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MARTINUS INLAND RAIL

FLOOD DESIGN REPORT

A2I | Albury to Illabo

Package: A2I – Pearson Street Bridge

CONTRACT NUMBER: 0052

PROJECT DOCUMENT NUMBER:

5-0052-210-IHY-W2-RP-0001

Document Control

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GLOSSARY

Specific terms and acronyms used throughout this plan and sub-plans are listed and described in Table 0-1 below.

Table 0-1: 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
CoA	Conditions of Approval
CO	Construct Only
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
GSDM	Generalised Short-Duration Method.
HF	Human Factors
I2S	Illabo to Stockinbingal
IFC	Issued for Construction
IR	Inland Rail
ITC	Incentivised Target Cost

Term	Definition
IV	Independent Verifier
Km	Kilometres
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
PMF	Probable Maximum Flood
PSR	Project Scope and Requirements
QDL	Quantitative Design Limits
RCP	Representative Concentration Pathway
REF	Review of Environmental Factors
RFI	Request for Information
RMAR	Rail Maintenance Access Road
S2P	Stockinbingal to Parkes
SA	Source Area
SAQP	Sampling, Analysis and Quality Plan
SDR	Systems Definition Review
SEMP	System Engineering Management Plan
TfNSW	Transport for New South Wales
TWL	Tail Water Level
UMM	Updated Mitigation Measures
V & V	Verification and Validation
WAD	Works Authorisation Deed
WBNM	Watershed Bounded Network Model
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)
- Junee Driver Platforms – JE11 and JE70
- 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

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

- Daroobalgie New Loop
- Wyndham Avenue (Track lowering)

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

- 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 F2M 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 Sites Description

This study conducts flood assessment for Pearson Street bridge (refer to Figure 1-1 below for the site location). The background and previous studies for the Wagga Wagga sites are listed in Section 1.6 below.

Figure 1-1: Site Location

1.3.1 Background

The Pearson Street bridge track lowering works form part of the Albury to Illabo Section works at Chainage (CH) 523.500km. Pearson Street connects the Glenfield Road/Urana Street intersection to the south and Dobney Ave/ Pearson Street to the north, providing safe traffic crossing over the railway track. The proposed solution is to lower the existing railway track to provide a vertical clearance of 7.1m under the Pearson Street bridge to allow the passage of double-stack rail traffic underneath the bridge.

1.4 Objectives

This report has been prepared to support the delivery of the track lowering at Pearson Street bridge and comply with the CSSI Condition of Approval and updated mitigation measures for quantitative flood modelling demonstrating compliance with pre- and post- development criteria. This Issued For Construction (IFC) stage report provides a flood impact assessment for the Issued For Construction (IFC) stage design. 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 outside of the project boundary.

1.5 Scopes

The scope of this study includes:

- Carrying out the flood assessment for the design in the IFC stage for design events of 10%, 5%, 2%, 1% AEPs, 1% AEP with Climate Change and PMF.
- Carrying out a sensitivity flood assessment for a revised IFC design for design events of 1% AEP (refer to Section 1.10).
- Checking flood assessment results against the criteria, including flood impact and flood immunity.
- Proposing any mitigation measures (if required).

1.6 Previous Studies

1.6.1 Flood Studies

Table 1-1 summarises all the flood studies associated with the Wagga Wagga area.

Table 1-1: Summary of the Previous Flood Studies

Item No.	Flood Study	Description	Comments
1	Wagga Wagga Major Overland Flow Flood Study (WMAwater, 2011)	This flood study provided detailed local design flooding information for an area of 167 km^2 on a 5m grid resolution. The hydrologic and hydraulic (Watershed Bounded Network Model (WBNM)/TUFLOW) modelling system was utilised, calibrated and validated for historical events. ARR1987 was adopted.	-
2	Wagga Wagga Major Overland Flow Floodplain Risk Management Scoping Study – Final Report (WMAwater, 2012)	This study was conducted to contextualise findings from item 1 before a Floodplain Risk Management Study commenced and recommendations were made.	-
3	Wagga Wagga Major Overland Flow Model Update Report (WMAwater, 2015)	This flood study updated the flood models originally established in item 1 by adopting the recommendations from item 2.	-
4	Wagga Wagga Revised Murrumbidgee River Floodplain Risk Management Study and Plan (WMAwater, 2018)	This study and plan assessed and ultimately recommended a broad range of mitigation options to manage flood risk in Wagga Wagga due to Murrumbidgee River flooding.	-
5	Wagga Wagga Major Overland Flow Floodplain Risk Management Study and Plan (MOFFS) (WMAwater, 2021)	This study and plan updated the hydrology and hydraulic models used in Items 1 and 3. ARR2019 has been used. The ARR2019 flood level results have been compared against the ARR1987 ones and it showed that flood levels in ARR2019 is 0.05 m - 0.3m higher than the ones from ARR1987. Therefore, ARR2019 is adopted as ARR1987 methodologies are likely to underestimate the flood risk throughout overland catchment areas. It is noted that ARR2019 flood extents remain largely unchanged compared with ARR1987 results.	TUFLOW and WBNM models in MOFFS were adopted and updated in this flood assessment. The TUFLOW model parameters can be found in Table 4-2.

1.6.2 Reference Design

The prior Reference Design report prepared by WSP is:

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

There is no detailed flood modelling within the report. The Reference Design report stated that the site was not impacted by major flooding from the Murrumbidgee River. There is, however, major localised flooding in the vicinity of the existing Glenfield Drain (CH523.560km) and Council's drainage system, which incorporates a series of attenuation basins upstream of the rail corridor. During the 1% and 2% AEP events, overtopping is found near Pearson Street bridge at Culvert CH523.737 km, but water redirects to Glenfield Drain and does not overtop the rail east of the bridge.

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)

As stated in the EIS report, the enhancement site is not affected by regional flooding from the Murrumbidgee River up to and including the PMF flood event (refer to Figure 1-2) and is not affected by overland flooding up to and including the 1% AEP flood event (refer to Figure 1-3).

For the Reference design used in the EIS assessment, an upstream bund is proposed to provide a 1% AEP flood immunity to the lowered track. The proposed works do not change the existing flood conditions. As there are no changes to flood conditions or hydraulic function of the floodplain, there are no or negligible changes in flow velocities.

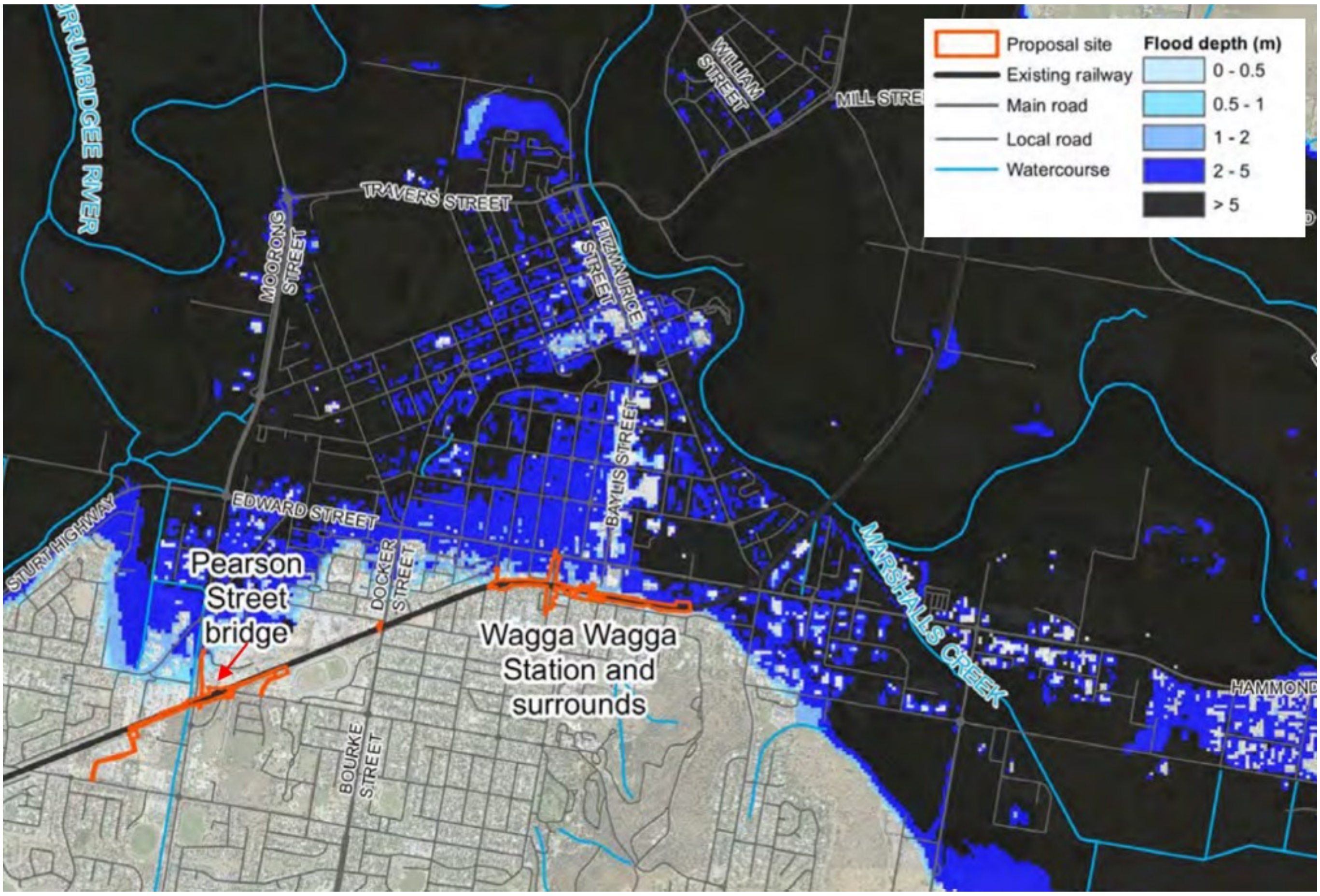


Figure 1-2: PMF Regional Flooding (Image source: Albury to Illabo EIS Technical Paper 11 (July 2022))

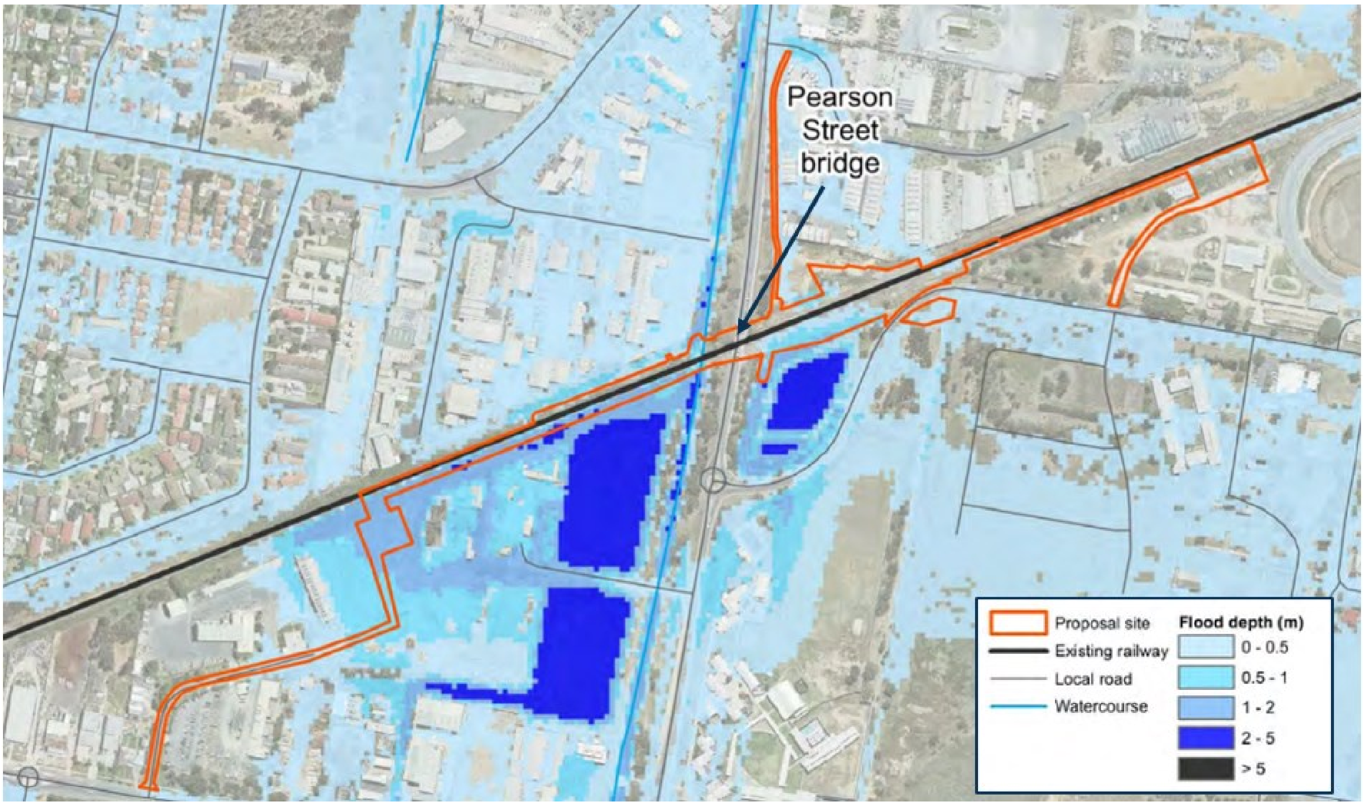


Figure 1-3: 1% AEP Local Flooding (Image source: Albury to Illabo EIS Technical Paper 11 (July 2022))

1.7 Purpose and Requirements

The primary purpose of this DDR flood assessment report is to describe how the design development and the associated review process will and is being managed.

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 the ARTC review, Appendix D for the 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:

- Wagga Wagga Major Overland Flow Floodplain Risk Management Study and Plan (WMA Water, 2021). This flood study supersedes the other flood study listed in Table 1-1 as it's the most recent flood study.
- Albury to Illabo (A2I) and Stockinbingal to Parkes (S2P) Projects Reference Design Report – Wagga Wagga (WSP, June 2022), 2-0008-210-PEN-03-RP-0002
- Albury to Illabo Environmental Impact Statement (EIS) Technical Paper 11 – Hydrology, flooding and water quality (WSP, July 2022), 2-0008-210-EAP-00-RP-0010

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

1.9.1 Input Data

Table 1-2 outlines the available information relevant to the site and used for flood modelling.

Table 1-2: Available Information

Item	Information	Type	Description / Comments
General			
1	Flood model used in Wagga Wagga Major Overland Flow Floodplain Risk Management Study and Plan (WMAwater, 2021)	TUFLOW model in GDA94 projection	Received from ARTC on 29/08/2023
2	Hydrology model used in Wagga Wagga Major Overland Flow Floodplain Risk Management Study and Plan (WMAwater, 2021)	WBN** (PMF for GSDM* only, 0.2% AEP, 0.5% AEP, 1% AEP, 2% AEP, 5% AEP, 10% AEP, 20% AEP)	Received on 29/08/2023 The WBN model files (refer to DJV RFI-007). PMF (Probable Maximum Flood) for GSDM* only, 0.2% AEP, 0.5% AEP, 1%AEP, 2% AEP, 5% AEP, 10% AEP, 20% AEP WBN files received include a single temporal pattern for durations 120 minutes, 360 minutes and 720 minutes for events 0.2% AEP, 0.5% AEP, 1% AEP, 2% AEP, 5% AEP, 10% AEP, 20% AEP and 90 minutes & 180 minutes for PMF
3	Additional GIS files with Indirectly Connected Area (ICA) and catchment data related to Hydrology.	GIS files	Received from Wagga Wagga City Council on 22/11/2023 as part of the response to RFI 020
4	LiDAR 2020 (The data used to create this DEM has an accuracy of 0.3m (95% Confidence Interval) vertical and 0.8m (95% Confidence Interval) horizontal)	TIF format in 1m resolution in GDA2020 projection	Downloaded from https://elevation.fsdf.org.au/ on 26/09/2023
5	LiDAR 2015 and High-Resolution Aerial Imagery. The data derived points have an accuracy of 0.15m (68% confidence interval) ARTC LiDAR	TIF format in 1m resolution in GDA94	The existing 1m LiDAR (provided by ARTC) was received from Martinus on 12/11/2024. However, the LiDAR2020 (item 4) is newer and in GDA2020. Therefore, only LiDAR 2020 (item 4) is used.
Site Specific			
6	5-0052-210-ISV-W2-MD-0001-PEARSON_STREET_FEATURE_SURVEY.dwg	DWG CAD file	Site Survey in the GDA94 projection received from ARTC on 13/10/2023
7	PEARSONS EXISTING RAIL.12daz	12daz	Existing rail received on 13/10/2023
8	A2P PSN EXT GDA20Z55 COMBINED_250710.12da	12da	Drainage survey and Topography survey received from Martinus on 10/07/2025
9	5-0052-210-CAL-W2-MD-0001-PEARSON_STREET_BRIDGE_3D_RAIL_DESIGN_STRINGS_DWG.dwg	DWG	IFC track design received from DJV Track Team on 25/08/2025
10	5-0052-210-CDR-W2-MD-0005-PEARSON_STREET_BRIDGE_3D_DRAINAGE_DESIGN_STRINGS_12DA.12da	12da	IFC Drainage design received from the DJV Drainage team on 12/12/2025
11	PEARSON ST BRIDGE W2 CIVIL DEM 0.2m grid - IFC - new pit and pipe at signal loc.dem	DEM	IFC Civil Design received from the DJV Civil Team on 12/12/2025
12	210 SBD W2 MD TOP 0.1m grid.dem 210 SBD W2 MD TOP.dwg	DEM and DWG	IFC Deflection Wall design received from the DJV Civil Team on 25/09/2025
13	PEARSON ST BRIDGE W2 CIVIL DEM 0.2m grid - IFC - 20260115.dem	DEM	Revised IFC Civil Design received from the DJV Civil Team on 15/01/2026
14	5-0052-210-CDR-W2-MD-0005-PEARSON_STREET_BRIDGE_3D_D	12da	Revised IFC Drainage design received from the DJV Drainage team on 15/01/2026

Item	Information	Type	Description / Comments
General			
	RAINAGE_DESIGN_STRINGS_12D A.12da		

*: GSDM stands for Generalised Short-Duration Method.
** "WBN" is the extension of the WBNM file.

1.10 Revised IFC Design Sensitivity

1.10.1 Model Update

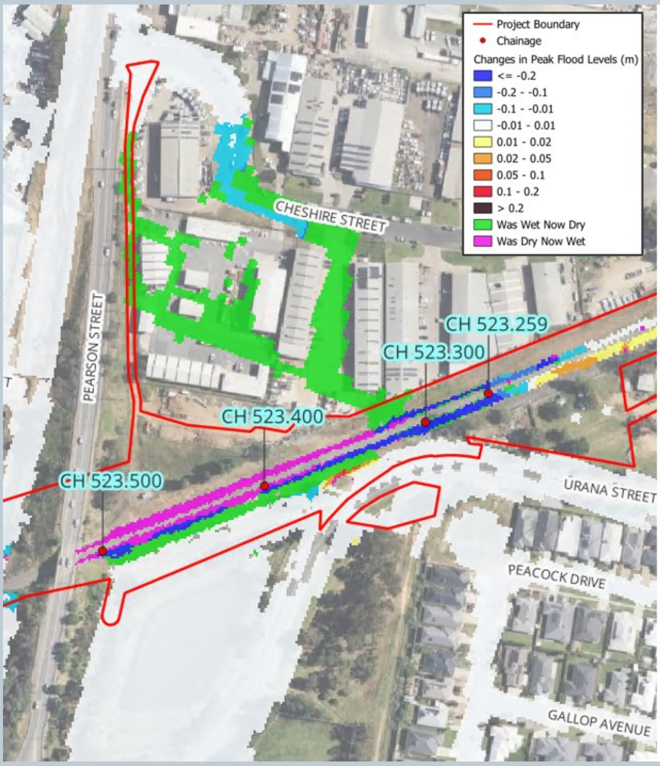
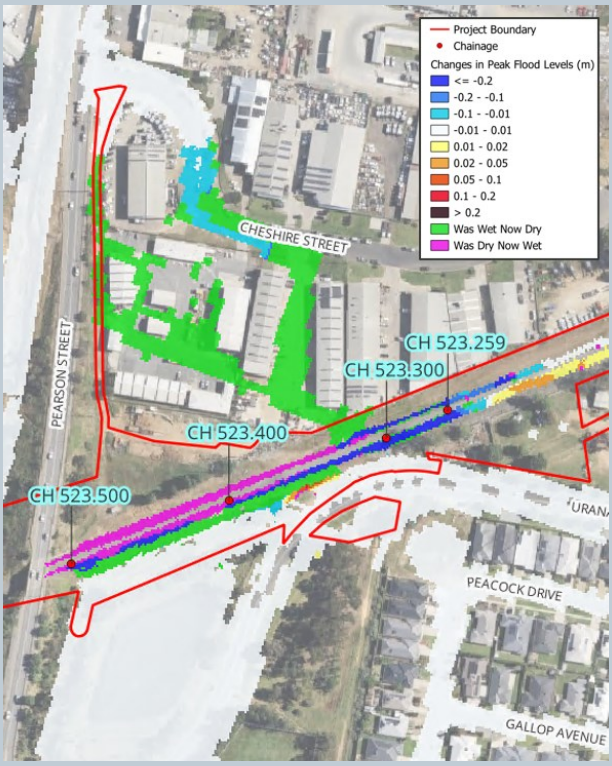
A sensitivity analysis was made to assess the flooding condition for the Pearson Street bridge based on the updated IFC design. The updates include:

- Updated drainage alignment at CH523.325km (Table 1-2 Item 13)
- Widening the cess drain from CH523,309.500km to CH523,324.500km by 0.2m on the southern side to fit for the drainage alignment above by (Table 1-2 Item 14).

1.10.2 Assessment

Storm events of the 1% AEP and 1%AEP with climate change have been run for the revised IFC Design sensitivity analysis. The results show that the above design update results in negligible changes in flood results. Only less than 10mm flood level differences (flood level in IFC revised design vs. flood level in IFC design, refer to Table 1-4) are identified within the cess drain between CH523,309.500km to CH523,324.500km. Refer to Table 1-3 for the IFC sensitivity analysis results comparison between IFC and IFC revised design stages

Table 1-3: Revised IFC Sensitivity Analysis Results Comparison (Design - Existing)

IFC	IFC Revised
Changes in Flood Level - 1% AEP Storm Event	
	

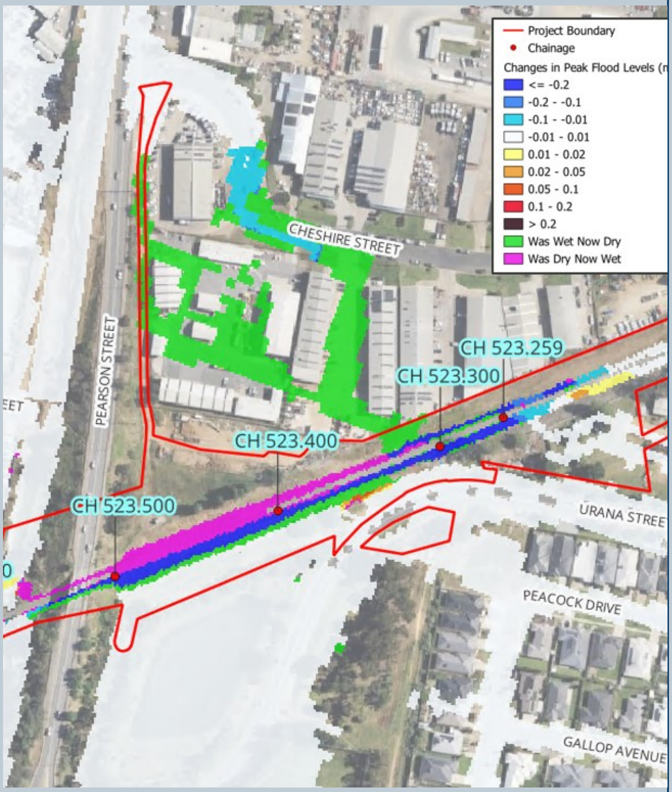
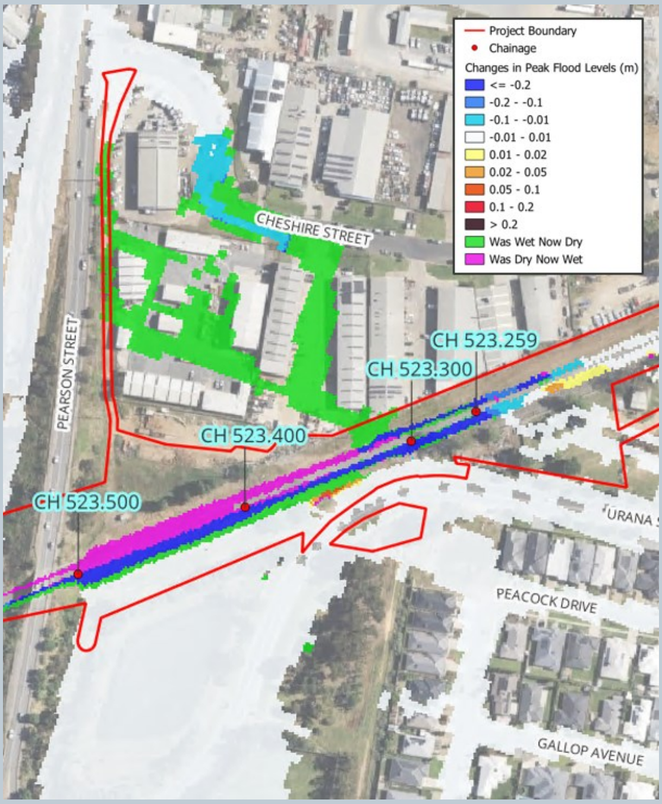
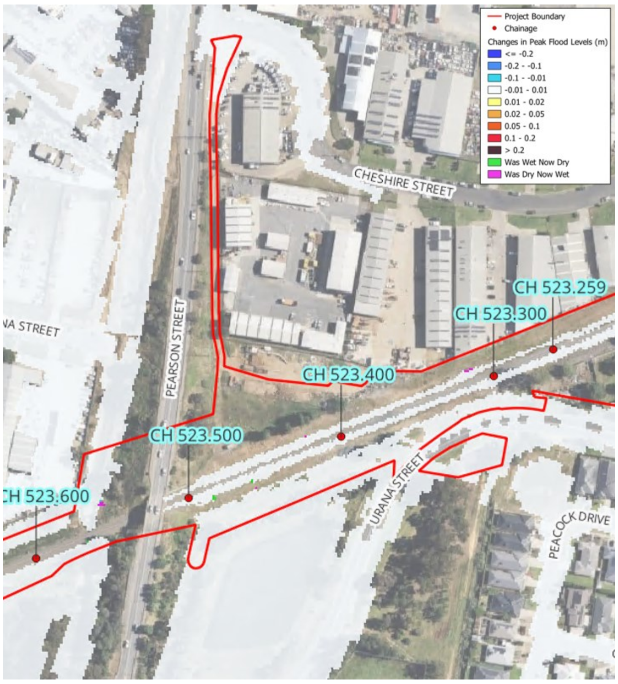
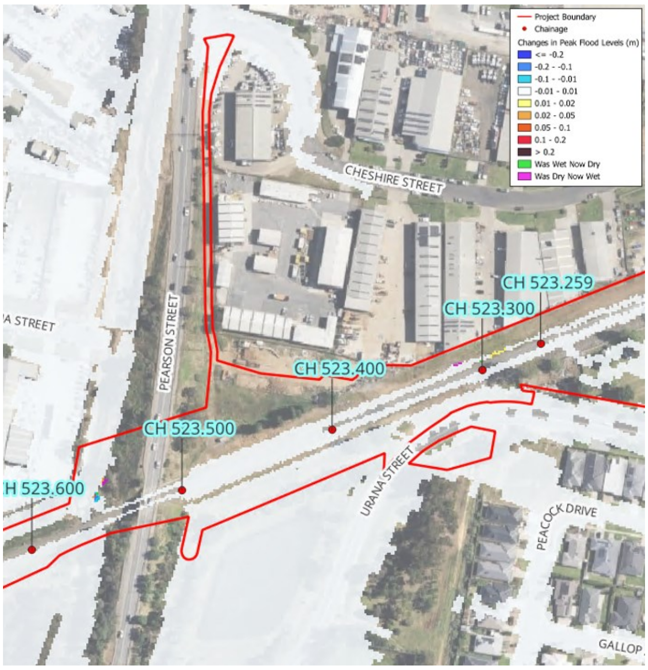
IFC	IFC Revised
Changes in Flood Level - 1% AEP Climate Change Storm Event	
	

Table 1-4: IFC Sensitivity Analysis Results Comparison (IFC Revised Design – IFC Design)

Changes in Flood Level - 1% AEP Storm Event	Changes in Flood Level - 1% AEP Climate Change Storm Event
	

1.10.3 Findings

- For the revised IFC assessment of the 1% AEP and 1%AEP with climate change, it shows negligible differences in terms of the changes when comparing with IFC (Refer to Table 1-4). Therefore, it would not identify any non-compliance in the other events.
- Therefore, it is not necessary to re-run the whole flood events (PMF, 0.05% AEP, 1%AEP, 2% AEP, 5% AEP and 10% AEP) for Pearson Street due to such minor changes.

Given that the changes in the revised IFC design are minimal compared to the IFC design, the flood assessment will not result in any non-compliance. Therefore, the flood assessment results and maps from the IFC stage will be utilised to inform the IFC flood assessment from Section 2 onwards.

1.11 Outputs

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

1.12 Limitations and Assumptions

The following limitations and assumptions are applied to the Pearson Street Bridge site.

- The site is not subject to regional flooding as per the EIS (Technical Paper 11, Hydrology, Flooding and Water Quality, Albury to Illabo Environmental Impact Statement).
- An assessment of temporary works and staging has not been undertaken as it is out of the flooding scope.
- Blockage assessment is carried out for the 1% AEP design scenario as per the guidance set out in ARR2019 for the culverts within the project boundary, while 20% blockage is adopted for all the other culverts, pits and pipes outside the project boundary.

2 COMPLIANCE WITH REQUIREMENTS

2.1 Project Scope and Requirements

Assessment of the IFC design to see if it meets the Project Scope and Requirements (PSRs) has been undertaken. This is demonstrated throughout the flood assessment with Table 2-1 below summarising the Pearson Street Bridge's Design Compliance with the PSRs.

Table 2-1: 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 waterway flow)
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.	The ARTC minimum requirement is 1% AEP, and the top of track is not overtopped in 1% AEP in the existing scenario. Thus 1% AEP will be adopted as the existing rail immunity. The existing immunity is 1% AEP and is maintained under design conditions. Refer to Section 6.3.
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.	The ARTC minimum requirement is 1% AEP, and the top of track is not overtopped in 1% AEP event in the existing scenario. Thus, 1% AEP will be adopted as the existing rail immunity. The existing immunity is 1% AEP and is maintained under design conditions. Refer to Section 6.3.
Project Wide	5.4.5	Bridge and culvert hydraulics shall comply with Austroads Guide to Bridge Technology Part 8: Hydraulic Design of Waterway Structures.	There are no other waterway structures within the Pearson Street bridge scope and the Pearson Street bridge itself is not a waterway bridge.
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.	Climate Change assessment was carried out by running the 1% AEP + 2090 RCP 8.5 and identifying that the bridge has low hazards. Refer to Section 6.3.
A2I Technical Requirements	IR-SR-A2I-349	The Corridor System for Enhancement Corridors shall have a flood immunity of no worse than existing.	The existing immunity is maintained under design conditions. Refer to Section 6.3.
A2I Technical Requirements	IR-SR-A2I-350	The Corridor System, where the existing track is lowered, shall maintain the existing flood immunity.	The existing immunity is maintained under design conditions. Refer to Section 6.3.
A2I Technical Requirements	IR-SR-A2I-352	The Corridor System shall prevent damage of the formation due to ponding of water.	No ponding of water. Existing Immunity is maintained. Proposed condition accommodates channels and additional drainage pipes to drain the site. Refer to Sections 6.2 & 6.3.

Requirement	Identifier	A2P Technical Requirements Description	Compliance Evidence Reference
			Refer to Drainage Design (5-0052-210-CDR-W2-DR-0101 and 5-0052-210-CDR-W2-DR-0102)
A2I Technical Requirements	IR-SR-A2I-458	The Corridor System shall prevent ponding in longitudinal open channels.	The proposed channels have culvert outlets which prevent ponding. Refer to Drainage Design (5-0052-210-CDR-W2-DR-0101 and 5-0052-210-CDR-W2-DR-0102)
A2I Technical Requirements	IR-SR-A2I-459	The Corridor System for Enhancement Corridors shall provide mitigation for flood impacts no worse than existing condition.	Existing condition is maintained. Refer to Section 6.3.
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.	Existing condition is maintained. Refer to Section 6.4.
A2I Technical Requirements	IR-SR-A2I-465	The Corridor System shall minimise changes to the existing or natural flow patterns.	Existing condition is maintained. Refer to Section 6.2 & 6.3.
A2I Technical Requirements	IR-SR-A2I-541	The Structures System new underbridges shall withstand the 0.05% annual exceedance probability design flood event.	N/A (there is no bridge design structure in this package)
A2I Technical Requirements	IR-SR-A2I-735	The Third-Party System private roads shall have flood immunity no worse than existing.	No third-party private roads are impacted.
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 2-2.
Wagga Wagga City Council MIRDA Special Conditions – 'Pearson Street Road Bridge'	(I)	ARTC agrees to construct an ARTC second bund resulting in the rail line being put in a trough (as further detailed in the Works Description).	Compliant. Two bunds were provided: one on each side of the track lowering area (Refer to 4.2.2)

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 Table 2-2 below.

Table 2-2: 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 6.
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 6.
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 Sections 4 and 6.

Condition	Condition or Criteria	Compliance Evidence Reference
E40	a) Hydrologic and hydraulic assessments consistent with *Australian Rainfall and Runoff – A Guide to Flood Estimation* (GeoScience Australia, 2019);	Compliant. Refer to Sections 4
E40	b) Use of modelling software appropriate to the relevant modelling task;	Compliant. Sections 4 shows that the appropriate software (TUFLOW) was used.
E40	c) Field survey of the existing rail formation and rail levels, should be included within the models; and	Compliant. The existing rail level was used to inform the flood immunity. Refer to Section 6**.**
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 Pearson Street bridge. Refer to the Wagga Yard Flood design report (5-0052-210-IHY-W7-RP-0001) for confirmation of predicted afflux at industrial properties.
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 shall be provided to IR, through this submission, for 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 is undertaken by the Proof Engineer's specialist contractor, who satisfies and complies with the requirements of A16. Consultation with Council and other stakeholder is being undertaken through a formal review of this Flood Design Report.
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:	See items below
E42	(a) a maximum increase in inundation time of one hour, or 10%, whichever is greater;	Compliant. Refer to Section 6.4.4.
E42	(b) a maximum increase of 10 mm in above-floor inundation to habitable rooms where floor levels are currently exceeded;	Compliant. No flood level increase of 10mm in above-floor inundation on any properties. Section 6.4.1.
E42	(c) no above-floor inundation of habitable rooms which are currently not inundated;	Compliant. No increase for above floor inundation of habitable rooms on any properties. Refer to Section 6.4.1.
E42	(d) a maximum increase of 50 mm in inundation of land zoned as residential, industrial or commercial;	Compliant. No flood level increase of more than 50mm in residential, industrial and commercial areas. Refer to Section 6.4.1
E42	(e) a maximum increase of 100 mm in inundation of land zoned as environment zone or public recreation;	Compliant. No flood level increase of more than 100mm in the environment zone or public recreation (Refer to Section 6.4.1)
E42	(f) a maximum increase of 200 mm in inundation of land zoned as rural or primary production, environment zone or public recreation;	Compliant. No flood level increase of more than 200mm in rural or primary production, environment zone or public recreation (Refer to Section 6.4.1)

Condition	Condition or Criteria	Compliance Evidence Reference
E42	(g) no increase in the flood hazard category or risk to life; and	Compliant (Refer to Section 6.4.3)
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 6.4.2). 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.
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.
E43	A **Flood Design Report** confirming the:	
E43	a) final design of the CSSI meets the requirements of **Condition E42;** and	Compliant (refer to Section 6)
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 in order 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 E47.**	Local drainage flow regime, catchment area and imperviousness remain the same as per 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 Wagga Wagga City 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-W2-RP-0001.

