

Appendix D

Flood impact consultation information

Woolgoolga to Ballina upgrade

every journey matters

Woolgoolga to Ballina upgrade

Agenda

This presentation includes the following information:

- Project update
- Summary of design refinements
- Explanation of key flood related terms
- Flood modelling and objectives
- Summary of differences in potential flood impacts between the environmental impact statement and detailed design
- Next steps

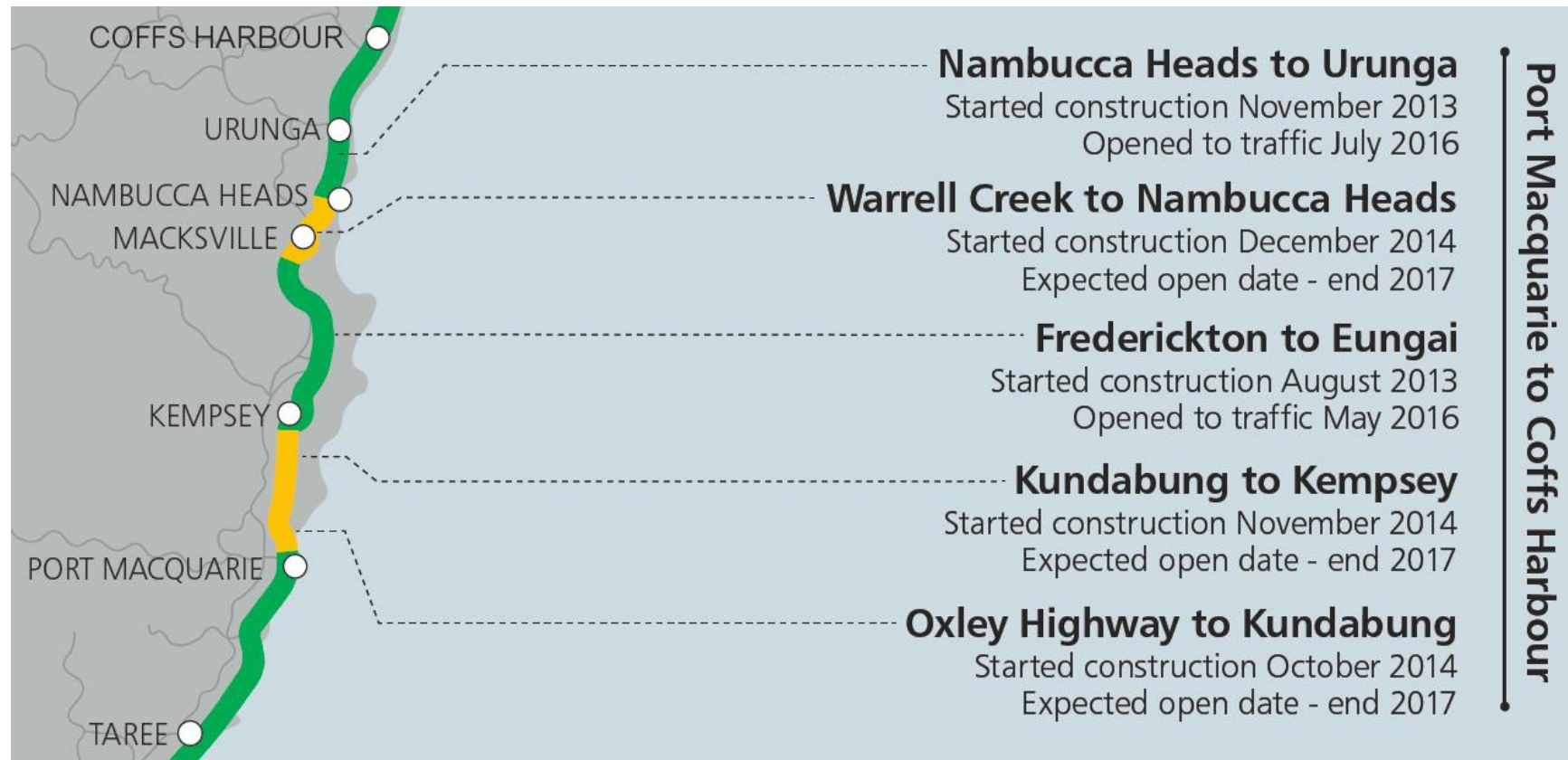
Pacific Highway upgrade

Overview




Pacific Highway upgrade

Port Macquarie to Coffs Harbour



Woolgoolga to Ballina upgrade

Overview



Woolgoolga to Ballina

- Stage 2 Pimlico to Teven south of Ballina completed May 2016
 - Early enabling works including soft soil work in progress
 - Woolgoolga to Glenugie started construction June 2015
 - Expected completion 2017
 - Contract awarded to design and build the bridge over the Clarence River at Harwood July 2016
 - Project expected open date 2020

Roads and Maritime Services’ Pacific Highway Office and Pacific Complete are working together to deliver the project.

