Public Works
Manly Hydraulics Laboratory

NSW ESTUARY AND RIVER WATER QUALITY ANNUAL SUMMARY 2013-2014

Report MHL2295
December 2014

prepared for
NSW Office of Environment and Heritage

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NSW Estuary and River Water Quality Annual Summary
2013-2014

Report MHL2295
December 2014

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Foreword

NSW Public Works Manly Hydraulics Laboratory (MHL) is a business group within NSW Public Works, a division of the Office of Finance and Services. The NSW water quality database has been developed by NSW Public Works MHL to support a number of programs associated with coastal, floodplain and estuary management for the NSW Office of Environment and Heritage (OEH), NSW Office of Water (NOW) and Wollongong City Council (WCC).

This summary presents the results of water quality measurements captured by the automatic recording stations along the coastal estuaries and rivers of New South Wales, from 1 July 2013 to 30 June 2014, and catalogues data collected in NSW by NSW Public Works MHL.

This summary has been prepared to provide ready access to NSW Public Works MHL's water quality database and the data analysis capabilities at NSW Public Works MHL.

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  Annual Summary 2013-2014
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  Report No. MHL2291
  PW Report No. 14047
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- NSW Coastal Rainfall
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- NSW Ocean and River Entrance Tidal Levels
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  PW Report No. 14048
  ISBN 978 0 7347 4487 6
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  Report No. MHL2294
  PW Report No. 14050
  ISBN 978 0 7347 4489 0

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Summary

This report contains:

- a brief description of the water quality programs
- guidelines on how to use this report
- information on how to access the database
- significant developments which occurred in 2013-2014
- the data summaries and station location maps for each station
- Appendix A which details the data available online
- Appendix B which shows data output formats available at MHL
- Appendix C a list of other publications which may be of interest.

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1. Water Quality Monitoring Programs

This report presents a summary of the water quality data currently collected by NSW Public Works Manly Hydraulics Laboratory (MHL). The network of automatic recorders and the associated analysis routines enable NSW Public Works MHL to provide an efficient service in providing water quality data. As well as near real time water quality information at 21 stations in NSW, extracts from the historical database of water quality data can be made available on request (refer to Appendix A).

The present program is based on a network of automatic recording stations installed at various estuaries (see Station Location Maps). This network consists of 21 permanent stations funded by the NSW Office of Environment and Heritage (OEH), NSW Office of Water (NOW) and Wollongong City Council (WCC) (see Table 1). Two water quality stations at Bungawalbin and Taree were decommissioned on 28/08/2013 and 30/10/2013 respectively. The logging systems consist of Campbells Scientific CR800 data loggers which record water quality information every 15 minutes. Data is transmitted via internet protocol (IP) telemetry to the database every six hours.

Table 1 Station List

River/ Estuary System	Station Name	Station No.	MGA	Easting	Northing	Station Owner	Data start
Richmond	Coraki	203403	56	527976	6793772	OEH/NOW	21-Oct-09
Richmond	Oakland Road	203470	56	526684	6791185	NOW	06-Mar-12
Richmond	Bungawalbin*	203450	56	527019	6788273	OEH/NOW	21-Oct-09
Clarence	Rogans Bridge	204414	56	488813	6723401	OEH/NOW	03-Dec-09
Clarence	Grafton	204400	56	493398	6715149	OEH/NOW	04-Dec-09
Macleay	Kempsey	206468	56	485099	6561395	OEH/NOW	09-Feb-10
Manning	Wingham	208400	56	440523	6473219	OEH/NOW	08-Dec-09
Manning	Taree-West	208420	56	447161	6469672	NOW	30-Apr-10
Manning	Taree*	208410	56	448684	6468641	OEH/NOW	16-Feb-10
Myall Lakes	Bombah Point	209475	56	434680	6403299	OEH	13-Jul-09
Myall River	Tea Gardens	209480	56	421723	6385111	OEH	20-Oct-09
Paterson	Dunmore	210409	56	369238	6383269	OEH/NOW	15-Oct-09
Paterson	Hinton Bridge	210410	56	373245	6379624	OEH/NOW	15-Oct-09
Hunter	McKimms Corner	210455	56	368162	6378933	OEH/NOW	08-Oct-09

River/ Estuary System	Station Name	Station No.	MGA	Easting	Northing	Station Owner	Data start
Hunter	Hexham	210448	56	376768	6367608	OEH/NOW	13-Apr-11
Hunter	Fullerton Cove Salinity Buoy	210149	56	386312	6364022	NOW	21-Jun-13
Hunter	Green Rocks	210432	56	377459	6378142	OEH/NOW	15-Oct-09
Williams	Raymond Terrace	210452	56	382352	6375361	OEH/NOW	15-Oct-09
Hawkesbury	Sackville	212406	56	303238	6292029	OEH/NOW	30-Oct-09
Hawkesbury	Leets Vale	212461	56	309195	6299263	NOW	22-Jun-10
Lake Illawarra	Koonawarra Bay	214440	56	300064	6179621	WCC	15-Jun-93
Lake Illawarra	Cudgeree Bay	214416	56	303885	6177264	WCC	09-Feb-93
Shoalhaven	Grady's Caravan Park	215430	56	268024	6138282	OEH/NOW	06-Oct-10

*Station decommissioned

The network features three distinctive water quality probes for obtaining temperature and conductivity readings:

- EC1500: designed for long-term deployment at unattended monitoring stations. The sensor head is epoxy encapsulated and has a large toroid to allow the flow of water through it. The sensor measures conductivity from zero to full scale with the probe resolution of electrical conductivity (EC) ± 1% at full scale and temperature ± 0.2°C
- AquiStar CT2X: a submersible sensor with built-in datalogging. The CT2X incorporates 4-pole electrode cell measurement technology with a probe resolution of EC ± 1 microsiemen/cm and temperature ± 0.01°C
- YSI Sonde 6820 V2: a multi-parameter probe with a probe resolution of EC ± 1 microsiemen/cm and temperature ± 0.01°C.

In 2010 NOW requested that logger programs at all NOW-funded sites be modified to output salinity as Practical Salinity Units (psu) and specific conductivity at 25°C (microseimens/cm) in addition to the standard outputs of water level, temperature and conductivity. This request is intended to make the near real-time data more usable by the diverse range of end users.

Temperature and conductivity values are obtained directly from the instrumentation. Specific conductivity at 25°C is calculated using the equation:

$$\text{Specific Conductivity [µs/cm]} = C / (1+0.0198933 * (T-25))$$

where C = uncompensated EC, T = temperature

Salinity is calculated using the UNESCO formula (seawater salinity calculation) and the full equation can be found in:

> *UNESCO Technical Papers in Marine Science, #36 (1981a)* 'The Practical Salinity Scale 1978 and the International Equation of State of Seawater 1980', UNESCO Division of Marine Sciences (Paris), p25.

Water quality data is transferred to the NSW Data Collection Warehouse, Data Centre 1 and to NSW Public Works MHL's data server using a variety of telemetry techniques including IP, landline telephone and cellular networks. The incoming raw data is then immediately available to external users to view via the web.

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

Data 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 NSW Public Works MHL's services and to the water quality 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. Extracts from the historical database of water quality data can be made available on request (refer 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.

There are various factors which can influence the water quality data presented in this report. The reader should be familiar with these factors and data recording limitations when interpreting it. For instance, in coastal streams or estuaries, salt water often mixes with fresh water. The addition of salt water greatly increases conductivity. Caution should be exercised when interpreting the conductivity and derived salinity plots in this report as the water quality station locations range significantly in proximity to the ocean. The ocean records an approximate level of 36 practical salinity units compared with freshwater which is almost zero. The auto scaling of the plots can overemphasise changes in low range locations (inland) caused by rainfall events, which increases freshwater inflows and lowers conductivity. Conversely, during low flow conditions the dissolved solids are more concentrated and therefore conductivity levels are higher. After an event, the station will again be influenced by salt water intrusion brought upstream by the tides; this can consequently present data to be misread as noisy fluctuations in the trace, and/or misread as instrument malfunction, rather than true responses to the surrounding environment.

3. How to Access the Data

NSW Public Works MHL provides a full on-line data access service via the Internet for its clients, and a restricted service for the general public at http://mhl.nsw.gov.au/.

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 NSW Public Works MHL web page (http://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 NSW Public Works MHL website has been updated in association with an updated database and data warehouse capability via Data Centre 1. The latest website was launched in March 2012 and includes updated functionality, data access and availability of water level time-series plots.

Appendix B describes sample data plots and NSW Public Works MHL's products that can be provided upon request.

Appendix C provides additional publications that may be of interest.

4. Significant Events and Developments

This section outlines events and developments which have influenced water quality monitoring during this reporting period. Floods introduce significant freshwater inflows which impact on electrical conductivity and temperature, as shown in the data summaries. During the reporting period flooding, as described by the Bureau of Meteorology's NSW flood classification scale, occurred as listed in Table 2.

Table 2 NSW Flood Classifications

River Basin	Flood Classification	Date
Paterson River	Moderate	November 2013
Richmond River	Minor	March 2014

In April, May and June 2014 cross-sectional water quality profiling was undertaken on the Richmond, Clarence, Macleay, Manning, Paterson, Hunter, Hawkesbury and Shoalhaven rivers, as part of the NOW monitoring program.

Two water quality stations at Bungawalbin and Taree were decommissioned on 28/08/2013 and 30/10/2013, respectively, at the request of NOW.

Fullerton Cove Salinity Buoy was dragged, tipped and inundated with water by a trawler in December 2013. It was relocated and redeployed with new equipment in a similar location in March 2014.

The orifice line at Wingham was re-trenched deeper into the ground to reduce any damage from external sources and hopefully prevent damage from future floods.

A Radio-link telemetry system was installed at Grady's Caravan Park on the Shoalhaven River to improve telemetry availability.

5. Water Quality Monitoring Summary

This section documents locality maps and quality assured water quality monitoring summaries for each station. Tables 3 and 4 provide indices to the figures presented.

Table 3 Index of Figures

River /Estuary System	Station Name	Station No.	Figure
Station Locality Map	Richmond River Region		1
Richmond	Coraki	203403	2
Richmond	Oakland Road	203470	3
Richmond	Bungawalbin	203450	4
Station Locality Map	Clarence River Region		5
Clarence	Rogans Bridge	204413	6
Clarence	Grafton	204400	7
Station Locality Map	Macleay River Region		8
Macleay	Kempsey	206468	9
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Manning	Wingham	208400	11
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Williams	Raymond Terrace	210452	24
Hunter	Hexham	210448	25
Hunter	Fullerton Cove Salinity Buoy	210149	26
Station Locality Map	Hawkesbury River Region		27
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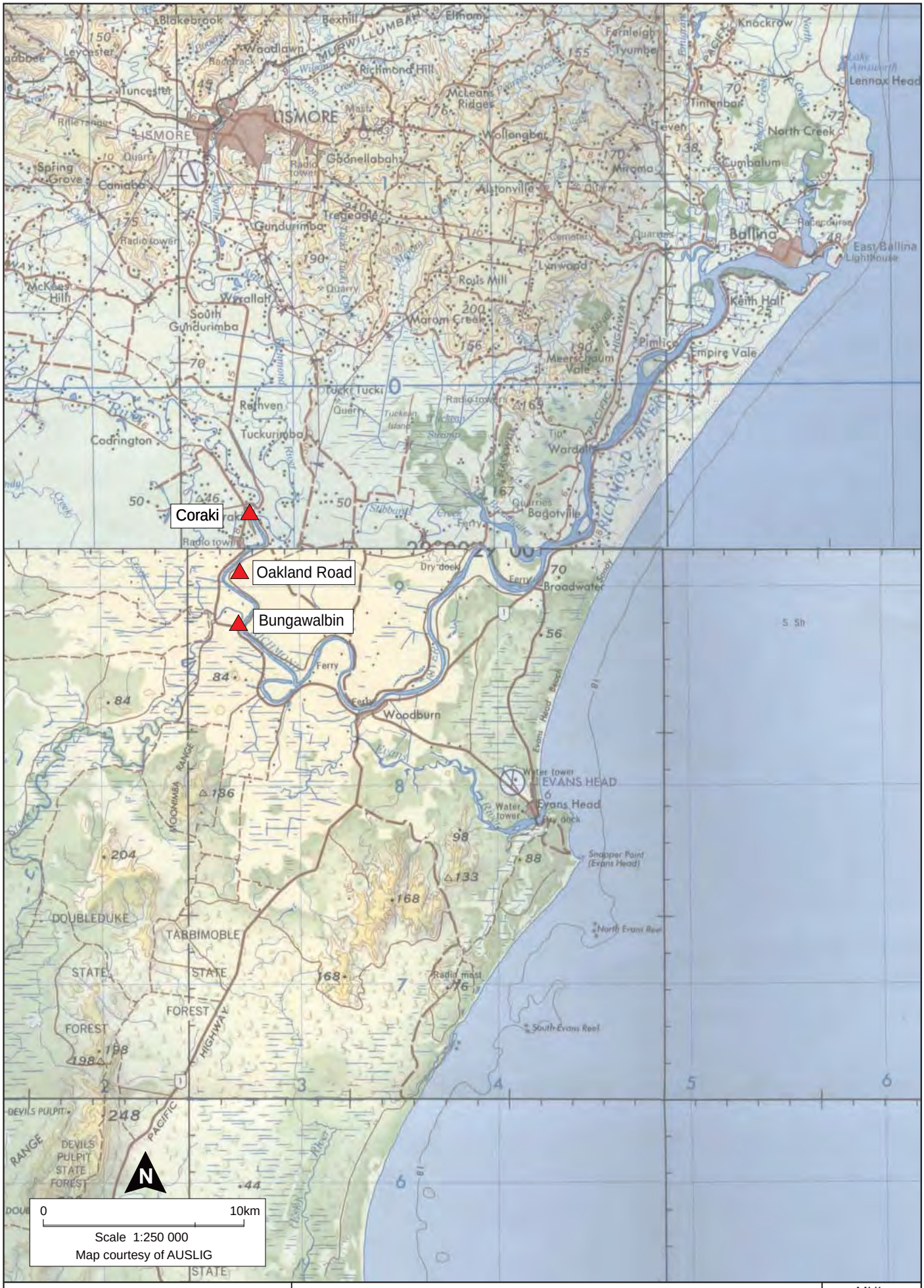

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STATION LOCATIONS
RICHMOND RIVER REGION

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Figure 1

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WATER LEVEL AND WATER QUALITY DATA
2013-2014
CORAKI

