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FLOOD DESIGN REPORT

A2I | Albury to Illabo

Package: A2I – Bomen Yard

CONTRACT NUMBER: 0052

PROJECT DOCUMENT NUMBER:

5-0052-210-IHY-W9-RP-0001

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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
BCS	Biodiversity, Conservation and Science Group of the NSW Department of Climate Change, Energy, the Environment and Water
BoD	Basis of Design
BoM	Bureau of Meteorology
CIZ	Construction Impact Zone
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
HF	Human Factors
I2S	Illabo to Stockinbingal
ICA	Indirectly Connected Area
IFC	Issued for Construction
IR	Inland Rail
ITC	Incentivised Target Cost
IV	Independent Verifier
Km	Kilometres
LPA	Licensed Project Area
LiDAR	Light Detection and Ranging
MGA	Map Grid of Australia

Term	Definition
MIRDA	Master Inland Rail Development Agreement
N/A	Not Applicable
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 Pathways
REF	Review of Environmental Factors
RFI	Request for Information
S2P	Stockinbingal to Parkes
SAQP	Sampling, Analysis and Quality Plan
SDR	Systems Definition Review
SEMP	System Engineering Management Plan
SES	NSW State Emergency Services
TfNSW	Transport for New South Wales
TWL	Tail Water Level
UMM	Updated Mitigation Measures
V & V	Verification and Validation
WAD	Works Authorisation Deed
WAE	Work-as-Executed

1 A2P PROJECT INTRODUCTION

1.1 Albury to Parkes (A2P)

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

1.2 Project Scope

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

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

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

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

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

- Daroobalgie New Loop
- Wyndham Avenue (track lowering)

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

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

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

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

1.3 Site Description

Bomen Yard package forms part of the Albury to Illabo (A2I) section works. The existing yard requires track slews to enable passing clearances of the Inland Rail F2M rollingstock. This flood study conducts a flood assessment for the Bomen Yard (refer to Figure 1-1 for site location) for both the existing and design conditions. The background and previous studies for the site location are listed below.

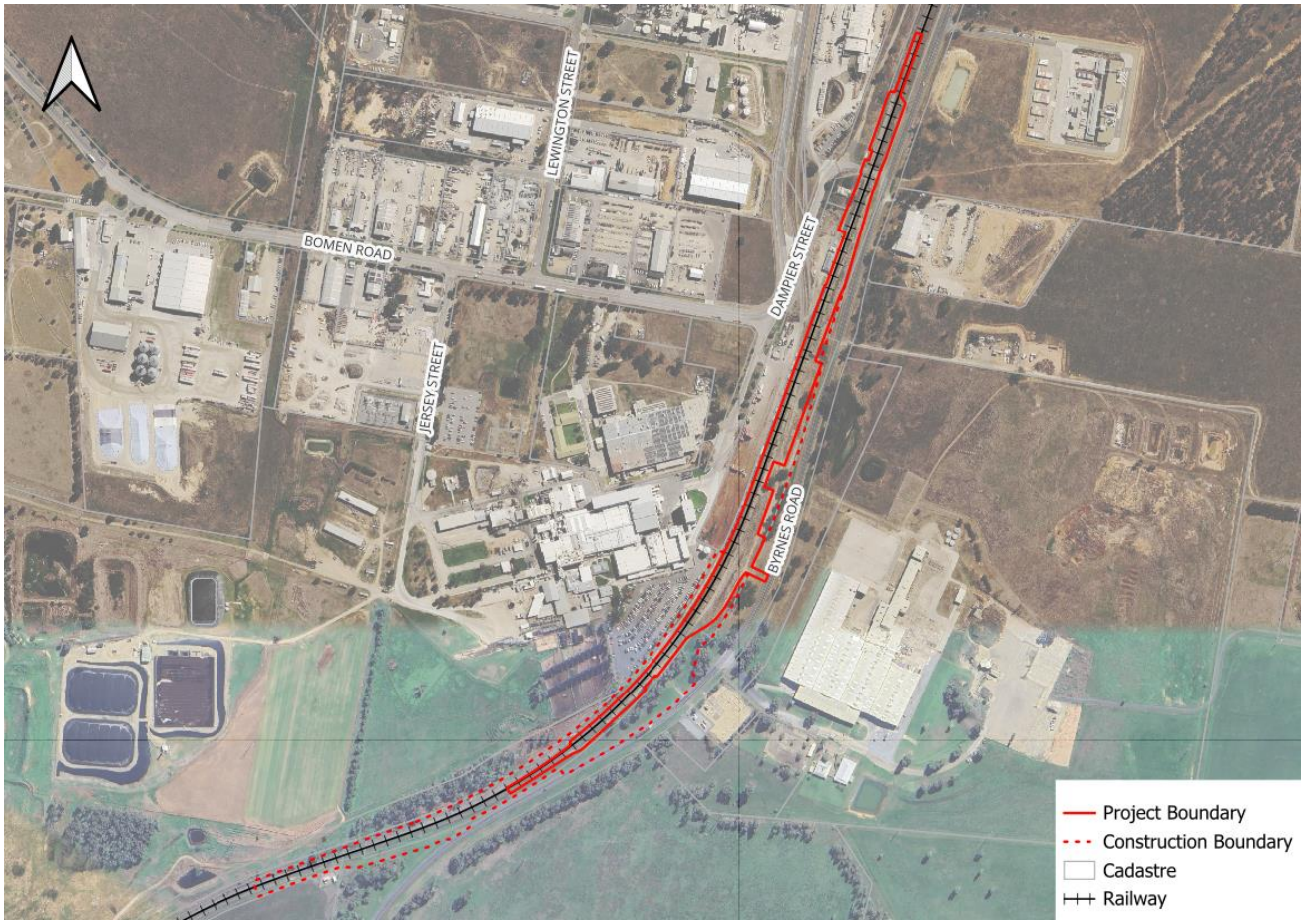


Figure 1-1: Site Location

1.3.1 Background

Bomen Yard clearance forms part of the Albury to Illabo Section works at Chainage (CH) 513.440 to CH514.880m. The Bomen Yard clearance is located north of Wagga Wagga Central Business District (CBD) and accessible through Bomen Road and Byrnes Road. As part of the project scope, the existing Loop and Main Lines will be slewed to support F2M rolling stock operations on the Main Line.

1.4 Objectives

This report has been prepared to support the delivery of the track slews at the Bomen Yard clearances and comply with the CSSI Condition of Approval (CoA) and updated mitigation measures (UMM) for quantitative flood modelling, demonstrating compliance with pre- and post-development criteria. This report provides a flood impact assessment for the Issued for Construction (IFC) stage. The flood assessment aims to estimate the flood behaviour within the study area, and to assess the potential flood impacts as a result of the design to the areas outside of the project boundary.

1.5 Scopes

The scope of this study includes:

- Carrying out the flood assessment of the IFC stage track and civil design for design events of 5%, 2%, 1%, AEPs, 1% AEP with climate change, and PMF.
- 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 on a 5m grid resolution. The hydrologic and hydraulic (WBNM/TUFLOW) modelling system was utilised, calibrated and validated for historical events. ARR1987 was adopted.	N/A
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.	N/A
3	Wagga Wagga Major Overland Flow Model Update Report (WMAwater, 2015)	This flood study updated the flood models established initially in item 1 by adopting the recommendations from item 2.	N/A
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.	N/A
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 are 0.3m higher in Dukes Creek and the vacant land south of the Olympic Highway.	TUFLOW and WBNM models (Wagga North) 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 Reference Design provided:

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

Hydrology and hydraulic assessments have been undertaken in accordance with ARR2019. The flood impact modelling was not undertaken. A qualitative assessment has been undertaken. Bomen Yard is not subject to regional flooding and the track is overtopped at the Dampier Street level crossing from the 20% AEP.

1.6.3 Environmental Impact Statement

The assessments carried out by Others, to support the EIS, are documented within:

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

This technical paper indicates that Bomen Yard is not subject to flooding from the Murrumbidgee River regional flood (refer to Figure 1-2). However, the track within Bomen Yard is overtopped at the level crossing from the 20% AEP local overland flood (refer to Figure 1-3 for the 1% AEP).

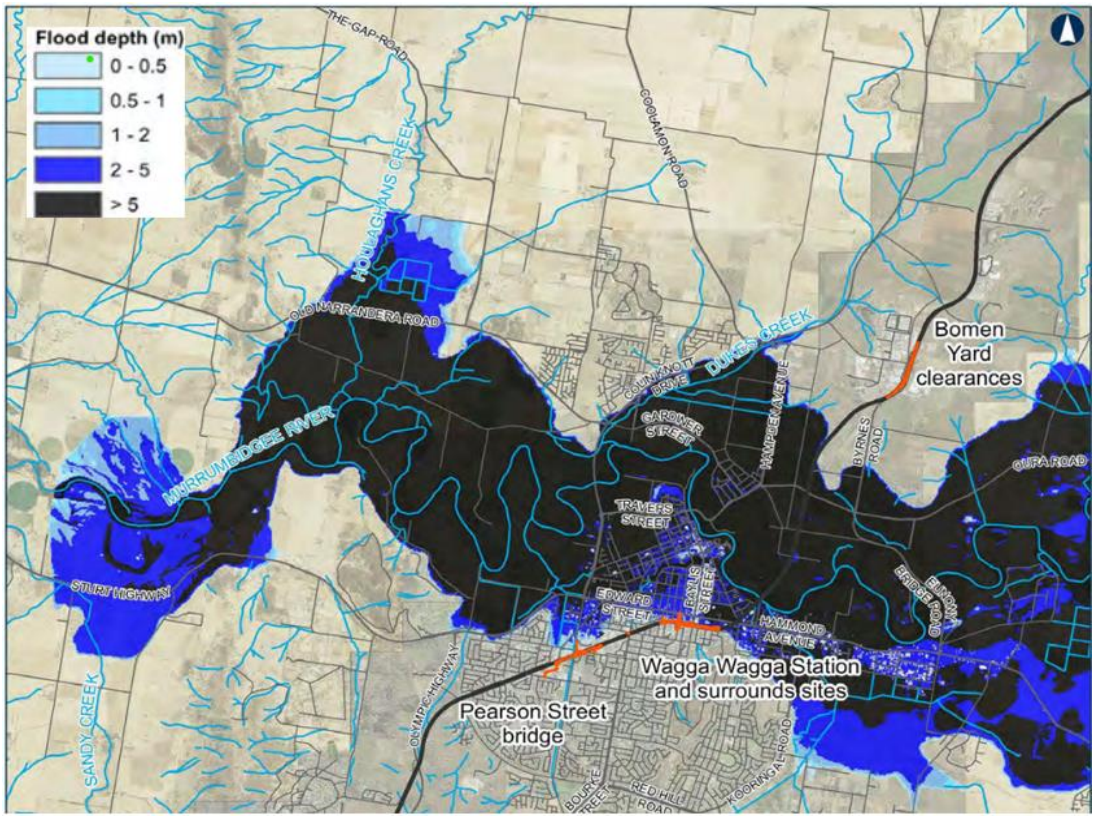


Figure 1-2: PMF Regional Flooding (Image source: Albury to Illabo EIS Technical Paper 11 Figure 4.37 (July 2022))

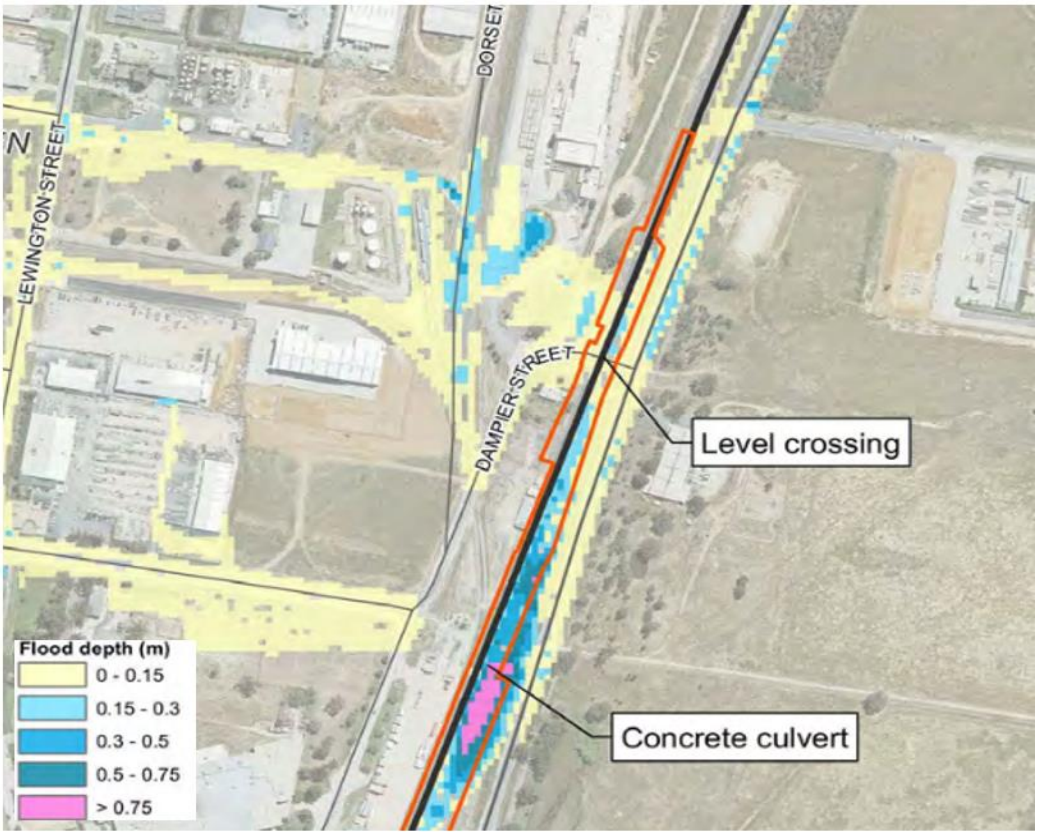


Figure 1-3: 1% AEP Local Flooding (Image Source: Albury To Illabo EIS Technical Paper 11 Figure 4.43 (July 2022))

1.7 Purpose and Requirements

The primary purpose of this IFC flood assessment report is to describe how the design development and the associated review process were 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 studies 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
- 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
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 Wagga Wagga City Council on 22/11/2023 as part of the response to RFI 020
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 from Wagga Wagga City Council on 22/11/2023 as part of the response to RFI 020 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
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)	TIF format in 1m resolution in GDA2020 projection	Downloaded from https://elevation.fsdf.org.au/ on 26/07/2024

Item	Information	Type	Description / Comments
	vertical and 0.8m (95% Confidence Interval) horizontal)		
5	A2P BMN EXT GDA20Z55 COMBINED_260610.12da A2P BMN EXT GDA20Z55 FLOOD MODELLING_241219.12da	12DA	Site survey in GDA2020 projection including Existing top of the railway track and existing Culverts Received from DJV Civil team on 02/07/2026.
6	5-0052-210-CDR-W9-MD-0104-BOMEN YARD_3D_DRAINAGE _DESIGN_STRINGS_12D.12da 300626 Bomen Yard Drainage Schedule.xlsx	12DA and Excel	IFC Drainage design in the GDA2020 Projection Received from DJV Drainage team on 02/07/2026
7	20260723 - BUND 21 W9 DEM 0.2m.dem 20260722 - CAPPING & BALLAST COMBINED 21 W9 DEM 0.2m.dem	DEM	IFC Civil design in the GDA2020 Projection Received from DJV Civil team on 23/07/2026
8	5-0052-210-CAL-W9-MD-0002-BOMEN_YARD_3D_RAIL_DESIGN_ STRINGS_DWG.dwg BOMEN-LOOP-LINE-FLOOD-ISSUE.dwg	DWG	IFC Rail design for Main and Loop track– top of the rail in the GDA2020 projection Received from DJV Rail team on 07/07/2026

*: 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.

1.11 Limitations and Assumptions

The following limitations and assumptions are applied to the Bomen Yard site.

- The site was not subjected to regional flooding as per the EIS (Technical Paper11, Hydrology, Flooding and Water Quality, Albury to Illabo Environmental Impact Statement).
- An assessment of temporary works and staging has not been undertaken.
- 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 detailed design, to determine 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 Bomen Yard Design's 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 (No watercourse associated with this site.)
Project Wide	5.4.2	Where existing flood immunity is lower than ARTC SMS minimum requirements, the functional requirements for flood immunity take precedence over the ARTC SMS.	Compliant. The ARTC minimum requirement is the 1% AEP. However, the railway is overtopped in the 5% AEP in the existing scenario. Thus, the existing immunity will be less than 1% AEP. The existing immunity 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.	N/A refer to Clause 5.4.2. The ARTC minimum requirement is 1% AEP. The top of the track is overtopped in the 5% AEP in the existing scenario. Thus, the existing immunity will be less than 1% AEP.
Project Wide	5.4.5	Bridge and culvert hydraulics shall comply with Austroads Guide to Bridge Technology Part 8: Hydraulic Design of Waterway Structures.	N/A. There are no bridge and culvert design within the site scope.
A2I Technical Requirements*	IR-SR-A2I-116	The System shall comply with 0-0000-900-ESS-00-ST-0001 Inland Rail Climate Change Risk Assessment Framework.	Compliant. Climate Change assessment was carried out by running the 1% AEP + Year 2090 Representative Concentration Pathways (RCP) 8.5 and identifying that the bridge has low hazards. Refer to Section 6.5.2.

Requirement	Identifier	A2P Technical Requirements Description	Compliance Evidence Reference
A2I Technical Requirements*	IR-SR-A2I-349	The Corridor System for Enhancement Corridors shall have a flood immunity of no worse than existing.	Compliant. The existing immunity is maintained under design conditions. 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.	Compliant. 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.	Compliant. No damage to the formation. Existing Immunity is maintained. The proposed condition accommodates cess drain to drain the site. Refer to Drainage Section 4.5 in 5-0052-210-PEN-W9-RP-0001
A2I Technical Requirements*	IR-SR-A2I-458	The Corridor System shall prevent ponding in longitudinal open channels.	Compliant. The proposed channels have grading towards proposed culvert outlets which prevents ponding. Refer to Drainage Section 4.5 in 5-0052-210-PEN-W9-RP-0001
A2I Technical Requirements*	IR-SR-A2I-459	The Corridor System for Enhancement Corridors shall provide mitigation for flood impacts no worse than existing condition.	Compliant. The existing condition is maintained. Flood impacts are no worse than existing conditions. Refer to Section 6.4
A2I Technical Requirements*	IR-SR-A2I-464	The Corridor System shall cause no adverse impacts either inside or outside the rail corridor when diverting water away from the track.	Compliant. The existing condition is maintained. Flood impacts are no worse than existing conditions. 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.	Compliant. The corridor system has minimised changes to the existing flow patterns. Flood impacts no worse than the existing condition. Refer to Section 6.4
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 in this package.
A2I Technical Requirements*	IR-SR-A2I-735	The Third-Party System private roads shall have flood immunity no worse than existing.	Compliant. No third-party private roads are impacted. Refer to Section 6.4.1

Requirement	Identifier	A2P Technical Requirements Description	Compliance Evidence Reference
A2I (Annexure F)	6.1.1	Without limiting clauses 8 and 14 of the Deed, the Contractor shall ensure that the Contractor's Activities and the Works comply with the following for A2I, the Conditions of Approval and the environmental assessment reports available on https://www.planningportal.nsw.gov.au/major-projects/projects/inland-rail-albury-illabo"	Compliant. Refer to Table 2-2

*A2I Technical requirements are used in A2P as A2I forms part of A2P.

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 river banks 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)
E40	a) Hydrologic and hydraulic assessments consistent with *Australian Rainfall and Runoff – A Guide to Flood Estimation* (GeoScience Australia, 2019);	Compliant. Section 4 methodology shows that ARR2019 guidelines were used for this assessment.
E40	b) Use of modelling software appropriate to the relevant modelling task;	Compliant. Section 4.2.1.2 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. Section 4.2.1.3 Inputs show that existing field survey and rail levels were used in the models.
E40	d) Confirmation of predicted afflux at industrial properties adjacent to Railway Street, Wagga Wagga based on field survey.	N/A. This criterion is related to the Wagga Wagga Yard enhancement site but not the Bomen Yard, which is the subject of this report

Condition #	Condition or Criteria	Compliance Evidence Reference
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 CoA clause A16 (refer to Appendix E) Consultation with Council will be undertaken through a formal review of this Flood Design Report. Consultation with other stakeholders will occur prior to finalisation of the 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 10 mm in above-floor inundation on any habitable 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. 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 more than 50mm in residential, industrial and commercial areas. 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 more than 100mm in 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 more than 200mm in rural or primary production, environment zone or public recreation (refer to Section 6.4.1)
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 worst-case criteria adopted. As such, this is

Condition #	Condition or Criteria	Compliance Evidence Reference
		consistent with requirements of the CoA and DPHI's interpretation.
E42	Where the requirements set out in clauses (d) to (f) inclusive cannot be met alternative flood levels or mitigation measures must be agreed to with the affected landowner.	N/A. (d) to (f) inclusive are compliant – refer above.
E43	A Flood Design Report confirming the:	See below
E43	a) final design of the CSSI meets the requirements of **Condition E42;** and	Compliant Refer to Section 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 the existing conditions. The design has not worsened the existing condition. The site does not include pumping station, storage tank and there are no additional discharges to the council's stormwater networks, refer to 5-0052-210-PEN-W9-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 the table below.

Table 2-3: Update Mitigation Measures – Water Quality

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 the Council and other relevant authorities will be undertaken through a formal review of this Flood Design Report.
HFWQ4	At Wagga Wagga Yard enhancement site, flood modelling would be carried out during detailed design to confirm predicted afflux at industrial properties located at Railway Street and compliance with the Quantitative Design Limits for Inland Rail. This would be informed by topographic and building floor surveys and a review of localised drainage structures (as required). Quantitative assessment of the sites of low and moderate hydraulic complexity will be carried out during detailed design and will consider the impact of the Possible Maximum Flood event at built-up areas (where information is available) and the tenure of the upstream areas that are impacted by drainage and/or flooding. The outcomes of the assessment are to be provided to DCCEW– BCS	This report relates to Bomen Yard, and so is not relevant to Wagga Wagga Yard. Compliant. Quantitative assessment has been undertaken. Refer to Section 4.2 and 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 criterion is related to the Riverina Highway bridge enhancement site but not the Bomen Yard, which is the subject of this report.

* 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

Flood modelling is not applicable to this stage.

Table 3-1: Design Differences Between Concept and SDR

Item	Difference	Reason for Change
N/A	N/A	N/A

3.2 SDR to PDR

Flood modelling is not applicable to this stage.

Table 3-2: Design Differences Between SDR and PDR

Item	Difference	Reason for Change
N/A	N/A	N/A

3.3 PDR to DDR

A new TUFLOW hydraulic model has been created to model the area of interest as no hydraulic model was available for the PDR stage or earlier.

Table 3-3: Design Differences Between PDR and DDR

Item	Difference	Reason for Change
1	Incorporation of the latest available LiDAR data	The latest LiDAR data (2020) was added in order to represent the terrain more accurately.
2	Incorporation of the latest existing condition survey (Point cloud data)	A new existing condition survey was provided in order to represent the terrain more accurately.
3	Incorporation of Rail Design	New DDR railway alignment and profile, new ballast design
4	Incorporation of Civil Design	New DDR civil design for capping and cess drain channel

3.4 DDR to IFC

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

Table 3-4: Design Differences Between DDR and IFC

Item	Difference	Reason for Change
1	Incorporation of hydrology inflows for additional southern project extent	To accommodate flood assessments for the additional project design extent further south.
2	Incorporation of the latest existing condition survey	A new existing condition survey was provided in order to represent the topography, railway track and culverts for the site extent
3	Incorporation of Track Design	New IFC Track Design

Item	Difference	Reason for Change
4	Incorporation of Civil Design	New IFC Civil design for ballast, formation, bund and cess drain channel

4 MODELLING METHODOLOGY

The overall approaches for flood modelling are listed below:

- Based on ARR2019, utilise the hydrological model and generate flow hydrographs for input to the hydraulic model for all events (5% AEP, 2%AEP, 1%AEP, 1% with climate change and PMF) to perform critical duration analysis.
- Update the received TUFLOW model by incorporating the latest LiDAR (Section 4.2) 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 verification against the received model results (Refer to Section 5).
- Update the TUFLOW model from the existing condition to the design condition model by incorporating the Bomen Yard design into the existing model.
- The flood impact was assessed up to the 1% AEP but the flood results were shown including 1% AEP + Climate Change and PMF.
- 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 Hydrology Modelling

The WBMN model (Wagga North Catchment) was utilised to generate flow hydrographs for input to the hydraulic model. Additional catchments were delineated and incorporated into the hydrologic model to account for the extended project works at the southern extent of the site. The hydrology model covers Dukes Creek as well as the Bomen Yard area. Refer to Figure 4-1 for the sub-catchment extents of the hydrology model.

As stated in Item 2 of Table 1-2, only the WBN run 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. Storm Injector (V 1.3.9.0) was used alongside the provided ICA and geometry data (Item 3, Table 1-2) to produce the inflow hydrographs for critical duration analysis. However, generating identical hydrograph inflow values proved challenging. As a conservative approach, slightly higher inflow values (generally 0.03 m^3/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 5% AEP, 2% AEP, 1% AEP, 1% AEP + Climate Change events and PMF to perform critical duration analysis (Refer to Table 4-1 in the Hydraulic modelling).

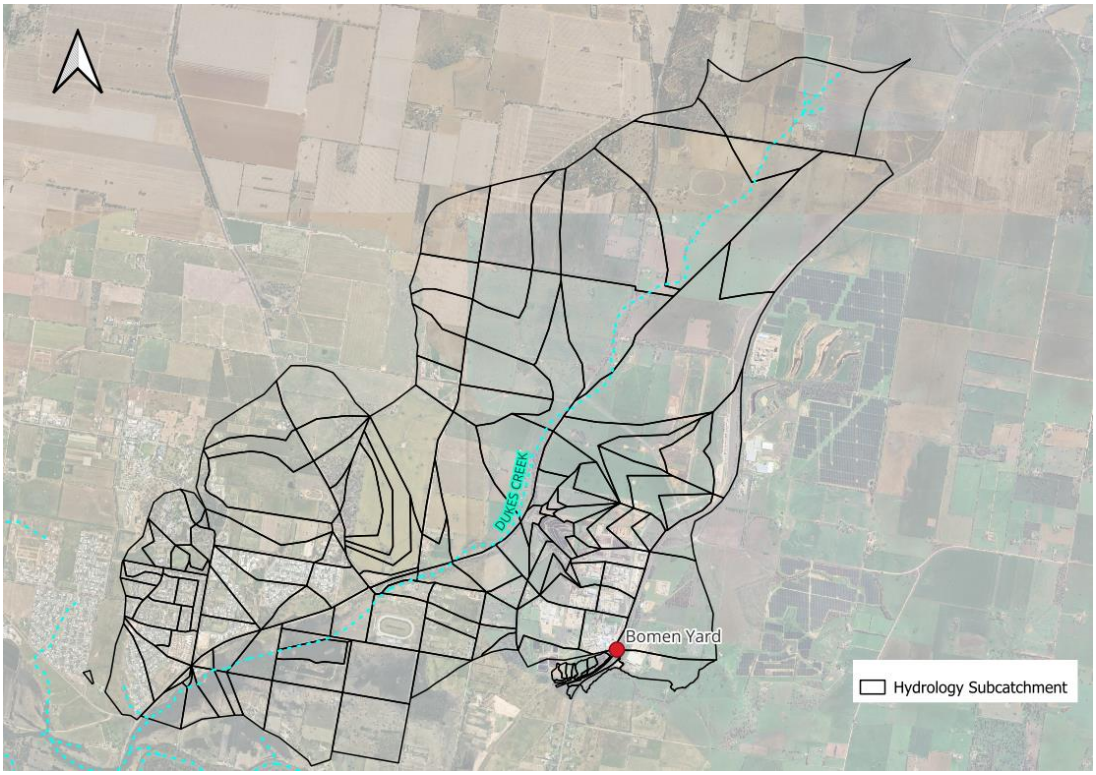


Figure 4-1: Hydrology Subcatchment Extents

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	3926 ha (39.26 km^2).	3978 ha (39.78 km^2)
Events	PMF, 0.2% AEP, 0.5% AEP, 1% AEP, 2% AEP, 5% AEP, 10% AEP, 20% AEP	PMF, 1% AEP + Climate Change, 1%AEP, 2% AEP, 5% AEP
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 each duration ranging from 30 minutes to 720 minutes Ensemble 11 temporal patterns for PMF from 15 minutes to 180minutes
Indirectly Connected Area (ICA)	Utilised received inflow hydrographs for events 1%AEP, 2% AEP and 5% AEP, which included ICA.	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 model from MOFFS (WMA Water, 2021). A summary of the received model and updated model parameters can be found in Table 4-2. The model extent encompasses Wagga Wagga North, spanning an area of approximately 34.5 km^2 (Refer to Figure 4-2).

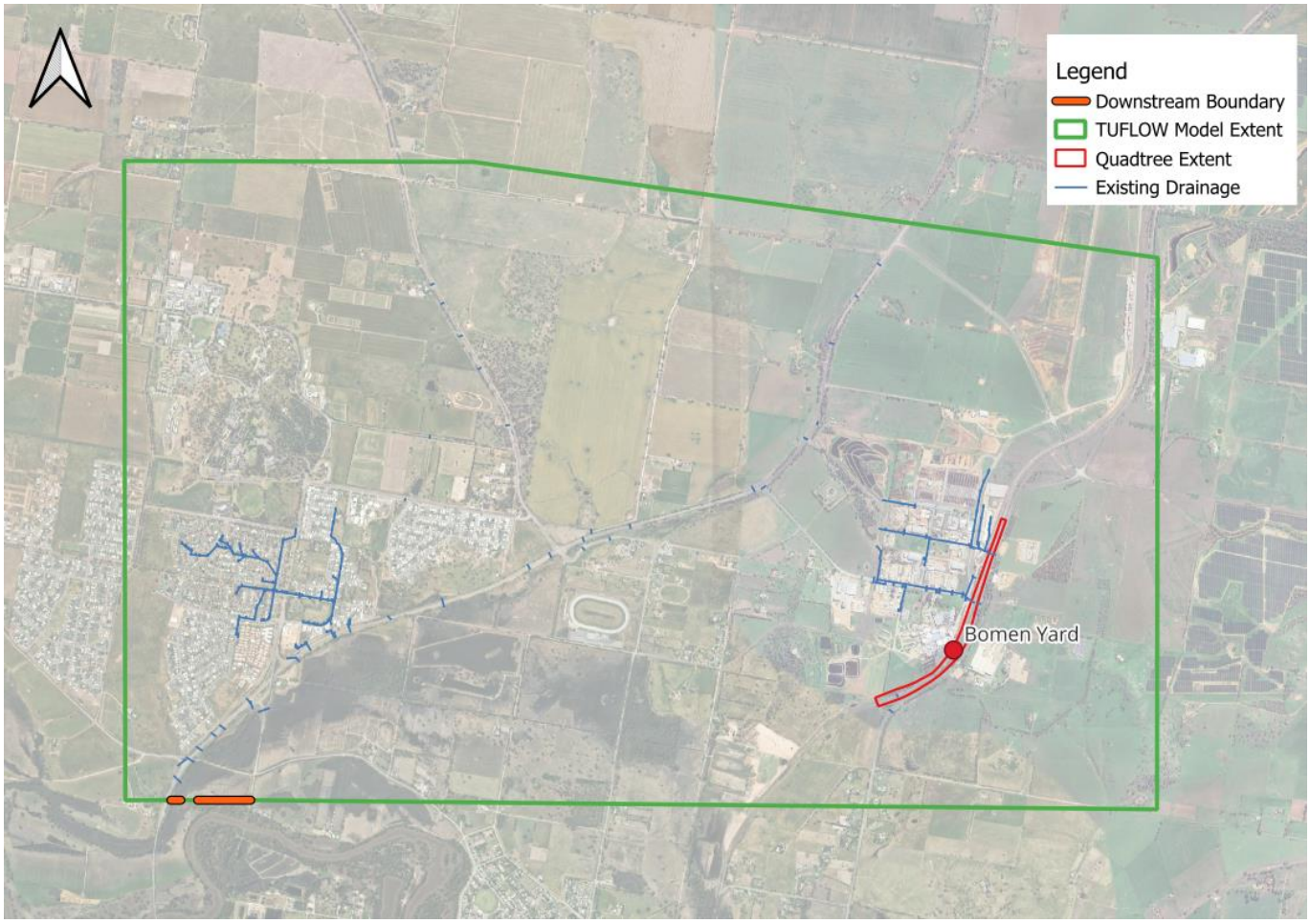


Figure 4-2: TUFLOW Model Extent – Bomen Yard IFC Model

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

Parameters	MOFFS 2021 Model	IFC Existing Model
Build	TUFLOW 2018-03-AC HPC	TUFLOW 2023-03-AE HPC
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 4-3). (Refer to the following Section 4.2.1.2 for more details)
Hydrology	WBNM ARR2019	WBNM ARR2019
Inflow type	SA Polygon	SA Polygon
Extent	Wagga North area including Dukes Creek catchment and Bomen Yard area.	Wagga North area, including Dukes Creek catchment and Bomen Yard area.
Downstream Boundary	Static downstream water boundary (HT)	Static downstream water boundary (HT)
Timestep	Dynamic	Dynamic

Parameters	MOFFS 2021 Model	IFC Existing Model
Building Representation	Null polygon	Null polygon
Topography	▪ 1 m resolution LiDAR collected in 2008	▪ 1 m resolution LiDAR collected in 2008 ▪ 2020 LiDAR for site ▪ Site survey (Refer to Items 5 in Table 1-2)
Roughness	Pasture: 0.045 Lots: 0.06 Ponds and other water bodies: 0.03 Industrial: 0.07 Roads: 0.022 creek permanent water: 0.04 Railway: 0.06	Pasture: 0.045 Lots: 0.06 Ponds and other water bodies: 0.03 Industrial: 0.07 Roads: 0.022 creek permanent water: 0.04 Railway: 0.06
Design Events	PMF, 0.2% AEP, 0.5% AEP, 1% AEP, 2% AEP, 5% AEP, 10% AEP, 20%AEP	PMF, 1% AEP + Climate Change, 1%AEP, 2% AEP, 5% AEP

4.2.1.1 GDA 2020 conversion

The conversion to GDA 2020 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 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 *quadtree* (only available in versions 2020 onwards) to the project site is favoured with level three (3) configuration that produced a 1.25m refined grid. The latest TUFLOW model version, 2023-03-AE, was utilised. (Refer to Figure 4-3 for the adopted quadtree extent).

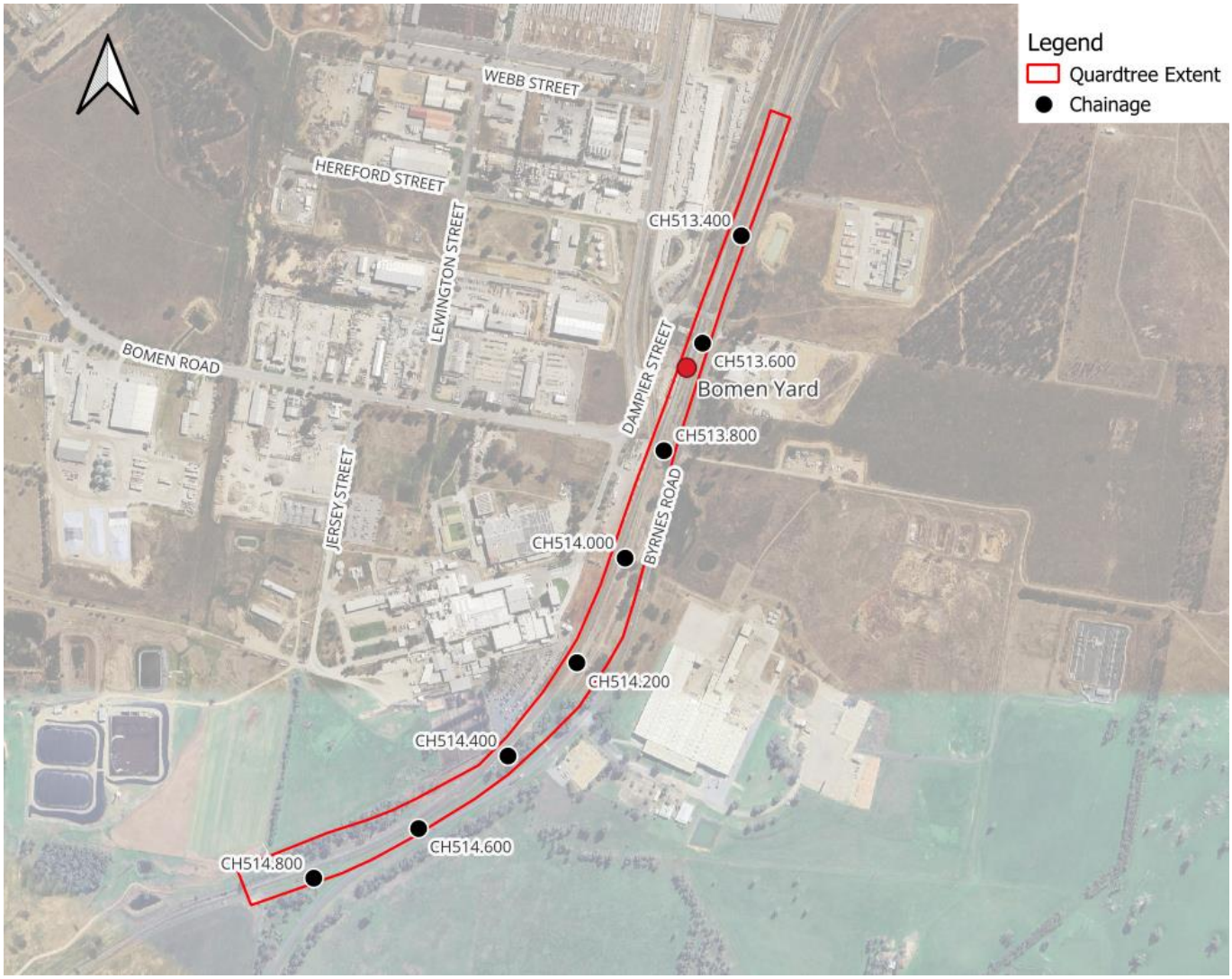


Figure 4-3: Quadtree Extent – Bomen Yard

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 4-4.

