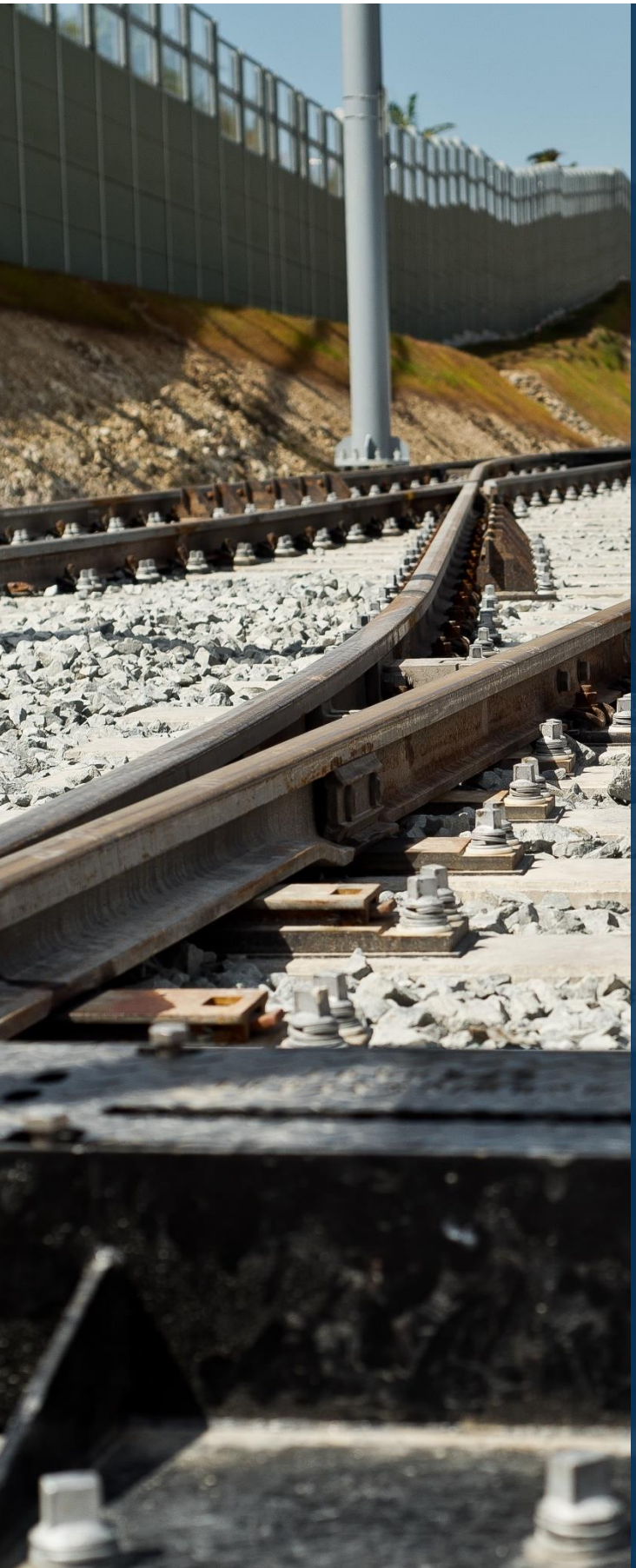
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MARTINUS INLAND RAIL



FLOOD DESIGN REPORT

A2I | Albury to Illabo

Package: A2I – Kemp Street Footbridge and Bridge Replacement

CONTRACT NUMBER: 0052

PROJECT DOCUMENT NUMBER:

5-0052-210-IHY-J2-RP-0001

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Revision History

REV	REV DATE	AMENDMENT	DATE TO CLIENT
A	24/10/2024	SDR Issue for review	24/10/2024
B	01/04/2025	PDR Issue for review	01/04/2025
C	11/08/2025	DDR Issue for review. HP2 IFC with Footbridge abutment on HOLD	11/08/2025
D	06/01/2026	HP3 IFC (Overbridge and Footbridge) with Intersection (WAD) scope on HOLD	06/01/2026
E	09/07/2026	Issued for Review - TfNSW WAD - Stage 2 Resubmission.	09/07/2026
0	29/08/2026	Issued for Use - TfNSW WAD IFC	01/09/2026

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GLOSSARY

Specific terms and acronyms used throughout this plan and sub-plans are listed and described in the table below.

TABLE 1: DEFINITIONS

Term	Definition
A2I	Albury to Illabo
A2P	Albury to Parkes Enhancement Project
AEP	Annual Exceedance Probability
ADC	Assumptions, Dependencies and Constraints
AHD	Australian Height Datum
ALCAM	Australian Level Crossing Assessment Model
ARF	Areal Reduction Factor
ARI	Average Recurrence Interval
ARR	Australian Rainfall and Runoff
ARTC	Australian Railway Track Corporation
BoD	Basis of Design
BoM	Bureau of Meteorology
CIZ	Construction Impact Zone
CO	Construct Only
CoA	Conditions of Approval
CRS	Coordination Reference System
CSSI	Critical State Significant Infrastructure
D&C	Design and Construct
DCN	Design Change Notice
DDR	Detailed Design Review
EMC	Electromagnetic compatibility
EDPM	Engineering, Design and Project Management
ECMP	Electromagnetic compatibility management plan
EIS	Environmental Impact Statement
FDR	Feasibility Design Review
FS	Finish-Start constraint type
FSL	Finished Surface Level
GDA	Geocentric Datum of Australia
GIR	Geotechnical Interpretative Report
HF	Human Factors

Term	Definition
I2S	Illabo to Stockinbingal
IFC	Issued for Construction
IR	Inland Rail
ITC	Incentivised Target Cost
IV	Independent Verifier
Km	Kilometers
LPA	Licensed Project Area
LiDAR	Light Detection and Ranging
MGA	Map Grid of Australia
MIRDA	Master Inland Rail Development Agreement
NCR	Non-Conformance Report
NLPA	Non-Licensed Project Area
NtP	Notice to Proceed
PDR	Preliminary Design Review
PSR	Project Scope and Requirements
QDL	Quantitative Design Limits
RCP	Representative Concentration Pathways
RFFE	Regional Flood Frequency Estimation
REF	Review of Environmental Factors
RFI	Request for Information
S2P	Stockinbingal to Parkes
SAQP	Sampling, Analysis and Quality Plan
SDR	Systems Definition Review
SDRP	State Design Review Panel
SEMP	System Engineering Management Plan
TDur	Time of Duration
TfNSW	Transport for New South Wales
TWL	Tail Water Level
UMM	Updated Mitigation Measure
V & V	Verification and Validation
WAD	TfNSW Works Authorisation Deed
WAE	Work-as-Executed

1 A2P PROJECT INTRODUCTION

1.1 Albury to Parkes (A2P)

As part of the Inland Rail program of projects, the Australian Rail Track Corporation (ARTC) has appointed Martinus as the delivery contractor for the Albury to Parkes (A2P) project, which comprises the brownfield sections between Albury and Illabo (A2I) and Stockinbingal to Parkes (S2P). The greenfield portion between Illabo to Stockinbingal (I2S) is not a part of the A2P project scope.

1.2 Project Scope

The S2P section will be delivered under an REF and as such construction works associated with the two (2) Construct Only packages can commence at Contract Award. The Design and Construct for the other seven (7) projects sites will also commence at Contract Award.

The A2I section will be delivered under an EIS and requires a Notice to Proceed from ARTC before works can commence on site. Design for A2I will however commence at Contract Award. The project received State Planning approval on 8th Oct 2024, and Martinus received the Notice to Proceed from IRPL on 18 Oct 2024.

Within the EIS for A2I section there are twenty (20) locations, within which there are thirty (30) Design and Construct (D&C) projects of varying degrees of design gate development. A further location and project for Junee Drivers Platforms has been added through Inland Rail Direction. Design packages are listed below:

- Murray River bridge (Structure modifications)
- Albury Station Yard (Track slews, track reconfigurations)
- Albury Station Yard Track Slews (retained 3-track alignment)
- Albury Station Yard Footbridge (footbridge replacement), both pre- and post- SDRP-response
- Riverina Highway bridge (Track lowering)
- Billy Hughes bridge (Track lowering)
- Tabletop Yard (Structure modification)
- Culcairn Station Yard (Track slews and bridge removal)
- Henty Yard (Track slews)
- Yerong Creek Yard (Track slews)
- The Rock Yard (Structure modification)
- Uranquinty Yard (Track slews)
- Pearson Street bridge (Track lowering)
- Cassidy Parade footbridge (Bridge replacement), both pre- and post- SDRP-response
- Edmondson Street Bridge (stand-alone road bridge)
- Edmondson Street Footbridge (stand-alone road bridge)
- Edmondson Street bridge and footbridge (combined Bridge replacement), post- SDRP-response
- Wagga Wagga Station Yard (Track slews)
- Wagga Wagga Footbridge (footbridge replacement), both pre- and post- SDRP-response
- Bomen Yard (Track slews)
- Harefield Yard (Track slews)
- Kemp Street Bridge (stand-alone road bridge)
- Kemp Street Footbridge (stand-along footbridge)
- Kemp Street bridge and footbridge (combined Bridge replacement)
- Junee Station Yard (Track slews and bridge removal)
- Olympic Highway Underbridge (Track reconfiguration and Structure modification)
- Junee to I2S dual track section (Track slews)
- LX605 & LX1472 Activations
- LX605 relocation and LX1472 closure, both 16m and 4m slew options
- Junee Drivers Platforms

Within the S2P section, there are two (2) Construct Only projects, being:

- Daroobalgie New Loop

- Wyndham Avenue (track lowering)

and seven (7) Design and Construct (D&C) projects, being:

- Milvale Yard (Structure modification)
- Bribbaree Yard (Track slews)
- Quandialla Yard (Structure modification)
- Caragabal Yard (Track slews)
- Wirrinya Yard (Track slews)
- Lachlan River bridge (Structure modifications)
- Forbes Station (Track slews and awning modifications)

The D&C scope typically includes works associated with route clearance to accommodate the new Structure Outline D H F2 clearance envelope, necessary to accommodate the double-stacked freight container trains and this includes:

- Structure modifications
- Track reconfigurations
- Bridge replacements
- Track lowering
- Track slews and level-crossing upgrades
- Bridge removal.

1.3 Site Description

This study conducted a flood assessment for the Kemp Street Bridge and Footbridge site. The figure below shows the site location.



FIGURE 1: SITE LOCATION

Kemp Street Bridge and Footbridge form part of the Albury to Illabo (A2I) section. A portion of the two structures are combined (and a portion separate) but due to the close vicinity of the works and being within the same Lower Butlers Gully catchment, these projects have been combined for a singular flooding investigation. The Kemp Street Bridge and Footbridge are in the centre of Junee and link the eastern and western sides of Junee town over the Inland Rail railway line which traverses north-south through the town. The Kemp Street Bridge replaces the existing bridge to provide a vertical

clearance of 7.1m over the Junee Yard Middle Road rail line, to allow the passage of Inland Rail double stacked rail traffic underneath the bridge.

While the Kemp Street Bridge is in the original scope of work, the Kemp Street Footbridge package, which connects to the Junee skatepark and Endeavor Park, has been added to the scope of work as a variation (VO-003). It was not detailed as part of the Reference Design and proposed a different alignment (alongside the road down to Ducker St) in the Concept Design. The Kemp Street Footbridge is proposed to be a Disability Discrimination Act (DDA) compliant pedestrian access bridge of a minimum 2.5 m width across the rail corridor. The footbridge is required to maintain the same clearance of 7.1 m over the railway line to allow the passage of double-stacked rolling stock.

Since the submission of the PDR Flood Design Report, ongoing design developments had been undertaken by relevant design disciplines, through the DDR stages and now at the TfNSW WAD IFC stage, for flood impact compliance. It should be noted that the latest IFC designs were incorporated and assessed in this TfNSW WAD IFC Stage Flood Design Report, to ensure that the design achieved a compliant flooding solution. The staging of the Flood Design Report through the design and review gates is listed here for clarification:

- PDR: Provide existing conditions assessments, design conditions assessment, and identify areas of non-compliance.
- DDR: Update design conditions for any design developments to achieve a compliant solution
- DDR No 2: Update the design and existing conditions for design developments and new information on existing conditions to achieve a compliant solution. This update corresponds to the 5-0052-210-PEN-J2-RP-0001_E Detailed Design Report which corresponds to the UGLRL Hold Point #3 (HP3) submission. This revision includes and incorporates the IFC design of Junee Yard, the IFC Design of Olympic Hwy Underbridge and the IFC design of all sub- and super-structures for Kemp St Bridge.
- TfNSW WAD Stage 2 Re-submission: Update the design and existing conditions for design developments and new information on existing conditions to achieve a compliant solution. This update corresponds to the 5-0052-210-PEN-J2-RP-0001_G Detailed Design Report. This revision includes and incorporates the IFC design of Junee Yard, the IFC Design of Olympic Hwy Underbridge and the IFC design of all sub- and super-structures for Kemp St Bridge, along with the latest WAD Stage 2 design of the Olympic/Kemp and Kemp/Ducker Street intersections.
- TfNSW WAD IFC: Update for any changes arising from the Olympic/Kemp Street intersection TfNSW WAD review and close-out comments. **This is the current report stage.**

1.4 Objectives

This flood design report has been prepared to support the delivery of the Kemp Street Bridge and Footbridge package and comply with the CSSI Conditions of Approval (CoA) and Updated Mitigation Measures (UMM) for quantitative flood modelling demonstrating compliance with pre- and post- development criteria. Refer to Section 2 for a summary of compliance.

This report provides a flood impact assessment for the IFC designs of the Overbridge and Footbridge, as well as the Olympic/Kemp and Kemp/Ducker Street intersections. The intersection of Olympic/Kemp Street is at IFC stage, to be approved by TfNSW under a Works Authorisation Deed (WAD). As such, this report is badged 'TfNSW WAD IFC'.

It should be noted that the Kemp Street Overbridge and Footbridge designs from 5-0052-210-PEN-J2-RP-0001 Revision 0 were incorporated into this flood assessment. The flood assessment aims to estimate the flood behaviour within the study area and assess the potential flood impacts as a result of the design, especially outside of the project boundary. The assessment also includes a cumulative assessment of the IFC track and civil designs from the Junee Station Yard package and from the Olympic Highway Underbridge package.

This report should be read in conjunction with the Issued For Construction Design Report – Kemp Street Overbridge and Footbridge (5-0052-210-PEN-J2-RP-0001 Revision 0) which incorporates the IFC of the road bridge, footbridge and Ducker St intersection works.

1.5 Scopes

The scope of this study includes:

- Carrying out the flood assessment for design events of 20%, 10%, 5%, 2%, 1% AEPs, 1% AEP with climate change, 0.5% AEP, 0.05% AEP and PMF (Probable Maximum Flood) under existing and design conditions.
- Checking flood assessment results with the criteria, including flood impacts and flood immunity.
- Proposing any mitigation measures (if required).

1.6 Previous Studies

1.6.1 Flood Studies

The table overleaf summarises all the flood studies associated with the Junee area including the Kemp Street area.

TABLE 2: SUMMARY OF PREVIOUS FLOOD STUDIES

Item No.	Flood Study	Description
1	Lower Butlers Gully Flood Study (Lyall & Associates Consulting Engineers, 2009)	This flood study defined the flood behaviour in the Lower Butlers Gully catchment in Junee. The hydrologic and hydraulic modelling was undertaken in RORB and HEC-RAS (1D only) using the ARR1987 guidelines. There was no historical flood data to calibrate the study.
2	Lower Butlers Gully Floodplain Risk Management Study and Plan (Lyall & Associates Consulting Engineers, 2011)	The flood management study and plan used the findings from the Lower Butlers Gully Flood Study to assess the impacts of flooding, review Council policies and consider options for management of flood affected land.

1.6.2 Reference Design

Reference Design Report:

- Albury to Illabo (A2I) and Stockinbingal to Parkes (S2P) Projects Reference Design Report – Junee Package (June 2022)

Regional flooding at the Junee Yard including the Kemp Street area was assessed against the Lower Butlers Gully Flood Study (Lyall and Associates, 2009), undertaken for the Junee Shire Council. The flood study indicates there is overland flooding within the rail corridor adjacent to Kemp Street bridge abutments during the 1% and 5% AEP flood events and the flows exit the rail corridor downstream to the Edgar Street Open Channel. However, the Kemp Street Bridge approaches and adjacent connecting roads were not affected by flooding. Refer to Figure 3 for the Kemp Street Bridge Location.

The Kemp Street Footbridge project scope was included as a variation to the A2I Detailed Design and was not originally included in the Reference Design. Refer to the figure below extracted from the Reference Design Report.

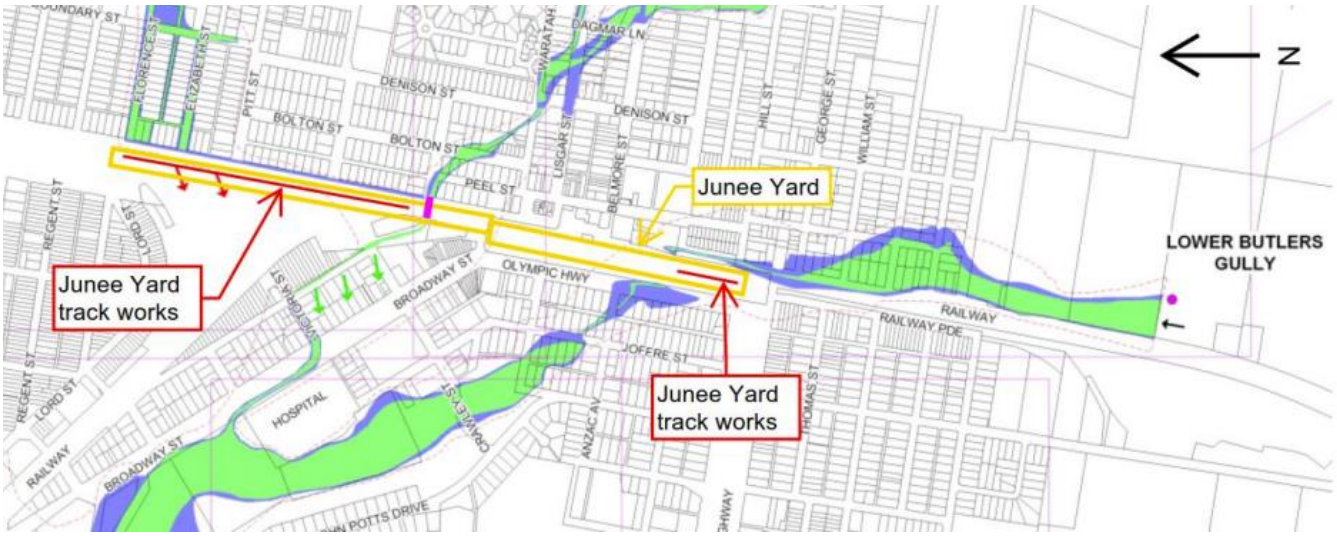


FIGURE 2: 1% AND 5% AEP FLOOD EXTENT AT JUNEE YARD (IMAGE SOURCE: ALBURY TO ILLABO EIS TECHNICAL PAPER 11, FIGURE 4.45 (JULY 2022))

1.6.3 Environmental Impact Statement

An EIS which has been approved, supports the application for approval of the Proposal under Division 5.2 of the Environmental Planning and Assessment Act 1979 (EP&A Act). It addresses the environmental assessment requirements set by the Secretary of the NSW Department of Planning, Industry and Environment, which is commonly referred to as the SEARs. The A2I CSSI Environmental Impact Statement contains the following relevant prior assessment documents:

- Albury to Illabo Environmental Impact Statement (EIS) Technical Paper 11 – Hydrology, flooding and water quality (July 2022)

A qualitative assessment of the Kemp Street Bridge works was undertaken in the EIS using the Lower Butlers Gully Flood Study (Lyall and Associates, 2009). As per the flood study, there are overland flows within the rail corridor in the 1% and 5% AEP events. The EIS states that the bridge and adjacent connecting roads are not impacted by flooding, as flood waters flow beneath the bridge along the rail corridor. An excerpt of the EIS is shown in the figure below, with the indicative locations of the Kemp Street bridge and footbridge.

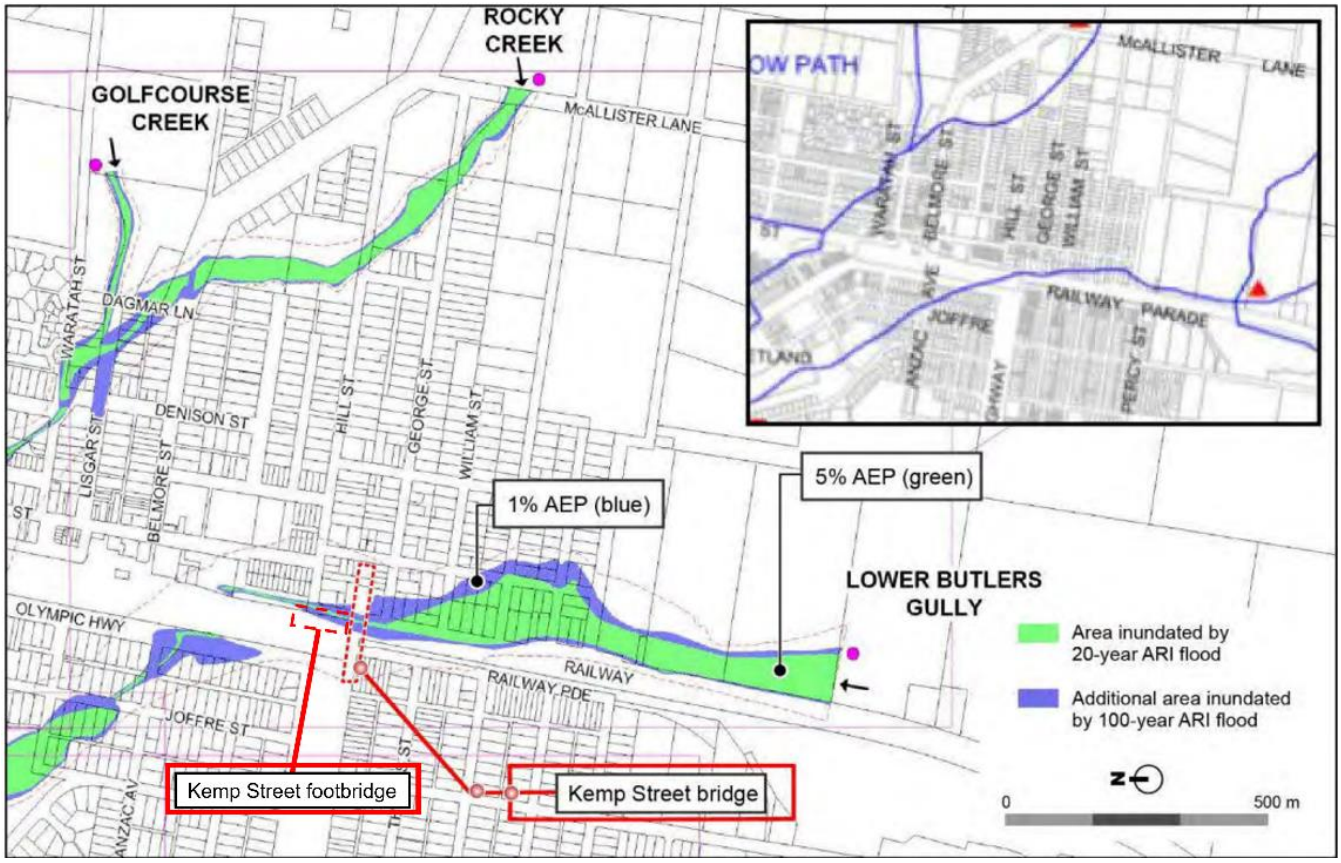


FIGURE 3: 1% AEP FLOOD EXTENT AT KEMP STREET OVERBRIDGE (IMAGE SOURCE: ALBURY TO ILLABO EIS TECHNICAL PAPER 11 FIGURE 4.37 (JULY 2022))

1.7 Purpose and Requirements

The primary purpose of this flood assessment report is to describe how the design development and the associated review process has been prepared and managed. The report assesses changes to the flood behaviour, and its impact on the rail immunity and on the neighbouring developments.

The secondary purpose of this report is to provide evidentiary documentation of consultation and review by external stakeholders, and the independent suitably qualified flood consultant, in demonstrating compliance with the CSSI conditions of approval. Refer to Appendix C for ARTC review, Appendix D for External Consultation Review, and Appendix E for the Independent Flood Consultant review comments.

1.8 Information Documents

The following documents have been provided ‘For Information’ and have been referenced/reviewed as part of the design development:

- Lower Butlers Gully Floodplain Risk Management Study and Plan (Lyall & Associates Consulting Engineers, 2011). This flood study supersedes the other flood studies listed in Table 2 as it is the most recent flood study.
- Albury to Illabo (A2I) and Stockinbingal to Parkes (S2P) Projects Reference Design Report – Junee Package (June 2022)
- Albury to Illabo Environmental Impact Statement (EIS) Technical Paper 11 – Hydrology, flooding and water quality (July 2022) (currently under planning assessment)

1.9 Inputs

The inputs to this flood assessment report include:

- Australian Standards and Guidelines: AS 7637 Railway Infrastructure – Hydrology and Hydraulics
- Australian Rainfall and Runoff: A Guide to Flood Estimation 2019 V4.1
- Austroads Guide to Bridge Technology – Part 8: Hydraulic Design of Waterway Structures
- Inland Rail Climate Change Risk Assessment Framework
- Flood Risk Management Manual, The Policy and Manual for the management of flood liable land' (Department of Planning and Environment (DPE), 2023

The table below outlines the available information relevant to the site, which is used for flood modelling.

TABLE 3: AVAILABLE INFORMATION

Item	Information / Data Name	Type	Description / Comments
Surveys / General			
1	All Google Maps; NSW Imagery by SIXMAPS; ESRI World Street Map; Open Street Map	WMS	Basemaps linked in QGIS referenced for guidance through the assessment.
2	AAM2015_10cm_210_04_2_KempSt	ECW	Aerial imagery used in Reference Design, dated on 16/08/2023.
3	Urban Stormwater Mains 29 Nov 23 and Urban Stormwater Pits 29 Nov 23	GIS files	GIS files of the urban stormwater within Junee Shire Council, received from Junee Shire Council on 01/12/2023.
4	NSW Landuse 2017 v1.5	GIS files	GIS files of the NSW land zoning by NSW Department of Climate Change, Energy, the Environment and Water, dated on 21/09/2023 and accessed on 20/12/2023.
5	IS2301309 Ortho 35mm MGA2020z55 Junee	ECW	Aerial imagery provided by Martinus, dated on 15/03/2024.
6	Junee201502_Merged_5m_LiDAR	TIF	5m LiDAR captured in 2015 in GDA2020 projection: the data has an accuracy of 0.9m (95% Confidence Interval) vertical and 1.25m (95% Confidence Interval) horizontal, downloaded from Elvis - Elevation and Depth - Foundation Spatial Data (https://elevation.fsdf.org.au/) on 15/07/2024. This LiDAR was used to delineate the hydrological catchments as it was received prior to the 1m LiDAR data.
7	A2P EXT JUN GDA20Z55 RAIL 240719	DXF	Existing rail strings in GDA2020 projection, received from Martinus on 19/07/2024.
8	Merge_1m_2015_GDA2020	TIF	1m LiDAR carried out in 2015 by ARTC (The data for the derived points have an accuracy of 0.15m (68% confidence level)), received from Martinus on 12/11/2024 for the rail corridor.
9	A2P JNK EXT GDA20Z55 COMBINED A2P JNK EXT GDA20Z55 COMBINED_250825.dxf	TIN, DWG/DXF	Survey of the rail corridor including ground surveys, rails, and drainage infrastructure within the project boundary area, received from Martinus on 18/09/2024 and 25/08/2025 respectively
Design Files			
1	5-0052-210-SBD-J2-MD-2001-KEMP_STREET_BRIDGE_3D_STRUCTURAL_DESIGN_BRIDGE_MODEL_DWG	DWG	IFC Kemp Street bridge design, received from the DJV design team on 14/05/2025 for 0052-210-PEN-J2-RP-0001_C Detailed Design Report.

Item	Information / Data Name	Type	Description / Comments
2	5-0052-210-CAL-J4-MD-0001-JUNEE_YARD_3D_RAIL_DESIGN_STRINGS	DWG/XML	IFC Junee Yard design rail 3d strings in GDA2020 projection, received from the DJV team on 06/06/2025 for 0052-210-PEN-J2-RP-0001_C Detailed Design Report.
3	IFC designs from the Olympic Park Underbridge package	TUFLOW files	IFC Design layers in TUFLOW, received from the DJV team on 08/07/2025 for 0052-210-PEN-J2-RP-0001_C Detailed Design Report.
4	KEMP FOOTBRIDGE 3D	DXF	IFC Kemp Street footbridge IFC design received from the DJV design team on 24/11/2025 for 0052-210-PEN-J2-RP-0001_E Detailed Design Report.
5	5-0052-210-DDR-J2-MD-2003-KEMP_STREET_BRIDGE_3D_DRAINAGE_DESIGN_STRINGS_12DA.12da 200826 PIT SCHEDULE.xlsx	12DA and excel file	IFC WAD Stage Design drainage pits and pipes and major existing pipes details, received from the DJV design team on 20/08/2026 corresponding to 5-0052-210-PEN-J2-RP-0001_0 IFC Report.
6	20260820 - TRIS 210 DCW J2 FLOOD.dem	DEM	IFC WAD Stage DEM of all combined design civil works, received from the DJV team on 20/08/2026 which corresponds to 0052-210-PEN-J2-RP-0001_0 IFC Report.

1.10 Outputs

The list of maps and flood maps are included in Appendix A.

1.11 Limitations and Assumptions

The following limitations and assumptions are applied to the current study for the IFC WAD Stage:

- Existing drainage data for the greater area within Junee Shire Council was adopted based on the supplied GIS files from Junee Shire Council, as well as available survey data from Martinus.
- A blockage assessment was carried out for the 1% AEP design scenario. The estimated blockage as per the ARR2019 guidelines was adopted for the culverts and bridges within the project boundary, and a 20% blockage was adopted for the other culverts, pits and pipes outside the project boundary. The details and results are presented in Section 5.5.2.
- An assessment of temporary works and staging has not been undertaken as it is out of the flooding assessment scope.

2 COMPLIANCE WITH REQUIREMENTS

2.1 Project Scope and Requirements

The detailed design has been assessed to check if it meets the Project Scope and Requirements (PSRs). This is demonstrated throughout the flood assessment with the table below summarising the Kemp Street designs' compliance with the PSRs.

TABLE 4: FLOODING CRITERIA WITHIN PSR ANNEXURE B TECHNICAL REQUIREMENTS

Requirement	Identifier	A2P Technical Requirements Description	Compliance Evidence Reference
Project Wide	5.4.10	Without limiting the environmental management requirements in Annexure F, section 6.1.1, all D&C Works in watercourses shall comply with the NSW Department of Primary Industries Standards: Policy and Guidelines for Fish Friendly Waterway Crossings; Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings; and Policy and Guidelines for Fish Habitat Conservation and Management Update.	N/A (structure modifications do not affect any watercourses environmentally)
Project Wide	5.4.2	Where existing flood immunity is lower than ARTC SMS minimum requirements, the functional requirements for flood immunity take precedence over the ARTC SMS.	Compliant. The existing immunity of the rails (lower than 20% AEP) is lower than the ARTC SMS minimum requirement (1% AEP), which would be maintained under design conditions as per the functional requirements. Refer to Section 5.3.
Project Wide	5.4.3	Where existing flood immunity is higher than ARTC SMS minimum requirements, the ARTC SMS requirements for flood immunity take precedence over the functional requirements.	Compliant. The existing immunity of the rails (lower than 20% AEP) is lower than the ARTC SMS minimum requirement (1% AEP), which would be maintained under design conditions as per the functional requirements. Refer to Section 5.3.
Project Wide	5.4.5	Bridge and culvert hydraulics shall comply with Austroads Guide to Bridge Technology Part 8: Hydraulic Design of Waterway Structures.	Compliant. Kemp Street bridge and the footbridge were modelled and simulated in compliance with the Austroads Guideline. Refer to Section 4.2.2.
A2I Technical Requirements	IR-SR-A2I-116	The System shall comply with 0-0000-900-ESS-00-ST-0001 Inland Rail Climate Change Risk Assessment Framework.	Compliant. Climate Change assessment was carried out by running the 1% AEP + 2090 RCP 8.5. Refer to Section 5.5.1 .
A2I Technical Requirements	IR-SR-A2I-349	The Corridor System for Enhancement Corridors shall have a flood immunity of no worse than existing.	Compliant. The existing immunity is maintained under design conditions.

Requirement	Identifier	A2P Technical Requirements Description	Compliance Evidence Reference
			Refer to Section 5.3.
A2I Technical Requirements	IR-SR-A2I-350	The Corridor System, where the existing track is lowered, shall maintain the existing flood immunity.	Compliant. The existing immunity is maintained under design conditions. Refer to Section 5.3.
A2I Technical Requirements	IR-SR-A2I-352	The Corridor System shall prevent damage of the formation due to ponding of water.	Compliant. The existing immunity and ponding conditions in the rail corridor are maintained. Refer to Sections 5.2 & 5.3.
A2I Technical Requirements	IR-SR-A2I-458	The Corridor System shall prevent ponding in longitudinal open channels.	Compliant. The proposed channel has grading towards downstream which prevents ponding. Refer to Drainage Design section 4.5 on Kemp Street Overbridge and Footbridge design report (5-0052-210-PEN-J2-RP-0001).
A2I Technical Requirements	IR-SR-A2I-459	The Corridor System for Enhancement Corridors shall provide mitigation for flood impacts no worse than existing condition.	Compliant. The existing conditions are maintained, and compliance is generally achieved with CoA E42. Refer to Section 5.2 & 5.4.
A2I Technical Requirements	IR-SR-A2I-464	The Corridor System shall cause no adverse impacts either inside or outside the rail corridor when diverting water away from the track.	Compliant. The existing conditions are maintained. No diversion of water is proposed. Refer to Section 5.2 & 5.4.
A2I Technical Requirements	IR-SR-A2I-465	The Corridor System shall minimise changes to the existing or natural flow patterns.	Compliant. There are no significant changes to the existing or natural flow patterns. Refer to Section 5.2 & 5.4.
A2I Technical Requirements	IR-SR-A2I-541	The Structures System's new underbridges shall withstand the 0.05% annual exceedance probability design flood event.	Compliant. The 0.05% AEP has been assessed as part of this package. Refer to the Detailed Design Report 5-0052-210-PEN-J2-RP-0001_G, Section 4.6 for the structural designs and integrity.
A2I Technical Requirements	IR-SR-A2I-735	The Third-Party System private roads shall have flood immunity no worse than existing.	Compliant. No third-party private roads are impacted. Refer to Section 5.2.

Requirement	Identifier	A2P Technical Requirements Description	Compliance Evidence Reference
A2I (Annexure F)	6.1.1	Without limiting clauses 8 and 14 of the Deed, the Contractor shall ensure that the Contractor's Activities and the Works comply with the following for A2I, the Conditions of Approval and the environmental assessment reports available on: https://www.planningportal.nsw.gov.au/major-projects/projects/inland-rail-albury-illabo"	Refer to Table 5.

2.2 Conditions of Approval - Flooding

The Conditions of Approval (CoA) have been provided as part of the CSSI approval and Inland Rail Deed of Variation. The detailed design has been assessed to check if it meets the CoA and the compliance is presented in the table below.

TABLE 5: CONDITIONS OF APPROVAL COMPLIANCE TABLE – FLOODING

Condition	Condition or Criteria	Compliance Evidence Reference
E38	All practicable measures must be implemented to ensure the design, construction and operation of the CSSI will not adversely affect flood behaviour, or adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses.	Compliant. Refer to Section 5.
E39	The CSSI must be designed with the objective to meet or improve upon the flood performance identified in the documents listed in **Condition A1**. Variation consistent with the requirements of this approval at the rail corridor is permitted to effect minor changes to the design with the intent of improving the flood performance of the CSSI.	Compliant. Refer to Section 5.
E40	Updated flood modelling of the project's detailed design must be undertaken for the full range of flood events, including blockage of culverts and flowpaths, considered in the documents listed in **Condition A1**. This modelling must include:	Compliant. Refer to Section 5.
E40	a) Hydrologic and hydraulic assessments consistent with *Australian Rainfall and Runoff – A Guide to Flood Estimation* (Geoscience Australia, 2019);	Compliant. Refer to Section 4.
E40	b) Use of modelling software appropriate to the relevant modelling task;	Compliant. Appropriate software (RORB and TUFLOW) was used. Refer to Section 4.
E40	c) Field survey of the existing rail formation and rail levels, should be included within the models; and	Compliant. The existing rail data was included in the hydraulic models. Refer to Section 1.9 and Section 4.
E40	d) Confirmation of predicted afflux at industrial properties adjacent to Railway Street, Wagga Wagga based on field survey.	N/A - This report relates to the Kemp Street site, which is not related to Wagga Wagga.
E40	Updated flood modelling must be made publicly available in accordance with **Condition B18**.	Flood design report and independent review of the flood design report have been provided to IR, through this submission, for

Condition	Condition or Criteria	Compliance Evidence Reference
		IR to upload on the IR website, as per CoA B18 responsibility allocation.
E41	The Proponent's response to the requirements of **Conditions E38** and **E40** must be reviewed and endorsed by a suitably qualified flood consultant, who is independent of the project's design and construction and approved in accordance with **Condition A16,** in consultation with directly affected landowners, DCCEEW Water Group, TfNSW, DPI Fisheries, BCS, NSW State Emergency Service (SES) and relevant Councils.	Independent review of the flood modelling, model and Flood Design Report has been undertaken by the Proof Engineer's specialist contractor, to satisfy and comply with the requirements of A16. Consultation with the Council and other stakeholders has been undertaken through formal review of this Flood Design Report. They are shown in Appendices C, D and E.
E42	The CSSI must be designed and constructed to limit impacts on flooding characteristics in areas *outside the project boundary* during any flood event up to and including the 1% AEP flood event, to the following:	Refer Below
E42	(a) a maximum increase in inundation time of one hour, or 10%, whichever is greater;	Compliant. Refer to Section 5.4.4.
E42	(b) a maximum increase of 10 mm in above-floor inundation to habitable rooms where floor levels are currently exceeded;	Compliant. Refer to Section 5.4.1 for discussion of changes in peak flood level.
E42	(c) no above-floor inundation of habitable rooms which are currently not inundated;	
E42	(d) a maximum increase of 50 mm in inundation of land zoned as residential, industrial or commercial;	
E42	(e) a maximum increase of 100 mm in inundation of land zoned as environment zone or public recreation;	
E42	(f) a maximum increase of 200 mm in inundation of land zoned as rural or primary production, environment zone or public recreation;	
E42	(g) no increase in the flood hazard category or risk to life; and	Compliant. Refer to Section 5.4.3.
E42	(h) maximum relative increase in velocity of 10%, or to 0.5m/s, whichever is greater, unless adequate scour protection measures are implemented and/or the velocity increases do not exacerbate erosion as demonstrated through site-specific risk of scour or geomorphological assessments	Compliant. Refer to Section 5.4.2. Both a maximum relative increase in velocity of 10%, or to 0.5m/s, whichever is greater, have been considered, and the governing and worst case criteria adopted. As such, this is consistent with requirements of the CoA and DPHI's interpretation.
E42	Where the requirements set out in clauses (d) to (f) inclusive cannot be met alternative flood levels or mitigation measures must be agreed to with the affected landowner.	Clause (d) to (f) are Compliant.

Condition	Condition or Criteria	Compliance Evidence Reference
E43	A **Flood Design Report** confirming the:	See below
E43	a) final design of the CSSI meets the requirements of **Condition E42;** and	Compliant Refer to Section 5.4.
E43	b) the results of consultation with the relevant council in accordance with **Condition E46**	Refer to E46.
E43	must be submitted to and approved by the Planning Secretary prior to the commencement of permanent works that would impact on flooding.	This report will be submitted to the Planning Secretary for approval prior to the commencement of permanent works that would impact on flooding.
E44	The **Flood Design Report** required by **Condition E43** must be approved by the Planning Secretary prior to works that may impact on flooding or the relevant council's stormwater network.	This report will be submitted to the Planning Secretary for approval prior to the commencement of permanent works that would impact on flooding.
E45	Flood information including flood reports, models and geographic information system outputs, and work as executed information from a registered surveyor certifying finished ground levels and the dimensions and finished levels of all structures within the flood prone land, must be provided to the relevant Council, BCS and the SES in order to assist in preparing relevant documents and to reflect changes in flood behaviour as a result of the CSSI. The Council, BCS and the SES must be notified in writing that the information is available no later than one (1) month following the completion of construction. Information requested by the relevant Council, BCS or the SES must be provided no later than six (6) months following the completion of construction or within another timeframe agreed with the relevant Council, BCS or the SES.	Flood information will be provided to the relevant Council, BCS and the SES to assist in preparing relevant documents and to reflect changes in flood behaviour as a result of the CSSI in accordance with the requirements of CoA E45.
E46	The design, operation and maintenance of pumping stations and storage tanks and discharges to council's stormwater network must be developed in consultation with the relevant council. The results of the consultation are to be included in the report required in **Condition E43.**	Local drainage flow regime, catchment area and imperviousness remain the same as per the existing condition, there is no additional flow towards the existing Council's stormwater network. The design has not worsened the existing condition. Discharges to the council's stormwater networks have been consulted with Junee Shire Council during the briefing workshops, various stages of design submissions with the Council's comments closed out, details are documented in 5-0052-210-PEN-J2-RP-0001_G. Changes to the design drainage since the last submission are documented in 5-0052-210-PEN-J2-RP-0001_G these changes are to be reviewed by Council.

2.3 Updated Mitigation Measures - Flooding

The Updated Mitigation Measures (UMM) have been provided, and the detailed design has been assessed to meet the UMM and the compliance is presented in the table below.

TABLE 6: UPDATED MITIGATION MEASURES COMPLIANCE TABLE - FLOODING

Condition	Criteria	Compliance Evidence Reference
HFWQ3	Further consultation will be undertaken with local councils and other relevant authorities to identify opportunities to coordinate the proposal with flood mitigation works committed to as part of the council's flood management plans, or other strategies.	Consultation with the Council and other relevant authorities will be undertaken through a formal review of this Flood Design Report.
HFWQ4	At Wagga Wagga Yard enhancement site, flood modelling would be carried out during detailed design to confirm predicted afflux at industrial properties located at Railway Street and compliance with the Quantitative Design Limits for Inland Rail. This would be informed by topographic and building floor surveys and a review of localised drainage structures (as required). Quantitative assessment of the sites of low and moderate hydraulic complexity will be carried out during detailed design and will consider the impact of the Possible Maximum Flood event at built-up areas (where information is available) and the tenure of the upstream areas that are impacted by drainage and/or flooding. The outcomes of the assessment are to be provided to DCCEW– BCS.	This report relates to Kemp Street Bridge and Footbridge site, which is not relevant to Wagga Wagga Yard. Compliant. A quantitative assessment has been undertaken. Refer to Section 5.
HFWQ5	At Riverina Highway bridge enhancement site, flood and drainage network modelling (including capacity and operation of the stormwater storage and pump system) will be carried out during detailed design to confirm predicted compliance with the Quantitative Design Limits (QDLs)* for Inland Rail. The modelling would be undertaken in consultation with Albury City Council.	This report relates to the Kemp Street Bridge and Footbridge Site, which is not relevant to the Riverina Highway track lowering site.

* QDL is superseded by CoA E42.

2.4 PS271 and PS371 WAD Requirements

As part of the Kemp Street/Olympic Highway Intersection Transport for NSW (TfNSW) Works Authorisation Deed (WAD) scope identified in PS271 and PS371, hydrologic and hydraulic assessments were undertaken in accordance with the specified requirements.

TABLE 7: PS271 COMPLIANCE TABLE - FLOODING

Condition	Criteria	Compliance Evidence Reference
2.1.a	During concept design, ARTC must consider:	See below
2.1.a.i	flooding, hydrology and hydraulic "Secretary's Environmental Assessment Requirements (SEARs)", if it is issued to the project;	Compliant The assessment considers the conditions of approval from the Critical State Infrastructure (CSSI) and project-specific requirements. Refer to Section 2

Condition	Criteria	Compliance Evidence Reference
2.1.a.ii	hydrological and hydraulic impacts of the proposal;	Compliant. Refer to Section 5.4
2.1.a.iii	flooding and flood immunity requirements, see Section 4.1.2.2 Flood immunity	Refer to condition no 4.1.2.2.a and 4.1.2.2.b below
2.1.a.vi	mitigation of adverse hydrologic and hydraulic impacts that is beyond the acceptable thresholds (see Section 4.1.2.2 Flood immunity);	Refer to condition no 4.1.2.2.a and 4.1.2.2.b below
2.1.b	As part of the concept design and environmental assessment, ARTC must prepare a hydrologic/hydraulic assessment report of the area studied. The assessment must meet the requirements of:	See below
2.1.b.i	this specification to develop the concept design	Compliant The Flood design report includes hydrologic/hydraulic assessment and is based on project requirements Refer to Section 2
2.1.c.i	The hydrologic and hydraulic modelling and assessment must be undertaken such that: (i) the modelling and flood assessment are suitable for: (A) assessment and recommendation of appropriate flood immunity; (B) flood impact assessment of lands outside the project boundary; (C) the concept design; and (D) subsequent detail design of the projects	Compliant Refer to Section 4
2.1.c.ii	the roadway project components achieve the required flood immunities (refer to Section 4.1.2.2 for Flood immunity).	Refer to condition no 4.1.2.2.a and 4.1.2.2.b below
2.1.e	If necessary, ARTC must undertake all investigations such as historical data collection, assessment, and flood within the project catchments and to support the project's needs for stormwater and flood risk management	Compliant Previous studies have been analysed, and site specific hydraulic and hydrology assessment has been undertaken for the site. Refer to Section 1.6 and 4
2.1.2.a	During the hydrologic and hydraulic modelling and assessment, ARTC must:	See below
2.1.2.a.i	describe the hydrologic and hydraulic regime and follow the appropriate modelling software in accordance with Australian industry current best practice;	Compliant Appropriate software (RORB and TUFLOW) was used. Refer to Section 4 and 5
2.1.2.a.ii	include all hydrologic, hydraulic and terrain features of the catchment/floodplains. The model must include sufficient	Compliant Refer to Section 4 and 5

Condition	Criteria	Compliance Evidence Reference
	details so that a well-defined flood regime can be established in both existing and design case scenarios;	
2.1.2.a.iii	ensure that all recent constructed and approved development information is included in the existing terrain of the catchment/floodplains	Compliant The site incorporates detailed site survey and the buildings were represented based on recent aerial photo. Refer to Section 4.2.1.1
2.1.2.a.iv	calibrate and validate flood models	Compliant The Hydrology model has been validated based on RFFE flow comparison. The hydrology flows were then utilised in the hydraulic model. Refer to section 4.1.2
2.1.2.a.v	model and describe the flood regime for existing/base case scenario;	Compliant Refer to Section 5
2.1.2.a.vi	model and describe the proposed scenario flood regime	Compliant Refer to Section 5.2
2.1.2.a.vii	assess and map the impacts of the project within and outside the project corridor;	Compliant Refer to Section 5.4 and Appendix A for maps
2.1.2.a.viii	assess the flood immunity of the project component; and	Compliant Refer to Section 5.3
2.1.2.a.ix	model future climate change scenarios in accordance with “Australian Rainfall and Runoff - A Guide to Flood estimation” (Ver 4.2) and the “Austroads Guide to Road Design Part 5: Drainage – General and Hydrology Considerations”, Section 3.2 Climate Change and assess the potential impacts on the project elements.	Compliant. Based on the flooding concession for implementing ARR2019 v4.1 has been approved by TfNSW on 28/04/26 - refer to CN 01913_2016 Notice of Concession and 5-0052-210-IHY-J2-ME-0001_0. Refer to Section 5.5.1 for climate change assessment
2.1.3.a	During the concept phase, ARTC must consider the following:	See below
2.1.3.a.i	assess the ultimate effects of the road project components on regional flooding – including a range of flood events up to and include the probable maximum flood (PMF), refer to Appendix A, Table 6 – Design storm events to be modelled;	Compliant Refer to item 2.1.4 below
2.1.3.a.ii	investigate flood mitigation measures and provide concept of the appropriate mitigation measures;	Compliant Refer to Section 5.4 and 6
2.1.3.a.iii	for each bridge or bridge size culvert (>6 meter wide) opening affected by flooding, review the hydrological study to confirm each bridge:	Compliant Refer to section 5.3 and 5.4

Condition	Criteria	Compliance Evidence Reference
	(A) serviceability effects of afflux on adjacent properties areas outside of the project boundary and the stability of the adjacent road embankment – 1% AEP	
2.1.3.a.ix	the design assessment and consideration of the potential impacts arising from the future climate change must follow "AGRD Part 5", Section 3.2 Climate Change;	Compliant. Refer to Section 4.1.4 and 5.5.1
2.1.3.a.x	the road alignment must take into account climate change impacts in accordance with "Australian Rainfall and Runoff 2019 (ARR)", Version 4.2 and Austroads "AGRD, Part 5";	Compliant. Based on the flooding concession for implementing ARR2019 v4.1 has been approved by TfNSW on 28/04/26 - refer to CN 01913_2016 Notice of Concession and 5-0052-210-IHY-J2-ME-0001_0. Refer to Section 5.5.1 for climate change assessment
2.1.3.a.xi	present day design rainfalls are to be BoM 2016 Intensity Frequency Duration (IFD) adjusted to SSP2-4.5 (year 2030) in accordance with "ARR", Ver 4.2;	Compliant. Based on the flooding concession for implementing ARR2019 v4.1 has been approved by TfNSW on 28/04/26 - refer to CN 01913_2016 Notice of Concession and 5-0052-210-IHY-J2-ME-0001_0. Refer to section 5.5.1 for climate change assessment
2.1.3.a.xii	where Section 3.2 of "AGRD, Part 5" refers to RCP 4.5 and RCP 8.5, use "ARR" (Ver 4.2) SSP2-4.5 (year 2100) and SSP5-8.5 (year 2100) scenarios for climate change risk assessment;	Compliant. Based on the flooding concession for implementing ARR2019 v4.1 has been approved by TfNSW on 28/04/26 - refer to CN 01913_2016 Notice of Concession and 5-0052-210-IHY-J2-ME-0001_0. Refer to section 5.5.1 for climate change assessment
2.1.3.a.xiii	ARTC must design the minimum road levels, transverse drainage systems and bridge designs (including freeboard and structural design loads) based on SSP2-4.5 (year 2100) design rainfall intensities. Use SSP5-8.5 (year 2100) rainfall intensities for sensitivity analysis;	Compliant. Based on the flooding concession for implementing ARR2019 v4.1 has been approved by TfNSW on 28/04/26 - refer to CN 01913_2016 Notice of Concession and 5-0052-210-IHY-J2-ME-0001_0. The climate change results show the road design immunity is improved Refer to section 5.5.1 for climate change assessment
2.1.3.a.xv	the outcomes of the climate change modelling and appropriate mitigation strategies must be presented and discussed in the Climate Risk Assessment Workshop, refer	N/A Agreement with TfNSW was reached that the Climate Change Risk Workshop is not applicable to the

<table>
<tr><th>Condition</th><th>Criteria</th><th>Compliance Evidence Reference</th></tr>
<tr><td></td><td>to Table 10 of “PS211”, where an appropriate design standard will be agreed upon with TfNSW;</td><td>WAD. Refer to Transmit 004232 sent in October 2025. A2I Climate change risk assessment was held on 27/02/24 and 09/07/24.</td></tr>
<tr><td>2.1.3.a.xvi</td><td>flood impacts (proposed case versus existing) should be assessed against existing conditions using present day design rainfalls, BoM 2016 IFD adjusted to SSP2-4.5 (year 2030);</td><td>Compliant.
Based on the flooding concession for implementing ARR2019 v4.1 has been approved by TfNSW on 28/04/26 - refer to CN 01913_2016 Notice of Concession and 5-0052-210-IHY-J2-ME-0001_0.
Refer to section 5 for flood impact assessment</td></tr>
<tr><td>2.1.3.a.xvii</td><td>the existing environmental constraints, minimising impacts on areas of wetlands, biodiversity, and heritage value;</td><td>Compliant.
Generally, no significant impacts outside the project boundary.
Refer to Section 5.4</td></tr>
<tr><td>2.1.3.a.xix</td><td>the use of the local council flood model (if one exists) for modelling and assessing the impacts of the project, this will require consultation with TfNSW’s Representative;</td><td>N/A
No existing flood model was available for the site</td></tr>
<tr><td>2.1.4</td><td>The hydrologic and hydraulic modelling must be undertaken for the following design storm event frequencies, see Section A.4 Design storm events to be modelled
<table>
<tr><th>Storm event</th><th>Comments</th></tr>
<tr><td>2 EY</td><td>stormwater quality</td></tr>
<tr><td>1 EY</td><td>self-cleaning, stormwater quality</td></tr>
<tr><td>0.5 EY</td><td>drainage design / temporary works</td></tr>
<tr><td>10% AEP</td><td>piped drainage, flood management</td></tr>
<tr><td>5% AEP</td><td>piped drainage, flood management</td></tr>
<tr><td>2% AEP</td><td>drainage design / flood management</td></tr>
<tr><td>1%AEP</td><td>drainage check, flood management</td></tr>
<tr><td>0.5%AEP</td><td>climate change, flood management</td></tr>
<tr><td>0.05% AEP</td><td>structural assessment</td></tr>
<tr><td>PMF</td><td>flood management</td></tr>
</table></td><td>Compliant.
20%, 10%, 5%, 2%, 1% AEPs, 1% AEP with climate change, 0.5% AEP, 0.05% AEP and PMF were assessed in this flood design report.