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Figure 2

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WATER LEVEL AND WATER QUALITY DATA
2013-2014
OAKLAND ROAD

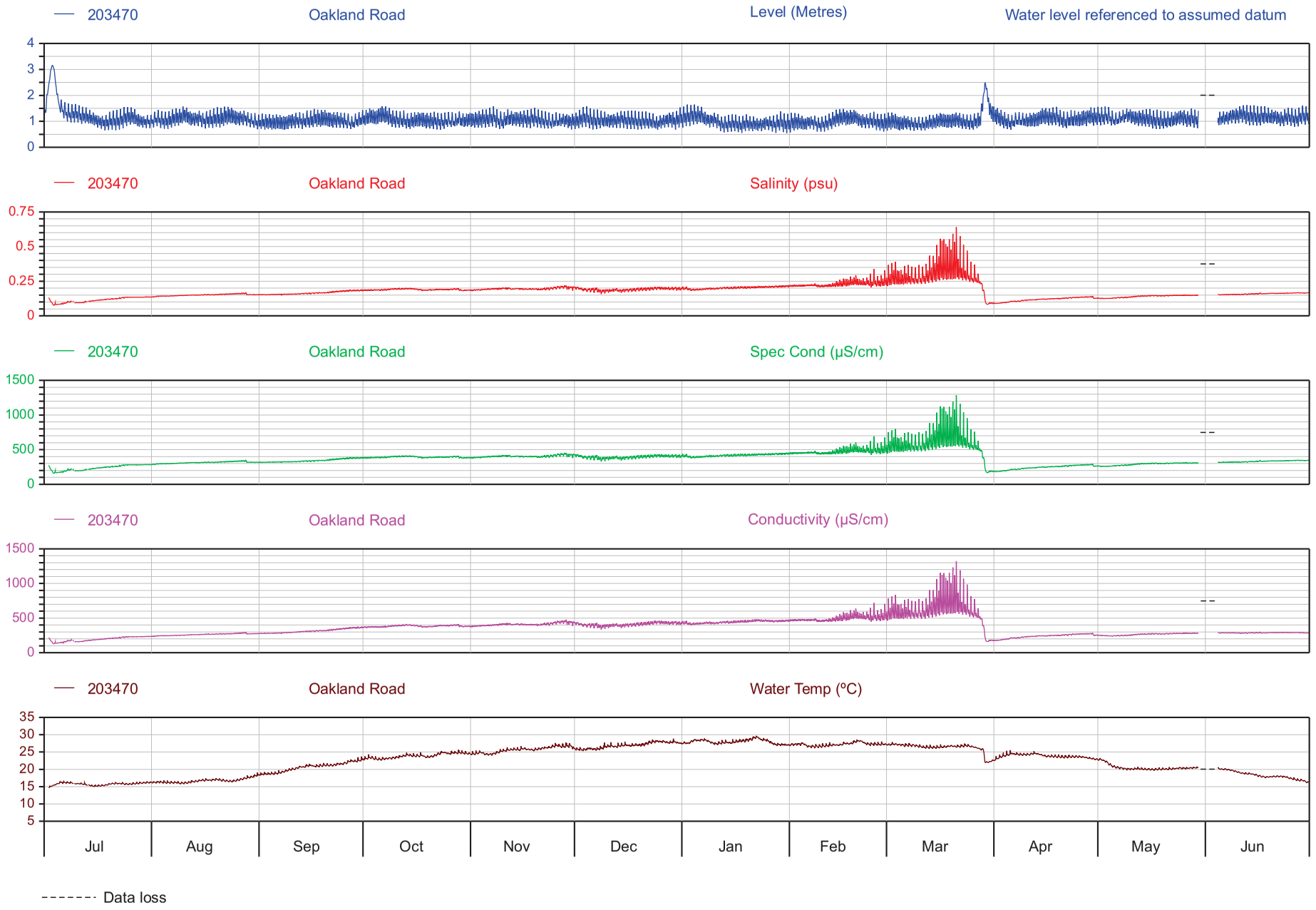

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Figure 3

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WATER LEVEL AND WATER QUALITY DATA
2013-2014
BUNGAWALBIN

*Water quality station was decommissioned at request of NOW

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Figure 4

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STATION LOCATIONS
CLARENCE RIVER REGION

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Figure 5

DRAWING 2295-5.cdr

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WATER LEVEL AND WATER QUALITY DATA
2013-2014
ROGANS BRIDGE

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Figure 6

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Manly Hydraulics Laboratory

WATER LEVEL AND WATER QUALITY DATA
2013-2014
GRAFTON

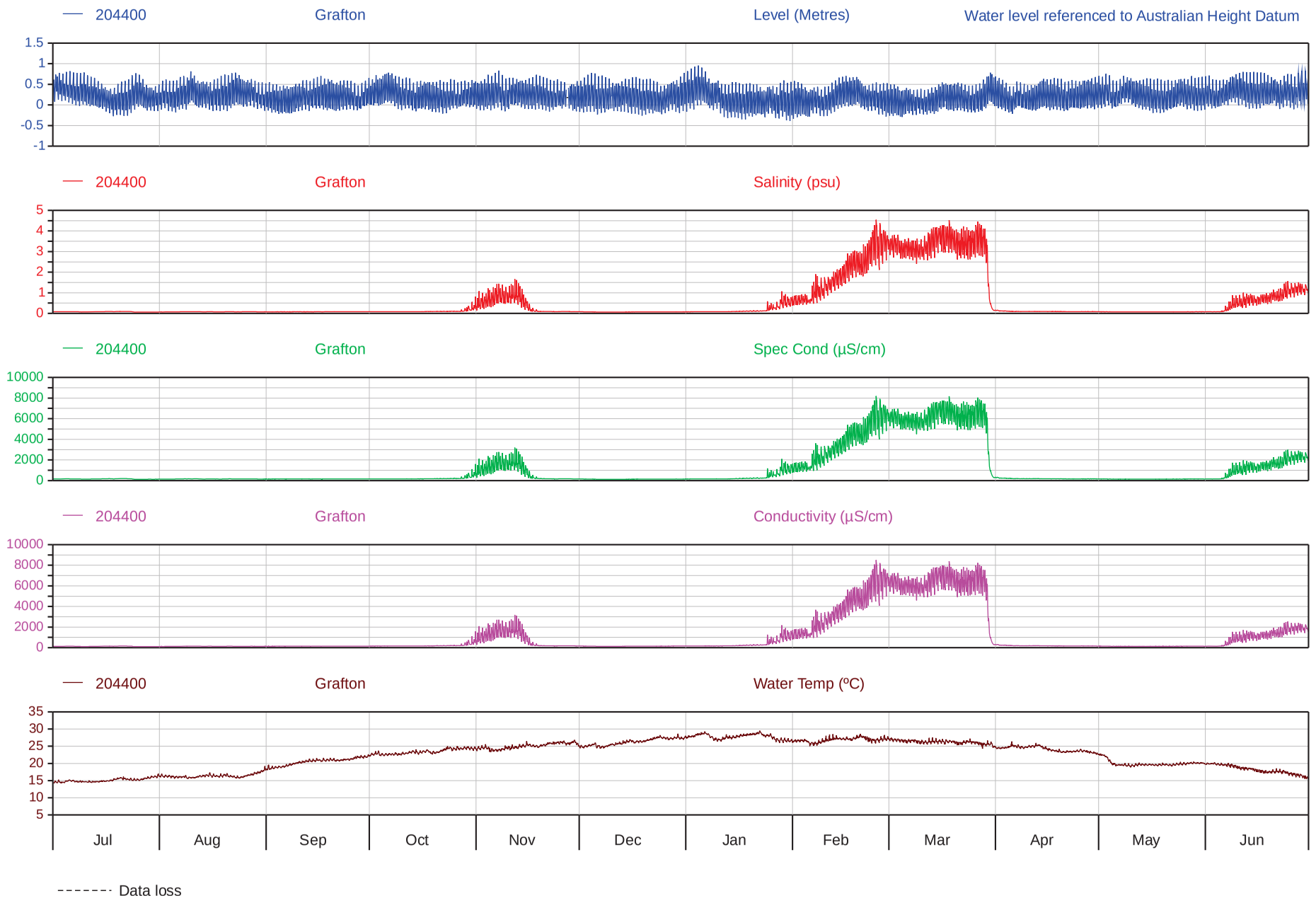

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Figure 7

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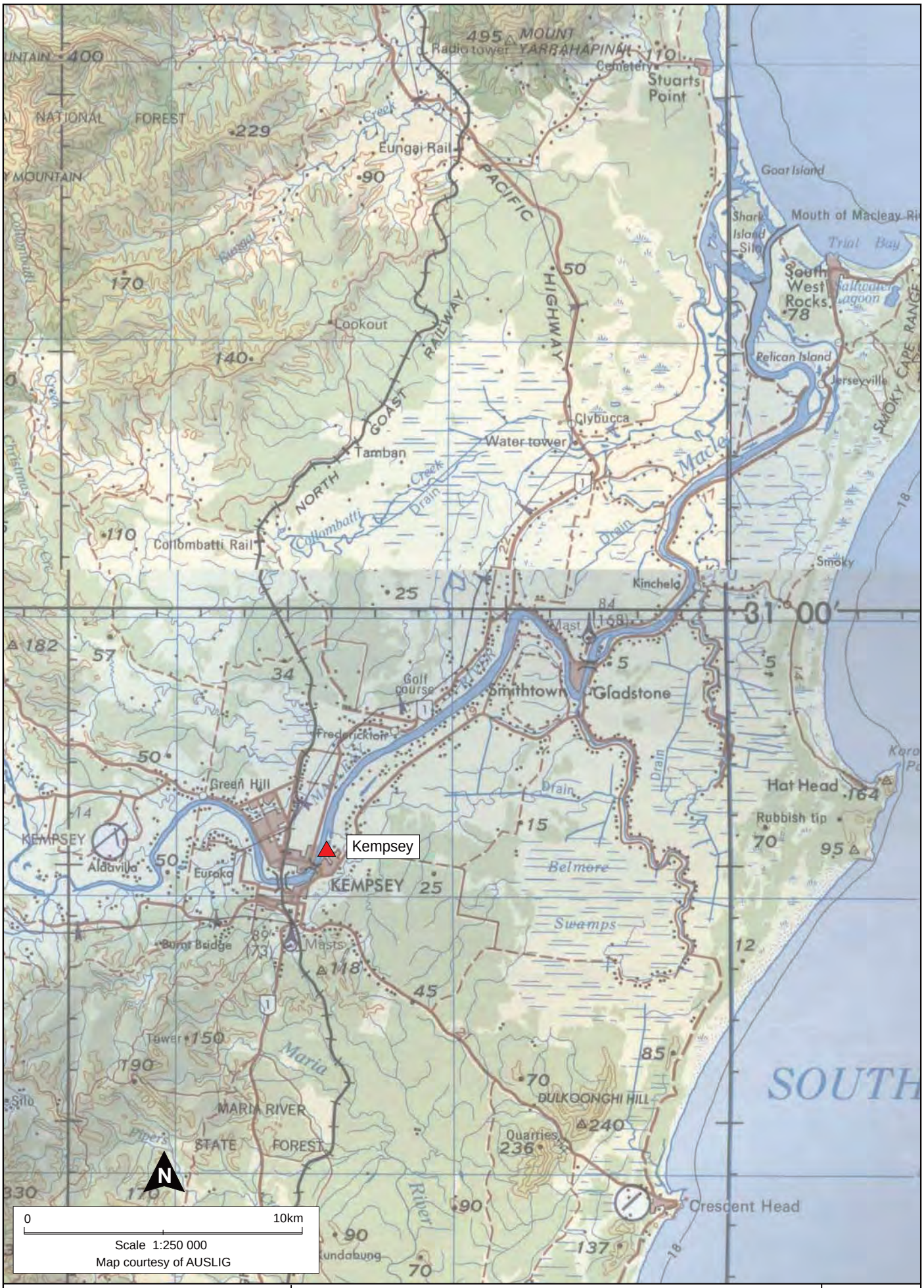

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STATION LOCATIONS
MACLEAY RIVER REGION

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Figure 8

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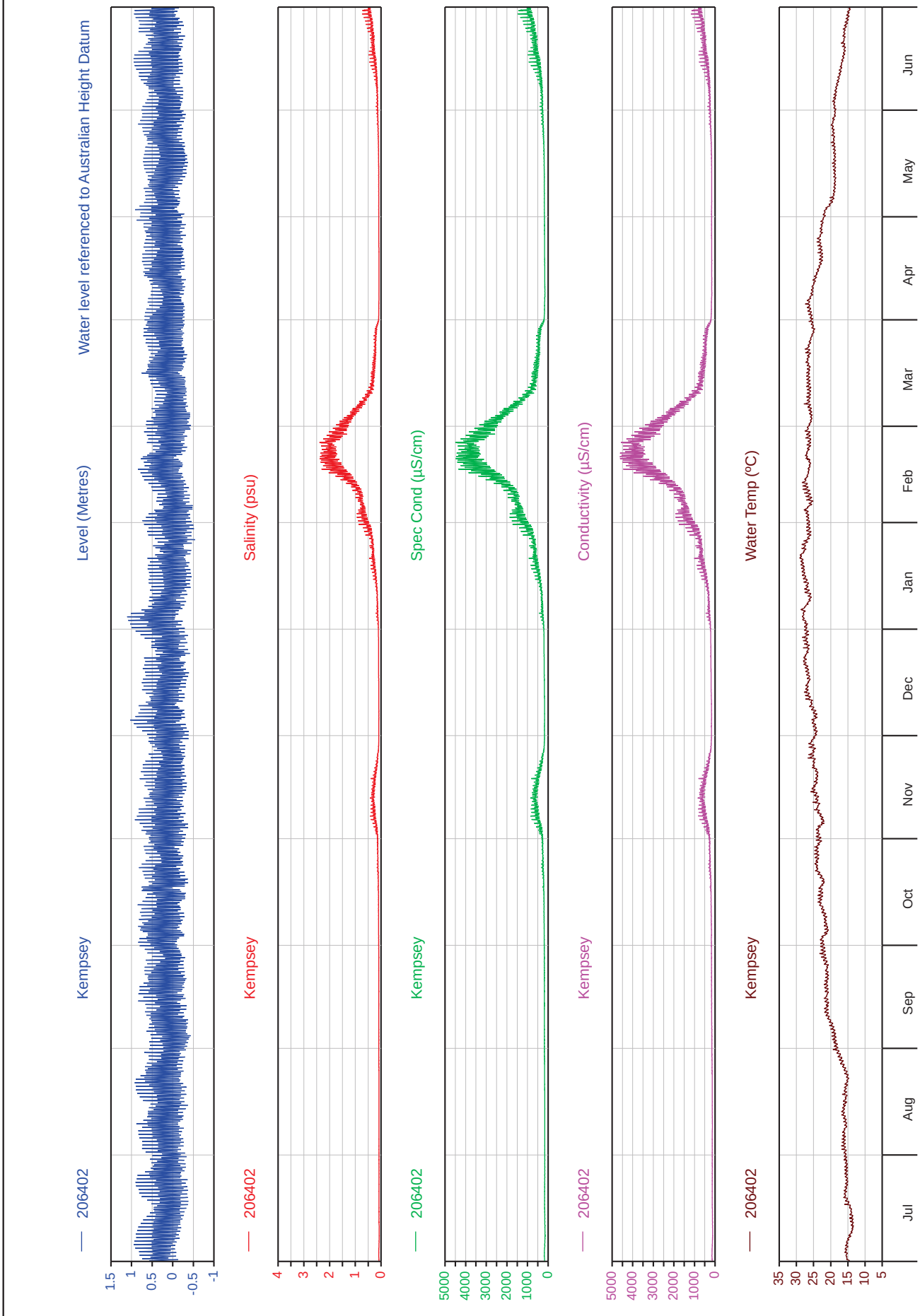

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WATER LEVEL AND WATER QUALITY DATA
2013-2014
KEMPSEY

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Figure 9

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NSW GOVERNMENT
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STATION LOCATIONS
MANNING RIVER REGION

