QUEANBEYAN-PALERANG REGIONAL COUNCIL

QUEANBEYAN
FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

JUNE 2019

VOLUME 2 – FIGURES

DRAFT REPORT FOR PUBLIC EXHIBITION

DRAFT REPORT FOR PUBLIC EXHIBITION

Job No: CO430 File: QFRMS_V2_Figures_[Rev 1.3].docx	Date: June 2019 Rev No: 1.3	Principal: SAB Author: SAB/TDR

COPYRIGHT NOTICE

This document, Queanbeyan Floodplain Risk Management Study and Plan 2019, is licensed under the Creative Commons Attribution 4.0 Licence, unless otherwise indicated.

Please give attribution to: *© Queanbeyan-Palerang Regional Council 2019*

We also request that you observe and retain any notices that may accompany this material as part of the attribution.

Notice Identifying Other Material and/or Rights in this Publication:
The author of this document has taken steps to both identify third-party material and secure permission for its reproduction and reuse. However, please note that where these third-party materials are not licensed under a Creative Commons licence, or similar terms of use, you should obtain permission from the rights holder to reuse their material beyond the ways you are permitted to use them under the Copyright Act 1968. Please see the Table of References at the rear of this document for a list identifying other material and/or rights in this document.

Further Information
For further information about the copyright in this document, please contact:
Queanbeyan-Palerang Regional Council
256 Crawford Street, Queanbeyan
council@qprc.nsw.gov.au
1300 735 025

DISCLAIMER
The Creative Commons Attribution 4.0 Licence contains a Disclaimer of Warranties and Limitation of Liability. In addition: ***This document (and its associated data or other collateral materials, if any, collectively referred to herein as the 'document') were produced by Lyall & Associates Consulting Water Engineers for Queanbeyan-Palerang Regional Council only. The views expressed in the document are those of the author(s) alone, and do not necessarily represent the views of the Queanbeyan-Palerang Regional Council. Reuse of this study or its associated data by anyone for any other purpose could result in error and/or loss. You should obtain professional advice before making decisions based upon the contents of this document.***

DRAFT REPORT FOR PUBLIC EXHIBITION

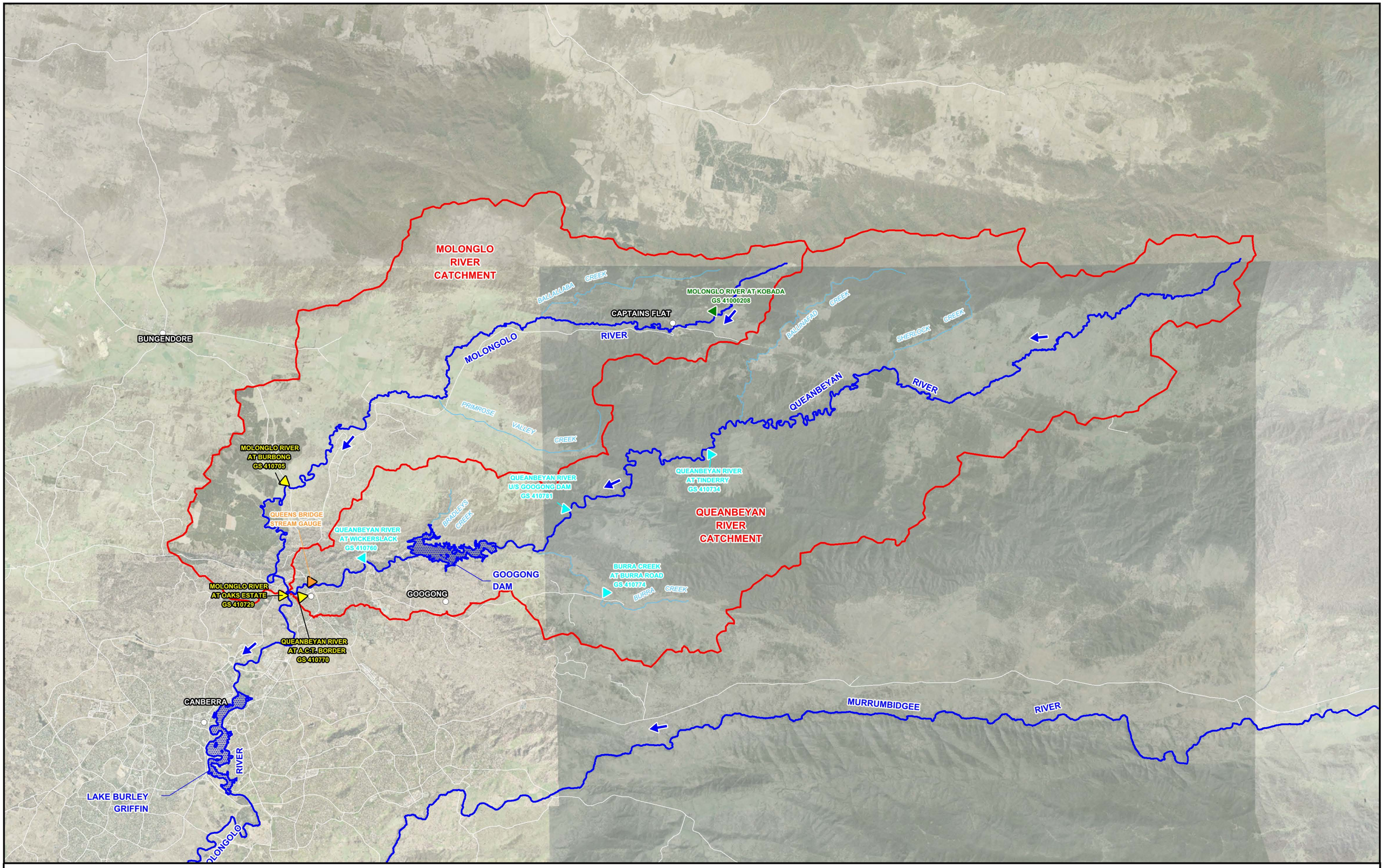
LIST OF FIGURES

1.1 Study Location Plan

2.1 Existing Drainage System at Queanbeyan (2 sheets)
2.2 Indicative Extent and Depths of Inundation - 1% AEP (2 Sheets)
2.3 Indicative Extent and Depths of Inundation - PMF (2 Sheets)
2.4 Design Water Surface Profiles – Queanbeyan and Molonglo Rivers (2 Sheets)
2.5 Time of Rise of Floodwaters at Location of Bridge Crossings
2.6 Rate of Rise of Floodwaters at Queens Bridge
2.7 Indicative Extent and Depths of Inundation – Local Catchment Flooding in Queanbeyan CBD - 1% AEP
2.8 Indicative Extent of Inundation and Location of Vulnerable Development and Critical Infrastructure (2 Sheets)
2.9 Potential Impact of Future Urbanisation on Local Catchment Flooding Patterns in Vicinity of Queanbeyan CBD – 1% AEP
2.10 Potential Impact of a 10% Increase in Rainfall on Flooding Patterns – 1% AEP (2 Sheets)
2.11 Potential Impact of a 30% Increase in Rainfall on Flooding Patterns – 1% AEP (2 Sheets)
2.12 Flood Hazard and Hydraulic Categorisation of Floodplain - 1% AEP (2 Sheets)
2.13 Flood Hazard and Hydraulic Categorisation of Floodplain – Local Catchment Flooding in Vicinity of Queanbeyan CBD - 1% AEP
2.14 Queanbeyan LEP 2012 Zoning

3.1 Potential CBD Levee Alignments
3.2 Longitudinal Sections along Potential CBD Levee Alignments
3.3 Typical Cross Sections Showing Kings Highway Upgrade Options
3.4 Impact of Kings Highway Upgrade Option 1D on Main Stream Flooding Behaviour
3.5 Impact of Kings Highway Upgrade Option 2A on Main Stream Flooding Behaviour
3.6 Flood Emergency Response Planning Classifications – 1% AEP (2 Sheets)
3.7 Flood Emergency Response Planning Classifications – PMF (2 Sheets)

DRAFT REPORT FOR PUBLIC EXHIBITION



N

2500 0 2500 5000 7500 m

Scale: 1:250,000

LEGEND

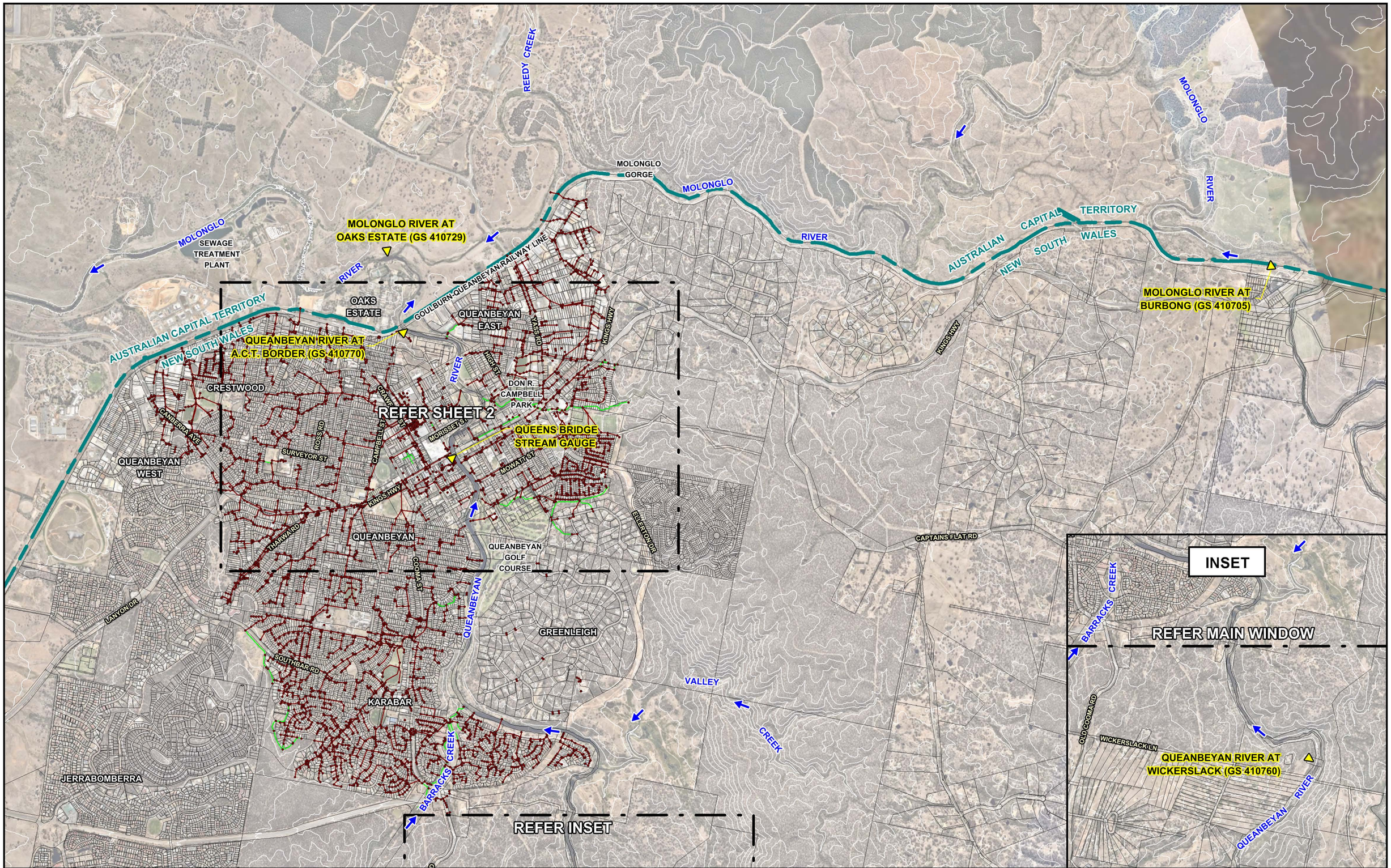
- Catchment Boundary
- Manually Read Stream Gauge
- IconWater Stream Gauge
- EPSDD Stream Gauge
- WaterNSW Stream Gauge

Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 1.1

STUDY LOCATION PLAN



N

300 0 300 600 900 m

Scale: 1:30,000

LEGEND

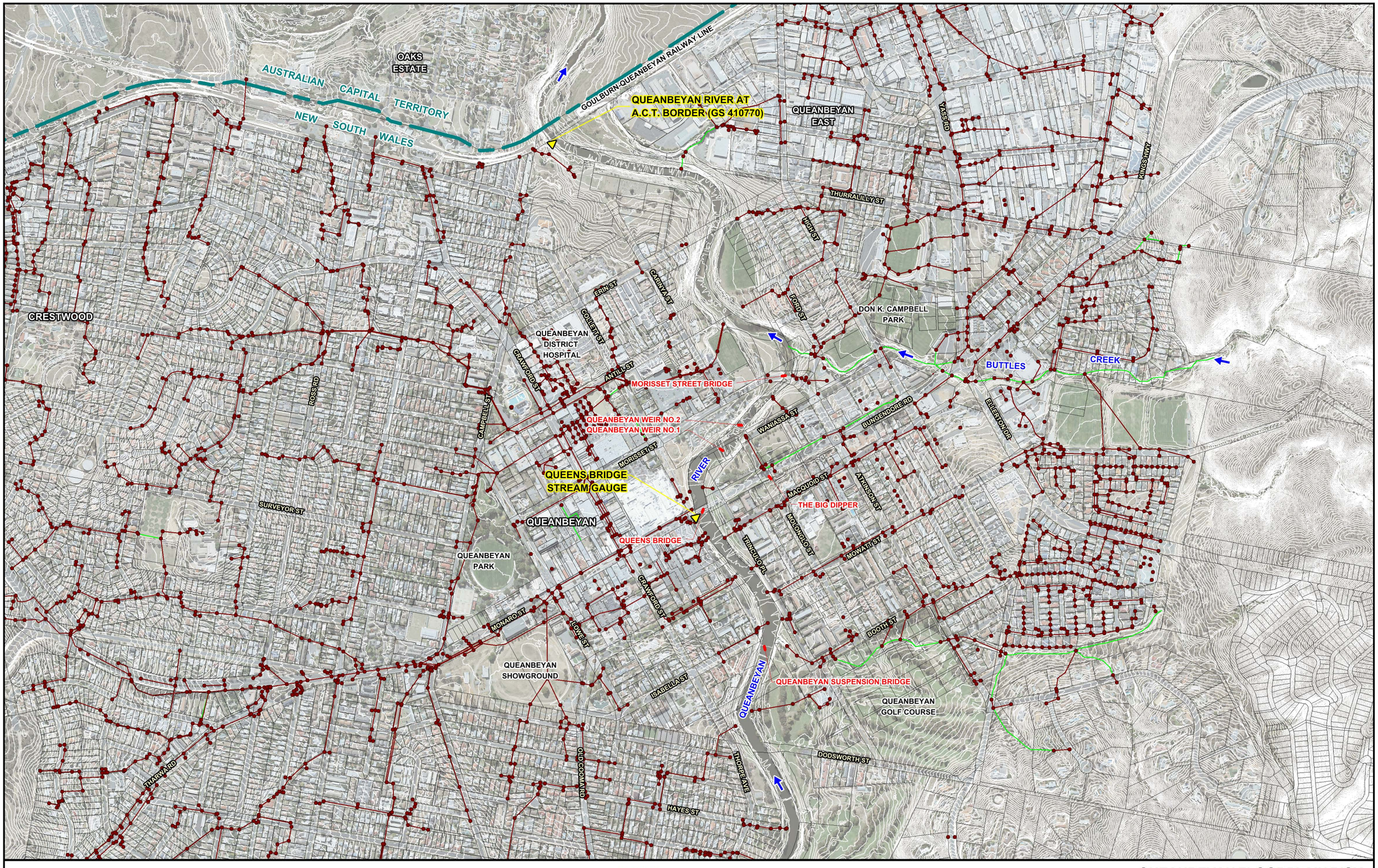
- Existing Piped Stormwater Drainage System
- Existing Stormwater Channel
- Stream Gauge

Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.1
(Sheet 1 of 2)

EXISTING DRAINAGE SYSTEM AT QUEANBEYAN



N

100 0 100 200 300 m

Scale: 1:10,000

LEGEND

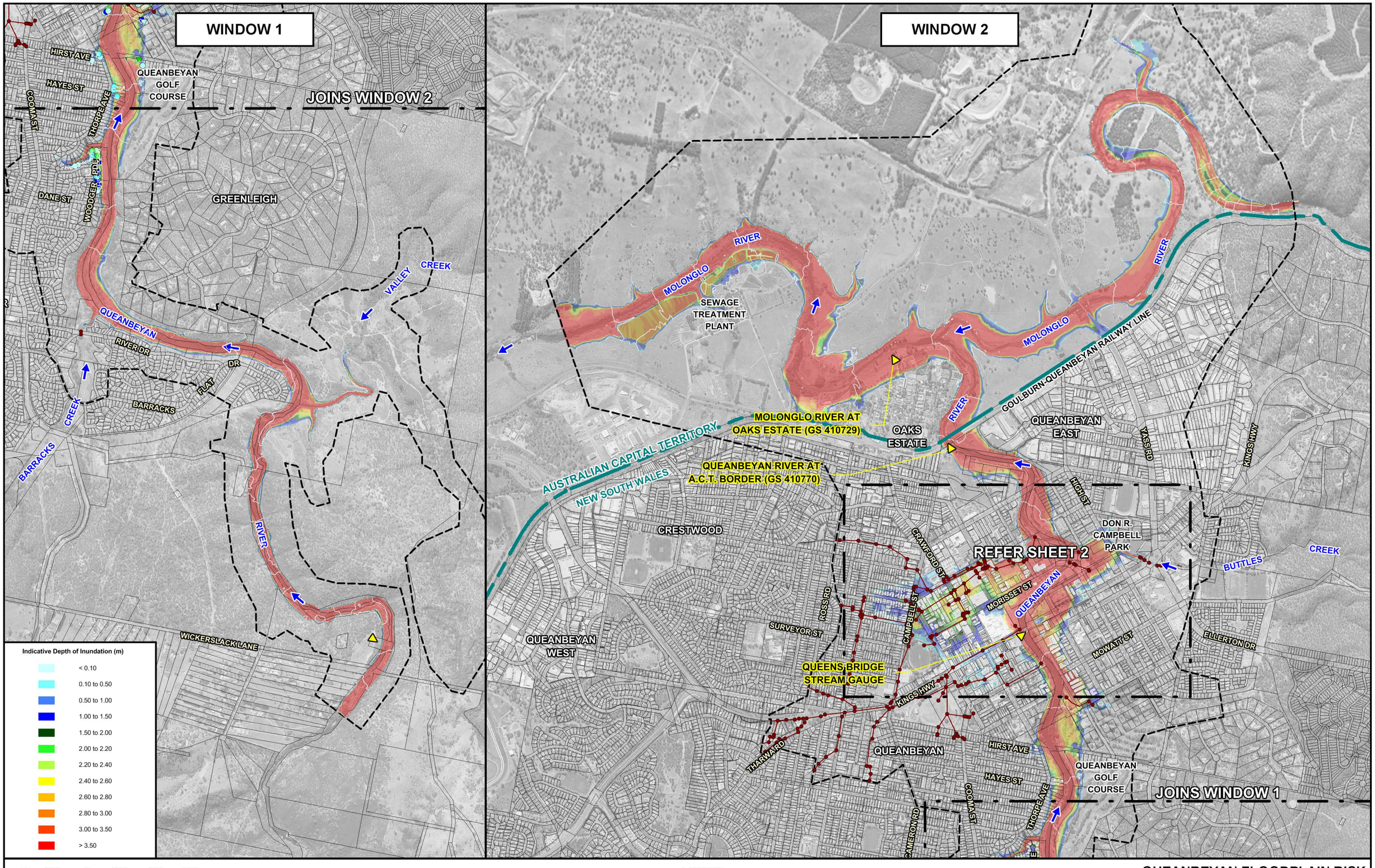
- Existing Piped Stormwater Drainage System
- Existing Stormwater Channel
- Stream Gauge

Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.1
(Sheet 2 of 2)

EXISTING DRAINAGE SYSTEM AT QUEANBEYAN



N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 575.0 Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.2
(Sheet 1 of 2)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
1% AEP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 575.0 Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.2
(Sheet 2 of 2)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
1% AEP

WINDOW 1

WINDOW 2

JOINS WINDOW 2

JOINS WINDOW 1

REFER SHEET 2

QUEANBEYAN GOLF COURSE

HAYES ST

COOMA ST

THORPE AVE

DANE ST

GREENLEIGH

VALLEY CREEK

QUEANBEYAN RIVER DR

BARRACKS CREEK

BARRACKS FLAT DR

RIVER

WICKERSLACK LANE

QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

MOLONGLO RIVER

SEWAGE TREATMENT PLANT

MOLONGLO RIVER AT OAKS ESTATE (GS 410729)

OAKS ESTATE

AUSTRALIAN CAPITAL TERRITORY

NEW SOUTH WALES

QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)

CRESTWOOD

GOULBURN-QUEANBEYAN RAILWAY LINE

QUEANBEYAN EAST

YASS RD

KINGS HWY

HIGH ST

DON R. CAMPBELL PARK

BUTTLES CREEK

CRAWFORD ST

MORISSET ST

QUEANBEYAN

ELLERTON DR

MOWATT ST

ROSS RD

CAMPBELL ST

SURVEYOR ST

QUEANBEYAN WEST

QUEENS BRIDGE STREAM GAUGE

THARWARD RD

NOTE:
Depth legend differs from that shown on Figure 2.2.

Indicative Depth of Inundation (m)

0.10 to 1.00
1.00 to 2.00
2.00 to 3.00
3.00 to 5.00
5.00 to 7.50
7.50 to 10.00
10.00 to 12.50
12.50 to 15.00
15.00 to 17.50
17.50 to 20.00
> 20.00

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

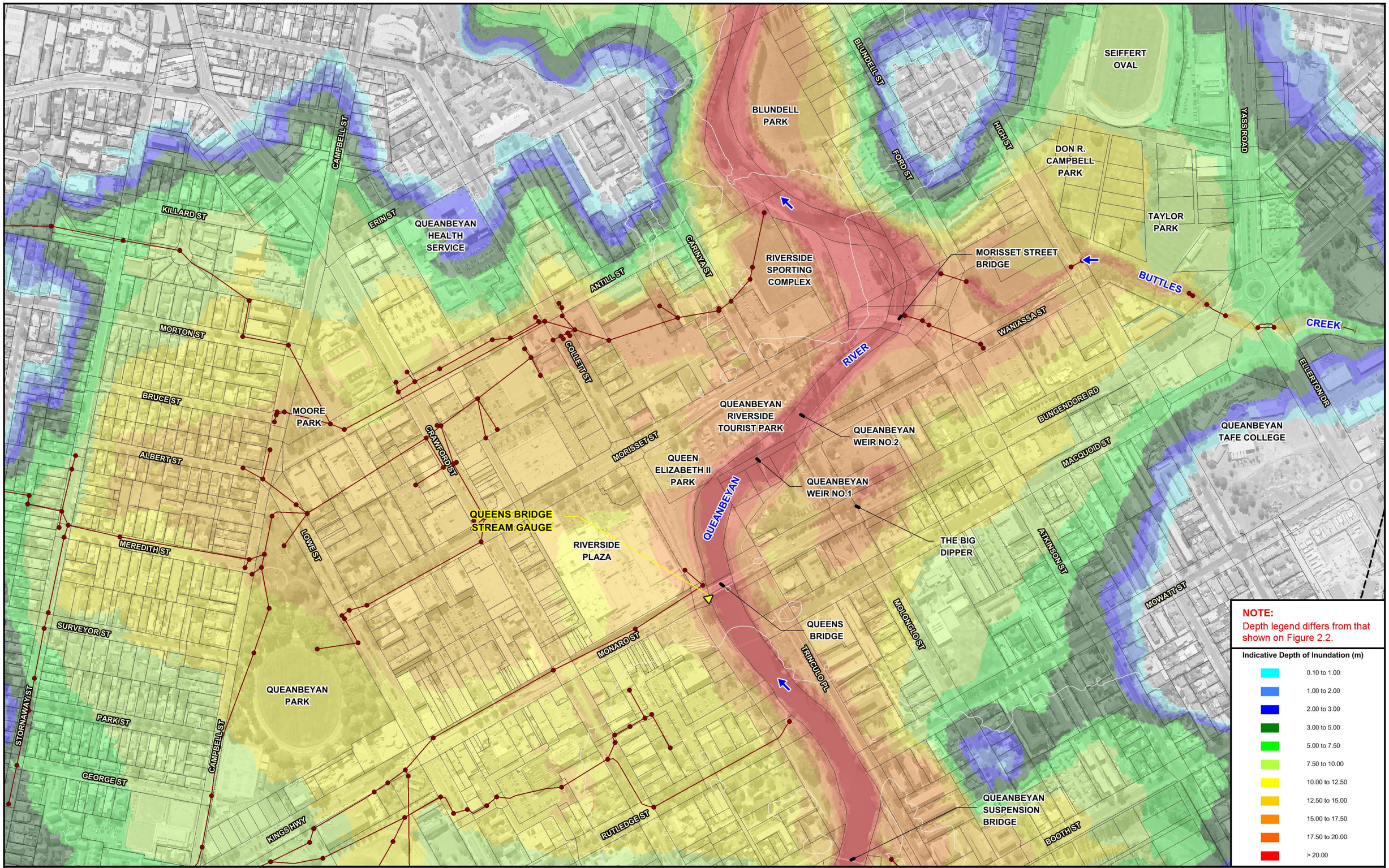
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 575.0 Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.3
(Sheet 1 of 2)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
PMF



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

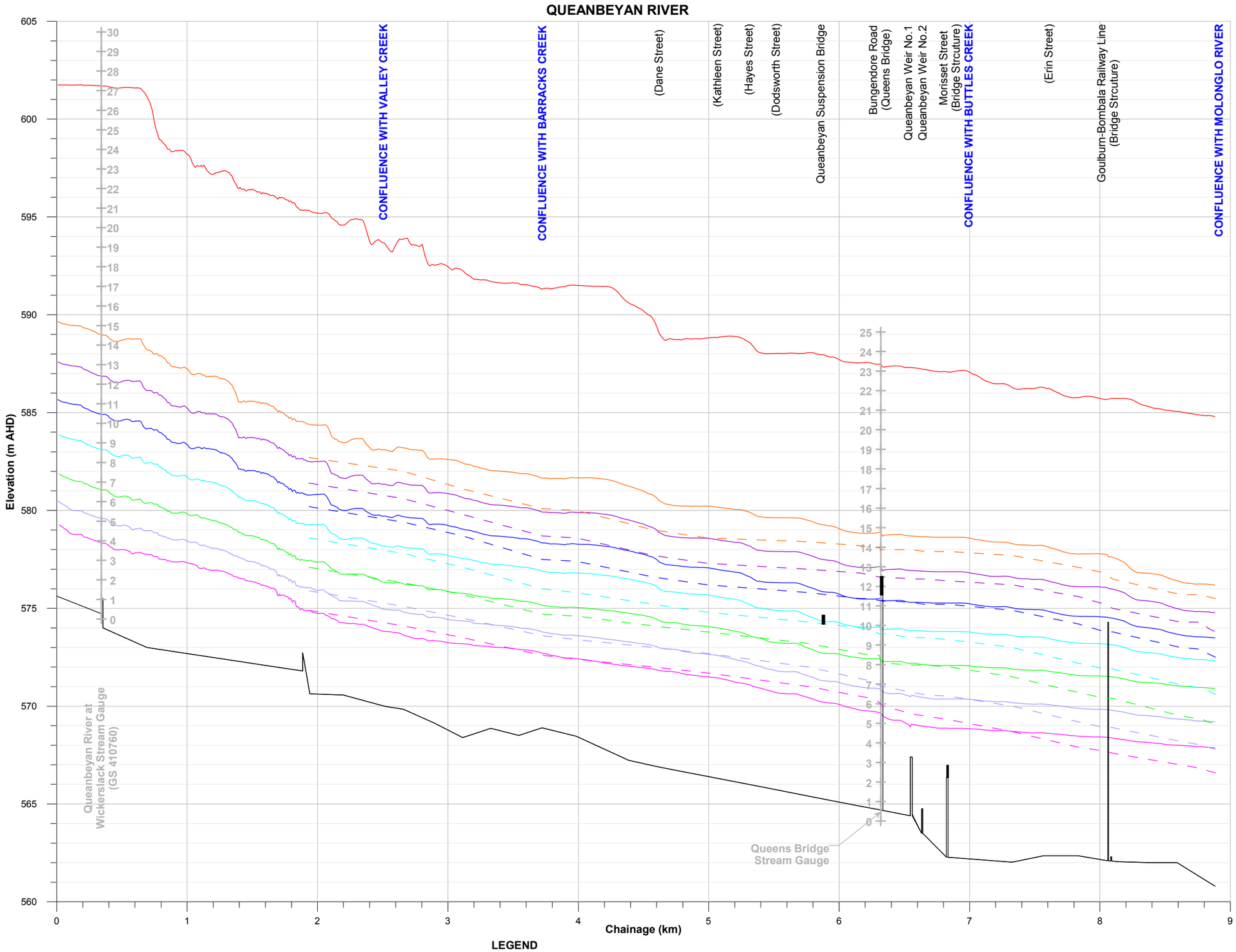
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 575.0 Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.3
(Sheet 2 of 2)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
PMF



LEGEND

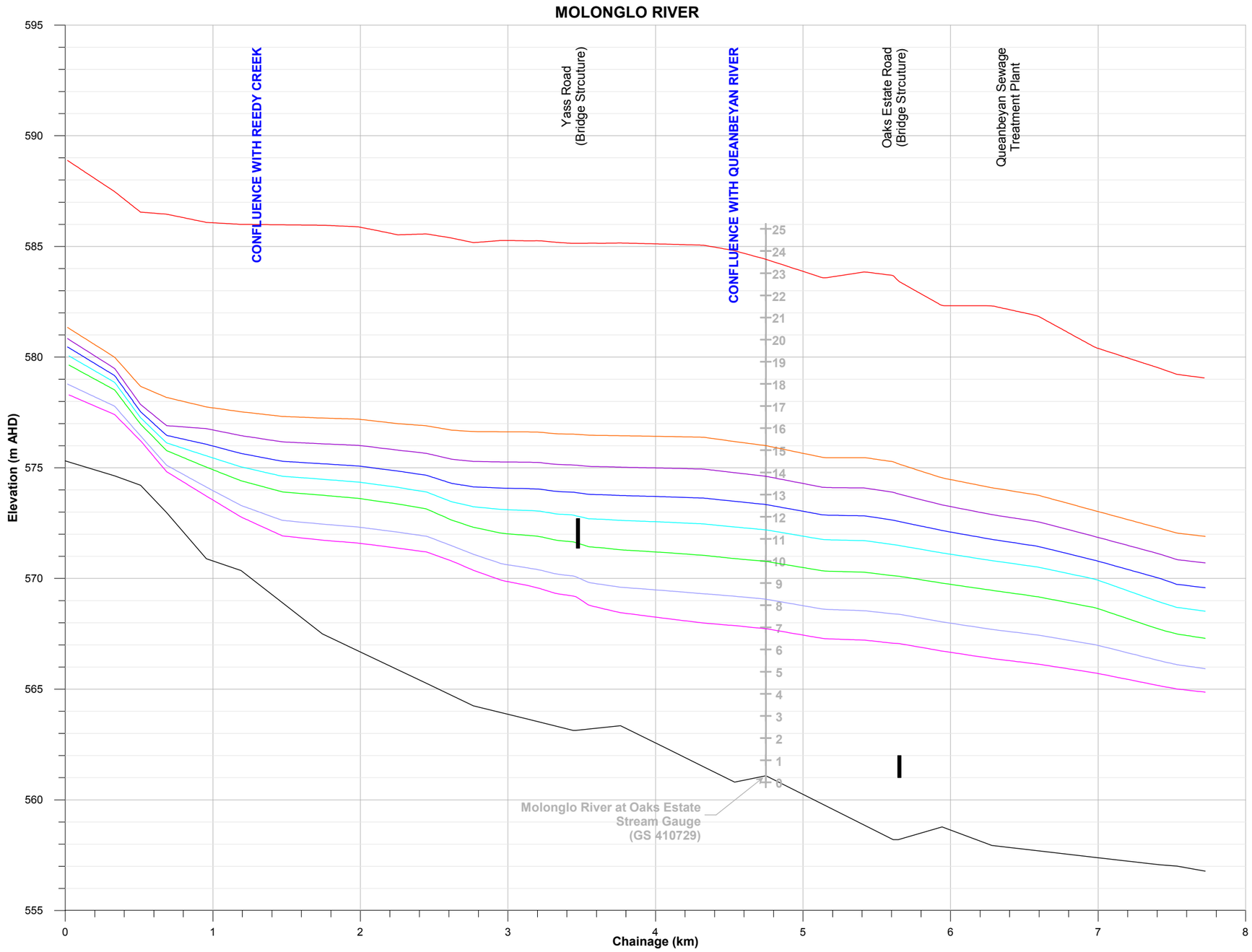
DWR, 1992	Present Study
	PMF
	0.2% AEP
	0.5% AEP
	1% AEP
	2% AEP
	5 %AEP
	10% AEP
	20% AEP

Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.4
(Sheet 1 of 2)

DESIGN WATER SURFACE PROFILES
QUEANBEYAN AND MOLONGLO RIVERS



LEGEND

PMF	2% AEP
0.2% AEP	5 %AEP
0.5% AEP	10% AEP
1% AEP	20% AEP

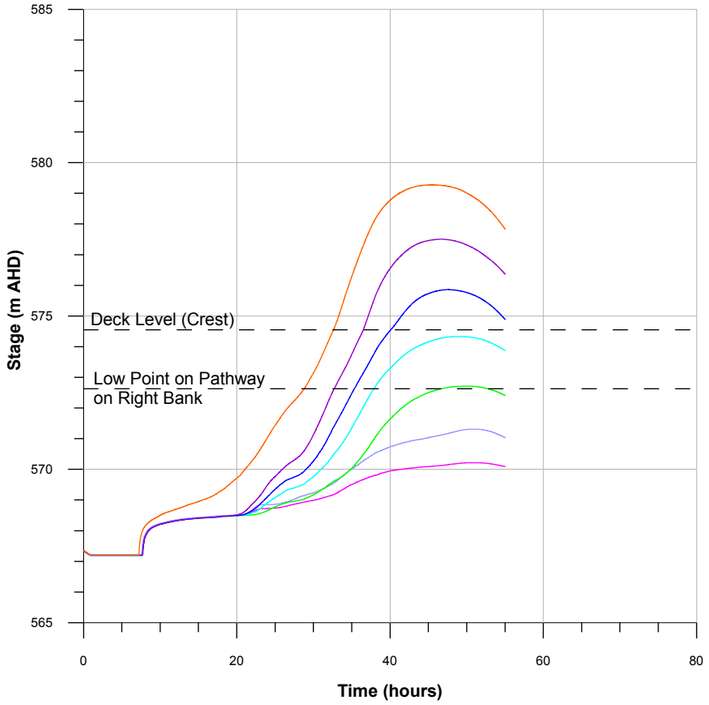
QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.4
(Sheet 2 of 2)

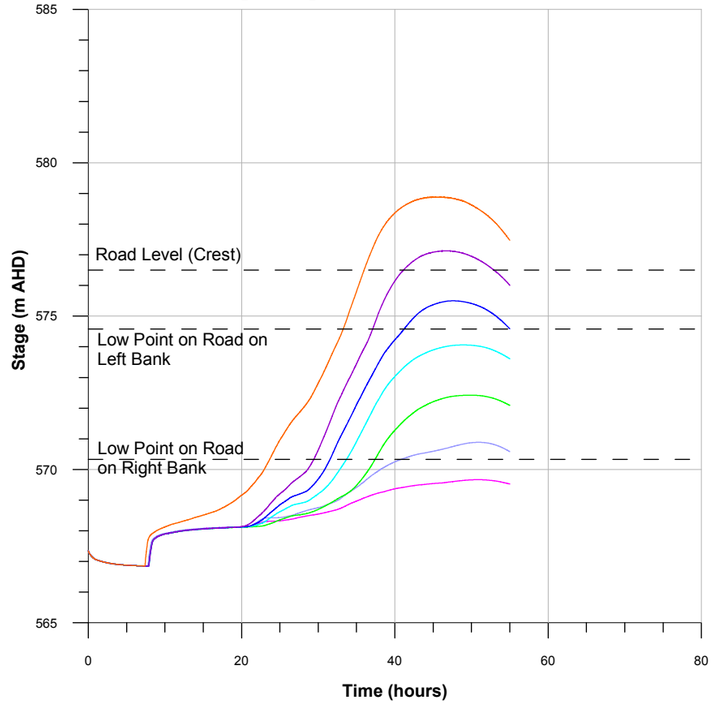
DESIGN WATER SURFACE PROFILES
QUEANBEYAN AND MOLONGLO RIVERS

Lyall & Associates

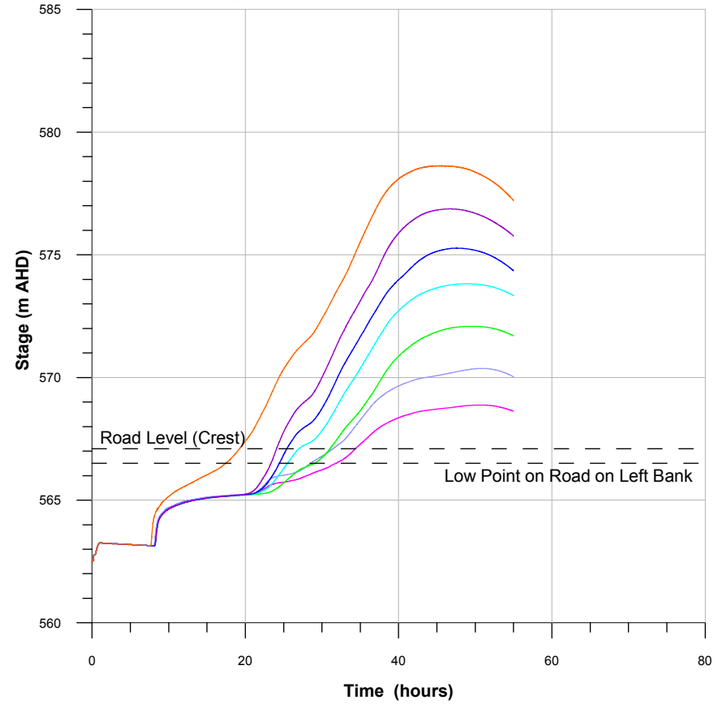
[RC01] - QUEANBEYAN SUSPENSION BRIDGE



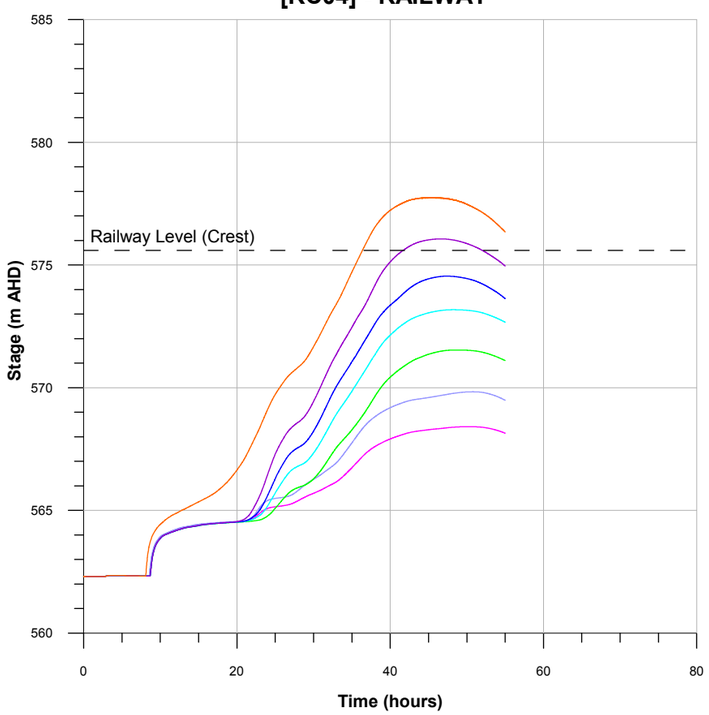
[RC02] - QUEENS BRIDGE



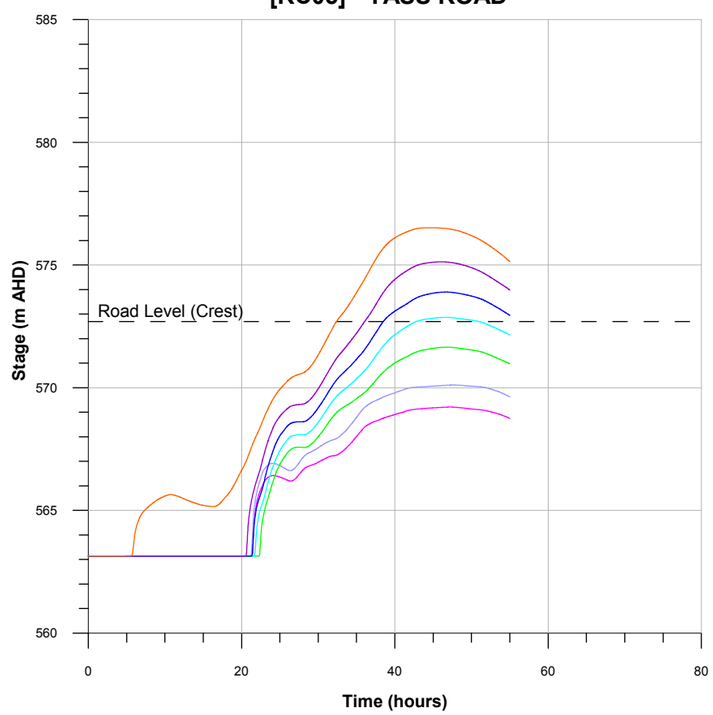
[RC03] - MORISSET STREET



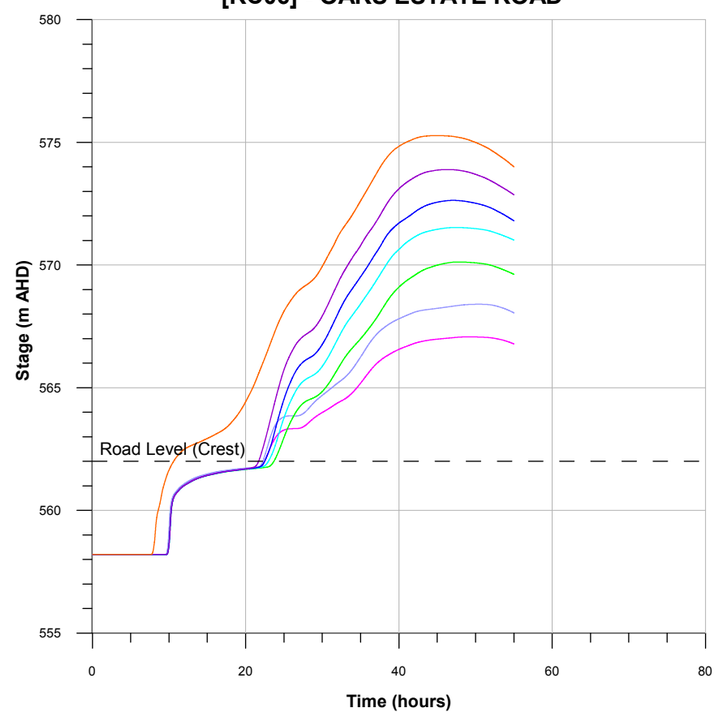
[RC04] - RAILWAY



[RC05] - YASS ROAD



[RC06] - OAKS ESTATE ROAD



LEGEND

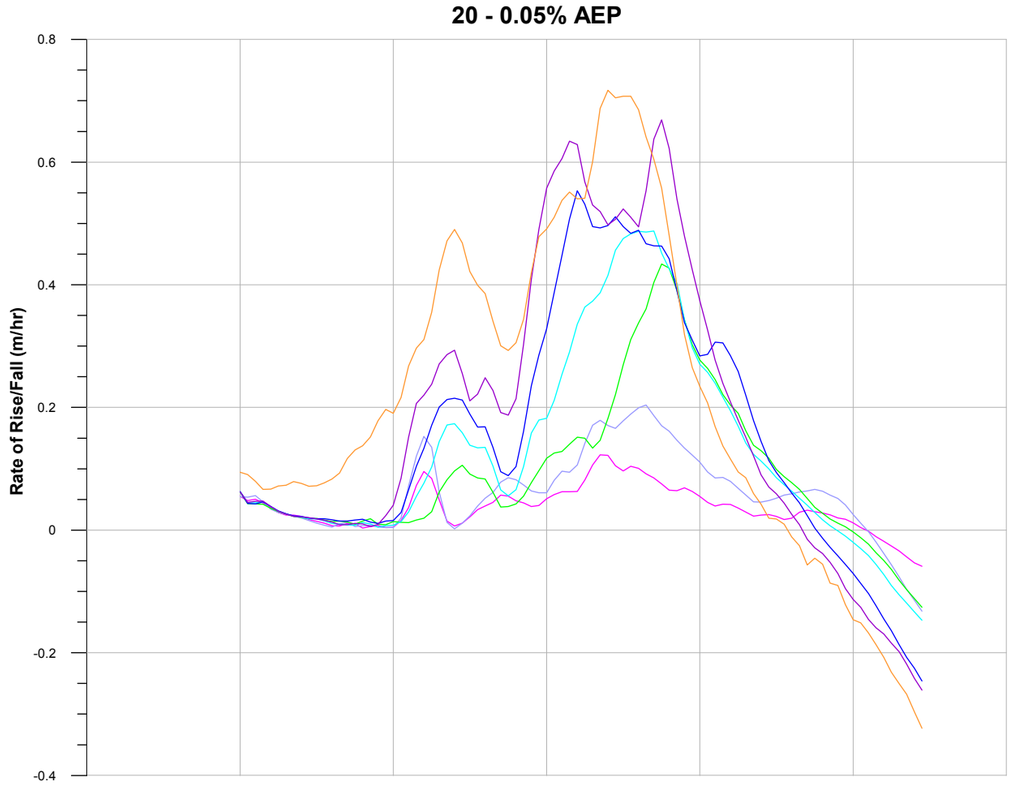
20% AEP
10% AEP
5% AEP
2% AEP
1% AEP
0.5% AEP
0.2% AEP

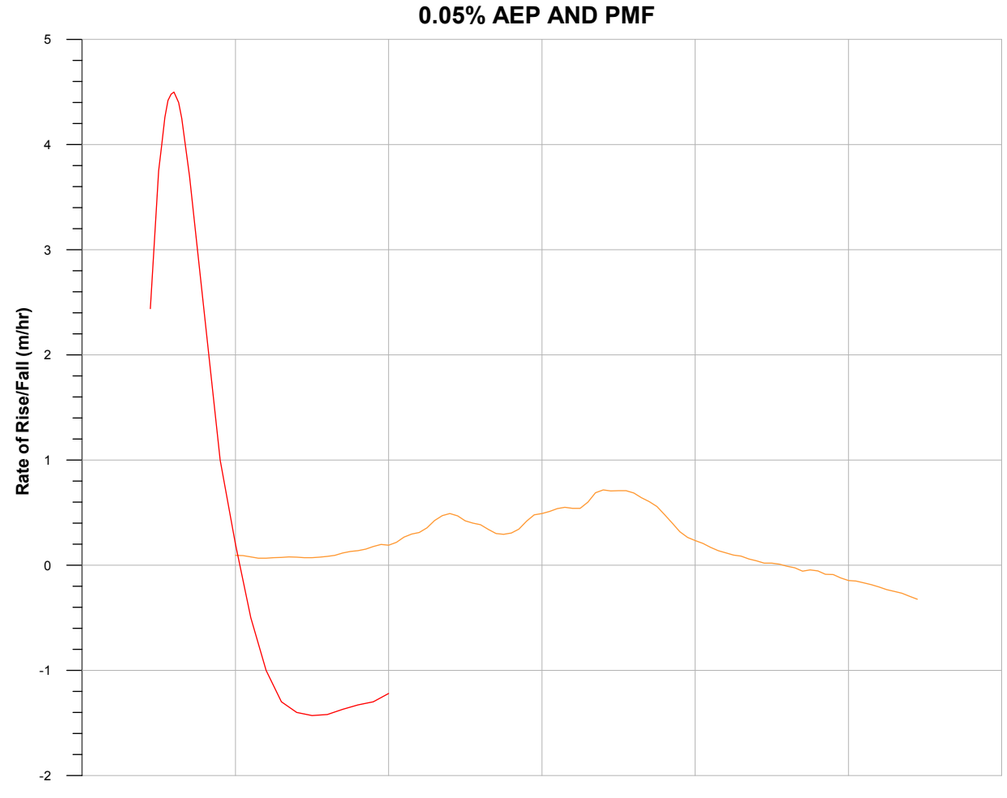
Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.5

TIME OF RISE OF FLOODWATERS
AT LOCATION OF BRIDGE CROSSINGS





LEGEND

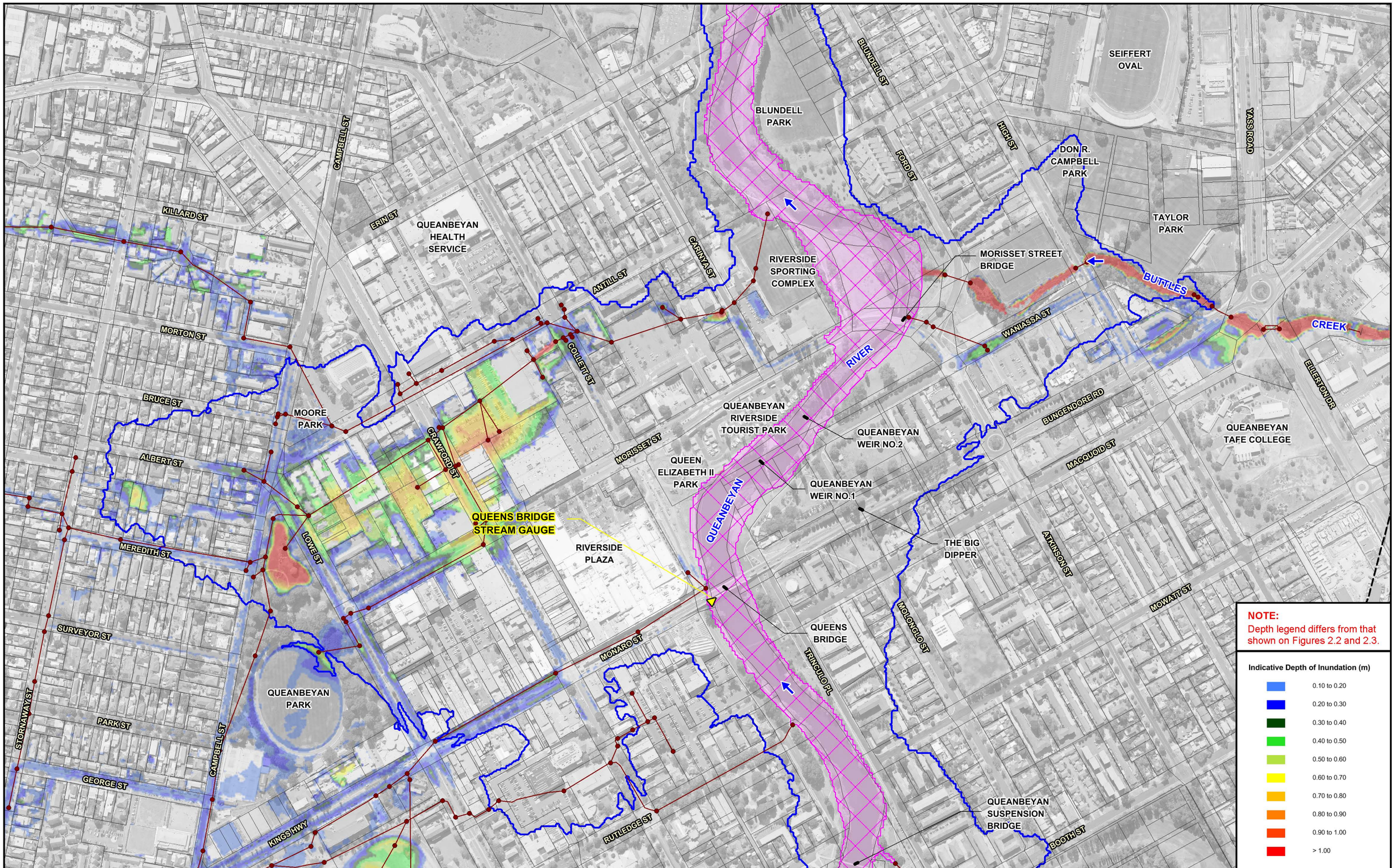
- PMF
- 0.2% AEP
- 0.5% AEP
- 1% AEP
- 2% AEP
- 5% AEP
- 10% AEP
- 20% AEP

Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.6

TIME OF RISE OF FLOODWATERS AT QUEENS BRIDGE



NOTE:
Depth legend differs from that shown on Figures 2.2 and 2.3.