4EY, 2EY, 1EY, 0.5 EY and 0.2EY not appliable for flooding assessment</td></tr>
<tr><td>4.1.2.2.a</td><td>If the road is inundated for a design flood event, ARTC must assess the potential impact on the roadway serviceability. This assessment must be undertaken in accordance with “AGRD” Section 4.4 and agree with the TfNSW’s</td><td>Compliant.
Refer to Section 5.3.1. The Kemp Street immunity is maintained, and Olympic Highway immunity is improved</td></tr>
</table>

<table>
<tr><th>Condition</th><th>Criteria</th><th>Compliance Evidence Reference</th></tr>
<tr><td></td><td>representative a design flood event (AEP) for the roadways' flood immunity</td><td>compared to existing conditions in 1% AEP</td></tr>
<tr><td>4.1.2.2.b</td><td>Unless otherwise agreed, the project components must achieve flood immunity to the design storm event frequencies shown in Table 2.
<table>
<tr><th>Item</th><th>Nominated minimum design event</th></tr>
<tr><td>General flood immunity [1, 2]</td><td>1% AEP /PMF</td></tr>
<tr><td>Main carriageway edge line (flood free)[2]</td><td>1% AEP</td></tr>
<tr><td>Local roads edge line.</td><td>10% AEP or Existing AEP, whichever produces higher immunity.</td></tr>
<tr><td>Cycleways including shared paths</td><td>Flood hazard during a 1% AEP flood event must be limited to low hazard as defined in Australian Rainfall and Runoff (ARR).</td></tr>
<tr><td>Water quality basins</td><td>10% AEP</td></tr>
<tr><td>TCS/ITS cabinets</td><td>1% AEP plus freeboard</td></tr>
<tr><td>Relocated or modified property accesses</td><td>10% AEP or Existing AEP, whichever produces higher immunity.</td></tr>
</table>
Note:
1) The general flooding and flood immunity must be designed for the 1%AEP with the PMF checked.
2) The nominated minimum design flood event may be modified based on the outcomes of the assessment in Section 4.1.2.2.</td><td>Compliant.
Refer to Section 5.3.1.
The Kemp Street immunity is maintained, and Olympic Highway immunity is improved compared to existing conditions in 1% AEP.
Local road immunity is generally maintained at the same level as existing conditions.
The design does not have a dedicated cycle way, however the proposed shared path experiences low flood hazard (H1) during 1% AEP flood event.
Water quality basins, TCS/ITS cabinets, and relocated or modified property access requirements are not applicable based on the current design</td></tr>
<tr><td>4.1.2.3.a</td><td>Any flooding that impacts lands outside the project boundary must comply with the limits set out in "AGRD, Part 5", Section 6.1 and Table 6.19, amended as follows:
(i) maximum allowable flood level impacts to habitable rooms are 0.01 m for events up to the 1% AEP where floor levels are exceeded in the existing case;
(ii) no above-floor inundation of habitable rooms which are currently not inundated;
(i) habitable rooms are defined as:
(A) a living, storage or working area, including (but not limited to) a lounge room, dining room, rumpus room, kitchen, bedroom, workroom, office, laundry, garage or any area used to store valuable possessions, plant or equipment susceptible to flood damage in the event of a flood. All rooms in buildings are assumed to be</td><td>Compliant.
Impacts have been assessed for events 20%, 10%, 5%, 2%, and 1 % AEP.
Refer to Section 5.4</td></tr>
</table>

Condition	Criteria	Compliance Evidence Reference
	habitable unless an internal inspection identifies otherwise. (ii) flooding impacts assessment outside the road corridor must be undertaken for a range of flood events, that must include but not limited to 20%, 10%, 5%, and 1%AEPs and PMF	

TABLE 8: PS371 COMPLIANCE TABLE – FLOODING

Condition no		Compliance Evidence Reference
2.2 Item 1	The detailed design must consider:	See below
2.2 Item 1.1	For EIS projects, the flooding, hydrology and hydraulic SEARs issued for the project (if required)	Compliant The assessment considers the conditions of approval from the Critical State Infrastructure (CSSI) and project-specific requirements. Refer to Section 2
2.2 Item 1.2	Hydrological impacts of the proposal.	Compliant. Refer to Section 5.4
2.2 Item 1.3	Flooding and flood immunity requirements.	Compliant. Refer to Section 2
2.2 Item 1.4	Hydrology/hydraulics: - Upstream and downstream impacts. - Ponding and retention of water. - Inundation times. - Mitigation of any adverse hydraulic affects.	Compliant. Impacts have been assessed for the 20%, 10%, 5%, 2% and 1% AEP events. Refer to Section 5.4
2.2 Item 2	ARTC must undertake further investigations, assessment and flood modelling as maybe necessary in order to confirm and enhance the understanding of flooding within the project catchments. Issues to be addressed include:	See below
2.2 Item 2.1	Ultimate effects of the road on regional flooding – including a range of flood events including the 20%, 10%, 5%, 2%, 1% (with and without Climate Change influences), 0.5%, 0.05% AEP events and the probable maximum flood (PMF) and details of appropriate flood mitigation measures.	Compliant. 20%, 10%, 5%, 2%, 1% AEPs, 1% AEP with climate change, 0.5% AEP, 0.05% AEP and PMF were assessed in this flood design report.
2.2 Item 2.2	The flood plain terrain model must be updated to include any changes resulting from infrastructure development and the cumulative impacts of these changes included in the flood modelling	Compliant. Cumulative assessment of all works in the catchment has been assessed in Section 5.
2.2 Item 2.3	For each bridge or bridge size culvert opening affected by flooding, review the hydrological study to confirm for each bridge:	Compliant.

Condition no		Compliance Evidence Reference
	- Serviceability effects of afflux on adjacent properties and the stability of the adjacent road embankment - 1% AEP & 0.05% AEP. - Ultimate limit state of bridges, major drainage structures and major retaining walls – refer Appendix A.2. - Refer also to bridgeworks and other structures, waterway investigations – PS361 Bridge and Structure Design.	Bridge structures assessed for the 1% AEP and 0.05% AEP. Refer to Section 5
2.2 Item 2.9	The potential effect arising from climatic change should be considered in the modelling	Compliant. Refer to Section 5.5.1 for climate change assessment
2.2 Item 2.10	Consideration of the 'Flood Risk Management Manual: The Policy and Manual for the management of flood liable land' (Department of Planning and Environment (DPE), 2023), including the flood risk management framework.	Compliant. Refer to Section 1.9
2.3	Performance requirements the project must be designed such that the carriageways are not inundated for a flood event with an average recurrence interval (ARI) Annual Exceedance Probability (AEP) of not less than that specified in Appendix A.2. - Item no 13 - General flooding and flood immunity – 1% AEP / PMF. The general flooding and flood immunity is to be design for the 1% AEP with the PMF checked.	Compliant. Refer to Section 5.3.1. The Kemp Street immunity is maintained, and Olympic Highway immunity is improved compared to existing conditions in the 1% AEP. Local road immunity is generally maintained at the same level as existing conditions.
3.2.1 Item 1.5	Hydraulically model all watercourses, which cross the roadway or flow adjacent to the project, and must provide flood mitigation measures where required	Compliant. Refer to Section 4 for details on watercourses and regional flooding, and Section 5 for flood impact assessments.
3.2.1 Item 1.7	Not increase upstream/downstream inundation levels by more than those levels determined in the REF, or any conditions of approval which may exist, refer to A.2 for the design storm event	Compliant. The flood impacts were assessed based on the project-specific CoA. Refer to section 2.2.

3 CHANGE MANAGEMENT

This section summarises the changes made to this design package due to changes in the project scope and/or evolution of the design.

3.1 Concept Design to SDR

DJV created a new TUFLOW hydraulic model to model the area of interest as no hydraulic model was available for the Concept Design stage or earlier.

TABLE 9: DESIGN DIFFERENCES BETWEEN CONCEPT DESIGN AND SDR

Item	Difference	Reason for Change
1	Incorporation of the latest available LiDAR data	The latest LiDAR data (2015, 5m cell size) was added to represent the terrain surrounding the project boundary.
2	Incorporation of the latest existing condition survey (Point cloud data)	A new existing condition survey was provided to represent the terrain more accurately.
3	Incorporation of Kemp Street Bridge Design	SDR design of the bridge includes piers and abutments, as well as surrounding road works.
4	Incorporation of Kemp Street Footbridge Design	SDR design of the bridge abutments, piers and elevated stairways tying into the ground surface.

3.2 SDR to PDR

Key design changes between the SDR Design and the PDR Design are listed in the table below.

TABLE 10: DESIGN DIFFERENCES BETWEEN SDR AND PDR

Item	Difference	Reason for Difference
1	The PDR Overbridge and PDR Footbridge designs were incorporated into the modelling. This includes the Kemp Street Footbridge connection to Kemp Street on the western side has been aligned to Kemp Street as opposed to the previous design which included a separate abutment.	Modelling of the most recent PDR design.
2	Junee Yard DDR works (track slews) were included in the Kemp Street model.	These were included due to the vicinity of the works occurring in the same catchment that a cumulative assessment was undertaken to assess that changes to the floodplain would not compound and create non-compliance with the CoA.

3.3 PDR to DDR

Key design changes between the PDR Design and the DDR Design are listed in the table below.

TABLE 11: DESIGN DIFFERENCES BETWEEN PDR AND DDR

Item	Difference	Reason for Difference
1	DJV updated the hydraulic and hydrologic models for both the existing conditions and the design conditions.	In addition to including the latest Kemp Street designs (at IFC stage for other design disciplines), the model was also updated for a cumulative impact assessment, representing the IFC designs as part of the Junee Yard package and the IFC designs as part of the Olympic Highway Underbridge package.

3.4 DDR to DDR No.2 (HP3 IFC)

The key design changes between the DDR design and DDR No.2 design are listed in the table below.

TABLE 12: DESIGN DIFFERENCES BETWEEN DDR AND DDR NO. 2

Item	Difference	Reason for Difference
1	Updates for IFC design of the road bridge, footbridge and Ducker St intersection. The hydraulic models for both the existing and design conditions have been updated accordingly.	Additional survey of the existing council drainage infrastructure was received surrounding the Kemp Street and Olympic Highway intersection. The design of the Kemp Street overbridge and tie-in to the Olympic Highway has been updated and incorporated into the hydraulic modelling. This includes updated drainage infrastructure for the proposed works. The drainage system for the new highway works was separated from the bridge and other works to provide independence of this drainage network, for Transport for NSW review and Returned Works asset ownership delineation. Refer to the Detailed Design Report (5-0052-210-PEN-J2-RP-0001_E) for more information on the design changes between packages.

3.5 DDR2 (HP3 IFC) to WAD Stage 2 Re-submission

The key design changes between the DDR No.2 design and WAD Stage 2 Re-submission design are listed in the table below.

TABLE 13: DESIGN DIFFERENCES BETWEEN DDR NO. 2 AND WAD STAGE 2 RE-SUBMISSION

Item	Difference	Reason for Difference
1	Updates for Stage 2 DDR Re-submission civil and drainage design The hydraulic models for both the existing and design conditions have been updated accordingly.	Additional survey of the existing council drainage infrastructure was received. The civil design of the Kemp Street overbridge and tie-in to the Olympic Highway has been updated and incorporated into the hydraulic modelling. This includes updated drainage infrastructure for the proposed works. Refer to the Detailed Design Report (5-0052-210-PEN-J2-RP-0001_G) for more information on the design changes between packages.

3.6 WAD Stage 2 Re-submission to WAD IFC Stage (Current stage)

The key design changes between the WAD Stage 2 Re-submission and WAD IFC Stage design are listed in the table below.

TABLE 14: DESIGN DIFFERENCES BETWEEN WAD STAGE 2 RE-SUBMISSION AND IFC WAD STAGE

Item	Difference	Reason for Difference
1	Updates for WAD IFC civil and drainage design The hydraulic models for both the existing and design conditions have been updated accordingly.	Additional survey of the existing council drainage infrastructure was received. The civil design of the Kemp Street overbridge and tie-in to the Olympic Highway has been updated and incorporated into the hydraulic modelling. This includes updated drainage infrastructure for the proposed works. Refer to the IFC Report (5-0052-210-PEN-J2-RP-0001_0) for more information on the design changes between packages.

4 MODELLING METHODOLOGY

The overall approaches for flood modelling are listed below:

- A 'RORB' runoff routing hydrologic model was developed to calculate flood hydrographs from rainfall and catchment characteristics.
- Based on ARR2019, utilise the hydrological model and generate flow hydrographs for input to the hydraulic model for all events (20 % AEP, 10% AEP, 5% AEP, 2% AEP, 1% AEP, 1% AEP with Climate Change, 0.5% AEP, 0.05% AEP and PMF) to perform critical duration analysis.
- The flood hydrographs generated in the RORB runoff routing model were compared against the Regional Flood Frequency Estimation (RFFE) Model to validate the runoff routing model. There is no stream level gauge within the catchment to calibrate the hydrologic model.
- A hydraulic model was created using the software TUFLOW, which is a 1D/2D hydraulic modelling software for flood assessments. The TUFLOW model was created using the latest available LiDAR and survey, as well as drainage infrastructure information supplied by the Junee Shire Council. This formed the existing model for this study.
- A rainfall-on-grid simulation was undertaken in the created TUFLOW model to assess if local overland flooding from the local catchment or mainstream flooding from Lower Butlers Gully and Rocky Creek was dominant at the site.
- From the initial assessment mainstream flooding was found to be dominant at the area of works. From this, the rainfall-on-grid simulation was removed from the flood assessment model, and inflows applied using 2D Source over Area (SA) and 2D Boundary Conditions (BC) for the total inflows at the model boundary and local inflows for catchment generated from the RORB model. The 2d_sa was used rather than a rainfall-on-grid simulation due to the size of the catchment and reducing model run times.
- The TUFLOW model was updated from the existing conditions to the design conditions by incorporating the proposed Kemp Street Overbridge and Footbridge designs, as well as the IFC design works from the Junee Yard package and the Olympic Highway Underbridge package.
- The cumulative flood impact was assessed for events up to and including the 1% AEP as per the CoA and the flood results are shown within this report.
- A sensitivity assessment by climate change was conducted for the 1% AEP existing and design conditions to inform the potential impacts on the flood immunity of the railway tracks.
- A sensitivity assessment for blockage as per ARR2019 procedures was undertaken for the 1% AEP design conditions to inform the potential impacts of blockage. The methodology used in assessing blockage is described in a separate Technical Memo. Refer to 5-0052-210-IHY-99-ME-0001.

4.1 Hydrology Modelling

4.1.1 RORB Modelling

A RORB model was developed to generate the flow hydrographs for input to the hydraulic model. The hydrology model covers the Lower Butlers Gully catchment, Rocky Creek catchment, the town of Junee, including the Kemp Street site. A figure of the catchment layout of the hydrology model can be seen in Figure 4. The RORB model was developed with catchment characteristics derived from LiDAR and aerial imagery, following ARR2019 guidelines. The table below lists the parameters used within the model.

TABLE 15: RORB PARAMETERS

Parameters	Descriptions
Hydrology model and version	RORBwin (Version 6.31) using Storm injector HL (V 1.4.0.0).
Events	PMP, 0.05% AEP, 0.5% AEP, 1% AEP + Climate Change, 1% AEP, 2% AEP, 5% AEP, 10% AEP, 20% AEP
Total catchment area to upstream model boundary for TUFLOW	The Kemp Street site is within the Lowers Butlers Gully catchment, which has an area of approximately 16.25 km^2. Refer to Figure 4 for the layout of streams and sub-catchments.
Design Rainfall	The Bureau of Meteorology (BOM) 2016 Intensity-Frequency-Duration (IFDs) were used for the design rainfall with the rainfall extracted at the centroid of the catchment. This is included in this report in Appendix B. PMP rainfalls were generated using the Generalised Short-Duration Method (GSDM).
Temporal Patterns	ARR2019 ensemble point temporal patterns for the Murray Basin region were used for the durations ranging from 30 minutes to 72 hours for the 20%, 10%, 5%, 2%, 1%, 1%

Parameters	Descriptions
	Climate Change events and 0.05% AEP. The ARR data used for this assessment is included in Appendix B of this report. The 10 Jordan and 1 BoM (total 11) temporal patterns from 15 minutes to 180 minutes were used for the PMF.
Spatial Varying Rainfall and Areal Reduction Factor (ARF)	Due to the small to medium size of the catchment, spatially varying rainfall was not adopted in this assessment. The ARF for the corresponding catchment area was adopted.
Climate Change Factors	A Climate change factor of 20.2% was applied from the representative concentration pathway (RCP) 8.5, the Year 2090.
Rainfall Losses	Impervious areas: initial loss 1 mm, continuing loss 0 mm/hr Pervious areas: initial loss - probability neutral burst initial loss, continuing loss 1.84 mm/hr
% Pervious / Impervious	The % pervious / impervious for each catchment was derived using aerial imagery of the catchments. Impervious areas were taken as roads, carparks and rooftops. Inter-connecting-areas (ICA's) were not used as the rooftops of buildings were classified as fully impervious.
Sub-catchments	Sub-catchments were derived from the 2015 LiDAR sourced from Geosciences Australia. Sub-catchments were created so that no sub-catchment was greater than 25% of the total catchment area, and at least 5 sub-catchments were upstream of any reporting locations.
Reach Slopes	The equal area slope was derived for each reach length from the available LiDAR.
Kc Value	Kc value of 4.25 was used, which were derived from the recommended Kc equation for NSW catchments as per ARR2019 Book 7 (Kleemola Equation 7.6.13: $Kc=1.18 * A^{0.46}$).
Coefficient m	0.8, recommended as per ARR2019

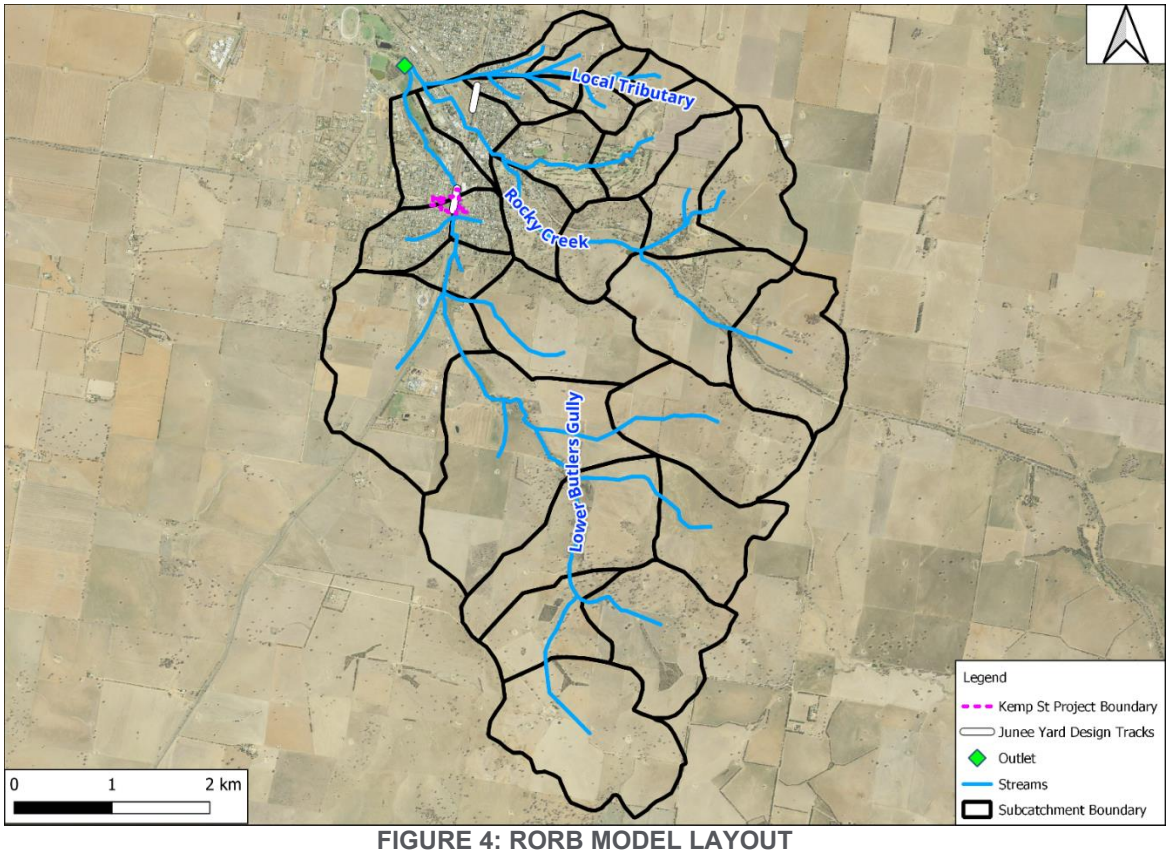


FIGURE 4: RORB MODEL LAYOUT

Storm Injector was used alongside the RORB model to produce the inflow hydrographs for critical duration analysis. Flow hydrographs were generated for input to the hydraulic model for the 20% AEP, 10% AEP, 5% AEP, 2% AEP, 1% AEP, 1% AEP Climate Change, 0.5% AEP, 0.05% AEP and PMF (Probable Maximum Flood) events. The critical durations and peak flows from the Lower Butlers Gully catchment are summarised in the table below. Refer to Figure 6 for the inflow locations into TUFLOW.

TABLE 16: CRITICAL STORMS AND PEAK FLOWS FROM RORB (FOR TUFLOW INPUTS)

Event	Critical Durations (minutes)	Peak Flows (m^3/s)
20% AEP	270	24.5
10% AEP	180	34.8
5% AEP	180	43.2
2% AEP	180	59.9
1% AEP	180	72.7
1% AEP Climate Change	180	92.3
0.5% AEP	180	83.0
0.05% AEP	180	119.5
PMF	90	824.1

4.1.2 RFFE Flow Comparison

The comparison of peak flows was undertaken between RFFE and RORB, for the Lower Butlers Gully catchment for validation purposes. The RFFE model 2021 version 2 was used for the regional flow estimation. As shown in the table below the RORB flows sit within the RFFE confidence limits and are slightly higher than the expected values. As the events become less frequent, the RORB flows match with the RFFE expected flows better in general. This comparison indicates that the peak flows estimated by RORB are consistent with those by RFFE with some levels of conservativeness.

TABLE 17: FLOW COMPARISON – RORB VS RFFE

Event	RORB Flow (m^3/s)	RFFE Expected Value (m^3/s)	RFFE Lower Confidence Limit (5%) (m^3/s)	RFFE Upper Confidence Limit (95%) (m^3/s)
20% AEP	24.5	9.4	2.0	44.0
10% AEP	34.8	18.2	4.0	76.2
5% AEP	43.2	29.8	6.1	123.8
2% AEP	59.9	49.4	8.7	227.7
1% AEP	72.7	67.3	10.5	349.8

4.1.3 RORB Kc Sensitivity Assessment

A comparison of the RORB Kc value used in the computation was undertaken to assess if the Kc adopted from ARR2019 Book 7 equation 7.6.13 is appropriate. This method was compared against the Australia wide method Yu (1989), Pearse et. Al. 2002, the Australia wide method Dyer (1994, Pearse et. Al. 2002), and the RORB Manual Equation 2.5. The comparison is shown in the table below. Overall, the ARR2019 Book 7 equation 7.6.13 was chosen as it fit for the purpose for this assessment.

TABLE 18: FLOW COMPARISON - RORB VS RFFE BASED ON DIFFERENT KC METHODS

AEP (%)	RFFE Expected Value (m^3/s)	ARR2019 Equation 7.6.13 (m^3/s)	RORB manual, equation 2.5 (m^3/s)	Dyer (1994, Pearse et. al. 2002) (m^3/s)	Yu (1989, Pearse et. al. 2002) (m^3/s)
20%	9.4	24.5	12.1	20.5	23.6

AEP (%)	RFFE Expected Value (m^3/s)	ARR2019 Equation 7.6.13 (m^3/s)	RORB manual, equation 2.5 (m^3/s)	Dyer (1994, Pearse et. al. 2002) (m^3/s)	Yu (1989, Pearse et. al. 2002) (m^3/s)
10%	18.2	34.8	18.5	28.3	33.1
5%	29.8	43.2	23.5	35.3	41.2
2%	49.4	59.9	34.5	50.9	57.3
1%	67.3	72.7	43.2	61.2	69.7

4.1.4 Climate Change

An assessment was conducted to evaluate the influence of climate change on flooding to anticipate any future climate change flood risk(s). The existing RORB model was employed to generate hydrographs for the TUFLOW model for the 1% AEP with climate change. As per the EIS report (Section 3.3.5 of Albury to Illabo Environmental Impact Statement Technical Paper 11) and the agreement between the Contractor and ARTC for the continued use of the prior version of ARR2019 climate change method (refer to 5-0052-210-IHY-J2-ME-0001_0), the Year 2090 RCP8.5 interim climate change factor sourced from the ARR Data Hub (https://data-legacy.arr-software.org/) was adopted – a 20.2% increase in rainfall.

A technical memo (5-0052-210-IHY-J2-ME-0001_0) has been submitted and finalised on the comparison between the data used to derive this climate change assessment to the recently released ARR2019 V4.2 climate change guidance. This is consistent with the approach taken on other Inland Rail Projects across NSW.

4.2 Hydraulic Modelling

4.2.1 Existing Model

No existing model was available for the baseline of the assessment, therefore a TUFLOW model was created in the previous stage (PDR) for both this package and the Junee Yard package. For the DDR stage a cumulative impact assessment was undertaken, for this the model was extended to include the model area from the Olympic Highway Underbridge Package (refer to the Flood Design Report 5-0052-210-IHY-J6-RP-0001 for details), covering a total area of approximately 2.7 km^2 shown in Figure 6, with another highlight view for the focus of this package shown in Figure 6. For DDR No. 2 additional detail was added to the local inflows, delineating the local catchments to apply flows across the area of works surrounding the Kemp Street and Olympic Highway intersection. Changes occurred within the existing drainage infrastructure from the additional survey received, this is listed in Section 4.2.1.3. A summary of the model parameters is included in the table below.

TABLE 19: MODEL PARAMETERS IN THE TUFLOW MODEL

Parameters	Descriptions
Build	TUFLOW 2023-03-AE HPC
Coordination Reference System (CRS)	GDA2020 MGA 55
Grid Size (see Quadtree extent in Figure 8)	1m within the Quadtree area (for main flow paths in general) and 2m outside of the Quadtree area.
Hydrology	RORB derived inflows as per ARR2019 guidelines.
Inflow type (Figure 6)	2D Flow versus Time (QT) boundaries for mainstream inflows from Lower Butlers Gully, Rocky Creek and the northern tributary. 2D Source over Area (SA) layers for local catchment inflows applied within the major flow paths.
Extent (Figure 5)	Central Junee, covering the Kemp Street site and Junee Yard site, as well as the Olympic Hwy Underbridge site in the north.
Downstream Boundary (Figure 6)	Water level (head) versus flow taken from the slope of the terrain (HQ type)

Parameters	Descriptions
Timestep	Adaptive timesteps by TUFLOW
Building Representation (Figure 8)	Buildings were modelled as null polygons based on the latest aerial images as listed in Section 1.9. The buildings are the nulled-out areas as shown in Figure 8.
Topography (Figure 8)	1m resolution 2015 LiDAR and site survey/ verified cloud point data, as listed in Section 1.9
Roughness (Figure 9)	Roads: 0.022 Railway: 0.06 Residential and Open Pervious Areas: 0.05
Drainage Network (Figure 11)	As shown in Section 1.9, the drainage data were sourced from the supplied surveys and/or from the supplied drainage GIS layer from Junee Shire Council. Culvert inverts were unavailable from the Council data and were estimated based on the 1m LiDAR data. The drainage network was modelled in 1d domain of TUFLOW. Refer to Section 4.2.1.3 for details.
Design Events (Table 16)	Full ensemble simulations of each duration for the PMF, 0.05% AEP, 0.5% AEP, 1% AEP + Climate Change, 1% AEP, 2% AEP, 5% AEP, 10% AEP, and 20% AEP events.

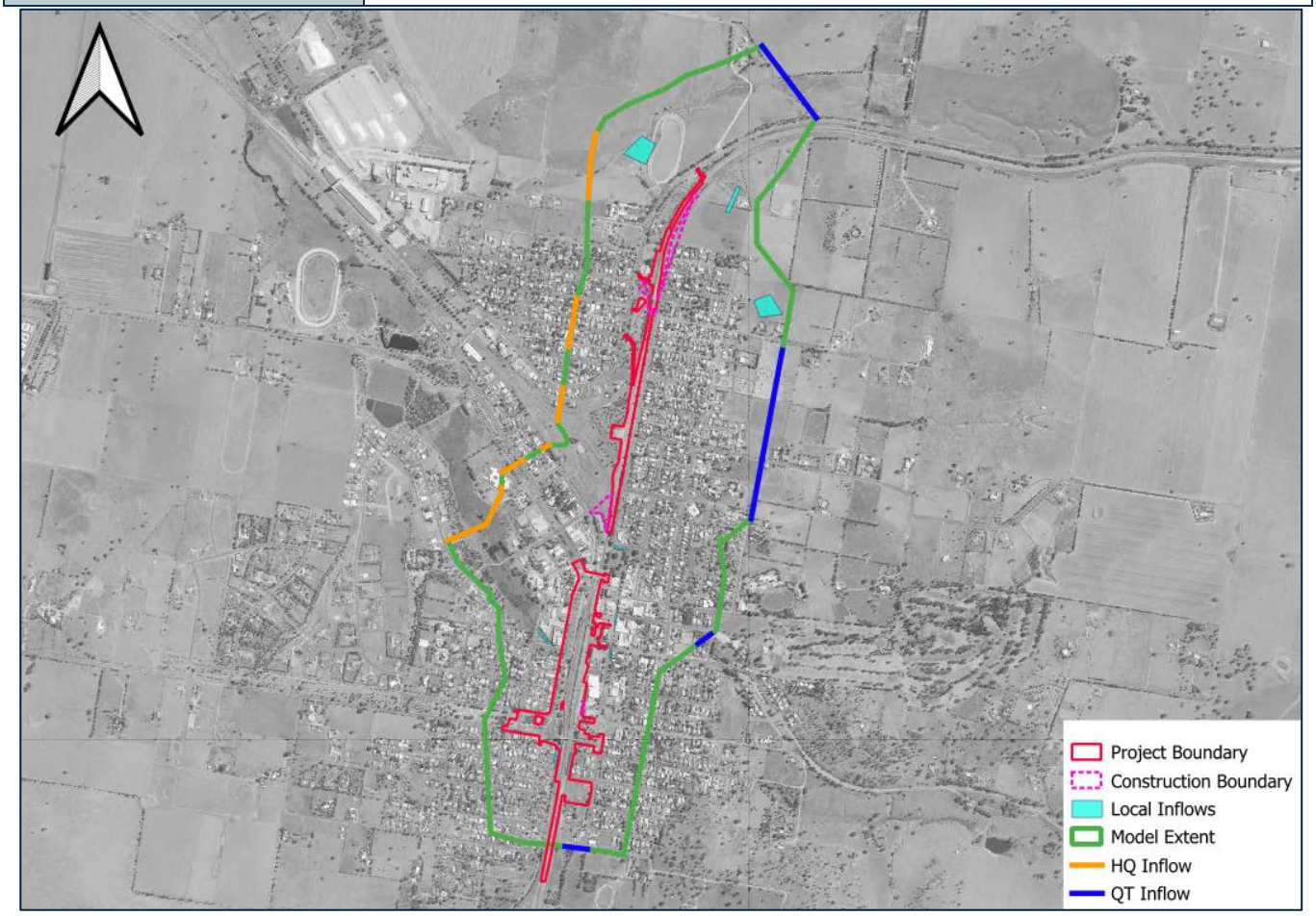


FIGURE 5: TUFLOW MODEL EXTENT

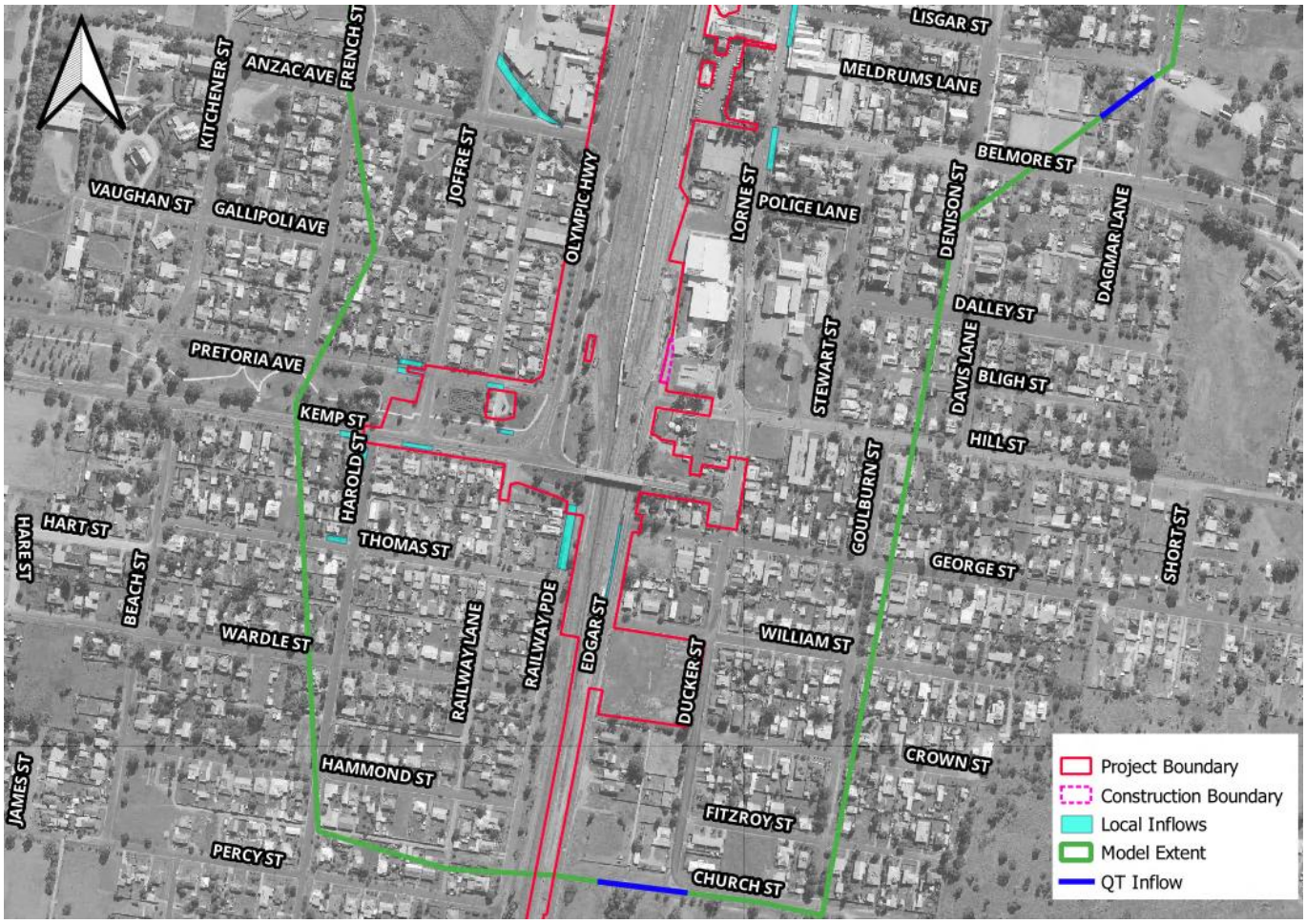


FIGURE 6: TUFLOW MODEL EXTENT AND INFLOW LOCATIONS, WITH A HIGHLIGHT VIEW FOR THE KEMP STREET AREA

4.2.1.1 Topography

As described in Section 1.9, the model base topography was represented by incorporating the 1m LiDAR data and additional survey data on top of it. The digital elevation model (DEM) of the model terrain under the existing conditions is shown in Figure 7 and Figure 8 below, with another highlight view for the focus of this package. The model sits at approximately 295–315mAHD for the Kemp Street area and its vicinity. The terrain within the town is largely flat to gently sloping, especially towards the western and southern portions of the model (covering the Kemp Street area). The railway corridor runs across a relatively flat bench cut into the local terrain.

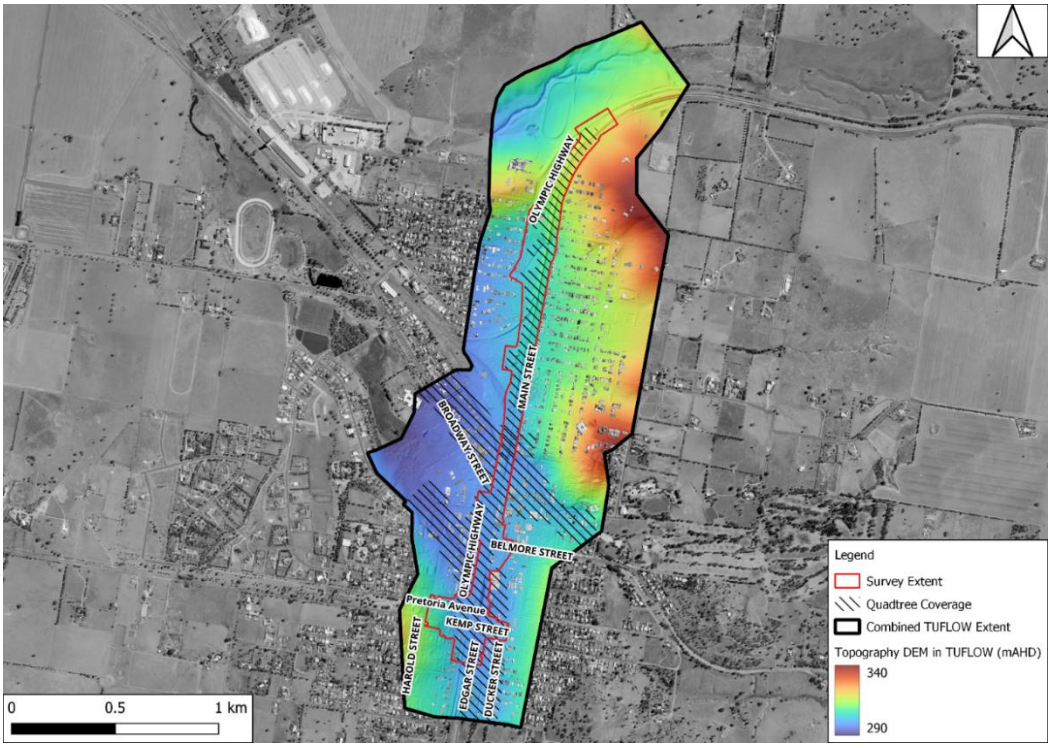


FIGURE 7: MODEL EXTENT AND TOPOGRAPHY

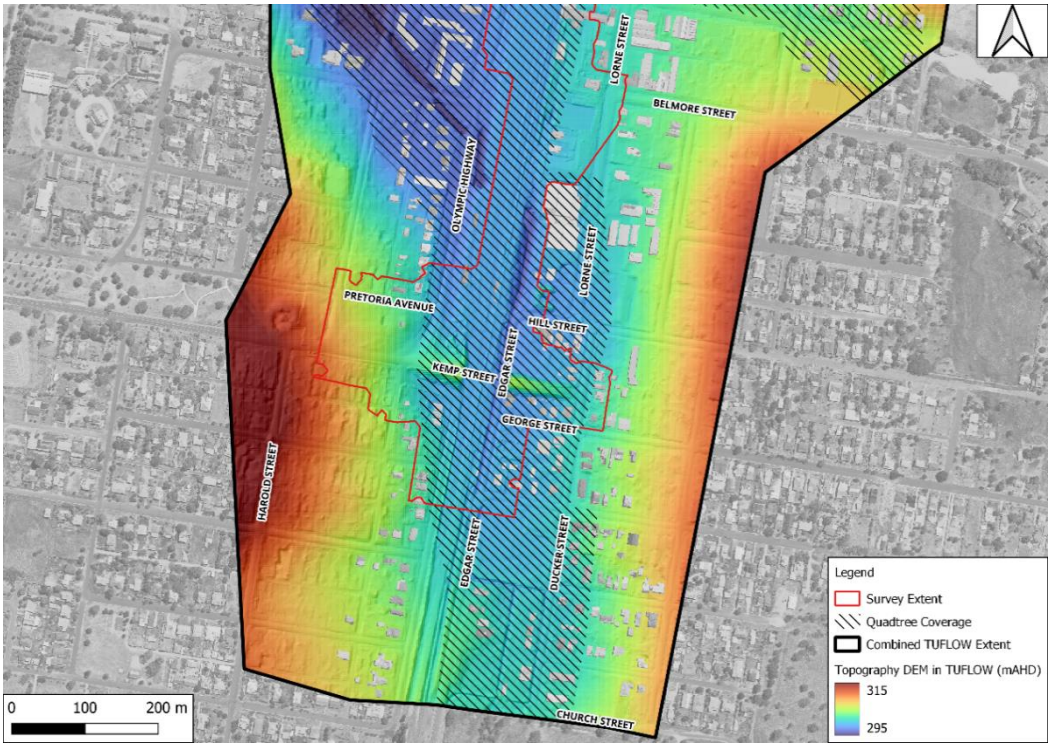


FIGURE 8: TOPOGRAPHY WITH QUADTREE & SURVEY EXTENT IN TUFLOW, WITH A HIGHLIGHT VIEW FOR THE KEMP STREET AREA

4.2.1.2 Hydraulic Roughness

In general, the land zones in TUFLOW were assigned based on the available land zoning data and aerial images as described in Section 1.9. The corresponding hydraulic roughness (Manning's n values) were determined in line with the ARR19 guidelines. The layout of the zones and the hydraulic roughness is shown in Figure 9 and Figure 10, with another highlight view for the focus of this package.

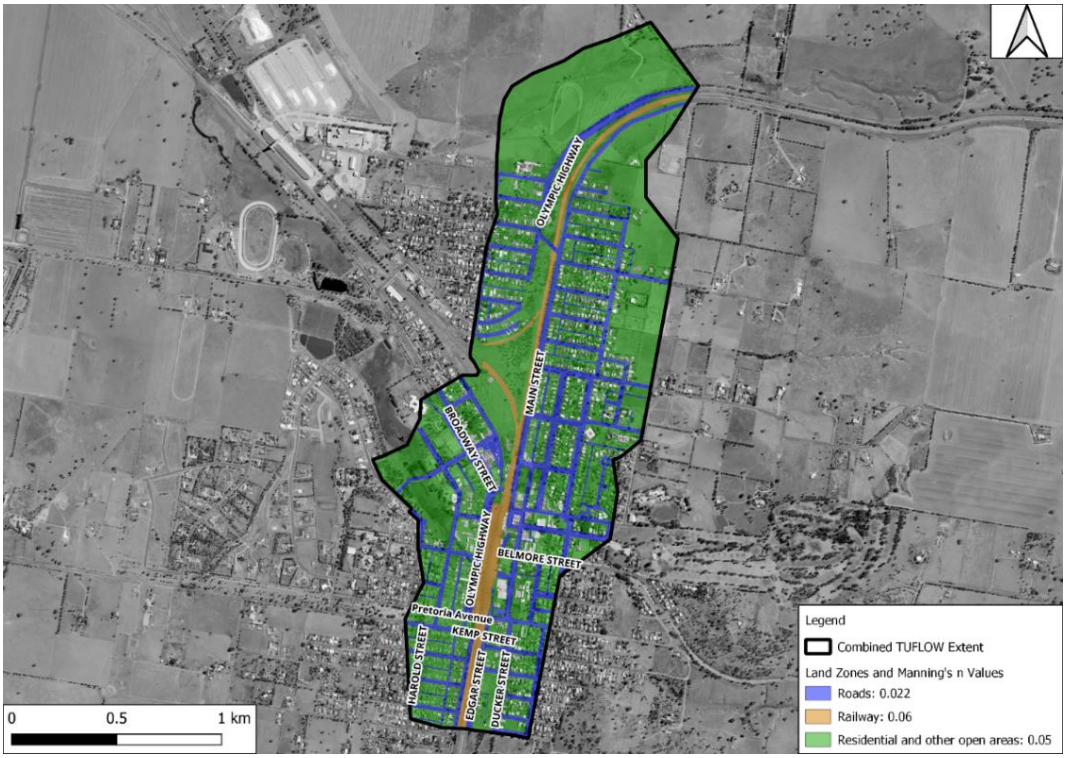


FIGURE 9: TUFLOW EXTENT MANNING'S N



FIGURE 10: ZONING AND MANNING'S N VALUES IN TUFLOW, WITH A HIGHLIGHT VIEW FOR THE KEMP STREET AREA

4.2.1.3 Drainage Network

As shown in Section 1.9, the drainage data were sourced from the supplied detailed surveys and/or from the supplied drainage GIS layer from Junee Shire Council. Where culvert inverts were unavailable from the Council data or surveys, they were estimated based on the 1m LiDAR data, or obtained from site topographic measures. The drainage network was modelled in 1d domain of TUFLOW, as shown in Figure 11. The key drainage data along major flow paths in TUFLOW are

summarised in the table below. As part of DDR No. 2 new survey was received which updated the sizing of KS_06 and KS_07 as shown below.