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 Table 2-3 below.

Table 2-3 Updated Mitigation Measures Compliance Table - Flooding

Condition	Condition or 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 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 the Pearson Street bridge site, and so is not relevant to the Wagga Wagga Yard enhancement site, Refer to Wagga Yard Flood design report (5-0052-210-IHY-W7-RP-0001) for predicted afflux at industrial properties. Compliant. Quantitative assessment has been undertaken. Refer to Section 6.
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 Pearson Street bridge site, and so is not relevant to the Riverina Highway track lowering site.

* QDL is superseded by CoA E42.

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

Key design changes between the Concept Design and the SDR Design are listed in Table 3-1.

Table 3-1: Design Differences Between Concept and SDR

Item	Difference	Reason for Change
1	Incorporation of existing condition survey	An existing condition survey was provided
2	Incorporation of Design Drainage	New drainage design
3	Incorporation of Civil Design	New civil design
4	Incorporation of Track Design	New track design

3.2 SDR to PDR

Key design changes between the SDR and PDR Designs are listed in Table 3-2.

Table 3-2: Design Differences Between SDR and PDR

Item	Difference	Reason for Change
1	Updated hydrology, which resulted in changes in critical durations for each AEP event.	Additional information (Item 3 of Table 1- 2) was provided on hydrology.
2	Incorporation of the latest existing condition survey (Point cloud data)	An updated existing conditions survey was undertaken
3	Incorporation of Design Drainage	Updated PDR Drainage Design for Pearson Street Bridge
4	Incorporation of Civil Design	Updated PDR Civil Design for the Pearson Street Bridge

3.3 PDR to DDR

Key design changes between the PDR and DDR Designs are listed in Table 3-3.

Table 3-3: Design Differences Between PDR and DDR

Item	Difference	Reason for Change
1	Incorporation of the latest existing condition topography survey	An updated existing conditions survey was undertaken (Item 8 in Table 1-2)
2	Incorporation of the latest existing drainage survey	An updated existing drainage survey was undertaken (Item 8 in Table 1-2)
3	Incorporation of Design Drainage	Updated IFC Drainage Design for Pearson Street Bridge (Item 10 in Table 1-2)
4	Incorporation of Civil Design	Updated IFC Civil elements including ballast, bund and deflection wall design for the Pearson Street Bridge (Item 11 and 12 in Table 1-2)
5	Incorporation of Track Design	Updated IFC Track Design for the Pearson Street Bridge (Item 9 in Table 1-2)

3.4 DDR to IFC

Key design changes between the DDR and IFR Designs are listed in Table 3-4.

Table 3-4: Design Differences Between DDR and IFC

Item	Difference	Reason for Change
1	Updating sections and text throughout the report	To address comments
2	Conducted sensitivity analysis based on revised IFC design and survey (Refer to section 131.10)	- Updated drainage alignment at CH523.325km (Table 1-2 Item 13) - Widening the cess drain from CH523,309.500km to CH523,324.500km by 0.2m on the southern side to fit for the drainage alignment above by (Table 1-2 Item 14).

4 MODELLING METHODOLOGY

The overall approaches for flood modelling are listed below:

- Utilise the hydrological model and generate flow hydrographs for input to the hydraulic model for all events to perform critical duration analysis.
- Update the received TUFLOW model by incorporating the latest LiDAR (Section 4.2.1) and survey. Use the updated TUFLOW model to predict hydraulic behaviour, which will be formed as the existing model for this study.
- The updated existing condition TUFLOW model results and compare against the received model results (refer to Section 5).
- Update the TUFLOW model from the existing condition to the master design condition model by incorporating the Pearson Street bridge design into the existing model.
- Incorporate the IFC Pearson Street Bridge design(5-0052-210-IHY-W2-RP-0001), IFC Wagga Wagga Yard design (5-0052-210-IHY-W7-RP-0001), DDR Cassidy Parade (5-0052-210-IHY-W4-RP-0001), IFC Wagga Mothers footbridge design (5-0052-210-IHY-W8-RP-0001) and IFC Edmondson Street Bridge and Footbridge design (5-0052-210-IHY-W5-RP-0001) into the Master Design condition to understand the cumulative impact on the site (Refer to Section 6.4.5).
- Conduct a Climate Change Sensitivity Assessment for the 1% AEP to inform the potential impact on the railway track flood immunity.
- Conduct a blockage assessment as per ARR 2019 procedures.

4.1 Hydrologic Modelling

The WBNM (City Catchment) was utilised to generate flow hydrographs for input to the hydraulic model. The hydrology model covers Glenfield Drain (CH523.560km) as well as the Wagga Wagga CBD and outer areas lying on the southern Murrumbidgee River floodplain. Refer to Figure 4-1 for the sub-catchment extents of the hydrology model.

As stated in Item 2, Table 1-2, only WBN running files generated by the Storm Injector were received, and those files could not be run directly through the WBNM software due to the lack of ICA and geometry. To produce the inflow hydrographs for critical duration analysis, Storm Injector HL (V 1.3.9.0) was used alongside the provided ICA and geometry data (Item 3, Table 1-2). However, generating identical hydrograph inflow values proved challenging. As a conservative approach, slightly higher inflow values (generally 0.0035 m3/s) than the received ones were created, which were then utilised in the hydraulic assessment. Table 4-1 presents a comparison between the received and adopted WBN files.

Flow hydrographs were generated for input to the hydraulic model for the 10% AEP, 5% AEP, 2% AEP, 1% AEP, and 1% AEP + Climate Change events to perform critical duration analysis (Refer to Table 4-1 in the Hydraulic modelling).

The PMF Hydrology model was based on the ARR1987 guidelines. This was then updated as per ARR2019 guidelines incorporating an ensemble of 11 temporal patterns for GSDM PMF from 15 minutes to 180 minutes.

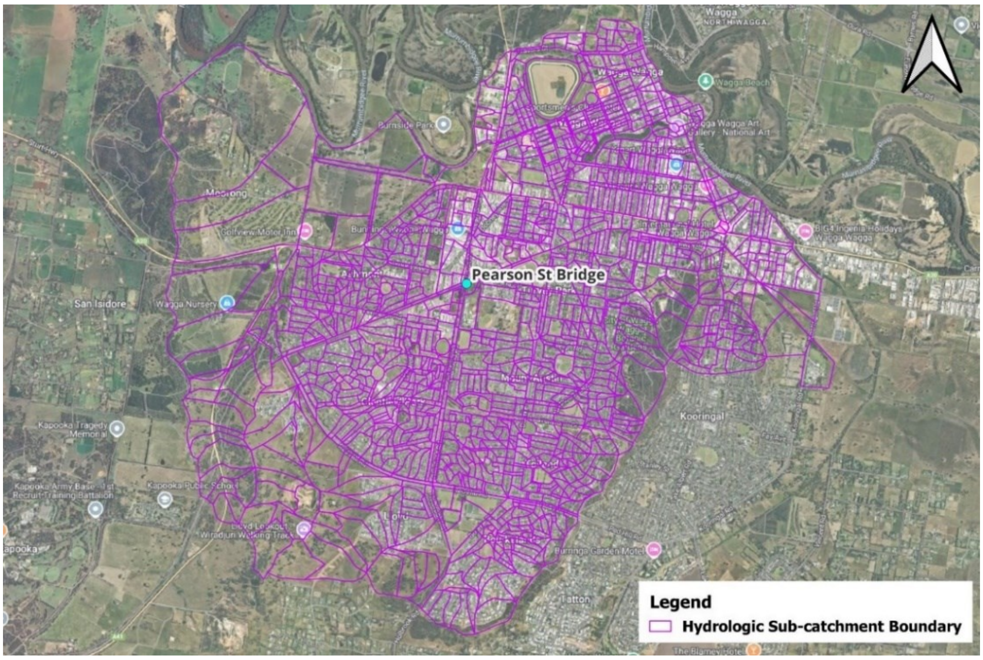


Figure 4-1: Hydrologic Sub-catchment Boundary

Table 4-1: Model Parameters of Hydrology Model

Parameters	Received Hydrology Model	Adopted Hydrology Model
Hydrology model and version	WBNM model (V2017) with WBN files	WBNM model (V2017) using Storm injector HL (V 1.3.9.0).
Total catchment area	3835 ha (38.35 km^2).	3835 ha (38.35 km^2).
Events	PMF, 0.2% AEP, 0.5% AEP, 1% AEP, 2% AEP, 5% AEP, 10% AEP, 20% AEP	1% AEP + Climate Change, 1%AEP, 2% AEP, 5% AEP, 10% AEP, PMF
Duration Temporal pattern received/generated	Single temporal pattern for durations 120 minutes, 360 minutes and 720 minutes for all events 90 minutes and 180 minutes for PMF	Ensemble temporal pattern for duration ranging from 30 minutes to 360 minutes
Indirectly Connected Area (ICA)	Utilised received inflow hydrographs for events 1%AEP, 2% AEP, 5% AEP and 10% AEP which had ICA included.	The hydrology model was updated with relevant ICA values from the data received from the Wagga City Council (item 3 in Table 1-2) and relevant inflow hydrographs for the hydraulic models were generated. These inflow hydrographs were then used in the model for the flood assessment.

4.2 Hydraulic Modelling

4.2.1 Existing Model Update

The existing model was updated based on the received TUFLOW from MOFFS (WMAwater, 2021) mentioned in Section 1.6.1. A summary of the received model and updated model parameters can be found in the table below.

Table 4-2: Model Parameters in the Updated Existing Model and MOFFS 2021 TUFLOW Model

Parameters	MOFFS 2021 Model	Updated TUFLOW Model
Build	TUFLOW 2018-03-AC HPC	TUFLOW.2020-10-AF HPC (Refer to Section 4.2.1.2– “TUFLOW model version and grid size” for more details)
Coordination Reference System (CRS)	GDA94 MGA 55	GDA2020 MGA 55
Grid Size	5m	1.25m within the quadtree area (Site area) and 5m outside of the quadtree area (Refer to Figure 4-5). (Refer to Section 4.2.1.2 for more details)
Hydrology	WBNM ARR2019	WBNM ARR2019
Inflow type	SA Polygon	SA Polygon (Refer to Figure 4-2)
Key Structures	No bridge was included.	The existing Cassidy footbridge, Edmondson Street Bridge and Wagga Wagga footbridge abutment was represented in the model.
Extent	Wagga Wagga’s central business district (CBD) and surrounding regions are situated along the southern floodplain of the Murrumbidgee River	Wagga Wagga’s central business district (CBD) and surrounding regions are situated along the southern floodplain of the Murrumbidgee River
Downstream Boundary	Dynamic downstream water boundary (HX) and slope boundary (HQ)	Dynamic downstream water boundary (HX) and slope boundary (HQ)
Timestep	Dynamic	Dynamic
Building Representation	Null polygon	Null polygon
Topography	1 m resolution LiDAR collected in 2008	1 m resolution LiDAR collected in 2008

Parameters	MOFFS 2021 Model	Updated TUFLOW Model
	5 m x 5 m resolution photogrammetry was obtained from Geoscience Australia – Elevation Information System (ELVIS) 2014 LiDAR was used for two basins upstream of Jubilee Park on Bourkelands Drive	5 m x 5 m resolution photogrammetry was obtained from Geoscience Australia – Elevation Information System (ELVIS) 2014 LiDAR was used for two basins upstream of Jubilee Park on Bourkelands Drive 2020 LiDAR for sites Site survey and verified cloud point data (Refer to Item 6, 7 and 8 in Table 1-2)
Roughness	Pasture: 0.045 1D cross section elements: 0.040 Lots: 0.060 Ponds and other water bodies: 0.030 Newly built/resurfaced road: 0.018 Industrial: 0.070 Roads: 0.022 Creek permanent water: 0.040 Vegetation: 0.100 Vegetated creek: 0.080 Railway: 0.060 Select 1D cross section (crooked creek): 0.060	Pasture: 0.045 1D cross section elements: 0.040 Lots: 0.060 Ponds and other water bodies: 0.030 Newly built/resurfaced road: 0.018 Industrial: 0.070 Roads: 0.022 Creek permanent water: 0.040 Vegetation: 0.100 Vegetated creek: 0.080 Railway: 0.060 Select 1D cross section (crooked creek): 0.060 Design Channel: 0.035 Note: Some roughness areas in the site (the rail line) were refined
Design Events	PMF, 0.2% AEP, 0.5% AEP, 1% AEP, 2% AEP, 5% AEP, 10% AEP, 0.2 EY	PMF, 1% AEP + Climate Change, 1%AEP, 2% AEP, 5% AEP, 10% AEP

The model extent encompasses Wagga Wagga's central business district (CBD) and surrounding regions situated along the southern floodplain of the Murrumbidgee River, spanning an area of approximately 42 km^2 (Refer to Figure 4-2).

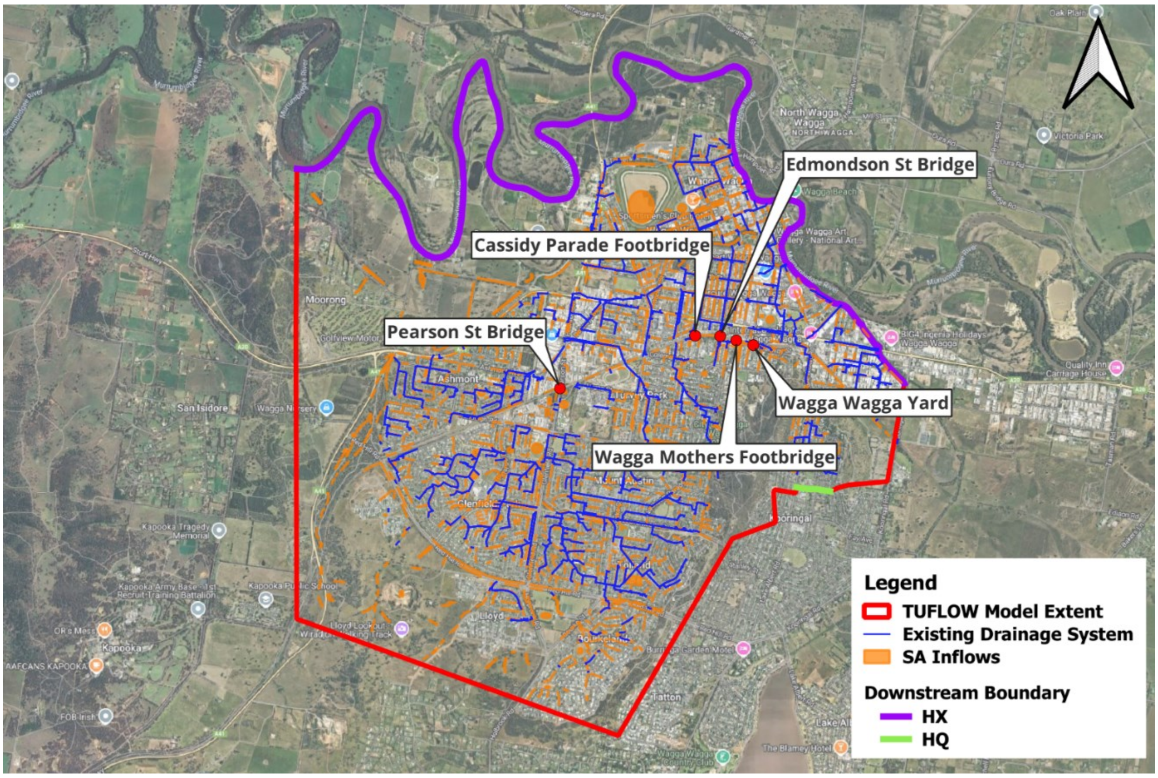


Figure 4-2: TUFLOW Model Extent

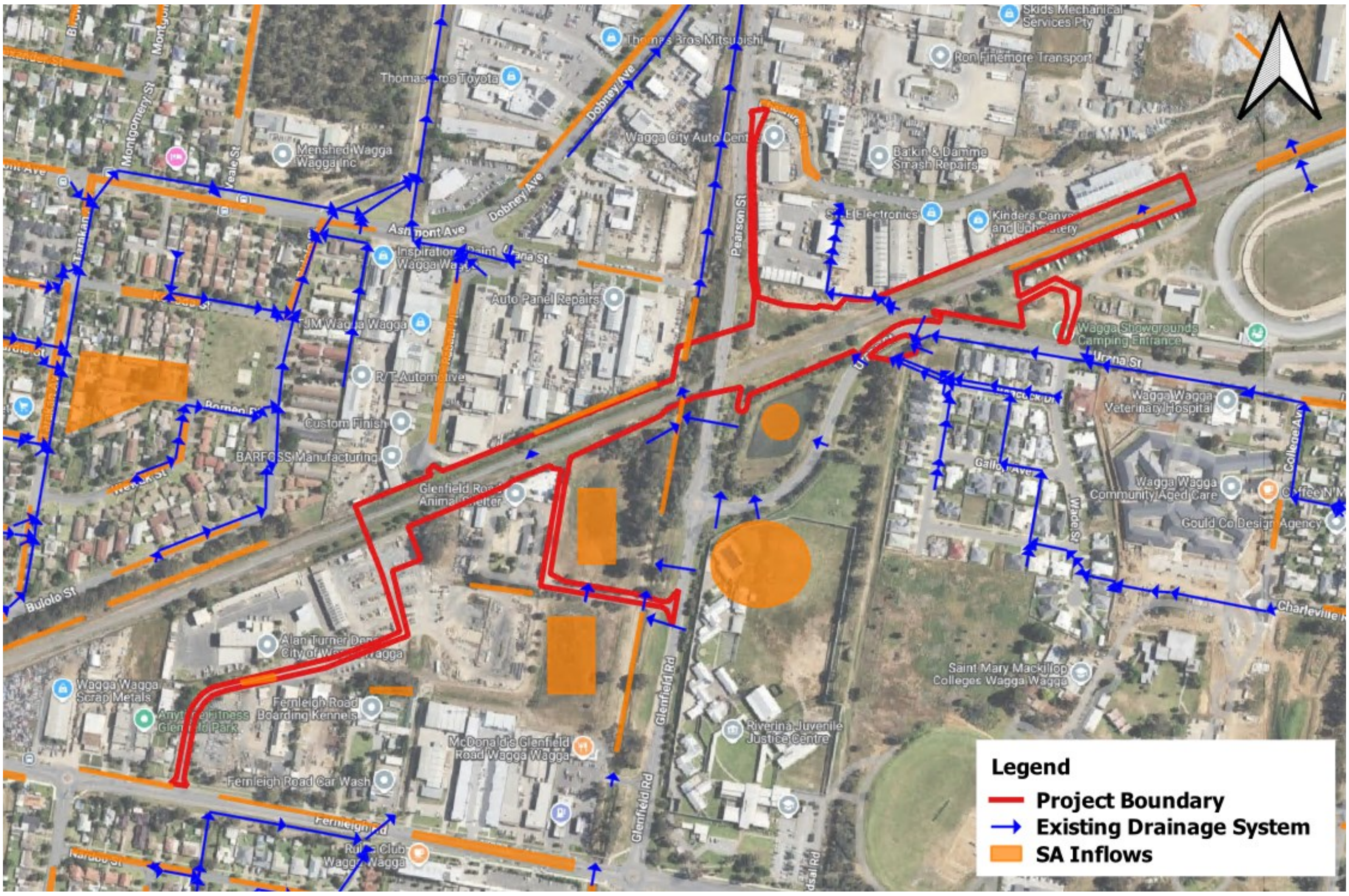


Figure 4-3: Pearson Street Bridge (Zoomed in)

4.2.1.1 GDA 2020 conversion

The conversion to the Geocentric Datum of Australia 2020 (GDA2020) represents a crucial update to modernise and align the model with the latest geodetic standards and reference systems and to meet project requirements on the CRS. The model layers and the rasters were converted into GDA2020 Map Grid of Australia (MGA) 55 from GDA94 MGA 55.

4.2.1.2 TUFLOW model version and grid size

The initial 5-meter grid size and TUFLOW 2018-03-AC HPC was adopted in the MOFFS 2021 TUFLOW model. However, a 5m grid was found to be insufficient to model the detailed specific requirements of the study area. Consequently, a more refined grid size is required. The application of a finer grid to the whole model extent is not cost-effective in terms of the computation time, as the site areas are limited compared with the model extent. As such, the approach of applying a quadtree (only available in versions from 2020 onwards) with 1.25m to the site area is favoured.

2023-03-AC is the most up-to-date TUFLOW version at the time when the modelling was carried out. However, when running the model using the 2023-03-AC HPC, inconsistencies were noted near the site area, particularly at area 1 and area 2 (refer to Figure 4-4), in comparison to the results obtained from the 2018-03-AC HPC. Area 1, which is located near Pearson Street Bridge, experienced an increase of around 0.1 m in flood level, while area 2 (upstream of Wagga Yard) experienced an increase of around 0.5 m in flood level.

Following a series of tests, it was found that version 2020-10-AF HPC (the latest release prior to 2023) yielded results most similar to the results produced by the MOFFS 2021 model (2018-03-AC HPC), which is accepted by Wagga City Council (refer to Section 5 for more details). In Area 1 and 2, the flood levels were increased by around 0.02m and 0.15m.

Therefore, TUFLOW 2020-10-AF HPC with a quadtree of 1.25m grid was adopted for this study (Refer to Figure 4-5 for the adopted quadtree extent).

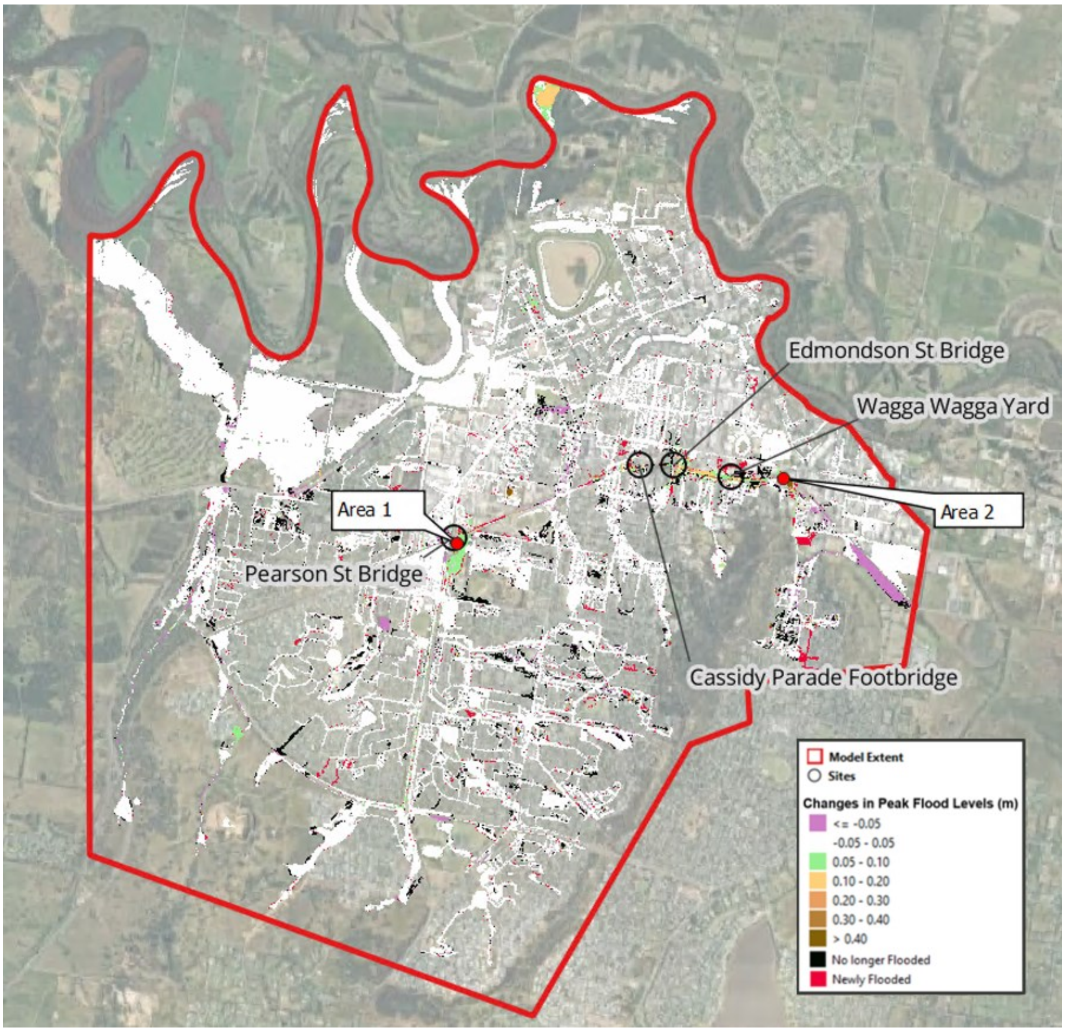


Figure 4-4: Discrepancies Between 2023-03-AC and 2018-03-AC TUFLOW Version Flood Levels

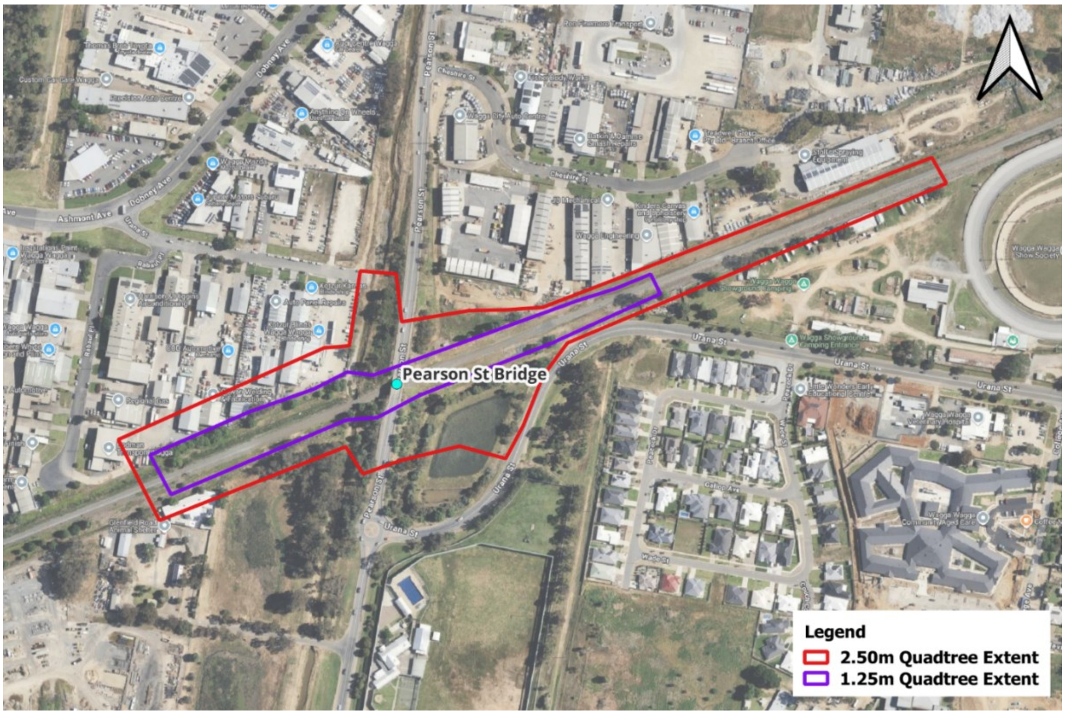


Figure 4-5: Quadtree Extent - Pearson Street Bridge

4.2.1.3 Topography

The model topography was updated by incorporating the 2020 LiDAR into site areas. The adopted 2020 LiDAR extents are shown in Figure 4-6. The model topography was updated by incorporating the site survey (Item 6, 7 and 8 in Table 1-2), This update was performed to enhance the accuracy of the model, ensuring a proper representation of the most recent topography within the study area.

Figure 4-6: LiDAR Extent

4.2.1.4 Key Structures

The following key structures were included in the model to accurately represent the existing condition of the site.

- Existing railway track levels
- The Glenfield Drain culvert (CH523.264km, 1 cell box culvert, W3.15m x H2.7m)
- The Pearson Street Bridge abutment

4.2.1.5 Drainage Network

Existing drainage networks (shown in Figure 4-7) were updated around the Pearson Street bridge area (based on item 10 in Table 1-2).

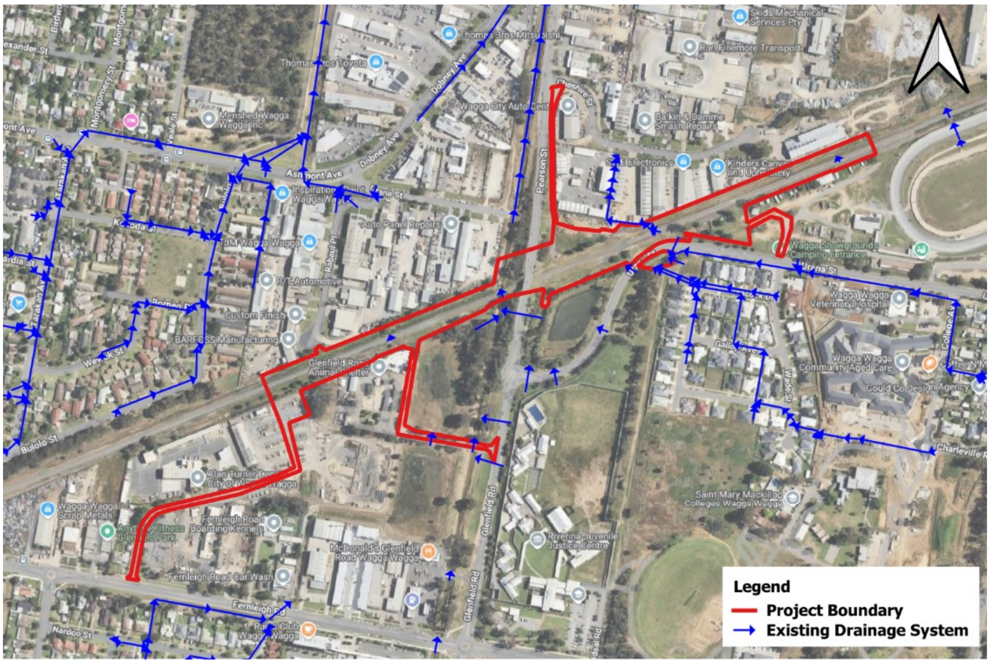


Figure 4-7: Existing Drainage Network

4.2.2 Design Model Update

To establish the model for design condition, further updates were undertaken to incorporate the Inland Rail Project Works as part of the IFC stage, including:

- Design land grading including bunds (Figure 4-8) and channel,
- Additional bunds far northeast of the site
- Design ballast formation,
- Design railway track; and
- Design drainage pit and pipes.
- Design deflection wall

These localised amendments to the model are shown in the figure below.

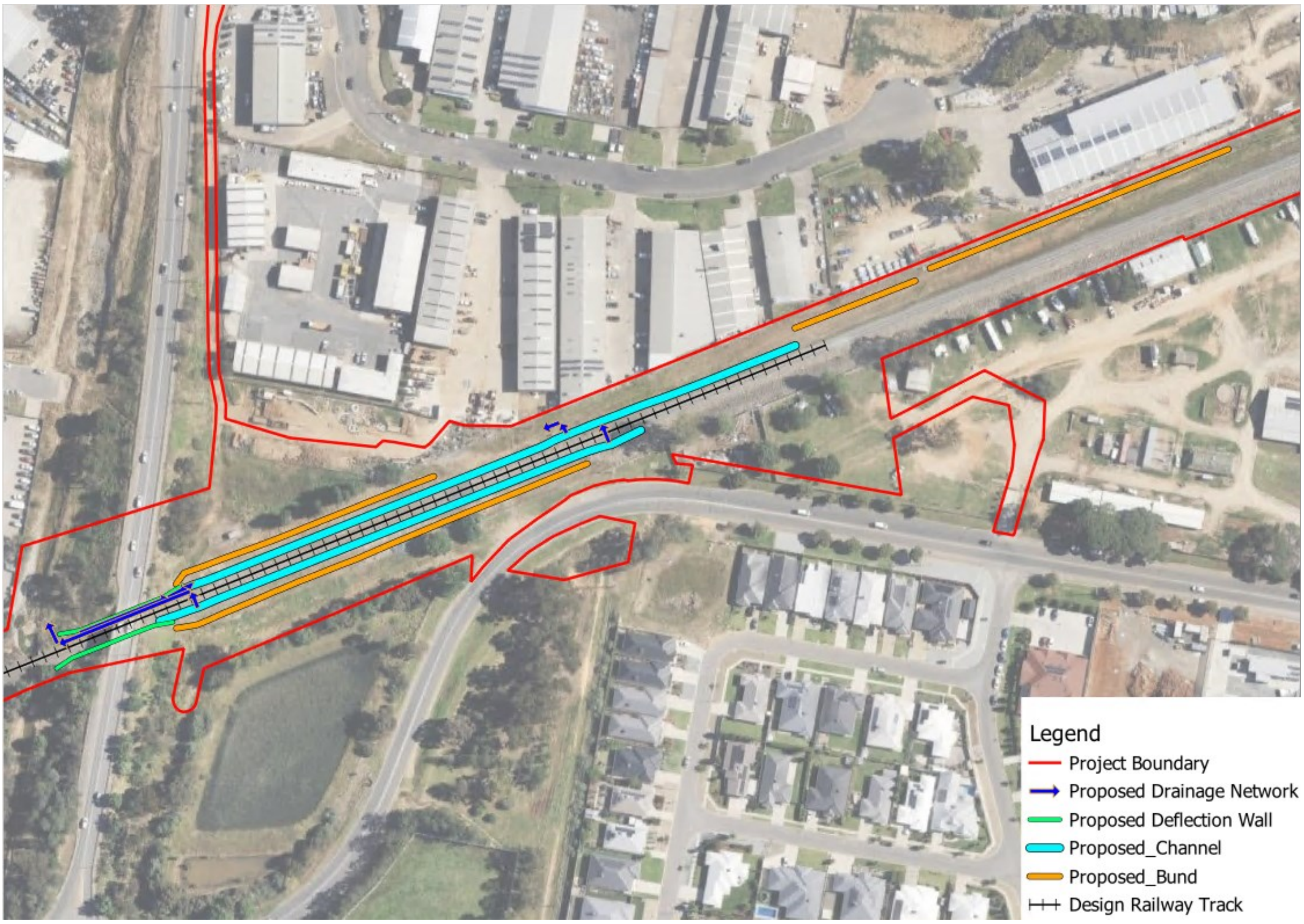


Figure 4-8: Design Model Updates

The model update does not change the flow characteristics of the catchment. Thus, the inflow locations remain consistent with the existing model.

The incorporation of the above design elements associated with the track lowering at Pearson Street results in localised changes to the topography, as represented in Figure 4-9.