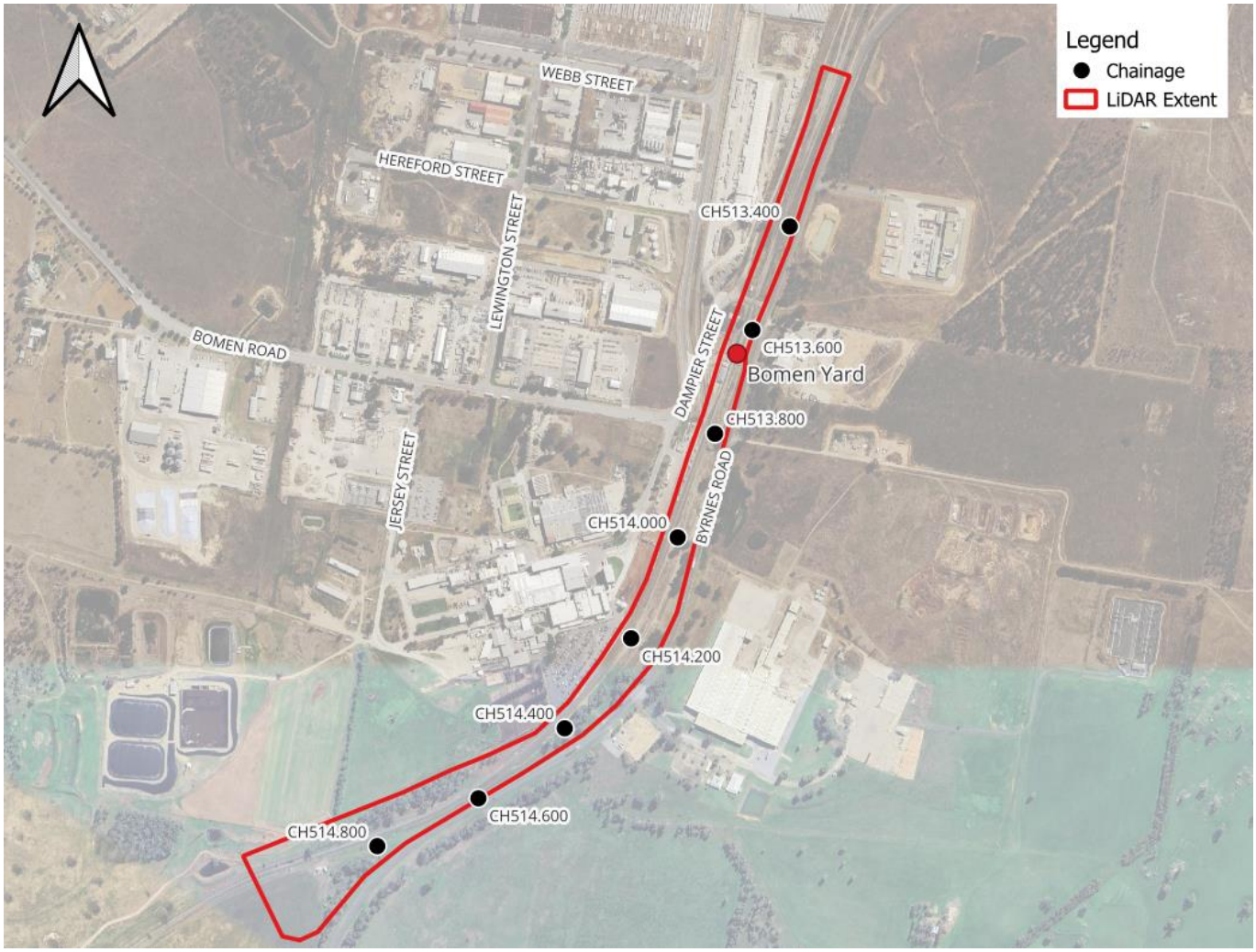


Figure 4-4: LiDAR Extent

The model topography was updated by incorporating the site survey (Item 5 in Table 1-2) and LiDAR (Item 4 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.

4.2.1.4 Drainage Network

The drainage data based on detailed survey was incorporated into the TUFLOW model (Item 5 in Table 1-2) and for drainage infrastructure outside the site, the drainage data from the TUFLOW model (WMAwater, 2021) were adopted.

4.2.2 Design Model Update

The design model was updated from the existing condition by incorporating the Inland Rail Project Works as part of the IFC stage, including:

- Track design: the track slews between CH513.446 and CH514.900.
- Civil design: Capping, ballast, cess drain and bund design for Bomen Yard. The cess drains generally comprising a minimum 600mm base width with 1V:2H side batters and where the cess drain ties into the retained existing culvert S00100500513.823LC, the cess drain has been widened to a 4 m base width. Refer to Section 4.5.6 of design report 5-0052-210-PEN-W9-RP-0001 and drawings 5-0052-210-CDR-W9-DR-0015, 5-0052-210-CDR-W9-DR-0101 to 0103 for dimension, capacity and gradient details of the cess drain.

Refer to Figure 4-5 for changes in topography between the existing and design conditions.

The drainage design at the level crossing includes a 200 mm ballast drain with no inlet pits. It could not be explicitly represented within the hydraulic model. Given its smaller pipe capacity, the ballast drain is not expected to have a significant influence on the site's flood behaviour. Consequently, the drainage pipe was not included in the flood model. Refer to Section 4.5 of Design report 5-0052-210-PEN-W9-RP-0001 for more details.

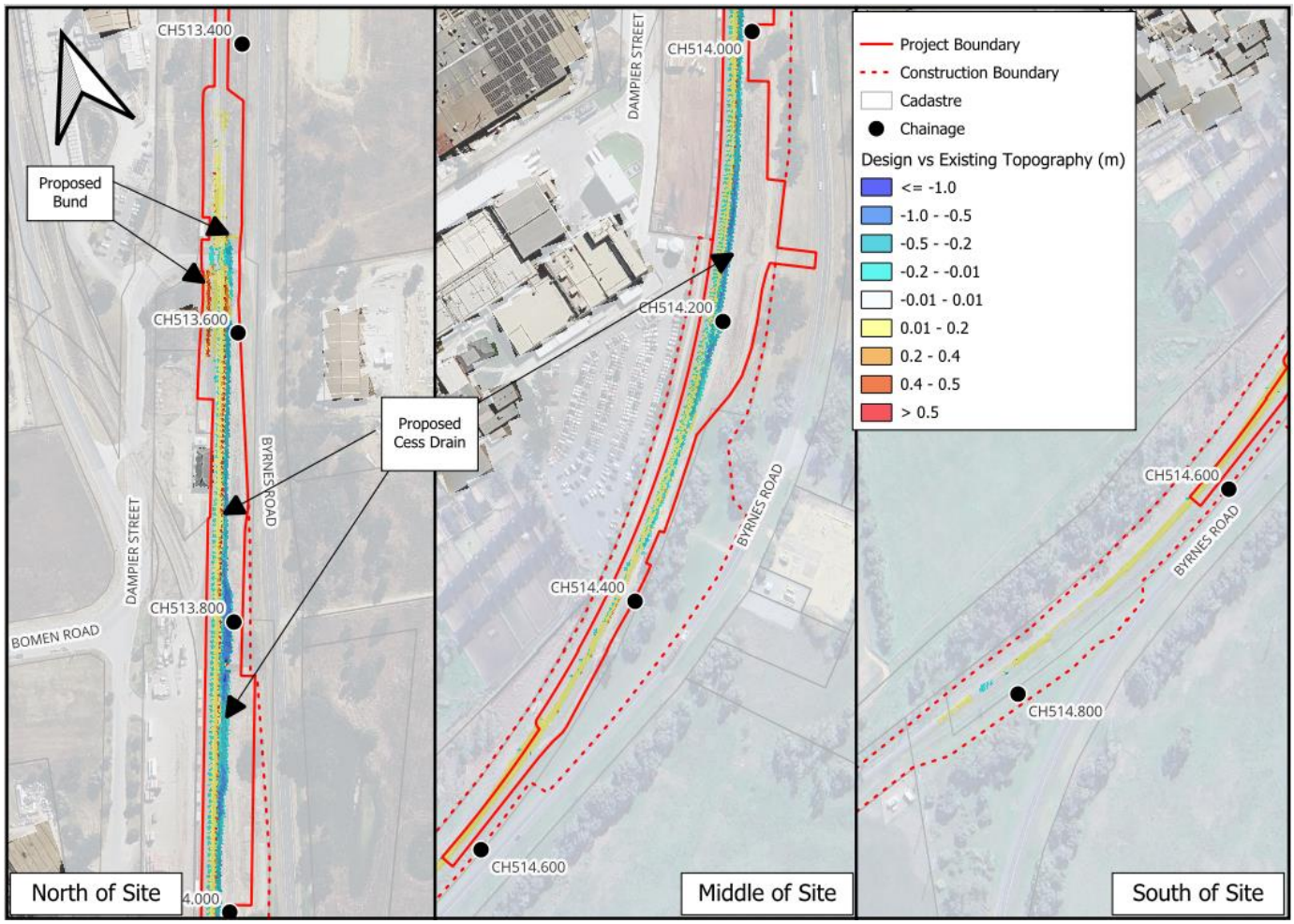


Figure 4-5: Changes in Topography (Design vs Existing) at the IFC Stage

4.2.3 Design Events

The critical duration analysis was conducted and elaborated by utilising inflow hydrographs generated from the hydrology model (Item 2 in Table 4-2). The storm durations of 15, 20, 25, 30, 45, 60, 90, 120, 180 and 270 minutes were modelled for the events of 5%, 2%, 1% AEPs and 1% AEP with climate change. An ensemble of 10 temporal patterns was run for each duration as recommended in ARR2019. The medium for the 10 temporal patterns will represent each duration. For PMF 15, 30, 45, 60, 90, 120, 150 and 180 minutes were modelled. 11 temporal patterns were run for each duration, which is in line with ARR2019. The maximum for the 11 temporal patterns will represent each duration. The critical durations were determined based on the maximum envelope method across the selected durations.

The critical duration and temporal patterns determined and elaborated below in Table 4-3 summarise the information of the design events.

Table 4-3: Summary of Events and Critical Durations Run in TUFLOW

Design Events	Critical Duration
5% AEP	30 minutes and 120 minutes
2% AEP	30 minutes and 60 minutes
1% AEP	20 minutes and 90 minutes
1% AEP + Climate Change	20 minutes and 90 minutes
PMF	15 minutes and 45 minutes

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 COMPARISONS

The comparison in this section involved the results from the updated IFC model existing condition against the results from the MOFFS TUFLOW model for the 1% AEP 120min (Figure 5-1).

Generally, the comparison shows the updated TUFLOW model produced a higher flood level up to 0.2 m than the MOFFS TUFLOW model. The following reasons contribute to this difference:

- It was initially expected that transitioning to a newer version of TUFLOW, which incorporates the quadtree method, might lead to 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 level.
- The updated TUFLOW model incorporated the latest 2020 LiDAR data, Detailed survey and top of the railway track. The updated terrain is generally higher than the MOFFS TUFLOW terrain, resulting in a higher flood level.
- The culverts within the site were updated based on detailed survey data, which involved modification in terms of pipe location, pipe size and inverts to reflect the existing site conditions accurately
- Additional inflows were incorporated to the southern site extent which results in newly wet area.

The majority of changes in the flood level are within the quadtree boundary, and the main reason is the terrain changes. The original 5m grid size model could not capture the gully or top of the railway accurately, while the 1.25m quadtree could reflect all those features. Based on the above, the differences from the comparisons are reasonable.

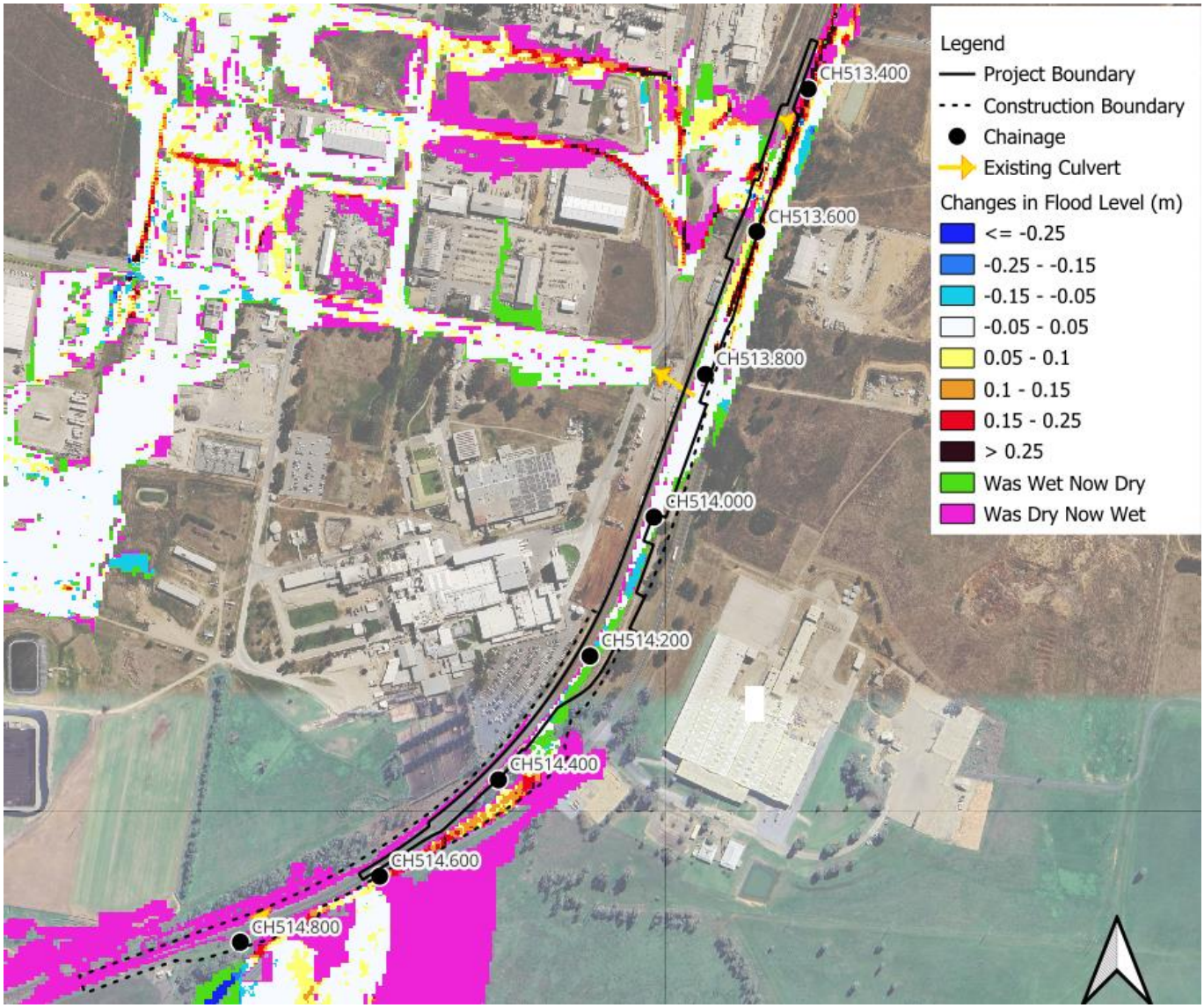


Figure 5-1: **Flood Level Comparison for 1% AEP Event – Bomen Yard IFC Existing Model vs MOFFS Model**

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.

Floodwater from the north flows along the eastern side of the railway corridor. A localised low point is present at CH513.446; consequently, a portion of the flow is intercepted by the culvert, while the remaining flow continues southward. Near the level crossing at CH513.550, part of the flow overtops the railway track and drains westward, while the balance continues towards the lowest point at CH513.850, where it is captured by the culvert. It should also be noted that a crest in the ground topography exists east of the railway at approximately CH514.100. Further south of the site, the flow flows west of the site, which is then intercepted by the culvert flowing southeast. The overall flow behaviour is illustrated in Figure 6-1.

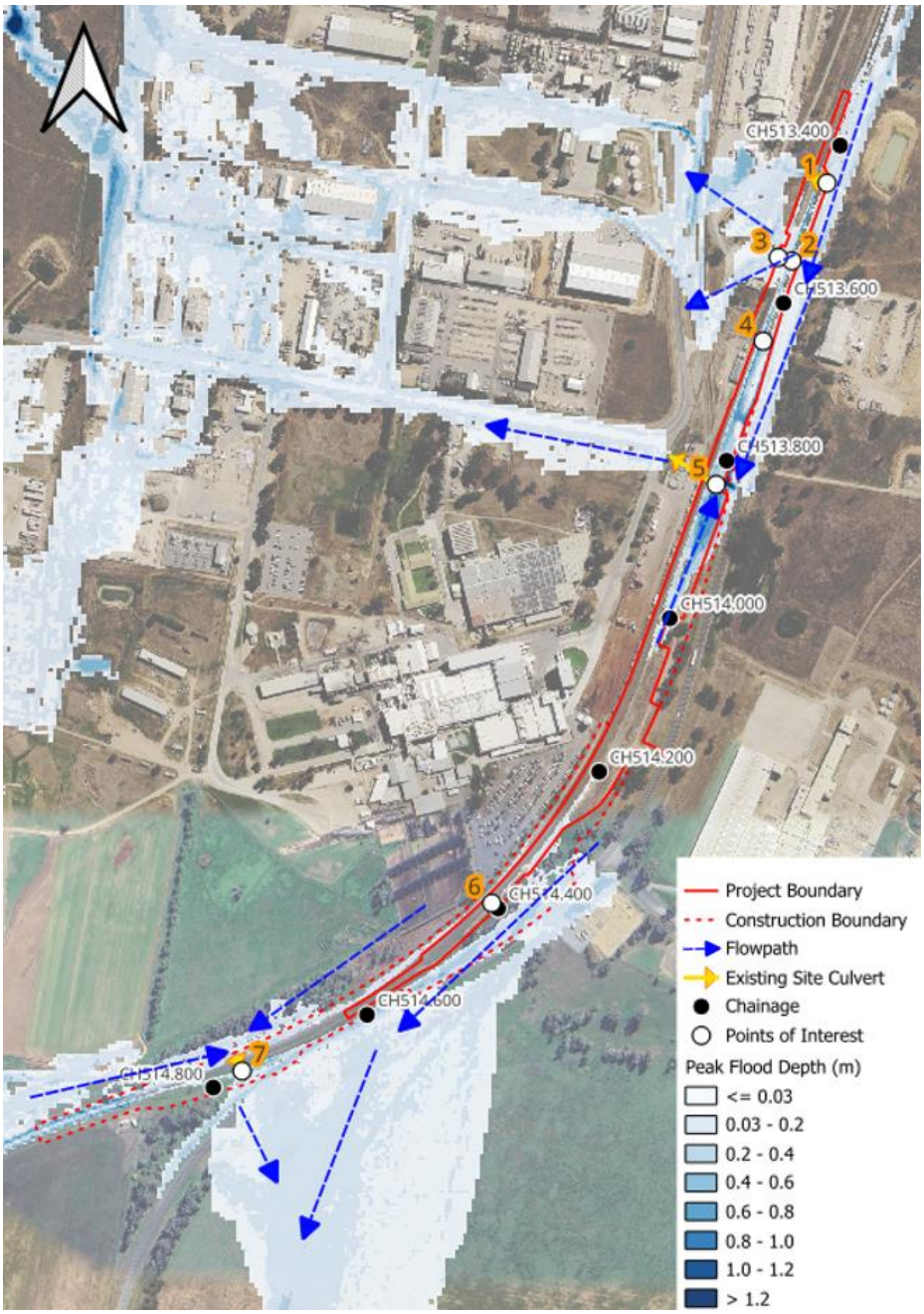


Figure 6-1: Bomen Yard Site Flow Paths

Figure 6-1 shows points of interest that have been used for the flood impact assessment presented in the following sections and Table 6-1 below describes the location at each point of interest.

Table 6-1: Points of Interest

Point of Interest	Chainage (m)	Description
1	CH513.447	Upstream of the pipe culvert
2	CH513.550	Level Crossing
3	CH513.550	Dampier Street
4	CH513.650	Channel
5	CH513.830	Upstream of the box culvert
6	CH514.400	Next to the Byrnes Road
7	CH514.765	Downstream of culvert

The tables below summarise the peak flood level results for the existing condition in the study area and points of interest (refer to Figure 6-1 for the location).

Table 6-2: Peak Flood Levels – Existing Conditions

Design Events	Flood Levels
5% AEP	▪ The flood waters overtop the existing railway tracks at the cross over (CH513.550) with approximate flood depth of 0.11m. ▪ Refer to Table 6-3 for flood level comparison based on points of interest.
2% AEP	▪ The flood waters overtop the existing railway tracks at the cross over (CH513.550) with approximate flood depth of 0.13m. ▪ Refer to Table 6-3 for flood level comparison based on points of interest
1% AEP	▪ The flood waters overtop the existing railway tracks at the cross over (CH513.550) with approximate flood depth of 0.15m. ▪ Refer to Table 6-3 for flood level comparison based on points of interest
1% AEP + Climate Change	▪ The flood waters overtop the existing railway tracks at the cross over (CH513.550) with approximate flood depth of 0.16m. ▪ Refer to Table 6-3 for flood level comparison based on points of interest
PMF	▪ The flood waters overtop the existing railway tracks at multiple location at site (from CH513.400 to CH514.000) with approximate flood depth of 0.460m. ▪ Refer to Table 6-3 for flood level comparison based on points of interest

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

Locations	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	PMF
Point 1	225.2	225.3	225.4	225.5	226.3
Point 2	225.2	225.2	225.2	225.3	225.5
Point 3	224.8	224.8	224.8	224.8	224.9
Point 4	224.5	224.6	224.6	224.7	225.2
Point 5	223.9	224.1	224.3	224.6	224.9
Point 6	Not Inundated	Not Inundated	Not Inundated	222.5	222.5
Point 7	216.1	216.2	216.2	216.2	216.2

The table below summarises the Peak flood velocity results

Table 6-4: Peak Flood Velocity – Existing Conditions

Design Events	Flood Velocity
5% AEP	▪ The peak velocity along the rail corridor is generally less than 1.0 m/s. ▪ Refer to Table 6-5 for flood velocity comparison based on points of interest
2% AEP	
1% AEP	
1% AEP + Climate Change	
PMF	▪ The peak velocity along the rail corridor is generally less than 2 m/s. ▪ Refer to Table 6-5 for velocity comparison based on points of interest

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

Locations	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	PMF
Point 1	0.8	0.8	0.9	0.9	1.1
Point 2	0.8	0.9	1.0	1.0	1.8
Point 3	0.8	0.9	1.0	1.1	2.3
Point 4	0.5	0.5	0.5	0.6	1.0
Point 5	0.7	0.7	0.8	0.8	1.1
Point 6	Not Inundated	Not Inundated	Not Inundated	0.4	0.7
Point 7	0.2	0.2	0.2	0.2	0.4

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 and tables below describe the hazards.

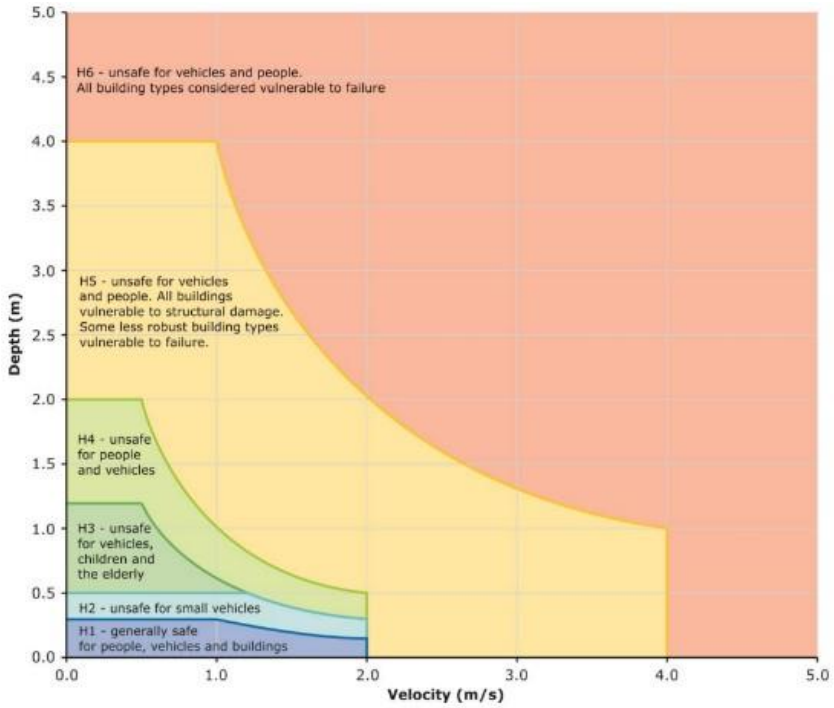


Figure 6-2: Hazard Category Classification

The tables below summarise the Peak flood hazard results and Peak flood hazard at points of interest for the existing conditions in the study area.

Table 6-6: Flood Hazard – Existing Conditions

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

Table 6-7: Peak Flood Hazard Category at Points of Interest – Existing Conditions

Locations	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	PMF
Point 1	H3	H3	H3	H3	H5
Point 2	H1	H1	H1	H1	H3
Point 3	H1	H1	H1	H1	H5
Point 4	H2	H3	H3	H3	H4
Point 5	H4	H4	H4	H5	H5
Point 6	Not Inundated	Not Inundated	Not Inundated	H1	H1
Point 7	H3	H3	H3	H3	H3

6.2 Design Condition

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.

Design condition results in a flooding scenario similar to the existing condition. However, due to proposed works near the level crossing at CH513.550 additional flood water is directed to southwest. The excess flood water that does not overtop the track flows southward along the east side of the railway. In summary, the flow behaviour in the proposed condition mimics the existing condition and maintains the same flood immunity. The overall flow behaviour is illustrated in Figure 6-3.

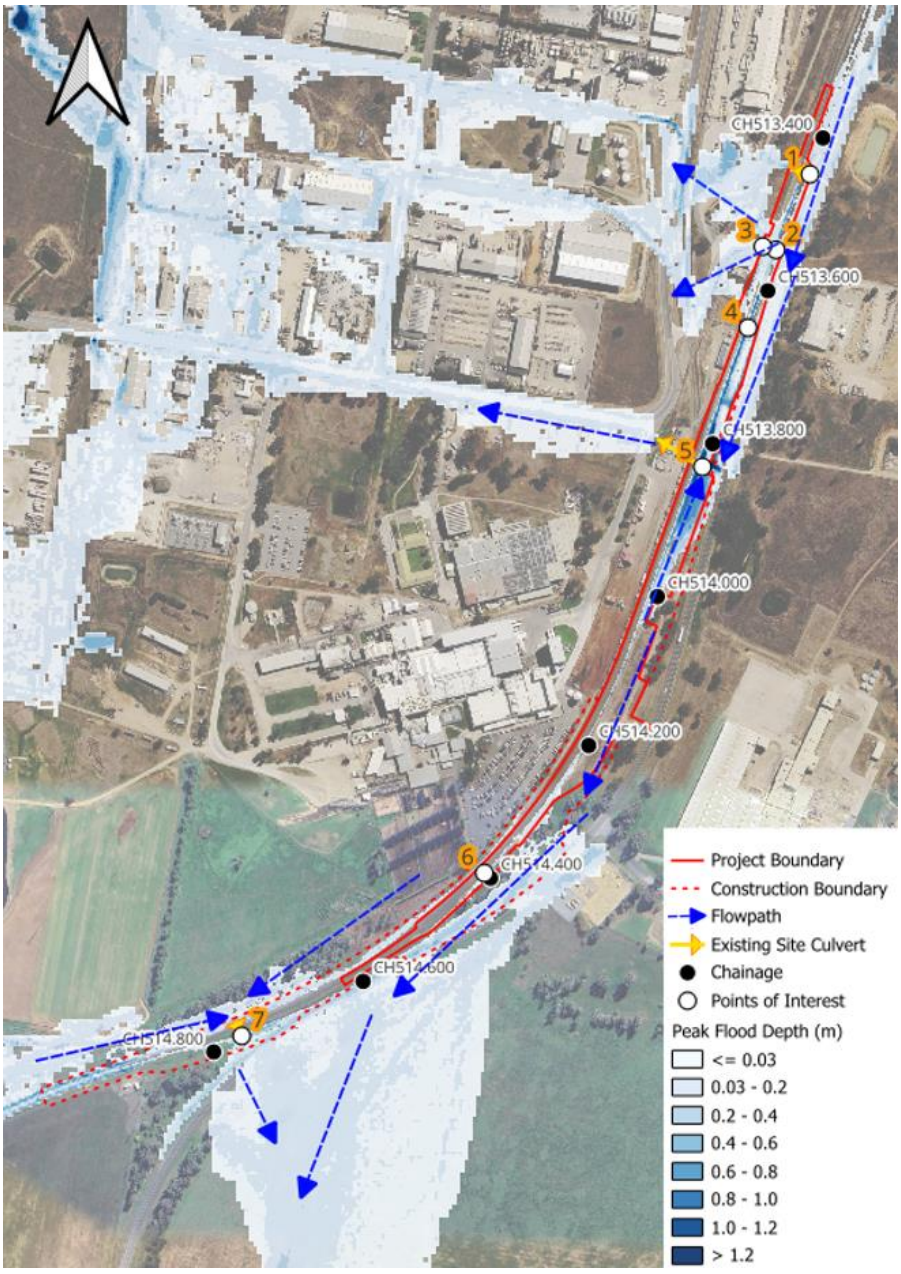


Figure 6-3: 1% AEP Flood Depth - Design

Table 6-8: Peak Flood Levels – Design Conditions

Design Events	Flood Levels
5% AEP	▪ The flood waters overtop the existing railway tracks at the cross over (CH513.550) with approximate flood depth of 0.06m. ▪ Refer to Table 6-9 for flood level comparison based on points of interest

Design Events	Flood Levels
2% AEP	▪ The flood waters overtop the existing railway tracks at the cross over (CH513.550) with approximate flood depth of 0.07m. ▪ Refer to Table 6-9 for flood level comparison based on points of interest
1% AEP	▪ The flood waters overtop the existing railway tracks at the cross over (CH513.550) with approximate flood depth of 0.1m. ▪ Refer to Table 6-9 for flood level comparison based on points of interest
1% AEP + Climate Change	▪ The flood waters overtop the existing railway tracks at the cross over (CH513.550) with approximate flood depth of 0.13m. ▪ Refer to Table 6-9 for flood level comparison based on points of interest
PMF	▪ The flood waters overtop the existing railway tracks at multiple location at site (from CH513.400 to CH514.000)) with approximate flood depth of 0.450m. ▪ Refer to Table 6-9 for flood level comparison based on points of interest

Table 6-9: Peak Flood Levels Category at Points of Interest – Design Conditions

Locations	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	PMF
Point 1	225.2	225.3	225.4	225.5	226.3
Point 2	225.1	225.2	225.2	225.2	225.5
Point 3	224.8	224.8	224.8	224.8	224.9
Point 4	224.4	224.5	224.5	224.6	225.2
Point 5	223.9	224.1	224.3	224.5	225.0
Point 6	Not Inundated	Not Inundated	222.4	222.5	222.6
Point 7	216.1	216.2	216.2	216.2	216.2

The table below summarises the peak flood velocity results for the design condition within the study area.

Table 6-10: Peak Flood Velocity – Design Conditions

Design Events	Flood Velocity
All other storm events	▪ The peak velocity along the rail corridor is generally less than 1.0 m/s. ▪ Refer to Table 6-11 for velocity comparison based on points of interest.
PMF	▪ The peak velocity along the rail corridor is generally less than 2 m/s. ▪ Refer to Table 6-11 for velocity comparison based on points of interest.

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

Locations	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	PMF
Point 1	1.0	1.0	1.0	1.0	1.1
Point 2	0.5	0.6	0.6	0.7	1.3
Point 3	0.3	0.6	0.7	0.9	2.2
Point 4	0.7	0.7	0.8	0.8	1.1
Point 5	0.6	0.7	0.7	0.7	1.0
Point 6	Not Inundated	Not Inundated	0.2	0.7	0.8

Locations	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	PMF
Point 7	0.2	0.2	0.2	0.2	0.4

The flood hazard for the design condition at the Bomen Yard study area is presented in the table below and the maps are presented in Appendix A.

Table 6-12: Flood Hazard – Design Conditions

Design Events	Flood Hazard
All other storm events	▪ The flood hazard along the rail corridor open channel is generally H4 or less. ▪ Refer to Table 6-13 for velocity comparison based on points of interest.
PMF	▪ The flood hazard along the rail corridor open channel is generally H5 or less. ▪ Refer to Table 6-13 for velocity comparison based on points of interest.

Table 6-13: Peak Flood Hazard Category at Points of Interest – Design Conditions

Locations	5% AEP	2% AEP	1% AEP	1% AEP + Climate Change	PMF
Point 1	H3	H3	H3	H3	H5
Point 2	H1	H1	H2	H2	H4
Point 3	H1	H1	H1	H1	H5
Point 4	H3	H3	H3	H4	H5
Point 5	H4	H4	H4	H5	H5
Point 6	Not Inundated	Not Inundated	H1	H1	H1
Point 7	H3	H3	H3	H3	H3

6.3 Flood Immunity and Scour Protection

The railway corridor has flood immunity of less than the 5% AEP flood immunity in the existing condition and the immunity is maintained in the design condition, which complies with the criteria in PSRs (Refer to Table 6-14 and Table 6-15). Furthermore, in the design condition, the flood velocity within the site is generally lower than 1m/s up to 1% AEP. Scour protection has been provided for proposed cess drains with grass lining (refer to Section 4.5.6 in 5-0052-210-PEN-W9-RP-0001 for details).

Table 6-14: Comparison of Flood Immunity at Overtopping Locations

Overtopping Location	Existing Condition Overtopping AEP	Design Condition Overtopping AEP
CH513.550	5% AEP	5% AEP
CH514.860	5% AEP	5% AEP

An assessment of the flood immunity at the noted locations of overtopping along the rail is seen in the table below for CH513.550 and CH514.860 where overtopping of the rail occurs.

Table 6-15: Overtopping Details at Main line

Chainage	Top of the Rail Level (mAHD)		Top of the Formation Level (mAHD)		5% AEP Flood Level (mAHD)	
	Existing	Design	Existing	Design	Existing	Design
CH513.550	225.070	225.089	224.403*	224.422*	225.178	225.141

Chainage	Top of the Rail Level (mAHD)		Top of the Formation Level (mAHD)		5% AEP Flood Level (mAHD)	
	Existing	Design	Existing	Design	Existing	Design
CH514.860	216.458	216.465	215.791*	215.798*	216.434	216.440

*Note that the top of the formation level has been assumed to be 667mm below the existing top of the rail level

Furthermore, in the design conditions, the flood velocities outside the project boundary (Northen site extent) show velocity impact exceedance as the relative velocity increase is above 10% for velocity above 0.5m/s in proposed condition. (Refer to Figure 35A to 37A in Appendix A). When assessing the velocity exceedance, a site-specific risk assessment was undertaken, which concluded that the predicted velocities are not likely to present a scour risk as it was identified that the absolute flow velocity under the design condition is less than 1.0 m/s during the rare storm event (1% AEP (worse case event)). Thus, not expected to experience erosion or other adverse impacts as a result of the predicted velocity changes (refer to Figure 6-4) and are therefore considered compliant.

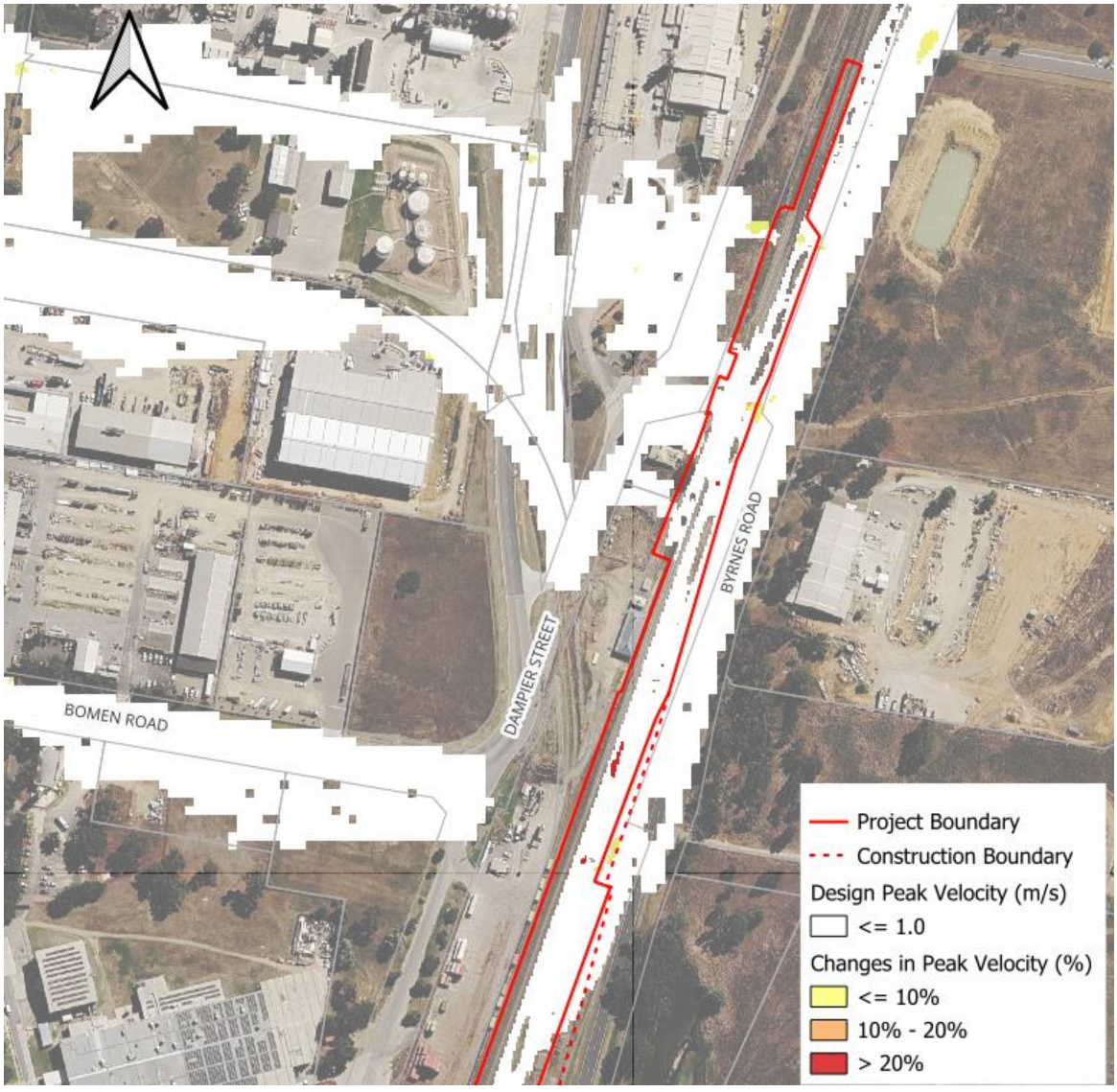


Figure 6-4: Changes in Velocity based on Design velocity of 1m/s

6.4 Flood Impact Assessment

The proposed cess drain compensates for the decreased downstream flow by also serving as a storage limiting the impact outside of the project boundary. Therefore, there is no adverse flood impact outside of the project boundary. The discussion about the peak level, velocity and hazard effect due to the design is illustrated in the following sections.

6.4.1 Changes in Peak Flood Levels

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

Table 6-16: Flood Levels Impact Assessment

Design Events	Changes in Peak Flood Levels
5% AEP, 2% AEP and 1% AEP	▪ The changes in flood level outside the project boundary are less than 0.05m and no residential, commercial or industrial properties are impacted. ▪ The property located immediate downstream of the crossing (at CH513.550) is considered as a habitable building. The increase in flood level is less than 0.01 m in all events up to 1% AEP. Based on the current land use of the building's land and neighbouring land (DP830096 Lot 1 and DP852602 Lot 3 respectively) (as per Sharing and Enabling Environmental Data (SEED) in NSW) it is classified as grazing native vegetation (primary production), for which an afflux of up to 200 mm is acceptable based on CoA clause E42 (f) (Refer to Figure 6-5). However, the additional inundated wet area resulting from the proposed flood bund is results flood depths of generally less than 0.1 m which is well within the 0.2m impact limit. ▪ The new wet area created outside the boundary is generally less than 0.05m.



Figure 6-5: Property Located Downstream of Crossover

Table 6-17: Changes in Flood Levels (m) at Points of Interest

Locations	5% AEP	2% AEP	1% AEP
Point 1	<0.01	0.01	0.01
Point 2	-0.05	-0.05	-0.05
Point 3	-0.01	-0.01	-0.01

Point 4	-0.07	-0.06	-0.06
Point 5	0.04	0.02	-0.02
Point 6	Not inundated		0.04
Point 7	<0.01	<0.01	<0.01

Based on the above, the changes in flood level outside the project boundary comply with the PSR and CoA clause E42 (b), (c), (d), (e) & (f) project requirements.

6.4.2 Changes in Peak Flood Velocity

The table below provides details of changes in peak flood velocity for the design condition.