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Figure 10

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WATER LEVEL AND WATER QUALITY DATA
2013-2014
WINGHAM

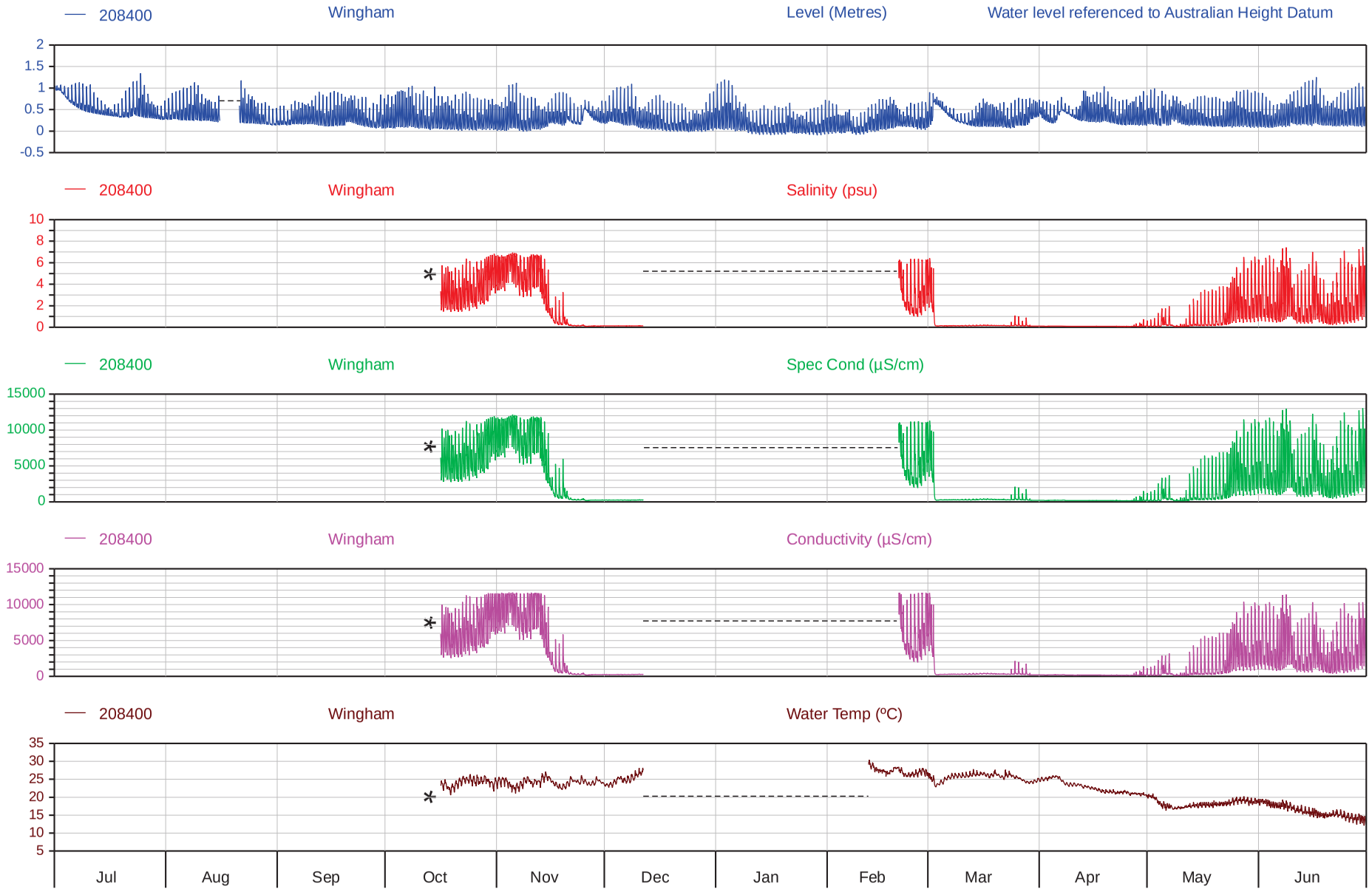

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Figure 11

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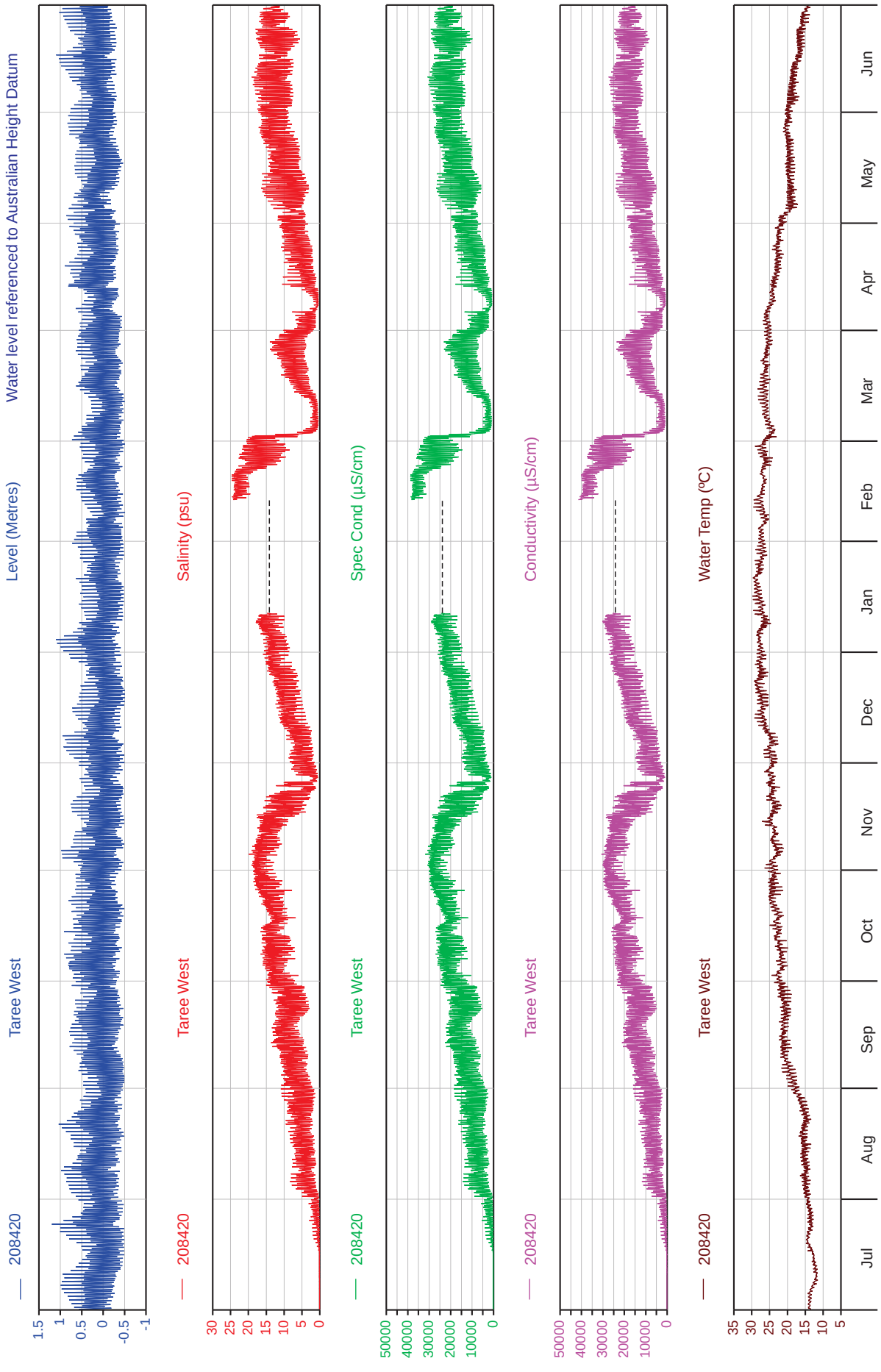

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WATER LEVEL AND WATER QUALITY DATA
2013-2014
TAREE WEST

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Figure 12

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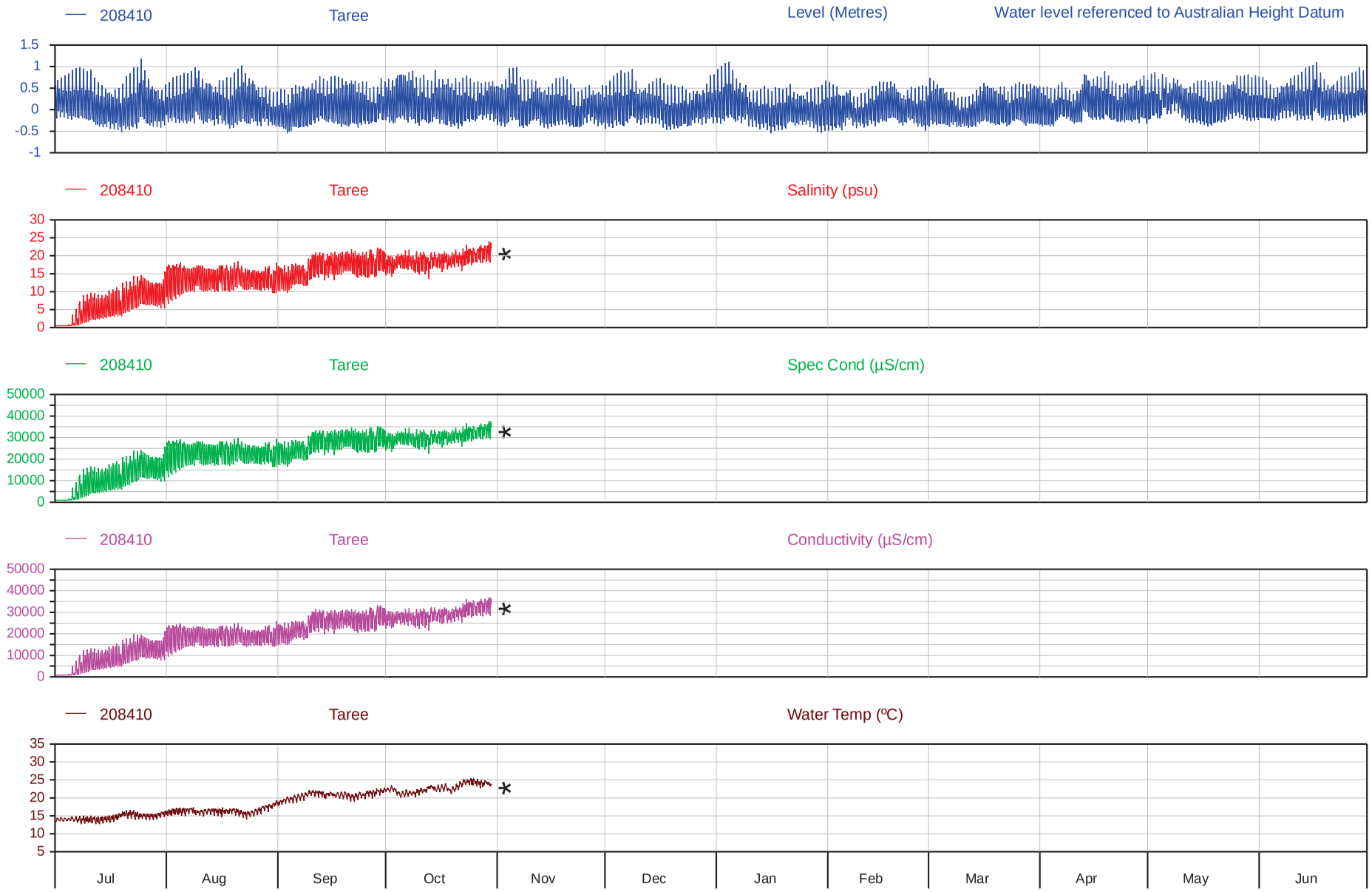
WATER LEVEL AND WATER QUALITY DATA
2013-2014
TAREE



*Water quality station was decommissioned as per request by NOW

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Figure 13

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Manly Hydraulics Laboratory

STATION LOCATIONS
GREAT LAKES REGION

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Figure 14

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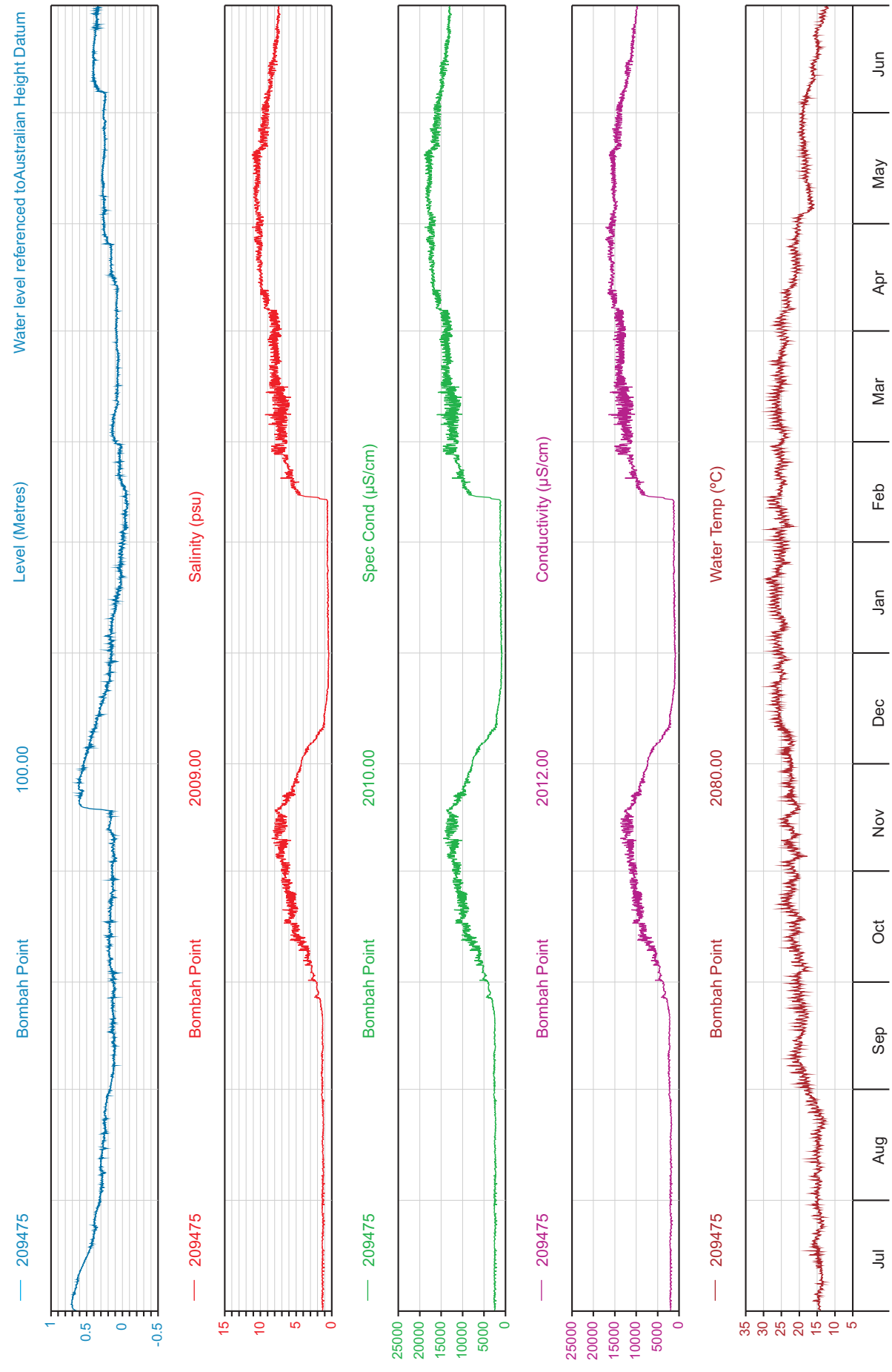