- 155km of highway upgrade
- \$4.36 billion
- Open to traffic 2020

Tyndale to Maclean

Project update - current early work activities

To prepare for building we are:

- Carrying out soft soil work between Tyndale and Maclean
- Removing materials and controlled blasting at Tyndale
- Established a site compound at Macintyres Lane
- Starting to build site compounds at Avenue Road and Tyndale
- Installing nest boxes to provide offset habitat for birds and animals
- Continuing geotechnical and ecological surveys
- Continuing utility relocation
- Soon starting early work between Glenugie and Tyndale



Soft soil work – foundation rock being placed at Ferry Park, Maclean

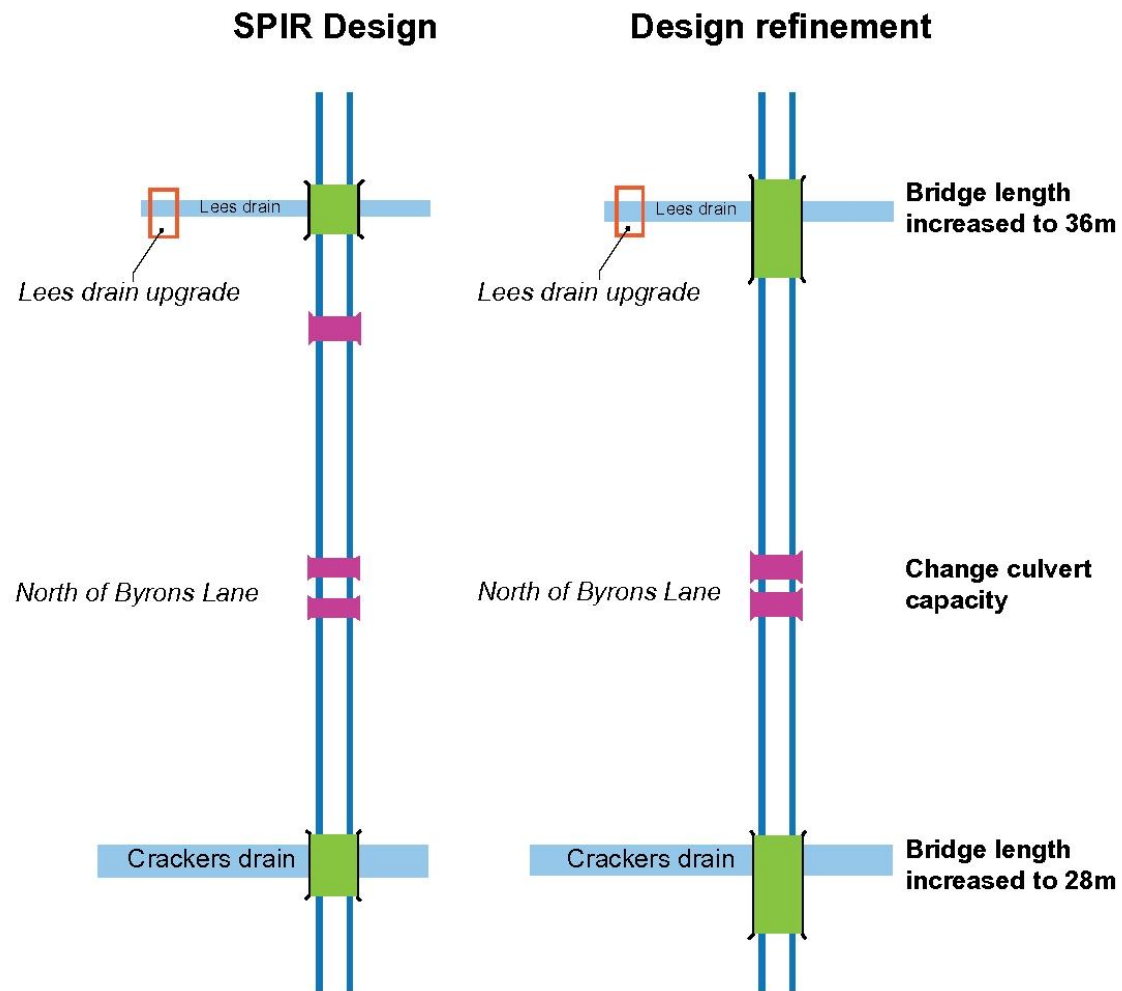
Tyndale to Maclean

Changes to design – flood immunity

- Achieved flood immunity objective of 20 year ARI flood immunity across the floodplain
- Achieved CoA requirements
- Improved local access road immunity
- Improved drainage performance in the Shark Creek area