Table 6-18: Flood Velocity Impact Assessment

Design Events	Changes in Peak Flood Velocity
5% AEP	▪ Velocity exceedances were identified outside the site where more than 10% increase in velocity were identified where design velocity is more than 0.5m/s. However, the site-specific assessment (refer to section 366.3) identified that the velocity increases do not exacerbate erosion which complies with the CoA clause E46(h).
2% AEP	
1% AEP	

Table 6-19: Changes in Flood Velocity (m/s) at Points of Interest

Locations	5% AEP	2% AEP	1% AEP
Point 1	More than 10% increase with absolute design velocity of 0.95m/s	More than 10% increase with absolute design velocity of 0.95m/s	More than 10% increase with absolute design velocity of 0.96m/s
Point 2	Design Velocity less than 0.5m/s	< 10% Increase	
Point 3	Design Velocity less than 0.5m/s	< 10% Increase	
Point 4	More than 10% increase with absolute design velocity of 0.62m/s	More than 10% increase with absolute design velocity of 0.65m/s	More than 10% increase with absolute design velocity of 0.75m/s
Point 5	< 10% Increase		
Point 6	Not inundated		Design Velocity less than 0.5m/s
Point 7	Design Velocity less than 0.5m/s		

Based on the above, the changes in flood velocity outside the project boundary comply with the PSR and CoA clause E42 (h) project requirements

6.4.3 Changes in Peak Flood Hazard

The table below details the changes in peak flood hazard for the design scenario.

Table 6-20: Flood Hazard Impact Assessment

Design Events	Changes in Peak Flood Hazard
All %AEP events	▪ Generally, no increase in hazard outside the project boundary. ▪ The property located immediately downstream of the crossing experiences H1 flood hazard up to 1% AEP which is considered safe for people, vehicle and buildings.

Table 6-21: Changes in Flood Hazard at Points of Interest

Locations	5% AEP	2% AEP	1% AEP
Point 1	No change in hazard		
Point 2	No change in hazard		Increased 1 Class
Point 3	No change in hazard		
Point 4	Increased 1 Class	No change in hazard	
Point 5	No change in hazard		
Point 6	Not inundated		Increased 1 Class
Point 7	No change in hazard		

The changes in flood hazard outside the project boundary comply with the PSR and CoA clause E42 (g) project requirements.

6.4.4 Changes in Duration of Inundation

The analysis around the changes in duration of inundation was undertaken by comparing the existing and design flood levels vs time in selected locations. The location adopted for the comparison is shown in Figure 6-6. The comparison of flood level vs time for Reporting Locations 1, 2, 3 and 4 is shown in Figure 6-7 to Figure 6-10. The design water level hydrograph shows a slightly lower but generally similar peak level duration with changes less than 1 hour. 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).

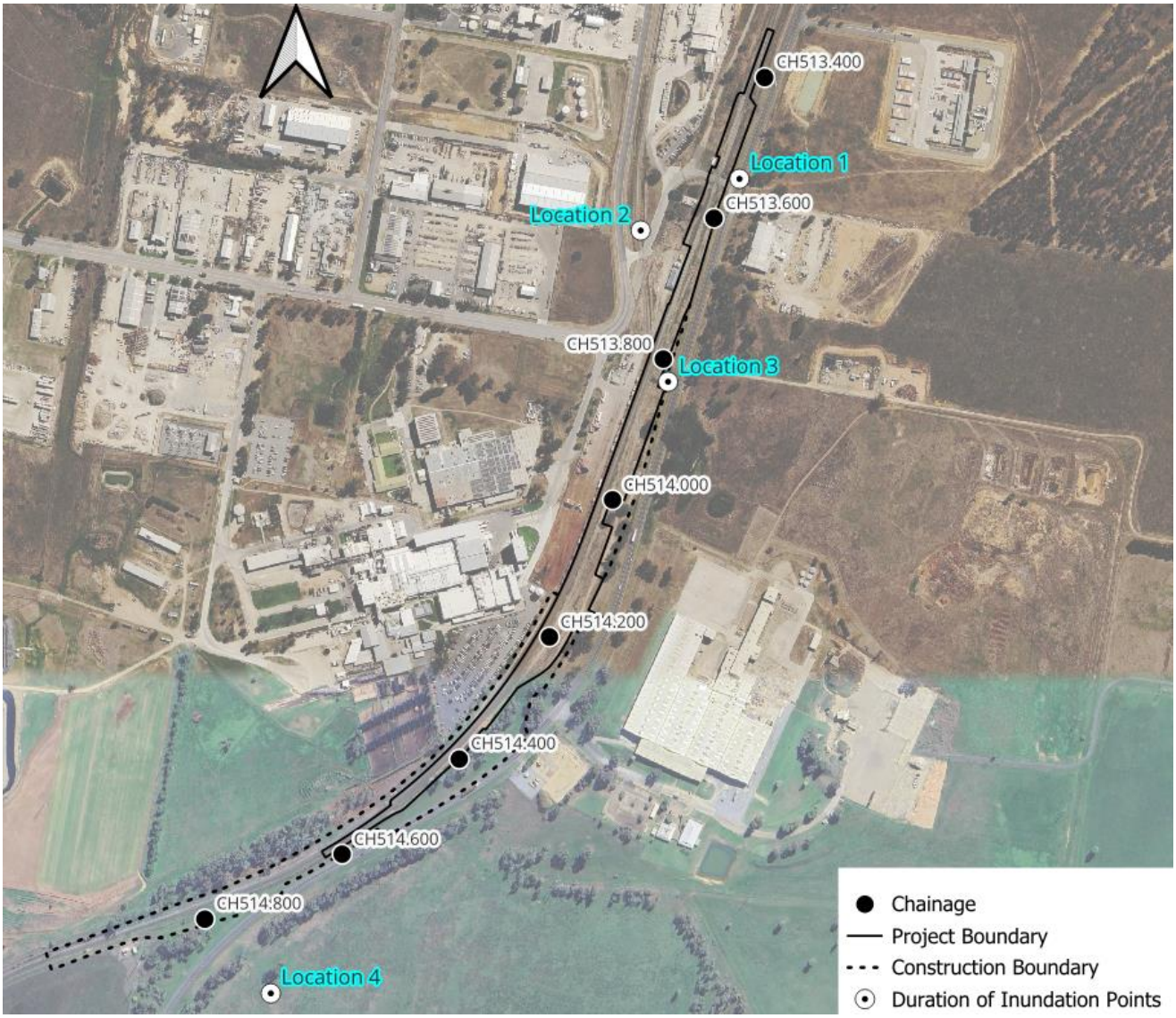
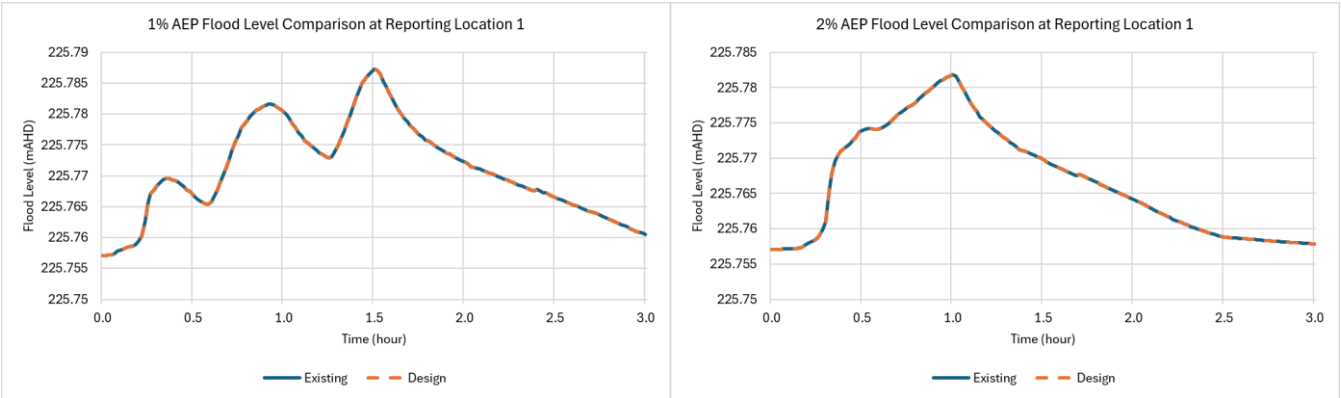


Figure 6-6: Locations for the Changes in Duration of Inundation



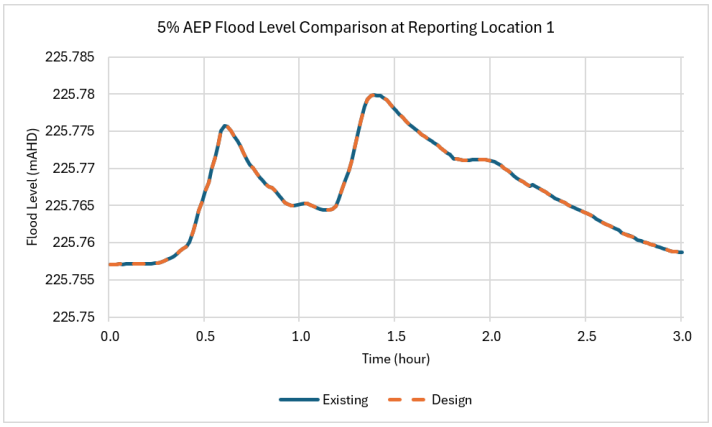
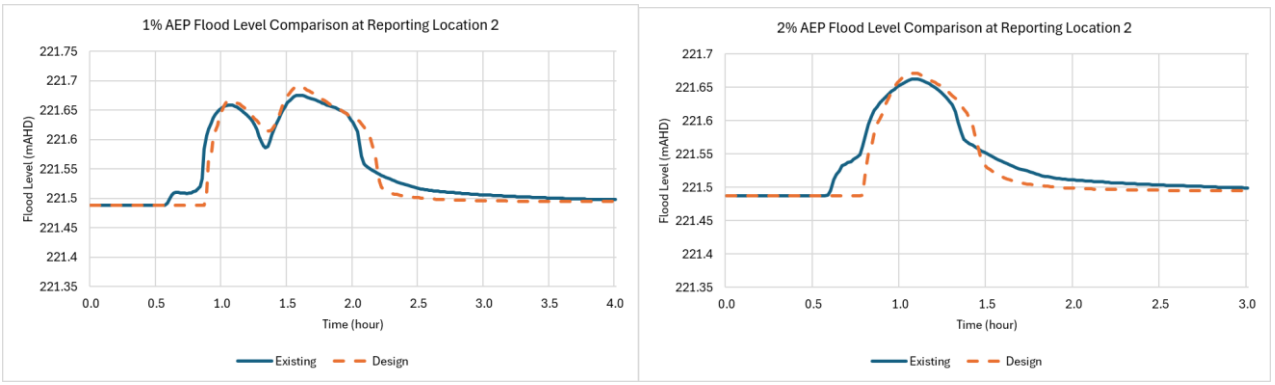


Figure 6-7: Comparison of the Flow Hydrographs at Reporting Location 1



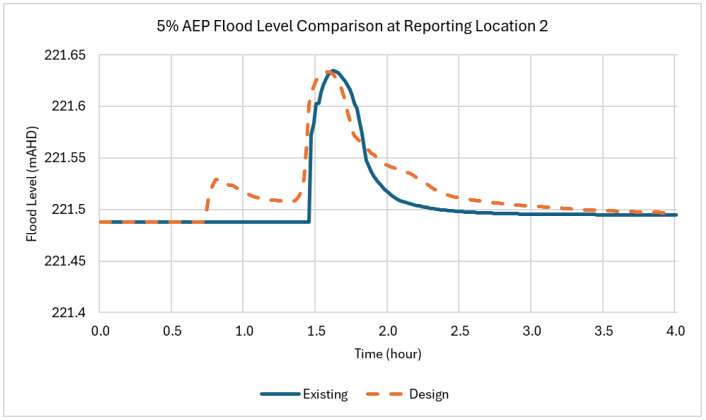
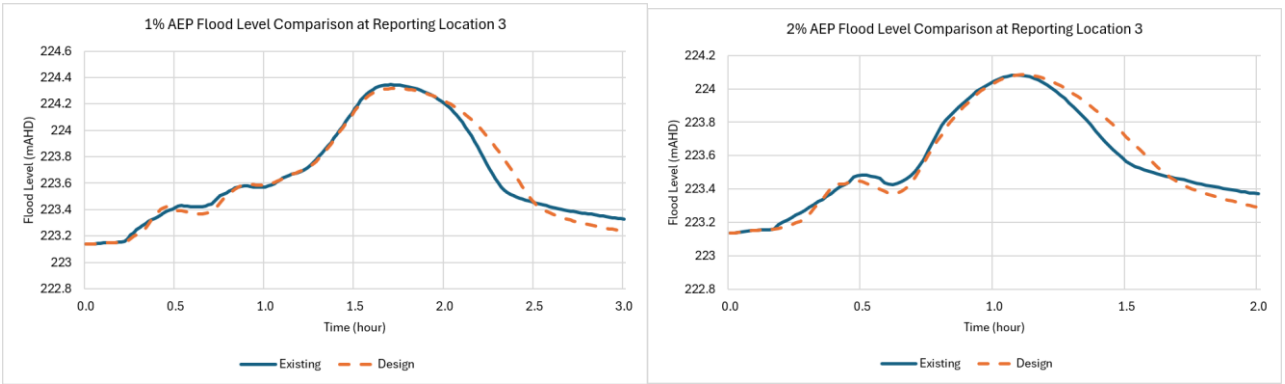


Figure 6-8: Comparison of the Flow Hydrographs at Reporting Location 2



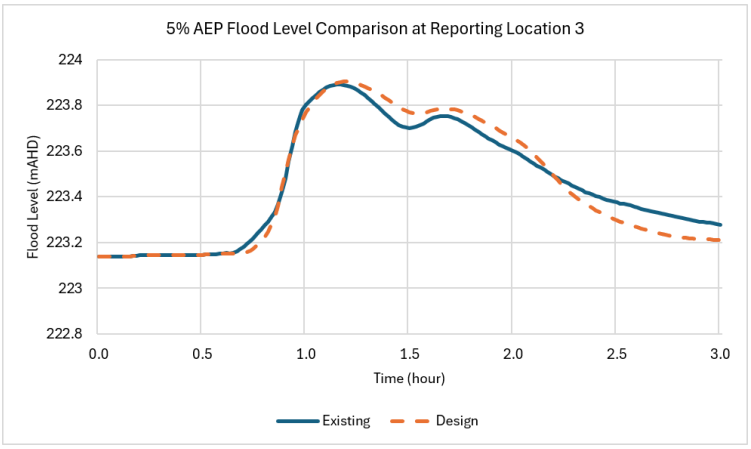
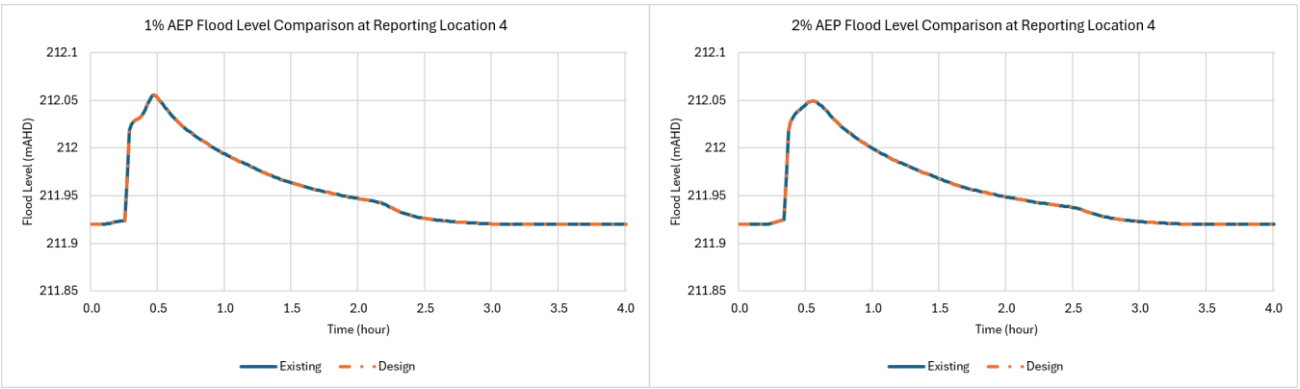


Figure 6-9: Comparison of Flood Level vs. Time at Reporting Location 3



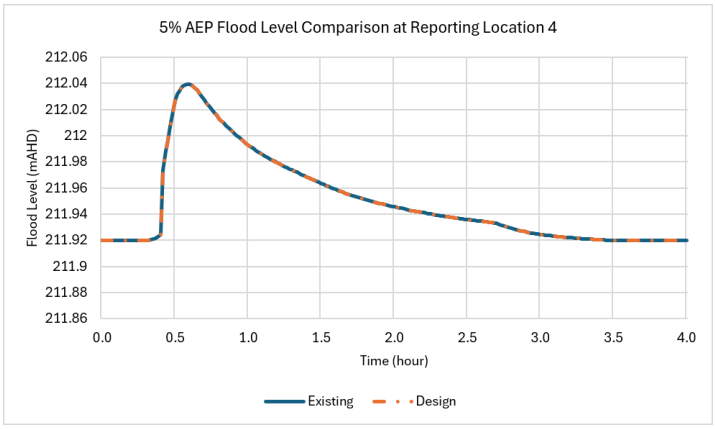


Figure 6-10: Comparison of Flood Level vs. Time at Reporting Location 4

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 and this, in conjunction with culvert size was used to determine the relevant blockage factors shown (refer to Table 6-22 and Table 6-23) below. Apart from the three culverts (CH513850, CH513446, and CH514765) within the project extent, 20% blockage was adopted for all the other culverts, pits and pipes outside the project boundary.

A flood level comparison between the blockage scenario and design is shown in Figure 6-11. Generally, the overall flood behaviour is subject to the blockage of the downstream drainage system. The water level increase of up to 0.15 m is mainly found at around the upstream of CH513850.

Table 6-22: Culvert Blockage Percentage

Culvert	Blockage Percentage (1% AEP)	Comments
CH513850 (1 cell 1.5m(W) x 1.5m (H))	0%	Inside the project boundary
CH513446 (3 cells 0.6 in diameter)	25%	Inside the project boundary
CH514765 (1 cell, 0.9m in diameter)	25%	Inside the project boundary
All others (culvert, pit and pipe)	20%	Outside of the project boundary

Table 6-23: Culvert Blockage Parameters

Culvert	Debris Availability	Debris Mobility	Debris Transportability	AEP Adjusted Debris Potential
Chainage 513850	Medium	Medium	Low	Low
Chainage 513446	Medium	Medium	Low	Low
Chainage 514765	Medium	Medium	Low	Low

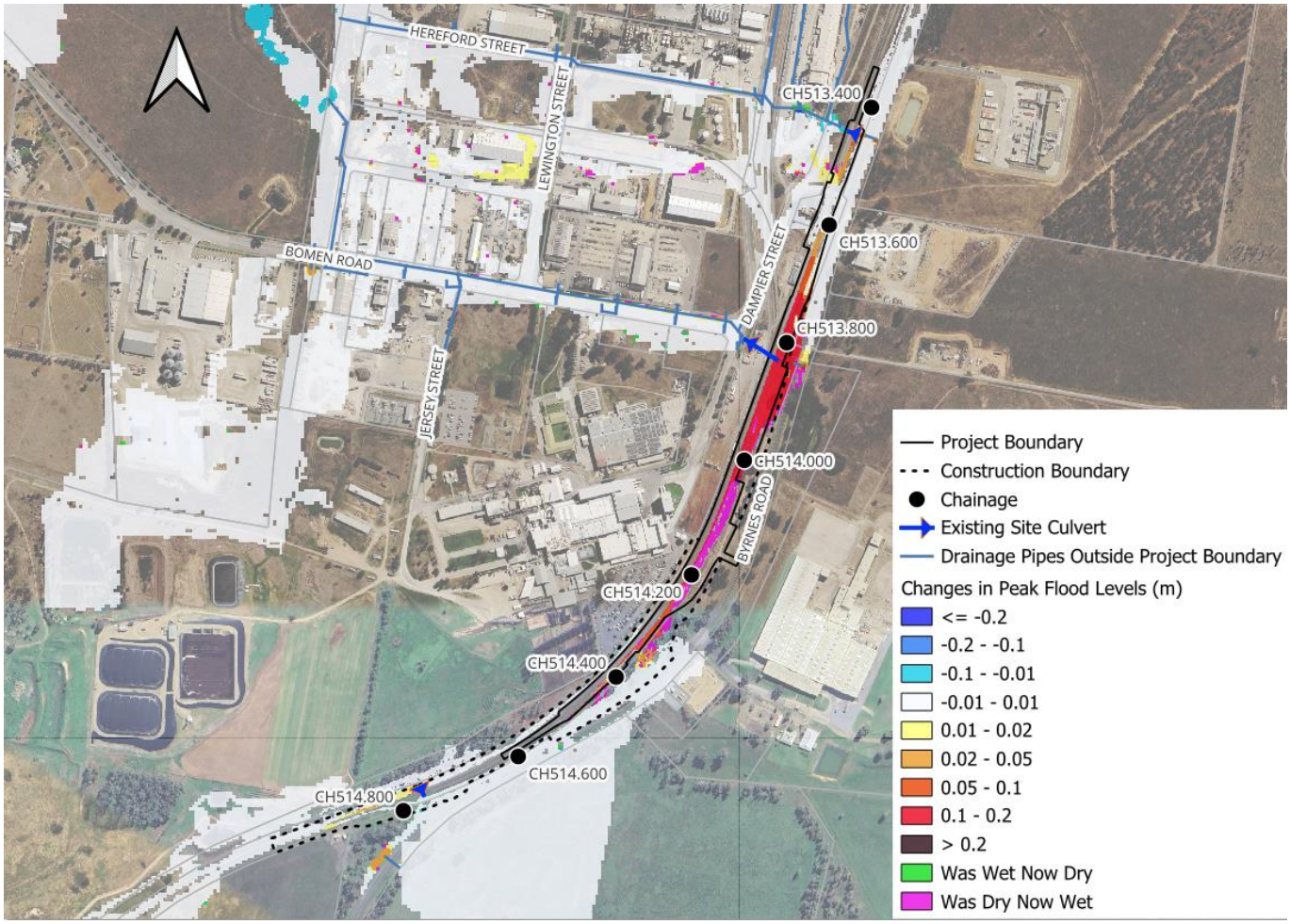


Figure 6-11: Flood Level Comparison for 1% AEP Design Condition – Blockage Design Condition vs Design Condition

6.5.2 Climate Change Risk Assessment

A Climate Change risk assessment was carried out by running the 1% AEP with the Year 2090 RCP8.5 interim climate change factor (refer to Section 0 for details of the approach) and the results of flood depth, flood velocity and flood hazard can be found in Section 6.1 and Section 6.2. The corresponding flood maps can be found in Appendix A. The assessment is summarised below:

- Within the study area, both the existing railway track and the proposed track cannot achieve flood immunity in climate change conditions.
- The floodwater overtops the railway with a flood depth generally 0.15m from CH513500 to CH513660
- Aside from the channel and culvert inlet location, the site and surrounding area generally experience H2 Hazard or less.

7 MITIGATION MEASURES

No instances of non-compliance in terms of flood impact were documented. Therefore, no additional 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 up to date raised by relevant parties have been resolved (refer to Appendices C, D and E). Any additional comments raised will be addressed.

Consequently, there are no further recommendations.

APPENDICES

APPENDIX A

Flood Maps

Table 8-1: List of Maps in Appendix A

Map ID	Map description
Figure 01A	5% AEP Peak Flood Level - Existing Condition
Figure 01B	5% AEP Peak Flood Level - Existing Condition
Figure 02A	2% AEP Peak Flood Level - Existing Condition
Figure 02B	2% AEP Peak Flood Level - Existing Condition
Figure 03A	1% AEP Peak Flood Level - Existing Condition
Figure 03B	1% AEP Peak Flood Level - Existing Condition
Figure 04A	1% AEP with Climate Change Peak Flood Level - Existing Condition
Figure 04B	1% AEP with Climate Change Peak Flood Level - Existing Condition
Figure 05A	PMF Peak Flood Level - Existing Condition
Figure 05B	PMF Peak Flood Level - Existing Condition
Figure 06A	5% AEP Peak Flood Velocity - Existing Condition
Figure 06B	5% AEP Peak Flood Velocity - Existing Condition
Figure 07A	2% AEP Peak Flood Velocity - Existing Condition
Figure 07B	2% AEP Peak Flood Velocity - Existing Condition
Figure 08A	1% AEP Peak Flood Velocity - Existing Condition
Figure 08B	1% AEP Peak Flood Velocity - Existing Condition
Figure 09A	1% AEP with Climate Change Peak Flood Velocity - Existing Condition
Figure 09B	1% AEP with Climate Change Peak Flood Velocity - Existing Condition
Figure 10A	PMF Peak Flood Velocity - Existing Condition
Figure 10B	PMF Peak Flood Velocity - Existing Condition
Figure 11A	5% AEP Hazard - Existing Condition
Figure 11B	5% AEP Hazard - Existing Condition
Figure 12A	2% AEP Hazard - Existing Condition
Figure 12B	2% AEP Hazard - Existing Condition
Figure 13A	1% AEP Hazard - Existing Condition
Figure 13B	1% AEP Hazard - Existing Condition
Figure 14A	1% AEP with Climate Change Hazard - Existing Condition
Figure 14B	1% AEP with Climate Change Hazard - Existing Condition
Figure 15A	PMF Hazard - Existing Condition
Figure 15B	PMF Hazard - Existing Condition
Figure 16A	5% AEP Peak Flood Level – Design Condition
Figure 16B	5% AEP Peak Flood Level - Design Condition
Figure 17A	2% AEP Peak Flood Level - Design Condition
Figure 17B	2% AEP Peak Flood Level - Design Condition
Figure 18A	1% AEP Peak Flood Level - Design Condition
Figure 18B	1% AEP Peak Flood Level - Design Condition
Figure 19A	1% AEP with Climate Change Peak Flood Level - Design Condition
Figure 19B	1% AEP with Climate Change Peak Flood Level - Design Condition

Map ID	Map description
Figure 20A	PMF Peak Flood Level - Design Condition
Figure 20B	PMF Peak Flood Level - Design Condition
Figure 21A	5% AEP Peak Flood Velocity - Design Condition
Figure 21B	5% AEP Peak Flood Velocity - Design Condition
Figure 22A	2% AEP Peak Flood Velocity - Design Condition
Figure 22B	2% AEP Peak Flood Velocity - Design Condition
Figure 23A	1% AEP Peak Flood Velocity - Design Condition
Figure 23B	1% AEP Peak Flood Velocity - Design Condition
Figure 24A	1% AEP with Climate Change Peak Flood Velocity - Design Condition
Figure 24B	1% AEP with Climate Change Peak Flood Velocity - Design Condition
Figure 25A	PMF Peak Flood Velocity - Design Condition
Figure 25B	PMF Peak Flood Velocity - Design Condition
Figure 26A	5% AEP Hazard - Design Condition
Figure 26B	5% AEP Hazard - Design Condition
Figure 27A	2% AEP Hazard - Design Condition
Figure 27B	2% AEP Hazard - Design Condition
Figure 28A	1% AEP Hazard - Design Condition
Figure 28B	1% AEP Hazard - Design Condition
Figure 29A	1% AEP with Climate Change Hazard - Design Condition
Figure 29B	1% AEP with Climate Change Hazard - Design Condition
Figure 30A	PMF Hazard - Design Condition
Figure 30B	PMF Hazard - Design Condition
Figure 31A	Changes in Peak Flood Levels for 5% AEP
Figure 31B	Changes in Peak Flood Levels for 5% AEP
Figure 32A	Changes in Peak Flood Levels for 2% AEP
Figure 32B	Changes in Peak Flood Levels for 2% AEP
Figure 33A	Changes in Peak Flood Levels for 1% AEP
Figure 33B	Changes in Peak Flood Levels for 1% AEP
Figure 34A	Changes in Peak Flood Levels for 1% AEP with Climate Change
Figure 34B	Changes in Peak Flood Levels for 1% AEP with Climate Change
Figure 35A	Changes in Peak Flood Velocity for 5% AEP
Figure 35B	Changes in Peak Flood Velocity for 5% AEP
Figure 36A	Changes in Peak Flood Velocity for 2% AEP
Figure 36B	Changes in Peak Flood Velocity for 2% AEP
Figure 37A	Changes in Peak Flood Velocity for 1% AEP
Figure 37B	Changes in Peak Flood Velocity for 1% AEP
Figure 38A	Changes in Peak Flood Velocity for 1% AEP with Climate Change
Figure 38B	Changes in Peak Flood Velocity for 1% AEP with Climate Change
Figure 39A	Changes in Peak Flood Hazard for 5% AEP

Map ID	Map description
Figure 39B	Changes in Peak Flood Hazard for 5% AEP
Figure 40A	Changes in Peak Flood Hazard for 2% AEP
Figure 40B	Changes in Peak Flood Hazard for 2% AEP
Figure 41A	Changes in Peak Flood Hazard for 1% AEP
Figure 41B	Changes in Peak Flood Hazard for 1% AEP
Figure 42A	Changes in Peak Flood Hazard for 1% AEP with Climate Change
Figure 42B	Changes in Peak Flood Hazard for 1% AEP with Climate Change
Figure 43A	1% AEP Peak Flood Levels - Blockage Condition
Figure 43B	1% AEP Peak Flood Levels - Blockage Condition
Figure 44A	1% AEP Peak Flood Velocity - Blockage Condition
Figure 44B	1% AEP Peak Flood Velocity - Blockage Condition
Figure 45A	1% AEP Peak Flood Hazard - Blockage Condition
Figure 45B	1% AEP Peak Flood Hazard - Blockage Condition

MARTINUS

aurecon BG&E

Legend

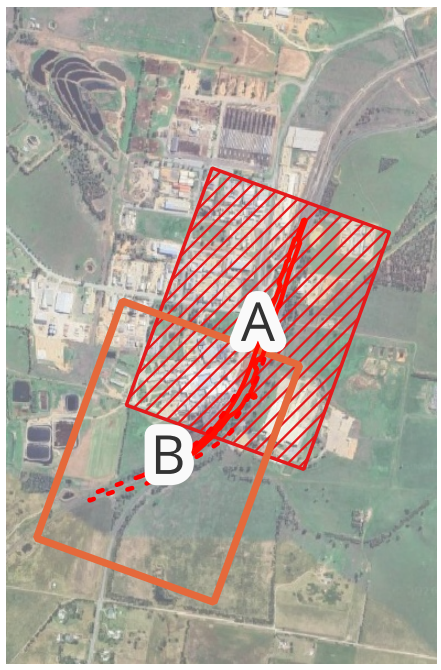
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 01A: 5% AEP Peak Flood Level - Existing Condition

MARTINUS

aurecon BG&E

Legend

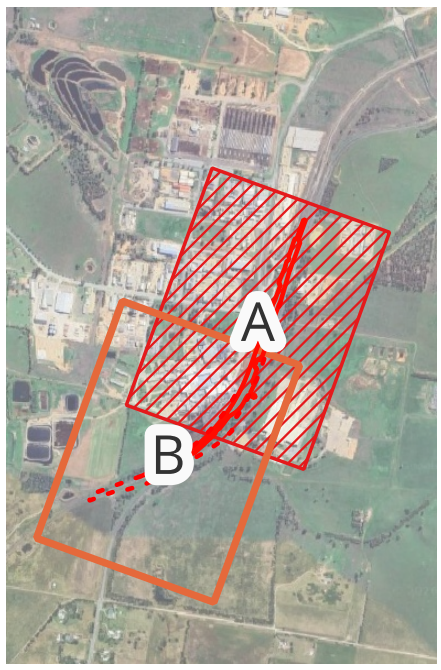
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 01A: 5% AEP Peak Flood Level - Existing Condition

MARTINUS

aurecon BG&E

Legend

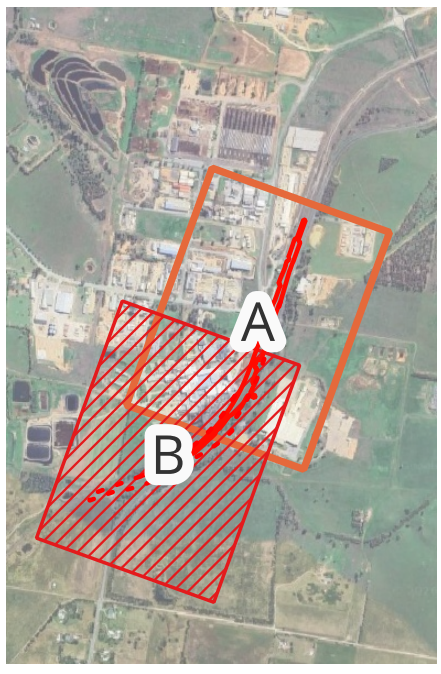
Project Boundary

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

- 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:

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

223.00 224.00 222.00 220.00 219.00 218.00 217.00 216.00 215.00 214.00 213.00 212.00 211.00 210.00 209.00 208.00 207.00 206.00 205.00 204.00

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

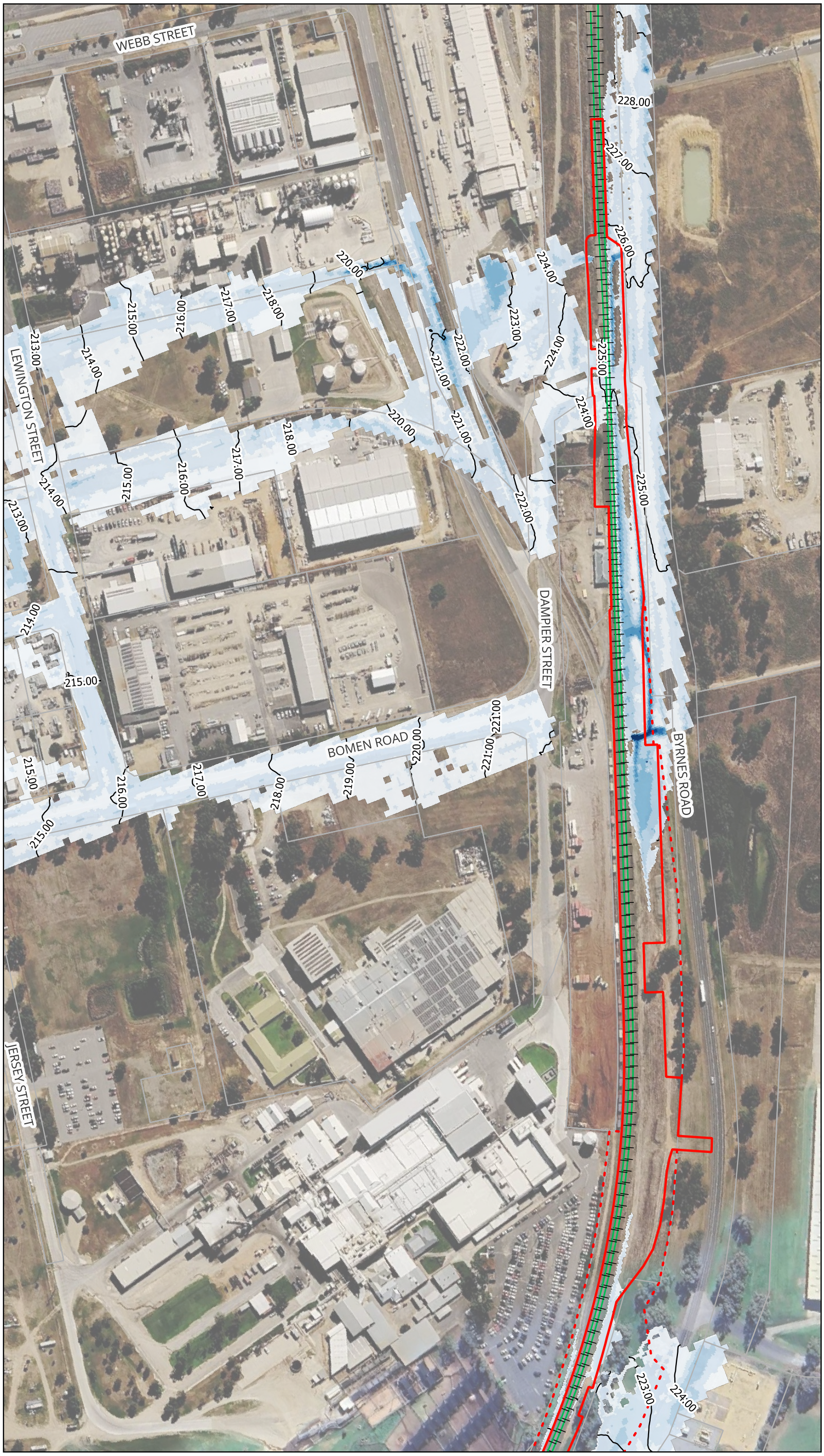
0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 01B: 5% AEP Peak Flood Level - Existing Condition



MARTINUS

aurecon BG&E

Legend

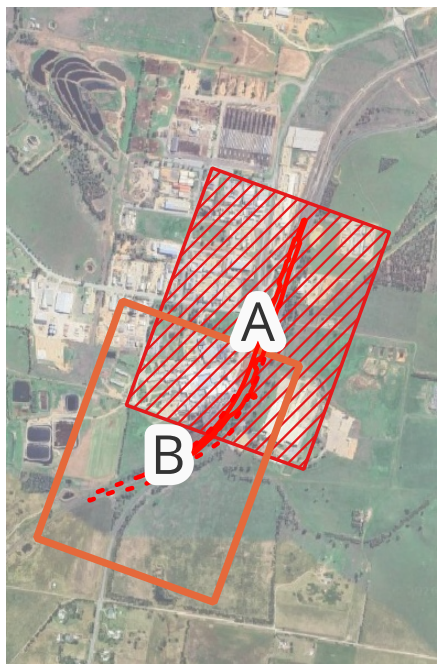
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 02A: 2% AEP Peak Flood Level - Existing Condition

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

MARTINUS

aurecon BG&E

Legend

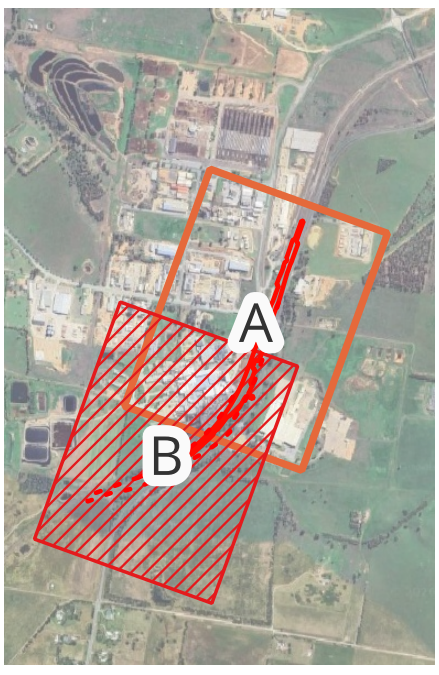
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

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Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 02B: 2% AEP Peak Flood Level - Existing Condition

MARTINUS

aurecon BG&E

Legend

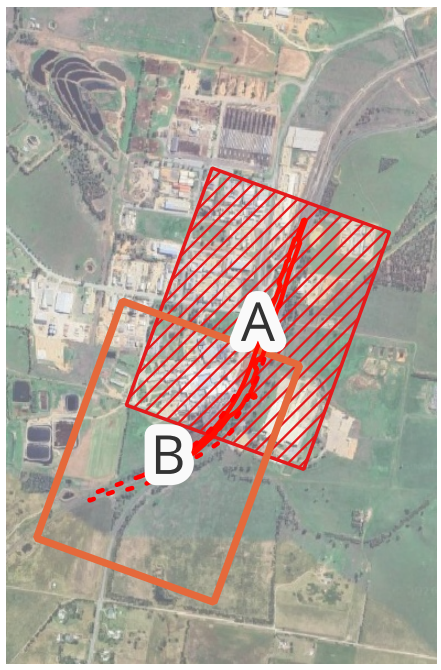
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 03A: 1% AEP Peak Flood Level - Existing Condition