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WATER LEVELAND WATER QUALITYDATA
2013-2014
BOMBAH POINT

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Figure 15

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Figure 16
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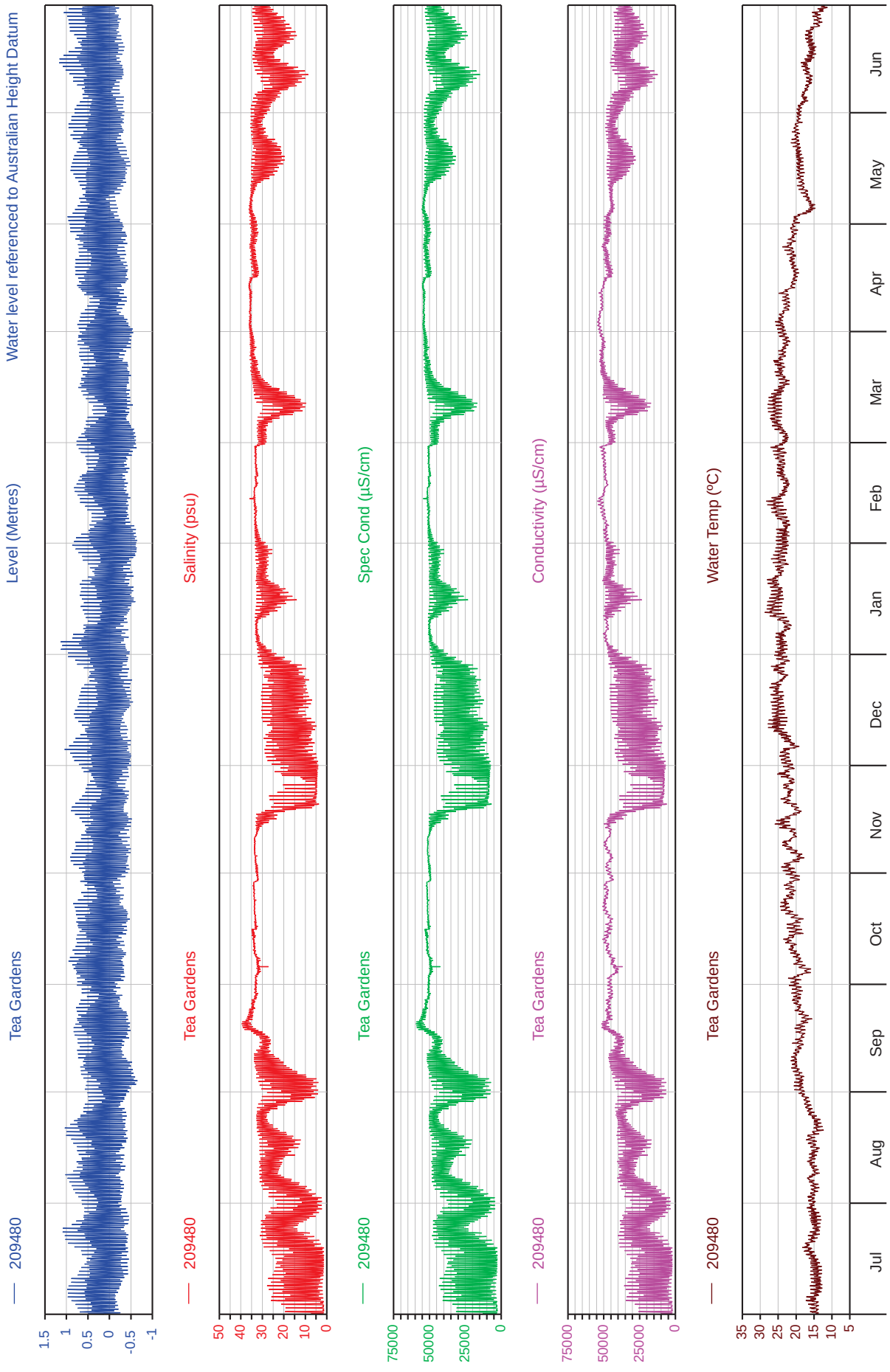

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WATER LEVEL AND WATER QUALITY DATA
2013-2014
TEA GARDENS

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Figure 17

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STATION LOCATIONS
PATERSON RIVER REGION

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Figure 18

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NSW GOVERNMENT

Public Works
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WATER LEVEL AND WATER QUALITY DATA
2013-2014
DUNMORE

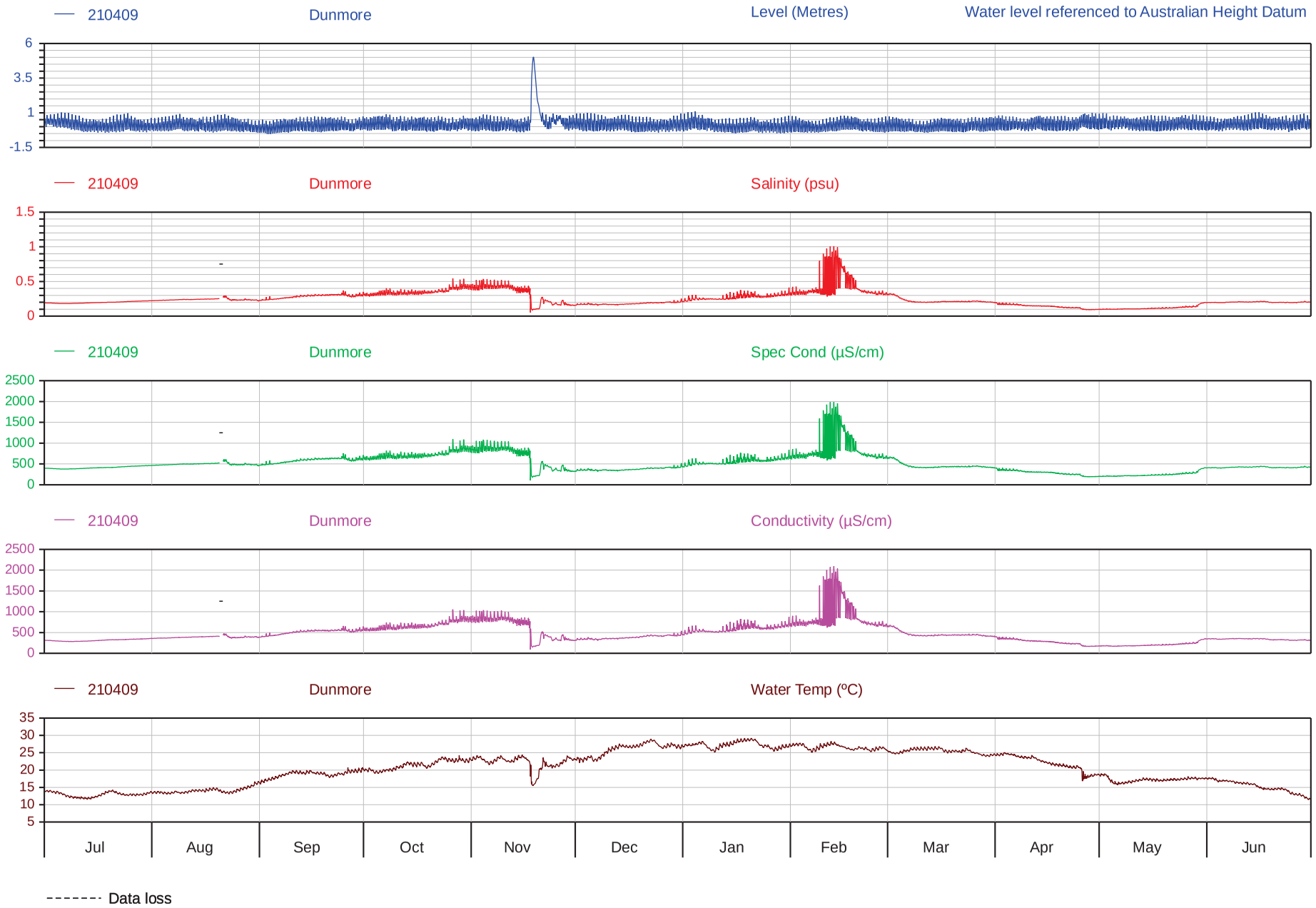

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Figure 19

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NSW GOVERNMENT

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WATER LEVEL AND WATER QUALITY DATA
2013-2014
HINTON BRIDGE

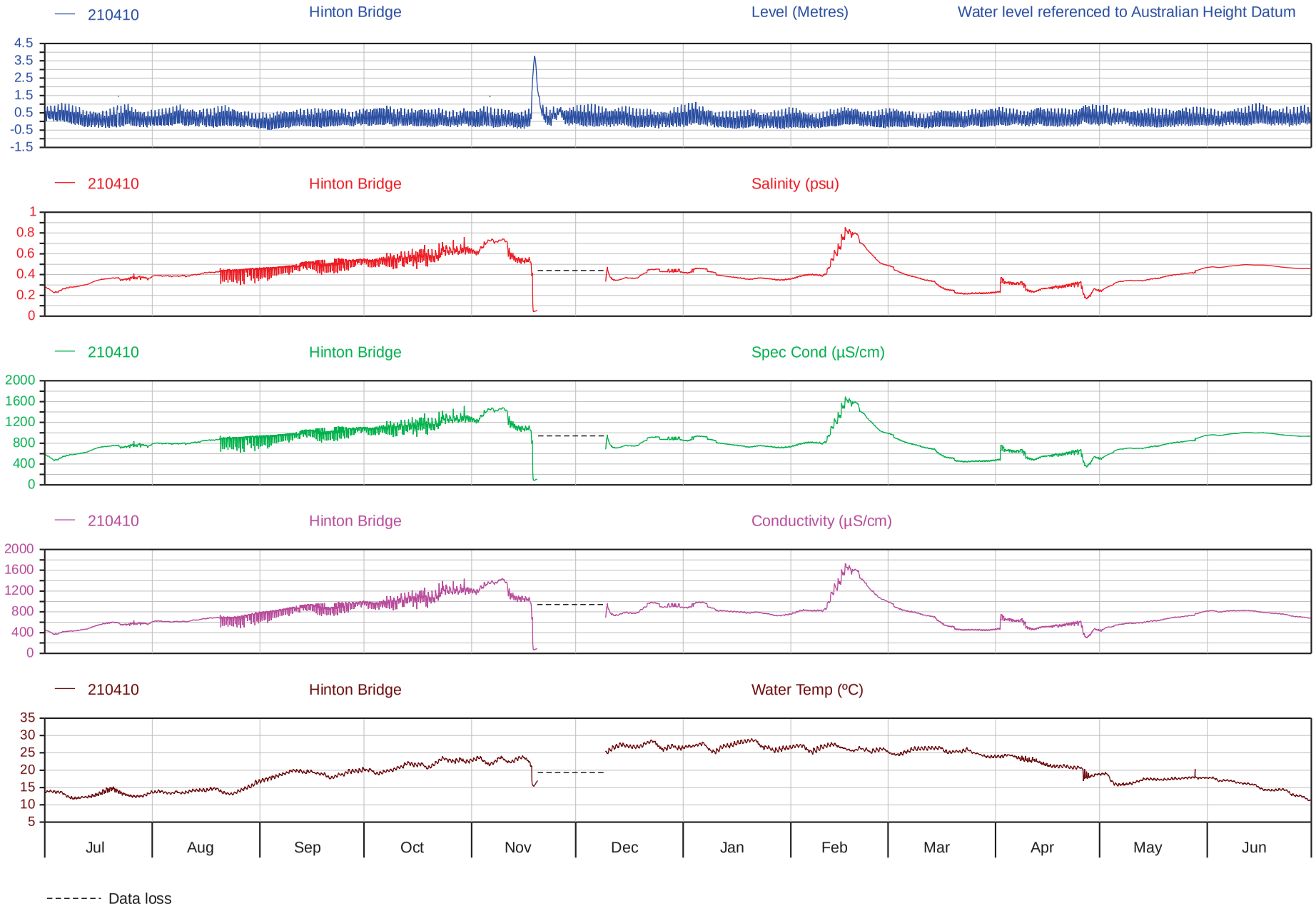

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Figure 20

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STATION LOCATIONS
HUNTER RIVER REGION

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Figure 21

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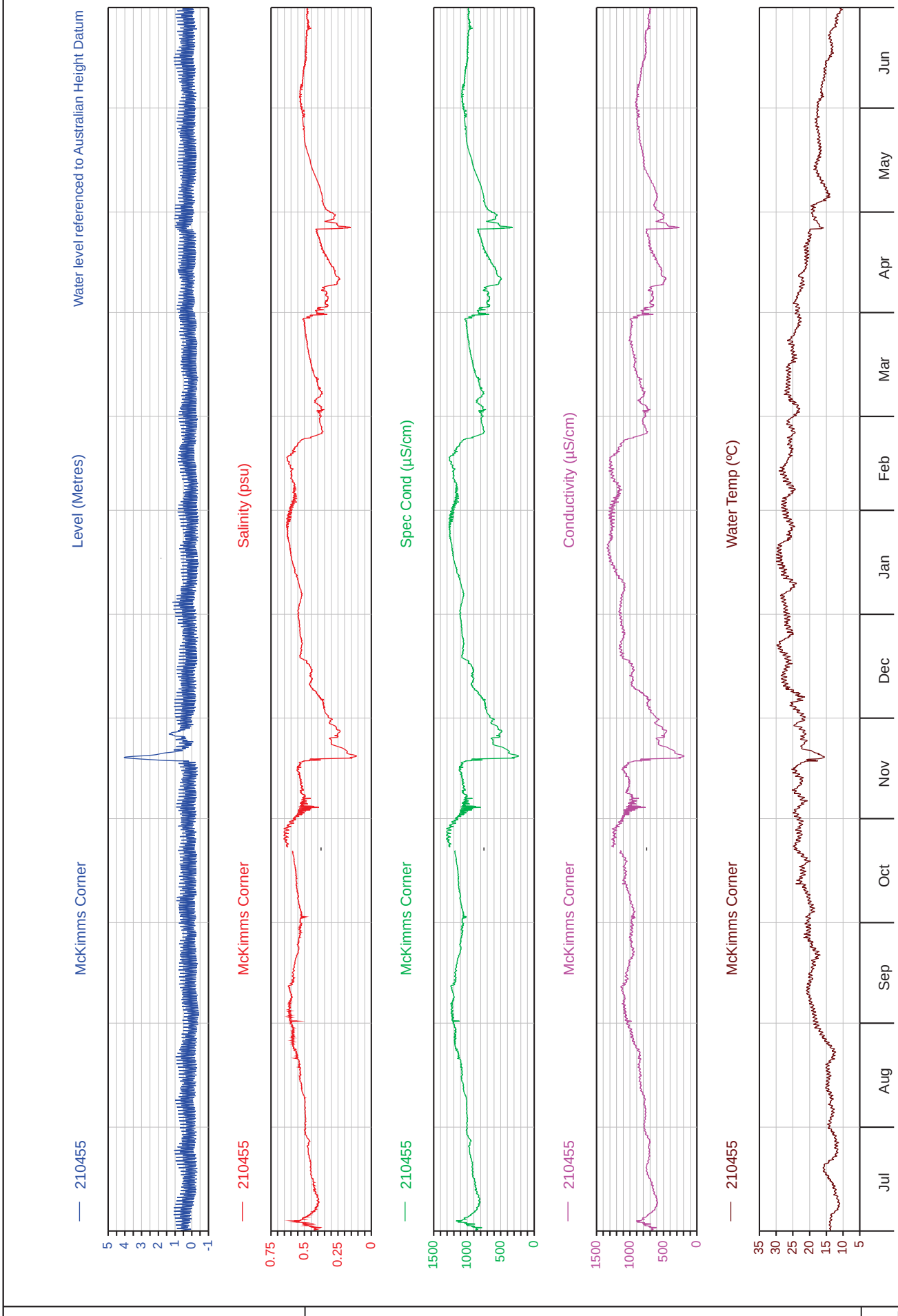

