

MEMORANDUM

To [REDACTED] | City of Ballarat
From [REDACTED] | Water Technology
Date 18 June 2026
Subject Ballarat 11 Waterways Amendment C217ball – Integra Response
Our ref 26010601_M01_V01_Integra.docx

1 SCOPE OF MEMORANDUM

Water Technology were engaged by the City of Ballarat to prepare a response addressing the specific matters raised by Integra that require modeller input, including:

- Consideration of existing and planned drainage infrastructure (e.g., PSP/DCP infrastructure such as Pipe 117 and RB3 drainage) in the modelling.
- Clarification of the approach to model current conditions vs future/planned infrastructure.
- Consistency of climate change scenarios applied in the flood study relevant to other planning work (as relevant).
- Any commentary on the appropriateness of FO vs LSIO application from a flood behaviour perspective.

Directive from the City of Ballarat are the response does not require a full review of the Integra submission, but rather a focussed response on the technical modelling matters only.

2 TECHNICAL RESPONSE

Responses to the key issues submitted by Integra relating to Amendment C217ball is as follows.

2.1 Consideration of Existing and Planned Drainage Infrastructure (e.g., PSP/DCP infrastructure such as Pipe 117 and RB3 drainage)

It is understood that Pipe 117 refers to the connection of RB02 (located the Ballymanus Estate) to the Kensington Creek, where it enters the culvert under Ballarat-Carngham Road. While this infrastructure would reduce the presence of overland flows during frequent storm events, the inundation observed during the 1% AEP RCP8.5 event (for the year 2100) would still resemble the extents currently modelled. The 1% AEP inundation at this location is driven by flood waters in the Kensington Creek accumulating at Ballarat-Carngham Road and rising towards RB02. Although Pipe 117 is proposed, it was not including in the modelling given it has not been constructed.

Drainage infrastructure associated with RB3 was based on As Constructed plans provided by the City of Ballarat which detailed the wetlands volume and outlet arrangement to RB04. Any works that were undertaken on the wetland (RB03) post 2023 or not shown in the As Constructed plans, were not included in the hydraulic model. Should information on the works be made available, such as a diversion channel to RB04 for spilling flows or changes in the embankment heights, alterations to the overlays may be considered.



2.2 Clarification of the approach to model current conditions vs future/planned infrastructure

The inclusion of planned drainage infrastructure was not included in hydrologic or hydraulic models. Pre-emptively including this infrastructure would have implications if it the construction of infrastructure was delayed or designs were to change. This could result in inaccurate overlays and it was determined only constructed infrastructure would be included in the modelling and mapping.

2.3 Consistency of climate change scenarios applied in the flood study relevant to other planning work (as relevant)

Any flood studies commenced post August 2024 are undertaken in line with Australian Rainfall and Runoff Version 4.2, which requires modelling current and future conditions using projected global warming levels under a range of potential climate projection scenarios called Shared Socioeconomic Pathways. The hydrology component of this study was completed in 2019 and the hydraulics revised and completed in early 2024 before the release of ARR4.2.

The climate change scenarios adopted for this study adopted the recommendations in ARR4.1, which used projected global warming levels under different climate projection scenarios called Regional Concentration Pathways.

Under the climate change scenario adopted, the 1% AEP storm event was increased by a factor of 1.184 (18.4%) for the 2100 RCP8.5 scenario. Climate change modelling under the current standard, ARR4.2, requires scaling of rainfall data to reflect current climate levels by accounting for the increase in global warming level since the baseline IFD representation period (1961-1990). Should planning controls be delineated using ARR4.2 recommendations it would be for the year 2100 and would likely entail a 34% to 86% in rainfall intensity.

2.4 Any commentary on the appropriateness of FO vs LSIO application from a flood behaviour perspective.

The delineation of FO and LSIO is intended to highlight areas which are inundated in a 1% AEP event (LSIO) and areas which provide significant flood water conveyance and are therefore high hazard (FO). The overlays provide relevant authorities with the ability to enforce set controls on any works or developments that intersect with the overlays. With stronger controls within the FO. In some cases, FO controls may not be necessary if they restrict the ability to do earthworks with the intent of improving flood risk. However, this may also depend on the schedules associated with the overlay.



3 CAPABILITY STATEMENT

3.1 Report Authors

██████████
Senior Engineer
Water Technology Pty Ltd
1/5 Bridge Street
Newtown, VIC 3220

Qualifications:

- Bachelor of Engineer (Civil) (Hons), Deakin University, 2017

Affiliations:

- Member, Institution of Engineers Australia

Area of Expertise:

- Assessment of flood and stormwater management;
- Expert in hydrological and hydraulic modelling;
- Advanced knowledge in application of GIS.

██████████
Senior Principal Engineer
Water Technology Pty Ltd
15 Business Park Drive
Notting Hill, VIC 3168

Qualifications:

- Bachelor of Engineering (Environmental) (hons), RMIT University, 2007
- Graduate Certificate, River Health Management, University of Melbourne, 2009

Affiliations:

- Member, Institution of Engineers Australia, Chartered Professional Engineer
- Member, Water Industry Operators Association of Australia
- Member, National Engineers Register

Area of Expertise:

- Assessment of flood and stormwater management;
- Expert in hydrological and hydraulic modelling;
- Expert witness for drainage and flood related issues at environmental effects panels, planning panels and civil hearings.