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

MARTINUS

aurecon BG&E

Legend

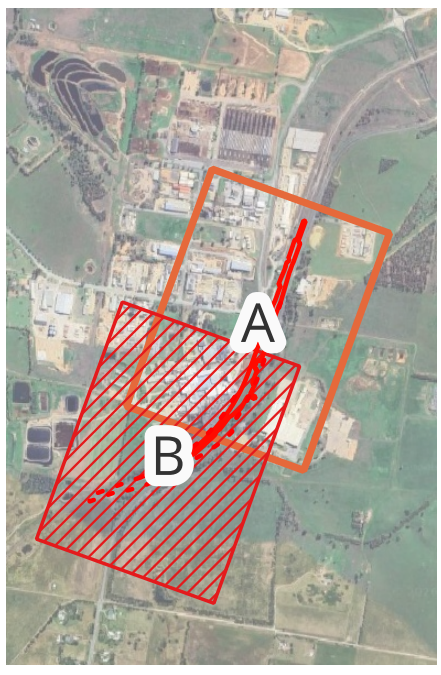
Project Boundary

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

- 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:

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

224.00
223.00
222.00
220.00
219.00
218.00
217.00
216.00
215.00
214.00
213.00
212.00
211.00
210.00
209.00
208.00
207.00
206.00
205.00
204.00

0 100 200 m

A3 Scale: 1:3,100

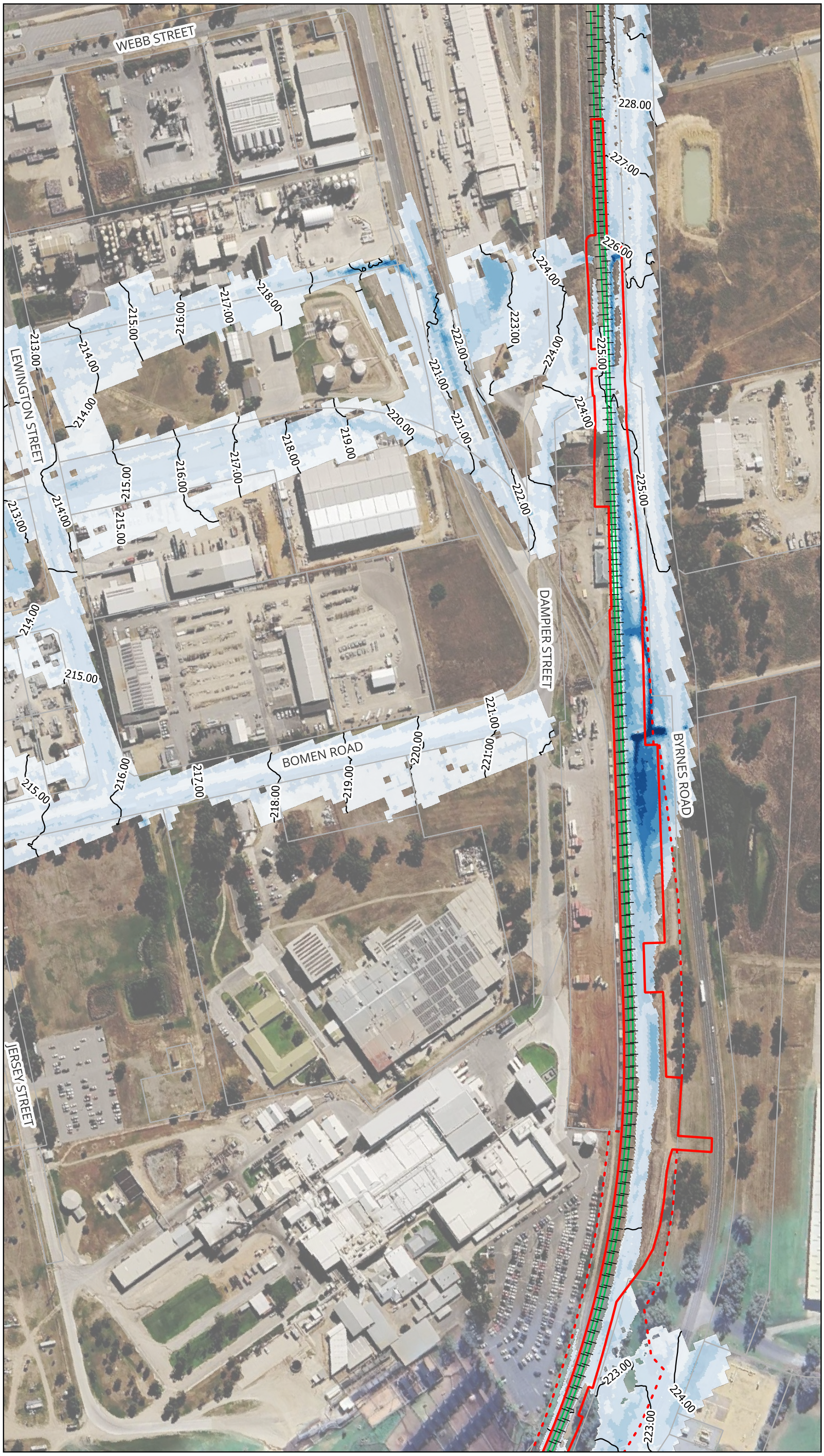
27/7/2026 GDA2020 / MGA zone 55

Map by: TT

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Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 03B: 1% AEP Peak Flood Level - Existing Condition



MARTINUS

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Legend

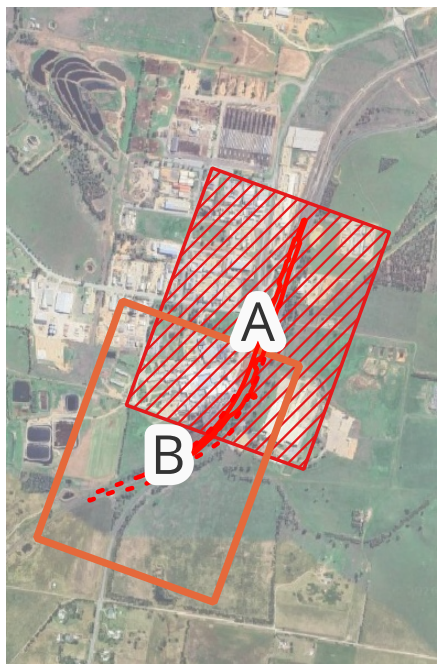
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

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Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 04A: 1% AEP with Climate Change Peak Flood Level - Existing Condition

MARTINUS

aurecon BG&E

Legend

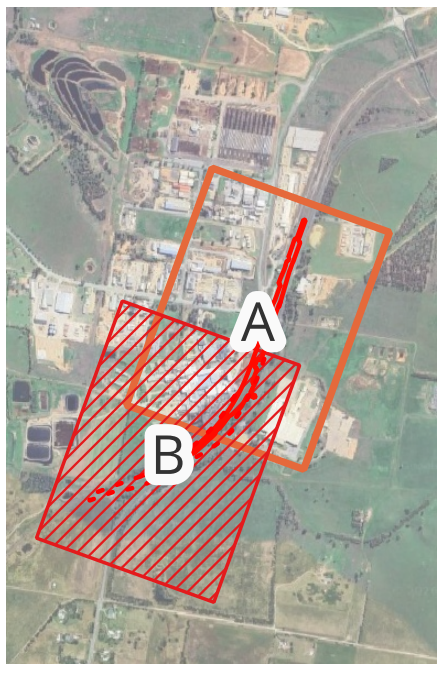
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

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Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 04B: 1% AEP with Climate Change Peak Flood Level - Existing Condition

MARTINUS

aurecon BG&E

Legend

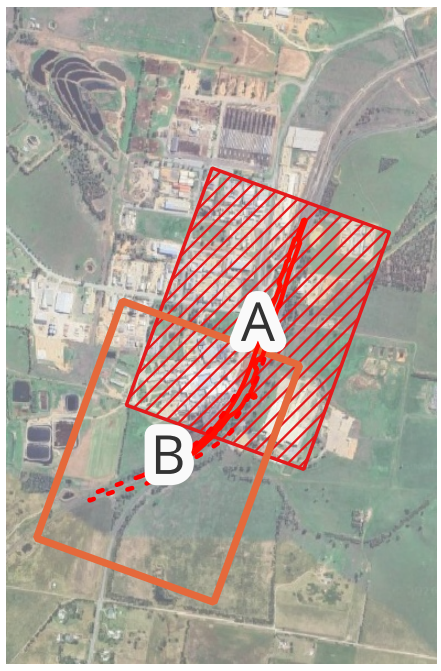
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 05A: PMF Peak Flood Level - Existing Condition

Map by: TT

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

MARTINUS

aurecon BG&E

Legend

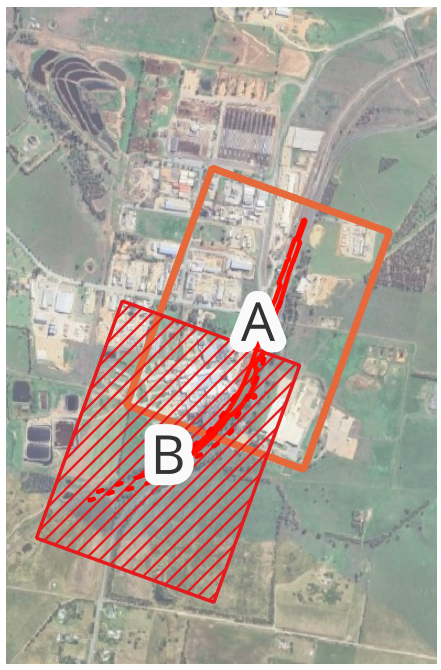
Project Boundary

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

- 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

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

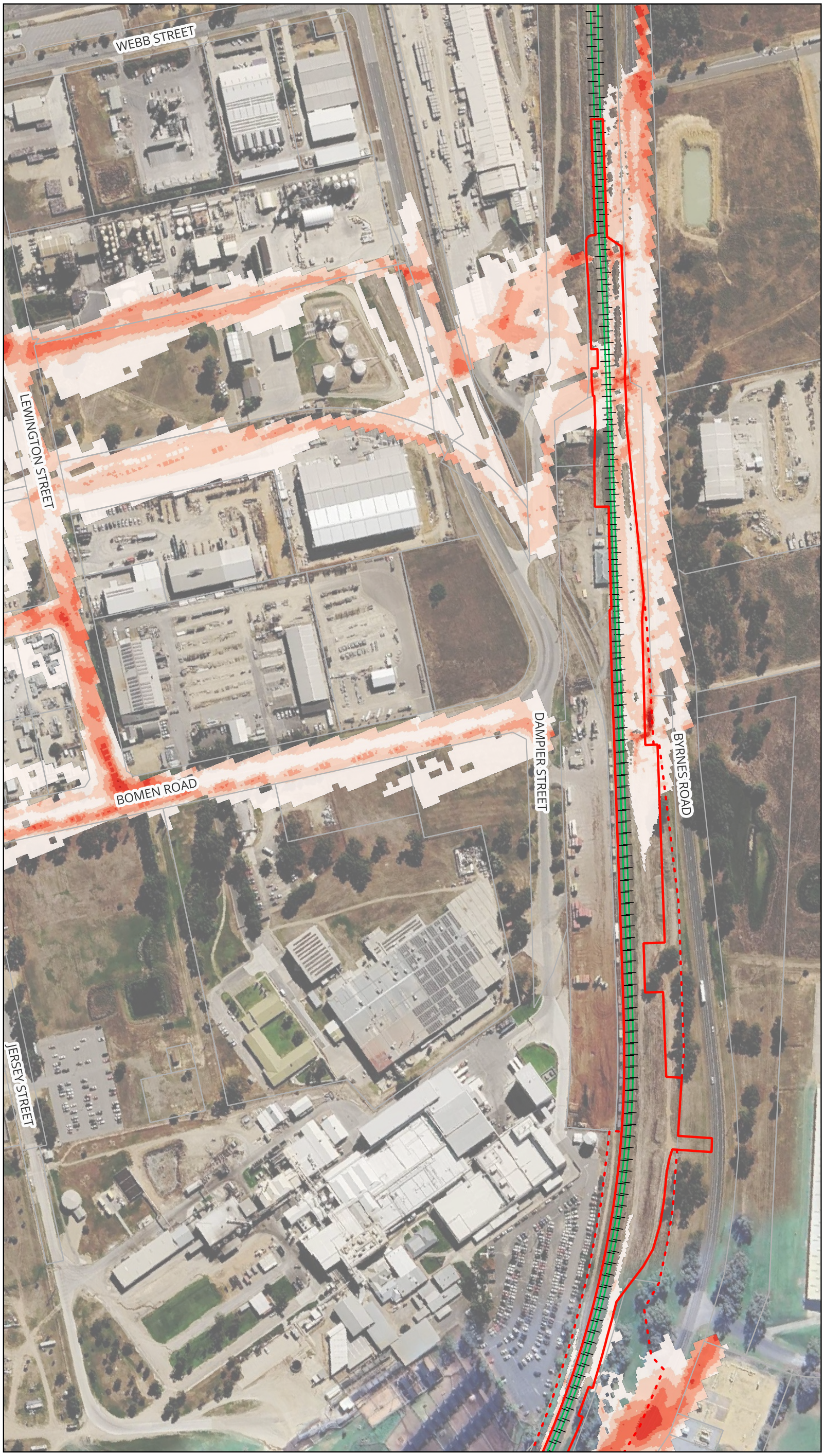
0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 05B: PMF Peak Flood Level - Existing Condition



MARTINUS

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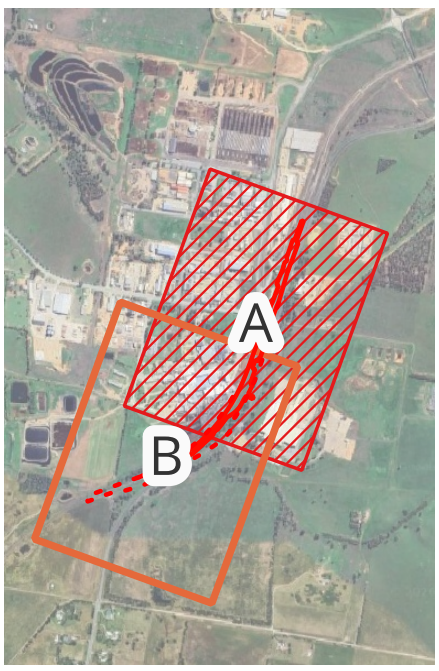
Legend

Project Boundary

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

Peak Flood Velocity (m/s)

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



Notes:

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Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 06A: 5% AEP Peak Flood Velocity - Existing Condition

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

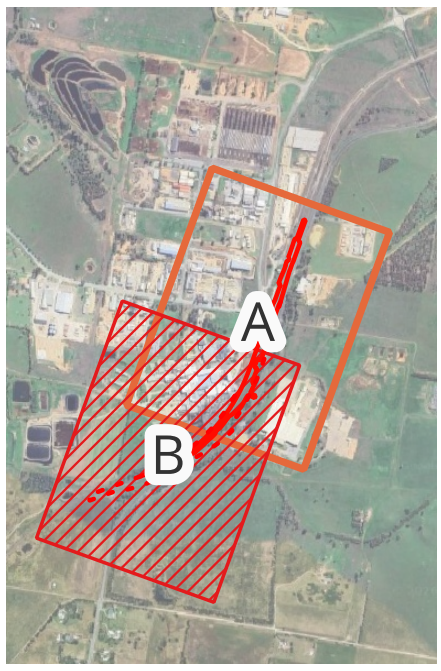
Legend

Project Boundary

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

Peak Flood Velocity (m/s)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 06B: 5% AEP Peak Flood Velocity - Existing Condition

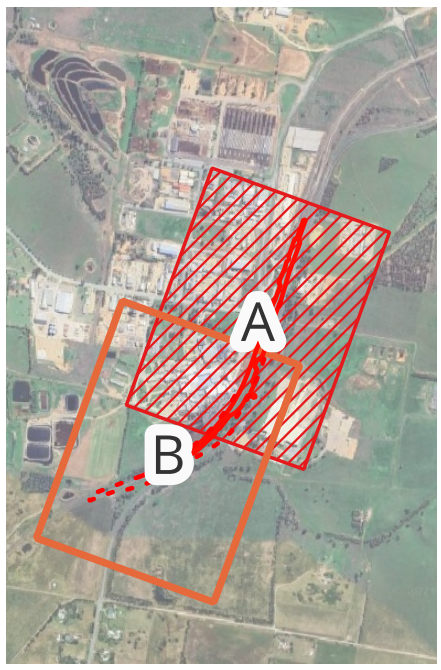
WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

MARTINUS
aurecon BG&E

Legend

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

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

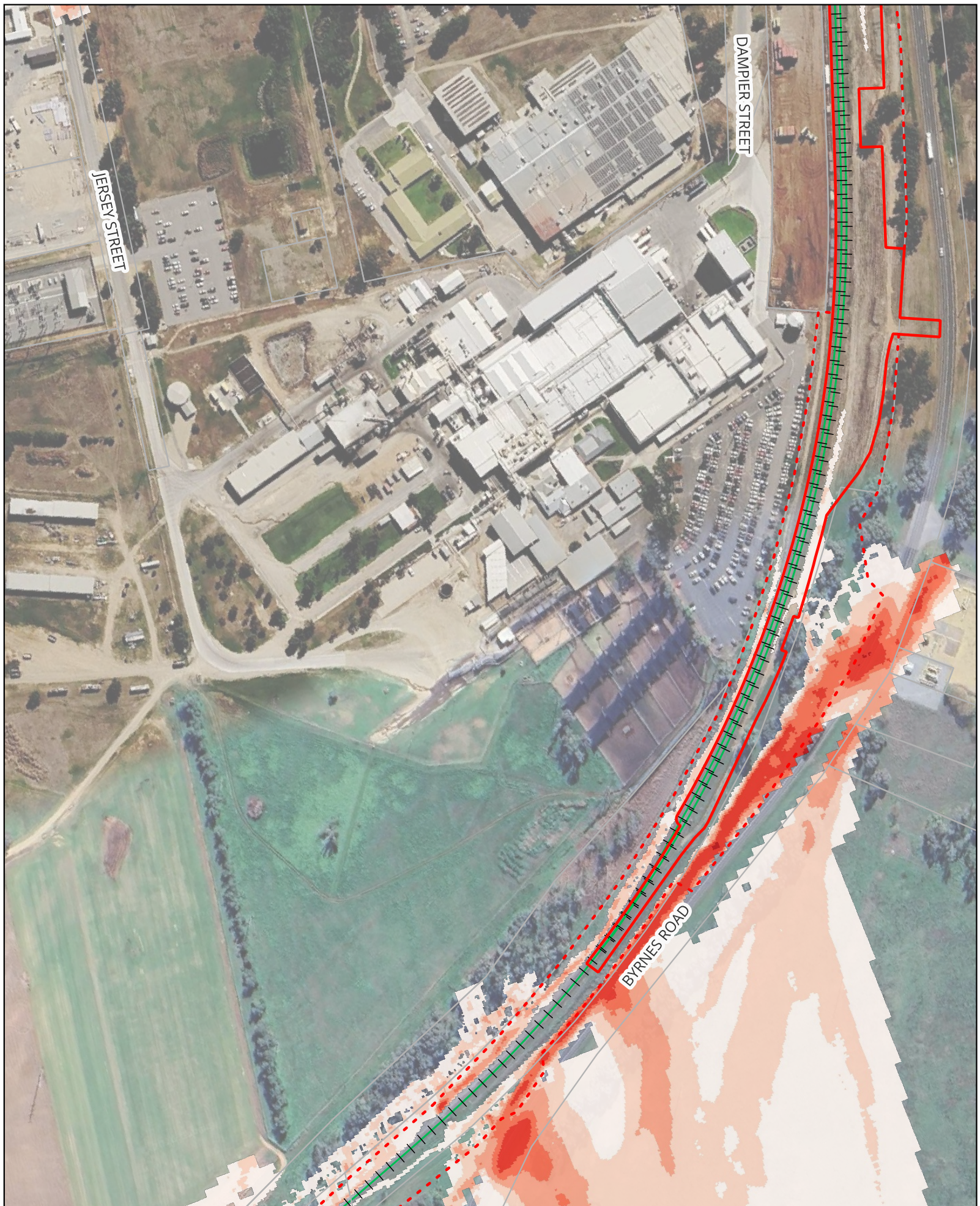
0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 07A: 2% AEP Peak Flood Velocity - Existing Condition



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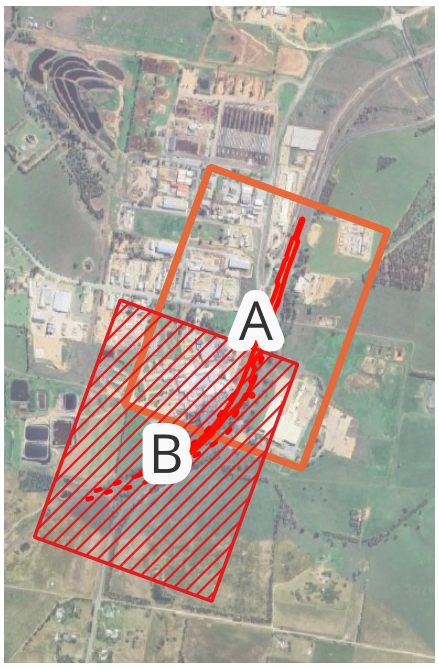
Legend

Project Boundary

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

Peak Flood Velocity (m/s)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 07B: 2% AEP Peak Flood Velocity - Existing Condition

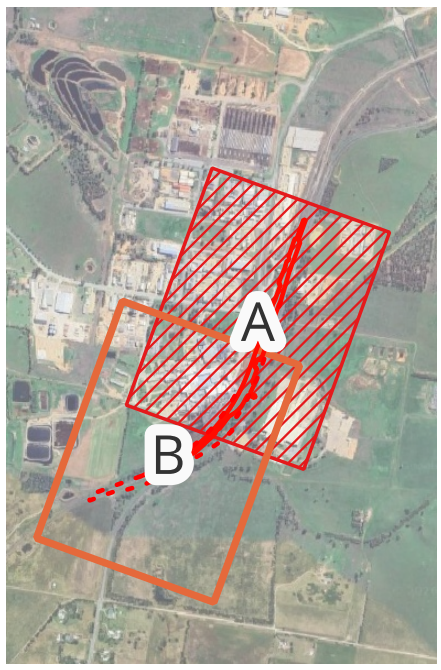
WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

MARTINUS
aurecon BG&E

Legend

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

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

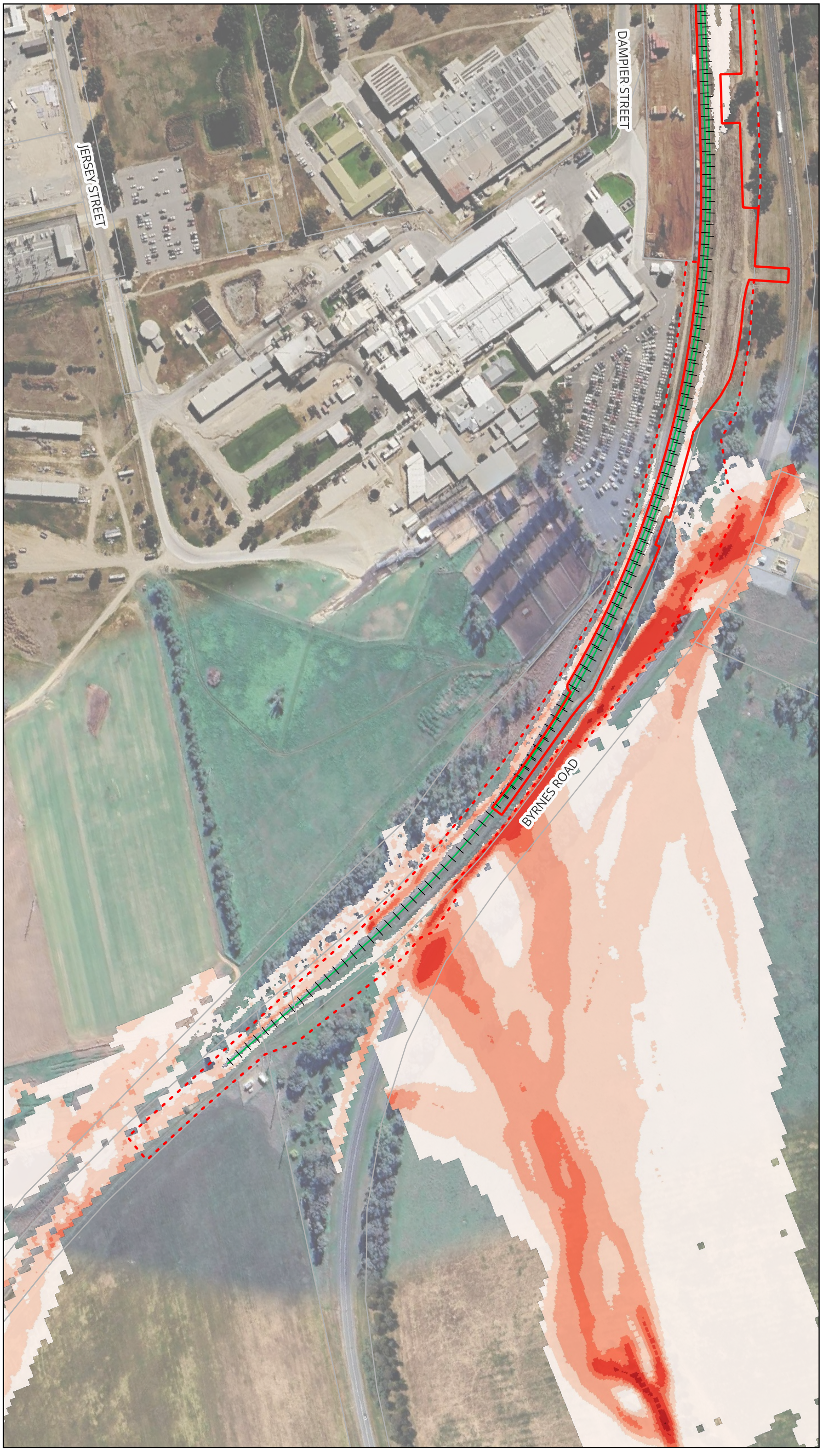
27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 08A: 1% AEP Peak Flood Velocity - Existing Condition

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT



MARTINUS

aurecon BG&E

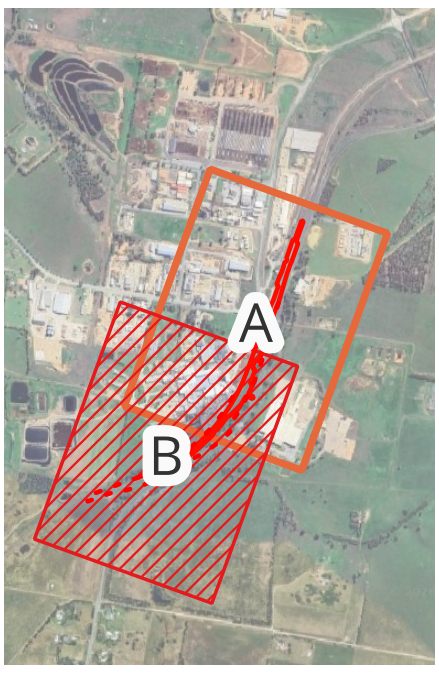
Legend

Project Boundary

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

Peak Flood Velocity (m/s)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 08B: 1% AEP Peak Flood Velocity - Existing Condition

WEBB STREET

LEWINGTON STREET

BOMEN ROAD

DAMPIER STREET

BYRNES ROAD

JERSEY STREET

MARTINUS

aurecon BG&E

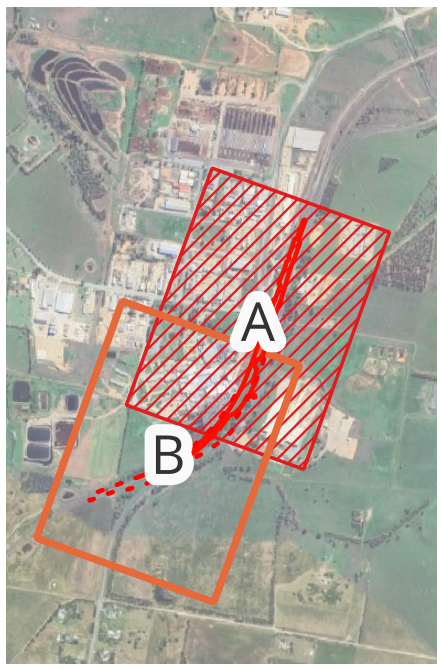
Legend

Project Boundary

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

Peak Flood Velocity (m/s)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

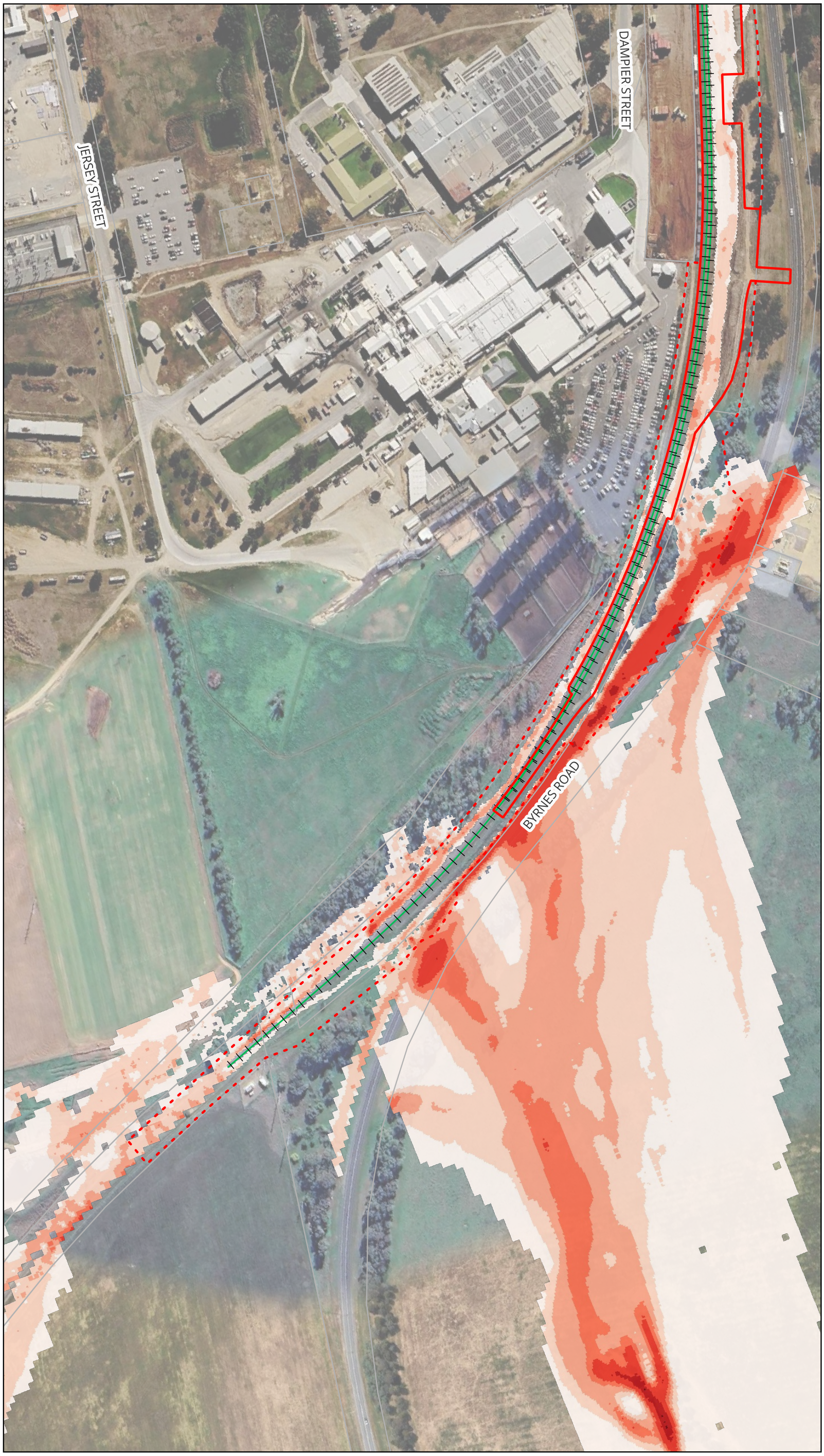
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A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 09A: 1% AEP with Climate Change Peak Flood Velocity - Existing Condition



MARTINUS

aurecon BG&E

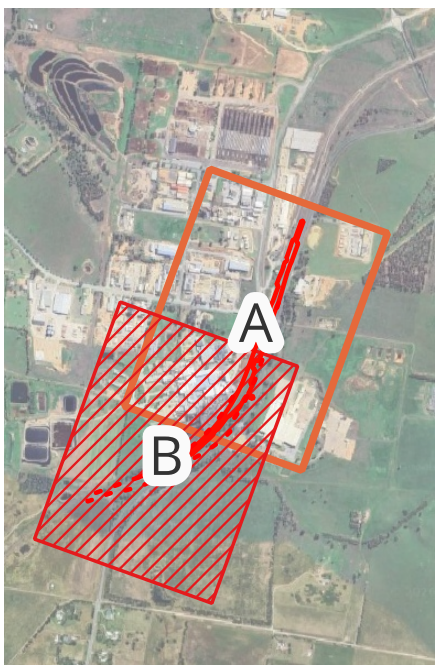
Legend

Project Boundary

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

Peak Flood Velocity (m/s)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 09B: 1% AEP with Climate Change Peak Flood Velocity - Existing Condition

MARTINUS

aurecon BG&E

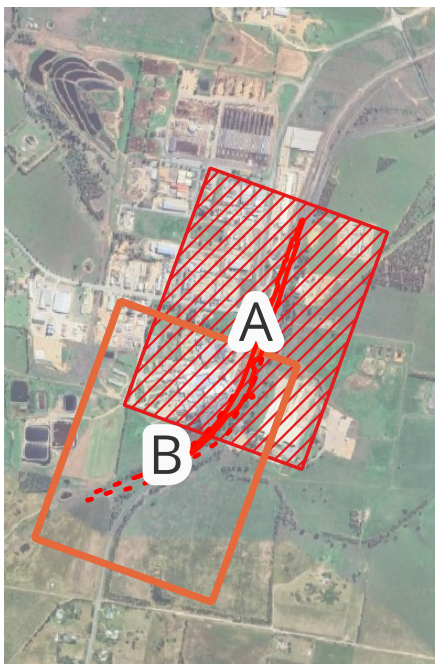
Legend

Project Boundary

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

Peak Flood Velocity (m/s)

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



Notes:

WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 10A: PMF Peak Flood Velocity - Existing Condition

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

MARTINUS

aurecon BG&E

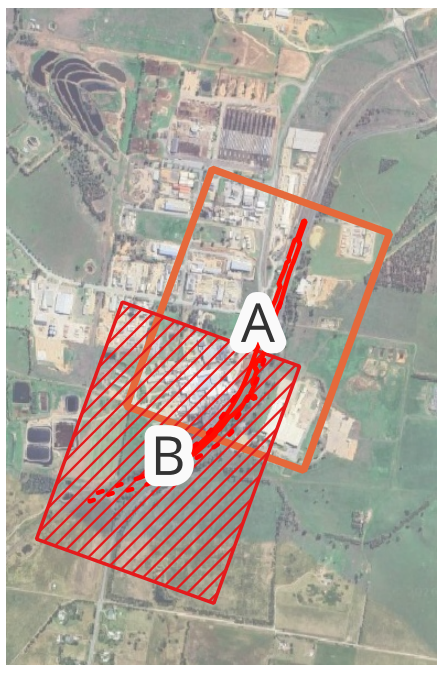
Legend

Project Boundary

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

Peak Flood Velocity (m/s)

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



Notes:

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Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 10B: PMF Peak Flood Velocity - Existing Condition

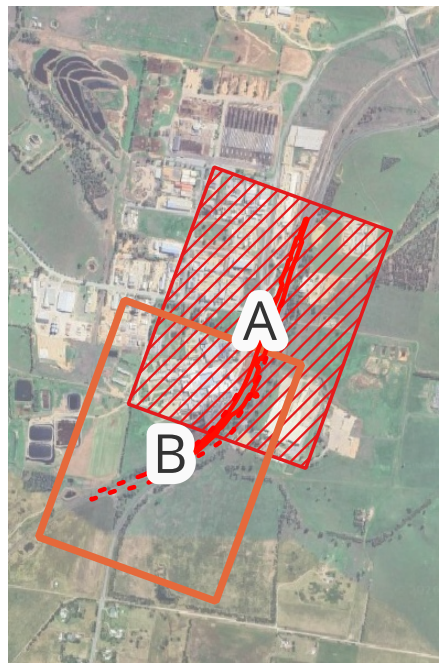
WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

MARTINUS
aurecon BG&E

Legend

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

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 11A: 5% AEP Hazard - Existing Condition

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

MARTINUS

aurecon BG&E

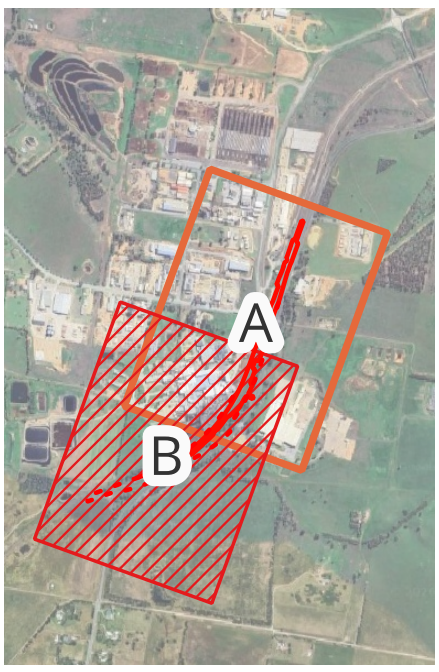
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

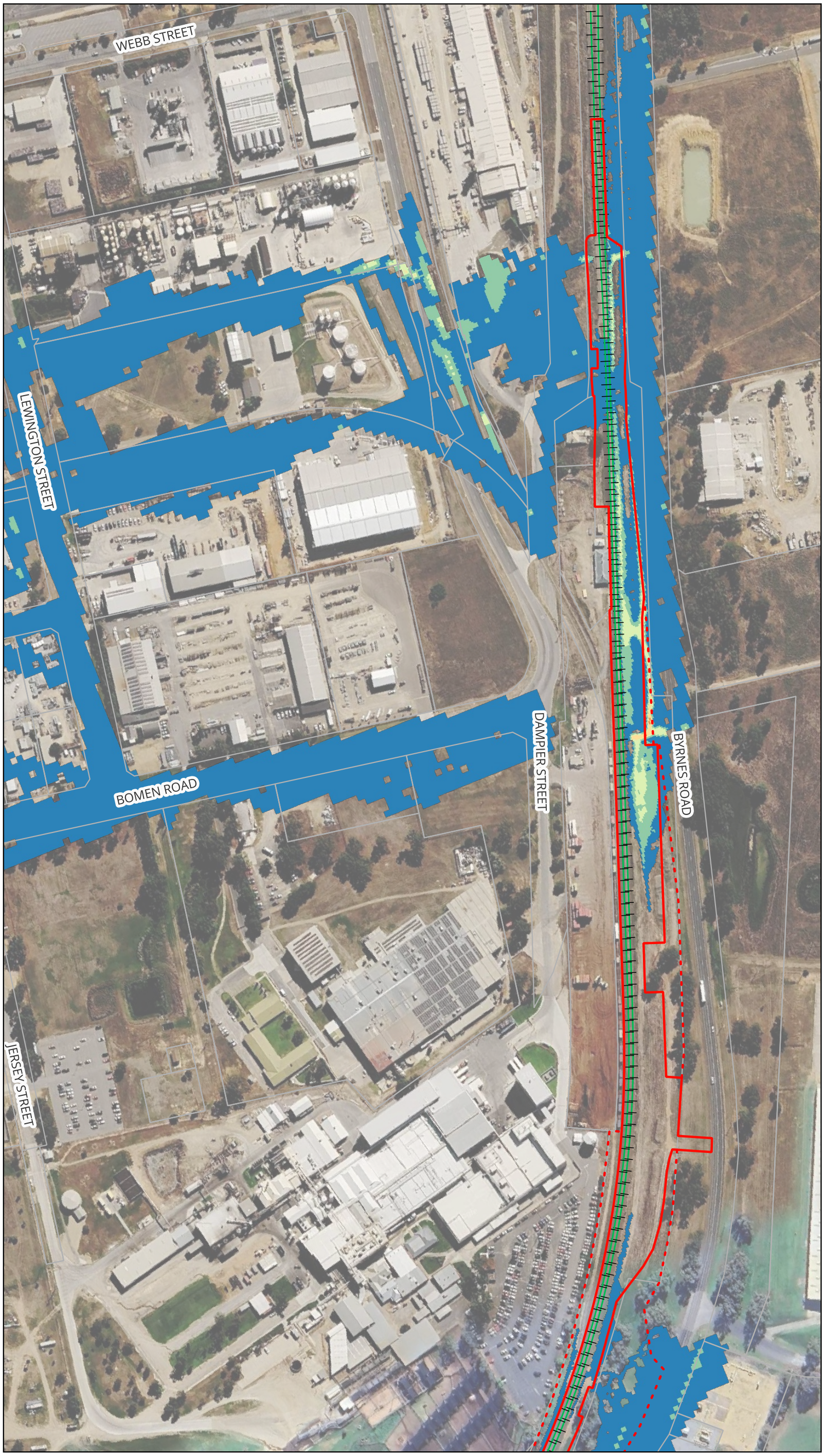
27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 11B: 5% AEP Hazard - Existing Condition