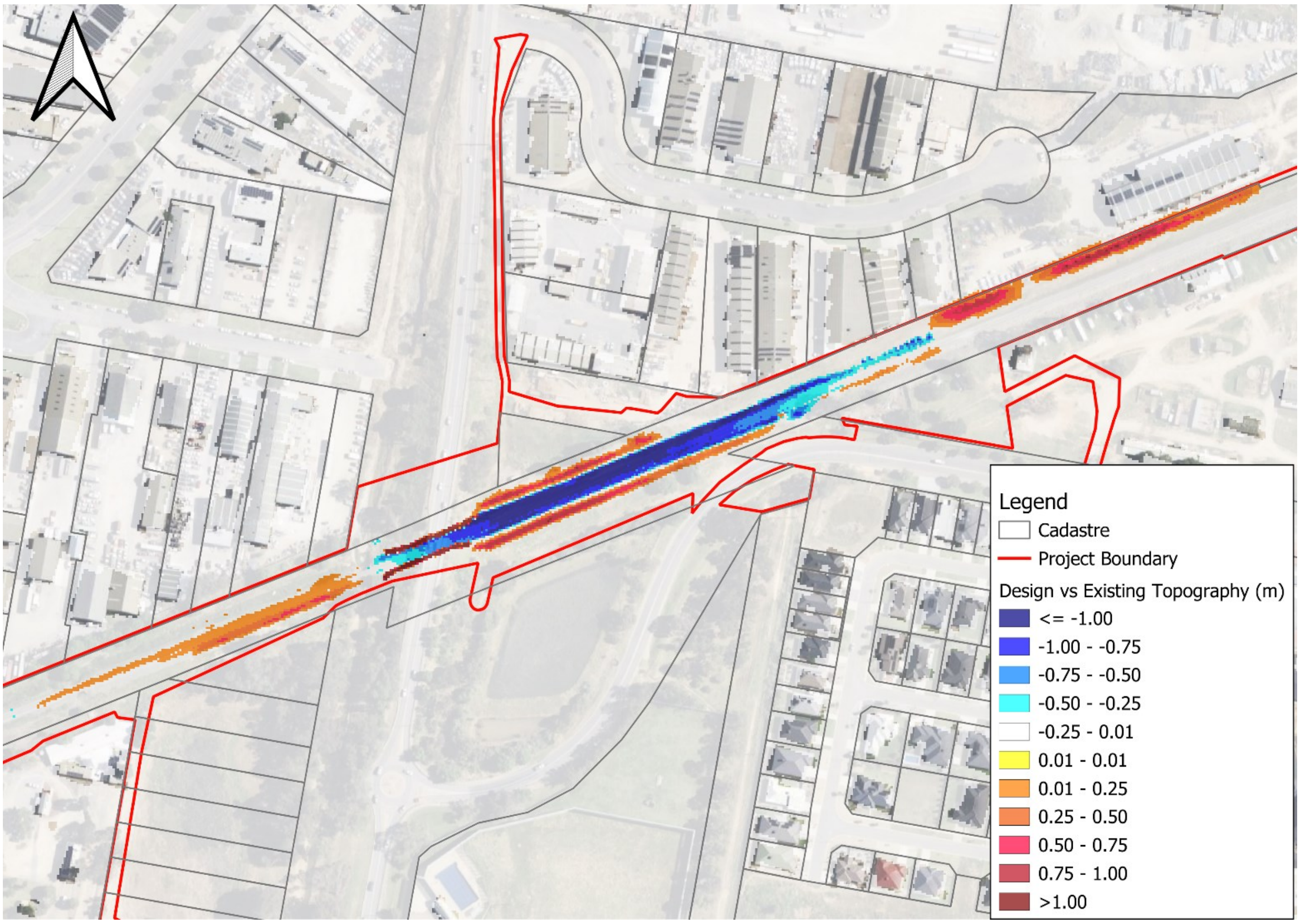


Figure 4-9: Changes in Site Topography – Design vs Existing

4.2.3 Design Events

The model was run for the design events of 10%, 5%, 2%, 1% AEPs and 1% AEP with climate change. The critical duration and temporal patterns for each design event are the same as those employed in MOFFS TUFLOW (2021) for the Pearson Street Bridge area. Table 4-3 summarises the information on the design events.

Table 4-3: Summary of Events and Critical Durations Run in TUFLOW – Pearson Street Bridge

Design Events	Critical Durations	Critical temporal pattern ID
10% AEP	30 minutes, 120 minutes, 180 minutes, 360 minutes	All 10 Temporal patterns for each duration
5% AEP	30 minutes, 120 minutes, 180 minutes, 360 minutes	
2% AEP	30 minutes, 60 minutes, 180 minutes, 360 minutes	
1% AEP	30 minutes, 90 minutes, 180 minutes, 360 minutes	
1% AEP + Climate Change	30 minutes, 90 minutes, 360 minutes	
PMF	60 minutes	All 11 temporal patterns for each duration

4.2.3.1 Climate Change

There is no design criterion for flood impact on climate change. Therefore, a sensitivity assessment was conducted to evaluate the influence of climate change on flooding to anticipate future climate change flood risk. The existing WBNM 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 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.

5 HYDRAULIC MODEL COMPARISON

The comparison in this section involved the results from the updated DDR model's existing condition against the results from the MOFFS TUFLOW model for the 1% AEP design event storm duration of 120 minutes and Temporal Pattern ID 3935.

Generally, this comparison revealed a high degree of consistency in flood levels between the two sets of results, with variations typically falling within the range of +/- 50 mm (refer to Figure 5-1). In some localised areas, larger differences were found, ranging from 0.05 to 0.3 meters. The possible reasons are listed below:

- It was initially expected that transitioning to a newer version of TUFLOW, which incorporates the quadtree method, might lead to minor changes in flood levels. The quadtree method could alter the model running timestep compared to the original model, potentially contributing to an increase in flood levels of up to 0.2m at the northern downstream boundary. However, since this area is distant from the sites, any such changes in flood levels would not impact the site.
- The changes in flood levels around the sites primarily stem from the integration of the 2020 LiDAR data and the comprehensive site survey.
- The existing drainage networks were updated based on the data provided by the DJV Drainage team which involved modification in terms of pipe location, pipe size inverts etc.
- Modifications were done based on the Independent Flood Consultant Specialist's review regarding the SA (Source Area) inflow polygons which additional flows were directed to the open channel at Colemans Street, creating more flows to the site

It is noted that the overall flood level and extent remain generally similar, hence the validation is considered satisfactory.

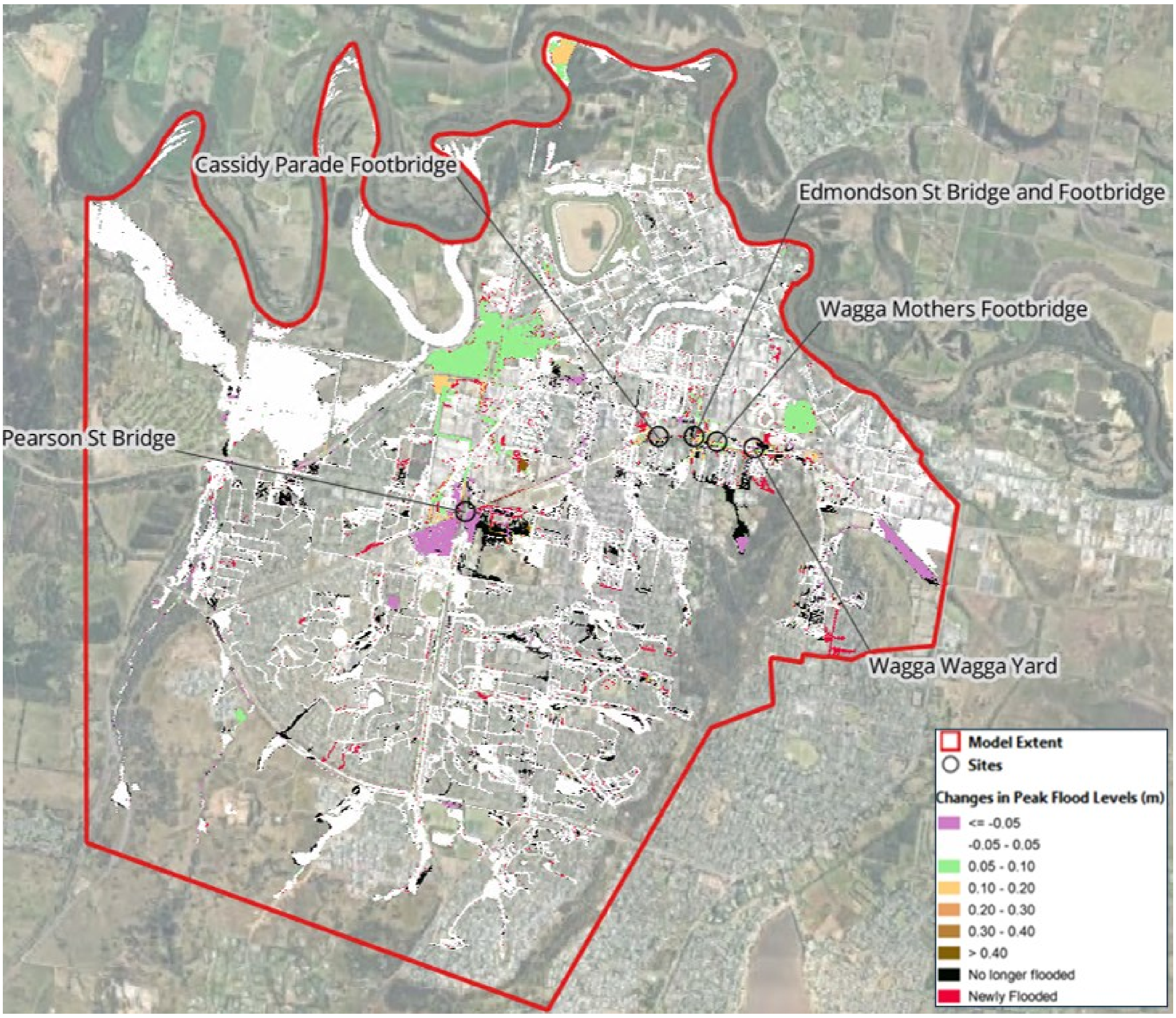


Figure 5-1: Comparison - Changes in Peak Flood Levels (Updated TUFLOW model VS MOFFS 2021 TUFLOW model)

6 FLOOD ASSESSMENT

6.1 Existing Condition

Existing flood maps, including peak flood depth and levels, peak flood velocity, and peak flood hazard for the modelled events, are provided in Appendix A.

The eastern water flow path to Pearson Street within the existing railway corridor directs water towards the west. This flow path is initiated by the flow overspilling from the existing channel near CH523.300km due to reaching the pipe capacity of the existing pipe network (refer to Figure 6-1). The excess water that overtops the channel then flows west along the railway corridor, eventually entering the southeastern flood storage area. When subjected to a 1% AEP flood event, the flow originating from the flood storage southeast of the Pearson Street site flows west along the rail corridor passing beneath the Pearson Street bridge, ultimately reaching the upstream area of the Glenfield culvert. This flow occurs as the water levels in the flood storage rise, approaching the storage's maximum capacity.

The Glenfield culvert is positioned west of the Pearson Street bridge, where it channels the south-to-north flow beneath the existing railway track. Additionally, this culvert serves as one of the outlets for the south-western flood storage. It is important to note that, during this 1% AEP flood, the water level does not overtop the existing railway track at Pearson Street.

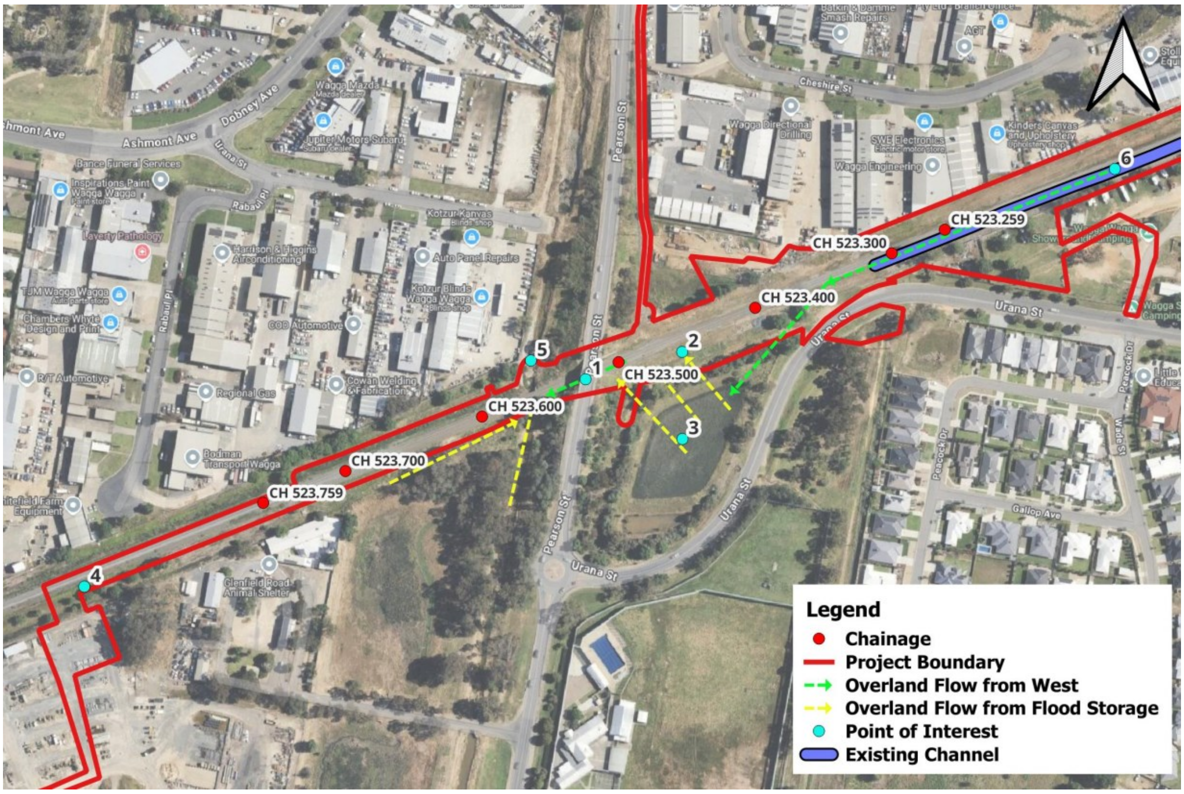


Figure 6-1: Pearson Street Bridge Site Flow Paths

The table below describes the Points of Interest as indicated above.

Table 6-1: Points of Interest

Point of Interest	Location
Point 1	Under the Pearson Street Bridge
Point 2	Along the channel at CH523.550km
Point 3	At the lake Southeast of Pearson Street Bridge
Point 4	Western end of project boundary at CH523.900km
Point 5	Downstream of Glenfield culvert at CH523.560km
Point 6	Along the channel at CH523.130km

Table 6-2 summarises the peak flood level results for the existing condition at Pearson Street Bridge.

Table 6-2: Peak Flood Levels – Existing Condition

Design Events	Flood Levels
10% AEP 5% AEP 2% AEP 1% AEP	▪ The flood waters do not overtop the existing railway track. ▪ The flood water does not flow east to west under the Pearson Street bridge. ▪ Refer to Table 6-3 for flood level comparison based on points of interest.
1% AEP + Climate change	▪ The flood waters do not overtop the existing railway track. ▪ The flood water flows east to west under the Pearson Street bridge (Refer to Appendix A).
PMF	▪ The flood waters overtop the existing railway track. ▪ The flood water flows east to west under the Pearson Street bridge (Refer to Appendix A).

Table 6-3 summarises the peak flood levels at the points of interest in the existing condition at Pearson Street Bridge.

Table 6-3: Points of Interest Data – Peak Flood Levels (mAHD) – Existing Condition

Locations	10% AEP	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	PMF
Point 1	Not flooded	Not flooded	Not flooded	Not flooded	188.20	189.34
Point 2	Not flooded	Not flooded	187.48	187.76	188.24	189.51
Point 3	187.08	187.20	187.49	187.76	188.24	189.52
Point 4	186.70	187.00	187.39	187.63	188.05	189.48
Point 5	185.17	185.24	185.38	185.48	185.60	187.28
Point 6	189.30	189.34	189.37	189.45	189.54	190.10

The flow velocity is generally low along the railway corridor's open channel. Table 6-4 summarises the peak flood velocity results for the existing condition at the Pearson Street bridge.

Table 6-4: Peak Flood Velocity – Existing Condition

Design Events	Flood Velocity
10% AEP	▪ Refer to Table 6-5 for flood velocity comparison based on points of interest. ▪ The peak velocity along the rail corridor open channel is generally less than 1.2m/s
5% AEP	▪ Refer to Table 6-5 for flood velocity comparison based on points of interest. ▪ The peak velocity along the rail corridor open channel is generally less than 1.3m/s
2% AEP	▪ Refer to Table 6-5 for flood velocity comparison based on points of interest. ▪ The peak velocity along the rail corridor open channel is generally less than 1.3m/s
1% AEP	▪ Refer to Table 6-5 for flood velocity comparison based on points of interest. ▪ The peak velocity along the rail corridor open channel is generally less than 1.4m/s
1% AEP + Climate Change	▪ Refer to Table 6-5 for flood velocity comparison based on points of interest. ▪ The peak velocity along the rail corridor open channel is generally less than 1.5m/s
PMF	▪ Refer to Table 6-5 for flood velocity comparison based on points of interest. ▪ The peak velocity along the rail corridor open channel is generally less than 2.0m/s but exceeds 3.5m/s on areas with overtopping.

Table 6-5 shows the peak flood velocities at the points of interest in the existing condition.

Table 6-5: Points of Interest Data – Peak Flood Velocity (m/s) – Existing Condition

Locations	10% AEP	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	PMF
Point 1	Not flooded	Not flooded	Not flooded	Not flooded	0.3	1.1
Point 2	Not flooded	Not flooded	<0.1	0.1	0.2	0.5
Point 3	<0.1	<0.1	<0.1	<0.1	0.1	0.3
Point 4	0.2	0.2	0.2	0.3	0.3	0.7
Point 5	1.3	1.3	1.3	1.3	1.4	2.0
Point 6	0.2	0.2	0.2	0.2	0.3	0.5

The flood hazard assessment is based on the general flood hazard classification set by the Australian Institute for Disaster Resilience in Australian Disaster Resilience Handbook Collection - Flood Hazard, 2017. The Figure 6-2 and the tables below describe the hazards.

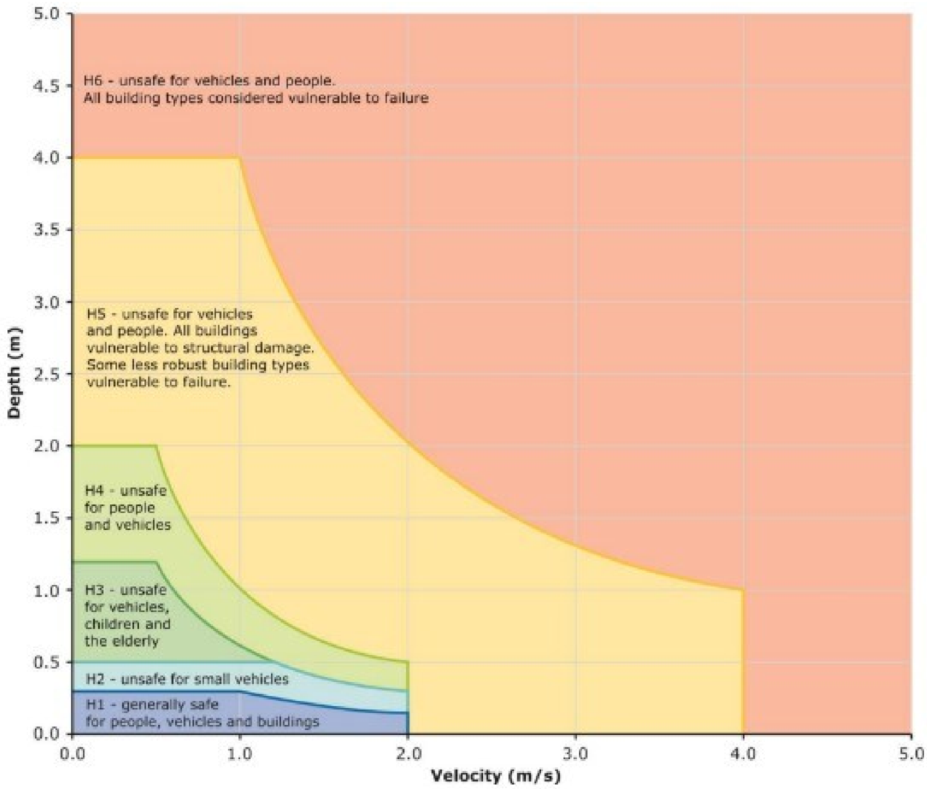


Figure 6-2: Hazard Category Classification

The flood hazard is generally high (H3 to H5) around the site area. The flood hazards for the existing case at the site area are presented in Table 6-6 and the maps are shown in Appendix A.

Table 6-6: Flood Hazard – Existing Condition

Design Events	Flood Hazard
10% AEP	▪ Refer to Table 6-7 for flood hazard comparison based on points of interest. ▪ The peak hazard along the rail corridor open channel is generally up to H3.
5% AEP	▪ Refer to Table 6-7 for flood hazard comparison based on points of interest. ▪ The peak hazard along the rail corridor open channel is generally up to H4.
2% AEP	▪ Refer to Table 6-7 for flood hazard comparison based on points of interest.

Design Events	Flood Hazard
	▪ The peak hazard along the rail corridor open channel is generally up to H4.
1% AEP	▪ Refer to Table 6-7 for flood hazard comparison based on points of interest. ▪ The peak hazard along the rail corridor open channel is generally up to H5.
1% AEP + Climate Change	▪ Refer to Table 6-7 for flood hazard comparison based on points of interest. ▪ The peak hazard along the rail corridor open channel is generally up to H5.
PMF	▪ Refer to Table 6-7 for flood hazard comparison based on points of interest. ▪ The peak hazard along the rail corridor open channel is generally up to H5.

Table 6-7 shows the hazard category at the points of interest in the existing condition

Table 6-7: Points of Interest Data – Peak Flood Hazard – Existing Condition

Locations	10% AEP	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	PMF
Point 1	Not flooded	Not flooded	Not flooded	Not flooded	H1	H5
Point 2	Not flooded	Not flooded	H1	H2	H3	H5
Point 3	H5	H5	H5	H5	H5	H6
Point 4	H3	H3	H4	H4	H5	H5
Point 5	H5	H5	H5	H5	H5	H6
Point 6	H3	H3	H3	H3	H3	H4

6.2 Design Condition

The design condition flood maps, including peak flood depth and levels, peak flood velocity, and peak flood hazard for the events modelled are provided in Appendix A.

During design conditions, the proposed bund prevents the water overtopping the proposed channel and flow towards the flood storage southeast of Pearson Street Bridge as shown in Figure 6-3.

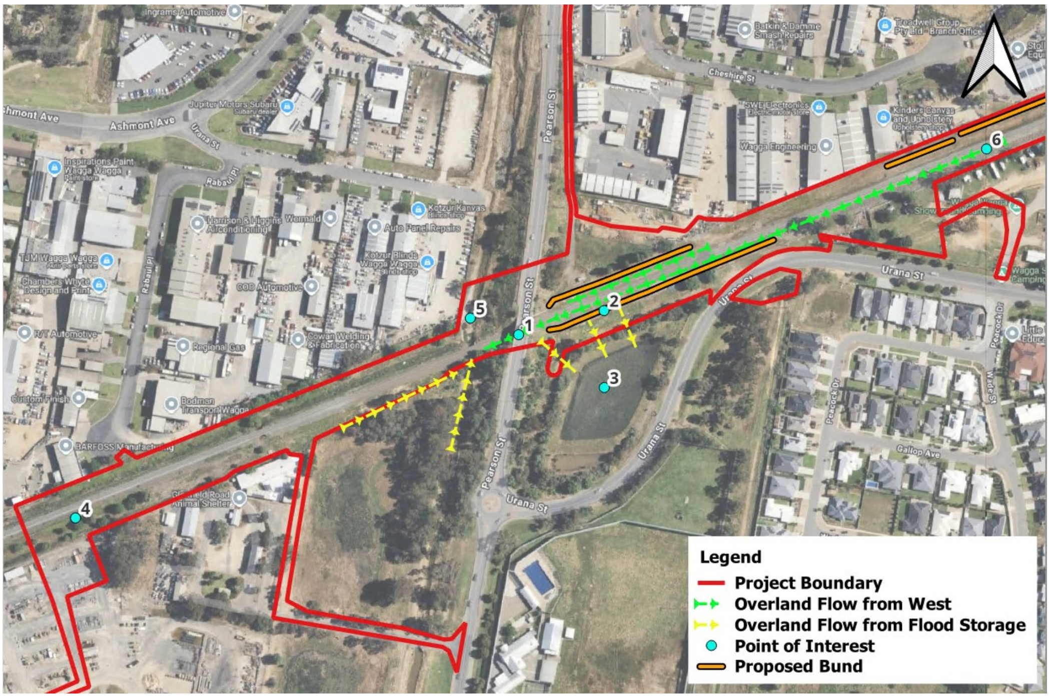


Figure 6-3: Design Condition Flow Characteristics

Table 6-8 summarises the peak flood level results for the design condition at the Pearson Street bridge.

Table 6-8: Peak Flood Levels – Design Condition

Design Events	Flood Levels
10% AEP	▪ The flood waters do not overtop the existing railway track. ▪ The flood water does not flow east to west under the Pearson Street bridge. ▪ Refer to Table 6-3 for flood level comparison based on points of interest.
5% AEP	
2% AEP	
1% AEP	
1% AEP + Climate change	▪ The flood waters overtop the design railway track. ▪ The flood water flows east to west under the Pearson Street bridge (Refer to Appendix A).
PMF	

Table 6-9 summarises the peak flood levels at the points of interest in the design condition at Pearson Street Bridge.

Table 6-9: Points of Interest Data – Peak Flood Levels (mAHD) – Design Condition

Locations	10% AEP	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	PMF
Point 1	Not flooded	Not flooded	Not flooded	Not flooded	187.83	189.16
Point 2	Not flooded	Not flooded	Not flooded	Not flooded	Not flooded	189.24
Point 3	187.09	187.20	187.49	187.76	188.23	189.36
Point 4	186.70	187.00	187.39	187.63	188.05	189.52
Point 5	185.18	185.24	185.39	185.48	185.60	187.14
Point 6	189.31	189.35	189.38	189.47	189.55	190.15

In the design condition, the flow velocity at the proposed open channel within the railway corridor is generally less than 1.3 m/s in 1% AEP. Table 6-10 summarises the peak flood velocity results for design condition at Pearson Street bridge.

Table 6-10: Peak Flood Velocity – Design Condition

Design Events	Flood Velocity
10% AEP	▪ Refer to Table 6-11 for flood velocity comparison based on points of interest. ▪ The peak velocity along the rail corridor open channel is generally less than 1.2m/s
5% AEP	▪ Refer to Table 6-11 for flood velocity comparison based on points of interest. ▪ The peak velocity along the rail corridor open channel is generally less than 1.2m/s
2% AEP	▪ Refer to Table 6-11 for flood velocity comparison based on points of interest. ▪ The peak velocity along the rail corridor open channel is generally less than 1.3m/s
1% AEP	▪ Refer to Table 6-11 for flood velocity comparison based on points of interest. ▪ The peak velocity along the rail corridor open channel is generally less than 1.3m/s
1% AEP + Climate Change	▪ Refer to Table 6-11 for flood velocity comparison based on points of interest. ▪ The peak velocity along the rail corridor open channel is generally less than 1.4m/s
PMF	▪ Refer to Table 6-11 for flood velocity comparison based on points of interest. ▪ The peak velocity along the rail corridor open channel is generally less than 1.8m/s but exceeds 3.5m/s on areas with overtopping.

Table 6-11 shows the peak flood velocities at the points of interest in the existing condition.

Table 6-11: Points of Interest Data – Peak Flood Velocity (m/s) – Design Condition

Locations	10% AEP	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	PMF
Point 1	Not flooded	Not flooded	Not flooded	Not flooded	0.3	0.7
Point 2	Not flooded	Not flooded	Not flooded	Not flooded	Not flooded	1.6
Point 3	< 0.1	< 0.1	< 0.1	< 0.1	0.1	0.5
Point 4	0.2	0.2	0.2	0.3	0.3	0.7
Point 5	1.3	1.3	1.3	1.3	1.4	2.2
Point 6	0.2	0.2	0.2	0.2	0.3	0.6

The flood hazard is generally high (H3 to H5) around the site area. The flood hazards for the existing case at the site area are presented in Table 6-12 and the maps are shown in Appendix A.

Table 6-12: Flood Hazard – Design Condition

Design Events	Flood Hazard
10% AEP	▪ Refer to Table 6-7 for flood hazard comparison based on points of interest. ▪ The peak hazard along the rail corridor open channel is generally up to H2.
5% AEP	▪ Refer to Table 6-7 for flood hazard comparison based on points of interest. ▪ The peak hazard along the rail corridor open channel is generally up to H3.
2% AEP	▪ Refer to Table 6-7 for flood hazard comparison based on points of interest. ▪ The peak hazard along the rail corridor open channel is generally up to H3.
1% AEP	▪ Refer to Table 6-7 for flood hazard comparison based on points of interest. ▪ The peak hazard along the rail corridor open channel is generally up to H3.
1% AEP + Climate Change	▪ Refer to Table 6-7 for flood hazard comparison based on points of interest. ▪ The peak hazard along the rail corridor open channel is generally up to H4.
PMF	▪ Refer to Table 6-7 for flood hazard comparison based on points of interest. ▪ The peak hazard along the rail corridor open channel is generally up to H5.

Table 6-13 shows the hazard category at the points of interest in the design condition.

Table 6-13: Points of Interest Data – Peak Flood Hazard – Design Condition

Locations	10% AEP	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	PMF
Point 1	Not flooded	Not flooded	Not flooded	Not flooded	H2	H5
Point 2	Not flooded	Not flooded	Not flooded	Not flooded	Not flooded	H5
Point 3	H5	H5	H5	H5	H5	H6
Point 4	H3	H3	H4	H4	H5	H5
Point 5	H5	H5	H5	H5	H5	H6
Point 6	H3	H3	H3	H3	H3	H4

6.3 Flood Immunity and Scour Protection

The existing railway track flood immunity of 1% AEP is maintained during the design condition which complies with the criteria in PSRs. Furthermore, in the design condition, the flood velocity along the proposed design track and bund within the project boundary complies with the CoA E42(h). Hence, there is no need for scour protection measures.

6.4 Flood Impact Assessment

The proposed bunds prevent the overtopping of the flood water from the open channel and leading more water to move west. Together with the track lowering of up to approximately 1.2m, more water should be flowing in the proposed channel south of the track, but the added cross culvert balances it out. The discussion about the peak level, velocity and hazard impact due to the design is illustrated in the following sections.

6.4.1 Changes in Peak Flood Level

Table 6-14 provides details regarding the peak flood level changes during the design scenario.

Table 6-14: Flood Level Impact Assessment

Design Events	Changes in Peak Flood Levels
10% AEP	▪ The changes in flood level happening inside the project boundary are due to the changes in the design terrain. For the areas outside of the project boundary, the changes in flood level are generally less than 10mm making it compliant with the CoA. ▪ Newly wet areas have a depth of generally less than 0.05m. ▪ No third-party private road is impacted.
5% AEP	
2% AEP	
1% AEP	

Table 6-15: Changes in Flood Level (m) at Points of Interest

Locations	10% AEP	5% AEP	2% AEP	1% AEP
Point 1	Not flooded	Not flooded	Not flooded	Not flooded
Point 2	Not inundated anymore	Not inundated anymore	Not flooded	Not flooded
Point 3	Negligible impacts*	Negligible impacts*	Negligible impacts*	Negligible impacts*
Point 4	Negligible impacts*	Negligible impacts*	Negligible impacts*	Negligible impacts*
Point 5	Negligible impacts*	Negligible impacts*	Negligible impacts*	Negligible impacts*
Point 6	0.01	0.01	0.01	0.02

*Impact less than 0.01m is considered as negligible impacts

The changes in flood level outside the project boundary are less than 0.01m and no residential, commercial or industrial properties are impacted. The changes in flood levels outside the project boundary comply with PSR and CoA project requirements. Refer to Figure 6-4 for changes in 1% AEP peak flood levels with land use categories specified.

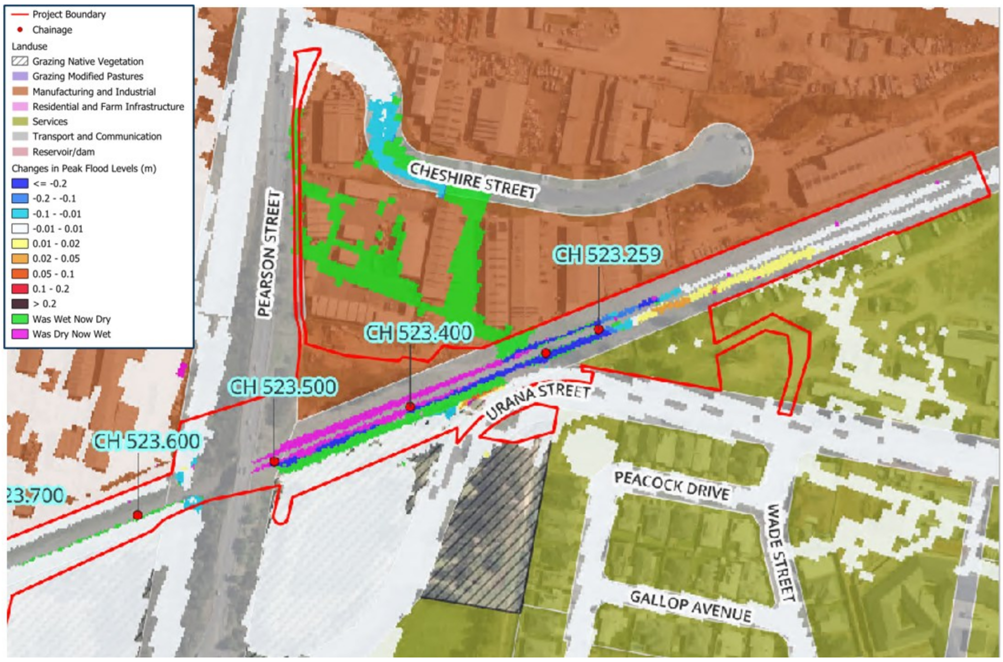


Figure 6-4: Changes in Peak Flood Levels (1% AEP) - with Land Use

6.4.2 Changes in Peak Flood Velocity

Table 6-16 provides details regarding the peak flood velocity changes during the design scenario.

Table 6-16: Flood Velocity Impact Assessment

Design Events	Changes in Peak Flood Velocity
10% AEP	▪ The changes in velocity outside the site are less than 0.5m/s. ▪ The velocity at new wet areas is less than 0.5m/s.
5% AEP	
2% AEP	
1% AEP	

Points 1 to 6 experience less than 0.5m/s of changes in velocity for the 10% AEP, 5% AEP, 2% AEP and 1% AEP events. The existing condition velocity outside the project boundary is less than 0.5m/s. Thus, the design complies with the PSR and CoA requirements.

6.4.3 Changes in Flood Hazard

Table 6-17: Flood Hazard Impact Assessment

Design Events	Changes in Peak Flood Hazard
10% AEP	▪ There is no increase in flood hazard outside the project boundary.
5% AEP	
2% AEP	
1% AEP	

There is no increase in hazard from Points 1 to 6 and the areas outside of the project boundary for the 10% AEP, 5% AEP, 2% AEP and 1% AEP events. Thus, the design complies with the PSR and CoA requirements.

6.4.4 Changes in Duration of Inundation

The analysis around the changes in the duration of inundation was undertaken by comparing the existing and design flood level vs time in selected locations. The locations adopted for the comparison are shown in Figure 6-5. Figure 6-6 and Figure 6-7 show the comparison of flow level vs time for Reporting Locations 1 and 2, respectively. Both the existing and design flood level vs time, is mostly similar for Locations 1 and 2. These demonstrate that the design will not create an extra duration of inundation upstream and downstream outside the project boundary. Consequently, the changes in the duration of inundation comply with the CoA E42(a).