Indicative Depth of Inundation (m)

	0.10 to 0.20
	0.20 to 0.30
	0.30 to 0.40
	0.40 to 0.50
	0.50 to 0.60
	0.60 to 0.70
	0.70 to 0.80
	0.80 to 0.90
	0.90 to 1.00
	> 1.00

N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

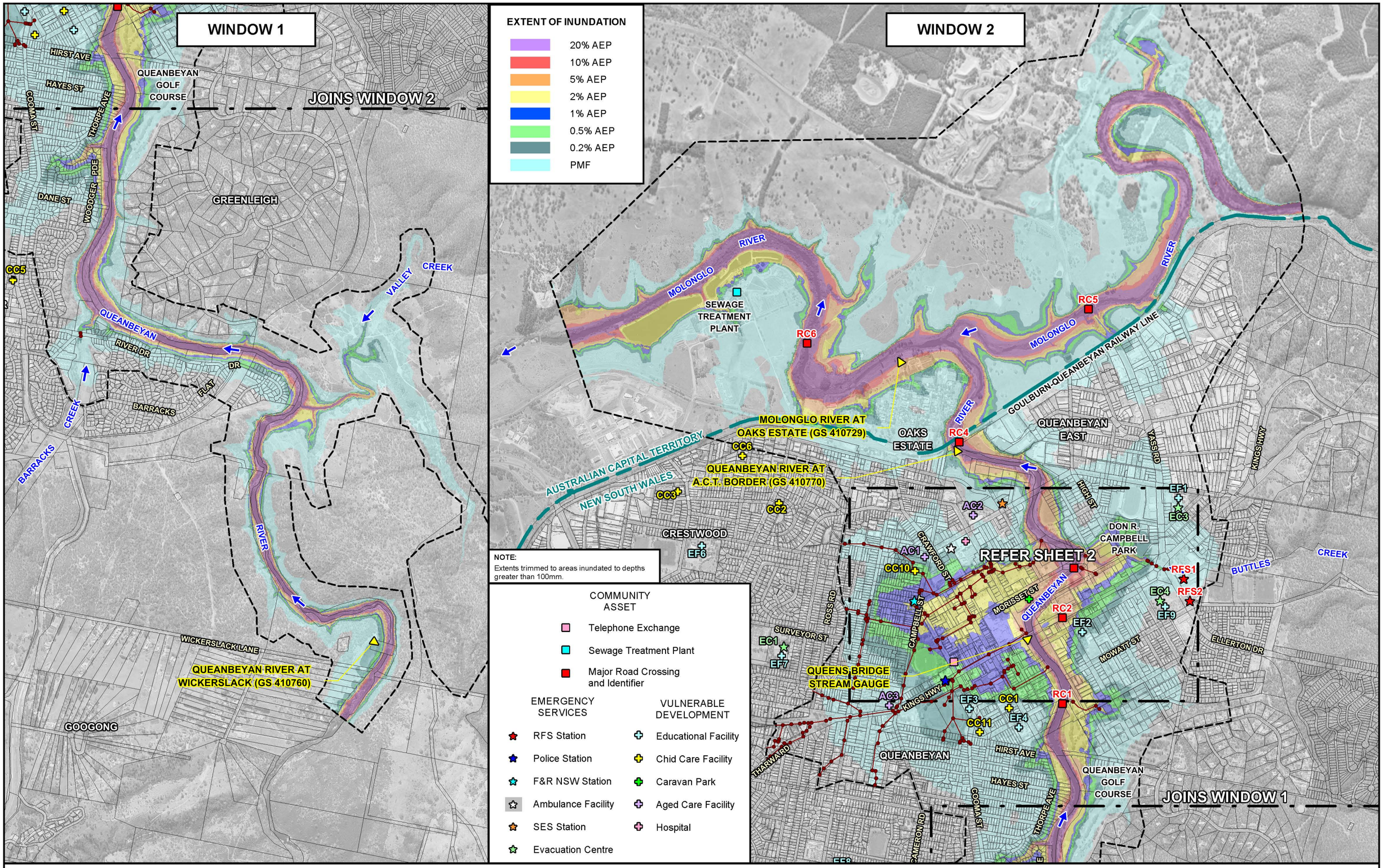
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- Extent of Queanbeyan River Flooding Not Shown
- Indicative Extent of 1% AEP Main Stream Flooding

QUEANBEAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.7

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
LOCAL CATCHMENT FLOODING IN QUEANBEYAN CBD - 1% AEP



N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

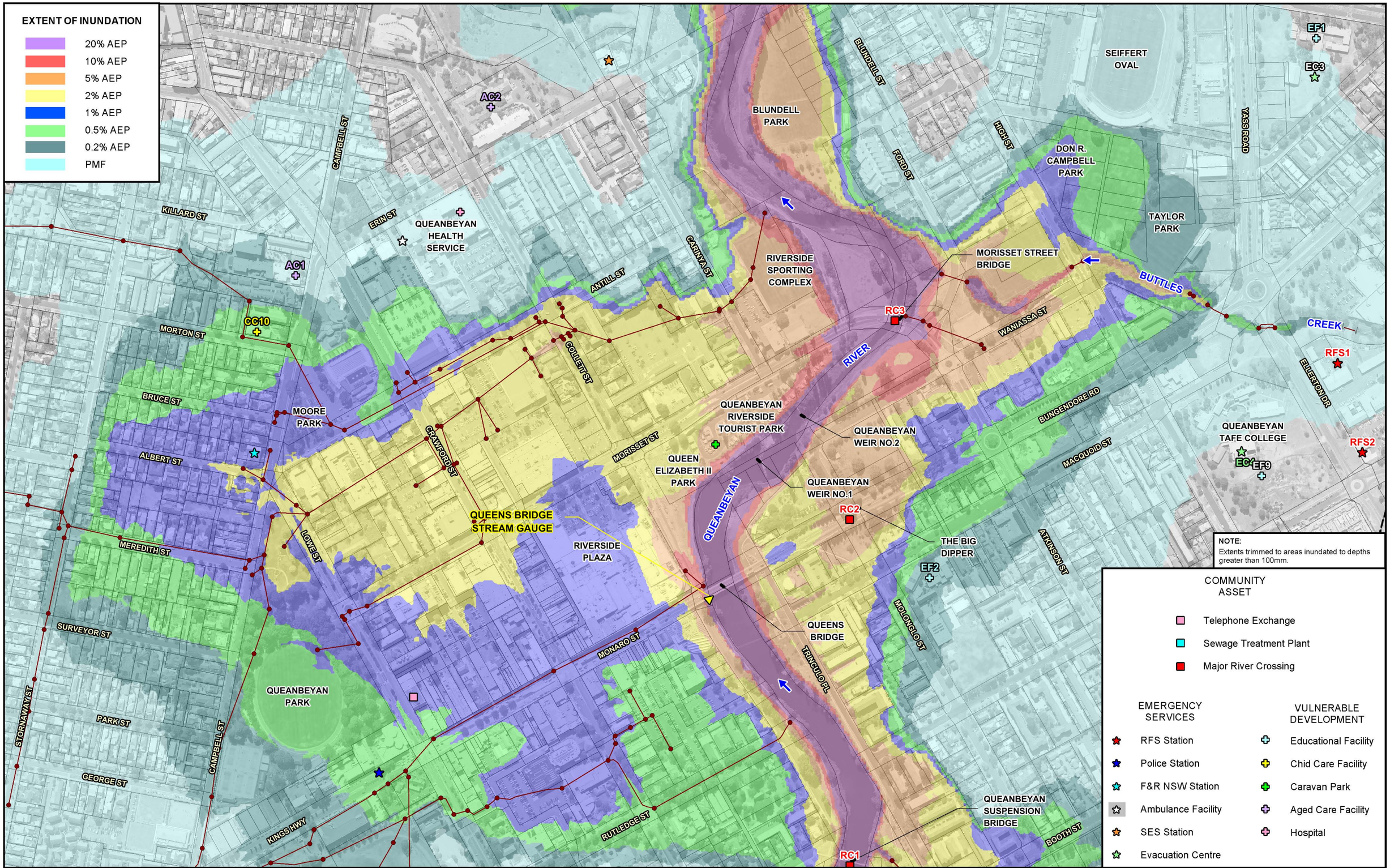
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.8
(Sheet 1 of 2)

INDICATIVE EXTENT OF INUNDATION AND LOCATION OF VULNERABLE DEVELOPMENT AND CRITICAL INFRASTRUCTURE


EXTENT OF INUNDATION
20% AEP
10% AEP
5% AEP
2% AEP
1% AEP
0.5% AEP
0.2% AEP
PMF
KILLARD ST
CAMPBELL ST
ERIN ST
QUEANBEYAN HEALTH SERVICE
AC2
AC1
CC10
MORTON ST
BRUCE ST
MOORE PARK
ALBERT ST
MEREDITH ST
LOWE ST
CRAWFORD ST
COLLETT ST
ANTILL ST
CARINYA ST
BLUNDELL PARK
BLUNDELL ST
FORD ST
HIGH ST
SEIFFERT OVAL
EF1
EC3
YASS ROAD
DON R. CAMPBELL PARK
TAYLOR PARK
RIVERSIDE SPORTING COMPLEX
MORISSET STREET BRIDGE
BUTTLES CREEK
RC3
WANIASSA ST
RIVER
RFS1
ELLERTON DR
BUNGENDORE RD
QUEANBEYAN RIVERSIDE TOURIST PARK
QUEANBEYAN WEIR NO.2
MORISSET ST
QUEEN ELIZABETH II PARK
QUEANBEYAN WEIR NO.1
QUEANBEYAN
RC2
QUEENS BRIDGE STREAM GAUGE
RIVERSIDE PLAZA
THE BIG DIPPER
EF2
QUEANBEYAN TAFE COLLEGE
EC4
EF9
RFS2
MACQUOID ST
ATKINSON ST
MOLONGLO ST
QUEENS BRIDGE
TRINCULO PL
SURVEYOR ST
STORNAWAY ST
PARK ST
GEORGE ST
CAMPBELL ST
QUEANBEYAN PARK
MONARO ST
KINGS HWY
RUTLEDGE ST
QUEANBEYAN SUSPENSION BRIDGE
BOOTH ST
RC1
NOTE:
Extents trimmed to areas inundated to depths greater than 100mm.
COMMUNITY ASSET
Telephone Exchange
Sewage Treatment Plant
Major River Crossing
EMERGENCY SERVICES
RFS Station
Police Station
F&R NSW Station
Ambulance Facility
SES Station
Evacuation Centre
VULNERABLE DEVELOPMENT
Educational Facility
Chid Care Facility
Caravan Park
Aged Care Facility
Hospital
N
50 0 50 100 150 m
Scale: 1:5,000
NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.
Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.
LEGEND
Two-Dimensional Model Boundary
Modelled Stormwater Drainage System
Stream Gauge
Lyall & Associates
QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN
Figure 2.8
(Sheet 2 of 2)
INDICATIVE EXTENT OF INUNDATION AND LOCATION OF VULNERABLE DEVELOPMENT AND CRITICAL INFRASTRUCTURE



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

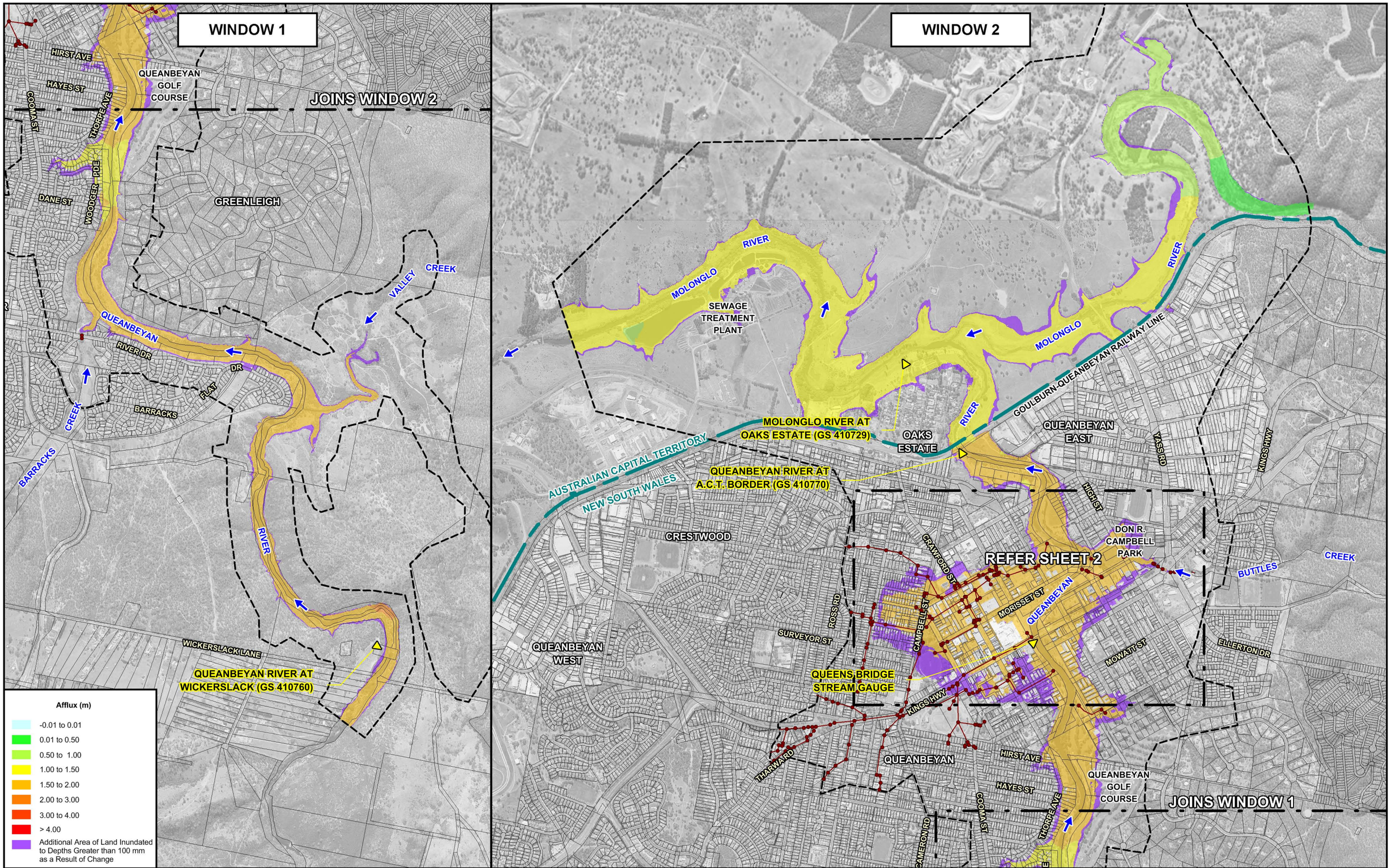
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- Extent of Queanbeyan River Flooding Not Shown

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.9

POTENTIAL IMPACT OF FUTURE URBANISATION ON LOCAL CATCHMENT FLOODING PATTERNS IN VICINITY OF QUEANBEYAN CBD 1% AEP



N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

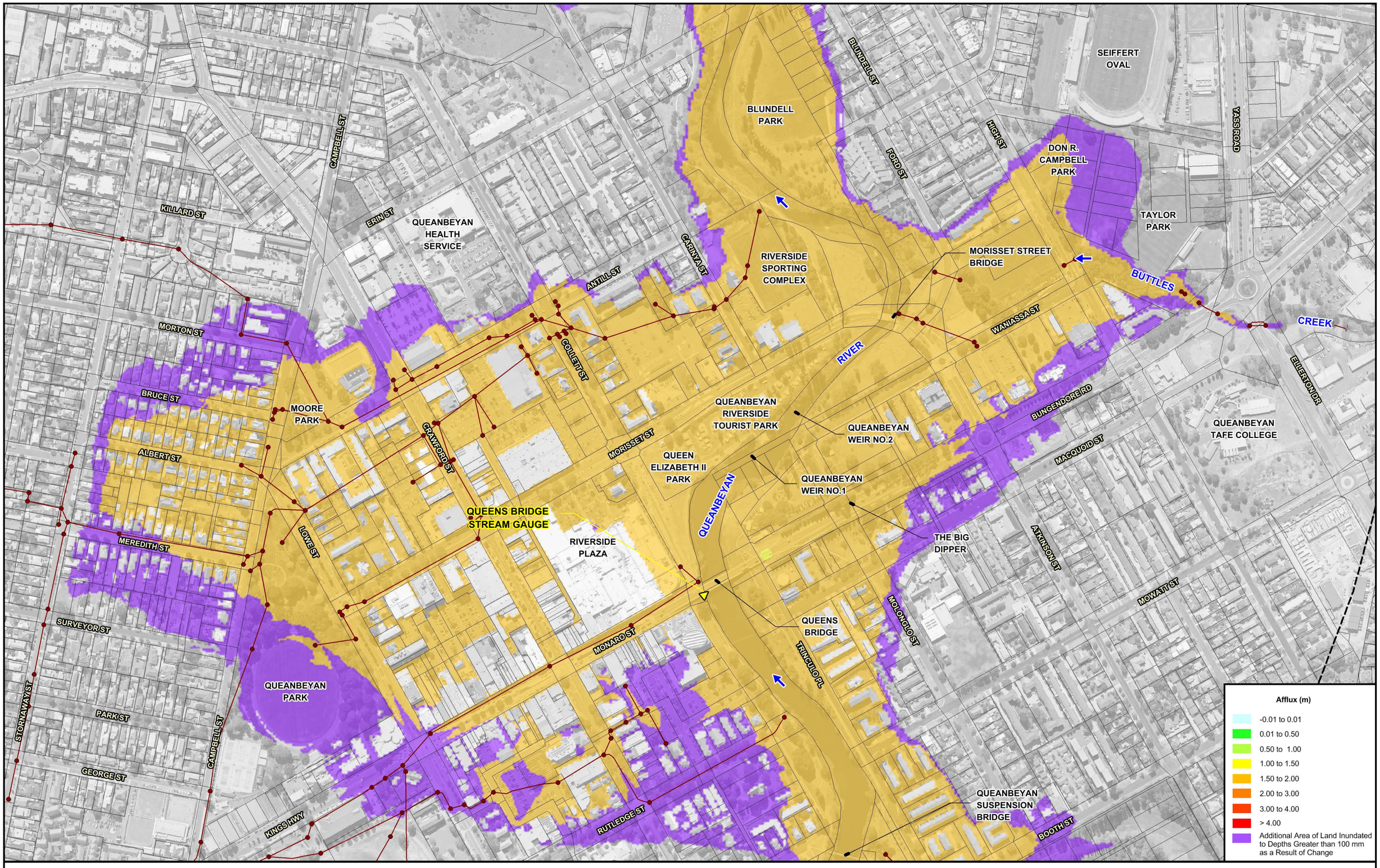
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.10
(Sheet 1 of 2)

POTENTIAL IMPACT OF A 10% INCREASE IN RAINFALL ON FLOODING PATTERNS
1% AEP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.10
(Sheet 2 of 2)

POTENTIAL IMPACT OF A 10% INCREASE IN RAINFALL ON FLOODING PATTERNS
1% AEP

WINDOW 1

WINDOW 2

HIRST AVE
HAYES ST
COOMAST
THORPE AVE
QUEANBEYAN GOLF COURSE
JOINS WINDOW 2
DANE ST
WOODGER PDE
GREENLEIGH
VALLEY CREEK
QUEANBEYAN RIVER DR
BARRACKS CREEK
FLAT DR
BARRACKS
RIVER
WICKERSLACK LANE
QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

MOLONGLO RIVER
SEWAGE TREATMENT PLANT
MOLONGLO RIVER
MOLONGLO RIVER
GOULBURN-QUEANBEYAN RAILWAY LINE
MOLONGLO RIVER AT OAKS ESTATE (GS 410729)
OAKS ESTATE
AUSTRALIAN CAPITAL TERRITORY
NEW SOUTH WALES
QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)
QUEANBEYAN EAST
YASS RD
KINGS HWY
HIGH ST
CRESTWOOD
CRAWFORD ST
REFER SHEET 2
DON R. CAMPBELL PARK
BUTTLES CREEK
ROSS RD
CAMPBELL ST
MORISSET ST
QUEANBEYAN
SURVEYOR ST
QUEANBEYAN WEST
QUEENS BRIDGE STREAM GAUGE
MOWATT ST
ELLERTON DR
KINGS HWY
THARWARD
QUEANBEYAN
HIRST AVE
HAYES ST
QUEANBEYAN GOLF COURSE
JOINS WINDOW 1
COOMAST
THORPE AVE
CAMERON RD

Afflux (m)

- -0.01 to 0.01
- 0.01 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- 3.00 to 4.00
- > 4.00
- Additional Area of Land Inundated to Depths Greater than 100 mm as a Result of Change

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

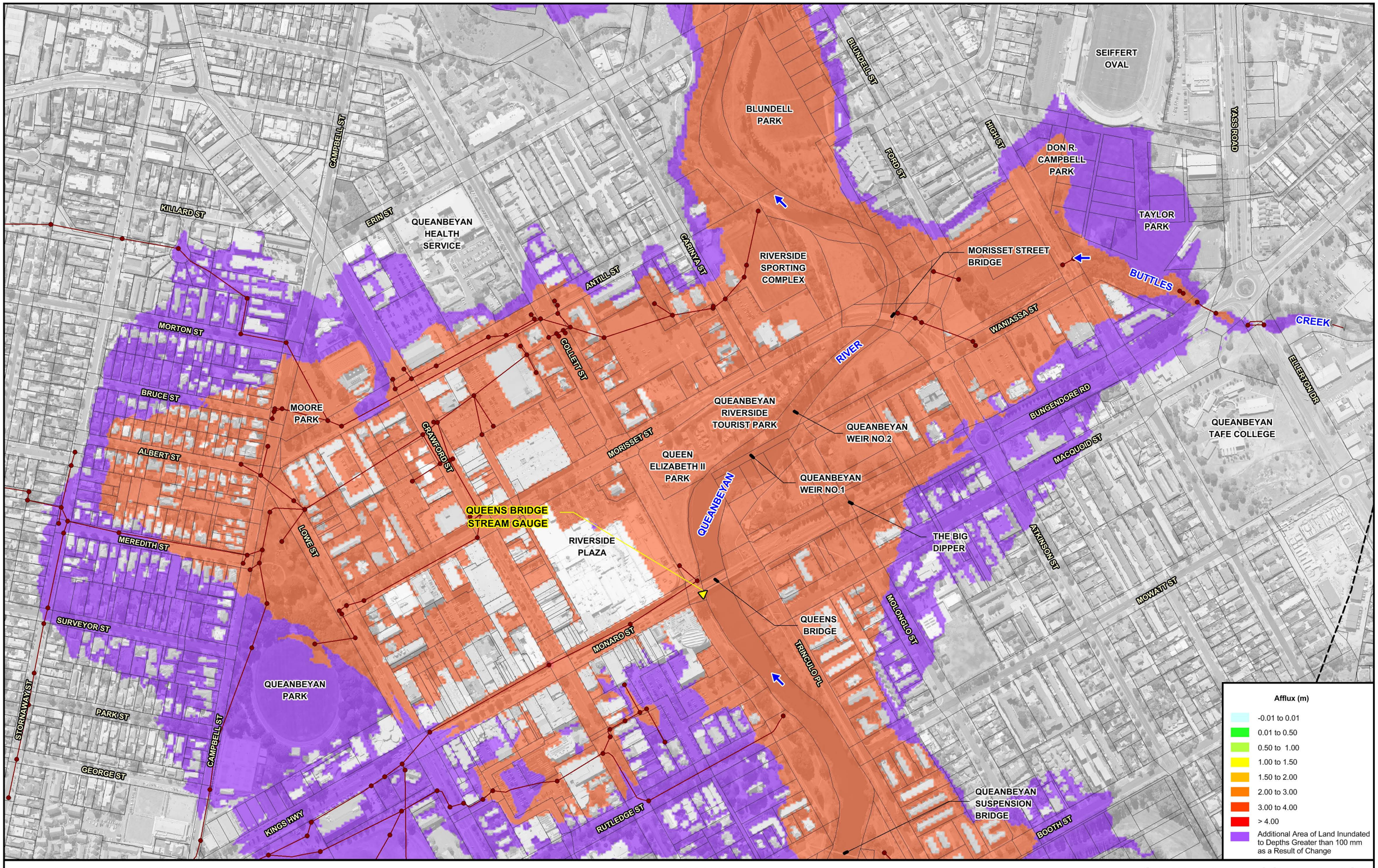
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.11
(Sheet 1 of 2)

POTENTIAL IMPACT OF A 30% INCREASE IN RAINFALL ON FLOODING PATTERNS
1% AEP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.11
(Sheet 2 of 2)

POTENTIAL IMPACT OF A 30% INCREASE IN RAINFALL ON FLOODING PATTERNS
1% AEP

WINDOW 1

WINDOW 2

HIRST AVE
HAYES ST
COOMAST
THORPE AVE
QUEANBEYAN GOLF COURSE
JOINS WINDOW 2
DANE ST
WOODGER PDE
GREENLEIGH
VALLEY
CREEK
QUEANBEYAN
RIVER DR
BARRACKS
FLAT
DR
CREEK
BARRACKS
RIVER
WICKERSLACK LANE
QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)
GOOGONG
MOLONGLO
RIVER
SEWAGE TREATMENT PLANT
MOLONGLO
RIVER
GOULBURN-QUEANBEYAN RAILWAY LINE
MOLONGLO RIVER AT OAKS ESTATE (GS 410729)
OAKS ESTATE
RIVER
QUEANBEYAN EAST
YASS RD
KINGS HWY
AUSTRALIAN CAPITAL TERRITORY
NEW SOUTH WALES
QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)
HIGH ST
CRESTWOOD
CRAWFORD ST
REFER SHEET 2
DON R. CAMPBELL PARK
BUTTLES
CREEK
ROSS RD
CAMPBELL ST
MORISSET ST
QUEANBEYAN
SURVEYOR ST
QUEANBEYAN WEST
QUEENS BRIDGE STREAM GAUGE
MOWATT ST
ELLERTON DR
KINGS HWY
THARWARD
QUEANBEYAN
HIRST AVE
HAYES ST
QUEANBEYAN GOLF COURSE
JOINS WINDOW 1
CAMERON RD
COOMAST
THORPE AVE

LEGEND

	Low Hazard	High Hazard
Floodway		
Flood Fringe		
Flood Storage		

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

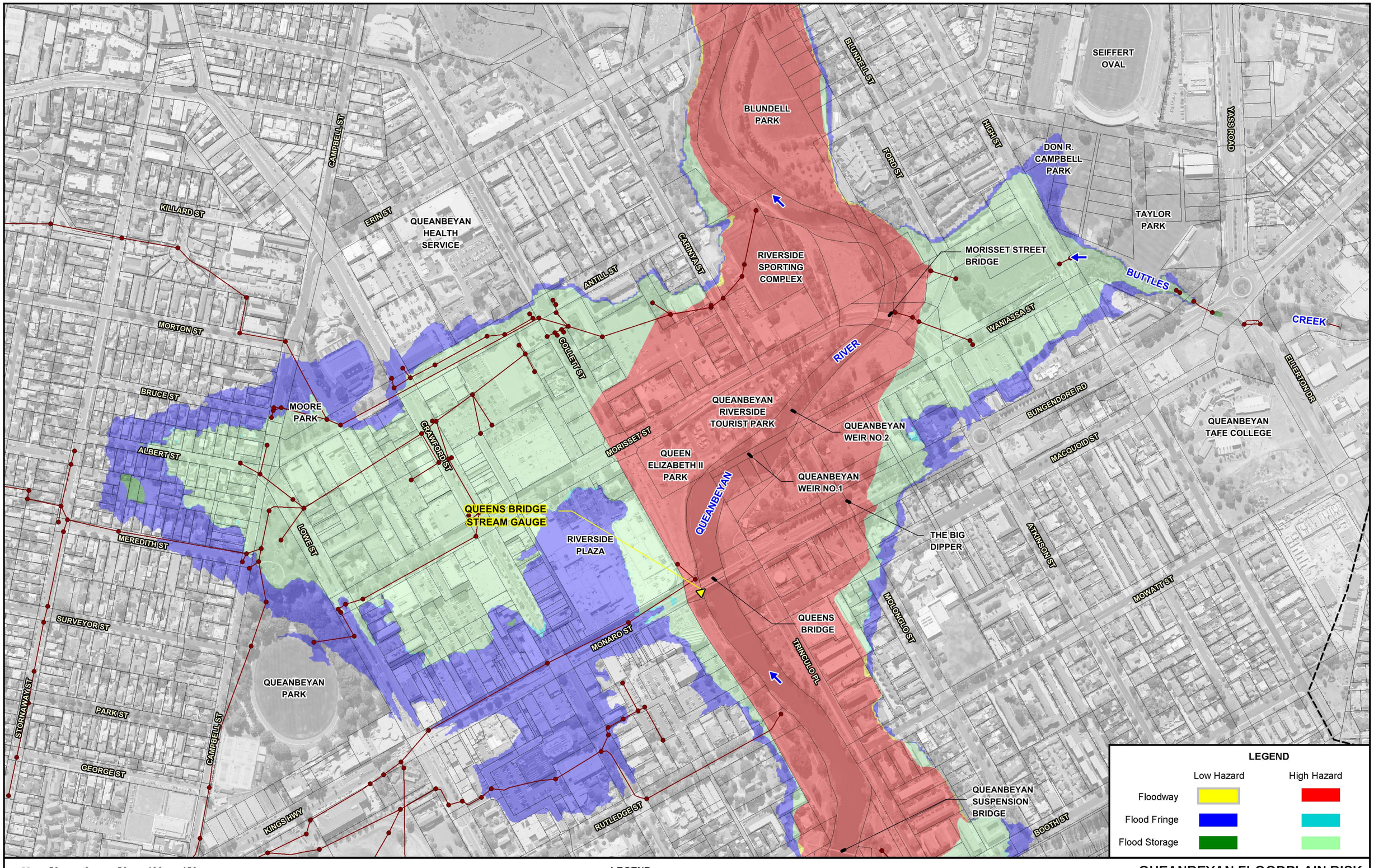
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.12
(Sheet 1 of 2)

FLOOD HAZARD AND HYDRAULIC CATEGORISATION OF FLOODPLAIN
1% AEP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

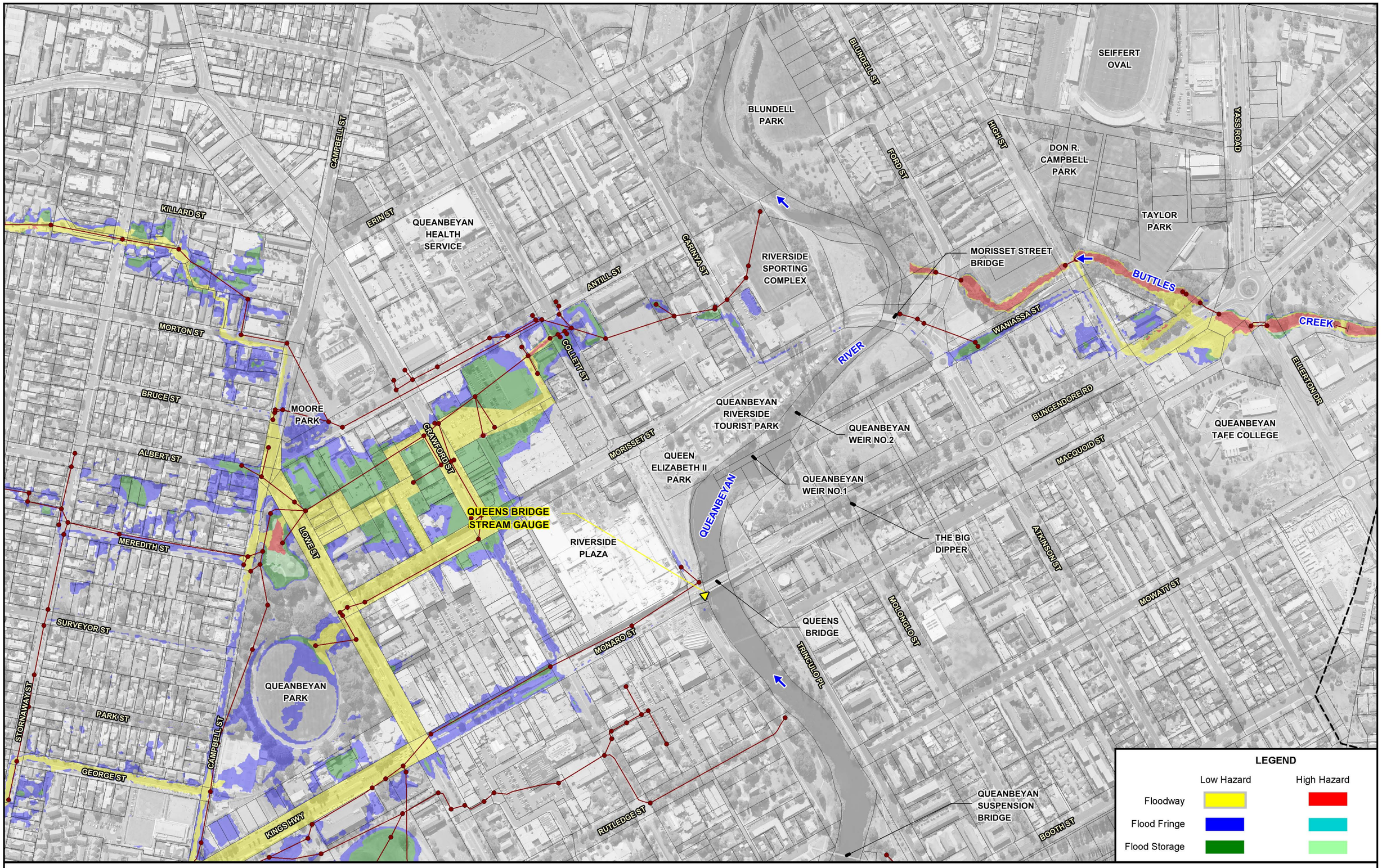
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.12
(Sheet 2 of 2)

FLOOD HAZARD AND HYDRAULIC CATEGORISATION OF FLOODPLAIN
1% AEP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

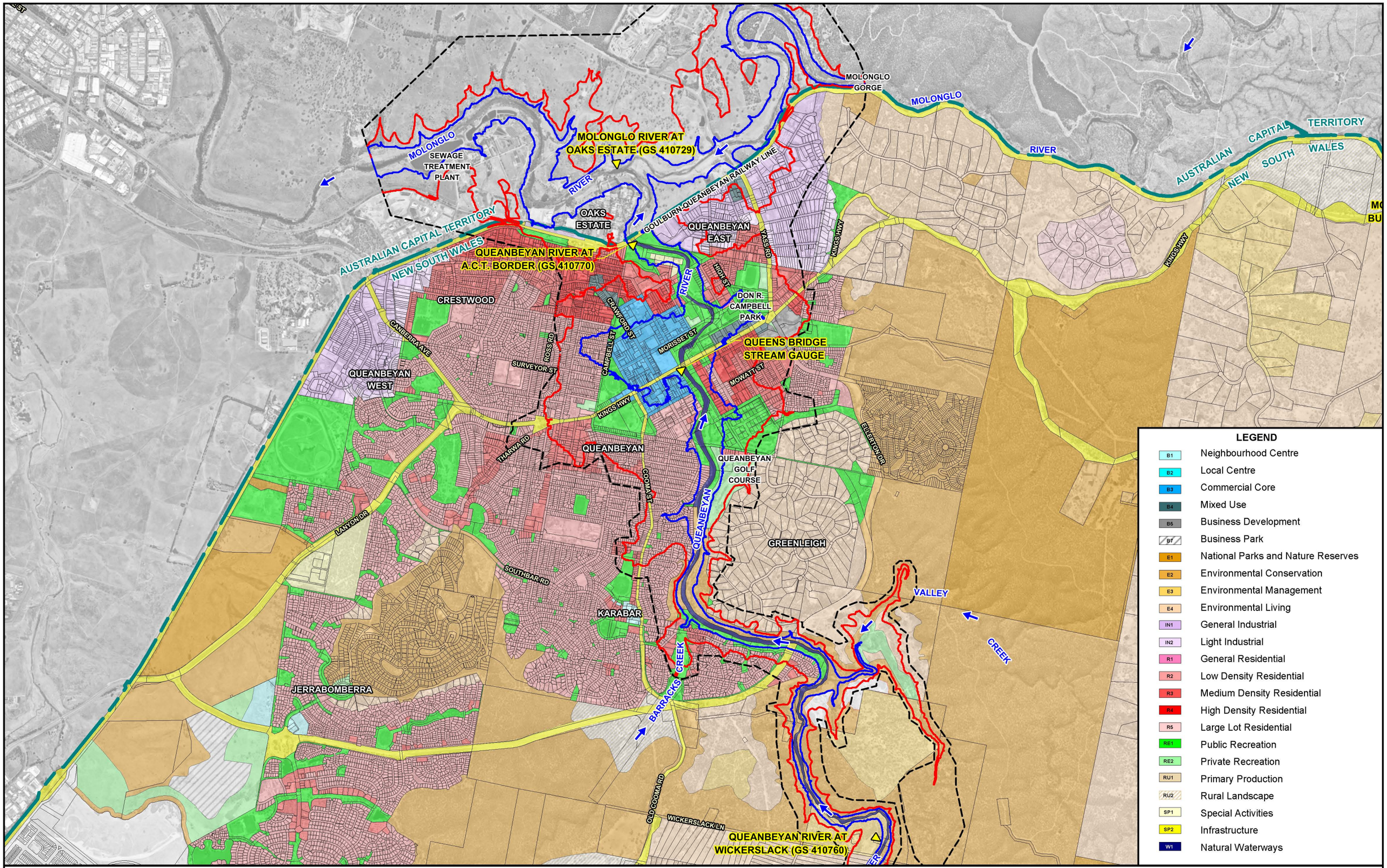
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.13