Map by: TT

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs



MARTINUS

aurecon BG&E

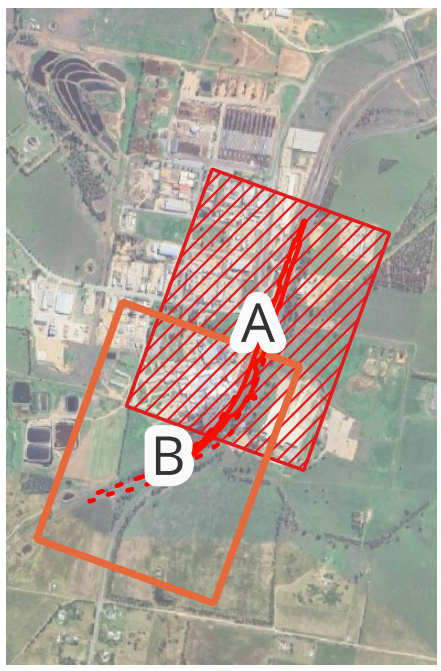
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

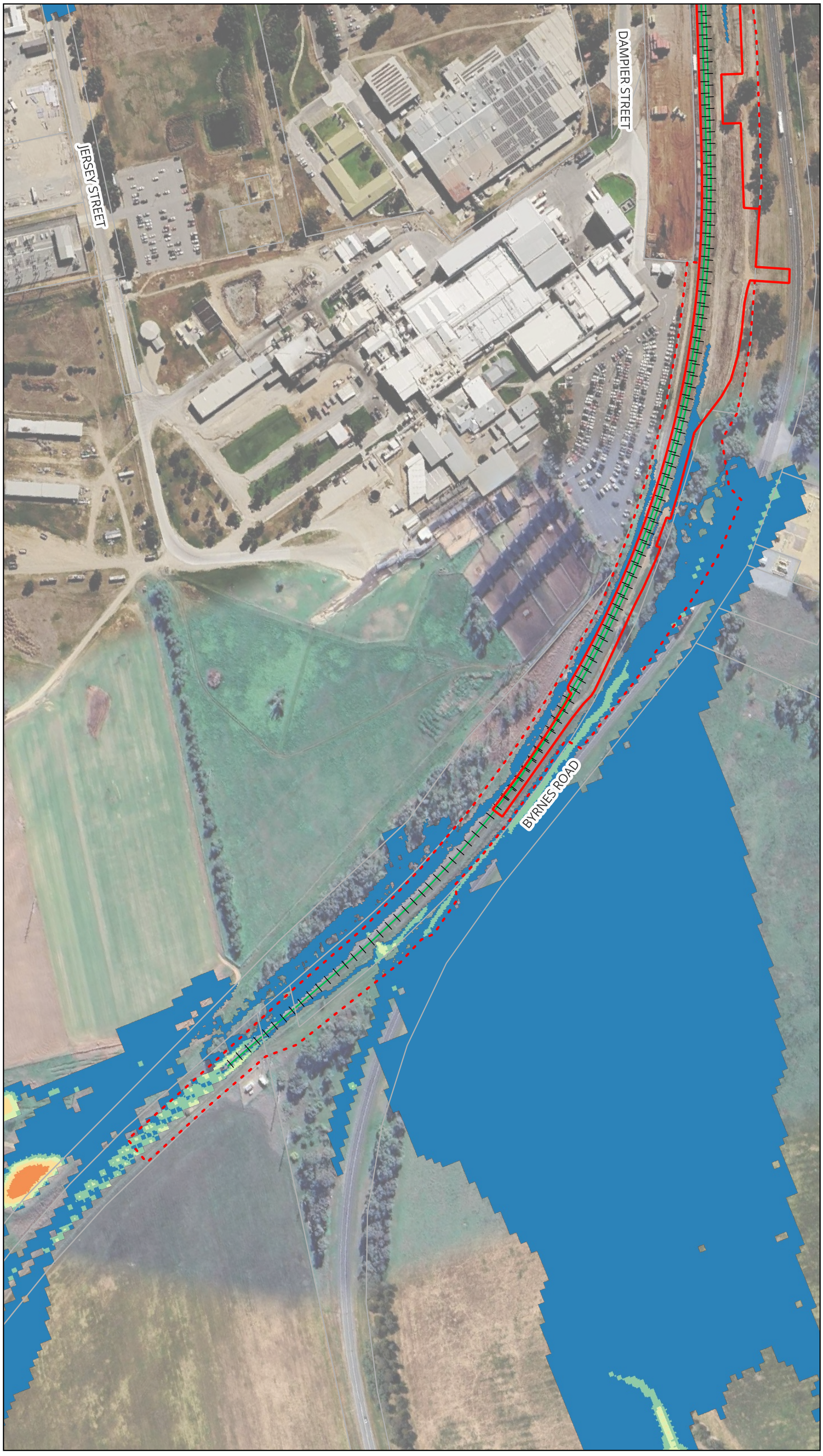
0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 12A: 2% AEP Hazard - Existing Condition



MARTINUS

aurecon BG&E

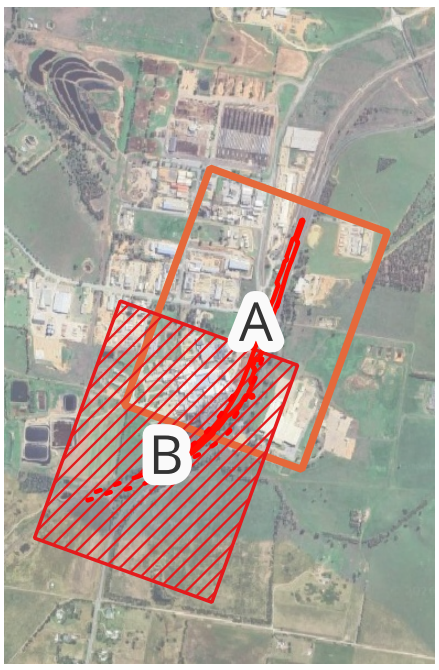
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

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Map by: TT

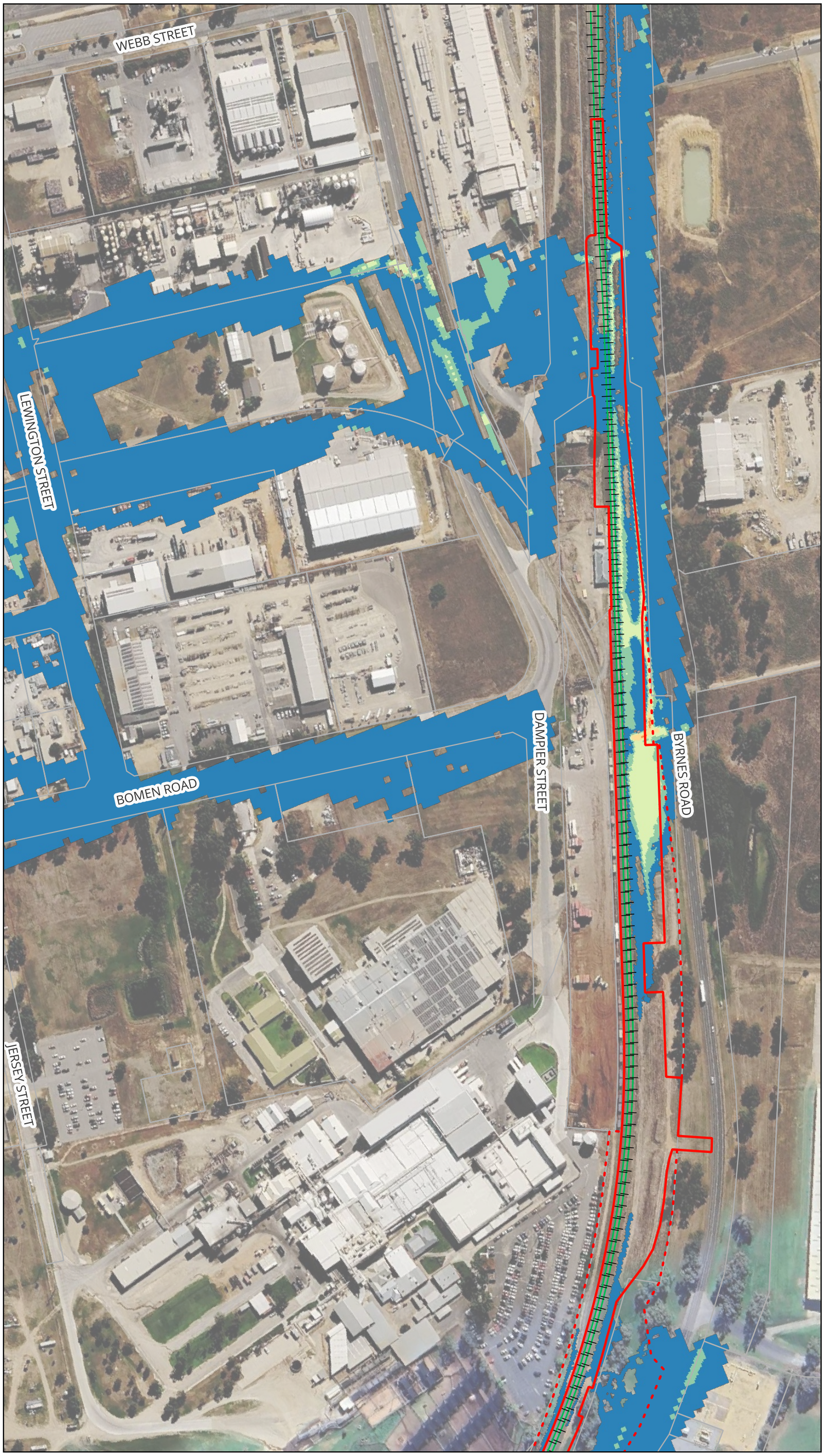
0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 12B: 2% AEP Hazard - Existing Condition



MARTINUS

aurecon BG&E

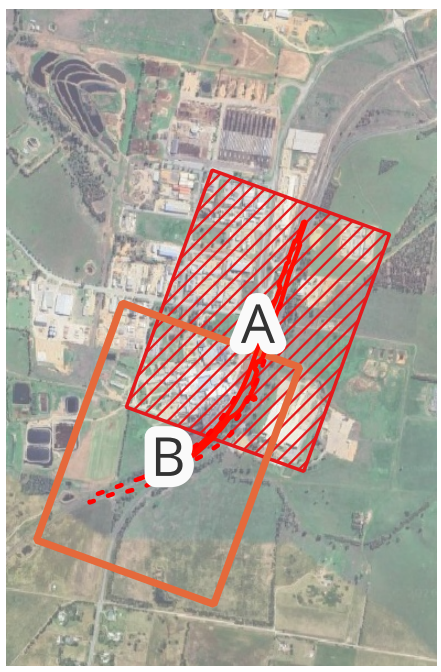
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

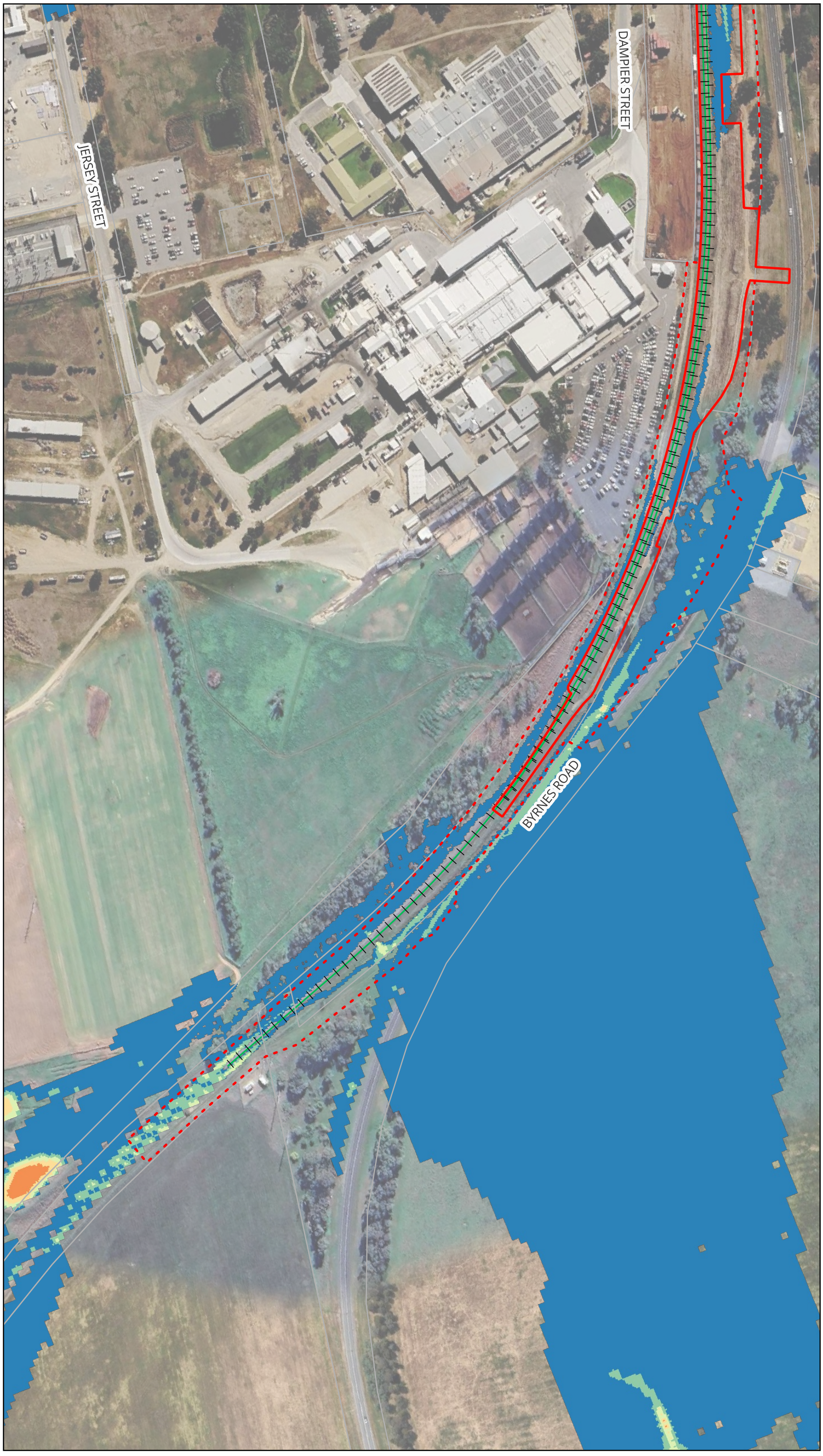
27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 13A: 1% AEP Hazard - Existing Condition

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT



MARTINUS

aurecon BG&E

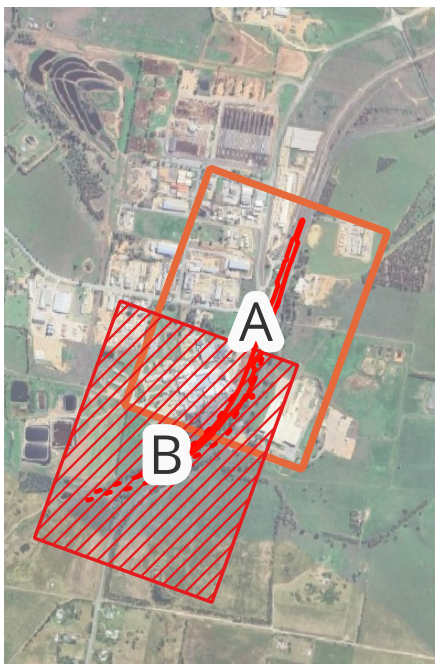
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

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Map by: TT

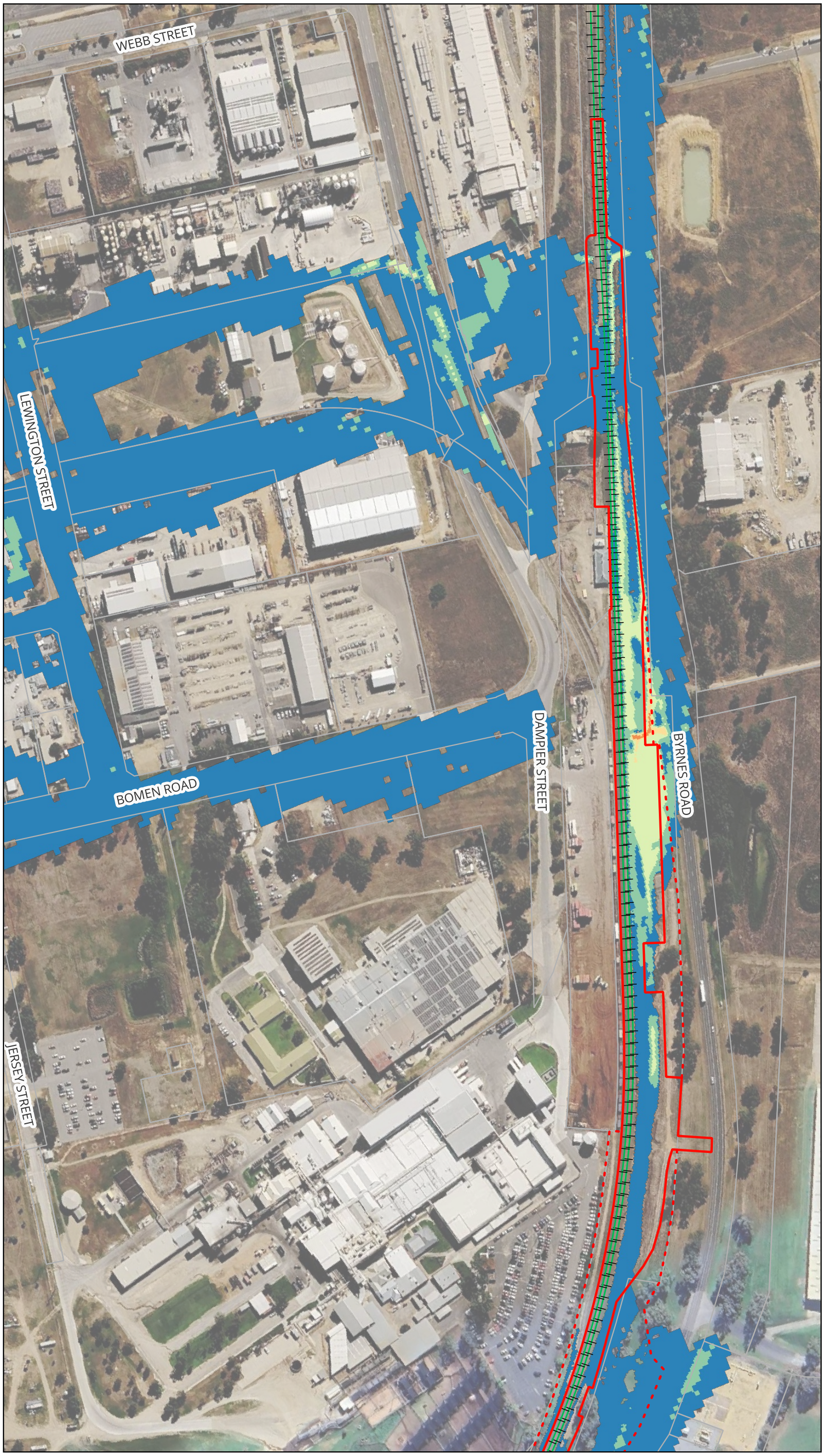
0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 13B: 1% AEP Hazard - Existing Condition



MARTINUS

aurecon BG&E

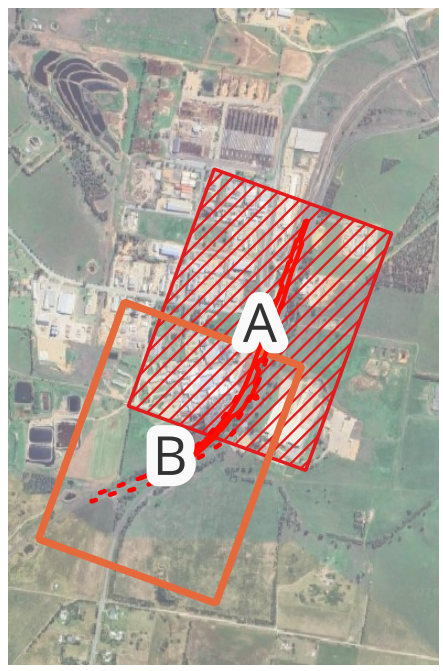
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

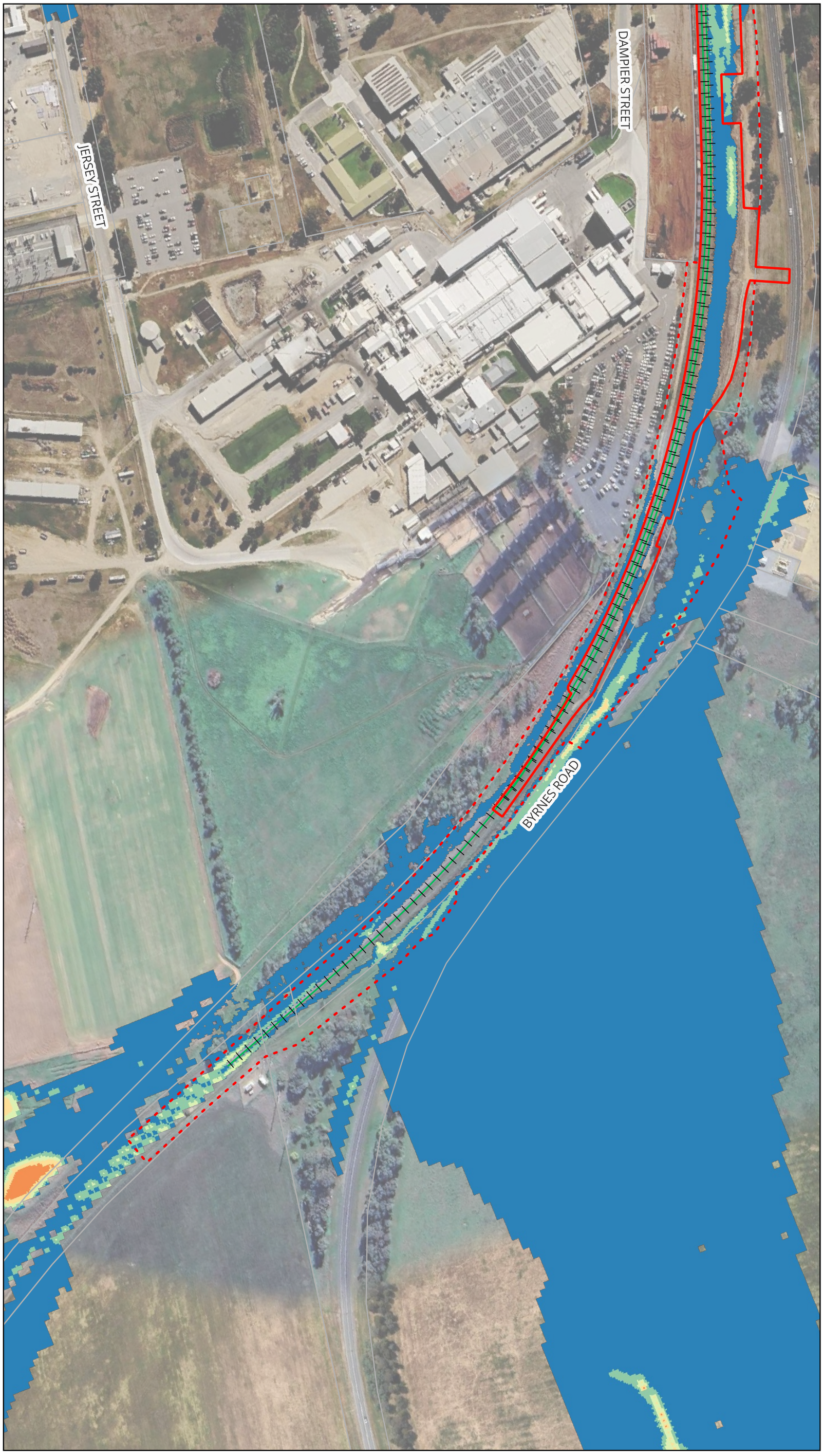
27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 14A: 1% AEP with Climate Change Hazard - Existing Condition

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT



MARTINUS
aurecon BG&E

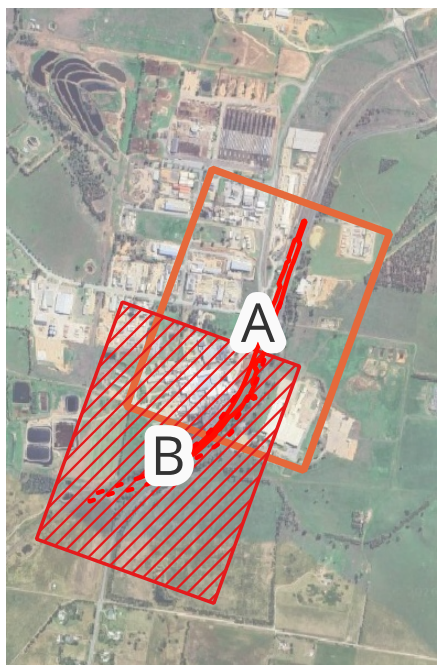
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 14B: 1% AEP with Climate Change Hazard - Existing Condition

WEBB STREET

LEWINGTON STREET

BOMEN ROAD

DAMPIER STREET

BYRNES ROAD

JERSEY STREET

MARTINUS

aurecon BG&E

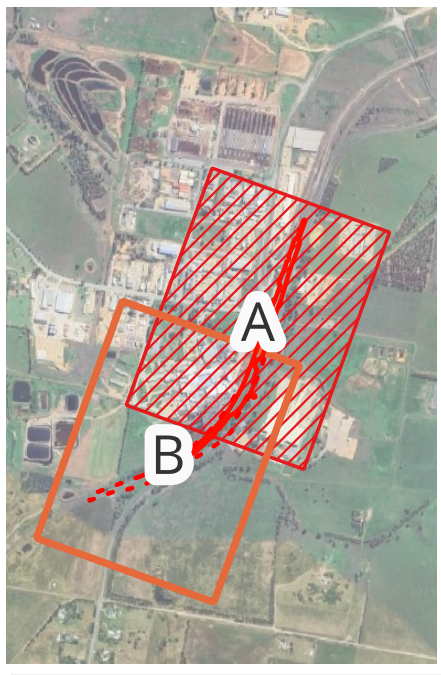
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

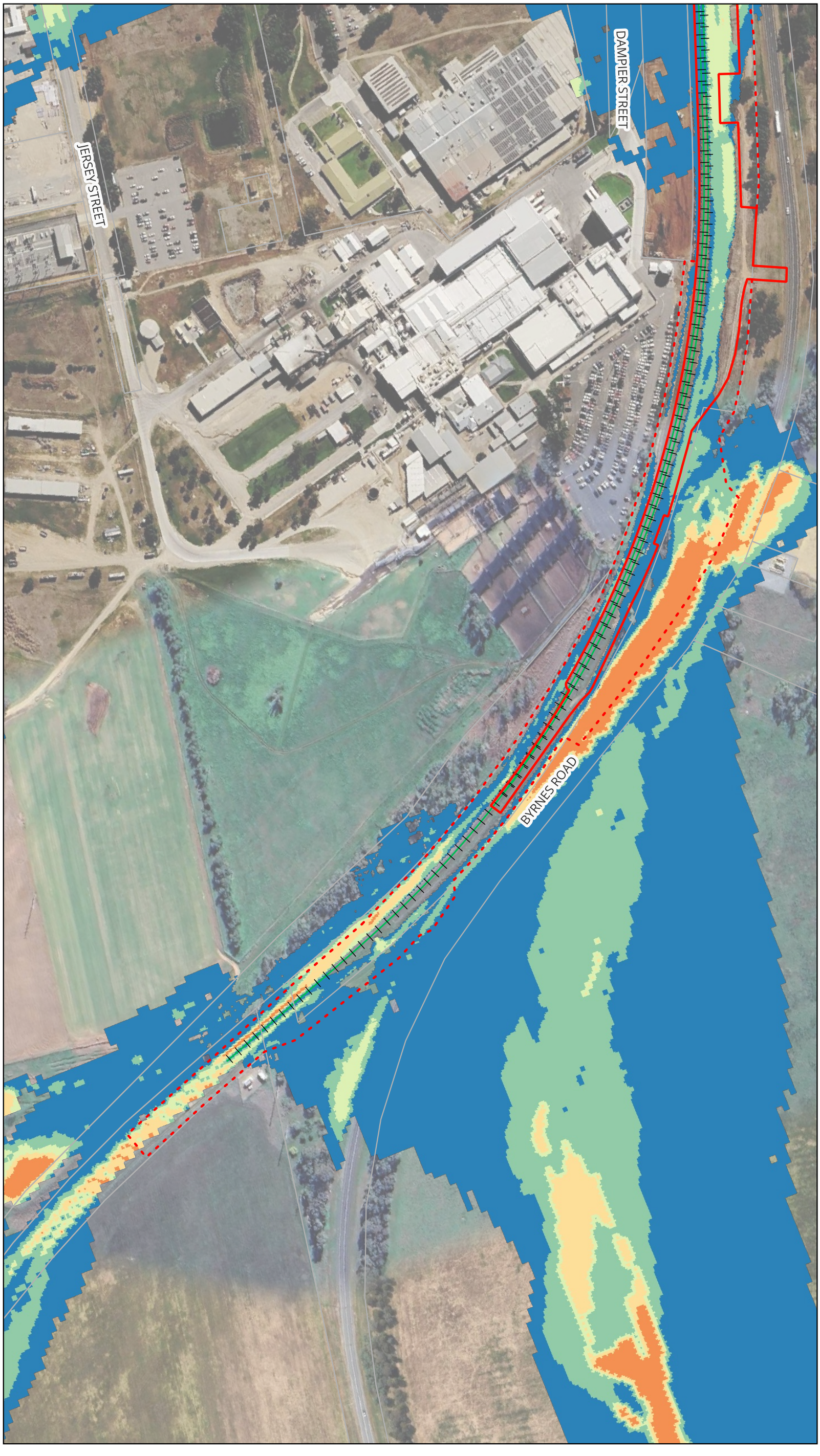
0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 15A: PMF Hazard - Existing Condition



MARTINUS

aurecon BG&E

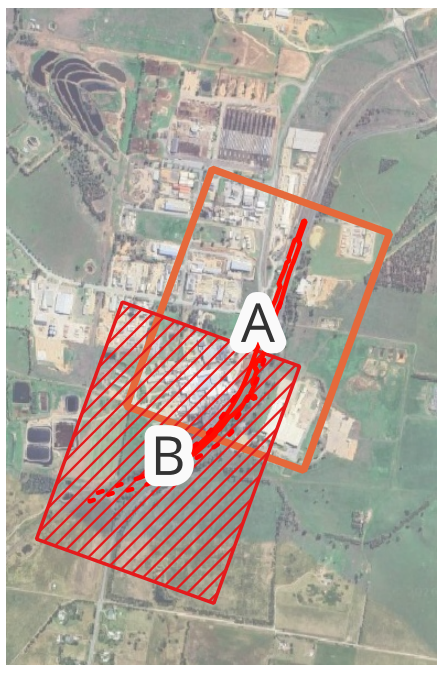
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 15B: PMF Hazard - Existing Condition

MARTINUS

aurecon BG&E

Legend

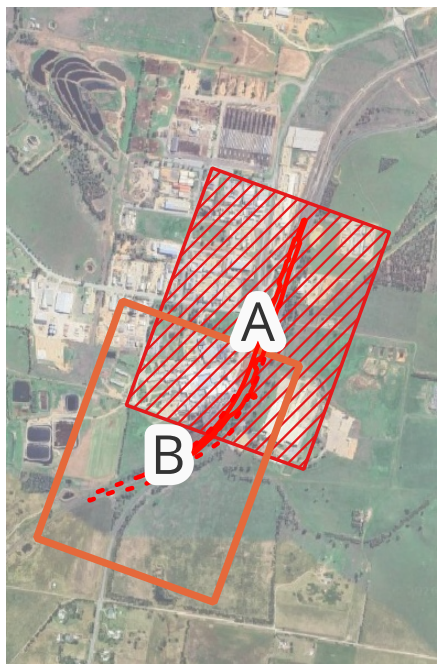
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 16A: 5% AEP Peak Flood Level - Design Condition

Map by: TT

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

MARTINUS

aurecon BG&E

Legend

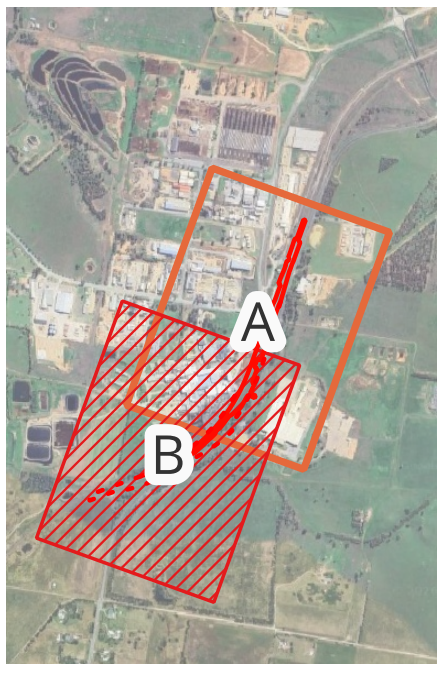
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 16B: 5% AEP Peak Flood Level - Design Condition

MARTINUS

aurecon BG&E

Legend

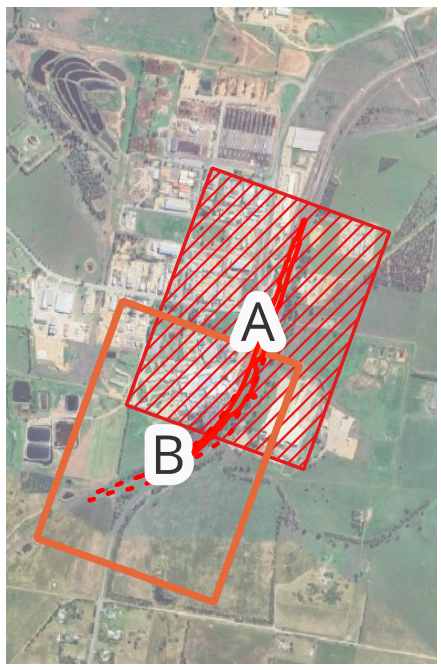
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 17A: 2% AEP Peak Flood Level - Design Condition

Map by: TT

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

MARTINUS

aurecon BG&E

Legend

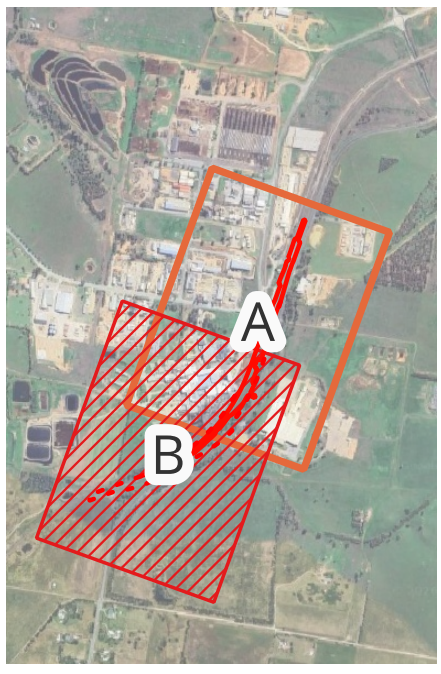
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 17B: 2% AEP Peak Flood Level - Design Condition

Map by: TT

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

MARTINUS

aurecon BG&E

Legend

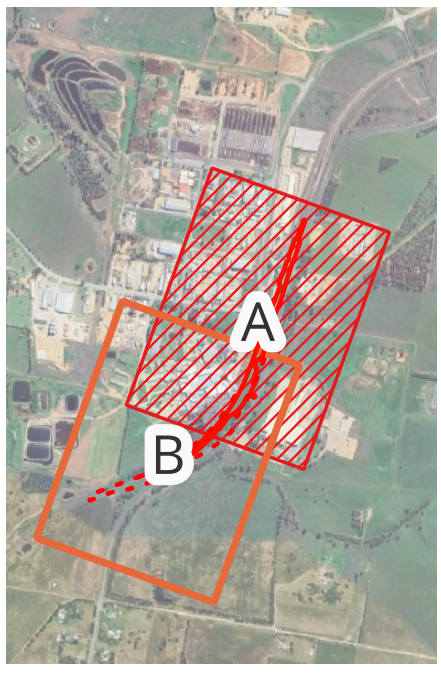
Project Boundary

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

- 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

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 18A: 1% AEP Peak Flood Level - Design Condition

MARTINUS

aurecon BG&E

Legend

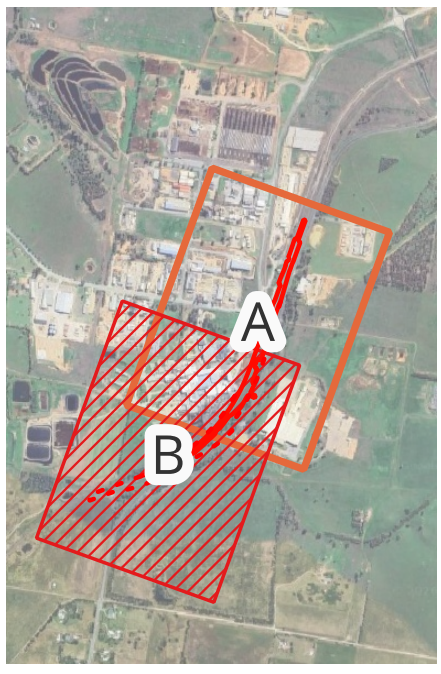
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 18B: 1% AEP Peak Flood Level - Design Condition

