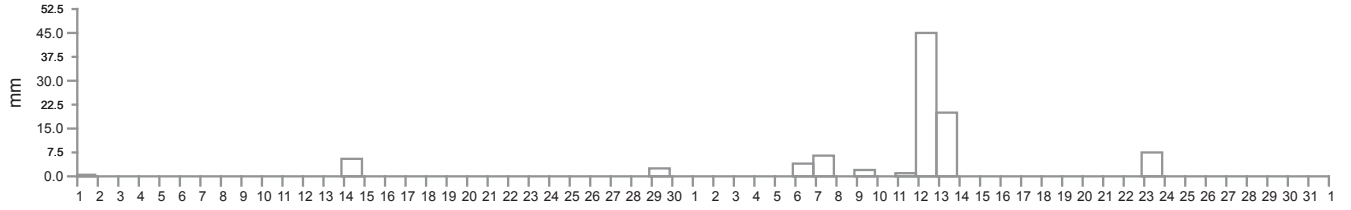
MHL Report 2220

Figure 77

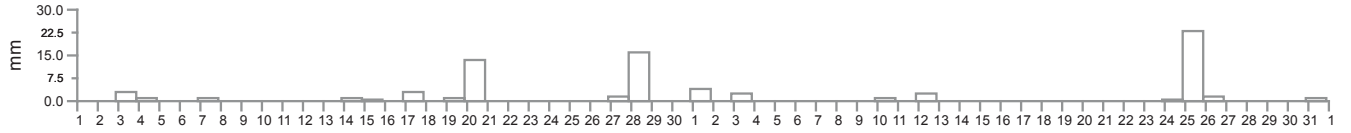
DRAWING 2220-77



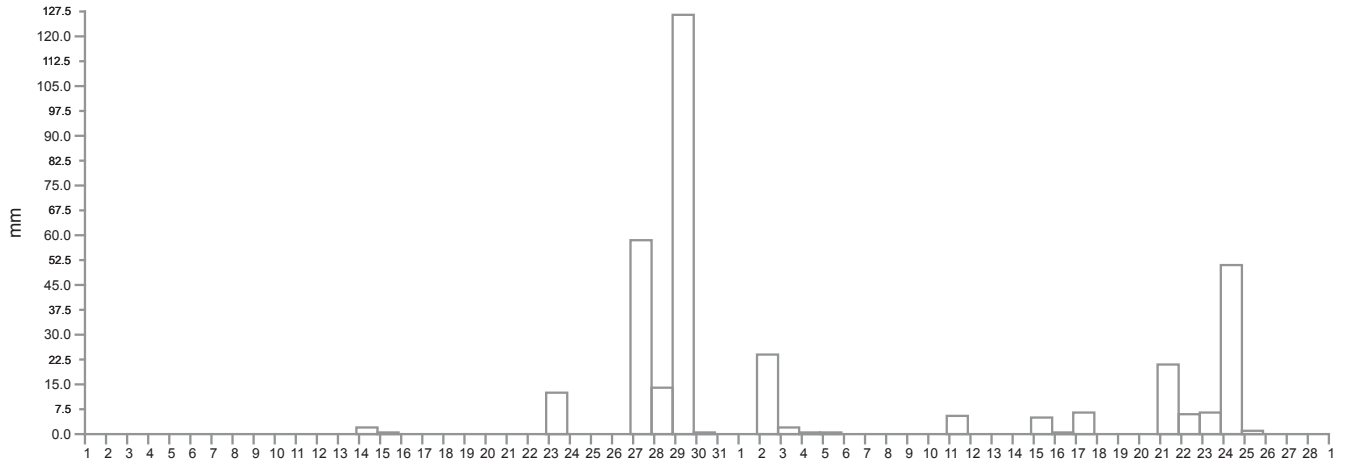
JUL -2012 AUG -2012 SEP -2012



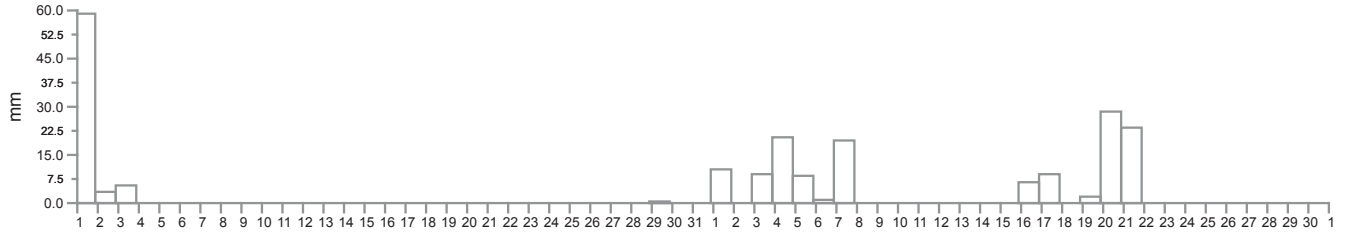
SEP -2012 OCT -2012 NOV -2012



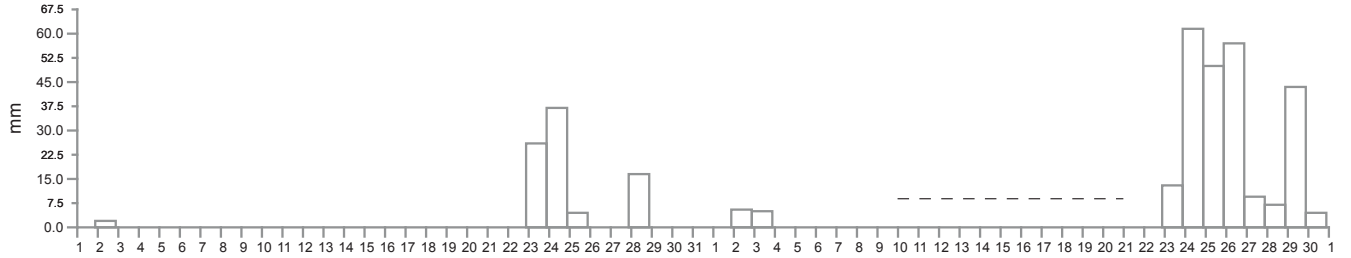
NOV -2012 DEC -2012 JAN -2013



JAN -2013 FEB -2013 MAR -2013



MAR -2013 APR -2013 MAY -2013



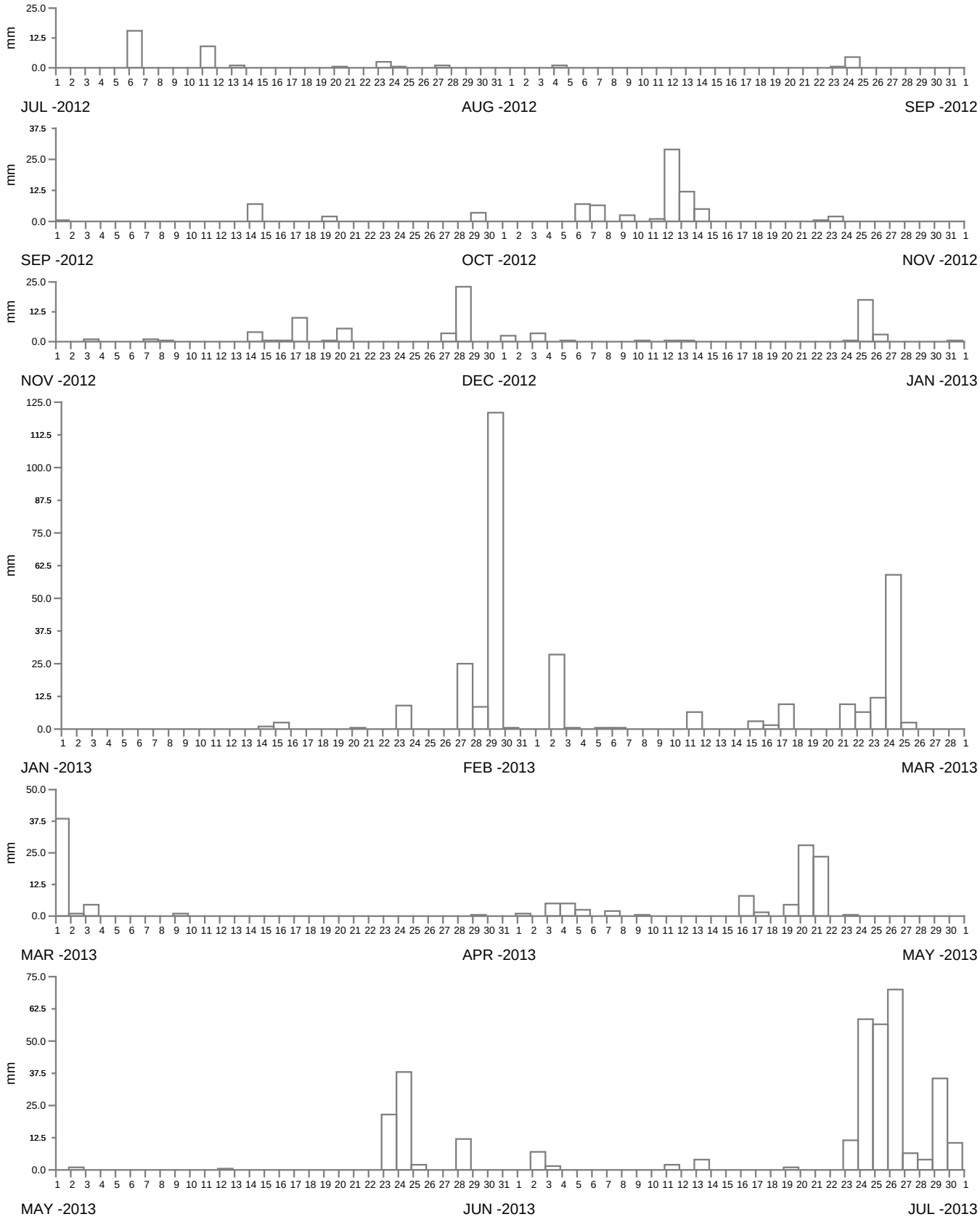
MAY -2013 JUN -2013 JUL -2013

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

