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GLENORCHY CITY COUNCIL
PLANNING SERVICES
APPLICATION No. : PLN-25-178
DATE RECEIVED: 6 May 2026

Flood Hazard Report Rev 2 – Conversion of Garage to Habitable Building

555 Main Road, Montrose – Rev 2

52899HC | 24 Apr 2025

Document Set ID: 3615183
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Revision History

Revision	Description	Date
0	Issue to Council	26 February 2025
1	Revision as per Council RFIs and discussions	23 April 2025
2	Revision as per Council feedback and issue to Client for inclusion in DA submission	24 April 2025

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1. Introduction

This report is revised to respond to feedback received from Council by email on 20 March 2025 and 27 March 2025, and as per a meeting held on site with Council on 16 April 2025.

1.1 Site overview

The proposed development is for the conversion of a garage / workshop to a mostly habitable building on the property 555 Main Road, Montrose. Below are shown the site survey and the layout of the proposed habitation. Roughly a quarter of the building will be a workshop / garage and remain non-habitable.

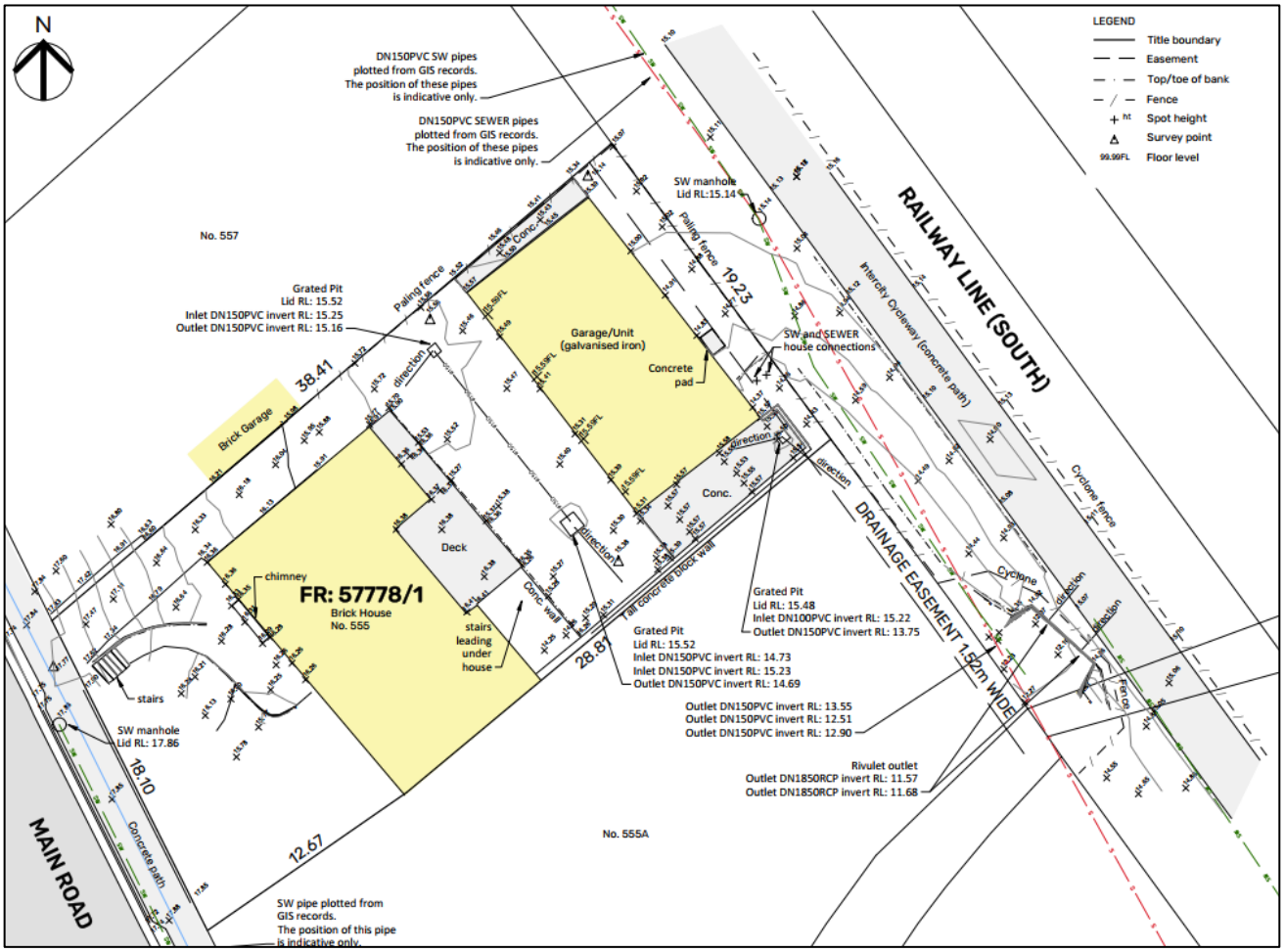

Figure 1 – Site survey

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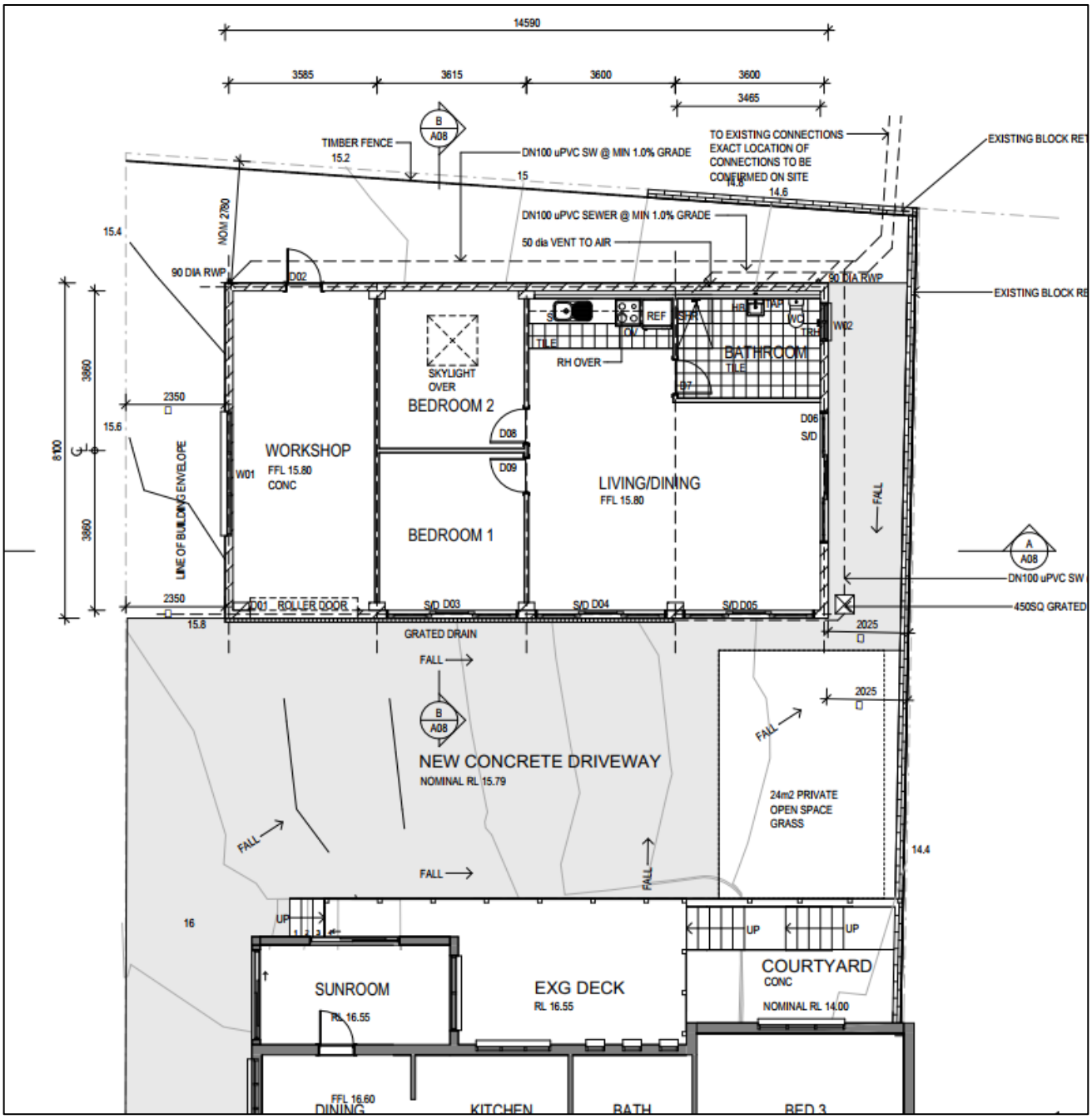

Figure 2 – Proposed habitation

1.2 Purpose of report

The purpose of the report is to assess the flood hazard posed to the new dwelling. There are two sources of potential hazard – flooding in the creek and flows entering the courtyard via the driveway.

1.3 Council Flood Modelling

According to the Council flood modelling, the site is located in a flood hazard zone. See an extract from the Council flood mapping below. Prompted by the flood mapping, Council has requested a flood hazard report.

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We believe that there is an inaccuracy in the mapping in the sense that the flood depths are not consistent with the location of the creek and the culvert under the railway line. In addition, according to the GCC GIS, the culvert consists of twin DN1500 pipes, whereas according to our detailed survey, the one pipe is DN1500 and the other DN1850.

