ENGENY

WINDELLAMA ROAD & GTSMF
Goulburn

Flood Impact and Risk Assessment

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3	16/02/2024	Client Issue	Simon Tang / Tim Shen	Daniel Niven	Tim Shen p.p	Daniel Niven NER 2311734 BE (Civil) Hons I
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GENERAL SUMMARY

The proposal is sought to rezone land by way of Planning Proposal from RU1 Primary Production to R5 Large Lot Residential, consistent with council's growth management strategy upon a three-hundred and seventy-seven (377) hectare site within two (2) kilometre proximity to the township of Goulburn. The proposal demonstrates compliance with the Environmental Planning and Assessment Act 1979, relevant Ministerial directions, guidelines, flood manual, council's strategic requirements, LEP and DCP requirements. Compliance with regulatory matters regarding flooding is demonstrated in Section 4 of this report.

This Flood Impact and Risk Assessment (FIRA) report provides the details of the following:

- Development and validation of a flood sub-model based on the Goulburn Floodplain Risk Management Study and Plan model provided by Council, including extension of the model to include the site.
- Refinement of the flood sub-model to create a base case hydraulic model with simulation of the 20%, 10%, 5%, 1%, 0.5%, 0.2%, and PMF events.
- Modification of the base case hydraulic model to include the proposed development with simulation of the 20%, 10%, 5%, 1%, 0.5%, 0.2%, and PMF events.
- Considers emergency response issues and options and provides management measures consistent with the Goulburn Mulwaree Local Flood Plan (NSW State Emergency Service, 2021).

All key reporting locations show a reduction or no worsening when compared between base and developed cases, with proposed works now providing flood free access to and through the site in a 1% AEP 36-hour duration event. This means the proposed channels are functioning as designed to constrain overland flows within the channel.

Based on the flood impact mappings attached (refer to Appendix E), in the 1%, 0.2% and 0.5% AEP flood event there is a flood level increase of approximately 30mm adjacent to the Northern boundary of the site near Rosemont Road. The predicted flood increases do not cause any impact to other properties or road structures, and therefore the observed flood level increases are considered acceptable as no impact and or actionable damage is observed external to the site.

The future residential homes will be protected from the Probable Maximum Flood (PMF) level. However, discussions with Council, State Emergency Service (SES) and the Department of Planning and Environment (DPE) have resulted with evacuation routes from the site to show the evacuation potential of the intermediate events between the 1% AEP and PMF. It is understood that it is not advised to drive through flooding of any depth, however the results indicate that the flood hazard along these routes is categorised as H1 and H2, which are considered generally safe/trafficable for most vehicles.

It is considered that when the proposal proceeds to detailed design there will be scope to further refine each channel capacity, flow rate, and manage overland flow to further reduce the risk of flooding for the locality.

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1. INTRODUCTION

1.1 Background

Engeny Australia Pty Ltd (Engeny) has been engaged by Windellama Road Pty Ltd & GTSMF Pty Ltd C/- Design Build Instruct Pty Ltd (hereby referred to as 'the Client') to undertake a Flood Impact and Risk Assessment (FIRA) to support a planning proposal (rezoning) for the Mountain Ash Road Precinct (hereby referred to as 'the Site'). The Site, shown in Figure 1.1 is located within the Goulburn Mulwaree Council (Council or GMC) local government area (LGA) and to the south and east of the Goulburn township. The site is also included within Council's Local Growth Management Strategy for R5 lands. R5 lands are defined as Large Lot Residential.

The Site's western boundary is located 350 m from the banks of the Gundary Creek. There are 10 non-perennial drainage channels mapped within the NSW Water Management (General) Regulation 2018 Hydro Line spatial data (NSW Government, 2023).