NSW GOVERNMENT
Public Works
Manly Hydraulics Laboratory

PORT KEMBLA AT FIVE ISLANDS ROAD
2012-2013

MHL Report 2220
Figure 78
DRAWING 2220-78



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

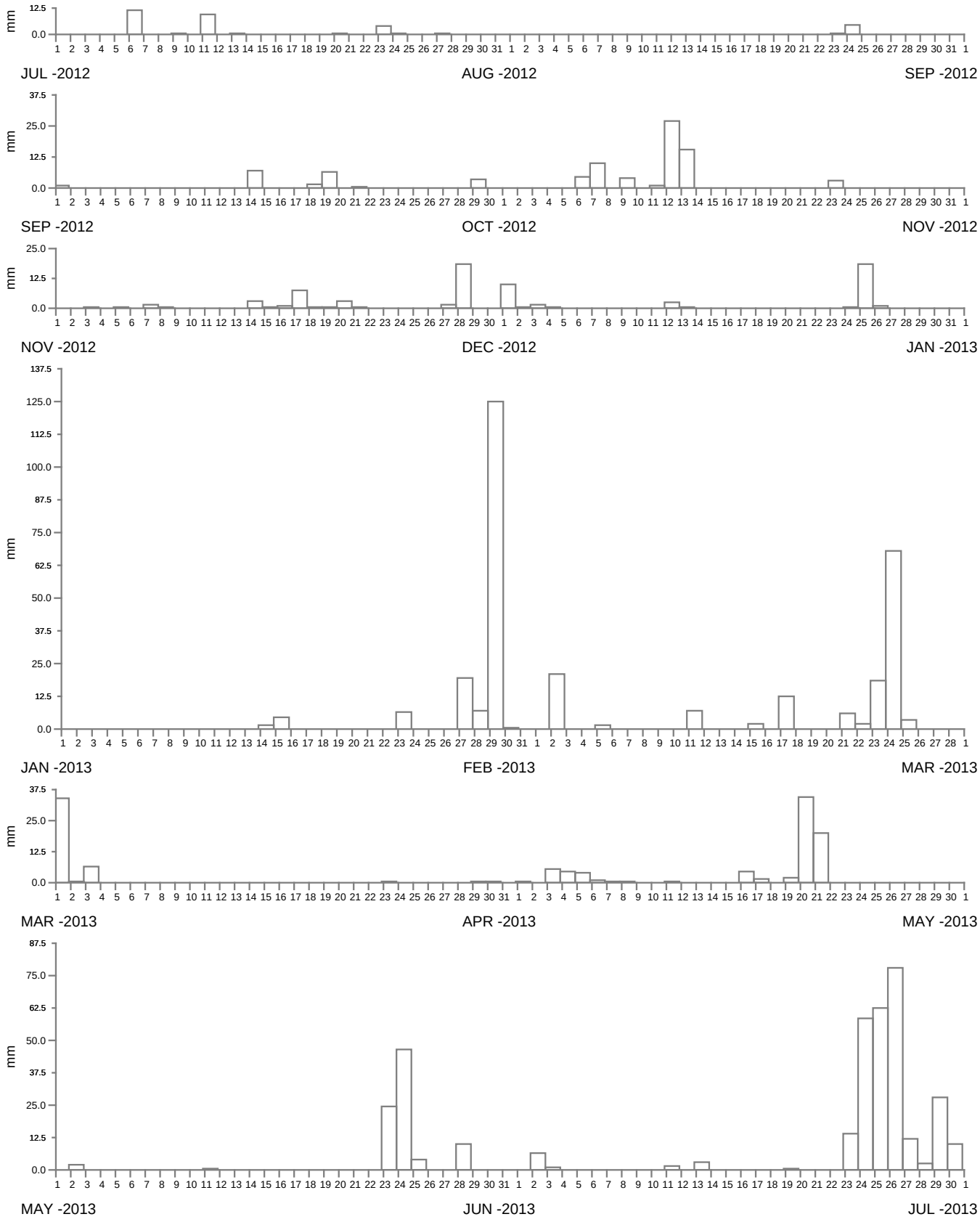
Public Works
Manly Hydraulics Laboratory

DAPTO AT DARKES ROAD
2012-2013

MHL Report 2220

Figure 79

DRAWING 2220-79



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

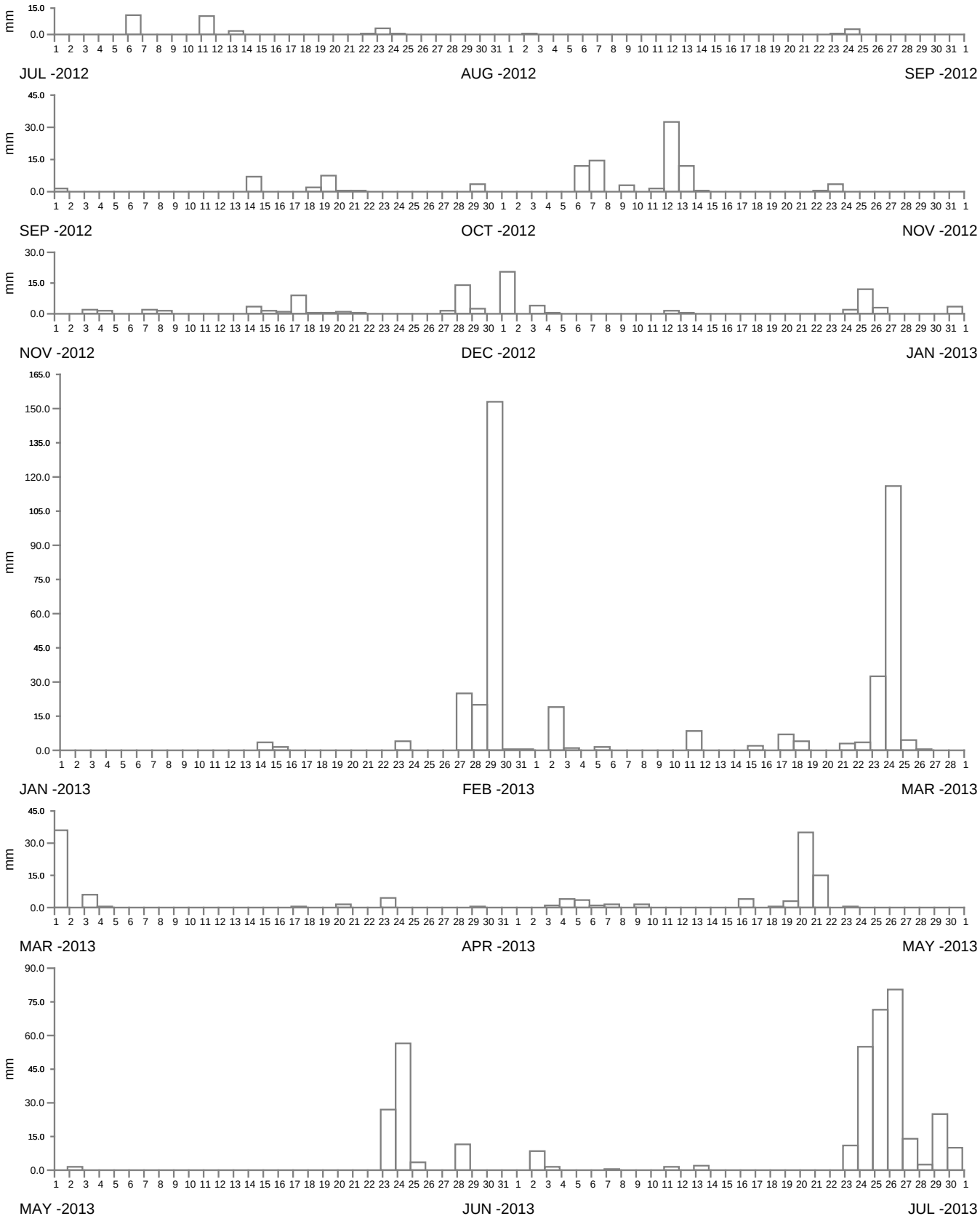
Public Works
Manly Hydraulics Laboratory