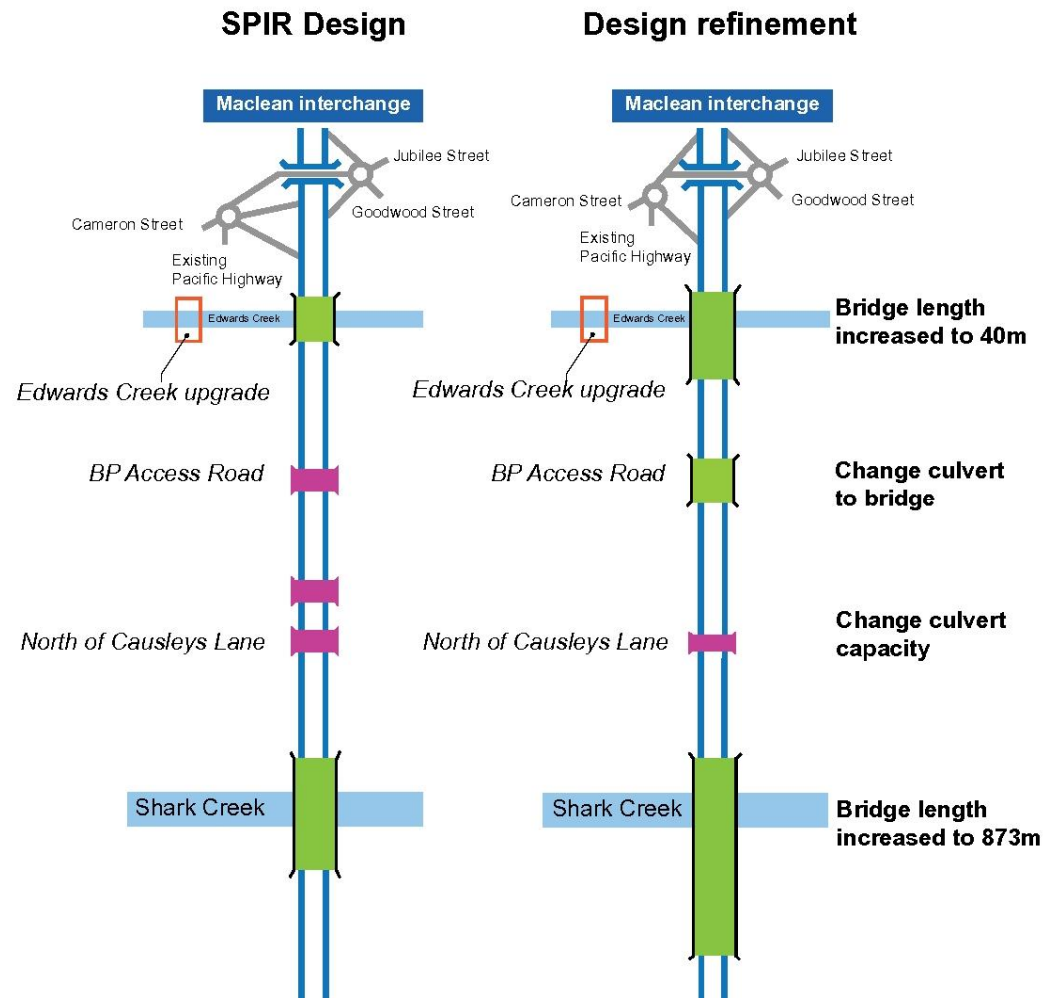
Tyndale to Maclean

Changes to design – Tyndale to Lees Drain



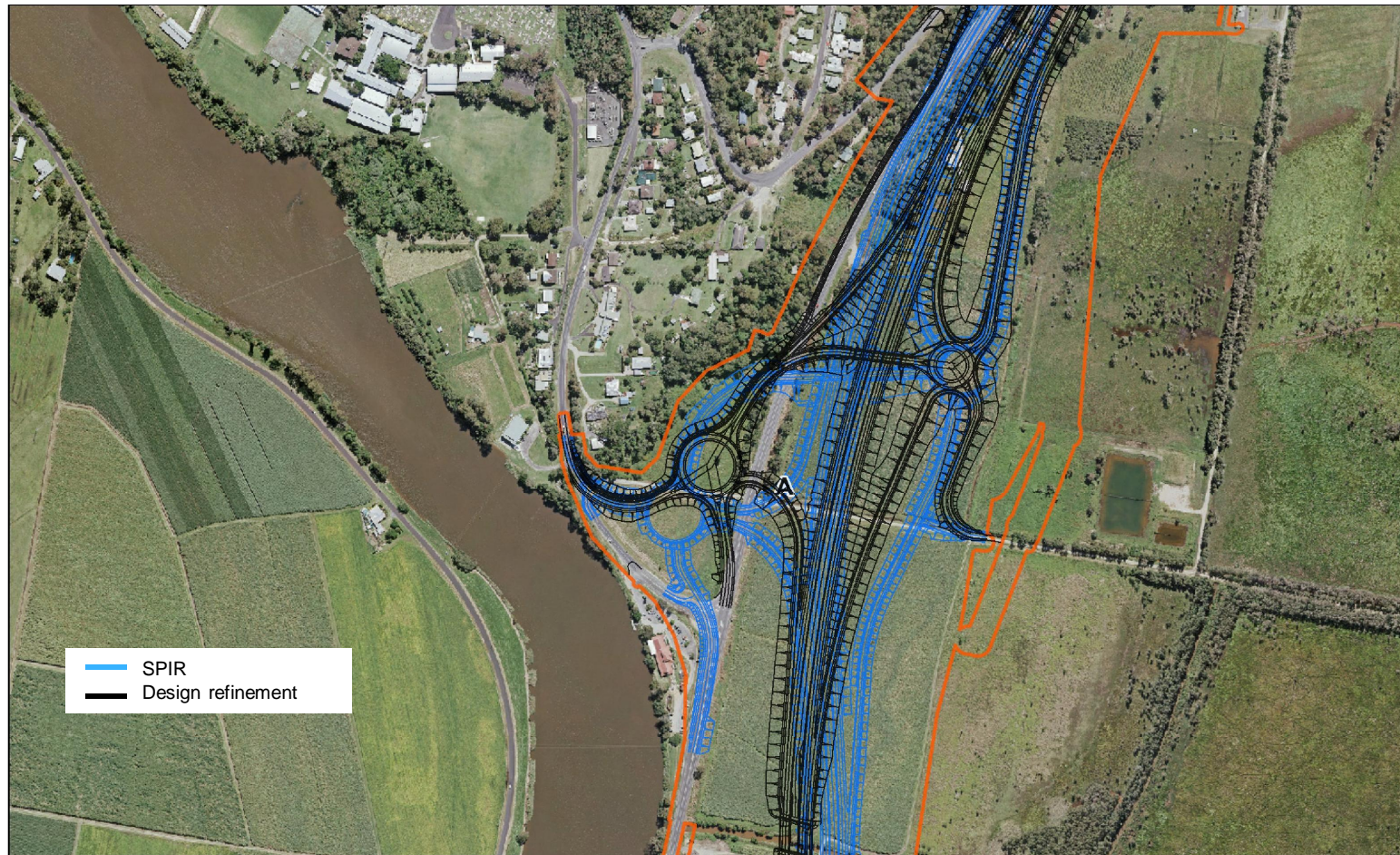
Tyndale to Maclean

Changes to design – Lees Drain to Maclean



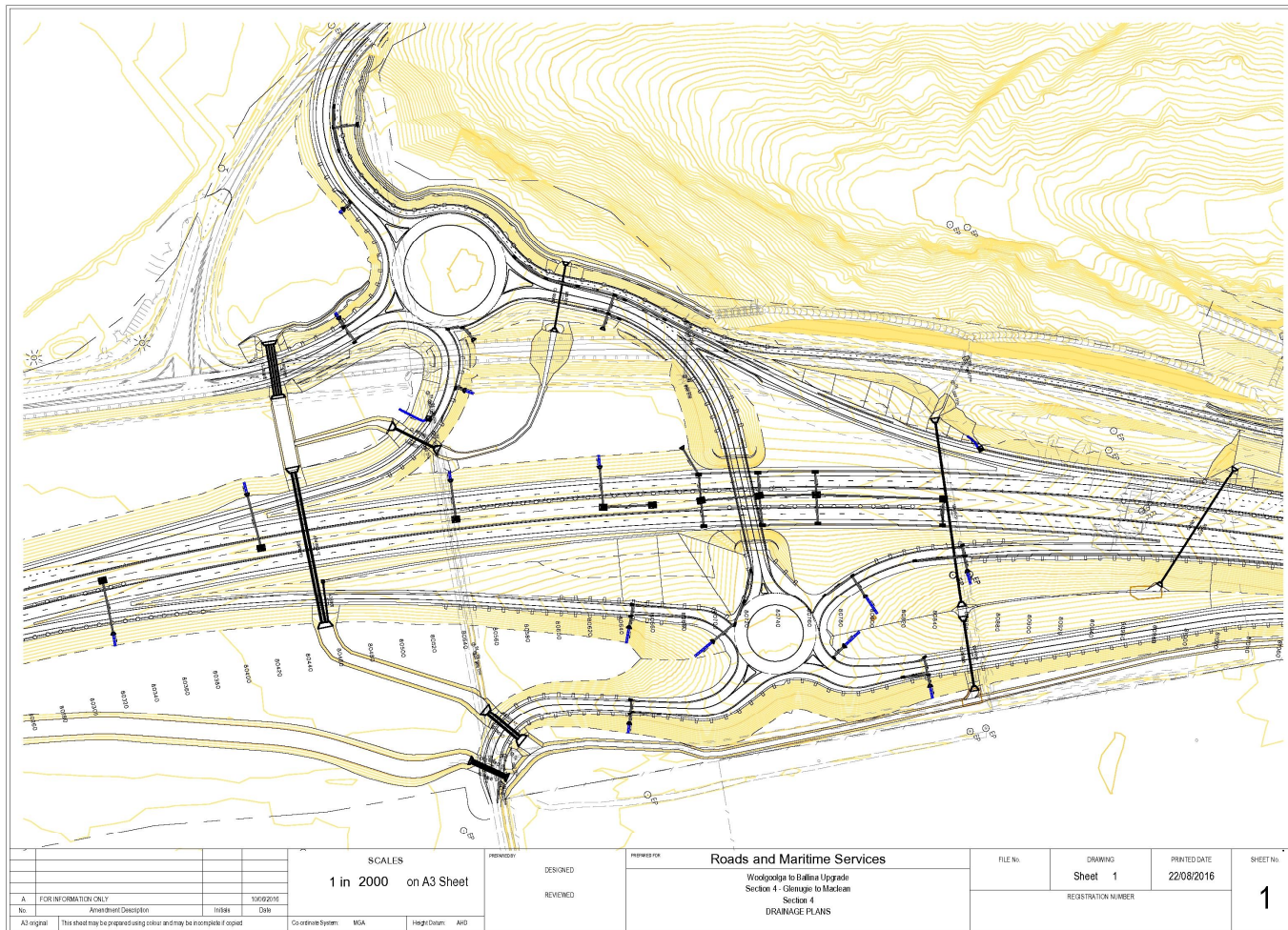
Tyndale to Maclean

Changes to design – Maclean interchange



Tyndale to Maclean

Drainage Design – Maclean interchange



Maclean to Iluka Road

Project update - current early work activities

To prepare for building we are :

- Continuing soft soil work between Maclean and Iluka Road
- Removing materials from Mororo for the soft soil work
- New site compound to be built at Iluka Road
- Continuing geotechnical investigations and survey work
- Ongoing service and utility relocation
- Preparation for building diversion roads