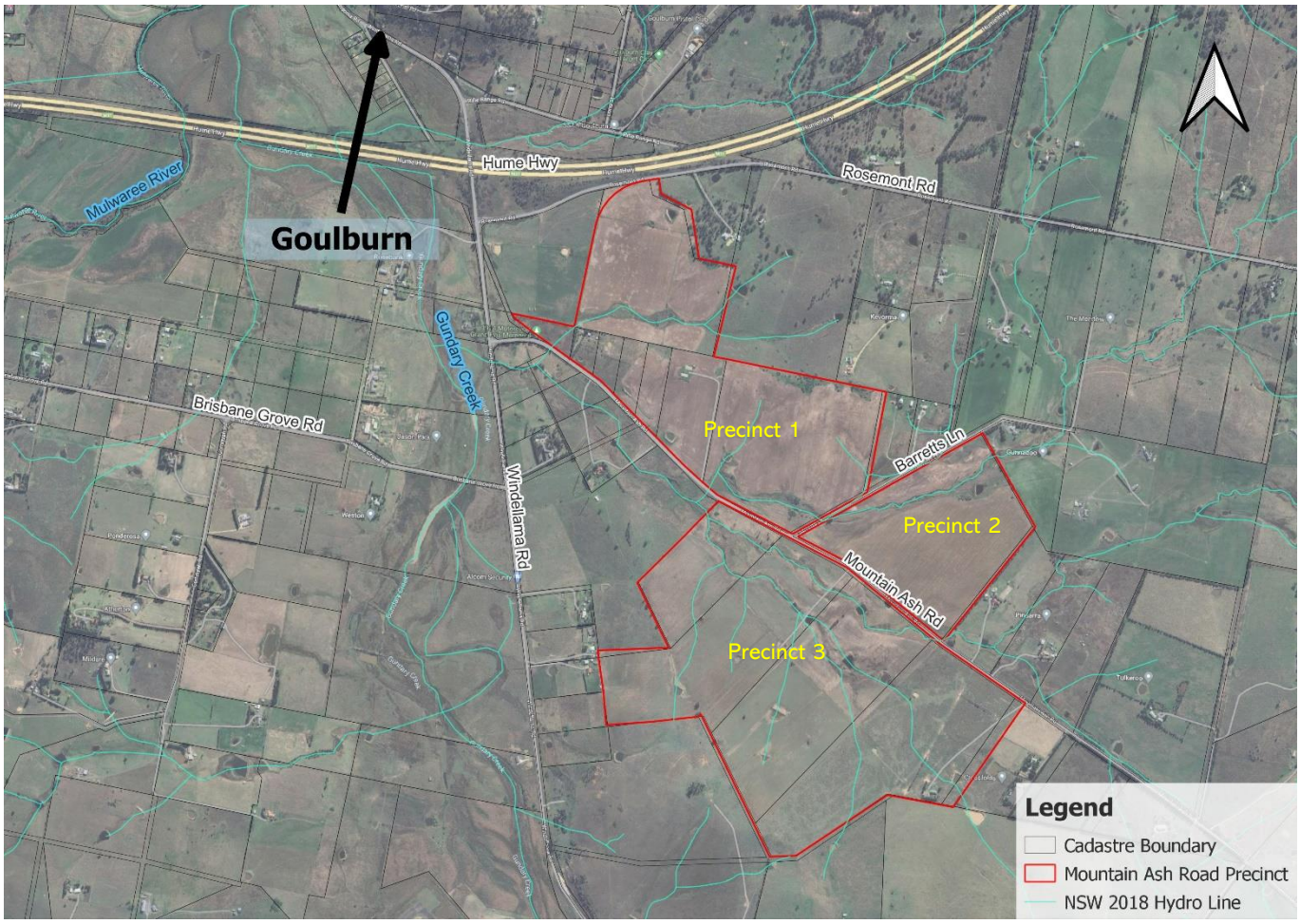

FIGURE 1.1: SITE LOCALITY

This report is an update of August 2023 FIRA to address the comments raised by Council, State Emergency Service (SES) and the Department of Planning and Environment (DPE) around the flood risks associated with the proposed layout.

1.2 Objectives

The scope of works for this FIRA includes consideration of the following:

- Development and validation of a hydraulic sub-model based on the Goulburn Floodplain Risk Management Study and Plan model provided by Council, including extension of the model to include the site.
- Refinement of the hydraulic sub-model to create a base case hydraulic model with simulation of the 20%, 10%, 5%, 1%, 0.5%, 0.2% and PMF events.
- Modification of the base case hydraulic model to include the proposed development with simulation of the 20%, 10%, 5%, 1%, 0.5%, 0.2% and PMF events.
- Review of the proposed development layout against the relevant flood planning controls and legislation.
- Determine and apply controls required to manage flood risk to the development and future residents.
- Consider emergency response issues and options and provide management measures consistent with the Goulburn Mulwaree Local Flood Plan (NSW State Emergency Service, 2021).
- Delivery of a technical report including a summary of results and key findings from the FIRA.

2. FLOOD MODELLING

2.1 Background Information & Existing Models

The existing Council's hydrologic (WBNM) and hydraulic (TUFLOW) models form part of the Goulburn Floodplain Risk Management Study and Plan (FRMSP) GRC Hydro completed July 2022, were provided to Engeny. Details of the model development were documented in the Wollondilly and Mulwaree Rivers Flood Study completed by WMAwater (WMA) on behalf of Council in 2016 and was revised to implement the updates to the Australian Rainfall and Runoff Guidelines 2019 (ARR2019).

According to the WMA flood study, 2016, the hydraulic model was built using joint event modelling where two flood mechanisms (independent or otherwise) interact to produce flood results. Flooding at Goulburn can result from the Wollondilly and Mulware rivers, thus the following scenario controls were implemented into the hydraulic model.

- Wollondilly.
- Mulwaree.
- Goulburn.

The Goulburn scenario combines the flow from Wollondilly River and Mulwaree River and is considered appropriate for the purpose of assessing the flood impact and risk associated with the site. This hydraulic model was used as a basis for developing a sub-model that was extended to cover the study area and truncated both upstream and downstream area to reduce simulation time (refer Section 2.3, for specific model details).

2.2 Sub-Model Hydrologic Assessment

No changes to the existing hydrologic (WBNM) were made. All simulated events, durations and temporal patterns are listed in Table 2.1. Critical duration and temporal pattern relevant to the Site were identified and listed in Table 2.2.

TABLE 2.1: SIMULATED HYDROLOGIC MODEL EVENTS

Events (AEP%)	Duration (mins)	TP
20	720, 1080, 1440, 2160, 2880, 4320, 5760, 7200, 8640	tp1 to tp10
10	720, 1080, 1440, 2160, 2880, 4320, 5760, 7200, 8640	tp1 to tp10
5	720, 1080, 1440, 2160, 2880, 4320, 5760, 7200, 8640	tp1 to tp10
2	720, 1080, 1440, 2160, 2880, 4320, 5760, 7200, 8640	tp1 to tp10
1	720, 1080, 1440, 2160, 2880, 4320, 5760, 7200, 8640	tp1 to tp10
0.5	720, 1080, 1440, 2160, 2880, 4320, 5760, 7200, 8640	tp1 to tp10
0.2	720, 1080, 1440, 2160, 2880, 4320, 5760, 7200, 8640	tp1 to tp10

TABLE 2.2: DEFINED CRITICAL DURATION AND TO RELEVANT TO SITE

Events (AEP%)	Duration (mins)	TP
20	2160	tp7
10	2160	tp7
5	2160	tp7
2	2160	tp7

Events (AEP%)	Duration (mins)	TP
1	2160	tp7
0.5	2160	tp5
0.2	2160	tp5

2.3 Sub-Model Hydraulic Model Validation

Council's TUFLOW model was used to develop a sub-model to include the Site and truncate both upstream and downstream areas to maximise the simulation time efficiency without impacting flood behaviour. The sub-model was validated to Council's flood model based on water surface level results for the critical 1% AEP flood event (36 hours). The TUFLOW model used for validation used the 2020-10-AF-iSP-w64 TUFLOW HPC (Heavily Parallelised Compute) with 6m grid size, while Council's TUFLOW model used the 2017-09-AC-iSP-w64 TUFLOW Classic with 10m grid size. The TUFLOW sub-model layout is presented in Figure 2.1, with the following sections summarising the methodology used to validate the sub-model. The extent of the sub-model was adopted based on:

- Extending the model to include the site, and
- Inclusion of sufficient downstream extent to achieve reasonable correlation of flood levels in the vicinity of the site and the township of Goulburn.