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WATER LEVEL AND WATER QUALITY DATA
2013-2014
McKIMMS CORNER

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Figure 22

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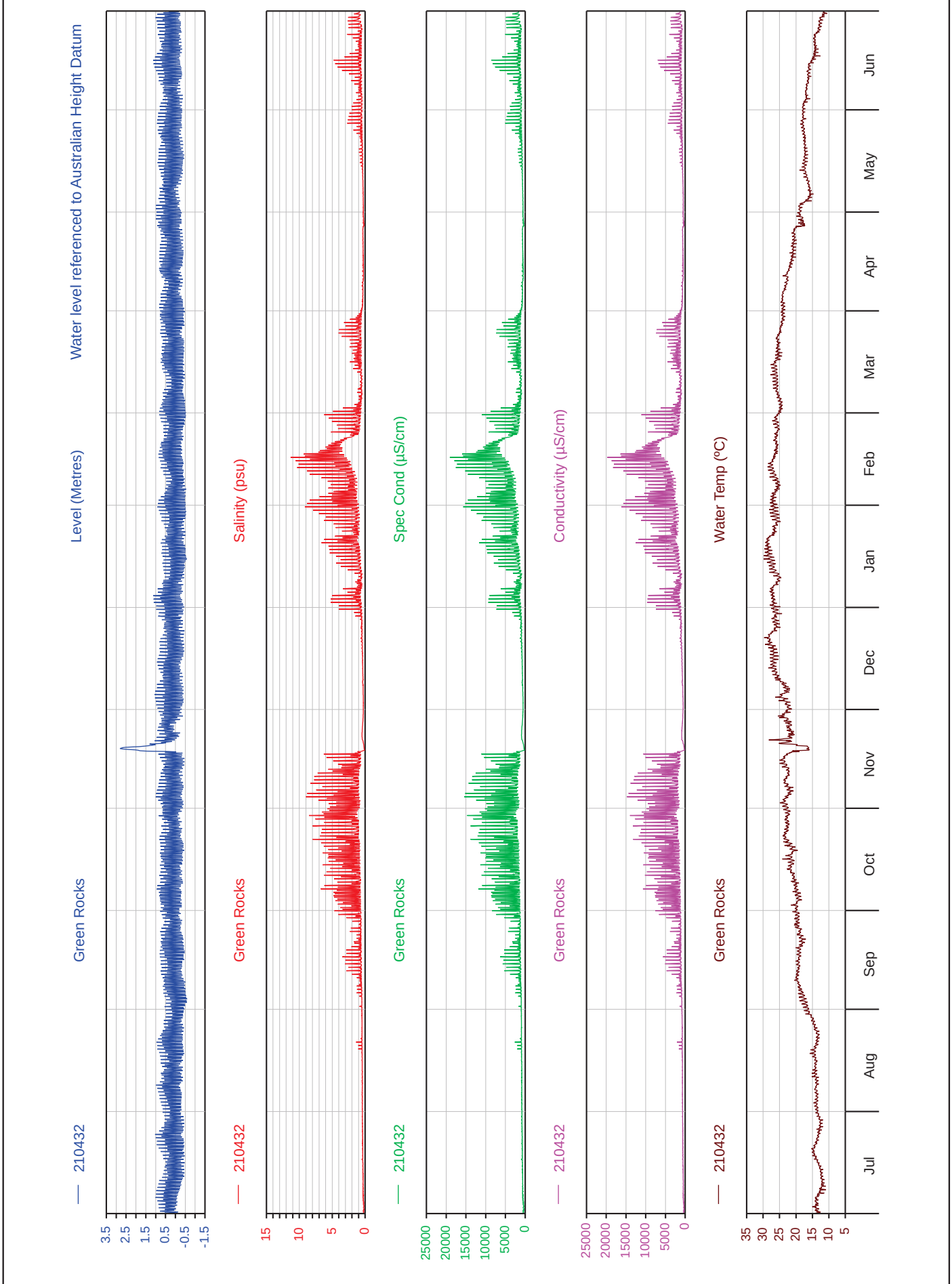

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WATER LEVEL AND WATER QUALITY DATA
2013-2014
GREEN ROCKS

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Figure 23

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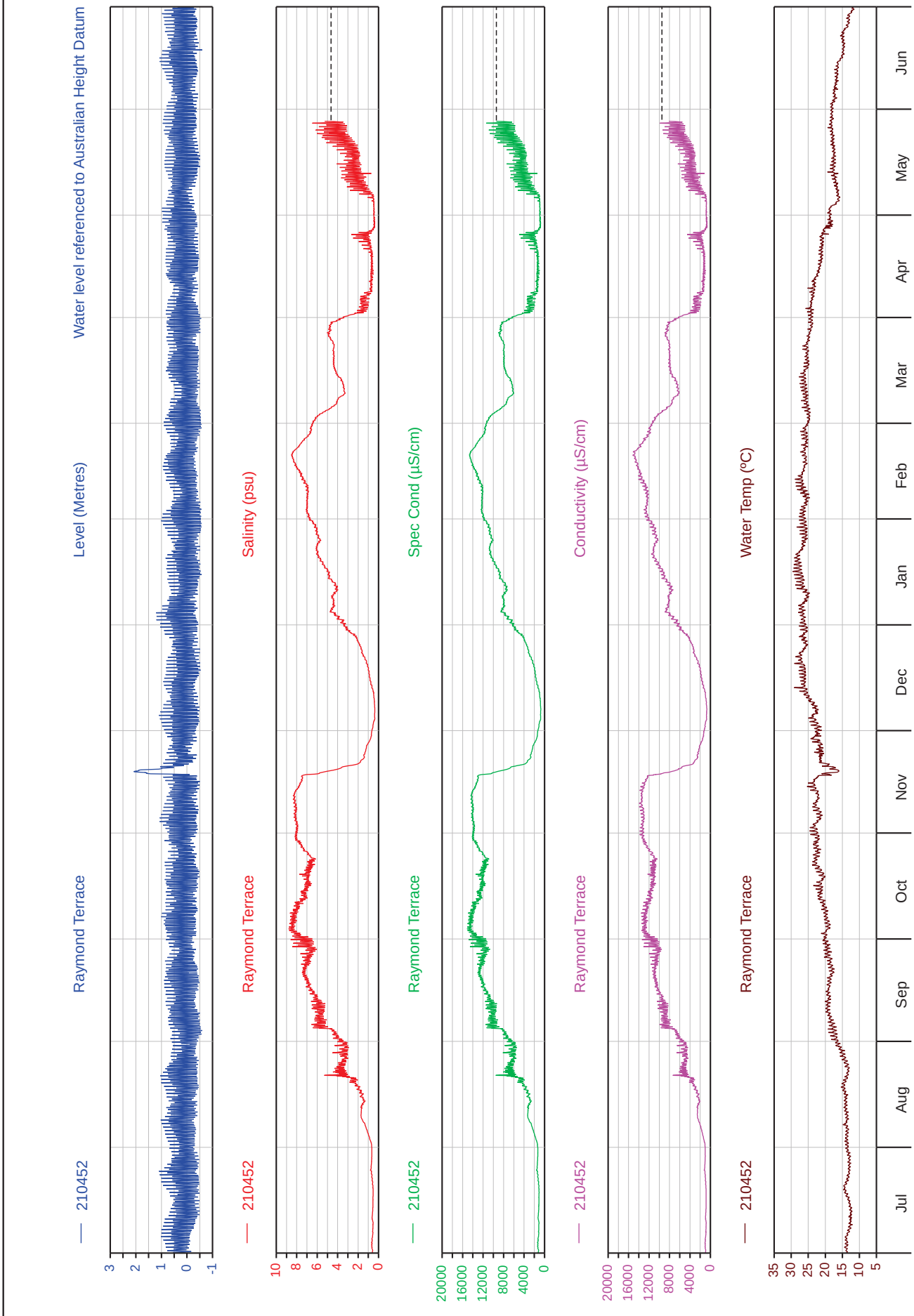

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WATER LEVEL AND WATER QUALITY DATA
2013-2014
RAYMOND TERRACE

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Figure 24

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NSW GOVERNMENT

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WATER LEVEL AND WATER QUALITY DATA
2013-2014
HEXHAM

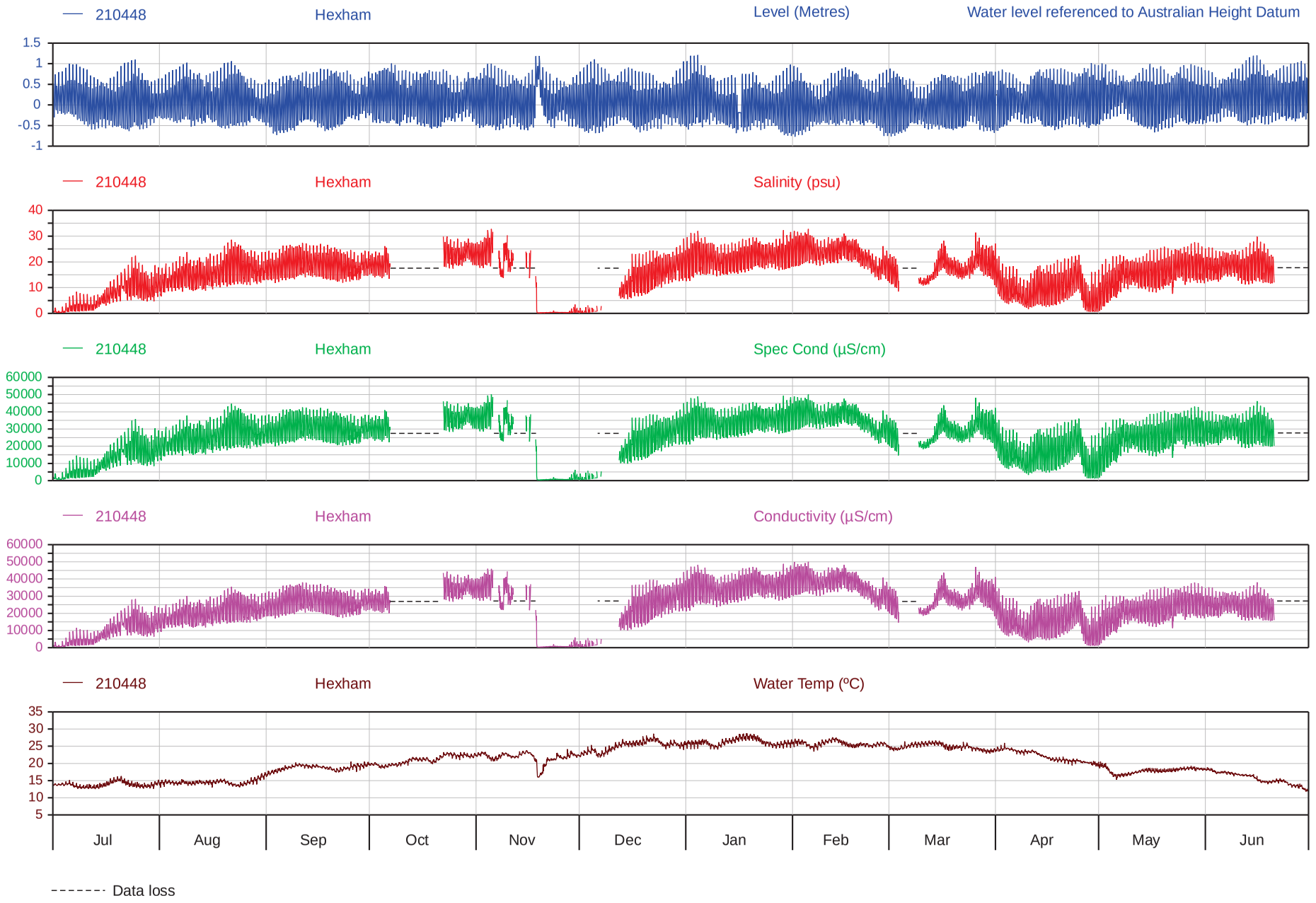

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Figure 25

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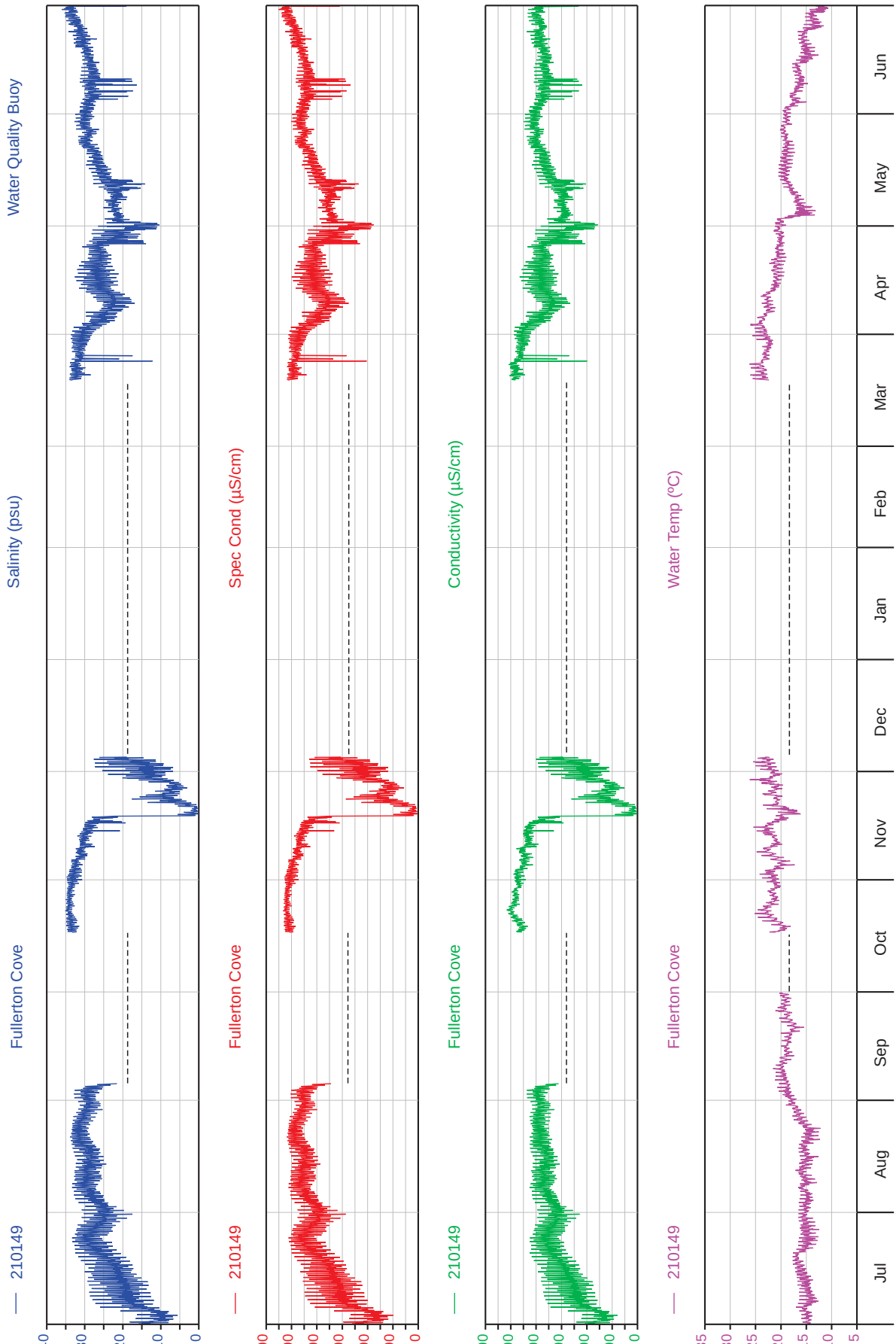

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WATER LEVEL AND WATER QUALITY DATA
2013-2014
FULLERTON COVE

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Figure 26

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STATION LOCATIONS
HAWKESBURY RIVER REGION

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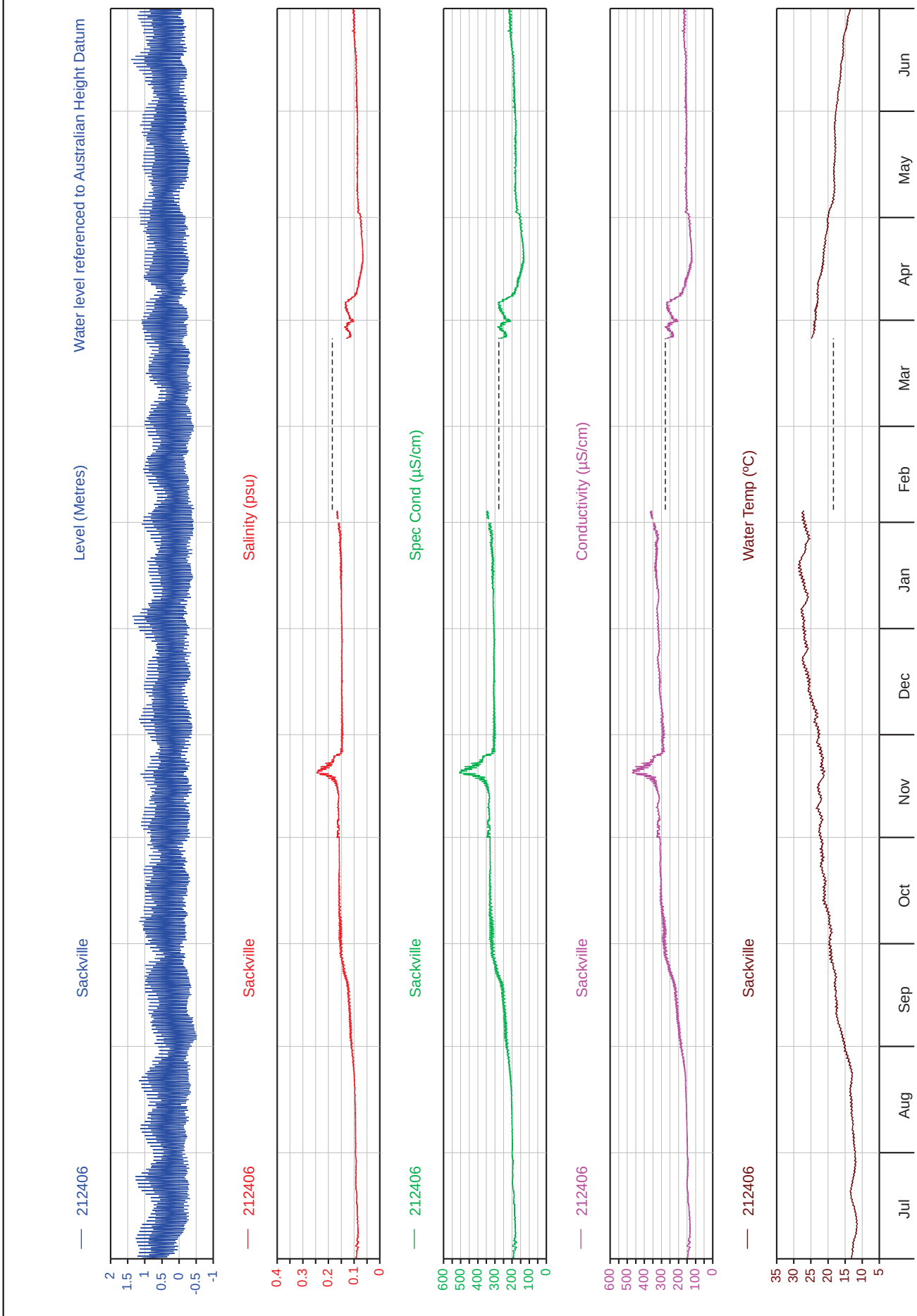
Figure 27