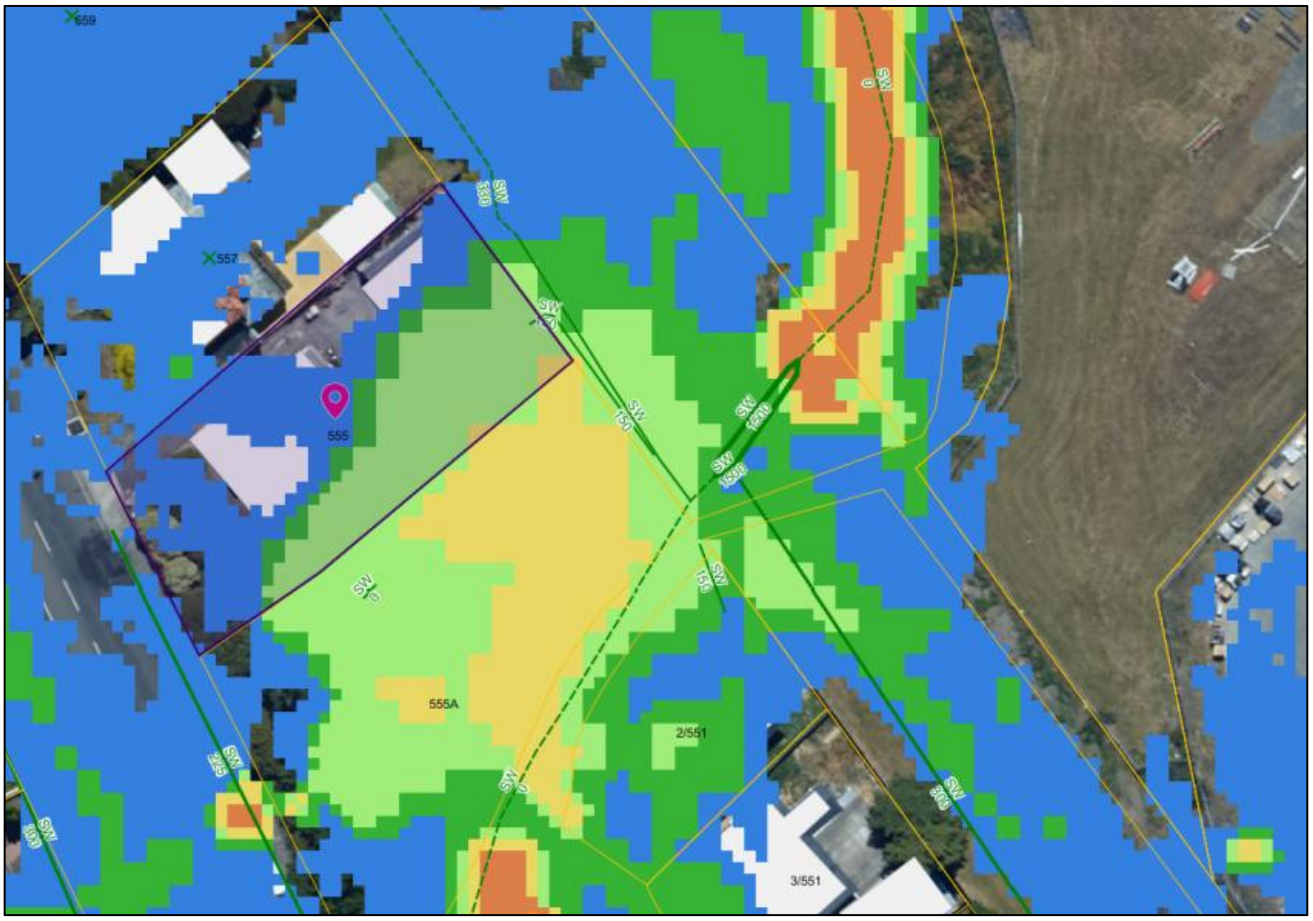

Figure 3 – Council flood mapping – 1% AEP RCP8.5 2090

It was therefore regarded as necessary to create a new flood model.

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2. Flood Model

A 2D flood model was created in TUFLOW, with input data and parameters as summarised below.

2.1 Extent of model and boundary conditions

The extent of the flood model is shown below.

Figure 4 – Extent of model

Council provided 1% AEP flow hydrographs which were applied to the indicated boundaries in the figure above. Listed below with same numbering as in the image:

1. 2D flow hydrograph for flows from #557 Main Road. See below.
2. 2D flow hydrographs for flows across Main Road. See below.
3. 2D flow hydrograph for flows incoming from #547 Main Road. See below.
4. 1D flow hydrograph for flows through Main Road culvert. See below.

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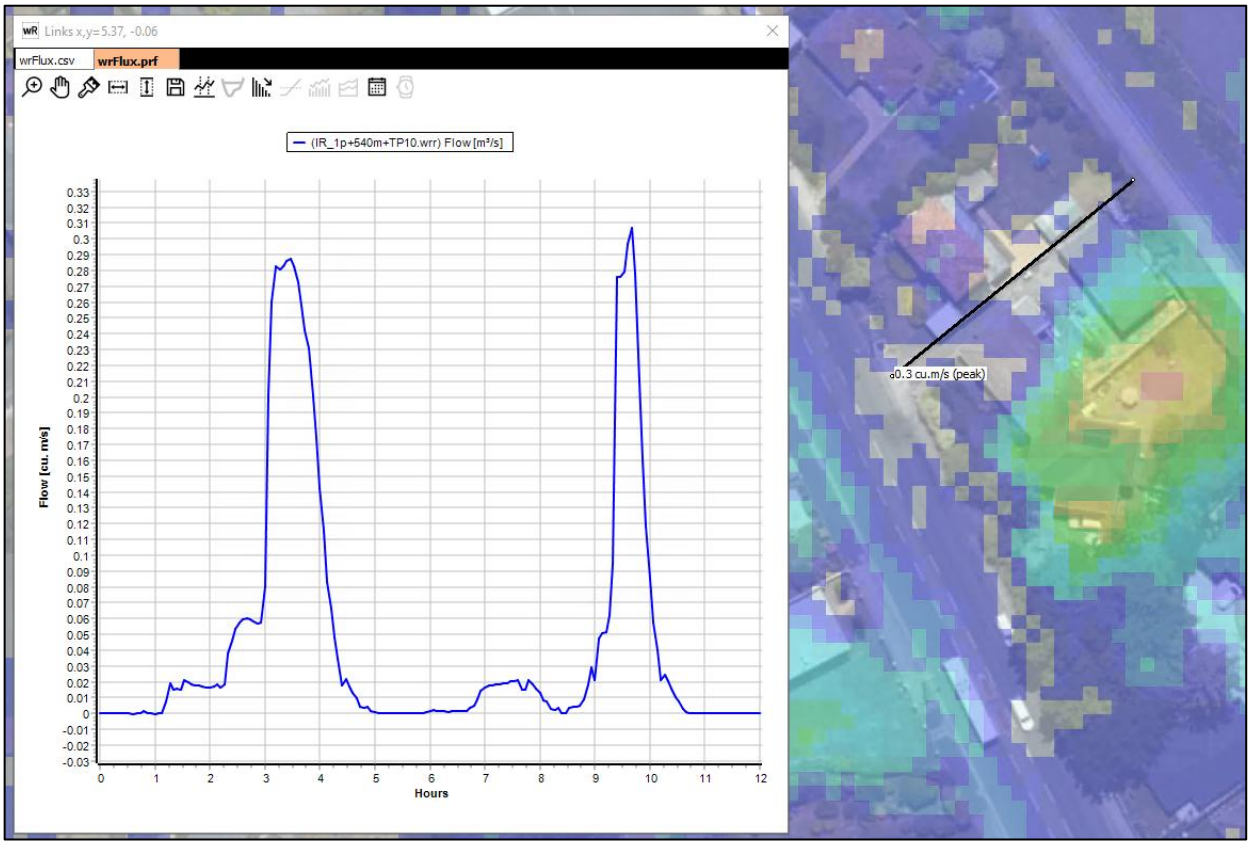