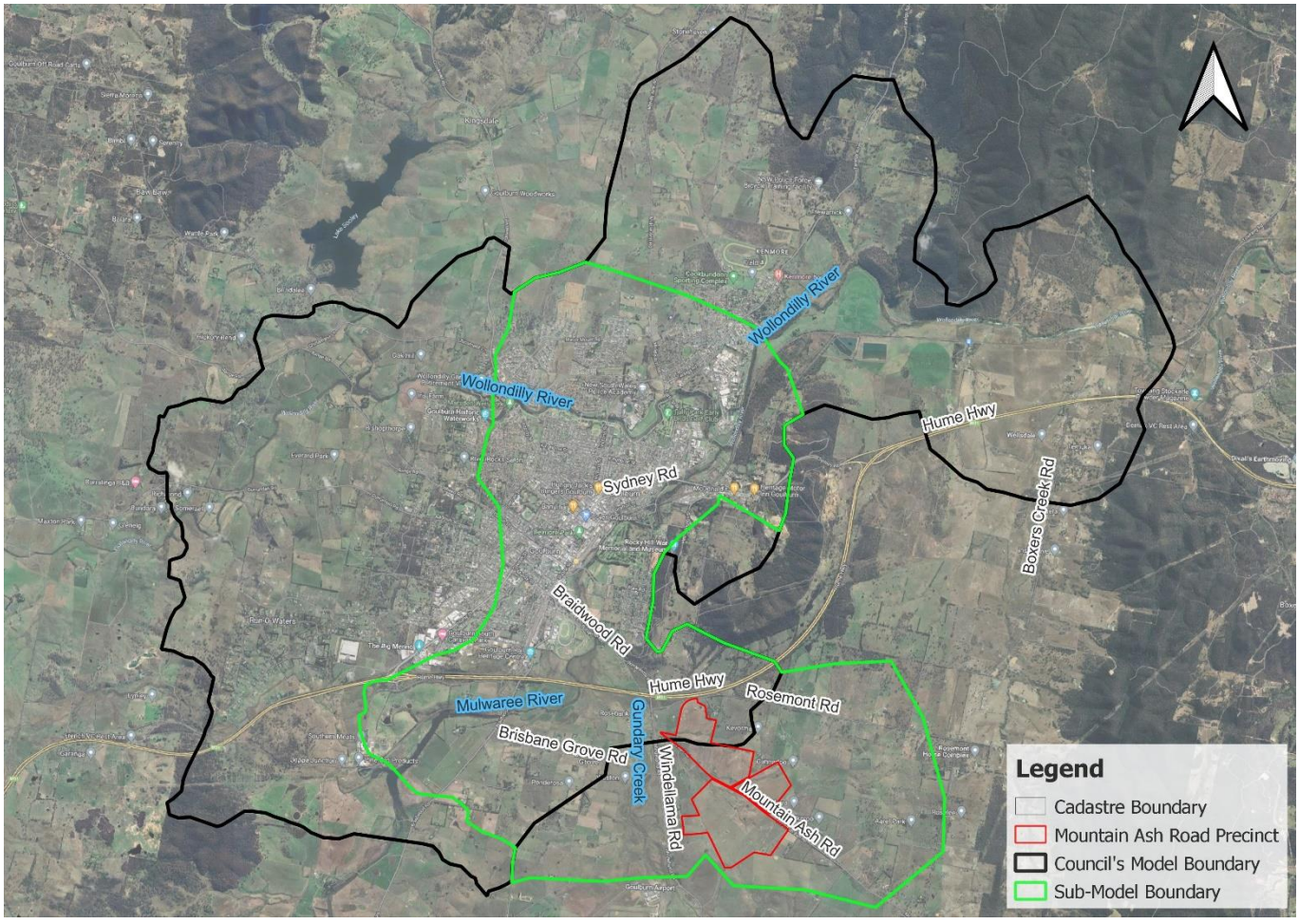

FIGURE 2.1: VALIDATED TUFLOW SUB-MODEL LAYOUT

2.3.1 Topography

The topography adopted in the sub-model for the validation was extracted directly from Council's full model. Both models used the same 2m DEM (Digital Elevation Model). Council's full model used a cell size of 10m, the sub-model used a 6m cell size. The adopted topography information for the sub-model is shown in Figure 2.2.