FLOOD HAZARD AND HYDRAULIC CATEGORISATION OF FLOODPLAIN
LOCAL CATCHMENT FLOODING IN VICINITY OF QUEANBEYAN CBD - 1% AEP



N

300 0 300 600 900 m

Scale: 1:30,000

LEGEND

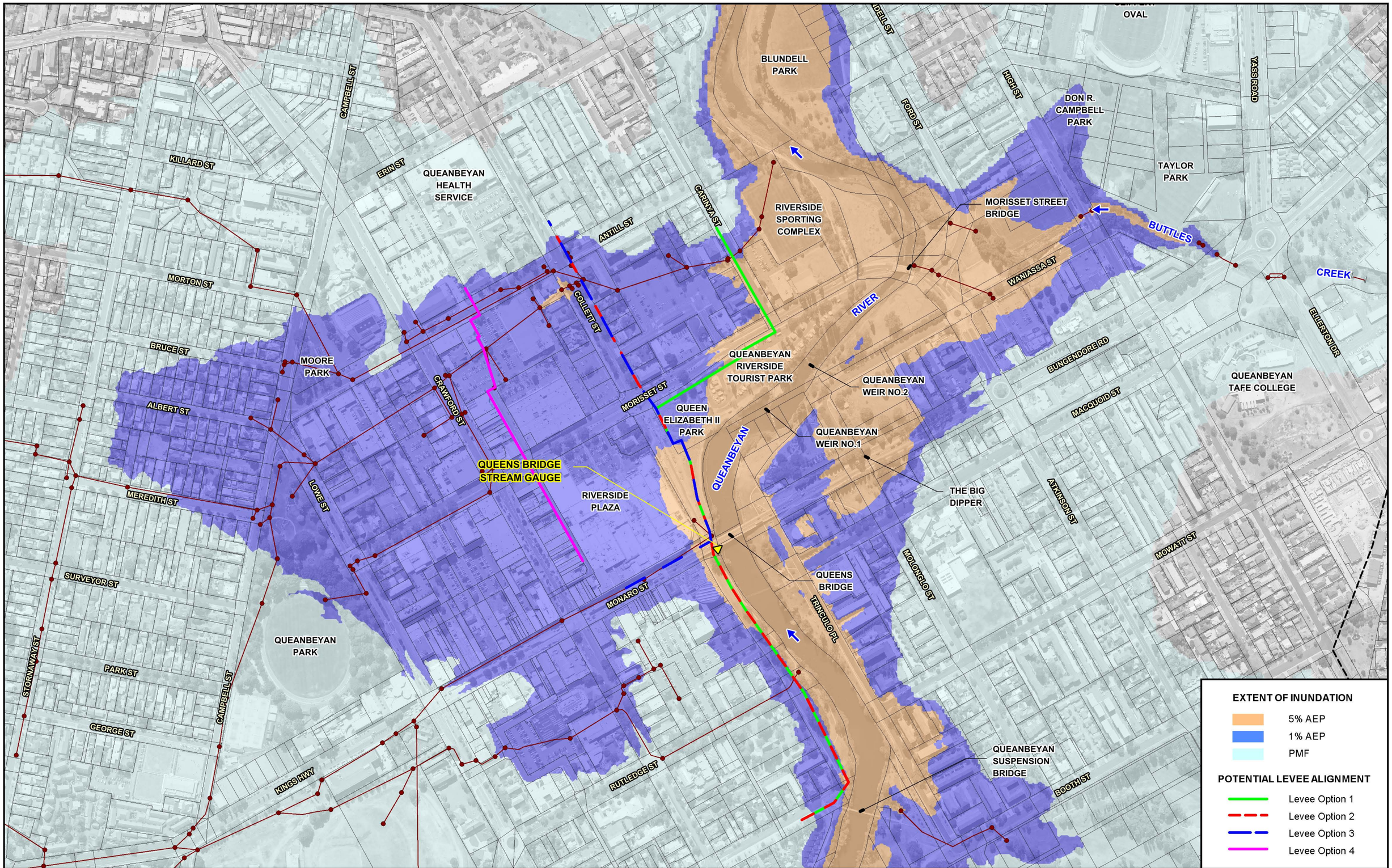
- Two-Dimensional Model Boundary
- Extent of 1% AEP Flood
- Extent of Flood Prone Land

Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.14

QUEANBEYAN LEP 2012 ZONING



EXTENT OF INUNDATION

- 5% AEP
- 1% AEP
- PMF

POTENTIAL LEVEE ALIGNMENT

- Levee Option 1
- Levee Option 2
- Levee Option 3
- Levee Option 4

N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

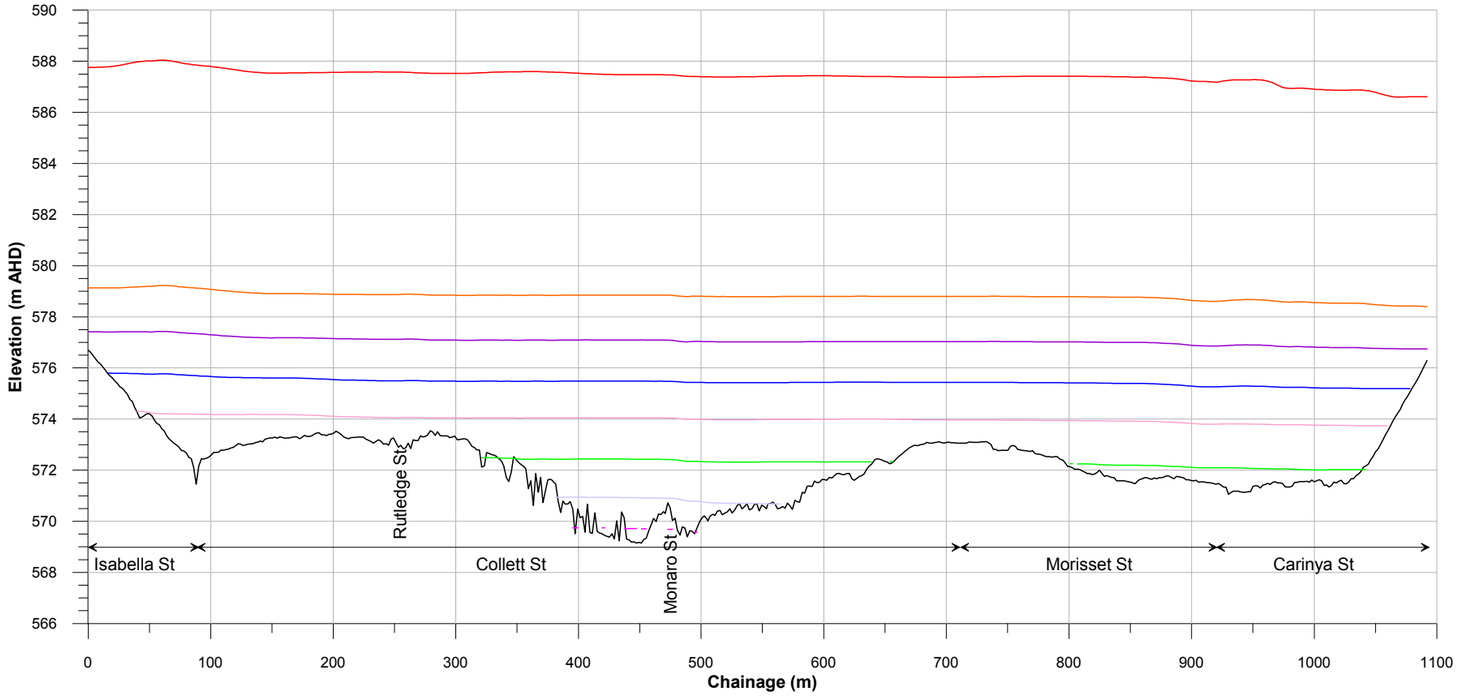
- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

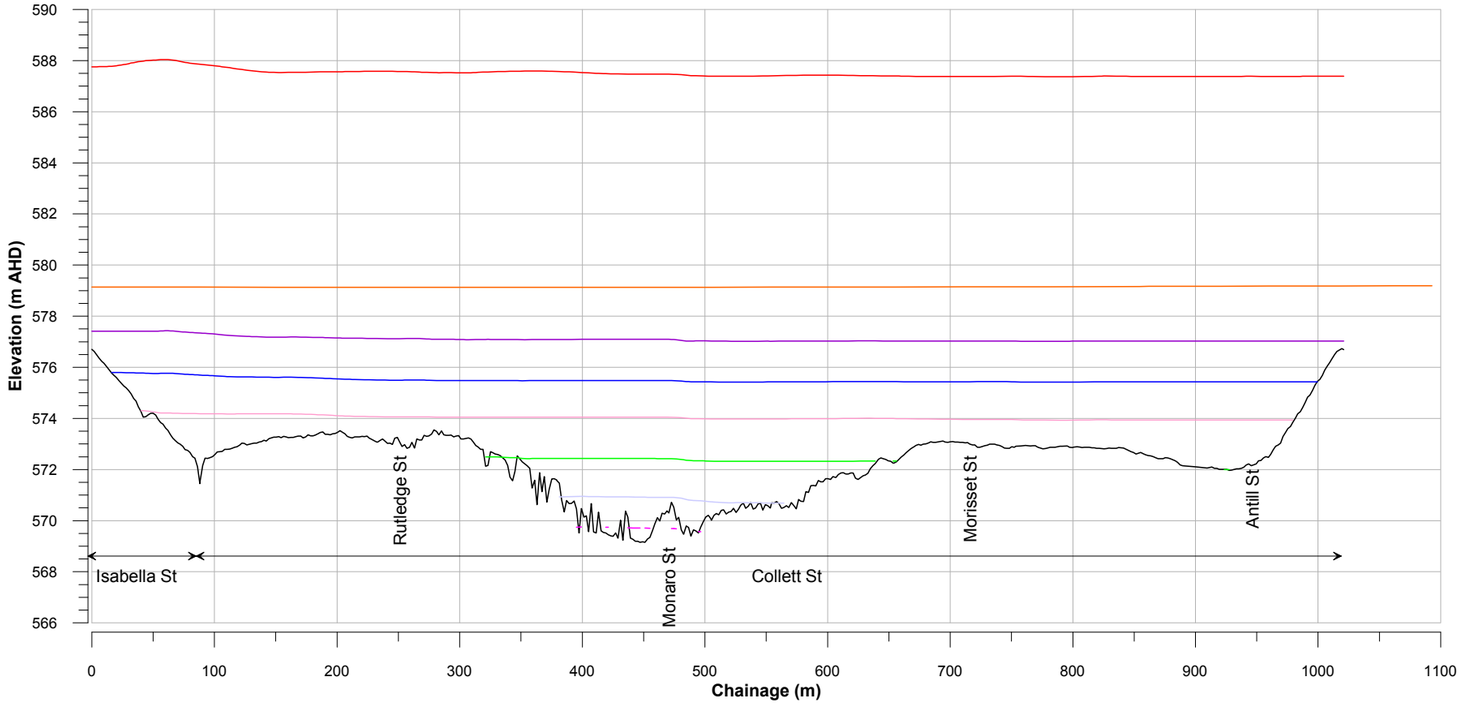
Figure 3.1

POTENTIAL CBD LEVEE ALIGNMENTS

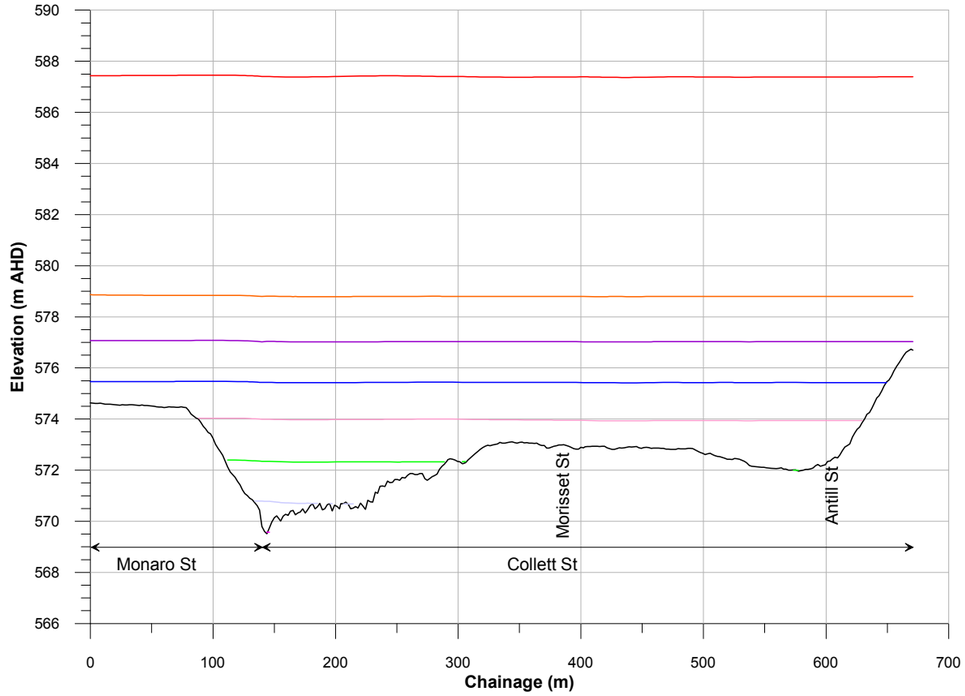
LEVEE OPTION 1



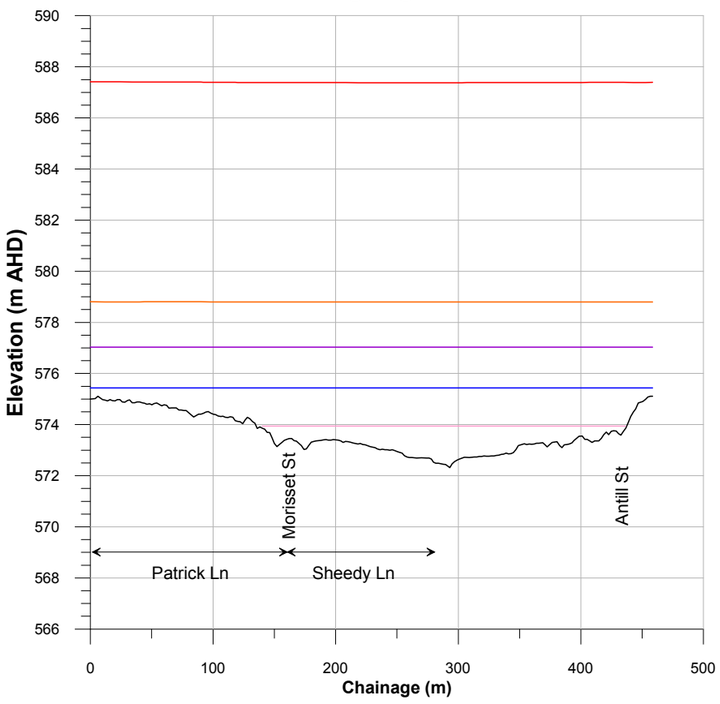
LEVEE OPTION 2



LEVEE OPTION 3



LEVEE OPTION 4



LEGEND

- PMF
- 0.2% AEP
- 0.5% AEP
- 1% AEP
- 2% AEP
- 5% AEP
- 10% AEP
- 20% AEP
- Natural Surface Elevation

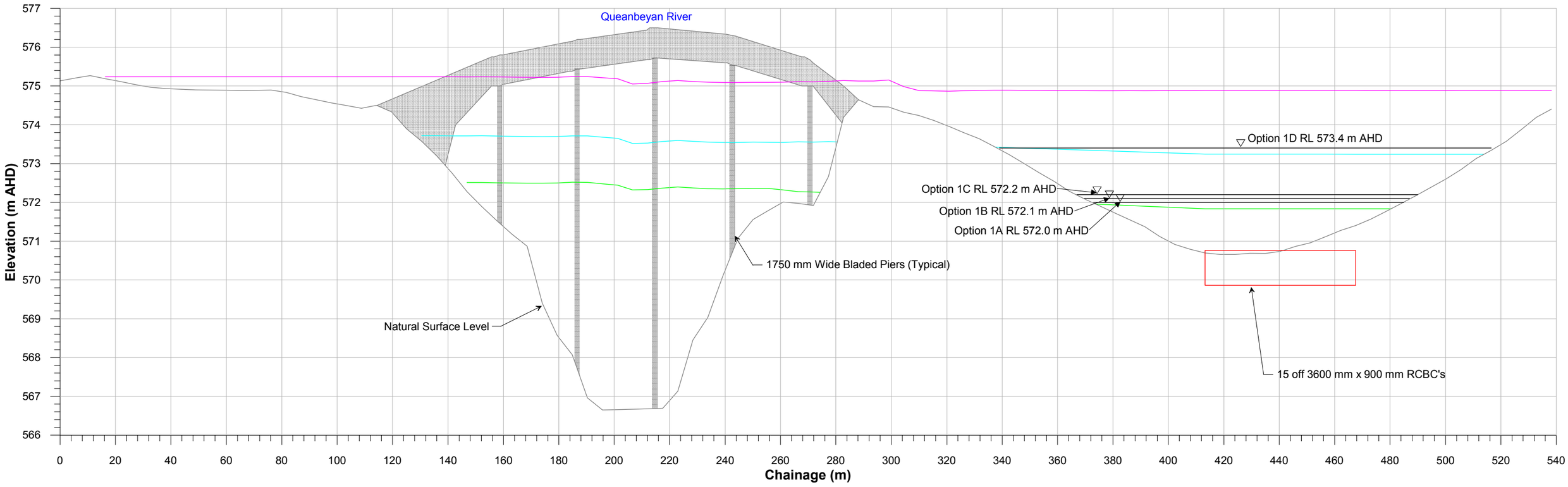
Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

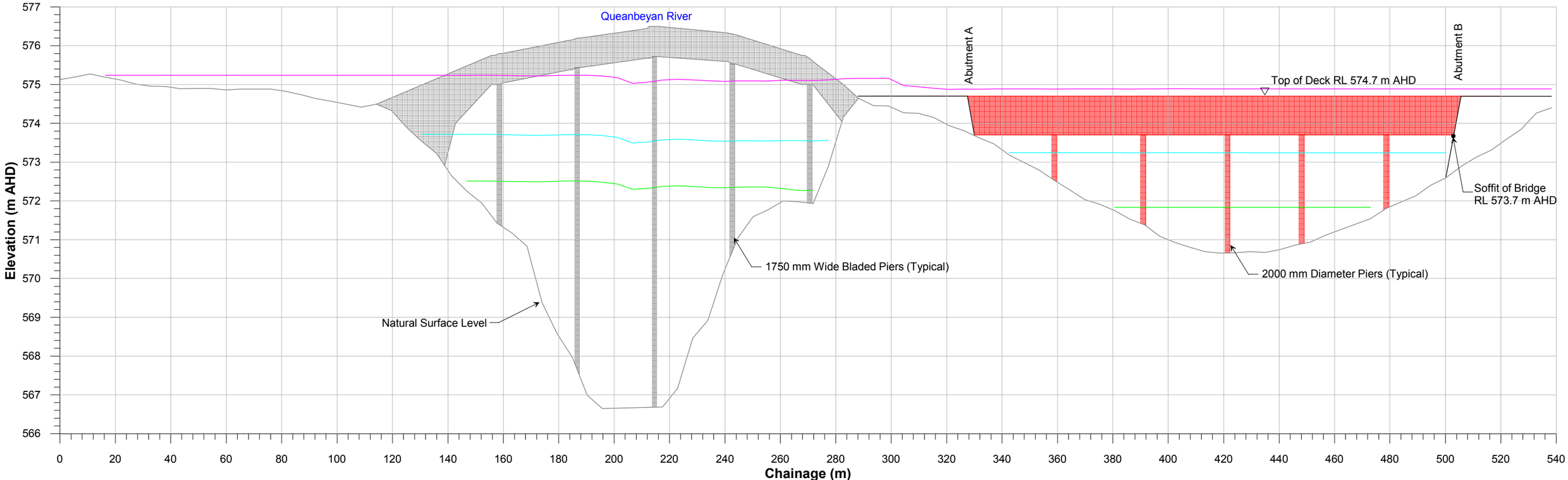
Figure 3.2

LONGITUDINAL SECTIONS ALONG POTENTIAL CBD LEVEE ALIGNMENTS

OPTION 1



OPTION 2



Lyall & Associates

NOTE:

1. Cross sections drawn looking in the downstream direction.
2. Peak flood levels based on results generated by the Kings Highway TUFLOW Model.

WATER SURFACE PROFILES

- 100 year ARI
- 50 year ARI
- 20 year ARI

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 3.3

TYPICAL CROSS SECTIONS SHOWING KINGS HIGHWAY UPGRADE OPTIONS

Afflux (m)

- < -0.2
- -0.20 to -0.10
- -0.10 to -0.01
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.50
- > 0.50
- Land Rendered Flood Free as a Result of Change
- Additional Area of Land Flooded as a Result of Change

5% AEP

2% AEP

1% AEP

RIVER
QUEANBEYAN
15 OFF 3600 mm x 900 mm RCBC's
571.8
573.4
574.9
KINGS HIGHWAY
No. 10 MACQUOID STREET
No. 18 TRINCULO PLACE
No. 2 MACQUOID STREET
MACQUOID STREET
TRINCULO PLACE

N

20 0 20 40 60 m

Scale: 1:2,000

Lyall & Associates

LEGEND

- Section of Road Raised to RL 573.4 m AHD
- RL 573.4 m AHD Contour Upstream of Raised Section of Road
- 573.4 — Peak Flood Level Under Post-Upgrade Conditions (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 3.4

IMPACT OF KINGS HIGHWAY UPGRADE OPTION 1D ON MAIN STREAM FLOODING BEHAVIOUR

Afflux (m)

- < -0.2
- -0.20 to -0.10
- -0.10 to -0.01
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.50
- > 0.50
- Land Rendered Flood Free as a Result of Change
- Additional Area of Land Flooded as a Result of Change

5% AEP

2% AEP

1% AEP

RIVER
QUEANBEYAN
KINGS HIGHWAY
No. 18 TRINCULO PLACE
No. 10 MACQUOID STREET
No. 2 MACQUOID STREET
MACQUOID STREET
TRINCULO PLACE
ABUTMENT A
ABUTMENT B
571.8
573.2
574.9

N

20 0 20 40 60 m

Scale: 1:2,000

Lyall & Associates

LEGEND

- Elevated Bridge Deck
- Bridge Approach
- Bridge Piers
- 573.2 Peak Flood Level Under Post-Upgrade Conditions (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 3.5

IMPACT OF KINGS HIGHWAY UPGRADE OPTION 2A ON MAIN STREAM FLOODING BEHAVIOUR

WINDOW 1

WINDOW 2

HIRST AVE
HAYES ST
COOMA ST
THORPE AVE
QUEANBEYAN GOLF COURSE
JOINS WINDOW 2
WOODGER PDE
DANE ST
GREENLEIGH
VALLEY CREEK
QUEANBEYAN RIVER DR
FLAT BARRACKS CREEK
BARRACKS
RIVER
WICKERSLACK LANE
QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)
GOOGONG

MOLONGLO RIVER
SEWAGE TREATMENT PLANT
MOLONGLO RIVER
GOULBURN-QUEANBEYAN RAILWAY LINE
MOLONGLO RIVER AT OAKS ESTATE (GS 410729)
OAKS ESTATE
QUEANBEYAN EAST
YASS RD
KINGS HWY
AUSTRALIAN CAPITAL TERRITORY
NEW SOUTH WALES
QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)
HIGH ST
CRESTWOOD
DON R. CAMPBELL PARK
BUTTLES CREEK
REFER SHEET 2
CRAWFORD ST
ROSS RD
CAMPBELL ST
MORISSET ST
QUEANBEYAN
SURVEYOR ST
ELLERTON DR
MOWATT ST
QUEANBEYAN WEST
QUEENS BRIDGE STREAM GAUGE
KINGS HWY
QUEANBEYAN
HIRST AVE
HAYES ST
COOMA ST
CAMERON RD
THORPE AVE
QUEANBEYAN GOLF COURSE
JOINS WINDOW 1

LEGEND

- High Hydraulic Hazard Flooding
- Low Hydraulic Hazard Flooding
- Low Flood Island
- Low Trapped Perimeter
- High Trapped Perimeter
- Area on the Floodplain with Rising Road Access
- Area on the Floodplain with Overland Escape Routes

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

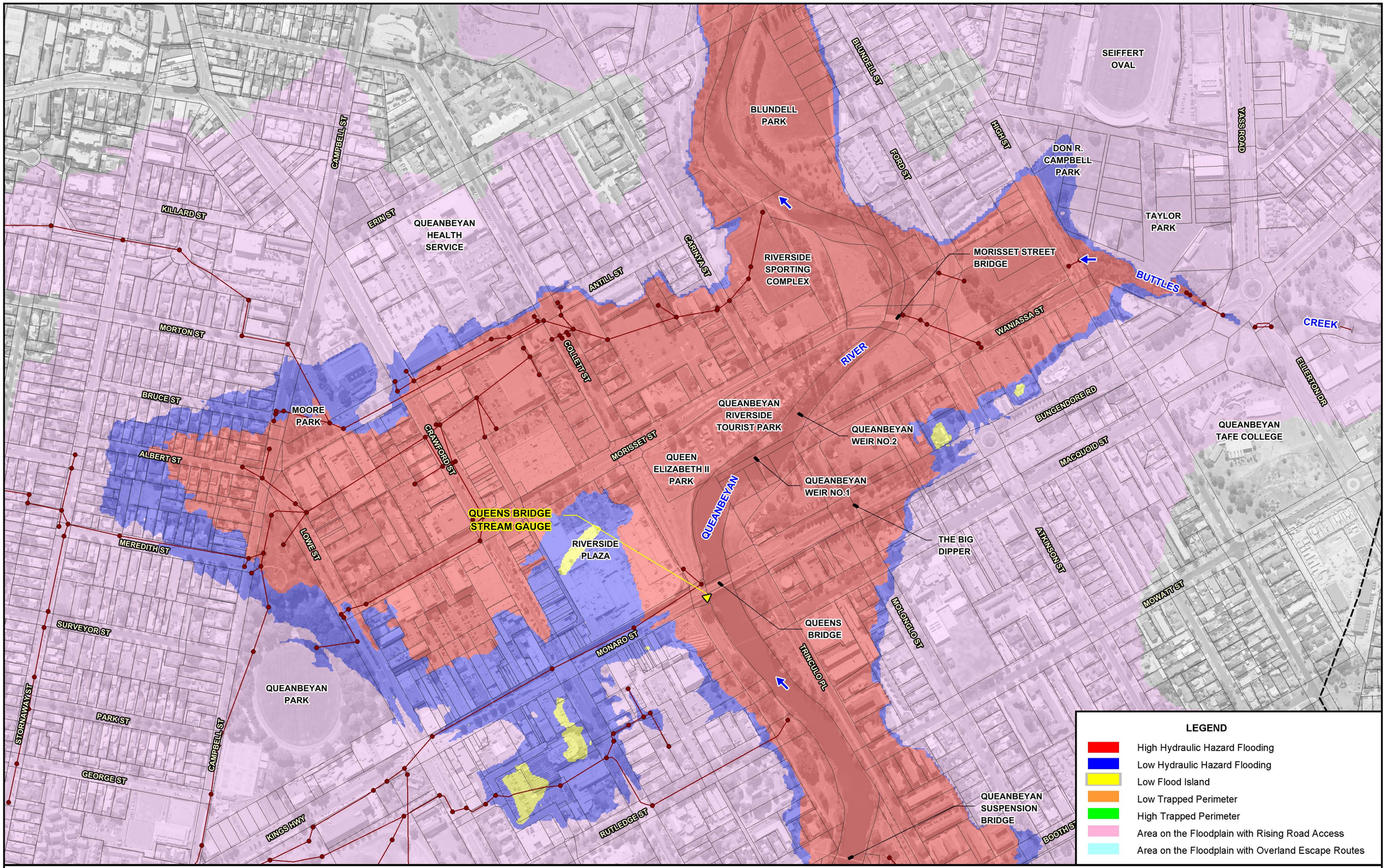
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 3.6
(Sheet 1 of 2)

FLOOD EMERGENCY RESPONSE PLANNING CLASSIFICATIONS
1% AEP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 3.6
(Sheet 2 of 2)

FLOOD EMERGENCY RESPONSE PLANNING CLASSIFICATIONS
1% AEP

WINDOW 1

WINDOW 2

HIRST AVE
HAYES ST
COOMAST
THORPE AVE
QUEANBEYAN GOLF COURSE
JOINS WINDOW 2
PDE
WOODGER
DANE ST
GREENLEIGH
VALLEY
CREEK
QUEANBEYAN
RIVER DR
DR
FLAT
BARRACKS
CREEK
BARRACKS
RIVER
WICKERSLACK LANE
QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)
GOOGONG
MOLONGLO
RIVER
SEWAGE TREATMENT PLANT
MOLONGLO
RIVER
GOULBURN-QUEANBEYAN RAILWAY LINE
MOLONGLO RIVER AT OAKS ESTATE (GS 410729)
OAKS ESTATE
RIVER
QUEANBEYAN EAST
YASS RD
KINGS HWY
AUSTRALIAN CAPITAL TERRITORY
NEW SOUTH WALES
QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)
HIGH ST
CRESTWOOD
DON R. CAMPBELL PARK
REFER SHEET 2
CRAWFORD ST
BUTTLES
CREEK
ROSS RD
CAMPBELL ST
MORISSET ST
QUEANBEYAN
SURVEYOR ST
QUEANBEYAN WEST
MOWATT ST
ELLERTON DR
QUEENS BRIDGE STREAM GAUGE
KINGS HWY
THARWARD
QUEANBEYAN
HIRST AVE
HAYES ST
QUEANBEYAN GOLF COURSE
JOINS WINDOW 1
COOMA ST
CAMERON RD
THORPE AVE

LEGEND

- High Hydraulic Hazard Flooding
- Low Hydraulic Hazard Flooding
- High Flood Island
- Low Flood Island
- High Trapped Perimeter

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

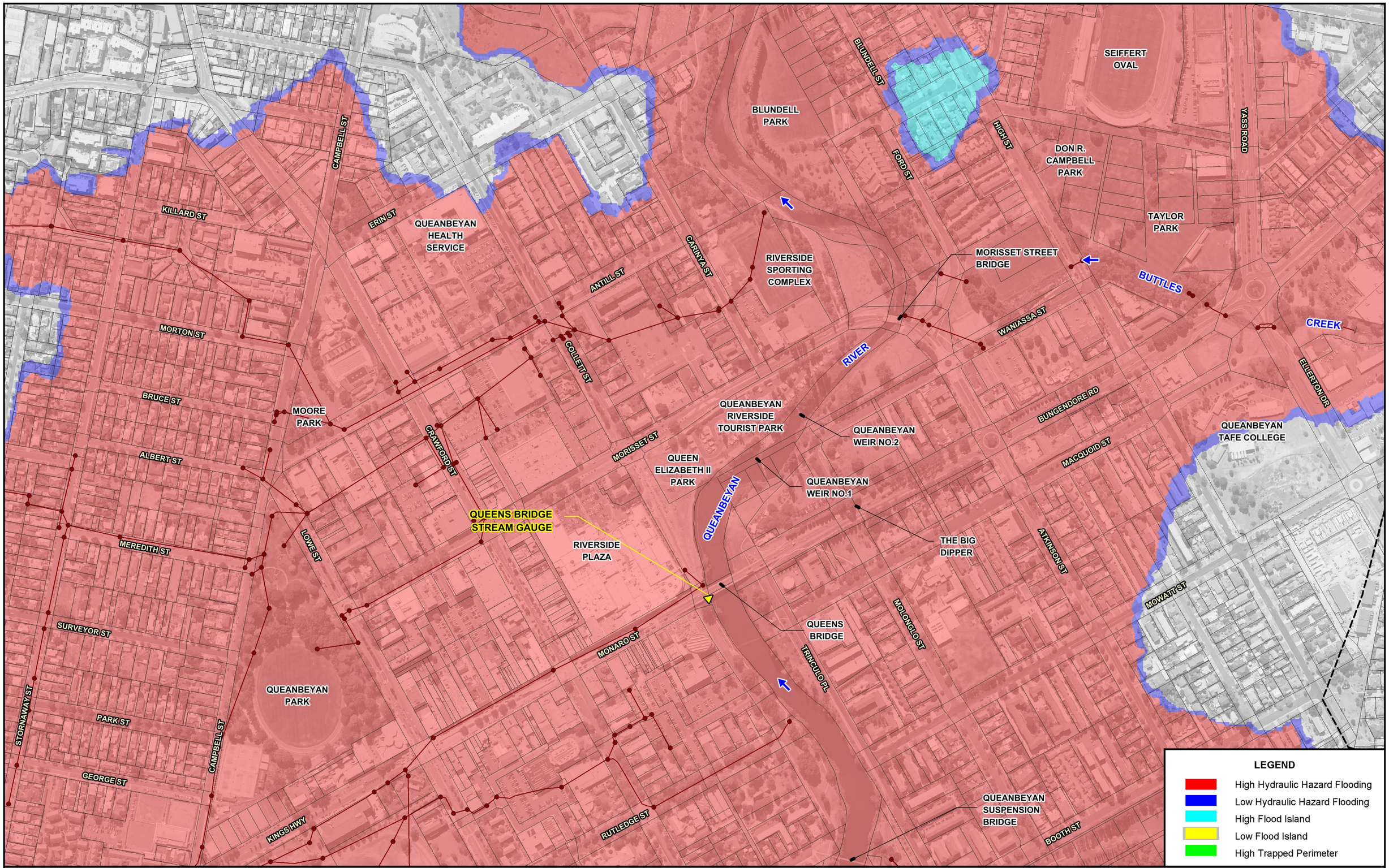
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 3.7
(Sheet 1 of 2)

FLOOD EMERGENCY RESPONSE PLANNING CLASSIFICATIONS
PMF



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 3.7
(Sheet 2 of 2)

FLOOD EMERGENCY RESPONSE PLANNING CLASSIFICATIONS
PMF

APPENDIX B

HISTORIC FLOOD DATA

DRAFT REPORT FOR PUBLIC EXHIBITION

LIST OF FIGURES (APPENDIX B)

B1.1 Location of Rain and Stream Flow Gauges
B1.2 Location of Historic Flood Marks and Sources of Data at Queanbeyan (2 Sheets)

B3.1 Cumulative Rainfall – December 2010 Storm
B3.2 Isohyetal Map – Rain Days of 9 and 10 December 2010
B3.3 Intensity-Frequency-Duration Curves and Historic Rainfall (5 Sheets)

B4.1 Rating Curves and Cross Section – Queanbeyan River at Wickerslack Stream Gauge (GS 410760)
B4.2 Recorded Discharge Hydrographs – August 1974 Flood
B4.3 Recorded Discharge Hydrographs and Googong Dam Details – October 1976 Flood
B4.4 Recorded Discharge Hydrographs and Googong Dam Details – December 2010 Flood
B4.5 Flood Frequency Relationship – Log-Pearson 3 Annual Series 1913-2017 – Queanbeyan River at Googong Stream Gauge (GS 410701)
B4.6 Flood Frequency Relationship – Log-Pearson 3 Annual Series 1977-2017 – Queanbeyan River at Wickerslack Stream Gauge (GS 410760)
B4.7 Flood Frequency Relationship – Log-Pearson 3 Annual Series 1913-2017 – Queanbeyan River at Wickerslack Stream Gauge (GS 410760)
B4.8 Flood Frequency Relationship – Log-Pearson 3 Annual Series 1930-2017 – Molonglo River at Burbong Stream Gauge (GS 410705)

DRAFT REPORT FOR PUBLIC EXHIBITION

LOWER BORO (ANNWYN)
GS 70342

MOUNT FAIRY (MERIGAN)
GS 70105

BRAIDWOOD (KHAN YUNIS)
GS 70219

BRAIDWOOD (KRAWARREE)
GS 70057

JERRABATTGULLA (GILSTON)
GS 70261

SNOWBALL
GS 69062

ROSSI (SAWMILL)
GS 570923

PARKERS GAP
GS 70214

PARKER'S GAP
GS 570960

MOLONGLO RIVER CATCHMENT

BUNGENDORE (GIDLEIGH)
GS 70035

BUNGENDORE POST OFFICE
GS 70011

BUNGENDORE

BALLALLABA CREEK

CAPTAINS FLAT (FOXLOW ST)
GS 70016

MOLONGLO RIVER AT KOBADA
GS 41000208

CAPTAINS FLAT

MOLONGOLO RIVER

BALLINAFAD CREEK

SHERLOCK CREEK

JERANGLE (SLAP-UP)
GS 570931

HOSKINTOWN RADIO OBSERVATORY
GS 70048

CAPTAINS FLAT (BALLINAFADO PLANTATION)
GS 70324

JINGERA (HILLSIDE)
GS 570916

PRIMROSE VALLEY CREEK

QUEANBEYAN RIVER

JERANGLE (LYONS CREEK)
GS 70321

TINDERRY (QUEANBEYAN RIVER)
GS 570965

MOLONGLO RIVER AT BURBONG
GS 410705

QUEANBEYAN RIVER U/S GOOGONG DAM
GS 410781

QUEANBEYAN RIVER AT TINDERRY
GS 410734

SUTTON THE ANCHORAGE
GS 70233

QUEENS BRIDGE STREAM GAUGE

BRADLEYS CREEK

QUEANBEYAN RIVER AT WICKERSLACK
GS 410760

QUEANBEYAN RIVER CATCHMENT

QUEANBEYAN RIVER U/S GOOGONG DAM
GS 570816

SUTTON (UBA)
GS 70232

SUTTON (GOOLABRI DVE)
GS 70346

MOLONGLO RIVER AT OAKS ESTATE
GS 570943

GOOGONG DAM

BURRA CREEK AT BURRA ROAD
GS 410774

BURRA CREEK

MOLONGLO RIVER AT OAKS ESTATE
GS 410729

WICKERSLACK
GS 570983

GOOGONG

GOOGONG CLIMATE STATION
GS 570818

CANBERRA AIRPORT COMPARISON
GS 70351

QUEANBEYAN BOWLING CLUB
GS 70072

GOOGONG (FERNLEIGH DVE)
GS 70347

QUEANBEYAN RIVER AT A.C.T. BORDER
GS 410770

BURRA CREEK AT BURRA ROAD
GS 570951

CANBERRA PARLIAMENT HOUSE
GS 70246

AINSLIE TYSON ST
GS 70000

CANBERRA

MICHELAGO (SOGLIO)
GS 70064

MURRUMBIDGEE RIVER

BREDBO (BREDBO STATION)
GS 70098

CANBERRA (AUSTRALIAN NATIONAL BOTANIC GA
GS 70247

MAWSON (BERNACCHI ST)
GS 70256

TUGGERANONG (ISABELLA PLAINS) AWS
GS 70339

GARRAN (FEDERAL GOLF CLUB)
GS 70249

MOLONGLO RIVER

CHAKOLA (RIVERSDALE)
GS 70073

LAKE BURLEY GRIFFIN

TORRENS (DARKE ST)
GS 70308

LANYON HOUSE
GS 70331

STROMLO FOREST
GS 70231

THARWA GENERAL STORE
GS 70083

MOLONGOLO

2500 0 2500 5000 7500 m

Scale: 1:250,000

Lyall & Associates

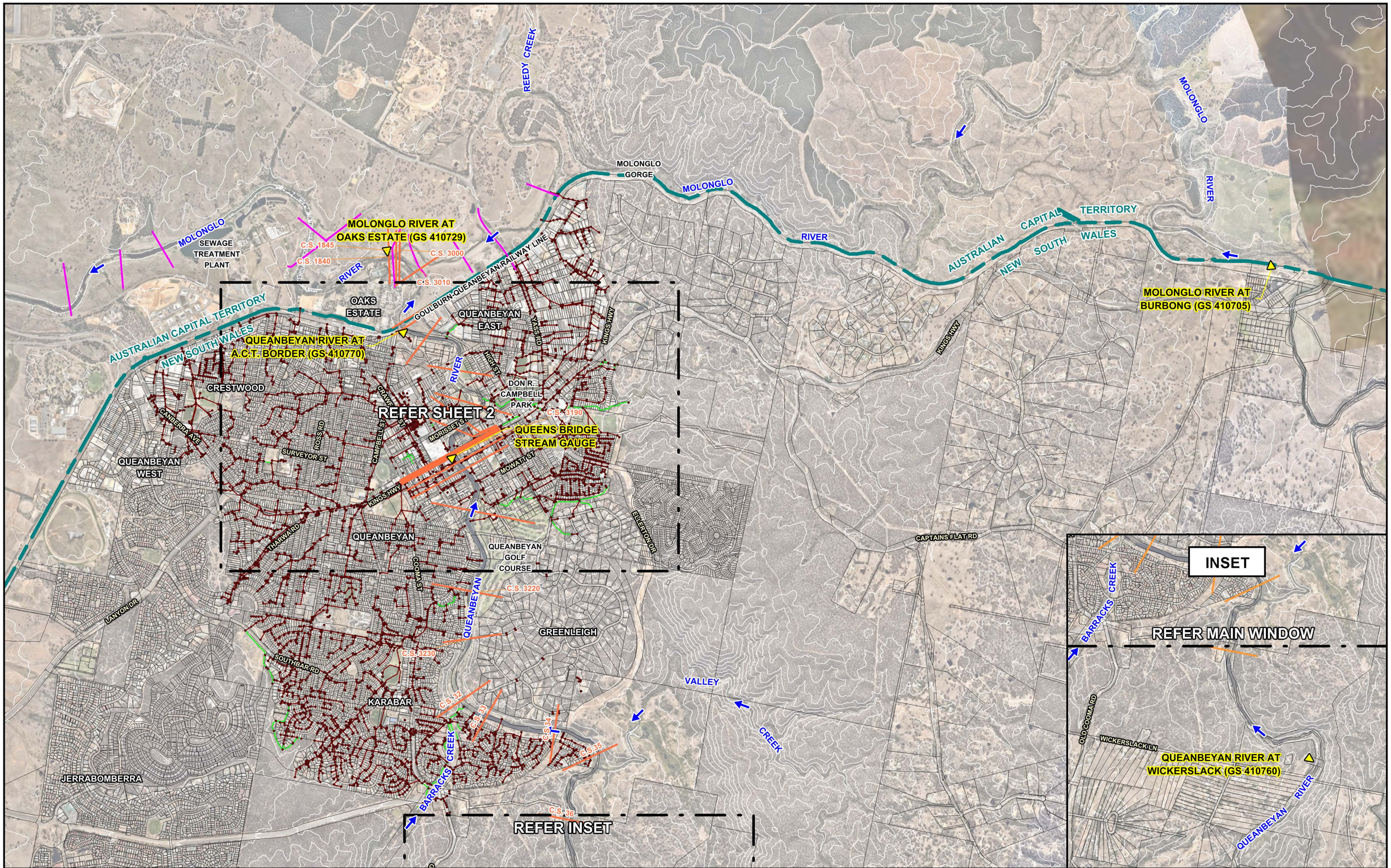
LEGEND

- Catchment Boundary
- Manually Read Stream Gauge
- IconWater Stream Gauge
- EPSDD Stream Gauge
- WaterNSW Stream Gauge
- BoM Daily Rainfall Station
- EPSDD Pluviographic Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure B1.1

LOCATION OF RAIN AND STREAM FLOW GAUGES



N

300 0 300 600 900 m

Scale: 1:30,000

Lyall & Associates

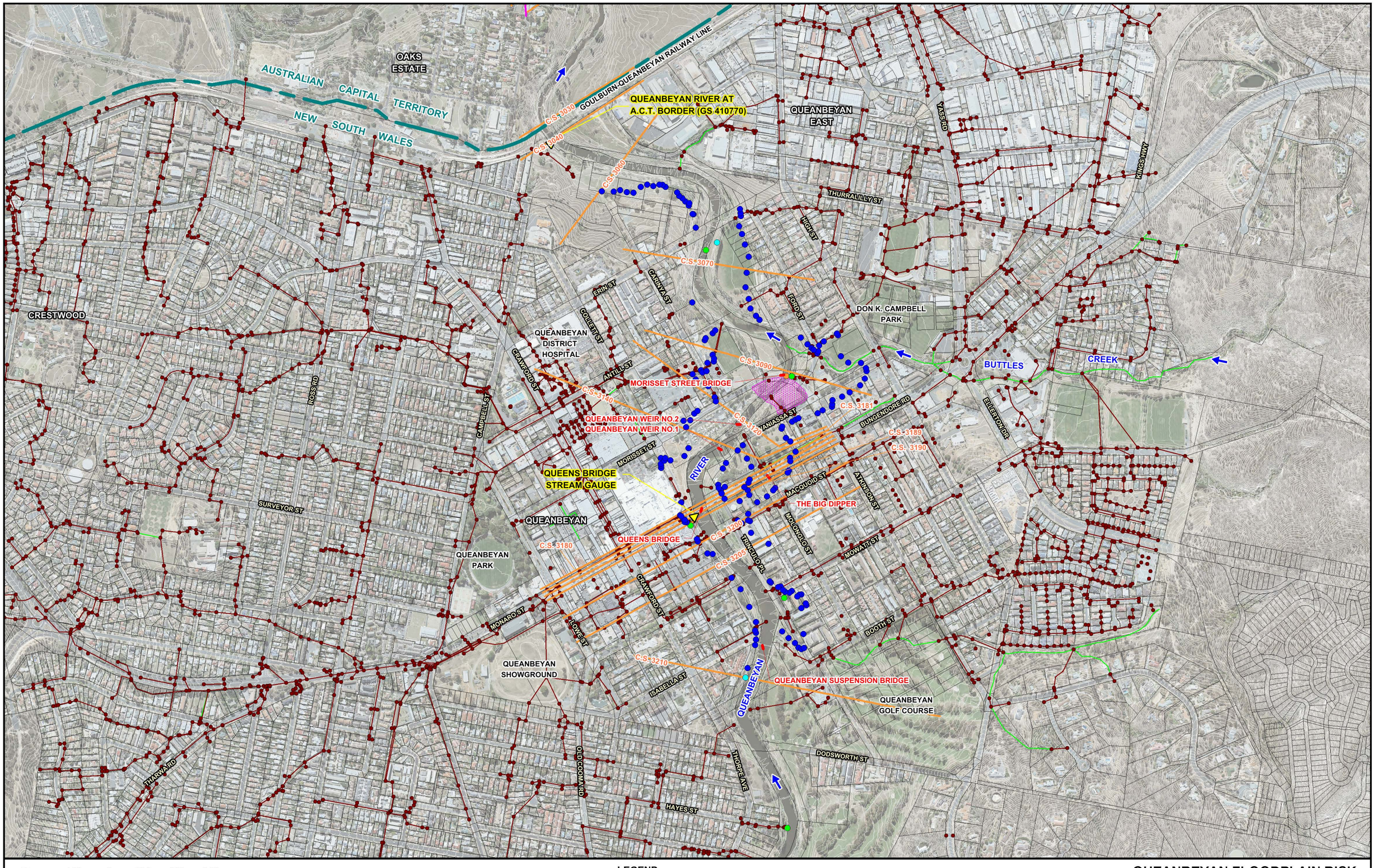
LEGEND

- Existing Piped Stormwater Drainage System
- Existing Stormwater Channel
- Stream Gauge
- Surveyed Cross Section (Lyall & Associates, 2008)
- Surveyed Cross Section (DWR, 1992)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure B1.2
(Sheet 1 of 2)