DRAWING 2295-27.cdr



Public Works
Manly Hydraulics Laboratory

WATER LEVEL AND WATER QUALITY DATA
2013-2014
SACKVILLE

MHL Report 2295

Figure 28

DRAWING 2295-28.cdr

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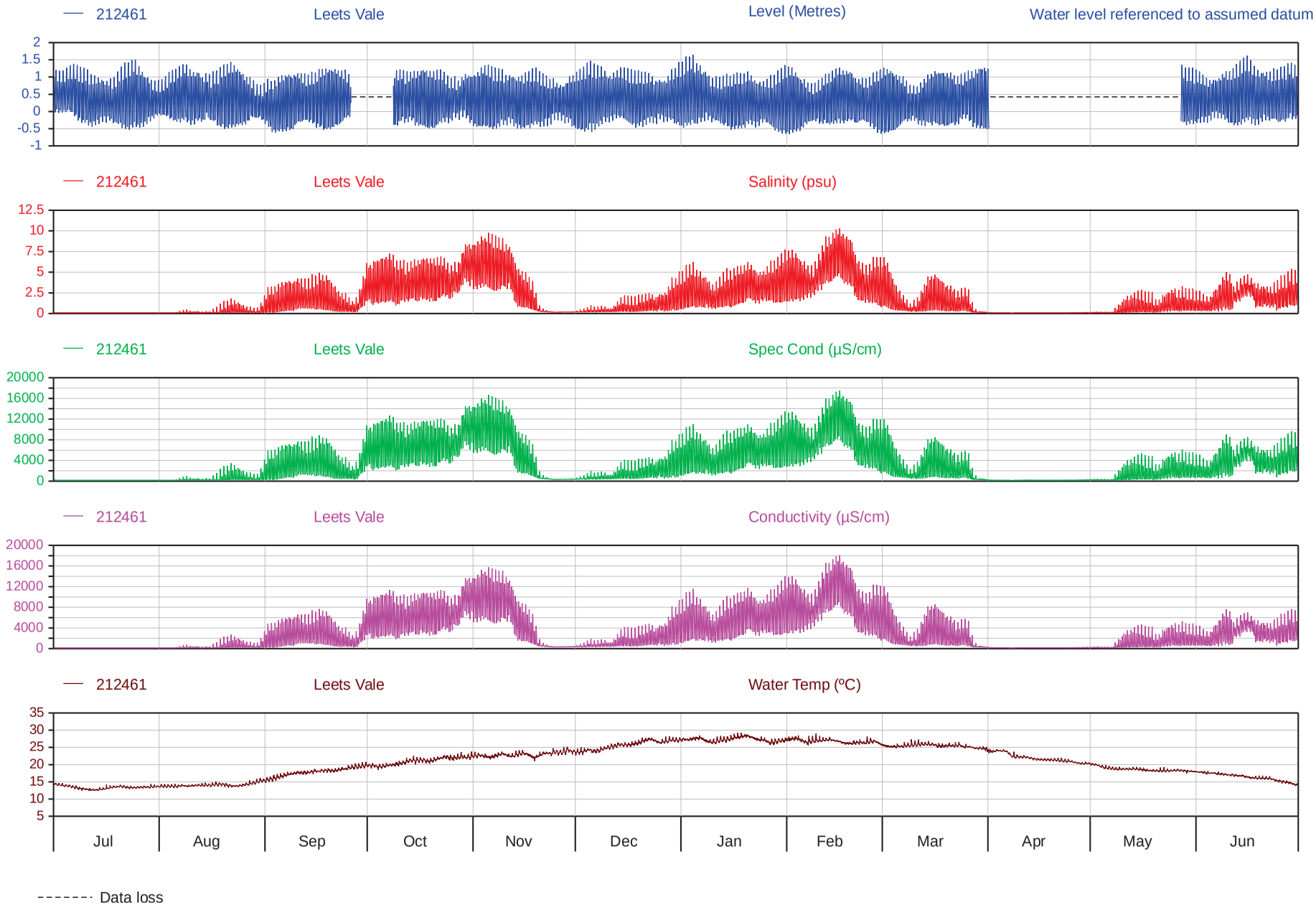
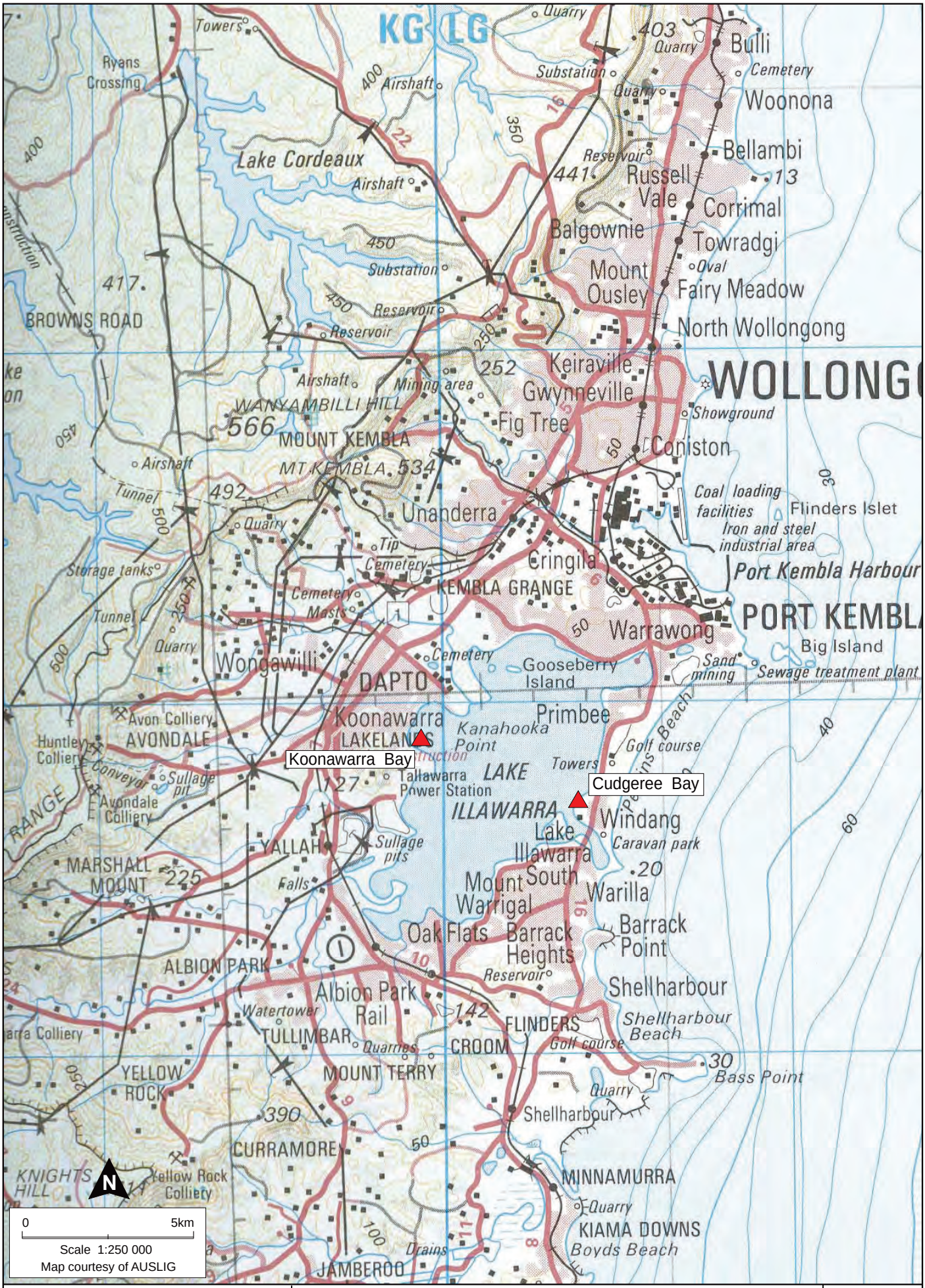
WATER LEVEL AND WATER QUALITY DATA
2013-2014
LEETS VALE



MHL Report 2295

Figure 29

DRAWING 2295-29.cdr



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STATION LOCATIONS
LAKE ILLAWARRA REGION

MHL Report 2295

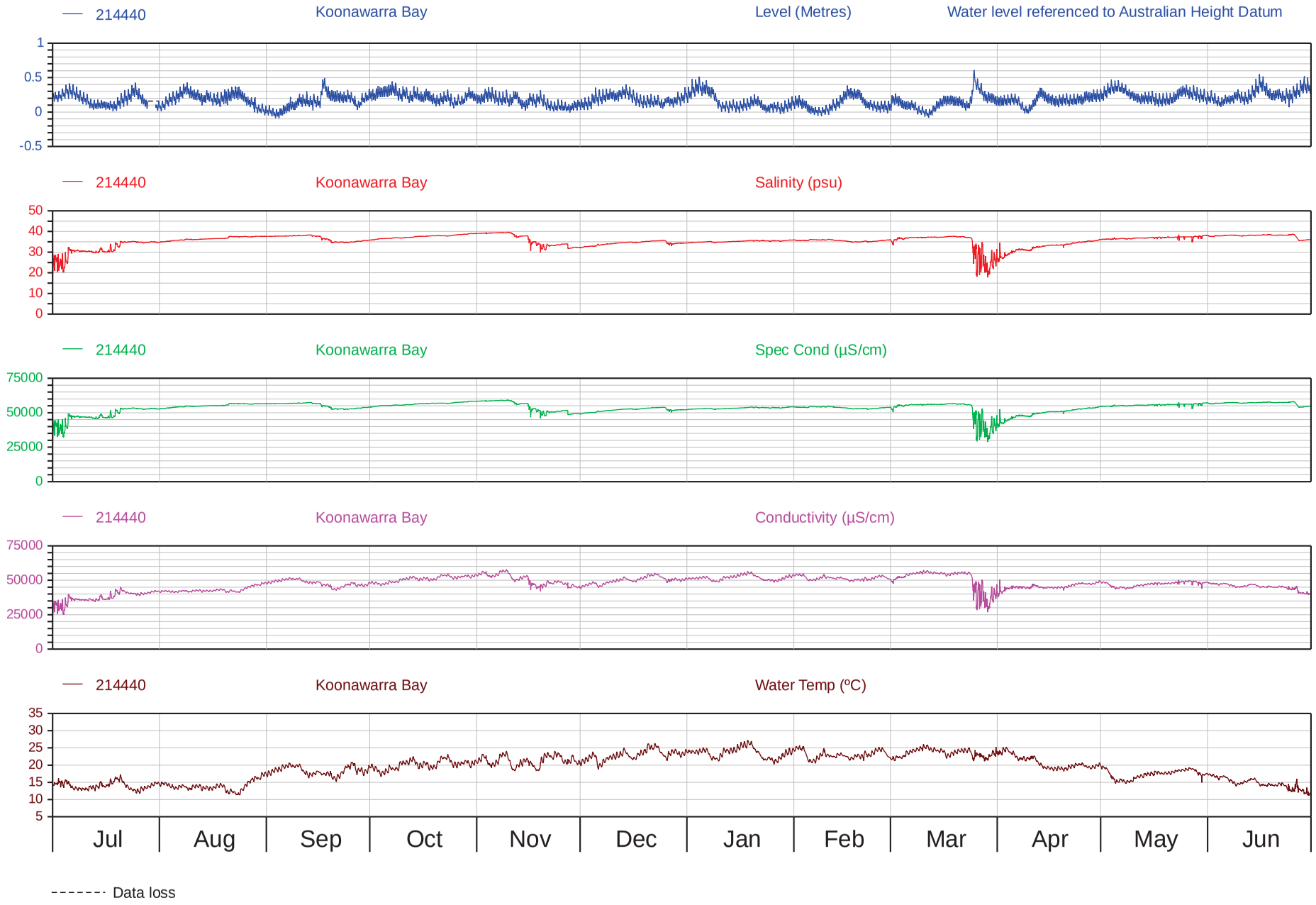
Figure 30

DRAWING 2295-30.cdr

NSW GOVERNMENT

Public Works
Manly Hydraulics Laboratory

WATER LEVEL AND WATER QUALITY DATA
2013-2014
KOONAWARRA BAY



MHL Report 2295

Figure 31

DRAWING 2295-31.cdr

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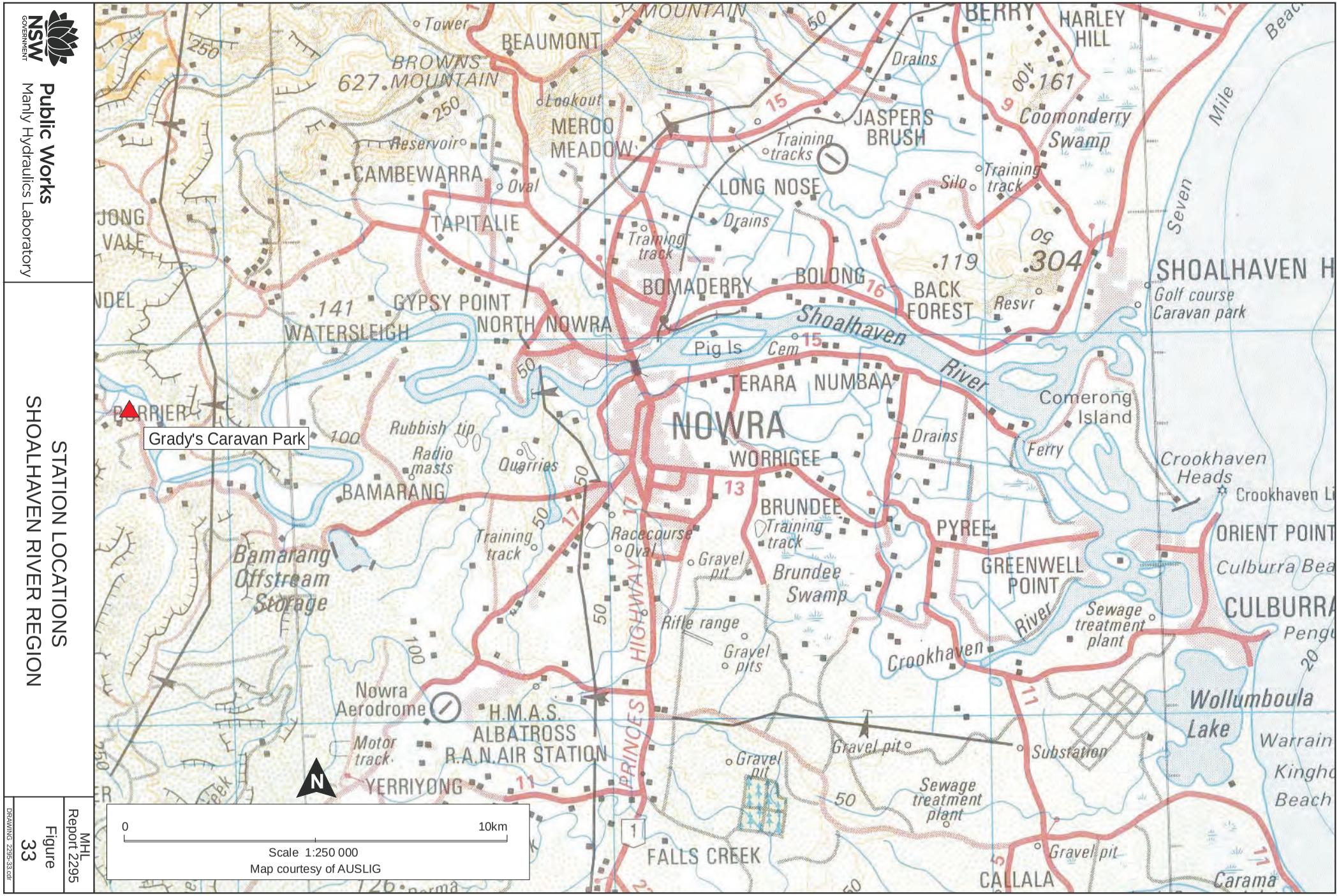
WATER LEVEL AND WATER QUALITY DATA
2013-2014
CUDGEREE BAY