Environmental controls at Serpentine Channel

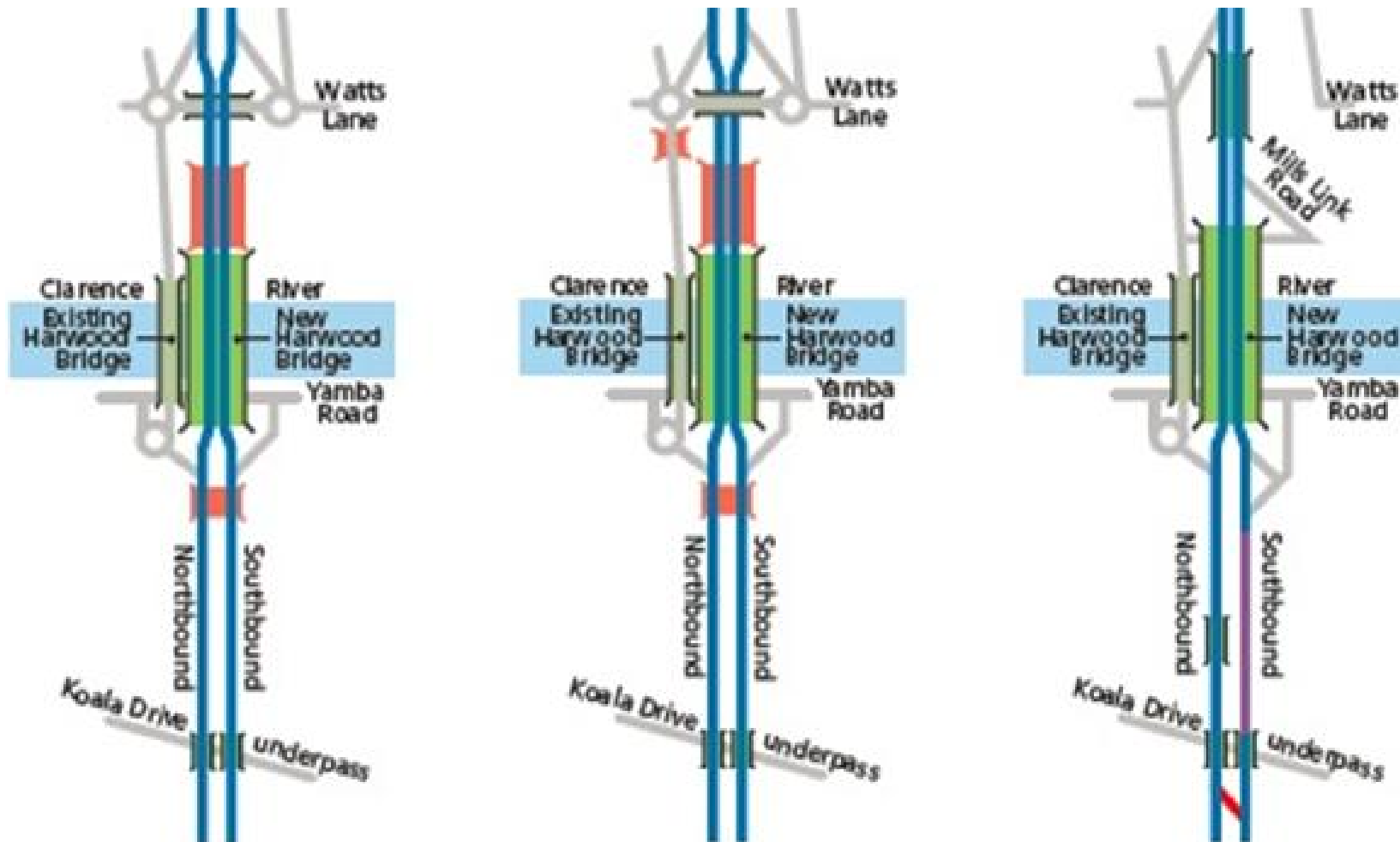
Maclean to Iluka Road

Changes to design – flood immunity

- Achieved flood immunity objective of 20 year ARI flood immunity across the floodplain
- Improved local access road immunity

Macleans to Iluka Road

Changes to design – Koala Drive to Watts Lane



Project update - design

Upcoming activities

Design has progressed and we are seeking community feedback.

This involves:

- Updating flood modelling and flood focus groups
- Design refinements currently displayed for community comment
- Draft urban design and landscape management plans currently displayed for community comment

Woolgoolga to Ballina upgrade

Key flood related terms

- ARI flood event
- Depth
- Flow velocity (speed)
- **Afflux**
- **Duration of flooding**
- **Flood immunity**
- Floodplain
- Flood direction

Flooding terms

Average Recurrence Interval and critical storm

Average Recurrence Interval

- Average Recurrence Interval – abbreviated to ARI
- EG – 100 ARI is the theoretical flood event with the chance of recurring once every 100 years
- 1% chance of occurring in any given year

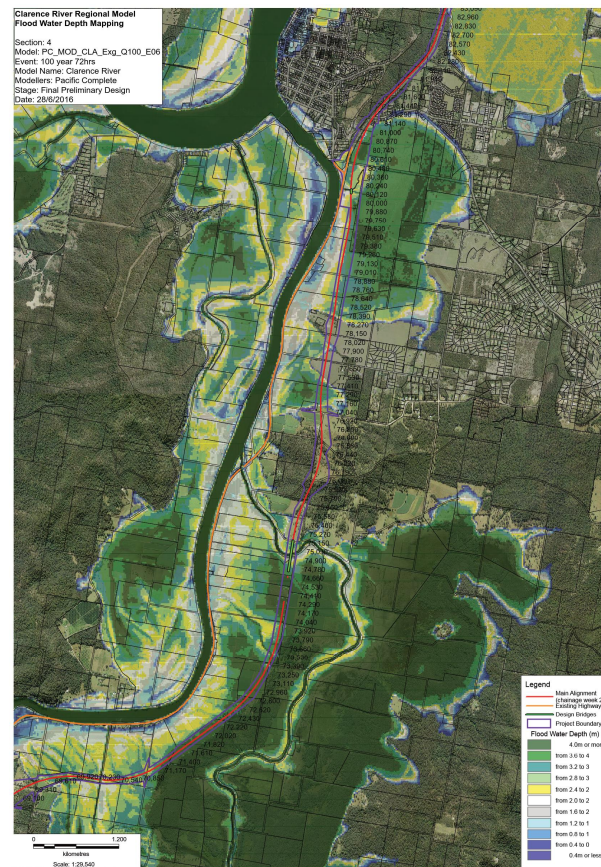
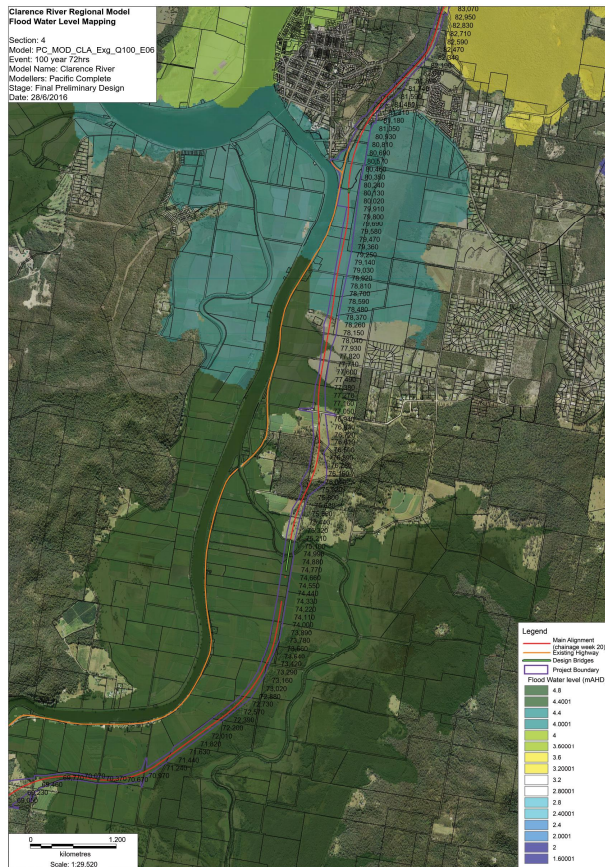
Critical storm