LOCATION OF HISTORIC FLOOD MARKS AND SOURCES OF DATA AT QUEANBEYAN



N

100 0 100 200 300 m

Scale: 1:10,000

Lyall & Associates

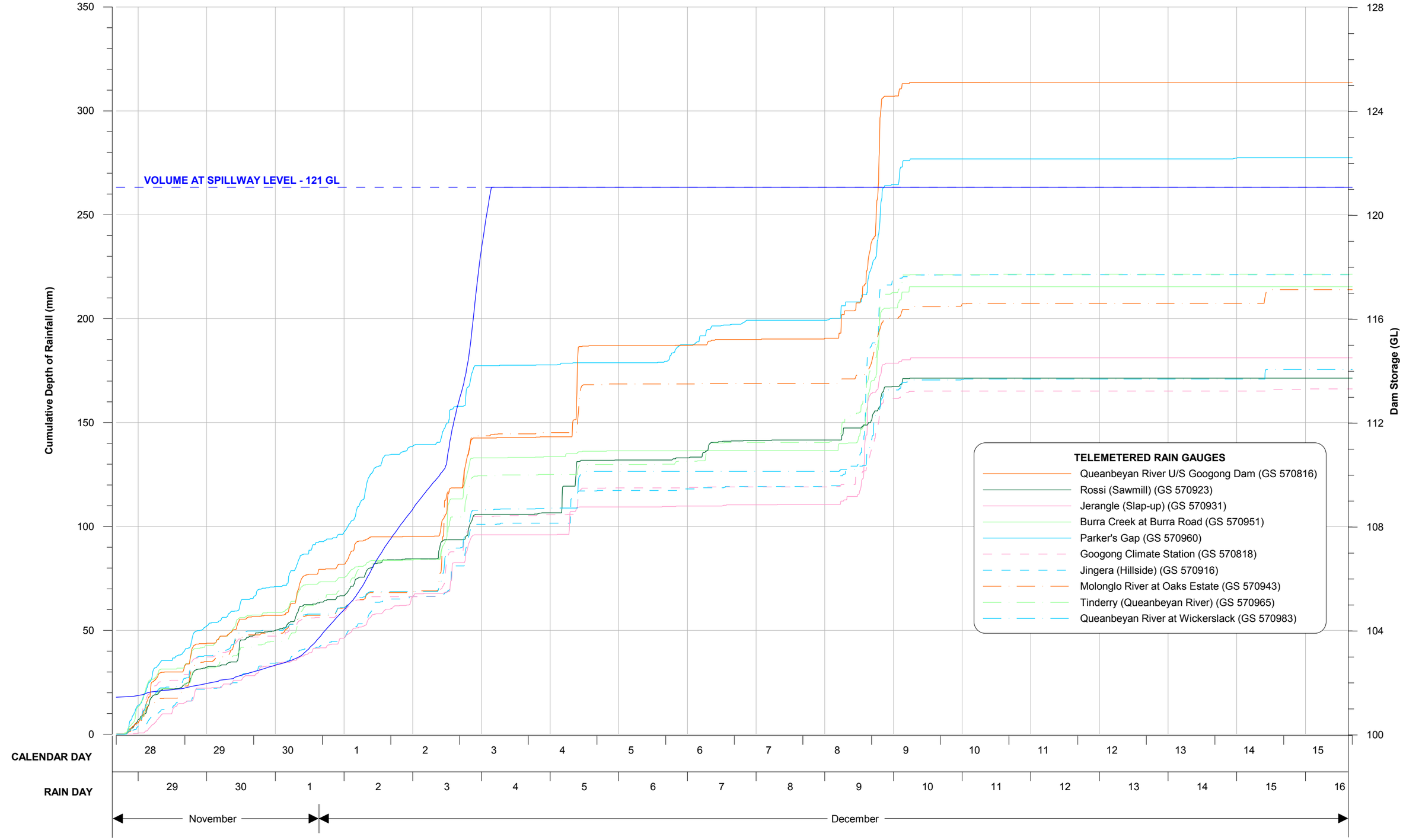
LEGEND

- May 1925 Flood Mark
- August 1974 Flood Mark
- October 1976 Flood Mark
- December 2010 Flood Mark
- Stream Gauge
- Existing Piped Stormwater Drainage System
- Existing Stormwater Channel
- Extent of Detailed Ground Survey
- Surveyed Cross Section (Lyall & Associates, 2008)
- Surveyed Cross Section (DWR, 1992)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure B1.2
(Sheet 2 of 2)

LOCATION OF HISTORIC FLOOD MARKS AND SOURCES OF DATA AT QUEANBEYAN



Lyall & Associates

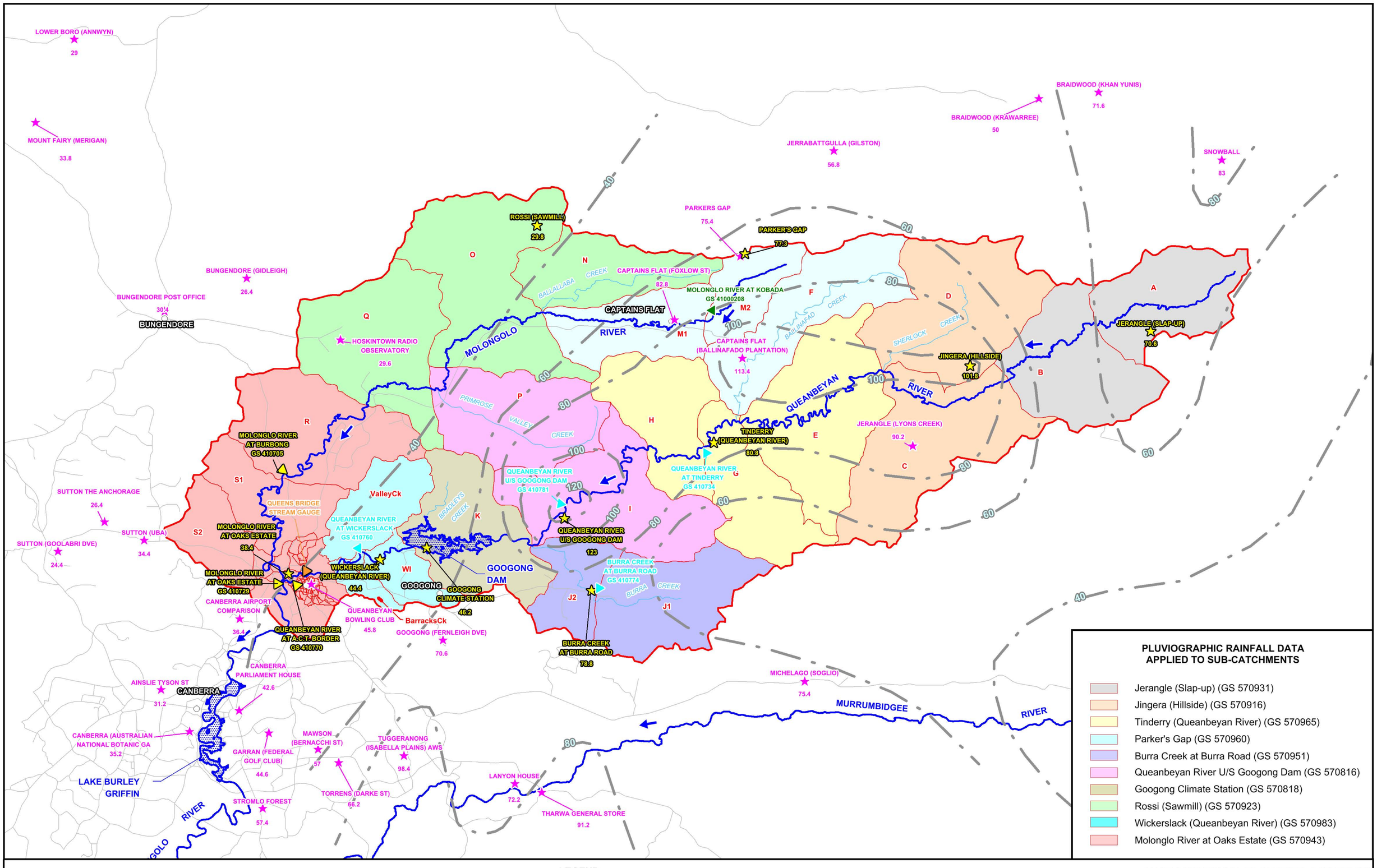
NOTE :
Time zero on calendar day axis = 00:00 hours on 28 November 2010

LEGEND
Storage Volume

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure B3.1

CUMULATIVE RAINFALL
DECEMBER 2010 STORM



PLUVIOGRAPHIC RAINFALL DATA APPLIED TO SUB-CATCHMENTS

- Jerangle (Slap-up) (GS 570931)
- Jingera (Hillside) (GS 570916)
- Tinderry (Queanbeyan River) (GS 570965)
- Parker's Gap (GS 570960)
- Burra Creek at Burra Road (GS 570951)
- Queanbeyan River U/S Googong Dam (GS 570816)
- Googong Climate Station (GS 570818)
- Rossi (Sawmill) (GS 570923)
- Wickerslack (Queanbeyan River) (GS 570983)
- Molonglo River at Oaks Estate (GS 570943)

2500 0 2500 5000 7500 m

Scale: 1:250,000

LEGEND

- J1 — Sub-Catchment Boundary and Identifier
- Manually Read Stream Gauge
- IconWater Stream Gauge
- EPSDD Stream Gauge
- WaterNSW Stream Gauge
- BoM Daily Rainfall Station and Recorded Depth (mm)
- EPSDD Pluviographic Gauge and Recorded Depth (mm)
- 48 Hour Depth of Rainfall (mm)

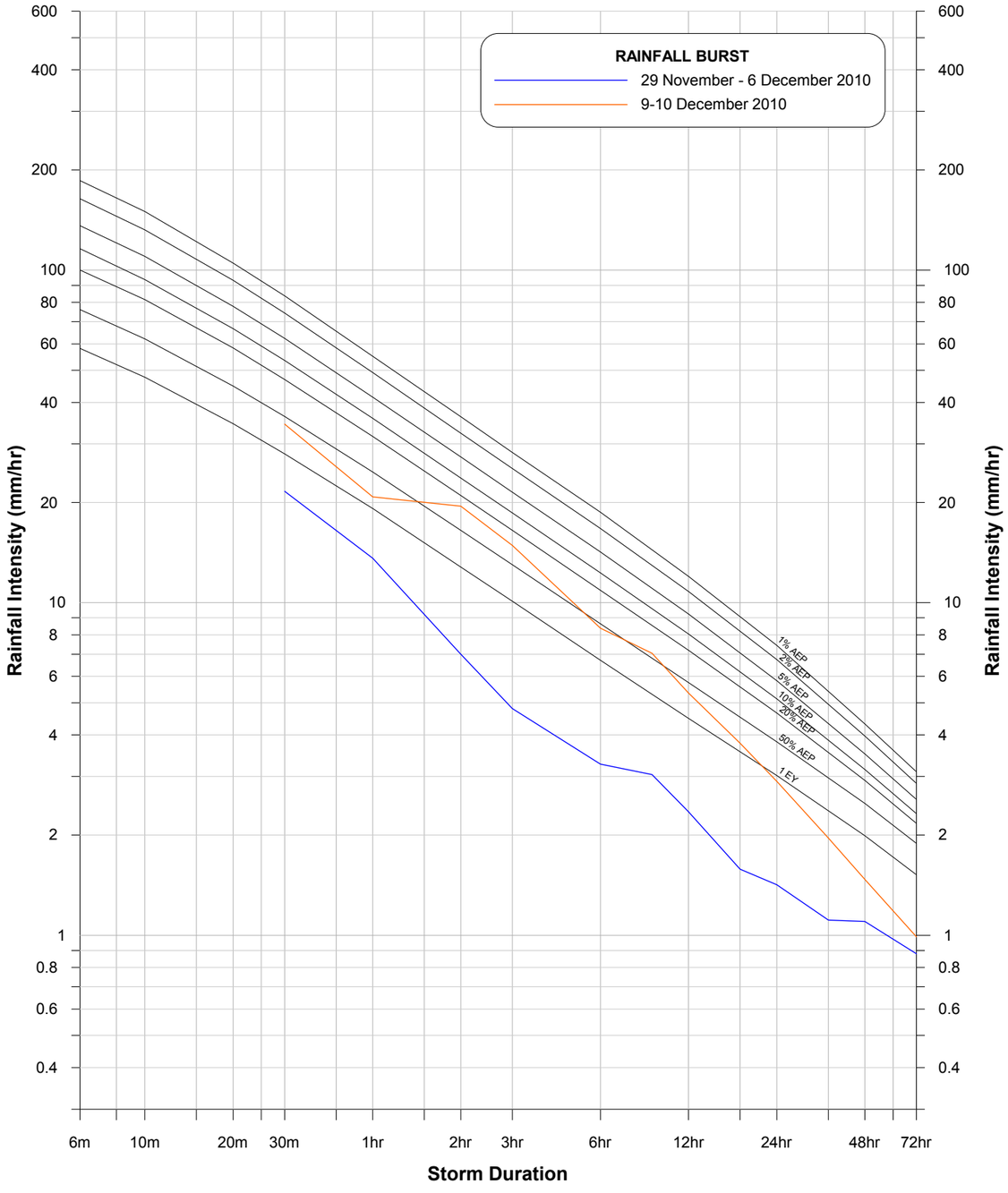
Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

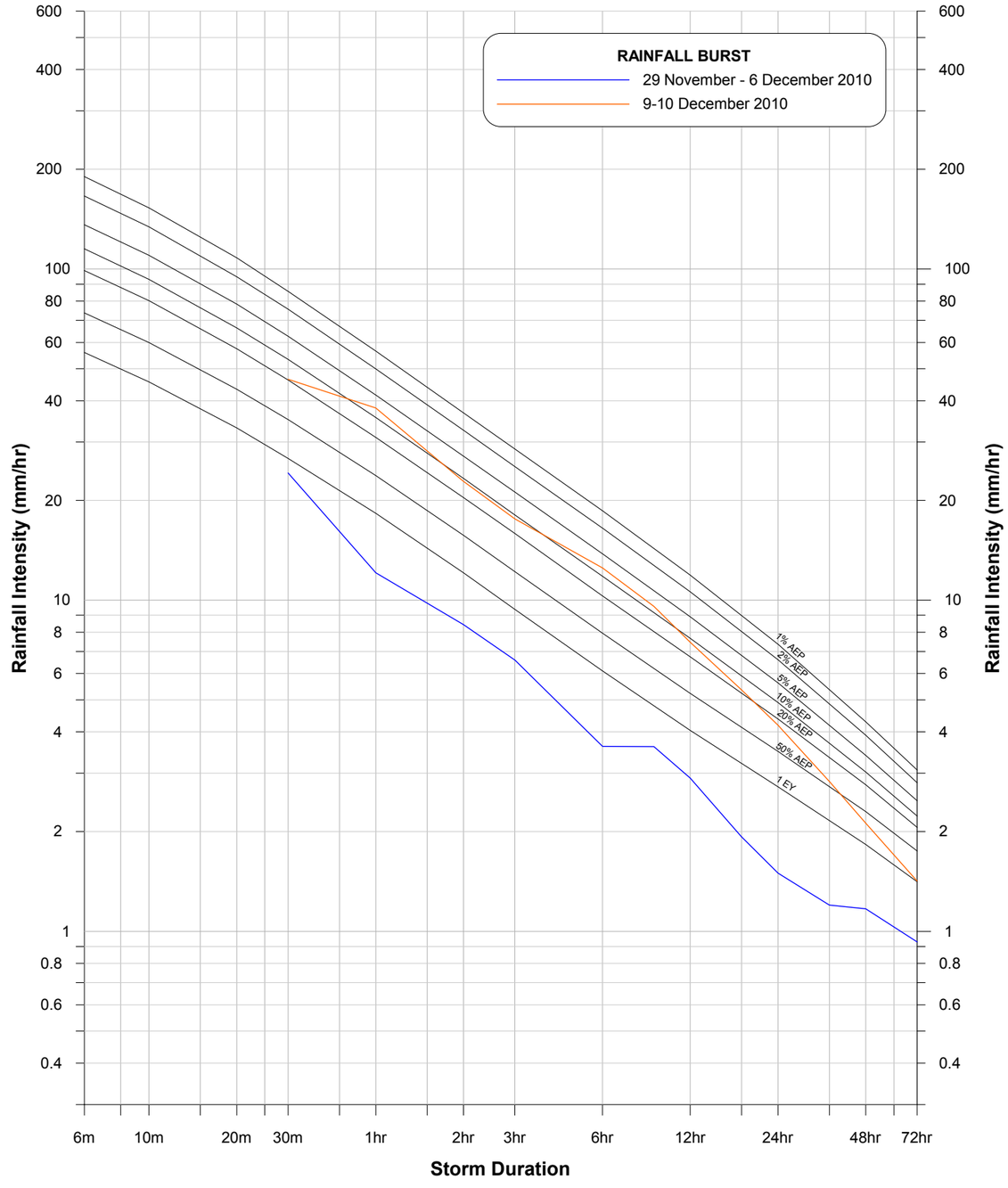
Figure B3.2

ISOHYETAL MAP
RAIN DAYS OF 9 AND 10 DECEMBER 2010

JERANGLE (SLAP-UP)
(GS 570931)



JINGERA (HILLSIDE)
(GS 570916)



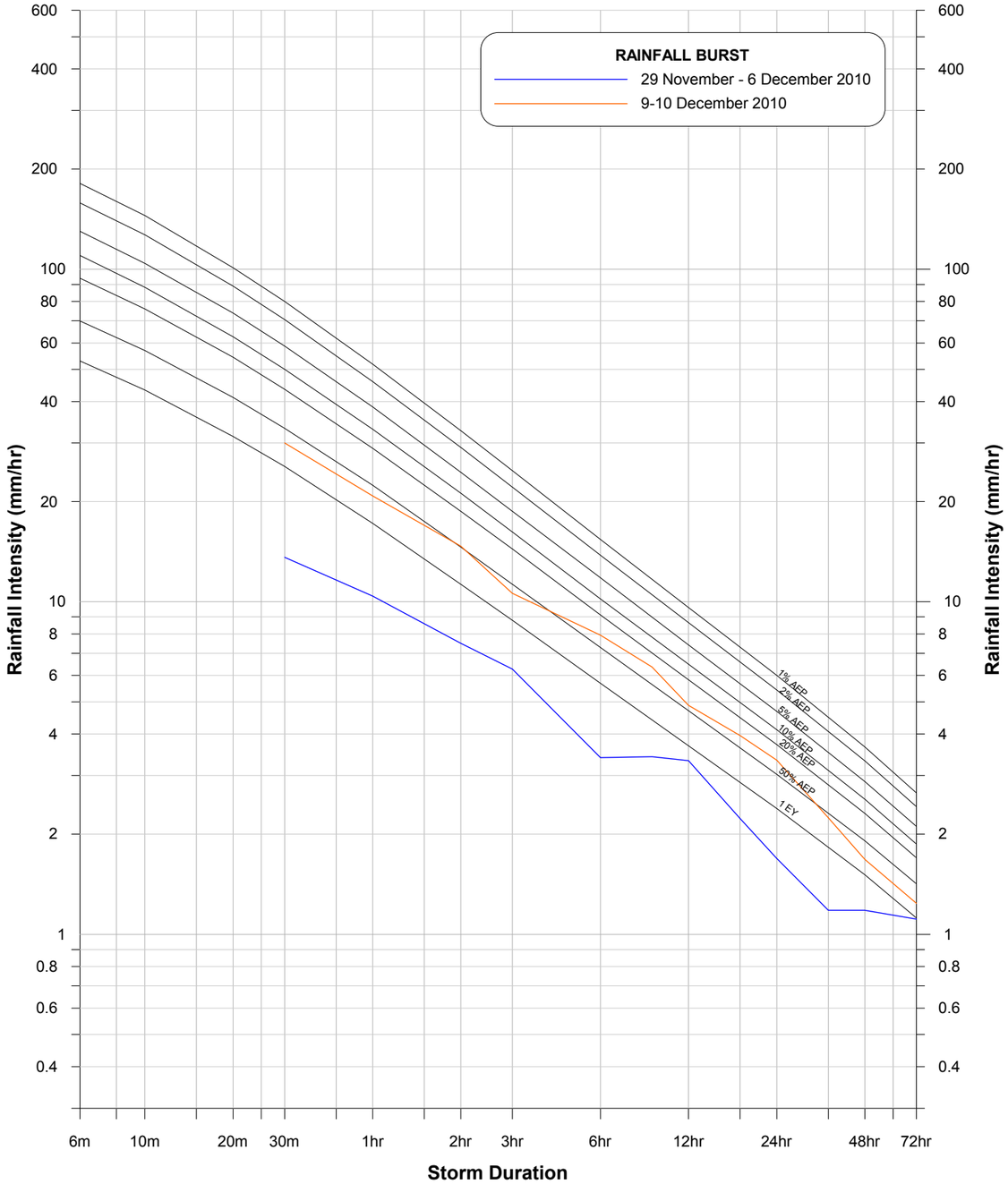
Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

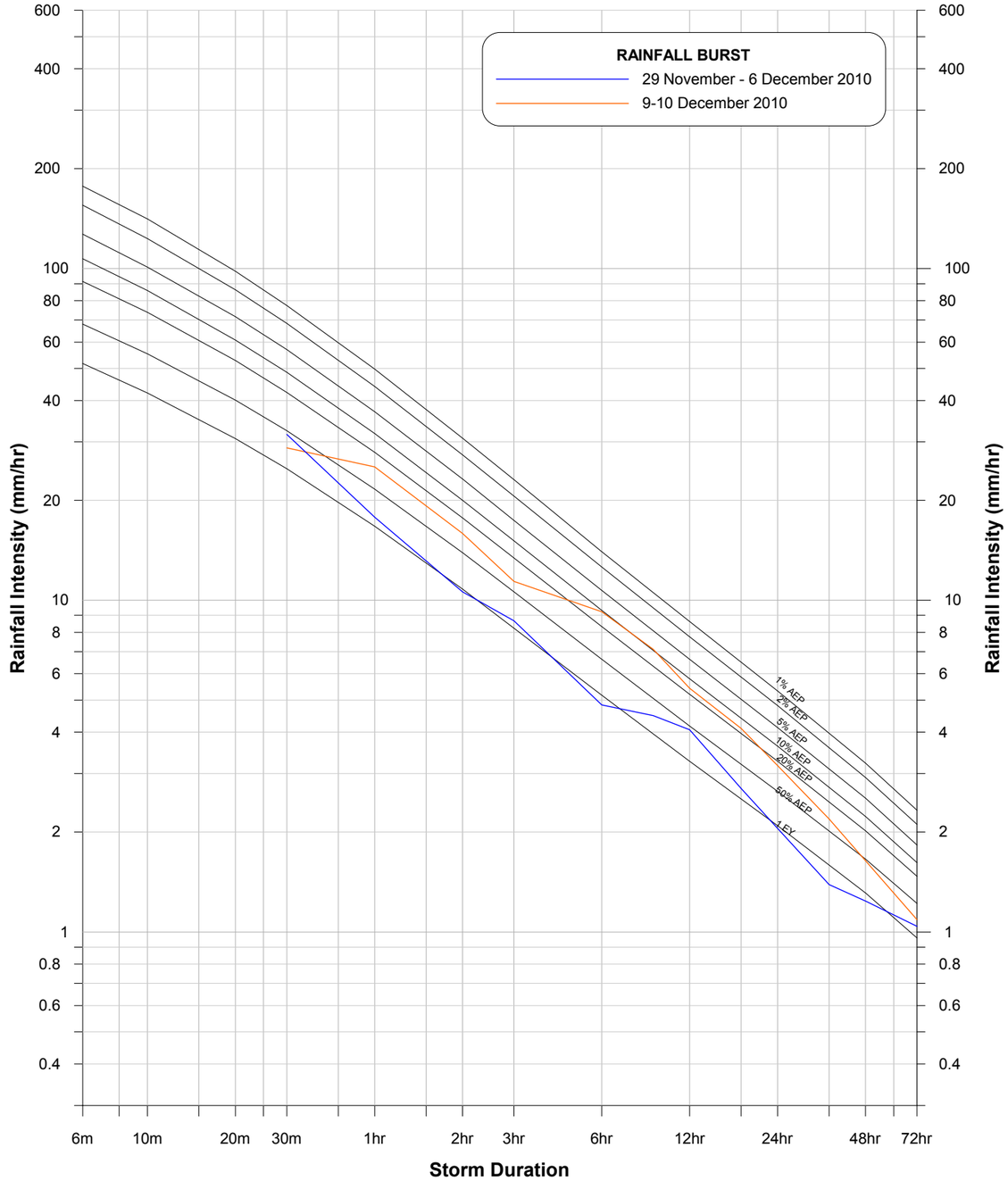
Figure B3.3
(Sheet 1 of 5)

INTENSITY-FREQUENCY-DURATION CURVES
AND HISTORIC RAINFALL

TINDERRY (QUEANBEYAN RIVER) (GS 570965)



BURRA CREEK AT BURRA ROAD (GS 570951)



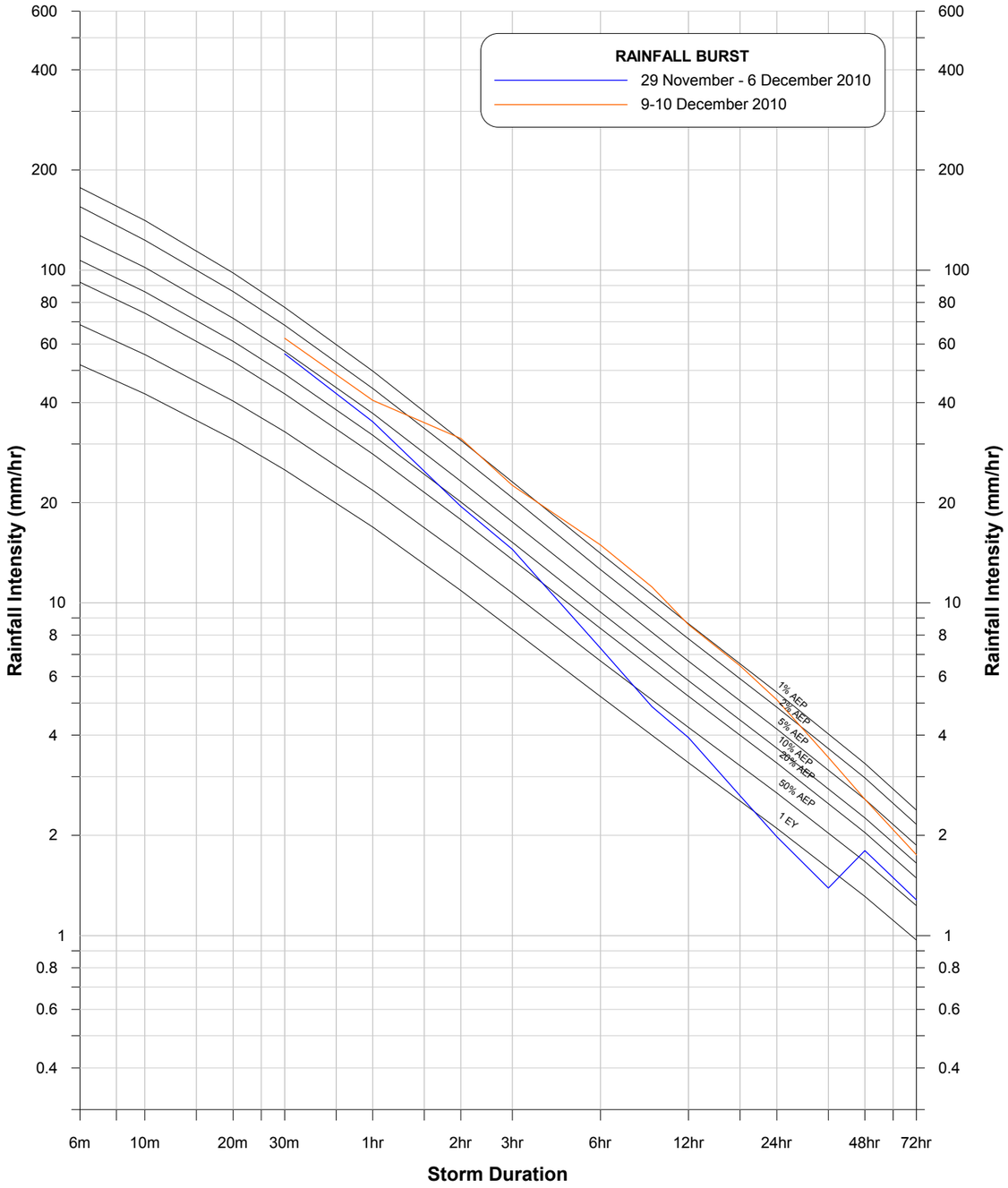
Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

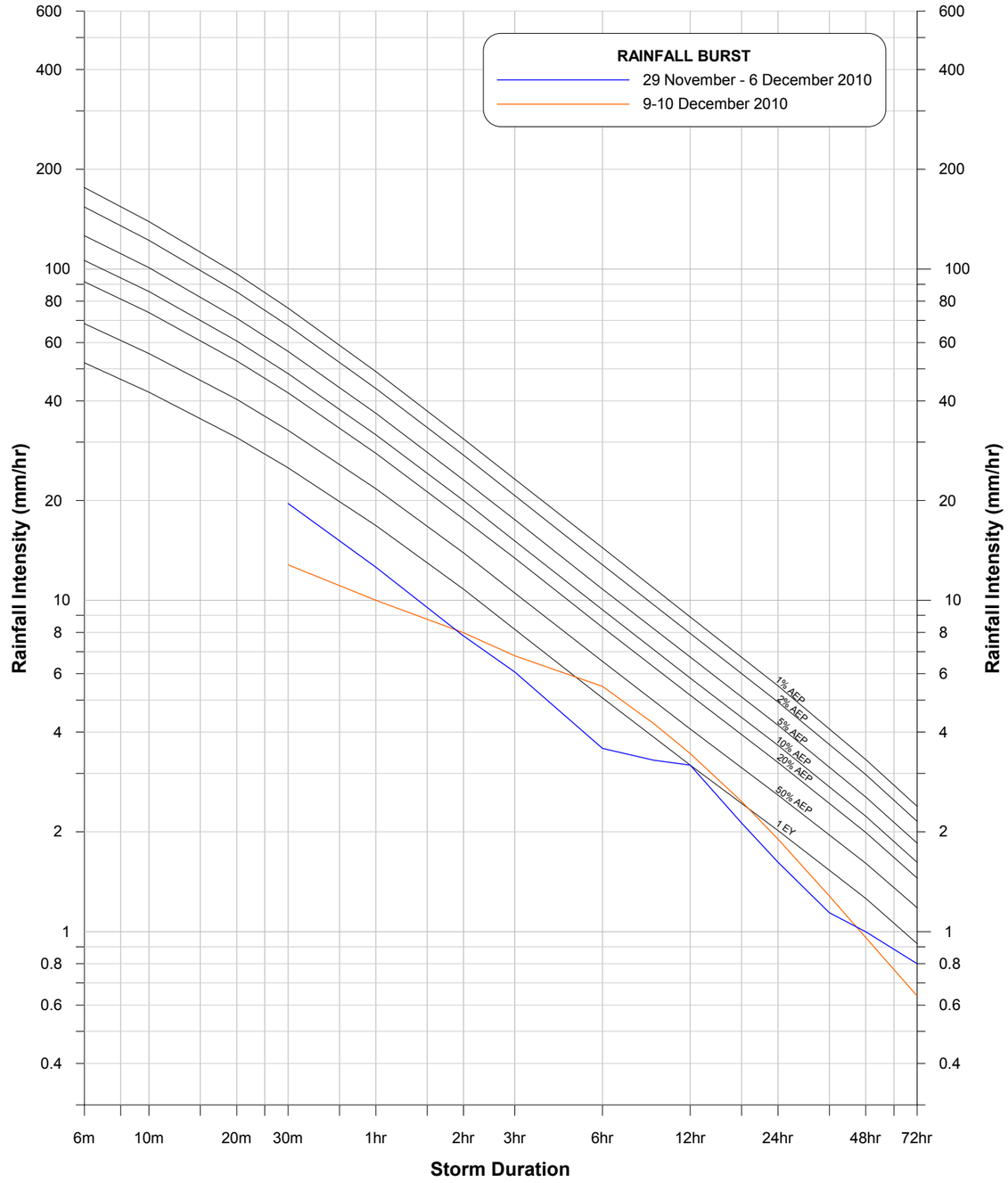
Figure B3.3
(Sheet 2 of 5)

INTENSITY-FREQUENCY-DURATION CURVES AND HISTORIC RAINFALL

QUEANBEYAN RIVER U/S GOOGONG DAM (GS 570816)



GOOGONG CLIMATE STATION (GS 570818)



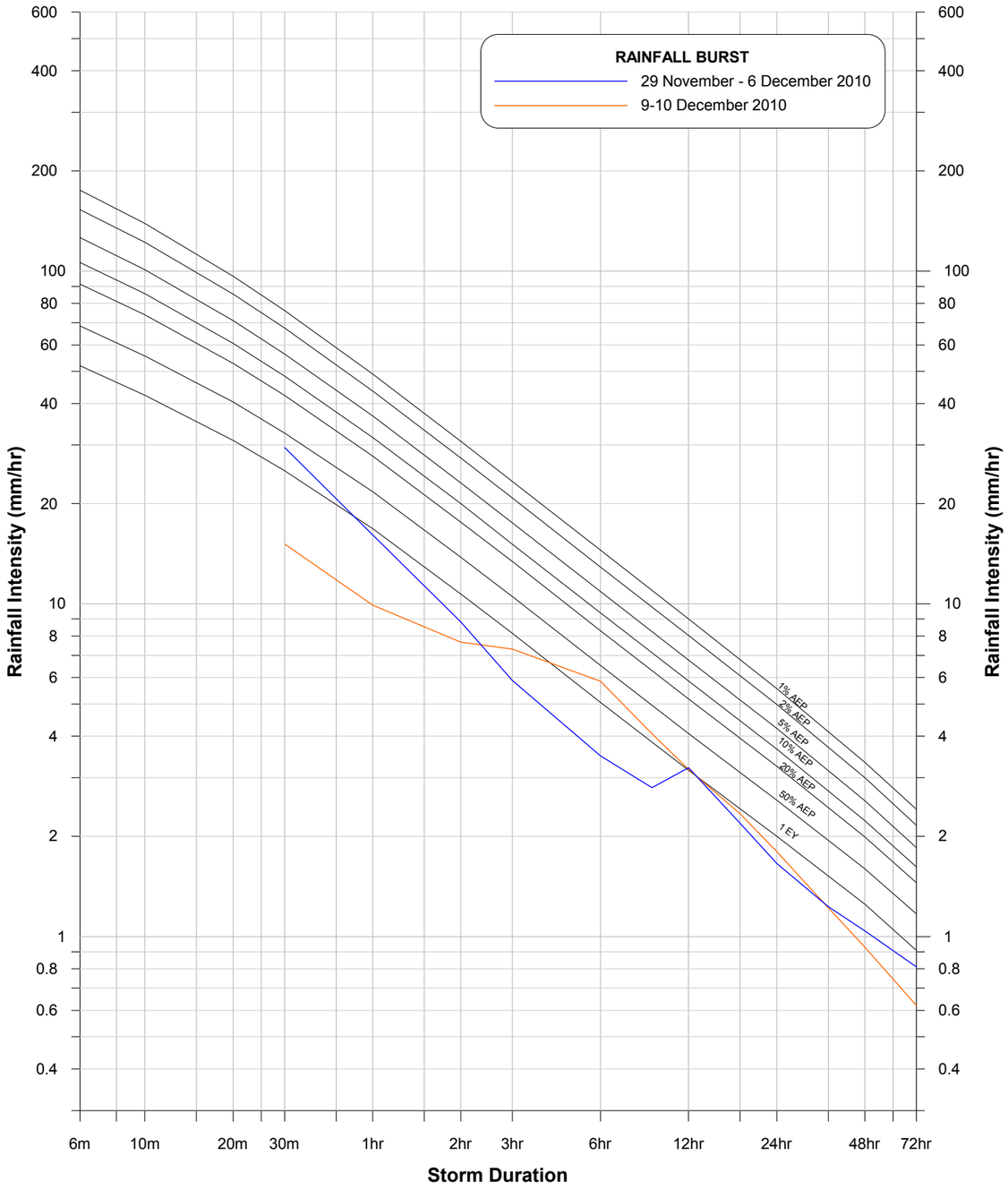
Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

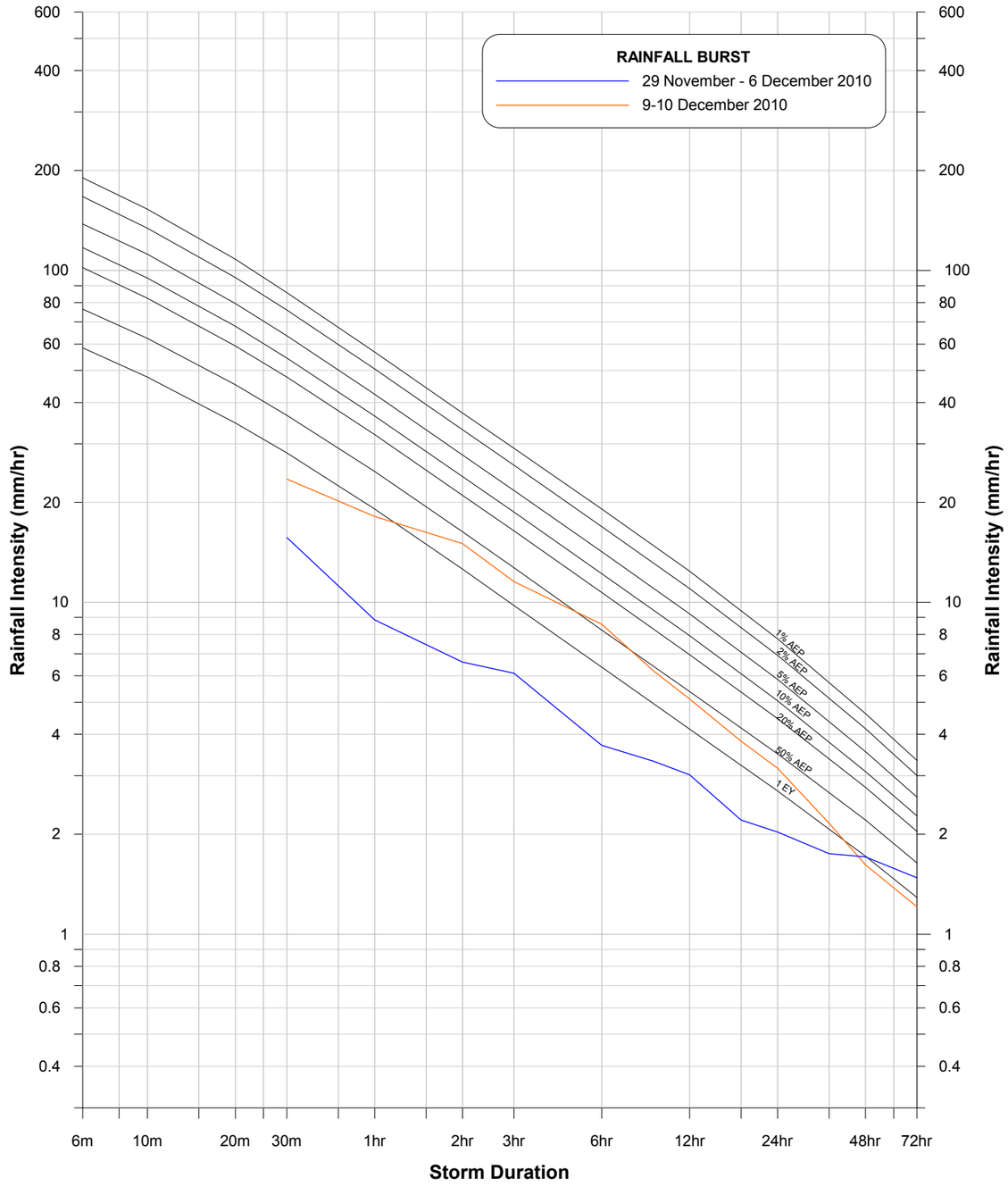
Figure B3.3
(Sheet 3 of 5)

INTENSITY-FREQUENCY-DURATION CURVES AND HISTORIC RAINFALL

WICKERSLACK (QUEANBEYAN RIVER)
(GS 570983)



PARKERS GAP
(GS 570960)



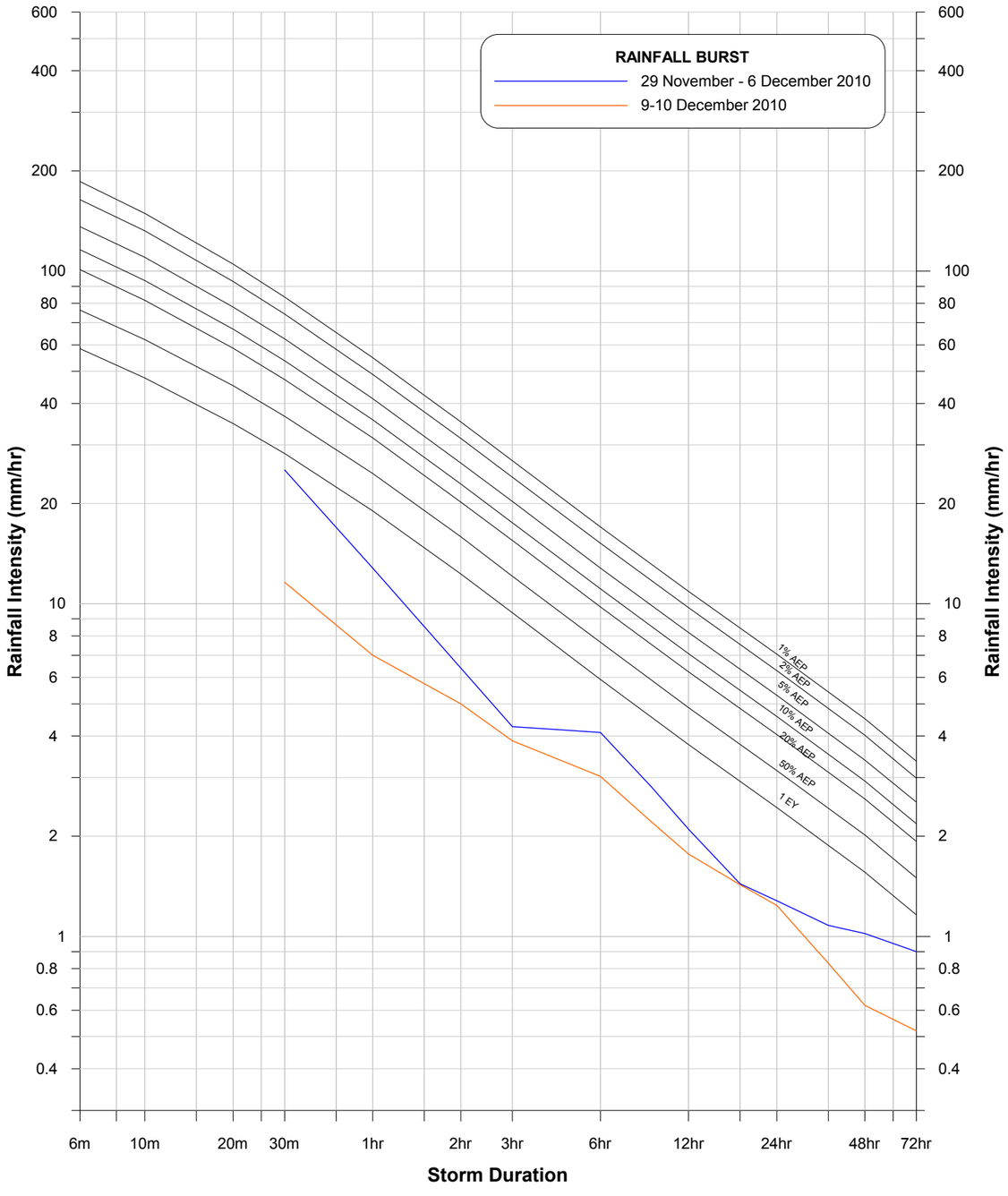
Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

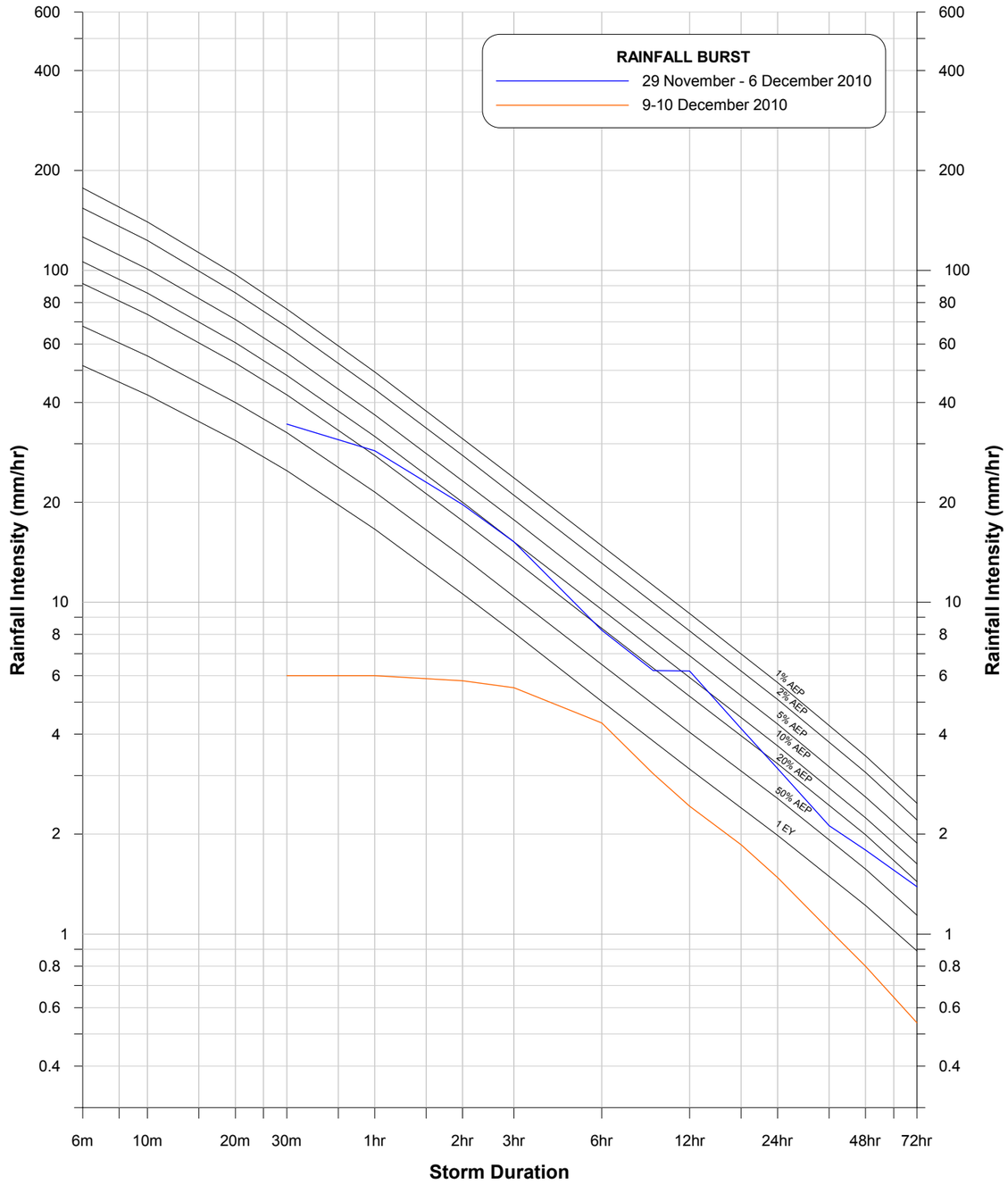
Figure B3.3
(Sheet 4 of 5)