CLEVELAND ROAD AT CLEVELAND ROAD
2012-2013

MHL Report 2220

Figure 80

DRAWING 2220-80



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

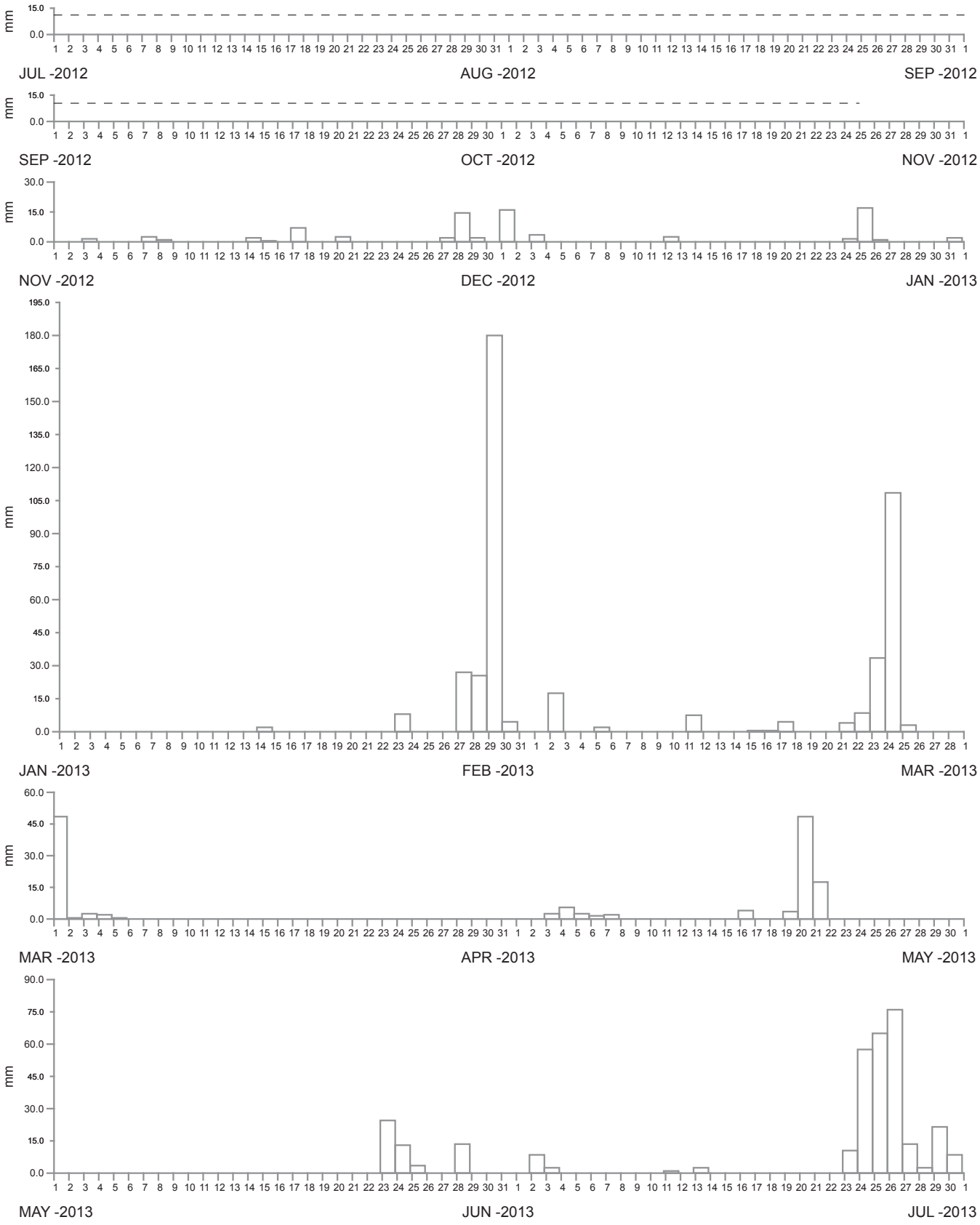
Public Works
Manly Hydraulics Laboratory

HUNTLEY COLLIERY AT AVONDALE ROAD
2012-2013

MHL Report 2220

Figure 81

DRAWING 2220-81



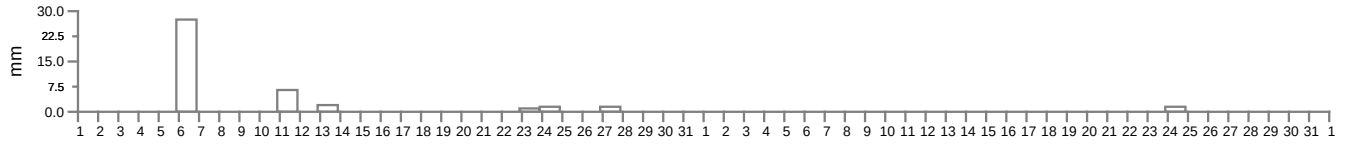
Public Works
Manly Hydraulics Laboratory

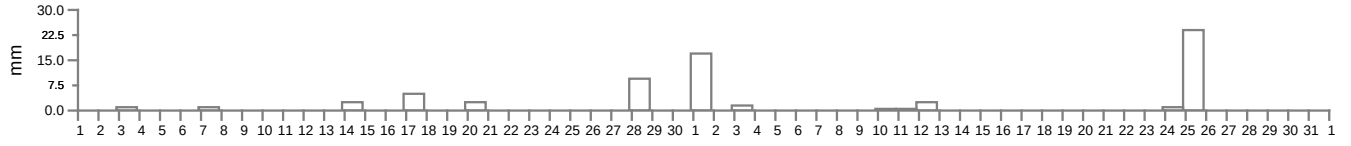
UPPER CALDERWOOD AT CALDERWOOD ROAD
2012-2013