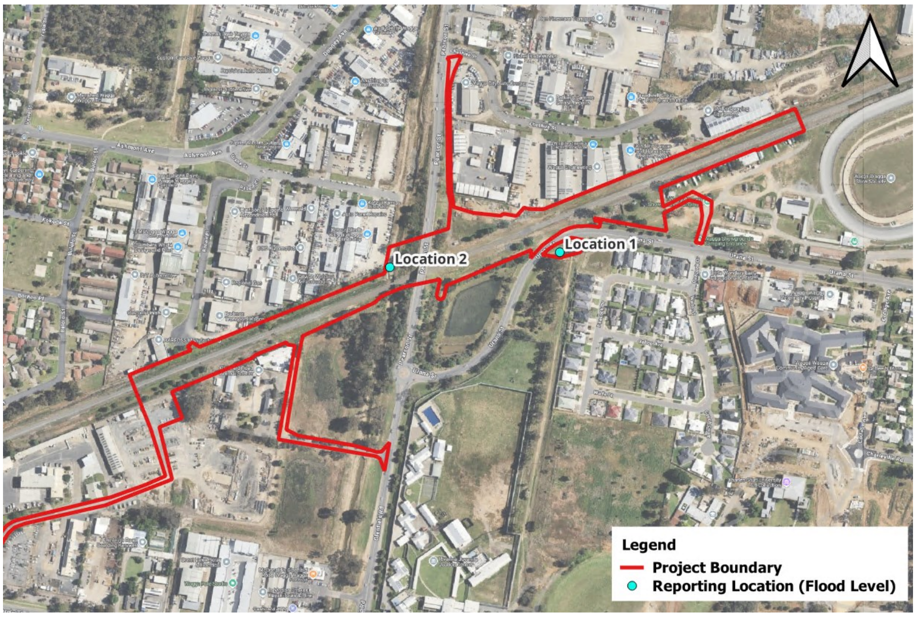


Figure 6-5: Reporting Locations for the Changes in Duration of Inundation

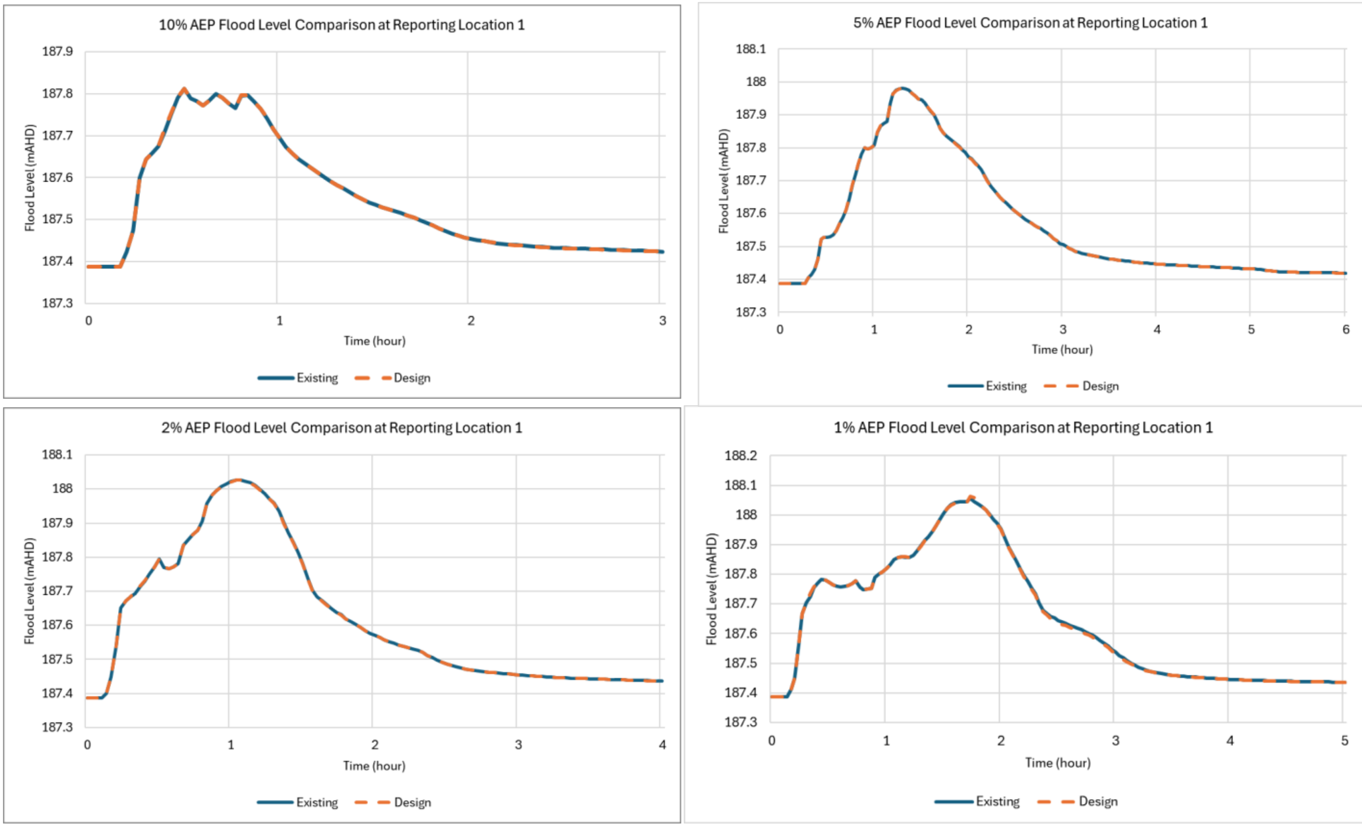


Figure 6-6: Comparison of Flood Level vs. Time at Reporting Location 1

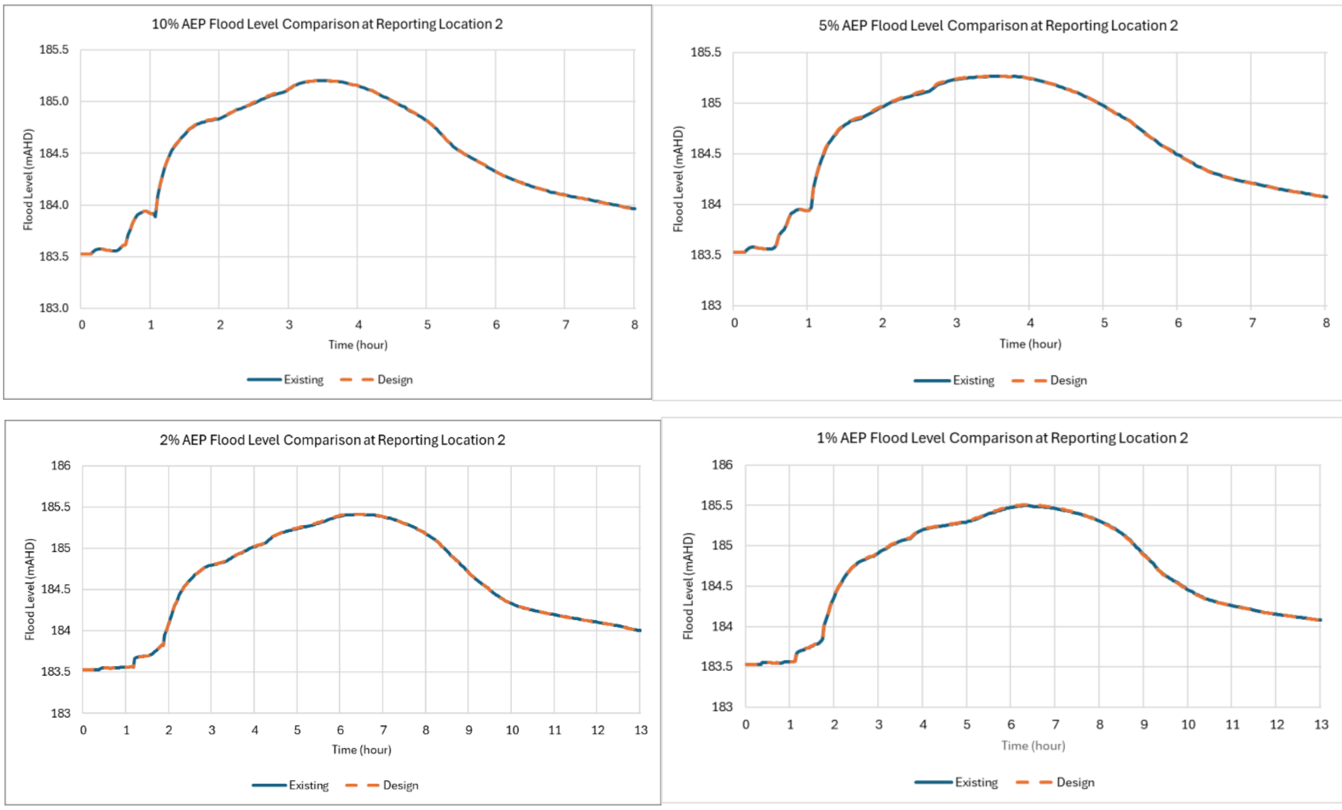


Figure 6-7: Comparison of Flood Level vs. Time at Reporting Location 2

6.4.5 Cumulative impact

As stated in Sections 4 under "Modelling Methodology", the master design condition incorporated the Wagga Wagga Yard design (5-0052-210-IHY-W7-RP-0001), Wagga Mothers Footbridge design (5-0052-210-IHY-W8-RP-0001), Cassidy Parade (5-0052-210-IHY-W4-RP-0001), Edmondson Street Bridge and Footbridge design (5-0052-210-IHY-W5-RP-0001) and Pearson Street Bridge design to understand an overall cumulative impact on the site. The changes in flood level maps indicate that there are no impacts on the Pearson Street bridge caused by the Cassidy Parade footbridge, Wagga Yard design, Wagga Mothers Footbridge design and Edmondson Street Bridge and Footbridge design for all events up to 1% AEP.

6.5 Sensitivity Test

6.5.1 Blockage Assessment

A hydraulic blockage assessment was carried out for the 1% AEP design scenario as per the guidance set out in ARR2019. The assessment involved assessing the site area for debris availability, mobility and transportability, in conjunction with culvert size to determine the relevant blockage factors shown (refer to Table 6-18 and Table 6-19). A 20% blockage was adopted for all the other culverts, pits, and pipes outside the project boundary (refer to Table 6-18). Figure 6-8 shows the drainage infrastructure to which the blockage sensitivity assessment was applied.

Table 6-18: Culvert Blockage Percentage

Culvert	Blockage Percentage (1% AEP)	Comments
cRailX_01 (1 cell 3.06m Width x 2.10m Height)	0%	Inside the project boundary
C_15 (1 cell 3.15m Width x 2.70m Height)	0%	Inside the project boundary
S0010 01to 02 (4 cell 0.30m in diameter)	50%	Inside the project boundary
cRailX_04 (1 cell 1.0m Width x 1.0m Height)	10%	Inside the project boundary
Stormwater network	20% (on grade pit), 50% (sag pits)	Inside the project boundary
All others (culvert, pit and pipe)	20%	Outside of the project boundary

Table 6-19: Culvert Blockage Parameters

Culvert	Debris Availability	Debris Mobility	Debris Transportability	AEP Adjusted Debris Potential
cRailX_01	Medium	Medium	High	Medium
C_15	Medium	Medium	High	Medium
S0010 01to 02	Medium	Medium	Medium	Medium
cRailX_04	Medium	Medium	Medium	Medium

Note: L10 value of 1.0m was adopted for the site culverts blockage calculation.

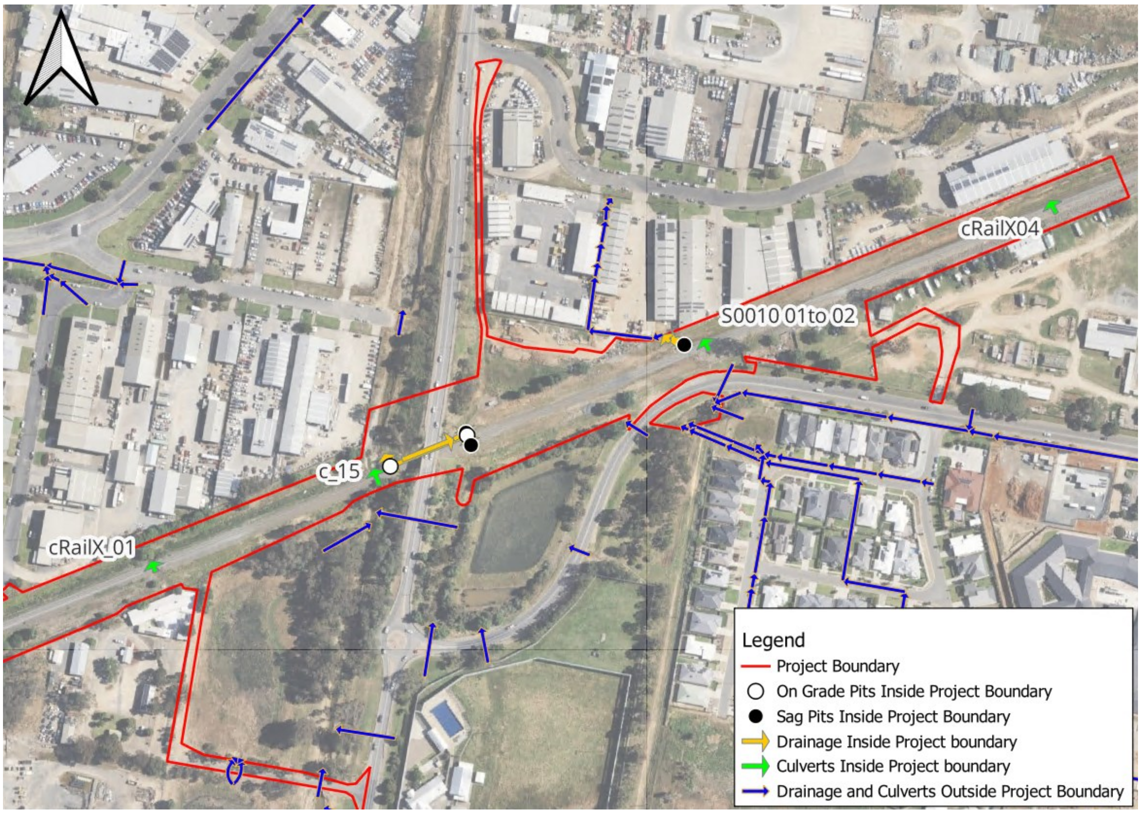


Figure 6-8: Culverts at Pearson Street Bridge

A flood level comparison between the blockage scenario and design is shown in Figure 6-9. A general water level increase of up to 0.31m is mainly found within the site and the flood water overtops the railway track. 60mm of increase in water level can be observed in the south east flood storage area south east to the site while the 25mm reduction in the south west flood storage area, as a consequence of implementing the 20% blockage networks and culverts located outside the site as shown in Figure 6-9.

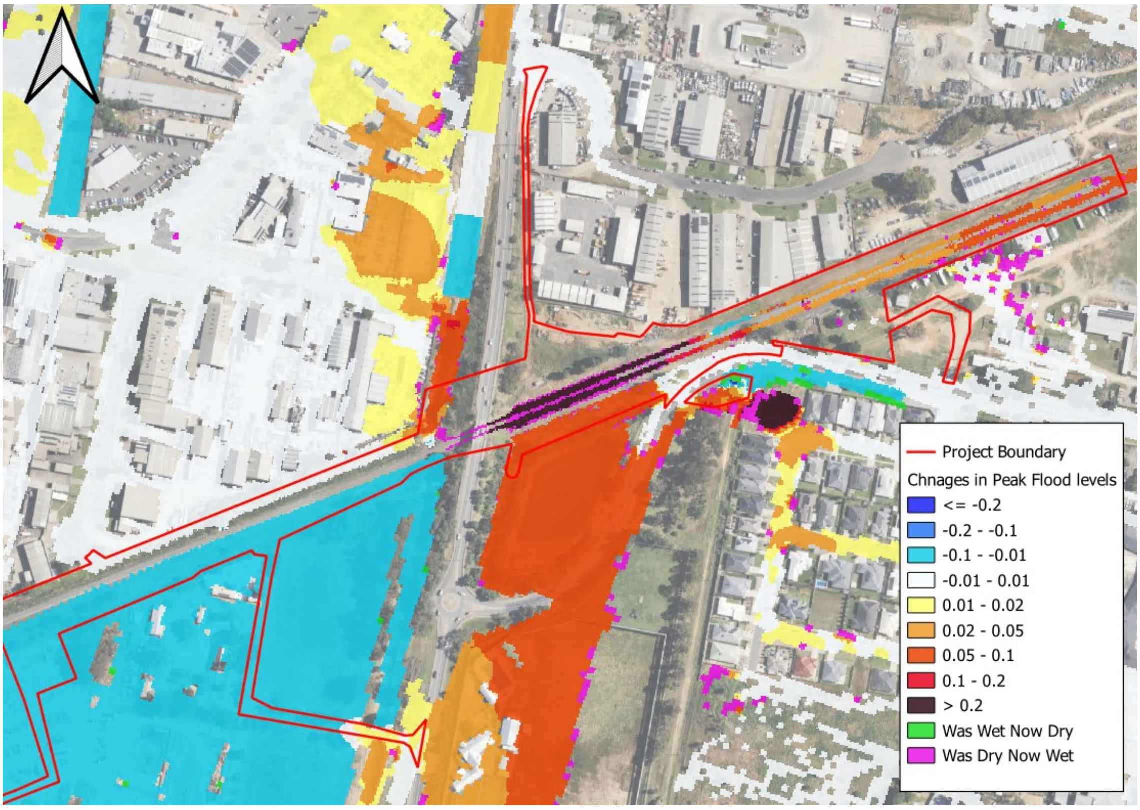


Figure 6-9: Flood Level Comparison for 1% AEP Design Condition – Blockage vs Design

6.5.2 Climate Change Risk Assessment

A Climate Change risk assessment was carried out by running the 1% AEP with 2090 RCP8.5 interim climate change factor (refer to Section 4.2.3.1 for details of the approach) and the results of flood depth, flood velocity and flood hazard can be found in Section 6.1, Section 6.2 and corresponding flood maps can be found in Appendix A. The assessment is summarised as below:

- Within the study area, the railway track does not achieve flood immunity in climate change conditions with an overtopping depth of up to 0.30m at CH523.450km. However, under the 1% AEP event, floodwaters do not overtop the proposed railway tracks.
- Within the study area, the flood water overtops the proposed railway track and bund with flood velocity generally up to 0.1m/s at CH523.450km. However, under the 1% AEP event, floodwaters do not overtop the proposed railway tracks and the bund.
- Within the study area, the flood hazard reached up to H4 in the climate change condition while in 1% AEP it only reached up to H3 hazard.
- Refer to Table 6-9, Table 6-11 and Table 6-13 for points-of-interest data on peak flood levels, velocities, and hazards under design conditions, respectively, for all modelled events compared with climate change conditions.

7 MITIGATION MEASURES

No instances of non-compliance in terms of flood impact were documented. Therefore, no mitigation measures are necessary at this stage.

8 RECOMMENDATIONS AND NEXT STAGE

This is the IFC stage of the report, and the following are finalised:

- No instances of non-compliance have been identified through the assessment.
- All comments raised by relevant parties have been resolved (refer to Appendices C, D, and E)

Consequently, there are no further recommendations.

APPENDICES

A – Flood Maps

B – ARR Data Hub Data

C – ARTC review

D – External stakeholder and consultation

E – Independent Flood Consultation review

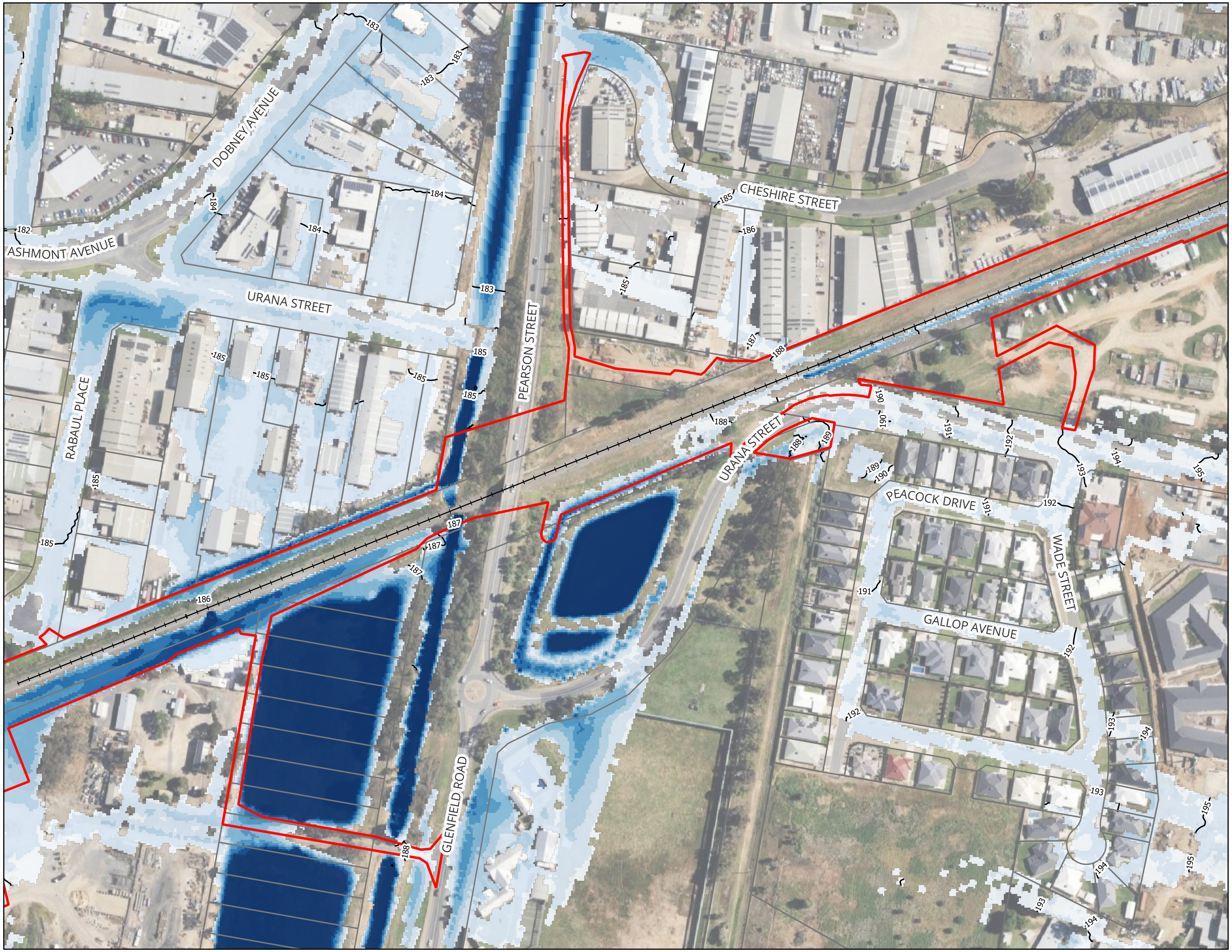
APPENDIX A

Flood Maps

Table A- 1: List of Maps in Appendix A

Map ID	Map description
Figure A01	10% AEP Peak Flood Depth and Levels - Existing Condition
Figure A02	5% AEP Peak Flood Depth and Levels - Existing Condition
Figure A03	2% AEP Peak Flood Depth and Levels - Existing Condition
Figure A04	1% AEP Peak Flood Depth and Levels - Existing Condition
Figure A05	1% AEP Climate Changes Peak Flood Depth and Levels - Existing Condition
Figure A06	PMF Peak Flood Depth and Levels - Existing Condition
Figure A07	10% AEP Peak Flood Velocity - Existing Condition
Figure A08	5% AEP Peak Flood Velocity - Existing Condition
Figure A09	2% AEP Peak Flood Velocity - Existing Condition
Figure A10	1% AEP Peak Flood Velocity - Existing Condition
Figure A11	1% AEP Climate Changes Peak Flood Velocity - Existing Condition
Figure A12	PMF AEP Peak Flood Velocity - Existing Condition
Figure A13	10% AEP Peak Flood Hazard - Existing Condition
Figure A14	5% AEP Peak Flood Hazard - Existing Condition
Figure A15	2% AEP Peak Flood Hazard - Existing Condition
Figure A16	1% AEP Peak Flood Hazard - Existing Condition
Figure A17	1% AEP Climate Changes Peak Flood Hazard - Existing Condition
Figure A18	PMF AEP Peak Flood Hazard - Existing Condition
Figure A19	10% AEP Peak Flood Depth and Levels - Master Design Condition
Figure A20	5% AEP Peak Flood Depth and Levels - Master Design Condition
Figure A21	2% AEP Peak Flood Depth and Levels - Master Design Condition
Figure A22	1% AEP Peak Flood Depth and Levels - Master Design Condition
Figure A23	1% AEP Climate Changes Peak Flood Depth and Levels - Master Design Condition
Figure A24	PMF Peak Flood Depth and Levels - Master Design Condition
Figure A25	10% AEP Peak Flood Velocity - Master Design Condition
Figure A26	5% AEP Peak Flood Velocity - Master Design Condition
Figure A27	2% AEP Peak Flood Velocity - Master Design Condition
Figure A28	1% AEP Peak Flood Velocity - Master Design Condition
Figure A29	1% AEP Climate Changes Peak Flood Velocity - Master Design Condition
Figure A30	PMF Peak Flood Velocity - Master Design Condition
Figure A31	10% AEP Peak Flood Hazard - Master Design Condition
Figure A32	5% AEP Peak Flood Hazard - Master Design Condition
Figure A33	2% AEP Peak Flood Hazard - Master Design Condition
Figure A34	1% AEP Peak Flood Hazard - Master Design Condition
Figure A35	1% AEP Climate Changes Peak Flood Hazard - Master Design Condition
Figure A36	PMF Peak Flood Hazard - Master Design Condition
Figure A37	Changes in Peak Flood Levels for 10% AEP - Master Design Condition vs Existing Condition
Figure A38	Changes in Peak Flood Levels for 5% AEP - Master Design Condition vs Existing Condition
Figure A39	Changes in Peak Flood Levels for 2% AEP - Master Design Condition vs Existing Condition
Figure A40	Changes in Peak Flood Levels for 1% AEP - Master Design Condition vs Existing Condition

Map ID	Map description
Figure A41	Changes in Peak Flood Levels for 1% AEP Climate Changes - Master Design Condition vs Existing Condition
Figure A42	Changes in Peak Flood Velocity for 10% AEP - Master Design Condition vs Existing Condition
Figure A43	Changes in Peak Flood Velocity for 5% AEP - Master Design Condition vs Existing Condition
Figure A44	Changes in Peak Flood Velocity for 2% AEP - Master Design Condition vs Existing Condition
Figure A45	Changes in Peak Flood Velocity for 1% AEP - Master Design Condition vs Existing Condition
Figure A46	Changes in Peak Flood Velocity for 1% AEP Climate Changes - Master Design Condition vs Existing Condition
Figure A47	Changes in Peak Flood Hazard for 10% AEP - Master Design Condition vs Existing Condition
Figure A48	Changes in Peak Flood Hazard for 5% AEP - Master Design Condition vs Existing Condition
Figure A49	Changes in Peak Flood Hazard for 2% AEP - Master Design Condition vs Existing Condition
Figure A50	Changes in Peak Flood Hazard for 1% AEP - Master Design Condition vs Existing Condition
Figure A51	Changes in Peak Flood Hazard for 1% AEP Climate Changes - Master Design Condition vs Existing Condition
Figure A52	1% AEP Peak Flood Depth and Levels - Master Design Blockage Condition
Figure A53	1% AEP Peak Flood Velocity - Master Design Blockage Condition
Figure A54	1% AEP Peak Flood Hazard - Master Design Blockage Condition



Map by: TT

MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Existing Railway Track
- Cadastre
- 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:

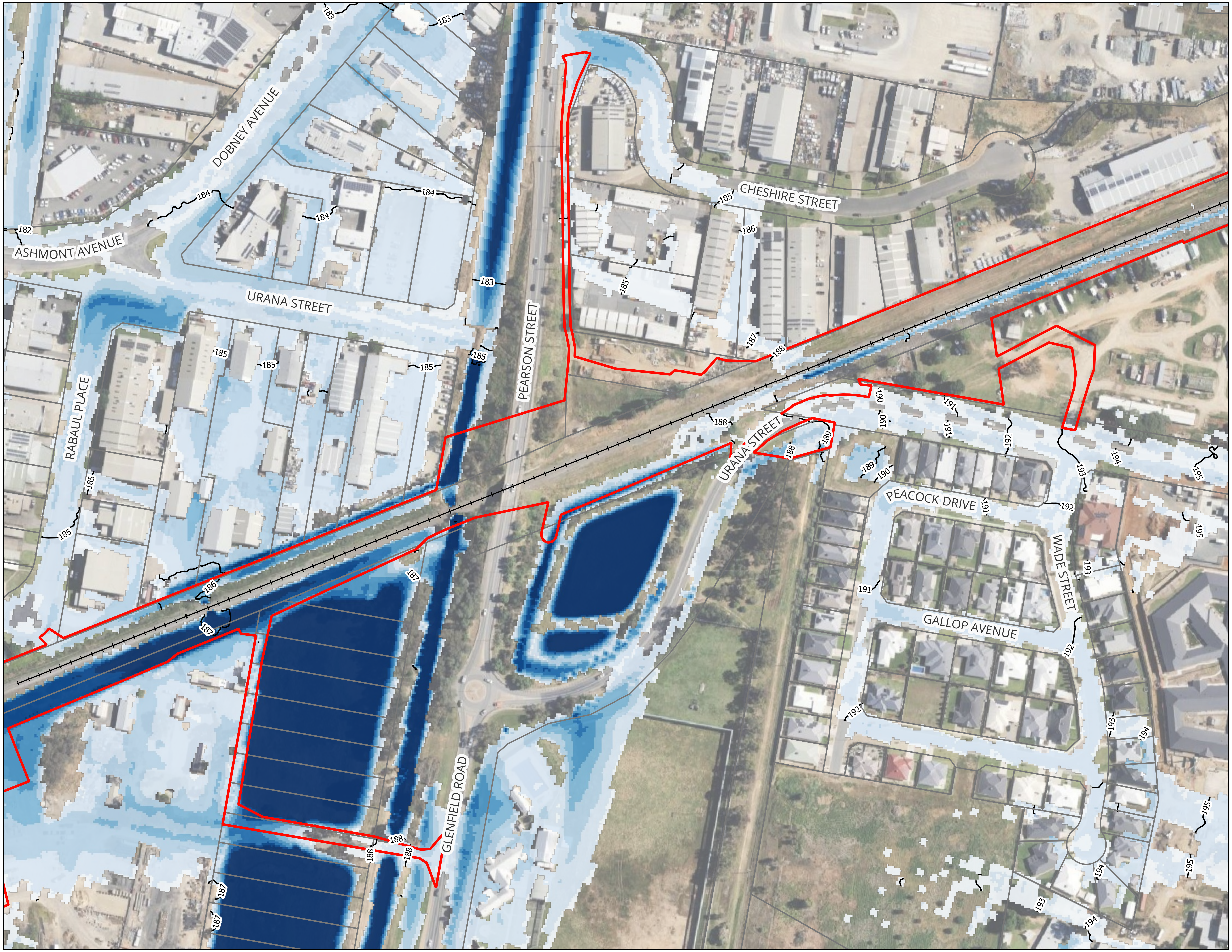
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A01 : 10% AEP Peak Flood Depth and Levels - Existing Condition



Map by: TT

MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Existing Railway Track
- Cadastre
- 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: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A02 : 5% AEP Peak Flood Depth and Levels - Existing Condition

MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Existing Railway Track
- Cadastre
- 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:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A03 : 2% AEP Peak Flood Depth and Levels - Existing Condition

MARTINUS

aurecon BG&E

Legend

- Project Boundary
- Existing Railway Track
- Cadastre
- 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:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A04 : 1% AEP Peak Flood Depth and Levels - Existing Condition

MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Existing Railway Track
- Cadastre
- 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:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

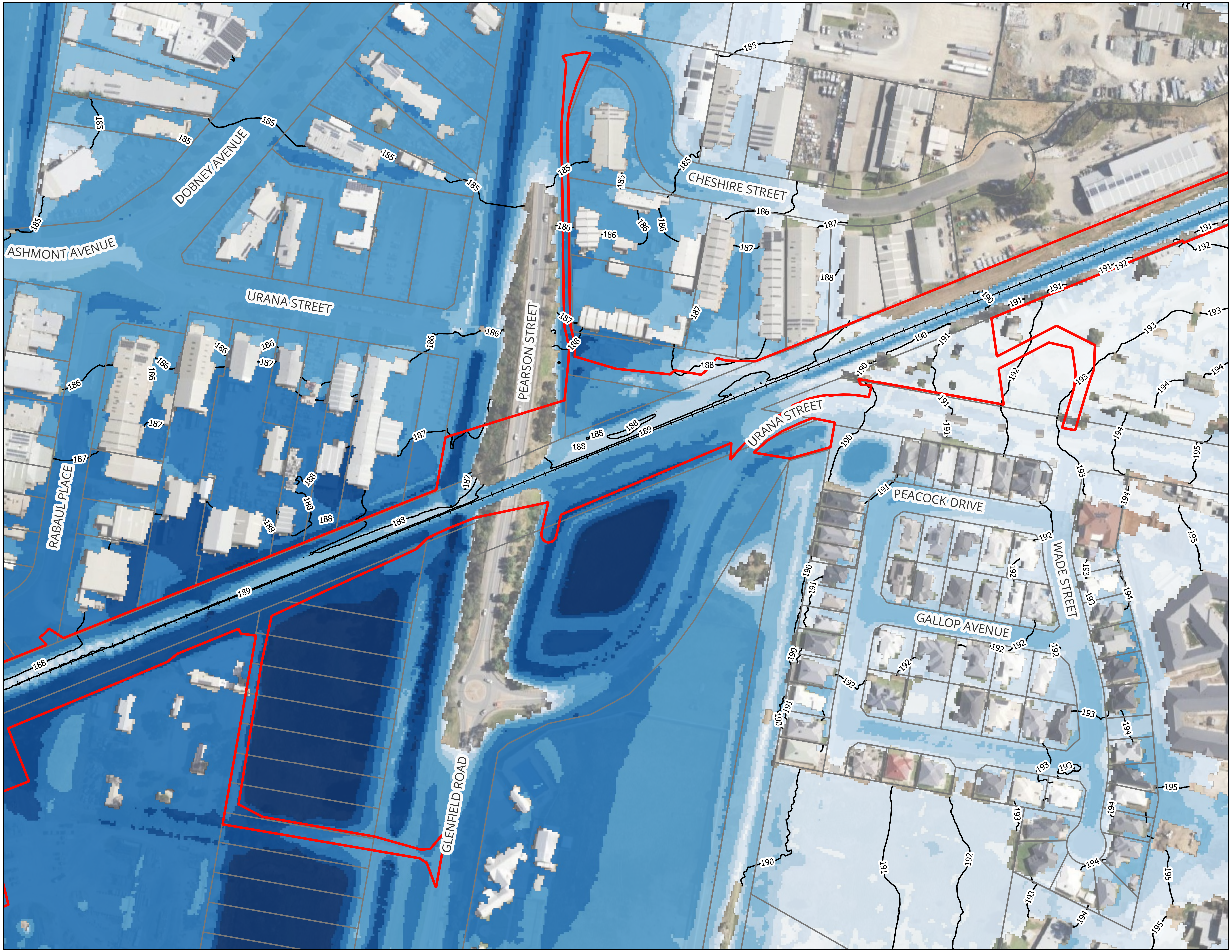
GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A05 : 1% AEP Climate Changes Peak Flood Depth and Levels - Existing Condition

MARTINUS

aurecon BG&E



Legend

- Project Boundary
- Existing Railway Track
- Cadastre
- Flood Level Contours (mAHD)

Peak Flood Depth (m)

- <= 0.05
- 0.05 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 3.00
- 3.00 - 4.00
- > 4.00

Notes:

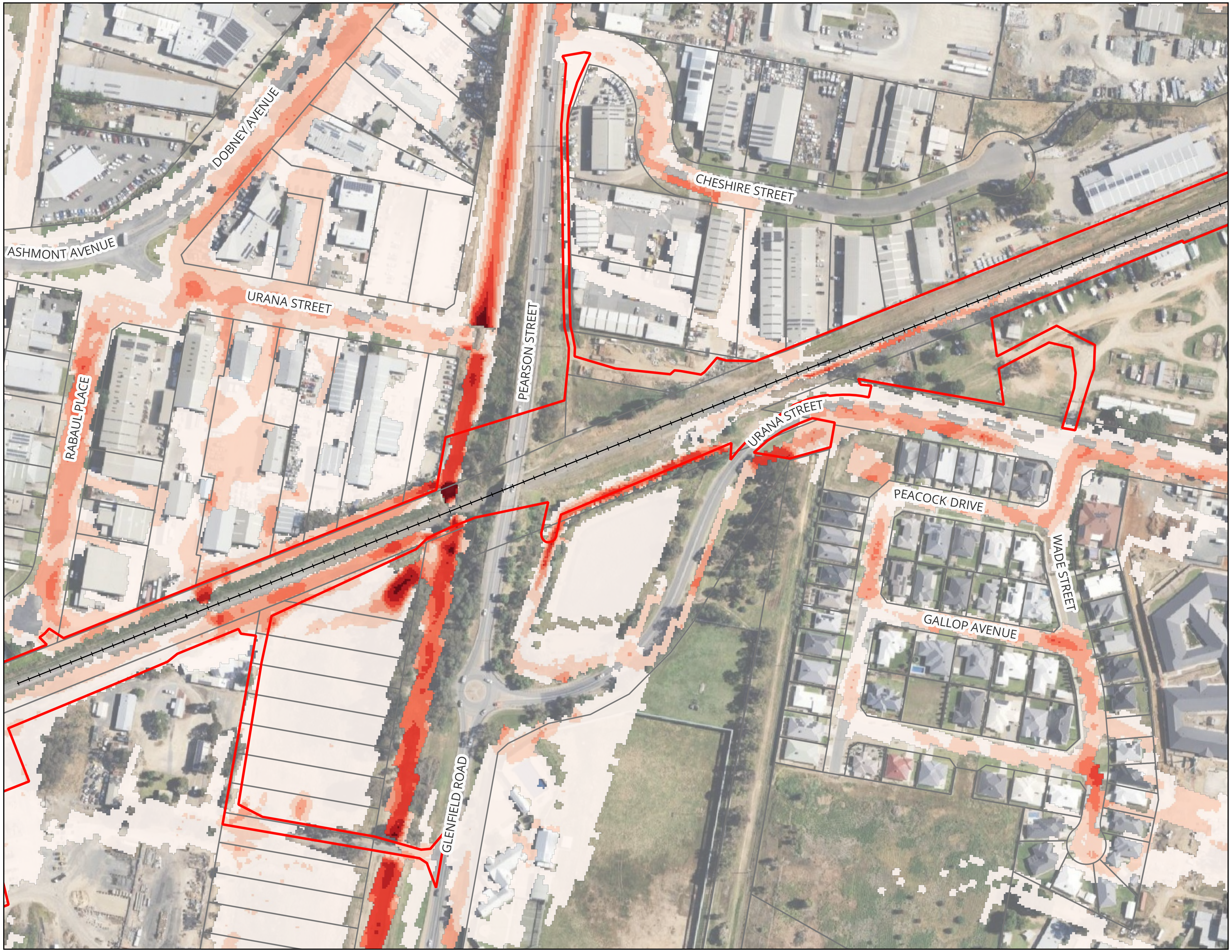
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A06 : PMF Peak Flood Depth and Levels - Existing Condition



MARTINUS

aurecon BG&E

Legend

- Project Boundary
- Existing Railway Track
- Cadastre

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:

Map by: TT

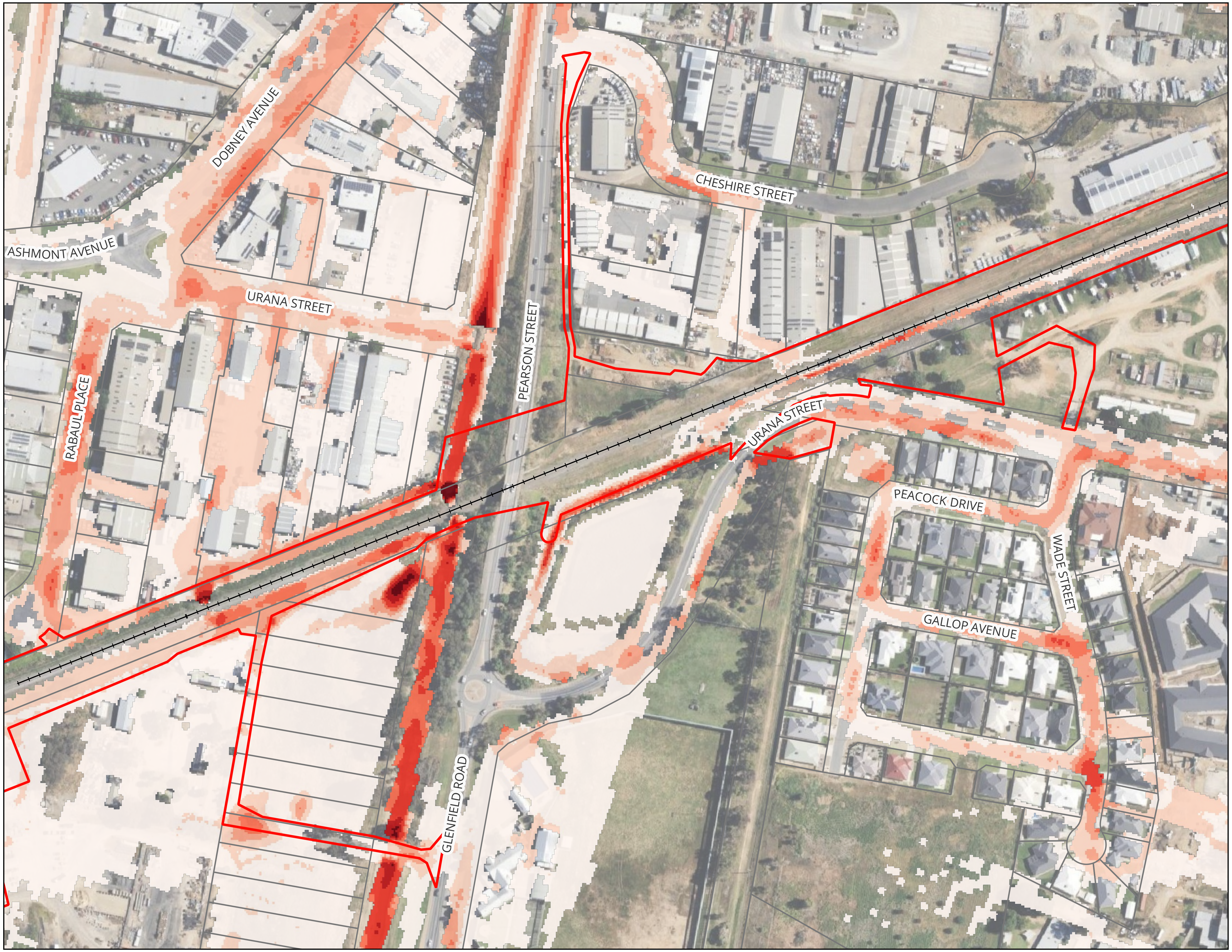
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A07 : 10% AEP Peak Flood Velocity - Existing Condition



MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Existing Railway Track
- Cadastre

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:

Map by: TT

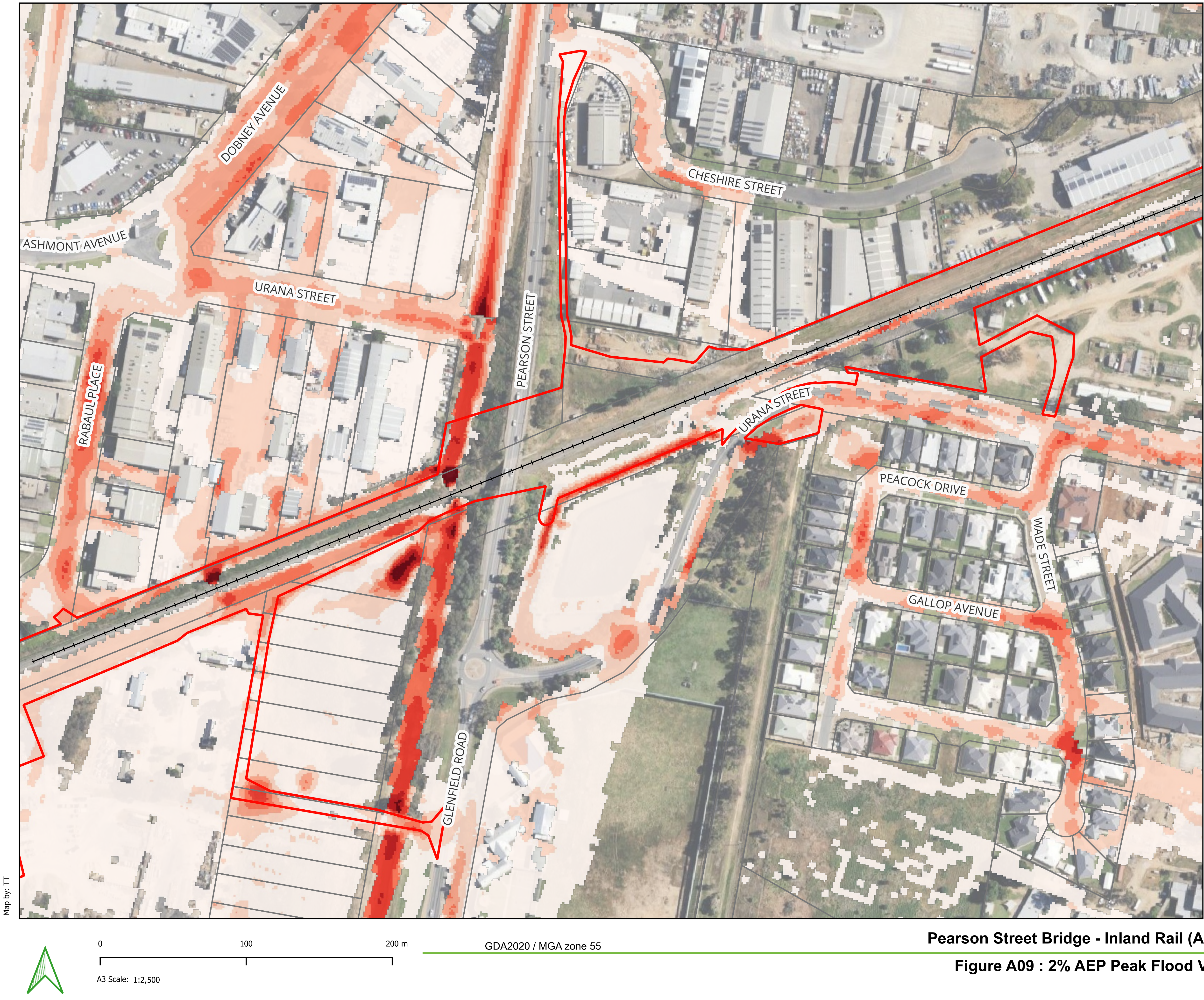
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A08 : 5% AEP Peak Flood Velocity - Existing Condition



MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Existing Railway Track
- Cadastre

Peak Flood Velocity (m/s)

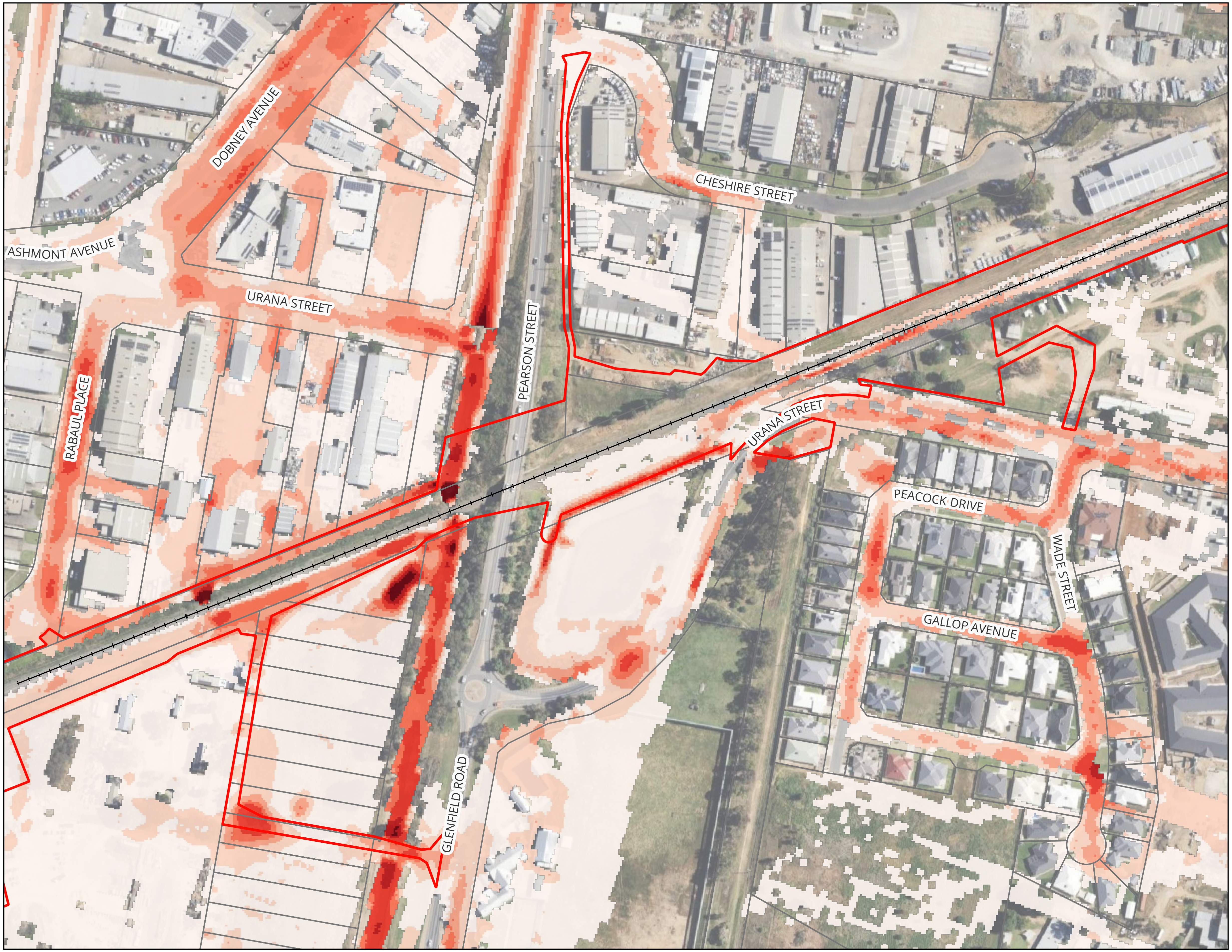
- <= 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- > 2

Notes:

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A09 : 2% AEP Peak Flood Velocity - Existing Condition



MARTINUS

aurecon

BG&E

Legend

Project Boundary

Existing Railway Track

Cadastre

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:

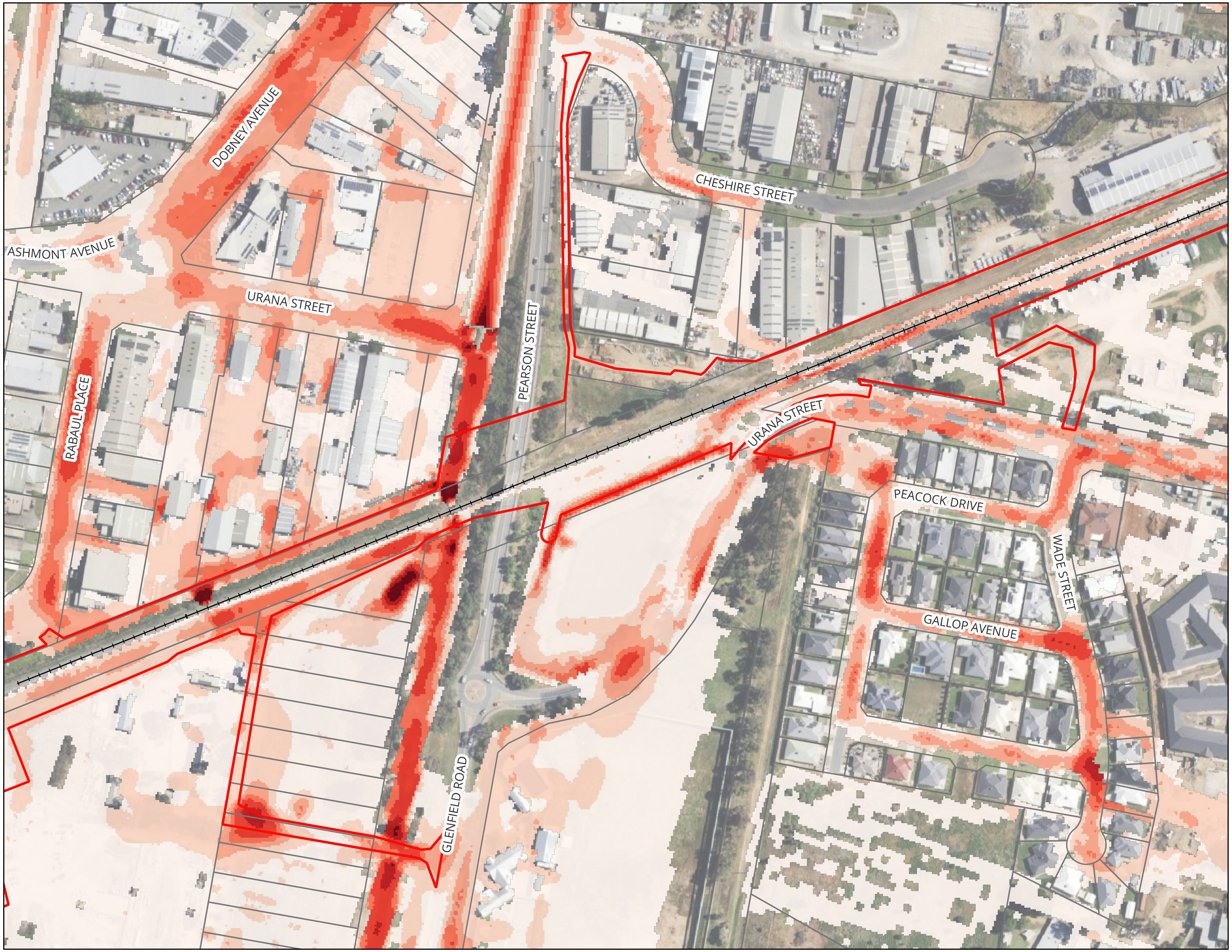
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A10 : 1% AEP Peak Flood Velocity - Existing Condition



MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Existing Railway Track
- Cadastre

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:

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A11 : 1% AEP Climate Changes Peak Flood Velocity - Existing Condition

MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Existing Railway Track
- Cadastre

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:

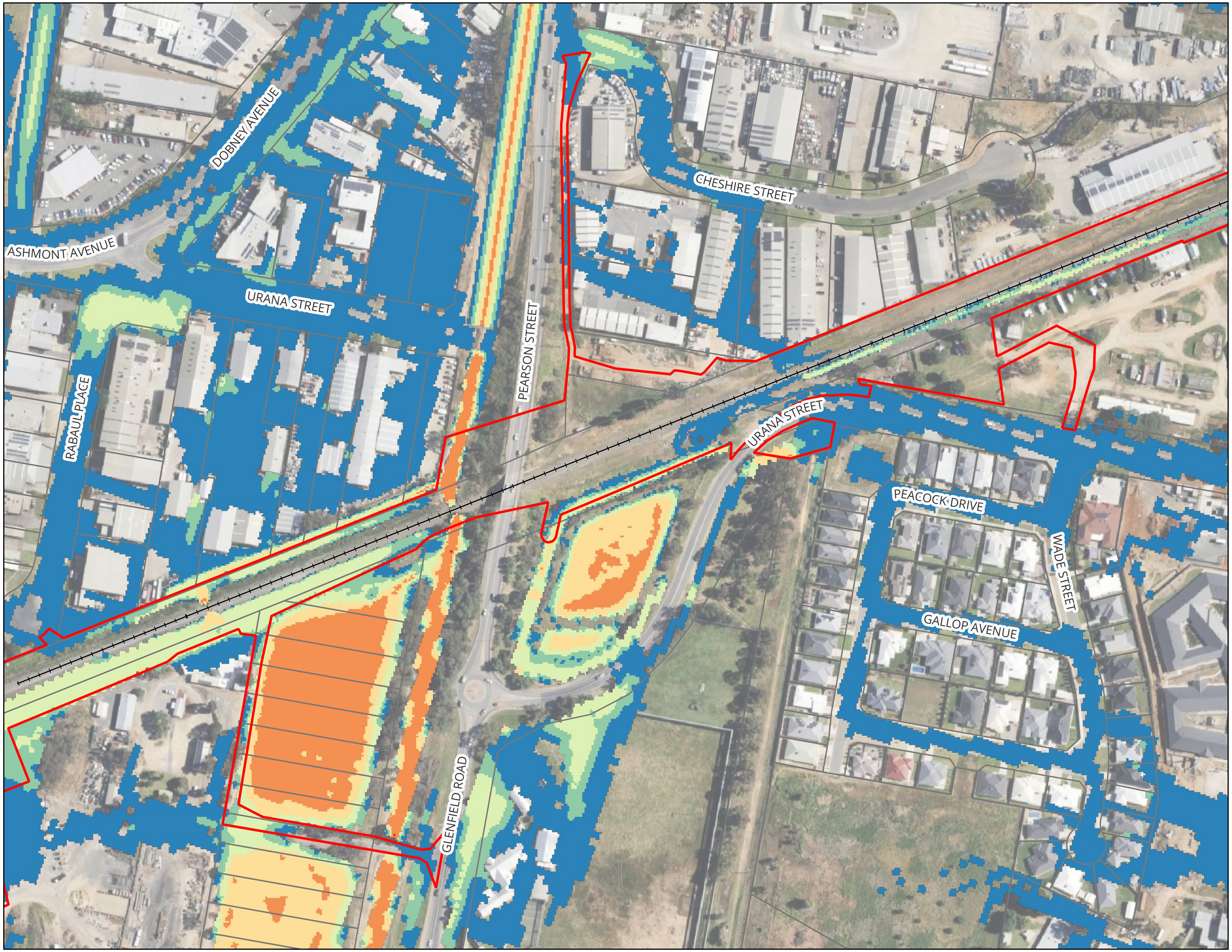
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A12 : PMF AEP Peak Flood Velocity - Existing Condition



MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Existing Railway Track
- Cadastre

Peak Flood Hazard

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

Notes:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A13 : 10% AEP Peak Flood Hazard - Existing Condition

MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Existing Railway Track
- Cadastre

Peak Flood Hazard

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

Notes:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A14 : 5% AEP Peak Flood Hazard - Existing Condition

Legend

- Project Boundary
- Existing Railway Track
- Cadastre

Peak Flood Hazard

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

Notes:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A15 : 2% AEP Peak Flood Hazard - Existing Condition

MARTINUS
aurecon BG&E

Legend

- Project Boundary
- Existing Railway Track
- Cadastre

Peak Flood Hazard

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

Notes:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A16 : 1% AEP Peak Flood Hazard - Existing Condition

MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Existing Railway Track
- Cadastre

Peak Flood Hazard

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

Notes:

Map by: TT

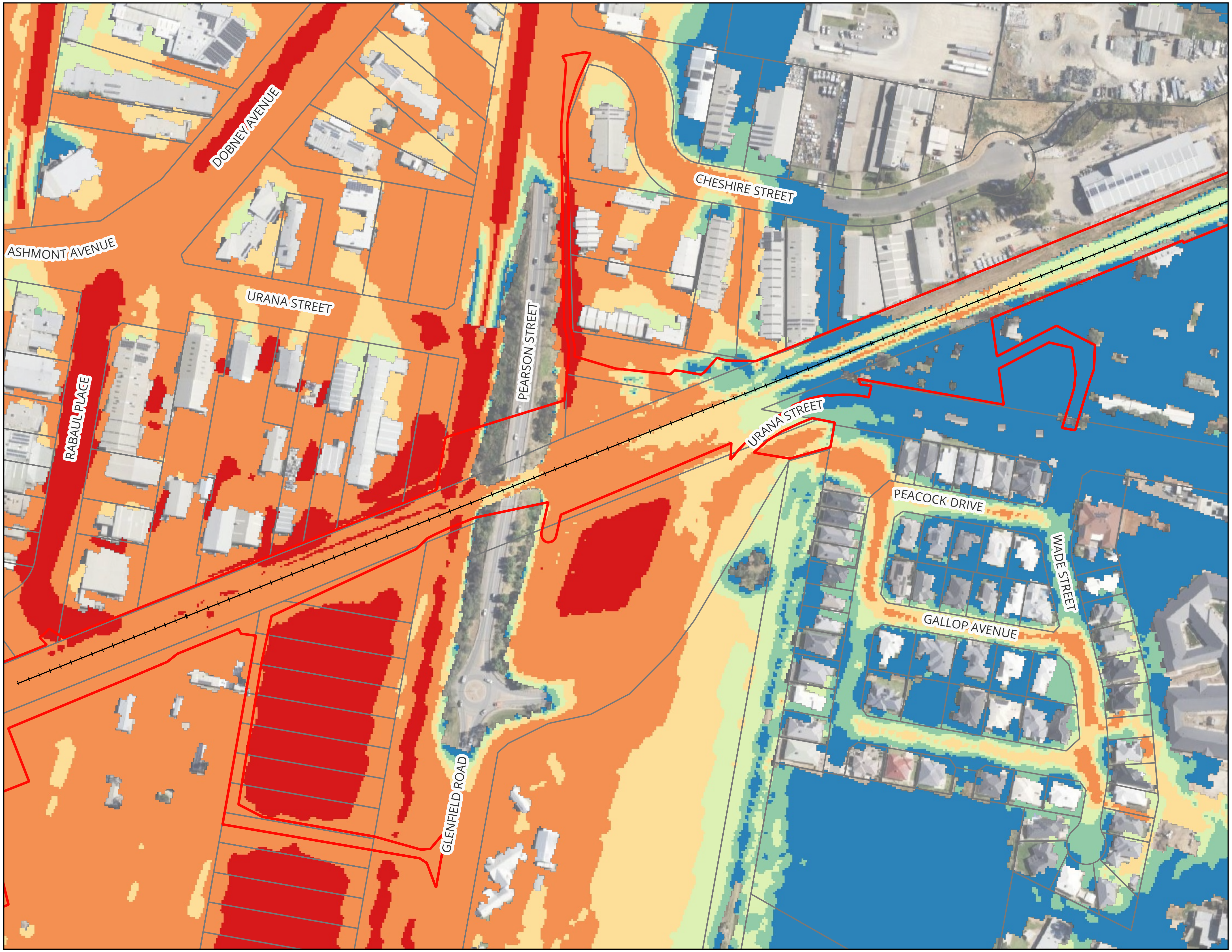
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A17 : 1% AEP Climate Changes Peak Flood Hazard - Existing Condition



MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Existing Railway Track
- Cadastre

Peak Flood Hazard

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

Notes:

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A18 : PMF Peak Flood Hazard - Existing Condition

MARTINUS aurecon BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre
- 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:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A19 : 10% AEP Peak Flood Depth and Levels - Master Design Condition

MARTINUS

aurecon BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre
- 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:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A20 : 5% AEP Peak Flood Depth and Levels - Master Design Condition

MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre
- 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:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A21 : 2% AEP Peak Flood Depth and Levels - Master Design Condition

MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre
- 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:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A22 : 1% AEP Peak Flood Depth and Levels - Master Design Condition

MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre
- 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:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

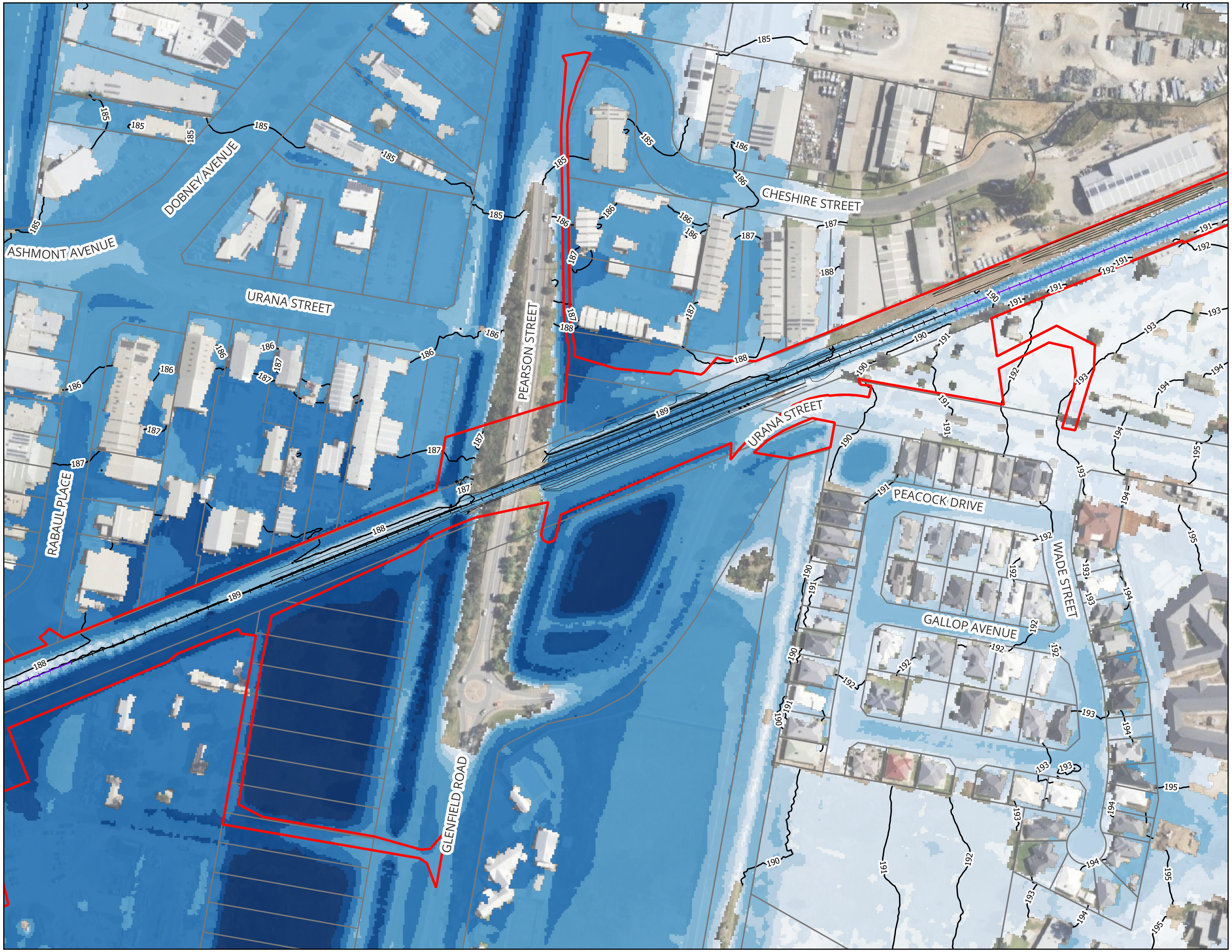
Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A23 : 1% AEP Climate Changes Peak Flood Depth and Levels - Master Design Condition

MARTINUS

aurecon

BG&E



Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre
- Flood Level Contours (mAHD)

Peak Flood Depth (m)

- <= 0.05
- 0.05 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 3.00
- 3.00 - 4.00
- > 4.00

Notes:

Map by: TT

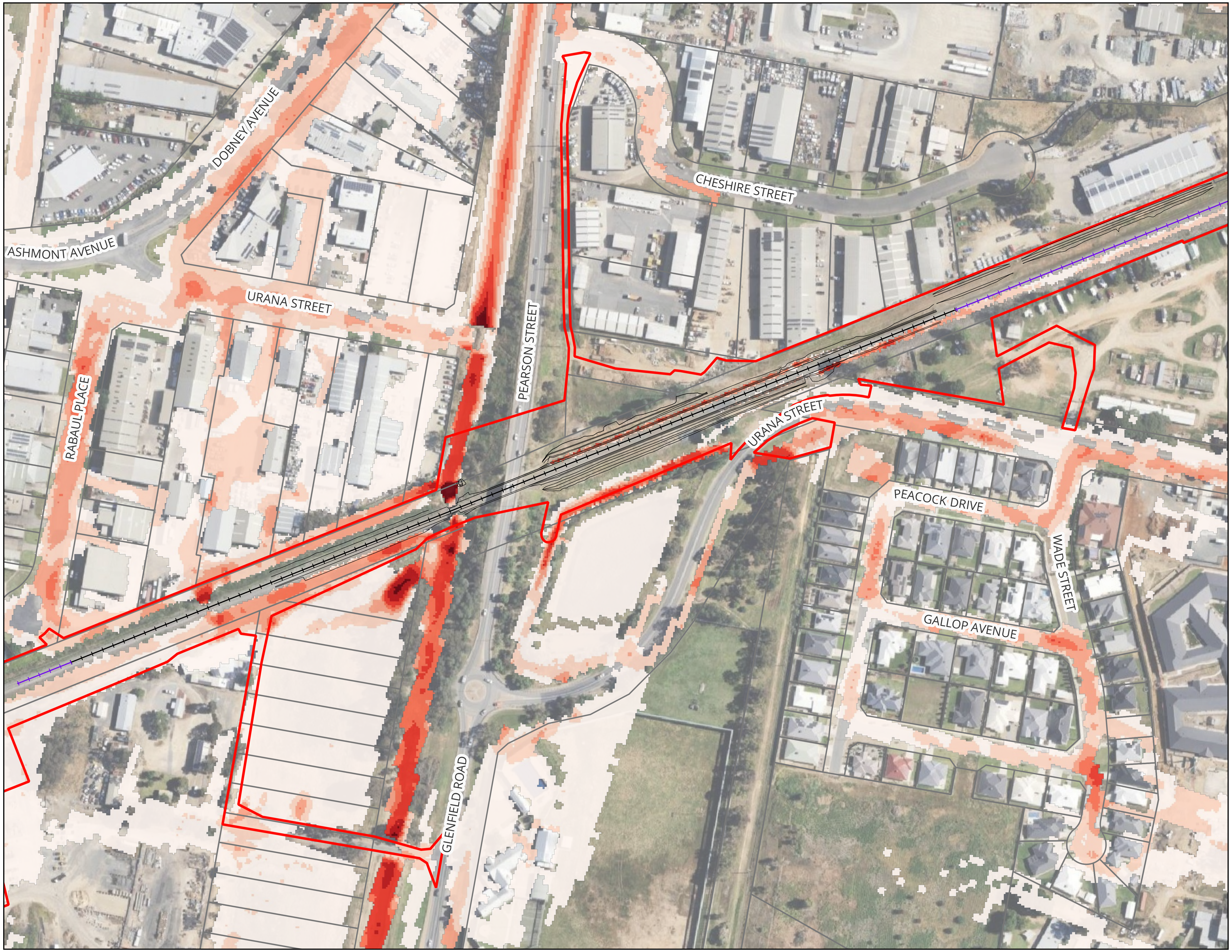
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A24 : PMF Peak Flood Depth and Levels - Master Design Condition



MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

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:

Map by: TT

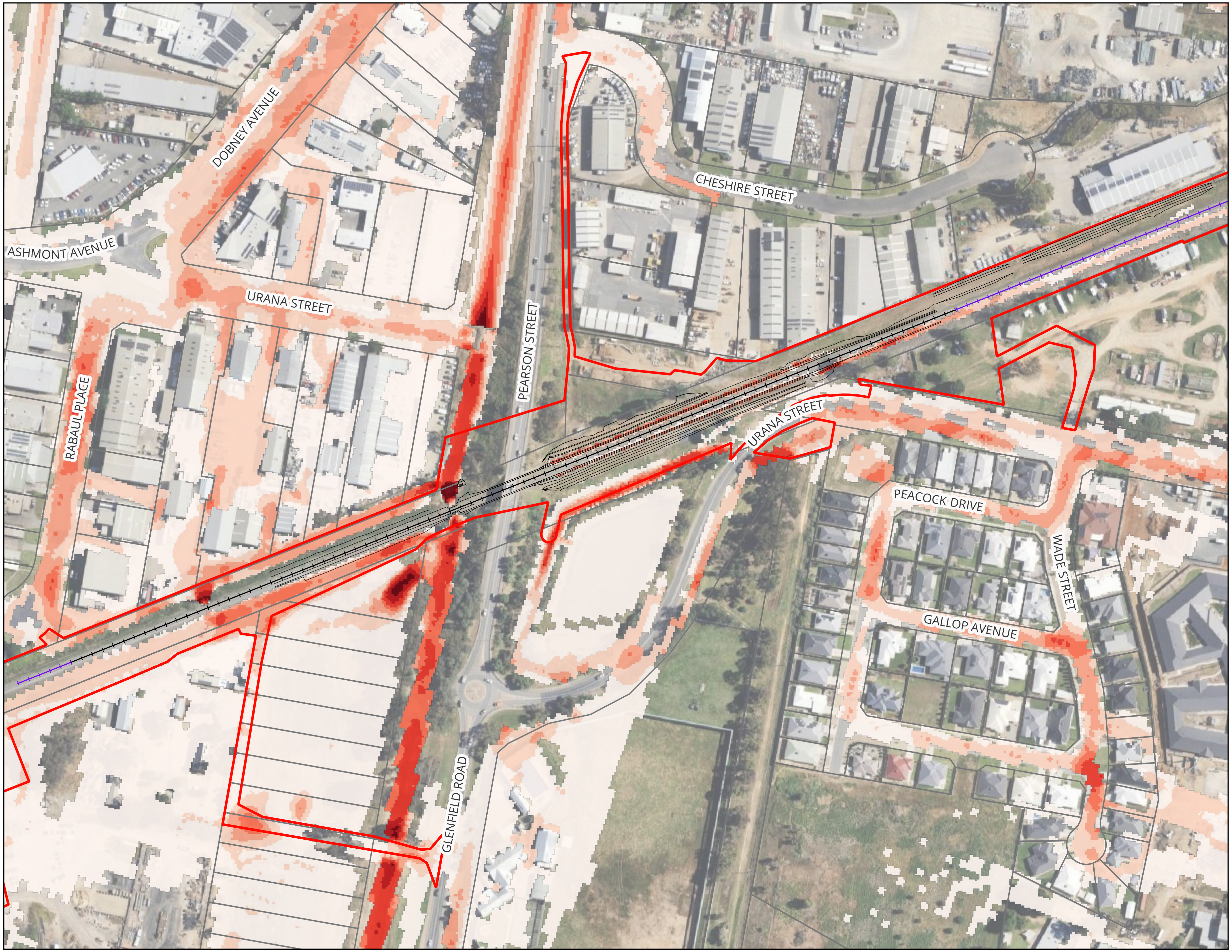
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A25 : 10% AEP Peak Flood Velocity - Master Design Condition



MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

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:

Map by: TT

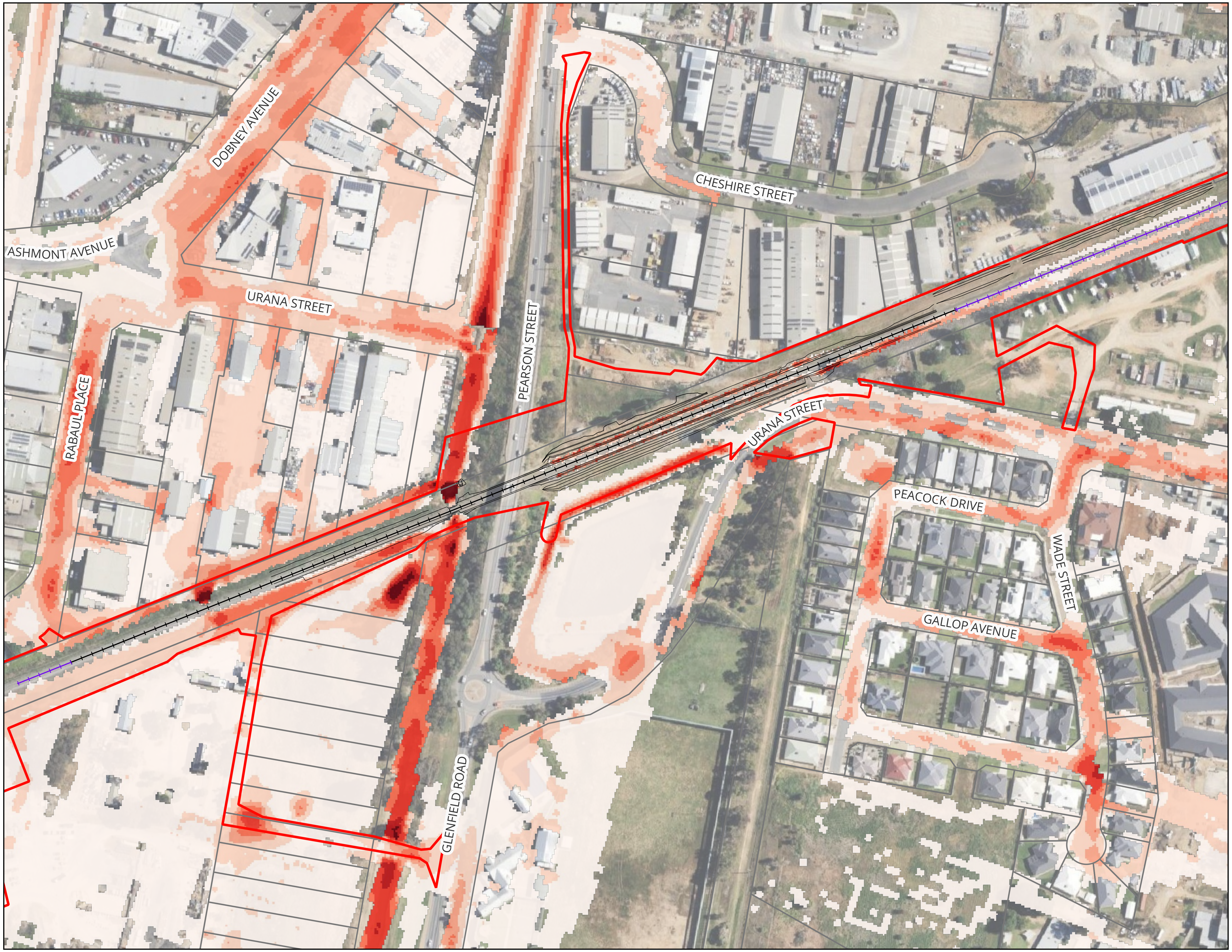
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A26 : 5% AEP Peak Flood Velocity - Master Design Condition



MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

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:

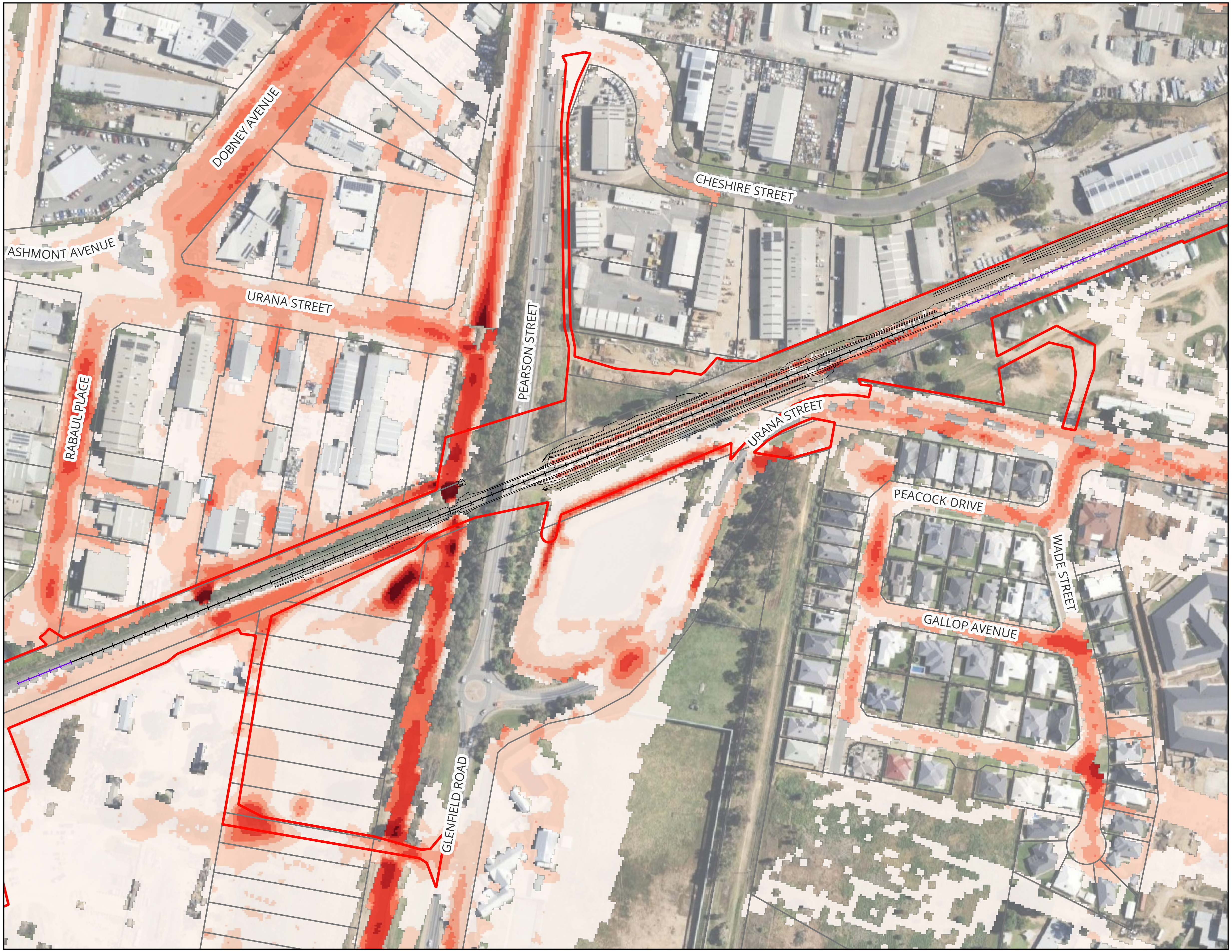
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A27 : 2% AEP Peak Flood Velocity - Master Design Condition



MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

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:

Map by: TT

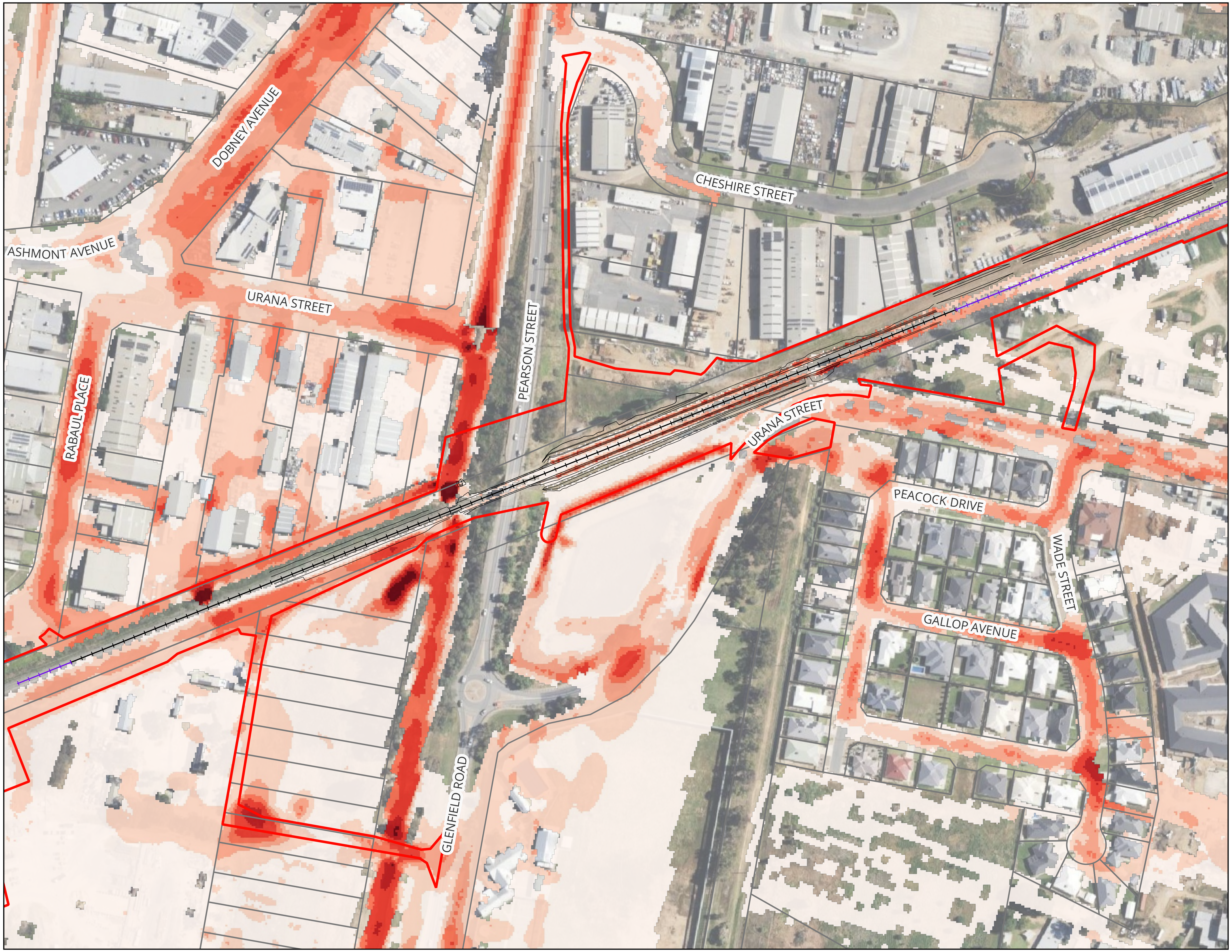
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A28 : 1% AEP Peak Flood Velocity - Master Design Condition



MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

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:

Map by: TT

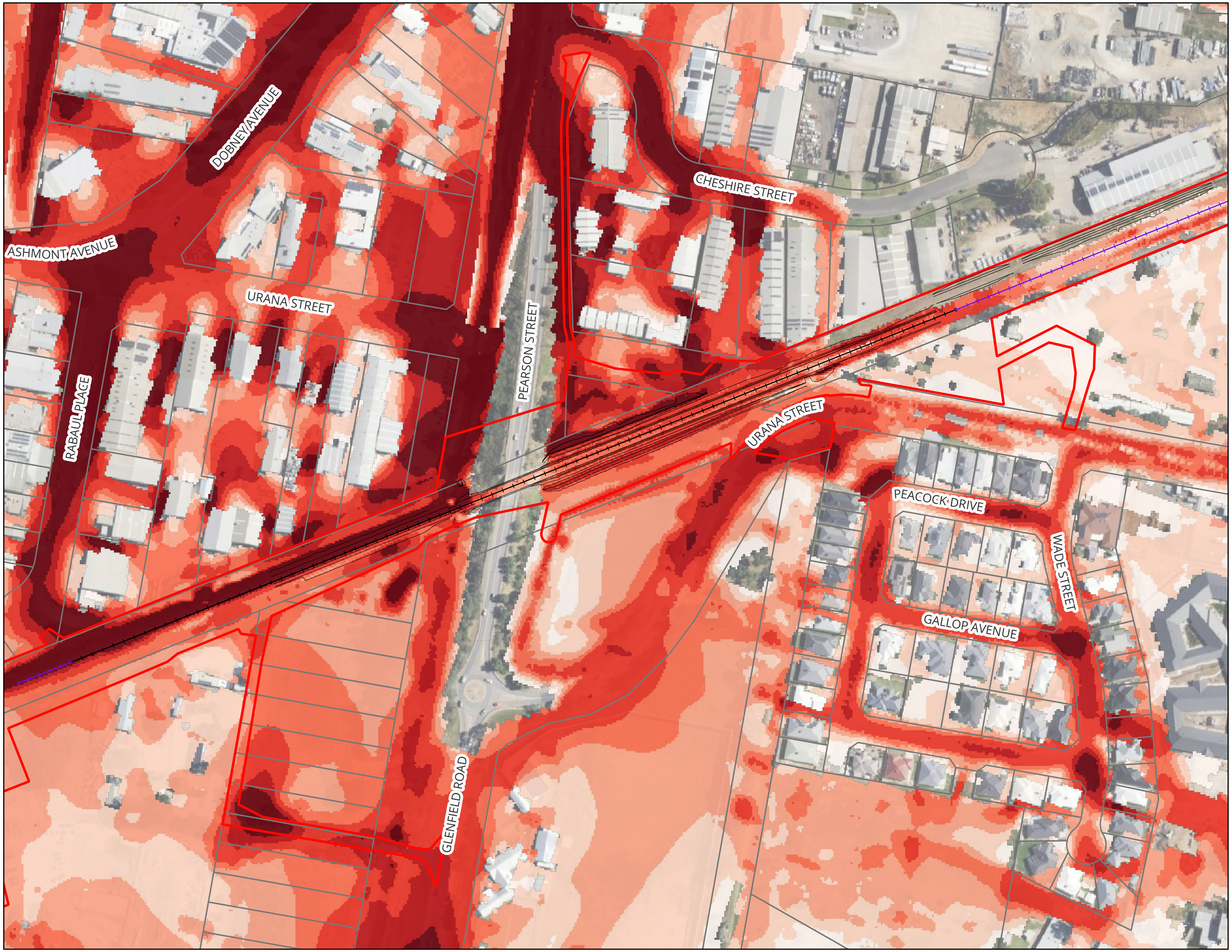
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A29 : 1% AEP Climate Changes Peak Flood Velocity - Master Design Condition



MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

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:

Map by: TT

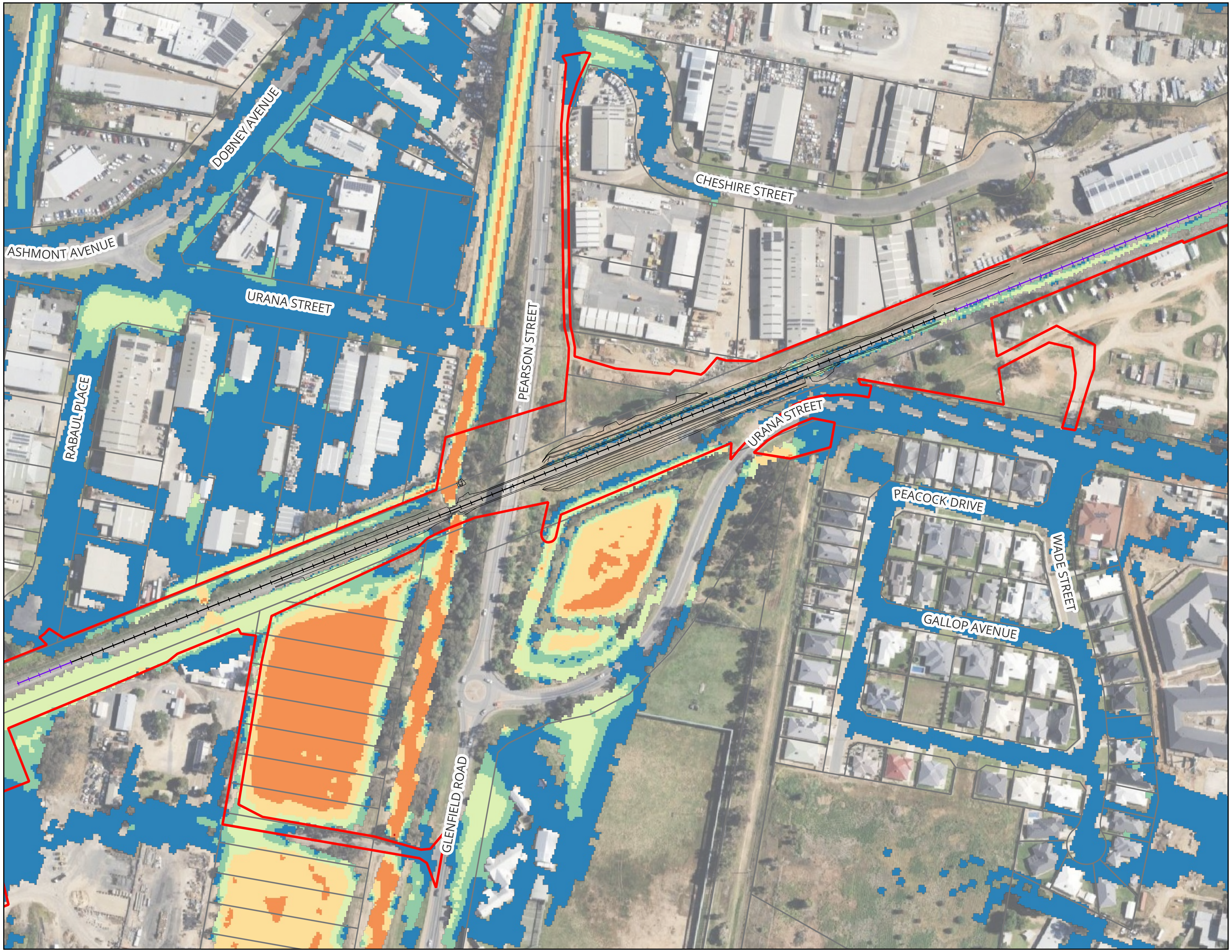
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A30 : PMF Peak Flood Velocity - Master Design Condition



MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Peak Flood Hazard

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

Notes:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A31 : 10% AEP Peak Flood Hazard - Master Design Condition

MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Peak Flood Hazard

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

Notes:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A32 : 5% AEP Peak Flood Hazard - Master Design Condition

MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Peak Flood Hazard

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

Notes:

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A33 : 2% AEP Peak Flood Hazard - Master Design Condition

MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Peak Flood Hazard

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

Notes:

Map by: TT

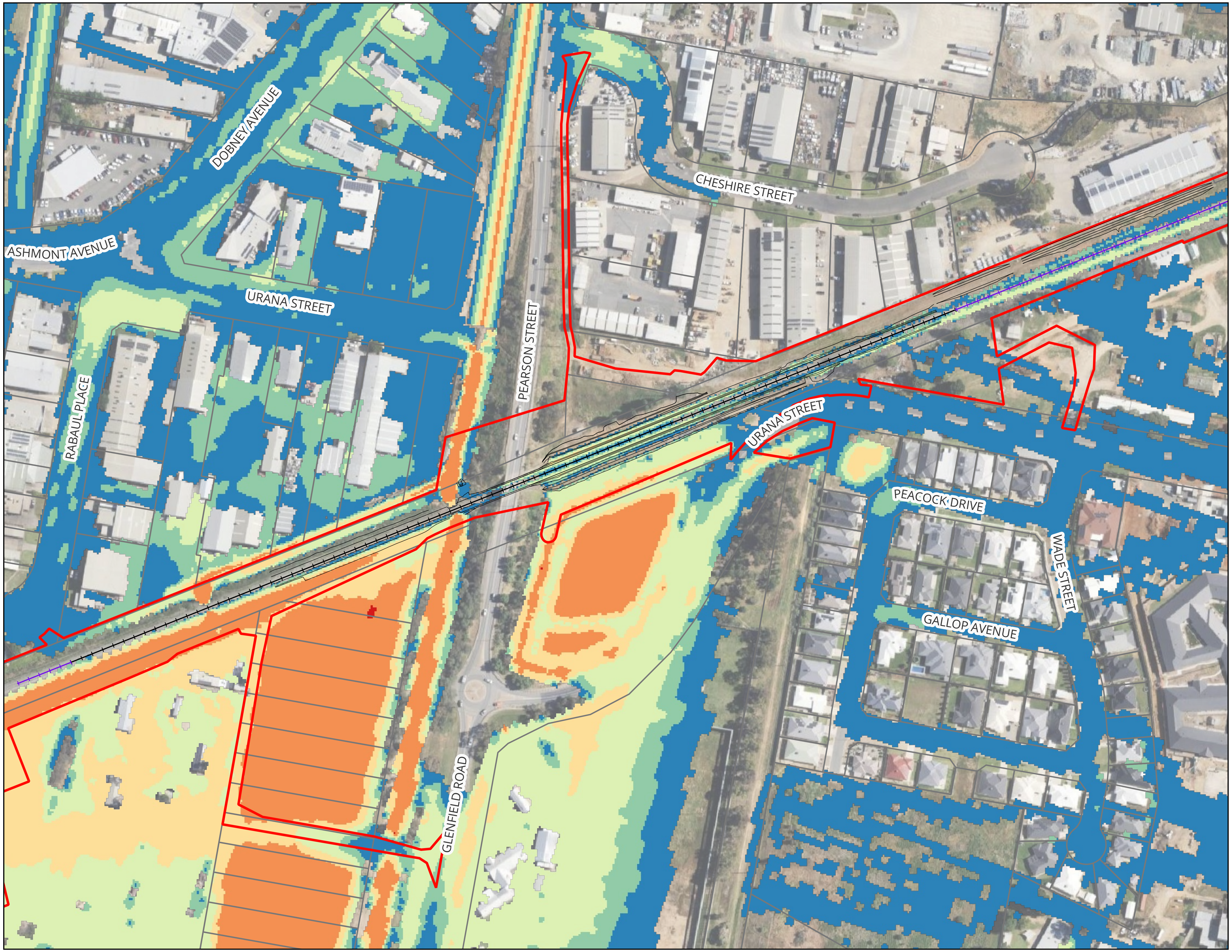
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A34 : 1% AEP Peak Flood Hazard - Master Design Condition



MARTINUS

aurecon BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Peak Flood Hazard

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

Notes:

Map by: TT

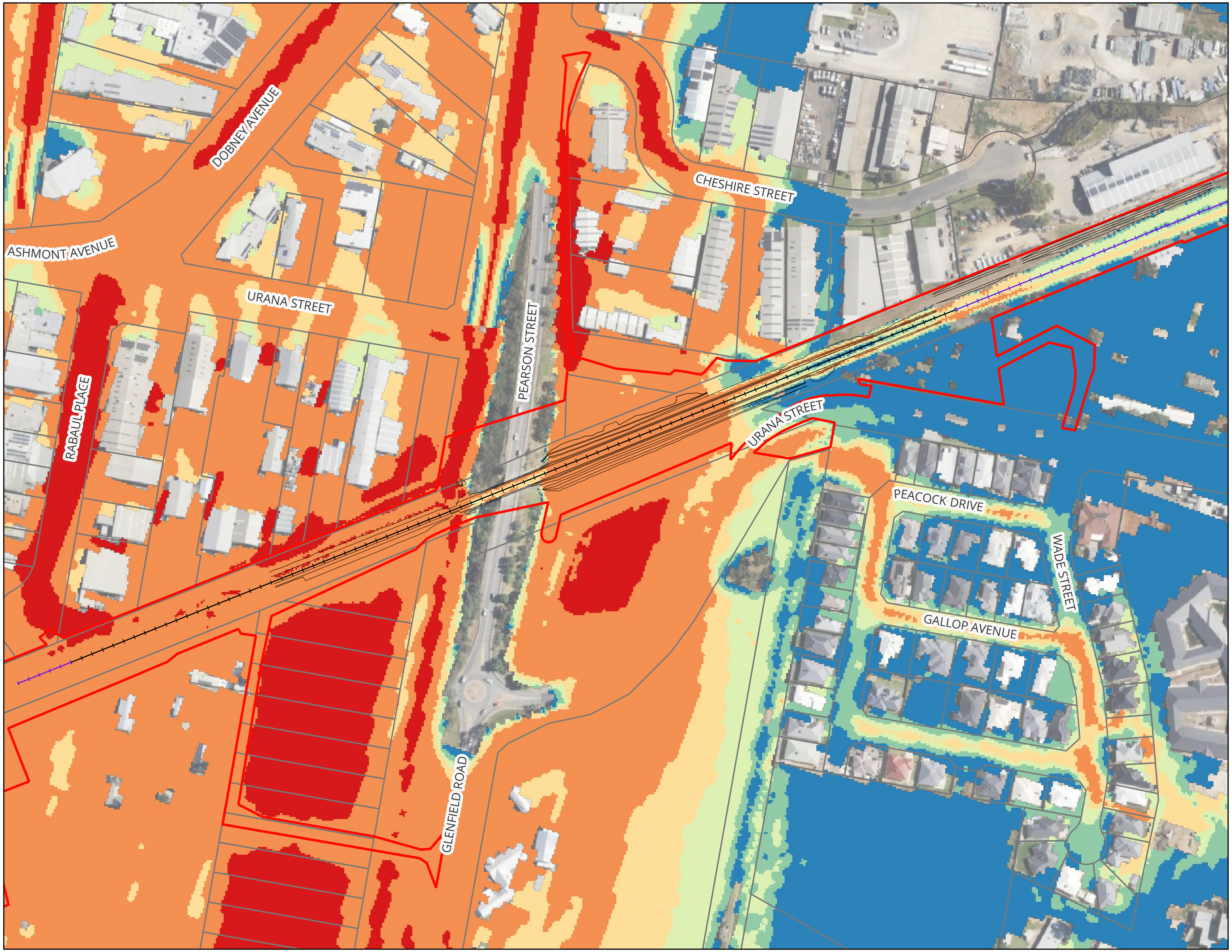
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A35 : 1% AEP Climate Changes Peak Flood Hazard - Master Design Condition



MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Peak Flood Hazard

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

Notes:

Map by: TT

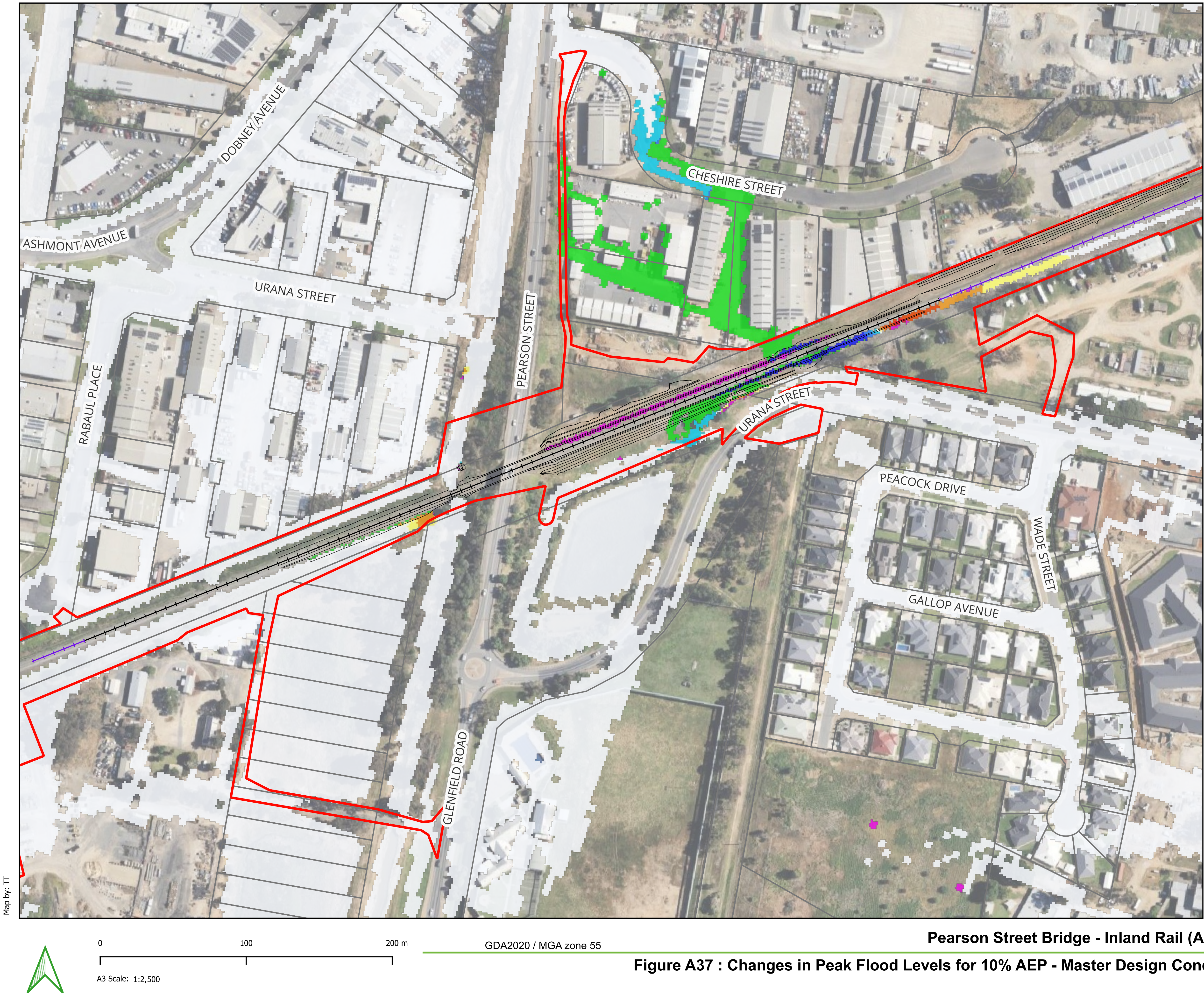
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A36 : PMF Peak Flood Hazard - Master Design Condition



MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Changes in Flood 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:

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A37 : Changes in Peak Flood Levels for 10% AEP - Master Design Condition vs Existing Condition

MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

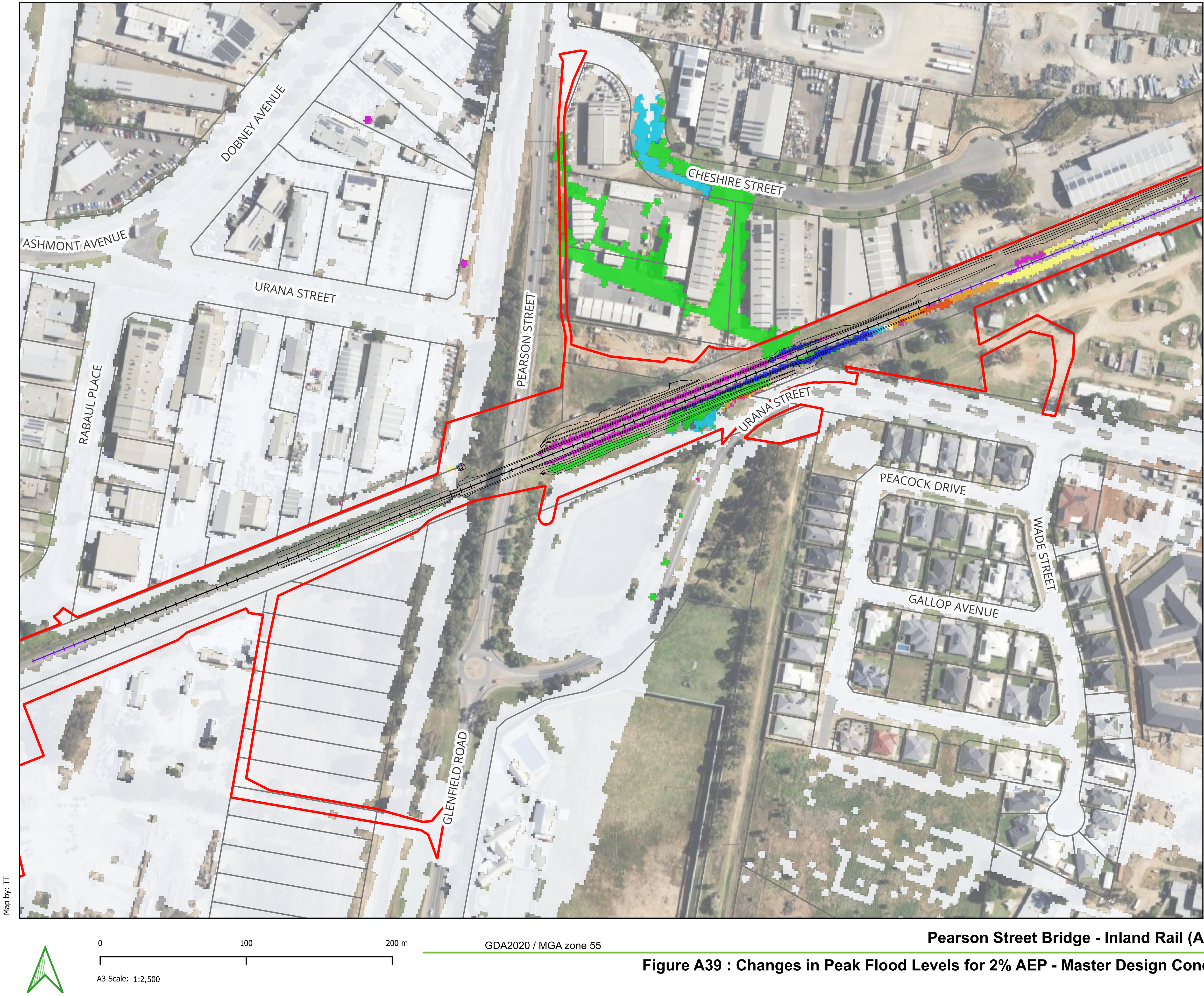
Changes in Flood Level (m)