Figure 5 – 2D hydrograph for 1% AEP, 540 min, TP10 – from 557 Main Road

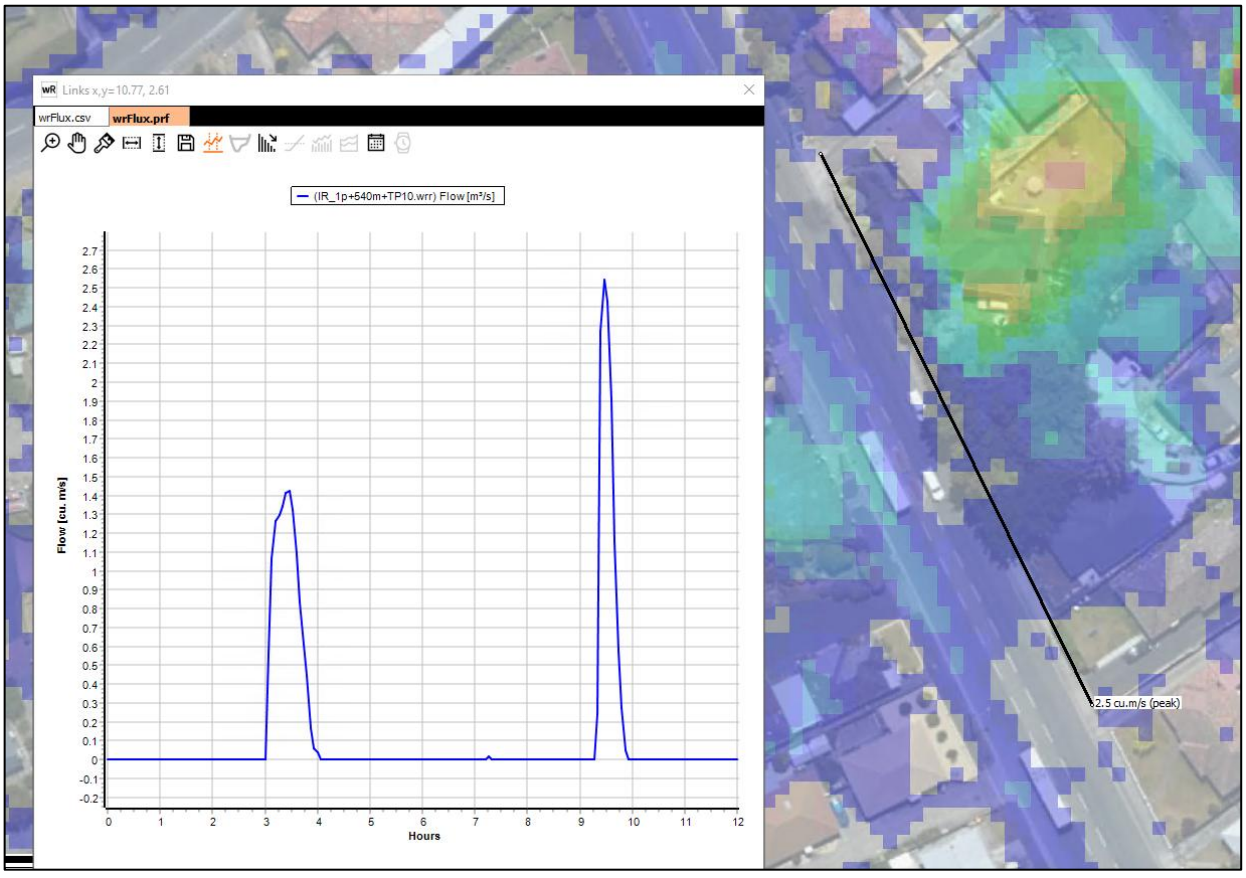

Figure 6 – 2D hydrograph for 1% AEP, 540 min, TP10 – from across Main Road

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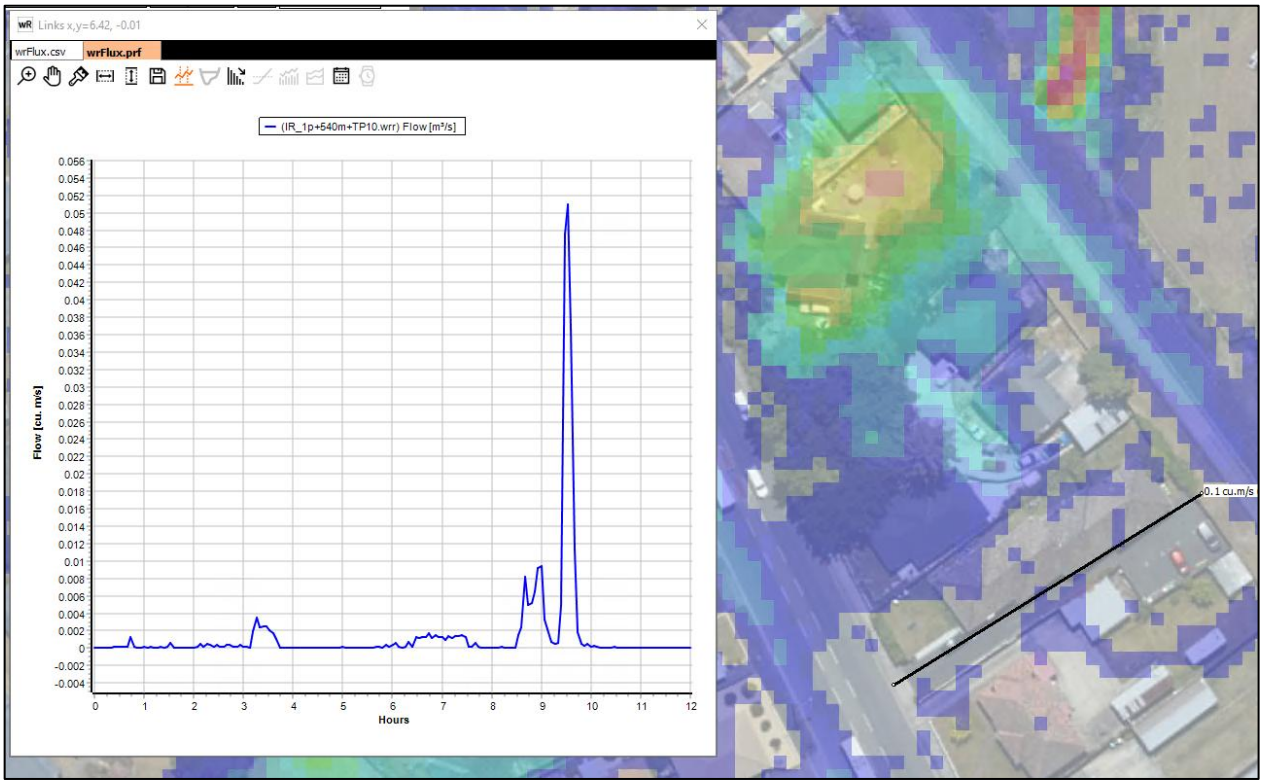

Figure 7 – 2D hydrograph for 1% AEP, 540 min, TP10 – from 547 Main Road

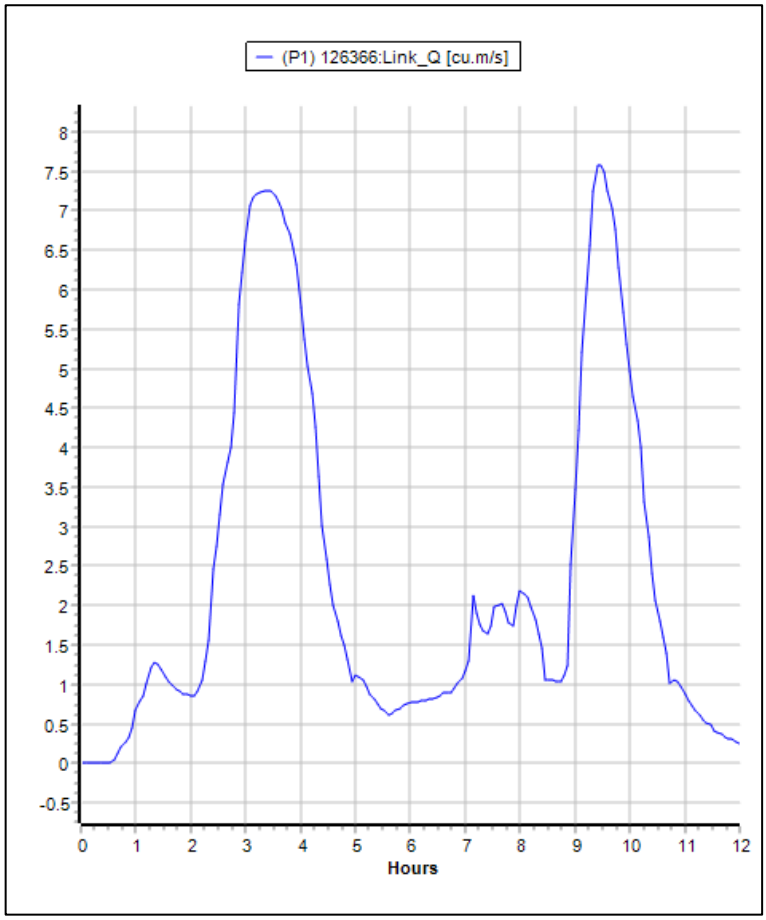

Figure 8 – 1D hydrograph for 1% AEP, 540 min, TP10 – Culvert from under Main Road

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The downstream boundary condition was applied along the Brooker Highway, with a nominal energy slope of 0.01. This is located far enough downstream not to be of consequence for the site in question.

2.2 Rainfall

In addition to the applied boundary conditions, rainfall was applied directly onto the gridded model of the topography. The rainfall data was imported from BOM and ARR for a 1% AEP event with a duration of 540 minutes and ARR temporal pattern TP10. In order to try match the input of the GCC model, a climate change correction was applied – namely SSP5-8.5 for the year 2090. The data for the RCP8.5-2090 was no longer available for TUFLOW, so the SSP5-8.5 data was used, which is the most recent update to the climate change corrections which ARR recommends. This hybrid scenario will be more conservative than the scenario currently used by Council.

Rainfall losses were modelled by means of the IL-CL method using loss values obtained from ARR by means of the TUFLOW ARR plugin in QGIS, QGIS being the GIS interface used.

2.3 Modelling of buildings

The existing and proposed dwelling were modelled as concrete slabs set at their respective finished floor levels. In the previous revision of this report, these buildings had been excluded from the model.

2.4 Grid resolution

Because the modelled area is small, it was feasible to use a small grid resolution of 0.5 m. In additional to this, TUFLOW allows a technique called sub-grid sampling, which takes into account the levels of points within each grid cell, to allow for more accurate estimate of storages within each cell. Sub-grid sampling was applied with 5 samplings for each grid direction.

2.5 Fences

The fences along the east and north of the site were regarded as providing no obstacle to surface flows. In the previous revision of this report, the fences had been modelled as presenting barriers to flow.

2.6 Topographical data

A detailed survey was conducted of the site and the creek between Main Road and the railway line. The data was then merged with LiDAR data of the surrounding area, to produce surface data for input into TUFLOW. The courtyard area between the two dwellings was modelled as per the survey. However, it is to be noted that the courtyard is not yet complete. Some base material and a concrete pavement are to be placed, which will create a finished concrete surface that is 50 mm below the FFL of the new dwelling.

2.7 Surface roughness

The surface roughness was modelled using the following Mannings n-values:

- Asphalt and concrete surfaces – 0.013
- Landscaping and grass – 0.03
- Existing and new dwelling - value 0.5.

2.8 Simulated duration

A duration of 12 hours was simulated, which gives enough time for the applied hydrographs to pass through the model.