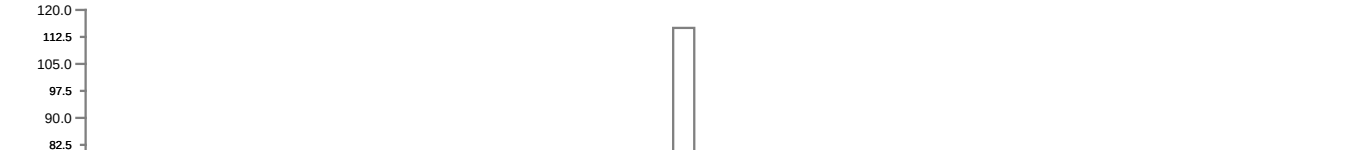
MHL Report 2220

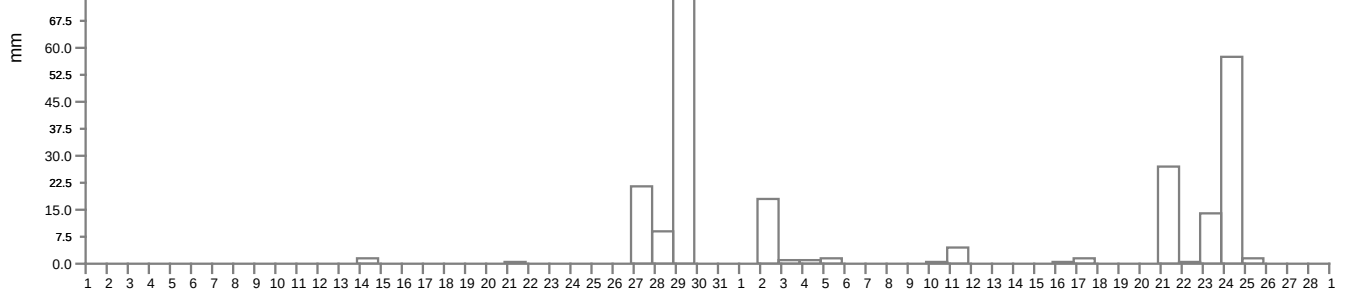
Figure 82

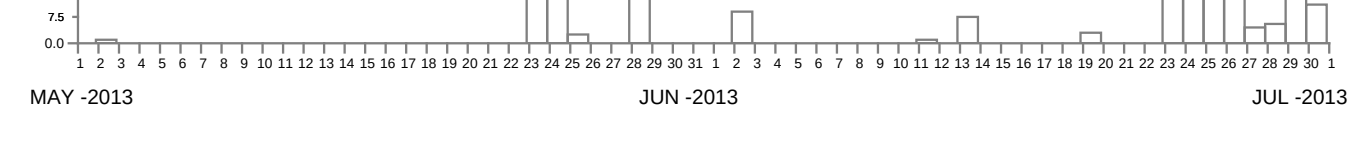
DRAWING 2220-82











JUL -2012 AUG -2012 SEP -2012

SEP -2012 OCT -2012 NOV -2012

NOV -2012 DEC -2012 JAN -2013

JAN -2013 FEB -2013 MAR -2013

MAR -2013 APR -2013 MAY -2013

MAY -2013 JUN -2013 JUL -2013

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

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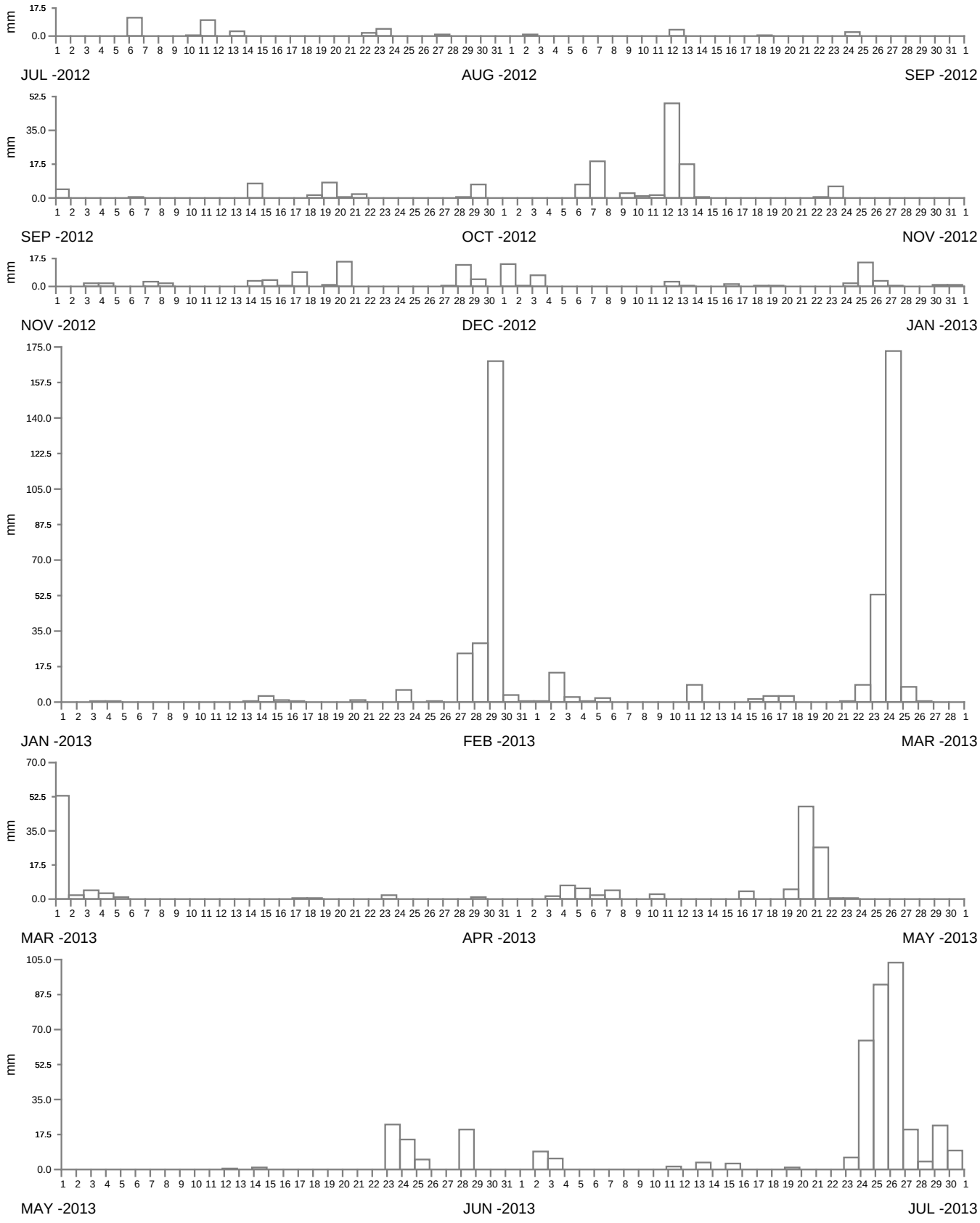
LITTLE LAKE AT LITTLE LAKE
2012-2013

MHL Report 2220

Figure 83

DRAWING 2220-83



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

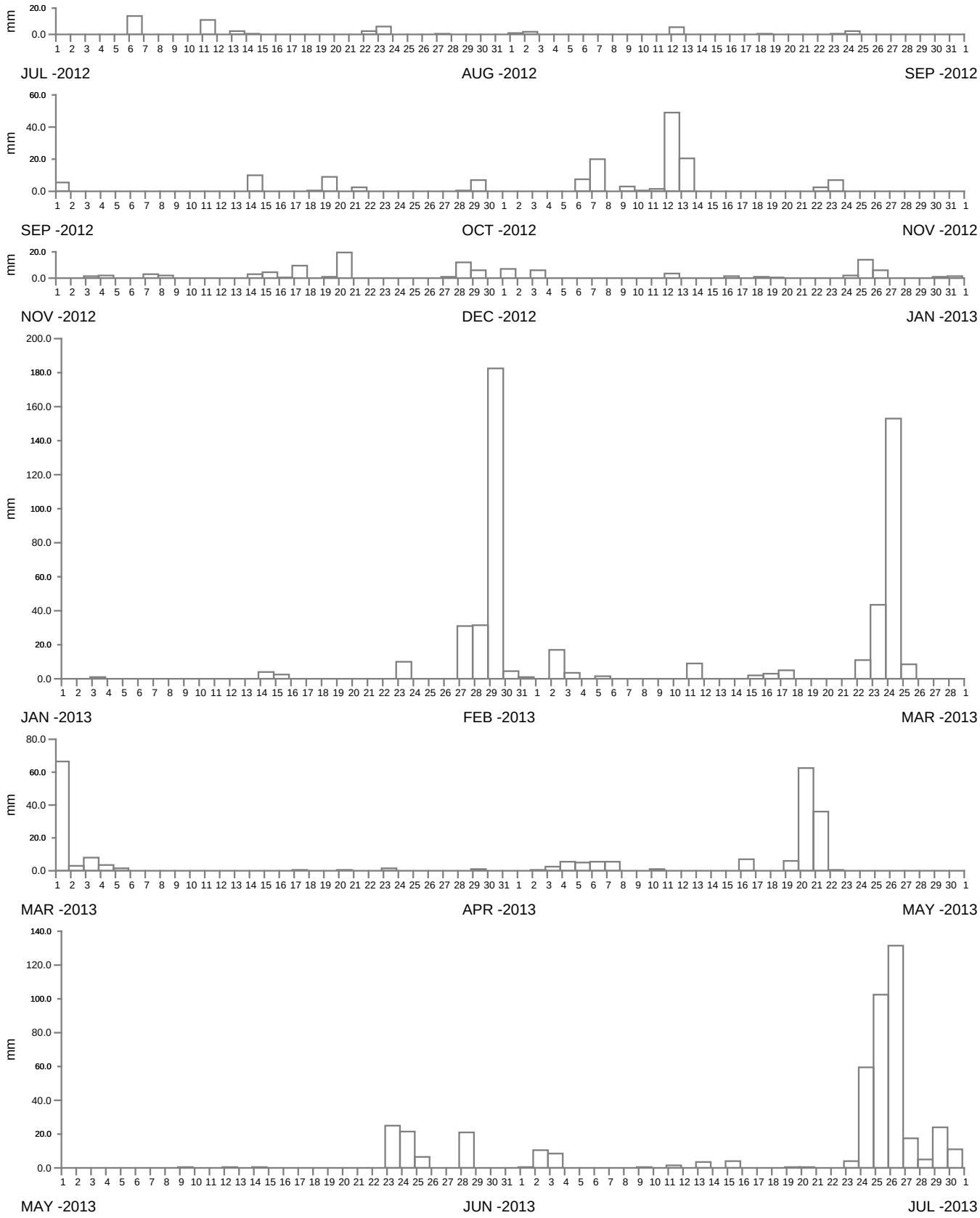
Public Works
Manly Hydraulics Laboratory