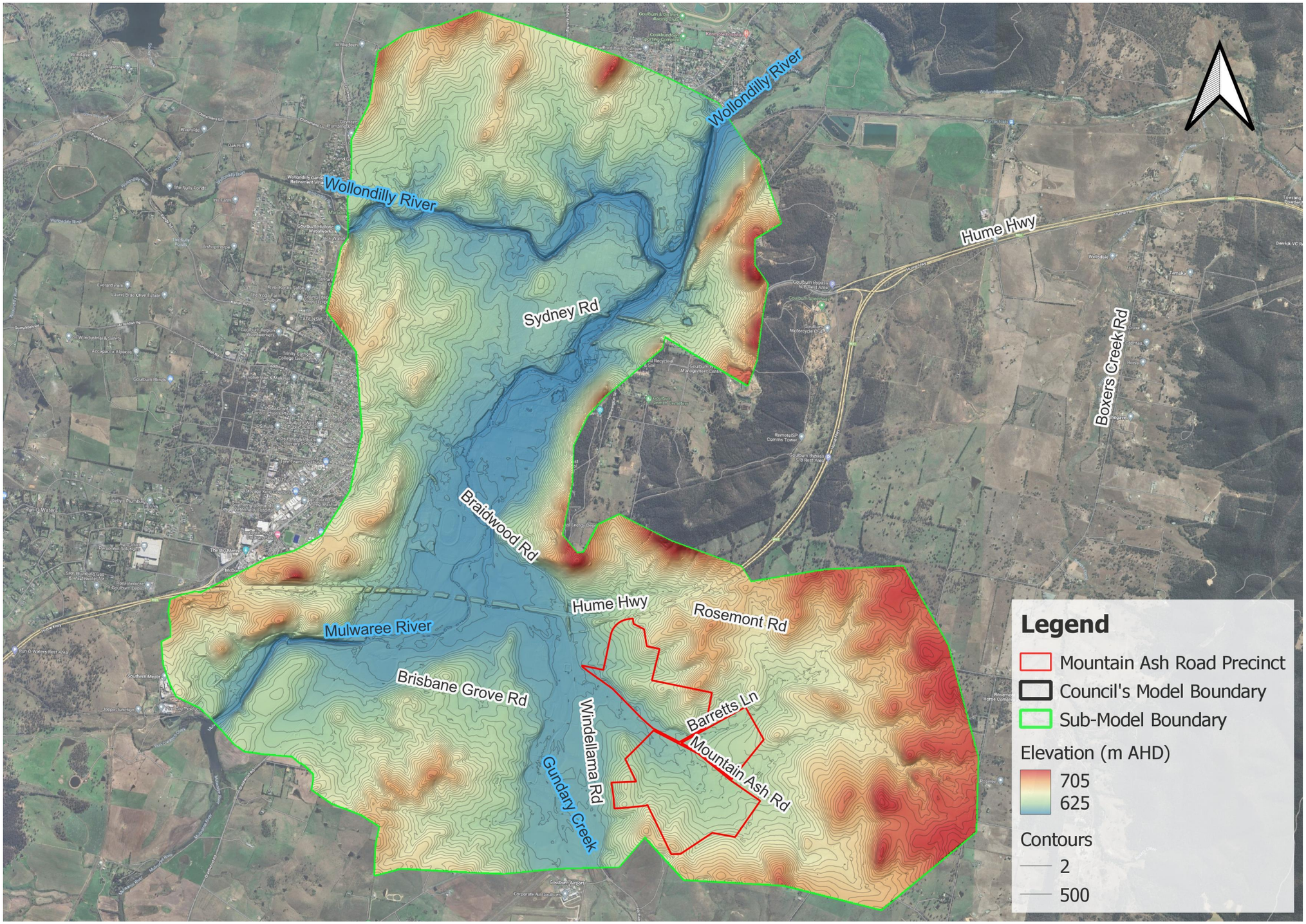

FIGURE 2.2: SUB-MODEL TOPOGRAPHY

2.3.2 Sub-Model Boundaries

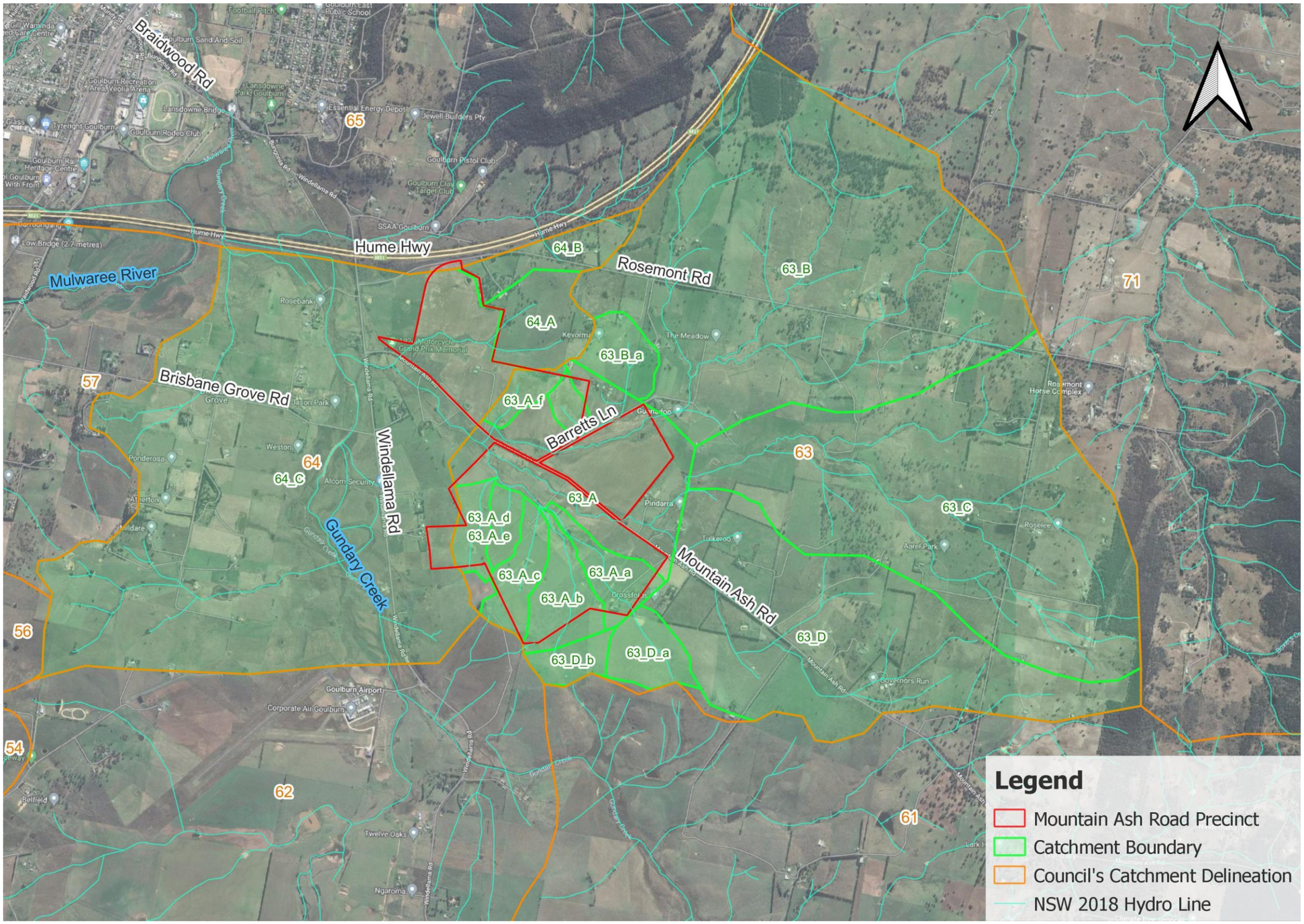

FIGURE 2.3: VALIDATED MODEL CATCHMENT DELINEATION

Council's existing hydrologic model catchment boundaries, based on the relevant supplied catchment shapefile, are shown in Figure 2.3, which shows the Site is located within Catchment 63 and 64. For the purpose of this assessment a higher level of catchment boundary inflow was considered necessary within the vicinity of the site. Therefore, Catchment 64 was divided into three sub-catchments, 64_A, 64_B and 64_C. Catchment 63 was first divided into four sub-catchments, 63_A, 63_B, 63_C and 63_D, but to represent the defined water course going through the Site, sub-catchment 63_A, 63_B and 63_D was further delineated. This catchment breakdown was used to proportionally adjust the inflow hydrographs for each sub-catchment based on the ratio of the sub-catchment area to the total catchment area.

Inflow hydrographs from the WBNM hydrologic model were applied directly into the model using Source Area (SA) inflow boundaries and lines. The SA boundaries outside of the Site were retained in the sub-model as per Council's full model. Near the site, to provide more detail, SA inflow boundaries were applied at the downstream boundaries of sub-catchments 63A, 63B, 63B_a, 63C, 63D, 63D_a, 63D_b, 64A and 64B. Within the site, SA inflow lines were applied along the existing watercourses based on the topographical information and defined watercourse lines.