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2.9 GIS data

GIS data of stormwater assets was downloaded from the GCC GIS portal. Of relevance were three stormwater assets:

- 3.7m x 2.8m rectangular box culvert under Main Road
- Twin DN1500 pipes under the railway line – these were confirmed to be one DN1850 and one DN1500 pipe during the detailed survey. Because it was difficult to model two pipes with different diameters with the same start and end point, the pipes were modelled as twin 1 690 mm pipes, which have the equivalent conveyance.
- Single DN1800 pipe downstream of the railway line.

2.10 Stormwater upgrades to existing property

Since the time of initial discussions with Council, the owner has implemented some stormwater upgrades to the courtyard area, as seen below.

- Three grated pits
- DN150 pipes draining the courtyard area to the drainage easement

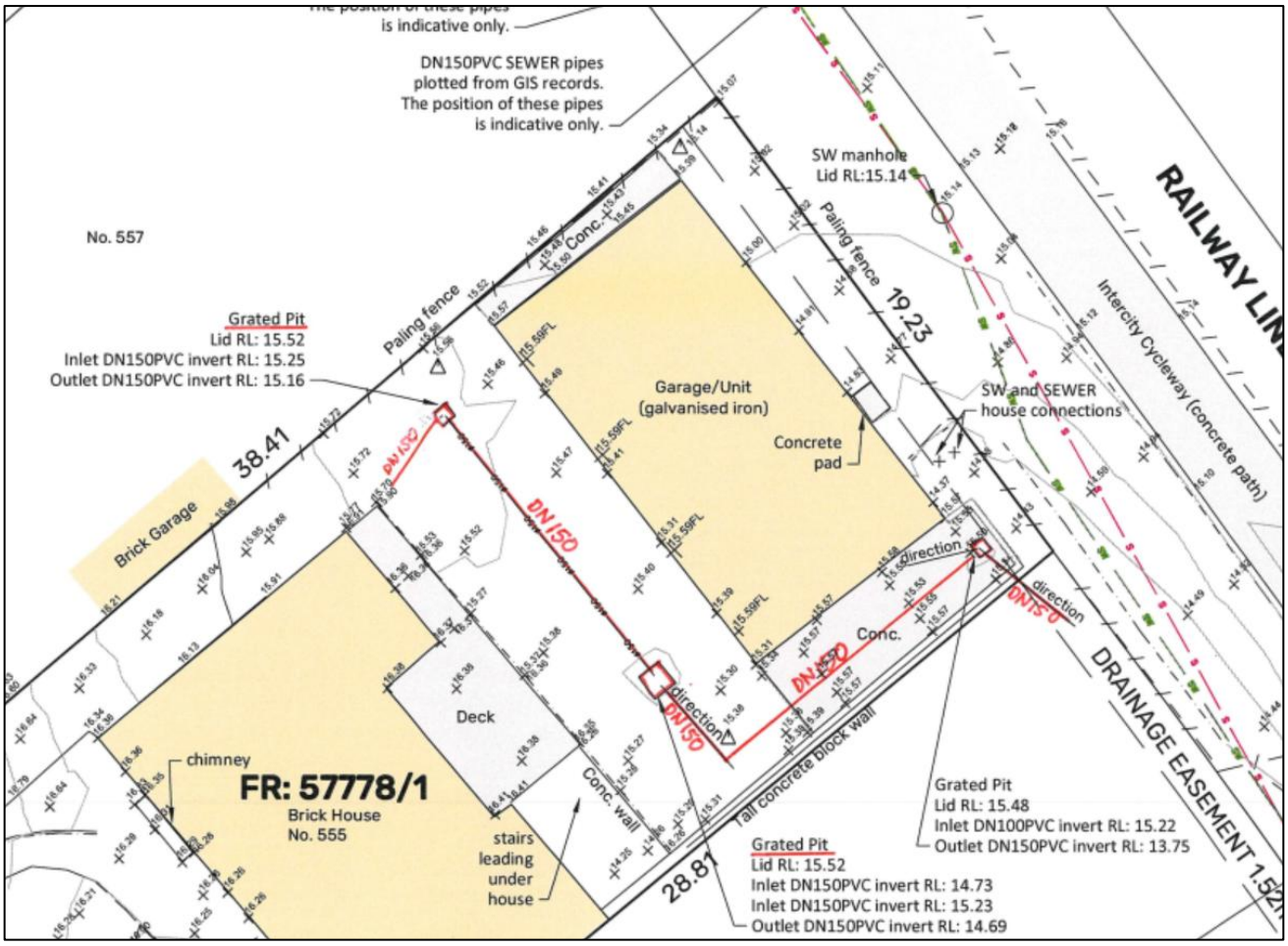

Figure 9 – Recently implemented stormwater upgrades

Further stormwater works are recommended and these will be discussed later.

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3. Results

3.1 Flood Depths

The resulting flood depth mapping is shown as a screenshot below and more completely in the Annexures. The light blue is for depths between 50 mm and 300 mm. A zoom-in of the courtyard area with velocity vectors is also shown.

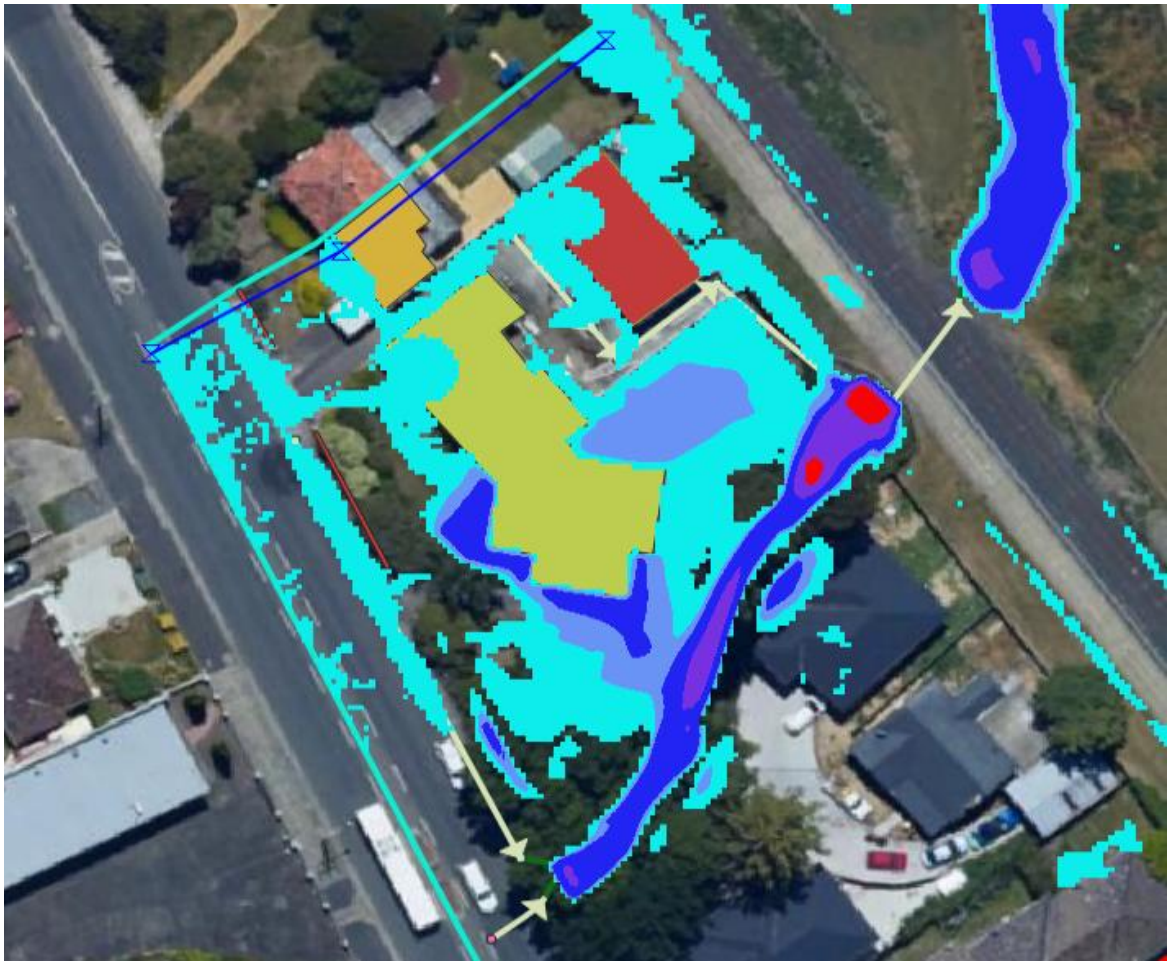

Figure 10 – Screenshot of flood depth mapping for 1% AEP, 540 min, TP10 – existing levels and infrastructure (RCP8.5)