INTENSITY-FREQUENCY-DURATION CURVES
AND HISTORIC RAINFALL

ROSSI (SAWMILL)
(GS 570923)



MOLONGLO RIVER AT OAKS ESTATE
(GS 570943)



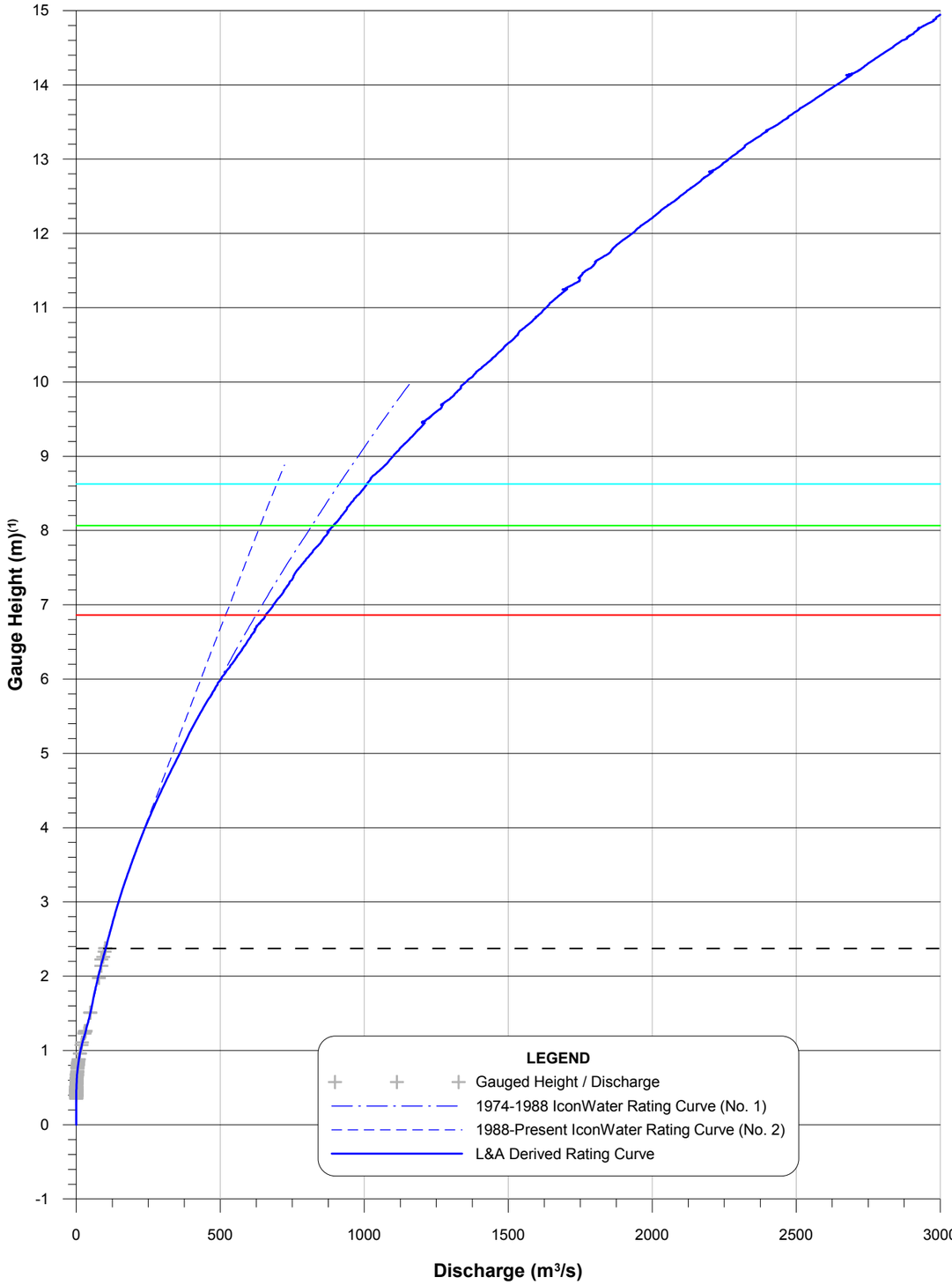
Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

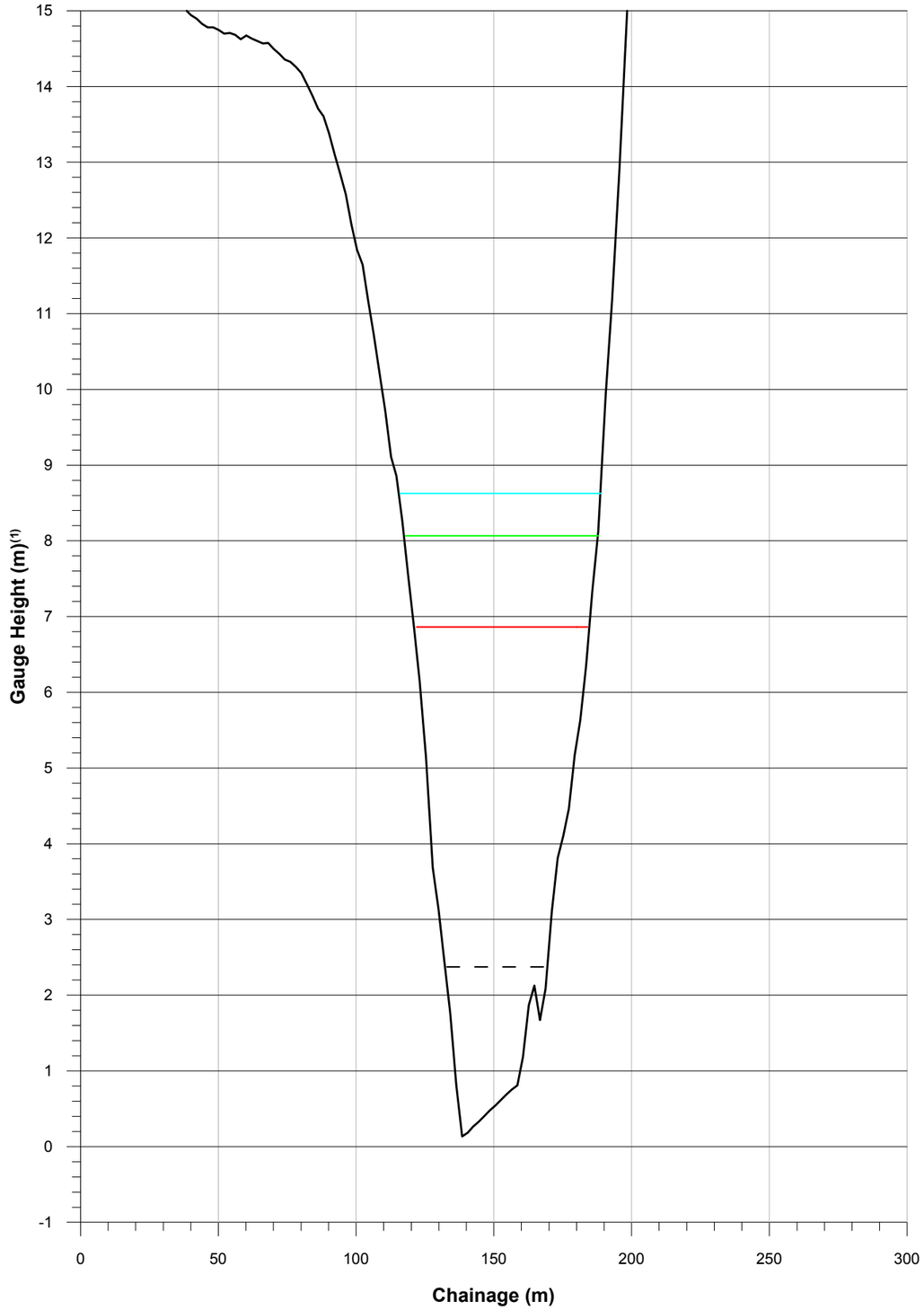
Figure B3.3
(Sheet 5 of 5)

INTENSITY-FREQUENCY-DURATION CURVES AND HISTORIC RAINFALL

RATING CURVES



CROSS SECTION(2)



LEGEND

- August 1974 Peak Height - 8.63 m
- October 1976 Peak Height - 8.07 m
- December 2010 Peak Height - 6.86 m
- Max Gauged Height - 2.37 m

Lyall & Associates

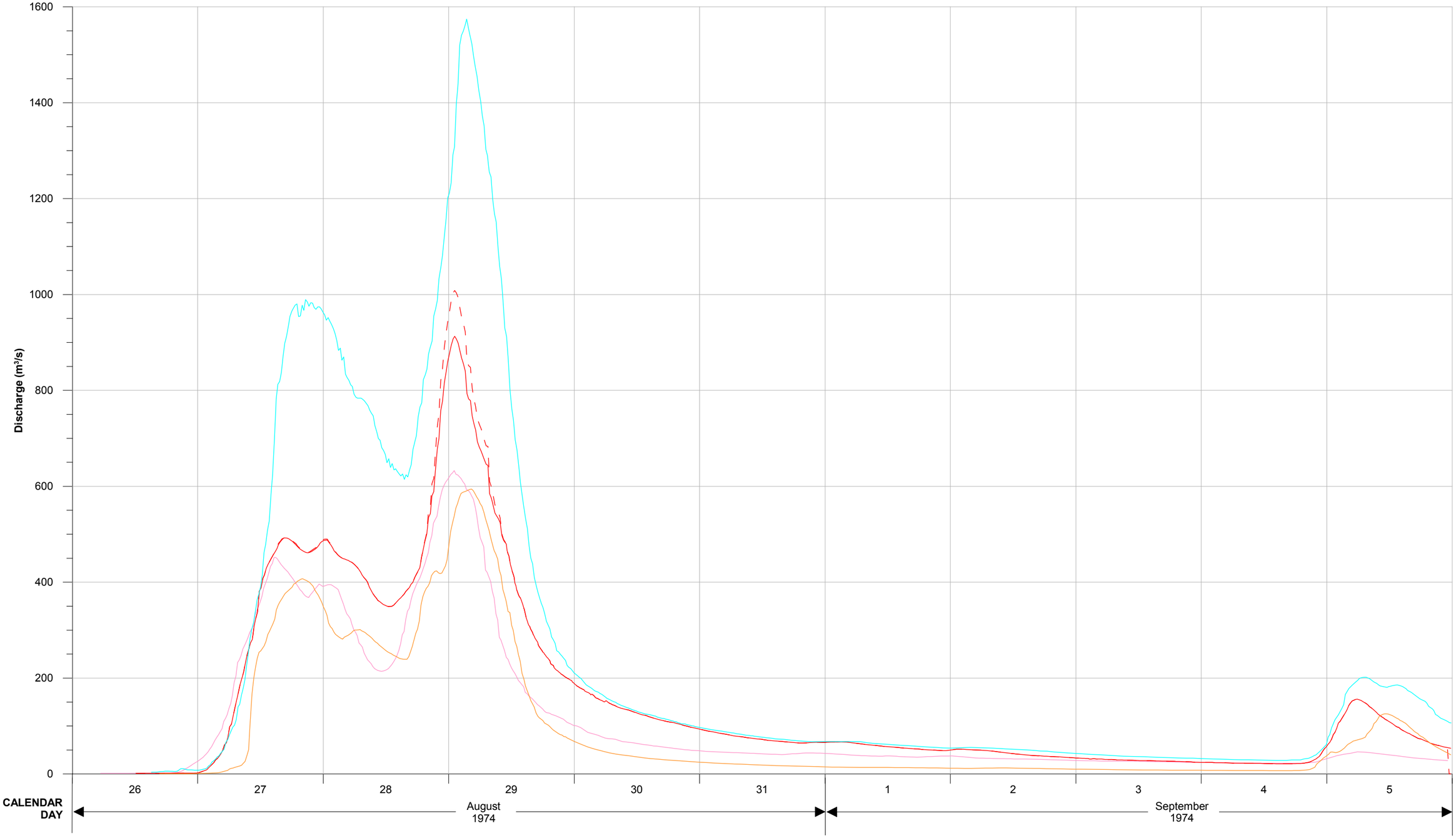
NOTES:

1. Gauge zero unknown.
2. Cross section derived using LiDAR survey data.

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure B4.1

RATING CURVES AND CROSS SECTION
QUEANBEYAN RIVER AT WICKERSLACK STREAM GAUGE (GS 410760)



LEGEND

- Queanbeyan River at Tinderry (GS 410734)
- Queanbeyan River at Wickerslack (GS 410760)(3)
- Molonglo River at Burbong (GS 410705)
- Molonglo River at Oaks Estate (GS 410729)

Lyall & Associates

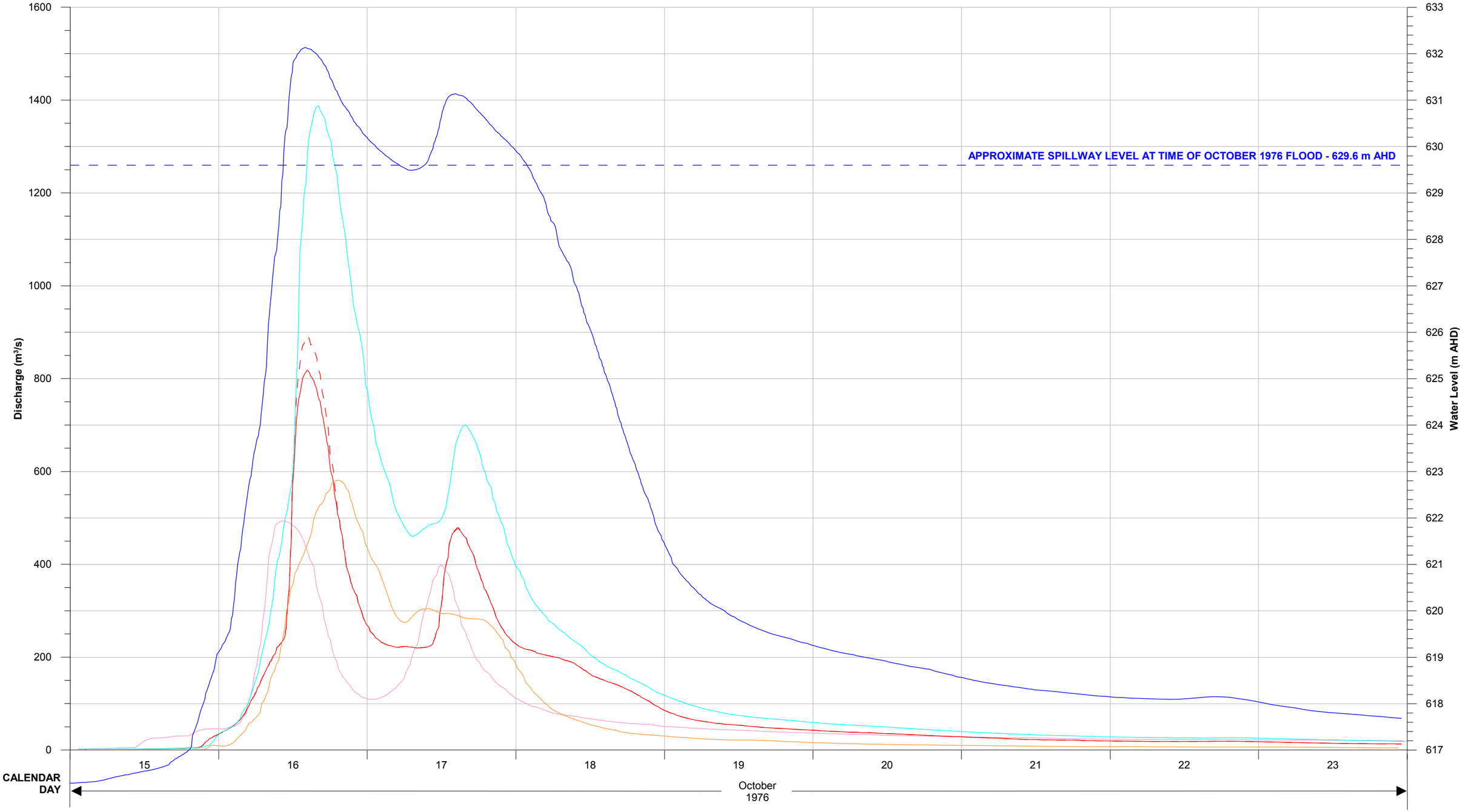
NOTES:

1. Time zero on calendar day axis = 00:00 hours on 26 August 1974.
2. Googong Dam was not present at the time of the August 1974 Flood.
3. Dashed line represents recorded discharge based on L&A Derived Rating Curve.

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure B4.2

RECORDED DISCHARGE HYDROGRAPHS
AUGUST 1974 FLOOD



LEGEND

- Queanbeyan River at Tinderry (GS 410734)
- Queanbeyan River at Wickerslack (GS 410760)(3)
- Molonglo River at Burbong (GS 410705)
- Molonglo River at Oaks Estate (GS 410729)
- Water Level - Googong Dam

Lyall & Associates

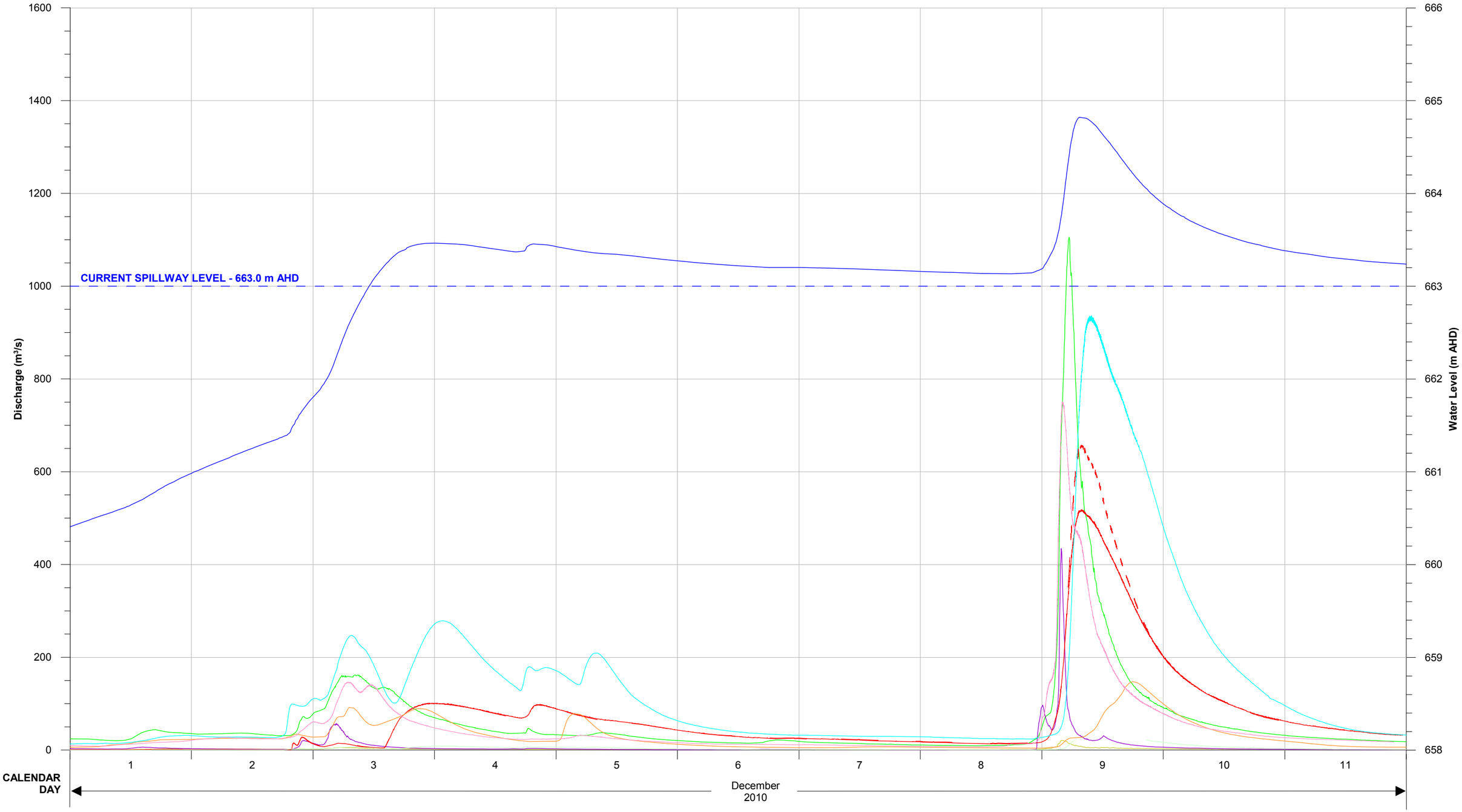
NOTES:

1. Time zero on calendar day axis = 00:00 hours on 15 October 1976.
2. Googong Dam was under construction at the time of the 1976 Flood.
3. Dashed line represents recorded discharge based on L&A Derived Rating Curve.

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure B4.3

RECORDED DISCHARGE HYDROGRAPHS AND GOOGONG DAM DETAILS
OCTOBER 1976 FLOOD



LEGEND

- Queanbeyan River at Tinderry (GS 410734)
- Queanbeyan River U/S Googong Dam (GS 410781)
- Burra Creek at Burra Road (GS 410774)
- Queanbeyan River at Wickerslack (GS 410760)(2)
- Molonglo River at Burbong (GS 410705)
- Molonglo River at Oaks Estate (GS 410729)
- Molonglo River at Kobada (GS 41000208)(3)
- Queanbeyan River at A.C.T. Border (GS 410770)
- Water Level - Googong Dam

Lyall & Associates

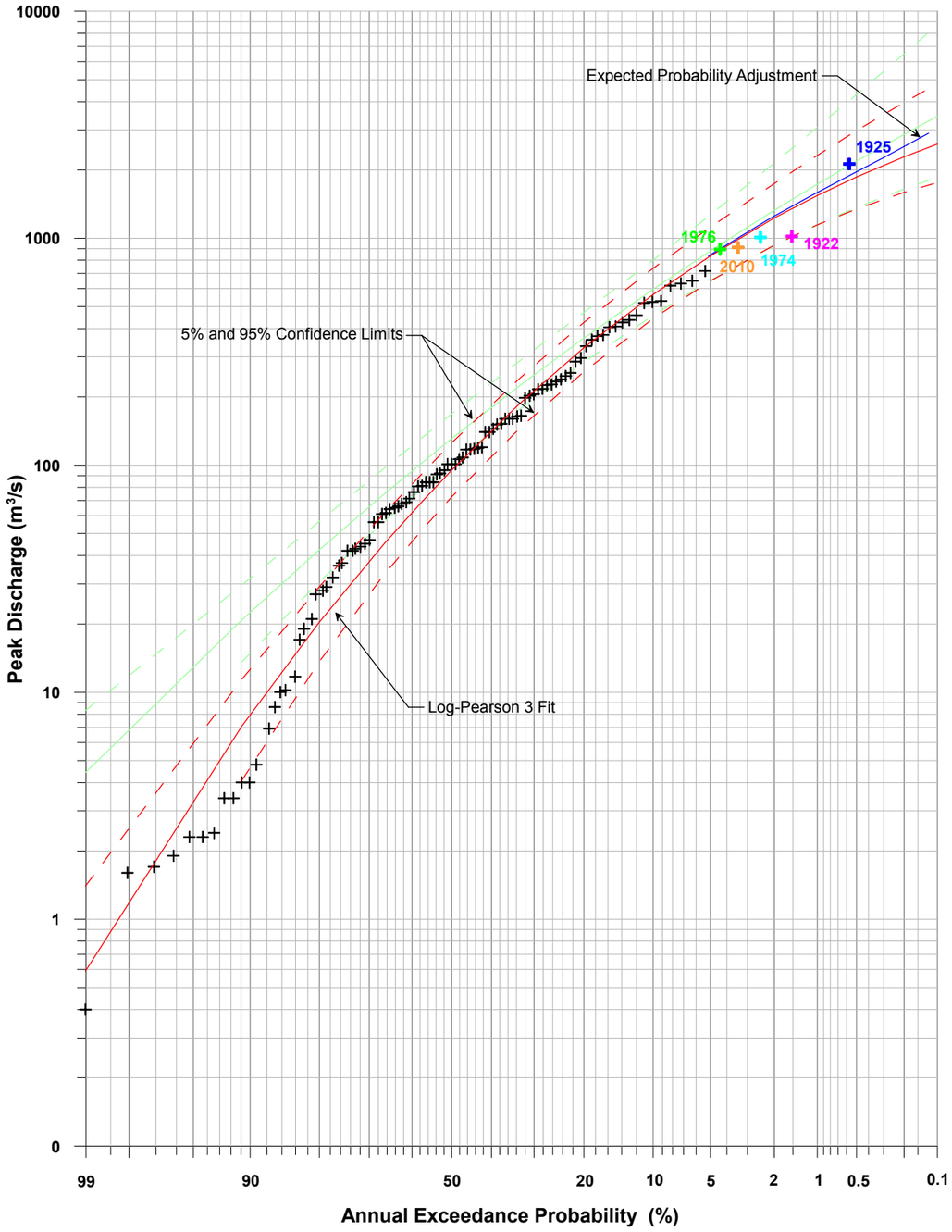
NOTES:

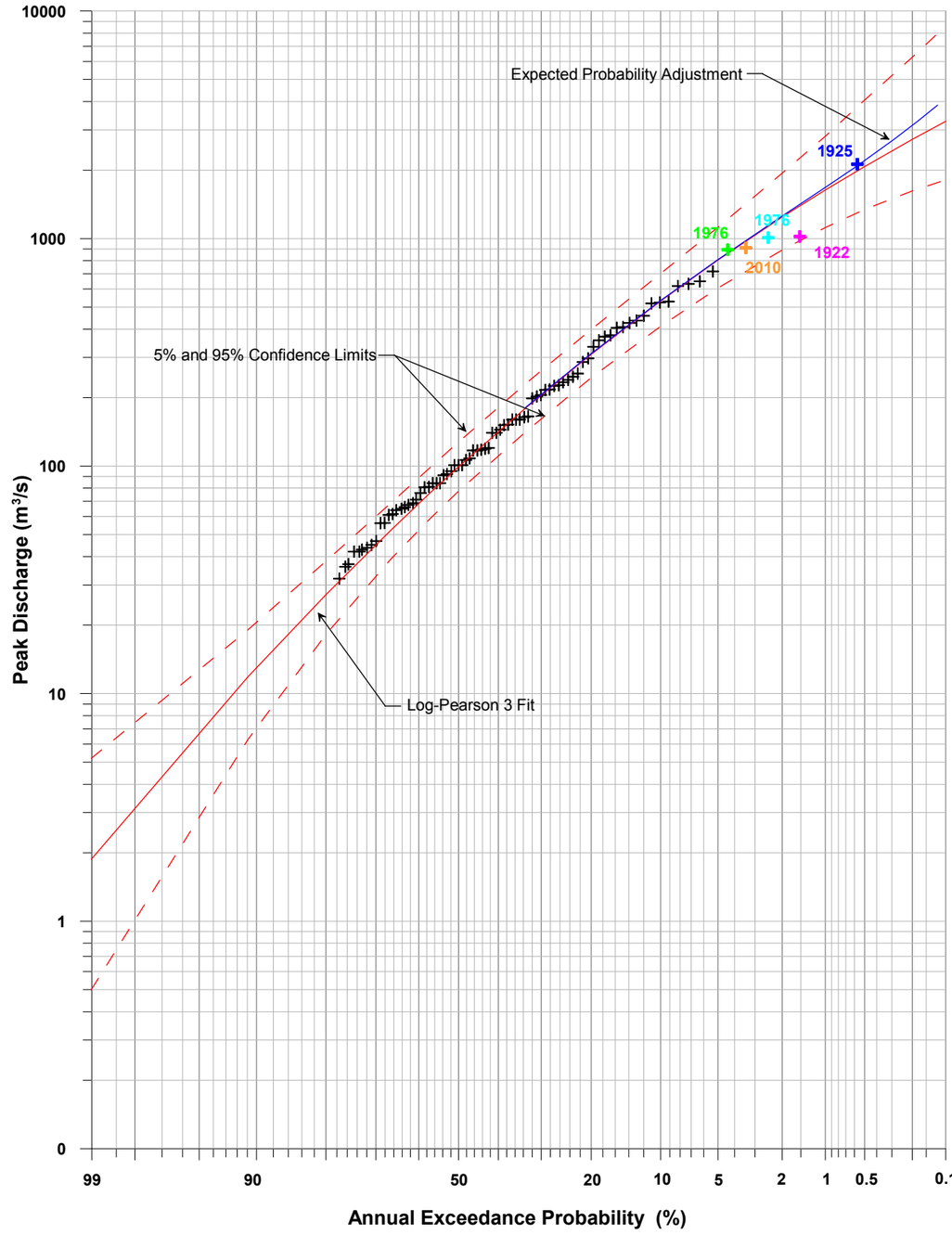
1. Time zero on calendar day axis = 00:00 hours on 1 December 2010.
2. Dashed line represents recorded discharge based on L&A Derived Rating Curve.
3. Discharge not recorded between 06:15 and 20:40 hours on 9 December 2010.

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure B4.4

RECORDED DISCHARGE HYDROGRAPHS AND GOOGONG DAM DETAILS DECEMBER 2010 FLOOD





Lyall & Associates

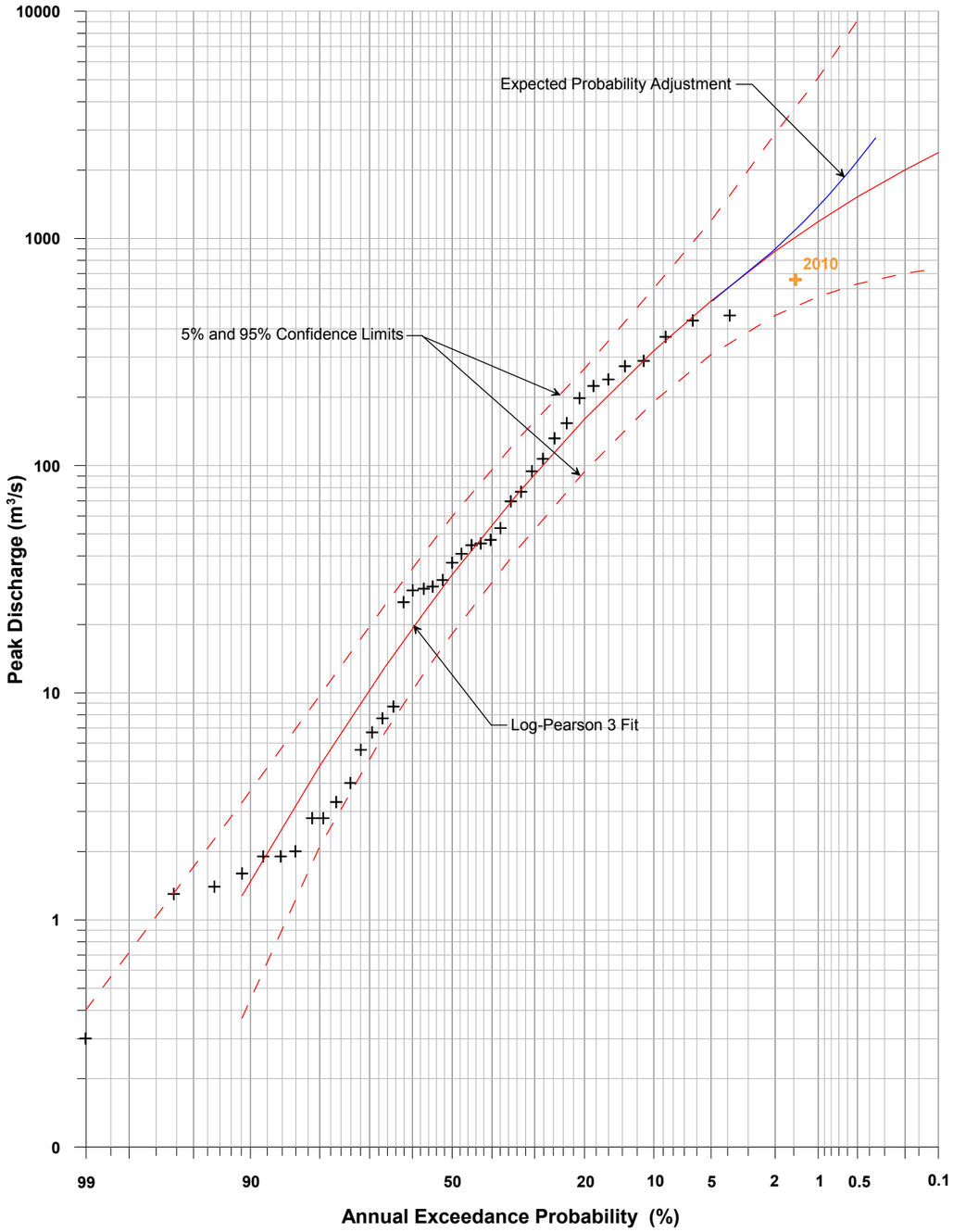
NOTES:

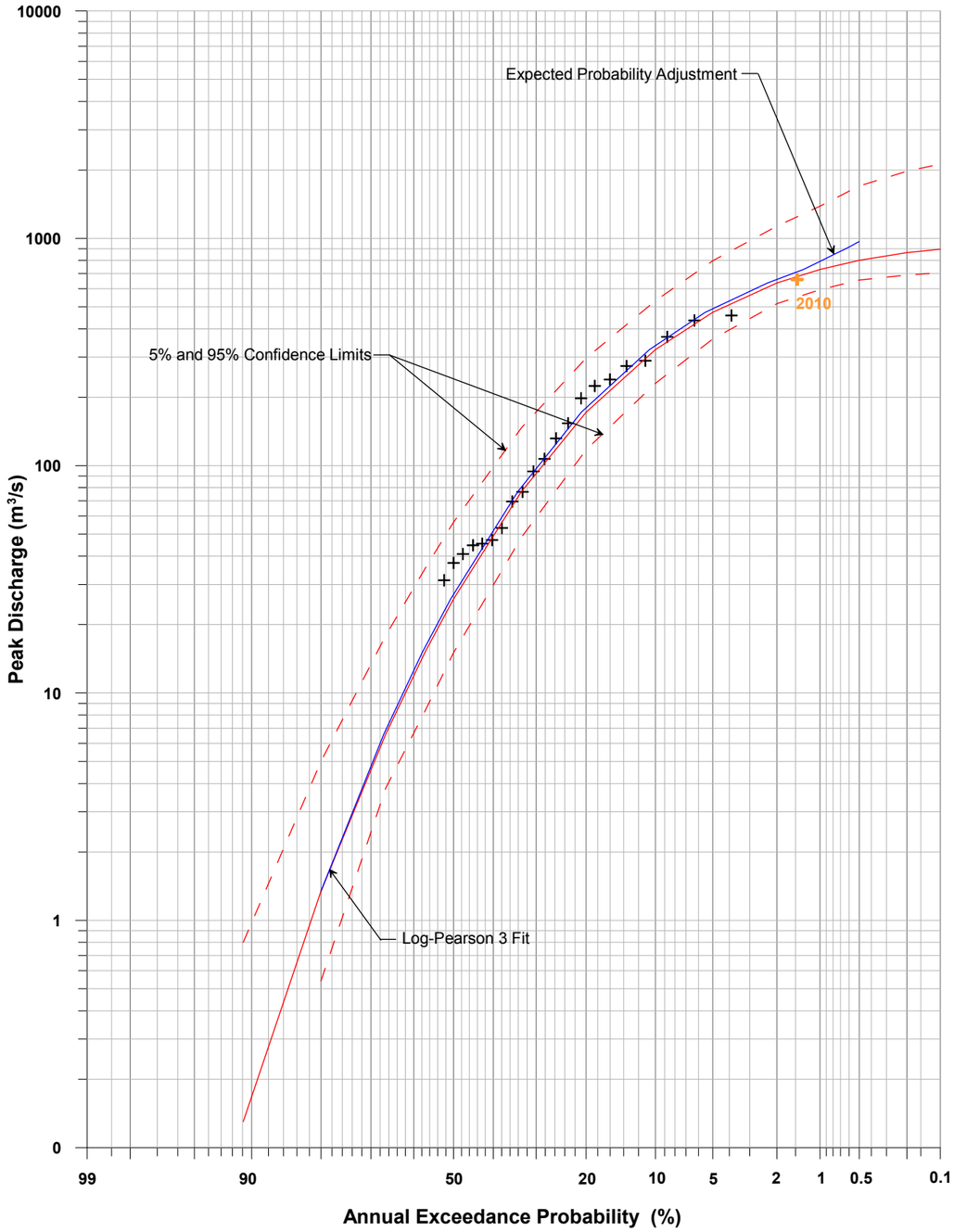
1. Flood frequency relationship based on pre-Googong Dam flows in the Queanbeyan River at the decommisioned Googong stream gauge. Annual peak flows for period of record after construction of the dam (i.e. 1977-2017) have been derived by converting post-dam peak flows recorded at the Wickerslack stream gauge using the pre- versus post-dam flow relationship presented in DWR, 1992 (refer Columns D and E in Table C2.2).
2. Red lines show flood frequency relationship based on full period of record (i.e. 1913-2017), while green lines show flood frequency relationship based on same period of record used in DWR, 1992 (i.e. 1913-1991).

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure B4.5

FLOOD FREQUENCY RELATIONSHIP
LOG-PEARSON 3 ANNUAL SERIES 1913-2017
QUEANBEYAN RIVER AT GOOGONG STREAM GAUGE (GS 410701)





Lyall & Associates

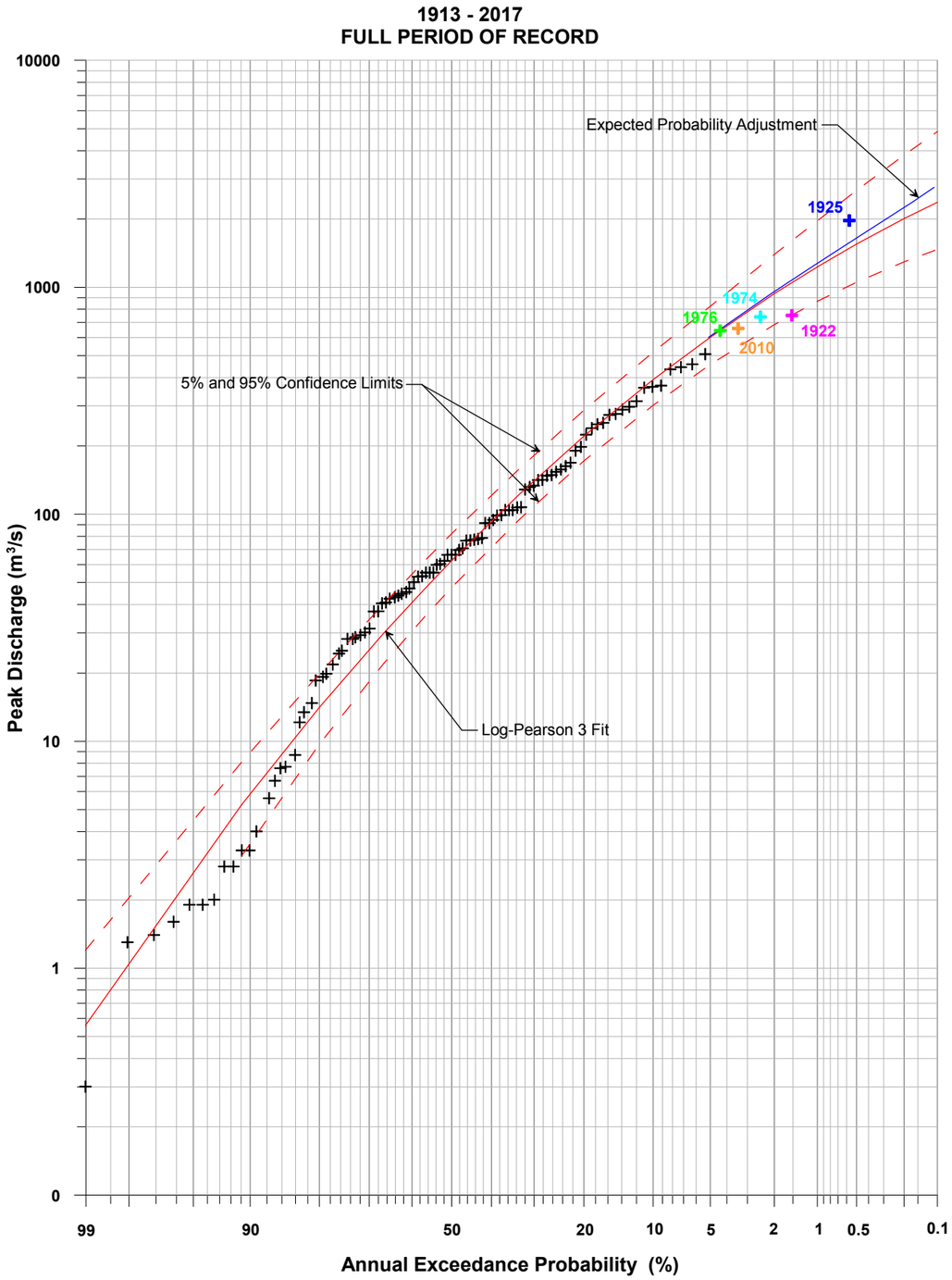
NOTE:

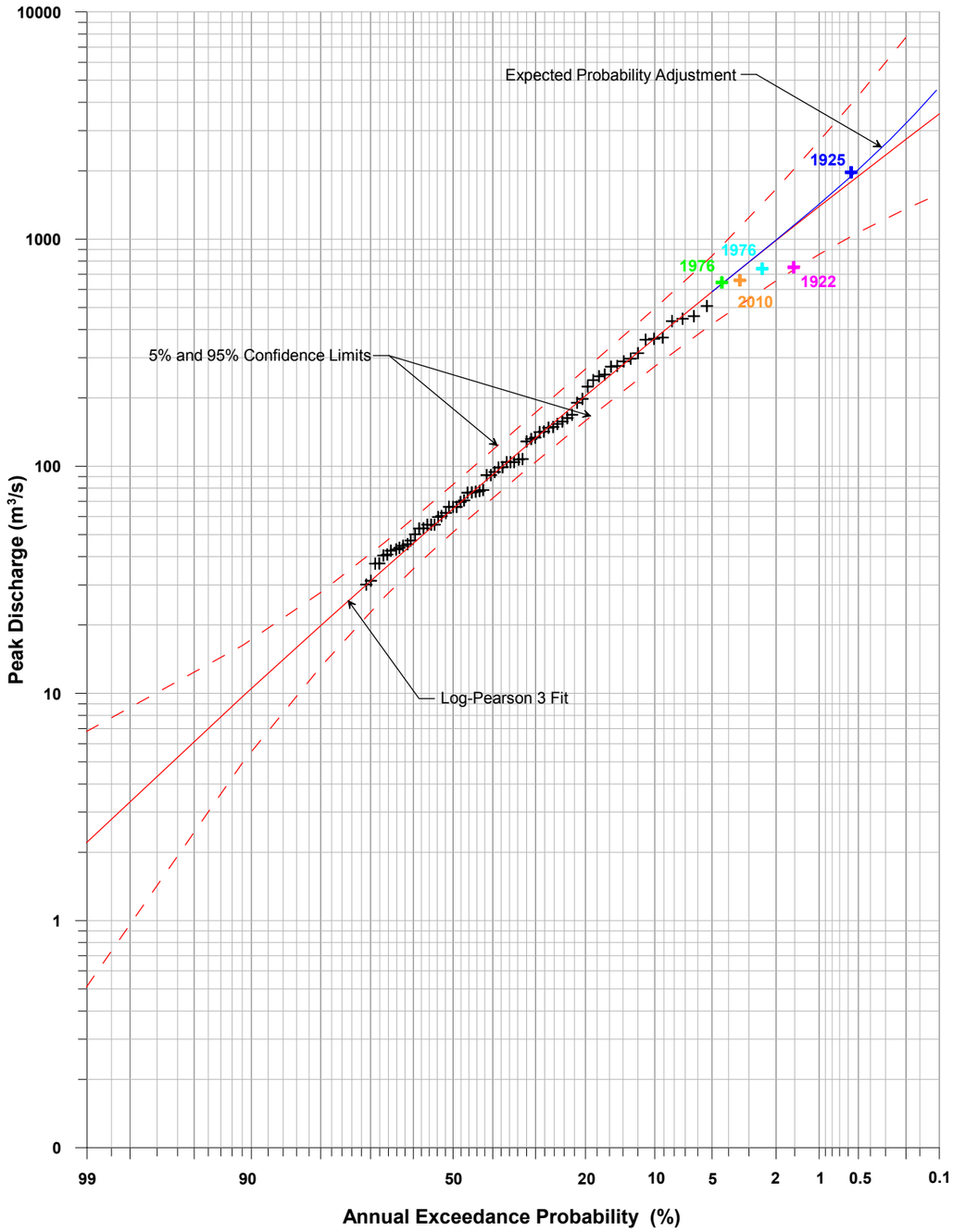
Flood frequency relationship based on post-Googong Dam flows in the Queanbeyan River at the Wickerslack stream gauge for period of record after construction of the dam (ie. 1977-2017).