- <= -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:

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A38 : Changes in Peak Flood Levels for 5% AEP - Master Design Condition vs Existing Condition



MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Changes in Flood 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:

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A39 : Changes in Peak Flood Levels for 2% AEP - Master Design Condition vs Existing Condition

MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Changes in Flood 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:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A40 : Changes in Peak Flood Levels for 1% AEP - Master Design Condition vs Existing Condition

MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Changes in Flood 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:

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A41 : Changes in Peak Flood Levels for 1% AEP Climate Changes - Master Design Condition vs Existing Condition

MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Changes in Velocity (m/s)

- <= 0.50

Changes in Velocity (%)

- <= 10%
- 10% - 20%
- > 20%
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A42 : Changes in Peak Flood Velocity for 10% AEP - Master Design Condition vs Existing Condition

MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Changes in Velocity (m/s)

- <= 0.50

Changes in Velocity (%)

- <= 10%
- 10% - 20%
- > 20%
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

Map by: TT

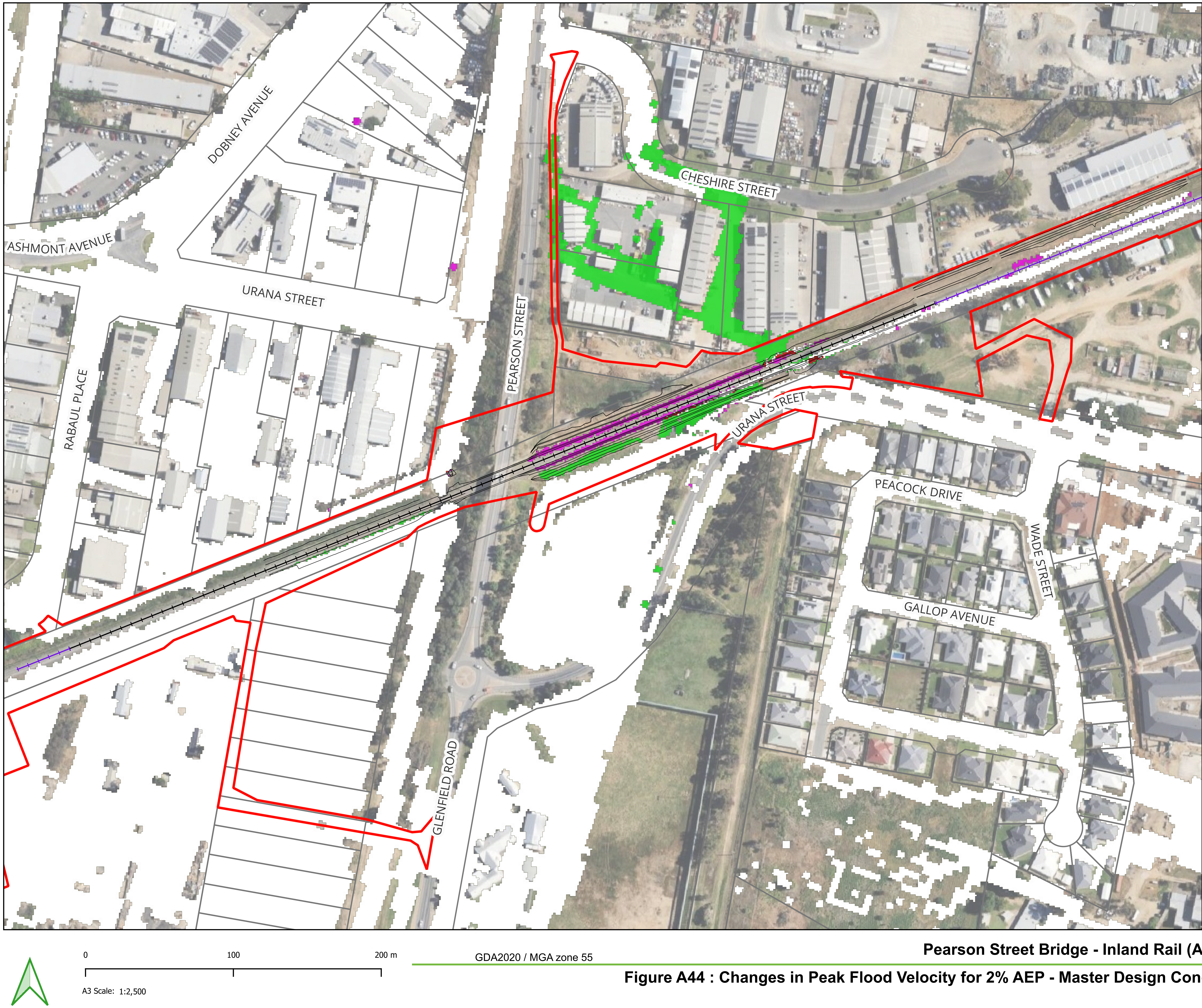
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A43 : Changes in Peak Flood Velocity for 5% AEP - Master Design Condition vs Existing Condition



MARTINUS

aurecon BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Changes in Velocity (m/s)

- <= 0.50

Changes in Velocity (%)

- <= 10%
- 10% - 20%
- > 20%
- Was Wet Now Dry
- Was Dry Now Wet

Notes:

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A44 : Changes in Peak Flood Velocity for 2% AEP - Master Design Condition vs Existing Condition

Map by: TT

MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Changes in Velocity (m/s)
- <= 0.50

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

Notes:

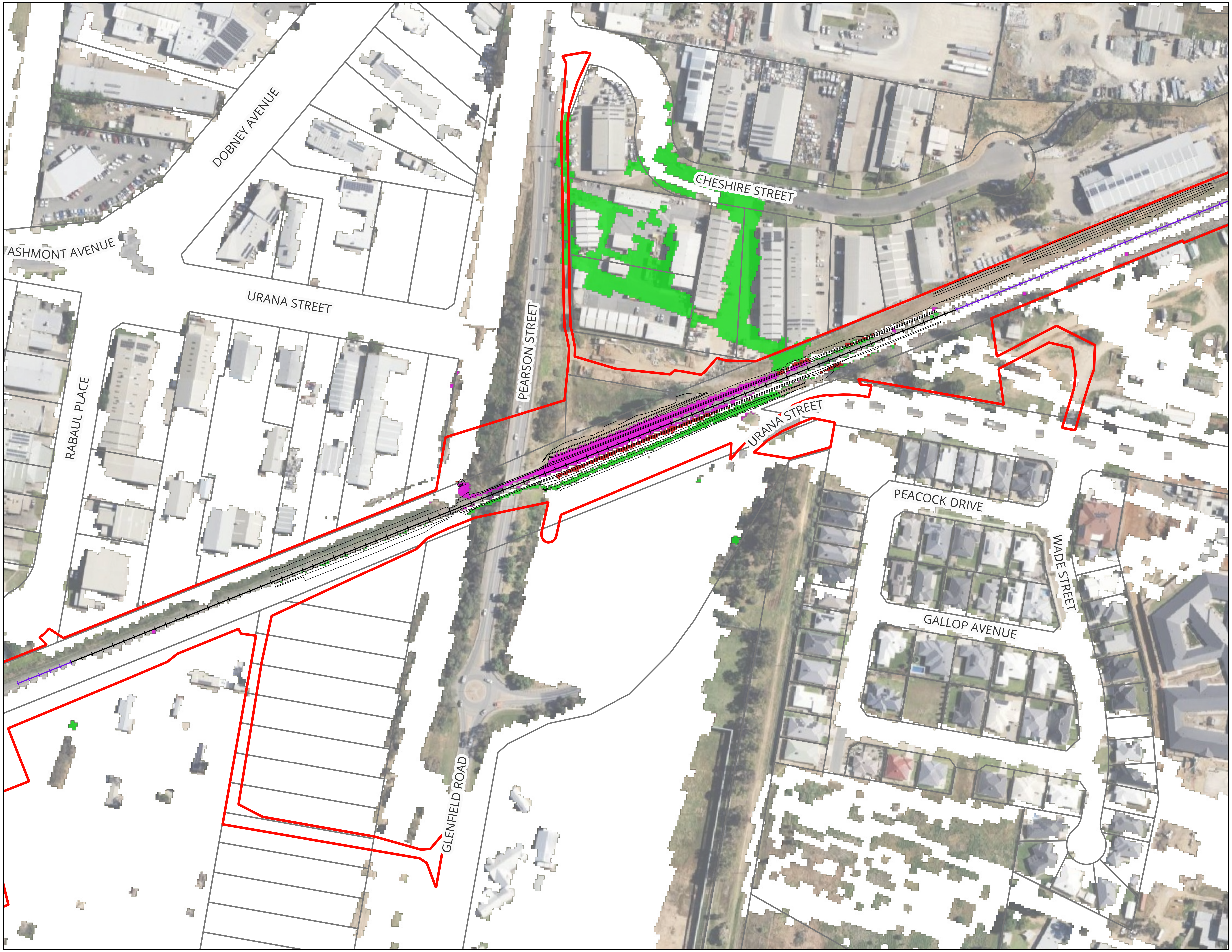
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A45 : Changes in Peak Flood Velocity for 1% AEP - Master Design Condition vs Existing Condition



MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Changes in Velocity (m/s)
- <= 0.50

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

Notes:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A46 : Changes in Peak Flood Velocity for 1% AEP Climate Changes - Master Design Condition vs Existing Condition

MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Changes 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:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A47 : Changes in Peak Flood Hazard for 10% AEP - Master Design Condition vs Existing Condition

MARTINUS

aurecon BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Changes 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:

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A48 : Changes in Peak Flood Hazard for 5% AEP - Master Design Condition vs Existing Condition

MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Changes 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:

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A49 : Changes in Peak Flood Hazard for 2% AEP - Master Design Condition vs Existing Condition

MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Changes 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:

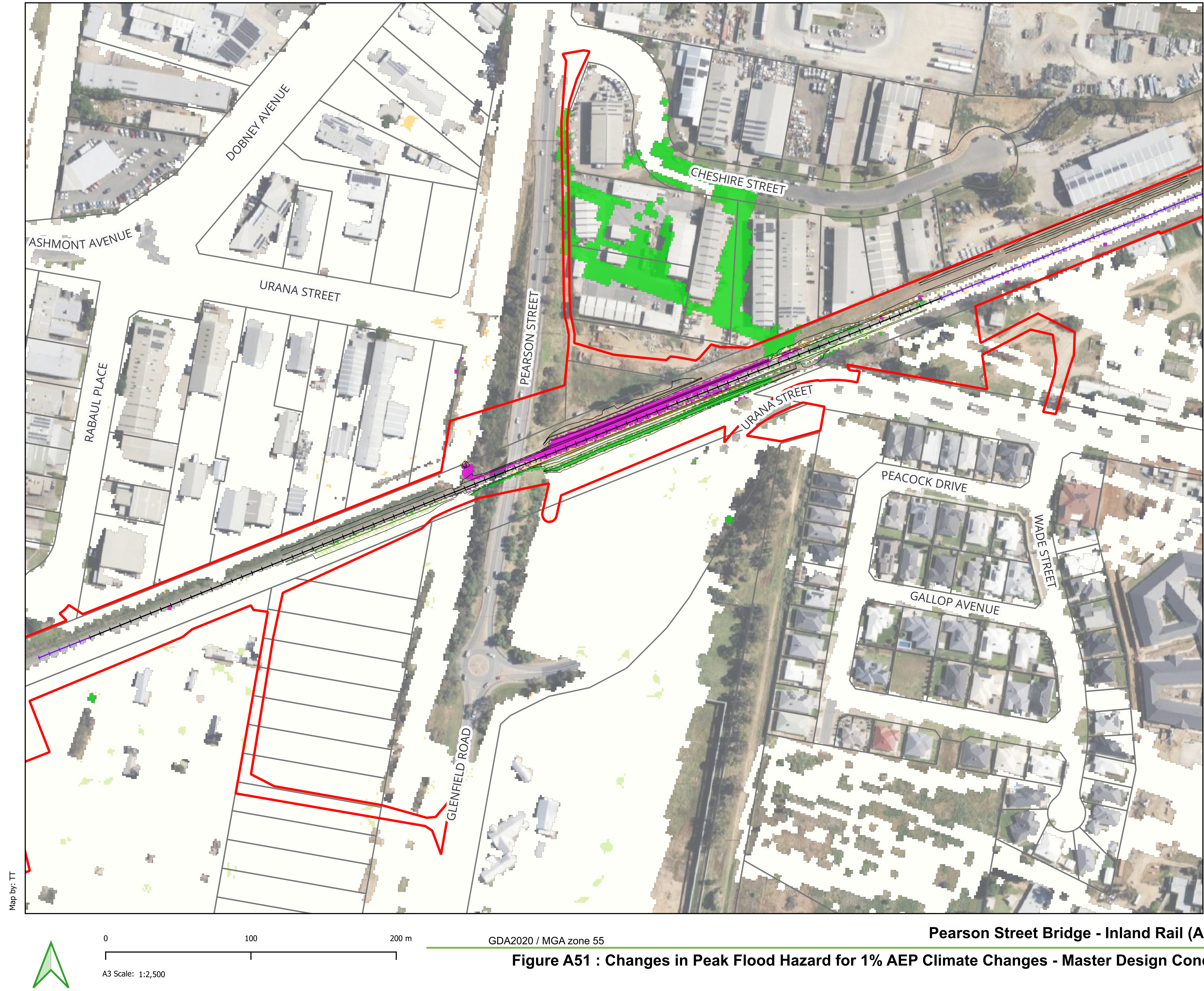
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A50 : Changes in Peak Flood Hazard for 1% AEP - Master Design Condition vs Existing Condition



MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Changes 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:

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A51 : Changes in Peak Flood Hazard for 1% AEP Climate Changes - Master Design Condition vs Existing Condition

MARTINUS

aurecon BG&E

Map by: TT

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre
- 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:

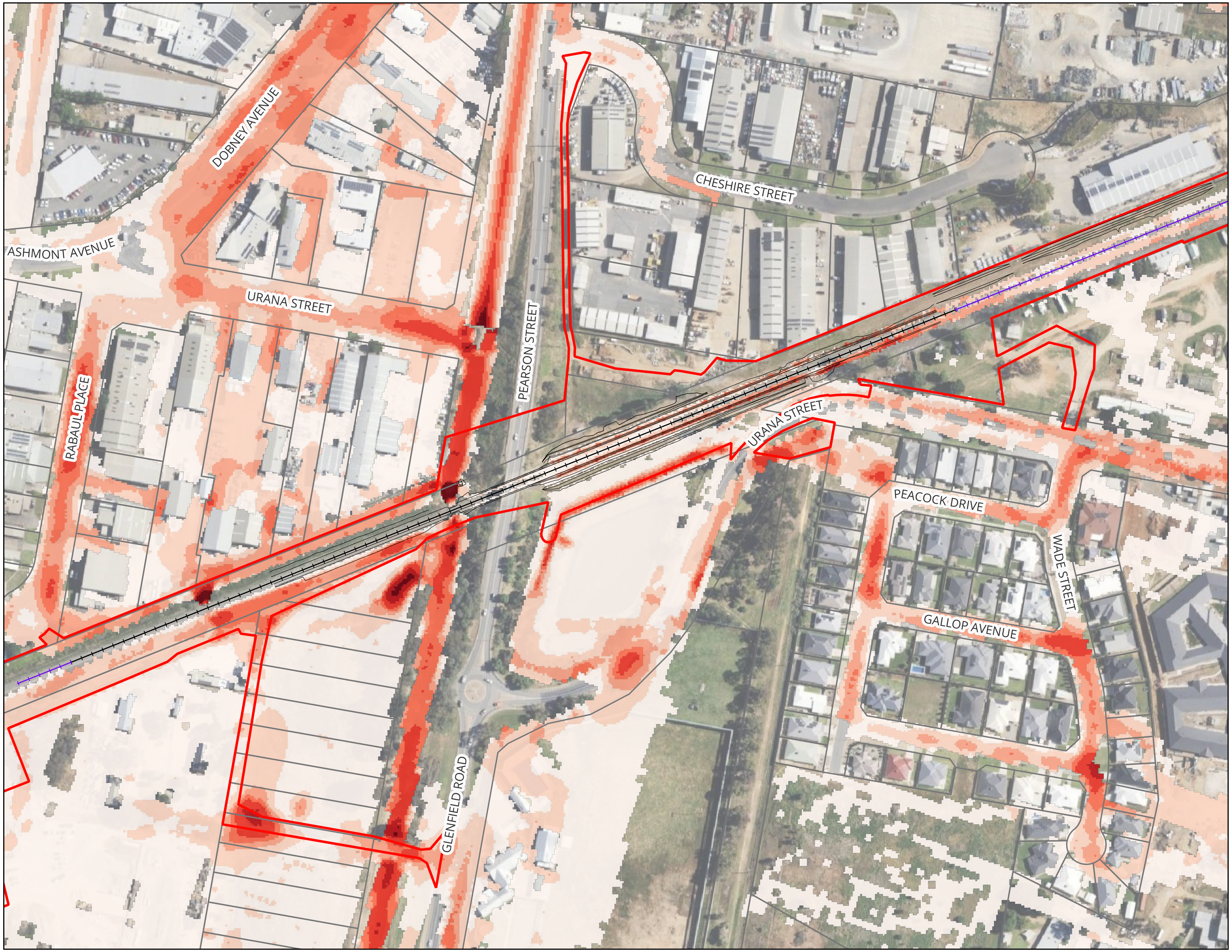
0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A52 : 1% AEP Peak Flood Depth and Levels - Master Design Blockage Condition



MARTINUS

aurecon

BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

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:

Map by: TT

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A53 : 1% AEP Peak Flood Velocity - Master Design Blockage Condition

Map by: TT

MARTINUS
aurecon
BG&E

Legend

- Project Boundary
- Civil Design Strings
- Existing Railway Track
- Proposed Railway Track
- Cadastre

Peak Flood Hazard

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

Notes:

0 100 200 m

A3 Scale: 1:2,500

GDA2020 / MGA zone 55

Pearson Street Bridge - Inland Rail (A2P) IFC Design - IFC Stage

Figure A54 : 1% AEP Flood Hazard - Master Design Blockage Condition

APPENDIX B

ARR Data Hub Data

Results - ARR Data Hub

[STARTTXT]

Input Data Information

[INPUTDATA]

Latitude,-35.122268

Longitude,147.367080

[END_INPUTDATA]

River Region

[RIVREG]

Division,Murray-Darling Basin

River Number,12

River Name,Murrumbidgee River

[RIVREG_META]

Time Accessed,18 June 2024 01:04PM

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,18 June 2024 01:04PM

Version,2016_v1

[END_LONGARF]

Storm Losses

[LOSSES]

ID,30818.0

Storm Initial Losses (mm),26.0

Storm Continuing Losses (mm/h),4.7

[LOSSES_META]

Time Accessed,18 June 2024 01:04PM

Version,2016_v1

[END_LOSSES]

Temporal Patterns

[TP]

code,MB

Label,Murray Basin

[TP_META]

Time Accessed,18 June 2024 01:04PM

Version,2016_v2

[END_TP]

Areal Temporal Patterns

[ATP]

code,MB

arealabel,Murray Basin

[ATP_META]

Time Accessed,18 June 2024 01:04PM

Version,2016_v2

[END_ATP]

Median Preburst Depths and Ratios

[PREBURST]

min (h)\AEP(%),50,20,10,5,2,1

60 (1.0),1.8 (0.089),1.6 (0.057),1.5 (0.044),1.4 (0.034),0.9 (0.019),0.5 (0.010)

90 (1.5),2.8 (0.123),1.9 (0.059),1.3 (0.033),0.7 (0.016),0.6 (0.011),0.5 (0.009)

120 (2.0),4.4 (0.178),3.2 (0.093),2.5 (0.059),1.7 (0.035),0.8 (0.013),0.1 (0.001)

180 (3.0),3.0 (0.108),2.9 (0.075),2.8 (0.062),2.8 (0.052),1.6 (0.025),0.7 (0.010)

360 (6.0),2.2 (0.065),1.3 (0.027),0.7 (0.012),0.1 (0.001),1.2 (0.016),2.1 (0.025)

720 (12.0),0.1 (0.002),1.0 (0.018),1.5 (0.024),2.1 (0.028),4.0 (0.045),5.4 (0.055)

1080 (18.0),0.0 (0.000),0.3 (0.005),0.5 (0.006),0.6 (0.008),2.5 (0.025),3.8 (0.035)

1440 (24.0),0.0 (0.000),0.2 (0.002),0.3 (0.003),0.4 (0.004),0.6 (0.006),0.8 (0.007)

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,18 June 2024 01:04PM

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,18 June 2024 01:04PM

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 (0.004),0.1 (0.001),0.0 (0.001),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,18 June 2024 01:04PM

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),15.3 (0.750),13.8 (0.480),12.7 (0.369),11.7 (0.291),11.8 (0.246),11.9 (0.220)

90 (1.5),15.3 (0.666),13.0 (0.404),11.5 (0.297),10.0 (0.222),10.5 (0.196),10.9 (0.180)

120 (2.0),16.6 (0.664),16.4 (0.471),16.3 (0.391),16.2 (0.334),12.4 (0.215),9.6 (0.147)

180 (3.0),11.8 (0.423),15.8 (0.410),18.5 (0.401),21.0 (0.393),20.3 (0.320),19.8 (0.278)

360 (6.0),12.7 (0.380),12.2 (0.265),11.8 (0.216),11.4 (0.181),17.4 (0.233),21.9 (0.261)

720 (12.0),5.5 (0.136),9.1 (0.167),11.5 (0.178),13.8 (0.185),18.3 (0.207),21.6 (0.219)

1080 (18.0),2.9 (0.064),6.1 (0.102),8.3 (0.117),10.4 (0.126),13.2 (0.136),15.4 (0.141)

1440 (24.0),0.2 (0.004),3.5 (0.054),5.7 (0.074),7.8 (0.088),9.1 (0.088),10.1 (0.087)

2160 (36.0),0.0 (0.000),0.9 (0.012),1.4 (0.017),2.0 (0.020),3.1 (0.027),4.0 (0.031)

2880 (48.0),0.0 (0.000),0.4 (0.006),0.7 (0.008),1.0 (0.010),1.1 (0.009),1.2 (0.009)

4320 (72.0),0.0 (0.000),0.0 (0.000),0.1 (0.001),0.1 (0.001),0.0 (0.000),0.0 (0.000)

[PREBURST75_META]

Time Accessed,18 June 2024 01:04PM

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),36.2 (1.772),29.9 (1.042),25.7 (0.746),21.7 (0.539),29.0 (0.603),34.4 (0.636)

90 (1.5),38.3 (1.665),34.2 (1.061),31.4 (0.814),28.8 (0.640),30.3 (0.566),31.5 (0.522)

120 (2.0),39.0 (1.565),36.1 (1.038),34.1 (0.821),32.3 (0.667),32.3 (0.561),32.3 (0.499)

180 (3.0),26.5 (0.953),31.5 (0.816),34.7 (0.755),37.9 (0.709),41.0 (0.647),43.4 (0.609)

360 (6.0),26.9 (0.804),28.0 (0.611),28.8 (0.528),29.5 (0.467),41.5 (0.555),50.5 (0.601)

720 (12.0),16.1 (0.400),24.9 (0.457),30.8 (0.477),36.4 (0.488),39.8 (0.451),42.3 (0.428)

1080 (18.0),16.2 (0.362),19.2 (0.318),21.1 (0.297),23.0 (0.280),30.3 (0.312),35.7 (0.328)

1440 (24.0),6.7 (0.138),13.4 (0.207),17.9 (0.234),22.2 (0.252),23.2 (0.223),23.9 (0.206)

2160 (36.0),1.1 (0.021),9.3 (0.131),14.8 (0.176),20.0 (0.208),17.3 (0.152),15.2 (0.119)

2880 (48.0),0.4 (0.007),6.8 (0.089),11.0 (0.123),15.1 (0.147),17.3 (0.143),18.9 (0.140)

4320 (72.0),0.0 (0.000),3.1 (0.037),5.1 (0.052),7.0 (0.063),13.9 (0.106),19.0 (0.130)

[PREBURST90_META]

Time Accessed,18 June 2024 01:04PM

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,18 June 2024 01:04PM

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),17.6,10.7,10.6,11.3,10.9,9.0

90 (1.5),17.1,11.2,10.9,11.8,11.9,9.3

120 (2.0),16.3,10.8,10.5,11.4,11.1,9.4

180 (3.0),17.7,12.1,10.9,11.3,9.7,7.3

360 (6.0),18.1,13.6,13.3,14.1,12.4,8.1

720 (12.0),21.1,15.8,14.6,14.6,12.5,8.5

1080 (18.0),22.0,17.3,16.6,17.1,14.3,9.0

1440 (24.0),24.3,19.2,18.7,19.1,17.1,11.5

2160 (36.0),25.6,21.0,20.4,21.2,19.3,15.9

2880 (48.0),26.2,21.5,21.4,22.4,20.6,15.4

4320 (72.0),26.6,22.1,23.3,24.0,21.9,15.7

[BURSTIL_META]

Time Accessed,18 June 2024 01:04PM

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),8.4,15.3,15.4,14.7,15.1,17.0

90 (1.5),8.9,14.8,15.1,14.2,14.1,16.7

120 (2.0),9.7,15.2,15.5,14.6,14.9,16.6

180 (3.0),8.3,13.9,15.1,14.7,16.3,18.7

360 (6.0),7.9,12.4,12.7,11.9,13.6,17.9

720 (12.0),4.9,10.2,11.4,11.4,13.5,17.5

1080 (18.0),4.0,8.7,9.4,8.9,11.7,17.0

1440 (24.0),1.7,6.8,7.3,6.9,8.9,14.5

2160 (36.0),0.4,5.0,5.6,4.8,6.7,10.1

2880 (48.0),0.0,4.5,4.6,3.6,5.4,10.6

4320 (72.0),0.0,3.9,2.7,2.0,4.1,10.3

[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

ARTC INLAND RAIL

Document Control Information			
	Contractor DC to update for re-submission	**Submitted Document No. or Transmittal No.:**	Martinus-PTRAN-002306
Project:	2100 - A2I	**Date Submission Received:**	19/12/2025
Comment Sheet Number_Revision:	5-0052-210-IHY-W2-CS-0001_H	**Comment Sheet Title:**	***External Comment Sheet - A2I | Flood Design Report - Pearson Street Bridge***
Revision Date:	12/02/2026	**Documents related in Aconex** (by IR DC)	Yes — Comments for Flood Design Report transferred from 5-0052-210-PEN-W2-CS-0001

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*	*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	Annexure F, Appendix F1, Design Development Deliverables (Design Mgt Spec 0-0000-900-PEN-00-SP-0008) Clarification	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 1, General comments	SDR	can you include a section to cover and address the planning mitigation measures and future conditions of approval. At the minute there's HFWQ3 to HFWQ6 in the EIS specific to flooding. Even if the mitigation is not relevant to the package, I would include a note saying why that's the case.	Non-Compliant	Chris Fay	23/11/2023	Jasmine Lee / Zoe Cruice	DJV Flooding Lead	12/12/2023	The Contractor's requirements wrt the EIS are those anticipated CoA included in Deed Schedule 8. We note and understand that these are based on N2N and may not be the same as the A2I EIS CoA or MM once the EIS is determined/approved. The Contractor has been provided with an 'Early Warning Notice' by IR to respond with an indication of impact to engaged scope as a result of the A2I EIS PIR MM. Future reports will include a register of the EIS aCoA as per Schedule 8, and the proposed controls and measures. Currently HFWQ3 and HFWQ6 do not existing in Schedule 8. It is noted, however, that the N2N Flood Modelling Specifications are being used to govern/guide flood modelling. 29/4/25 ZC: Appendix D of the PEN report contains the Desgin compliance track for the CoA, incl UMMs. Please refer Appendix D of the PDR PEN-report		Stephen Brierley	19/01/2024	TRANSFERRED	Commerical discussions are at play within ARTC Project Environment SMEs to understand the scope of works for the ACoA Appendix 8. This is item to be resolved in due course. SB - Comments related to the aCOA are to be transferred to the appropriate environmental forum for resoution. It was agreed that the construction working pack will resolve these type of comments. Please see Dallas Nixon for further information.
2	Annexure F, Appendix F1, Design Development Deliverables (Design Mgt Spec 0-0000-900-PEN-00-SP-0008) Clarification	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 5, Glossary Table 0-1 Definitions pg 4	SDR	Please update glossary to list all acronyms used within this report. RCP8.5 is listed but not defined.	Non-Compliant	Andrew Aitken	15/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	Noted. It will be updated in the next design report. 29/4/25: Glossary has been updated, including RCP	PDR submission design deliverables	Andrew Aitken	17/01/2024	CLOSED	
3	Annexure F, Appendix F1, Design Development Deliverables (Design Mgt Spec 0-0000-900-PEN-00-SP-0008) Clarification	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 9, 5-0052-210-IHY-W2-RP-0001_A, Section 1.3.2.2	SDR	Any inundation map due to local flooding will help understanding the flooding pattern. Any overland flow path map will also be helpful.	Non-Compliant	Ayub Ali	29/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	Noted. The inundation map from local flooding will be added in the next design report. 29/4/25 ZC: Section 4.8 of the PDR report covers off the flooding impact at a high level. Please refer to the site specifica Flood Design Report for all scenario mapping and full assessment of flood impacts.	PDR submission design deliverables	Ayub Ali	19/05/2025	CLOSED	Satisfactorily addressed in the flood design report.
4	PSR Annexure B Technical Requirements (IR-SR-A2I-349 and IR-SR-A2I-350)	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 9, 5-0052-210-IHY-W2-RP-0001_A, Section 1.3.2.3	SDR	Any figure identifying the location of the bund, overland flow direction, extend and depth will help understanding the flooding and overland flow pattern.	Non-Compliant	Ayub Ali	29/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	Noted. A figure including the bund and overland flow path will be added in the next next design report.	PDR submission design deliverables	Ayub Ali	19/05/2025	CLOSED	Satisfactorily addressed in the flood design report.
5	EIS CoA	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 11, 1.8	SDR	Please add a note that QDLs will be reviewed and checked for compliance once the project is DPE approved and final A2I CoA are obtained	Non-Compliant	Daniel Lumby	13/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	Noted. It will be updated in the next design report when the EIS CoA are provided. 21/11/25 ZC: The EIS has been determined and the anticipated CoA replaced with determined CoA. Section 2 of the FDR outlines compliance of the assessment and works to the determined EIS CoA.	no current action. TO be addressed when the EIS CoA are provided/confirmed.	Dallas Nixon	13/01/2026	CLOSED	Commerical discussions are at play within ARTC Project Environment SMEs to understand the scope of works for the ACoA Appendix 8. This is item to be resolved in due course. Awaiting resolution of COA between IR Environment and MR.
6	A2I ACoA, Schedule 8 of the Deed	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 12, Section 2	SDR	Compliance with Requirements should include relevant Anticipated Conditions of Approval	Non-Compliant	Daniel Lumby	13/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	Future reports will include a compliance table of the EIS aCoA as per Schedule 8. The Contractor's requirements wrt the EIS are those anticipated CoA included in Deed Schedule 8. We note and understand that these are based on N2N and may not be the same as the A2I EIS CoA or MM once the EIS is determined/approved. The Contractor has been provided with an 'Early Warning Notice' by IR to respond with an indication of impact to engaged scope as a result of the A2I EIS PIR MM. 21/11/25 ZC: The EIS has been determined and the anticipated CoA replaced with determined CoA. Section 2 of the FDR outlines compliance of the assessment and works to the determined EIS CoA.	PDR submission design deliverables	Dallas Nixon	13/01/2026	CLOSED	Commerical discussions are at play within ARTC Project Environment SMEs to understand the scope of works for the ACoA Appendix 8. This is item to be resolved in due course. Awaiting resolution of COA between IR Environment and MR.
7	PSR Annexure B Technical Requirements (IR-SR-A2I-349 and IR-SR-A2I-350)	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 12, 5-0052-210-IHY-W2-RP-0001_A, Table 2.1	SDR	It is understood that the site is not affected by any regional flood and the track overtops from local flooding. Will this overtopping compromise the normal use of track? Is there any drainage solution that may prevent the track from overtopping during local storm events? A discussion about this issue is necessary for better understanding of the risk.	Non-Compliant	Ayub Ali	29/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	The overtopping of the track from the local catchment is a non-compliance and it will be addressed in the next design stage. The drainage solution was proposed as a mitigation option lised in Section 7. The discussion of the risk will be included in the next design report.	PDR submission design deliverables	Ayub Ali	19/05/2025	CLOSED	Satisfactorily addressed in the flood design report.
8	PSR Annexure B Technical Requirements (IR-SR-A2I-349 and IR-SR-A2I-350)	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 13, 5-0052-210-IHY-W2-RP-0001_A, Table 2.1	SDR	As mentioned above, it is understood that the site is not affected by any regional flood and the track overtops from local flooding. Will this overtopping compromise the normal use of track? Is there any drainage solution that may prevent the track from overtopping during local storm events? A discussion about this issue is necessary for better understanding of the risk.	Non-Compliant	Ayub Ali	29/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	The overtopping of the track from the local catchment is againest the design criteria and it will be addressed in the next design stage. The existing track immunity is 1% AEP so the design scenario should keep the same flood immunity. The drainage solution was proposed as a mitigation option lised in Section 7. The discussion of the risk will be included in the next design report.	PDR submission design deliverables	Ayub Ali	19/05/2025	CLOSED	Satisfactorily addressed in the flood design report.
9	EIS ACoA QDLs	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 14, Section 2.2, Table 2-2	SDR	Table is missing Flood Duration parameters.	Non-Compliant	Daniel Lumby	13/11/2023	Jasmine Lee / Zoe Cruice	DJV Flooding Lead	12/12/2023	The QDLs adopted the same as N2NS EIS, as the aCoA are based on this prior set of EIS CoA. It is likely these will be the same/similar for A2P. Although EIS included flood duration parameter, it did not assess flood duration in the report. To avoid any confusion, the flood duration paramaters were removed from QDLs. In addition, the QDLs were taken from N2N project which may not be suitable for A2I. Therefore, QDLs will be reviewed and checked once the final A2I CoA is released. (Also please refer to the comment item 21) 21/11/25 ZC: The EIS has been determined and the anticipated CoA replaced with determined CoA. Section 2 of the FDR outlines compliance of the assessment and works to the determined EIS CoA.	no current action. TO be addressed when the EIS CoA are provided/confirmed.	Dallas Nixon	13/01/2026	CLOSED	Commerical discussions are at play within ARTC Project Environment SMEs to understand the scope of works for the ACoA Appendix 8. This is item to be resolved in due course. Awaiting resolution of COA between IR Environment and MR.
10	PSR Annexure B Technical Requirements (IR-SR-A2I-352)	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 14, 5-0052-210-IHY-W2-RP-0001_A, Table 2.2	SDR	Is there any drainage solution? Any mitigation measure tested and recommended? Inclusion of some details in response to the above question is required.	Non-Compliant	Ayub Ali	29/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	The mitigation options of increasing channel size and pipe size were proposed and listed in Section 7 to solve the flood impact issue. It will be tested and reported in the next desing stage.	PDR submission design deliverables	Ayub Ali	19/05/2025	CLOSED	Satisfactorily addressed in the flood design report.
11	Annexure F, Appendix F1, Design Development Deliverables (Design Mgt Spec 0-0000-900-PEN-00-SP-0008) Clarification	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 14, 5-0052-210-IHY-W2-RP-0001_A, Table 2.2	SDR	Any mitigation measure tested and recommended? Inclusion of some details in response to the above question is required. PSR Annexure B Technical Requirements IR-SR-A2I-459)	Non-Compliant	Ayub Ali	29/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	Similar to the mitigation for the flood level impact, increasing the channel and pipe size will be implemented in the next design stage to sovle the velocity increase issue.	PDR submission design deliverables	Ayub Ali	19/05/2025	CLOSED	Satisfactorily addressed in the flood design report.
12	Annexure F, Appendix F1, Design Development Deliverables (Design Mgt Spec 0-0000-900-PEN-00-SP-0008) Clarification	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 15, 5-0052-210-IHY-W2-RP-0001_A, Table 2.2	SDR	Any mitigation measure tested and recommended? Inclusion of some details in response to the above question is required. PSR Annexure B Technical Requirements IR-SR-A2I-459)	Non-Compliant	Ayub Ali	29/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	The mitigations (listed in the Section 7) mentioned for item 31 and 32 will also be used to solve the flood hazard impact in the next design stage.	PDR submission design deliverables	Ayub Ali	19/05/2025	CLOSED	Satisfactorily addressed in the flood design report.
13	Annexure F, Appendix F1, Design Development Deliverables (Design Mgt Spec 0-0000-900-PEN-00-SP-0008) Clarification	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 20, 5-0052-210-IHY-W2-RP-0001_A, Section 4.1.1.2	SDR	What is the reason for the latest version 2023-03-AC producing significantly different result? Generally, the latest version would produce more accurate result. Hence, it is expected that the latest version is used for simulation unless there is a valid reason.	Non-Compliant	Ayub Ali	29/11/2023	Jasmine Lee / Zoe Cruice	DJV Flooding Lead	12/12/2023	Comparing with 2018-03-AC version, the 2023-03-AC introduces a significant changes to the model features including the break-line representations, structure losses method and momentum flux for 1d-2d connection. All of those changes may contribute the differences. ARR2019 and the TUFLOW mannual recommend to use the latest version of the software but the original model run by 2018 version was calibrated. Therefore, when upgrading to the newer software version, producing the similar results with the 2018 one will be more important. After comparison and testing, 2020-10-AF is assessed as fit for the purpose.		Ayub Ali	9/06/2025	CLOSED	