The downstream boundary was adopted as a Water Level vs Flow (HQ) Curve, with a slope assumed as 0.001 based on the topography. The upstream boundary lines adopted Inflow hydrographs of related upstream catchments. The locations of the inflow and outflow boundary conditions are shown in Figure 2.4.

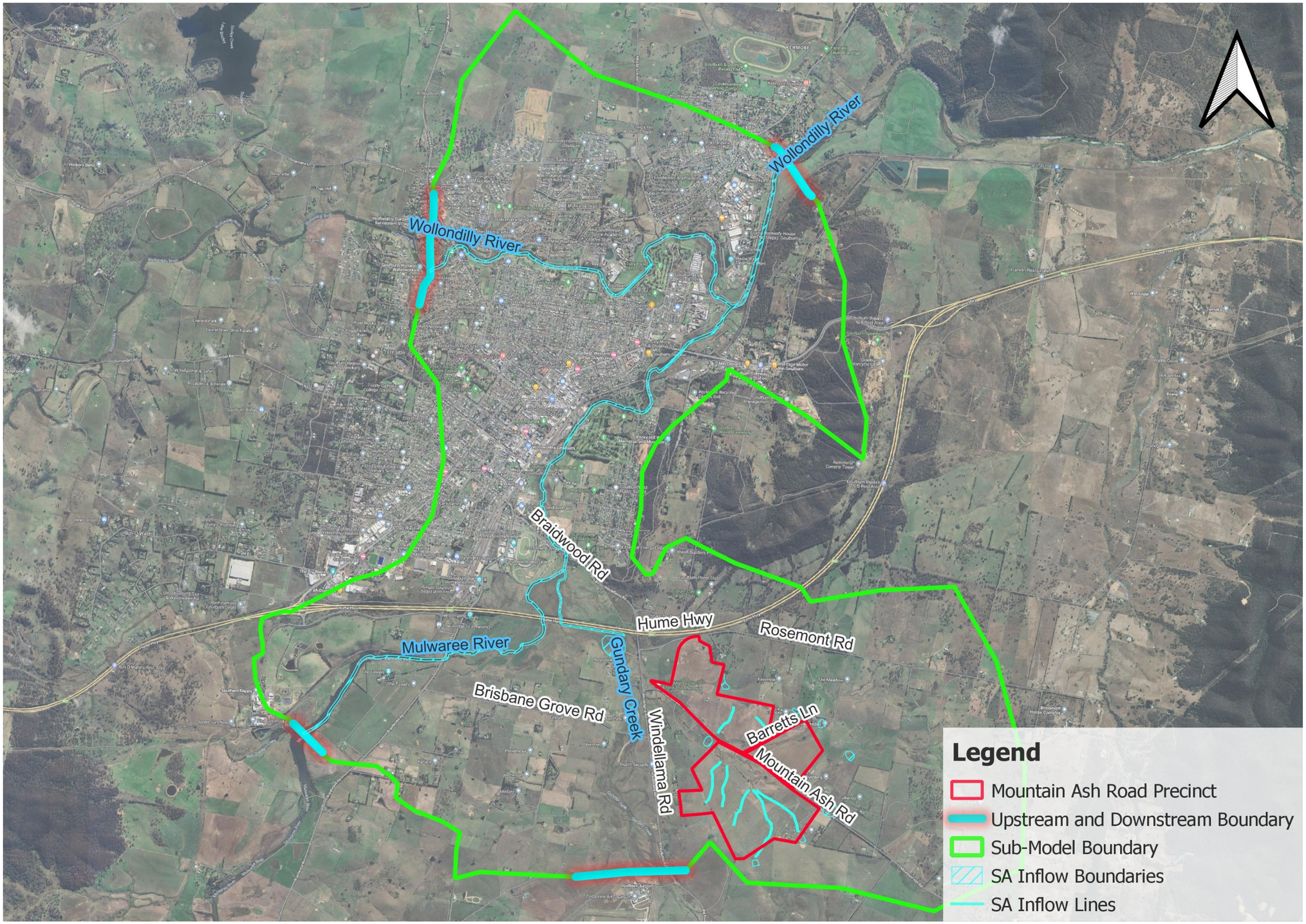

FIGURE 2.4: SUB-MODEL BOUNDARY CONDITION

2.3.3 Hydraulic Structures

All hydraulic structures within the extents of the sub-model were retained from Council's model, key structures include:

- Hume Highway Bypass bridges crossing the Mulwaree River.
- Bridge crossing the Mulwaree River along Braidwood Road.
- Lansdowne Bridge over the Mulwaree River.
- Weir Structure across the Mulwaree River (580 m downstream of Bungonia Road).
- Park Road Culverts over the Mulwaree River.
- The Railway Viaduct across the Mulwaree River.
- Sydney Road Bridge across the Mulwaree River.
- Sewer Aqueduct crossing the Wollondilly River.
- Railway Bridge over the Wollondilly River 200 m downstream of Tarlo Street.
- Kenmore Bridge which crosses the Wollondilly River along Tarlo Street.
- Victoria Street Bridge which crosses the Wollondilly River.
- Marsden Bridge which crosses the Wollondilly River at Fitzroy Street.

2.3.4 Manning's 'n' Roughness

The Manning's 'n' Roughness values were adopted in accordance with Council's hydraulic model, with the roughness layer extended to the extent of the sub-model. The materials adopted within the sub-model are presented below in Figure 2.5.