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure B4.6

FLOOD FREQUENCY RELATIONSHIP
LOG-PEARSON 3 ANNUAL SERIES 1977-2017
QUEANBEYAN RIVER AT WICKERSLACK STREAM GAUGE (GS 410760)





Lyall & Associates

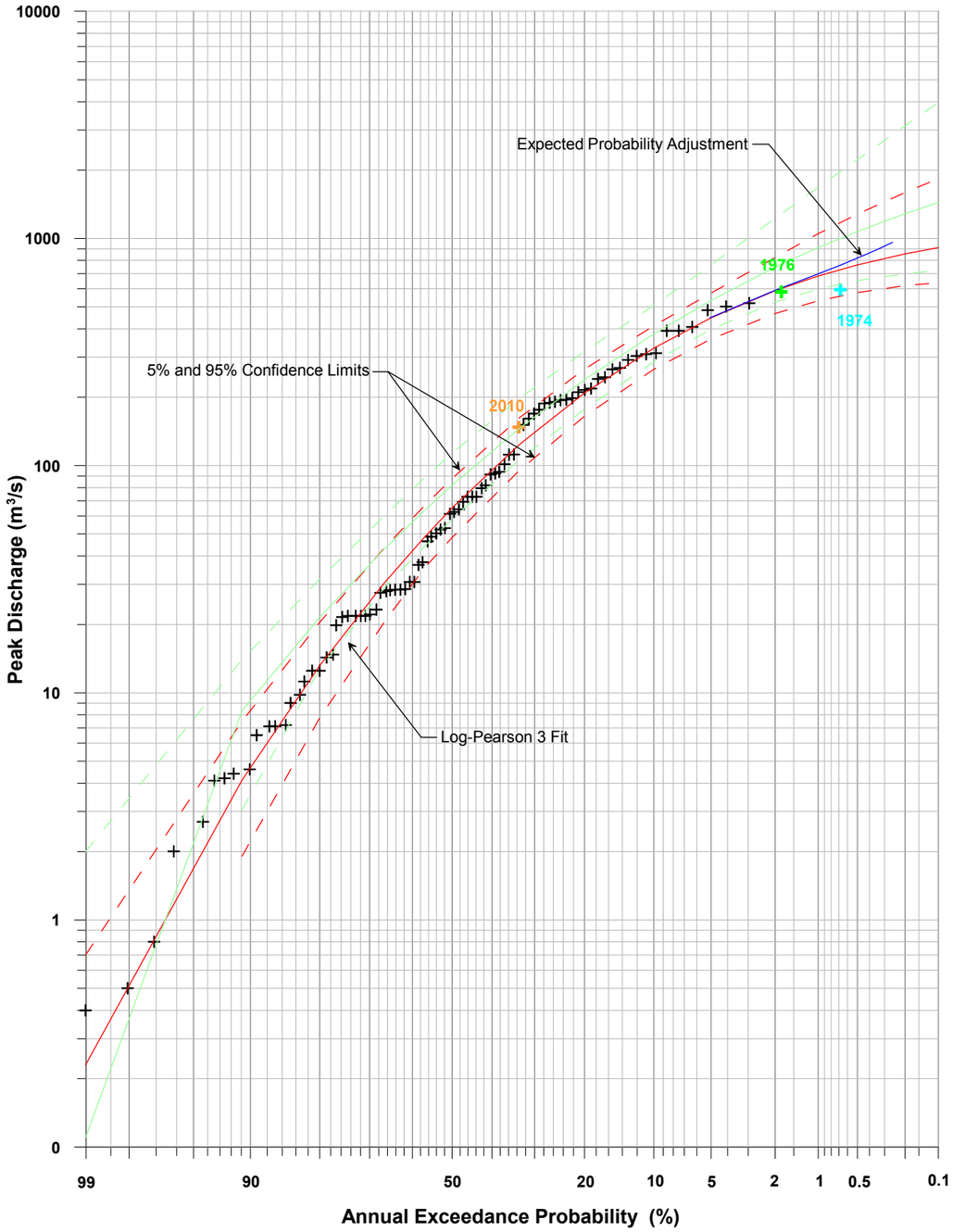
NOTE:

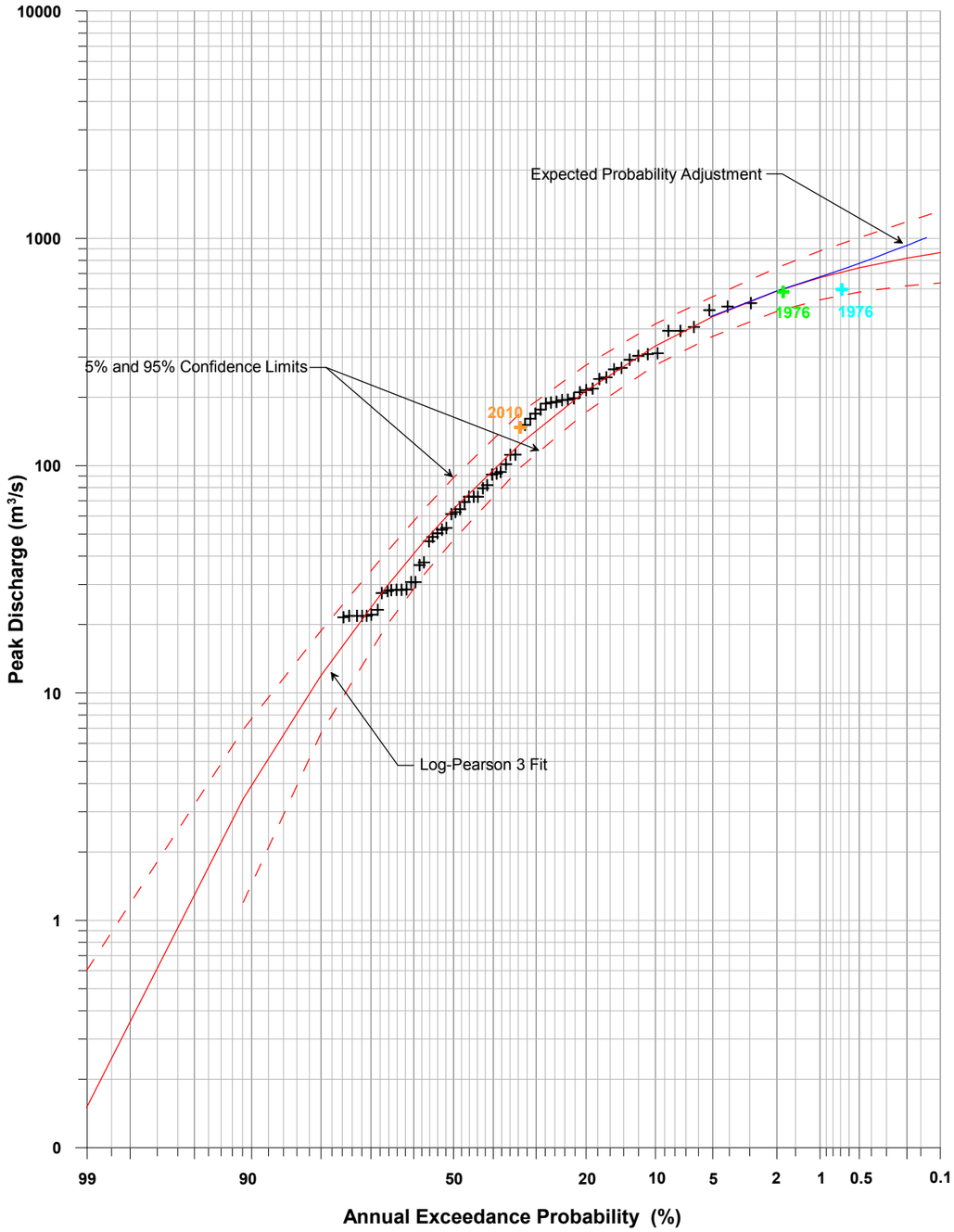
Flood frequency relationship based on post-Googong Dam flows in the Queanbeyan River at the Wickerslack stream gauge. Annual peak flows for period of record prior to construction of the dam (ie. 1913-1976) have been derived by converting pre-dam flows at the Googong stream gauge using the pre- versus post-dam flow relationship presented in DWR, 1992 (refer Columns D and E in Table C2.2).

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure B4.7

FLOOD FREQUENCY RELATIONSHIP
LOG-PEARSON 3 ANNUAL SERIES 1913-2017
QUEANBEYAN RIVER AT WICKERSLACK STREAM GAUGE (GS 410760)





Lyall & Associates

NOTE:

1. Red lines show flood frequency relationship based on full period of record (i.e. 1930-2017), while green lines show flood frequency relationship based on same period of record used in DWR, 1992 (i.e. 1930-1991).

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure B4.8

FLOOD FREQUENCY RELATIONSHIP
LOG-PEARSON 3 ANNUAL SERIES 1930-2017
MOLONGLO RIVER AT BURBONG STREAM GAUGE (GS 410705)

APPENDIX C

FLOOD STUDY UPDATE

DRAFT REPORT FOR PUBLIC EXHIBITION

LIST OF FIGURES (APPENDIX C)

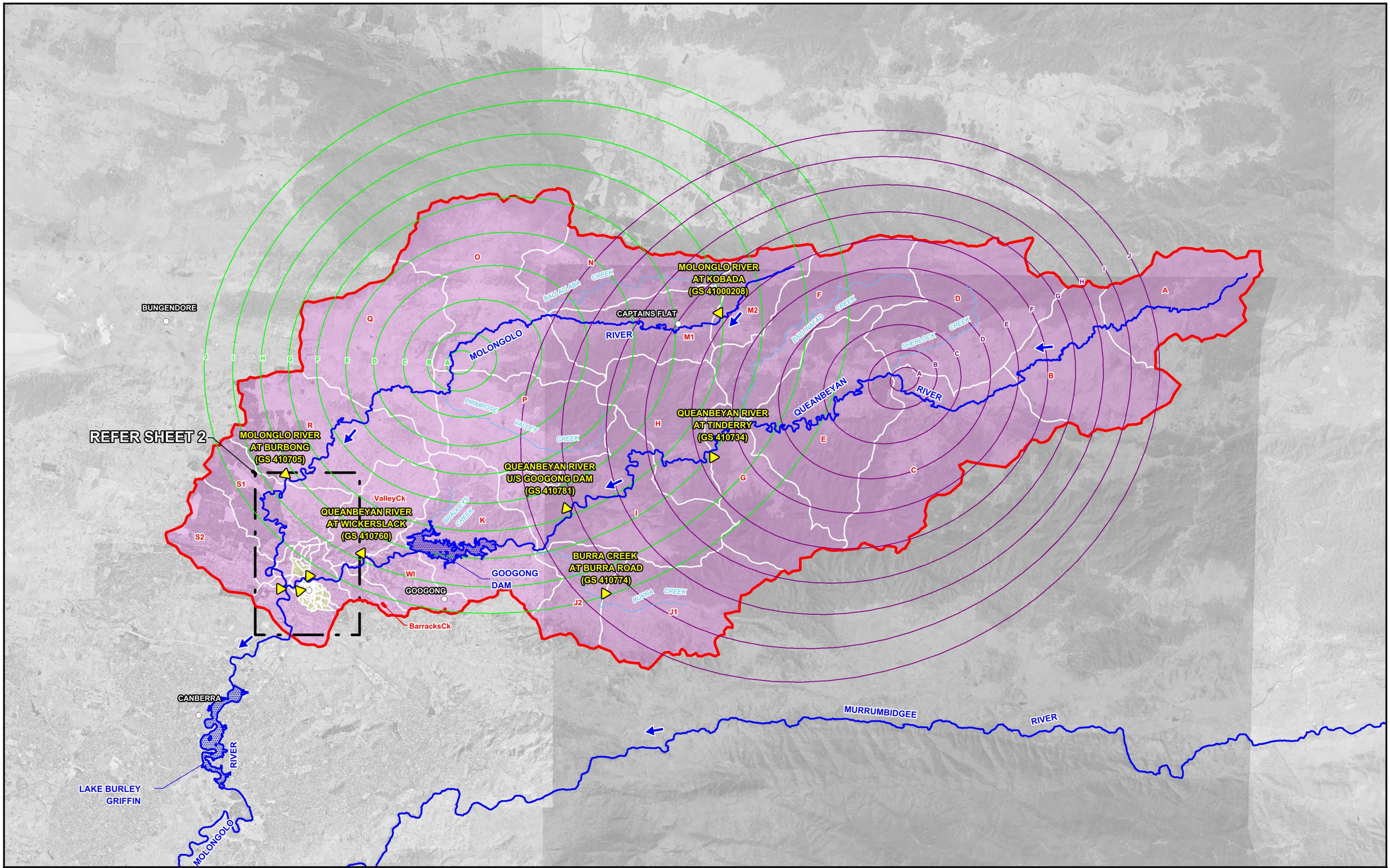
C1.1 Queanbeyan Hydrologic Model Layout (2 Sheets)
C1.2 Modelled and Recorded Discharge Hydrographs – December 2010 Flood

C2.1 Queanbeyan TUFLOW Model Layout (2 Sheets)
C2.2 TUFLOW Schematisation of Floodplain
C2.3 TUFLOW Model Results – May 1925 Flood
C2.4 TUFLOW Model Results – August 1974 Flood
C2.5 TUFLOW Model Results – October 1976 Flood
C2.6 TUFLOW Model Results – December 2010 Flood (2 Sheets)
C2.7 Water Surface Profiles – Historic Flood Events (2 Sheets)

C3.1 Design Inflow Hydrographs

C4.1 Indicative Extent and Depths of Inundation – 20% AEP (2 Sheets)
C4.2 Indicative Extent and Depths of Inundation –10% AEP (2 Sheets)
C4.3 Indicative Extent and Depths of Inundation – 5% AEP (2 Sheets)
C4.4 Indicative Extent and Depths of Inundation – 2% AEP (2 Sheets)
C4.5 Indicative Extent and Depths of Inundation – 0.5% AEP (2 Sheets)
C4.6 Indicative Extent and Depths of Inundation – 0.2% AEP (2 Sheets)
C4.7 Sensitivity of Flood Behaviour to 20% Increase in Hydraulic Roughness Values – 1% AEP (2 Sheets)
C4.8 Sensitivity of Flood Behaviour to Reduction in Hydraulic Roughness Values in Lower Reaches of Molonglo River – 1% AEP (2 Sheets)
C4.9 Sensitivity of Flood Behaviour to Partial Blockage of Hydraulic Structures – Main Stream Flooding Only - 1% AEP (2 Sheets)
C4.10 Sensitivity of Flood Behaviour to Partial Blockage of Hydraulic Structures – Local Catchment Flooding in Vicinity of Queanbeyan CBD - 1% AEP

DRAFT REPORT FOR PUBLIC EXHIBITION



N

2500 0 2500 5000 7500 m

Scale: 1:250,000

Lyall & Associates

LEGEND

- Catchment Boundary
- Stream Gauge
- Wickerslack PMP Ellipse
- RAFTS Sub-Catchment Boundary and Identifier
- ILSAX Sub-CAtchment Boundary
- Burbong PMP Ellipse

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C1.1
(Sheet 1 of 2)

QUEANBEYAN HYDROLOGIC MODEL LAYOUT

MOLONGLO RIVER AT OAKS ESTATE (GS 410729)

QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)

QUEENS BRIDGE STREAM GAUGE

MOLONGLO RIVER AT BURBONG (GS 410705)

MOLONGLO SEWAGE TREATMENT PLANT

OAKS ESTATE

QUEANBEYAN EAST

CRESTWOOD

QUEANBEYAN WEST

QUEANBEYAN

QUEANBEYAN GOLF COURSE

GREENLEIGH

KARABAR

JERRABOMBERRA

DON R. CAMPBELL PARK

MOLONGLO GORGE

REEDY CREEK

VALLEY CREEK

BARRACKS CREEK

MOLONGLO RIVER

GOULBURN-QUEANBEYAN RAILWAY LINE

AUSTRALIAN CAPITAL TERRITORY

NEW SOUTH WALES

KINGS HWY

CAPTAINS FLAT RD

QUEANBEYAN RIVER

HIGH ST

CROWFORD ST

MORISSET ST

MOWATT ST

CAMPBELL ST

ROSS RD

SURVEYOR ST

CANBERRA AVE

THARWARD

COOMA ST

ELLERTON DR

LANYON DR

SOUTHBAR RD

S1

S2

L.1

node4

Larmer

MR

BC_1

BC_2

BC_3

BC_4

BC_5

CBD01

Queens

WI2

BarracksCk

ValleyCk

R

N

300 0 300 600 900 m

Scale: 1:30,000

LEGEND

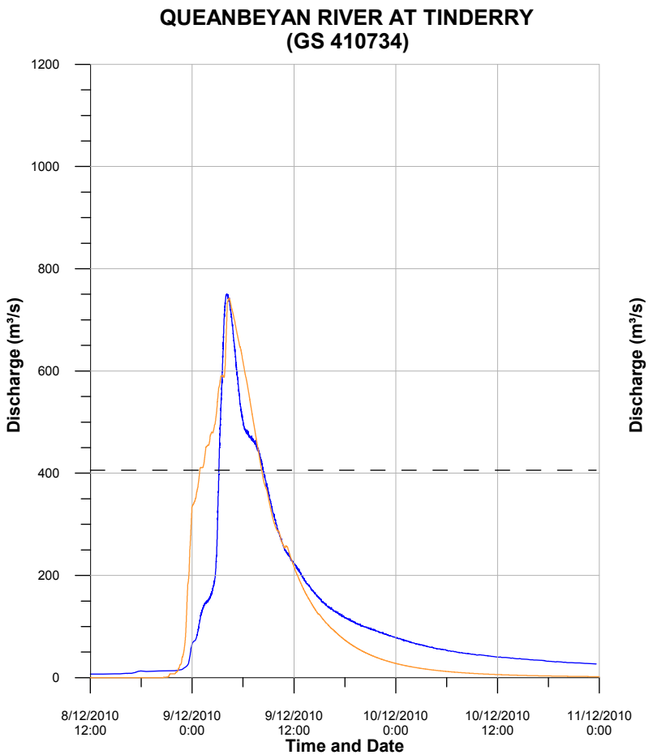
- Stream Gauge
- Stormwater Network
- Two-Dimensional Model Boundary
- BC_1 RAFTS Sub-Catchment Boundary and Identifier
- ILSAX Sub-Catchment Boundary

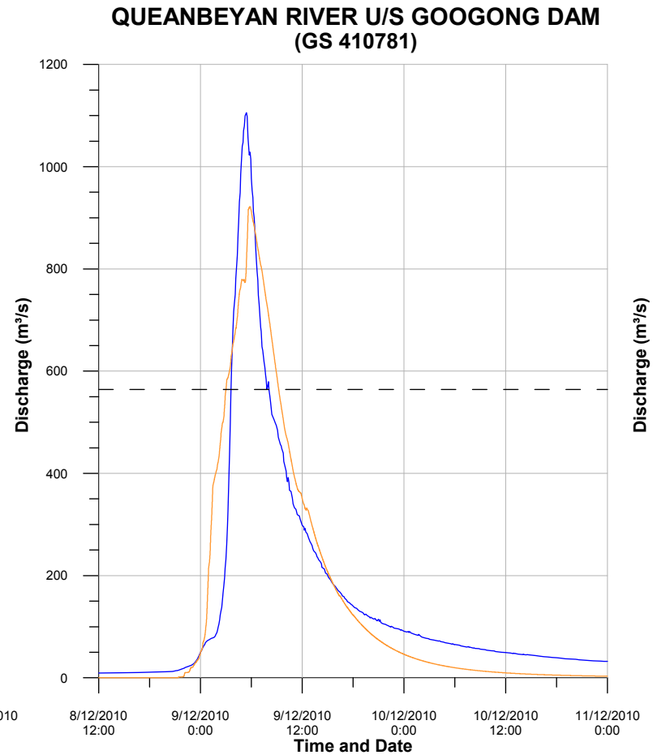
Lyall & Associates

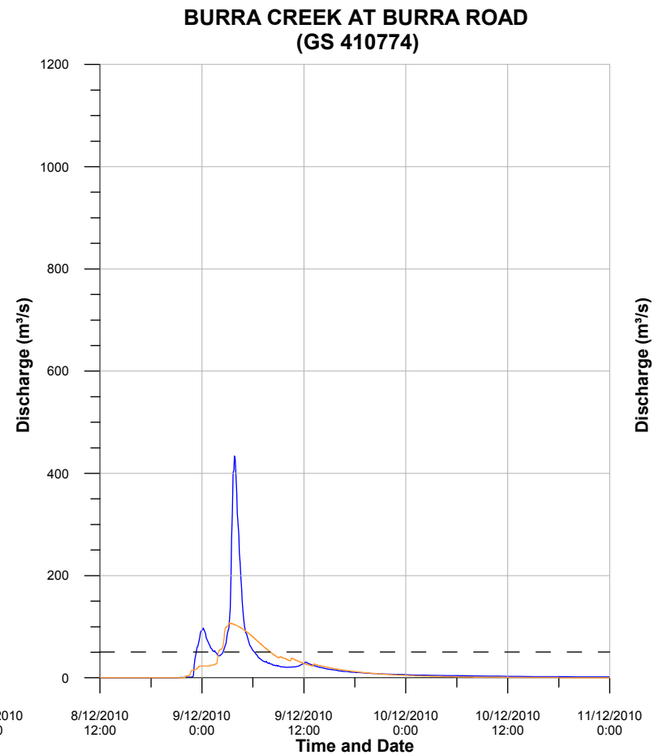
QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

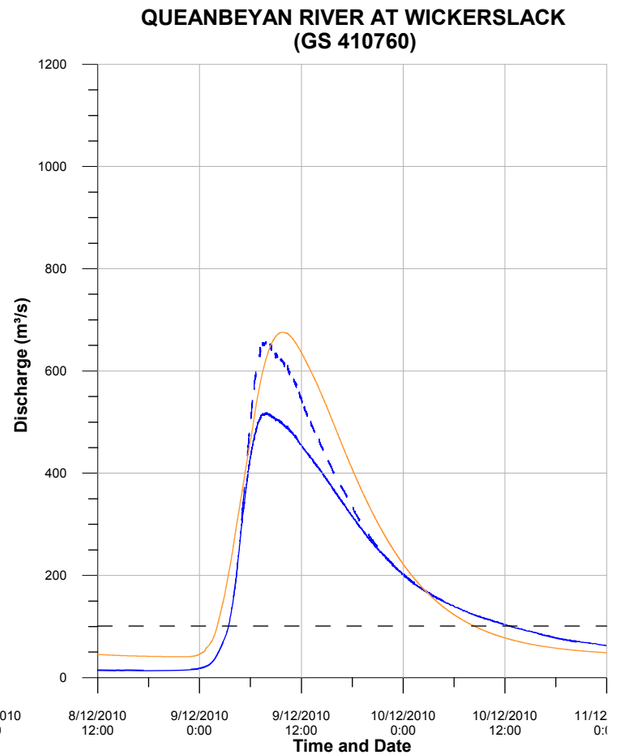
Figure C1.1
(Sheet 2 of 2)

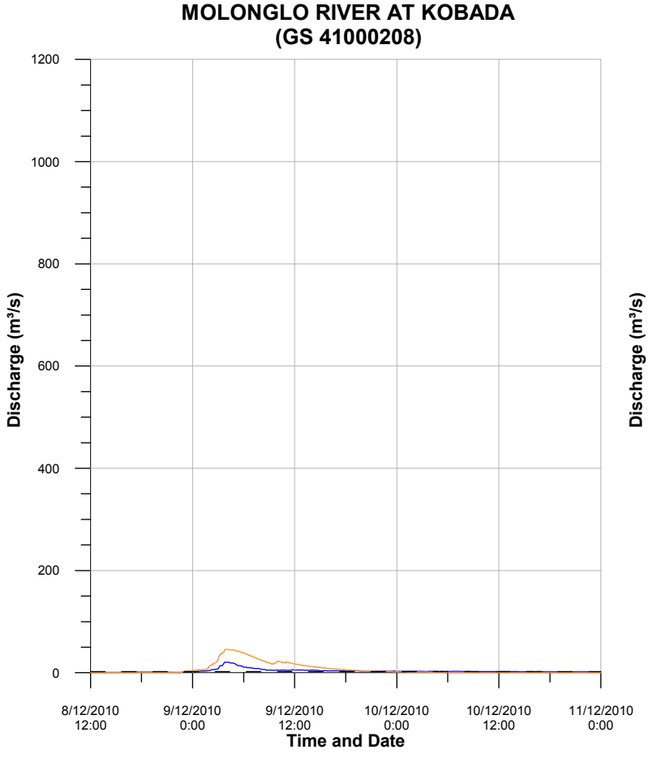
QUEANBEYAN HYDROLOGIC MODEL LAYOUT

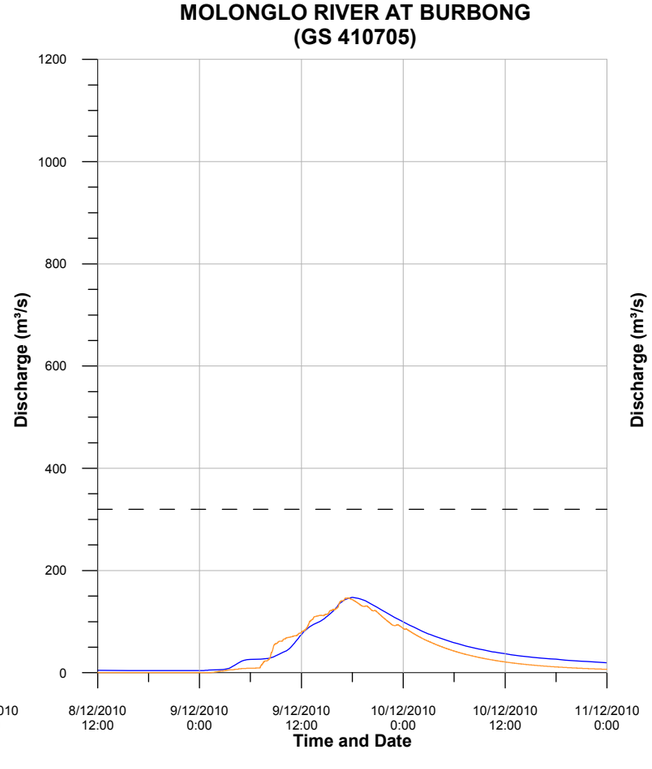


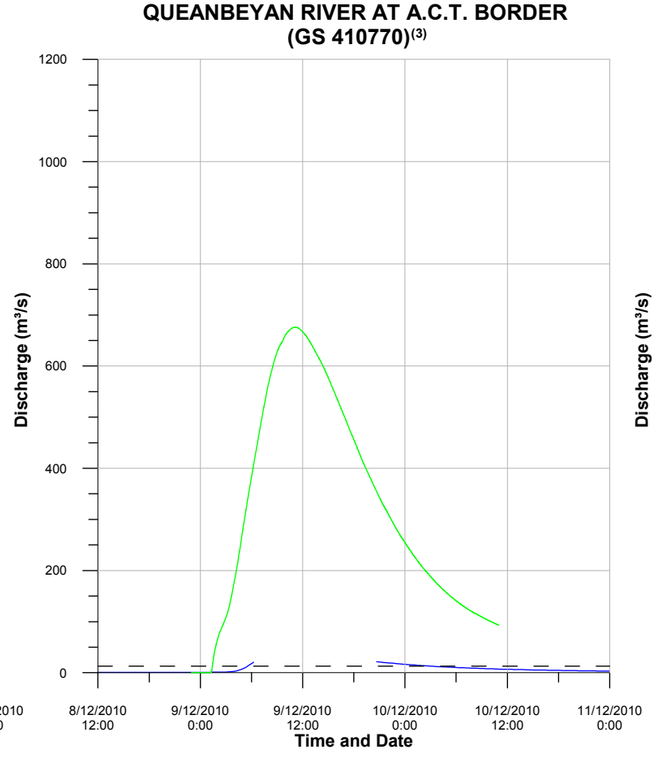


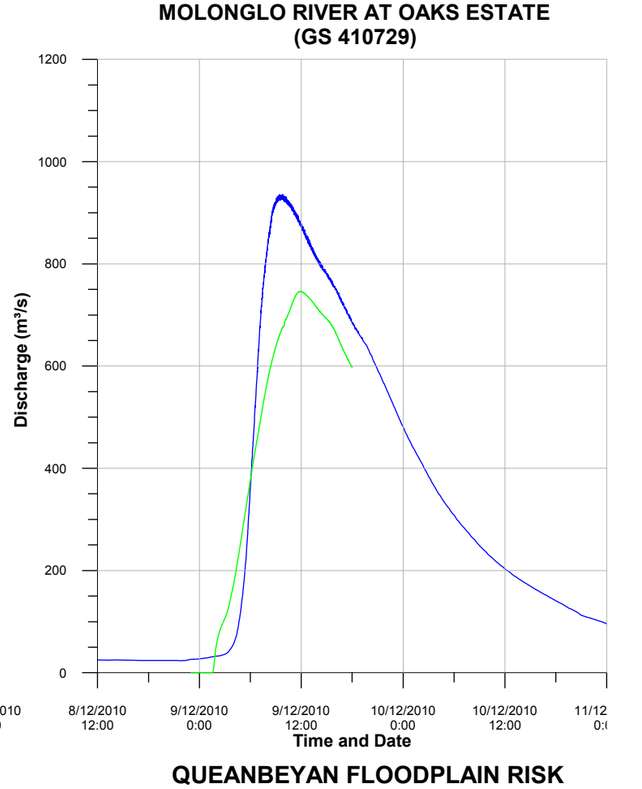












NOTES:

1. Dashed line represents recorded discharge based on the *L&A Derived Rating Curve*.
2. Discharges above maximum gauged value have been derived by extrapolating the rating curve and thereby may not represent actual recorded values.
3. Discharge not recorded between 06:15 and 20:40 hours on 9 December 2010.

LEGEND

- Recorded (Rating Curve Current at Time of Flood)(1)
- Modelled (Queanbeyan Hydrologic Model RAFTS)
- Modelled (Queanbeyan TUFLOW Model)

Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C1.2

MODELLED AND RECORDED DISCHARGE HYDROGRAPHS
DECEMBER 2010 FLOOD

REFER INSET 1

REEDY CREEK

MOLONGLO GORGE

MOLONGLO RIVER

MOLONGLO SEWAGE TREATMENT PLANT

MOLONGLO RIVER AT OAKS ESTATE (GS 410729)

OAKS ESTATE

GOULBURN-QUEANBEYAN RAILWAY LINE

AUSTRALIAN CAPITAL TERRITORY

NEW SOUTH WALES

QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)

QUEANBEYAN EAST

CRESTWOOD

REFER SHEET 2

HIGH ST

DON R. CAMPBELL PARK

QUEENS BRIDGE STREAM GAUGE

MORISSET ST

MOWATT ST

KINGS HWY

ROSS RD

SURVEYOR ST

CAMPBELL ST

CAWFORD ST

THARWA RD

QUEANBEYAN

QUEANBEYAN GOLF COURSE

ELLERTON DR

COOMA ST

QUEANBEYAN RIVER

GREENLEIGH

SOUTHBAR RD

KARABAR

BARRACKS CREEK

REFER INSET 2

MOLONGLO RIVER AT BURBONG (GS 410705)

CAPTAINS FLAT

INSET 1

MAJURA RD

MORSHEAD DR

LAKE BURLEY GRIFFIN

MONARO HWY

DAIRY RD

PIALLIGO AVE

NEWCASTLE ST

REFER MAIN WINDOW

INSET 2

BARRACKS CREEK

REFER MAIN WINDOW

OLD COOMA RD

WICKERSLACK LN

QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

QUEANBEYAN RIVER

TUFLOW ONE-DIMENSIONAL ELEMENT

- Inlet Pit
- Junction Pit
- Headwall
- Pipe / Box Culvert
- Channel
- LiDAR Derived Cross Section
- Surveyed Cross Section

TUFLOW BOUNDARY CONDITIONS

- Inflow - Rain Boundary
- Inflow - Point Source
- Outlet (Free Discharge)
- Inflow Boundary
- Two-Dimensional Model Boundary

N

300 0 300 600 900 m

Scale: 1:30,000

LEGEND

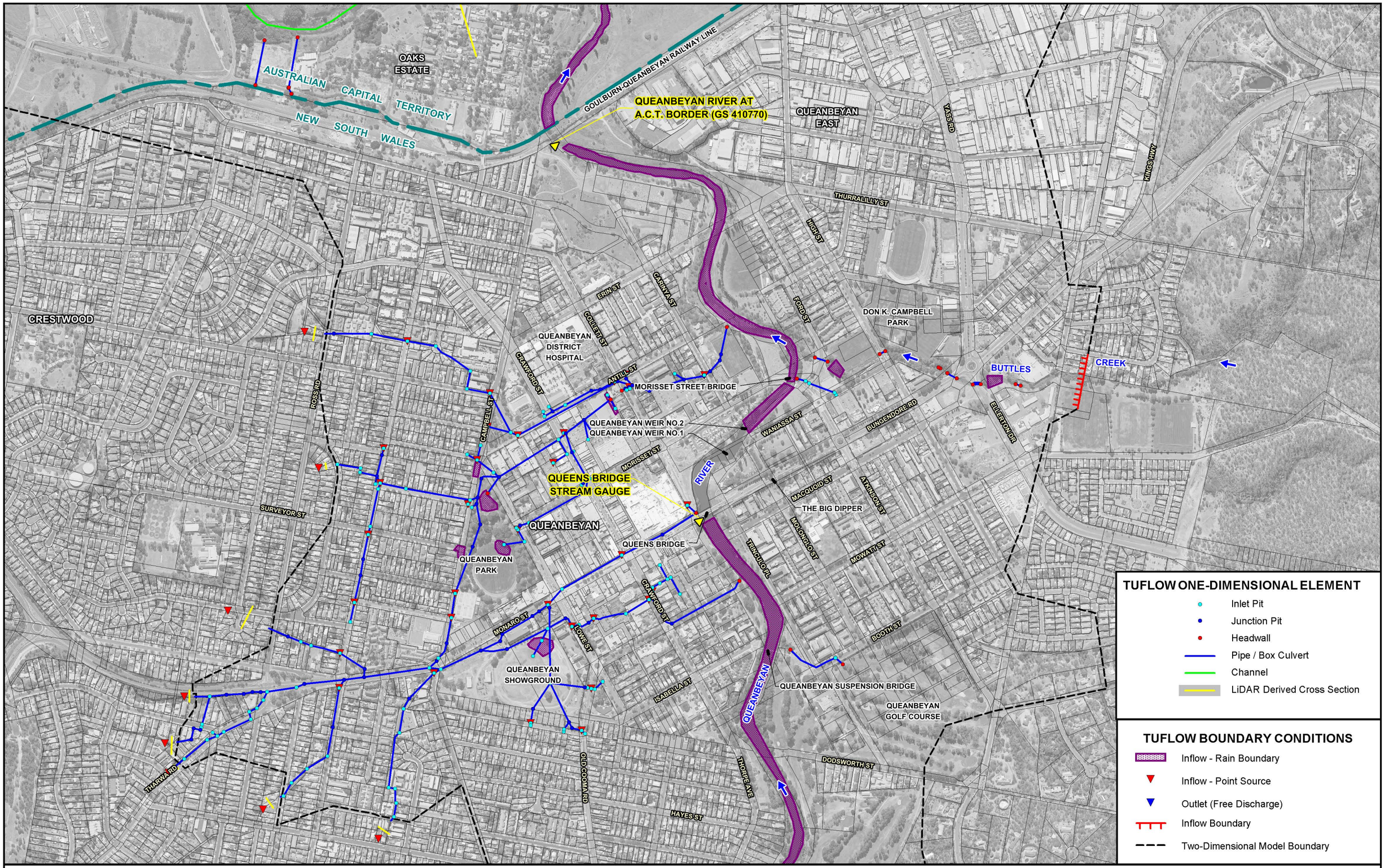
- Stream Gauge

Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C2.1
(Sheet 1 of 2)

QUEANBEYAN TUFLOW MODEL LAYOUT



TUFLOW ONE-DIMENSIONAL ELEMENT

- Inlet Pit
- Junction Pit
- Headwall
- Pipe / Box Culvert
- Channel
- LiDAR Derived Cross Section

TUFLOW BOUNDARY CONDITIONS

- Inflow - Rain Boundary
- Inflow - Point Source
- Outlet (Free Discharge)
- Inflow Boundary
- Two-Dimensional Model Boundary

N

100 0 100 200 300 m

Scale: 1:10,000

LEGEND

Stream Gauge

Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C2.1
(Sheet 2 of 2)

QUEANBEYAN TUFLOW MODEL LAYOUT

TUFLOW HYDRAULIC ROUGHNESS SCHEMATISATION

- Grassed Areas
- Roads
- Vegetation
- Dense Vegetation
- River Bed and Ponding Areas
- Maintained Parks
- Buildings
- Grassed/Paved Inter-Allotment Area

Indicative Depth of Inundation (m)

- 0.10 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 2.20
- 2.20 to 2.40
- 2.40 to 2.60
- 2.60 to 2.80
- 2.80 to 3.00
- 3.00 to 3.50
- > 3.50
- Flow Direction Arrow

RIVERSIDE SPORTING FACILITY
CARINYA ST
COLLETT ST
MORISSET ST
RIVERSIDE TOURIST PARK
RIVER
QUEEN ELIZABETH PARK
QUEANBEYAN

N

20 0 20 40 60 m

Scale: 1:2,000

LEGEND

- Modelled Stormwater Network
- Building Outlines

Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C2.2

TUFLOW SCHEMATISATION OF FLOODPLAIN

WINDOW 1

WINDOW 2

JOINS WINDOW 2

JOINS WINDOW 1

QUEANBEYAN GOLF COURSE

HAYES ST

COOMA ST

THORPE AVE

DANE ST

GREENLEIGH

VALLEY CREEK

QUEANBEYAN RIVER DR

BARRACKS CREEK

BARRACKS FLAT DR

RIVER

WICKERSLACK LANE

QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

MOLONGLO RIVER

SEWAGE TREATMENT PLANT

MOLONGLO RIVER AT OAKS ESTATE (GS 410729)

OAKS ESTATE

AUSTRALIAN CAPITAL TERRITORY

NEW SOUTH WALES

QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)

CRESTWOOD

QUEANBEYAN WEST

QUEENS BRIDGE STREAM GAUGE

GOULBURN-QUEANBEYAN RAILWAY LINE

QUEANBEYAN EAST

YASS RD

KINGS HWY

HIGH ST

DON R. CAMPBELL PARK

1925.1

BUTTLES CREEK

CRAWFORD ST

ROSS RD

CAMPBELL ST

SURVEYOR ST

MORISSET ST

QUEANBEYAN

MOWATT ST

ELLERTON DR

THARWARD RD

QUEANBEYAN

HAYES ST

COOMA ST

THORPE AVE

QUEANBEYAN GOLF COURSE

DON RD

Indicative Depth of Inundation (m)

< 0.10
0.10 to 0.50
0.50 to 1.00
1.00 to 1.50
1.50 to 2.00
2.00 to 2.20
2.20 to 2.40
2.40 to 2.60
2.60 to 2.80
2.80 to 3.00
3.00 to 3.50
> 3.50

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 1925.1 Flood Mark Location and Identifier
- 575.0 Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C2.3

TUFLOW MODEL RESULTS
MAY 1925 FLOOD

WINDOW 1

WINDOW 2

JOINS WINDOW 2

JOINS WINDOW 1

QUEANBEYAN GOLF COURSE

HAYES ST

COOMA ST

THORPE AVE

1974.1

DANE ST

GREENLEIGH

VALLEY CREEK

QUEANBEYAN RIVER DR

BARRACKS FLAT DR

BARRACKS CREEK

RIVER

WICKERSLACK LANE

QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

MOLONGLO RIVER

SEWAGE TREATMENT PLANT

MOLONGLO RIVER AT OAKS ESTATE (GS 410729)

OAKS ESTATE

GOULBURN-QUEANBEYAN RAILWAY LINE

QUEANBEYAN EAST

YASS RD

KINGS HWY

AUSTRALIAN CAPITAL TERRITORY

NEW SOUTH WALES

QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)

CRESTWOOD

1974.5

HIGH ST

DON R. CAMPBELL PARK

BUTTLES CREEK

CRAWFORD ST

ROSS RD

CAMPBELL ST

MORISSET ST

QUEANBEYAN

1974.4

SURVEYOR ST

QUEANBEYAN WEST

QUEENS BRIDGE STREAM GAUGE

MOWATT ST

ELLERTON DR

KINGS HWY

1974.3

THARWA RD

QUEANBEYAN

HAYES ST

1974.2

QUEANBEYAN GOLF COURSE

COOMA ST

THORPE AVE

Indicative Depth of Inundation (m)

- < 0.10
- 0.10 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 2.20
- 2.20 to 2.40
- 2.40 to 2.60
- 2.60 to 2.80
- 2.80 to 3.00
- 3.00 to 3.50
- > 3.50

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 1974.1 Flood Mark Location and Identifier
- 575.0 Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C2.4

TUFLOW MODEL RESULTS
AUGUST 1974 FLOOD

WINDOW 1

WINDOW 2

JOINS WINDOW 2

JOINS WINDOW 1

QUEANBEYAN GOLF COURSE

HAYES ST

COOMA ST

THORPE AVE

1976.1

DANE ST

GREENLEIGH

VALLEY CREEK

QUEANBEYAN RIVER DR

BARRACKS CREEK

BARRACKS FLAT DR

QUEANBEYAN RIVER

WICKERSLACK LANE

QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

MOLONGLO RIVER

SEWAGE TREATMENT PLANT

MOLONGLO RIVER AT OAKS ESTATE (GS 410729)

OAKS ESTATE

AUSTRALIAN CAPITAL TERRITORY

NEW SOUTH WALES

QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)

CRESTWOOD

GOULBURN-QUEANBEYAN RAILWAY LINE

QUEANBEYAN EAST

YASS RD

KINGS HWY

HIGH ST

1976.6

DON R. CAMPBELL PARK

1976.5

BUTTLES CREEK

CRAWFORD ST

ROSS RD

CAMPBELL ST

MORISSET ST

QUEANBEYAN

1976.3

SURVEYOR ST

QUEANBEYAN WEST

QUEENS BRIDGE STREAM GAUGE

MOWATT ST

1976.4

ELLERTON DR

KINGS HWY

THARWARD RD

QUEANBEYAN

HAYES ST

1976.2

QUEANBEYAN GOLF COURSE

COOMA ST

THORPE AVE

DON RD

Indicative Depth of Inundation (m)

< 0.10
0.10 to 0.50
0.50 to 1.00
1.00 to 1.50
1.50 to 2.00
2.00 to 2.20
2.20 to 2.40
2.40 to 2.60
2.60 to 2.80
2.80 to 3.00
3.00 to 3.50
> 3.50

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 1976.2 Flood Mark Location and Identifier
- 575.0 Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C2.5

TUFLOW MODEL RESULTS
OCTOBER 1976 FLOOD

WINDOW 1

WINDOW 2

QUEANBEYAN GOLF COURSE

JOINS WINDOW 2

HAYES ST

COOMA ST

THORPE AVE

DANE ST

GREENLEIGH

VALLEY CREEK

QUEANBEYAN RIVER DR

BARRACKS FLAT DR

BARRACKS CREEK

RIVER

WICKERSLACK LANE

QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

MOLONGLO RIVER

SEWAGE TREATMENT PLANT

MOLONGLO RIVER

GOULBURN-QUEANBEYAN RAILWAY LINE

AUSTRALIAN CAPITAL TERRITORY

NEW SOUTH WALES

MOLONGLO RIVER AT OAKS ESTATE (GS 410729)

OAKS ESTATE

QUEANBEYAN EAST

YASS RD

KINGS HWY

HIGH ST

2010.62

2010.61

2010.63

2010.64

2010.59

QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)

CRESTWOOD

CRAWFORD ST

DON R. CAMPBELL PARK

REFER SHEET 2

BUTTLES CREEK

MORISSET ST

QUEANBEYAN

ROSS RD

CAMPBELL ST

SURVEYOR ST

QUEANBEYAN WEST

QUEENS BRIDGE STREAM GAUGE

MOWATT ST

ELLERTON DR

KINGS HWY

2010.09

2010.11

2010.01

2010.08

THARWARD

QUEANBEYAN

HAYES ST

COOMA ST

THORPE AVE

QUEANBEYAN GOLF COURSE

JOINS WINDOW 1

Indicative Depth of Inundation (m)

< 0.10
0.10 to 0.50
0.50 to 1.00
1.00 to 1.50
1.50 to 2.00
2.00 to 2.20
2.20 to 2.40
2.40 to 2.60
2.60 to 2.80
2.80 to 3.00
3.00 to 3.50
> 3.50

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

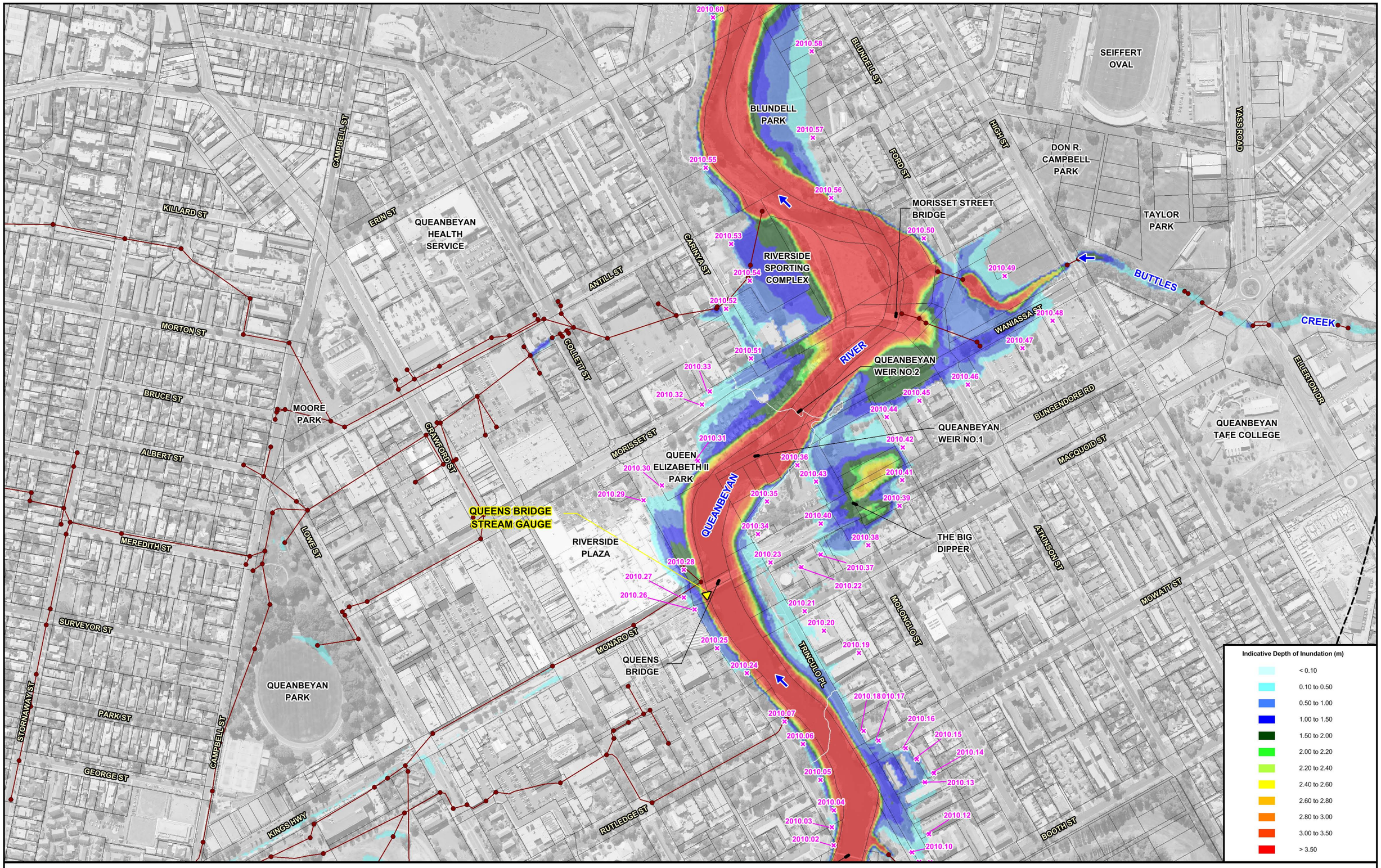
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 2010.63 Flood Mark Location and Identifier
- 575.0 Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C2.6
(Sheet 1 of 2)