MHL Report 2295

Figure 32

DRAWING 2295-32.cdr



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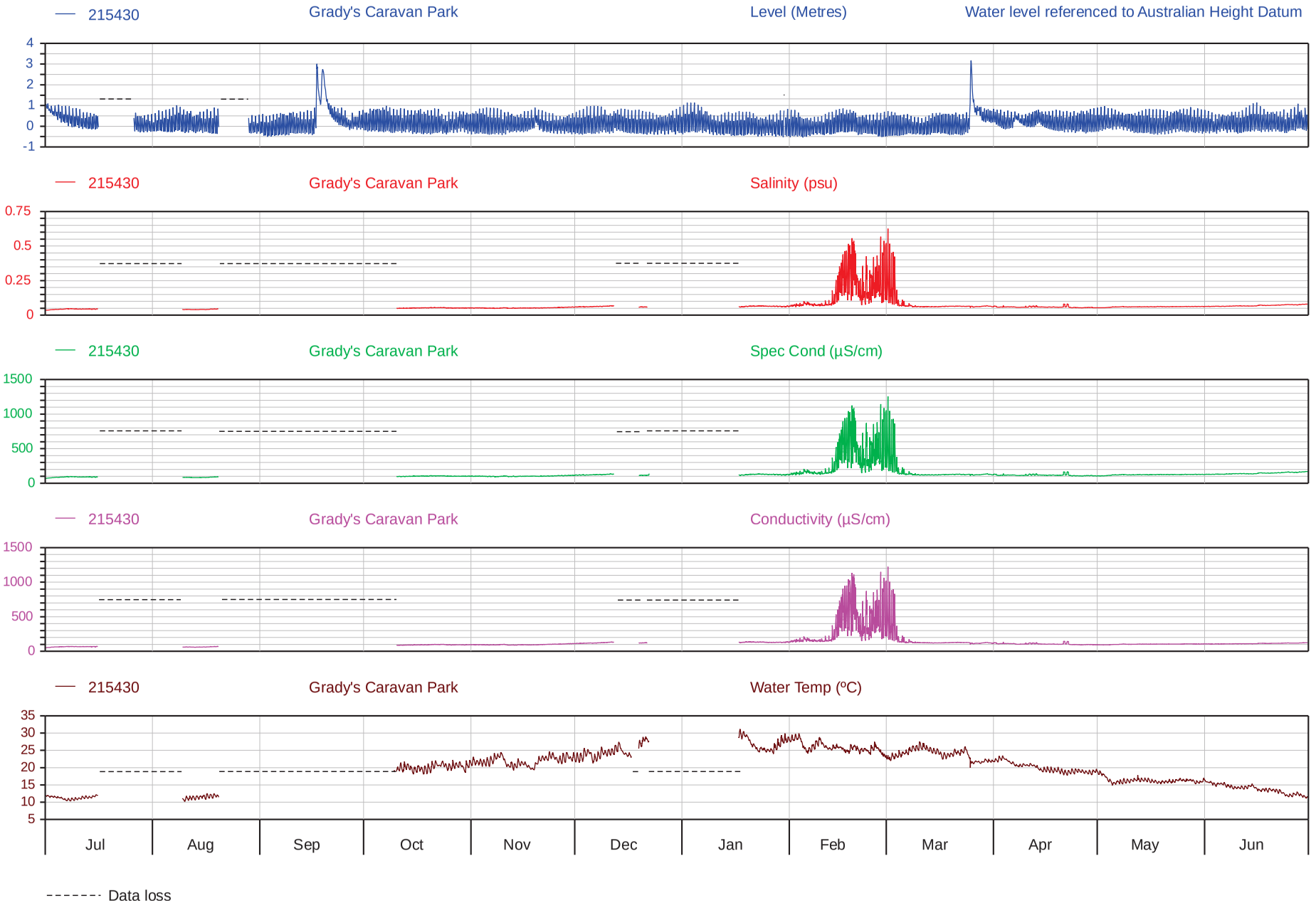
STATION LOCATIONS
SHOALHAVEN RIVER REGION

MHL Report 2295
Figure 33
DRAWING 2295-33.cdr

NSW GOVERNMENT

Public Works
Manly Hydraulics Laboratory

WATER LEVEL AND WATER QUALITY DATA
2013-2014
GRADY'S CARAVAN PARK



MHL Report 2295

Figure 34

DRAWING 2295-34.cdr

Appendix A

Data On-line

Appendix A Data On-line

Station Longname	Station Name	Station Number	Start Date	End Date	Additional MHL Report Available
Brunswick River at Mullumbimby	Mullumbimby	202402	08-Apr-98	18-Mar-99	1000
Richmond River at Coraki	Coraki	203403	20-Sep-94	ongoing	749
Richmond River at Oakland Road	Oakland Road	203470	06-Mar-12	ongoing	
Tucombil Canal at Tucombil Highway Bridge	Tucombil Highway Bridge	203411	21-Aug-97	29-Aug-98	961
Rocky Mouth Creek at Rocky Mouth Creek	Rocky Mouth Creek	203432	06-Sep-94	21-Aug-96	794
Tucombil Canal at Tucombil Floodgate	Tucombil Floodgate	203434	09-Sep-94	29-Sep-95	961
Richmond River at Bungawalbin	Bungawalbin	203450	09-Sep-94	28-Aug-13	
Lennox Head at Lake Ainsworth	Lake Ainsworth	203455	15-Nov-95	30-Nov-96	851
Clarence River at Grafton	Grafton	204400	02-Mar-99	ongoing	1065
Clarence River at Rogans Bridge	Rogans Bridge	204413	09-Mar-99	ongoing	1065
Clarence River at Mylneford	Mylneford	204460	21-May-10	29-Jan-13	
Nambucca River at Macksville	Macksville	205416	17-Feb-99	22-Feb-00	1050
Coffs Creek at Coffs Creek Highway Bridge	Coffs Creek Highway Bridge	205439	14-Dec-92	23-Nov-96	
Bonville Creek at Bonville	Bonville	205480	08-Aug-97	15-Feb-99	985
Borirgala Creek at Borirgala Creek	Borirgala Creek	206450	06-Apr-01	26-Sep-01	1151
Macleay River at South West Rocks	South West Rocks	206456	01-Mar-96	01-Mar-99	986
Macleay River at Euroka Upstream	Euroka Upstream	206458	07-Dec-09	17-Jun-11	
Macleay River at Kempsey	Kempsey	206402	09-Feb-10	ongoing	
Maria River at Green Valley	Green Valley	207406	30-Sep-94	01-Nov-95	760
Lake Cathie at Lake Cathie	Lake Cathie	207441	18-Aug-93	07-Sep-94	
Manning River at Wingham	Wingham	208400	08-Dec-09	ongoing	
Manning River at Taree	Taree	208410	16-Feb-10	30-Oct-13	
Manning River at Taree West	Taree West	208420	30-Apr-10	ongoing	
Myall River at Bombah Point	Bombah Point	209475	09-Jul-96	ongoing	906

Station Longname	Station Name	Station Number	Start Date	End Date	Additional MHL Report Available
Myall River at Tea Gardens	Tea Gardens	209480	20-Oct-09	ongoing	
Paterson River at Dunmore	Dunmore	210409	15-Oct-09	ongoing	
Paterson River at Hinton Bridge	Hinton Bridge	210410	03-Dec-93	ongoing	750
Wallis Creek at Wallis Creek Downstream	Wallis Creek Downstream	210428	21-Sep-95	01-Oct-98	965
Hunter River at Green Rocks	Green Rocks	210432	03-Dec-93	ongoing	750
Hunter River at Hexham Bridge	Hexham Bridge	210448	17-Dec-93	ongoing	750
Hunter River at Hexham	Hexham	210448	13-Apr-11	ongoing	
Williams River at Raymond Terrace	Raymond Terrace	210452	15-Oct-09	ongoing	
Hunter River at McKimms Corner	McKimms Corner	210455	08-Oct-09	ongoing	
Hunter River at Belmore Bridge	Belmore Bridge	210458	01-Dec-93	ongoing	750
Nepean River at Castlereagh	Castlereagh	212404	01-Jul-94	01-Jul-98	
Hawkesbury River at Sackville	Sackville	212406	01-Jul-94	ongoing	
Hawkesbury River at Colo Junction	Colo Junction	212407	07-Nov-09	05-Jul-13	
Hawkesbury River at Ebenezer	Ebenezer	212427	01-Jul-94	01-Jul-98	
Hawkesbury at Wisemans Ferry Wharf	Wisemans Ferry Wharf	212460	10-Jun-10	19-Jul-13	
Hawkesbury at Leets Vale	Leets Vale	212461	22-Jun-10	ongoing	
Lake Illawarra at Cudgeree Bay	Cudgeree Bay	214416	09-Feb-93	ongoing	994
Lake Illawarra at Koonawarra Bay	Koonawarra Bay	214440	15-Jun-93	ongoing	994
Shoalhaven at Grady’s Caravan Park	Grady’s Caravan Park	215430	06-Oct-10	ongoing	
Wollumboola Lake at Wollumboola	Wollumboola	215454	01-Feb-99	06-Jan-11	1145
Crookhaven River at Crookhaven Heads	Crookhaven Heads	215471	06-Mar-95	07-Apr-95	
Currarong Creek at Currarong Creek	Currarong Creek	216405	04-Mar-96	04-Mar-97	858
Swan Lake at Swan Lake	Swan Lake	216425	02-Feb-99	02-Feb-00	
Clyde River at Nelligen	Nelligen	216453	17-Sep-96	17-Sep-97	889
Tomaga at George Bass Drive	George Bass Drive	216455	28-Aug-96	28-Aug-97	890
Tuross River at Coila Lake	Coila Lake	218405	08-Mar-96	21-Nov-96	848
Wagonga River at Barlows Bay	Barlows Bay	218415	30-Aug-96	30-Aug-97	888
Wallaga Lake at Regatta Point	Regatta Point	219405	06-Mar-95	07-Apr-95	
Bega River at Bega	Bega	219410	24-Feb-10	21-May-13	
Back Lagoon at Back Lagoon	Back Lagoon	219415	25-Sep-97	25-Sep-98	963
Lake Curalo at Lake Curalo	Lake Curalo	220420	09-Mar-96	09-Mar-98	920
Wonboyn River at Agnew Wharf	Agnew Wharf	220425	20-Aug-97	20-Aug-98	964

Station Longname	Station Name	Station Number	Start Date	End Date	Additional MHL Report Available
Bartletts Creek at Bartletts Creek	Bartletts Creek	NA	06-Jun-95	19-Mar-96	780
Leddays Creek at Leddays Creek	Leddays Creek	NA	02-Jun-95	31-Jul-96	780
Officer Drain at Officer Drain	Officer Drain	NA	02-Jun-95	21-Mar-96	780
McLeods Drain at McLeods Drain	McLeods Drain	NA	21-Mar-96	31-Jul-96	780
McLeods Drain Offshoot at McLeods Drain Offshoot	McLeods Drain Offshoot	NA	21-Mar-96	30-Sep-96	780
Cudgen Lake at Cudgen Lake	Cudgen Lake	NA	14-Dec-92	05-Nov-93	674
Cudgen Creek at Cudgen Lake West	Cudgen Lake West	NA	08-Oct-93	05-Nov-93	674
Cudgen Creek at Cudgen Creek	Cudgen Creek	NA	15-Dec-92	05-Nov-93	674
Simpsons Creek at Belongil	Belongil	NA	06-Dec-94	17-Dec-96	
Richmond River at Shaws Bay	Shaws Bay	NA	11-Mar-99	12-Apr-00	755, 849
Marshalls Creek at Capricornia Canal	Capricornia Canal	NA	24-Mar-97	31-Mar-11	1051
Marshalls Creek at New Brighton	New Brighton	NA	17-Mar-97	24-Apr-98	1000
Brunswick River at Pacific Highway Bridge	Pacific Highway Bridge	NA	18-Mar-97	18-Mar-99	1000
Simpsons Creek at Simpsons Creek	Simpsons Creek	NA	03-Apr-98	18-Mar-99	1000
Tuckean Broadwater at Tuckean	Tuckean	NA	30-Oct-95	29-Oct-96	850
Richmond River at Empire Vale Creek	Empire Vale Creek	NA	08-May-98	12-Oct-99	1032
Roberts creek at Roberts Creek	Roberts Creek	NA	20-May-94	24-May-96	784
Clarence River at Tarrent Bridge	Tarrent Bridge	NA	04-Mar-99	11-Apr-00	1065
Andersons Inlet at Middle Island MM1	Middle Island MM1	NA	06-Apr-01	15-Dec-06	986
Andersons Inlet at Middle Island MM2	Middle Island MM2	NA	19-Mar-96	03-Feb-99	986
Andersons Inlet at Double Island	Double Island	NA	19-Mar-96	03-Feb-99	986
Macleay River at Andersons Inlet	Andersons Inlet	NA	06-Apr-01	27-Sep-01	1151
Maria River at Connection Creek	Connection Creek	NA	22-Sep-94	26-Oct-95	760
Hastings River at Lake Innes	Lake Innes	NA	19-Aug-93	07-Sep-94	760
Scotts Creek at Scotts Creek	Scotts Creek	NA	20-Oct-98	22-Oct-99	1029
Wallis Lake at Peach Tree Point	Peach Tree Point	NA	30-Jul-97	09-Mar-99	987
Wallis Lake at Wallamba	Wallamba	NA	30-Jul-97	25-Aug-98	987
Wallis Lake at Booti Island	Booti Island	NA	31-Jul-97	25-Aug-98	987
Wallis Lake at Darawakh Creek	Darawakh Creek	NA	26-Aug-98	08-Mar-99	987
Smiths Lake at smiths Lake	Smiths Lake	NA	04-May-95	16-May-96	771
Myall Lake at Mayers Point	Mayers Point	NA	10-Jul-96	04-Mar-98	906