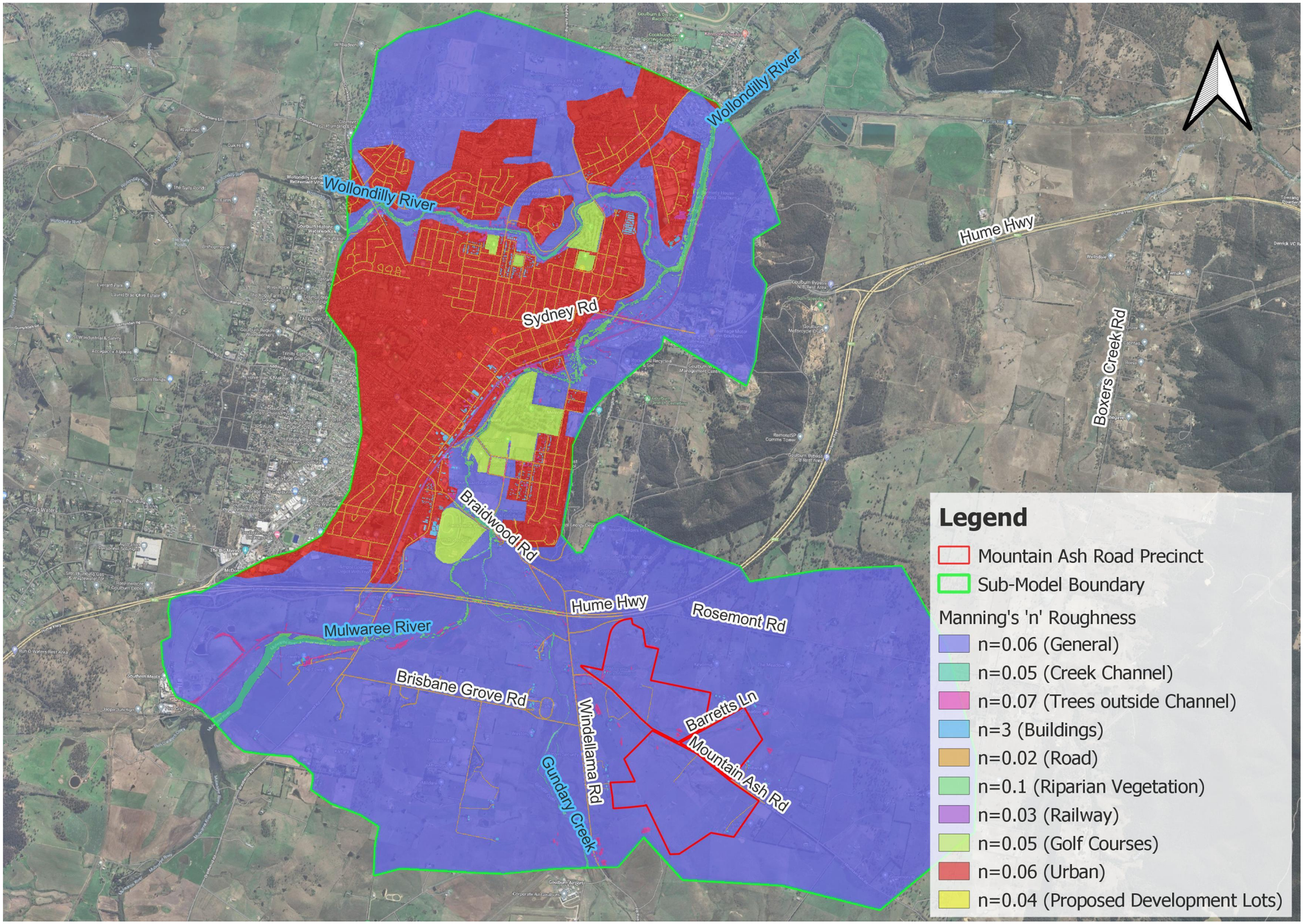

FIGURE 2.5: SUB-MODEL MANNING'S ROUGHNESS

2.3.5 Validation Results

Council's hydraulic model does not extend to the Site, a direct comparison of flood levels between Council's model extent and the validation sub-model adjacent to Site cannot be achieved. Instead, flood level differences were assessed in the centre of Goulburn area, which is downstream of the Site and locates between Hume Highway and Sydney Road. Within the assessed area, flood level difference is generally between 10mm to 50mm, as shown on the Flood height afflux map presented in Figure 2.6. These variances are considered due to the differences in the updated TUFLOW model build and reduced grid size adopted in the sub-model compared to the Council's model.

More significant water level increases are observed within Wollondilly River and Mulwaree River, immediately downstream of the model extent. This can be attributed to the truncation of the model at these locations, thus adjustment of hydrologic inflow location. These areas are expected to be far enough away to not present a material impact on the flood behaviour for our site area.

With consideration of the observations above, it is considered that the sub-model has been appropriately validated to Council's model and is therefore suitable for a flood impact and risk assessment for the Site located within the Goulburn Mulwaree Council LGA.