TABLE 20: MAJOR EXISTING DRAINAGE NETWORK IN TUFLOW

ID	Type	Dimension (width x height or diameter in mm)	Number of Barrels
JY_001	Circular Pipe	525	2
JY_002	Circular Pipe	600	2
JY_003	Box Culvert	1800 x 900	3
JY_004	Box Culvert	1800 x 900	3
JY_005	Box Culvert	1800 x 900	2
JY_006	Box Culvert	2750 x 2100	3
JY_007	Box Culvert	1800 x 1200	6
JY_008	Box Culvert	1800 x 900	2
JY_009	Box Culvert	1800 x 900	2
JY_010	Box Culvert	2400 x 900	2
JY_011	Box Culvert	2400 x 900	2
KS_01	Box Culvert	2500 x 900	3
KS_02	Box Culvert	2400 x 1050	3
KS_03	Box Culvert	1800 x 1200	3
KS_04	Box Culvert	3650 x 2100	5
KS_05	Box Culvert	2100 x 900	2
KS_06	Box Culvert	1300 x 800	1
KS_07	Circular Pipe	900	2
KS_010	Circular Pipe	600	2
KS_011	Circular Pipe	600	2



FIGURE 11: MAJOR EXISTING DRAINAGE NETWORK IN TUFLOW

4.2.2 Design Model

The design model was updated from the Existing Model by incorporating all relevant Inland Rail Project Works, as listed in Section 1.9 and illustrated in the figure below, including:

- IFC track works (from Olympic Highway Underbridge package):

  The design rail tracks were represented as 3d breaklines to reinforce the top of rail levels.
- IFC track works (from Junee Station Yard package):

  The design rail tracks were represented as 3d breaklines to reinforce the top of rail levels.
- Civil works (from Kemp Street Bridge and Footbridge package 0052-210-PEN-J2-RP-0001_0 Detailed Design Report – this package):

  IFC WAD Stage civil works at Kemp Street (MC10), Olympic Highway (MC20), Pretoria Avenue (MC30), Ducker Street (MC40) and for the proposed footbridge were incorporated into the model as DEMs.
- Structural works (from Kemp Street Bridge and Footbridge package 0052-210-PEN-J2-RP-0001_0 Detailed Design Report – this package):

  The Kemp Street Bridge (overbridge) and footbridge IFC structures, including the approaches, were incorporated into the model. The approach slabs, bridge decks, piers and handrails were modelled in 2d_zsh and 2d_lfcsh layers in TUFLOW in line with the TUFLOW recommendations on modelling 2D Hydraulic Structures.
- Drainage works (from Kemp Street Bridge and Footbridge package 0052-210-PEN-J2-RP-0001_0 Detailed Design Report – this package):

  The IFC WAD Stage pit and pipe drainage at Edgar Street and Kemp Street was modelled in the 1D domain of TUFLOW. The proposed open drains were included in the DEM TINs provided by the civil works to the west and the east of the design overbridge. The ARTC culverts under the existing railway line will be retained.

  The IFC WAD pit and pipe drainage design along Olympic Hwy was modelled in the 1D domain of TUFLOW. The proposed open drains were included in the DEM TINs provided by the civil works to the west and the east of the design overbridge.

Further details for design disciplines are discussed in the Design Reports of each interfacing package:

- 5-0052-210-PEN-J6-RP-0001 for Olympic Highway Underbridge package (IFC stage).
- 5-0052-210-PEN-J4-RP-0001 for Junee Station Yard package (IFC stage).
- 5-0052-210-PEN-J2-RP-0001 for Kemp Street Bridge and Footbridge package (this package).



FIGURE 12: DESIGN MODEL KEY FEATURES FOR THE KEMP STREET AREA

4.2.2.1 Design Events

The TUFLOW hydraulic model was run for the 20%, 10%, 5%, 2%, 1%, 1% AEP + Climate Change, 0.5%, 0.05% AEP, and PMF design events to determine the peak flood levels, depths, velocities and hazards under the existing and design conditions. The critical storm durations identified by the RORB modelling, as summarised in Table 16, were adopted in the TUFLOW model simulations. The full ensemble of 11 temporal patterns for PMF and 10 temporal patterns for the other events was run for each critical duration as recommended in ARR2019. The enveloped median results were adopted for all design events except for PMF, while the enveloped maximum results were adopted for the PMF events.

4.2.2.2 Rainfall-On-Grid Assessment

An assessment of the critical form of flooding was undertaken by assessing the peak flood levels generated from overland flows at the Junee Yard locations (including the Kemp Street area) via a rainfall-on-grid assessment. This utilised the IFD rainfall depths and temporal patterns used in the RORB assessment applied via a 2d_rf file, and the same initial and continuing losses were applied directly to the model terrain via a material layer. This assessment was undertaken to ensure the critical forms of flooding at the site locations were from Rocky Creek, Lower Butlers Gully and the local tributary rather from rainfall runoffs from the local catchment. It was found that the mainstream flow paths were the critical form of flooding dominating flood behaviour for the project works. The 2d_rf rainfall application was removed from the model moving forward.

4.2.2.3 Comparison to the Previous Study

The hydraulic model from the Lower Butlers Gully Flood Study (Lyall & Associates Consulting Engineers, 2009) (report only) was not made available for this assessment. The Lower Butlers Gully Flood Study was undertaken in 2009 using ARR1987 principles, it used a HEC-RAS 1d model for the hydraulic modelling. HEC-RAS is a hydraulic modelling package developed by the Hydrologic Engineering Centre of the US Army Corps of Engineers. It does not consider areas of floodplain storage within the modelling as it is used when the flow paths are confined to a relatively narrow strip, close to the proximity of the channels and drainage infrastructure.

Results at two locations were compared for the Lower Butlers Gully, upstream of the railway at the entrance to the railway culvert, and within the Edgar Street channel downstream of William Street. Due to the differences in methods between the two studies the results of each assessment are not expected to be directly comparable. The comparison has been undertaken to ensure the estimated flow and flood behaviour in the catchment is appropriate.

Results at two locations under existing conditions were compared for the Lower Butlers Gully Catchment, upstream of the railway at the entrance to the railway culvert KS_04, and within the Edgar Street channel downstream of culvert KS_05 (see culvert locations in Figure 11). Due to the differences in methods between the two studies the results are not expected to be directly comparable. The comparison has been undertaken to ensure the modelled flood behaviour in TUFLOW is reasonably consistent with the HEC-RAS results, which is demonstrated in the table below.

The peak flood levels from this assessment are reasonably higher than those in the Lower Butlers Gully Flood Study, which is likely due to differences such as:

- The HEC-RAS model conveys flow more efficiently in the 1D system generated by a series of cross sections.
- In TUFLOW drainage networks were modelled in the 1D domain and transferred through 1D/2D connections.
- There were finer definitions in the TUFLOW model, such as for buildings and for hydraulic roughness (Manning's n).
- The TUFLOW model used 2d terrain data with more recent surveys of the area.
- Different hydrological inflows were applied due to the change in design IFDs from ARR1987 to ARR2019.

TABLE 21: COMPARISON OF EXISTING PEAK FLOOD LEVELS IN TUFLOW (DDR STAGE) AND HEC-RAS MODELS

AEP Event	Flood Level at Upstream of KS_04 (mAHD)		Flood Level in the Edgar Street Channel Downstream of KS_05 (mAHD)	
	Lower Butlers Gully Flood Study	TUFLOW DDR Stage	Lower Butlers Gully Flood Study	TUFLOW DDR Stage
1% AEP	298.4	299.0	300.2	300.5
5% AEP	297.5	298.3	299.2	300.3

5 FLOOD ASSESSMENT

5.1 Existing Conditions

The flood maps under the existing conditions, including peak flood depths, peak velocities, and peak hazards for all flood events, are provided in Appendix A.

For the Kemp Street area, mainstream floodwaters flow north from Lower Butlers Gully through the Edgar Street channel between Edgar Street and the railway tracks, continue under the Kemp Street overbridge towards the ARTC railway culvert (KS_04 - the highlighted culverts shown in Figure 13), and eventually discharge to the Junee Urban Wetland. The railway culvert KS_04 acts as a major hydraulic control for its upstream area in a major flood event (i.e. 1% AEP and rarer). Within the rail corridor, the area above this culvert generally sits at the lowest point along the longitudinal alignment.

Figure 13 shows the 1% AEP peak flood depths under the existing conditions with the reporting locations for further discussion below. A description of the reporting locations is listed in the table below.

TABLE 22: REPORTING LOCATION DESCRIPTIONS

Reporting Location	Description
Point 1	On the western side of the rail corridor at approx. CH486.066km in the project boundary
Point 2	Adjacent to the Olympic Highway to the west of the rail corridor at approx. CH485.997km
Point 3	Downstream of Point 1 outside of the project boundary at approx. CH485.997km
Point 4	At Hill Street to the east of the rail line in front of the Locomotive Hotel at approx. CH486.066km
Point 5	In the Edgar Street concrete channel at approx. CH485.997km, within the project boundary
Point 6	At Edgar Street upstream of the Kemp Street Bridge at approx. CH486.161km, within the project boundary
Point 7	At Edgar Street downstream of the Kemp Street Bridge at approx. CH486.085km, within the project boundary
Point 8	In the corridor adjacent to the intersection of Olympic Highway and Pretoria Avenue at approx. CH485.997km, within the construction impact zone

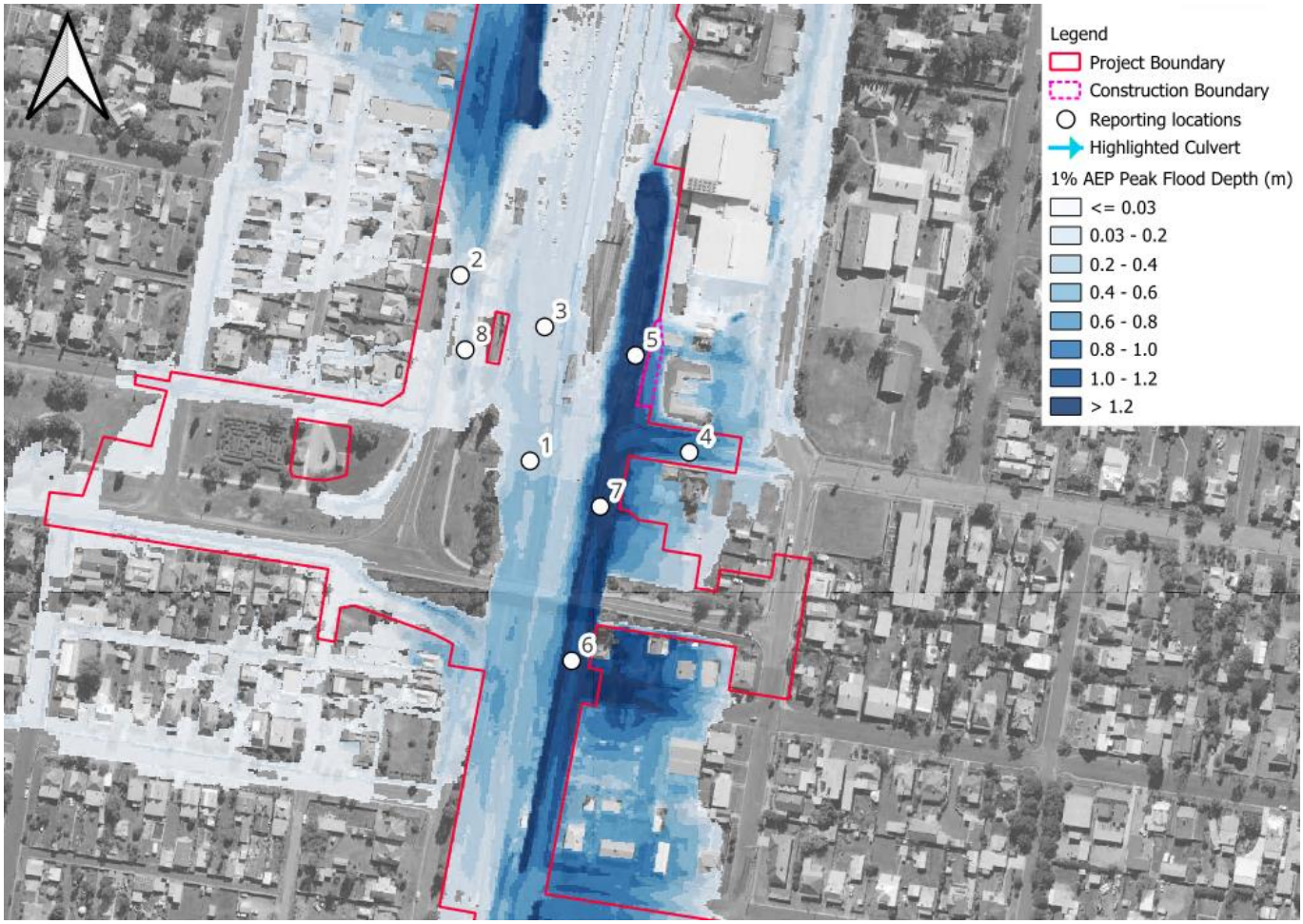


FIGURE 13: 1% AEP EXISTING FLOOD DEPTHS AND REPORTING LOCATIONS

The table below shows the peak flood depths at the reporting locations in the existing conditions. Points 1, 2 and 3 indicate that the western side of the rail corridor (to the east of the Edgar Street Channel) carries less flow from Lower Butlers Gully than the flow paths along Edgar Street and the Edgar Street Channel. Point 4 at Hill Street suggests that the Locomotive Hotel is flood-prone and likely to be inundated by floodwaters under the existing conditions for the 1% AEP event (and rarer events). Point 5 results in the highest flood depths being located within the Edgar Street Channel, where the surrounding flows concentrate. Along the Edgar Street under the Kemp Street Bridge, Points 6 and 7 show that the street is inundated with relatively deep floods of approximately 1m or greater across the events. Results at Point 8 are generally consistent to the Points 2 and 3 in its vicinity. The peak flood depth maps are included in Appendix A.

TABLE 23: PEAK FLOOD DEPTHS (M) AT REPORTING LOCATIONS UNDER EXISTING CONDITIONS

Locations	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	0.5% AEP	0.05% AEP	PMF
Point 1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.6	2.3
Point 2	Not Inundated	< 0.1	< 0.1	< 0.1	< 0.1	0.2	0.1	0.5	3.1
Point 3	< 0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.4	2.2
Point 4	0.1	0.2	0.4	0.6	0.8	1.1	1.0	1.3	3.2
Point 5	1.6	1.8	2.0	2.3	2.5	2.8	2.7	3.1	5.0
Point 6	0.5	0.7	0.9	1.1	1.2	1.4	1.3	1.6	4.0
Point 7	0.5	0.7	0.8	1.1	1.2	1.5	1.4	1.7	3.6
Point 8	< 0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.4	2.6

The table below shows the peak flood velocities at the reporting locations in the existing conditions. At Points 1 and 3, the flows are relatively slow, typically less than 1m/s, except for the PMF within the rail corridor. The peak velocity at Point 2 is relatively higher as it is within the side drain of Olympic Highway. Velocities at Point 4 are generally low, at less than 0.5m/s, as the terrain is generally flat in front of the Locomotive Hotel and the floodwaters in this area caused by backwaters rather than a major flow path. Within the Edgar Street Channel at Point 5, the velocity is relatively high among the reporting locations, generally about 2.0 m/s across all the modelled events except for the PMF. Along Edgar Street under the Kemp Street Bridge, Points 6 and 7 show that the street is inundated with relatively fast-moving floods of approximately 2m/s or greater across the events. The upstream velocities are faster than the downstream ones at the locations except for the PMF. Results at Point 8 are generally consistent with Points 2 and 3 in its vicinity. The peak flood velocity maps are included in Appendix A.

TABLE 24: PEAK FLOOD VELOCITY (M/S) AT REPORTING LOCATIONS UNDER EXISTING CONDITIONS

Locations	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	0.5% AEP	0.05% AEP	PMF
Point 1	0.1	0.3	0.3	0.4	0.4	0.6	0.5	0.7	2.3
Point 2	Not Inundated	0.1	0.3	0.4	0.7	1.3	1.0	1.7	2.5
Point 3	< 0.1	0.1	0.2	0.2	0.2	0.4	0.3	0.5	1.4
Point 4	< 0.1	< 0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.5
Point 5	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.3
Point 6	1.9	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.5
Point 7	1.6	1.8	1.9	1.9	1.9	2.0	2.0	1.9	3.2
Point 8	0.8	1.3	1.3	1.3	1.5	1.9	1.6	2.4	2.9

The flood hazard assessment was based on the general flood hazard classification set by the Australian Institute for Disaster Resilience in the Australian Disaster Resilience Handbook Collection - Flood Hazard, 2017. The figure below shows the general flood hazard vulnerability curves and categories.

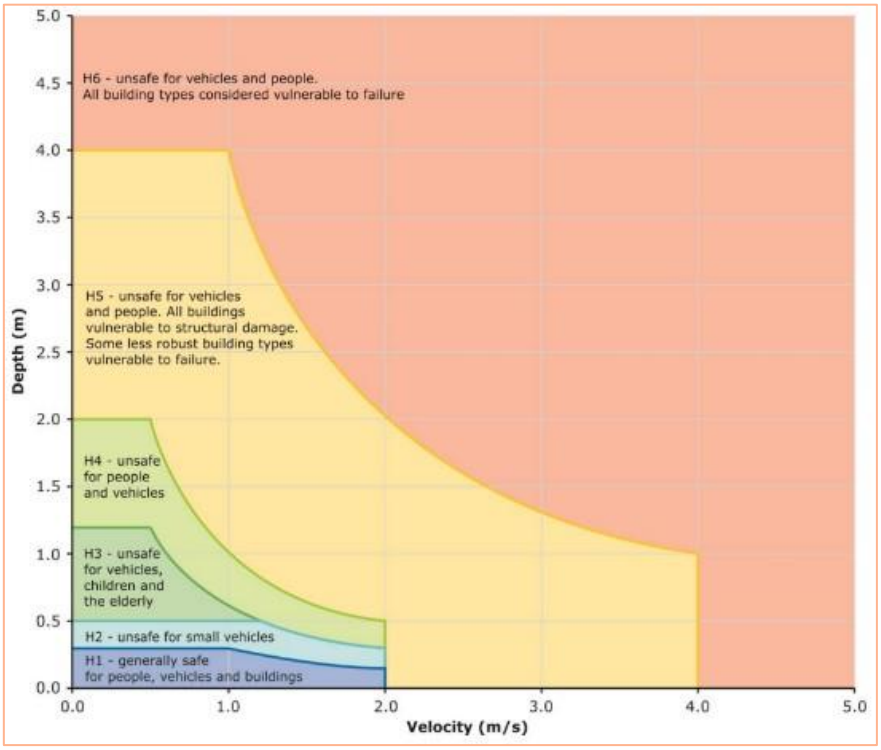


FIGURE 14: GENERAL FLOOD HAZARD VULNERABILITY CURVES AND CATEGORIES

The table below shows the peak flood hazards at the reporting locations in the existing conditions. At Points 1, 2, and 3, on the western side of the rail line it is Category H1 - generally safe for people, vehicles and buildings for the events up to and including 1% AEP, showing typically low hazards within the rail corridor and adjacent to Olympic Highway. At Point 4, peak hazards are generally above H2 Category due to the ponding depths in front of the Hotel, further suggesting that it is flood-prone with relatively high existing flood risks at this location. The most hazardous location is at Point 5 within the Edgar Street Channel floodway zone, which reaches Category H5 in the 20% AEP event. Along Edgar Street under the Kemp Street Bridge, Points 6 and 7 show that the street is unsafe for vehicles and people during the events. Results at Point 8 are generally consistent with Points 2 and 3 in its vicinity. The peak flood hazard maps are included in Appendix A.

TABLE 25: PEAK FLOOD HAZARDS AT REPORTING LOCATIONS UNDER EXISTING CONDITIONS

Locations	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	1% AEP + Climate change	0.5% AEP	0.05% AEP	PMF
Point 1	H1	H1	H1	H1	H1	H2	H2	H3	H6
Point 2	Not Inundated	H1	H1	H1	H1	H1	H1	H4	H6
Point 3	H1	H1	H1	H1	H1	H1	H1	H2	H5
Point 4	H1	H1	H2	H3	H3	H3	H3	H4	H5
Point 5	H5	H5	H5	H6	H6	H6	H6	H6	H6
Point 6	H5	H5	H5	H5	H5	H5	H5	H5	H6
Point 7	H4	H5	H5	H5	H5	H5	H5	H5	H6
Point 8	H1	H1	H1	H1	H1	H2	H1	H5	H6

5.2 Design Conditions

Under the design conditions, for the track designs within the extents of the bridge, the maximum lift is approximately 50mm and the maximum lowering is approximately 30mm. It generally causes minimal changes in flood behaviour as the flow across the proposed rail track is much less than the flow in parallel to the track. Refer to the key design features in Figure 15.

A maximum lift of approximately 60mm occurs within the Junee Yard extents, however this maximum lift is further north of the bridge. Refer the Junee Yard Flood Design Report for detailed assessment of the yard track impacts. However, the cumulative impacts from the yard lifts have been fully considered within the Kemp St bridge reporting and assessment.

The table below shows the 1% AEP peak flood depths under the design conditions, with the reporting locations, for further discussion below. A description of the reporting locations was listed in Table 22.

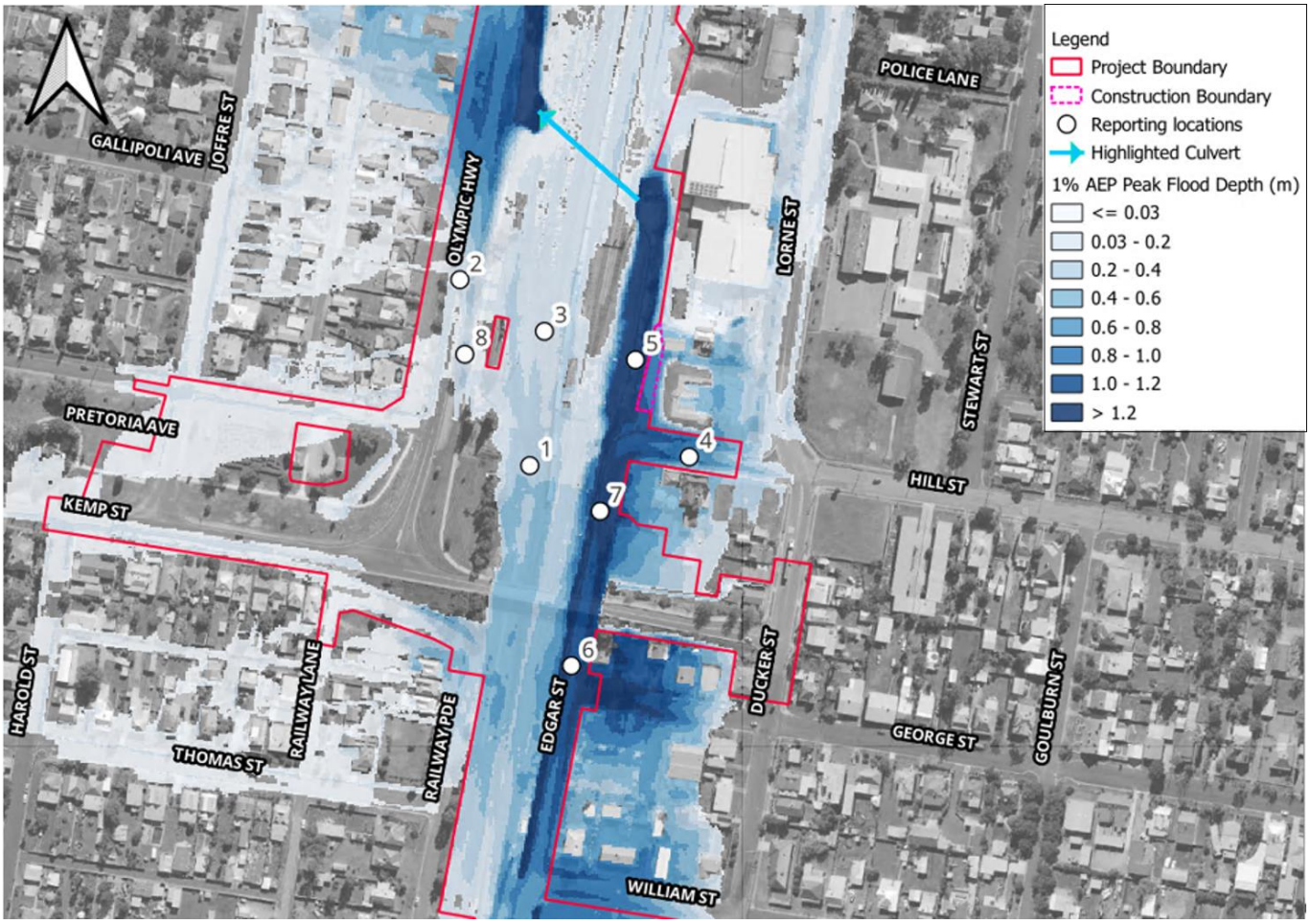


FIGURE 15: 1% AEP DESIGN FLOOD DEPTHS AND REPORTING LOCATIONS

The table below shows the peak flood depths at the reporting locations in the design condition. The peak flood depths in the design conditions have minimal changes from those in the existing condition. For a detailed discussion on changes, refer to Section 5.4. The peak flood depth maps are included in Appendix A.

TABLE 26: PEAK FLOOD DEPTHS (M) AT REPORTING LOCATIONS UNDER DESIGN CONDITIONS

Locations	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	0.5% AEP	0.05% AEP	PMF
Point 1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.6	2.4
Point 2	Not Inundated	< 0.1	< 0.1	< 0.1	< 0.1	0.2	0.1	0.5	3.0
Point 3	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.4	2.2
Point 4	0.1	0.2	0.4	0.6	0.8	1.1	1.0	1.3	3.3
Point 5	1.6	1.8	2.0	2.3	2.5	2.8	2.7	3.1	5.0
Point 6	0.5	0.7	0.9	1.1	1.2	1.4	1.3	1.6	4.0
Point 7	0.5	0.7	0.8	1.1	1.2	1.5	1.4	1.7	3.7
Point 8	< 0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.3	2.6

The table below shows the peak flood velocities at the reporting locations in the design conditions. The velocities remain consistent with the existing conditions, with relatively high velocities occurring at Point 5, 6 and 7 in the Edgar Street Channel and along Edgar Street. For a detailed discussion on changes, refer to Section 5.4. The peak flood velocity maps are included in Appendix A.

TABLE 27: PEAK FLOOD VELOCITY (M/S) AT REPORTING LOCATIONS UNDER DESIGN CONDITIONS

Locations	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	0.5% AEP	0.05% AEP	PMF
Point 1	0.1	0.3	0.3	0.3	0.4	0.6	0.5	0.7	2.4
Point 2	Not Inundated	0.1	0.3	0.4	0.7	1.3	1.0	1.7	2.4
Point 3	< 0.1	0.1	0.1	0.2	0.2	0.4	0.3	0.5	1.5
Point 4	< 0.1	< 0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.5
Point 5	1.4	1.5	1.6	1.6	1.6	1.6	1.6	1.6	2.4
Point 6	1.9	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.3
Point 7	1.6	1.7	1.8	1.9	1.9	1.9	1.9	1.9	3.0
Point 8	0.6	1.0	1.1	1.1	1.2	1.5	1.3	2.1	2.9

The table below shows the peak flood hazards at the reporting locations in the design conditions. The flood hazards remain consistent with the existing conditions, with relatively high flood hazards occurring at Points 5, 6 and 7 within the Edgar Street Channel and along Edgar Street. For a detailed discussion on changes, refer to Section 5.4. The peak flood hazard maps are included in Appendix A.

TABLE 28: PEAK FLOOD HAZARDS AT REPORTING LOCATIONS UNDER DESIGN CONDITIONS

Locations	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	0.5% AEP	0.05% AEP	PMF
Point 1	H1	H1	H1	H1	H1	H2	H2	H3	H6
Point 2	Not Inundated	H1	H1	H1	H1	H1	H1	H4	H6
Point 3	H1	H1	H1	H1	H1	H1	H1	H2	H5
Point 4	H1	H1	H2	H3	H3	H3	H3	H4	H5
Point 5	H5	H5	H5	H5	H6	H6	H6	H6	H6
Point 6	H5	H5	H5	H5	H5	H5	H5	H5	H6
Point 7	H4	H5	H5	H5	H5	H5	H5	H5	H6
Point 8	H1	H1	H1	H1	H1	H2	H1	H5	H6

5.3 Flood Immunity and Scour Protection

The flood immunity of the rail tracks in the existing and design conditions is discussed in Table 29. There has been no worsening in flood immunity due to the proposed designs. Refer to Table 23 and Table 26 for peak flood depths at the reporting locations in the existing and design conditions. The peak flood depth maps are included in Appendix A for illustration of inundation extents.

TABLE 29: RAIL IMMUNITY – EXISTING CONDITIONS AND DESIGN CONDITIONS

Design Events	Overtopping Descriptions
20% AEP	▪ Floodwaters did not overtop the existing rail tracks except for the section from CH486.080km to CH486.140km with depths of up to 0.12m. ▪ Overtopping extents are maintained for both sections of the track works under the design conditions.

Design Events	Overtopping Descriptions
10% AEP	▪ Floodwaters did not overtop the existing rail tracks except for the section from CH486.020km to CH486.250km with depths of up to 0.20m. ▪ Overtopping extents are maintained for both sections of the track works under the design conditions.
5% AEP	▪ Floodwaters did not overtop the existing rail tracks except for the section from CH486.020km to CH486.290km with depths of up to 0.29m. ▪ Overtopping extents are maintained for both sections of the track works under the design conditions.
2% AEP	▪ Floodwaters did not overtop the existing rail tracks except for the section from CH486.020km to CH486.300km with depths of up to 0.49m. ▪ Overtopping extents are maintained for both sections of the track works under the design conditions.
1% AEP	▪ Floodwaters did not overtop the existing rail tracks except for the section from CH486.000km to CH486.300km with depths of up to 0.61m. ▪ Overtopping extents are maintained for both sections of the track works under the design conditions.

The table below compares the flood immunity at CH486.110km, where the rail has been raised by approximately 10mm, which shows minimal change to the flood levels.

TABLE 30: COMPARISON OF FLOOD IMMUNITY AT CH486.110KM

Level (mAHD)	Existing Conditions	Design Conditions
Top of Rail Level	299.53	299.54
Top of Formation Level*	298.86	298.87
20% AEP Flood Level	299.54	299.54
10% AEP Flood Level	299.67	299.67
5% AEP Flood Level	299.70	299.69
2% AEP Flood Level	299.71	299.70
1% AEP Flood Level	299.78	299.78

*Note: top of formation level has been assumed to be 667mm below the existing top of rail level, assuming a 167mm depth 53kg/m rail, 10mm rail pad, 250mm sleeper depth and 250mm ballast depth below sleeper.

Based on the results above, the existing flood immunity of the rails is lower than the 20% AEP event. The proposed track lifts would slightly improve the existing immunity (i.e. at CH486.110km, a track lift of 0.01m results in generally similar inundation depths. As per the functional requirements. The existing immunity of the rails is lower than the ARTC SMS minimum requirement (1% AEP), which would be maintained under the design conditions. The rail formation has not been affected as part of the design. This complies with the criteria in PSRs and the CoA flood immunity criteria.

As per A2I Technical Requirements IR-SR-A2I-541, the Structures System's new underbridges shall withstand the 0.05% AEP design flood event. For details of the Kemp Street Bridge design and its compliance, refer to the Detailed Design Report 5-0052-210-PEN-J2-RP-0001 Revision 0 Section 4.6. The 0.05% AEP peak flood levels vary from approximately 300.2 to 300.3mAHD under the deck of the design bridge, indicating that the superstructure would not be affected by the design floods up to and including the 0.05% AEP. It is also noted that this bridge is not a waterway bridge which is located over the rail corridor and Edgar Street.

In the design conditions, the flood velocities outside the project boundary show scattered velocity impact exceedances as the relative velocity increase is above 10% or above 0.5m/s in the proposed condition (whichever is greater). (Refer to Figure 16).

Velocity impacts occur between the project boundary and the construction boundary within the extent of works along the asphalt road. As these impacts are confined to a sealed road surface and the extent of works, they do not present a scouring risk and are therefore considered compliant.

Minor velocity increases occur outside the project boundary and construction boundary in multiple storm events, but predominantly during the 20% AEP event (Refer to location 1 in Figure 16). However, the resulting velocities generally remain below 1.2 m/s. The affected areas outside the project boundary are well vegetated with grass cover and are not expected to experience erosion or other adverse impacts as a result of the predicted velocity changes (refer to Figure 17) and therefore considered compliant.



FIGURE 16: VELOCITY NON-COMPLIANCE AT LOCATION 1 IN 20% AEP



FIGURE 17: GOOGLE STREET VIEW OF LOCATION 1 FROM HILLS STREET

5.3.1 Road Immunity Assessment

The upgraded section of Kemp Street (MC10), located west of the Kemp Street Overbridge, has been observed to experience inundation however the water does not overtop the road. This section is similarly observed in the existing case and maintains one trafficable lane (refer to Figure 18)

Despite these conditions, the entire upgraded segment of Kemp Street (MC10) remains trafficable during the 1% AEP event, with a DxV factor below 0.3m/s, consistent with AustRoads Guide to Road Design Part 5 (AGRD P5) Section 4.5.2.

The upgraded portion of the Olympic Highway (MC20) north of the Kemp Street Overbridge demonstrates improved flood immunity compared to the existing condition. This section, extending from the Kemp Street intersection to the north, maintains trafficability during the 1% AEP event, with a DxV value below 0.3 m/s in accordance with AGRD P5 Section 4.5.2.

The Joffre Street (local road) is removed in the design condition, which results in additional sheet flow to the east toward Olympic Highway. However, the resulting flood depth is less than 10 mm, and the associated hazard rating is H1, which is considered safe for both pedestrians and vehicles.

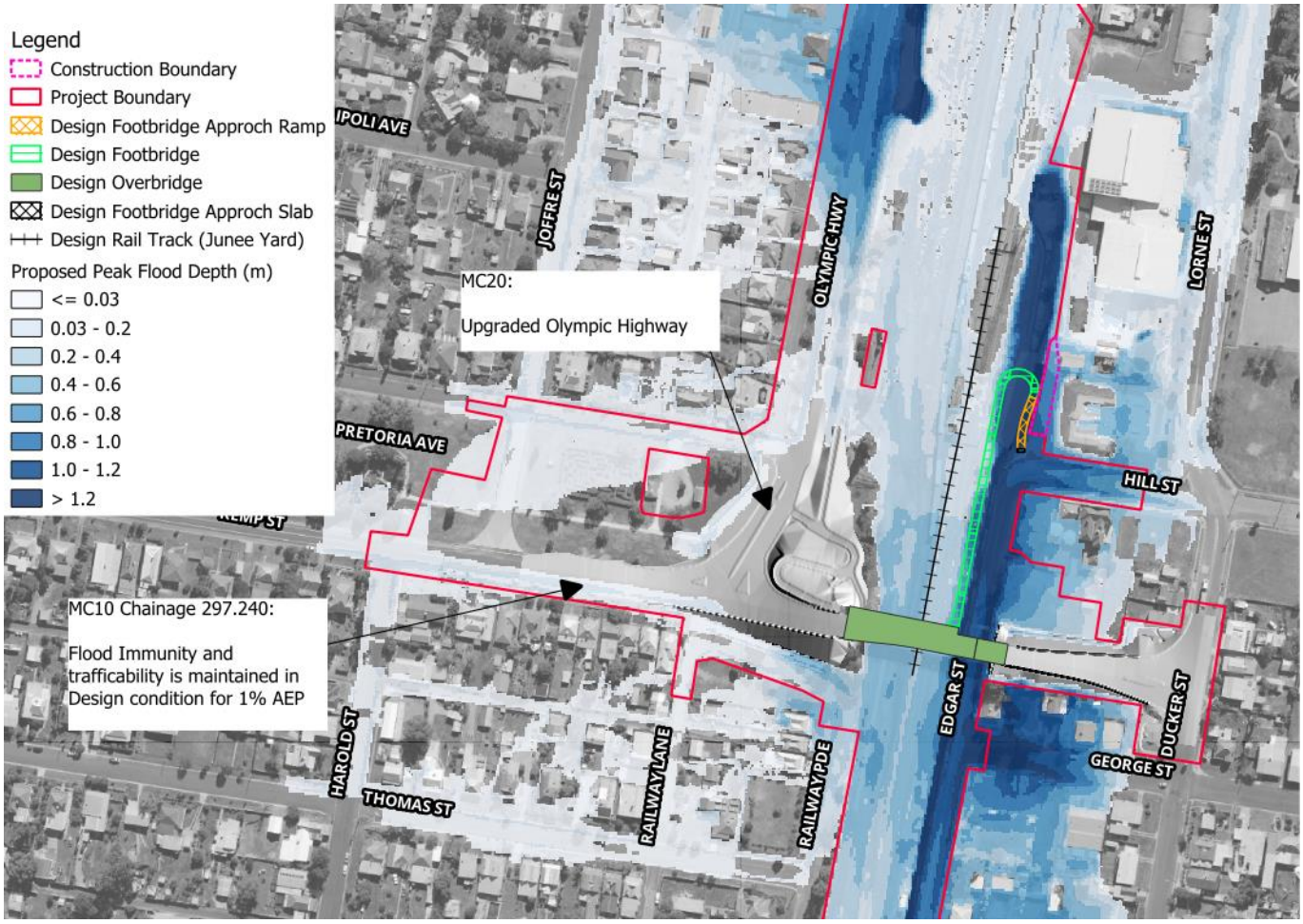


FIGURE 18: ROAD DESIGN FLOOD IMMUNITY 1% AEP

5.4 Flood Impact Assessment

As per CoA E42, the flood impact assessment was conducted. The results are summarised for events up to and including the 1% AEP event and discussed for the Kemp Street Project Works (refer to Figure 15) respectively. The discussion focuses on the flood impacts outside the project boundary (and the construction impact zone) for compliance. The flood impact maps are included in Appendix A for illustration of the project areas, which are recommended to be read with the discussion below.

5.4.1 Changes in Peak Flood Level

The changes in peak flood level are summarised and discussed in the table below.

TABLE 31: SUMMARY OF IMPACTS ON PEAK FLOOD LEVEL

Design Events	Changes in Peak Flood Level
20% AEP	▪ The changes are generally within ±10mm outside the project boundary. No properties are adversely affected by the project works. Due to the proposed footbridge and associated civil designs, the peak levels are typically increased by 10-100mm downstream of the footbridge within the Edgar Street Channel. To its east, within the Junee Recreation and Aquatic Centre complex, the affected building appears to be a non-habitable storage structure. The increases are compliant within the 100mm limit as per the CoA E42(e) for the public recreation zone. ▪ Adjacent to the intersection of Pretoria Avenue and Olympic Highway, there are increases in peak flood level and newly wet areas within the approved Construction Impact Zone, which are due to the increases in design level from the civil works. The impacts are generally observed in the corridor area on the eastern side of the Highway. These changes are compliant due to the increases being caused by the civil design DEM and showing no increase in flood depths. ▪ The 'newly wet' grids outside the project boundary are varied between 0 and 50 mm in the road/ rail corridors, and below 100mm in the public recreation zones. There is no inundation of habitable properties which are currently not inundated. These are within the limits as per CoA

Design Events	Changes in Peak Flood Level
	E42. Refer to the maps showing the peak flood depths under the design conditions in Appendix A for details.
10% AEP	▪ The changes are consistent with the 20% AEP above. The peak levels are typically increased by 10-80mm downstream of the footbridge within the Edgar Street Channel and to its east, with marginally more impact than the 20% AEP at this location.
5% AEP	▪ The changes are consistent with the 10% AEP above. The peak levels are typically increased by 10-70mm downstream of the footbridge within the Edgar Street Channel and to its east, with marginally more impact than the 10% AEP at this location.
2% AEP	▪ The changes are consistent with the 5% AEP above. The peak levels are typically increased by 10-60mm downstream of the footbridge within the Edgar Street Channel and to its east, with marginally more impact than the 5% AEP at this location.
1% AEP	▪ The changes are consistent with the events above. The peak levels are typically increased by 10-40mm downstream of the footbridge within the Edgar Street Channel and to its east, which causes further less impact than the 2% AEP at this location.

The changes in flood levels at the reporting locations in Figure 13 are shown below in Table 32.

The reduction in peak flood levels at Point 4 is due to the improvement of flow conveyance by the civil design works around the proposed footbridge, which allows for the constrictions by the bridge abutment, piers, decks and handrails. The increases occurring at Point 5 are due to the flow constrictions by the presence of the proposed footbridge. The changes at Points 6 and 7 are minimal due to the Kemp Street Bridge design piers. At Point 6, it shows that the design piers will have a minimal impact on the flood behaviour. At Point 8 there is minimal change to the flood levels.

TABLE 32: CHANGES IN PEAK FLOOD LEVEL (M) AT REPORTING LOCATIONS (DESIGN MINUS EXISTING)

Locations	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
Point 1 (within the project boundary)	-0.01			Negligible impacts	
Point 2 (outside the project boundary)	Not inundated	Negligible impacts			
Point 3 (outside the project boundary)	Negligible impacts				
Point 4 (outside the project boundary)	Negligible impacts	-0.01			Negligible impacts
Point 5 (within the project boundary)	0.05	0.04	0.03	0.02	0.01
Point 6 (within the project boundary)	Negligible impacts				
Point 7 (within the project boundary)	Negligible impacts				
Point 8 (within the construction zone)	Negligible impacts				0.01

As discussed, the changes in peak flood level outside the project boundary comply with the PSR and CoA requirements.

5.4.2 Changes in Peak Flood Velocity

For the events up to and including the 1% AEP, the changes in peak flood velocity outside the project boundary are less than the maximum relative increase of 10%, or 0.5m/s. The newly wet grids outside the project boundary have velocities less than 0.5m/s. Refer to the peak flood velocity maps and flood impact maps in Appendix A for demonstration. Within the project boundary, the changes are localised, generally due to the proposed footbridge across the Edgar Street Channel and the associated piers.

The changes in flood velocity at the reporting locations in Figure 13 are insignificant in general (with maximum relative increase in velocity of 10%, or to 0.5m/s). Generally, the points of interest experience negligible impacts.

As discussed, the changes in peak flood velocity outside the project boundary comply with the PSR and CoA requirements.

5.4.3 Changes in Peak Flood Hazard

For the events up to and including the 1% AEP, there is no increase in flood hazard or risk to life outside the project boundary and extent of works. Where there are scattered individual cells showing an increase by 1 category, velocities, depths and V × D were inspected and reviewed at these locations. The changes in V × D at the scattered cells are within ±0.01 m^2/s, showing no real change in hazard category or risk to life, according to the combined hazard curves thresholds in Figure 14. The inaccuracies are likely due to the output configurations in TUFLOW assigning values for the peak flood hazards. According to the TUFLOW Classic/HPC User Manual (2025.0), Section 11.2.3.1, grid map output hazard categories are output as integer grids (i.e. values are rounded to the nearest integer when a grid output cell centre is located at a change in category).

The changes in peak flood hazard at the reporting locations in Figure 13 generally experience no change, except for Point 5 in the 2% AEP event, where the hazard is lowered (Category H6 to Category H5) due to the velocity reductions by the footbridge as flow constrictions.

As discussed, the changes in peak flood hazard outside the project boundary comply with the PSR and CoA requirements.

5.4.4 Changes in Duration of Inundation

The analysis around the changes in the duration of inundation was undertaken by comparing the time series of flood level between the existing and design conditions at selected locations. The typical locations were selected in the vicinity of the project works outside the project boundary, which are the key locations of concern in terms of the flood impacts, as shown by the Time of Duration points in Figure 19. The diagrams are shown in Figure 20. The comparison of the flood level vs time for the 1%, 2%, 5%, 10%, 20% AEP events indicate that there are minimal changes to the duration of inundation, thereby complying with the maximum increase in inundation time of one hour, or 10%, whichever is greater as per the CoA E42(a).

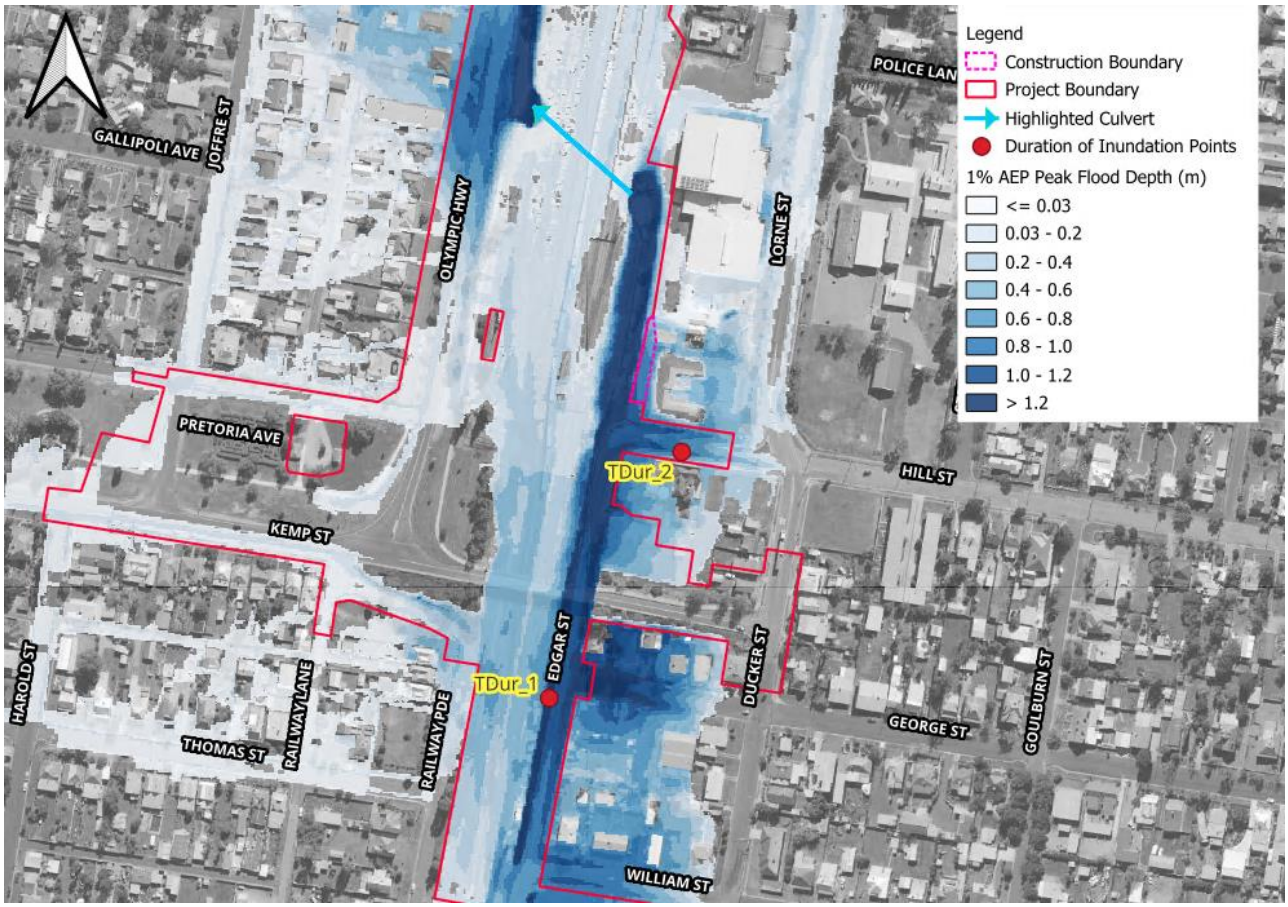


FIGURE 19: REPORTING LOCATIONS (TDUR) FOR THE CHANGES IN DURATION OF INUNDATION WITH EXISTING 1% AEP FLOOD DEPTHS

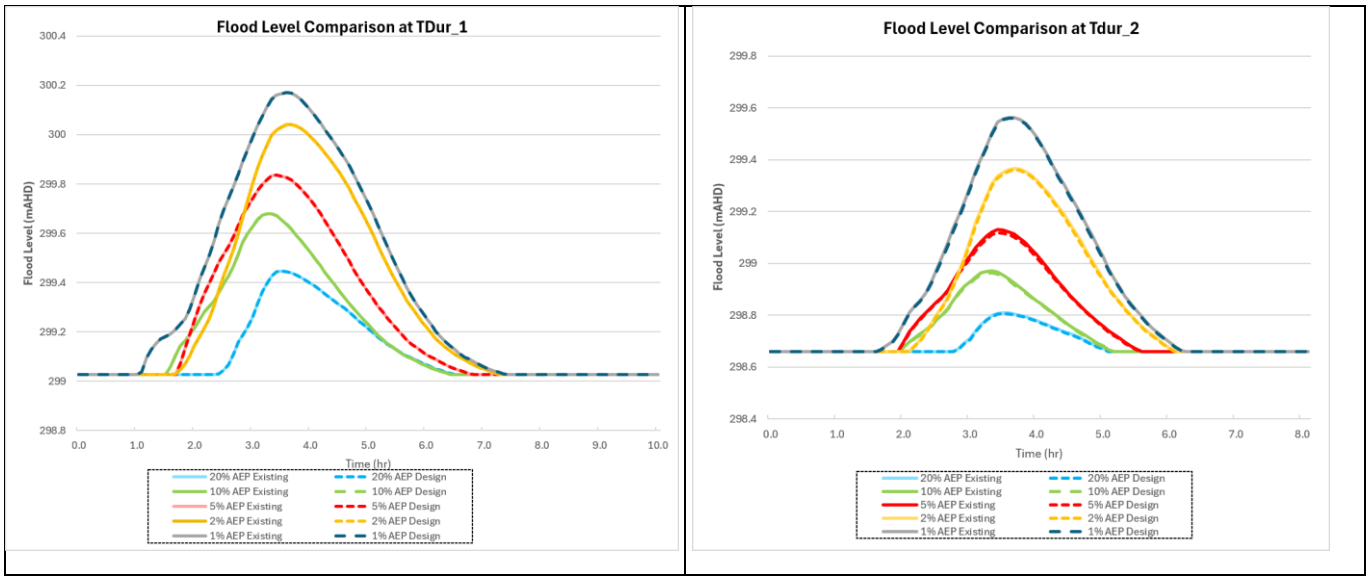


FIGURE 20: COMPARISON FOR CHANGES IN DURATION OF INUNDATION AT KEY LOCATIONS (ALL EVENTS)

5.4.5 Cumulative Impact

As stated in Section 4 under "Modelling Methodology", the design condition incorporated the Olympic Highway Underbridge design (5-0052-210-PEN-J6-RP-0001) and Junee Station Yard design (5-0052-210-PEN-J4-RP-0001) to understand an overall cumulative impact on the site. Those cumulative impacts have been reflected in Sections 5.4.1 to 5.4.4, indicating that there are no non-compliances caused by the Olympic Highway Underbridge design, and the Junee Yard design for all events up to 1% AEP.