NURREWIN AT ILLAWARRA HIGHWAY
2012-2013

MHL Report 2220

Figure 84

DRAWING 2220-84



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

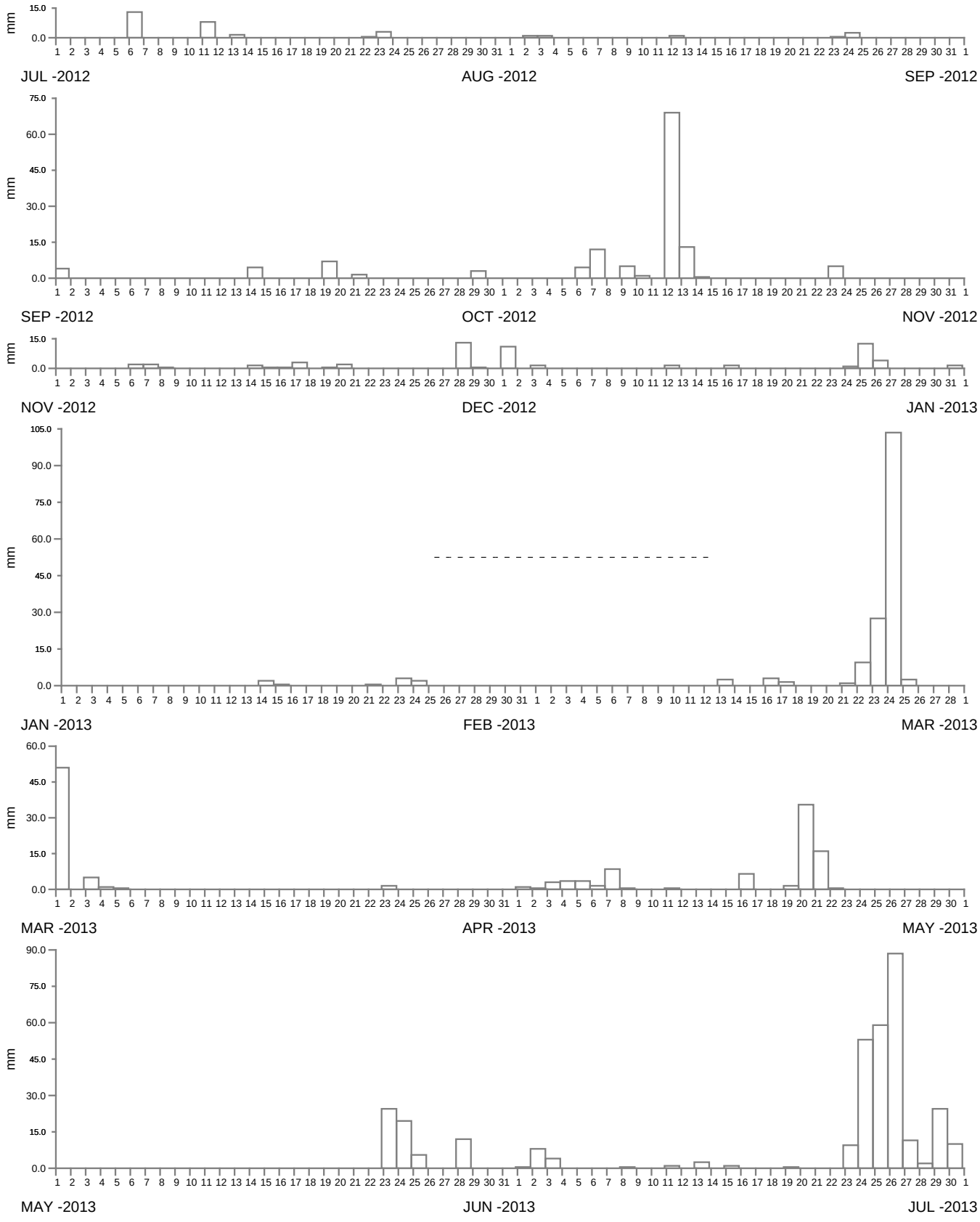
Public Works
Manly Hydraulics Laboratory

CLOVER HILL AT CLOVER HILL ROAD
2012-2013

MHL Report 2220

Figure 85

DRAWING 2220-85



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

Public Works
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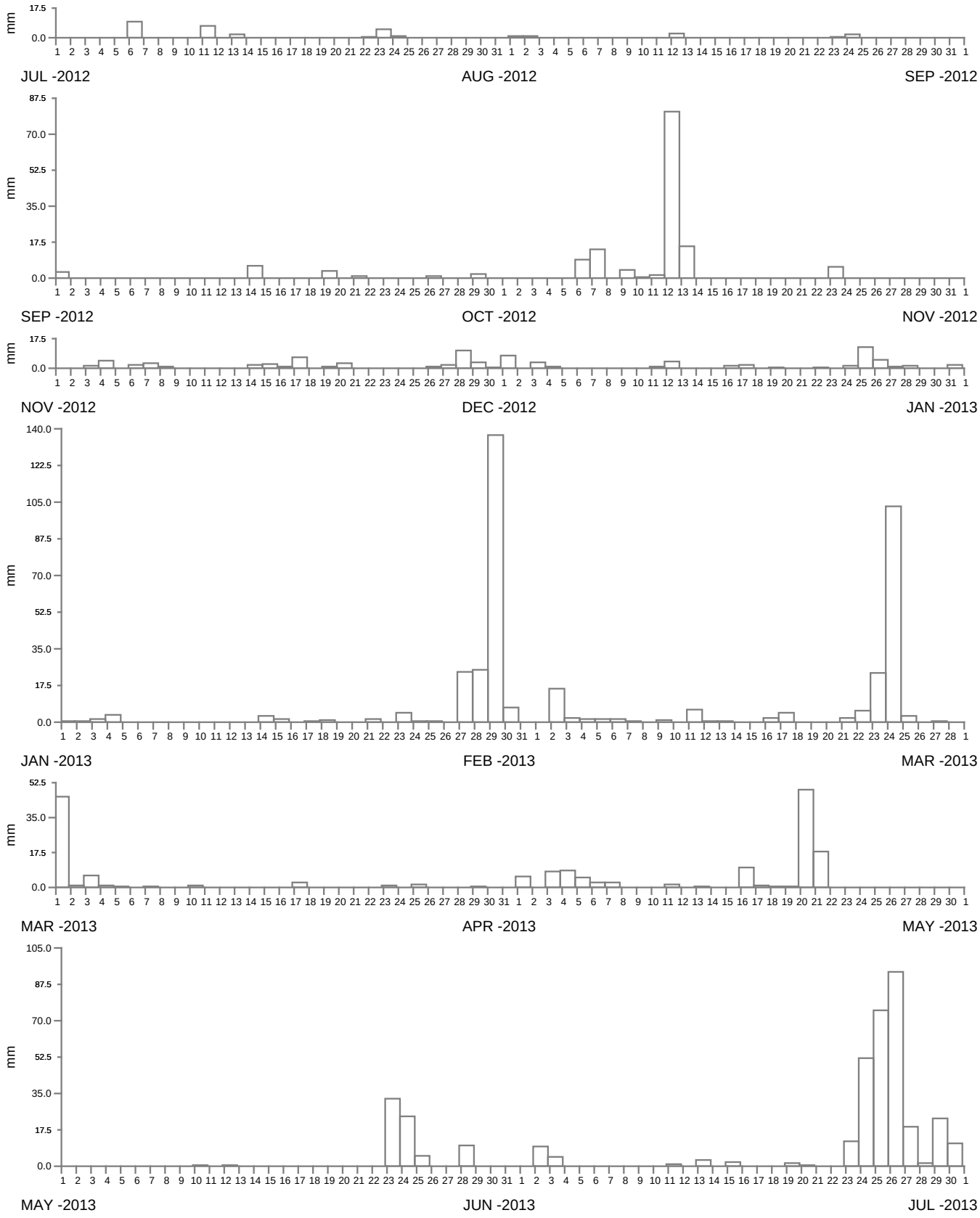
NORTH MACQUARIE AT NORTH MACQUARIE ROAD
2012-2013

MHL Report 2220

Figure 86

DRAWING 2220-86



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

Public Works
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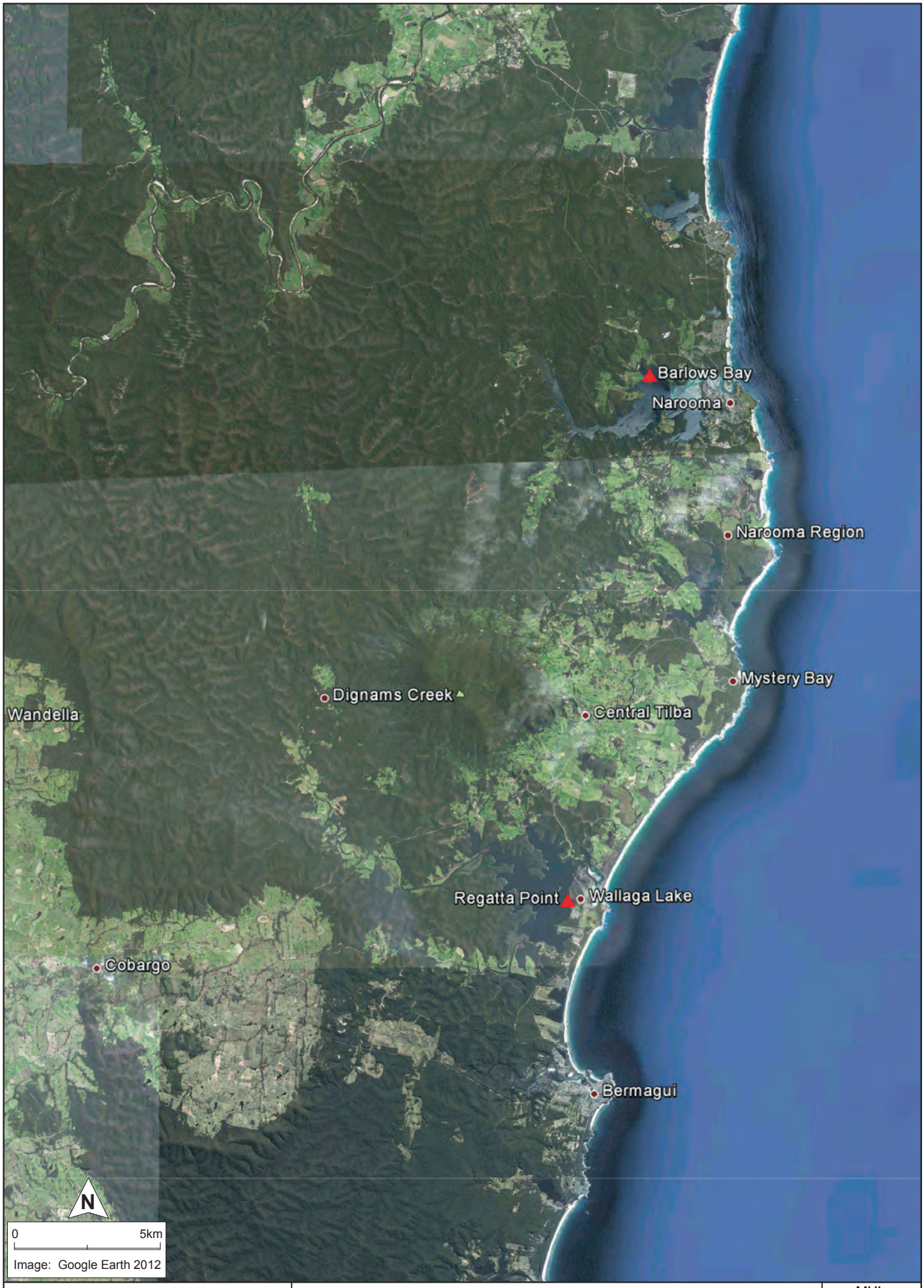
YELLOW ROCK ROAD AT YELLOW ROCK ROAD
2012-2013