- The critical storm is the storm that produces the highest flood level in the area of interest
- For the Clarence floodplain the critical storm is the 72 hour storm

Flooding terms

100 year ARI Flood Levels and Depths

Example Maclean (Section 4) Q100 flood level and depth maps

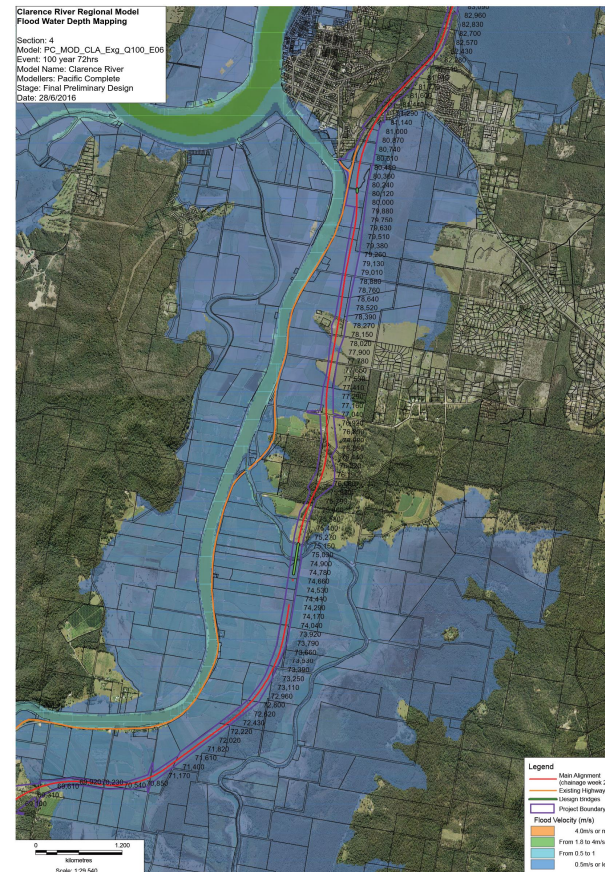


Flooding terms

Flow velocity and direction

- Velocities less than 0.5 metres per second
 - Very gentle, similar to an ingoing or outgoing tide
 - Will transport very fine silt and sand particles
- Velocities between 0.5 - 1.8 metres per second
 - Will transport silt particles
 - At about 1.8 m/s velocity pasture and crop areas may erode
- Velocities in the Clarence River floodplain are generally less than 1 metre per second
- Flow direction also a key focus in the model – floodplain flows are multi-directional and complex

Example Maclean (Section 4) Q100 flood velocity map

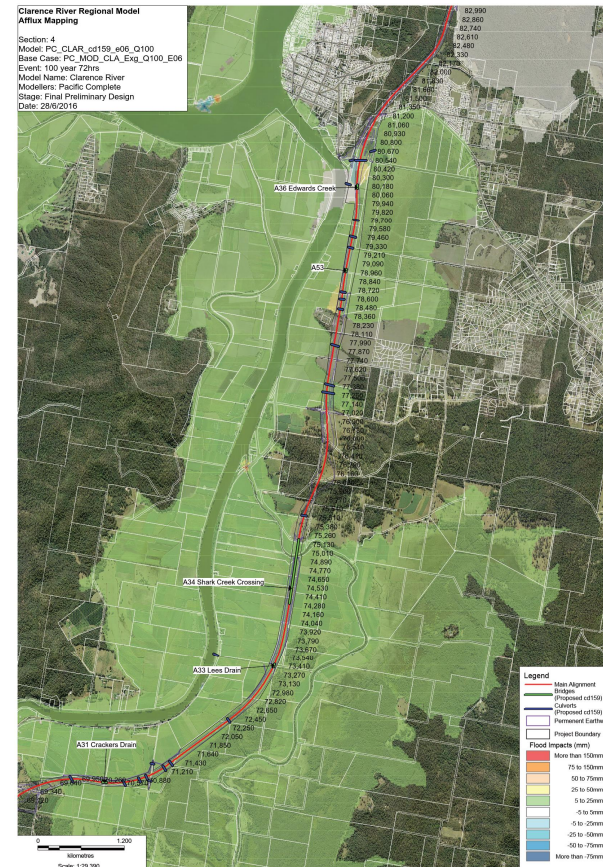


Flooding terms

Afflux

- Afflux is the change in flood level due to change in conditions across the floodplain
- A positive afflux value means an increase in flood level
- A negative afflux value means a decrease in flood level