5.5 Sensitivity Test

5.5.1 Climate Change Risk Assessment

Climate Change risk assessment was carried out by running the 1% AEP with Year 2090 RCP8.5 interim climate change factor (refer to Section 4.1.4 for details of methodology). The results of peak flood depths, flood velocities and flood hazards are shown in Sections 5.1 and 5.2. The corresponding flood maps are included in Appendix A.

As discussed in Section 5.3 for flood immunity, the railway tracks would be overtopped in both the existing and design conditions in the 1% AEP event + Climate Change event. The depth of overtopping is higher due to the increased rainfall. The road immunity of Kemp Street and Olympic Highway is generally improved in the climate change scenario.

5.5.2 Blockage Assessment

A hydraulic blockage assessment was carried out for the 1% AEP design scenario. A 20% blockage was adopted for all the other culverts, pits and pipes outside the project boundary. Within the project boundary, blockage of culverts and bridges was assessed based on the ARR2019 guidelines. The assessment involved assessing the site area for debris availability, mobility and transportability. The adopted blockage factors are shown in the table below.

TABLE 33: BLOCKAGE ASSESSMENT FOR THE STRUCTURES WITHIN THE PROJECT BOUNDARY

Structures	Debris Availability	Debris Mobility	Debris Transportability	AEP Adjusted Debris Potential	Blockage
Culverts	Low	Low	Medium	Low	25%
Kemp Street overbridge	Medium	Medium	Medium	Medium	10%
Kemp Street footbridge	Medium	High	High	High	20%

Note: It is estimated that the L10 values are 1.5m for the culverts, 8m for the Kemp Street Overbridge and 5m for the Kemp Street Footbridge.

The impacts of blockage on the flood behaviour are prominent due to the presence of major culverts, the proposed bridge and footbridge around the Kemp Street area, as well as the mainstream flooding mechanism. The increases are up to 200mm between the proposed footbridge and the ARTC rail culvert (KS_04 shown in the figure below) and are approximately 65mm along Hill Street. There are newly flooded areas at the back of the Hill Street properties with flood

depths of approximately 30mm. The flood water overtops Kemp Street at the sag location (Refer to Figure 21). It is noted that the blockage assessment was undertaken for sensitivity testing as per CoA E40, rather than for compliance against prescribed numerical thresholds.

The change in peak flood levels for the 1% AEP design conditions is shown in the figure below. The culverts are highlighted as the key hydraulic controls adjacent to the project works, upstream of which are most sensitive to the potential blockage.

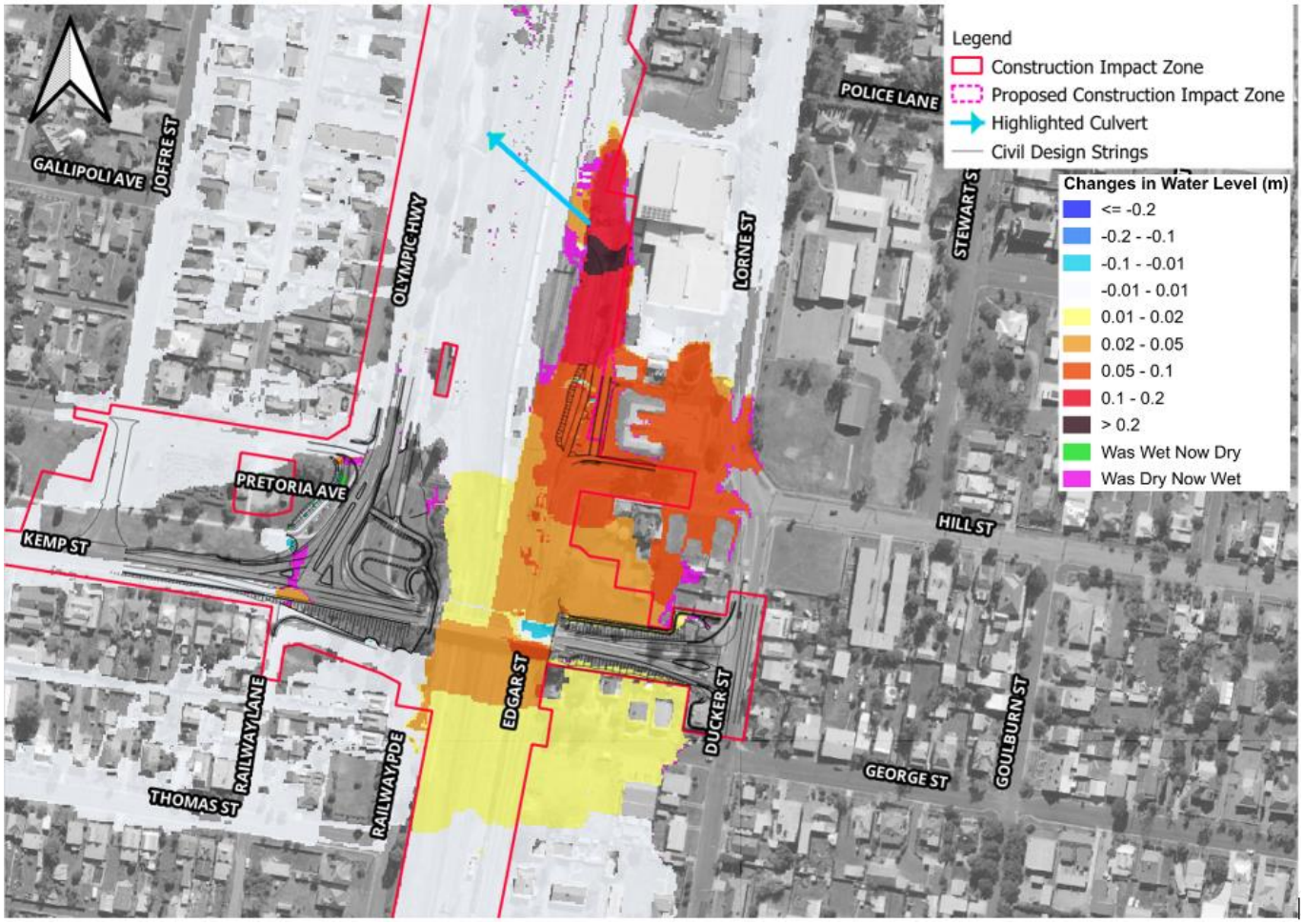


FIGURE 21: CHANGES IN PEAK FLOOD LEVELS FOR THE 1% AEP DESIGN CONDITIONS (BLOCKAGE VS NO BLOCKAGE)

6 MITIGATION MEASURES

No instances of non-compliance in terms of flood impact were documented. Therefore, no mitigation measures are proposed.

7 RECOMMENDATIONS

Based on the findings in this report, the following recommendations are listed:

- Address any comments on this WAD IFC Stage flood design report.



APPENDICES

APPENDIX A

Flood Maps

LIST OF FLOOD MAPS

Figure Number	Figure Name
FigureA01	20% AEP Peak Flood Depth and Levels - Existing Condition
FigureA02	10% AEP Peak Flood Depth and Levels - Existing Condition
FigureA03	5% AEP Peak Flood Depth and Levels - Existing Condition
FigureA04	2% AEP Peak Flood Depth and Levels - Existing Condition
FigureA05	1% AEP Peak Flood Depth and Levels - Existing Condition
FigureA06	1% AEP Climate Change Peak Flood Depth and Levels - Existing Condition
FigureA07	0.5% AEP Peak Flood Depth and Levels - Existing Condition
FigureA08	0.05% AEP Peak Flood Depth and Levels - Existing Condition
FigureA09	PMF Peak Flood Depth and Levels - Existing Condition
FigureA10	20% AEP Peak Flood Velocity - Existing Condition
FigureA11	10% AEP Peak Flood Velocity - Existing Condition
FigureA12	5% AEP Peak Flood Velocity - Existing Condition
FigureA13	2% AEP Peak Flood Velocity - Existing Condition
FigureA14	1% AEP Peak Flood Velocity - Existing Condition
FigureA15	1% AEP Climate Change Peak Flood Velocity - Existing Condition
FigureA16	0.5% AEP Peak Flood Velocity - Existing Condition
FigureA17	0.05% AEP Peak Flood Velocity - Existing Condition
FigureA18	PMF Peak Flood Velocity - Existing Condition
FigureA19	20% AEP Peak Flood Hazard - Existing Condition
FigureA20	10% AEP Peak Flood Hazard - Existing Condition
FigureA21	5% AEP Peak Flood Hazard - Existing Condition
FigureA22	2% AEP Peak Flood Hazard - Existing Condition
FigureA23	1% AEP Peak Flood Hazard - Existing Condition
FigureA24	1% AEP Climate Change Peak Flood Hazard - Existing Condition
FigureA25	0.5% AEP Peak Flood Hazard - Existing Condition
FigureA26	0.05% AEP Peak Flood Hazard - Existing Condition
FigureA27	PMF Peak Flood Hazard - Existing Condition
FigureA28	20% AEP Peak Flood Depth and Levels - Design Condition

Figure Number	Figure Name
FigureA29	10% AEP Peak Flood Depth and Levels - Design Condition
FigureA30	5% AEP Peak Flood Depth and Levels - Design Condition
FigureA31	2% AEP Peak Flood Depth and Levels - Design Condition
FigureA32	1% AEP Peak Flood Depth and Levels - Design Condition
FigureA33	1% AEP Peak Flood Depth and Levels - Design Blockage Condition
FigureA34	1% AEP Climate Change Peak Flood Depth and Levels - Design Condition
FigureA35	0.5% AEP Peak Flood Depth and Levels - Design Condition
FigureA36	0.05% AEP Peak Flood Depth and Levels - Design Condition
FigureA37	PMF Peak Flood Depth and Levels - Design Condition
FigureA38	20% AEP Peak Flood Velocity - Design Condition
FigureA39	10% AEP Peak Flood Velocity - Design Condition
FigureA40	5% AEP Peak Flood Velocity - Design Condition
FigureA41	2% AEP Peak Flood Velocity - Design Condition
FigureA42	1% AEP Peak Flood Velocity - Design Condition
FigureA43	1% AEP Peak Flood Velocity - Design Blockage Condition
FigureA44	1% AEP Climate Change Peak Flood Velocity - Design Condition
FigureA45	0.5% AEP Peak Flood Velocity - Design Condition
FigureA46	0.05% AEP Peak Flood Velocity - Design Condition
FigureA47	PMF Peak Flood Velocity - Design Condition
FigureA48	20% AEP Peak Flood Hazard - Design Condition
FigureA49	10% AEP Peak Flood Hazard - Design Condition
FigureA50	5% AEP Peak Flood Hazard - Design Condition
FigureA51	2% AEP Peak Flood Hazard - Design Condition
FigureA52	1% AEP Peak Flood Hazard - Design Condition
FigureA53	1% AEP Peak Flood Hazard - Design Blockage Condition
FigureA54	1% AEP Climate Change Peak Flood Hazard - Design Condition
FigureA55	0.5% AEP Peak Flood Hazard - Design Condition
FigureA56	0.05% AEP Peak Flood Hazard - Design Condition
FigureA57	PMF Peak Flood Hazard - Design Condition

Figure Number	Figure Name
FigureA58	Changes in Peak Flood Levels for 20% AEP - Design Condition vs Existing Condition
FigureA59	Changes in Peak Flood Levels for 10% AEP - Design Condition vs Existing Condition
FigureA60	Changes in Peak Flood Levels for 5% AEP - Design Condition vs Existing Condition
FigureA61	Changes in Peak Flood Levels for 2% AEP - Design Condition vs Existing Condition
FigureA62	Changes in Peak Flood Levels for 1% AEP - Design Condition vs Existing Condition
FigureA63	Changes in Peak Flood Levels for 1% AEP Climate Change - Design Condition vs Existing Condition
FigureA64	Changes in Peak Flood Velocity for 20% AEP - Design Condition vs Existing Condition
FigureA65	Changes in Peak Flood Velocity for 10% AEP - Design Condition vs Existing Condition
FigureA66	Changes in Peak Flood Velocity for 5% AEP - Design Condition vs Existing Condition
FigureA67	Changes in Peak Flood Velocity for 2% AEP - Design Condition vs Existing Condition
FigureA68	Changes in Peak Flood Velocity for 1% AEP - Design Condition vs Existing Condition
FigureA69	Changes in Peak Flood Velocity for 1% AEP Climate Change - Design Condition vs Existing Condition
FigureA70	Changes in Peak Flood Hazard for 20% AEP - Design Condition vs Existing Condition
FigureA71	Changes in Peak Flood Hazard for 10% AEP - Design Condition vs Existing Condition
FigureA72	Changes in Peak Flood Hazard for 5% AEP - Design Condition vs Existing Condition
FigureA73	Changes in Peak Flood Hazard for 2% AEP - Design Condition vs Existing Condition
FigureA74	Changes in Peak Flood Hazard for 1% AEP - Design Condition vs Existing Condition
FigureA75	Changes in Peak Flood Hazard for 1% AEP Climate Change - Design Condition vs Existing Condition



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Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

- Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)
- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

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Map by: TT

0 100 200 m

A3
Scale: 1:3,000

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Kemp Street Bridge and Footbridge - IFC WAD

FigureA01 : 20% AEP Peak Flood Depth and Levels - Existing Condition

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Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)
- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

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Map by: TT

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Scale: 1:3,000

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Kemp Street Bridge and Footbridge - IFC WAD

FigureA02: 10% AEP Peak Flood Depth and Levels - Existing Condition

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Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

- Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)
- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

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Map by: TT

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Scale: 1:3,000

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Kemp Street Bridge and Footbridge - IFC WAD

FigureA03: 5% AEP Peak Flood Depth and Levels - Existing Condition

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Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

- Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)
- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

0 100 200 m

A3
Scale: 1:3,000

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Map by: TT

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Kemp Street Bridge and Footbridge - IFC WAD

FigureA04: 2% AEP Peak Flood Depth and Levels - Existing Condition

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Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

- Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)
- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

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Map by: TT

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Scale: 1:3,000

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Kemp Street Bridge and Footbridge - IFC WAD

FigureA05: 1% AEP Peak Flood Depth and Levels - Existing Condition

MARTINUS

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Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)
- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

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Map by: TT

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Scale: 1:3,000

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Kemp Street Bridge and Footbridge - IFC WAD

FigureA06: 1% AEP Climate Change Peak Flood Depth and Levels - Existing Condition

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Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

- Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)
- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

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Map by: TT

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Scale: 1:3,000

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Kemp Street Bridge and Footbridge - IFC WAD

FigureA07: 0.5% AEP Peak Flood Depth and Levels - Existing Condition

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Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

- Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)
- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

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Map by: TT

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Scale: 1:3,000

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Kemp Street Bridge and Footbridge - IFC WAD

FigureA08: 0.05% AEP Peak Flood Depth and Levels - Existing Condition

MARTINUS

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Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

- Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)
- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

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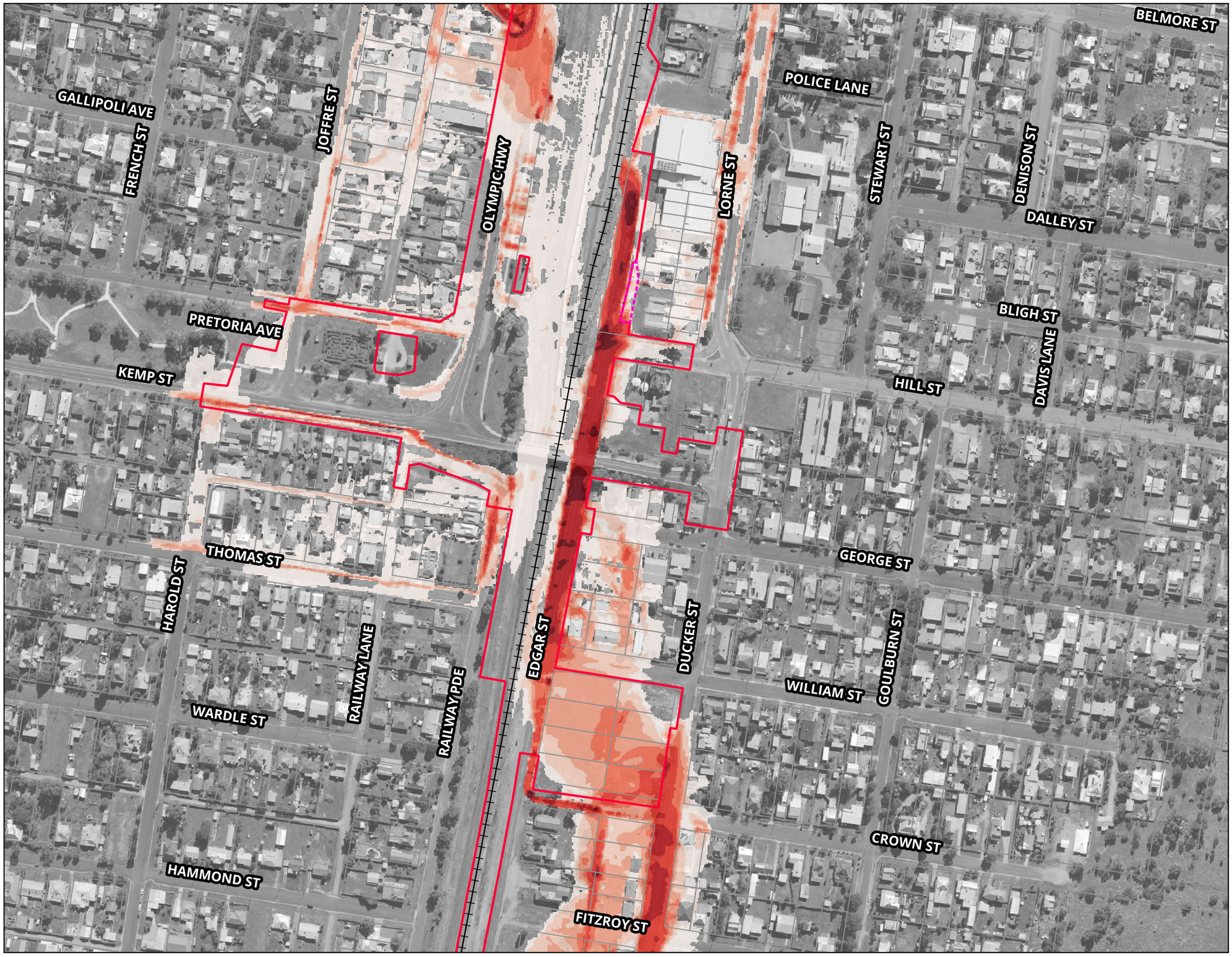
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Scale: 1:3,000

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Kemp Street Bridge and Footbridge - IFC WAD

FigureA09: PMF Peak Flood Depth and Levels - Existing Condition



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Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Velocity (m/s)

- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

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Map by: TT

0 100 200 m

A3
Scale: 1:3,000

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Kemp Street Bridge and Footbridge - IFC WAD

FigureA10: 20% AEP Peak Flood Velocity - Existing Condition

MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Velocity (m/s)
- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

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Map by: TT

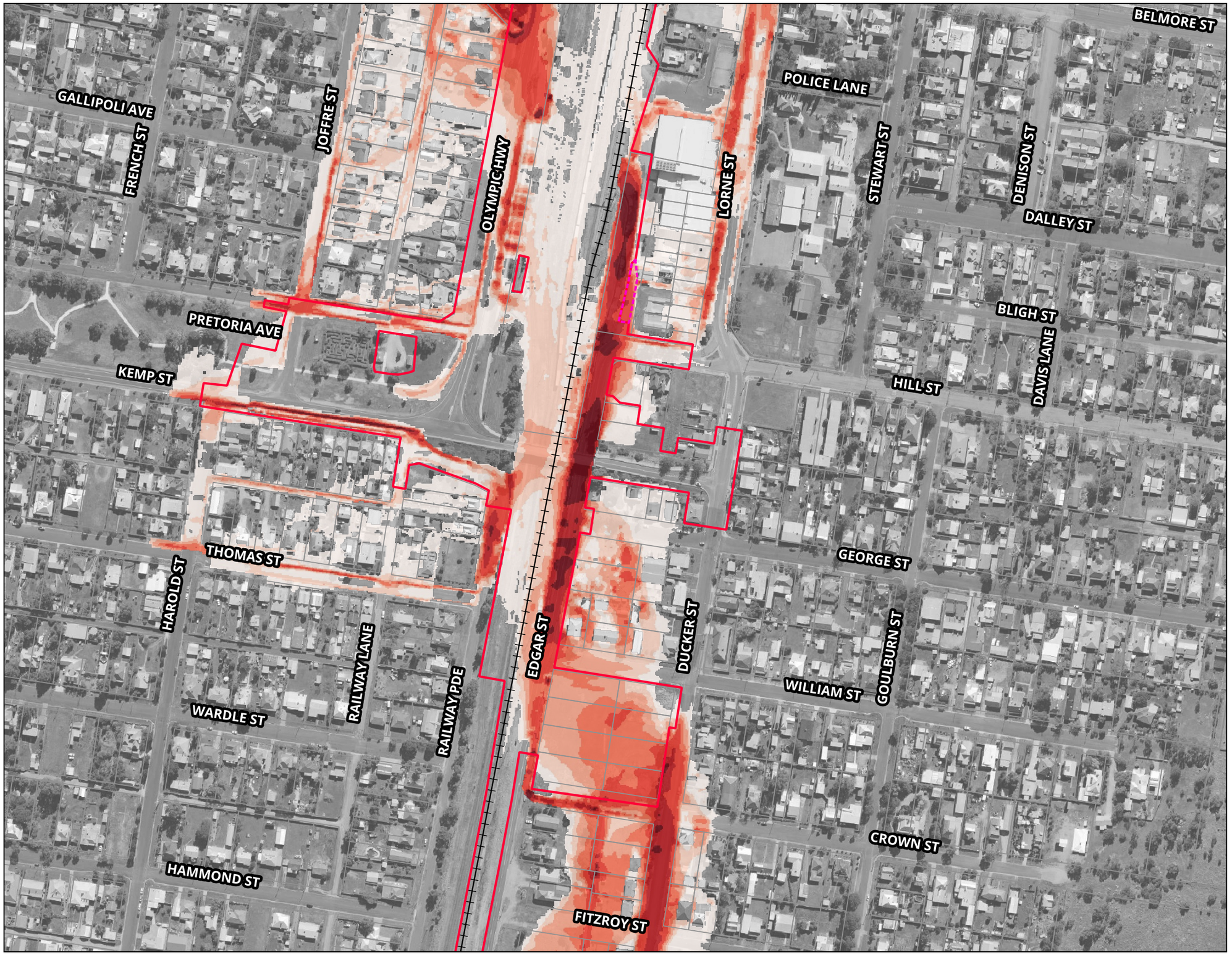
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA11: 10% AEP Peak Flood Velocity - Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Velocity (m/s)

- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

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Map by: TT

0 100 200 m

A3
Scale: 1:3,000

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Kemp Street Bridge and Footbridge - IFC WAD

FigureA12: 5% AEP Peak Flood Velocity - Existing Condition

MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Velocity (m/s)
- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

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Map by: TT

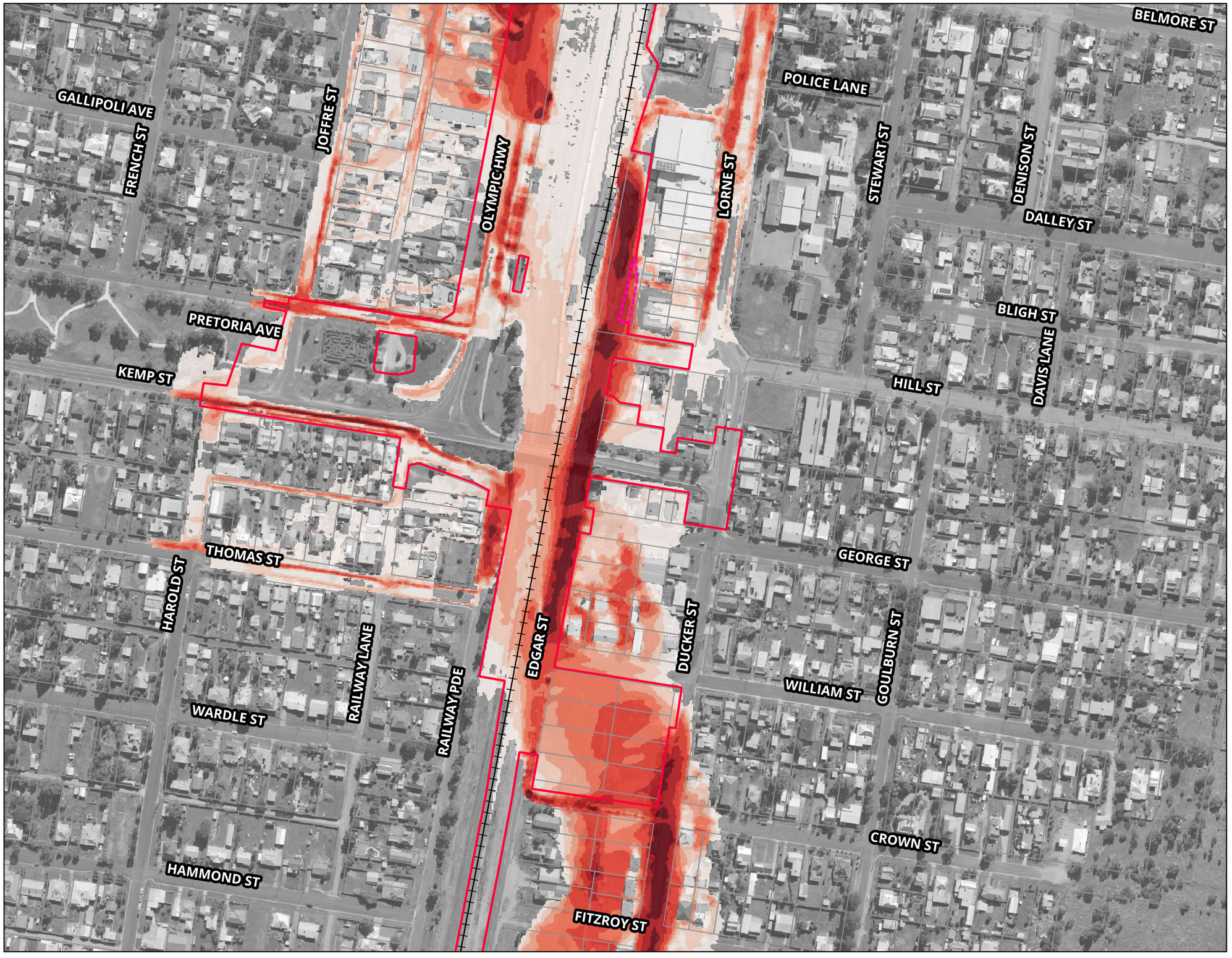
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA13: 2% AEP Peak Flood Velocity - Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Velocity (m/s)

- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

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Map by: TT

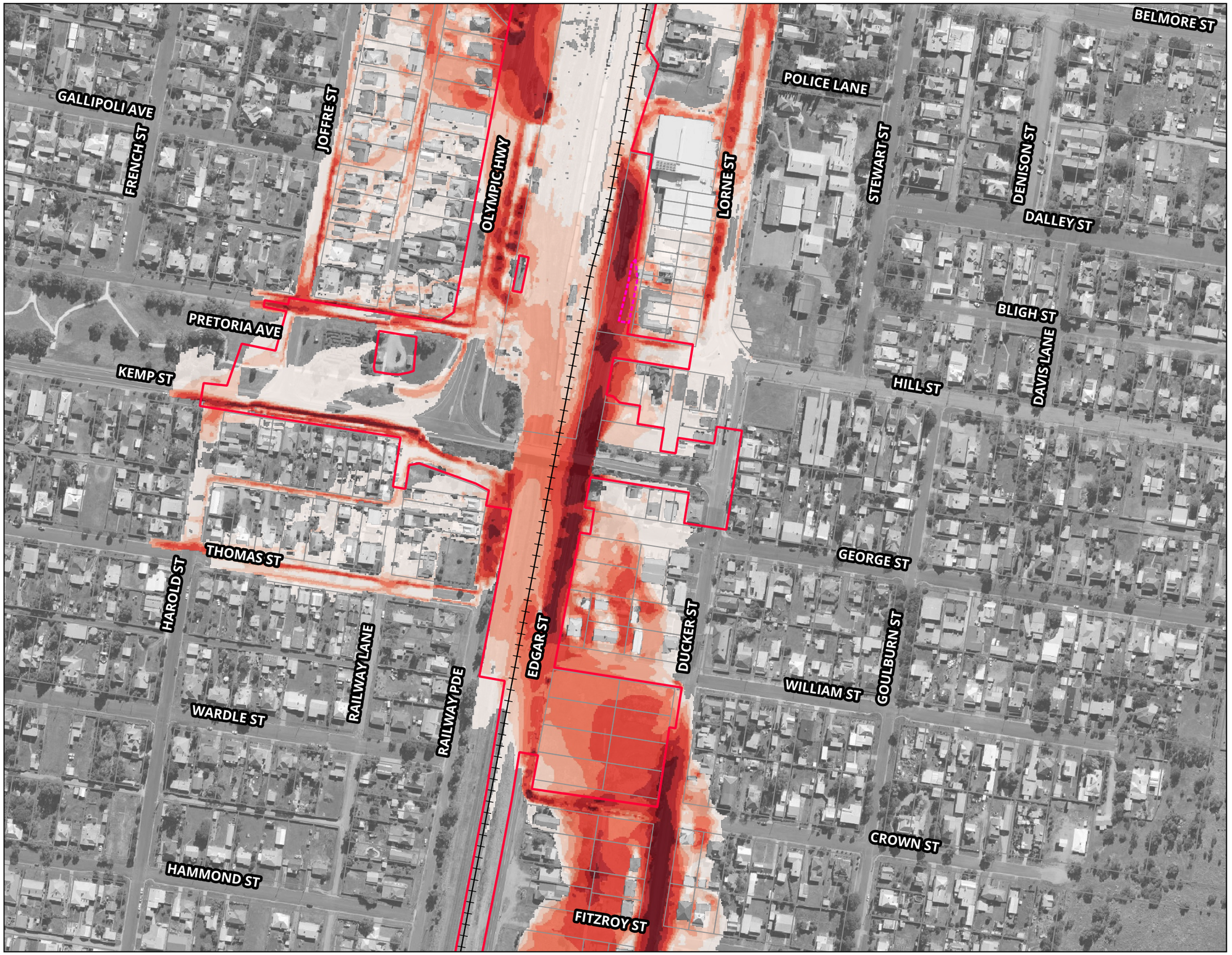
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA14: 1% AEP Peak Flood Velocity - Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Velocity (m/s)

- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

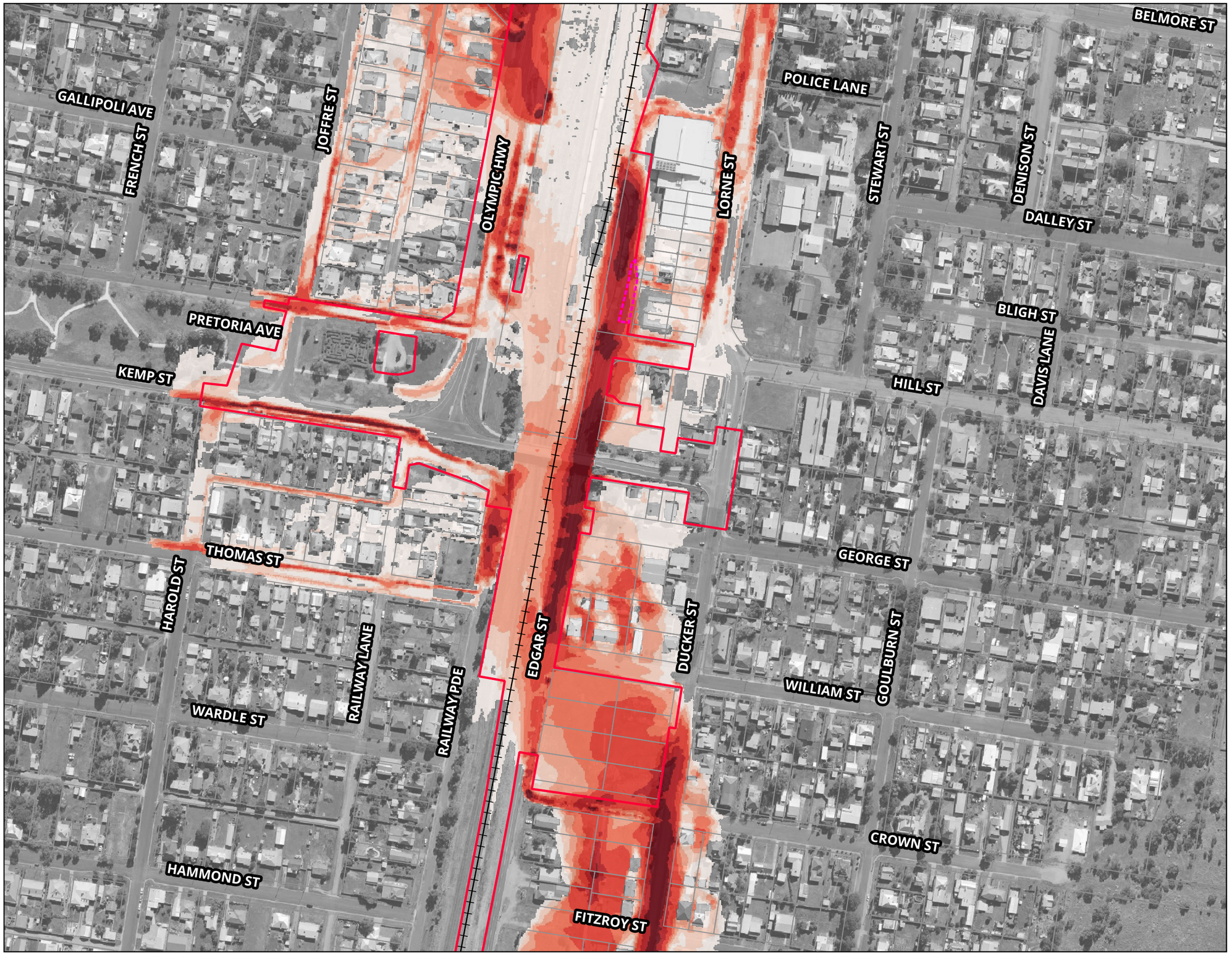
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA15: 1% AEP Climate Change Peak Flood Velocity - Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Velocity (m/s)

- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

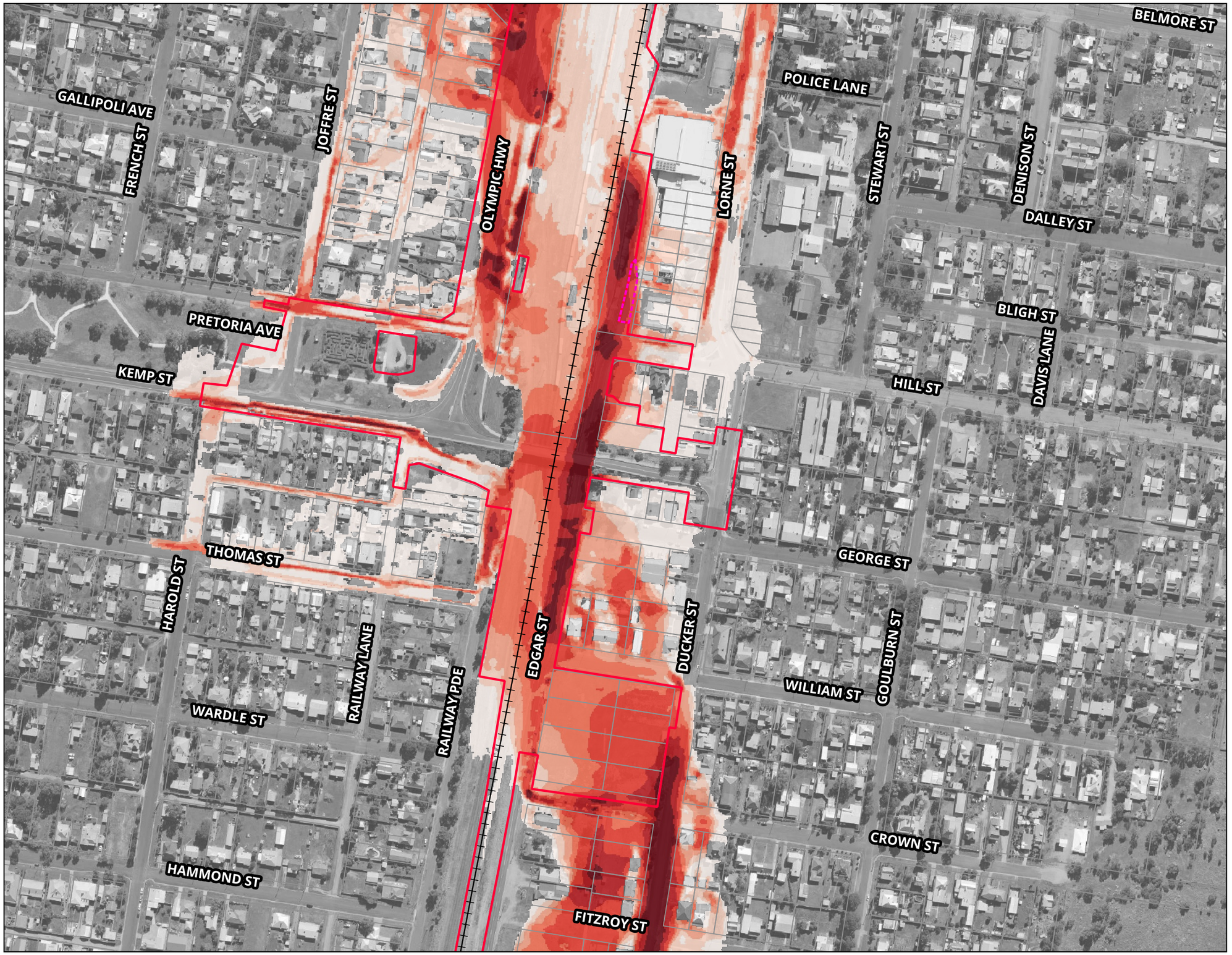
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA16: 0.5% AEP Peak Flood Velocity - Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Velocity (m/s)

- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

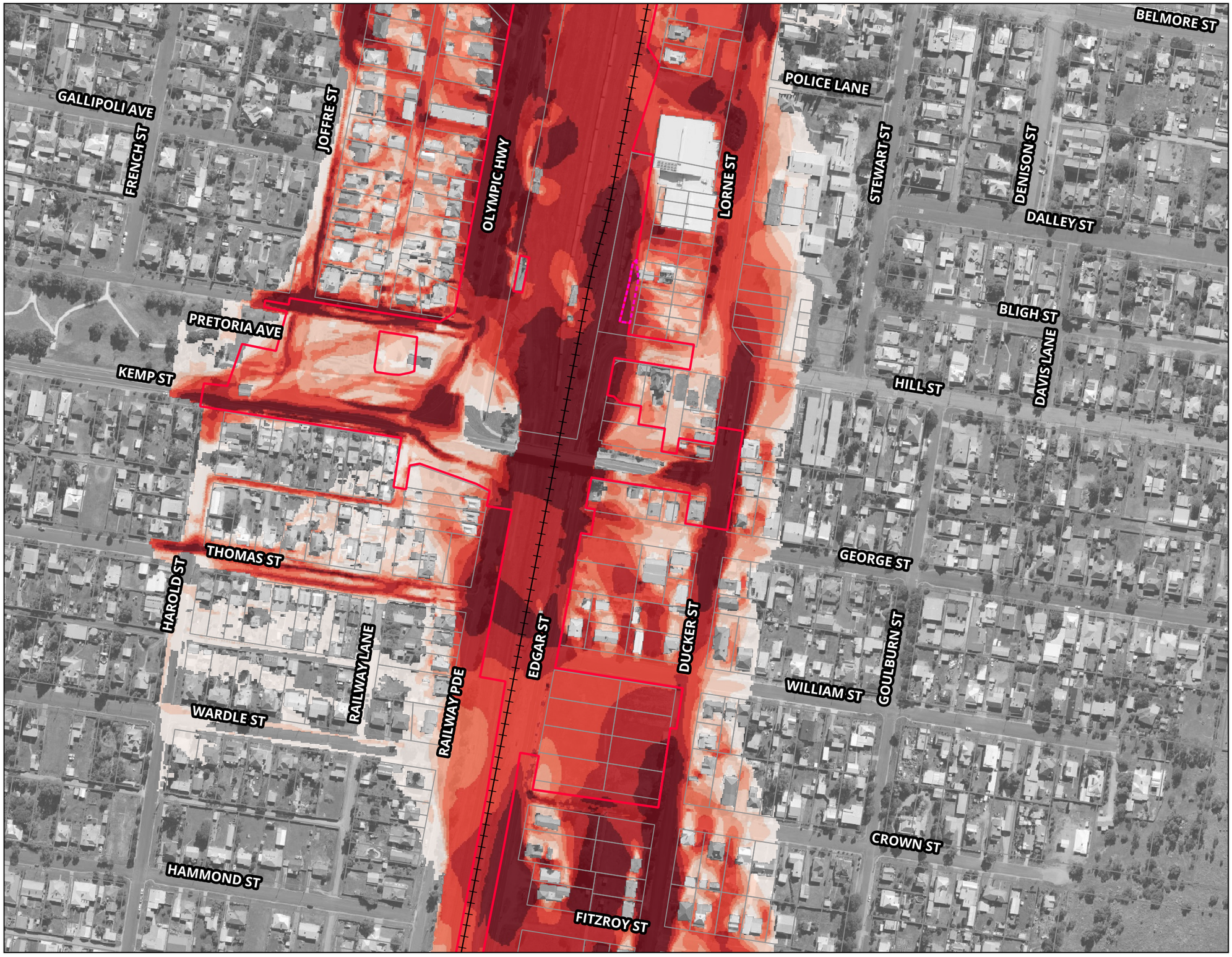
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA17: 0.05% AEP Peak Flood Velocity - Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Velocity (m/s)

- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

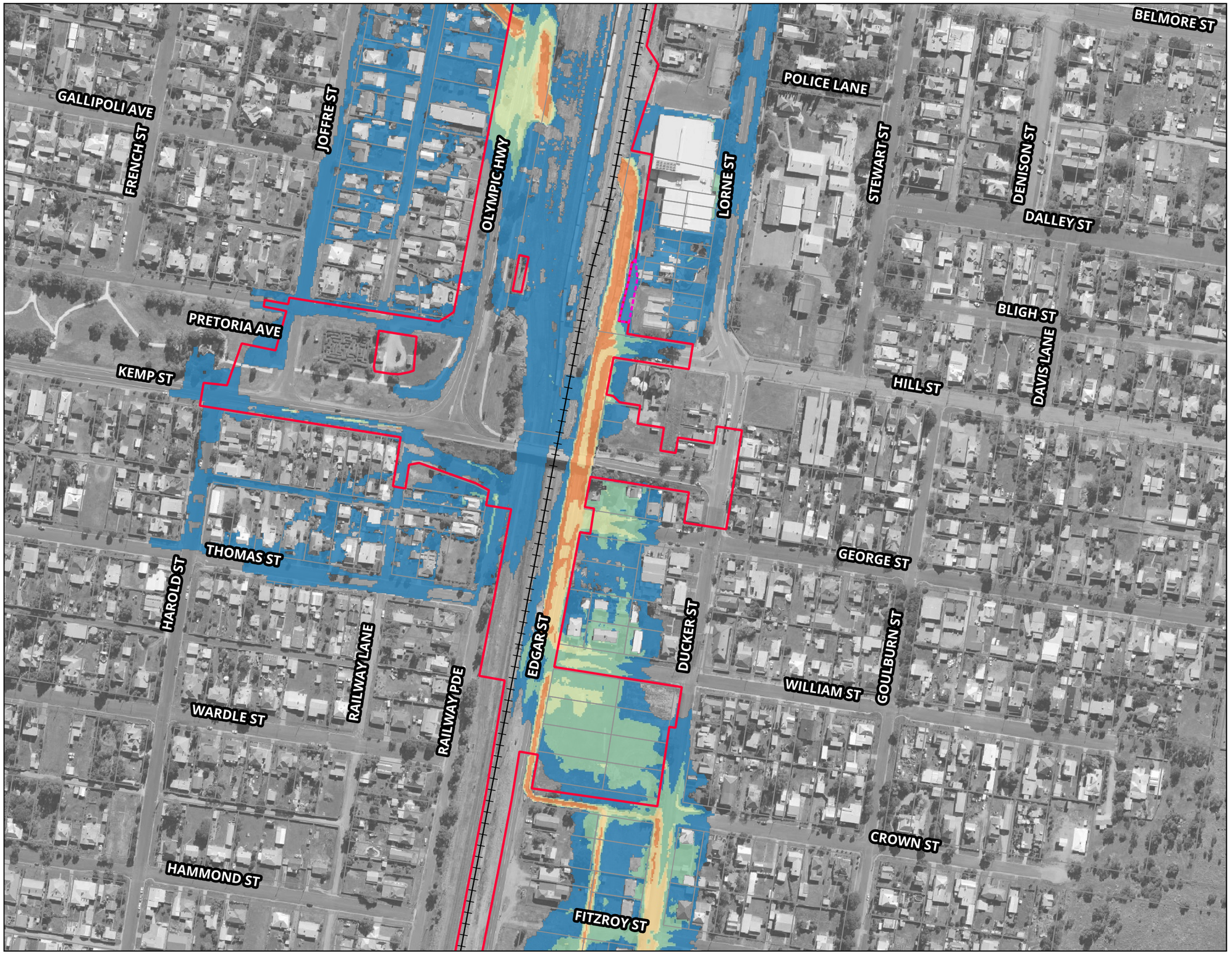
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA18: PMF Peak Flood Velocity - Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6

Notes:

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Map by: TT

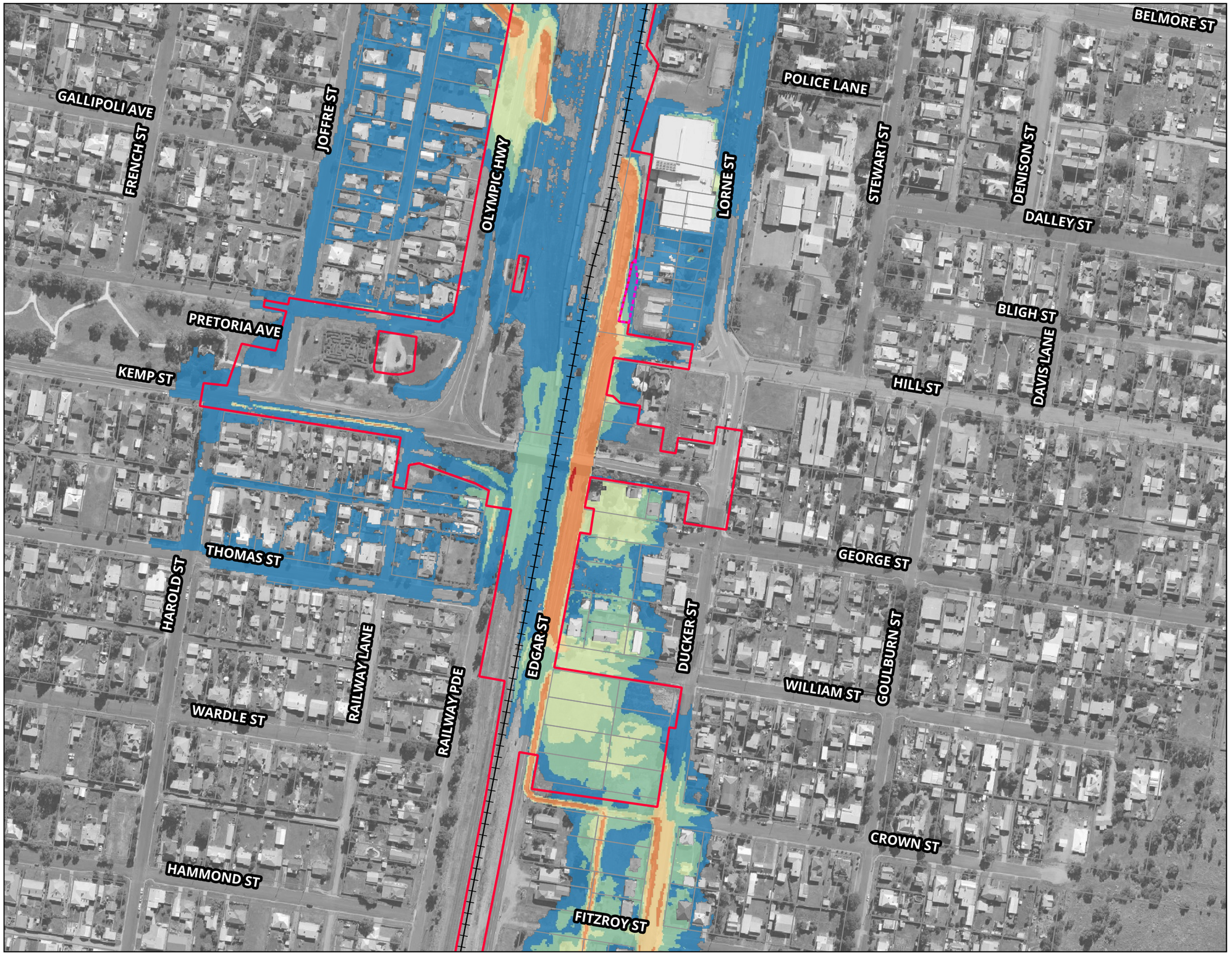
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA19: 20% AEP Peak Flood Hazard - Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6

Notes:

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Map by: TT

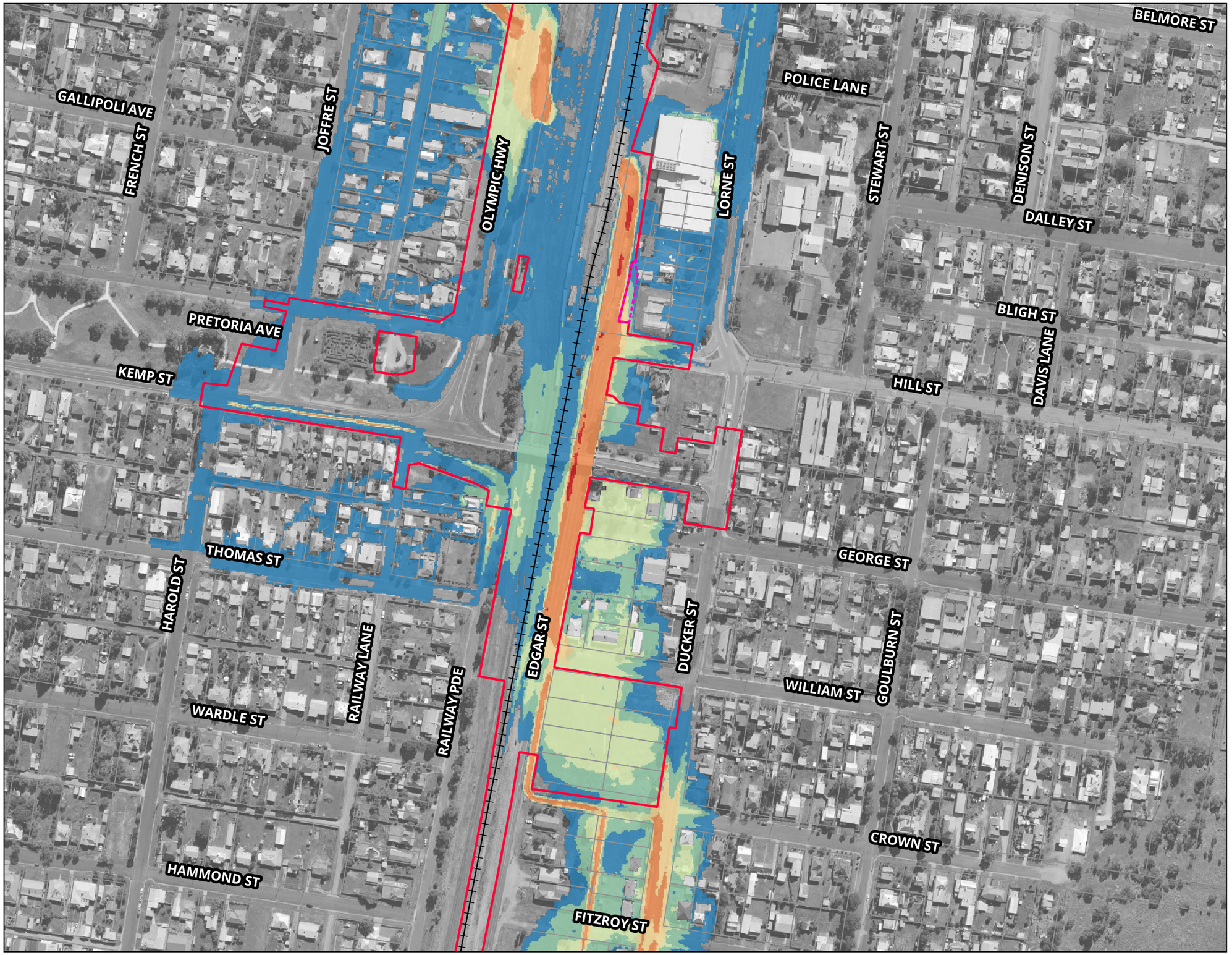
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA20: 10% AEP Peak Flood Hazard - Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6

Notes:

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Map by: TT

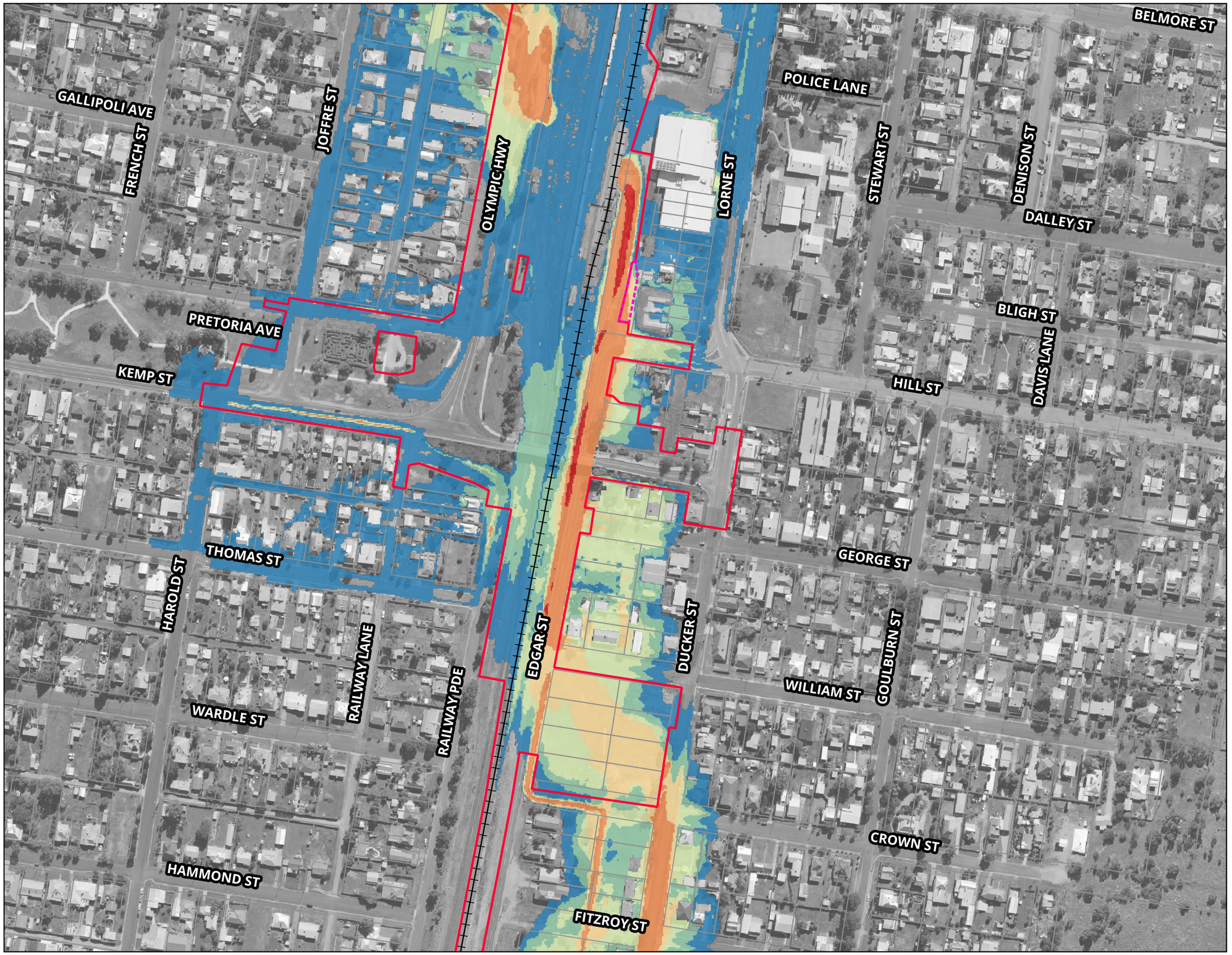
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA21: 5% AEP Peak Flood Hazard - Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6

Notes:

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Map by: TT

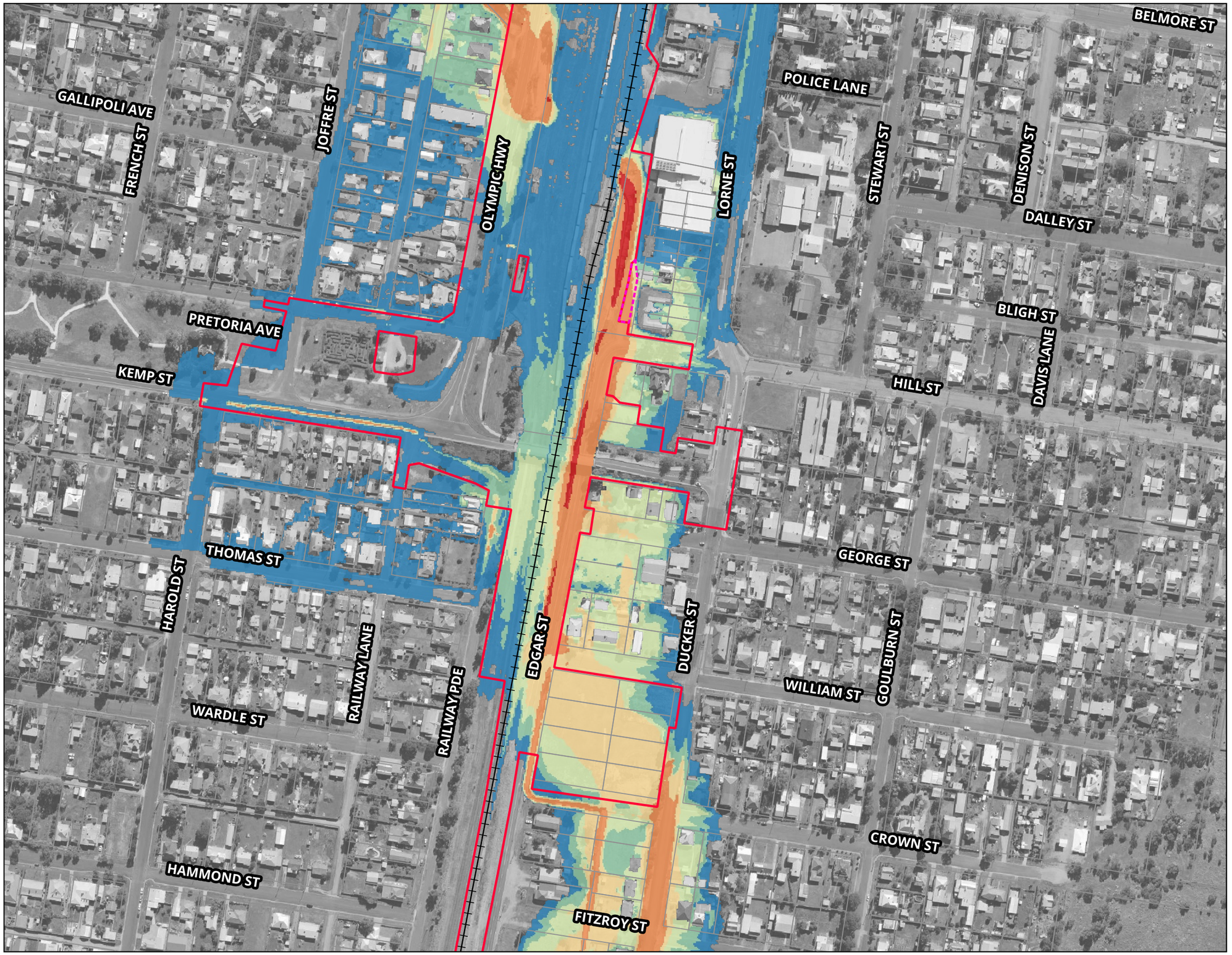
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA22: 2% AEP Peak Flood Hazard - Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Hazard
- H1
- H2
- H3
- H4
- H5
- H6

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

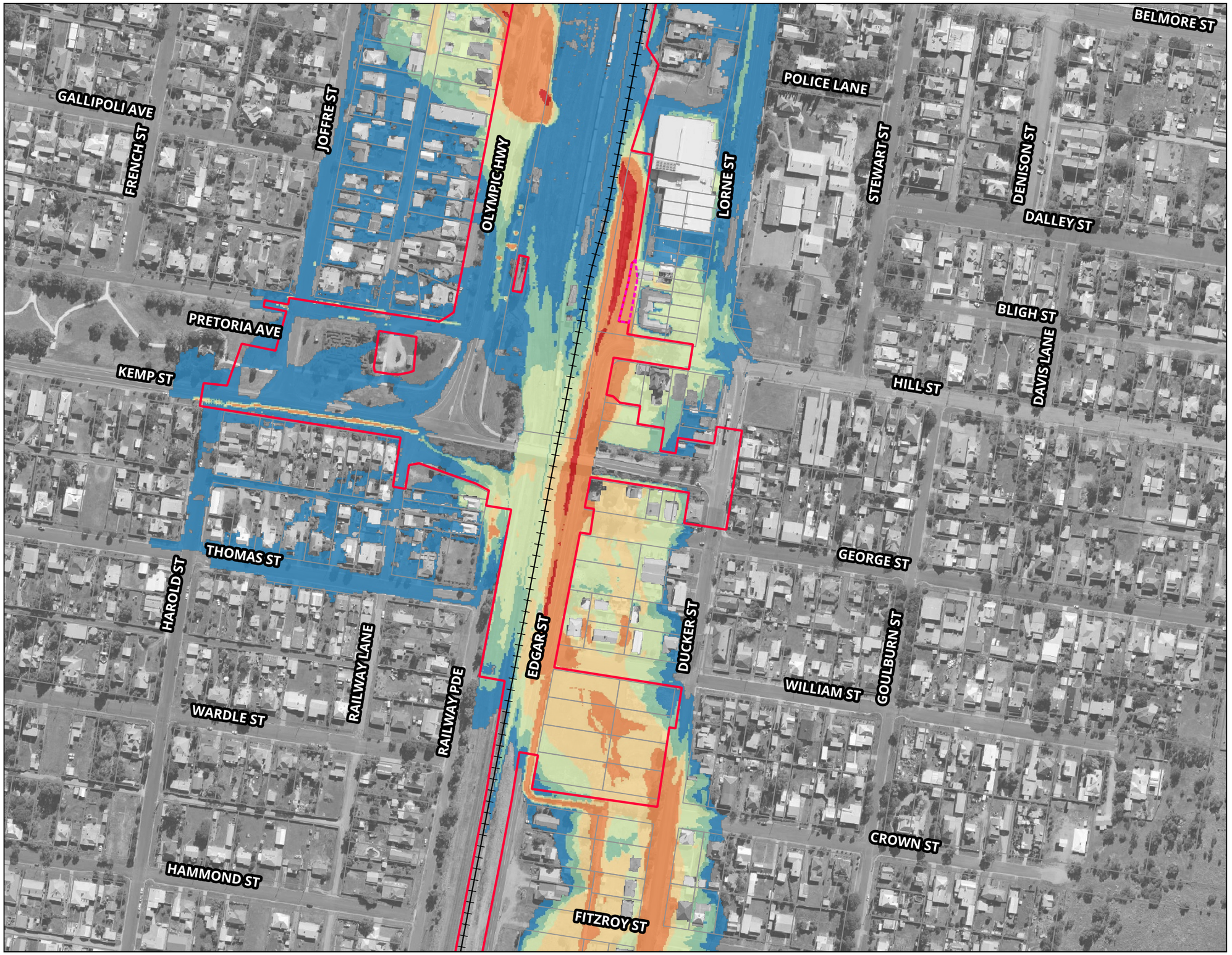
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA23: 1% AEP Peak Flood Hazard - Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6

Notes:

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Map by: TT

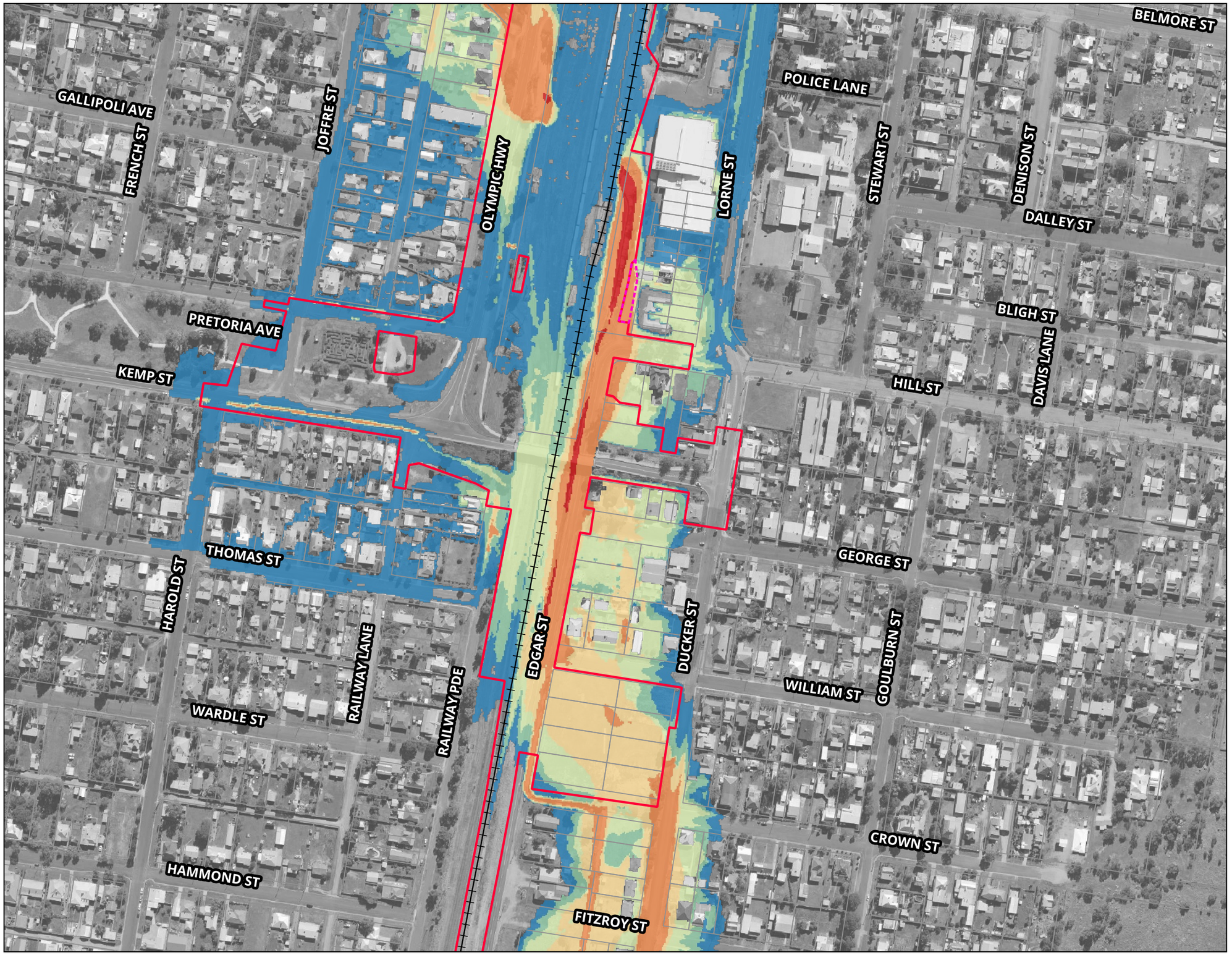
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA24: 1% AEP Climate Change Peak Flood Hazard - Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

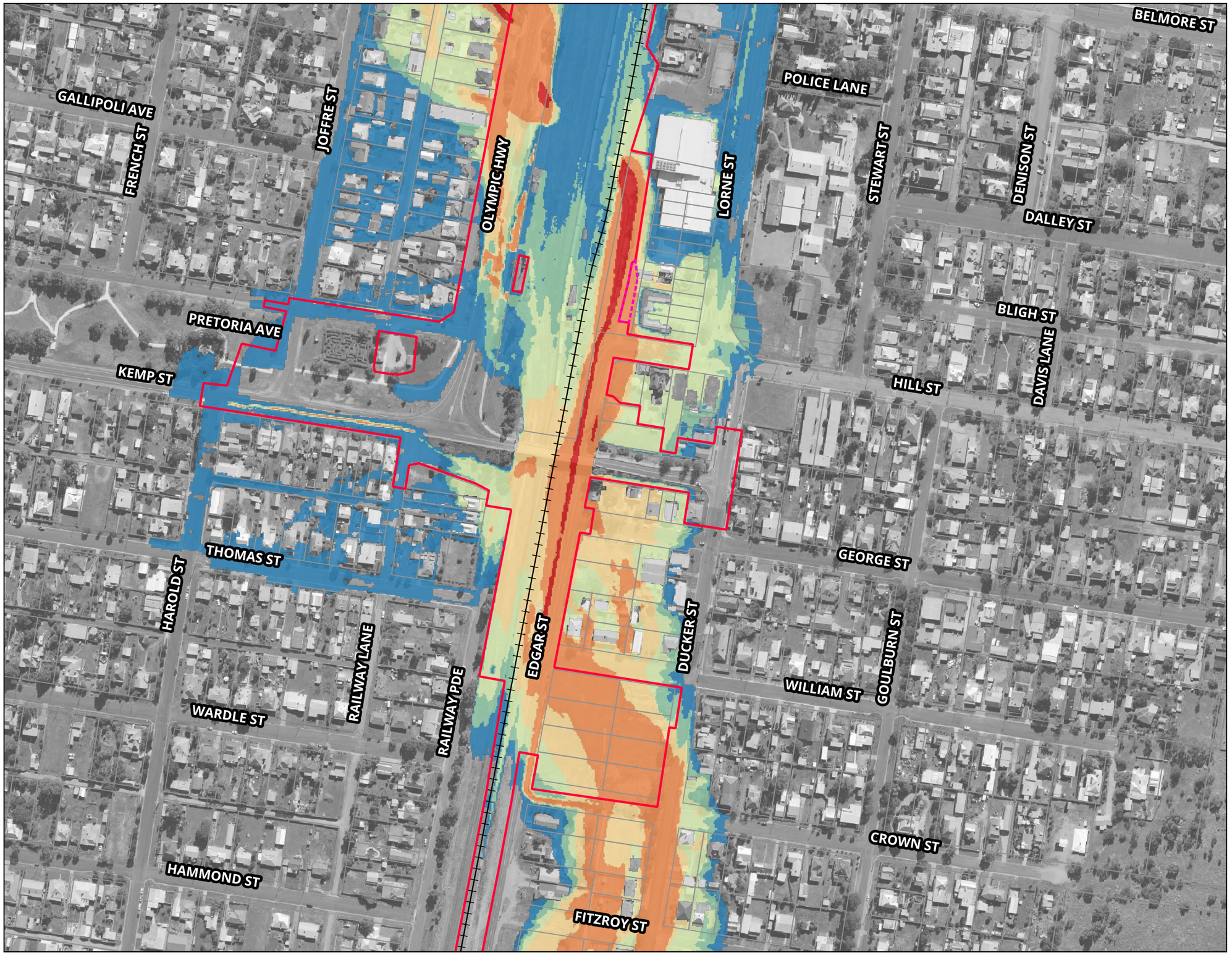
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA25: 0.5% AEP Peak Flood Hazard - Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6

Notes:

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Map by: TT

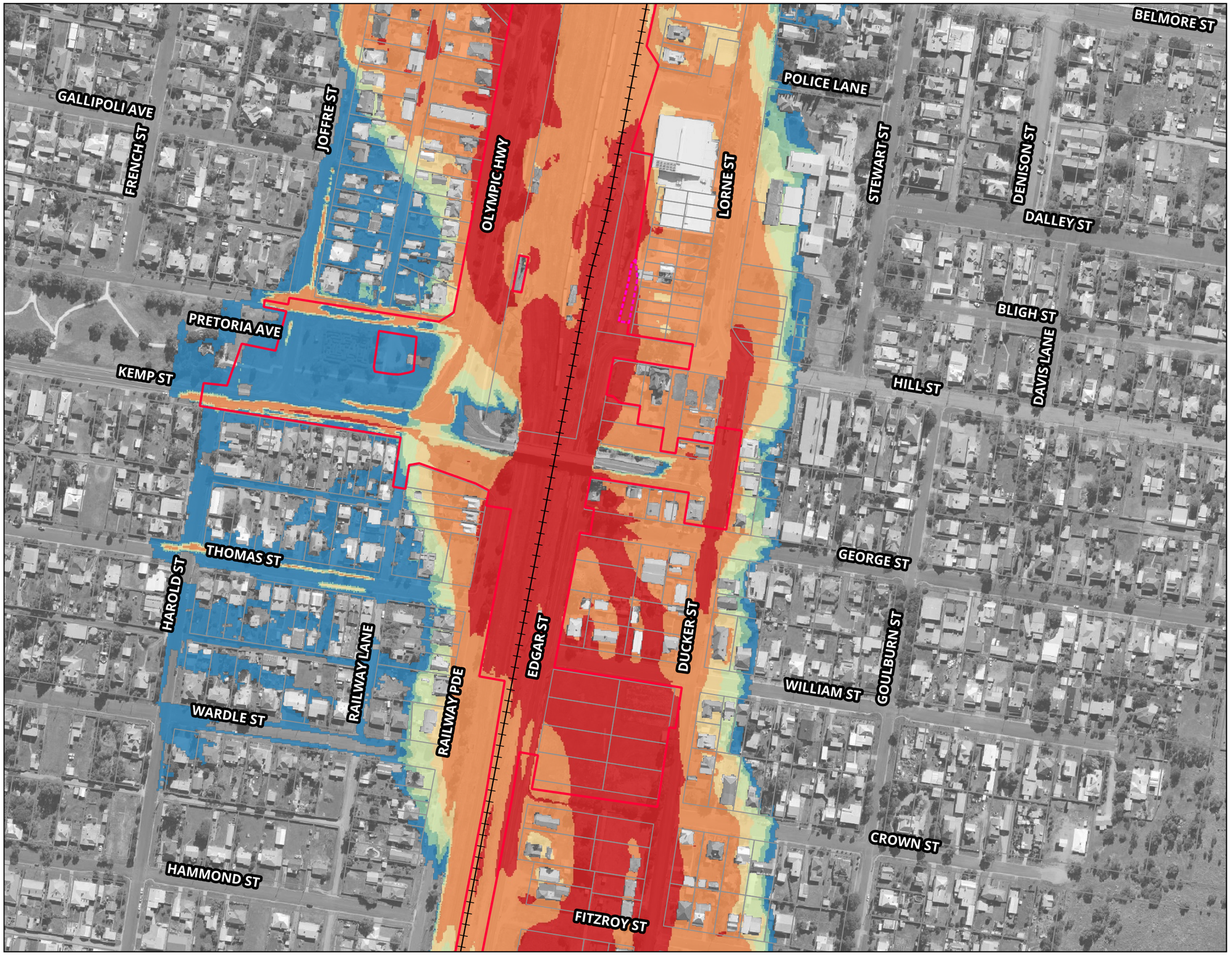
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA26: 0.05% AEP Peak Flood Hazard - Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Railway Track

Peak Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6

Notes:

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Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA27: PMF Peak Flood Hazard - Existing Condition

MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

- Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)
- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA28: 20% AEP Peak Flood Depth and Levels - Design Condition

MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

- Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)

- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

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Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA29: 10% AEP Peak Flood Depth and Levels - Design Condition

MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)
- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

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Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA30: 5% AEP Peak Flood Depth and Levels - Design Condition

MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

- Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)
- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

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Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA31: 2% AEP Peak Flood Depth and Levels - Design Condition

MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

- Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)

- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA32: 1% AEP Peak Flood Depth and Levels - Design Condition

MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

- Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)
- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

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Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA33: 1% AEP Peak Flood Depth and Levels - Design Blockage Condition

MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

- Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)
- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

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Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA34: 1% AEP Climate Change Peak Flood Depth and Levels - Design Condition

MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

- Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)

- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

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Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA35: 0.5% AEP Peak Flood Depth and Levels - Design Condition

MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

- Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)
- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

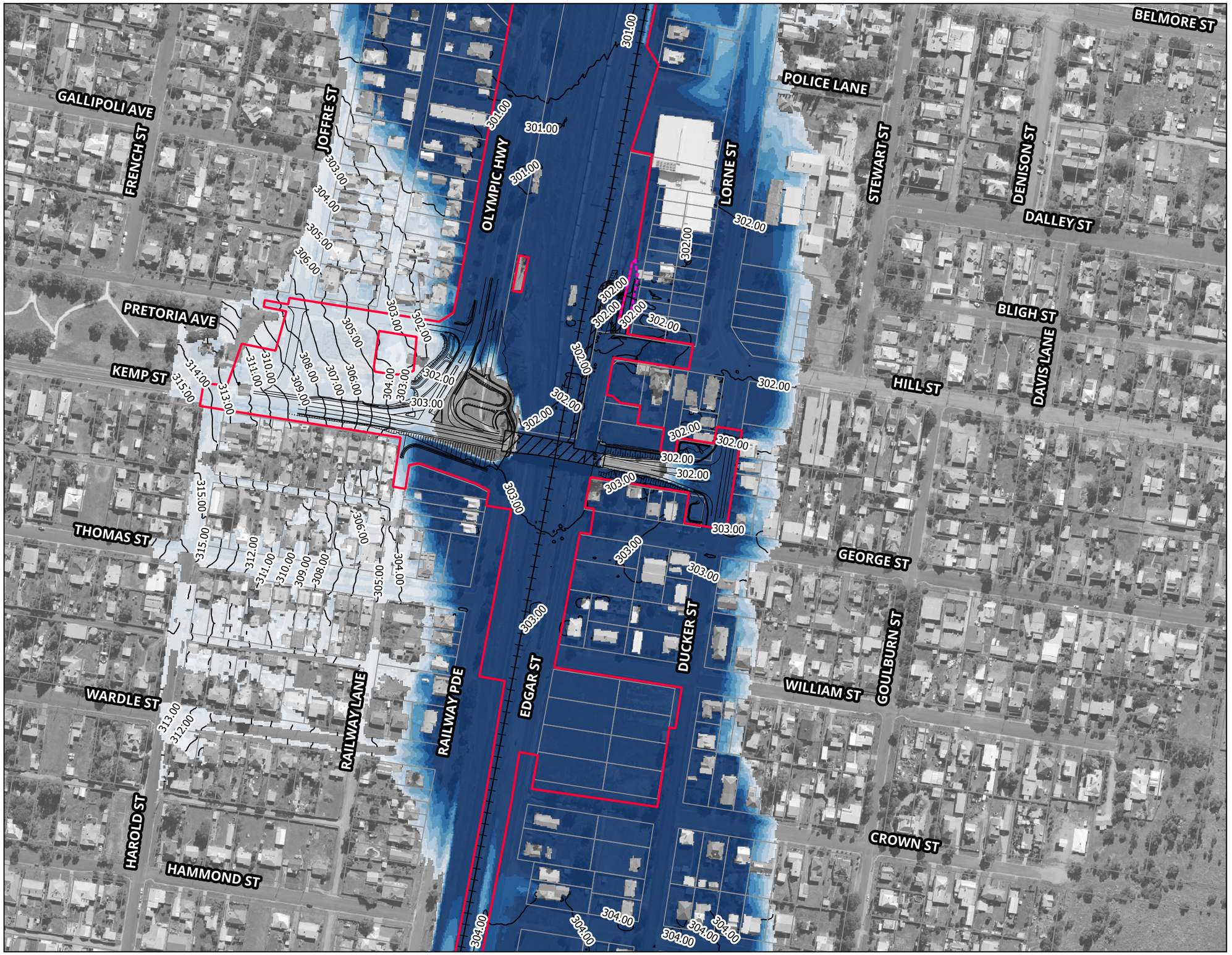
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA36: 0.05% AEP Peak Flood Depth and Levels - Design Condition



R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

- Peak Flood Level Contours (mAHD)

Peak Flood Depth (m)
- <= 0.03
- 0.03 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 1.2
- > 1.2

Notes:

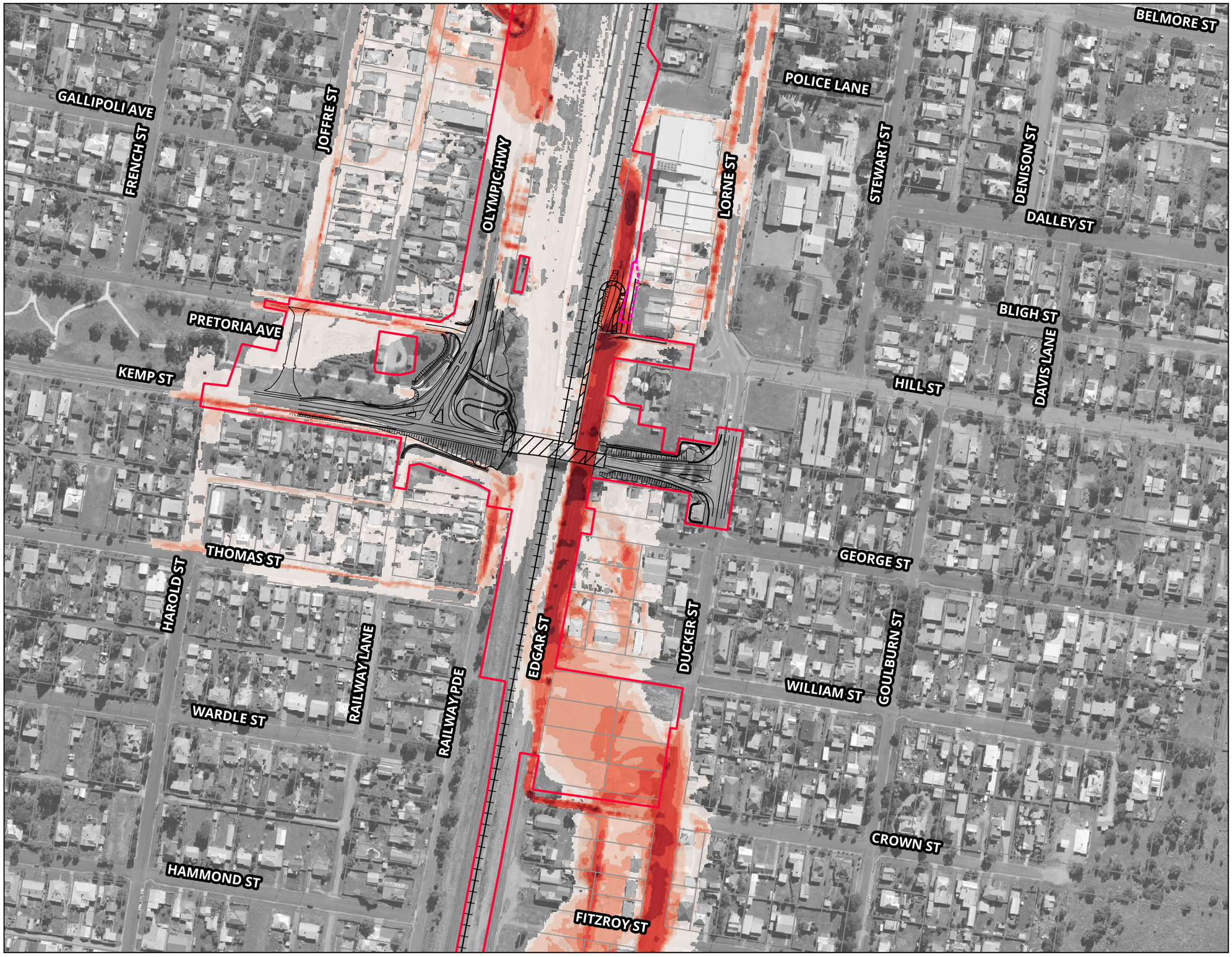
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA37: PMF Peak Flood Depth and Levels - Design Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Velocity (m/s)

- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

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Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA38: 20% AEP Peak Flood Velocity - Design Condition

MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Velocity (m/s)
- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

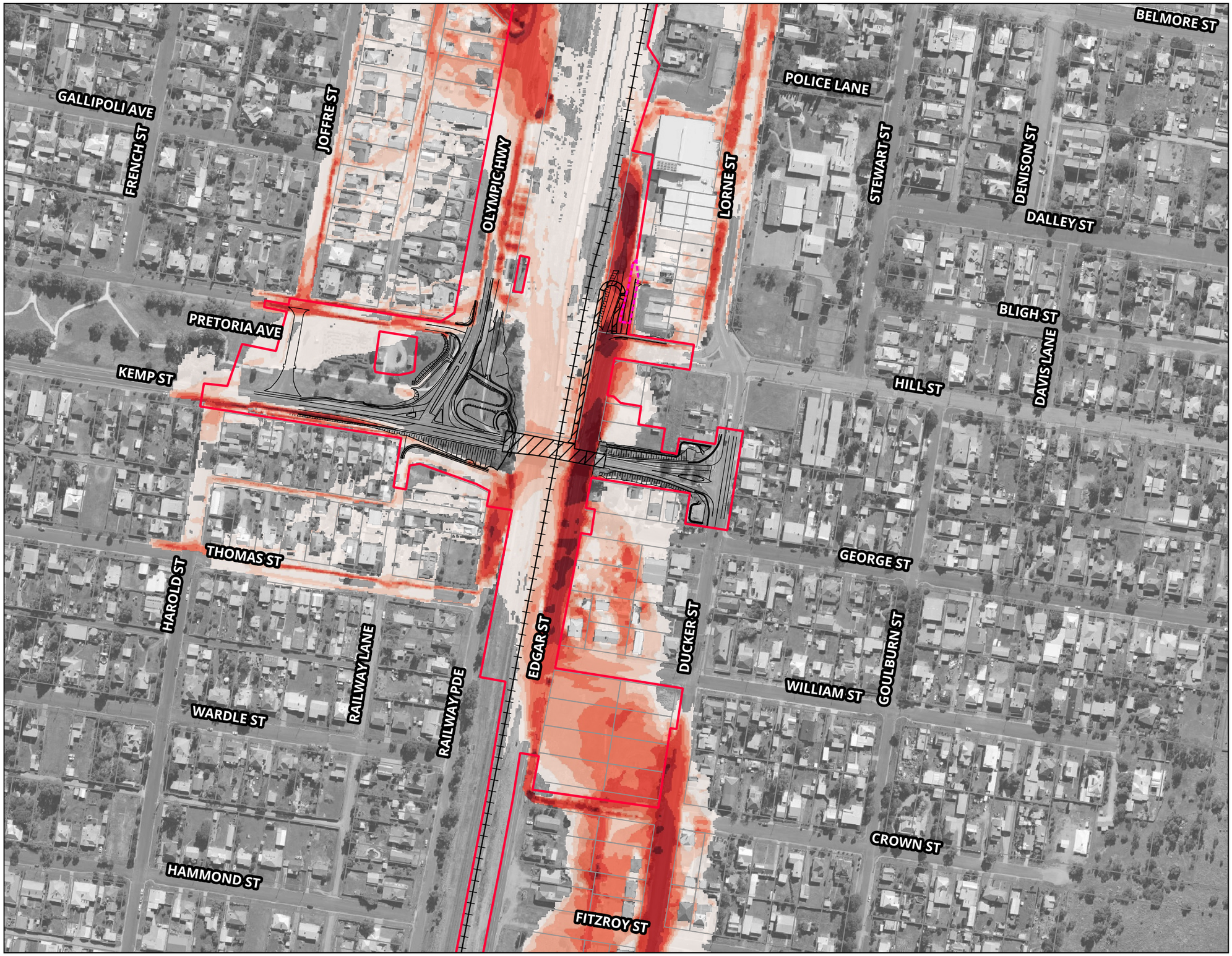
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA39: 10% AEP Peak Flood Velocity - Design Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Velocity (m/s)

- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA40: 5% AEP Peak Flood Velocity - Design Condition

MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Velocity (m/s)
- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

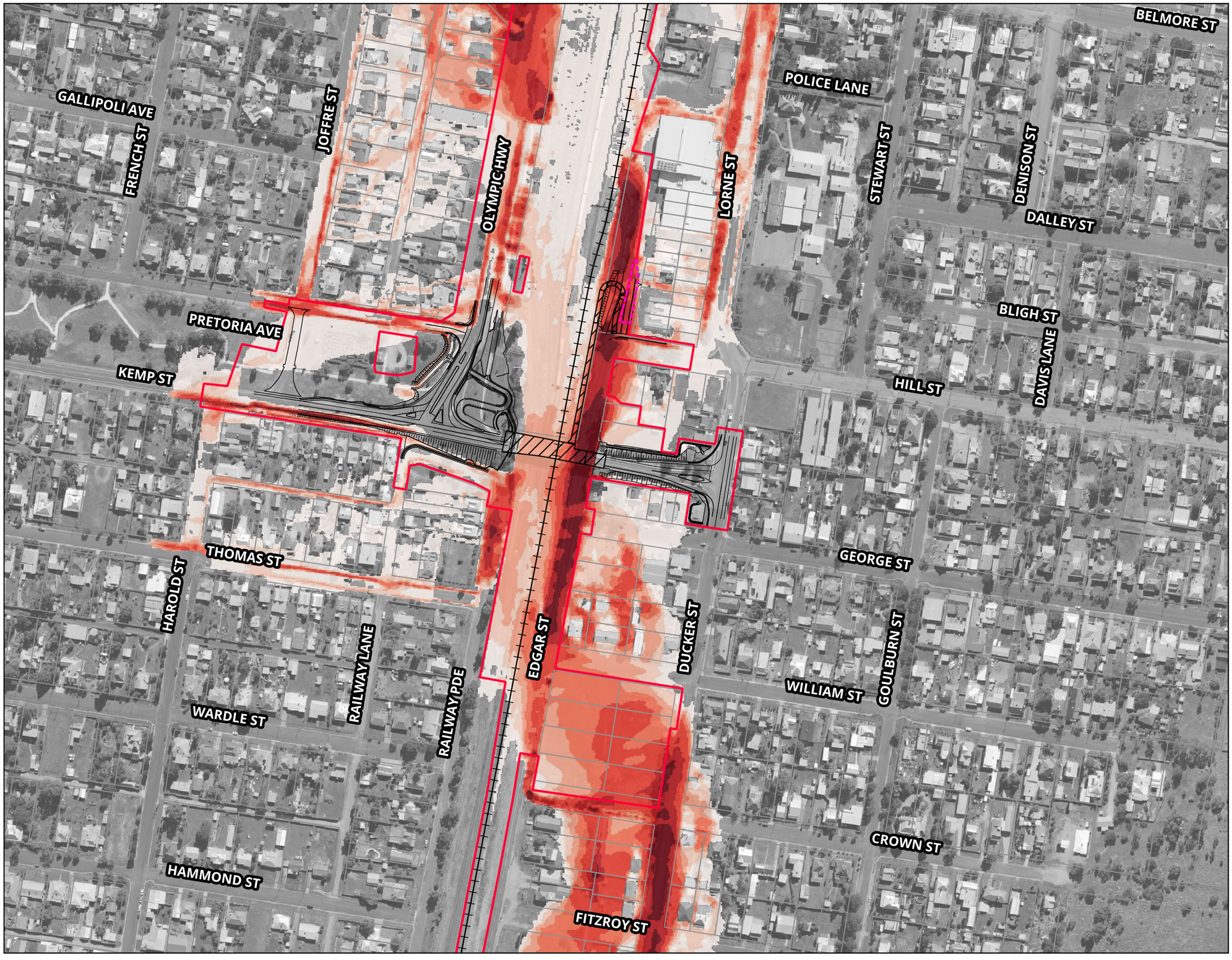
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA41: 2% AEP Peak Flood Velocity - Design Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Velocity (m/s)

- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA42: 1% AEP Peak Flood Velocity - Design Condition

MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Velocity (m/s)
- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

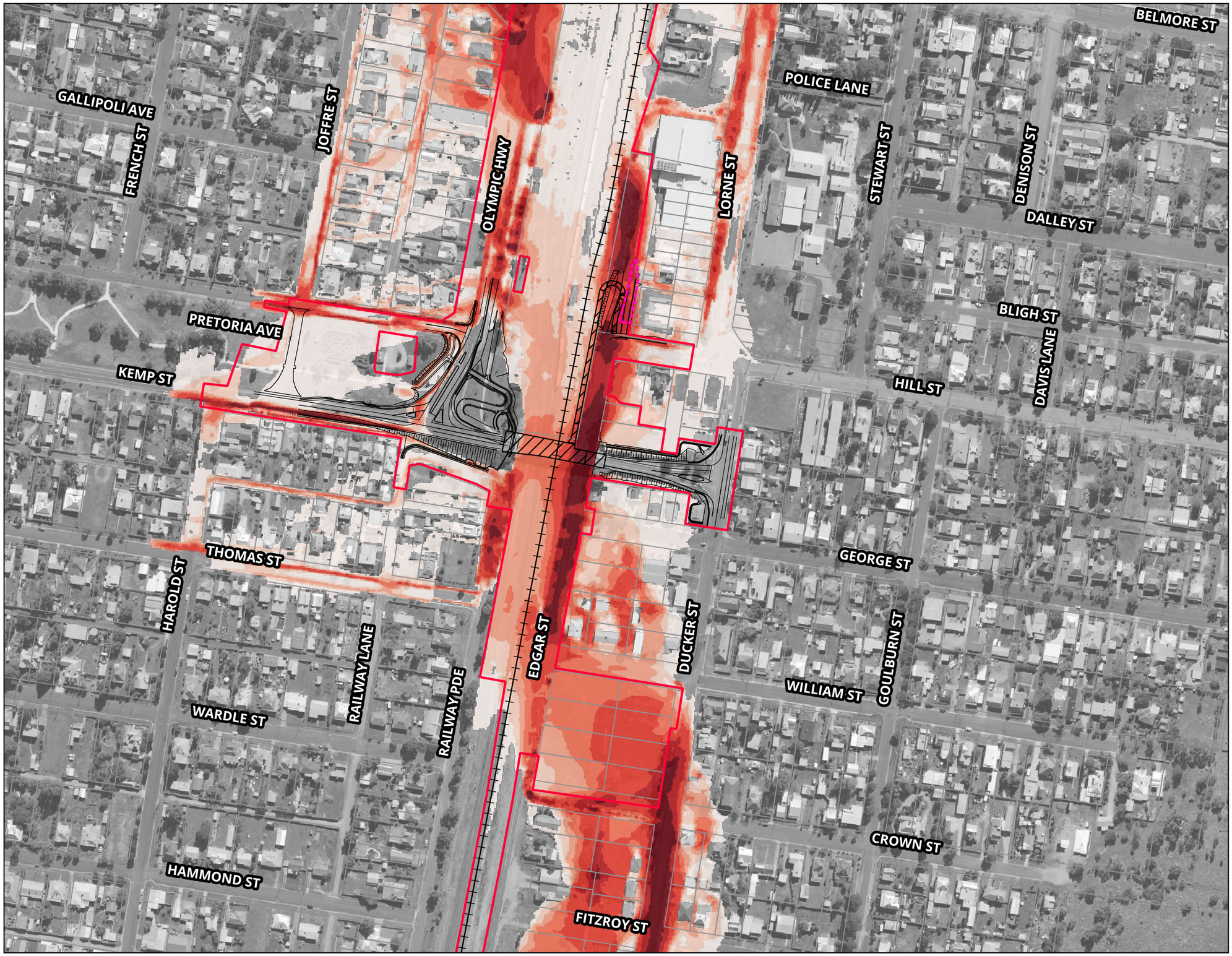
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA43: 1% AEP Peak Flood Velocity - Design Blockage Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Velocity (m/s)
- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