MHL Report 2220

Figure 87

DRAWING 2220-87



Public Works
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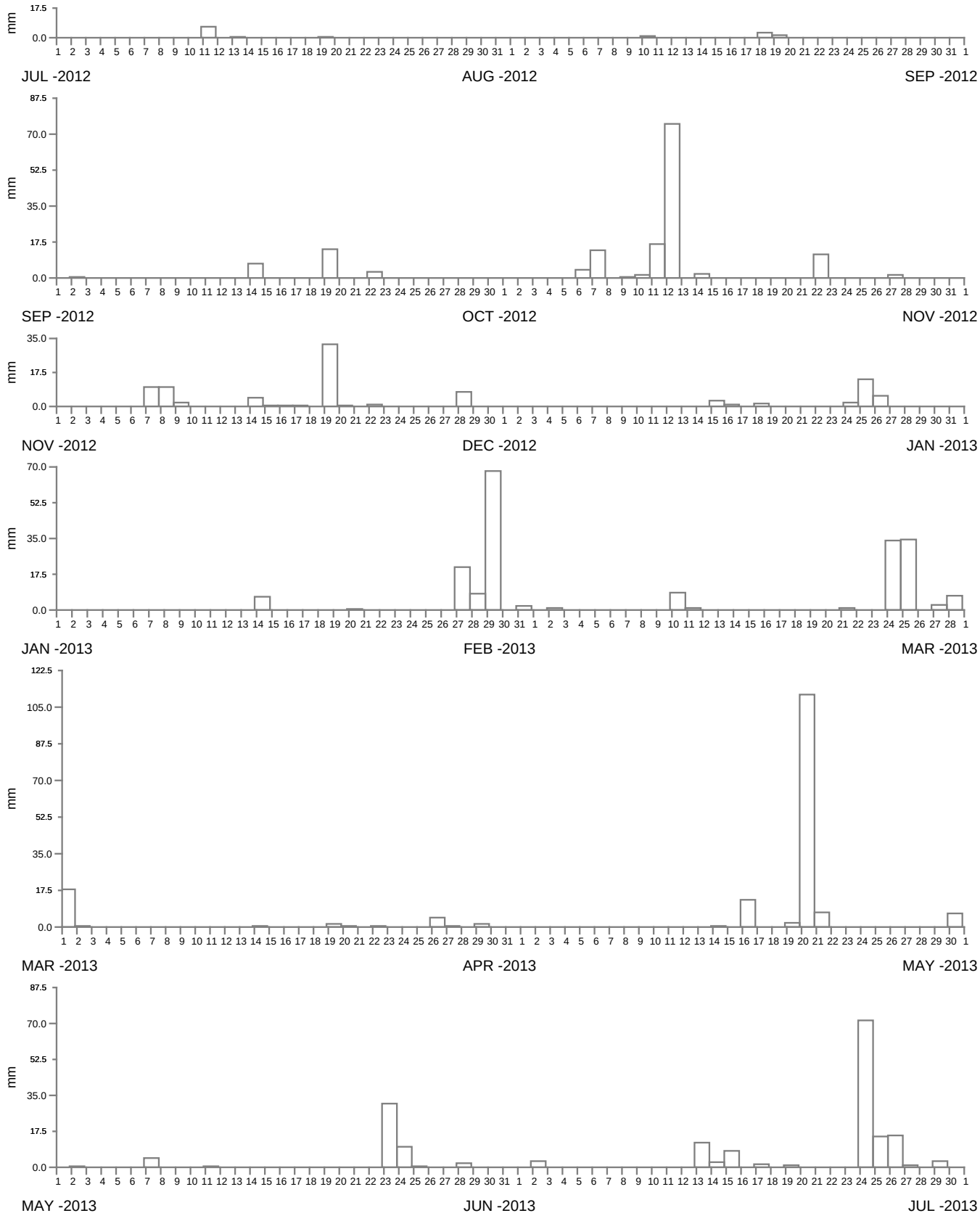
RAINFALL STATION LOCATIONS
SOUTH COAST (MID) REGION

MHL Report 2220

Figure 88

DRAWING 2220-88.cdr



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

Public Works
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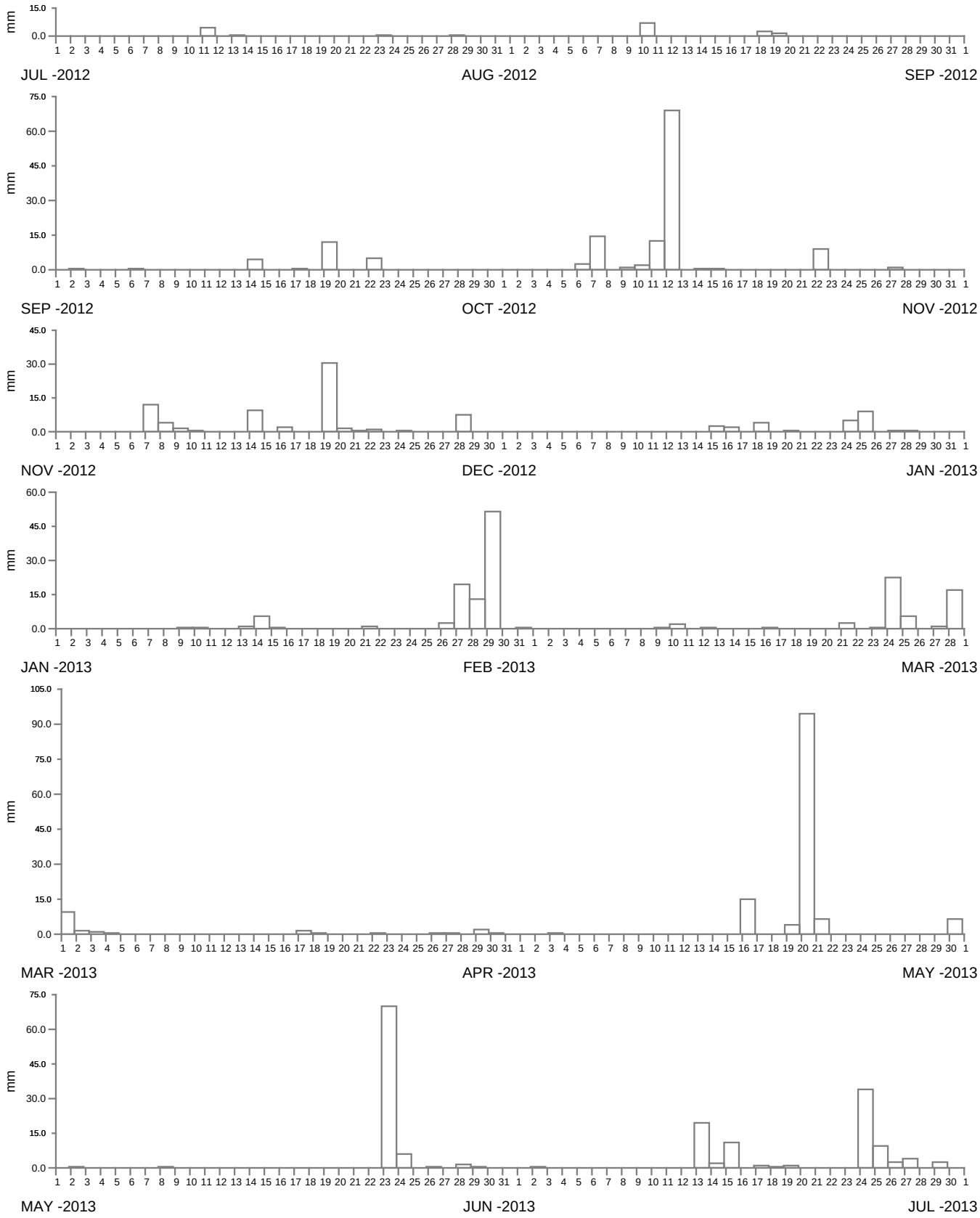
WAGONGA INLET AT BARLOWS BAY
2012-2013

MHL Report 2220

Figure 89

DRAWING 2220-89



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

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WALLAGA LAKE AT REGATTA POINT
2012-2013