TUFLOW MODEL RESULTS
DECEMBER 2010 FLOOD



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

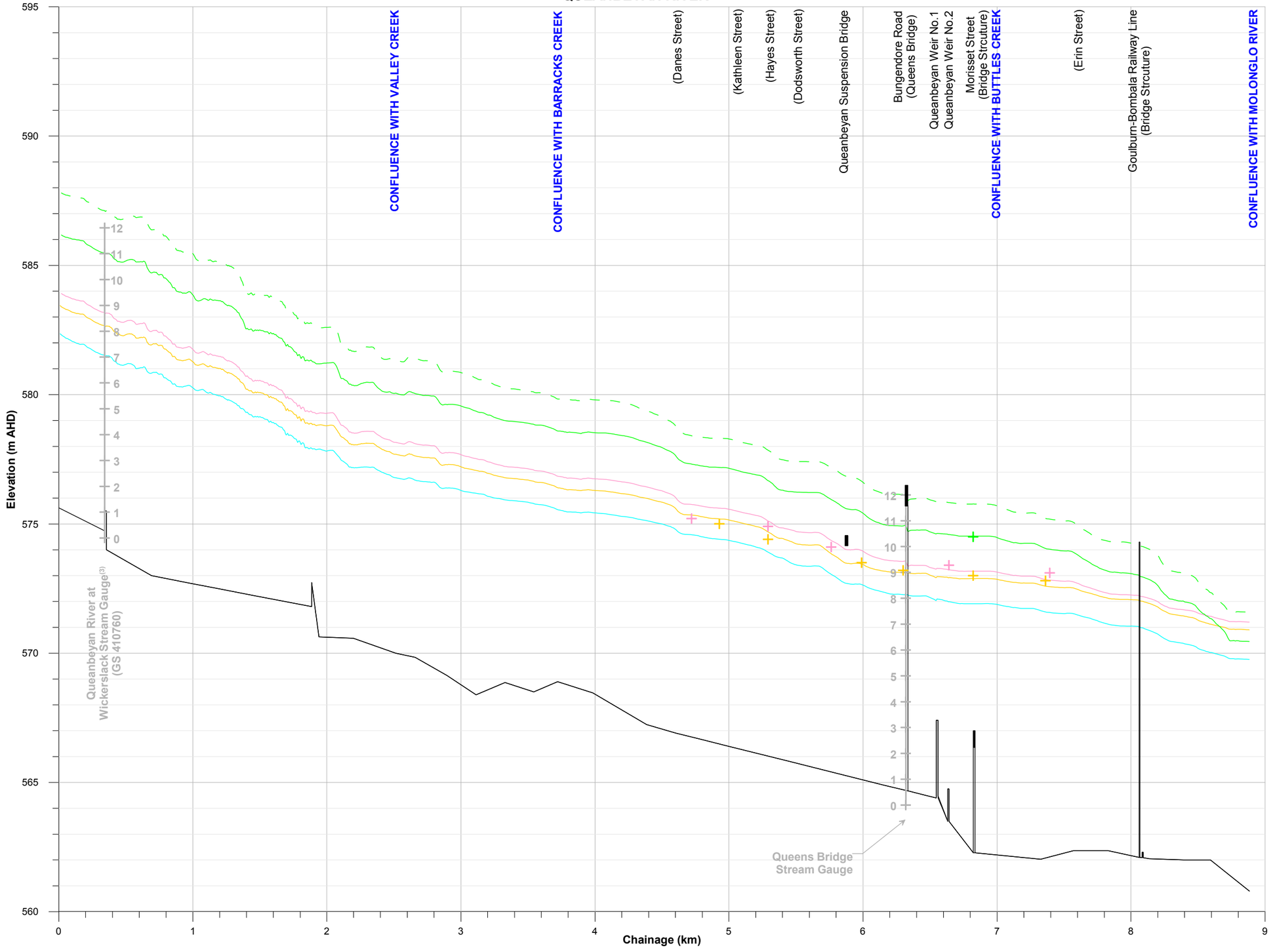
- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 2010.21 Flood Mark Location and Identifier
- 575.0 Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C2.6
(Sheet 2 of 2)

TUFLOW MODEL RESULTS
DECEMBER 2010 FLOOD

QUEANBEYAN RIVER



LEGEND

Historic Flood Mark	Historic Water Surface Profile
+	May 1925 Flood(1)
+	August 1974 Flood
+	October 1976 Flood
	December 2010 Flood

NOTES:

1. Solid lines represent May 1925 water surface profile based on the Lower Estimate of the peak flow in the Queanbeyan River (i.e. 1,600 m^3/s), while the dashed line represents the surface profile based on the Upper Estimate of peak flow in the Queanbeyan River (i.e. 2,120 m^3/s).
2. Recorded flood marks are located on the edges of the flood affected area and are not representative of water levels within the inbank area of the Queanbeyan River. Table C4.7 shows the difference between modelled and recorded peak flood levels.
3. Gauge zero of Wickerslack stream gauge assummed to be 574.45 m AHD

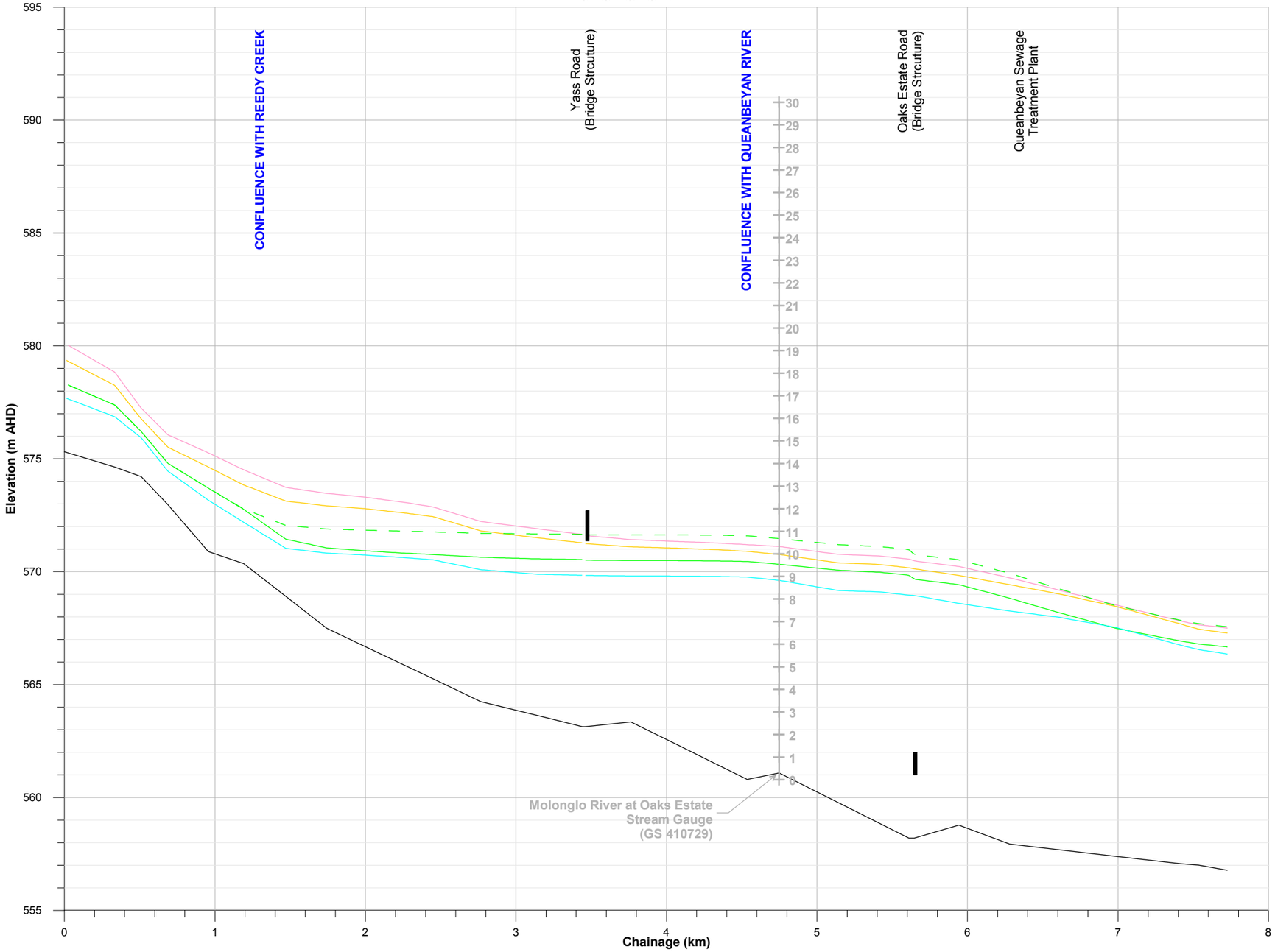
Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C2.7
(Sheet 1 of 2)

WATER SURFACE PROFILES
HISTORIC FLOOD EVENTS

MOLONGLO RIVER



LEGEND

Historic Water Surface Profile

- May 1925 Flood[1]
- August 1974 Flood
- October 1976 Flood
- December 2010 Flood

NOTE:

Solid lines represent May 1925 water surface profile based on the Lower Estimate of the peak flow in the Queanbeyan River (i.e. 1,600 m^3/s), while the dashed line represents the surface profile based on the Upper Estimate of peak flow in the Queanbeyan River (i.e. 2,120 m^3/s).

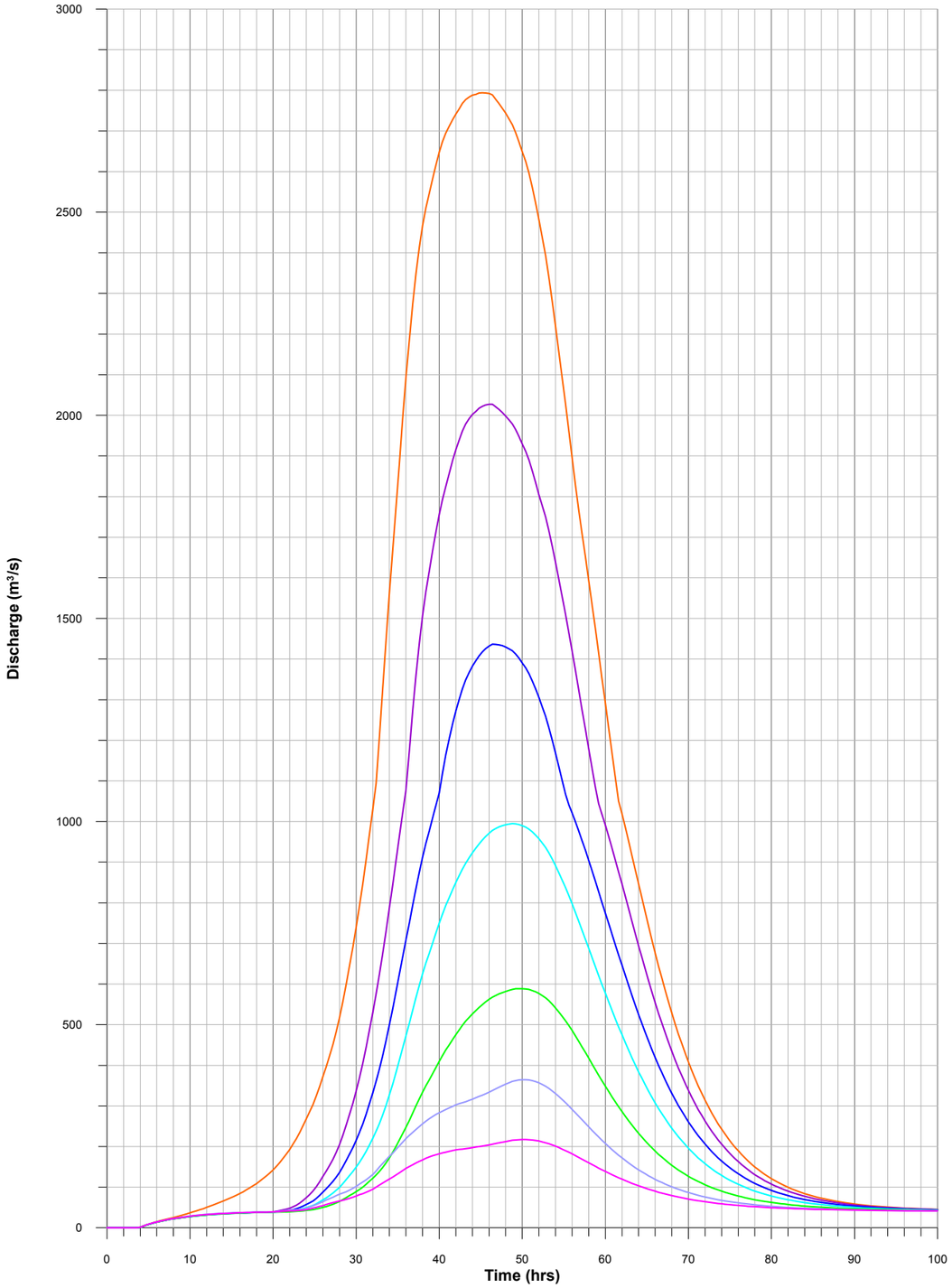
Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

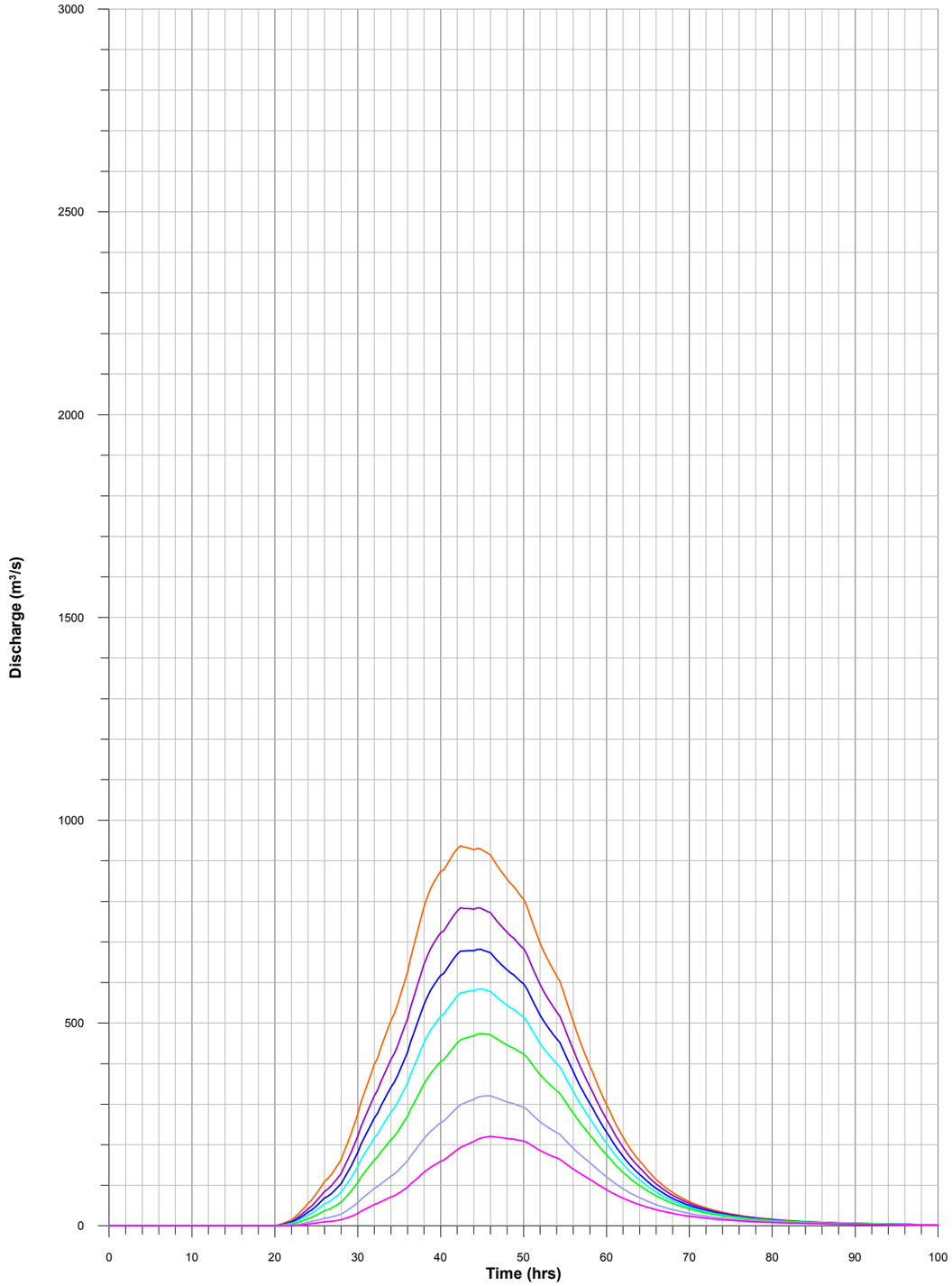
Figure C2.7
(Sheet 2 of 2)

WATER SURFACE PROFILES
HISTORIC FLOOD EVENTS

DESIGN INFLOW HYDROGRAPHS AT WICKERSLACK



DESIGN INFLOW HYDROGRAPHS AT BURBONG



LEGEND

- 2% AEP
- 5% AEP
- 10% AEP
- 20% AEP
- 0.2% AEP
- 0.5% AEP
- 1% AEP

Lyall & Associates

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C3.1

DESIGN INFLOW HYDROGRAPHS

WINDOW 1

WINDOW 2

HIRST AVE
HAYES ST
COOMAST
THORPE AVE
QUEANBEYAN GOLF COURSE
JOINS WINDOW 2
PDE
WOODGER
DANE ST
GREENLEIGH
VALLEY
CREEK
QUEANBEYAN
RIVER DR
DR
FLAT
BARRACKS
CREEK
BARRACKS
RIVER
WICKERSLACK LANE
QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

MOLONGLO
RIVER
SEWAGE TREATMENT PLANT
MOLONGLO
RIVER
GOULBURN-QUEANBEYAN RAILWAY LINE
MOLONGLO RIVER AT OAKS ESTATE (GS 410729)
OAKS ESTATE
RIVER
QUEANBEYAN EAST
YASS RD
KINGS HWY
AUSTRALIAN CAPITAL TERRITORY
NEW SOUTH WALES
QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)
HIGH ST
CRESTWOOD
CRAWFORD ST
REFER SHEET 2
DON R. CAMPBELL PARK
BUTTLES
CREEK
ROSS RD
CAMPBELL ST
MORISSET ST
QUEANBEYAN
SURVEYOR ST
QUEANBEYAN WEST
QUEENS BRIDGE STREAM GAUGE
MOWATT ST
ELLERTON DR
KINGS HWY
THARWARD
QUEANBEYAN
HIRST AVE
HAYES ST
QUEANBEYAN GOLF COURSE
JOINS WINDOW 1
CAMERON RD
COOMAST
THORPE AVE

Indicative Depth of Inundation (m)

< 0.10
0.10 to 0.50
0.50 to 1.00
1.00 to 1.50
1.50 to 2.00
2.00 to 2.20
2.20 to 2.40
2.40 to 2.60
2.60 to 2.80
2.80 to 3.00
3.00 to 3.50
> 3.50

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

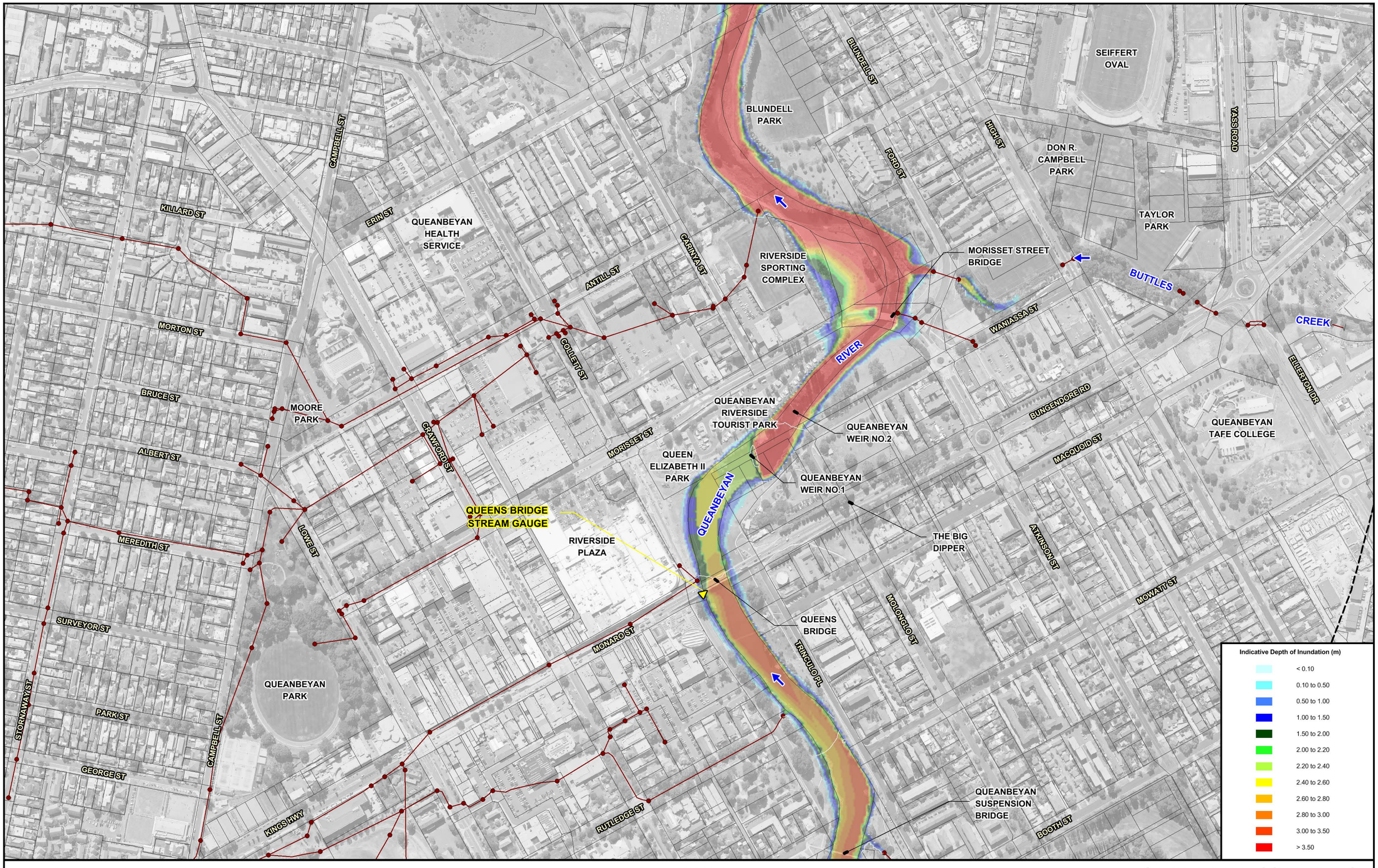
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 575.0 Mainstream Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.1
(Sheet 1 of 2)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
20% AEP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 575.0 Mainstream Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.1
(Sheet 2 of 2)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
20% AEP

WINDOW 1

WINDOW 2

HIRST AVE
HAYES ST
COOMAST
THORPE AVE
QUEANBEYAN GOLF COURSE
JOINS WINDOW 2
WOODGER PDE
DANE ST
GREENLEIGH
VALLEY CREEK
QUEANBEYAN RIVER DR
BARRACKS CREEK
BARRACKS FLAT DR
RIVER
WICKERSLACK LANE
QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

MOLONGLO RIVER
SEWAGE TREATMENT PLANT
MOLONGLO RIVER
GOULBURN-QUEANBEYAN RAILWAY LINE
MOLONGLO RIVER
MOLONGLO RIVER AT OAKS ESTATE (GS 410729)
OAKS ESTATE
AUSTRALIAN CAPITAL TERRITORY
NEW SOUTH WALES
QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)
QUEANBEYAN EAST
YASS RD
KINGS HWY
HIGH ST
CRESTWOOD
CRAWFORD ST
REFER SHEET 2
DON R. CAMPBELL PARK
BUTTLES CREEK
ROSS RD
CAMPBELL ST
MORISSET ST
QUEANBEYAN
SURVEYOR ST
QUEANBEYAN WEST
QUEENS BRIDGE STREAM GAUGE
KINGS HWY
MOWATT ST
ELLERTON DR
THARWARD
QUEANBEYAN
HIRST AVE
HAYES ST
QUEANBEYAN GOLF COURSE
JOINS WINDOW 1
CAMERON RD
COOMAST
THORPE AVE

Indicative Depth of Inundation (m)

< 0.10
0.10 to 0.50
0.50 to 1.00
1.00 to 1.50
1.50 to 2.00
2.00 to 2.20
2.20 to 2.40
2.40 to 2.60
2.60 to 2.80
2.80 to 3.00
3.00 to 3.50
> 3.50

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

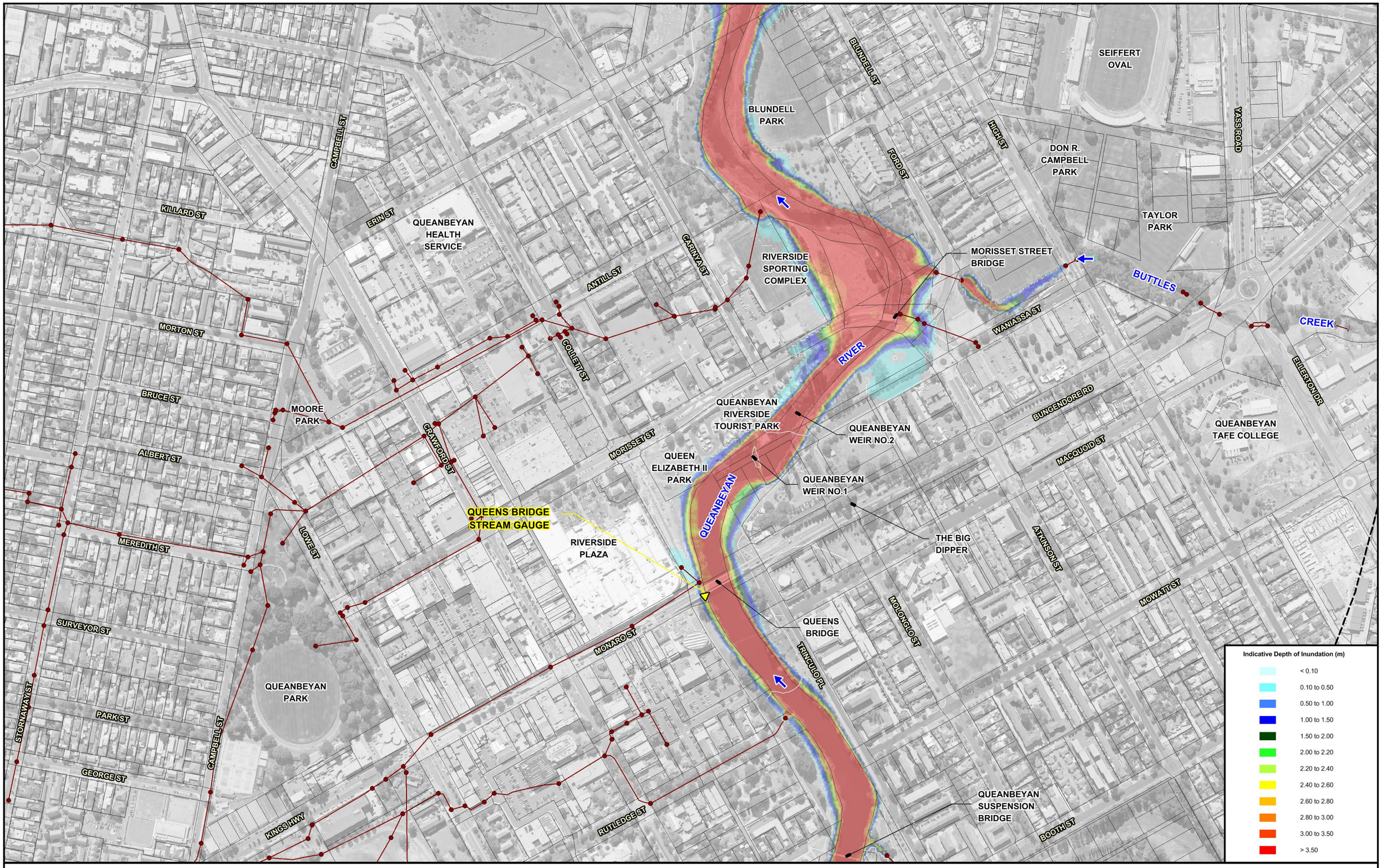
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 575.0 Mainstream Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.2
(Sheet 1 of 2)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
10% AEP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 575.0 Mainstream Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.2
(Sheet 2 of 2)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
10% AEP

WINDOW 1

WINDOW 2

HIRST AVE
HAYES ST
COOMAST
THORPE AVE
QUEANBEYAN GOLF COURSE
JOINS WINDOW 2
PDE
WOODGER
DANE ST
GREENLEIGH
VALLEY
CREEK
QUEANBEYAN
RIVER DR
DR
FLAT
BARRACKS
CREEK
BARRACKS
RIVER
WICKERSLACK LANE
QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

MOLONGLO
RIVER
SEWAGE TREATMENT PLANT
MOLONGLO
RIVER
GOULBURN-QUEANBEYAN RAILWAY LINE
MOLONGLO RIVER AT OAKS ESTATE (GS 410729)
OAKS ESTATE
RIVER
QUEANBEYAN EAST
YASS RD
KINGS HWY
AUSTRALIAN CAPITAL TERRITORY
NEW SOUTH WALES
QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)
RIGHST
CRESTWOOD
CRAWFORD ST
REFER SHEET 2
DON R. CAMPBELL PARK
BUTTLES
CREEK
ROSS RD
CAMPBELL ST
MORISSET ST
QUEANBEYAN
SURVEYOR ST
QUEANBEYAN WEST
QUEENS BRIDGE STREAM GAUGE
MOWATT ST
ELLERTON DR
KINGS HWY
THARWARD
QUEANBEYAN
HIRST AVE
HAYES ST
QUEANBEYAN GOLF COURSE
JOINS WINDOW 1
CAMERON RD
COOMAST
THORPE AVE

Indicative Depth of Inundation (m)

< 0.10
0.10 to 0.50
0.50 to 1.00
1.00 to 1.50
1.50 to 2.00
2.00 to 2.20
2.20 to 2.40
2.40 to 2.60
2.60 to 2.80
2.80 to 3.00
3.00 to 3.50
> 3.50

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

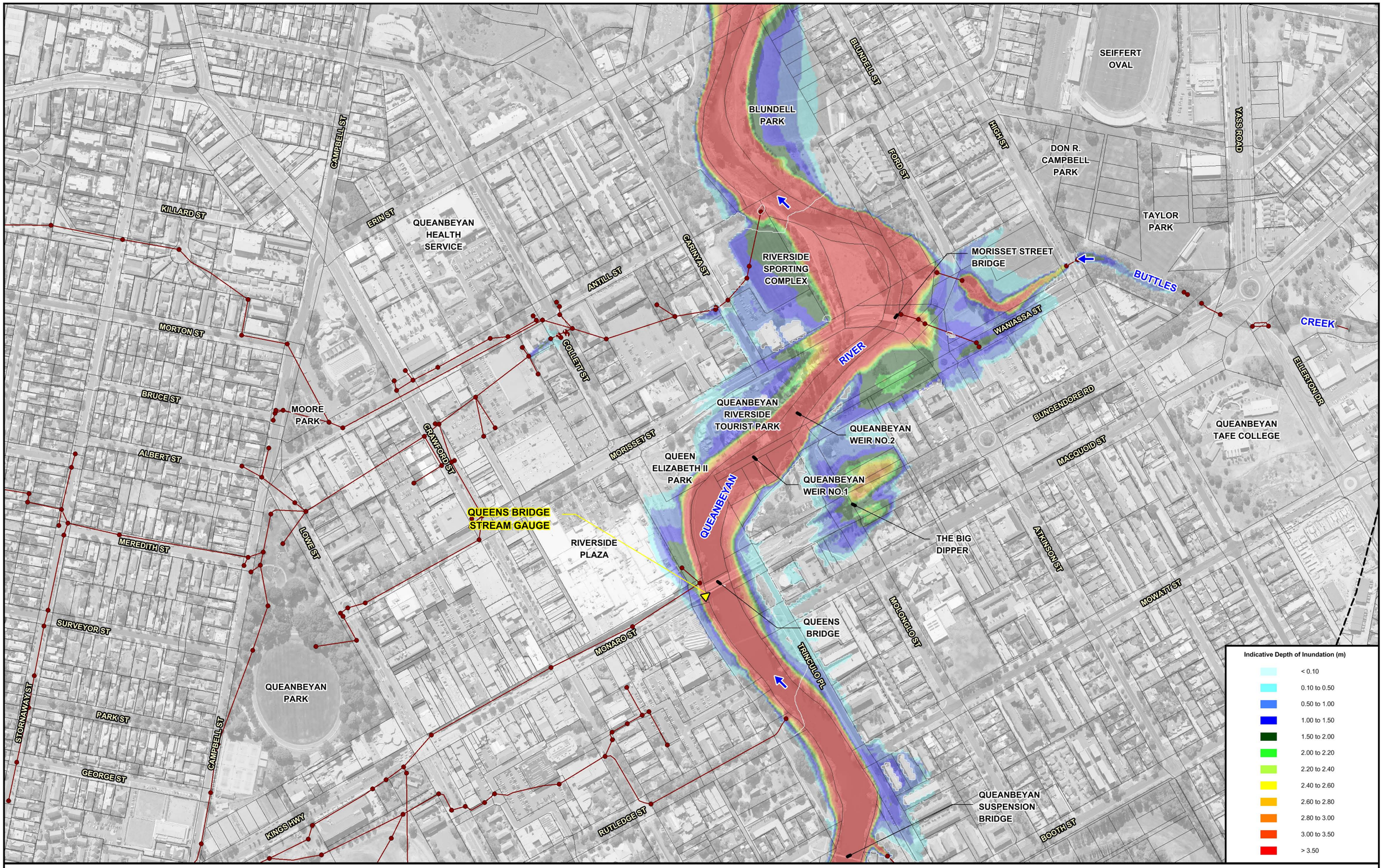
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 575.0 Mainstream Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.3
(Sheet 1 of 2)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
5% AEP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 575.0 Mainstream Water Surface Elevation Contours (m AHD)

QUEANBEAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.3
(Sheet 2 of 2)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
5% AEP

WINDOW 1

WINDOW 2

HIRST AVE
HAYES ST
COOMA ST
THORPE AVE
QUEANBEYAN GOLF COURSE
JOINS WINDOW 2
PPS
WOODGER
DANE ST
GREENLEIGH
VALLEY
CREEK
QUEANBEYAN
RIVER DR
FLAT
DR
BARRACKS
CREEK
BARRACKS
RIVER
WICKERSLACK LANE
QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

MOLONGLO
RIVER
SEWAGE TREATMENT PLANT
MOLONGLO
RIVER
GOULBURN-QUEANBEYAN RAILWAY LINE
MOLONGLO RIVER AT OAKS ESTATE (GS 410729)
OAKS ESTATE
RIVER
QUEANBEYAN EAST
YASS RD
KINGS HWY
AUSTRALIAN CAPITAL TERRITORY
NEW SOUTH WALES
QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)
HIGH ST
CRESTWOOD
CRAWFORD ST
REFER SHEET 2
DON R. CAMPBELL PARK
BUTTLES
CREEK
ROSS RD
CAMPBELL ST
MORISSET ST
QUEANBEYAN
SURVEYOR ST
QUEANBEYAN WEST
QUEENS BRIDGE STREAM GAUGE
MOWATT ST
ELLERTON DR
KINGS HWY
THARWARD
QUEANBEYAN
HIRST AVE
HAYES ST
QUEANBEYAN GOLF COURSE
JOINS WINDOW 1
CAMERON RD
COOMA ST
THORPE AVE

Indicative Depth of Inundation (m)

< 0.10
0.10 to 0.50
0.50 to 1.00
1.00 to 1.50
1.50 to 2.00
2.00 to 2.20
2.20 to 2.40
2.40 to 2.60
2.60 to 2.80
2.80 to 3.00
3.00 to 3.50
> 3.50

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 575.0 Mainstream Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.4
(Sheet 1 of 2)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
2% AEP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 575.0 Mainstream Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.4
(Sheet 2 of 2)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
2% AEP

WINDOW 1

WINDOW 2

HIRST AVE
HAYES ST
COOMAST
THORPE AVE
QUEANBEYAN GOLF COURSE
JOINS WINDOW 2
WOODGER PDE
DANE ST
GREENLEIGH
VALLEY CREEK
QUEANBEYAN RIVER DR
BARRACKS CREEK
BARRACKS FLAT DR
RIVER
WICKERSLACK LANE
QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

MOLONGLO RIVER
SEWAGE TREATMENT PLANT
MOLONGLO RIVER
MOLONGLO RIVER
GOULBURN-QUEANBEYAN RAILWAY LINE
MOLONGLO RIVER AT OAKS ESTATE (GS 410729)
OAKS ESTATE
QUEANBEYAN EAST
YASS RD
KINGS HWY
AUSTRALIAN CAPITAL TERRITORY
NEW SOUTH WALES
QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)
CRESTWOOD
CRAWFORD ST
REFER SHEET 2
DON R. CAMPBELL PARK
BUTTLES CREEK
ROSS RD
SURVEYOR ST
CAMPBELL ST
MORISSET ST
QUEANBEYAN
ELLERTON DR
MOWATT ST
QUEANBEYAN WEST
QUEENS BRIDGE STREAM GAUGE
KINGS HWY
THARWARD
QUEANBEYAN
HIRST AVE
HAYES ST
QUEANBEYAN GOLF COURSE
JOINS WINDOW 1
COOMAST
THORPE AVE
CAMERON RD

Indicative Depth of Inundation (m)

< 0.10
0.10 to 0.50
0.50 to 1.00
1.00 to 1.50
1.50 to 2.00
2.00 to 2.20
2.20 to 2.40
2.40 to 2.60
2.60 to 2.80
2.80 to 3.00
3.00 to 3.50
> 3.50

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

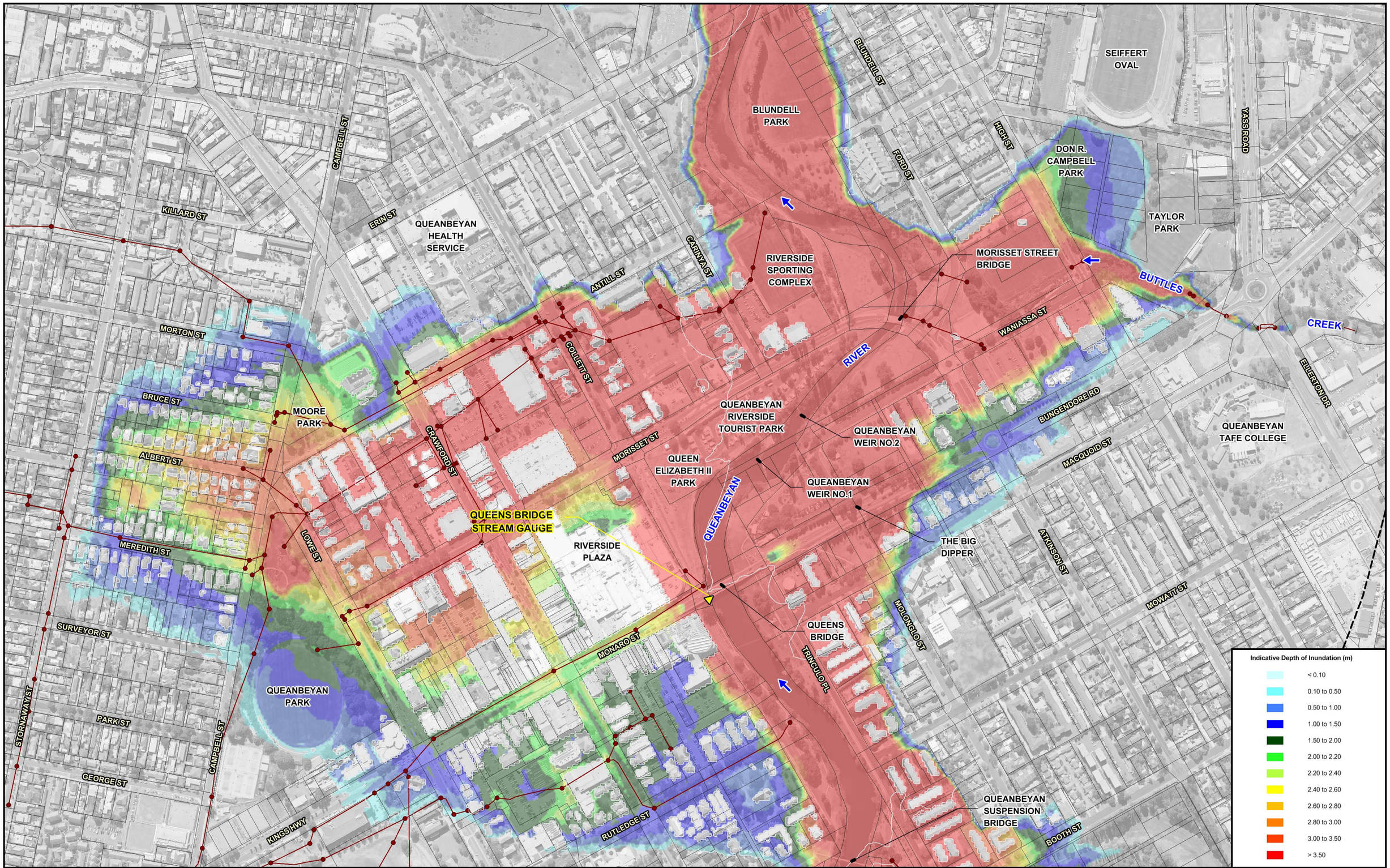
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 575.0 Mainstream Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.5
(Sheet 1 of 2)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
0.5% AEP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 575.0 Mainstream Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.5
(Sheet 2 of 2)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
0.5% AEP

WINDOW 1

WINDOW 2

HIRST AVE
HAYES ST
COOMAST
THORPE AVE
QUEANBEYAN GOLF COURSE
JOINS WINDOW 2
DANE ST
WOODGER PDE
GREENLEIGH
VALLEY CREEK
QUEANBEYAN RIVER DR
BARRACKS CREEK
FLAT DR
BARRACKS
RIVER
WICKERSLACK LANE
QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

MOLONGLO RIVER
SEWAGE TREATMENT PLANT
MOLONGLO RIVER
MOLONGLO RIVER
GOULBURN-QUEANBEYAN RAILWAY LINE
MOLONGLO RIVER AT OAKS ESTATE (GS 410729)
OAKS ESTATE
AUSTRALIAN CAPITAL TERRITORY
NEW SOUTH WALES
QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)
QUEANBEYAN EAST
YASS RD
KINGS HWY
HIGH ST
CRESTWOOD
CRAWFORD ST
REFER SHEET 2
DON R. CAMPBELL PARK
BUTTLES CREEK
ROSS RD
CAMPBELL ST
MORISSET ST
QUEANBEYAN
SURVEYOR ST
QUEANBEYAN WEST
QUEENS BRIDGE STREAM GAUGE
KINGS HWY
MOWATT ST
ELLERTON DR
THARWARD
QUEANBEYAN
HIRST AVE
HAYES ST
QUEANBEYAN GOLF COURSE
JOINS WINDOW 1
CAMERON RD
COOMAST
THORPE AVE

Indicative Depth of Inundation (m)

< 0.10
0.10 to 0.50
0.50 to 1.00
1.00 to 1.50
1.50 to 2.00
2.00 to 2.20
2.20 to 2.40
2.40 to 2.60
2.60 to 2.80
2.80 to 3.00
3.00 to 3.50
> 3.50