Example Maclean (Section 4) Q100 afflux map

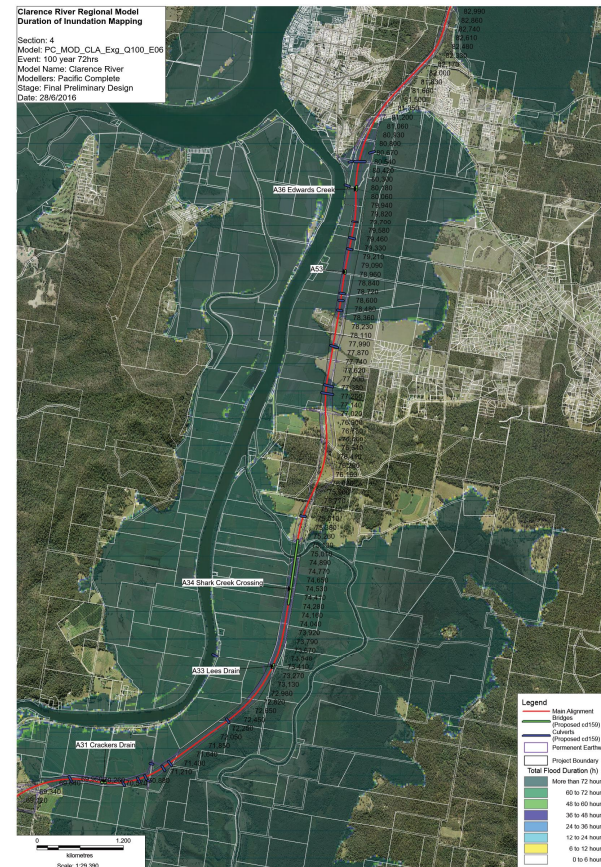


Flooding terms

Duration of flooding

- Duration of flooding refers to the length of time a particular area is affected by flooding
- 100 year ARI duration of flooding is generally >72 hours for the critical 72 hour storm
- Time of flooding varies depending on the terrain, local drainage and size of the flood

Example Maclean (Section 4) Q100 flood duration



How does the model work?

- Regional scale model – over 1000 square kilometres
- Calibrated against real flood events
- Runs theoretical ‘design’ events based on averaged observed rainfall patterns
- Run for the 5, 20, 50, 100 and 2000 year ARI events
- Used to:
 - Check flood immunity for the highway upgrade
 - Inform the design of bridges, structures and cross drainage
 - Check against the projects flood management objectives

Flood management objectives

Parameter	Houses and cane farm land	Grazing, forested and other rural lands
Flood levels	< 50 mm increase in flood level up to and including the 100 year ARI flood event	Generally < 250 mm increase with localised increased of up to 400 mm for short duration/ local catchment flooding acceptable over small areas (nominally less than 5 ha) up to the 100 year ARI event
Flood duration	No more than 5 % increase	No more than 10 % increase
Flood velocity	<p>Houses: velocity-depth to remain in the zone of low hazard for children (i.e. < 0.4 m/s) where current velocity-depth are currently low hazard</p> <p>Cane farms: velocities to remain below 1.0 m/s where currently below this figure</p> <p>An increase of not more than 20% where existing velocity is above 1 m/s</p>	<p>Velocities to remain below 1.0 m/s where currently below this figure</p> <p>An increase of not more than 20% where existing velocity is above 1.0 m/s</p>
Flood direction	No change to the direction of watercourses or the direction of flood flows except for constriction in and expansion out of discrete openings (culverts and bridges) and construction diversions	

Recent flood modelling

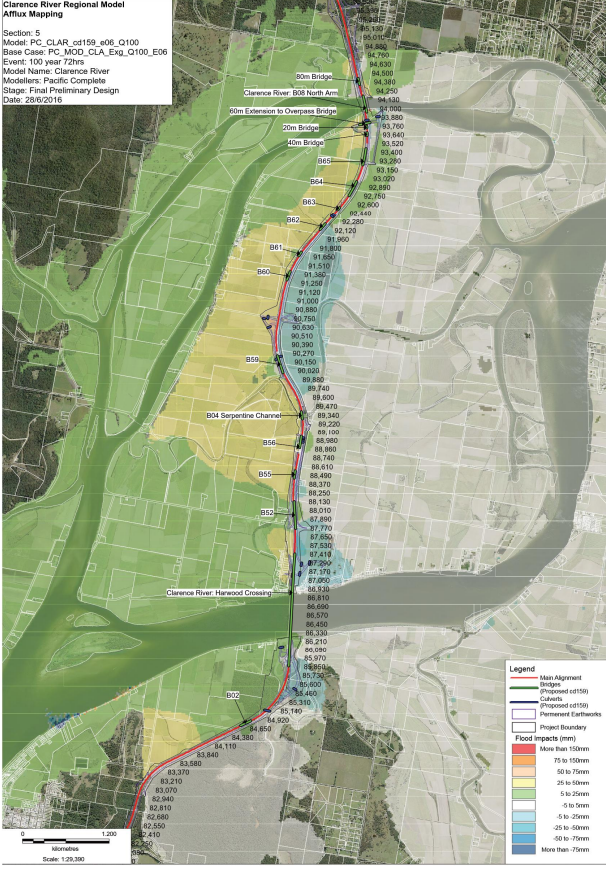
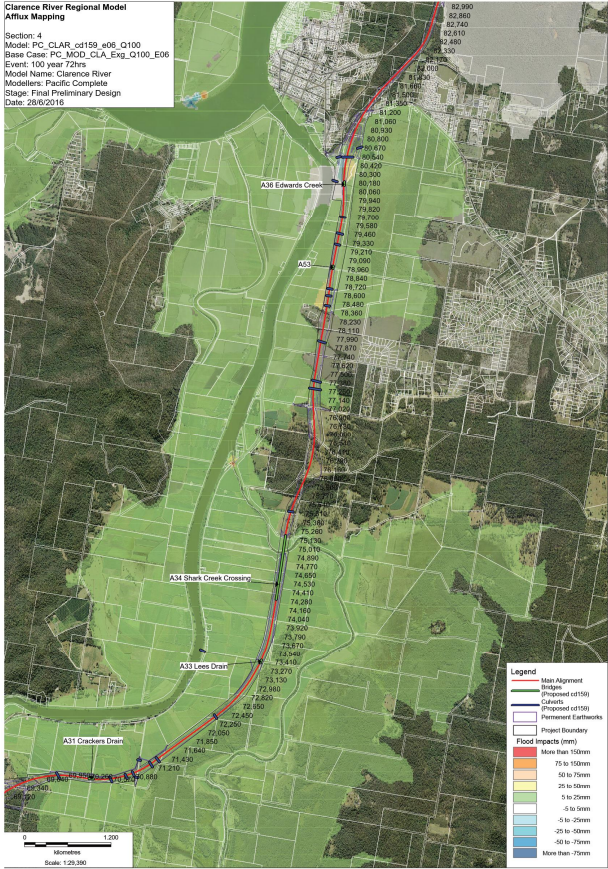
What has changed?