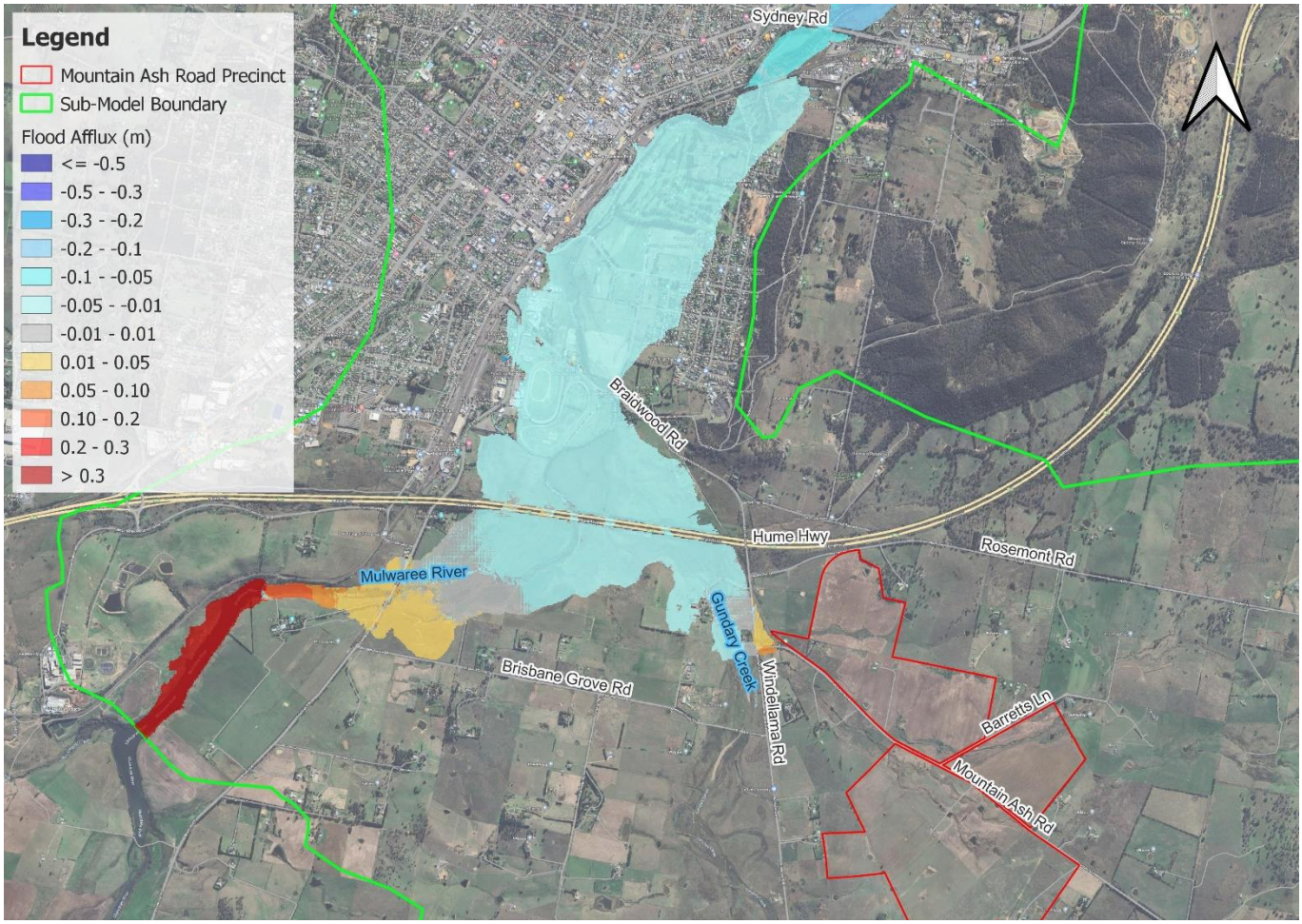

FIGURE 2.6: VALIDATION RESULTS

2.4 Base Case Model

The base case model is as per the validated sub-model. The base case model was simulated for all events with critical durations and temporal patterns identified in Table 2.2, Section 2.2. Key model aspects as follows:

- TUFLOW model build is 2020-10-AF-iSP-w64 running HPC solver.
- Extended model boundary to include the Site area.
- Model cell size reduced to 6m (was 10m).

2.5 Developed Case Model

2.5.1 Developed Case Hydrologic Model

The base case hydrologic model (WBNM) was updated to represent the proposed future development within the Site. The Site's proposed layout supplied by the Client (refers to Appendix A) was used to identify the change in fraction impervious for the developed case in Catchments 63 and 64. Since there is less than one lot per hectare in the proposed development area, this area is considered a rural residential area where a fraction impervious of 10% is considered appropriate. For the modelling purpose, all road structures were assumed a fraction impervious of 90%. The updated total catchment fraction imperviousness is shown in Table 2.3 for the partial development of these catchments.

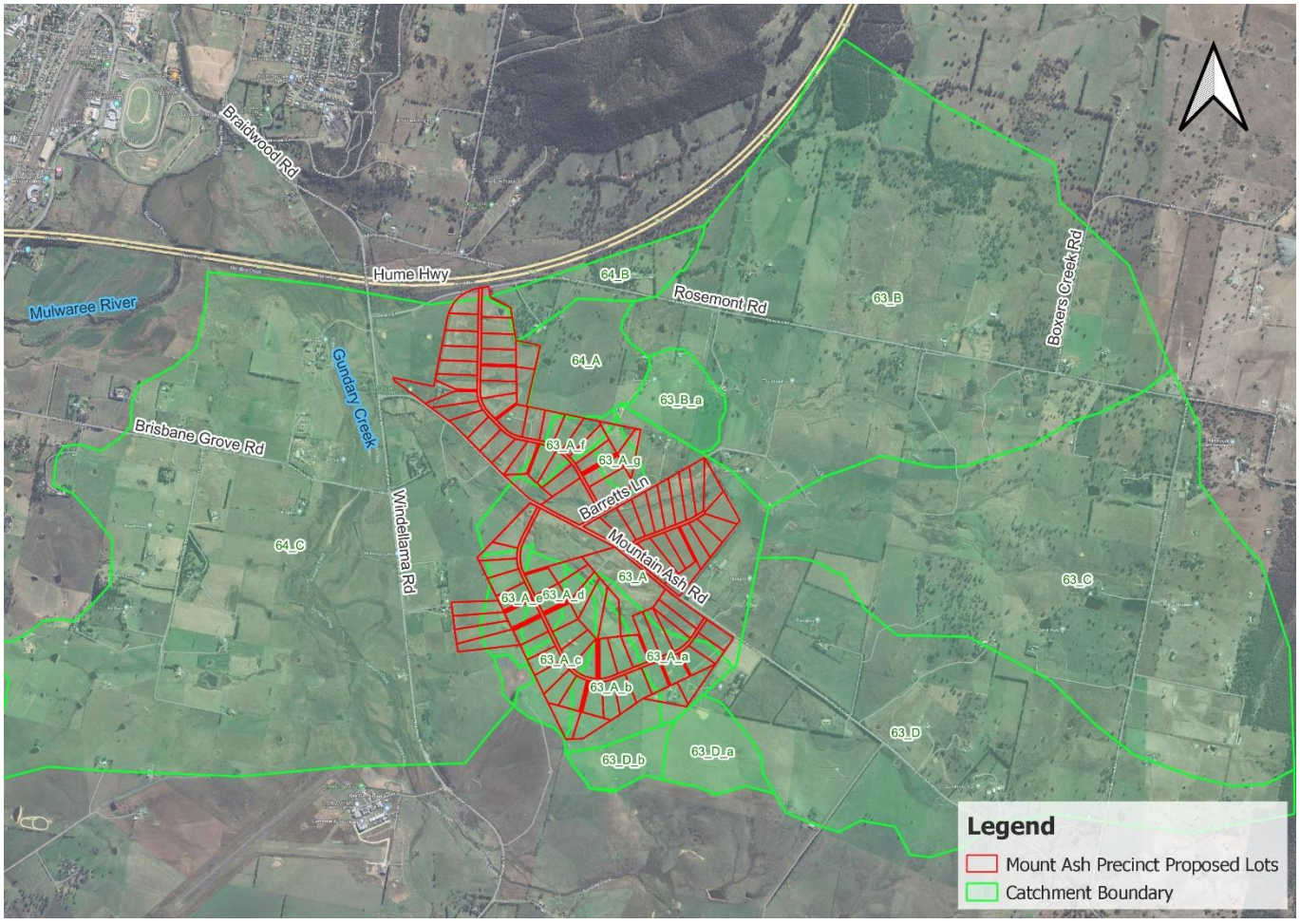

FIGURE 2.7: PROPOSED FUTURE DEVELOPMENT LOTS

TABLE 2.3: UPDATED CATCHMENT FRACTION IMPERVIOUS

Catchment	Area (ha)	Base Case Fraction Impervious (%)	Developed Case Fraction Impervious (%)
63	1659.2	0	2.04
64	846.5	0	0.94

Local peak flows at Catchments 63 and 64 were then estimated by the updated WBNM model. Table 2.4 shows the local peak flow comparison between the base case and developed case for the 1% AEP with 36-hour duration event. These change in flow impacts are negligible and are not anticipated to create any significant impact on the peak flood levels within the system. The change in peak flood levels due to these changes in the hydrologic behaviour has been assessed in the hydraulic model, as discussed below.