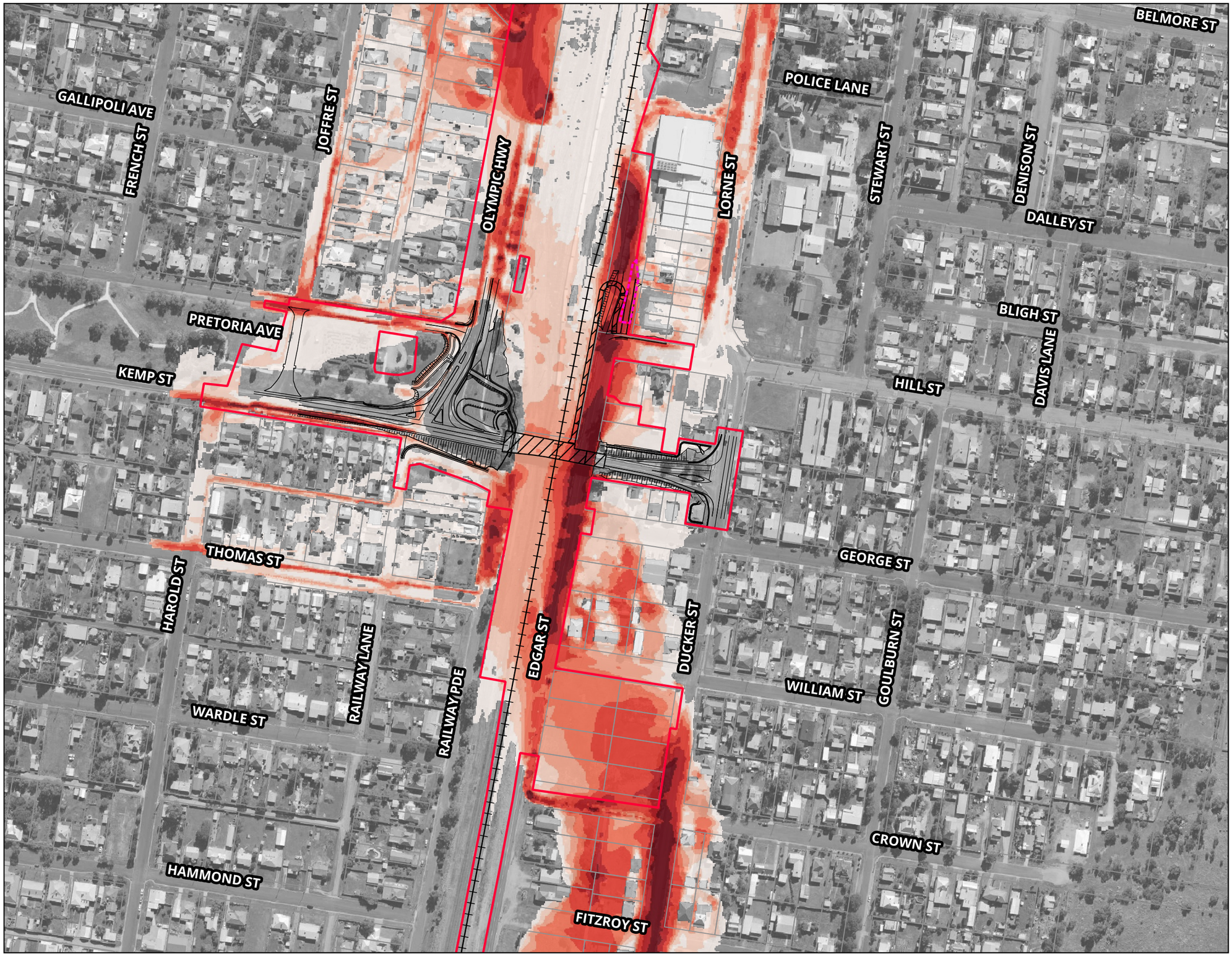
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA44: 1% AEP Climate Change Peak Flood Velocity - Design Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Velocity (m/s)

- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

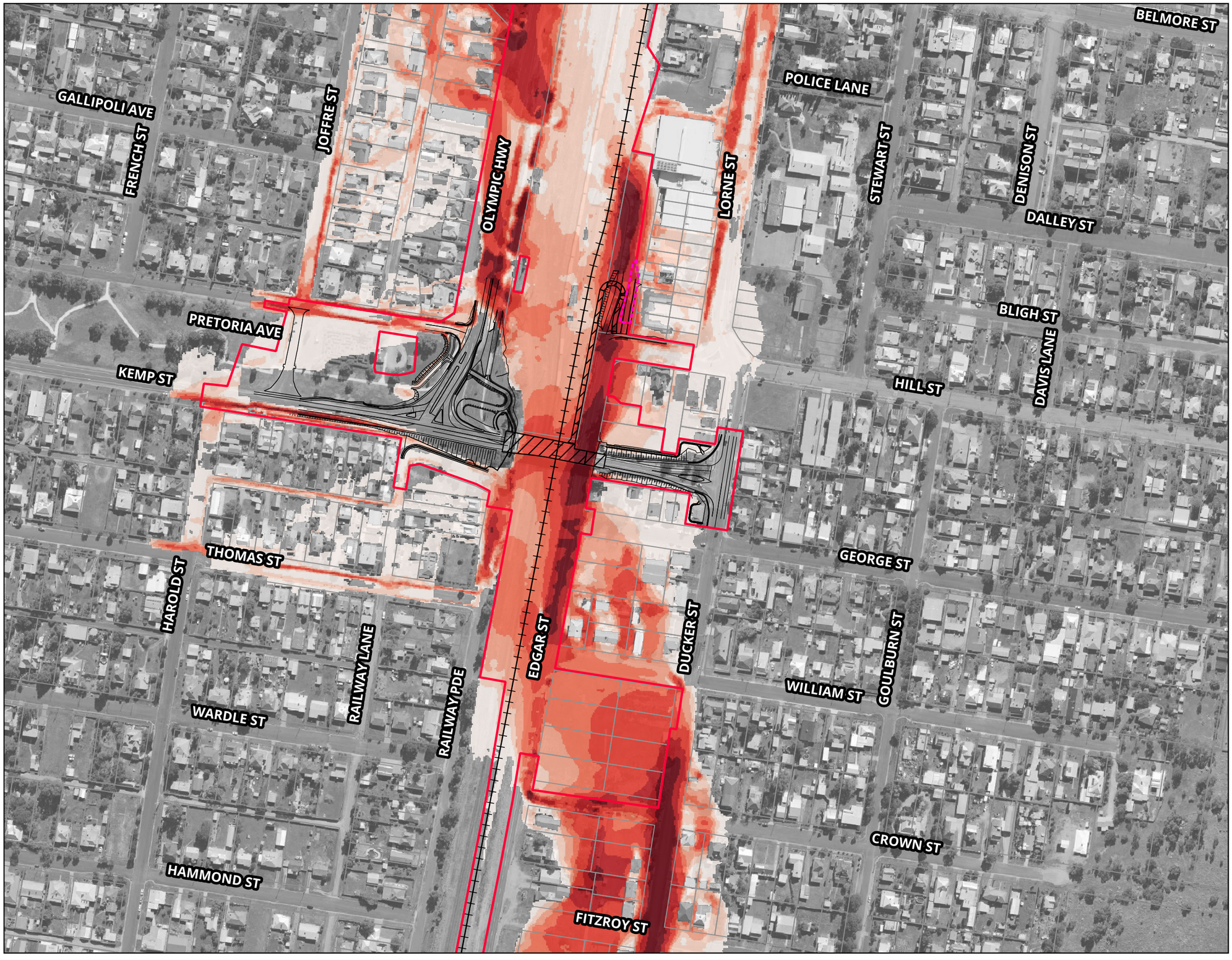
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA45: 0.5% AEP Peak Flood Velocity - Design Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Velocity (m/s)

- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA46: 0.05% AEP Peak Flood Velocity - Design Condition

MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Velocity (m/s)

- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA47: PMF Peak Flood Velocity - Design Condition

MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Hazard
- H1
- H2
- H3
- H4
- H5
- H6

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

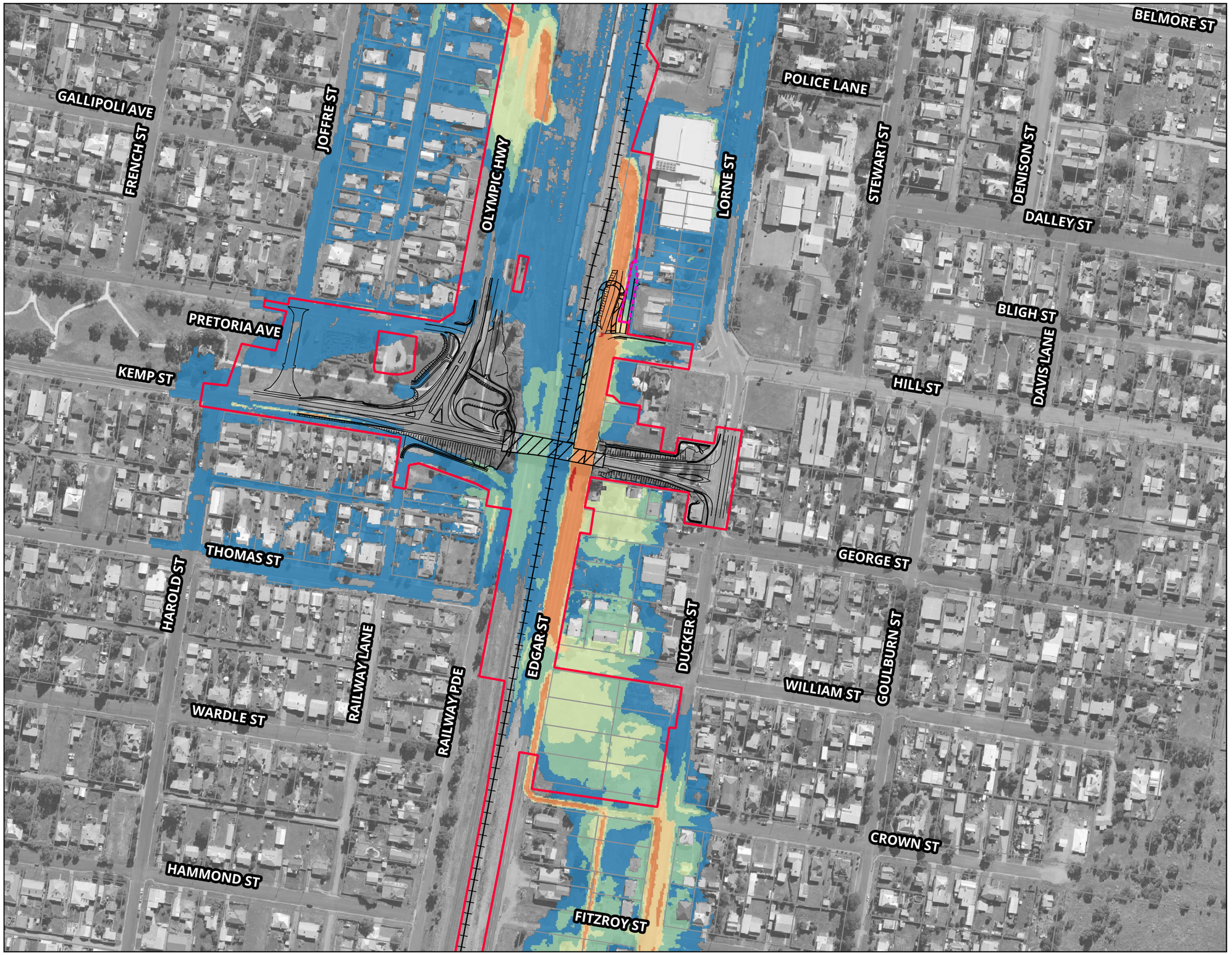
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA48: 20% AEP Peak Flood Hazard - Design Condition



MARTINUS
aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Hazard
- H1
- H2
- H3
- H4
- H5
- H6

Notes:

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Map by: TT

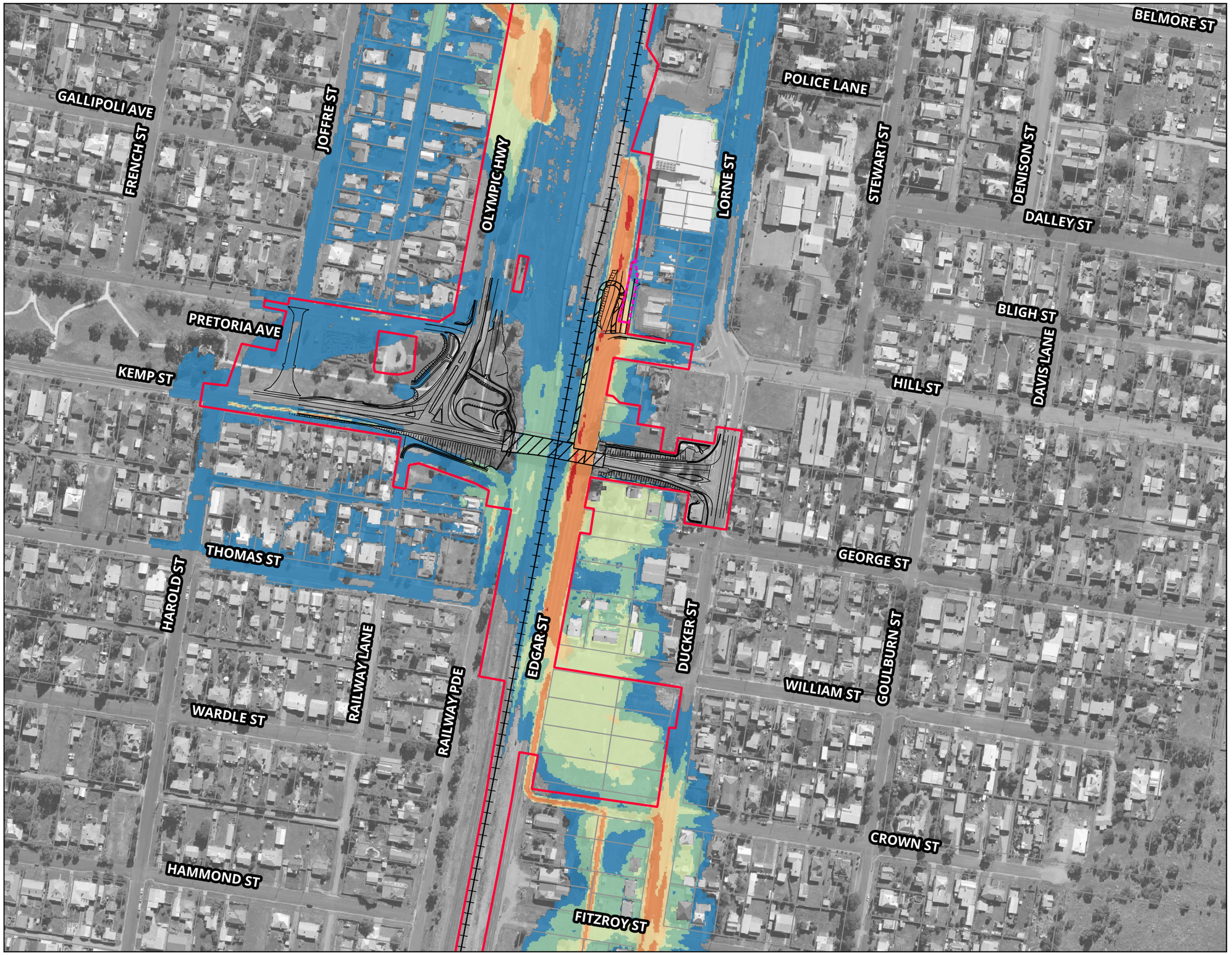
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA49: 10% AEP Peak Flood Hazard - Design Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6

Notes:

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Map by: TT

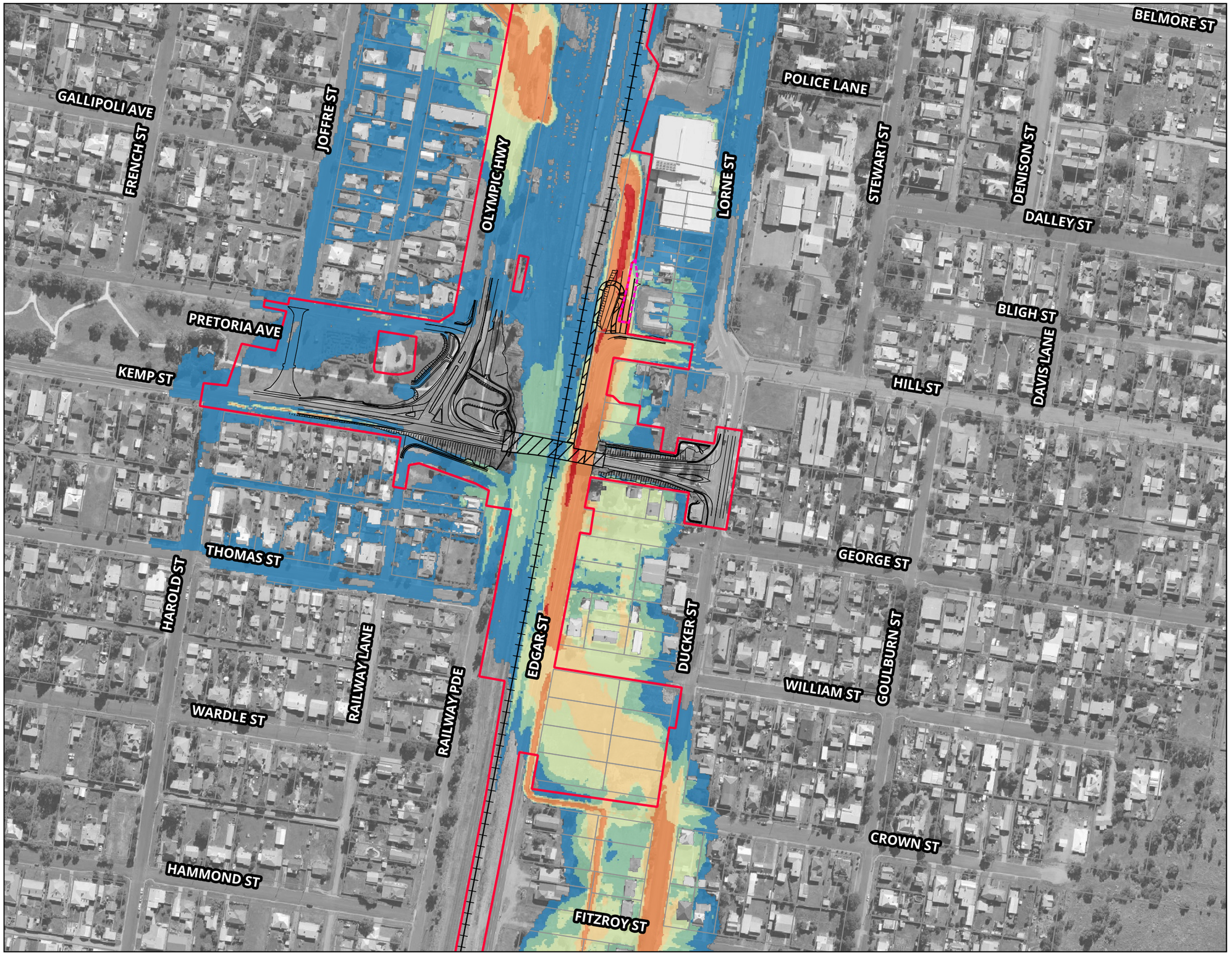
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA50: 5% AEP Peak Flood Hazard - Design Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6

Notes:

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Map by: TT

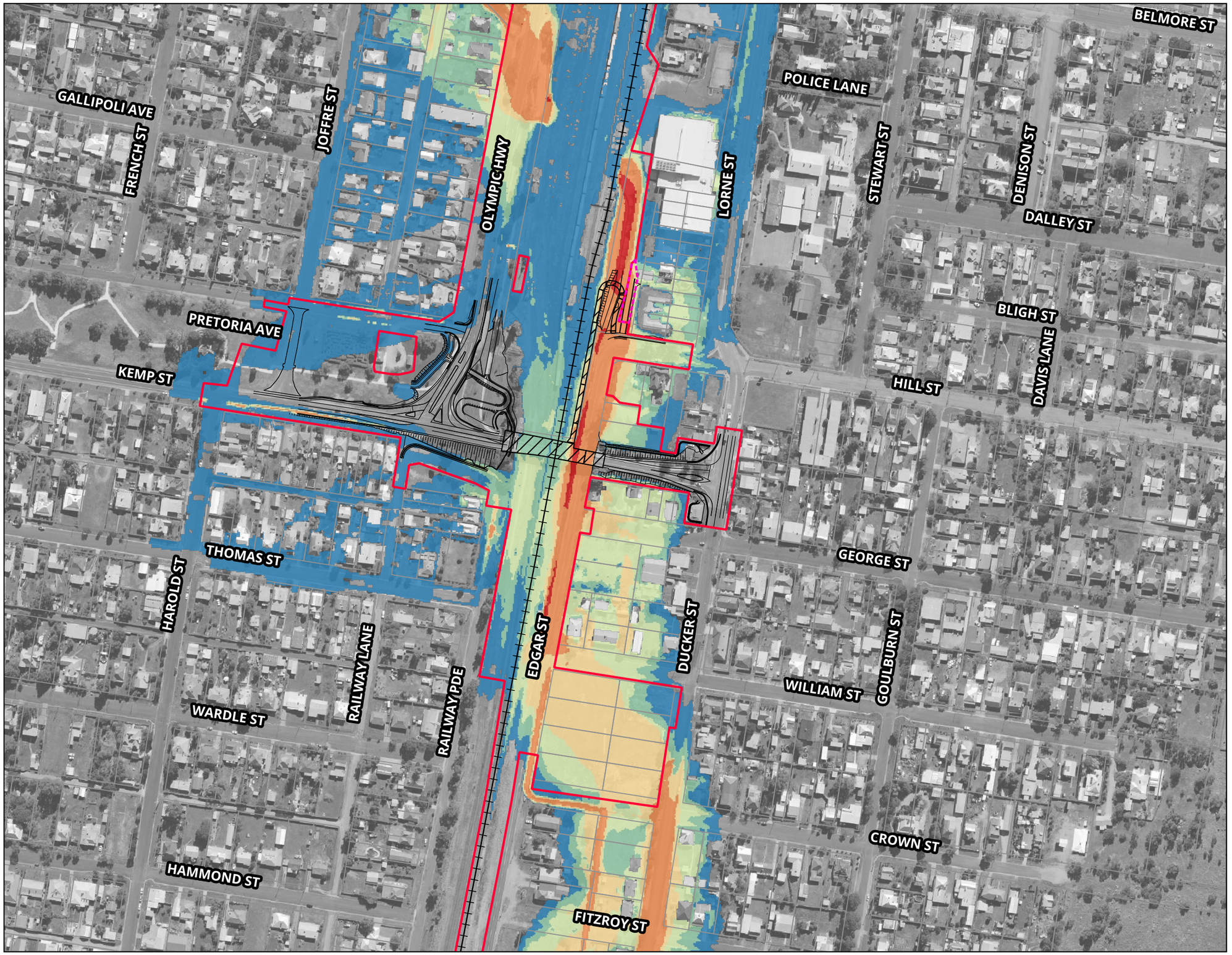
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA51: 2% AEP Peak Flood Hazard - Design Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6

Notes:

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Map by: TT

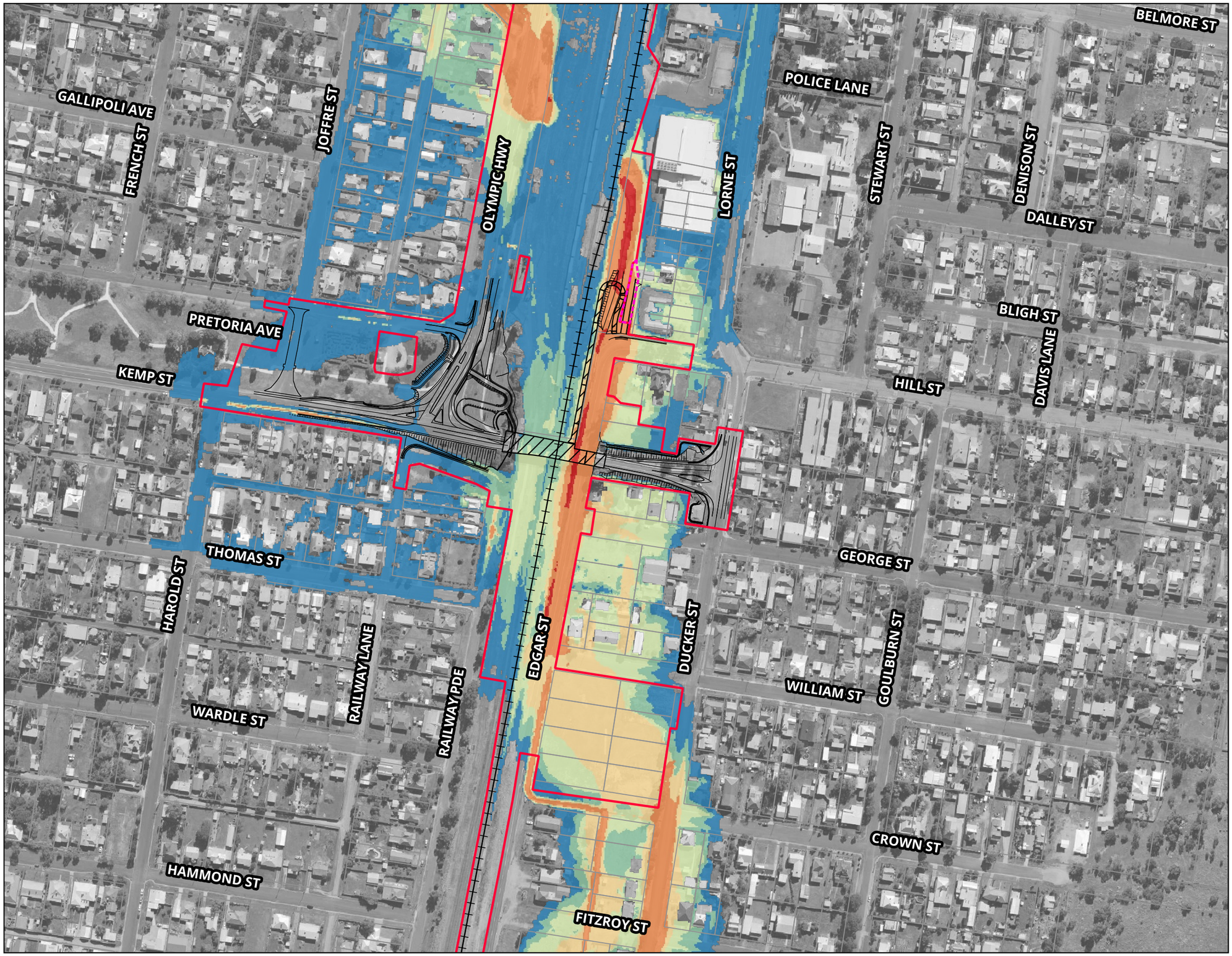
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA52: 1% AEP Peak Flood Hazard - Design Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

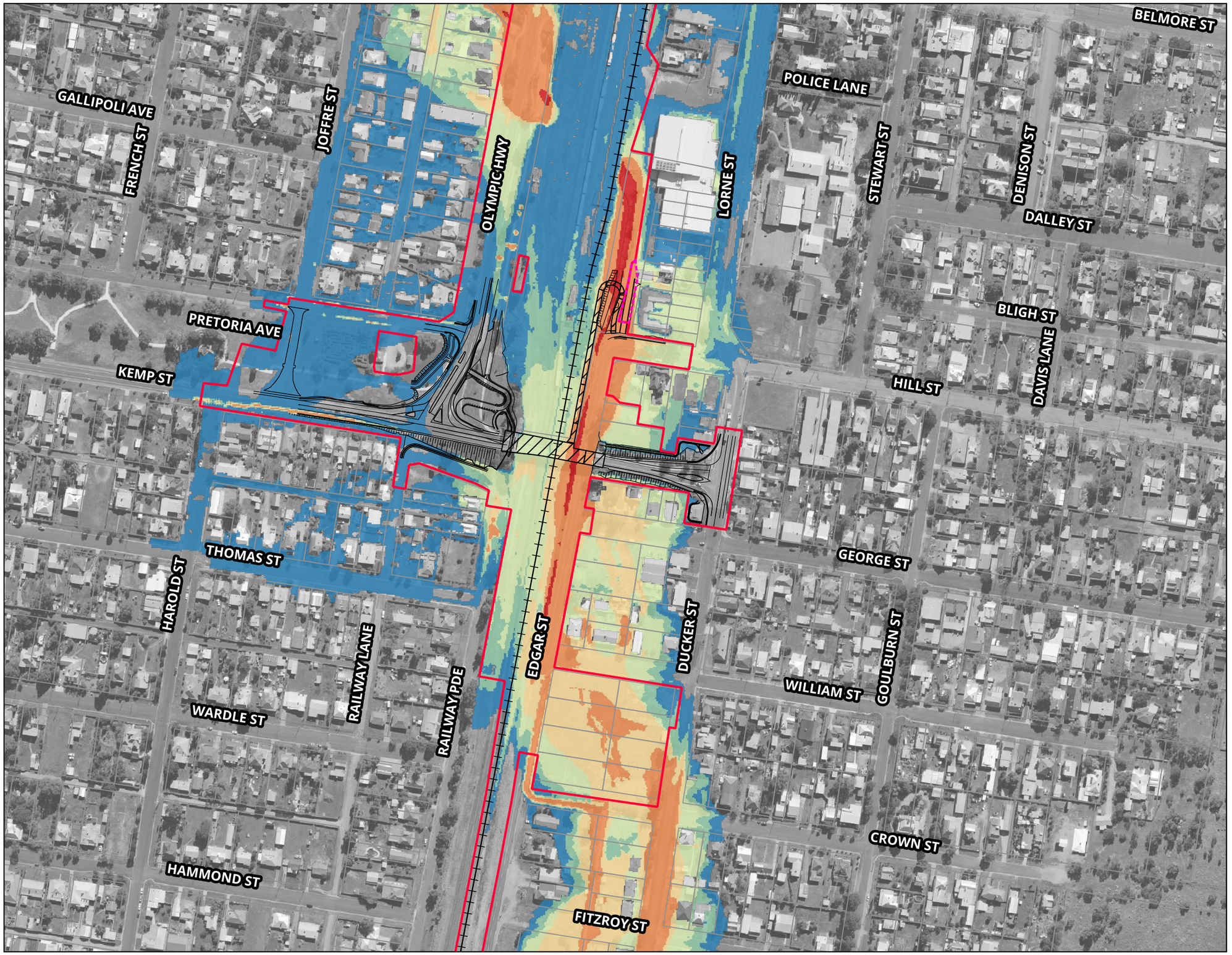
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA53: 1% AEP Peak Flood Hazard - Design Blockage Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

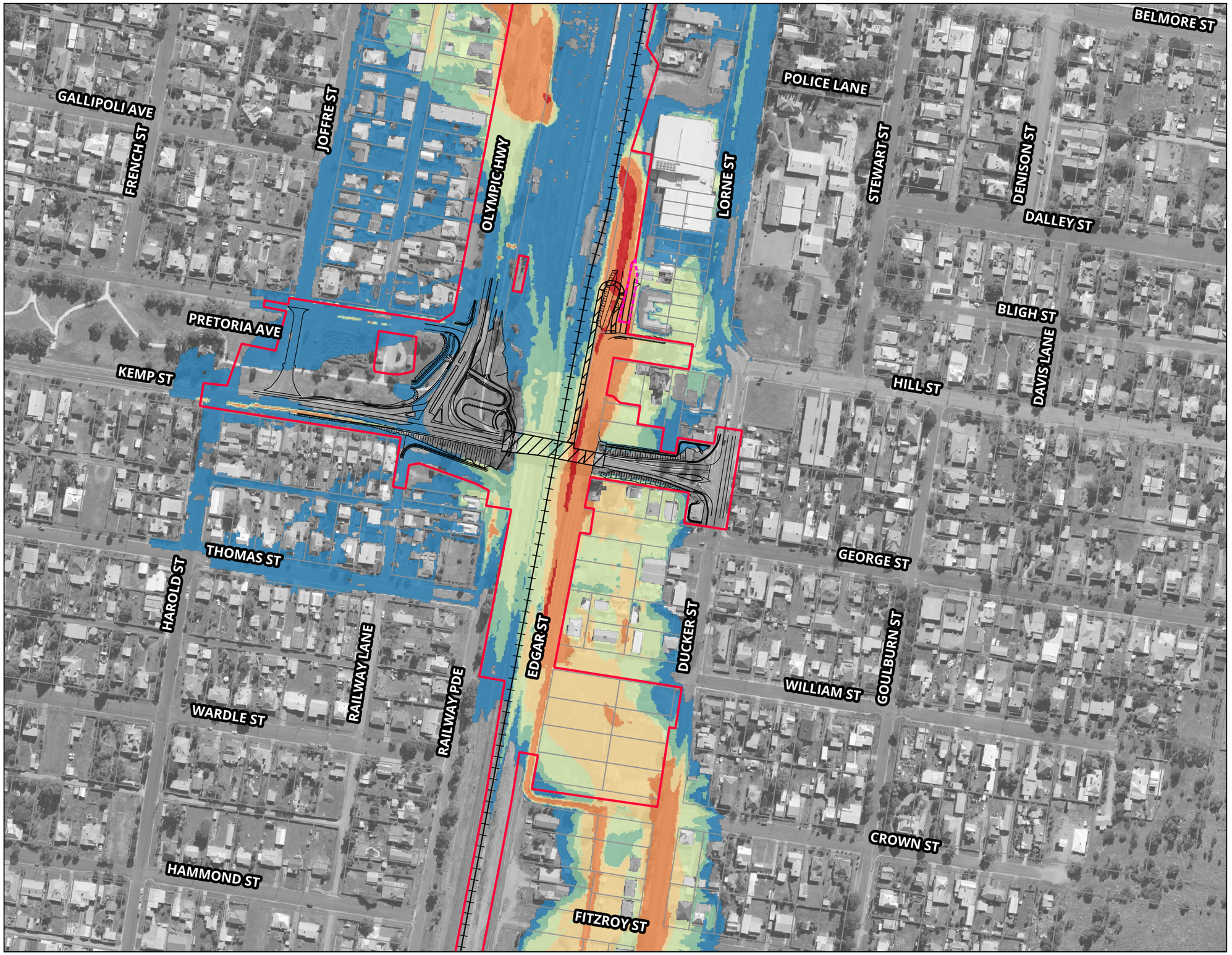
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA54: 1% AEP Climate Change Peak Flood Hazard - Design Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

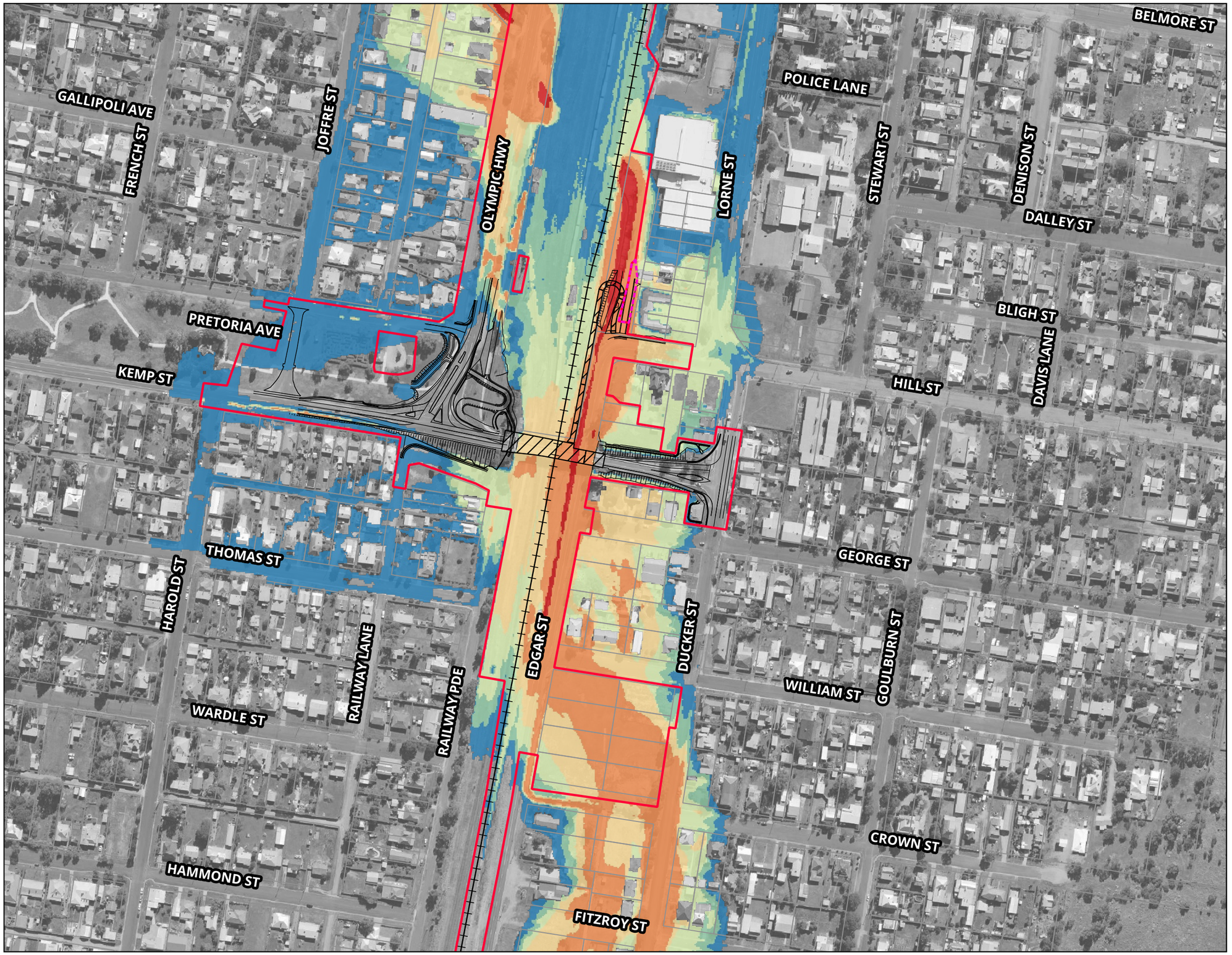
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA55: 0.5% AEP Peak Flood Hazard - Design Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6

Notes:

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Map by: TT

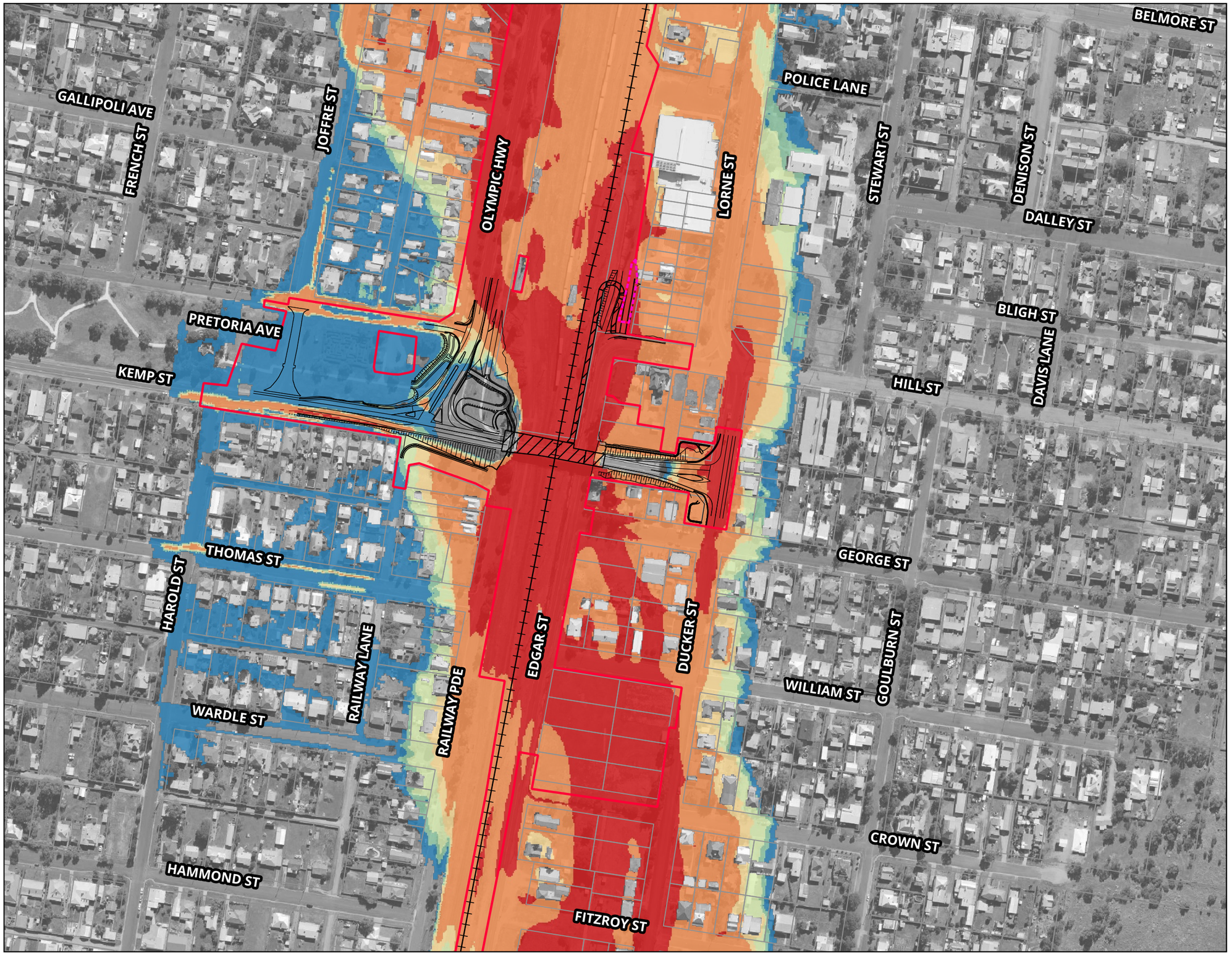
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA56: 0.05% AEP Peak Flood Hazard - Design Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Peak Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA57: PMF Peak Flood Hazard - Design Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Changes in Water Level (m)

- <= -0.2
- -0.2 - -0.1
- -0.1 - -0.01
- -0.01 - 0.01
- 0.01 - 0.02
- 0.02 - 0.05
- 0.05 - 0.1
- 0.1 - 0.2
- > 0.2
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA58: Changes in Peak Flood Levels for 20% AEP - Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Changes in Water Level (m)

- <= -0.2
- -0.2 - -0.1
- -0.1 - -0.01
- -0.01 - 0.01
- 0.01 - 0.02
- 0.02 - 0.05
- 0.05 - 0.1
- 0.1 - 0.2
- > 0.2
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA59: Changes in Peak Flood Levels for 10% AEP - Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Changes in Water Level (m)

- <= -0.2
- -0.2 - -0.1
- -0.1 - -0.01
- -0.01 - 0.01
- 0.01 - 0.02
- 0.02 - 0.05
- 0.05 - 0.1
- 0.1 - 0.2
- > 0.2
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA60: Changes in Peak Flood Levels for 5% AEP - Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Changes in Water Level (m)

- <= -0.2
- -0.2 - -0.1
- -0.1 - -0.01
- -0.01 - 0.01
- 0.01 - 0.02
- 0.02 - 0.05
- 0.05 - 0.1
- 0.1 - 0.2
- > 0.2
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA61: Changes in Peak Flood Levels for 2% AEP - Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Changes in Water Level (m)

- <= -0.2
- -0.2 - -0.1
- -0.1 - -0.01
- -0.01 - 0.01
- 0.01 - 0.02
- 0.02 - 0.05
- 0.05 - 0.1
- 0.1 - 0.2
- > 0.2
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA62: Changes in Peak Flood Levels for 1% AEP - Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Changes in Water Level (m)

- <= -0.2
- -0.2 - -0.1
- -0.1 - -0.01
- -0.01 - 0.01
- 0.01 - 0.02
- 0.02 - 0.05
- 0.05 - 0.1
- 0.1 - 0.2
- > 0.2
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

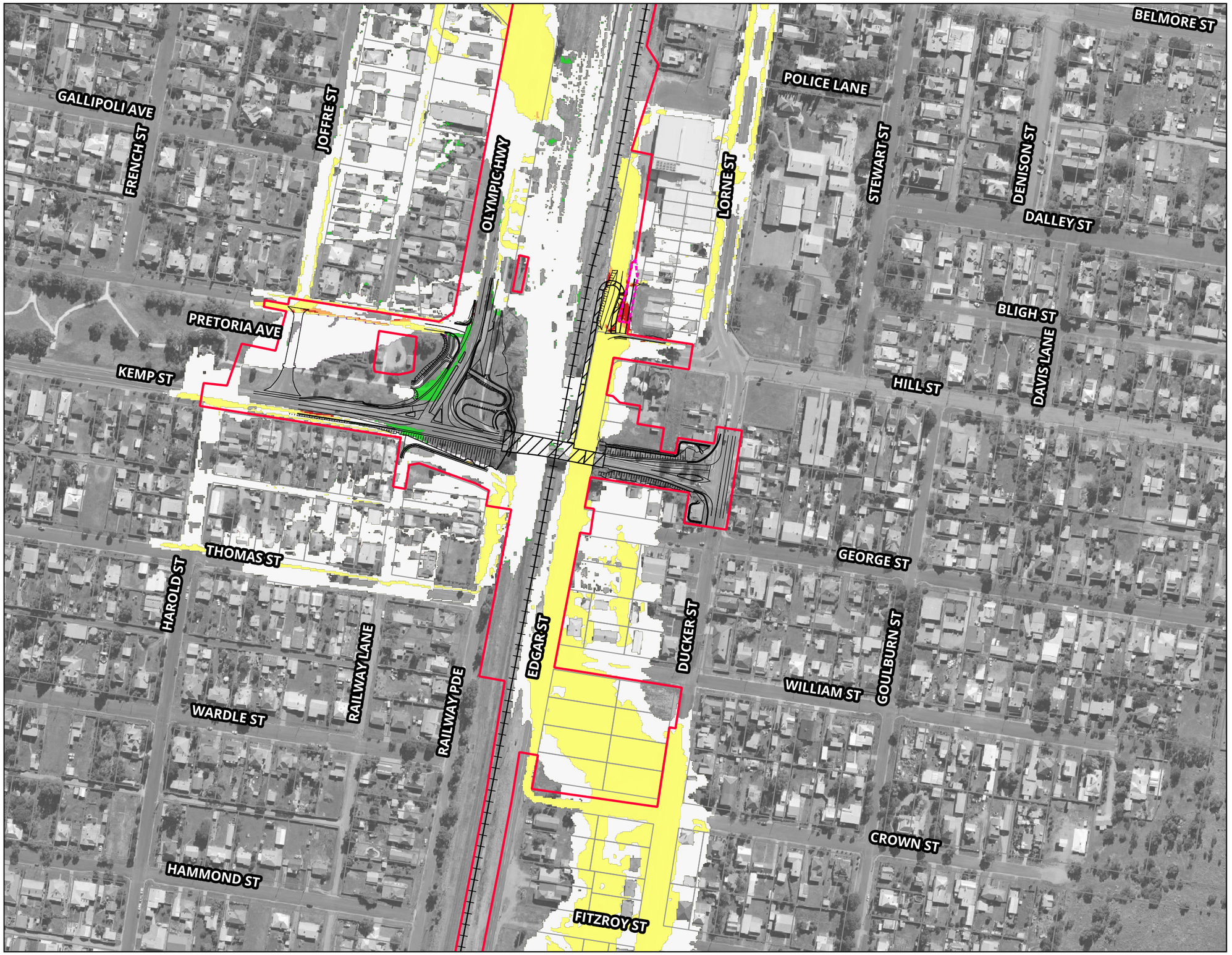
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA63: Changes in Peak Flood Levels for 1% AEP Climate Change - Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Proposed Peak Flood Velocity (m/s)
- <= 0.5

Change in Velocity (%)
- <= 10%
- 10% - 20%
- > 20%
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