MHL Report 2220

Figure 90

DRAWING 2220-90

Appendix A

Data On-Line

Table A1 Data On-line

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 - Ongoing
Bellinger	Perry Drive	Dec 1998 - Ongoing
Bellinger	Shepards 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 - Ongoing
Bellinger	North Bonville	Dec 1990 - Ongoing
Bellinger	Gleniffer	Aug 1993 - Feb 2007
Bellinger	Bellinger Council	Apr 1993 - Jun 2001
Bellinger	Kooroowi	May 1991 - Ongoing
Bellinger	Thora	Feb 1993 - Ongoing
Nambucca	Bowraville	Jun 1993 - Oct 2001
Nambucca	Utungun	Dec 1991 - Ongoing
Macleay	Euroka U/S	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 1984 - Ongoing
Karuah	Tuncurry	Aug 2002 - Ongoing
Karuah	Tiona	Jun 2002 - Ongoing
Karuah	Tarbuck Bay	May 1996 - Ongoing
Karuah	Bulahdelah	Aug 1996 - Ongoing
Hunter	Gostwyck	Oct 1999 - Ongoing
Hunter	Seaham	Sep 1999 - Ongoing
Hunter	Hexham Bridge	May 1998 - Ongoing
Hunter	Belmore Bridge	Sep 1995 - Ongoing
Hunter	Cardiff	Mar 1991 - Sept 1996
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

Region	Station	Period of Data
Macquarie-Tuggerah Lakes	Wyee	May 1992 - Ongoing
Macquarie-Tuggerah Lakes	Whitemans Ridge	Apr 1989 - Ongoing
Macquarie-Tuggerah Lakes	Yarramalong	Feb 1987 - Ongoing
Macquarie-Tuggerah Lakes	Kulnura	Mar 1989 - Ongoing
Macquarie-Tuggerah Lakes	Toukley	Dec 1985 - Ongoing
Macquarie-Tuggerah Lakes	Warnervale	Jan 1986 - Apr 2010
Macquarie-Tuggerah lakes	Hamlyn Terrace	Mar 2010 - Ongoing
Macquarie-Tuggerah Lakes	Wyong Weir	Jan 1986 - Apr 2008
Macquarie-Tuggerah Lakes	Wyong	Jan 1986 - Apr 1991
Macquarie-Tuggerah Lakes	Kangy Angy	Aug 2010 - Ongoing
Macquarie-Tuggerah Lakes	Chittaway	May 1989 - Aug 2010
Macquarie-Tuggerah Lakes	Berkeley Vale	Jun 1988 - Ongoing
Macquarie-Tuggerah Lakes	Mardi Dam	Jun 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	Mar 1989 - Ongoing
Hawkesbury	Strickland	Dec 1985 - Ongoing
Hawkesbury	Narara	Apr 1989 - Ongoing
Hawkesbury	Mount Elliot	Dec 1985 - Ongoing
Hawkesbury	Wyoming	Aug 1988 - Ongoing
Hawkesbury	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 - Jul 1996
Hawkesbury	Cowan	Jun 1991 - Jul 1996
Hawkesbury	Penrith	Nov 1990 - Ongoing
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 - Jul 1996
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 - Ongoing
Sydney Coastal	Middle Creek	Apr 1995 - Ongoing
Sydney Coastal	Cromer	Mar 1994 - Ongoing
Sydney Coastal	Belrose	May 1994 - Ongoing
Sydney Coastal	Allambie	Jun 1999 - Ongoing
Sydney Coastal	Balgowlah	Aug 1999 - May 2005
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

Region	Station	Period of Data
Sydney Coastal	M4 Motorway	Jun 1993 - Sep 1996
Sydney Coastal	Homebush Bay	Feb 1993 - Mar 1994
Sydney Coastal	Kelso Creek	Nov 1996 - Ongoing
Wollongong Coastal	Bulli Pass	Sep 1982 - 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	Sep 1982 - Feb 1997
Wollongong Coastal	Mount Kembla	Jun 1985 - Ongoing
Wollongong Coastal	Dombarton Loop	Jun 1985 - Ongoing
Wollongong Coastal	Wongawilli	Sep 1982 - 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	Jun 1982 - Ongoing
Wollongong Coastal	Calderwood	Jan 1983 - Jun 1985
Wollongong Coastal	Upper Calderwood	Jun 1985 - Ongoing
Wollongong Coastal	Little Lake	May 1991 - Ongoing
Wollongong Coastal	Airport	Jun 1991 - Mar 1995
Wollongong Coastal	North Macquarie	Jul 1985 - Ongoing
Wollongong Coastal	Clover Hill	Aug 1985 - Ongoing
Wollongong Coastal	Nurrewin	May 2005 - Ongoing
Wollongong Coastal	Yellow Rock Road	Jun 1982 - Ongoing
Wollongong Coastal	Balgownie	Jul 1982 - Jun 1987
Wollongong Coastal	Woonona	Jul 1982 - Jun 1985
South Coast	Lake Wollumboula	Feb 1999 - Oct 2000
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