ARTC INLAND RAIL

Comment Sheet Number_Revision:	5-0052-210-IHY-W2-CS-0001_H	Comment Sheet Title:	External Comment Sheet - A2I | Flood Design Report - Pearson Street Bridge
Revision Date:	12/02/2026	Documents related in Aconex (by IR DC)	Yes — Comments for Flood Design Report transferred from 5-0052-210-PEN-W2-CS-0001

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
14	Annexure F, Appendix F1, Design Development Deliverables (Design Mgt Spec 0-0000-900-PEN-00-SP-0008) Clarification	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 23, Section 4.1.3.1 Climate Change pg 22	SDR	At the PDR stage, please update this report to specifically outline the 'climate change factor' included in the modelling. Please refer to the DJV Sustainability specialist to ensure that the requirements of the climate change credits of the IS rating are addressed.	Non-Compliant	Andrew Aitken	15/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	Section 4.1.3.1 only shows the approach to climate change modelling. Relevant climate change results are described in the results section. If required, a separate section for the climate change could be presented in the next design stage. 21/11/25 ZC: Section 6.5.2 of the PDR report includes a climate change sensitivity assessment. Refer snip below 6.5.2 Climate Change Risk Assessment A Climate Change risk assessment was carried out by running the 1% AEP with 2090 RCP8.5 interim climate change factor (refer to Section 4.2.3.1 for details of the approach) and the results of flood depth, flood velocity and flood hazard can be found in Section 6.1, Section 6.2 and corresponding flood maps can be found in Appendix A. The assessment is summarised as below: • Within the study area, the railway track does not achieve flood immunity in climate change condition with an overtopping depth of up to 0.55m at CH523.500km • Within the study area, the flood water overtops the proposed railway track and bund with flood velocity generally up to 0.1m/s at CH523.500km. • Within the study area, the flood hazard reached up to H5 in climate change condition.	PDR submission design deliverables	Andrew Aitken	19/01/2026	Closed	To be updated and reviewed at DDR 19/01/2026 - flood modelling consistent with assessment of IR CRR 15 and 17 in CCRA. Comment Closed.
15	PSR Annexure B Technical Requirements IR-SR-A2I-459)	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 29, 5-0052-210-IHY-W2-RP-0001_A, Section 6.2	SDR	Will the overtopping compromise the required use of the track? What are the risks? Any mitigation measure tested and recommended? Inclusion of some details are required.	Non-Compliant	Ayub Ali	29/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	The overtopping of the track for the 1% AEP is a non-compliance. The mitigation option of increasing the channel size and pipe size were proposed in Section 7 and it will be implemented in the next design stage. The track's flood immunity will be the same as existing (i.e. 1% AEP).	PDR submission design deliverables	Ayub Ali	19/05/2025	CLOSED	Satisfactorily addressed in the flood design report.
16	PSR Annexure B Technical Requirements IR-SR-A2I-459)	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 30, 5-0052-210-IHY-W2-RP-0001_A, Table 6.6	SDR	Will the overtopping compromise the required use of the track? What are the risks? Any mitigation measure tested and recommended? Inclusion of some details are required.	Non-Compliant	Ayub Ali	29/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	In the design scenario, the flood water overtops the rail track 5% AEP, 2% AEP and 1% AEP is a non-compliance as the existing rail track could achieve flood immunity up to 1% AEP. The mitigation options of increasing the channel size and pipe size were proposed and described in Section 7. It will be adopted to solve the non-compliance in the next design stage.	PDR submission design deliverables	Ayub Ali	19/05/2025	CLOSED	Satisfactorily addressed in the flood design report.
17	PSR Annexure B Technical Requirements IR-SR-A2I-459)	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 32, 5-0052-210-IHY-W2-RP-0001_A, Section 6.3	SDR	Any mitigation measure tested and recommended? Inclusion of some details are required.	Non-Compliant	Ayub Ali	29/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	The mitigation options of increasing channel size and pipe size were proposed and listed in Section 7 and it will be implemented in the next design stage.	PDR submission design deliverables	Ayub Ali	19/05/2025	CLOSED	Satisfactorily addressed in the flood design report.
18	PSR Annexure B Technical Requirements IR-SR-A2I-459)	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 32, 5-0052-210-IHY-W2-RP-0001_A, Section 6.4	SDR	It is understood that the site is not affected by any regional flood and the track overtops from local flooding. Will this overtopping compromise the normal use of track? Is there any drainage solution that may prevent the track from overtopping during local storm events? A discussion about this issue is necessary for better understanding of the risk.	Non-Compliant	Ayub Ali	29/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	The overtopping of the track for the 1% AEP is a non-compliance. The mitigation options have been proposed in Section 7 and it will be implemented in the next design stage. The track's flood immunity will be the same as existing.	PDR submission design deliverables	Ayub Ali	19/05/2025	CLOSED	Satisfactorily addressed in the flood design report.
19	PSR Annexure B Technical Requirements IR-SR-A2I-459)	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 33, 5-0052-210-IHY-W2-RP-0001_A, Table 6.9	SDR	What is land use category of the affected area? Does it exceed the QDL? Any mitigation measure tested and recommended? A discussion about this issue is necessary for better understanding of the risk.	Non-Compliant	Ayub Ali	29/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	The land use (https://datasets.seed.nsw.gov.au/dataset/nsw-landuse-2017-v1p2-f0ed) of affected areas are Manufacturing and industrial and Transport and communication. As stated in Table 2-2 the affected area has a flood depth more than 100mm (2% AEP) which exceeds th QDL limit. As discussed in the Section 7, upsizing the open channels and pipe would reduce the impacts and it will be implemented in the next design stage.	PDR submission design deliverables	Ayub Ali	19/05/2025	CLOSED	Satisfactorily addressed in the flood design report.
20	PSR Annexure B Technical Requirements IR-SR-A2I-459)	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 33, 5-0052-210-IHY-W2-RP-0001_A, Table 6.9	SDR	What is land use category of the affected area? Does it exceed the QDL? Any mitigation measure tested and recommended? A discussion about this issue is necessary for better understanding of the risk.	Non-Compliant	Ayub Ali	29/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	The land use of affected areas are Manufacturing and industrial and Transport and communication. As discussed in Table 2-2 the affected area has a flood depth more than 100mm which exceeds th QDL limit.As stated in Table 2-2 the affected area has a flood depth more than 100mm (1% AEP) which exceeds th QDL limit. As discussed in the Section 7, upsizing the open channels and pipe would reduce the impacts and it will be implemented in the next design stage.	PDR submission design deliverables	Ayub Ali	19/05/2025	CLOSED	Satisfactorily addressed in the flood design report.
21	PSR Annexure B Technical Requirements IR-SR-A2I-459)	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 34, 5-0052-210-IHY-W2-RP-0001_A, Table 6.9	SDR	Any mitigation measure tested and recommended? A discussion about this issue is necessary for better understanding of the risk.	Non-Compliant	Ayub Ali	29/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	The mitigation options of upsizing the channel and pipe were proposed in Section 7 and it will be implemented in the next design stage.	PDR submission design deliverables	Ayub Ali	19/05/2025	CLOSED	Satisfactorily addressed in the flood design report.
22	PSR Annexure B Technical Requirements IR-SR-A2I-459)	5-0052-210-IHY-W2-RP-0001_A.pdf	Page 35, 5-0052-210-IHY-W2-RP-0001_A, Section 6.4.3	SDR	Any flood hazard mitigation measure required and recommended? Inclusion of some details are required.	Non-Compliant	Ayub Ali	29/11/2023	Jasmine Lee	DJV Flooding Lead	12/12/2023	The mitigation options measure for flood hazard are similar to flood level impact. The measures of upsizing the channel and pipe would be the ones, which were proposed in Section 7 and will be implemented in the next design stage.	PDR submission design deliverables	Ayub Ali	19/05/2025	CLOSED	Satisfactorily addressed in the flood design report.
23		5-0052-210-IHY-W2-RP-0001_A.pdf	Page 20, 5-0052-210-IHY-W2-RP-0001_A, Section 4.1.1.2	SDR	It's understood that the TUFLOW version 2020-10-AF produced better calibration result compared to the latest version 2023-03-AC while acknowledging the fact that the latest version introduced a significant	Non-Compliant	Ayub Ali	29/11/2023	Zoe Cruice	Engineering Manager	13/05/2025	Please refer to Section 4.1 for th eHydrologic modelling and Section 4.2 for the hydraulic modelling discussion.		Ayub Ali	19/05/2025	CLOSED	Satisfactorily addressed in the flood design report.
24	CSSI CoA E42	5-0052-210-IHY-W2-RP-0001_C.pdf	Page 17, 5-0052-210-IHY-W2-RP-0001_C, Table 2-2	DDR	I believe it will be "to" instead of "of". Please check and correct it.	Non-Compliant	Ayub Ali	12/01/2026	Yucen Lu	DJV Flooding Checker	11/02/2026	The wording of Conidtion E42 (h) has been updated in Table 2-2 to read: *Compliant (Refer to Section 6.4.2).* *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.				CLOSED	
25	CSSI CoA E42	5-0052-210-IHY-W2-RP-0001_C.pdf	Page 36, 5-0052-210-IHY-W2-RP-0001_C, Section 6.4.2	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, statements in this section need to be rewritten.	Non-Compliant	Ayub Ali	12/01/2026	Yucen Lu	DJV Flooding Checker	11/02/2026	The wording of Conidtion E42 (h) has been updated in Table 2-2 to read: *Compliant (Refer to Section 6.4.2).* *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.				CLOSED	
26		5-0052-210-IHY-W2-RP-0001_C.pdf	Page 40, 6.5.2 Climate change Risk Assessment	DDR	Please can you express all these changes relative to the 1% event. For example, it overtops the rail by 200 mm in the 1% AEP event, and 300 mm in the 1% AEP+CC event, a change of 100 mm etc..	Opportunity	Hartley Bulcock	12/01/2026	Yucen Lu	DJV Flooding Checker	11/02/2026	Additional Description is added under section 6.5.2 which reads: 6.5.2 Climate Change Risk Assessment A Climate Change risk assessment was carried out by running the 1% AEP with 2090 RCP8.5 interim climate change factor (refer to Section 4.2.3.1 for details of the approach) and the results of flood depth, flood velocity and flood hazard can be found in Section 6.1, Section 6.2 and corresponding flood maps can be found in Appendix A. The assessment is summarised as below: • Within the study area, the railway track does not achieve flood immunity in climate change conditions with an overtopping depth of up to 0.30m at CH523.450km. However, under the 1% AEP event, floodwaters do not overtop the proposed railway tracks. • Within the study area, the flood water overtops the proposed railway track and bund with flood velocity generally up to 0.1m/s at CH523.450km. However, under the 1% AEP event, floodwaters do not overtop the proposed railway tracks and the bund. • Within the study area, the flood hazard reached up to H4 in the climate change condition while in 1% AEP it only reached up to H3 hazard. • Refer to Table 6-9, Table 6-11 and Table 6-13 for points-of-interest data on peak flood levels, velocities, and hazards under design conditions, respectively, for all modelled events compared with climate change conditions.	Page 40, 6.5.2 Climate change Risk Assessment			CLOSED	11/2/26 ZC: workshop comment from HB: the interpretation should be directly as per the wording of the CSSI CoA.
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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-compliance.

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 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 D

External Consultation Review

D1 – TfNSW Review

D2 – CPHR Review

APPENDIX D1

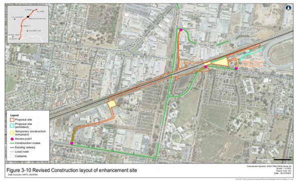
TfNSW Review

A2I Flood Design Report CONSULTATION - COMMENTS REGISTER Pearson St bridge

Comment Sheet Number_Revision: 5-0052-210-IHY-W2-CS-0001-TW_C

Title: External Comment Sheet - A2I | Flood Design Report - Pearson Street Bridge - Transport for NSW (TfNSW)

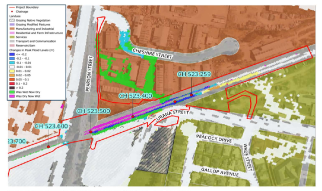
Revision Date: 3/02/2026

Stakeholder Category	Stakeholder Name	Flood Design Report name	Document reference (e.g. section, figure, table)	Date raised	Topic that comment relates	Comments	Responder Name	Date	Response	Doc Evidence	Stakeholder Name	Date	Comment Status	Close-Out Comment
State Government Agency	TfNSW	Pearson Flood Design Report 5-0052-210-IHY-W2-RP-0001_B	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 E38 and E40..." - please correct.	Thinesh Thirumurugan / Zoe Cruice	26/06/2025	COA E41 reference has been corrected in Table 2-2	5-0052-210-IHY-W2-RP-0001_C Table 2-2 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 is undertaken by the Proof Engineer's specialist contractor, who satisfies and complies with the requirements of A16. Consultation with Council and other Stakeholders in being undertaken through a formal review of this Flood Design Report.	TfNSW	4/02/2026	Closed	Noted.
State Government Agency	TfNSW	Pearson Flood Design Report 5-0052-210-IHY-W2-RP-0001_B	4.2.1 Existing Model Update	23/06/2025	Project boundary	The "project boundary" shown on Figure 4-3 does not appear to exactly match the "proposal site" as shown on Figure 3-10 in the PIR (being the revised construction layout), particularly near the northern limit - please confirm.	Zoe Cruice	26/06/2025	The boundary has been expanded to include the construction impact zones, and fully contain all the permanent works neccessary to comply with the EIS/PIR and CSSI CoA. Consistency assessments will be undertaken to ensure any changes are consistent with the EIS&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.  Figure 3-10 Revised Construction layout of enhancement site	5-0052-210-IHY-W2-RP-0001_C Figure 4-3 and Appendix A flood maps	TfNSW	4/02/2026	Closed	Noted. The outcomes of the EIS consistency assessment regarding the project boundary for flood impacts does not impact any classified roads managed by TfNSW. Therefore, TfNSW has no further comments.

APPENDIX D2

CPHR Review

A2I Flood Design Report CONSULTATION - COMMENTS REGISTER

Stakeholder Category	Stakeholder Name	Flood Design Report name	Document reference (e.g. section, figure,	Date raised	Topic that comment relates to	Comments	Responder Name	Date	Response	Doc Evidence	Stakeholder	Responder Name	Date	Response	Comment Status
	CPHR	A2I-Pearson Street Bridge-Flood Design Report (5-0052-210-IHY-W2-RP-0001) (rev B)	Generally	6/02/2025	Critical culvert details missing in the modelling	Although this flood design report (FDR) is classified as preliminary, it should include the existing and proposed culvert structures that impact on flood behavior. The Detailed Design Report (DDR) that accompanies this FDR includes a lot more detail of these culverts e.g. Figure 4-14 to that which seems to be included in the FDR. In particular, the culvert that connects the detention (salinity) basin on the eastern side under Pearson St to the Glenfield Drain to the west does not seem to be included in the modelling.	Thinesh Thirumurugan	11/08/2025	The Flood model includes all the culverts that were presented in Figure 4-14 from the main Design report. The culvert details were obtained from the Drainage team and were incorporated into the Model. The updated culverts are shown in Figure 4-7 of the Flood Design Report.  	5-0052-210-IHY-W2-RP-0001 figure 4-7	CPHR	Steve Manwaring	28/1/2026	Thanks for clarifying - no further action.	Closed.
	CPHR	A2I-Pearson Street Bridge-Flood Design Report (5-0052-210-IHY-W2-RP-0001) (Rev B)	Generally	6/02/2025	Council modelling	Lyall and Associates are currently revising the MOF Flood model as part of the Glenfield Drain Flood Mitigation Options Feasibility Assessment Project. In initial discussions held with the Consultant the results of the hydraulic modelling seem to differ somewhat to these results in this location. Suggest that Martinus consult closely with Wagga Council to ensure consistency between the different models.	Thinesh Thirumurugan	18/08/2025	As of 9th July 2025, the enviro team and the Martinus project team have taken the position that it is not required to update our models based on the Lyall and Associates. The flood assessment will be performed based on the original Wagga Wagga council model.		CPHR	Steve Manwaring	28/1/2026	Accept that its too late to update the hydraulic modelling but it is important that Council are consulted with to ensure that their flood modelling remains current.	Closed
	CPHR	A2I-Pearson Street Bridge-Flood Design Report (5-0052-210-IHY-W2-RP-0001) (Rev B)	Section 1.11 - Limitations and Assumptions	6/02/2025	Missing culvert data	Noted that this version of the modelling (PDR) is missing some culvert information. This may have an impact on the flood impacts which needs to be verified at the DDR stage.	Thinesh Thirumurugan	18/08/2025	A survey request has been submitted for the missing culvert data on 14/07/2025. Once the survey has been received, the Models will be updated based on the latest survey data in the DDR Stage 5/2/26 ZC: There is some confusion around the date of the submissions and the dating of the comments. Please may I clarity with the below: - The PDR (Rev B) flood design report is dated 14/5/25 - I'm unsure when it was received by you. - We received comments dated 6/2/25 (Col E) - which we presume was a typo - We provided comment responses on 18/8/25 (col I) which relate to the PDR (Rev B) submission - The DDR (Rev C) flood design report is dated 19/12/2025 - I'm unsure when it was received by you - We have recevied comments dated 28/1/2026 (col N) which we presume are on the DDR submission As such, the original response (18/8/25) related to the PDR submission, but has been actioned and incorporated into the DDR submission. Table 1-2 lists the information incorporated into the DDR (Rev C) report, and this includes the receipt of the drainage survey. Refer snip below from the DDR (Rev C) report Site Specific 6 | 5-0052-210-ISV-W2-MD-0001-PEARSON_STREET_FEATURE_SURVEY.dwg | DWG CAD file | Site Survey in the GDA94 projection received from ARTC on 13/10/2023 7 | PEARSONS EXISTING RAIL.12daz | 12daz | Existing rail received on 13/10/2023 8 | A2P PSN EXT GDA2020 COMBINED_250710.12da | 12da | Drainage survey and Topography survey received from Martinus on 10/07/2025 9 | 5-0052-210-CAL-W2-MD-0001-PEARSON_STREET_BRIDGE_3D_RAIL_DESIGN_STRINGS_DWG.dwg | DWG | IFC track design received from DJV Track Team on 25/08/2025 10 | 5-0052-210-CDR-W2-MD-0005-PEARSON_STREET_BRIDGE_3D_DRAINAGE_DESIGN_STRINGS_12DA.12da | 12da | IFC Drainage design received from the DJV Drainage team on 12/12/2025 11 | PEARSON ST BRIDGE W2 CIVIL DEM 0.2m grid - IFC - new pit and pipe at signal loc.dem | DEM | IFC Civil Design received from the DJV Civil Team on 12/12/2025 12 | 210 SBD W2 MD TOP 0.1m grid.dem 210 SBD W2 MD TOP.dwg | DEM and DWG | IFC Deflection Wall design received from the DJV Civil Team on 25/09/2025 *: GSDM stands for Generalised Short-Duration Method. ** "WBN" is the extension of the WBNM file. 1.10 Outputs The list of flood maps and the flood maps are included in Appendix A.		CPHR	Steve Manwaring	28/1/2026	I though this version of the FDR is at the DDR stage. As such can we expect a revised FDR (DDR Stage) that includes accurate details of all drainage culverts for a subsequent review?	Open
	CPHR	A2I-Pearson Street Bridge-Flood Design Report (5-0052-210-IHY-W2-RP-0001)	Section 4.2.3.1	6/11/2025	Climate change	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	Thinesh Thirumurugan	18/08/2025	Section 4.2.3.1 of the report provides a discussion regarding previous climate change adoptation 5/2/26 ZC: The current discussions indicated to Martinus are that two sites - not including Pearson - will be assessed for their sensitivity to ARR2019 V4.2 scenarios. As such, this statement remains correct and current for Pearson.	5-0052-210-IHY-W2-RP-0001 Section 4.2.3.1	CPHR	NA	29/1/2026	Given the current conversation occurring with Martinus and Inland Rail regarding climate change and ARR v4.2, this issue needs to be updated for consistency. The note in the report on climate change is out dated.	Open
	CPHR	A2I-Pearson Street Bridge-Flood Design Report (5-0052-210-IHY-W2-RP-0001)	Section 6	6/11/2025	Flood assessment	The impact on flooding has been described in a general context. The DDR should consider referencing the specific impacts and the land tenure of any impacted areas.	Thinesh Thirumurugan	18/08/2025	The flood report's compliance check is based on COA and PSR in terms of land use or land zone, impact assessments based on tenure is out of scope. The specific points of interest are provided and discussed the impacts for the specific interest area. In the DDR stage, the Design will be checked against the compliance with COA and PSR outside the project boundary and will provide comments. 5/2/26 ZC: We understand land tenure to describe land ownership, and land zoning to describe land use. CoA E42 does not contain requirements on land tenure. E42 does contain requirements on land use, which have been assessed through zoning, specifically E42 (c): which relates to habitable rooms, and E42 (d) - (f) : which relate to zoning. 6/2/26 YL: A figure "Changes in Peak Flood Levels (1% AEP) - with Land Use" is included in Section 6.4.1. It should be noted that there is negligible flood impact outside of the project boundary and no residential, commercial or industrial properties are impacted.  Figure 6-4: Changes in Peak Flood Levels (1% AEP) - with Land Use	Refer figure 6-4 in the Rev 0 report	CPHR	NA	29/1/2026	COA in particular E42, note conditions specifically related to land use and tenure. This issue has not been resolved and further information is still sought as per the original comment.	Open
	CPHR	A2I-Pearson Street Bridge-Flood Design Report (5-0052-210-IHY-W2-RP-0001)	Section 6	6/11/2025	Flood assessment	The 0.2 & 0.5% events have been omitted. Confirm the reason for this and whether they will be included in the DDR. The 0.5% event could be an important event in considering the latest climate change guidelines.	Thinesh Thirumurugan	18/08/2025	Assessing the 0.2% and 0.5% AEPs events is out of scope for the site. Section 4.2.3.1 of the report provides discussion regarding climate change adoption based on the prior version of ARR2019. 4.2.3.1 Climate Change There is no design criterion for flood impact on climate change. Therefore, a sensitivity assessment was conducted to evaluate the influence of climate change on flooding to anticipate future climate change flood risk. The existing WBNM 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 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. 5/2/26 ZC: Martinus understands the current conversations regarding ARR2019 V4.2 to be that a sensitivity assessment to the inputs on the models will be carried out at 2 sites, however, Pearson is not one of them. As such, the assessment at Pearson continues to be as per ARR2019 V4.1. As per the response above, there are no CoA or criteria or performance limitations for climate change, and so a sensitivity assessment has been carried out.	5-0052-210-IHY-W2-RP-0001 Section 4.2.3.1	CPHR	NA	29/1/2026	The reponse does not confirm why these events have been omitted from the FDR. We need to understand why the events are not assessed, particularly in the absence of an ARR2019 v4.2 assessment. Given the current conversation occurring with Martinus and Inland Rail regarding climate change and ARR2019 v4.2, this issue needs to be updated for consistency. The note in the report on climate change is out-dated.	Open
	CPHR	A2I-Pearson Street Bridge-Flood Design Report (5-0052-210-IHY-W2-RP-0001)	Section 6.4.1 - Table 6-14	6/02/2025	Newly wet areas	The second dot point mentions a "ramp". Confirm whether this refers to the Pearson St site or if it is being confused with one of the other sites.	Thinesh Thirumurugan	18/08/2025	The Typo has been deleted, 6.4.1 Changes in Peak Flood Level Table 6-14 provides details regarding the peak flood level changes during the design scenario. Table 6-14: Flood Level Impact Assessment Design Events | Changes in Peak Flood Levels 10% AEP, 5% AEP, 2% AEP, 1% AEP | • The changes in flood level happening inside the project boundary are due to the changes in the design terrain. For the areas outside of the project boundary, the changes in flood level are generally less than 30mm making it compliant with the CoA. • Newly wet areas are with a depth of generally less than 0.05m. Change in flood level on points of interest are all less than 0.01m. For the areas outside of the project boundary, the changes in flood level are generally less than 30mm, which complies with PSR and CoA project requirements.	5-0052-210-IHY-W2-RP-0001 Table 6-14	CPHR	Steve Manwaring	28/1/2026	Noted	Closed
		A2I-Pearson Street Bridge-Flood Design Report (5-0052-210-IHY-W2-RP-0001)	Appendix D	6/11/2025	External consultation review	It was noted that this had not been received, however one of the objectives was that the report was to provide evidentiary documentation of consultation and review with and by external stakeholders and the independent suitably-qualified flood consultant. All external consultation reviews should be included in the report.	Thinesh Thirumurugan	18/08/2025	PDR stage is the initial stage where the models will be provided for External review. The evidentiary documentation will be attached in the DDR stage 5/2/26 ZC: The CSSI approval conditions do not stipulate or require a Flood Design Verification Report (FDVR). The requirement under E41 is to develop the Flood Design Report (FDR) in consultation with DCCEEWWG, TfNSW, DPI Fisheries, BCS, SES and Councils. The requirement to provide evidence of the consultation is under A8. As such, an A8 Consultation Report for E41 Flood Design Report is produced and submitted seperately to DPHI and then the planning secretary for approval. This consultation report is not a part of the flood design report. To obtain and demonstrate consultation in the development of the flood design report as required under E43, the reporting is developed alongside the design development: - PDR flood report captures and assesses a track and civil design that is 70% complete and compares it to the existing conditions. If there are any areas of non-compliance, they are identified, with a range of potential mitigation options presented, but not yet incorporated. - DDR flood report captures and assesses a track and civil design that is 100% complete and compares it to the existing conditions. The range of mitigation options have been tested and the successful options incorporated to ensure full compliance. - The IFC flood report incorporates any comments from stakeholders on the PDR and DDR reports for acceptance. As a result subject to the closure of the current comments, the future IFC revision will not be re-issued for consultation to stakeholders.	5-0052-210-IHY-W2-RP-0001 Appendix c,d,e	CPHR	NA	29/1/2026	Please confirm which version/s of the flood design report CPHR will be provided in future stages to review. It was previously understood that the FDVR was the final report to be reviewed and the external review would accoumpany this report.	Open
	CPHR	A2I-Pearson Street Bridge-Flood Design Report (5-0052-210-IHY-W2-RP-0001)	Generally	6/02/2025	Additional figure/s to aid clarity	An additional figure that shows a long section of the rail with the levels of the proposed rail sag, Pearson St bridge and the existing and proposed culverts is needed. It is very difficult to determine the design layout with the supplied plan maps only. A long section with the design flood levels included (pre and post construction) would also add greatly to clarity.	Thinesh Thirumurugan	18/08/2025	Refer to drawing 5-0052-210-CAL-W2-DR-0101 to 102 for railway long section plan It should be noted that the flood water does not overtop the railway up to 1% AEP. Refer to Table 6-1 for flooding points of interest which provides water level comparison for existing and design conditions.	5-0052-210-IHY-W2-RP-0001 Table 6-1	CPHR	Steve Manwaring	28/1/2026	I note the response that no changes have been made to the report to address my concern. This is disapponting as this was an opportunity to provide clarity.	Closed
	CPHR	5-0052-210-PEN-W2-RP-0001_B Detailed Design Report - Pearson PDR	Section 4.5.5	6/11/2025	Drainage conditions	Confirm whether there are any changes in catchment sub areas and what their contribution to the Council drainage assets is (i.e. do the relative catchment areas change due to track regrading).	Thinesh Thirumurugan	18/08/2025	This has been discussed in Table 2-2 under condition E46 Condition | Condition or Criteria | Compliance Evidence Reference 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 E47.** | Local drainage flow regime, catchment area and imperviousness remain the same as per 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 Wagga Wagga City 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-W2-RP-0001.	5-0052-210-IHY-W2-RP-0001 Table 2-2	CPHR	NA	29/1/2026	Noted	Closed

APPENDIX E

Independent Flood Consultant Review

Project: 2300 **Deliverable:** Pearson Street Bridge

Comment Sheet Reference: 5-0052-210-IHY-W2-CS-0001-PE_E

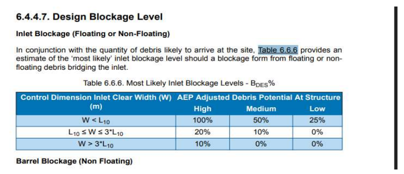
Review Comments (Reviewer)										Responses (Document Owner)					Close-Out				
#	Document number / drawing number - Revision Number	Section # / page #	Company	Full Name	Functional Area	Date	Design Gate	Comment (for example must be specific on non compliance. Reference mark-ups, if required)	Comment 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-W2-RP-0001_B	TUFLOW files	Hatch	Sam Drysdale	Flood Assessment	15/07/2025	PDR	The 1D channel downstream of the site is currently active in the 2D domain, this needs to be removed. Sensitivity testing demonstrated minimal affect at the project area.	Minor	Thinesh Thirumurugan	DJV flood modeller	22/07/2025	In the DDR stage, the 1D channel downstream of the site will be coded out of the 2d Domain	DDR stage flood model	Dan Williams	Hatch	17/01/2026	CLOSED	DDR review confirmed that this has been undertaken
2	5-0052-210-IHY-W2-RP-0001_B	TUFLOW files	Hatch	Sam Drysdale	Flood Assessment	15/07/2025	PDR	The downstream culverts dictate water levels at the site. It is recommended these are surveyed and their representation updated within the modelling.	Major	Thinesh Thirumurugan	DJV flood modeller	22/07/2025	The Updated Survey has been received, and the downstream culvert will be updated according to it.	DDR stage flood model	Dan Williams	Hatch	17/01/2026	CLOSED	DDR review confirmed that this has been undertaken
3	5-0052-210-IHY-W2-RP-0001_B	TUFLOW files	Hatch	Sam Drysdale	Flood Assessment	15/07/2025	PDR	It is recommended that the finer Quadtree cell size is extended downstream from the works area to the beginning of the 1D open channel to ensure appropriate representation between model domains.	Minor	Thinesh Thirumurugan	DJV flood modeller	22/07/2025	The 2.5m Quadtree cell size will be extended downstream from the works area to the beginning of the 1D open channel	DDR stage flood model	Dan Williams	Hatch	17/01/2026	CLOSED	DDR review confirmed that this has been undertaken
4	5-0052-210-IHY-W2-RP-0001_B	TUFLOW files	Hatch	Sam Drysdale	Flood Assessment	15/07/2025	PDR	Several minor changes were noted between the existing and design case modelled drainage networks local to the various work packages. It is assumed these changes are from updated survey being included in one scenario but not the other.	Minor	Thinesh Thirumurugan	DJV flood modeller	22/07/2025	The drainage networks near Cassidy Parade, Edmondson Street, and the Wagga Yard site were being updated (for various design stages) during the beginning of the flood modeling process for Pearson Street (PDR stage). Noting that Pearson Street is geographically distant from these sites, no cumulative impacts are expected, and these changes will not affect Pearson Street. However, in DDR stage, the final Wagga CBD Master modelled drainage will be checked between the design and the existing condition across all the site areas, and any inconsistencies will be resolved.	DDR stage flood model	Dan Williams	Hatch	17/01/2026	CLOSED	DDR review confirmed that this has been undertaken
5	5-0052-210-IHY-W2-RP-0001_B	TUFLOW files	Hatch	Sam Drysdale	Flood Assessment	15/07/2025	PDR	Minor changes in modelled peak flood level between the existing and design case models were noted throughout the model, suggesting model instability, particularly for more frequent flood events. Within the proof engineering a sensitivity run was undertaken adopting a fixed tailwater level for the full downstream boundary, adopting consistent .tef files for the existing and design case models, as well as recreation of the design case model from the existing case model template. These changes resolve the differences in modelled levels across most of the model extent.	Minor	Thinesh Thirumurugan	DJV flood modeller	22/07/2025	Noted. Since the model was obtained from the council, the downstream boundary conditions will be maintained exactly as in the original model to ensure consistency with the council's version. Noting that the model contains multiple sites, including Pearon Street bridge, Cassidy Pde Bridge, Edmondson Street Bridge, Wagga Mothers Bridge & Wagga Yard, and any changes that are made in the downstream boundary condition would result in rerunning the model for these sites. Thus, the original boundary condition will be maintained in the model. Nevertheless, the site designs will demonstrate full compliance with the PSR and CoA requirements.	n/A	Dan Williams	Hatch	17/01/2026	CLOSED	
6	5-0052-210-IHY-W2-RP-0001_B	TUFLOW files	Hatch	Sam Drysdale	Flood Assessment	15/07/2025	PDR	The blockage sensitivity assessment in the Flood Design Report adopts a 15% blockage to the cross-drainage structures regardless of size. Table 6-18 notes that an L10 value of 1.0 m and an AEP adjusted debris potential of Medium are adopted. From ARR Table 6.6.6, a blockage of 10% should be applied to the three RCBC structures and 50% to the two RCP structures. It is recommended this sensitivity is revised in DDR. e applied to the 4 cells of 0.3m RCPs to the east.	Minor	Thinesh Thirumurugan	DJV flood modeller	22/07/2025	The blockage sensitivity will be recalculated based on the updated survey data for the relevant culverts and ARR 2019 methodology. However, it should be noted that Table 6.6.6 is based on the Width of the culvert and L10 values. The blockage value is independent of the number of RCBC stuctures 	DDR stage flood model	Dan Williams	Hatch	17/01/2026	CLOSED	DDR review confirmed that this has been undertaken
7								No further comments		Zoe Cruice	Engineering Manager	20/01/2026	Noted. Thankyou					CLOSED	
8	5-0052-210-IHY-W2-RP-0001_C	TUFLOW files	Hatch	Dan Williams	Flood Assessment	17/01/2026	DDR	The DDR review has confirmed that the above recommendations have been implemented within the updated modelling		Zoe Cruice	Engineering Manager	20/01/2026	Noted. IFC will be provided to confirm no further comments and obtain certification					CLOSED	
9	5-0052-210-IHY-W2-RP-0001_0	TUFLOW files	Hatch	Darren Lyons	Flood Assessment	12/02/2026	IFC	No further comments							Darren Lyons	Hatch	12/02/2026	CLOSED	

Image 1 (screenshot in the row 6 Response cell):

6.4.4.7. Design Blockage Level

Inlet Blockage (Floating or Non-Floating)

In conjunction with the quantity of debris likely to arrive at the site, Table 6.6.6 provides an estimate of the 'most likely' inlet blockage level should a blockage form from floating or non-floating debris bridging the inlet.

Table 6.6.6. Most Likely Inlet Blockage Levels - B_{DES}%

Control Dimension Inlet Clear Width (W) (m)	AEP Adjusted Debris Potential At Structure: High	Medium	Low
$W < L_{10}$	100%	50%	25%
$L_{10} \le W \le 3^*L_{10}$	20%	10%	0%
$W > 3^*L_{10}$	10%	0%	0%

Barrel Blockage (Non Floating)

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