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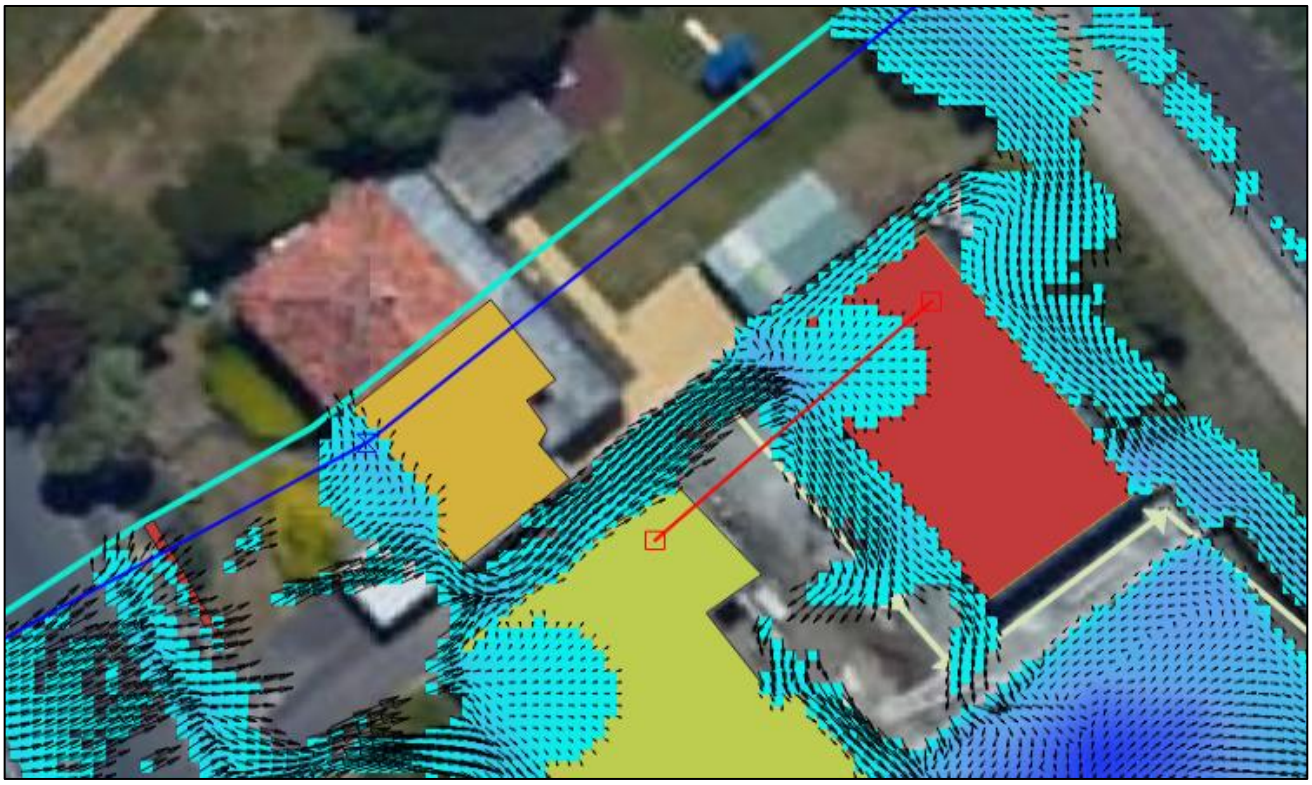

Figure 11 – Zoom in of courtyard – (with velocity vectors) – 1% AEP, 540 min, TP10, RCP8.5

See in the figures below several cross sections through the site.

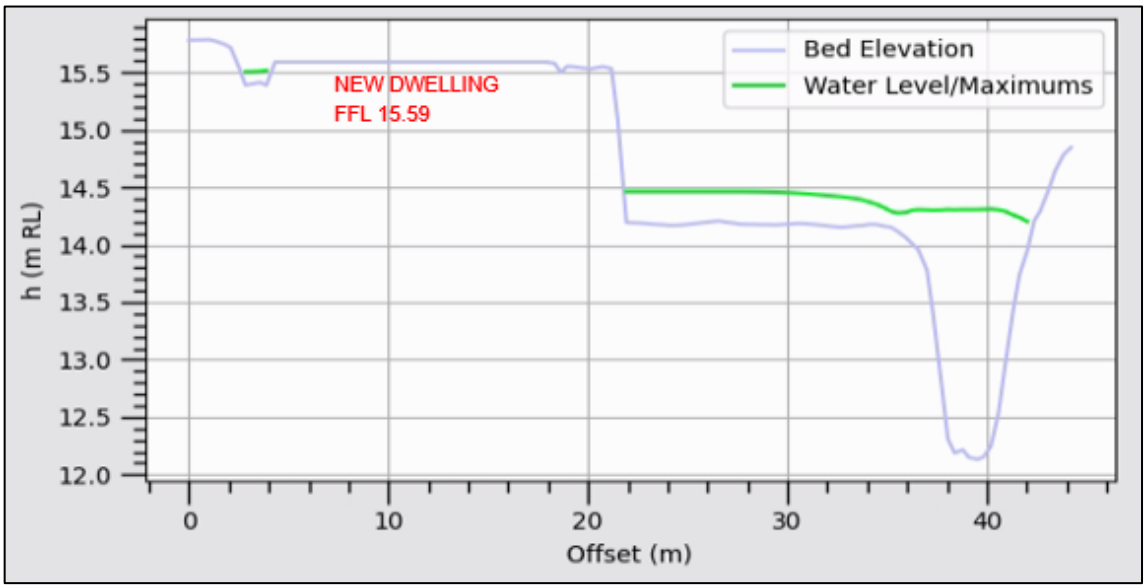

Figure 12 – Cross-section through watercourse and new dwelling 1% AEP, 540 min, TP10 – existing levels (RCP8.5)

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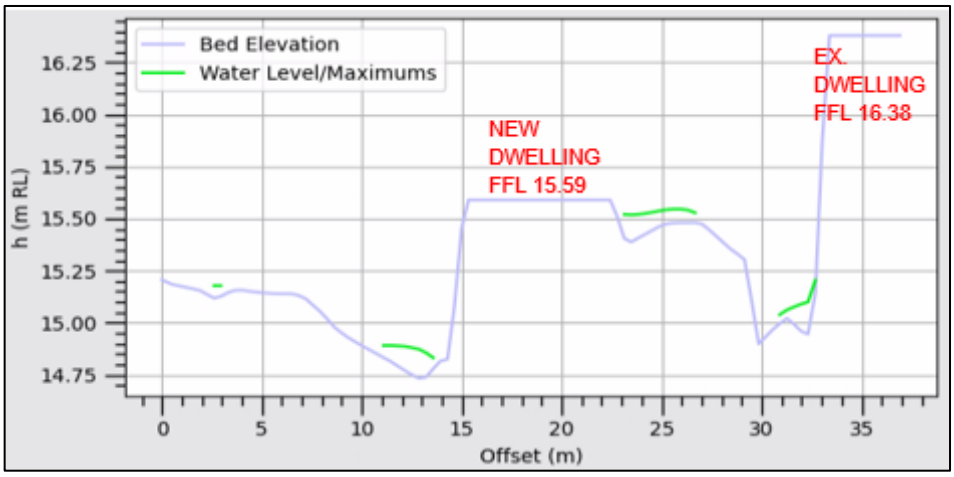

Figure 13 – Cross section through courtyard and rail embankment 1% AEP, 540 min, TP10 – existing levels (RCP8.5)

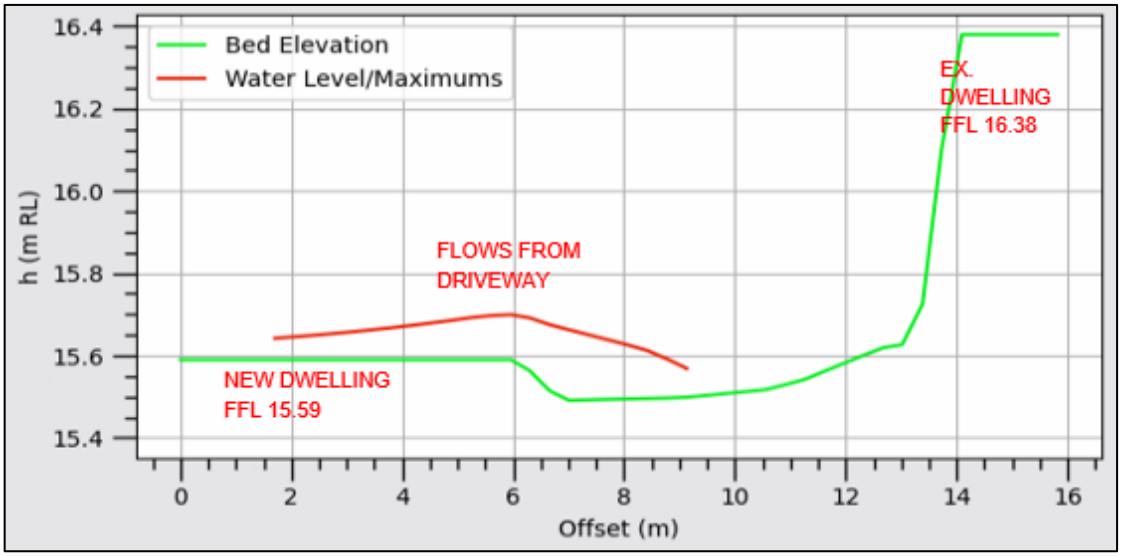

Figure 14 – Cross section courtyard immediately next to driveway 1% AEP, 540 min, TP10 – existing levels (RCP8.5)

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3.1 Flood Hazards

Flood hazards were mapped in accordance with the hazard categories of the Australian Institute for Disaster Resilience. See categories below, followed by screenshots of the hazard mapping for the site, with the same colour coding.