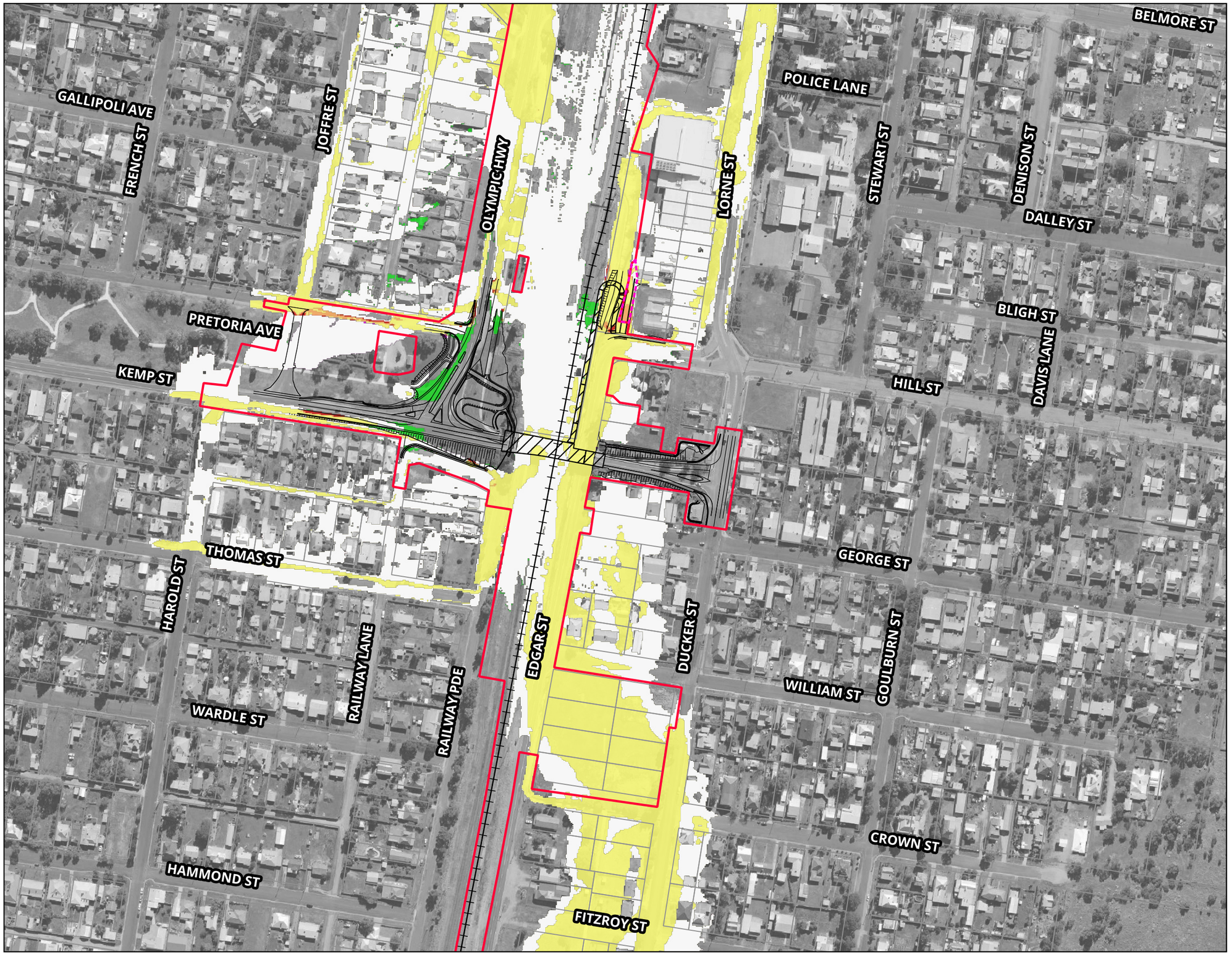
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA64: Changes in Peak Flood Velocity for 20% AEP - Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Proposed Peak Flood Velocity (m/s)
- <= 0.5

Change in Velocity (%)
- <= 10%
- 10% - 20%
- > 20%
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

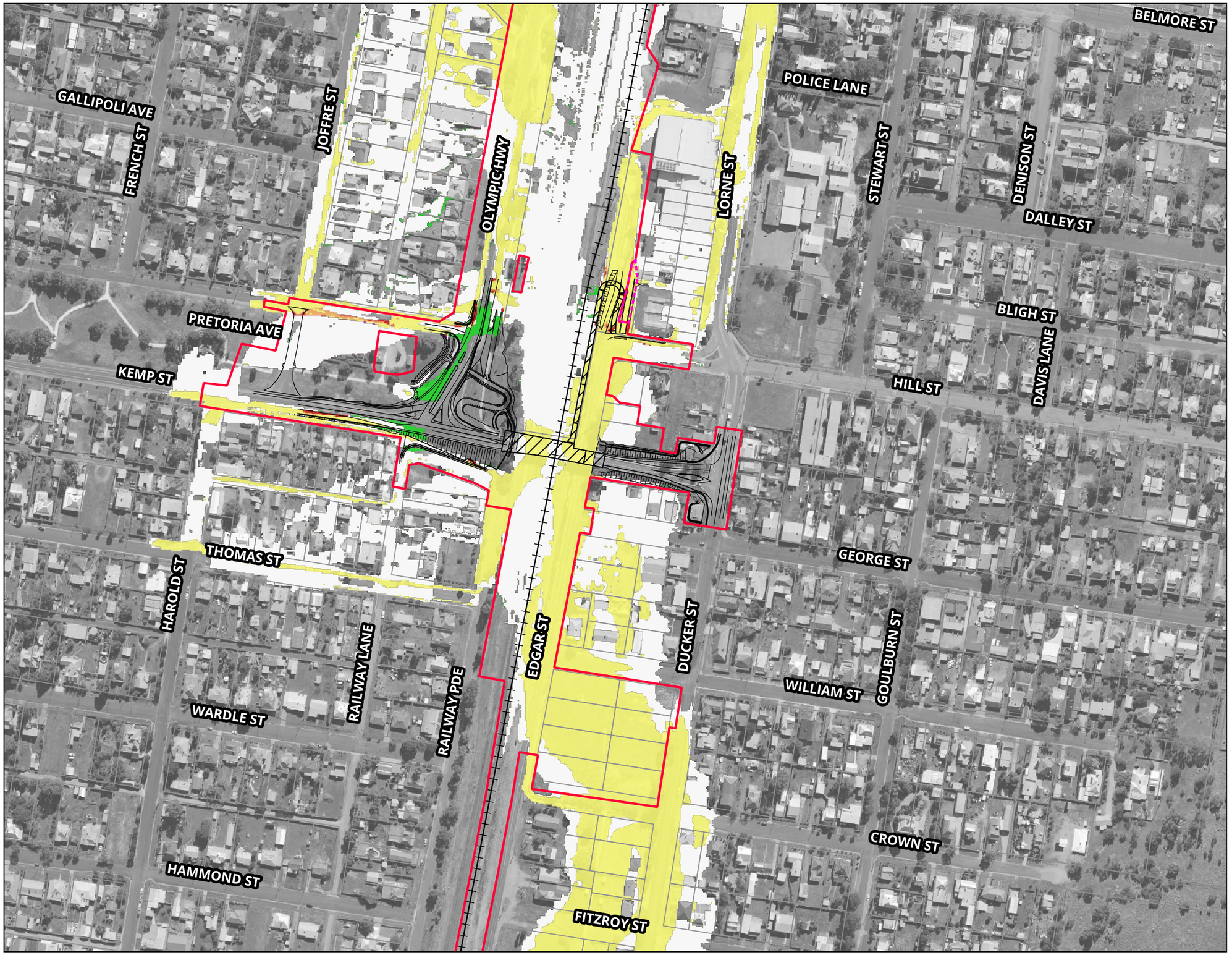
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA65: Changes in Peak Flood Velocity for 10% AEP - Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Proposed Peak Flood Velocity (m/s)
- <= 0.5

Change in Velocity (%)
- <= 10%
- 10% - 20%
- > 20%
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

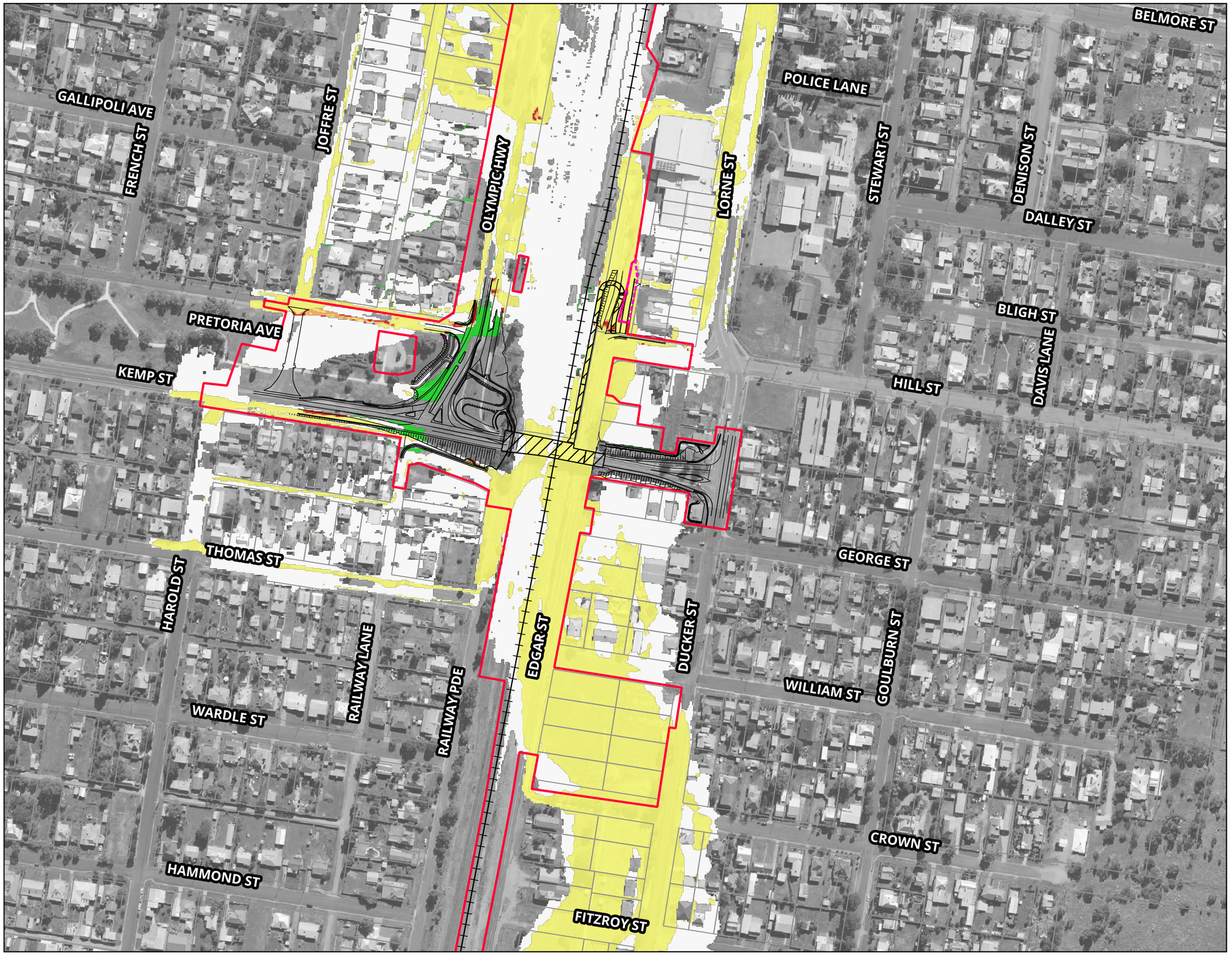
31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA66: Changes in Peak Flood Velocity for 5% AEP - Design Condition vs Existing Condition

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT



MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Proposed Peak Flood Velocity (m/s)
- <= 0.5

Change in Velocity (%)
- <= 10%
- 10% - 20%
- > 20%
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

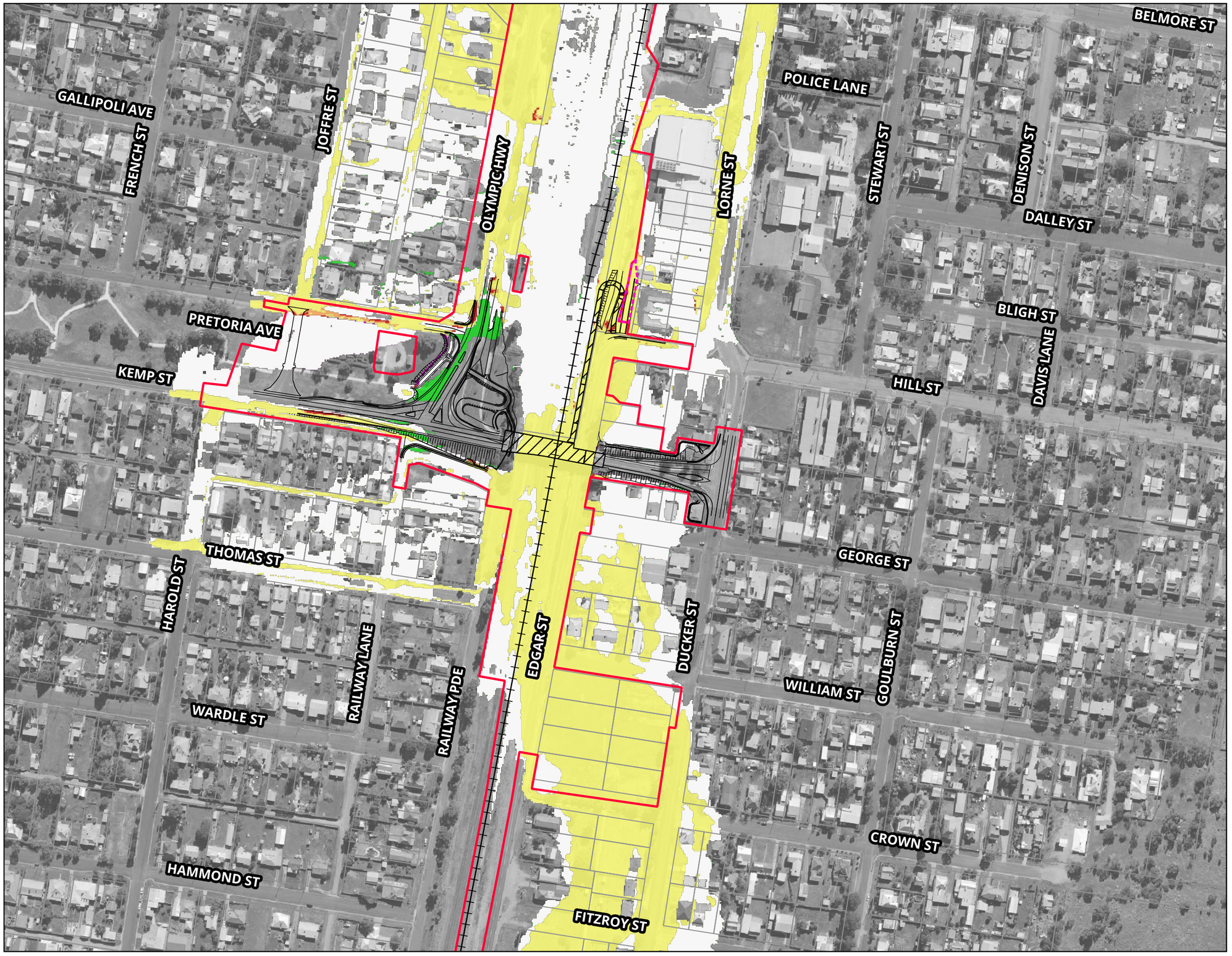
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA67: Changes in Peak Flood Velocity for 2% AEP - Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Proposed Peak Flood Velocity (m/s)
- <= 0.5

Change in Velocity (%)
- <= 10%
- 10% - 20%
- > 20%
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

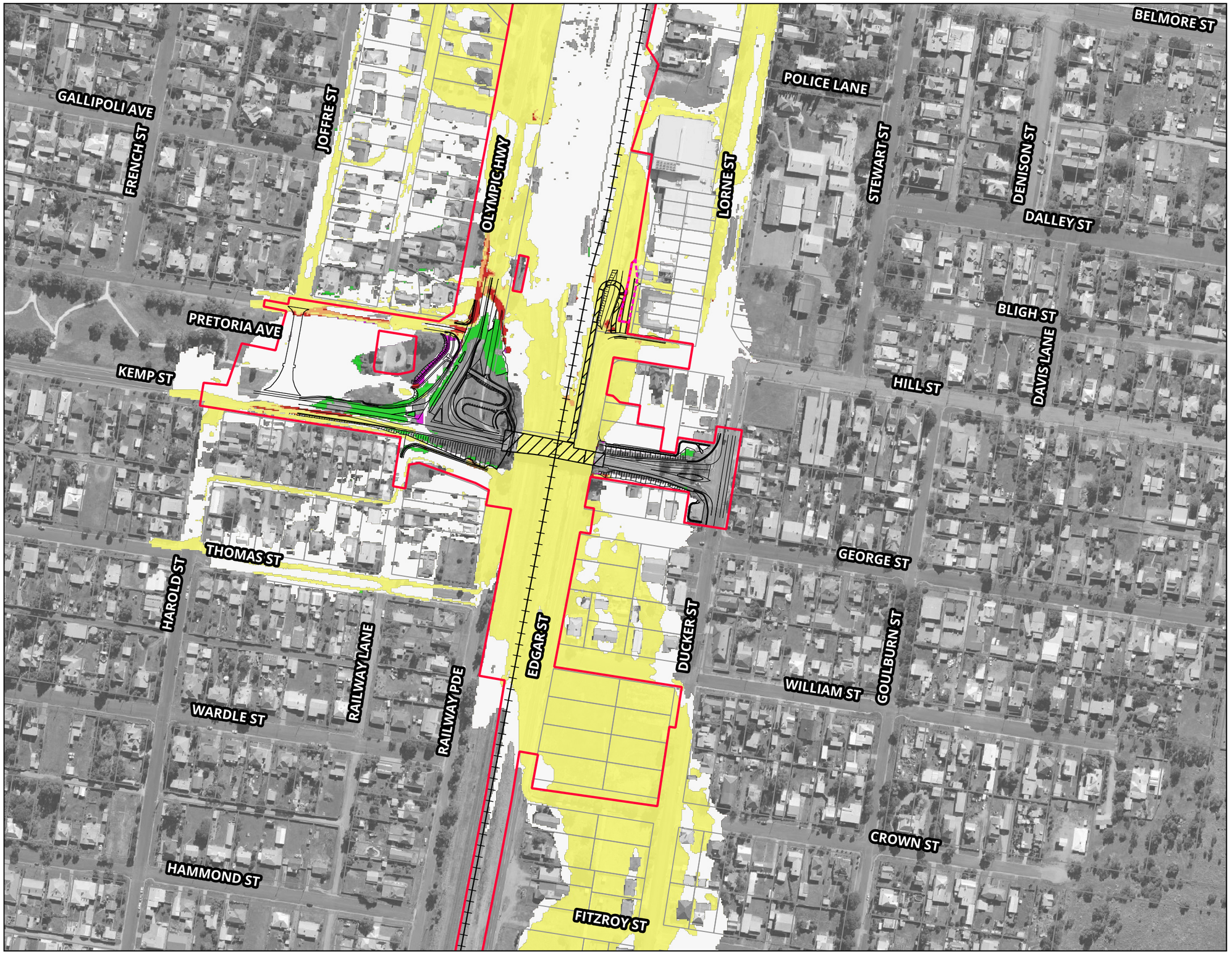
0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA68: Changes in Peak Flood Velocity for 1% AEP - Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Proposed Peak Flood Velocity (m/s)
- <= 0.5

Change in Velocity (%)
- <= 10%
- 10% - 20%
- > 20%
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA69: Changes in Peak Flood Velocity for 1% AEP Climate Change - Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Change in Hazard

- Reduced 5 Classes
- Reduced 4 Classes
- Reduced 3 Classes
- Reduced 2 Classes
- Reduced 1 Class
- No Change
- Increased 1 Class
- Increased 2 Classes
- Increased 3 Classes
- Increased 4 Classes
- Increased 5 Classes
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA70: Changes in Peak Flood Hazard for 20% AEP - Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Change in Hazard
- Reduced 5 Classes
- Reduced 4 Classes
- Reduced 3 Classes
- Reduced 2 Classes
- Reduced 1 Class
- No Change
- Increased 1 Class
- Increased 2 Classes
- Increased 3 Classes
- Increased 4 Classes
- Increased 5 Classes
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA71: Changes in Peak Flood Hazard for 10% AEP - Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Change in Hazard
- Reduced 5 Classes
- Reduced 4 Classes
- Reduced 3 Classes
- Reduced 2 Classes
- Reduced 1 Class
- No Change
- Increased 1 Class
- Increased 2 Classes
- Increased 3 Classes
- Increased 4 Classes
- Increased 5 Classes
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA72: Changes in Peak Flood Hazard for 5% AEP - Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Change in Hazard
- Reduced 5 Classes
- Reduced 4 Classes
- Reduced 3 Classes
- Reduced 2 Classes
- Reduced 1 Class
- No Change
- Increased 1 Class
- Increased 2 Classes
- Increased 3 Classes
- Increased 4 Classes
- Increased 5 Classes
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA73: Changes in Peak Flood Hazard for 2% AEP - Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary

- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Change in Hazard

- Reduced 5 Classes
- Reduced 4 Classes
- Reduced 3 Classes
- Reduced 2 Classes
- Reduced 1 Class
- No Change
- Increased 1 Class
- Increased 2 Classes
- Increased 3 Classes
- Increased 4 Classes
- Increased 5 Classes
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA74: Changes in Peak Flood Hazard for 1% AEP - Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

Project Boundary
- Construction Boundary
- Project Boundary
- Cadastre
- Proposed Civil Design
- Railway Track
- Bridge Design extent

Change in Hazard
- Reduced 5 Classes
- Reduced 4 Classes
- Reduced 3 Classes
- Reduced 2 Classes
- Reduced 1 Class
- No Change
- Increased 1 Class
- Increased 2 Classes
- Increased 3 Classes
- Increased 4 Classes
- Increased 5 Classes
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

R:\Projects\524067_A2P\3_Hydraulics\KempSt\Mapping\260825_Post_IFC_V2\KEMP_Mapping_PostIFCV2.qgz

Map by: TT

0 100 200 m

A3
Scale: 1:3,000

31/8/2026 GDA2020 / MGA zone 55

Kemp Street Bridge and Footbridge - IFC WAD

FigureA75: Changes in Peak Flood Hazard for 1% AEP Climate Change - Design Condition vs Existing Condition



APPENDIX B

Hydrologic Data (ARR Data Hub)

BOM IFD

Duration	Duration in min	63.20%	50%	20%	10%	5%	2%	1%
1 min	1	1.6	1.82	2.52	3.03	3.53	4.23	4.79
2 min	2	2.72	3.1	4.3	5.14	5.98	7.13	8.05
3 min	3	3.72	4.23	5.87	7.02	8.17	9.76	11
4 min	4	4.58	5.21	7.23	8.65	10.1	12.1	13.6
5 min	5	5.34	6.07	8.42	10.1	11.8	14.1	15.9
10 min	10	8.09	9.2	12.8	15.3	17.9	21.5	24.3
15 min	15	9.91	11.3	15.7	18.8	22	26.3	29.8
20 min	20	11.3	12.8	17.8	21.4	25	29.9	33.8
25 min	25	12.3	14	19.5	23.4	27.4	32.8	37
30 min	30	13.2	15.1	21	25.1	29.4	35.1	39.7
45 min	45	15.3	17.4	24.2	29	33.8	40.5	45.7
1 hour	60	16.8	19.1	26.6	31.9	37.2	44.4	50.2
1.5 hour	90	19.1	21.7	30.2	36.1	42.1	50.3	56.9
2 hour	120	20.9	23.7	32.9	39.3	45.8	54.9	62
3 hour	180	23.7	26.8	37	44.3	51.7	61.9	70
4.5 hour	270	26.9	30.3	41.7	49.9	58.2	69.8	79.1
6 hour	360	29.4	33.1	45.4	54.2	63.3	76	86.1
9 hour	540	33.3	37.4	51.1	61.1	71.3	85.5	97
12 hour	720	36.4	40.8	55.5	66.3	77.5	92.9	105
18 hour	1080	41	45.9	62.2	74.2	86.7	104	117
24 hour	1440	44.4	49.7	67.2	80.1	93.4	111	126
30 hour	1800	47.2	52.7	71.1	84.7	98.7	117	132
36 hour	2160	49.4	55.1	74.3	88.4	103	122	137
48 hour	2880	52.8	59	79.3	94.1	109	129	145
72 hour	4320	57.4	64.1	86.1	102	118	138	154
96 hour	5760	60.5	67.6	90.5	107	123	144	160
120 hour	7200	62.8	70.2	93.9	110	127	149	165
144 hour	8640	64.7	72.3	96.5	113	130	152	169
168 hour	10080	66.4	74.1	98.8	116	133	156	173

ARR Data Hub

Results - ARR Data Hub
[STARTTXT]

Input Data Information
[INPUTDATA]
Latitude,-34.890813
Longitude,147.598348
[END_INPUTDATA]

River Region
[RIVREG]
Division,Murray-Darling Basin
River Number,12
River Name,Murrumbidgee River
[RIVREG_META]
Time Accessed,31 July 2024 03:17PM
Version,2016_v1
[END_RIVREG]

ARF Parameters
[LONGARF]
Zone,Southern Temperate
a,0.158
b,0.276
c,0.372
d,0.315
e,0.000141
f,0.41
g,0.15
h,0.01
i,-0.0027
[LONGARF_META]
Time Accessed,31 July 2024 03:17PM
Version,2016_v1
[END_LONGARF]

Storm Losses
[LOSSES]
ID,16277.0
Storm Initial Losses (mm),26.0
Storm Continuing Losses (mm/h),4.6
[LOSSES_META]
Time Accessed,31 July 2024 03:17PM
Version,2016_v1
[END_LOSSES]

Temporal Patterns
[TP]
code,MB
Label,Murray Basin
[TP_META]
Time Accessed,31 July 2024 03:17PM
Version,2016_v2
[END_TP]

Areal Temporal Patterns
[ATP]
code,MB
arealabel,Murray Basin
[ATP_META]
Time Accessed,31 July 2024 03:17PM
Version,2016_v2
[END_ATP]

Median Preburst Depths and Ratios
[PREBURST]
min (h)\AEP(%),50,20,10,5,2,1

60 (1.0),2.6 (0.134),2.0 (0.074),1.6 (0.049),1.2 (0.032),1.0 (0.022),0.8 (0.017)
90 (1.5),1.9 (0.087),1.4 (0.046),1.1 (0.029),0.7 (0.017),0.6 (0.011),0.4 (0.008)
120 (2.0),4.2 (0.176),3.3 (0.101),2.8 (0.070),2.2 (0.049),1.0 (0.018),0.1 (0.001)
180 (3.0),3.5 (0.130),3.2 (0.087),3.1 (0.069),2.9 (0.056),1.4 (0.023),0.3 (0.004)
360 (6.0),1.9 (0.059),1.1 (0.024),0.5 (0.010),0.0 (0.000),0.7 (0.009),1.3 (0.015)
720 (12.0),0.2 (0.004),1.1 (0.020),1.7 (0.026),2.3 (0.030),6.2 (0.066),9.0 (0.086)
1080 (18.0),0.0 (0.000),0.4 (0.007),0.7 (0.009),0.9 (0.011),4.0 (0.038),6.2 (0.053)
1440 (24.0),0.0 (0.000),0.2 (0.003),0.3 (0.004),0.4 (0.004),0.5 (0.005),0.7 (0.005)
2160 (36.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
2880 (48.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
4320 (72.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
[PREBURST_META]
Time Accessed,31 July 2024 03:17PM
Version,2018_v1
Note,Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.
[END_PREBURST]From preburst class

10% Preburst Depths
[PREBURST10]
min (h)\AEP(%),50,20,10,5,2,1
60 (1.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
90 (1.5),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
120 (2.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
180 (3.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
360 (6.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
720 (12.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
1080 (18.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
1440 (24.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
2160 (36.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
2880 (48.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
4320 (72.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
[PREBURST10_META]
Time Accessed,31 July 2024 03:17PM
Version,2018_v1
Note,Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.
[END_PREBURST10]From preburst class

25% Preburst Depths
[PREBURST25]
min (h)\AEP(%),50,20,10,5,2,1
60 (1.0),0.1 (0.005),0.1 (0.002),0.0 (0.001),0.0 (0.000),0.0 (0.000),0.0 (0.000)
90 (1.5),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
120 (2.0),0.1 (0.002),0.0 (0.001),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
180 (3.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
360 (6.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
720 (12.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
1080 (18.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
1440 (24.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
2160 (36.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
2880 (48.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
4320 (72.0),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000),0.0 (0.000)
[PREBURST25_META]
Time Accessed,31 July 2024 03:17PM
Version,2018_v1
Note,Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

[END_PREBURST25]From preburst class

75% Preburst Depths
[PREBURST75]
min (h)\AEP(%),50,20,10,5,2,1
60 (1.0),13.2 (0.691),12.5 (0.470),12.0 (0.378),11.6 (0.311),14.8 (0.334),17.3 (0.344)
90 (1.5),15.1 (0.694),12.4 (0.411),10.6 (0.294),8.9 (0.212),9.1 (0.181),9.3 (0.163)
120 (2.0),15.9 (0.668),16.3 (0.495),16.5 (0.421),16.8 (0.367),11.1 (0.203),6.9 (0.111)
180 (3.0),12.7 (0.472),15.2 (0.410),16.9 (0.380),18.5 (0.357),18.6 (0.300),18.7 (0.267)
360 (6.0),11.9 (0.358),11.3 (0.249),10.9 (0.201),10.6 (0.167),17.3 (0.228),22.3 (0.259)
720 (12.0),4.1 (0.101),8.2 (0.148),10.9 (0.165),13.5 (0.175),22.0 (0.237),28.4 (0.270)
1080 (18.0),3.5 (0.076),6.6 (0.106),8.7 (0.117),10.7 (0.123),15.5 (0.150),19.2 (0.163)
1440 (24.0),0.2 (0.004),3.3 (0.049),5.3 (0.066),7.3 (0.078),8.9 (0.080),10.1 (0.081)
2160 (36.0),0.0 (0.000),1.2 (0.016),2.0 (0.022),2.7 (0.026),3.7 (0.031),4.5 (0.033)
2880 (48.0),0.0 (0.000),0.3 (0.004),0.5 (0.006),0.7 (0.007),1.6 (0.013),2.3 (0.016)
4320 (72.0),0.0 (0.000),0.0 (0.000),0.1 (0.001),0.1 (0.001),0.2 (0.001),0.3 (0.002)
[PREBURST75_META]
Time Accessed,31 July 2024 03:17PM
Version,2018_v1
Note,Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.
[END_PREBURST75]From preburst class

90% Preburst Depths
[PREBURST90]
min (h)\AEP(%),50,20,10,5,2,1
60 (1.0),26.6 (1.391),22.8 (0.858),20.3 (0.638),17.9 (0.482),26.1 (0.588),32.3 (0.644)
90 (1.5),33.8 (1.554),29.7 (0.984),27.0 (0.747),24.4 (0.579),26.6 (0.529),28.3 (0.497)
120 (2.0),34.8 (1.465),33.1 (1.008),32.0 (0.815),31.0 (0.676),31.7 (0.578),32.2 (0.520)
180 (3.0),24.9 (0.929),29.0 (0.782),31.7 (0.715),34.2 (0.663),36.2 (0.585),37.6 (0.537)
360 (6.0),23.5 (0.710),27.1 (0.598),29.5 (0.545),31.9 (0.503),46.8 (0.616),58.0 (0.673)
720 (12.0),17.3 (0.423),25.3 (0.456),30.7 (0.463),35.8 (0.462),47.1 (0.507),55.6 (0.528)
1080 (18.0),16.1 (0.352),20.4 (0.327),23.2 (0.312),25.9 (0.299),42.8 (0.413),55.5 (0.473)
1440 (24.0),11.0 (0.222),14.8 (0.221),17.4 (0.217),19.8 (0.212),20.5 (0.184),21.0 (0.167)
2160 (36.0),3.5 (0.063),8.8 (0.118),12.3 (0.139),15.7 (0.152),16.6 (0.136),17.3 (0.126)
2880 (48.0),0.7 (0.011),6.8 (0.085),10.8 (0.115),14.7 (0.134),19.5 (0.151),23.1 (0.160)
4320 (72.0),0.2 (0.004),4.3 (0.050),7.0 (0.069),9.6 (0.081),13.3 (0.097),16.2 (0.105)
[PREBURST90_META]
Time Accessed,31 July 2024 03:17PM
Version,2018_v1
Note,Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.
[END_PREBURST90]From preburst class

Interim Climate Change Factors
[CCF]
,RCP 4.5,RCP6,RCP 8.5
2030,0.816 (4.1%),0.726 (3.6%),0.934 (4.7%)
2040,1.046 (5.2%),1.015 (5.1%),1.305 (6.6%)
2050,1.260 (6.3%),1.277 (6.4%),1.737 (8.8%)
2060,1.450 (7.3%),1.520 (7.7%),2.214 (11.4%)
2070,1.609 (8.2%),1.753 (8.9%),2.722 (14.2%)
2080,1.728 (8.8%),1.985 (10.2%),3.246 (17.2%)
2090,1.798 (9.2%),2.226 (11.5%),3.772 (20.2%)

[CCF_META]
Time Accessed,31 July 2024 03:17PM
Version,2019_v1

Note,ARR recommends the use of RCP4.5 and RCP 8.5 values. These have been updated to the values that can be found on the climate change in Australia website.
[END_CCF]

Probability Neutral Burst Initial Loss
[BURSTIL]
min (h)\AEP(%),50.0,20.0,10.0,5.0,2.0,1.0
60 (1.0),19.2,11.2,10.8,11.7,11.0,8.6
90 (1.5),18.6,11.2,11.3,12.4,12.2,10.8
120 (2.0),17.6,11.1,10.5,11.3,11.5,10.6
180 (3.0),18.5,12.7,11.2,12.1,11.0,8.0
360 (6.0),19.3,14.4,13.9,14.9,13.2,8.2
720 (12.0),22.0,16.3,15.2,15.9,12.6,6.9
1080 (18.0),22.7,17.9,17.2,17.6,14.5,9.9
1440 (24.0),24.2,19.5,19.8,20.8,19.1,12.9
2160 (36.0),25.9,21.6,21.8,23.2,21.0,15.9
2880 (48.0),27.0,22.3,22.5,23.9,21.7,15.0
4320 (72.0),27.5,22.8,24.2,24.9,22.7,18.2
[BURSTIL_META]
Time Accessed,31 July 2024 03:17PM
Version,2018_v1
Note,As this point is in NSW the advice provided on losses and pre-burst on the NSW Specific Tab of the ARR Data Hub is to be considered. In NSW losses are derived considering a hierarchy of approaches depending on the available loss information. Probability neutral burst initial loss values for NSW are to be used in place of the standard initial loss and pre-burst as per the losses hierarchy.
[END_BURSTIL]
Transformational Pre-burst Rainfall
[PREBURST_TRANS]
min (h)\AEP(%),50.0,20.0,10.0,5.0,2.0,1.0
60 (1.0),6.8,14.8,15.2,14.3,15.0,17.4
90 (1.5),7.4,14.8,14.7,13.6,13.8,15.2
120 (2.0),8.4,14.9,15.5,14.7,14.5,15.4
180 (3.0),7.5,13.3,14.8,13.9,15.0,18.0
360 (6.0),6.7,11.6,12.1,11.1,12.8,17.8
720 (12.0),4.0,9.7,10.8,10.1,13.4,19.1
1080 (18.0),3.3,8.1,8.8,8.4,11.5,16.1
1440 (24.0),1.8,6.5,6.2,5.2,6.9,13.1
2160 (36.0),0.1,4.4,4.2,2.8,5.0,10.1
2880 (48.0),0.0,3.7,3.5,2.1,4.3,11.0
4320 (72.0),0.0,3.2,1.8,1.1,3.3,7.8
[PREBURST_TRANS_META]
The tranformational pre-burst is intended for software suppliers in the NSW area and is simply the Initial Loss - Burst Initial Loss. It is not appropriate to use these values if considering a calibrated initial loss.
[END_PREBURST_TRANS]

[ENDTXT]



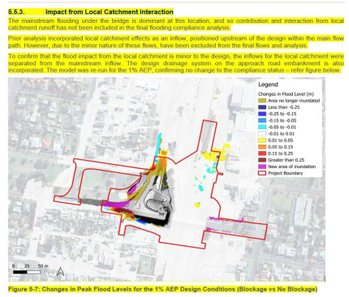
APPENDIX C

ARTC Review

Document Control Information			
	Contractor DC to update for re-submission	**Submitted Document No. or Transmittal No.:**	Martinus-PTRAN-003222
Project:	2100 - A2I	**Date Submission Received:**	9/07/2026
Comment Sheet Number_Revision:	5-0052-210-IHY-J2-CS-0001_L	**Comment Sheet Title:**	***External Comment Sheet - A2I | Flood Design Report - Kemp Street Footbridge and Bridge Replacement***
Revision Date:	13/08/2026	**Documents related in Aconex** (by IR DC)	*Yes*

Review Comments (Reviewer)									Responses (Document Owner)					Close-Out			
#	PSR ID No. **or** Compliance Reference Document *(State the fully qualified reference the deliverable is non-compliant with)*	Document / drawing number - Revision Number	Section # / page #	Engineering Assurance Stage	Comment *(for example must be specific on non compliance. Reference mark-ups, if required)*	Comment Type	Full Name	Date	Full Name	Company	Date	Response *(must be specific on how the comment has been addressed. Agreed approach for re-submission)*	Documentation Section # / Figure #	Full Name	Date	Comment Status	Close-Out Comment
Example	*IR-SR-A2I-517* **or** *01-3500-PD-P00-DE-0008-A*	*0-0000-900-PEN-00-TE-0020_A*		*CRR*	*Is there sufficient space for a 10m maintenance vehicle to turn around at the end of the RMAR?*	*Non-Compliant*	*Joe Bloggs*	#######	*Fred Bloggs*	*Designer*	#######	*The area has been increased - now possible to turn 12.5m vehicle. The drawings are updated.*	*01-3500-PD-P00-DE-0008-A* *01-3500-PD-P00-DE-0015-C*	*Jane Doe*	*27/09/2023*	CLOSED	
1	Clarification	5-0052-210-IHY-J2-RP-0001_A.pdf	Page 20	SDR	Please update/correct all table and figure numbering	Opportunity	Hartley Bulcock	#######	Zoe Cruice	Martinus	#######	Apologies. When the updating for pdf-bookmarking occurs, for some reason the hyperlink updating resets and we lose the correct numbering. We will get this corrected throughout for the next submission.		Hartley Bulcock	29/08/2025	CLOSED	
2	No valid or visible ARTC Design Competencies	5-0052-210-IHY-J2-RP-0001_B.pdf	Page 2, 5-0052-210-IHY-J2-RP-0001_B, Document Control	PDR	No valid or visible ARTC Design Competencies	Non-Compliant	Mick Parnell	#######	Andre / Michal / Zoe Cruice	Martinus	#######	Martinus has outstanding Martinus-RFI-000868 seeking IRPL to advise the appropriate and relevent RIW discipline for flooding designers		Mick Parnell	29/08/2025	CLOSED	
3	CoA E40	5-0052-210-IHY-J2-RP-0001_B.pdf	Page 20, 5-0052-210-IHY-J2-RP-0001_B, Section 4	PDR	What about blockage assessment? Please include it here if done, otherwise justify why not.	Non-Compliant	Ayub Ali	#######	Jasmine	DJV	#######	Blockage assessment has been undertaken and reported in Section 6.2. A sentence about blockage assessment will be added to Section 4 in the next design stage report.	Section 4 of 5-0052-210-IHY-J2-RP-0001	Ayub Ali	1/09/2025	CLOSED	This item is closed based on the updated Flood Design Report.
4	PSR Annexure B: Technical Requirements (identifiers 5.4.2 and 4.5.3)	5-0052-210-IHY-J2-RP-0001_B.pdf	Page 34, 5-0052-210-IHY-J2-RP-0001_B, Section 5.3	PDR	It is understood that the flood immunity of the rail has not been worsened in developed conditions compared to existing conditions. However, it has not been identified what is the flood immunity at these locations (i.e., in which largest event flood water does not overtop the rail and the top of formation). We understand that the smallest modelled flood event (5% AEP) shows overtopping at this section of the rail and further smaller design flood events modelling will be necessary to identify which flood events do not overtop the rail and the top of formation. Based on the above facts, inclusion of the top of formation level, rail level and simulated flood levels into the report at these vulnerable locations will provide valuable information in understanding the flooding risks, service reliability and possible mitigation measures.	Non-Compliant	Ayub Ali	#######	Yucen Lu	DJV	#######	The table containing top of the formation, top of the rail and the flood level will be provided in Section 5.3 in the next design stage report.	Section 5.3 of 5-0052-210-IHY-J2-RP-0001	Ayub Ali	1/09/2025	CLOSED	This item is closed based on the updated Flood Design Report.
5	CSSI CoA E42	5-0052-210-IHY-J2-RP-0001_B.pdf	Page 39, 5-0052-210-IHY-J2-RP-0001_B, Section 7	PDR	What non-structural measures are recommended in case the above structural measures do not achieve the required outcome?	Non-Compliant	Ayub Ali	#######	Yucen Lu / Zoe Crucie	DJV	#######	There are two potential measures that can be undertaken. Firstly, the track design in Junee Yard will be reviewed as the flood impact is the accumulative flood impact. It could be reduced if the Junee Yard design is adjusted, and then the desirable outcome could be achieved. A lowered-lift Junee Yard track alignment has been incorporated to reduce the contributed component to the cummulative impact. Secondly, the floor survey of the impacted properties could be undertaken and assess whether the habitable floor will be impacted. If not, the criteria of 10mm flood impact on the habitable floor will not be applied.		Ayub Ali	1/09/2025	CLOSED	This item is closed based on the updated Flood Design Report.
6	Clarification	5-0052-210-IHY-J2-RP-0001_C.pdf	Page 24, 5-0052-210-IHY-J2-RP-0001_C, Table 4-5	DDR	It has been stated in Section 4 that Rainfall-on-Grid for local catchments has been applied in TUFLOW model. How the 2D Source over Area (SA) layer for local catchment inflows are applied to avoid any double counting?	Opportunity	Ayub Ali	#######	Scott Mortimer / Zoe	DJV	#######	A rainfall-on-grid simulation was undertaken for the project location to compare with the RORB inflows and determine the dominant cause of flooding in the area. From this, it was determined that the mainstream flow (via RORB) was the dominant flooding control. For the flood assessment, the rainfall on the grid was removed, and the inflows were applied as per Table 4-5. Using 2d SA and 2d BC for the total inflows at the model boundary and local inflows for catchments within the model extent. Wording to this effect has been added in Section 4 introduction - refer snip below **4. MODELLING METHODOLOGY** The overall approaches for flood modelling are listed below: • A 'RORB' runoff routing hydrologic model was developed to calculate flood hydrographs from rainfall and catchment characteristics. • Based on ARR2019, utilise the hydrological model and generate flow hydrographs for input to the hydraulic model for all events (5% AEP, 2% AEP, 1% AEP, 1% AEP with Climate Change, 0.05% AEP and PMF) to perform critical duration analysis. • The flood hydrographs generated in the RORB runoff routing model were compared against the Regional Flood Frequency Estimation (RFFE) Model to validate the runoff routing model. There is no stream level gauge within the catchment to calibrate the hydrologic model. • A hydraulic model was created using the software TUFLOW, which is a 1D/2D hydraulic modelling software for flood assessments. The TUFLOW model was created using the latest available LIDAR and survey, as well as drainage infrastructure information supplied by the Junee Shire Council. This formed the existing model for this study. • A rainfall-on-grid simulation was undertaken in the created TUFLOW model to assess if local overland flooding or mainstream flooding from Lower Butlers Gully and Rocky Creek was dominant at the site. • The rainfall-on-grid simulation was removed from the flood assessment model, and inflows applied (as per Table 4-5) using 2D Source over Area (SA) and 2D Boundary Conditions (BC) for the total inflows at the model boundary and local inflows for catchment • The TUFLOW model was updated from the existing conditions to the design conditions by incorporating the proposed Kemp Street Overbridge and Footbridge designs, as well as the IFC design works from the Junee Yard package and the Olympic Highway Underbridge package. • The cumulative flood impact was assessed for events up to and including the 1% AEP as per the CoA and the flood results are shown within this report. • A sensitivity assessment by climate change was conducted for the 1% AEP existing and design conditions to inform the potential impacts on the flood immunity of the railway tracks. • A sensitivity assessment for blockage as per ARR2019 procedures was undertaken for the 1% AEP design conditions to inform the potential impacts of blockage. The methodology used in assessing blockage is described in a separate Technical Memo. Refer to 5-0052-210-IHY-99-ME-0001. **4.1. Hydrology Modelling**	5-0052-210	Ayub Ali	5/01/2026	CLOSED	This item is closed based on the response and evidence.