Station Longname	Station Name	Station Number	Start Date	End Date	Additional MHL Report Available
Myall River at Monkey Jacket	Monkey Jacket	NA	09-Jul-96	04-Mar-98	906
Lake Wollumboola at Lake Wollumboola	Lake Wollumboola Floating	NA	07-Dec-00	19-Jun-01	1145
Tuross Lake at Trunketabella	Trunketabella	NA	04-May-94	11-Mar-98	921
Wallaga Lake at Meads Bay	Meads Bay	NA	03-Feb-99	10-Feb-00	1048
Hexham Swamp at Ironbark Creek Downstream	Ironbark Creek Downstream	NA	08-Aug-02	30-Jun-09	
Hexham Swamp at Ironbark Creek Upstream	Ironbark Creek Upstream	NA	09-Aug-02	27-Oct-04	
Hexham Swamp at Morris Jetty	Morris Jetty	NA	07-Aug-02	30-Jun-09	
Hunter River at Fishery Creek	Fishery Creek	NA	08-Aug-02	07-Mar-03	
Hunter River at Fishery Creek 2	Fishery Creek	NA	11-Jun-03	29-Aug-03	
Hexham Swamp at Shortland Wetland Centre	Shortland Wetland Centre	NA	10-Mar-99	04-Jul-00	1058
Hexham Swamp at SWC Canoe Trail	SWC Canoe Trail	NA	07-Aug-02	09-Jan-03	12, 21
Lake Macquarie at Swansea Channel Site 4	Swansea Channel Site 4	NA	28-Mar-96	14-Jun-96	770
Lake Macquarie at Swansea Channel Site 5	Swansea Channel Site 5	NA	15-Apr-96	10-May-96	770
Orphan site at Berowra Water Quality	Berowra Creek Water Quality	NA	26-May-95	29-Nov-95	745
Berowra Creek at Berowra Waters Marina	Berowra Waters Marina	NA	22-Aug-01	23-Nov-01	
Narrabeen Lagoon at Pittwater Road Bridge	Pittwater Road Bridge	NA	23-Feb-96	15-Nov-05	
Manly Lagoon at Riverview Parade	Riverview Parade	NA	02-Feb-96	05-Jan-07	
Manly Lagoon at Manly Dam	Manly Dam	NA	29-Jan-96	22-Aug-01	
Shoalhaven River at Wharf Road	Wharf Road	NA	06-Mar-95	07-Apr-95	
Shoalhaven River at Nowra Bridge	Nowra Point	NA	07-Mar-95	07-Apr-95	
Clyde River at Clyde Site 7	Clyde River Site 7	NA	25-Sep-96	08-Oct-96	792
Clyde River at Clyde Site 16	Clyde River Site 16	NA	25-Sep-96	08-Oct-96	
Wonboyn River Upstream of Wonboyn Lake	Wonboyn River	NA	21-Aug-97	06-Sep-98	

Appendix B

Sample Outputs

Public Works
Manly Hydraulics Laboratory

SAMPLE DATA PLOTS

Figure B1

MHL Report 2295

DRAWING: 2295-B1.cdr

Station Name, Port Stephens (Live),,
Station Number,209471,,
Latitude,+152:10:56.06,,
Longitude,-32:42:53.57,,
Datum,PSHD,,
,,,
date,time,value,value.status
5/07/2011,0:00:00,1.61325,6 (Good)
5/07/2011,0:15:00,1.56495,6 (Good)
5/07/2011,0:30:00,1.47403,6 (Good)
5/07/2011,0:45:00,1.39316,6 (Good)
5/07/2011,1:00:00,1.3186,6 (Good)
5/07/2011,1:15:00,1.22369,6 (Good)
5/07/2011,1:30:00,1.10246,6 (Good)
5/07/2011,1:45:00,1.03073,6 (Good)
5/07/2011,2:00:00,0.949726,6 (Good)
5/07/2011,2:15:00,0.84358,6 (Good)
5/07/2011,2:30:00,0.756913,6 (Good)
5/07/2011,2:45:00,0.658031,6 (Good)
5/07/2011,3:00:00,0.573691,6 (Good)
5/07/2011,3:15:00,0.504744,6 (Good)
5/07/2011,3:30:00,0.423529,6 (Good)
5/07/2011,3:45:00,0.361451,6 (Good)
5/07/2011,4:00:00,0.317804,6 (Good)
5/07/2011,4:15:00,0.276461,6 (Good)
5/07/2011,4:30:00,0.214138,6 (Good)
5/07/2011,4:45:00,0.196576,6 (Good)
5/07/2011,5:00:00,0.182245,6 (Good)
5/07/2011,5:15:00,0.190659,6 (Good)
5/07/2011,5:30:00,0.205091,6 (Good)
5/07/2011,5:45:00,0.22192,6 (Good)
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5/07/2011,6:30:00,0.337178,6 (Good)
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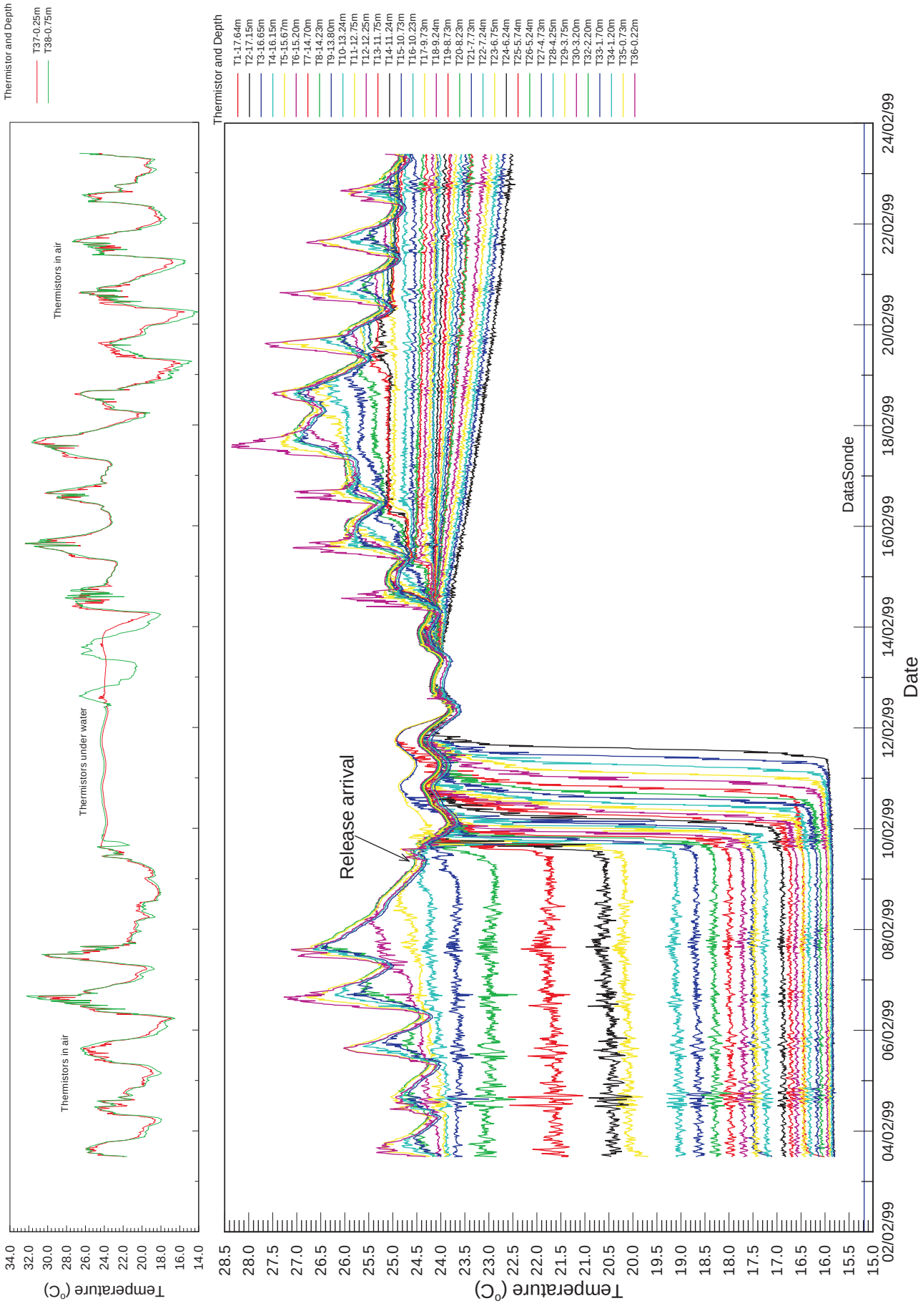
5/07/2011,7:15:00,0.495641,6 (Good)



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SAMPLE THERMISTOR CHAIN DATA
TEMPERATURE DISTRIBUTION TIME SERIES

MHL Report 2295

Figure B3

DRAWING 2295-B3.cdr

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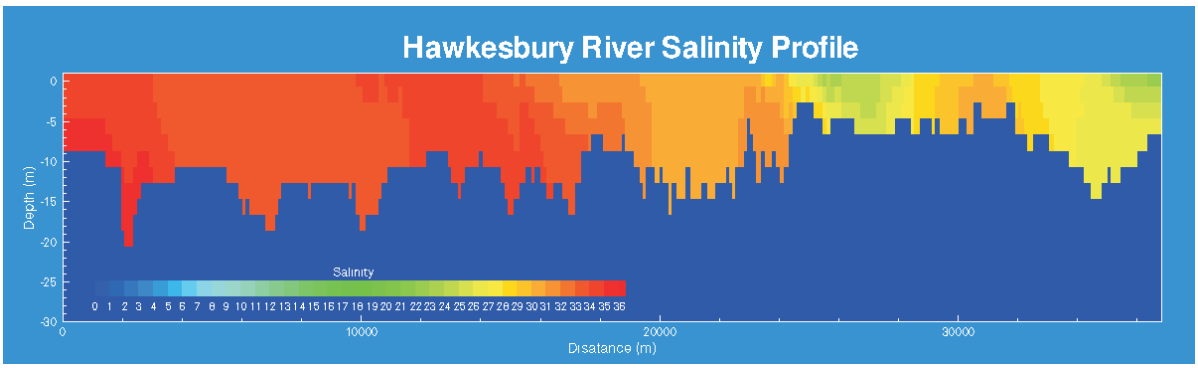
Manly Hydraulics Laboratory

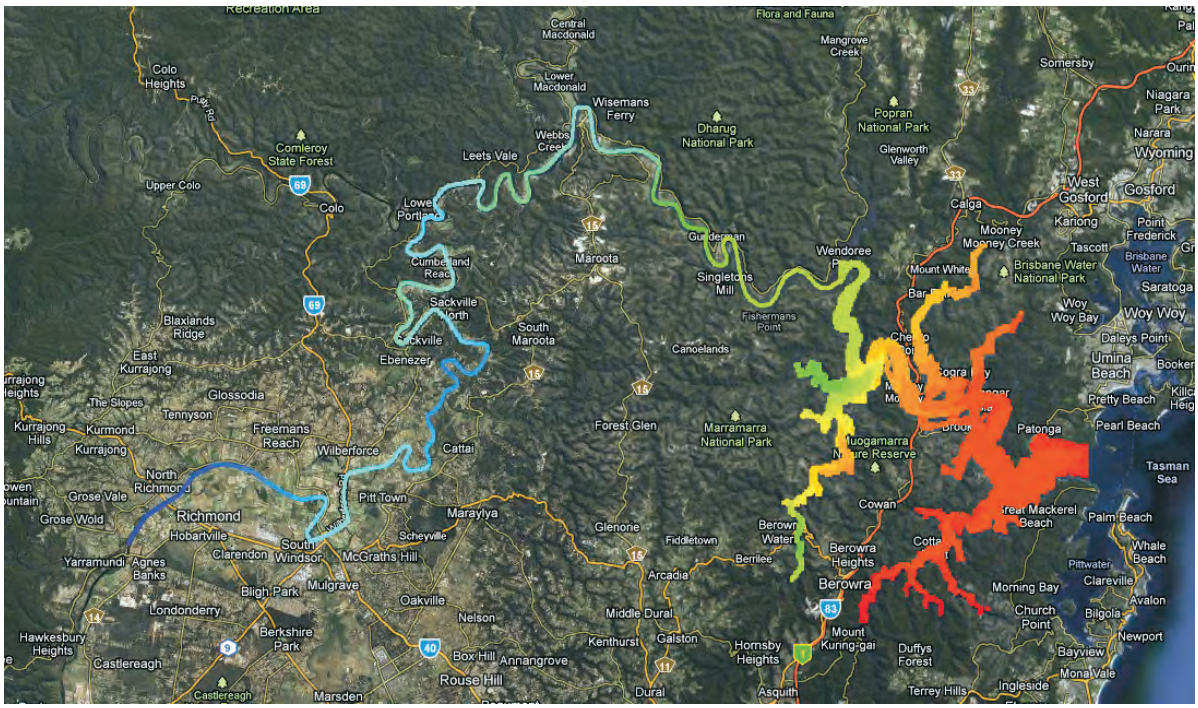
SAMPLE FLOW, WEATHER DATA AND TEMPERATURE CONTOURS

MHL Report 2295

Figure B4

DRAWING 2295-B4.cdr


Hawkesbury River Salinity Profile
Depth (m)
0
-5
-10
-15
-20
-25
-30
Salinity
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
0
10000
20000
30000
Distance (m)


Central Macdonald
Lower Macdonald
Wisemans Ferry
Webbs Creek
Leets Vale
Comleroy State Forest
Upper Colo
Colo
Colo Heights
Dharug National Park
Popran National Park
Glenworth Valley
Somersby
Niagara Park
Narara
Wyoming
West Gosford
Gosford
Kariong
Point Frederick
Mooney Mooney Creek
Tascott
Brisbane Water National Park
Saratoga
Woy Woy
Woy Woy Bay
Daleys Point
Umina Beach
Pretty Beach
Pearl Beach
Patonga
Tasman Sea
Palm Beach
Whale Beach
Avalon
Bilgola
Newport
Bayview
Mona Vale
Ingleside
Terrey Hills
Duffys Forest
Mount Kuring-gai
Hornsby Heights
Asquith
Dural
Galston
Kenthurst
Middle Dural
Nelson
Oakville
Box Hill
Annangrove
Rouse Hill
Marsden
Castlereagh
Hawkesbury Heights
Berkshire Park
Londonderry
Bligh Park
Mulgrave
Yarramundi
Agnes Banks
South Windsor
McGraths Hill
Clarendon
Richmond
Hobartville
Grose Wold
Grose Vale
North Richmond
Kurrajong
Kurrajong Hills
Kurmond
Tennyson
Glossodia
The Slopes
East Kurrajong
Blaxlands Ridge
Sackville North
Sackville
Ebenezer
Wilberforce
Freemans Reach
Cattai
Pitt Town
Maraylya
Scheyville
Glenorie
Fiddletown
Berrilee
Arcadia
Berowra Waters
Berowra Heights
Berowra
Cowan
Great Mackerel Beach
Morning Bay
Church Point
Pittwater
Clareville
Cottage Point
Forest Glen
Marramarra National Park
Canoelands
Fishermans Point
Singletons Mill
Maroota
South Maroota
Cumberland Reac
Wendoree
Mount White
Brisbane Water
Calga
Mooney
Guiderman
Lower Portland
Flora and Fauna
Mangrove Creek
Recreation Area

Appendix C

Other Publications of Interest

Appendix C Other Publications of Interest

Data Reports

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).

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).

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).

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).

MHL Estuary and River Water Quality Summaries available:

MHL Report No. 2161 (11-12), 2222 (12-13).

NSW Public Works 2012, *Monitoring of Estuaries for Water Sharing Plans Annual Summary 2011-2012*, Manly Hydraulics Laboratory, Report No. 2162, 2012

NSW Public Works 2013, *Monitoring of Estuaries for Water Sharing Plans Annual Summary 2012-2013*, Manly Hydraulics Laboratory, Report No. 2241, 2013

Salinity Profiling

NSW Public Works 2010, *Bellinger and Kalang Rivers Data Collection July 2008–September 2009,* Manly Hydraulics Laboratory, Report No. 1951.

NSW Public Works 2012, *NSW Estuaries Salinity Data Compilation*, Manly Hydraulics Laboratory, Report No. 1812

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