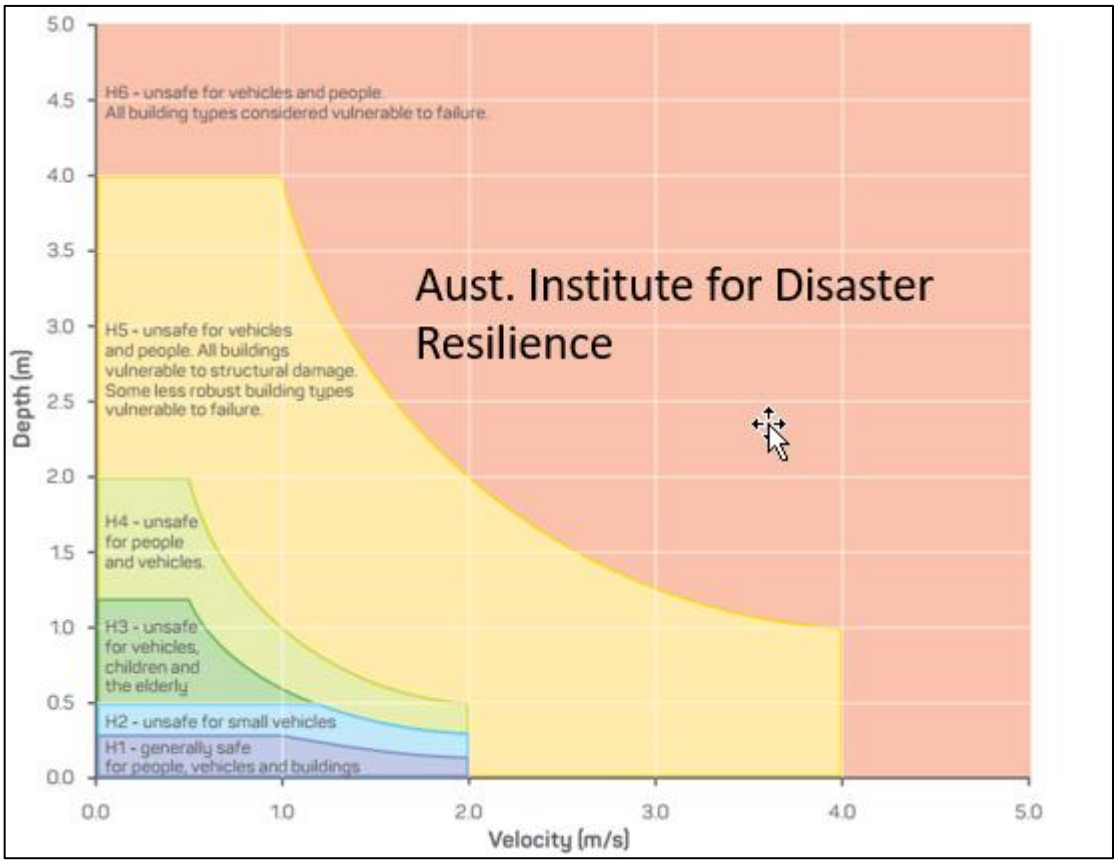

Figure 15 – Hazard categories of the Australian Institute for Disaster Resilience

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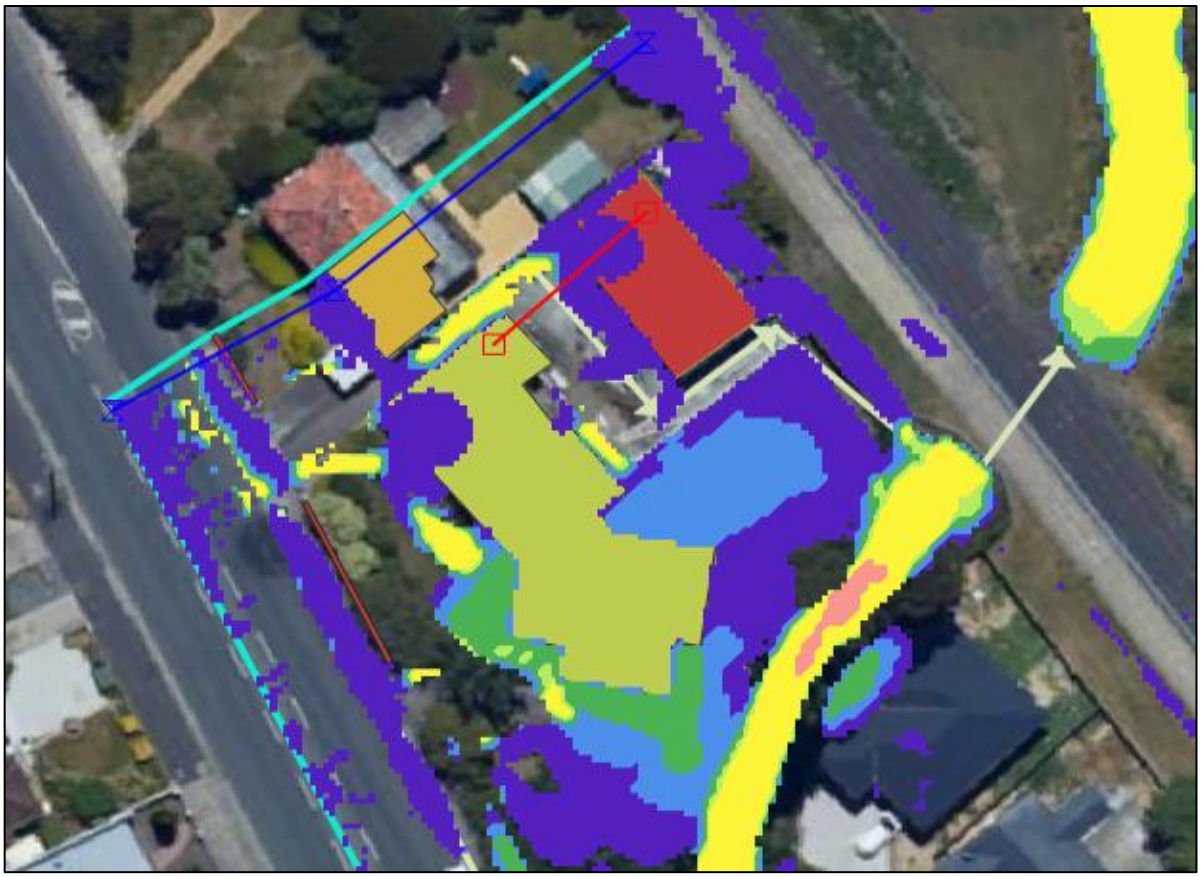

Figure 16 – Screenshot of hazard mapping – 1% AEP, 540 min, TP10 – RCP8.5

Figure 17 – Zoom-in of hazard mapping – 1% AEP, 540 min, TP10 – RCP8.5

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3.3 Discussion

Flood risk from the creek

The predicted flow through the railway culvert in the Council modelling was 0.54 m³/s, whereas the revised modelling predicts a flow of 10.78 m³/s, as seen in the screenshots below. We believe this is due to the different position of the creek in topographical surfaces used in the Council modelling and the revised modelling. The consequence is that less water is trapped above the railway line and hence the flood levels are lower. The water surface elevation upstream of the railway embankment is estimated to be about RL 14.5 m. This is comfortably below the finished levels of the proposed dwelling and parking area.