Comment Sheet Number_Revision:	5-0052-210-IHY-J2-CS-0001_L	**Comment Sheet Title:**	***External Comment Sheet - A2I | Flood Design Report - Kemp Street Footbridge and Bridge Replacement***
Revision Date:	13/08/2026	**Documents related in Aconex** (by IR DC)	Yes

Review Comments (Reviewer)								Responses (Document Owner)					Close-Out			
#	PSR ID No. **or** Compliance Reference Document *(State the fully qualified reference the deliverable is non-compliant with)*	Document / drawing number - Revision Number	Section # / page #	Engineering Assurance Stage	Comment *(for example must be specific on non compliance. Reference mark-ups, if required)*	Comment Type	Full Name	Date	Full Name	Company	Date	Response *(must be specific on how the comment has been addressed. Agreed approach for re-submission)*	Documentation Section # / Figure #	Full Name	Date	Comment Status	Close-Out Comment
7	Clarification	5-0052-210-IHY-J2-RP-0001_C.pdf	Page 31, 5-0052-210-IHY-J2-RP-0001_C	DDR	In the flood modelling should local catchment runoff interaction with the embankments and stormwater assets or surface drainage at the approach roads also been included?	Opportunity	Stephen Brierley	########	Scott Mortimer	DJV	########	The mainstream flooding under the bridge is dominant at this location, which is a conservative approach. It should be noted that the local catchment was incorporated in the mainstream inflow in the DDR assessment. As the regional flooding dominated the Kemp Street area, the inflow was positioned upstream of the design within the main flow path. It is believed that the flood impact from the local catchment on the west is minor. To confirm that the flood impact from the local catchment is minor to the design, the inflows for the local catchment were separated from the mainstream inflow. The design drainage system on the approach road embankment is also incorporated. The model was re-run for the 1% AEP, and the results still show the compliance (the results are shown in the screenshot). This check has been incorporated into the report - refer snip below. 	5-0052-210-IHY-J2-RP-0001_D	Ayub Ali	5/01/2026	CLOSED	This item is closed based on the response and evidence.
8	Clarification	5-0052-210-IHY-J2-RP-0001_C.pdf	Page 46, 5-0052-210-IHY-J2-RP-0001_C	DDR	If there are no mitgation measures applied. remove 'additional'	Opportunity	Stephen Brierley	########	Scott Mortimer	DJV	########	Acknowledged, this has been updated as the screenshot below. **6. MITIGATION MEASURES** No instances of non-compliance in terms of flood impact were documented. Therefore, no mitigation measures are necessary unless the design changes.	5-0052-210-IHY-J2-RP-0001_D Section 6	Stephen Brierley	24/12/2025	CLOSED	
9	CSSI CoA E42	5-0052-210-IHY-J2-RP-0001_D.pdf	Page 18, 5-0052-210-IHY-J2-RP-0001_D, Table 5	DDR	I believe it will be "to" instead of "of". Please check and correct it.	Non-Compliant	Ayub Ali	########	Stanley Weng	MR	########	The wording of Conidtion E42 (h) has been updated in Table 5 to read: Compliant Refer to Section 5.4.2. Both a maximum relative increase in velocity of 10%, or to 0.5m/s, whichever is greater, have been considered, and the governing and worse case criteria adopted. As such, this is consistent with requirements of the CoA and DPHI's interpretation.		Stephen Brierley	16/07/2026	CLOSED	
10	CSSI CoA E42	5-0052-210-IHY-J2-RP-0001_D.pdf	Page 40, 5-0052-210-IHY-J2-RP-0001_D, Section 5.4.2	DDR	It has been confirmed with DPHI that the velocity 0.5m/s stated in the CSSI CoA E42 is not the velocity changes. It's the maximum allowable velocity. Therefore, this statement needs to be rewritten.	Non-Compliant	Ayub Ali	########	Stanley Weng	MR	########	The wording of Conidtion E42 (h) has been updated in Table 5 to read: Compliant Refer to Section 5.4.2. Both a maximum relative increase in velocity of 10%, or to 0.5m/s, whichever is greater, have been considered, and the governing and worse case criteria adopted. As such, this is consistent with requirements of the CoA and DPHI's interpretation.		Stephen Brierley	16/07/2026	CLOSED	

Non-Compliant:	Non-compliance which requires correction before further design development occurs.
Opportunity:	Comment which identifies an opportunity to save capex, achieve increased quality or operational outcome. Not a non-compli

OPEN:	Comment has not been addressed.
CLOSED:	Comment is closed. No further action.
NEXT PHASE:	Comment response has been accepted. Resulting actions have been deferred to the next Phase of the Project (for Doc Control purposes comment is considered OPEN)
TRANSFERRED:	Response is not acceptable or review has been split and the comment has been transferred to another comment sheet. (for Doc Control purposes comment is considered CLOSED)



APPENDIX D

External Consultation Review

D1 – Junee Shire Council

D2 – Transport for NSW

D3 – CPHR

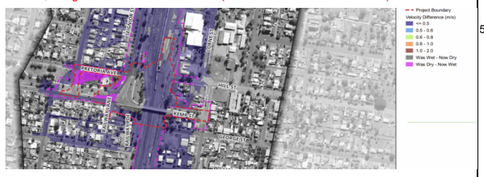
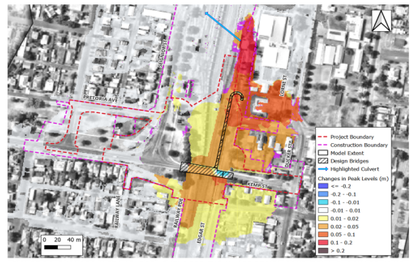
APPENDIX D1

Junee Shire Council Review

Document Control Information			
	Contractor DC to update for re-submission	**Submitted Document No. or Transmittal No.:**	Martinus-PTRAN-001148
Project:	2100 - A2I	**Date Submission Received:**	1/04/2025
Comment Sheet Number_Revisio	5-0052-210-IHY-J2-CS-0001-JC_C	**Comment Sheet Title:**	***External Comment Sheet - A2I | Flood Design Report - Kemp Street Footb***
Revision Date:	12/12/2025	**Documents related in Aconex** (by IR DC)	No

Review Comments (Reviewer)									Responses (Document Owner)					Close-Out			
#	PSR ID No. or Compliance Reference Document	Document / drawing number -	Section # / page #	Engineering Assurance Stage	Comment (for example must be specific on non compliance. Reference mark-ups, if applicable)	Comment Type	Full Name	Date	Full Name	Company	Date	Response (must be specific on how the comment has been addressed. Agreed approach for re-submission)	Documentation Section # /	Full Name	Date	Comment Status	Close-Out Comment
Example	*IR-SR-A2I-517 or 01-3500-PD-P00-DE-0008-A*	*0-0000-900-PEN-00-TE-0020_A*		*CRR*	*Is there sufficient space for a 10m maintenance vehicle to turn around at the end of the RMAR?*	*Non-Compliant*	*Joe Bloggs*	*15/02/2023*	*Fred Bloggs*	*Designer*	*15/03/2023*	*The area has been increased - now possible to turn 12.5m vehicle. The drawings are updated.*	*01-3500-PD-P00-DE-0008-A 01-3500-PD-P00-DE-0015-C*	*Jane Doe*	*27/09/2023*	CLOSED	
1	Austroads Guide to Road Design Part 5A Drainage - Road Surface, Networks, Basins and Subsurface.	5-0052-210-IHY-J2-RP-0001_A	Appendix A	SDR	Ducker Street has suface water flows on the road, from Kemp onto George Street to the eastern side of the bridge. Given the grade increases, the environment will be worsened in this location i.e. higher velocity flows on a larger hardstand. No flood impact is shown in this area, when in reality, this is a key point of interest for local homeowners. This should be incorporated into the model. Finer survey data should show this.	Non-Compliant	Stephen Targett	24/12/2024	Zoe Cruice	Martinus	1/04/2025	The remit of the CoA is to assess the impact from the works against existing conditions to within the performance limits. Management of overland surface water flows is covered in drainage design. Please refer to the detailed design report (5-0052-210-PEN-J2-RP-0001_B) for drainage design. 12/12 ZC: Flood Maps A37 to A45 demonstrate the difference between the design and existing flood conditions, and demonstrate compliance with the CSSI CoA with respect to levels (afflux), velocity, and hazard (product of level and velocity). Map A37 shows that for a 5% AEP event, the area in question (Ducker St/ George St) has aflux changes less than 10mm. This complies with the CSSI CoA for the land use.  Figure A37 – 5% AEP Change in Water Levels (m) - Developed Less Existing	5-0052-210-PEN-J2-RP-0001_D			OPEN	
2	Austroads Guide to Road Design Part 5A Drainage - Road Surface, Networks, Basins and Subsurface.	5-0052-210-IHY-J2-RP-0001_A	1.9.1. Input Data/Page 11	SDR	*Survey of the rail corridor within the project boundary area, received on 24/03/2024.* Survey outside the rail corridor, particularly on the approach roads is critical to the drainage management for the structure. 5m lidar does not pick up sufficient data for road drainage modelling.	Non-Compliant	Stephen Targett	24/12/2024	Zoe Cruice	Martinus	1/04/2025	1m LiDAR has been used in the PDR submission - please refer Section 1.9.1 of the PDR Flood Design report. 12/12 ZC: 1m lidar is noted as an input to the modelling in table 1-2: TABLE 1-2: AVAILABLE INFORMATION Item / Information / Data Name / Type / Description / Comments Surveys / General 1 — Alt Google Maps; NSW Imagery by SIXMAPS; ESRI World Street Map; Open Street Map — WMS — Basemaps linked in QGIS referenced for guidance through the assessment. 2 — AAM2015_10cm_210_04_2_KempSt — ECW — Aerial imagery used in Reference Design, dated on 16/08/2023. 3 — Urban Stormwater Mains 29 Nov 23 and Urban Stormwater Pits 29 Nov 23 — GIS files — GIS files of the urban stormwater within Junee Shire Council, received from Junee Shire Council on 01/12/2023. 4 — NSW Landuse 2017 v1.5 — GIS files — GIS files of the NSW land zoning by NSW Department of Climate Change, Energy, the Environment and Water, dated on 21/09/2023 and accessed on 20/12/2023. 5 — IS23913095 Ortho 35mm MGA2620z55 Junee — ECW — Aerial imagery provided by Martinus, dated on 15/8/2024. 6 — Junee201502_Merged_5m_LIDAR — TIF — 5m LIDAR captured in 2015 in GDA2020 projection; the data has an accuracy of 0.9m (95% Confidence Interval) Vertical and 1.25m (95% Confidence Interval) horizontal, downloaded from Elvis - Elevation and Depth - Foundation Spatial Data (https://elevation.fsdf.org.au/) on 15/07/2024. This LIDAR was used to delineate the hydrological catchments as it was received prior to the 1m LIDAR data. 7 — A2P EXT JUN GDA2620Z55 RAIL 240719 — DXF — Existing rail strings in GDA2020 projection, received from Martinus on 19/07/2024. 8 — Merge_1m_2015_GDA2020 — TIF — 1m LIDAR carried out in 2015 by ARTC (The data for the derived points have an accuracy of 0.15m (68% confidence level)), received from Martinus on 12/11/2024 for the rail corridor 9 — A2P_JNKEXT GDA26Z55 COMBINED — TIN, DWG/DXF — Survey of the rail corridor including ground surveys, rails, and drainage infrastructure within the project boundary area, received from Martinus on 18/09/2024 and updated on 04/03/2025. Design Files 1 — 5-0052-210-SBD-J2-MD-2001-KEMP_STREET_BRIDGE_3D_STRUCTURAL_DESIGN_BRIDGE_MODEL_DWG — DWG — Kemp Street bridge design, received from the IJW design team on 14/05/2025 for 5052-210-PEN-J2-RP-0001_C Detailed Design Report.	5-0052-210-PEN-J2-RP-0001_D			OPEN	
3	Austroads Guide to Road Design Part 5A Drainage - Road Surface, Networks, Basins and Subsurface.	5-0052-210-IHY-J2-RP-0001_A	5.1 Existing Condition/Page 30	SDR	Points of interest do not consider drainage flows from, the abutments or over the approach roads to the bridge. This environment will be changed by the new structure I.e. Water exiting the new bridge, at higher velocities onto Kemp and Ducker Street. Other than new abutments blocking the flow path this is the most critical impact.	Non-Compliant	Stephen Targett	24/12/2024	Zoe Cruice	Martinus	1/04/2025	Ducker Street is not affected by flooding up to or including the 1%. Only the PMF indicates impacts to Ducker St. Management of sfc water flow is captured through drainage design, and is documented within in the civil and structures detailed design report. Refer 5-0052-210-PEN-J2-RP-0001_B 12/12 ZC: THe points of interest are chosen based on high-risk locations as determined by the modelling team, from their experience with the design and model as to where are the most sensitive locations. Refer Figure 5-1 for the locations. This does not include the intersectio nof Ducker and Kemp as this intersection does not demostrate changes conditions. Refer Maps A37 to A45 that show the difference between design and existing. Snip below shows Ducker St intersection does not have existing or design flow impacts.  FIGURE 5-1: 1% AEP EXISTING FLOOD DEPTHS AND REPORTING LOCATIONS  	5-0052-210-PEN-J2-RP-0001_D			OPEN	

Comment Sheet Number_Revisio	5-0052-210-IHY-J2-CS-0001-JC_C	**Comment Sheet Title:**	***External Comment Sheet - A2I | Flood Design Report - Kemp Street Footb***
Revision Date:	12/12/2025	**Documents related in Aconex** (by IR DC)	No

Review Comments (Reviewer)									Responses (Document Owner)					Close-Out			
#	PSR ID No. **or** Compliance Reference Document	Document / drawing number -	Section # / page #	Engineering Assurance Stage	Comment *(for example must be specific on non compliance. Reference mark-ups, if required)*	Comment Type	Full Name	Date	Full Name	Company	Date	Response *(must be specific on how the comment has been addressed. Agreed approach for re-submission.)*	Documentation Section # /	Full Name	Date	Comment Status	Close-Out Comment
4	Austroads Guide to Road Design Part 5A Drainage - Road Surface, Networks, Basins and Subsurface.	5-0052-210-IHY-J2-RP-0001_A	5.4.1. Changes in Peak Flood Level	SDR	The changes to the flood level, over the bridge approach roads and abutment are not clearly defined. The points of interest indicate no change, but they do not address the likely increased velocity of water impacting approach roads.	Non-Compliant	Stephen Targett	24/12/2024	Zoe Cruice	Martinus	1/04/2025	The approach roads are not affected by mainstream flooding up to or including the 1%. Only the PMF indicates impacts to Ducker St. Management of sfc water flow is captured through drainage design, and is documented within in the civil and structures detailed design report. Refer 5-0052-210-PEN-J2-RP-0001_B 12/12 ZC: Maps A40 to A42 show the change in velocity between design and existing (5%, 2% and 1%). The bridge approaches do not have any existing velocity flows, nor any in design, so these areas show no impact - refer snip below. In other areas (purple) the impact is within the CSSI limits, being the worse-of 0.5m/s or 10% (here it's 0.5m/s relative increase). 	5-0052-210-PEN-J2-RP-0001_D			OPEN	
5	Austroads Guide to Road Design Part 5A Drainage - Road Surface, Networks, Basins and Subsurface.	5-0052-210-IHY-J2-RP-0001_A	5.5.1. Blockage Assessment/Page 40	SDR	*20% blockage was adopted for all the other culverts, pits and pipes outside the project boundary. Some consideration needs to go into blockage factors.* While 20% - 25% is acceptable for open chanel flows, all pipe culverts should be considered at 50% blockage, as this will be a far more accurate model of typical conditions. The most critical pipes for this are KS_08 and KS_09 at 375 diameter and KS_10 at 600 diameter. Unless the grades can be demonstrated to be over 5%. The smaller the pipe the more prone to regular, larger percentage blockages.	Non-Compliant	Stephen Targett	24/12/2024	Zoe Cruice / Scott Mortimer	Martinus	1/04/2025	Noted. A per ARR2019, the debris availability, mobility and transportability is low-medium within Junee, which equates to a 25% blockage for culvert widths less than 1.8m in the 1% AEP. Further, blockage assessment is only carried out as a sensitivity assessment - not as an input to the design findings assessed against the CoA limits. 12/12 ZC: The blockage methodology is consistent and compliant with the requirements of ARR and the CSSI CoA. The sensitivity of the impacts to blockage is shown in Figure 5-1. It remains the responsibility of the Council to clean stormwater assets to ensure they remain free of debris. The proposed works do not increase the liklihood of culvert blockage.  FIGURE 5-6: CHANGES IN PEAK FLOOD LEVELS FOR THE 1% AEP DESIGN CONDITIONS (BLOCKAGE VS NO BLOCKAGE)	5-0052-210-PEN-J2-RP-0001_D			OPEN	
6	Austroads Guide to Road Design Part 5A Drainage - Road Surface, Networks, Basins and Subsurface.	5-0052-210-IHY-J2-RP-0001_A	6 MITIGATION MEASURES/Page 42	SDR	Mitigation measures do not detail stormwater management on bridge approaches. This will be key to managing velocities of water off the new bridge structure.	Non-Compliant	Stephen Targett	24/12/2024	Zoe Cruice	Martinus	1/04/2025	Stormwater management is covered as part of drainage design, and is assessed and discussed in the Drainage section of the Detailed Design Report. Refer 5-0052-210-PEN-J2-RP-0001_B. 12/12 ZC: The IFC HP3 and DDR highway drainage designs are a key input to the flood modelling, to ensure the design scenario incorporates all aspects of design - including design pit and pipe system. Refer Table 1-2 for the input design files to the model. As per Section 2, the result of incorporating the design files is that the modelling and impact is compliant with the CSSI CoA  Design Files 1 — 5-0052-210-SBD-J2-MD-2001-KEMP_STREET_BRIDGE_3D_STRUCTURAL_DESIGN_BRIDGE_MODEL_DWG — DWG — Kemp Street bridge design, received from the DJV design team on 14/05/2025 for 0052-210-PEN-J2-RP-0001_C Detailed Design Report. 2 — 5-0052-210-CAL-J4-MD-0001-JUNEE YARD 3D RAIL DESIGN STRINGS — DWG/XML — Junee Yard design rail 3d strings in GDA2020 projection, received from the DJV team on 06/06/2025 0052-210-PEN-J2-RP-0001_C Detailed Design Report. 3 — IFC designs from the Olympic Park Underbridge package — TUFLOW Bes — Design layers in TUFLOW, received from the DJV team on 08/07/2025 for 0052-210-PEN-J2-RP-0001_C Detailed Design Report. 4 — KEMP FOOTBRIDGE 3D — DXF — Kemp Street footbridge IFC design received from the DJV design team on 29/11/2025 for 0052-210-PEN-J2-RP-0001_E Detailed Design Report. DOC NO: 5-0052-210-IHY-J2-RP-0001_D — Page 11 of 146 — Document Uncontrolled when printed AUSTRALIAN RAIL TRACK CORP. — FLOOD DESIGN REPORT – KEMP STREET BRIDGE AND FOOTBRIDGE — INLAND RAIL — MARTINUS Item — Information / Data Name — Type — Description / Comments 5 — 5-0052-210-DDR-J2-MD-0003-KEMP_STREET_BRIDGE_DRAINAGE_3D_STRINGS_12DA.12da — 12DAZ — Design drainage pits and pipes and major existing pipes details, received from the DJV design team on 19/11/2025 corresponding with 5-0052-210-PEN-J2-RP-0001 E Detailed Design Report. 6 — 20251120 - TRIS 210 DCW J2 FLOOD ALL.dem — DEM — DEM of all combined design civil works, received from the DJV team on 29/10/2025 which corresponds to 0052-210-PEN-J2-RP-0001_E Detailed Design Report	5-0052-210-PEN-J2-RP-0001_D			OPEN	

Non-Compliant:	Non-compliance which requires correction before further design development occurs.	**OPEN:**	Comment has not been addressed.
Opportunity:	Comment which identifies an opportunity to save capex, achieve increased quality or operational outcome. Not a non-compliance.	**CLOSED:**	Comment is closed. No further action.
		NEXT PHASE:	Comment response has been accepted. Resulting actions have been deferred to the next Phase of the Project (for Doc Control purposes the comment is considered OPEN)
		TRANSFERRED:	Response is not acceptable or review has been split and the comment has been transferred to another comment sheet. (for Doc Control purposes comment is considered CLOSED)



APPENDIX D2

Transport for NSW Review

Transport for NSW

17 August 2026

TfNSW Reference: WST24/00003/170 | SF2024/002449

Ms Cassandra Hodges
Senior Project Manager – Interfaces
Inland Rail Pty Ltd
290 Clarinda Street
PARKES NSW 2870

SSI-10055; Albury to Illabo Inland Rail Project; Flood Design Report for Kemp Street Footbridge and Bridge Replacement (Revision E)

Dear Ms Hodges,

Transport for NSW (TfNSW) received Revision E of the Flood Design Report (FDR) for Kemp Street Footbridge and Bridge Replacement for the Albury to Illabo (A2I) Inland Rail project on 20 July 2026 via email from Martinus Rail for comment close out.

The review package, received via email, included the following:

- *Kemp Street FDR - 5-0052-210-IHY-J2-RP-0001_E*
- *5-0052-210-IHY-J2-CS-0001-TW_D* [this has been superseded, as discussed below].

TfNSW reviewed Revision D of the FDR in February 2026, closing out one comment and leaving two open until the Works Authorisation Deed (WAD) scope for the intersection of Kemp Street with Olympic Highway was included. However, TfNSW did not receive a response from Martinus Rail to the two open comments. As agreed, the comments register in **Attachment 1** contains TfNSW's comments on both Revision D (supersedes the comments register issued as part of the review package) and Revision E of the FDR for completeness.

TfNSW has reviewed Revision E. **Attachment 1** confirms that all comments made on previous revisions are now closed and TfNSW makes no further comment.

Should you require further information in relation to this matter, please contact the undersigned via: development.inlandrail@transport.nsw.gov.au or on 0417 125 741.

Yours sincerely,

Howard Orr
Manager Development Services – Inland Rail
Transport Planning Branch
Planning, Integration and Passenger

A2I Flood Design Report CONSULTATION - COMMENTS REGISTER - Kemp Street Footbridge and Bridge Replacement

Comment Sheet Number_Revision: 5-0012-210-WH-I2-CI-0001-TW_0
Title: External Comment Sheet - A2I | Flood Design Report - Kemp Street Footbridge and Bridge Replacement - Transport for NSW (TfNSW)
Date: 17/08/2026

Stakeholder Category	Stakeholder Name	Flood Design Report name	Document reference	Date raised	Topic that comment relates to	Comments	Date	Response	Doc Evidence	Date	Comment Status	Close-Out Comment	Date	Response	Doc Evidence	Date	Flood Design Report Revision	Comment Status	Close-Out Comment	Date	Flood Design Report Revision	Comment Status	Close-Out Comment
State Government Agency	TfNSW	Kemp St Flood Design Report 5-0012-210-WH-I2-RP-0001_B.1	2.2. Conditions of Approval - Flooding	23/06/2025	Conditions of approval	In Table 2-2 for Condition of Approval E41 this should read "The Proponent's response to the requirements of Conditions C28 and E45..." - please correct.	27/06/2025	Acknowledged and will be corrected for next submission.		9/09/2025	Closed	Noted.											
State Government Agency	TfNSW	Kemp St Flood Design Report 5-0012-210-WH-I2-RP-0001_B.1	2.2. Conditions of Approval - Flooding	23/06/2025	Conditions of approval	Table 2-2 for Condition of Approval E41 indicates "Consultation with Council will be undertaken through formal review of this Flood Design Report; Consultation with other stakeholders will occur upon receipt of the RAT". Section 1.2 indicates "All actions received the Notice to Proceed from IRFs on 18 Oct 2024". TfNSW queries if the required Notice to Proceed has already been received by Martinus. If so, please amend Table 2-2 to include relevant details on the status of consultation with other stakeholders (not just Council).	27/06/2025	Martinus has been given the Notice to Proceed. This sentence is incorrect and will be rectified to read: "Consultation with Council and other stakeholders is being undertaken through formal review of this Flood Design Report".		9/09/2025	Closed	Noted.											
State Government Agency	TfNSW	Kemp St Flood Design Report 5-0012-210-WH-I2-RP-0001_B.1	2.2. Conditions of Approval - Flooding	23/06/2025	Conditions of approval	Table 2-2 for Condition of Approval E42 does not provide an adequate status update of "Where the requirements set out in clauses (d) to (f) inclusive cannot be met alternative flood levels or mitigation measures must be agreed to with the affected landowner." Please expand beyond "Clause (d) is non-compliant".	27/06/2025	Since the FDR submission, the design has been in progress for flood impact compliance with feasible mitigation measures, so that clauses (d) to (f) can be met. The updated status of compliance and mitigation measures will be reported for the next submission. The structure of the Flood Design Report through the design and review gates is: FDR: Provide existing conditions assessments, design conditions assessment, and identify areas of non-compliance. DDR: Update design conditions for any design developments, implement mitigations to achieve a compliance solution. IFC: update for any close-out comments.		9/09/2025	Closed	Noted.											
State Government Agency	TfNSW	Kemp St Flood Design Report 5-0012-210-WH-I2-RP-0001_B.1	4.2.4. Design Model Update	23/06/2025	Project impact area	The proposed design works (grey shading) in Figure 4-5 appears to extend beyond the project boundary in some areas - please confirm. Additionally, the "project boundary" shown does not appear to exactly match the "proposal site" as shown on Figure 3-13 in the PIR (being the revised construction layout). In the PIR the proposal site is defined as the area that would be directly impacted by the enhancement works, so TfNSW would not expect any works to occur outside this boundary - please confirm.	27/06/2025	The boundary was expanded to include the construction impact zones. Consistency assessments will be undertaken to ensure any changes are consistent with the PIR designs. If the proposal is not consistent, a MOD will be required. The Contractor is undertaking consistency assessments for these changes to the project boundary to align with Council requirements, and construction access. The updated project boundaries will be confirmed and corrected in the report for the next submission.		9/09/2025	Open	TfNSW will review the outcomes of the consistency assessment / confirmation of project boundary to comment further on this matter in the next design stage.	22/09/2025	At the time submitting DDR FDR, the boundaries (project boundary and construction boundary) were included in the report as shown in the snip at right:		18/02/2026	Rev D	Closed	TfNSW considers this item closed, and makes the following close out comments: TfNSW notes the QDL non-compliances on classified roads indicated in previous revisions have now been resolved, regardless of project boundaries, and appreciates this work as the design has progressed. Suggestions for IRFs to consider: The C2Z shown on Figure 1 does not match the 'Construction Boundary' shown on Figure 11, particularly in relation to the Olympic Highway - TfNSW presumes these should be the same. Similarly, the 'Project Boundary' has slight variations across these two figures - consider correcting for consistency. TfNSW also presumes the consistency assessments have now been undertaken to extend the C2Z / 'Construction Boundary' and that the area shown on Figure 1 / Figure 13.x is approved - if not, consider clarifying the approval status of the extended C2Z in the report.	17/08/2026	Rev E	Closed	With the expansion of the project boundary there are now errors in the text/tables in the report i.e. Table 11 - there are now no longer any points 'outside the project boundary' but several points are still referenced throughout the report as such. TfNSW suggests IRFs correct such descriptions for accuracy.
State Government Agency	TfNSW	Kemp St Flood Design Report 5-0012-210-WH-I2-RP-0001_B.1	5.4.2. Changes in Peak Flood Velocity	23/06/2025	Editorial	For Table 5-11 regarding Changes in Flood Velocity the units should be m/s.	27/06/2025	This has been corrected		9/09/2025	Closed	Noted.											
State Government Agency	TfNSW	Kemp St Flood Design Report 5-0012-210-WH-I2-RP-0001_B.1	5.4.3. Changes in Peak Flood Hazard	23/06/2025	Flood impacts	This sentence appears contradictory, it is unclear if these instances are considered to be non-compliances or not: "There are increases in flood hazard within the rail corridor at Point 4 and on the road corridor near Point 7, which do not affect the Olympic Highway. These increases are considered non-compliant with the CoA in they occur within the project boundary and do not affect the risk to life." TfNSW considers all areas showing an increase in flood hazard category on the classified road network, which includes all newly flooded areas, to be non-compliances with CoA E42(g). This importantly includes sections of the Olympic Highway. TfNSW expects these impacts will be designed out to mitigate the non-compliances listed in this report.	27/06/2025	It's acknowledged this sentence is incorrect, and it's meant to be 'compliant' , which will be corrected for next submission. For E42, it stipulates that CSI designs shall limit flooding impacts in areas outside the project boundary. However, the updated status of impacts and compliance will be reported for the next submission.		9/09/2025	Open	TfNSW would like to acknowledge the design progression since the Preliminary Design Review submission towards mitigating flood impacts on the classified road network; being the Olympic Highway in this location. TfNSW considers all newly flooded areas on the classified road network to be unacceptable project impacts, constituting an increase in flood hazard category. TfNSW would like to see further reduction/elimination of newly flooded areas on the Olympic Highway in the next design iteration, to mitigate flood impacts on the classified road network.	22/09/2025	In the DDR flooding assessment, there is no non-compliance: 1. There is no flood hazard increase on Olympic Highway. 2. The flood immunity of Olympic Highway remained the same as the existing. The road (or at least the adjacent nature strip) is inundated in the existing case. 3. it should be noted that CoA and PSR do not stipulate "newly flooded area" requirement. In the 1% ASP, there is a minor increase in the existing flood extent. The design works result in a minor increase in the local peak flood level, which in turn results in a minor increase in the flood extent, and the flood depth is less than 10mm, which should be considered as "sheet flow". Based on above, the design works comply with the criteria of CoA and PSR.		18/02/2026	Rev D	Open	The report states: This report provides a flood impact assessment for the IFC designs of the overbridge and footbridge. The intersection of Kemp St with Olympic Highway is on HOLD at DDR, pending submission to, and review by, TfNSW under a Works Authorisation Deed (WAD). Please provide TfNSW's Development Services team with the IFC version of this report when available, incorporating the Olympic Hwy / Kemp St intersection (WAD) design, noting that Development Services will review the full alignment flood impacts to classified roads both within and outside of the WAD site.	17/08/2026	Rev E	Closed	TfNSW notes the Olympic Hwy / Kemp St intersection (WAD) design is now included in the FDR. TfNSW makes no further comments.
State Government Agency	TfNSW	Kemp St Flood Design Report 5-0012-210-WH-I2-RP-0001_B.1	5.4.4. Changes in Duration of Inundation	23/06/2025	Flood impacts	The analysis around the change in duration of inundation appears to only have been undertaken at one location near Point 3. Please clarify why this location was selected, i.e. is it the most impacted location in terms of change in duration of inundation? Please clarify why only one location has been analysed, as Condition E42(d) applies to all flood-impacted area outside the project boundary during any flood event up to and including the 1% AEP flood event.	30/06/2025	This location was selected as it is the most impacted location and as the flood behaviour east of the rail is ponding it is a conservative representative of all upstream impacts on the eastern side of the rail. Impacts on the western side of the rail are in overland flow paths which are free flowing and are not expected to have any change in duration of inundation.		9/09/2025	Closed	TfNSW notes "typical locations were selected in the vicinity of the project works" outside the project boundary, which are the key locations for concern in terms of the flood impacts, as shown in Figure 5-4." However, Tdur_1 location is within the project boundary.											
State Government Agency	TfNSW	Kemp St Flood Design Report 5-0012-210-WH-I2-RP-0001_B.1	7. Mitigation Measures	23/06/2025	Flood impacts	TfNSW recommends the mitigation measures proposed in Section 7 be modelled at this PDR stage to assess effectiveness. At a minimum, the description of mitigation measures in Section 7 should be expanded, with diagrams included to provide greater clarity on the proposed mitigation measures.	27/06/2025	The structure of the Flood Design Report through the design and review gates is: FDR: Provide existing conditions assessments, design conditions assessment, and identify areas of non-compliance. DDR: Update design conditions for any design developments, implement mitigations to achieve a compliance solution. IFC: update for any close-out comments. Mitigations are not implemented at the PDR stage, because the track and civil design is only 70% developed. The development of the track and civil works from 70% to 100% could render any mitigations implemented at the 70% stage no longer effective. The staging described above ensures that the PDR stage highlights the areas of potential flooding non-compliance, so that the track and civil design from 70% to 100% can be developed to mitigate these, making mitigations at the 100% design stage effective.		9/09/2025	Closed	TfNSW notes no mitigation measures are proposed now in Section 6.											
State Government Agency	TfNSW	Kemp St Flood Design Report 5-0012-210-WH-I2-RP-0001_B.1	Appendix A - Flood Maps	23/06/2025	Flood impacts	The flood modelling indicates flood impacts over the Olympic Highway, being increases in flood level, increases in flood hazard categories, increases in flood velocities and new areas of flooding. These impacts do not meet criteria listed in Condition of Approval E42. These impacts on the State Road are not acceptable to TfNSW. TfNSW expects these impacts will be designed out to mitigate the non-compliances listed in this report.	27/06/2025	The flood assessment of DDR design is in progress and the impacts will fully compliant with CoA and PSR. Those results will be reported in next submission.		9/09/2025	Open	TfNSW will await the outcomes of further design progression through to IFC stage to comment further on this matter.	22/09/2025	The DDR flood design report has been issued on 6/08/2026 (5-0012-210-WH-I2-RP-0002_C).		18/02/2026	Rev D	Open	TfNSW will await the outcomes of further design progression through to IFC stage, incorporating the Olympic Hwy / Kemp St intersection (WAD), to comment further on this matter.	17/08/2026	Rev E	Closed	TfNSW notes the Olympic Hwy / Kemp St intersection (WAD) design is now included in the FDR. TfNSW makes no further comments.

APPENDIX D3

CPHR Review

A2I Flood Design Report CONSULTATION - COMMENTS REGISTER

Stakeholder Category	Stakeholder Name	Flood Design Report name	Document reference (e.g. section, figure, table)	Date raised	Topic that comment relates to	Comments	Responder Name	Date	Response	Doc Evidence	RD comments 10/09 2025
	CPHR	A2I-Kemp Street Footbridge and Bridge Replacement-Flood Design Report (5-0052-210-IHY-J2-RP-0001)	Section 1.6 - Previous Studies	6/02/2025	Other flood studies at Junee	Junee Shire Council is currently in the progress of developing a new flood study for Junee. Although it is not yet finalised it is recommended that discussions are held with Council to ensure consistency with this new flood modelling.	Zoe Cruice	11/08/2025	Noted. JSC is provided with this Flood Design Report for review and comment. Engagement with them occurs monthly on any requests and exchanges for information - including any flooding related items	Rev C FDR	Rev C FDR has not been provided for our review. This comment applies to all responses for the Kemp Street Footbridge and Bridge Replacement comments (line items 16-28). Discussions should occur with Inland Rail's next meeting with Council regarding the new flood study being prepared to ensure modelling consistency.
	CPHR	A2I-Kemp Street Footbridge and Bridge Replacement-Flood Design Report (5-0052-210-IHY-J2-RP-0001)	Section 2.4 - Table 2-3	6/02/2025	Flood mitigation measures	Given there is a need for flood mitigation measures to be developed due to a number of non-compliances, consultation with Council is needed in the development of said mitigation measures. This needs to occur during their design (rather than after) as per HFWQ3.	Zoe Cruice	11/08/2025	Updated civil and structural models have been incorporated into a cumulative flood model, and all non-compliances have been resolved. The assessment and Works are now fully compliant.	Rev C FDR	Rev C not provided for review.
	CPHR	A2I-Kemp Street Footbridge and Bridge Replacement-Flood Design Report (5-0052-210-IHY-J2-RP-0001)	Section 4.	6/02/2025	Blockage assessment	Need to include another dot point to cover the blockage assessment. This is a crucial element given that the flood levels at the properties upstream of the rail line are very sensitive to any blockages.	Zoe Cruice	11/08/2025	Blockage assessment is covered in Section 5.5.2	Section 5.5.2 of the Rev C FDR	Rev C not provided for review.
	CPHR	A2I-Kemp Street Footbridge and Bridge Replacement-Flood Design Report (5-0052-210-IHY-J2-RP-0001)	Section 4.3	6/02/2025	Previous and current flood modelling	Reference is made to the previous flood modelling completed by Lyall and Associates on behalf of Junee Council in 2009. Although it is true that this outdated 1D hydraulic model is not available, Council have engaged the services of this same consultant to develop a new 2D flood model for Junee. This flood model is at an advanced stage so consultation with Council (Stephen Targett) is needed to ensure consistency.	Zoe Cruice	11/08/2025	All flood models will be provided to the Council for incorporation into any Council model updates		No further action, however it would be ideal to compare design flood levels between models if the Council flood model is advanced enough.
	CPHR	A2I-Kemp Street Footbridge and Bridge Replacement-Flood Design Report (5-0052-210-IHY-J2-RP-0001)	Section 4.3 - Table 4-6	6/02/2025	Flood level comparisons between models	The differences shown in this table between the old Council hydraulic model (2009) and the new modelling shows an increase in the flood levels of up to 0.8m in the 1% AEP design flood. This is another reason to consult with Council on this issue and compare levels with their new hydraulic model currently in development.	Zoe Cruice	11/08/2025	Updated civil and structural models have been incorporated into a cumulative flood model, and all non-compliances have been resolved. The assessment and Works are now fully compliant. The assessment and Works are now fully compliant. Changes in peak flood levels are captured in Table 5-11 and show max increases of 28mm (within the project boundary at Location 5).	Section 5.4 of the Rev C FDR	Rev C not provided for review. We cannot confirm that non-compliances have been resolved if we have not been able to review the revised report.
	CPHR	Kemp St Footpbridge 5-0052-210-PEN-J2-RP-0001_C	Section 4.5.3.2	6/11/2025	Velocities	Maximum velocities of 2.4 m/s are high and are not considered to be conservative. These velocities depend on 100% ground cover and they are not suitable for fine textured soils. Provide further details to justify this velocity is acceptable.	Zoe Cruice	11/08/2025	The stand-along footbridge report has been replaced by the combined structures report. Please refer Rev C of the OB and FB FDR	Rev C FDR	Rev C not provided for review.
		Kemp St Flood Design Report 5-0052-210-IHY-J2-RP-0001_B.2	Section 5	6/11/2025	Flood impact	Non compliance and further mitigation measures noted.	Michael Ren	11/08/2025	Updated civil and structural models have been incorporated into a cumulative flood model, and all non-compliances have been resolved. The assessment and Works are now fully compliant. The assessment and Works are now fully compliant.	Rev C FDR Section 5	Rev C not provided for review.
	CPHR	A2I-Kemp Street Footbridge and Bridge Replacement-Flood Design Report (5-0052-210-IHY-J2-RP-0001)	Section 5.4	6/02/2025	Excessive flood impacts	While we note that quantitative design limits have been set for the project, ideally there should be no flood impacts on residential properties whether or not they are already flooded above floor level. Detailed design should minimise impacts to residential properties as much as possible.	Michael Ren	11/08/2025	Updated civil and structural models have been incorporated into a cumulative flood model, and all non-compliances have been resolved. The assessment and Works are now fully compliant. The assessment and Works are now fully compliant.	Rev C FDR Section 5	Rev C not provided for review.
	CPHR	Kemp St Flood Design Report 5-0052-210-IHY-J2-RP-0001_B.1	Section 6.1	6/11/2025		The method of calculating climate change has been noted as prior version of ARR2019. The DDR should include some comment and sensitivity analysis of the implications of the new ARR2019 (4.2) guidelines	Michael Ren	11/08/2025	As per the EIS report (Section 3.3.5 of Albury to Illabo Environmental Impact Statement Technical Paper 11) and the agreement between the Contractor and ARTC for the continued use of the prior version of ARR2019 climate change method (refer to IR2140-RTRFI-000773), the Year 2090 RCP8.5 interim climate change factor sourced from the ARR Data Hub (https://data-legacy.arr-software.org/) and the associated 20.2% increase in rainfall was adopted. ; also discussed in Section 4.1.4	Rev C FDR	We acknowledge that this text has been included however we reiterate that information is still required regarding the impact of the change. The model does not need to be re-run, however at a minimum some commentary should be provided describing any potential impact.
	CPHR	A2I-Kemp Street Footbridge and Bridge Replacement-Flood Design Report (5-0052-210-IHY-J2-RP-0001)	Section 6.2	6/02/2025	Blockage Factors	A table showing the actual blockage factors applied at each culvert would be beneficial.	Michael Ren	11/08/2025	This is now included in Section 5.5.2	Rev C FDR	Resolved, however we need to review Rev C to confirm this.
	CPHR	A2I-Kemp Street Footbridge and Bridge Replacement-Flood Design Report (5-0052-210-IHY-J2-RP-0001)	Section 7	6/02/2025	Mitigation measures	Strongly recommend that Martinus work closely with Council to develop complementary flood mitigation measures. This collaboration may be able to achieve some flood mitigation for those properties that are already flood affected.	Michael Ren	11/08/2025	Noted. Updated civil and structural models have been incorporated into a cumulative flood model, and all non-compliances have been resolved.. The assessment and Works are now fully compliant. JSC is provided with this Flood Deisgn Report for review and comment. Engagement with them occurs monthly on any requests and exchanges for information - including any flooding related items	Rev C FDR	Rev C not provided for review. Confirm whether Council has been supplied with the Rev C report.
	CPHR	A2I-Kemp Street Footbridge and Bridge Replacement-Flood Design Report (5-0052-210-IHY-J2-RP-0001)	Section 8	6/02/2025	Next DDR Stage	Looking forward to reviewing the next DDR flood design report. Most importantly the developed flood mitigation measures/design changes to address the non-compliances.	Michael Ren	11/08/2025	Updated civil and structural models have been incorporated into a cumulative flood model, and all non-compliances have been resolved. The assessment and Works are now fully compliant.	Rev C FDR	Rev C not provided for review. We cannot confirm that non-compliances have been resolved if we have not been able to review the revised report.
	CPHR	Kemp St Footpbridge 5-0052-210-PEN-J2-RP-0001_C	Section 4.8.4.1	6/11/2025	Flood impact	Noted as non compliance of 1% flood impact. This non-compliance needs to be resolved in the DDR. (Note there is some confusion in this document; section 4.8.6 states a range of flood mitigation measures have been investigated in the DDR, however the flood report states it is a PDR not DDR).	Michael Ren	11/08/2025	There are slight differences of stages between the Flood Assessment and the other design disciplines due to timing and consequences. Updated civil and structural models have been incorporated into a cumulative flood model, and all non-compliances have been resolved. The assessment and Works are now fully compliant.	Rev C FDR	Rev C not provided for review.

APPENDIX E

Independent Flood Consultant Review

E1 – Review comments

E2 – Staged Works Certification for HP3



APPENDIX E1

Review comments

Project: 2300 **Deliverable:** Kemp Street Bridge and Footbridge

Comment Sheet Reference: 5-0052-210-IHY-J2-CS-0001-PE_H

Review Comments (Reviewer)											Responses (Document Owner)					Close-Out					
#	Document number / drawing number - Revision Number	Section # / page #	Company	Full Name	Functional Area	Date	Design Gate	Comment (for example must be specific on non compliance. Reference mark-ups, if required)	Compliance Reference Document (Note the fully	Comment Type	Full Name	Role	Date	Response (must be specific on how the comment has been addressed)	Where addressed (Section # / Figure #)	Full Name		Company	Date	Comment Outcome	Close-Out Comment
1	5-0052-210-IHY-J2-RP-0001_B	TUFLOW files	Hatch	Sam Drysdale	Flood Assessment	22/07/2025	PDR	Reporting includes non-compliant flood impacts and identifies the need for mitigation measures. This will need to be adressed in the DDR submission		Major	Michael Ren	DJV Flood modeller	29/07/2025	The DDR report is being prepared for compliance in flooding by incorporating the latest designs.	5-0052-210-PEN-J2-RP-0001_C	Sam Drysdale		TA	12/09/2025	CLOSED	Non-compliant impacts have been mitigated in the DDR submission
2	5-0052-210-IHY-J2-RP-0001_B	TUFLOW files	Hatch	Sam Drysdale	Flood Assessment	22/07/2025	PDR	The TUFLOW model does not include assessment of local catchment runoff interaction with the proposed approach road embankments. This is inconsistent with the scale of assessment undertaken for other works packages and should be addressed in the DDR submission		Minor	Michael Ren	DJV Flood modeller	29/07/2025	An initial rainfall-on-grid test simulation was undertaken in the created TUFLOW model to assess the dominant flooding mechanism at this location. It was found that the mainstream flows were the critical form of flooding dominating peak flood levels for the project works. In addition, the drainage design undertook the local catchment analysis/ surface drainage compliance of the Kemp Street bridge including the bridge approaches. Refer to the Detailed Design Report– Kemp Street Overbridge and Footbridge – (5-0052-210-PEN-J2-RP-0001 Revision C. UPDATED RESPONSE HERE: 19/09/2025 (YL) : 1. It should be noted that the local catchment on the western side of the design was incorporated in the inflow (as circled in the first screenshot below this table, "Hyd005_Junee" and "Hyd014_North") in the DDR assessment. As the regional flooding dominated the Kemp Street area, the inflow was positioned upstream of the design within the main flow path. It is believed that the flood impact from the local catchment on the west is minor. 2. To confirm that the flood impact from the local catchment on the west is minor to the design, the inflows for the local catchment on the west were separated from "Hyd005_Junee" and "Hyd014_North" (second screenshot below). The design drainage system on the approach road embankment is incorporated. 3. The model was re-run for the 1% AEP, and the results still show the compliance (the results are shown in the third screenshot). 	5-0052-210-PEN-J2-RP-0001_C Section 4.2.4	Sam Drysdale		TA	12/09/2025	CLOSED	This sensitivity analysis is ackowledged in the report, but no evidence has been provided. The overland flow paths conveyed along Olympic Highway that will be redirected by the proposed works are not represented within the modelling. While the design changes are anticipated to result in only minor impacts and are likely to be compliant, the absence of this representation means compliance cannot be confirmed. Consequently, all comments related to this area remain unresolved from the PDR stage. The omission of the simulation of local runoff in this instance is inconsistent with the modelling approach that has been undertaken for other work packages. The Design Report includes drainage design works at this location, so this detail should be included within the TUFLOW modelling for confirmation that the resultant overland flow paths do not have non-compliant flood impacts, as has been undertaken for other works packages. 22 December 2025: Transferred to Comment #5 (DJW)
3	5-0052-210-IHY-J2-RP-0001_B	TUFLOW files	Hatch	Sam Drysdale	Flood Assessment	22/07/2025	PDR	The local drainage network should be revised to include existing stormwater assets at the approach road embankment works to facilitate the requirement identified in comment #2		Minor	Michael Ren	DJV Flood modeller	29/07/2025	As discussed for comment #2, the mainstream flooding under the bridge is dominant at this location, which is a conservative approach. In addition, the drainage design undertook the local catchment analysis/ surface drainage compliance of the Kemp Street bridge including the bridge approaches. Refer to the Detailed Design Report– Kemp Street Overbridge and Footbridge – (5-0052-210-PEN-J2-RP-0001 Revision C. UPDATED RESPONSE HERE: 19/09/2025 (YL) : As per the response to comment#2, the drainage system and the local catchment inflow are included in the model. The 1% AEP results still show the compliance.		Sam Drysdale		TA	12/09/2025	CLOSED	As noted in the response to Comment 2, this issue does not relate to flooding through the rail corridor but instead concerns overland flow paths to the west. The response does not address the potential impacts of the proposed works between Kemp Street and Seignior Street/Olympic Highway. The Design Report includes drainage design works at this location, so this detail should be included within the TUFLOW modelling for confirmation that the resultant overland flow paths do not have non-compliant flood impacts, as has been undertaken for other works packages. 22 December 2025: Transferred to Comment #5 (DJW)
4	5-0052-210-IHY-J2-RP-0001_B	TUFLOW files	Hatch	Sam Drysdale	Flood Assessment	22/07/2025	PDR	While form loss has been included within the layered flow constriction shapes to represent the bridge, no application of blockage has been included. Piers should be represented by both a reduction of conveyable area through blockage as well as a form loss factor.		Minor	Michael Ren	DJV Flood modeller	29/07/2025	According to the TUFLOW recommendations, the pier form loss coefficients in Hydraulics of Bridge Waterways are derived based on the cross-sectional averaged velocity through the bridge opening in the absence of piers. It's not necessary to specify a blockage value if a pier form loss coefficient estimated from this method is used.		Sam Drysdale		TA	12/09/2025	CLOSED	The representation of substructure blockage and losses is a key consideration for modelling potential flood impacts associated with the proposed works to Kemp Street bridge. The proof engineering process derived and applied form losses and blockage factors for both the existing and proposed scenarios independently of those used in the provided design models. Sensitivity testing of these independently derived factors produced results that aligned with those presented in the flood mapping.
5	5-0052-210-IHY-J2-RP-0001_D	TUFLOW files	Hatch	Daniel Williams	Flood Assessment	22/12/2025	DDR2	The local overland flow west of the Kemp St - Olympic Hwy intersection has now been included in the modelling, enabling comments #2 and #3 to be closed out. As anticipated, the impact of the intersection upgrade and associated works is minor and consistent with a stormwater management scale rather than flooding. The modelling also confirms that these works do not contribute to impacts associated with the Junee Yard and Kemp Street Bridge works, which are compliant. The Junee Yard and Kemp Street Bridge works can be independently finalised for IFC, with the Kemp St - Olympic Hwy intersection works still to be updated prior to IFC.								Darren Lyons		Hatch	22/12/2025	CLOSED	
6	5-0052-210-IHY-J2-RP-0001_E	TUFLOW files	Hatch	Sam Drysdale	Flood Assessment	30/07/2026	WAD	Mapping shows a redirection of upstream flows due to a discrepancy between the survey and base LiDAR elevations to the west of Joffe Street. The application of flows is also affected by the varying cell size in this location, with the end of the 2d_qnl polygon local to the area, and by the 2d_sa ALL application over-selecting the gutter and applying inflow onto the median strips and over the crown of the road. Combined, these factors result in floodwaters being disproportionately directed towards Pretoria Avenue; more water should flow down the southern side of Olympic Highway and into Railway Lane. Proof Engineering updated the modelling to resolve the redirected flow paths and determined that no non-conformances were identified when adopting the provided critical duration.		Major	Yucen Lu	DJV flood modeller	28/08/2026	1. A sensitivity model was prepared using the files provided by Proof Engineer, including: •adjusted SA polygons; •adjusted quadtree extent; and •survey clipping polygon. The sensitivity model was used to assess whether the identified model configuration and survey/LiDAR interface could materially affect the flood impact conclusions. 2. The critical duration has been assessed for 1%AEP and 10%AEP for the interest area: •1% AEP: 10 minutes •10% AEP: 30 minutes As expected, it confirms that shorter-duration events can govern the local flow response. 3. The model has been run for 1%AEP and 10%AEP for design based on the design from last submission by using the latest critical duration: •differences in local flow distribution are primarily associated with the interface between the detailed survey and base LiDAR elevations; •some local redistribution of shallow overland flow occurs under the PE model configuration; however, •no non-compliances were identified for either the 1% AEP or 10% AEP events. On this basis, the identified modelling differences do not materially affect the conclusions of the flood impact assessment. It is therefore proposed to retain the existing FDR model configuration and assessment methodology. Fully incorporating the sensitivity model changes would require the existing-condition and design models, together with the broader critical-duration assessment, to be rerun. Given that the targeted sensitivity testing has demonstrated no change to the compliance outcome, this additional modelling is not considered warranted. The above results and action has been discussed and agreed with Proof Engineer and Martinus on 13/08/2026.							
7	5-0052-210-IHY-J2-RP-0001_E	TUFLOW files	Hatch	Sam Drysdale	Flood Assessment	30/07/2026	WAD	The shortest critical duration under 1% AEP conditions was 45 minutes. This duration is unlikely to be appropriate for assessing the impacts of flows propagating down Olympic Highway to the site, particularly given the breakouts from the southern gutter that travel along the median strip and through private properties before entering Railway Lane. This in combination with comment 6 may result in concentration of flows on properties south of the area of works. It is recommended critical durations are revised with modelling changes in comment 6 to ensure no impacts.		Major	Yucen Lu	DJV flood modeller	28/08/2026	As outlined in the response above, the critical duration has been reassessed and the model rerun as a sensitivity test. No non-compliances were identified for either the 1% AEP or 10% AEP events. On this basis, further modelling is not considered warranted. The sensitivity assessment results and proposed approach were discussed with, and agreed by, Proof Engineering and Martinus on 13 August 2026.							

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APPENDIX E2

Staged Works Certification for HP3

Schedule 12 Consultant Certificate

Part A – Consultant's Statement of Conformance for Services

(clause 5.3 (b))

Date:	22 December 2025
Project:	Albury to Parkes Enhancement Project (A2P) (the Project) J2 – Kemp Street Bridge and Footbridge Flood (IFC)
Consultant:	Hatch Pty Ltd ABN 59 008 630 500
In relation to:	The contract between the Consultant and Martinus Rail Pty Ltd (MR) dated …18 March 2024…….with respect to the Project

1. This Statement of Conformance is given in relation to the Agreement.

2. The Consultant hereby certifies to MR that:

   a. the design calculations and drawings are agreed with the Designer; and

   b. it has provided a full and independent assessment of all factors influencing the final integrity of the specified components of the Works,

   c. it has reviewed the design calculations, models and drawings, and undertaken separate calculations for critical aspects of the Works,

   d. it has undertaken an independent detailed check of the Design Documentation,

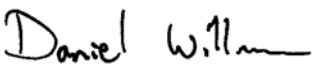
   e. it has provided all advice and comment, including calculations, in writing.

   Statement 2 above applies to the extent clarified in Section 3 and 4 on the following page.



……..

Signature of Authorised Person



……..

Signature of Witness

Darren Lyons

……..

Name of Authorised Person

Daniel Williams

……..

Name of Witness

Schedule 12 Consultant Certificate

Part A – Consultant's Statement of Conformance for Services

(clause 5.3 (b))

3. This statement of conformance applies to the following work packages only:

   a. J2 – Kemp Street Bridge and Footbridge Flood (IFC)

4. Statement 2 is limited to the degree at which the design and review has progressed at the relevant phase (SDR, PDR, DDR & IFC) and the information provided by Martinus.

   It confirms a complete and compliant assessment of the IFC design at Hold Point 3 for works associated with the substructure and superstructure design for the Kemp Street Bridge and Footbridge.

   Design works for the Kemp Street – Olympic Highway and Kemp Street – Ducker Street intersections and the approach roads to Kemp Street Bridge are subject to additional review prior to IFC. However, impacts associated with these works are relatively minor and can be addressed (if required) through further design modification prior to IFC.

   All proof engineering comments identified as part of our IFC review have been closed.



MARTINUS

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