Map by: TT

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

MARTINUS

aurecon BG&E

Legend

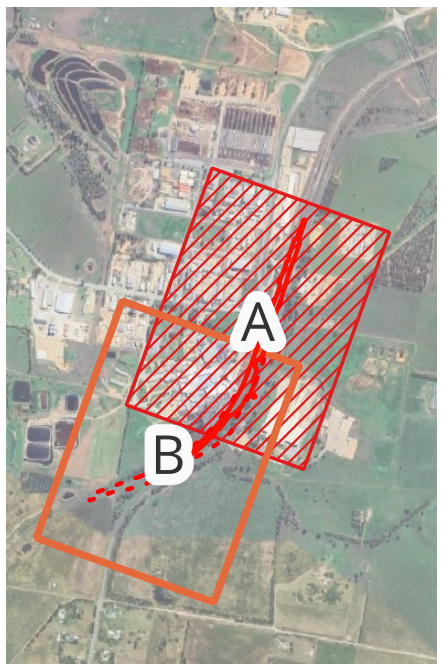
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 19A: 1% AEP with Climate Change Peak Flood Level - Design Condition

Map by: TT

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

MARTINUS

aurecon BG&E

Legend

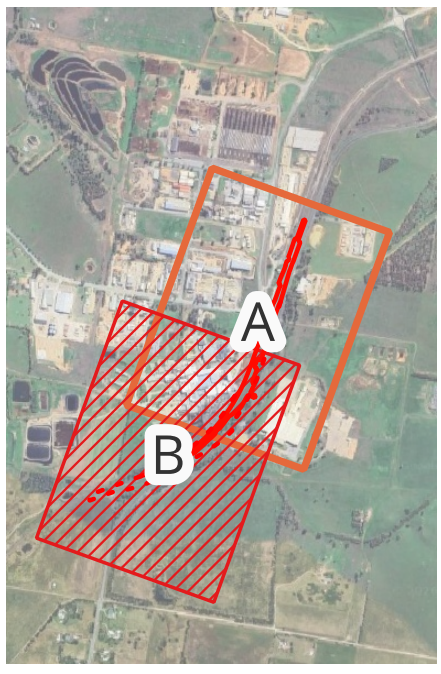
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 19B: 1% AEP with Climate Change Peak Flood Level - Design Condition

MARTINUS

aurecon BG&E

Legend

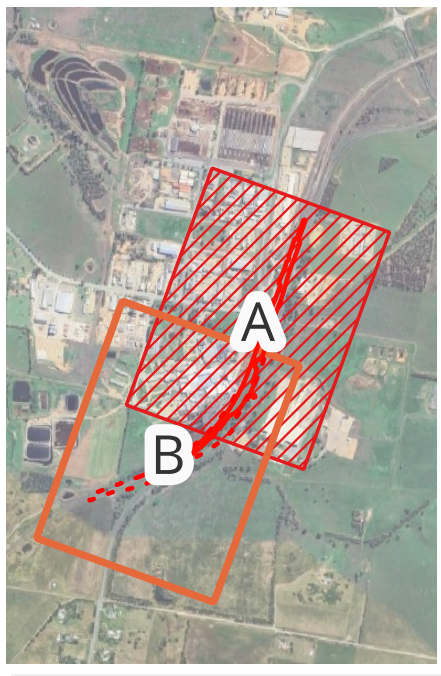
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 20A: PMF Peak Flood Level - Design Condition

MARTINUS

aurecon BG&E

Legend

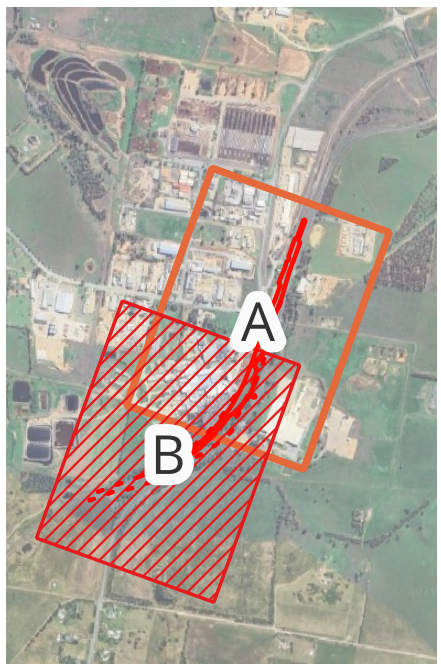
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 20B: PMF Peak Flood Level - Design Condition

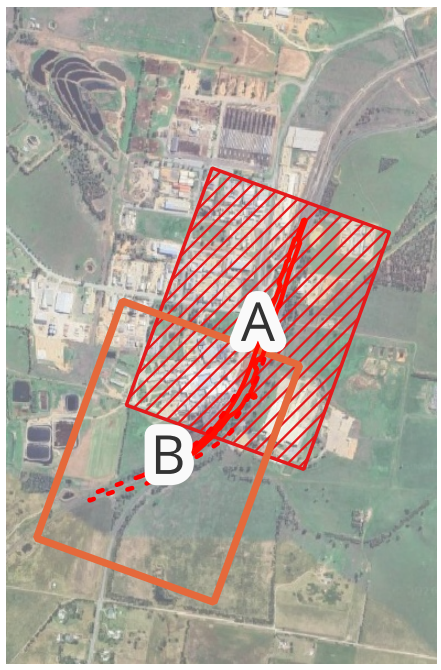
WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

MARTINUS
aurecon BG&E

Legend

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

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 21A: 5% AEP Peak Flood Velocity - Design Condition

MARTINUS

aurecon BG&E

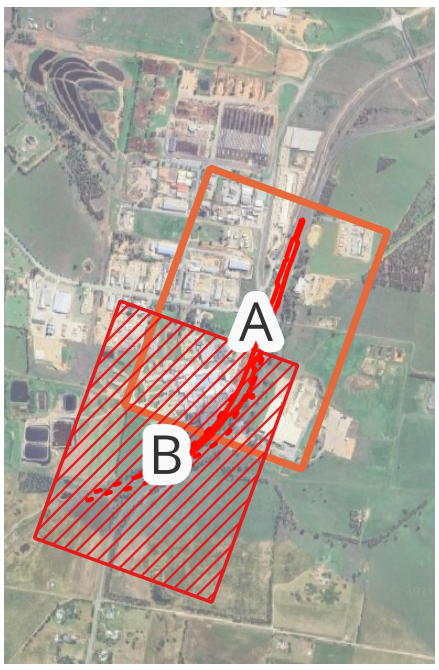
Legend

Project Boundary

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

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:

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 21B: 5% AEP Peak Flood Velocity - Design Condition

WEBB STREET

LEWINGTON STREET

BOMEN ROAD

DAMPIER STREET

BYRNES ROAD

JERSEY STREET

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

MARTINUS

aurecon BG&E

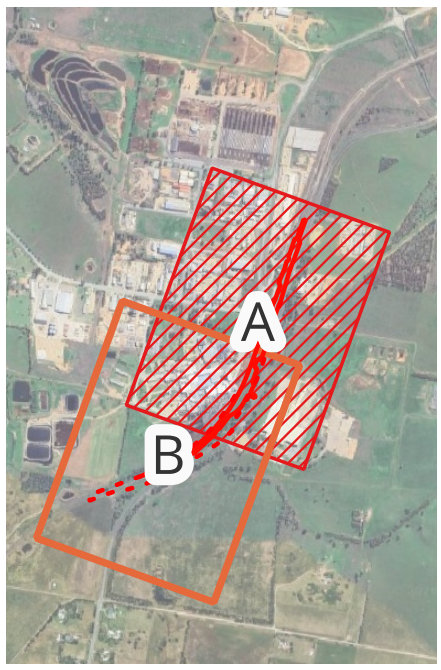
Legend

Project Boundary

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

Peak Flood Velocity (m/s)

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



Notes:

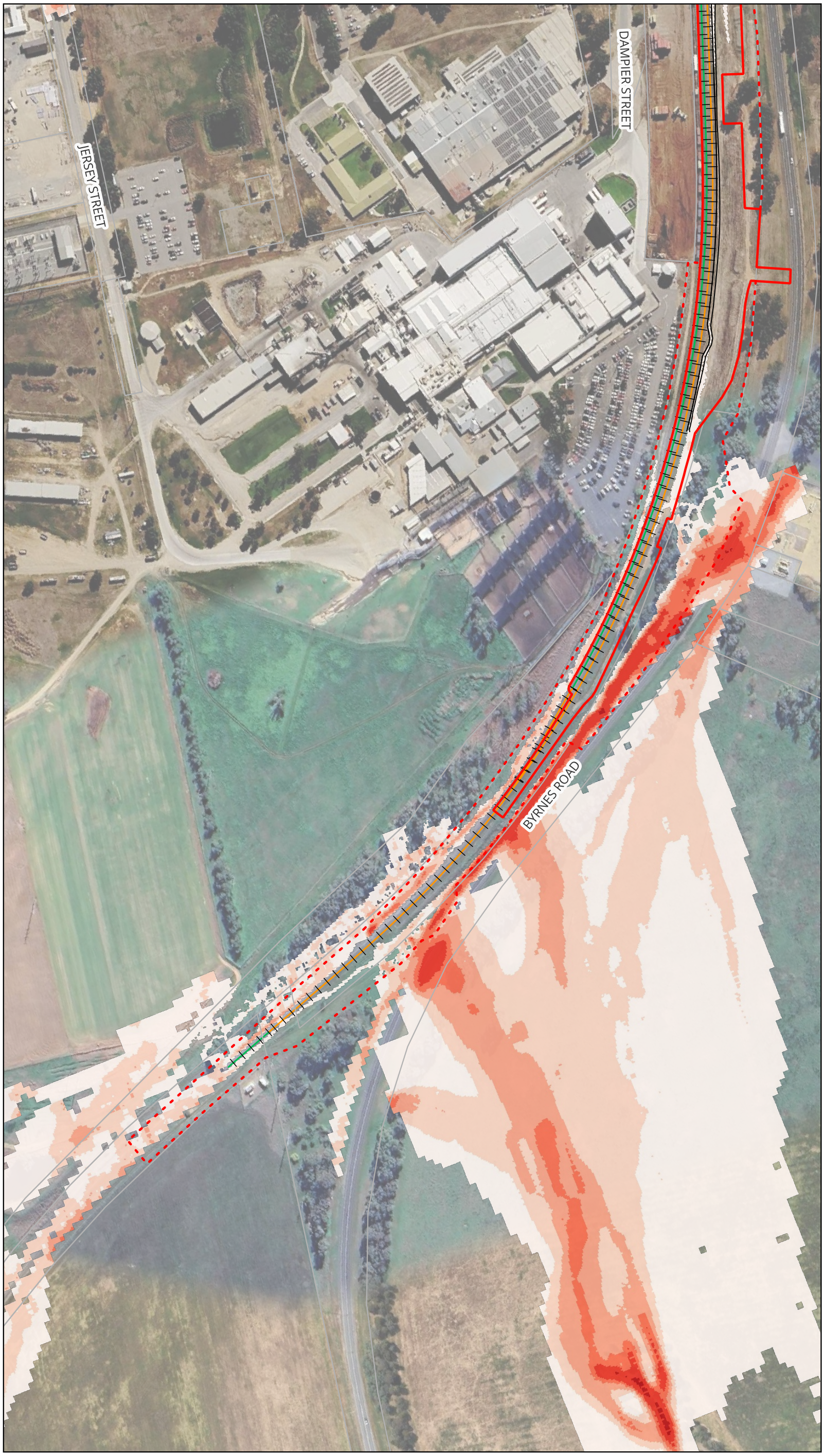
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A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 22A: 2% AEP Peak Flood Velocity - Design Condition



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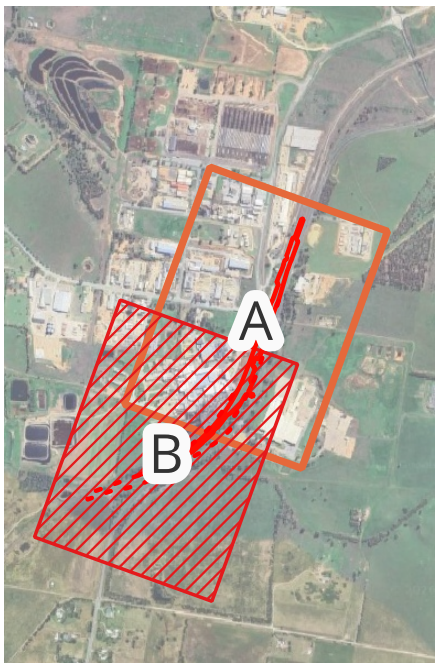
Legend

Project Boundary

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

Peak Flood Velocity (m/s)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 22B: 2% AEP Peak Flood Velocity - Design Condition

WEBB STREET

LEWINGTON STREET

BOMEN ROAD

DAMPIER STREET

BYRNES ROAD

JERSEY STREET

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

MARTINUS

aurecon BG&E

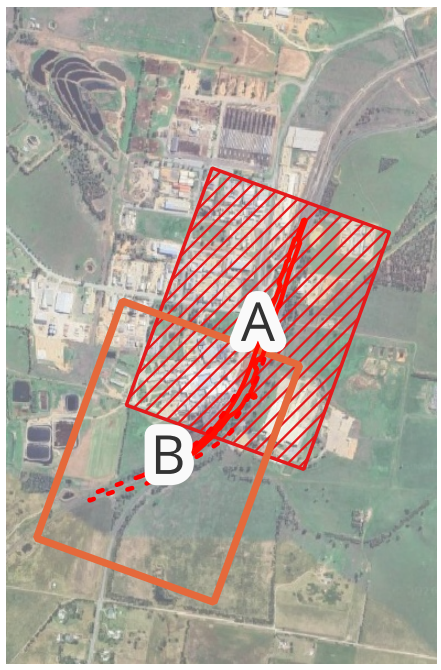
Legend

Project Boundary

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

Peak Flood Velocity (m/s)

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



Notes:

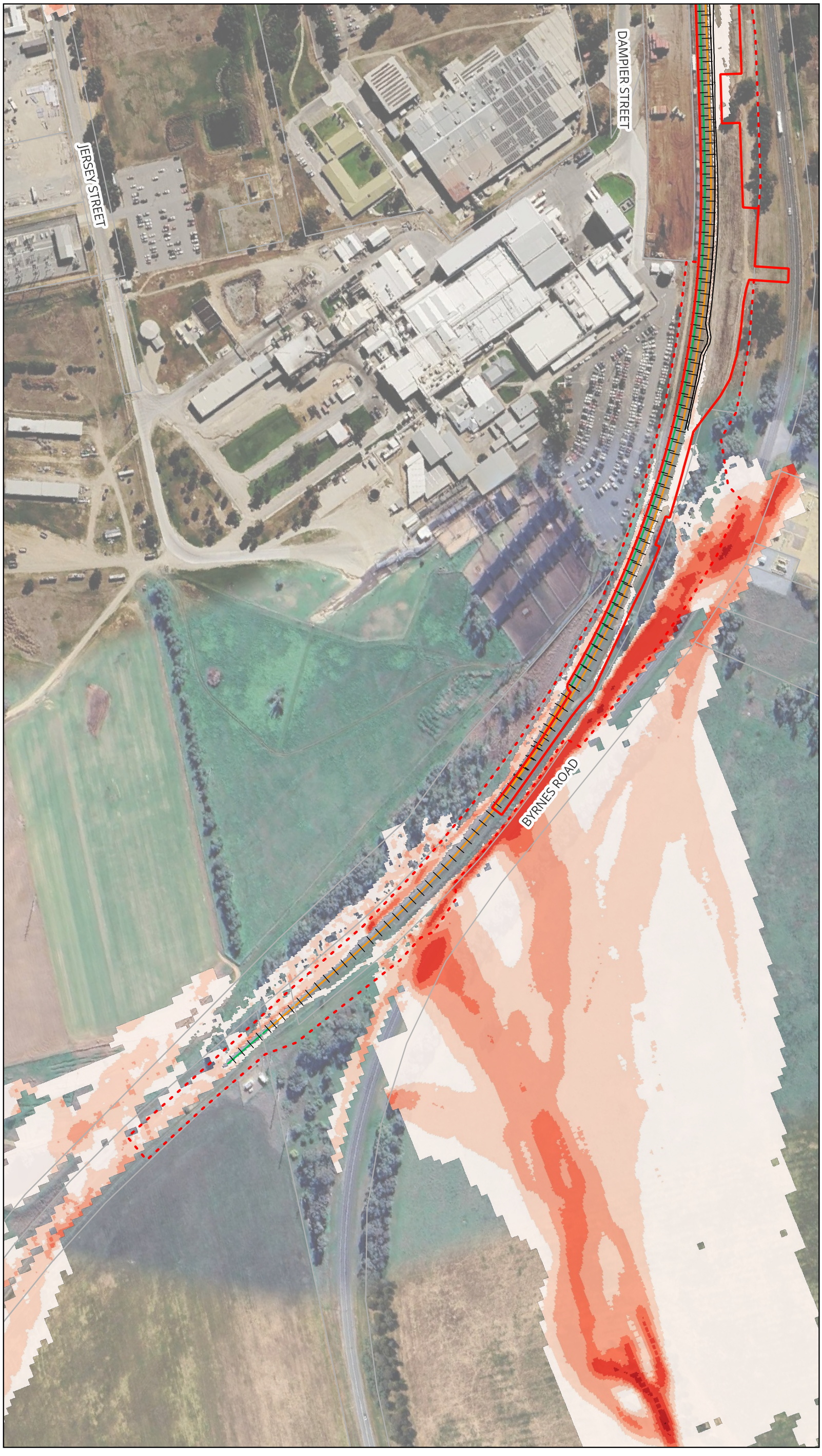
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A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 23A: 1% AEP Peak Flood Velocity - Design Condition

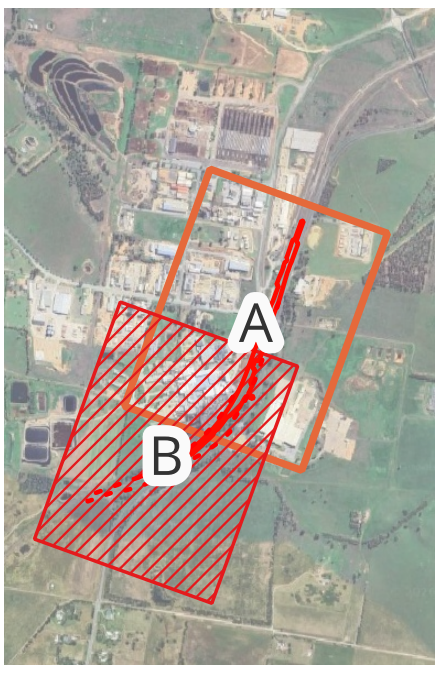


MARTINUS
aurecon BG&E

Legend

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

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 23B: 1% AEP Peak Flood Velocity - Design Condition

WEBB STREET

LEWINGTON STREET

BOMEN ROAD

DAMPIER STREET

BYRNES ROAD

JERSEY STREET

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

MARTINUS

aurecon BG&E

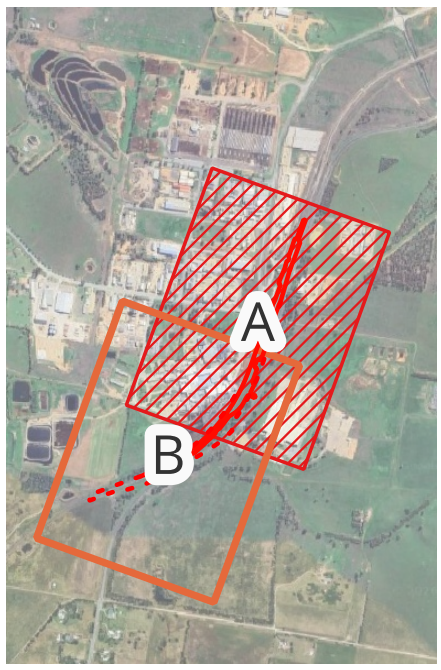
Legend

Project Boundary

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

Peak Flood Velocity (m/s)

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



Notes:

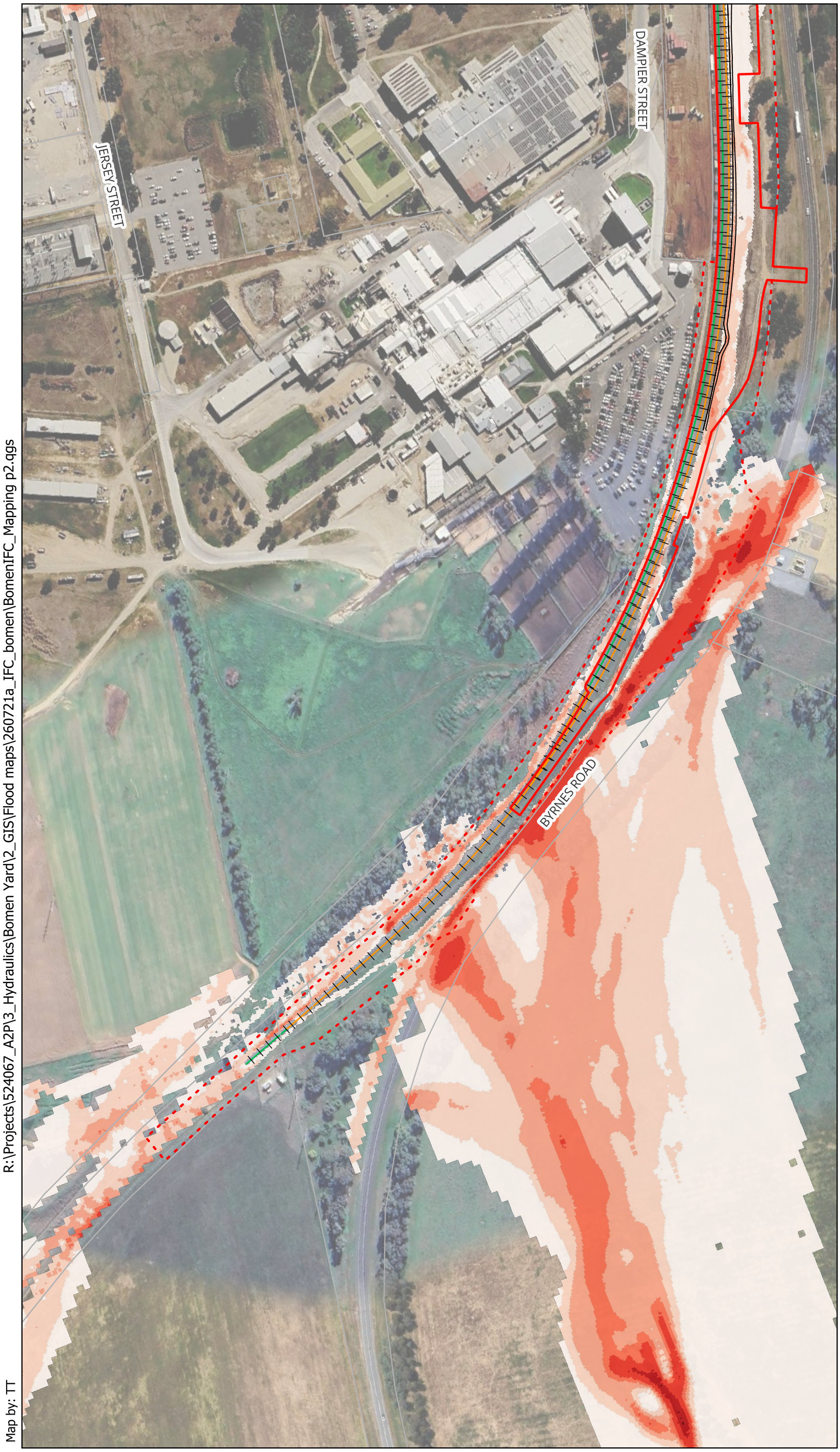
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A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 24A: 1% AEP with Climate Change Peak Flood Velocity - Design Condition



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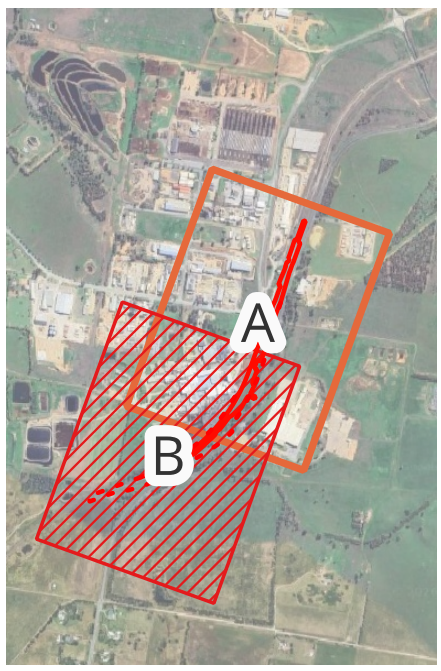
Legend

Project Boundary

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

Peak Flood Velocity (m/s)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 24B: 1% AEP with Climate Change Peak Flood Velocity - Design Condition

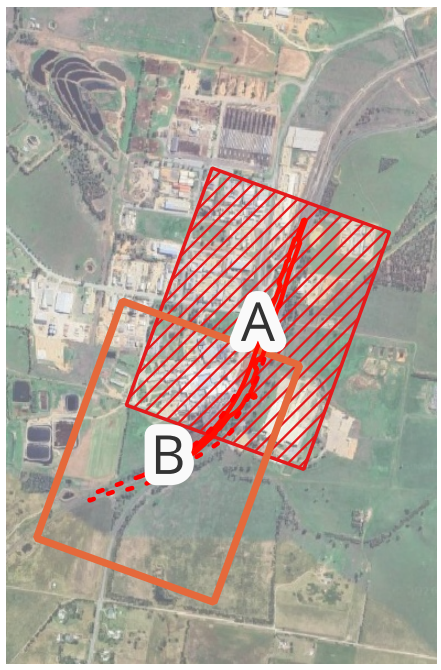
WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

MARTINUS
aurecon BG&E

Legend

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

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 25A: PMF Peak Flood Velocity - Design Condition

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

MARTINUS

aurecon BG&E

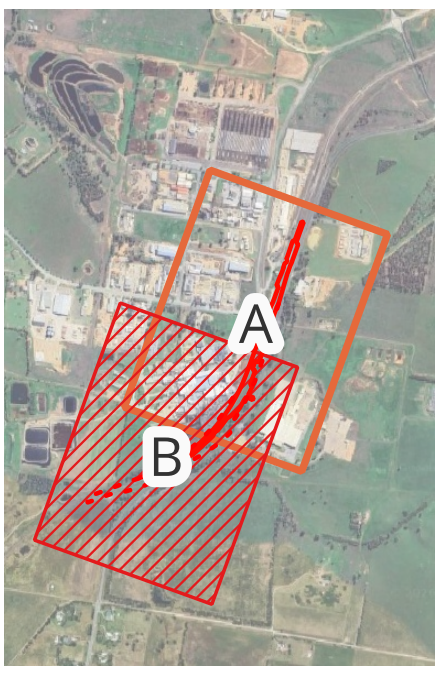
Legend

Project Boundary

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

Peak Flood Velocity (m/s)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 25B: PMF Peak Flood Velocity - Design Condition

WEBB STREET

LEWINGTON STREET

BOMEN ROAD

DAMPIER STREET

BYRNES ROAD

JERSEY STREET

MARTINUS

aurecon BG&E

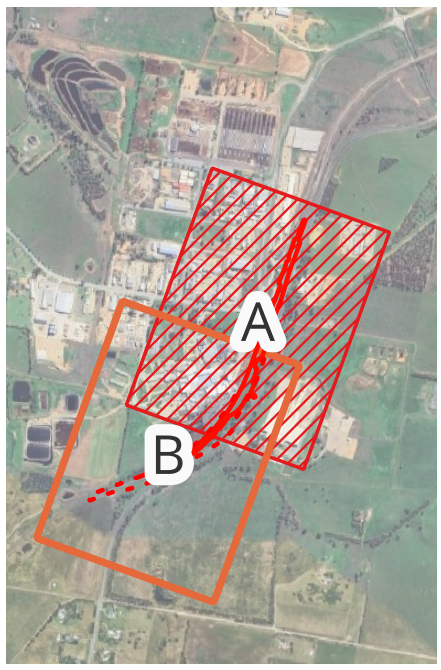
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 26A: 5% AEP Hazard - Design Condition

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

MARTINUS

aurecon BG&E

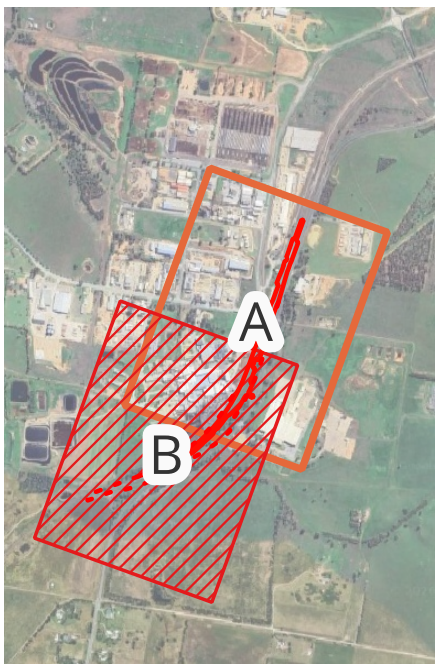
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 26B: 5% AEP Hazard - Design Condition

WEBB STREET

LEWINGTON STREET

BOMEN ROAD

DAMPIER STREET

BYRNES ROAD

JERSEY STREET

MARTINUS

aurecon BG&E

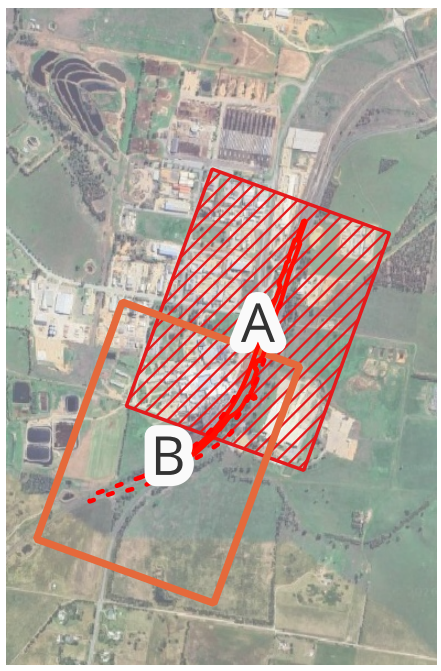
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 27A: 2% AEP Hazard - Design Condition

Map by: TT

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

MARTINUS

aurecon BG&E

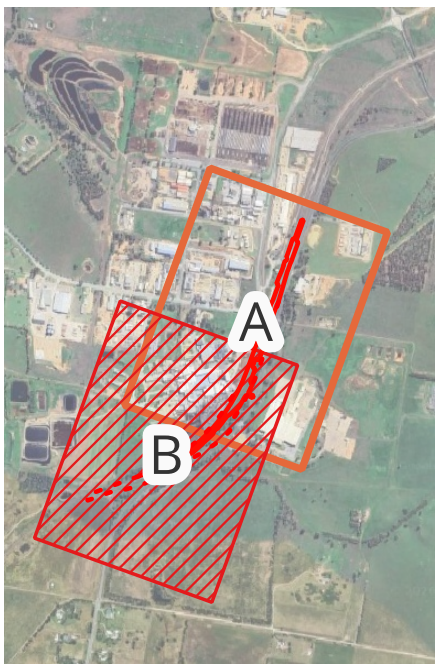
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

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Map by: TT

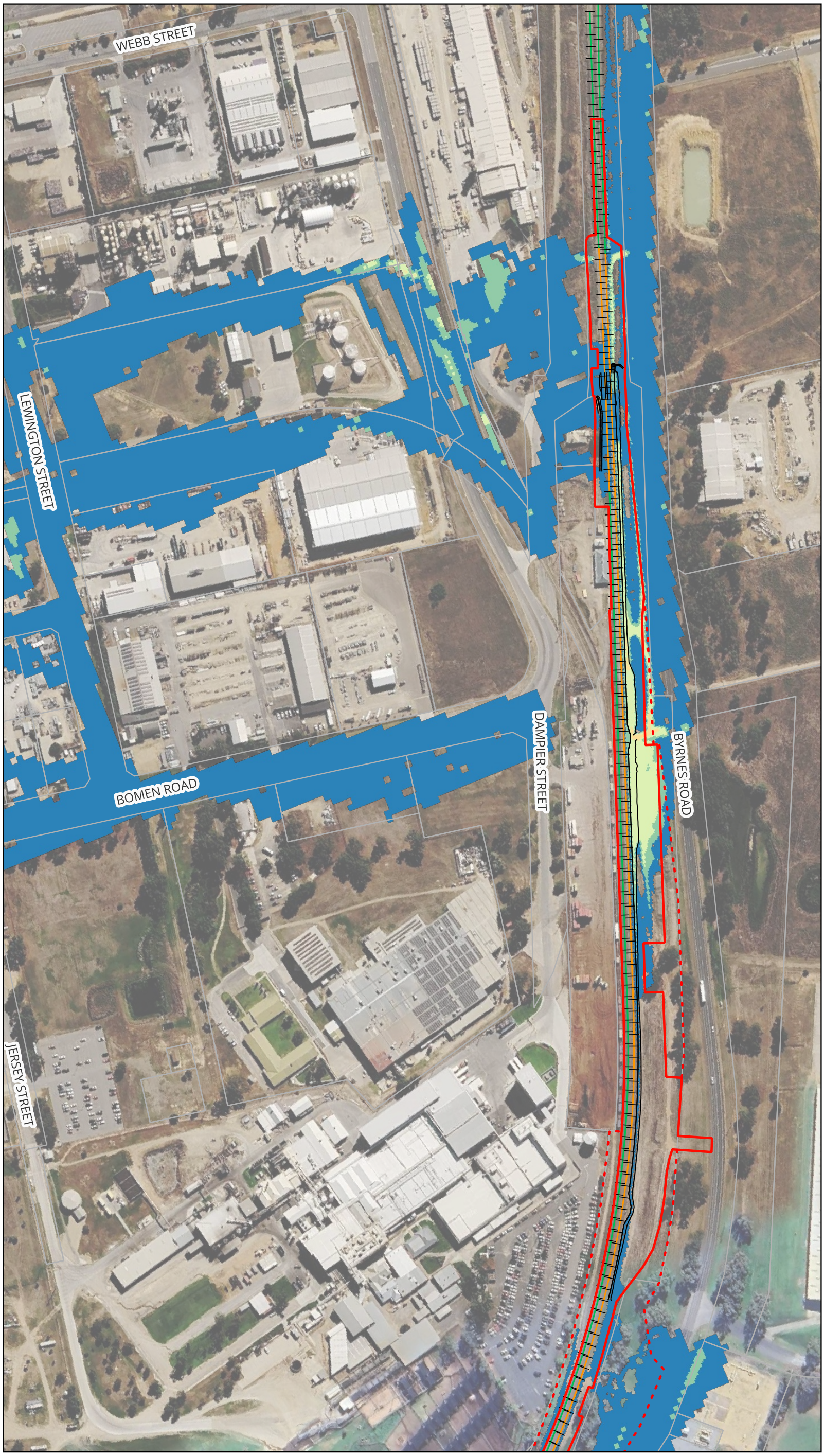
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A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 27B: 2% AEP Hazard - Design Condition



MARTINUS

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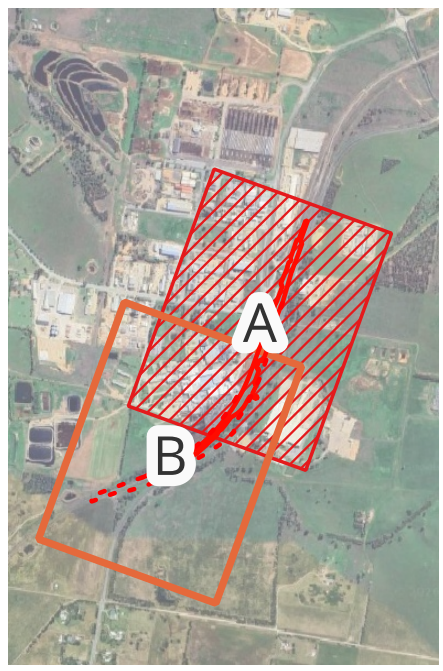
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 28A: 1% AEP Hazard - Design Condition

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

MARTINUS

aurecon BG&E

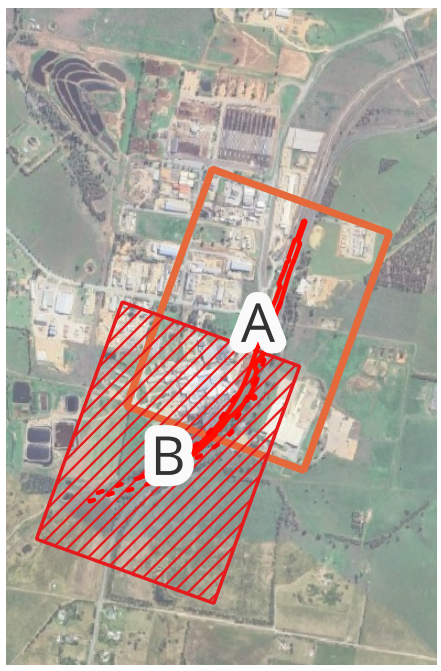
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

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Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 28B: 1% AEP Hazard - Design Condition

WEBB STREET

LEWINGTON STREET

BOMEN ROAD

DAMPIER STREET

BYRNES ROAD

JERSEY STREET

MARTINUS

aurecon BG&E

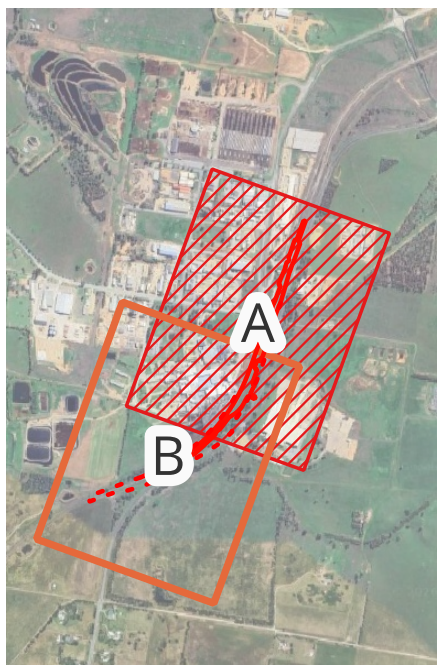
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