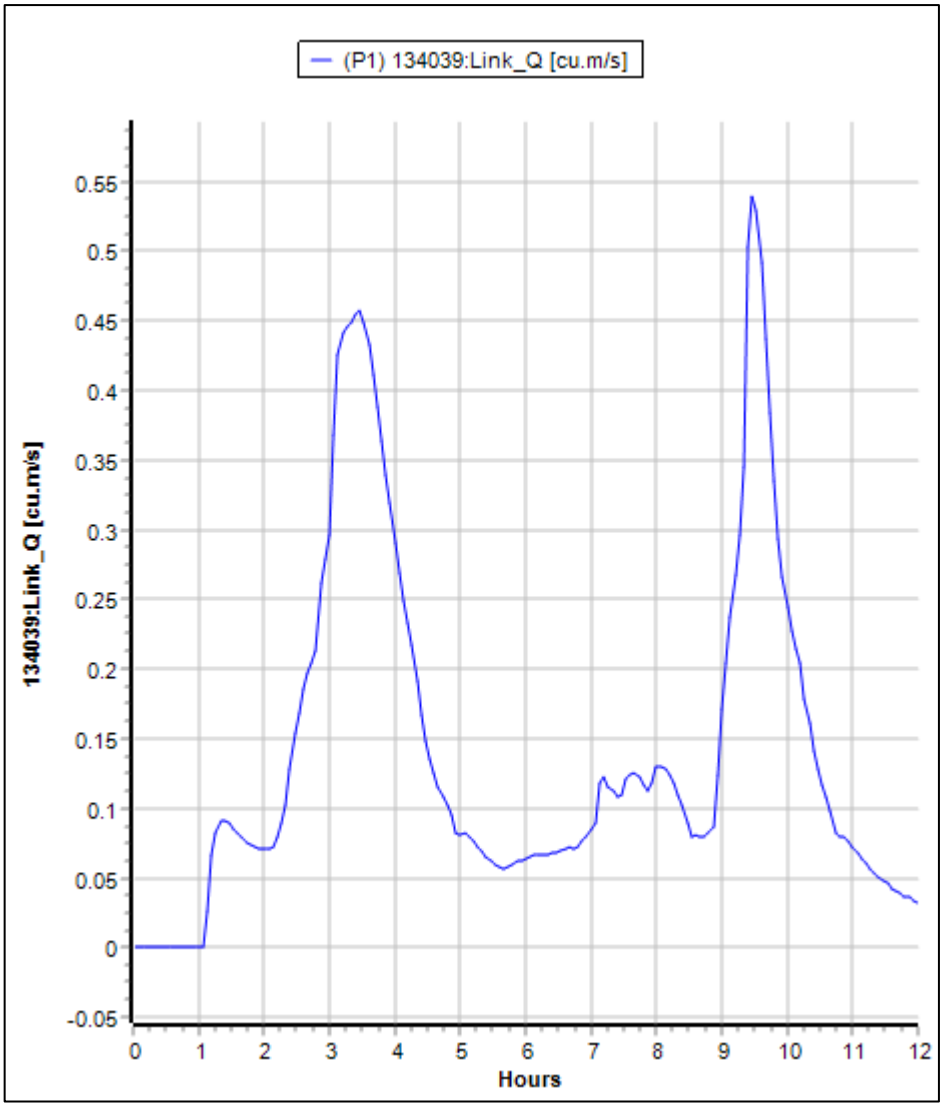

Figure 18 – Flows in railway culvert as predicted by existing modelling

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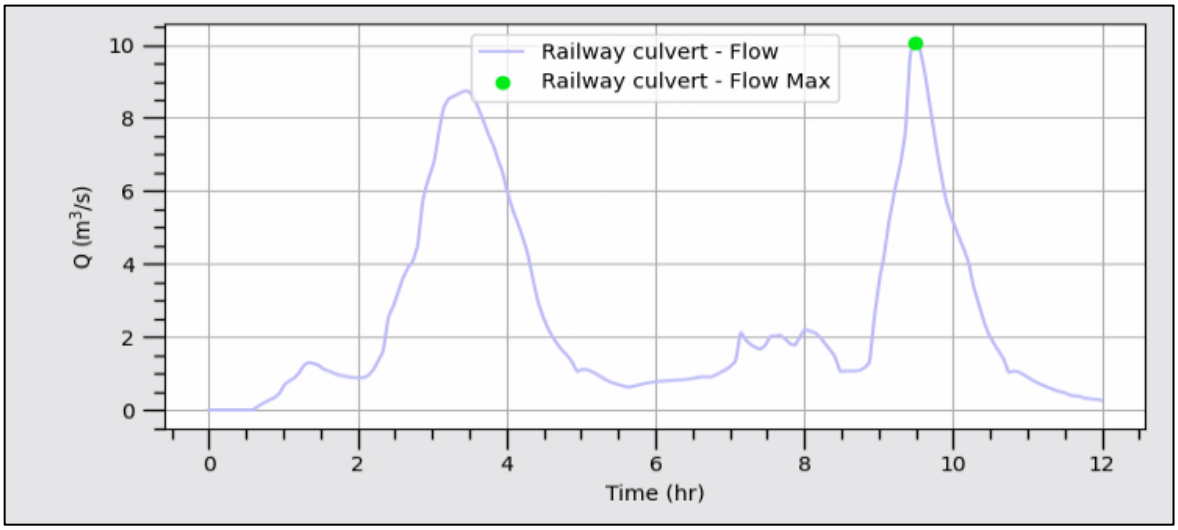

Figure 19 – Flows in railway culvert as predicted by revised (PDA) model

Flood risk in courtyard area

The model predicts that water will run into the courtyard area and potentially run into the proposed dwelling. It is therefore recommended that mitigation measures be implemented – shown in the figure below:

- 200 mm ACO or similar grated trench across the driveway
- 100 mm ACO or similar grated trench along the front of the new dwelling. This is also specified on the architect's drawings.

We note that the flows in the driveway are mapped as being H5. This is due to the velocities being greater than 2.0 m/s. However, the velocities are below 2.5 m/s and the predicted flow depth is around 75 mm. We note that this is due to the steep driveway and that GCC is willing to accept a velocity limit of 3 m/s.

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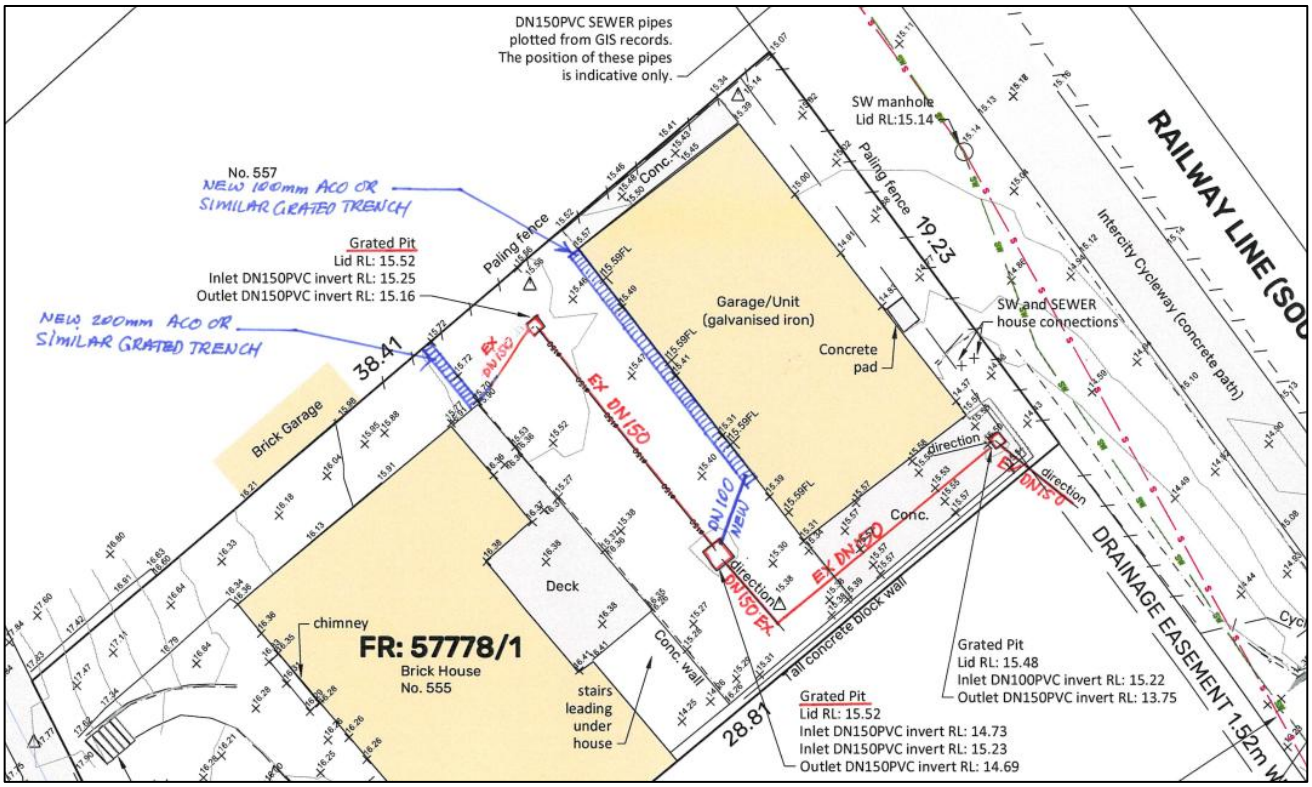

Figure 20 – Proposed SW mitigation measures

Risk of water entering the building

Although the model predicts water entering the building, this is concentrated in the northern quarter of the building, which is earmarked to be a workshop / garage. This can be seen in the screenshot below.

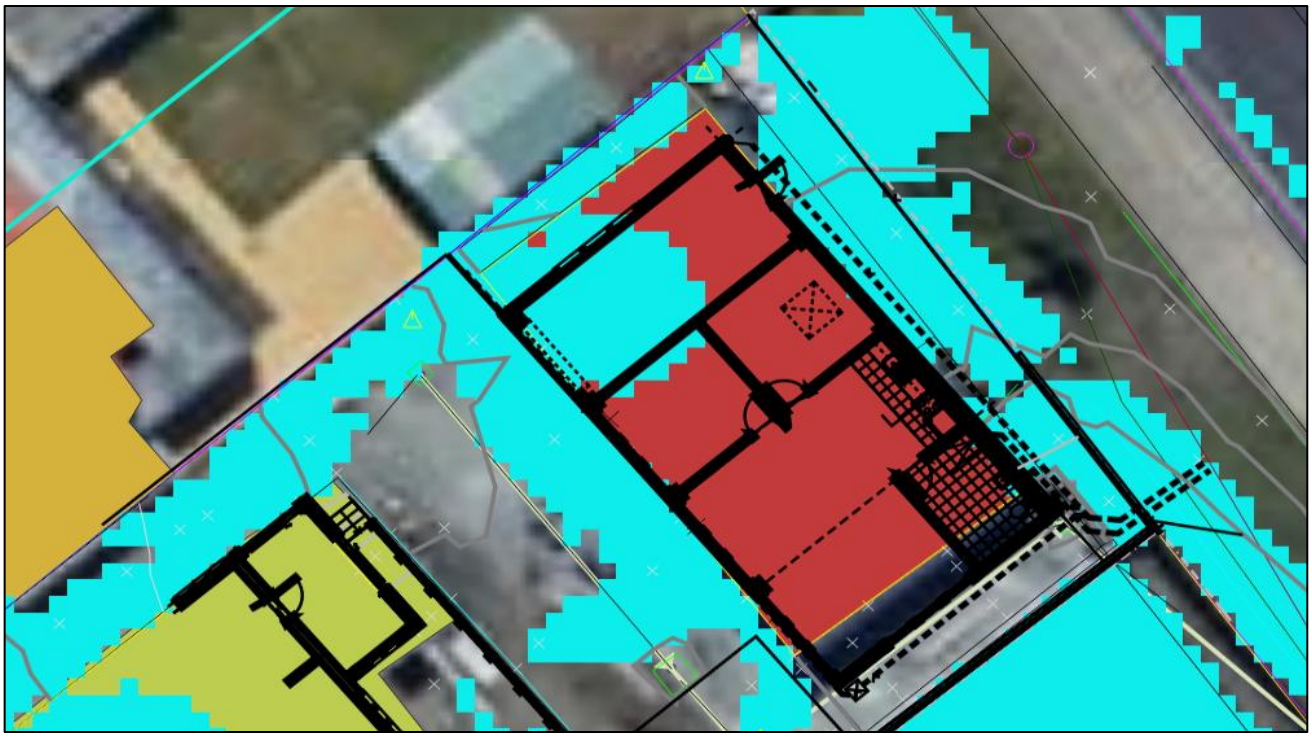

Figure 21 – Water concentrated in garage area

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4. Review Against Planning Scheme

4.1 TPS Clause C12.5.1

Table 1 reproduces of TPS Clause C12.5.1: Uses within a flood-prone hazard area.