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

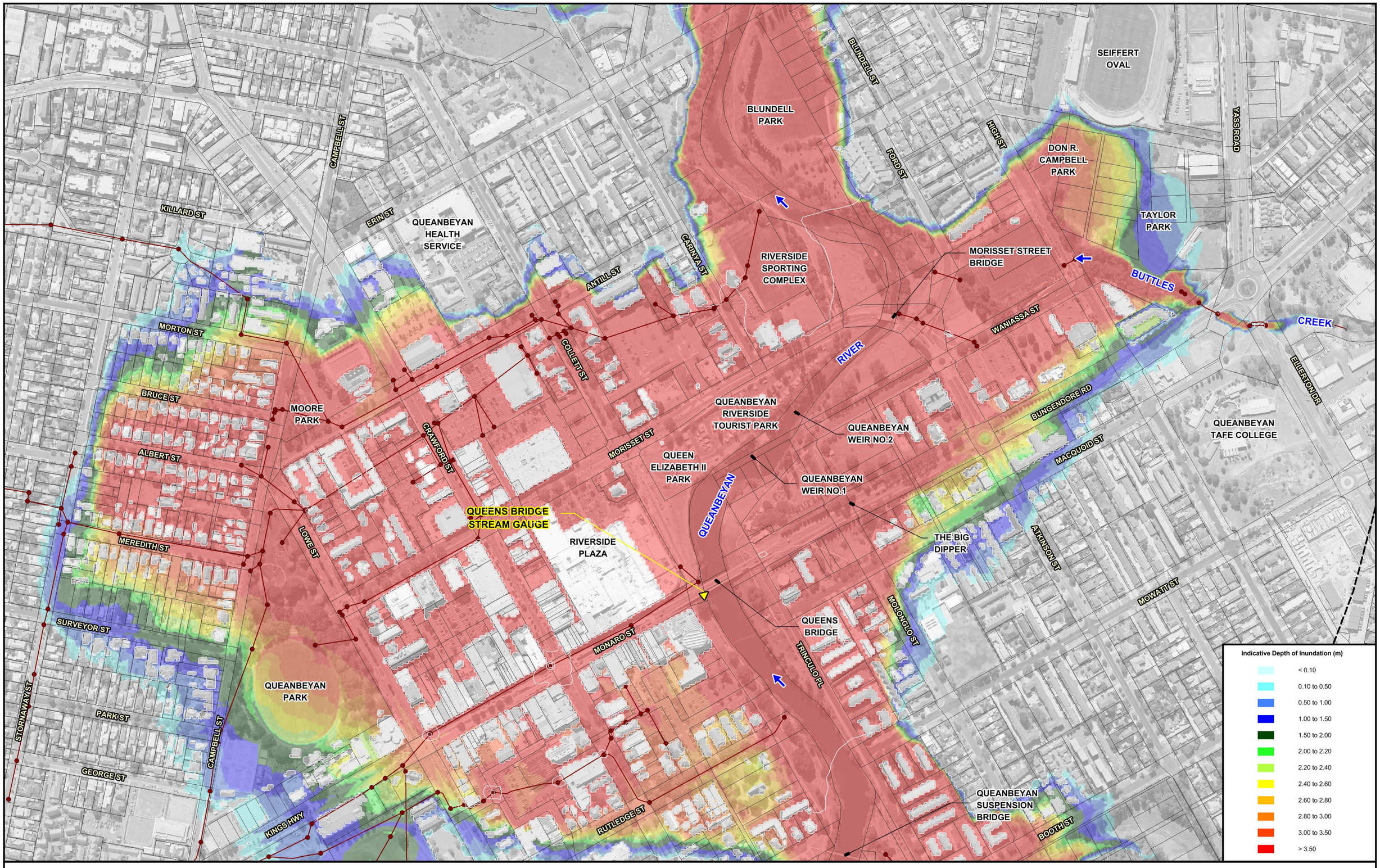
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 575.0 Mainstream Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.6
(Sheet 1 of 2)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
0.2% AEP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

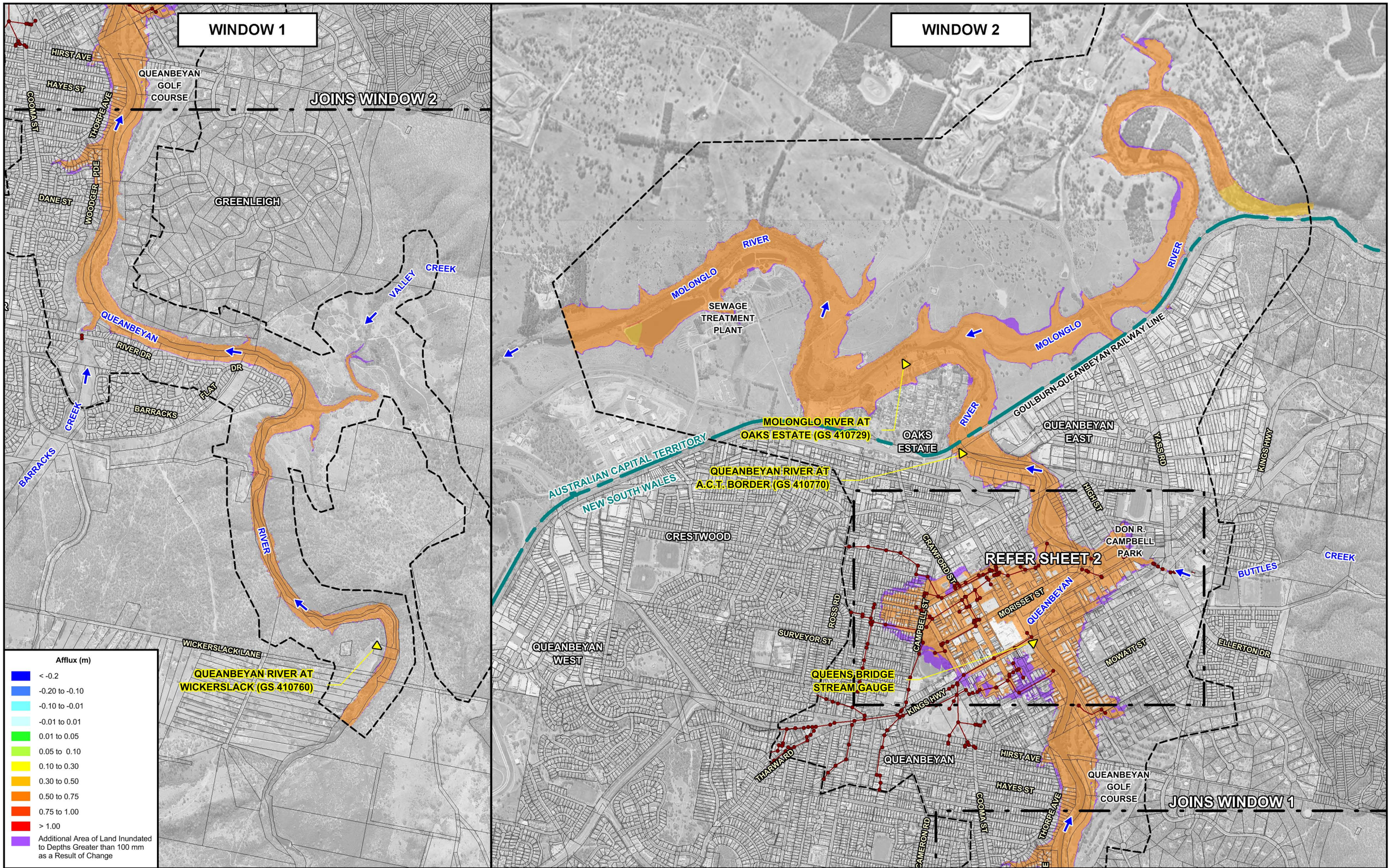
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- 575.0 Mainstream Water Surface Elevation Contours (m AHD)

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.6
(Sheet 2 of 2)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
0.2% AEP



N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

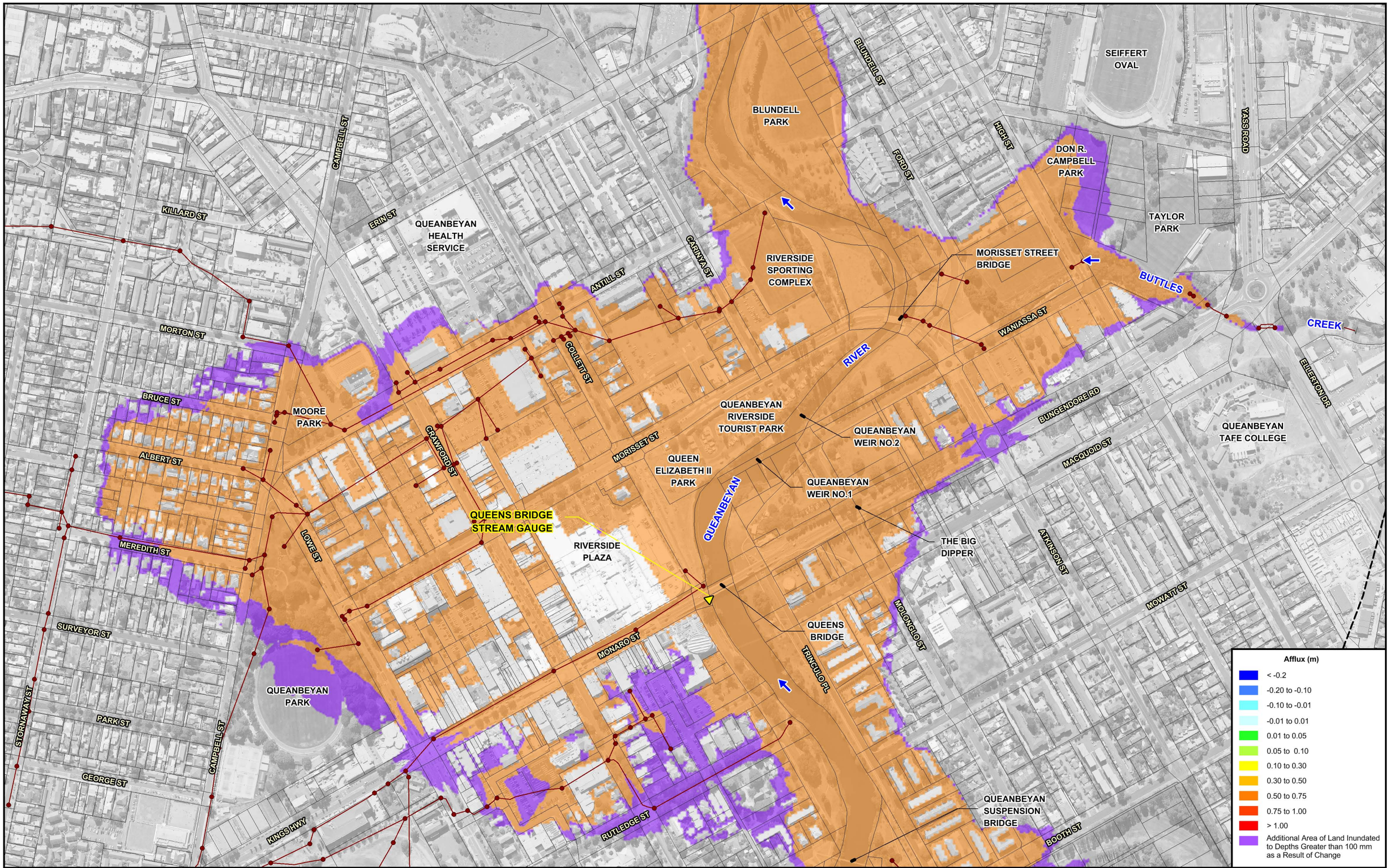
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.7
(Sheet 1 of 2)

SENSITIVITY OF FLOOD BEHAVIOUR TO 20% INCREASE IN HYDRAULIC ROUGHNESS VALUES
1% AEP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.7
(Sheet 2 of 2)

SENSITIVITY OF FLOOD BEHAVIOUR TO 20% INCREASE IN HYDRAULIC ROUGHNESS VALUES
1% AEP

WINDOW 1

WINDOW 2

HIRST AVE
HAYES ST
COOMAST
THORPE AVE
QUEANBEYAN GOLF COURSE
JOINS WINDOW 2
PDE
WOODGER
DANE ST
GREENLEIGH
VALLEY
CREEK
QUEANBEYAN
RIVER DR
DR
FLAT
BARRACKS
CREEK
BARRACKS
RIVER
WICKERSLACK LANE
QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

MOLONGLO
RIVER
SEWAGE TREATMENT PLANT
MOLONGLO
RIVER
GOULBURN-QUEANBEYAN RAILWAY LINE
MOLONGLO RIVER AT OAKS ESTATE (GS 410729)
OAKS ESTATE
RIVER
QUEANBEYAN EAST
YASS RD
KINGS HWY
AUSTRALIAN CAPITAL TERRITORY
NEW SOUTH WALES
QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)
CRESTWOOD
CRAWFORD ST
REFER SHEET 2
DON R. CAMPBELL PARK
BUTTLES
CREEK
ROSS RD
SURVEYOR ST
CAMPBELL ST
MORISSET ST
QUEANBEYAN
MOWATT ST
ELLERTON DR
QUEANBEYAN WEST
QUEENS BRIDGE STREAM GAUGE
KINGS HWY
THARWARD
QUEANBEYAN
HIRST AVE
HAYES ST
QUEANBEYAN GOLF COURSE
JOINS WINDOW 1
CAMERON RD
COOMAST
THORPE AVE

Afflux (m)

- < -2.00
- -2.00 to -1.50
- -1.50 to -1.00
- -1.00 to -0.50
- -0.50 to -0.01
- -0.01 to 0.01
- Additional Area of Land Inundat to Depths Less than 100 mm as a Result of Change

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

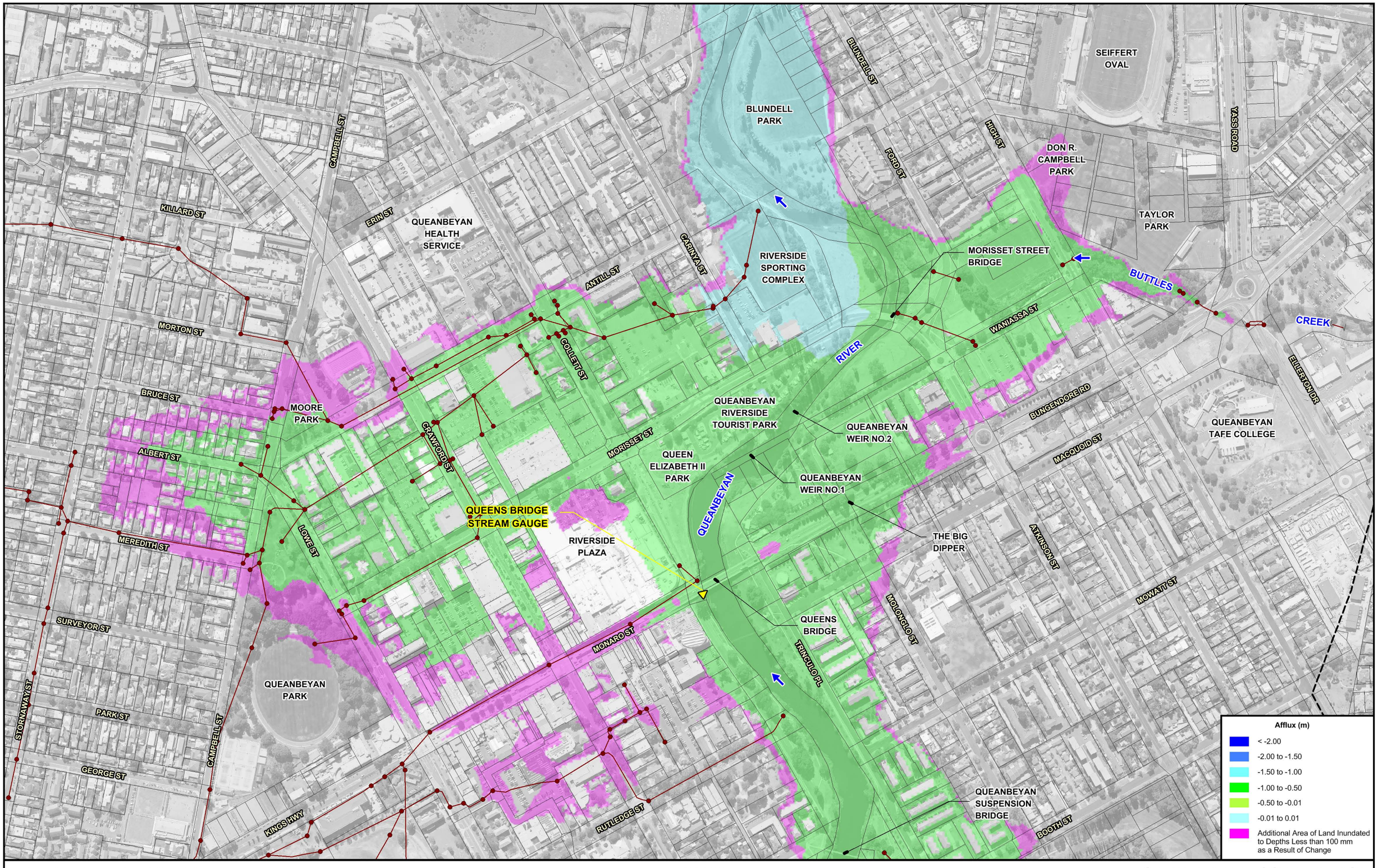
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.8
(Sheet 1 of 2)

SENSITIVITY OF FLOOD BEHAVIOUR TO REDUCTION IN HYDRAULIC ROUGHNESS VALUES IN LOWER REACHES OF MOLONGLO RIVER - 1% AEP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.8
(Sheet 2 of 2)

SENSITIVITY OF FLOOD BEHAVIOUR TO REDUCTION IN HYDRAULIC ROUGHNESS VALUES IN LOWER REACHES OF MOLONGLO RIVER - 1% AEP

WINDOW 1

WINDOW 2

HIRST AVE
HAYES ST
COOMA ST
THORPE AVE
QUEANBEYAN GOLF COURSE
JOINS WINDOW 2
DANE ST
WOODGER PDE
GREENLEIGH
VALLEY CREEK
QUEANBEYAN RIVER DR
BARRACKS CREEK
BARRACKS FLAT DR
RIVER
WICKERSLACK LANE
QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

MOLONGLO RIVER
SEWAGE TREATMENT PLANT
BLK6
BLK5
MOLONGLO RIVER
GOULBURN-QUEANBEYAN RAILWAY LINE
MOLONGLO RIVER AT OAKS ESTATE (GS 410729)
OAKS ESTATE
BLK4
QUEANBEYAN EAST
YASS RD
KINGS HWY
AUSTRALIAN CAPITAL TERRITORY
NEW SOUTH WALES
QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)
REFER SHEET 2
HIGH ST
CRESTWOOD
CRAWFORD ST
DON R. CAMPBELL PARK
BLK3
BUTTLES CREEK
ROSS RD
CAMPBELL ST
MORISSET ST
QUEANBEYAN
SURVEYOR ST
QUEANBEYAN WEST
QUEENS BRIDGE STREAM GAUGE
KINGS HWY
BLK1
MOWATT ST
ELLERTON DR
THARWARD RD
QUEANBEYAN
HIRST AVE
HAYES ST
COOMA ST
CAMERON RD
THORPE AVE
QUEANBEYAN GOLF COURSE
JOINS WINDOW 1

Afflux (m)

- < -0.2
- -0.20 to -0.10
- -0.10 to -0.01
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.50
- > 0.50
- Additional Area of Land Inundated to Depths Greater than 100 mm as a Result of Change

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

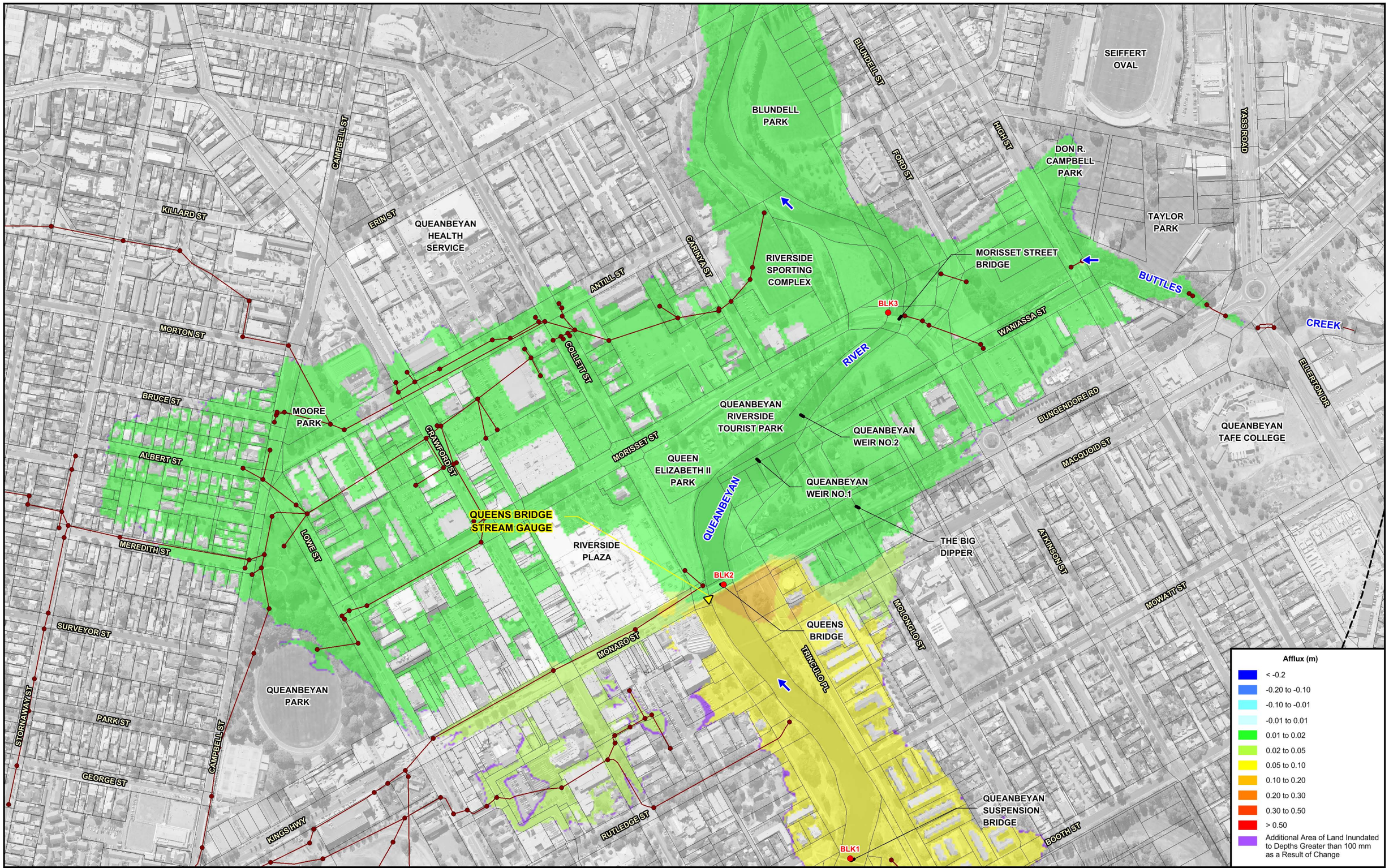
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- BLK3 — Location and Identifier of Blocked Structure

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.9
(Sheet 1 of 2)

SENSITIVITY OF FLOOD BEHAVIOUR TO PARTIAL BLOCKAGE OF HYDRAULIC STRUCTURES
MAIN STREAM FLOODING ONLY - 1% AEP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

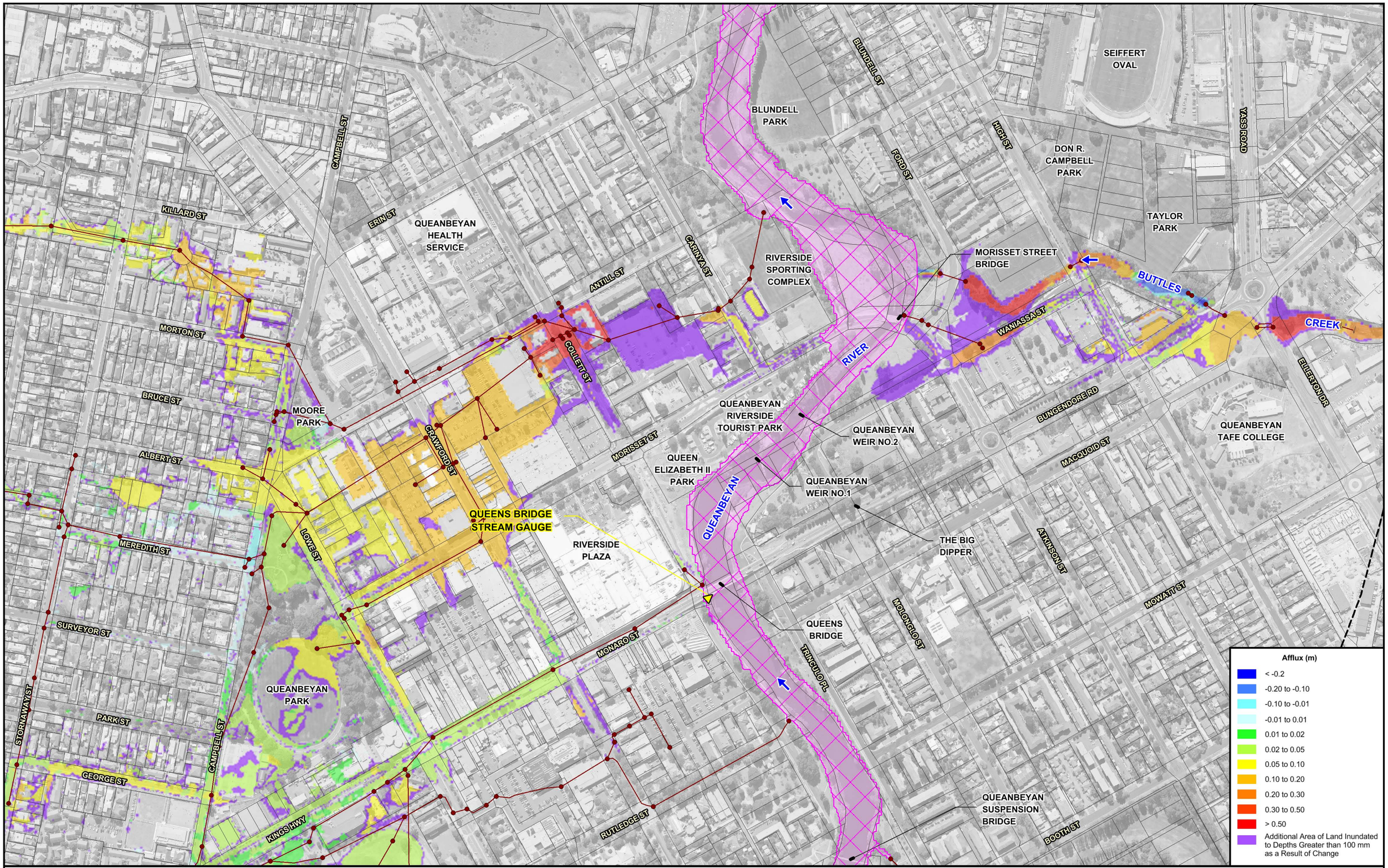
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- BLK3 — Location and Identifier of Blocked Structure

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.9
(Sheet 2 of 2)

SENSITIVITY OF FLOOD BEHAVIOUR TO PARTIAL BLOCKAGE OF HYDRAULIC STRUCTURES
MAIN STREAM FLOODING ONLY - 1% AEP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge
- Extent of Queanbeyan River Flooding Not Shown

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure C4.10

SENSITIVITY OF FLOOD BEHAVIOUR TO PARTIAL BLOCKAGE OF HYDRAULIC STRUCTURES
LOCAL CATCHMENT FLOODING IN VICINITY OF QUEANBEYAN CBD - 1% AEP

APPENDIX D

FLOOD DAMAGES

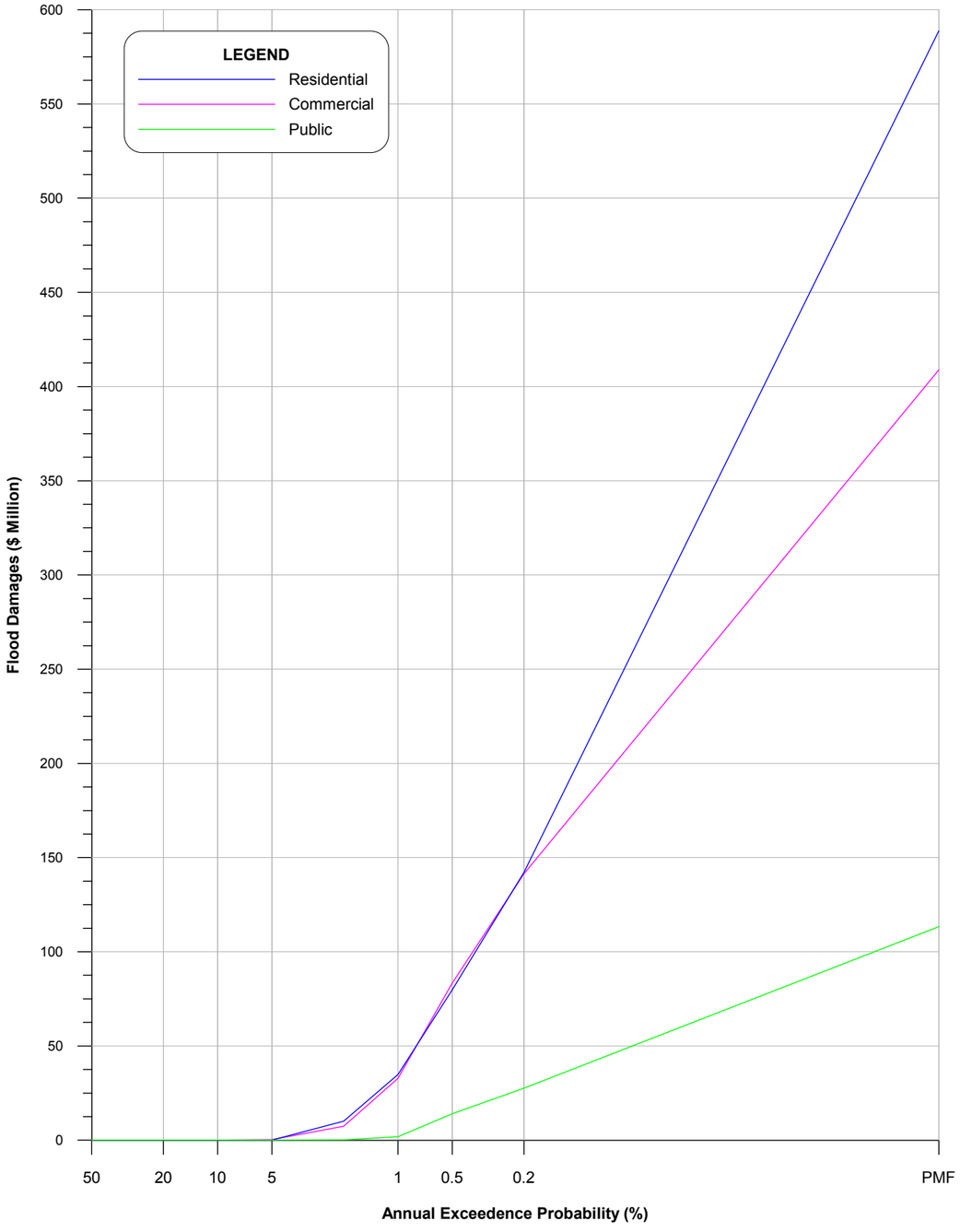
DRAFT REPORT FOR PUBLIC EXHIBITION

LIST OF FIGURES (APPENDIX D)

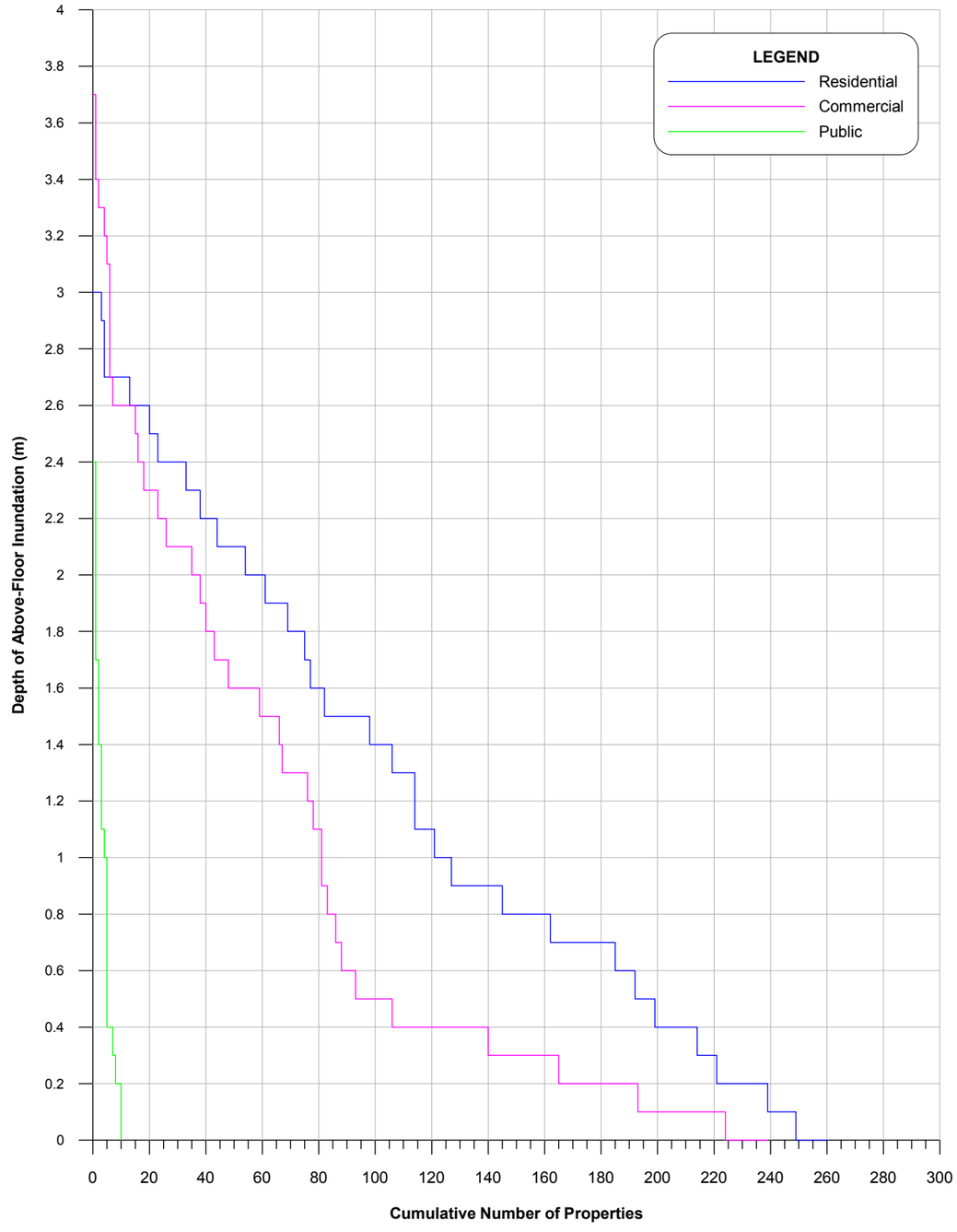
D8.1 Damage - Frequency Curves and Cumulative Flooded Properties versus Depth of Inundation Diagram – 1% AEP

DRAFT REPORT FOR PUBLIC EXHIBITION

DAMAGE FREQUENCY CURVE



CUMULATIVE FLOODED PROPERTIES VERSUS DEPTH OF INUNDATION DIAGRAM - 1% AEP



Lyall & Associates

NOTE:
Values apply for nominal design flood levels case.

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure D8.1

DAMAGE - FREQUENCY CURVES AND CUMULATIVE FLOODED PROPERTIES VERSUS DEPTH OF INUNDATION DIAGRAM
1% AEP

APPENDIX E

DRAFT FLOOD POLICY

DRAFT REPORT FOR PUBLIC EXHIBITION

LIST OF FIGURES (APPENDIX E)

E1.1 Extract of Flood Planning Map at Queanbeyan (2 sheets)
E1.2 Queanbeyan Flood Hazard Map (2 sheets)

DRAFT REPORT FOR PUBLIC EXHIBITION

WINDOW 1

WINDOW 2

JOINS WINDOW 2

JOINS WINDOW 1

REFER SHEET 2

QUEANBEYAN GOLF COURSE

HAYES ST

COOMA ST

THORPE AVE

DANE ST

GREENLEIGH

VALLEY CREEK

QUEANBEYAN RIVER DR

BARRACKS FLAT CREEK

BARRACKS

RIVER

WICKERSLACK LANE

QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

GOOGONG

MOLONGLO RIVER

SEWAGE TREATMENT PLANT

AUSTRALIAN CAPITAL TERRITORY

NEW SOUTH WALES

MOLONGLO RIVER AT OAKS ESTATE (GS 410729)

QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)

OAKS ESTATE

CRESTWOOD

GOULBURN-QUEANBEYAN RAILWAY LINE

QUEANBEYAN EAST

YASS RD

KINGS HWY

HIGH ST

DON R. CAMPBELL PARK

BUTTLES CREEK

CRAWFORD ST

MORISSET ST

QUEANBEYAN

ROSS RD

CAMPBELL ST

SURVEYOR ST

QUEANBEYAN WEST

QUEENS BRIDGE STREAM GAUGE

ELLERTON DR

MOWATT ST

THARWA RD

QUEANBEYAN

HAYES ST

THORPE AVE

COOMA ST

QUEANBEYAN GOLF COURSE

LEGEND

- Flood Planning Area
- Outer Floodplain
- 578 Flood Planning Level (m AHD) (Contours are spaced at 0.2 m intervals)

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

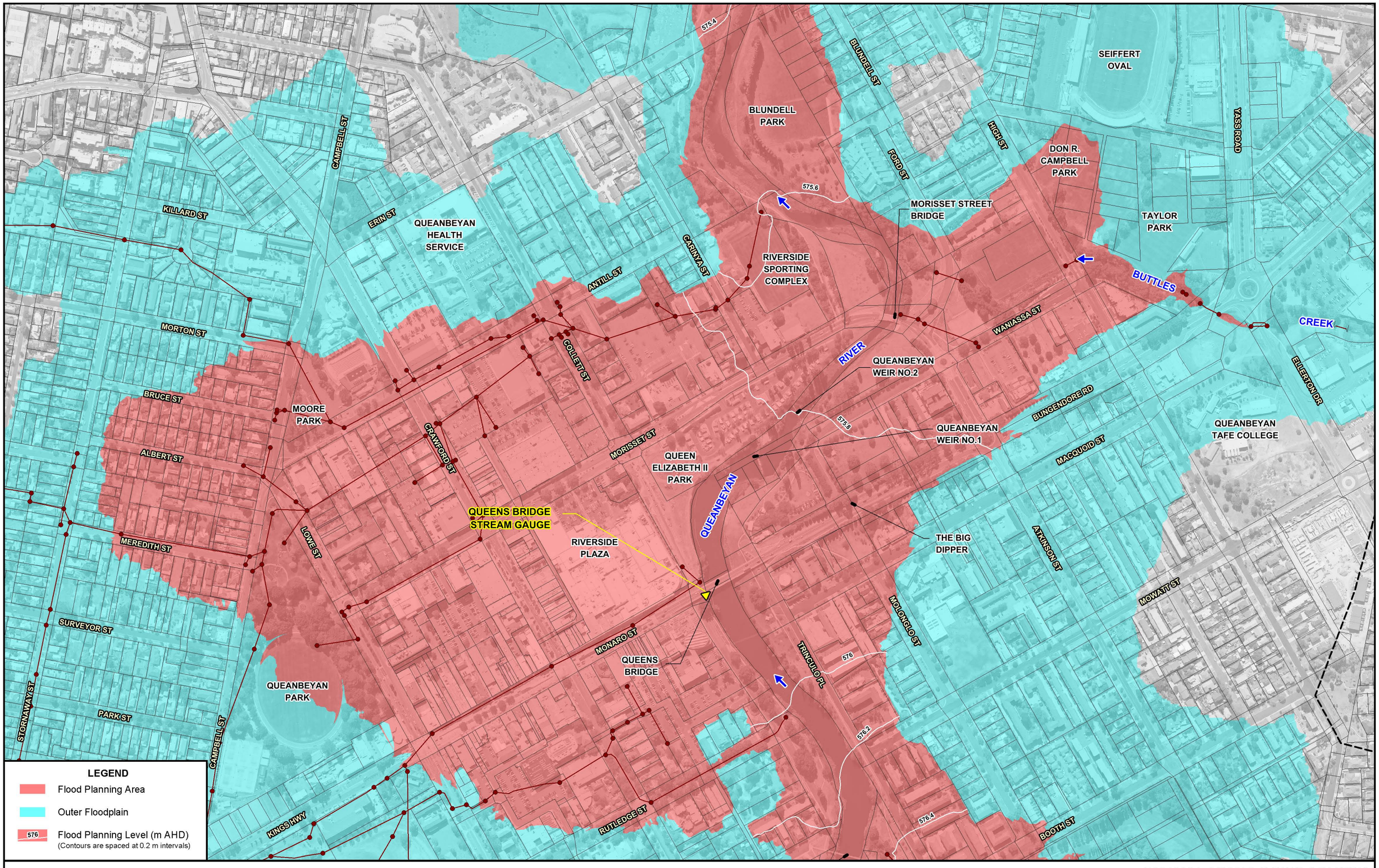
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure E1.1
(Sheet 1 of 2)

EXTRACT OF FLOOD PLANNING MAP AT QUEANBEYAN



Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure E1.1
(Sheet 2 of 2)

EXTRACT OF FLOOD PLANNING MAP AT QUEANBEYAN

WINDOW 1

WINDOW 2

JOINS WINDOW 2

JOINS WINDOW 1

REFER SHEET 2

QUEANBEYAN GOLF COURSE

GREENLEIGH

SEWAGE TREATMENT PLANT

MOLONGLO RIVER AT OAKS ESTATE (GS 410729)

QUEANBEYAN RIVER AT A.C.T. BORDER (GS 410770)

QUEANBEYAN RIVER AT WICKERSLACK (GS 410760)

QUEENS BRIDGE STREAM GAUGE

OAKS ESTATE

QUEANBEYAN EAST

QUEANBEYAN WEST

QUEANBEYAN

CRESTWOOD

GOOGONG

DON R. CAMPBELL PARK

AUSTRALIAN CAPITAL TERRITORY

NEW SOUTH WALES

GOULBURN-QUEANBEYAN RAILWAY LINE

HAYES ST

COOMA ST

THORPE AVE

DANE ST

QUEANBEYAN RIVER DR

BARRACKS FLAT DR

BARRACKS CREEK

VALLEY CREEK

MOLONGLO RIVER

WICKERSLACK LANE

CRANFORD ST

ROSS RD

CAMPBELL ST

SURVEYOR ST

MORISSET ST

QUEANBEYAN

KINGS HWY

THARWA RD

MOWATT ST

ELLERTON DR

BUTTLES CREEK

YASS RD

HIGH ST

KINGS HWY

LEGEND

- Inner Floodplain (Category 1)
- Inner Floodplain (Category 2A)
- Inner Floodplain (Category 2B)
- Inner Floodplain (Category 2C)
- Intermediate Floodplain
- Outer Floodplain

N

200 0 200 400 600 m

Scale: 1:20,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

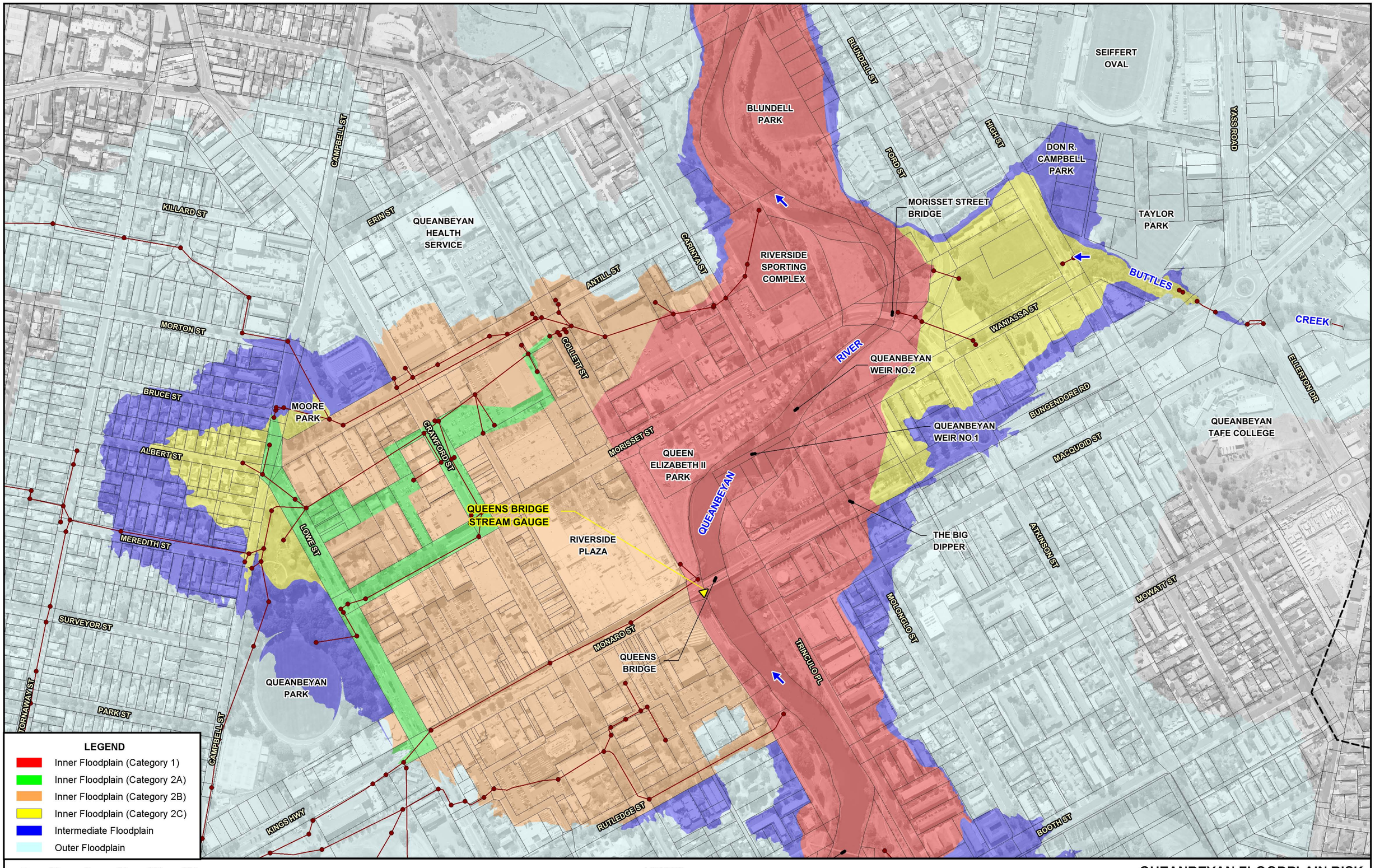
LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure E1.2
(Sheet 1 of 2)

QUEANBEYAN FLOOD HAZARD MAP



N

50 0 50 100 150 m

Scale: 1:5,000

Lyall & Associates

NOTE:

The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 4 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Stream Gauge

QUEANBEYAN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure E1.2
(Sheet 2 of 2)

QUEANBEYAN FLOOD HAZARD MAP