- The base flood model has been updated and improved since the EIS:
 - More recent data
 - Model checked against recent flood event in 2009
- The proposed case flood model has been updated and improved:
 - Latest design of the road embankment, bridges and cross drainage structures
 - Latest design of side roads
 - Over 160 model iterations to optimise designs and minimise impacts
 - More detailed assessment of changes in flood duration

Outcomes of flooding assessment

Afflux – changes in flood level

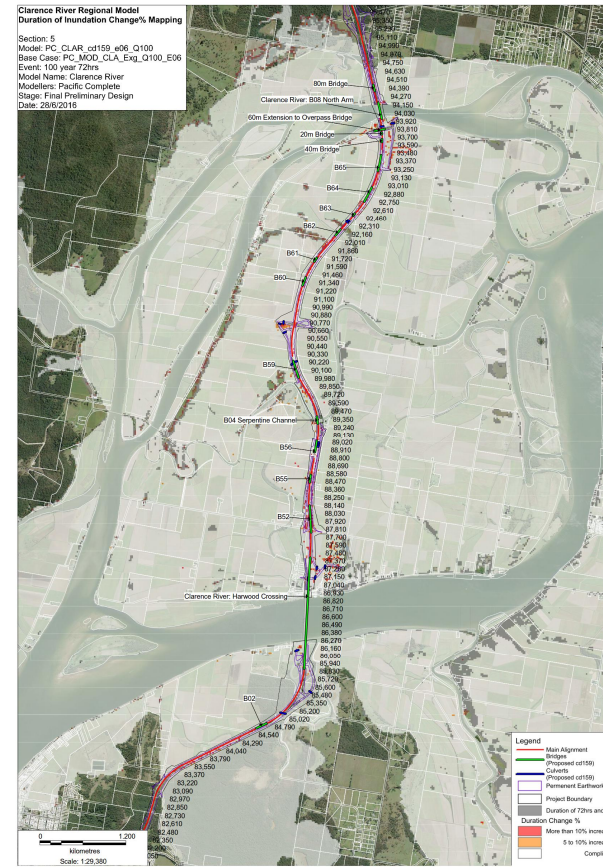
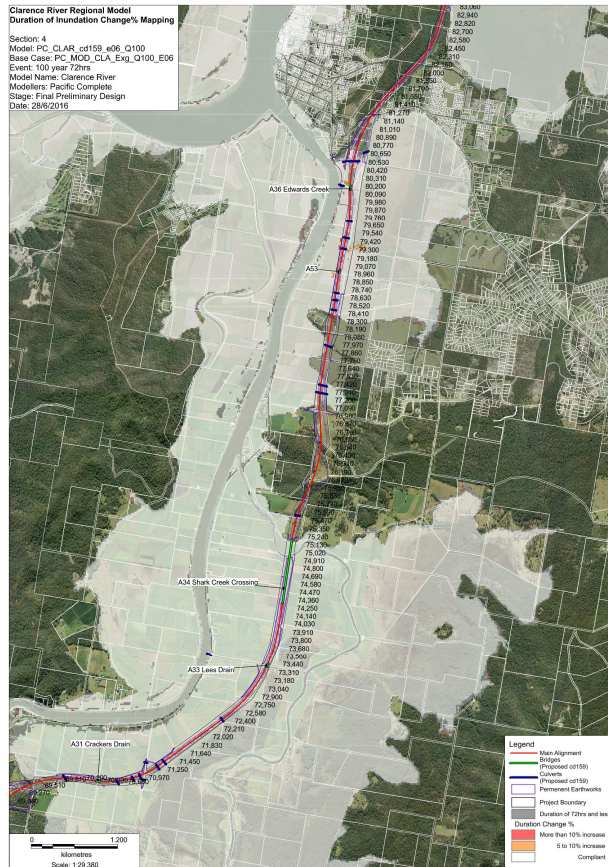
Example Maclean (Section 4) and Harwood/Chatsworth Islands (Section 5) Q100 afflux maps



Outcomes of flooding assessment

Duration of flooding

Example Maclean (Section 4) and Harwood/Chatsworth Islands (Section 5) Q100 duration change maps



Outcomes of flooding assessment

Summary

- Flood modelling is a work in progress
- Design and flood model currently at around 85% completion
- Generally meet flood management objectives
- One-on-one consultation with landowners where flood management objectives cannot be achieved
- Discussions ongoing with Council on implications of minor increases in flood levels adjacent to Maclean levee

Independent verification

- Modelling has been independently reviewed and checked
- Roads and Maritime has engaged an independent hydrologist, Mark Babister

Next steps

- Ongoing consultation with landowners and the community
- Finalise flood modelling
- Detailed design
- Urban Design and Landscape Plan

- Email: W2B@pacificcomplete.com.au
- Phone: 1800 778 900
- Visit: www.rms.nsw.gov.au/W2B



Thank you



rms.nsw.gov.au/W2B



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