Table 1 – TPS Clause C12.5.1 Uses within a flood-prone hazard area

C12.5.1 Uses within a flood-prone hazard area

Objective:	That a habitable building can achieve and maintain a tolerable risk from flood.
Acceptable Solutions	**Performance Criteria**
A1 No Acceptable Solution.	**P1.1** A change of use that, converts a non-habitable building to a habitable building, or a use involving a new habitable room within an existing building, within a flood-prone hazard area must have a tolerable risk, having regard to: (a) the location of the building; (b) the advice in a flood hazard report; and (c) any advice from a State authority, regulated entity or a council. **P1.2** A flood hazard report also demonstrates that: (a) any increase in the level of risk from flood does not require any specific hazard reduction or protection measures; or (b) the use can achieve and maintain a tolerable risk from a 1 % annual exceedance probability flood event for the intended life of the use without requiring any flood protection measures.

Performance Criterion P1.1(a) has been adopted and is discussed later.

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4.1 TPS Clause C12.6.1

Table 2 shows an overview of TPS Clause C12.6.1: Buildings and works within a flood-prone hazard area.

Table 2 – TPS Clause C12.6.1 Building and works within a flood-prone hazard area

C12.6.1 Buildings and works within a flood-prone hazard area

Objective:	That: (a) building and works within a flood-prone hazard area can achieve and maintain a tolerable risk from flood; and (b) buildings and works do not increase the risk from flood to adjacent land and public infrastructure.

Acceptable Solutions	**Performance Criteria**
A1 No Acceptable Solution.	**P1.1** Buildings and works within a flood-prone hazard area must achieve and maintain a tolerable risk from a flood, having regard to: (a) the type, form, scale and intended duration of the development; (b) whether any increase in the level of risk from flood requires any specific hazard reduction or protection measures; (c) any advice from a State authority, regulated entity or a council; and (d) the advice contained in a flood hazard report. **P1.2** A flood hazard report also demonstrates that the building and works: (a) do not cause or contribute to flood on the site , on adjacent land or public infrastructure; and (b) can achieve and maintain a tolerable risk from a 1% annual exceedance probability flood event for the intended life of the use without requiring any flood protection measures.

Performance Criteria P1.1(a) – (c) have been adopted and are discussed later.

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5. Responses in terms of Performance Criteria

C12.5.1 P1.1

A change of use the converts a non-habitable building to a habitable building, or a use involving a new habitable room within an existing building, within a flood-prone hazard area must have a tolerable risk, having regard to:

(a) The location of the building;

As demonstrated above, the level of the building is high enough not to be affected by the flood level in the creek in a 1% AEP event, where the RCP8.9 2090 climate change scenario has been accounted for.

Furthermore, the flows that are predicted to enter the building from the driveway are almost entirely confined to the non-habitable portion of the building. Any flow which may enter a remaining portion of the building will fall under hazard rating H1, which is generally considered safe. In addition to this, grated trenches are proposed as a mitigation, as discussed above.

The predicted velocity of the flow entering the courtyard down the driveway is under 2.5 m/s with a maximum depth of 75 mm. This is an existing condition which will be improved upon by the introduction of a grated trench across the driveway.

We believe that the above conditions will pose a tolerable risk to users of the new dwelling.

C12.6.1 P1.1

Buildings and works within a flood-prone hazard area must achieve and maintain a tolerable risk from a flood, having regard to:

(a) the type, form, scale and intended duration of the development;

As discussed above, the flood model predicts a tolerable flood risk for a time horizon till 2090, based on the climate change scenario currently applied by Council.

(b) whether any increase in the level of risk from flood requires and specific hazard reduction or protection measures;

We recommend that Council continue its regime of maintenance of the creek to prevent build up of debris and blockages. Fortunately for the property in consideration, the cycleway / railway embankment will overtop before rising sufficiently to affect the property in question.

(c) any advice from a State authority, regulated entity or a council; and

No relevant advice has been received from an Authority.

(d) the advice contained in a flood hazard report.

To our knowledge, no other relevant flood hazard report exists.

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6. Summary

1. A 1% AEP event has been modelled, with flood hydrographs provided from Council for the RCP8.5 2090 scenario and rainfall for the SSP5-8.5 2090 scenario;
2. The modelling shows that the flood levels in the creek are more than a meter below the finished level of the proposed dwelling. Blockages of the railway culvert have not been considered in the modelling, but in the event of a blockage occurring, the railway culvert will overtop before the flood level would push up to the FFL level of the proposed building.
3. Flows from above the site, entering the driveway and courtyard, may pose a nuisance in large events, but flood risk is tolerable and in addition, mitigation measures in the form of grated trenches across the driveway and along the front of the new dwelling are proposed.

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Annexure A – A3 Flood Depth Map

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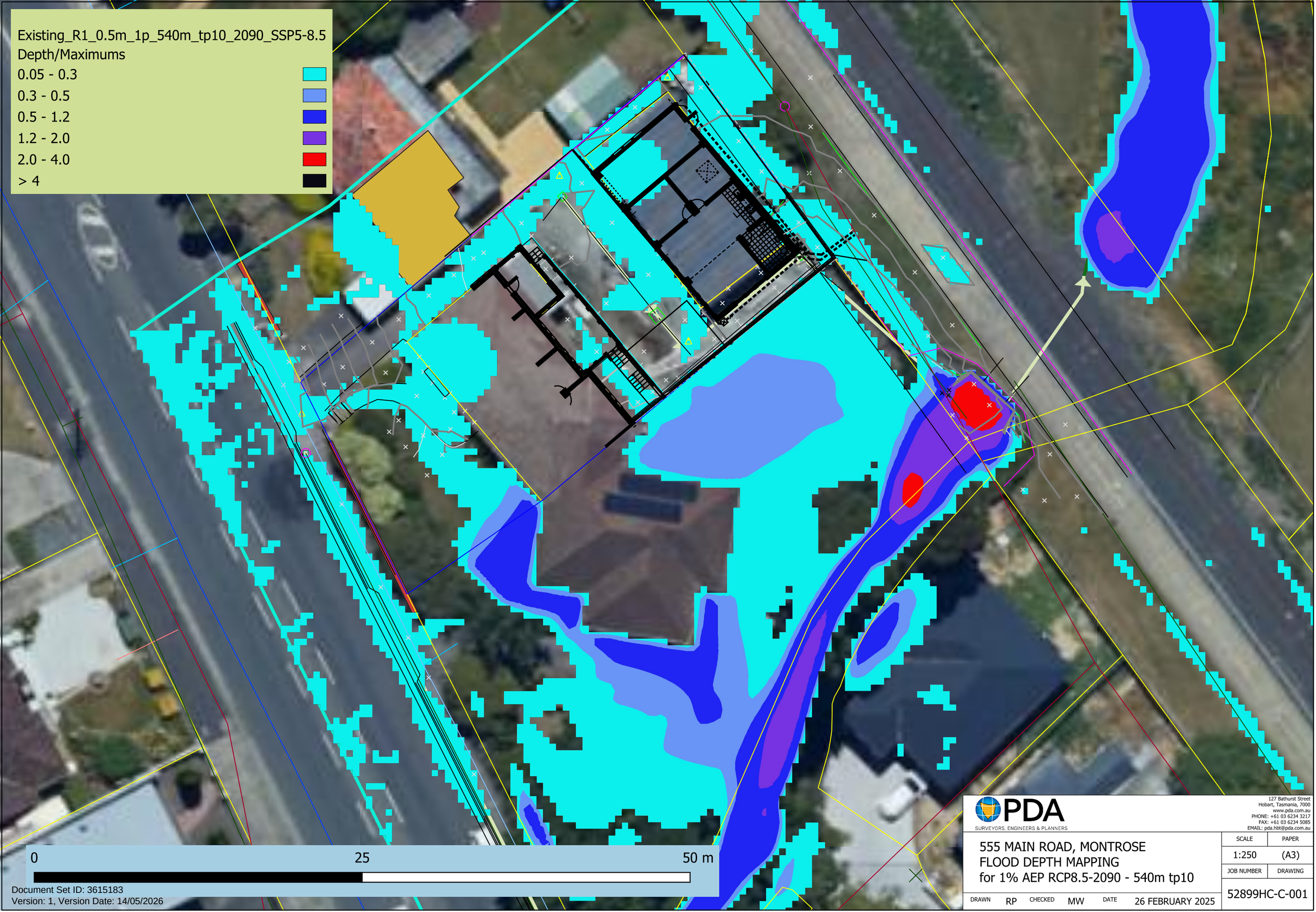

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555 MAIN ROAD, MONTROSE
FLOOD DEPTH MAPPING
for 1% AEP RCP8.5-2090 - 540m tp10

SCALE	PAPER
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JOB NUMBER	DRAWING
52899HC-C-001	

DRAWN	CHECKED	DATE
RP	MW	26 FEBRUARY 2025

Annexure B – A3 Flood Hazard Map

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Existing_R1_0.5m_1p_540m_tp10_2090_SSP5-8.5
ZAEM1/Maximums

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

0 25 50 m

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555 MAIN ROAD, MONTROSE
FLOOD HAZARD MAPPING
for 1% AEP RCP8.5-2090 - 540m tp10

SCALE	PAPER
1:250	(A3)
JOB NUMBER	DRAWING
52899HC-C-001	

DRAWN RP CHECKED MW DATE 26 FEBRUARY 2025

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1 SITE PLAN
1 : 200

LEGEND

- NEW SEWER PVC
- NEW STORMWATER PVC
- EXISTING STORMWATER
- EXISTING SEWER
- GP1 450MM SQ GRATED PIT
- GP2 900MM GRATED PIT
- 100MM & 200MM ACO CHANNEL HEAVY DUTY
- WC TOILET
- S SINK
- BSN BASIN
- SHR SHOWER
- LT LAUNDRY TROUGH
- WM WASHING MACHINE
- HWS HOT WATER SERVICE
- IO INSPECTION OPENING
- BIO BOUNDARY INSPECTION OPENING
- ORG OVERFLOW RELIEF GULLY
- DP DOWNPIPE
- FW FLOOR WASTE

SITE LOCATION:

555 MAIN RD, ROSETTA
STORMWATER AND SEWER UPGRADE TO PVC

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