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Map by: TT

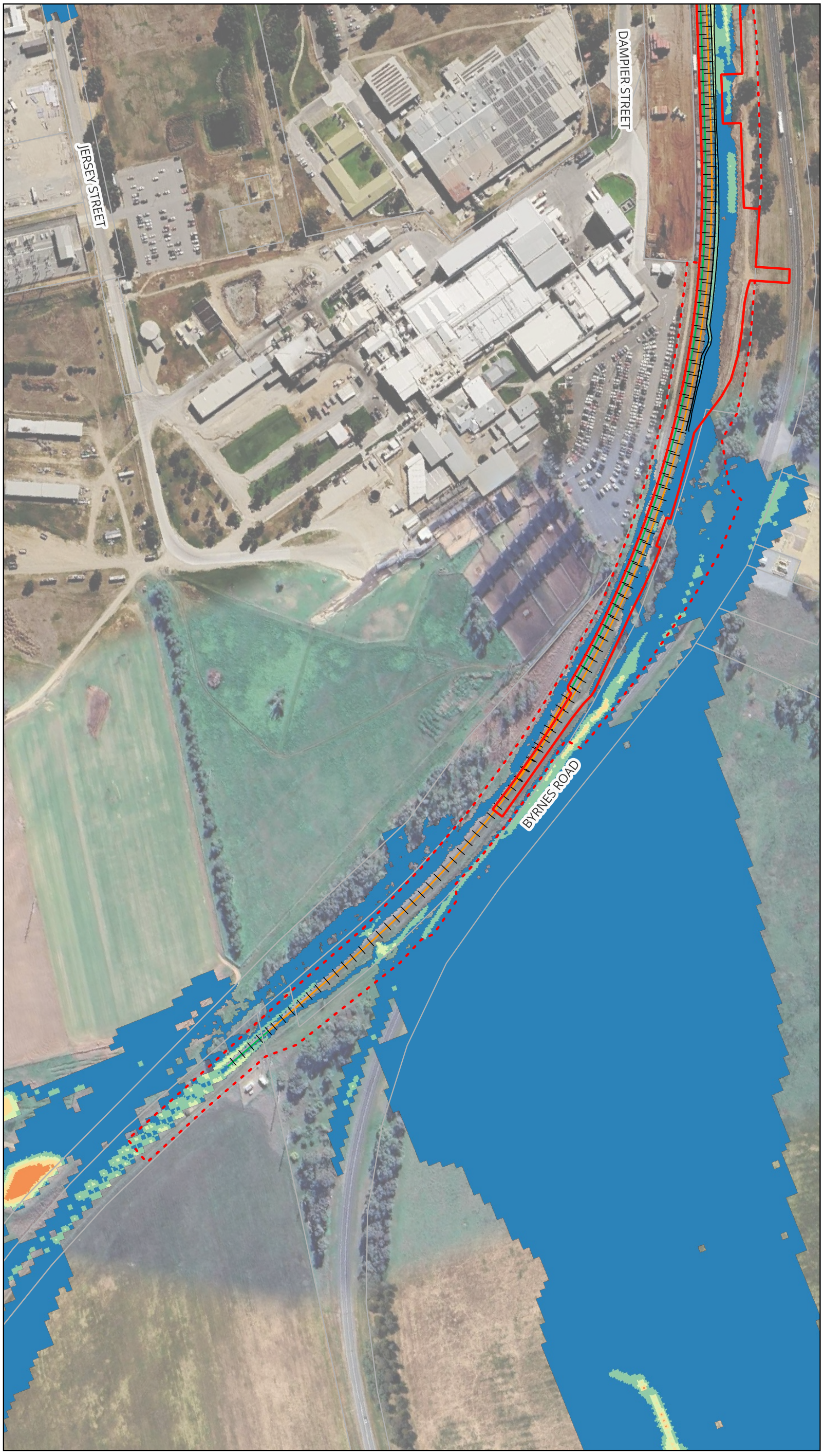
0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 29A: 1% AEP with Climate Change Hazard - Design Condition



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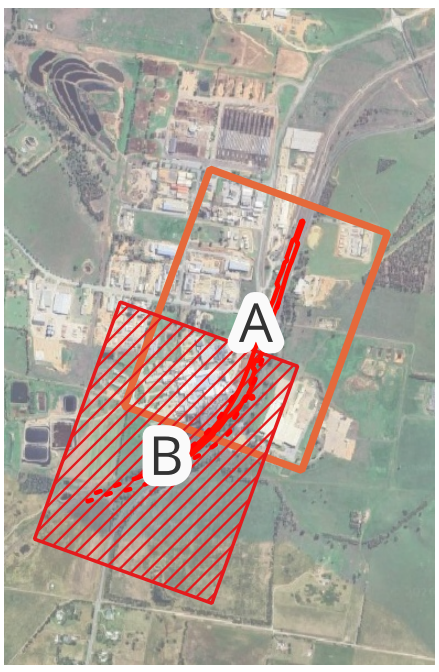
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

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Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 29B: 1% AEP with Climate Change Hazard - Design Condition

WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

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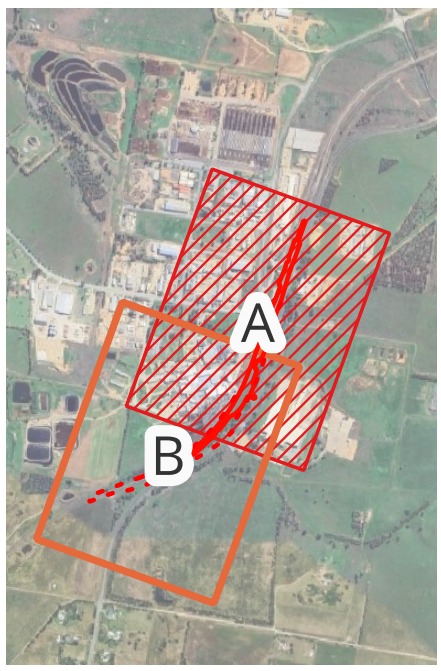
Map by: TT

MARTINUS
aurecon BG&E

Legend

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

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 30A: PMF Hazard - Design Condition

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

MARTINUS

aurecon BG&E

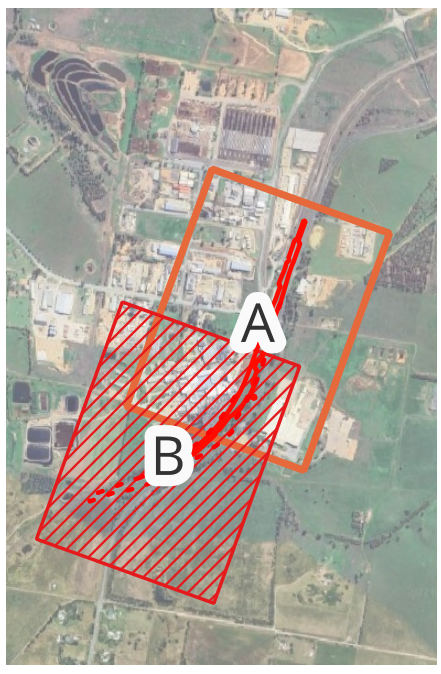
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 30B: PMF Hazard - Design Condition

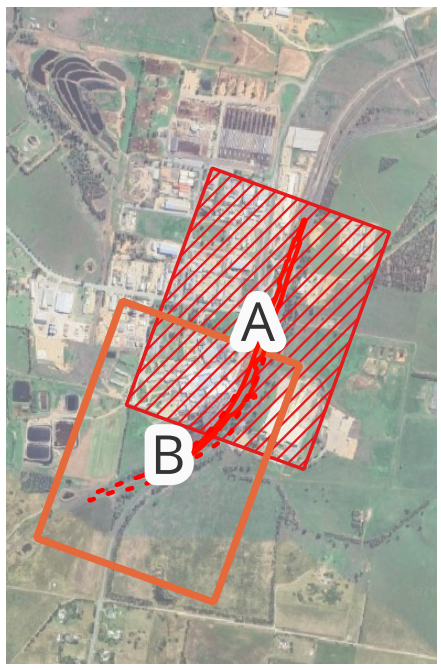
WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

MARTINUS
aurecon BG&E

Legend

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

Changes in Peak 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:

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Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 31A: Changes in Peak Flood Levels for 5% AEP



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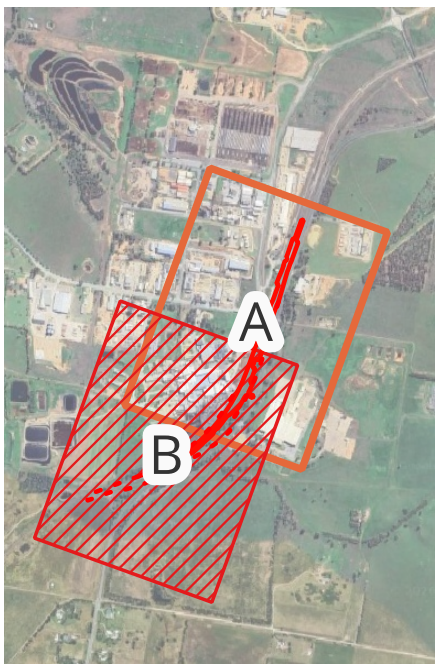
Legend

Project Boundary

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

Changes in Peak 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:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 31B: Changes in Peak Flood Levels for 5% AEP

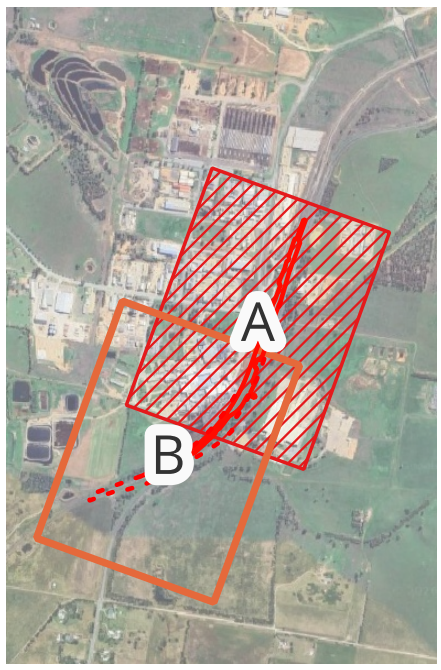
WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

MARTINUS
aurecon BG&E

Legend

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

Changes in Peak 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:

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Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 32A: Changes in Peak Flood Levels for 2% AEP

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

MARTINUS

aurecon BG&E

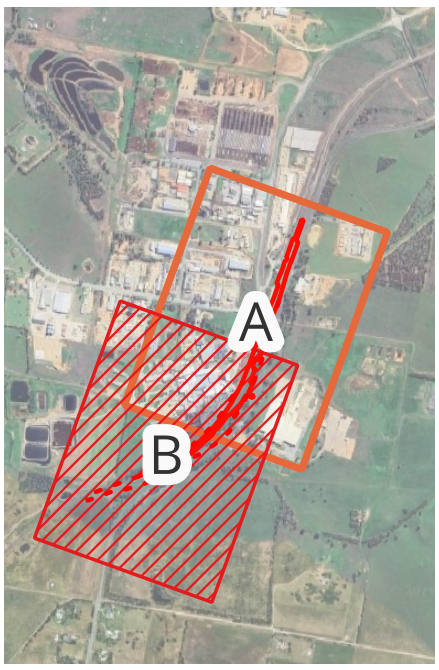
Legend

Project Boundary

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

Changes in Peak 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:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 32B: Changes in Peak Flood Levels for 2% AEP

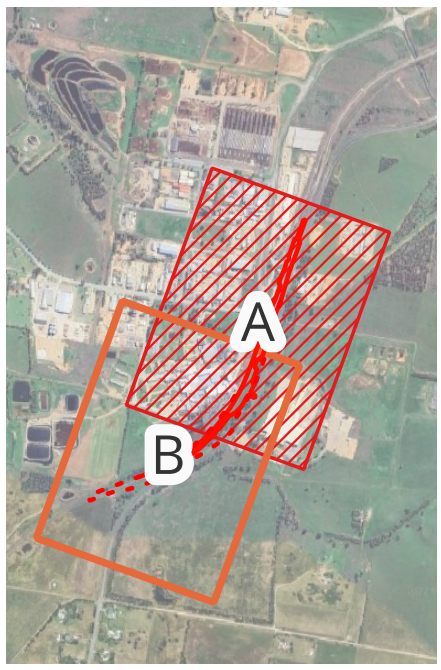
WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

MARTINUS
aurecon BG&E

Legend

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

Changes in Peak 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:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 33A: Changes in Peak Flood Levels for 1% AEP

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

MARTINUS

aurecon BG&E

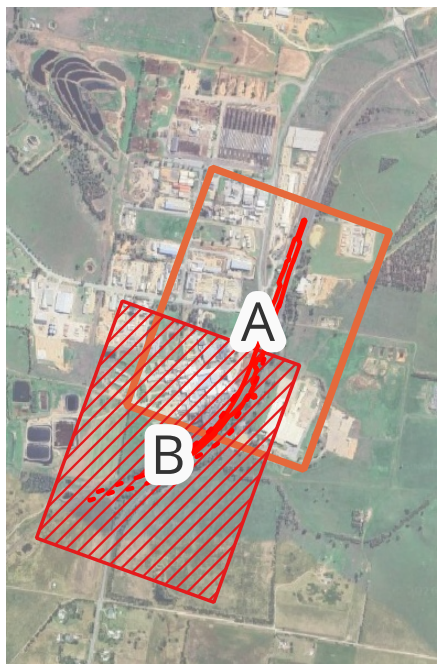
Legend

Project Boundary

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

Changes in Peak 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:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 33B: Changes in Peak Flood Levels for 1% AEP

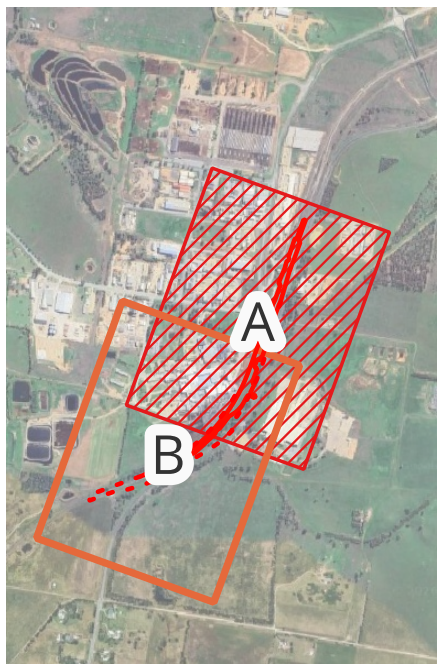
WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

MARTINUS
aurecon BG&E

Legend

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

Changes in Peak 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:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 34A: Changes in Peak Flood Levels for 1% AEP with Climate Change

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

MARTINUS

aurecon BG&E

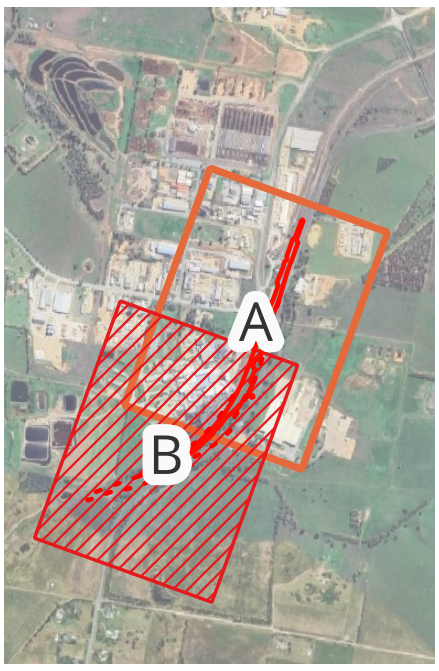
Legend

Project Boundary

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

Changes in Peak 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:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 34B: Changes in Peak Flood Levels for 1% AEP with Climate Change

WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

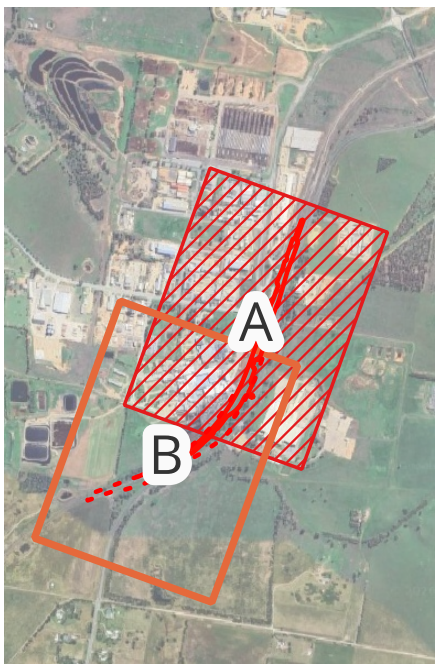
MARTINUS
aurecon BG&E

Legend

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

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

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 35A: Changes in Peak Flood Velocity for 5% AEP

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

MARTINUS

aurecon BG&E

Legend

Project Boundary

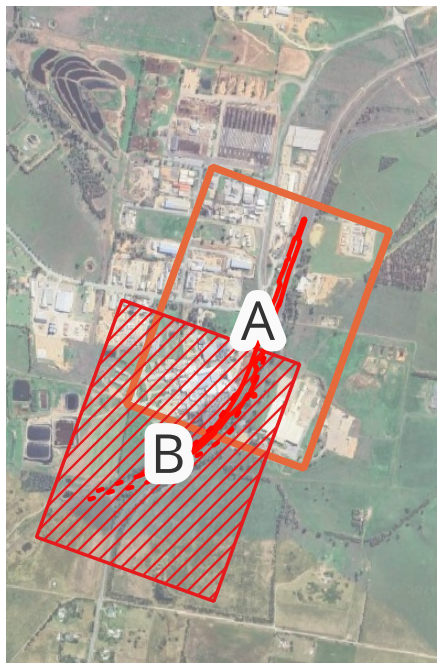
- Project Boundary
- Construction Boundary
- Cadastre
- Existing Railway Track
- Proposed Railway Track
- Civil Design Strings

Design Peak Flood Velocity (m/s)

<= 0.5

Changes in Peak Flood Velocity (%)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 35B: Changes in Peak Flood Velocity for 5% AEP

MARTINUS

aurecon BG&E

Legend

Project Boundary

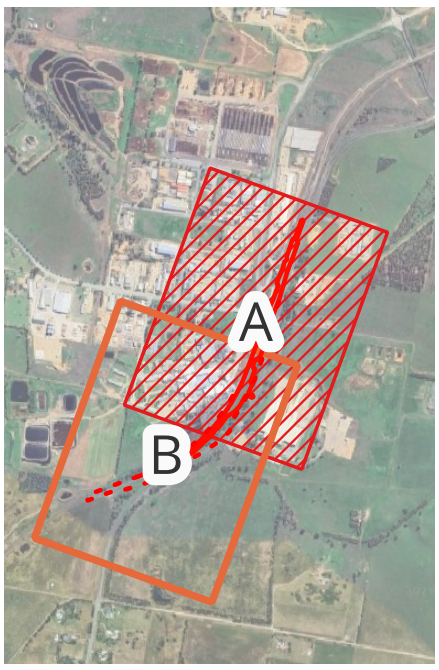
- Project Boundary
- Construction Boundary
- Cadastre
- Existing Railway Track
- Proposed Railway Track
- Civil Design Strings

Design Peak Flood Velocity (m/s)

<= 0.5

Changes in Peak Flood Velocity (%)

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



Notes:

WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 36A: Changes in Peak Flood Velocity for 2% AEP

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

MARTINUS

aurecon BG&E

Legend

Project Boundary

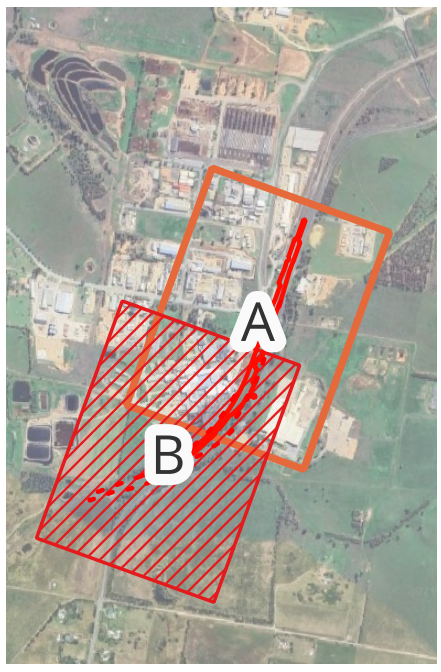
- Project Boundary
- Construction Boundary
- Cadastre
- Existing Railway Track
- Proposed Railway Track
- Civil Design Strings

Design Peak Flood Velocity (m/s)

<= 0.5

Changes in Peak Flood Velocity (%)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 36B: Changes in Peak Flood Velocity for 2% AEP

WEBB STREET

LEWINGTON STREET

BOMEN ROAD

DAMPIER STREET

BYRNES ROAD

JERSEY STREET

MARTINUS

aurecon BG&E

Legend

Project Boundary

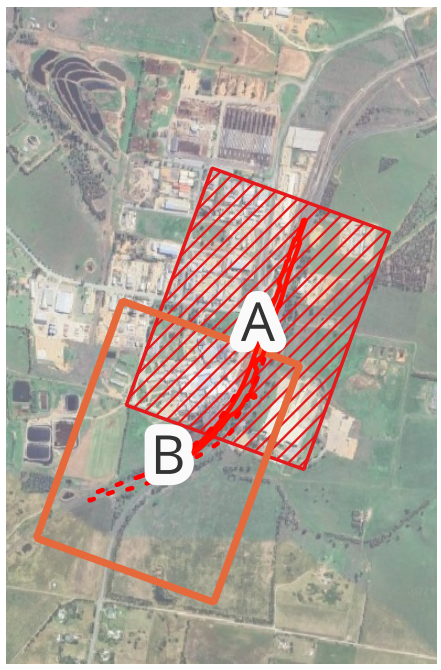
- Project Boundary
- Construction Boundary
- Cadastre
- Existing Railway Track
- Proposed Railway Track
- Civil Design Strings

Design Peak Flood Velocity (m/s)

<= 0.5

Changes in Peak Flood Velocity (%)

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



Notes:

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Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 37A: Changes in Peak Flood Velocity for 1% AEP

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

Legend

Project Boundary

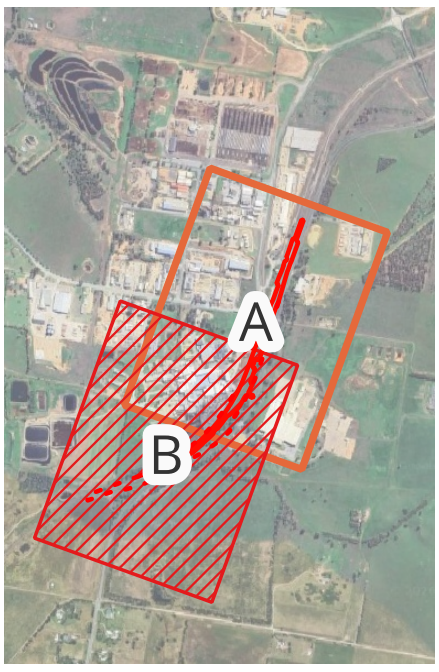
- Project Boundary
- Construction Boundary
- Cadastre
- Existing Railway Track
- Proposed Railway Track
- Civil Design Strings

Design Peak Flood Velocity (m/s)

<= 0.5

Changes in Peak Flood Velocity (%)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 37B: Changes in Peak Flood Velocity for 1% AEP

WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

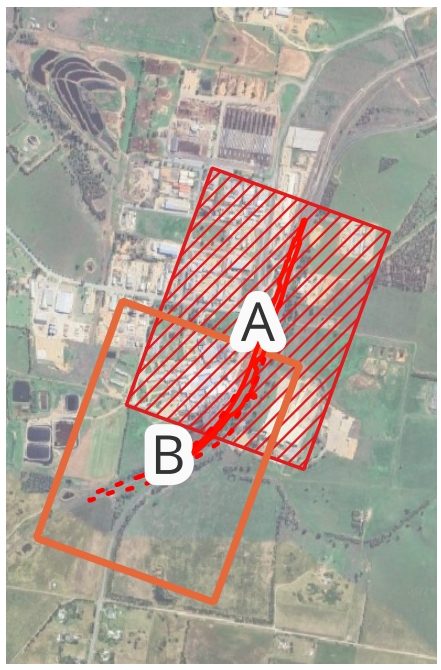
MARTINUS
aurecon BG&E

Legend

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

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

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 38A: Changes in Peak Flood Velocity for 1% AEP with Climate Change

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

Legend

Project Boundary

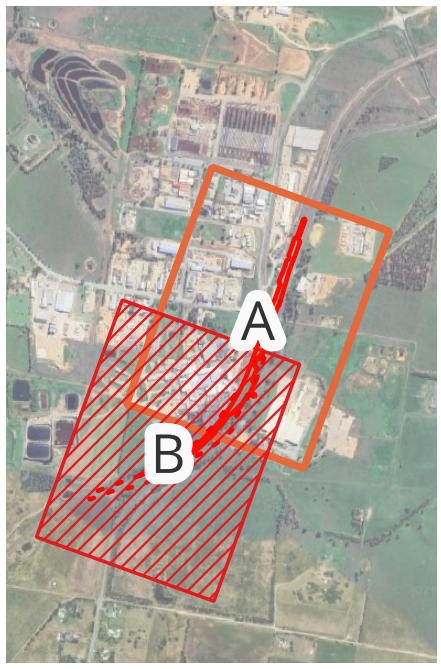
- Project Boundary
- Construction Boundary
- Cadastre
- Existing Railway Track
- Proposed Railway Track
- Civil Design Strings

Design Peak Flood Velocity (m/s)

<= 0.5

Changes in Peak Flood Velocity (%)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 38B: Changes in Peak Flood Velocity for 1% AEP with Climate Change

WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

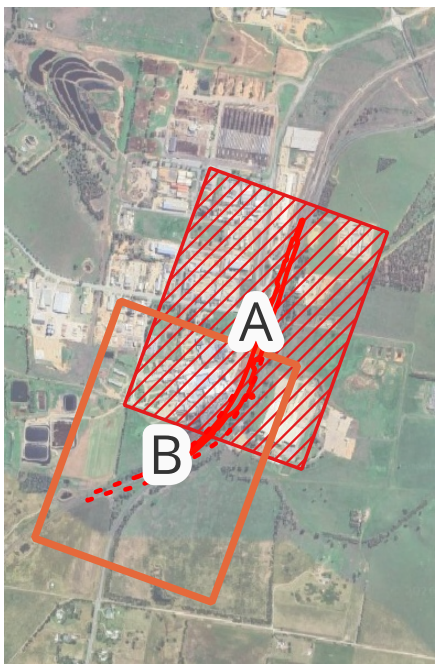
Map by: TT

MARTINUS
aurecon BG&E

Legend

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

Changes in Peak Flood 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:

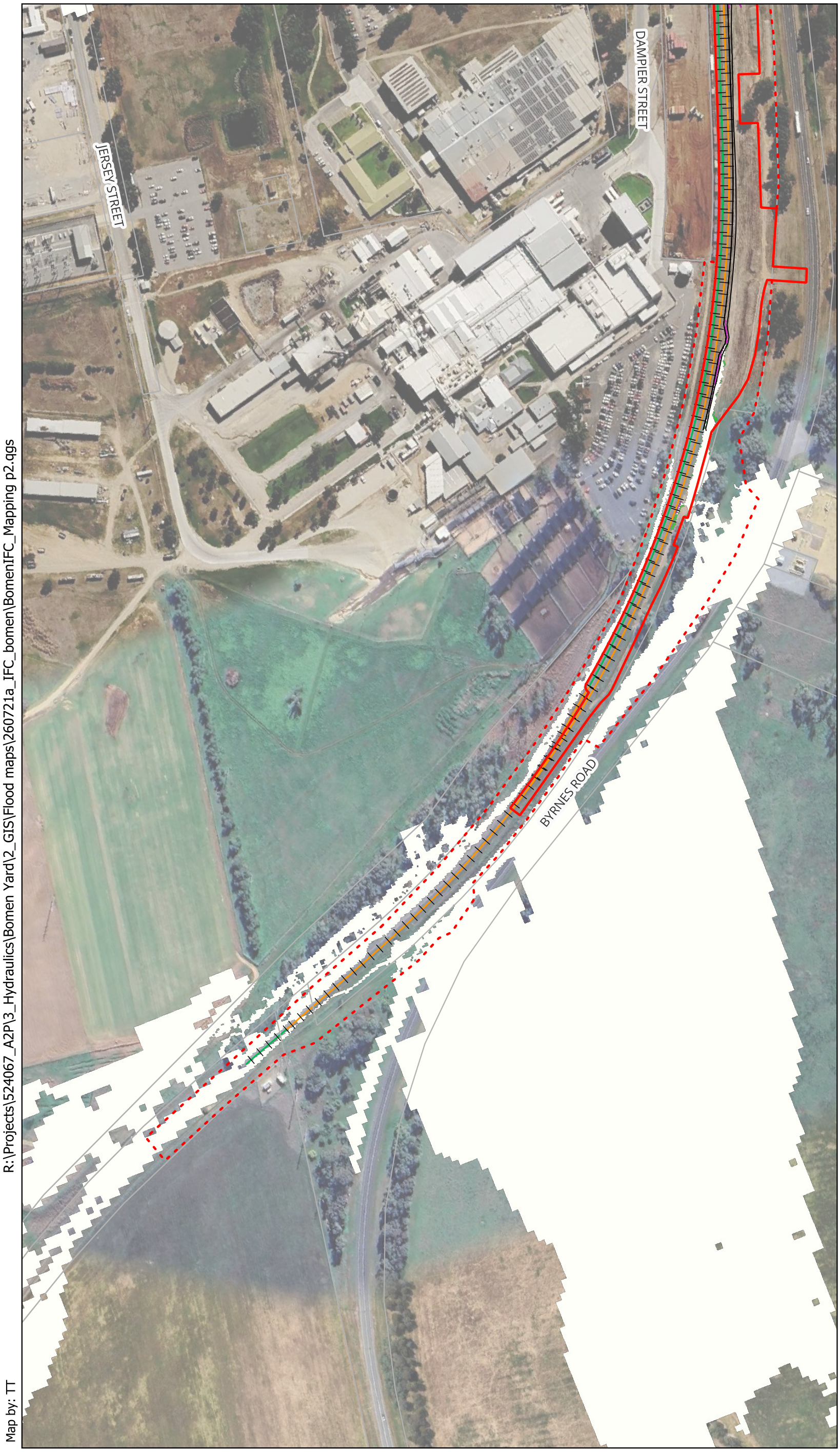
0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 39A: Changes in Peak Flood Hazard for 5% AEP



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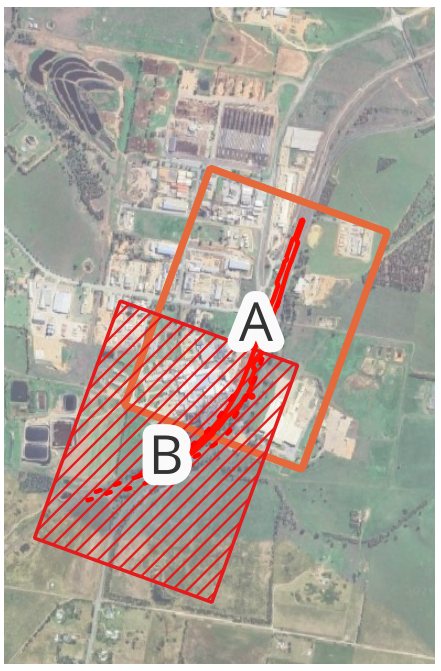
Legend

Project Boundary

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

Changes in Peak Flood Hazard

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 39B: Changes in Peak Flood Hazard for 5% AEP

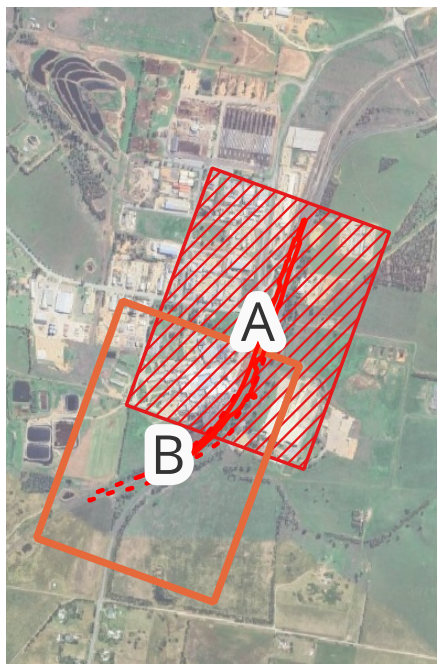
WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

MARTINUS
aurecon BG&E

Legend

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

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

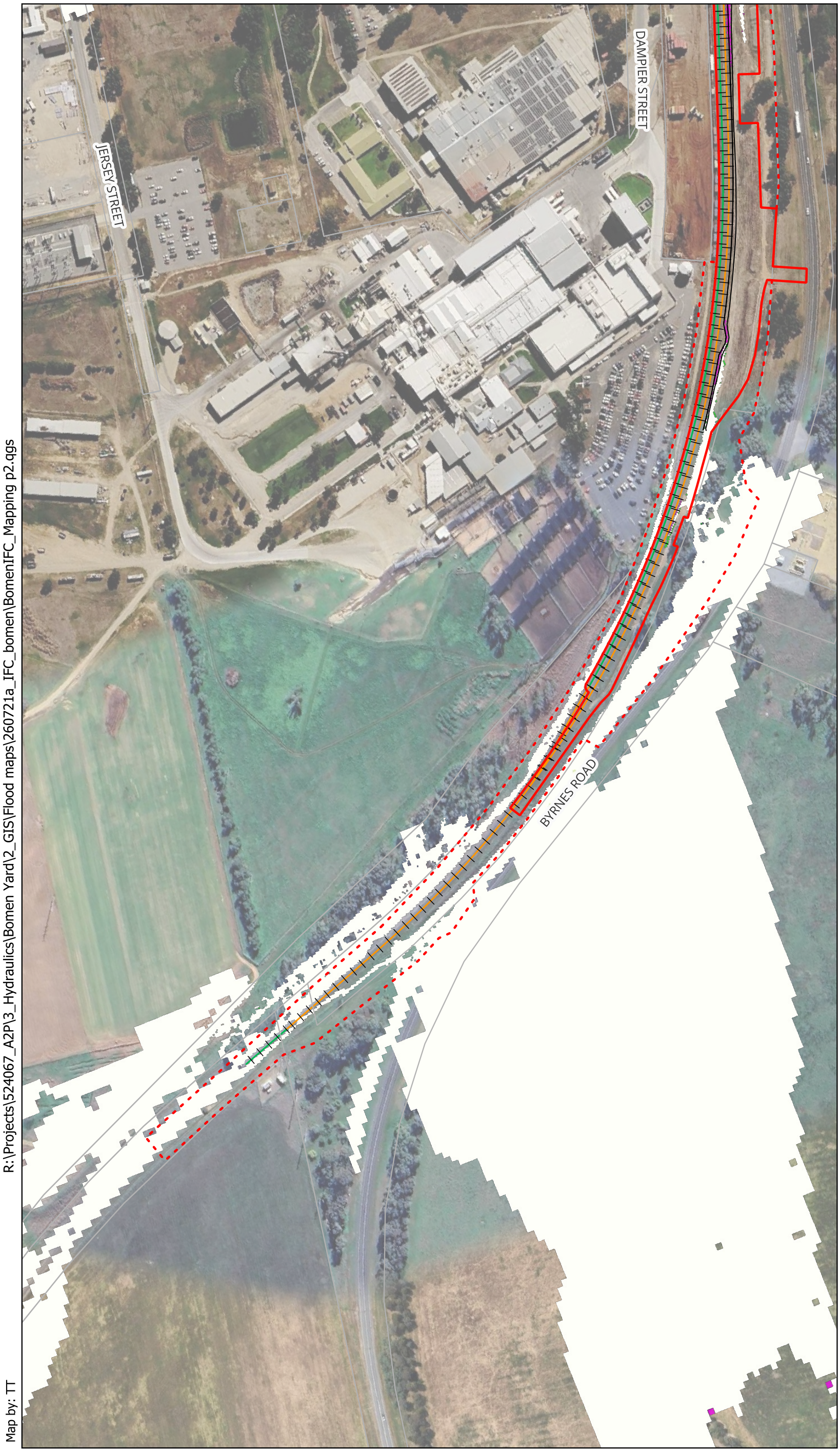
0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 40A: Changes in Peak Flood Hazard for 2% AEP

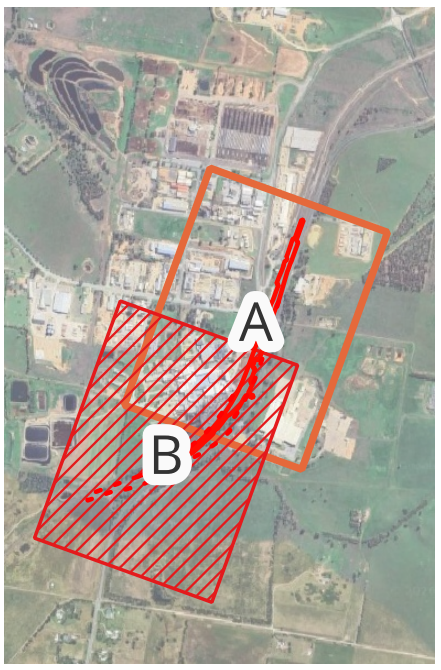


MARTINUS
aurecon BG&E

Legend

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

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 40B: Changes in Peak Flood Hazard for 2% AEP

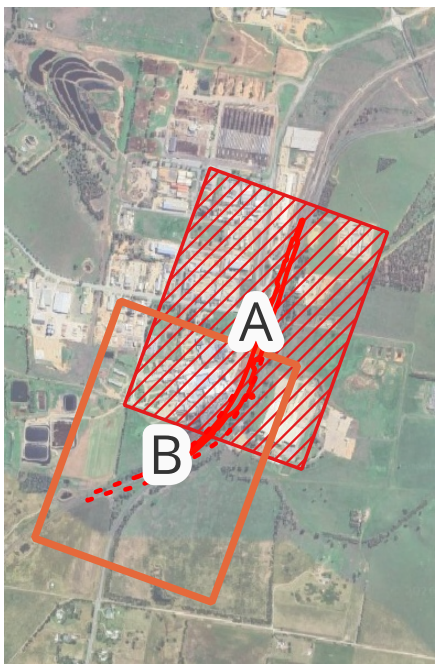
WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

MARTINUS
aurecon BG&E

Legend

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

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 41A: Changes in Peak Flood Hazard for 1% AEP

JERSEY STREET

DAMPIER STREET

BYRNES ROAD

MARTINUS

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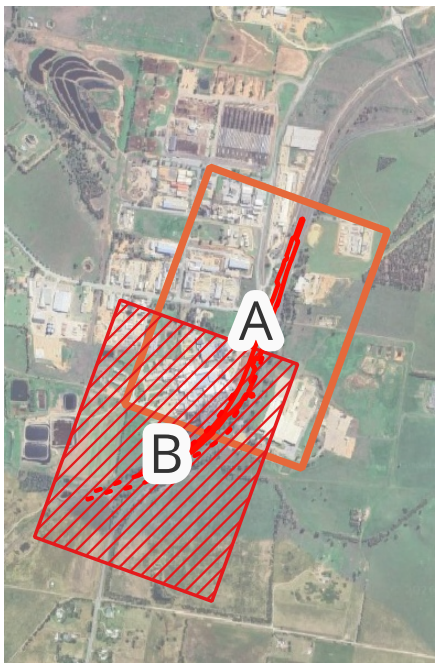
Legend

Project Boundary

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

Changes in Peak Flood 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:

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Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 41B: Changes in Peak Flood Hazard for 1% AEP

WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

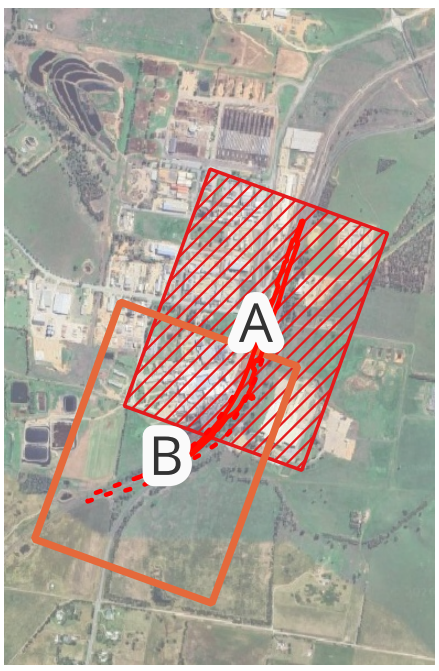
Map by: TT

MARTINUS
aurecon BG&E

Legend

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

Changes in Peak Flood 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:

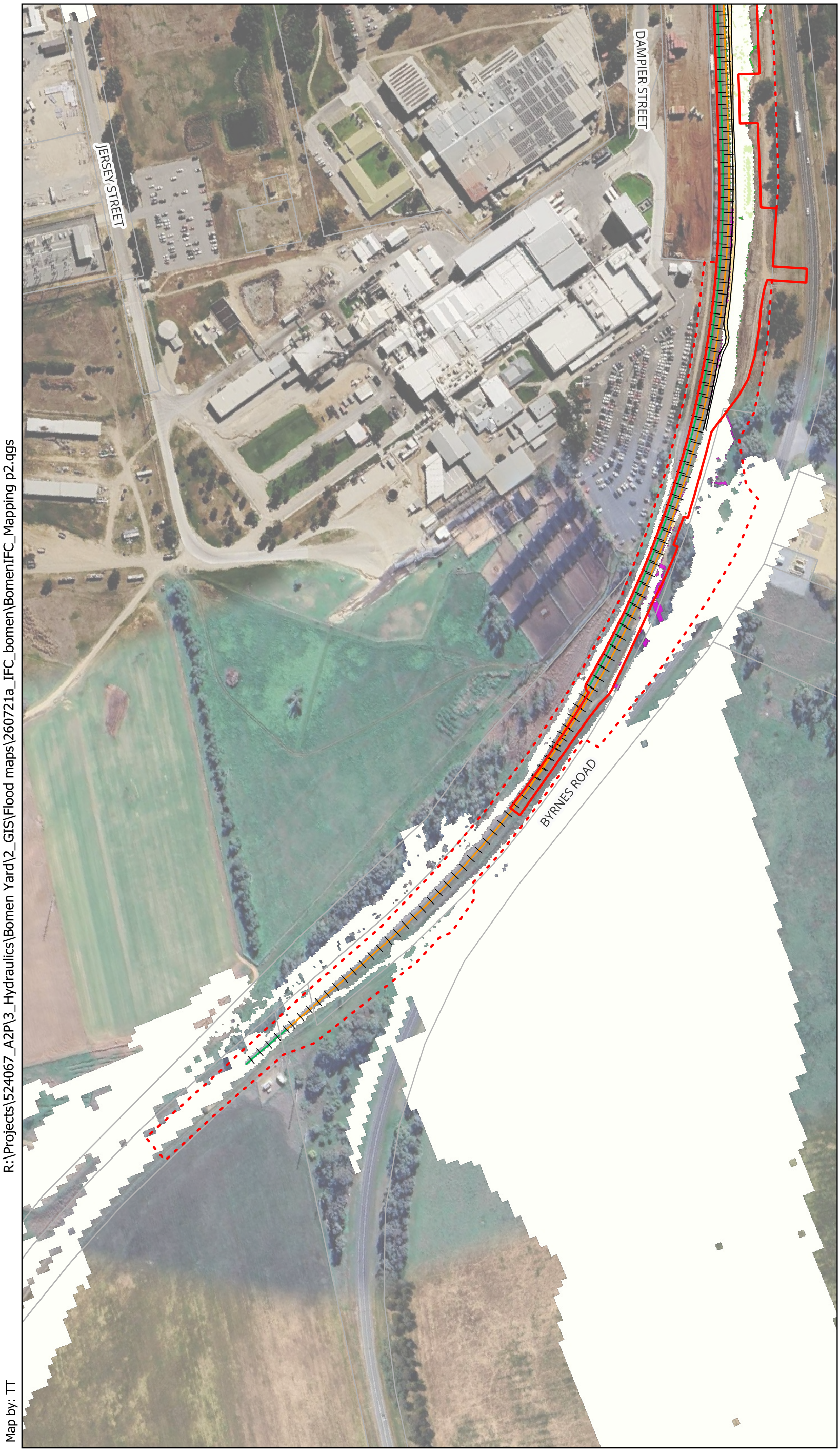
0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 42A: Changes in Peak Flood Hazard for 1% AEP with Climate Change



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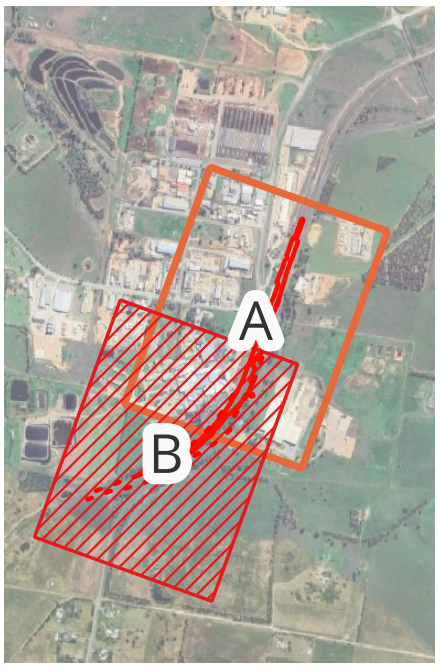
Legend

Project Boundary

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

Changes in Peak Flood Hazard

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 42B: Changes in Peak Flood Hazard for 1% AEP with Climate Change

MARTINUS

aurecon BG&E

Legend

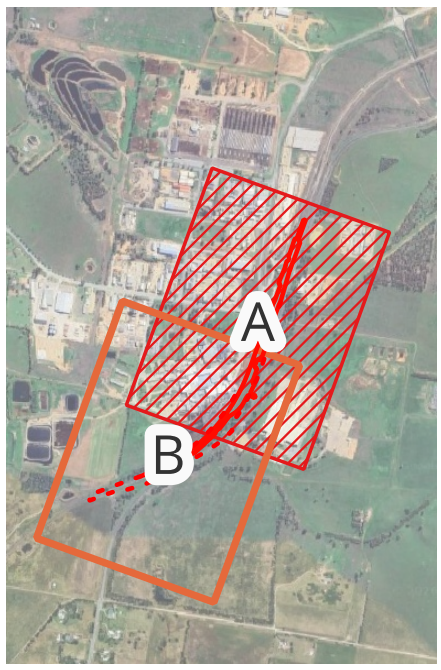
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 43A: 1% AEP Peak Flood Levels - Blockage Condition

Map by: TT

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

MARTINUS

aurecon BG&E

Legend

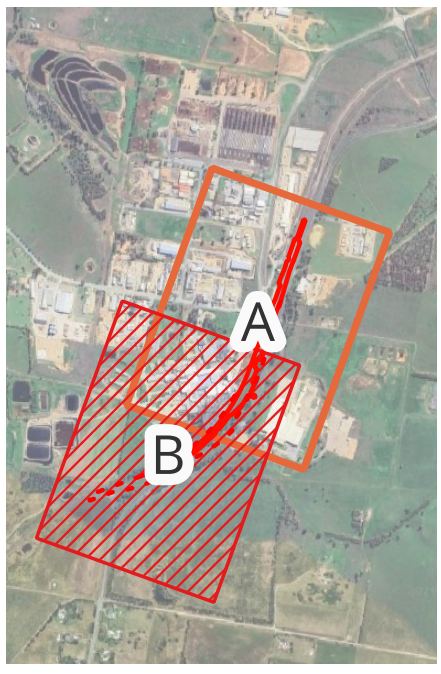
Project Boundary

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

- Flood Level contours (mAHD)

Peak Flood Depth (m)

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



Notes:

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 43B: 1% AEP Peak Flood Levels - Blockage Condition

Map by: TT

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

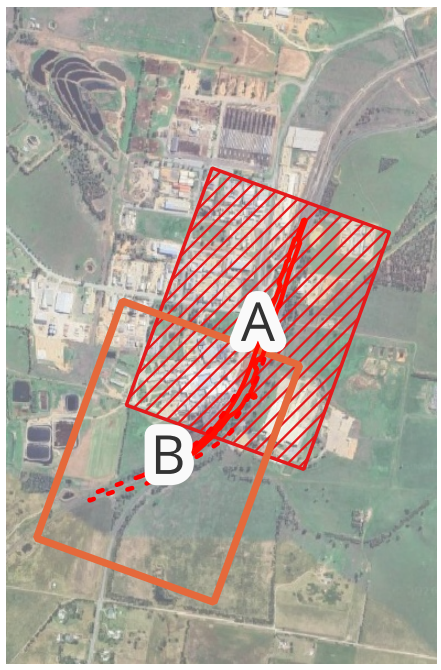
WEBB STREET
LEWINGTON STREET
BOMEN ROAD
DAMPIER STREET
BYRNES ROAD
JERSEY STREET

MARTINUS
aurecon BG&E

Legend

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

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 44A: 1% AEP Peak Flood Velocity - Blockage Condition

MARTINUS

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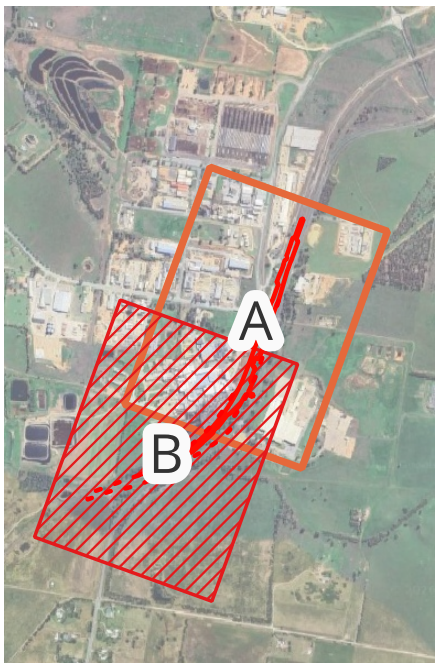
Legend

Project Boundary

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

Peak Flood Velocity (m/s)

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 44B: 1% AEP Peak Flood Velocity - Blockage Condition

WEBB STREET

LEWINGTON STREET

BOMEN ROAD

DAMPIER STREET

BYRNES ROAD

JERSEY STREET

MARTINUS

aurecon BG&E

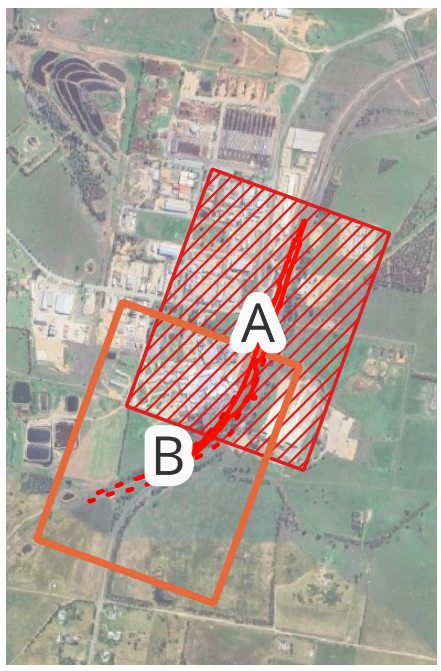
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

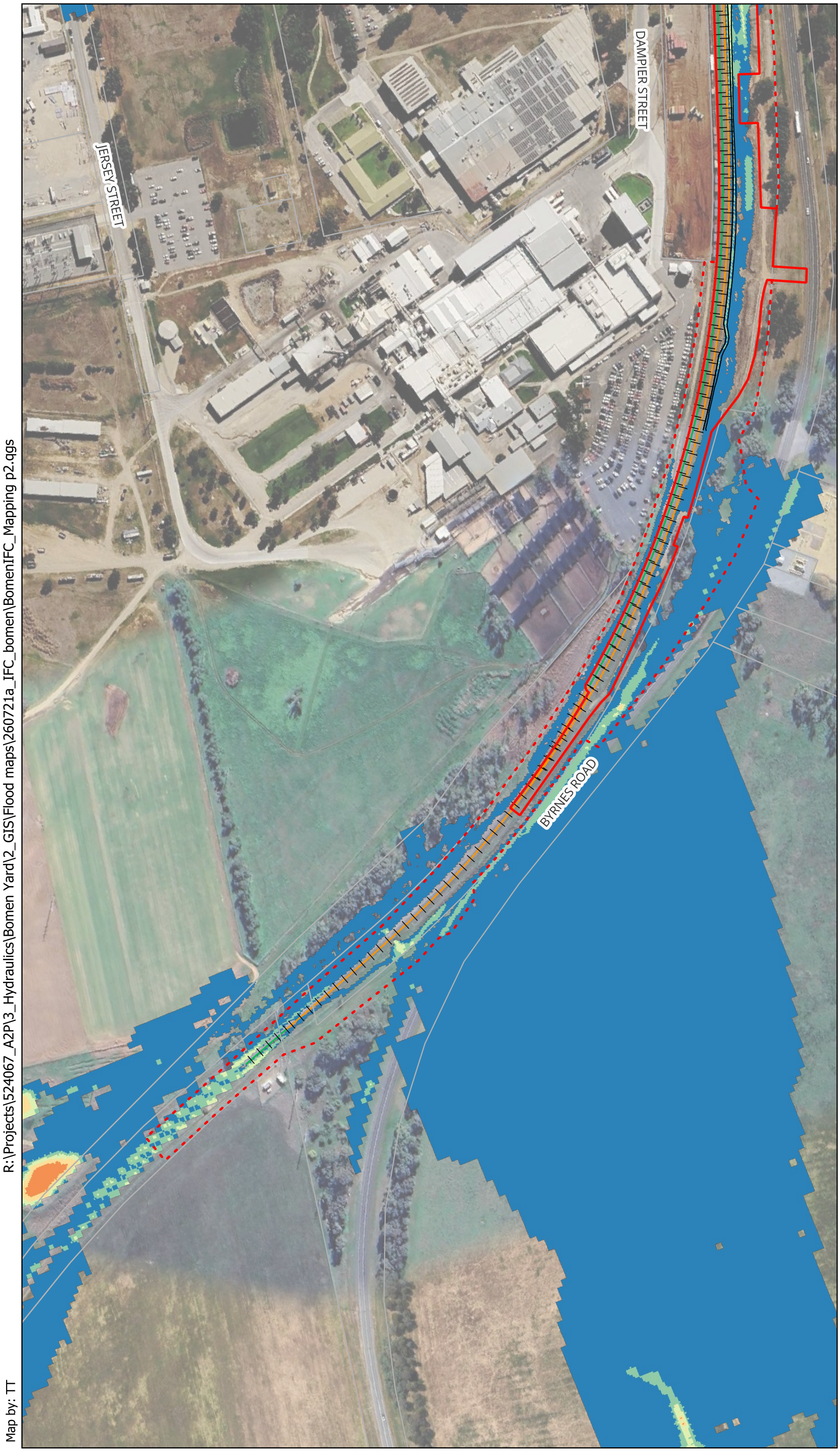
0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 45A: 1% AEP Peak Flood Hazard - Blockage Condition



MARTINUS

aurecon BG&E

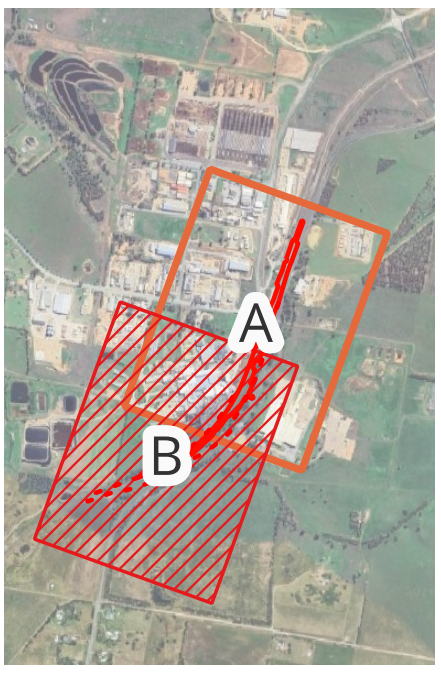
Legend

Project Boundary

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

Peak Flood Hazard

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



Notes:

R:\Projects\524067_A2P\3_Hydraulics\Bomen Yard\2_GIS\Flood maps\260721a_IFC_bomen\BomenIFC_Mapping p2.qgs

Map by: TT

0 100 200 m

A3 Scale: 1:3,100

27/7/2026 GDA2020 / MGA zone 55

Bomen Yard - Inland Rail (A2P) - IFC Stage

Figure 45B: 1% AEP Peak Flood Hazard - 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

Comment Sheet Number_Revision:	5-0052-210-IHY-W9-CS-0001_D	**Comment Sheet Title:**	***External Comment Sheet - A2I | Flood Design Report - Bomen Yard***
Revision Date:	4/08/2026	**Documents related in Aconex** (by IR DC)	*Yes*

Review Comments (Reviewer)									**Responses (Document Owner)**					**Close-Out**			
#	PSR ID No. **or** Compliance Reference Document *(State the fully qualified reference the deliverable is non-compliant with)*	Document / drawing number - Revision Number	Section # / page #	Engineering Assurance Stage	Comment *(for example must be specific on non compliance. Reference mark-ups, if required)*	Comment Type	Full Name	Date	Full Name	Company	Date	Response *(must be specific on how the comment has been addressed. Agreed approach for re-submission)*	Documentation Section # / Figure #	Full Name	Date	Comment Status	Close-Out Comment
Example	*IR-SR-A2I-517* **or** *01-3500-PD-P00-DE-0008-A*	*0-0000-900-PEN-00-TE-0020_A*		*CRR*	*Is there sufficient space for a 10m maintenance vehicle to turn around at the end of the RMAR?*	*Non-Compliant*	*Joe Bloggs*	*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	PSR Annexure B: Technical Requirements (Section 5.4)	5-0052-210-IHY-W9-RP-0001_A.pdf	Page 26, 5-0052-210-IHY-W9-RP-0001_A, Section 4.2.2 (page 25)	DDR	Please include details (e.g., dimensions, gradient, capacity etc.) of the cess drain.	Non-Compliant	Ayub Ali	28/10/2024	Yucen Lu	DJV Flood Modeller	6/12/2024	The details of the cess drain will be included in the next design report. TT 05/08/2026 - A general cess drain description is provided within the flood design report (refer to Section 4.2.2). The flood design report also refers to relevant section in the main design report (Section 4.5.6) and drawings for more in depth details of the cess drain.	5-0052-210-IHY-W9-RP-0001_0 Section 4.2.2 Section 4.5.6 of design report 5-0052-210-PEN-W9-RP-0001 and drawings 5-0052-210-CDR-W9-DR-0015, 5-0052-210-CDR-W9-DR-0101 to 0103	Stephen Brierley	20/02/2025	OPEN	As there is no next phase and we are at DDR for Bomen, evidence will need to be provided, sighted and approved before this comment can be closed.
2	Clarification	5-0052-210-IHY-W9-RP-0001_A.pdf	Page 29, 5-0052-210-IHY-W9-RP-0001_A	DDR	Please confirm that any changes to the design at the Southern end (currently track design changes are being considered with MR with changes to the loop line) there will be no impacts to this flood assessment report?	Opportunity	Stephen Brierley	21/11/2024	Zoe Cruice	Engineering Manager	12/12/2024	The impacts on the flooding assessment will be considered when the direction to undertake the variation work is received. TT 05/08/2026 - The flood design report incorporates the latest IFC design, including the design changes to the southern site extent, and assesses the associated flood impacts based on the IFC design.(Refer to Section 4.2.2, 6.3 and 6.4)	5-0052-210-IHY-W9-RP-0001_0 Section 4.2.2 and Section 6.3 and 6.4	Stephen Brierley	20/02/2025	OPEN	Waiting design reolution at the southern end and impact to the flood assessment. Remains open until resolved.

APPENDIX D

External Consultation Review

D1 – TfNSW review

D2 – WWCC Review

APPENDIX D1

TfNSW review

Attachment 1: A2I Flood Design Report CONSULTATION - COMMENTS REGISTER

Stakeholder Category	Stakeholder Name	Flood Design Report name	Document reference (e.g.	Date raised	Topic that comment relates to	Comments	Full Name	Company & Role	Date	Response	Documentation Section # / Figure #
State Government Agency	TfNSW	5-0052-210-IHY-G1-RP-0001_A.1 Flood Design Report - Culcairn Yard - For Consultation 5-0052-210-IHY-G2-RP-0001_A.1 Flood Design Report - Henty Yard - For Consultation 5-0052-210-IHY-G4-RP-0001_A.1 The Rock Yard - Flood Design Report - For Consultation 5-0052-210-IHY-W1-RP-0001_A.1 Flood Design Report - Uranquinty Yard - For Consultation 5-0052-210-IHY-W9-RP-0001_A.1 Bomen Yard Flood Design Report - For Consultation	Whole document	14/11/2024	Administrative	Multiple cross-referencing links are broken in the reports. TfNSW assumes administrative errors such as these will be corrected.	Zoe Cruice	Martinus - Engineering Manager	29/11/2024	Noted. Apologies. These will be fixed to hyperlink and reference correctly.	Rev B reporting
State Government Agency	TfNSW	5-0052-210-IHY-G1-RP-0001_A.1 Flood Design Report - Culcairn Yard - For Consultation	Whole document	14/11/2024	Environmental assessment process	The report references "draft Conditions of Approval". Please update to reflect project approval status.	Zoe Cruice	Martinus - Engineering Manager	29/11/2024	This will be updated to reflect the determined project CoA and UMM	Rev B report
State Government Agency	TfNSW	5-0052-210-IHY-G1-RP-0001_A.1 Flood Design Report - Culcairn Yard - For Consultation 5-0052-210-IHY-G2-RP-0001_A.1 Flood Design Report - Henty Yard - For Consultation 5-0052-210-IHY-G4-RP-0001_A.1 The Rock Yard - Flood Design Report - For Consultation 5-0052-210-IHY-W1-RP-0001_A.1 Flood Design Report - Uranquinty Yard - For Consultation 5-0052-210-IHY-W9-RP-0001_A.1 Bomen Yard Flood Design Report - For Consultation	Blockage Assessment section of each report	14/11/2024	Blockage assumptions	All assesments adopted a site-specific blockage, but a consistent 20% blockage for all culverts outside of the project area. What informed this assumption? If the purpose was to assess ARR2019 blockage guidelines, TfNSW suggests that the blockage rates for all culverts should be informed by this guidance as even off-site culverts have the potential to influence flows within the sites.	Yucen Lu	DJV Flood Modeller	3/12/2024	A technical memo has been provided to provide explanation and justification of the proposed approach. Please review this memo and advise if the blockage assessment and assumptions are acceptable.	Technical Memo
State Government Agency	TfNSW	5-0052-210-IHY-G1-RP-0001_A.1 Flood Design Report - Culcairn Yard - For Consultation 5-0052-210-IHY-G2-RP-0001_A.1 Flood Design Report - Henty Yard - For Consultation 5-0052-210-IHY-G4-RP-0001_A.1 The Rock Yard - Flood Design Report - For Consultation 5-0052-210-IHY-W1-RP-0001_A.1 Flood Design Report - Uranquinty Yard - For Consultation 5-0052-210-IHY-W9-RP-0001_A.1 Bomen Yard Flood Design Report - For Consultation	Blockage Assessment section of each report	14/11/2024	Blockage assumptions	Why was the ARR2019 blockage guidance not included in the design runs? One of the compliance requirements is that all modelling be undertaken in line with this guidance. The design runs have not been undertaken with this blockage guidance incorporated. A typical blockage sensitivity test would have been to include the ARR2019 blockage guidance in the design runs, and then to assess higher and/or lower rates of blockage as necessary.	Yucen Lu	DJV Flood Modeller	3/12/2024	A technical memo has been provided to provide explanation and justification of the proposed approach. Please review this memo and advise if the blockage assessment and assumptions are acceptable.	Technical Memo
State Government Agency	TfNSW	5-0052-210-IHY-G1-RP-0001_A.1 Flood Design Report - Culcairn Yard - For Consultation	Section 1.4	14/11/2024	Detailed Design Report	The report states that it should be read in conjuction with the Detailed Design Report – Culcairn Station Yard (5-0052-210-PEN-G1-RP-0001). The Detailed Design Report has not been provided to TfNSW.	Zoe Cruice	Martinus - Engineering Manager	29/11/2024	The track and civil detailed design reports can be provided. These detailed design reports provide an overview, and discipline specific description of the scope of works and impacts.	
State Government Agency	TfNSW	5-0052-210-IHY-G1-RP-0001_A.1 Flood Design Report - Culcairn Yard - For Consultation	Section 1.11	14/11/2024	Climate change assumptions	The report states that flow was scaled to represent climate change impacts. Should this be that rainfall intensity was scaled? If the statement is correct, given hydrological modelling was undertaken, why was the rainfall intensity not scaled instead, as per ARR2019 guidance?	Malinda Gunasekera/ Yucen Lu	DJV Flood Modeller	3/12/2024	Regarding the regional flows, the flows themselves were scaled rather than the rainfall intensity. This approach was necessary because the Hydrologic WBNM model from the original flood study was unavailable, and the DJV did not develop an independent hydrological model. As detailed in Section 4 of the methodology, the resultant WBNM flows from the flood study/report were used directly as inputs to the TUFLOW models. However, it should be noted that a comment was received from Greater Hume Shire Council (Ref: 5-0052-210-PEN-G1-CS-0001-GH_C , Comment 2 and Comment 1) which stated "The major Anabranch as shown on Figure 1-2 has been terminated with no flood flows to reach the township up to >1:500 Event" as a result of "implemented Flood Mitigation Works as determined through Council FRMSP". This information was not available at the time the DDR Flood Design Report was being prepared. Therefore, the modelling methodology will be changed in the next design phase by only considering local catchment flooding for all events other than the PMF. In addition, 1 in 500 Event is larger than the 1% AEP with climate change, so no flood flows from Anabranch to the township for 1% with climate change. As such, this comment will not be relevant.	Rev B report
State Government Agency	TfNSW	5-0052-210-IHY-G1-RP-0001_A.1 Flood Design Report - Culcairn Yard - For Consultation	Section 1.6.3	14/11/2024	Environmental assessment process	The report states that the EIS and PIR have not yet been determined. Please update to reflect project approval status.	Zoe Cruice	Martinus - Engineering Manager	29/11/2024	This will be updated to reflect the determined project CoA and UMM	Rev B report
State Government Agency	TfNSW	5-0052-210-IHY-G1-RP-0001_A.1 Flood Design Report - Culcairn Yard - For Consultation	Section 4.1	14/11/2024	Routing parameter	The report states that a WBNM 'C' routing parameter of 1.7 was used. WBNM guidance is to use 1.6 unless a change is supported by calibration. The report states no calibration was undertaken, therefore TfNSW queries why the routing parameter was adjusted?	Malinda Gunasekera/ Yucen Lu	DJV Flood Modeller	3/12/2024	The WBNM 'C' value of 1.7 was from Culcairn, Henty, Holbrook Flood Studies (WMA Water, 2013), which was calibrated. DJV cited the value in the Flood Design Report and did not run or change the WBNM model as the model is not available. The above information will be included in the next design report.	Rev B report
State Government Agency	TfNSW	5-0052-210-IHY-G2-RP-0001_A.1 Flood Design Report - Henty Yard - For Consultation	Appendix A - Flood Maps A3, A4, A13, A14, A18, A19, A33 and A34	14/11/2024	1% AEP and 1% AEP + Climate change mapping	The 1% AEP flood results shown a larger flood extent/depths than the 1% AEP + Climate change event. Please review and confirm the correct layers have been used to generate these maps.	Yucen Lu	DJV Flood Modeller	3/12/2024	Noted. The correct 1% AEP + Climate Change flood maps will be updated in the next design stage report.	Rev B report
State Government Agency	TfNSW	5-0052-210-IHY-W1-RP-0001_A.1 Flood Design Report - Uranquinty Yard - For Consultation	Appendix A - Mapping	14/11/2024	Climate change impact assessment	TfNSW notes that the Conditions of Approval require impacts to be managed up to and including the 1% AEP. However, the climate change assessment shows that the works are likely to have an adverse impact on future 1% AEP floods. It also shows the activation of a new flowpath that results in newly flooded areas and properties. The intention of the climate change impact assessment is unclear - was it simply a sensitivity check or was the purpose to confirm that the design is compatible with future climate change? If the later, and IRPL has considered climate change in the assessment to identify measures that may need to be taken in the future to address increased impacts due to climate change, then the design appears to warrant further refinement to address identified increased impacts due to climate change.	Yucen Lu	DJV Flood Modeller	3/12/2024	As per the Conditions of Approval E42, flood impact assessment is only up to 1% AEP design event. So 1% AEP climate change is for sensitivity test only. This will be clearly stated in the Section 6.5.2 in the next design stage report.	Rev B report
State Government Agency	TfNSW	5-0052-210-IHY-W9-RP-0001_A.1 Bomen Yard Flood Design Report - For Consultation	Section 4.1	14/11/2024	Subcatchment definition	The subcatchment shapes are not ideal for use in WBNM. However, it is noted that the model was sourced from a prior study and was appropriately calibrated and validated.	Yucen Lu	DJV Flood Modeller	3/12/2024	Noted. The WBNM model was sourced from the Wagga Wagga Major Overland Flow Floodplain Risk Management Study and Plan (WMA Water 2021) . Therefore, the hydrology model methodology was not changed.	
State Government Agency	TfNSW	5-0052-210-IHY-W9-RP-0001_A.1 Bomen Yard Flood Design Report - For Consultation	Section 4.2.1.4	14/11/2024	Additional culvert details	The report notes that some culvert details were based on site photographs, and that the model may need to be updated when survey is received. Has this survey been collected? If so, TfNSW would expect this report to be updated with the revised culvert data.	Yucen Lu	DJV Flood Modeller	3/12/2024	The survey data has been received and the information will be updated in the next design report.	Rev B report
State Government Agency	TfNSW	5-0052-210-IHY-W9-RP-0001_A.1 Bomen Yard Flood Design Report - For Consultation	Section 6.5.1	14/11/2024	Blockage assumptions	Table 6-20 notes that culvert CH513446 had a 0% blockage based on ARR2019 guidelines. The size of this culvert was 0.375m. A 0% blockage only applies if the L10 is less than the width. TfNSW suggests that an L10 of less than 0.375m is unrealistic, unless evidence is available to support it. The guidance suggests an adoption of an L10 value of 1.5m for urban areas if no good evidence is available to the contrary.	Yucen Lu	DJV Flood Modeller	3/12/2024	The reason for adopting CH513446 culvert with 0% is: - the flow direction is perpendicular to the culvert - there are 3 cells in total for this culvert and it is less likely that 3 cells will be blocked uniformly at the same time. - the source area of the culvert is mostly classified as grazing land. Therefore, the L10 length was adopted less than 1m. However, a blockage factor (25%) will be applied to the culvert CH513446 by adopting L10 of 1.5m as a conservative sensitivity test. The results and map will be updated in the next design report.	Rev B report
State Government Agency	TfNSW	5-0052-210-IHY-W9-RP-0001_A.1 Bomen Yard Flood Design Report - For Consultation	Appendix A - Flood Maps	14/11/2024	Queries relating to Flood Maps	Regarding the Flood Maps in Appendix A: - The water level contour extents do not appear to align with the flood extents on most of the depth plots; the contours extend beyond the depth extents. This may be due to the depths being filtered. TfNSW suggests reviewing this to make sure the correct data is being shown. - The 1% AEP flood results in some areas show larger flood depths than the 1% AEP + Climate change event (Figures A3 and A4). The 1% AEP + Climate change results are smaller in the northern and central region of the map than the 1% AEP, though larger in the eastern section. This isn't the case with the velocity maps, which appear reasonable. Please confirm the correct data is being used to generate Figures A3 and A4. - There are no water level contours on Figure A19.	Yucen Lu	DJV Flood Modeller	3/12/2024	- A mapping cut-off depth filter is applied to the flood depth grid, which gives rise to discrepancies between contour and flood extents. This will be updated in the next design report. - The mapping cut-off depth filter applying to 1% AEP and 1% AEP CC are different, contributing to the differences. This will be updated in the next design report. - Noted. Flood level contours will be added to Figure A19 in the next design report.	Rev B report

APPENDIX D2

WWCC Review

Outlook

RE: BCS response: Feedback requested on Flood Design Reports for Albury to Illabo project - BCS

From Renee Shepherd <Renee.Shepherd@environment.nsw.gov.au>
Date Mon 2024-11-18 12:23 PM
To Simon Fisher <simon.fisher@martinus.com.au>

Wonderful – thanks for responding so quickly.

Regards,
Renee.

Renee Shepherd
Principal Project Manager – Infrastructure Projects, North West
Biodiversity, Conservation and Science Group
Department of Climate Change, Energy, the Environment and Water
M 0488 444 953 | **E** renee.shepherd@environment.nsw.gov.au
48-52 Wingewarra Street, Dubbo NSW 2830

dcceew.nsw.gov.au

From: Simon Fisher <simon.fisher@martinus.com.au>
Sent: Monday, November 18, 2024 8:38 AM
To: Renee Shepherd <Renee.Shepherd@environment.nsw.gov.au>; Chris Standing <chris.standing@martinus.com.au>
Cc: Zoe Cruice <zoe.cruice@martinus.com.au>; Rachel don-wauchope <rachel.don-wauchope@martinus.com.au>; Andrew Fisher <Andrew.Fisher@environment.nsw.gov.au>; Steve Manwaring <Steve.Manwaring@environment.nsw.gov.au>; Neal Albert <neal.albert@alluvium.com.au>; Scott Cooper <Scott.Cooper@planning.nsw.gov.au>
Subject: Re: BCS response: Feedback requested on Flood Design Reports for Albury to Illabo project - BCS

Hi Renee,

Confirming that relevant councils have been provided with an opportunity to review and comment on these reports. Flood design reports will also be developed for all Stage B sites and will include a demonstration of compliance with HFWQ4. These reports will also be issued for consultation in accordance with the conditions of approval.

Regards,

From: Renee Shepherd <Renee.Shepherd@environment.nsw.gov.au>
Sent: Friday, 15 November 2024 4:21 PM
To: Chris Standing <chris.standing@martinus.com.au>
Cc: Simon Fisher <simon.fisher@martinus.com.au>; Zoe Cruice <zoe.cruice@martinus.com.au>; Rachel don-wauchope <rachel.don-wauchope@martinus.com.au>; Andrew Fisher <Andrew.Fisher@environment.nsw.gov.au>; Steve Manwaring <Steve.Manwaring@environment.nsw.gov.au>; Neal Albert <neal.albert@alluvium.com.au>; Scott Cooper <Scott.Cooper@planning.nsw.gov.au>
Subject: BCS response: Feedback requested on Flood Design Reports for Albury to Illabo project - BCS

Some people who received this message don't often get email from renee.shepherd@environment.nsw.gov.au. Learn why this is important

Hi Chris,

BCS has reviewed the five flood design reports you attached in the email below.

We do not have any specific comments to make on these plans given that these sites have minimal to no impact on flooding, and the proposed works are minor in nature.

It would be appreciated if you could confirm whether the relevant councils are having the opportunity to review and comment on these plans.

Finally, we would also like to confirm that mitigation measure HFWQ4 will be addressed in the Stage B flood design reports where relevant:

> *"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 DPE – BCS".*

Regards,
Renee.

Renee Shepherd
Principal Project Manager – Infrastructure Projects, North West
Biodiversity, Conservation and Science Group
Department of Climate Change, Energy, the Environment and Water
M 0488 444 953 | **E** renee.shepherd@environment.nsw.gov.au
48-52 Wingewarra Street, Dubbo NSW 2830

dcceew.nsw.gov.au

From: Chris Standing <chris.standing@martinus.com.au>
Sent: Tuesday, October 29, 2024 11:47 AM
To: Renee Shepherd <Renee.Shepherd@environment.nsw.gov.au>
Cc: Simon Fisher <simon.fisher@martinus.com.au>; Zoe Cruice <zoe.cruice@martinus.com.au>; Rachel don-wauchope <rachel.don-wauchope@martinus.com.au>
Subject: CM Record: Feedback requested on Flood Design Reports for Albury to Illabo project - BCS

Dear Renee,

Martinus Rail has been engaged by Inland Rail Pty Ltd (IRPL) to design and construct the Albury to Illabo (the project) section of the Inland Rail Program.

We would like to thank you for your participation so far in the project's design and assessment, through the Environmental Impact Statement (EIS) and Preferred Infrastructure Report (PIR) processes that were run by ARTC and IRPL. Your feedback has helped ARTC and IRPL to identify key risks and opportunities, as well as to highlight management and mitigation processes during construction. You can find the EIS and the PIR on the Major Projects website: https://www.planningportal.nsw.gov.au/major-projects/projects/inland-rail-albury-illabo

Martinus Rail is in the process of detailed design finalisation and we are seeking your feedback on the Flood Design Reports that have been developed for The Rock Yard, Culcairn, Uranquinty, Bomen and Henty. Please note that additional reports for the remaining sites are currently under development and will be issued subsequently when they become available.

These reports have been drafted to meet the requirements of the Conditions of Approval (CoA) issued to the project by the Department of Planning, Housing and Infrastructure.

The purpose of these reports is to demonstrate the impacts, if any, of the project's detailed design for the full range of flood events.

In the link below you can find the relevant draft Flood Design Reports for your review.

07. BCS

We are aware that the list of people we have sent this email may not be the most appropriate people to review. Please kindly download the relevant documents and the comments spreadsheet and send onto them.

If you are interested in providing your feedback, please kindly review the document(s) in the folder above and fill out the spreadsheet provided. Alternatively, if you are not interested in providing feedback on these documents, please let us know in writing.

Consultation will close on **Monday, 18 November 2024**.

Please reach out if you have any questions or need any support with this process.

Kind regards,

Chris Standing

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Any views expressed in this email are those of the individual sender except where the sender expressly and with authority states them to be the views of the NSW Office of Environment, Energy and Science.

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APPENDIX E

Independent Flood Consultant Review

Project: 2300 **Deliverable:** Bomen Yard

Comment Sheet Reference: 5-0052-210-IHY-W9-CS-0001-PE_C

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-W9-RP-0001_B	TUFLOW files	Hatch	Sam Drysdale	Flood Assessment	16/12/2024	DDR	Stabilise the pipes downstream of NP2745A and review the connection between the drainage line and the cross-drainage asset.	Minor	Yucen Lu	DJV Flood Modeller	22/01/2025	Noted. The pipes downstream of NP2745A will be stabilised in the next design stage.	IFC flood models	Dan Williams	Hatch	17/08/2026	CLOSED	The pipe now appears to be running stable
2	5-0052-210-IHY-W9-RP-0001_B	TUFLOW files	Hatch	Sam Drysdale	Flood Assessment	16/12/2024	DDR	Add in missing sub-catchments to the south.	Minor	Yucen Lu	DJV Flood Modeller	22/01/2025	Noted. The missing sub-catchments to the south will be included in the next design stage.	IFC flood models	Dan Williams	Hatch	17/08/2026	CLOSED	The model inflows have been extended further to the south
3	5-0052-210-IHY-W9-RP-0001_B	TUFLOW files	Hatch	Sam Drysdale	Flood Assessment	16/12/2024	DDR	Review the requirement for the bunds at the southern end of the cess drain and ensure consistency between the design drawings and flood assessment report.	Minor	Yucen Lu	DJV Flood Modeller	22/01/2025	The DDR FDR submission is after the DDR drawings. So there is some discrepancy between the FDR and the drawing regarding the bund at the end of the cess drain. However, this has been discussed and agreed upon with other disciplines. In the next design stage, the proposed works within FDR and drawings will be consistent.	IFC flood models	Dan Williams	Hatch	17/08/2026	CLOSED	Drawings have been updated to include the bunds
4	5-0052-210-IHY-W9-RP-0001_B	TUFLOW files	Hatch	Sam Drysdale	Flood Assessment	16/12/2024	PDR	Inclusion of the detail survey and further IFC works as stated within the design report.	Minor	Yucen Lu	DJV Flood Modeller	22/01/2025	Noted. The detailed survey and IFC works will be included in the next design stage.	IFC flood models	Dan Williams	Hatch	17/08/2026	CLOSED	Model details have been updated with the detailed survey
5	5-0052-210-IHY-W9-RP-0001_0	TUFLOW files	Hatch	Dan Williams	Flood Assessment	46251	IFC	In reviewing the model inflows it was noted that the main inflow upstream of the works (sub-catchment 88) was not ideally implemented as it should be on the upstream (eastern) side of Byrnes Rd, being predominantly input to the model between the road and rail alignments. The inflow could also be better distributed to ensure that the correct volume of water arrivers at the inlets of the road cross-drainage structures (3x525 and 4x600). This model change was implemented as part of the PE works, with the 1% AEP 90 minute TP1 event being simulated as a sensitivity test. This resulted in a greater portion of inflow reporting to 4x600 and less to 3x525. The change to the modelled peak flood level impacts was a general reduction in impact to the west of the northern end of the works and an increased impact to the east of the works at the southern end (~50 mm in an area of open space), as shown in the image below. 	Opportunity						Dan Williams	Hatch	17/08/2026	CLOSED	
								No further comments											



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