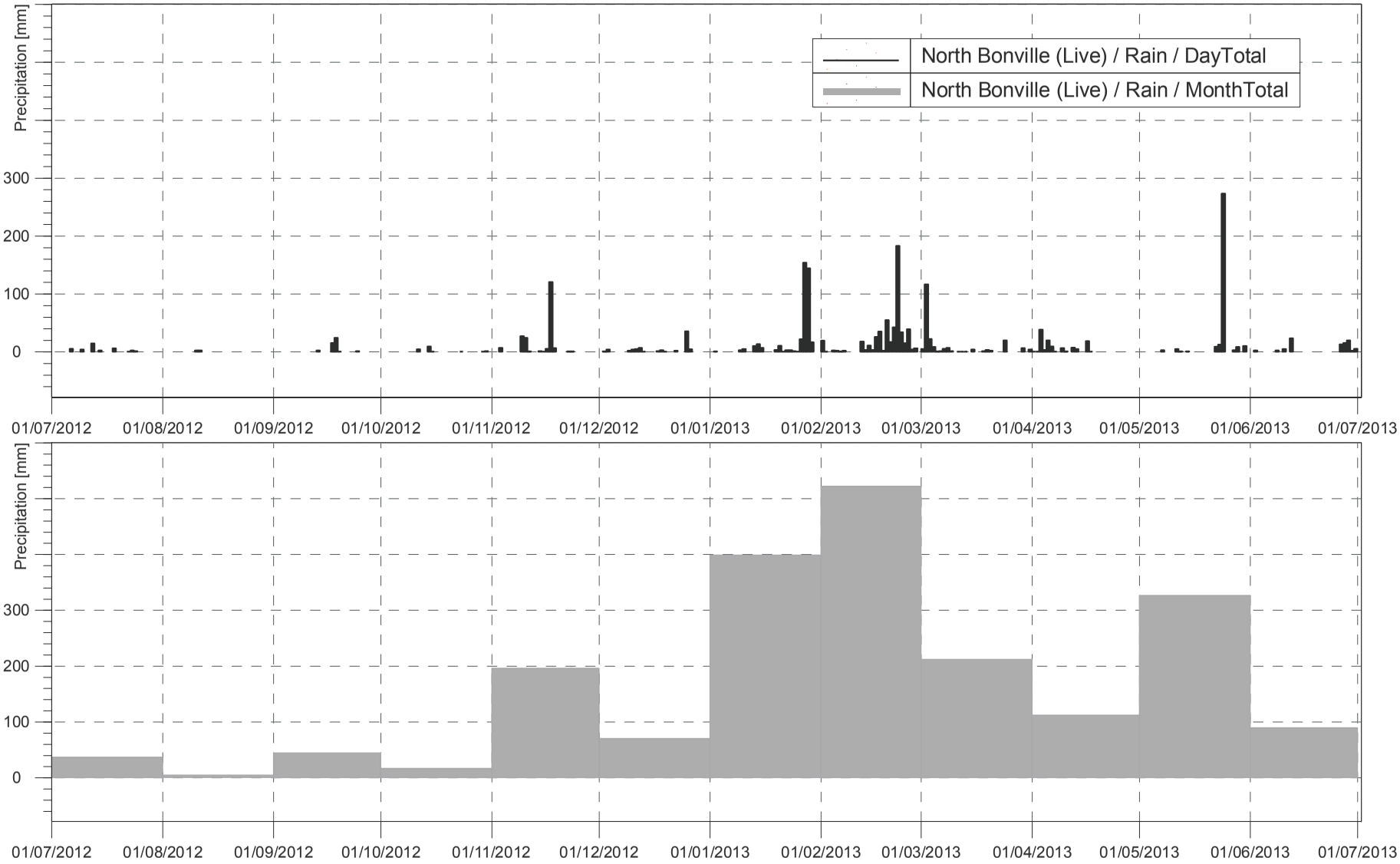
Appendix B

Sample Rainfall Data Outputs

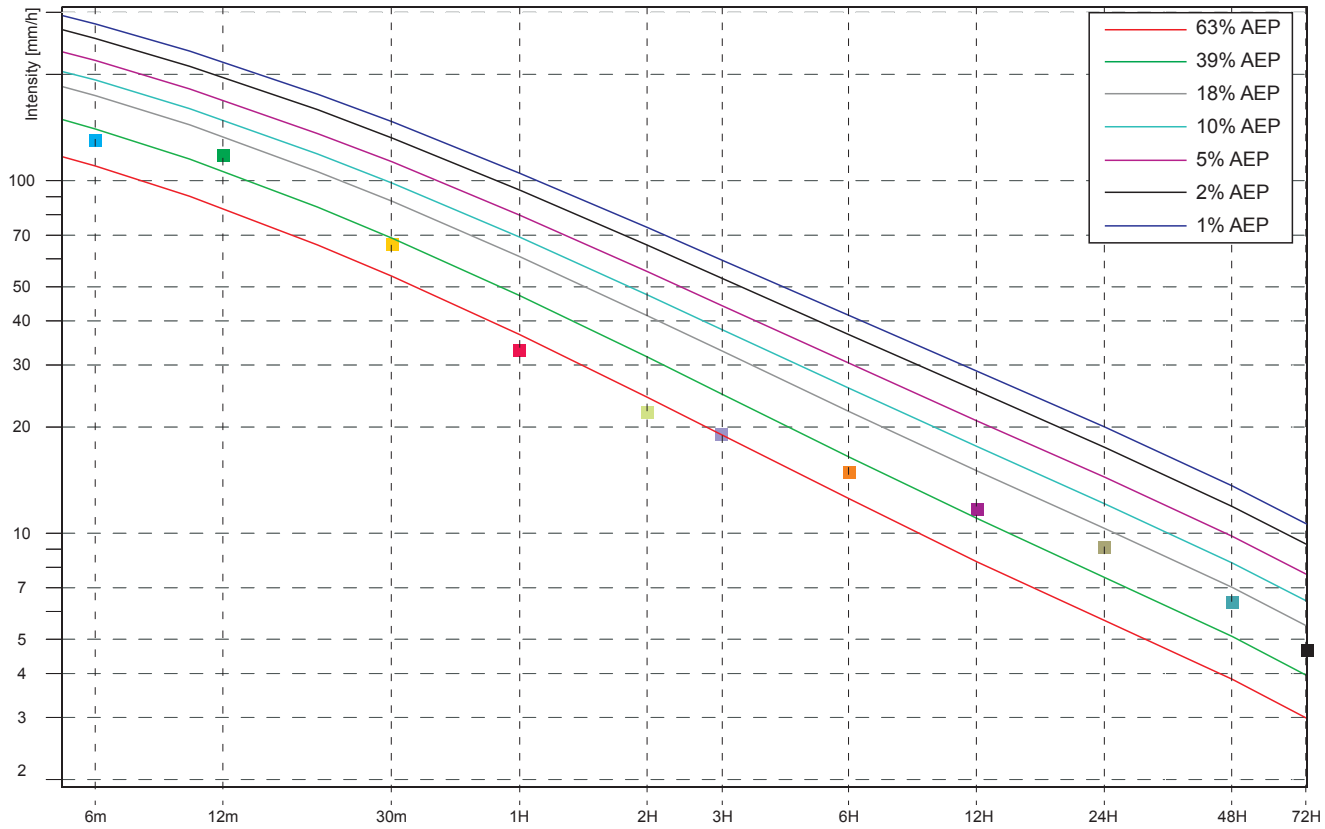
NSW GOVERNMENT

Public Works
Manly Hydraulics Laboratory

DAILY AND MONTHLY RAINFALL PLOTS
NORTH BONVILLE



MHL Report 2220
Figure B1
DRAWING 2220-B1.cdr



Duration
(minutes: m, hours: H)
Reference: Australian Rainfall and Runoff 1987

North Bonville Rainfall Intensity 21 January-21 March 2013		
Duration (minutes: m) (hours: H)	**Intensity (mm/hr)**	**Date/Time**
6m	130.00	17/02/2013 17:14
12m	117.50	17/02/2013 17:14
30m	66.00	17/02/2013 17:26
1H	33.00	17/02/2013 17:26
2H	22.00	22/02/2013 14:44
3H	19.00	22/02/2013 14:42
6H	14.83	22/02/2013 16:40
12H	11.67	22/02/2013 19:56
24H	9.08	28/01/2013 11:12
48H	6.35	28/01/2013 21:46
72H	4.64	29/01/2013 5:54

Australian Rainfall and Runoff (Institute of Engineers Australia 1987) states:
Use of the terms 'recurrence interval' and 'return period' has been criticised as leading to confusion in the minds of some decision-makers and members of the public. Although the terms are simple superficially, they are sometimes misinterpreted as implying that the associated magnitude is only exceeded at regular intervals, and that they are referring to the elapsed time to the next exceedance.

The use of the term 'Average Recurrence Interval' (ARI) can lead to confusion. It is preferable, therefore, to express the rarity of a rainfall event in terms of Annual Exceedance Probability (AEP). For example, 'a rainfall total of 60mm falling in 3 hours at Cudgera has a 0.010 (i.e. 1%) probability of being equalled or exceeded in any one year' can be easier to understand than the equivalent statement of 'rainfall total of 60mm in 3 hours has an ARI of 100 years'.

Adapted from: http://www.bom.gov.au/water/designRainfalls/ifd/glossary.shtml

NSW GOVERNMENT
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INTENSITY-FREQUENCY-DURATION
NORTH BONVILLE
21 JANUARY-21 MARCH 2013

MHL Report 2220
Figure B2
DRAWING 2220-B2.cdr

Station Name	North Bonville (Live)
Station Number	559050
MGA Easting (m zone 56)	500592.91
MGA Northing (m zone 56)	6641143.16

Date	Time	Value [mm]	State of value
26/01/2013	2:05:00	0	5 (Very Good)
26/01/2013	2:35:17	0.5	5 (Very Good)
26/01/2013	2:40:12	0.5	5 (Very Good)
26/01/2013	4:04:04	0.5	5 (Very Good)
26/01/2013	4:04:53	0.5	5 (Very Good)
26/01/2013	4:07:48	0.5	5 (Very Good)
26/01/2013	5:56:18	0.5	5 (Very Good)
26/01/2013	5:57:42	0.5	5 (Very Good)
26/01/2013	5:59:16	0.5	5 (Very Good)
26/01/2013	6:00:32	0.5	5 (Very Good)
26/01/2013	6:01:22	0.5	5 (Very Good)
26/01/2013	6:02:22	0.5	5 (Very Good)
26/01/2013	8:00:00	0	5 (Very Good)
26/01/2013	12:20:33	0.5	5 (Very Good)
26/01/2013	12:20:51	0.5	5 (Very Good)
26/01/2013	12:21:32	0.5	5 (Very Good)
26/01/2013	12:22:02	0.5	5 (Very Good)
26/01/2013	12:22:42	0.5	5 (Very Good)
26/01/2013	12:23:49	0.5	5 (Very Good)
26/01/2013	12:24:37	0.5	5 (Very Good)
26/01/2013	12:25:42	0.5	5 (Very Good)
26/01/2013	12:35:17	0.5	5 (Very Good)
26/01/2013	13:55:00	0	5 (Very Good)
26/01/2013	19:16:58	0.5	5 (Very Good)
26/01/2013	19:49:01	0.5	5 (Very Good)
26/01/2013	19:51:13	0.5	5 (Very Good)
26/01/2013	21:12:07	0.5	5 (Very Good)
26/01/2013	21:55:36	0.5	5 (Very Good)
26/01/2013	22:01:34	0.5	5 (Very Good)
26/01/2013	22:05:28	0.5	5 (Very Good)
26/01/2013	22:10:31	0.5	5 (Very Good)
26/01/2013	22:12:16	0.5	5 (Very Good)
26/01/2013	22:13:47	0.5	5 (Very Good)
26/01/2013	22:15:34	0.5	5 (Very Good)
26/01/2013	22:17:57	0.5	5 (Very Good)

Appendix C

Publications of Interest

Appendix C 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).

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).

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).

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).

Flood Reports

Manly Hydraulics Laboratory Flood Reports:

- *NSW North Coast Flood Summary January–March 2013*, MHL Report No. 2202
- *Northern Rivers May 2009 Flood Report*, MHL Report No. 1965
- *NSW Coffs Harbour and Bellinger River Regions April 2009 Flood Summary*, MHL Report No. 1913
- *NSW Coffs Harbour, Bellinger and Nambucca Rivers Region February 2009 Flood Summary*, MHL Report No. 1908

- *Bellinger and Coffs Harbour Regions January 2008 Flood Summary*, MHL Report No. 1804
- *Clarence River January 2008 Flood Summary*, MHL Report No. 1803
- *Richmond River January 2008 Flood Summary*, MHL Report No. 1802
- *Tweed and Brunswick Rivers January 2008 Flood Summary*, MHL Report No. 1802
- *NSW Hawkesbury and Nepean June 2007 Flood Summary*, MHL Report No. 1756
- *NSW Hunter Valley, Wallamba River and Myall River June 2007 Flood Summary*, MHL Report No. 1755
- *NSW Central Coast June 2007 Flood Summary*, MHL Report No. 1754
- *NSW North Coast March 2006 Flood Summary*, MHL Report No. 1482
- *NSW North Coast January 2007 Flood Summary*, MHL Report No. 1469
- *NSW North Coast Flood Summary June 2005*, MHL Report No. 1426

Other References

Bureau of Meteorology 2002, 'Climate Glossary – Southern Oscillation Index' *Australian Government*. Retrieved from http://www.bom.gov.au/climate/glossary/soi.shtml

The Institution of Engineers 1987, *Australian Rainfall and Runoff*

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