TABLE 2.4: BASE VS DEVELOPED WBNM MODEL PEAK FLOW ESTIMATE

Design Events (AEP%)	Duration (hours)	Base Catchment 63 Local Peak Flow (m^3/s)	Developed Catchment 63 Local Peak Flow (m^3/s)	Percentage Difference (%)	Base Catchment 64 Local Peak Flow (m^3/s)	Developed Catchment 64 Local Peak Flow (m^3/s)	Percentage Difference (%)
1	36	26.393	26.89	1.98%	14.02	14.12	0.71%

2.5.2 Developed Case Hydraulic Model

The base case TUFLOW hydraulic model was updated to represent the proposed future development at the Site. The following adjustments were made in the developed case model:

- Manning's 'n' roughness values over the proposed development area were added (refer Figure 2.7):
  - Proposed Lots: n = 0.04 (Rural Residential).
  - Proposed Local Roads: n = 0.02 (Bitumen Road).

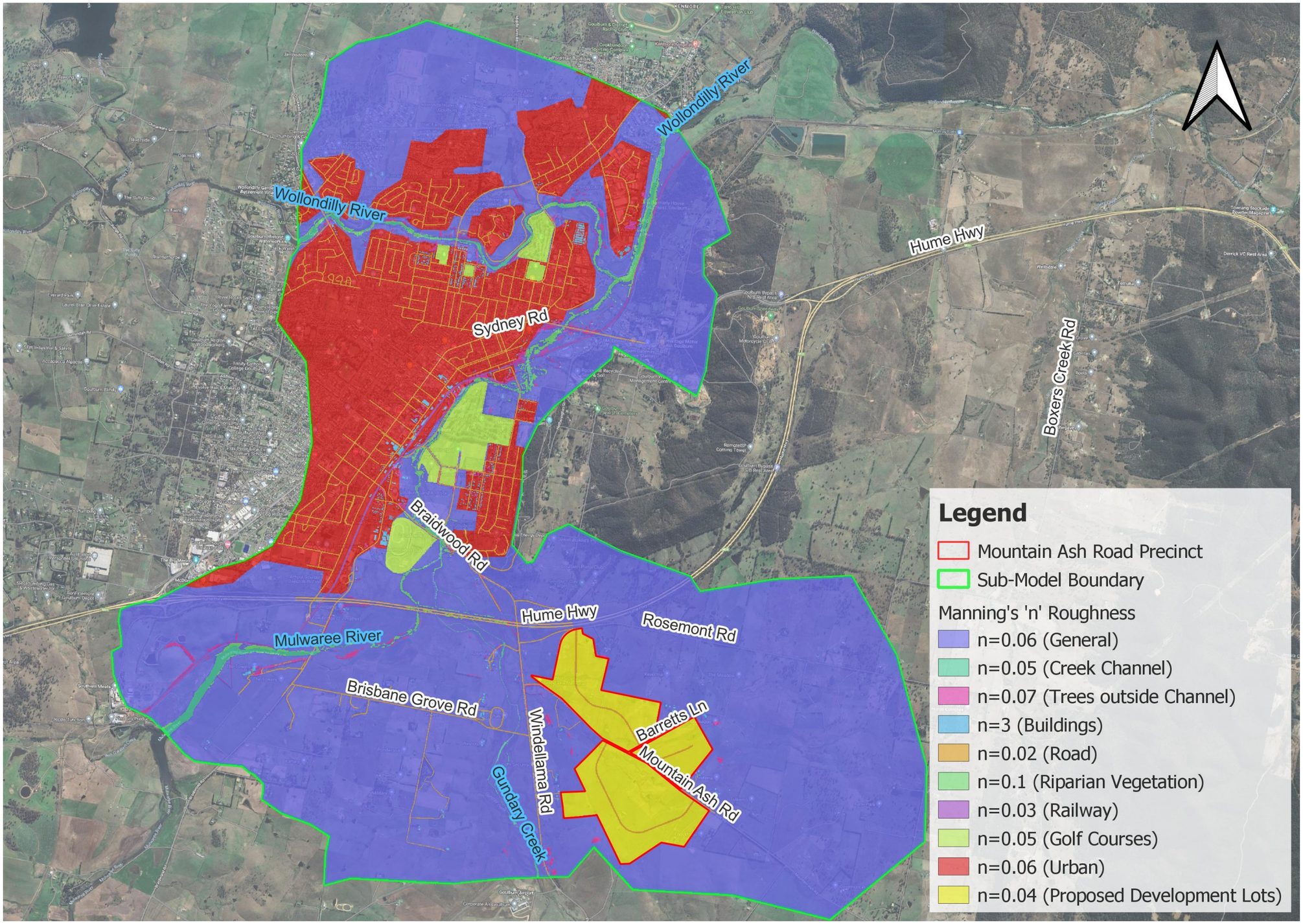

FIGURE 2.8: DEVELOPED CASE MODEL MANNING'S ROUGHNESS

There are several ephemeral drainage channels that flow through the Site area. Topography was adjusted to formalise the existing channels. The channels were sized based on the base case flood results using manning's open channel calculations. TUFLOW 2D Z Shape polygons were used to fill the existing inland basin on the tributary of defined water courses. 2D Z shape lines and points were used to add in channels and bunds. Based on the manning's open channel calculations (refers to Appendix B), a channel depth of approximate 200 mm is more than adequate to make sure overland flows are contained within the channel. Developed case topography information is shown in Figure 2.8.

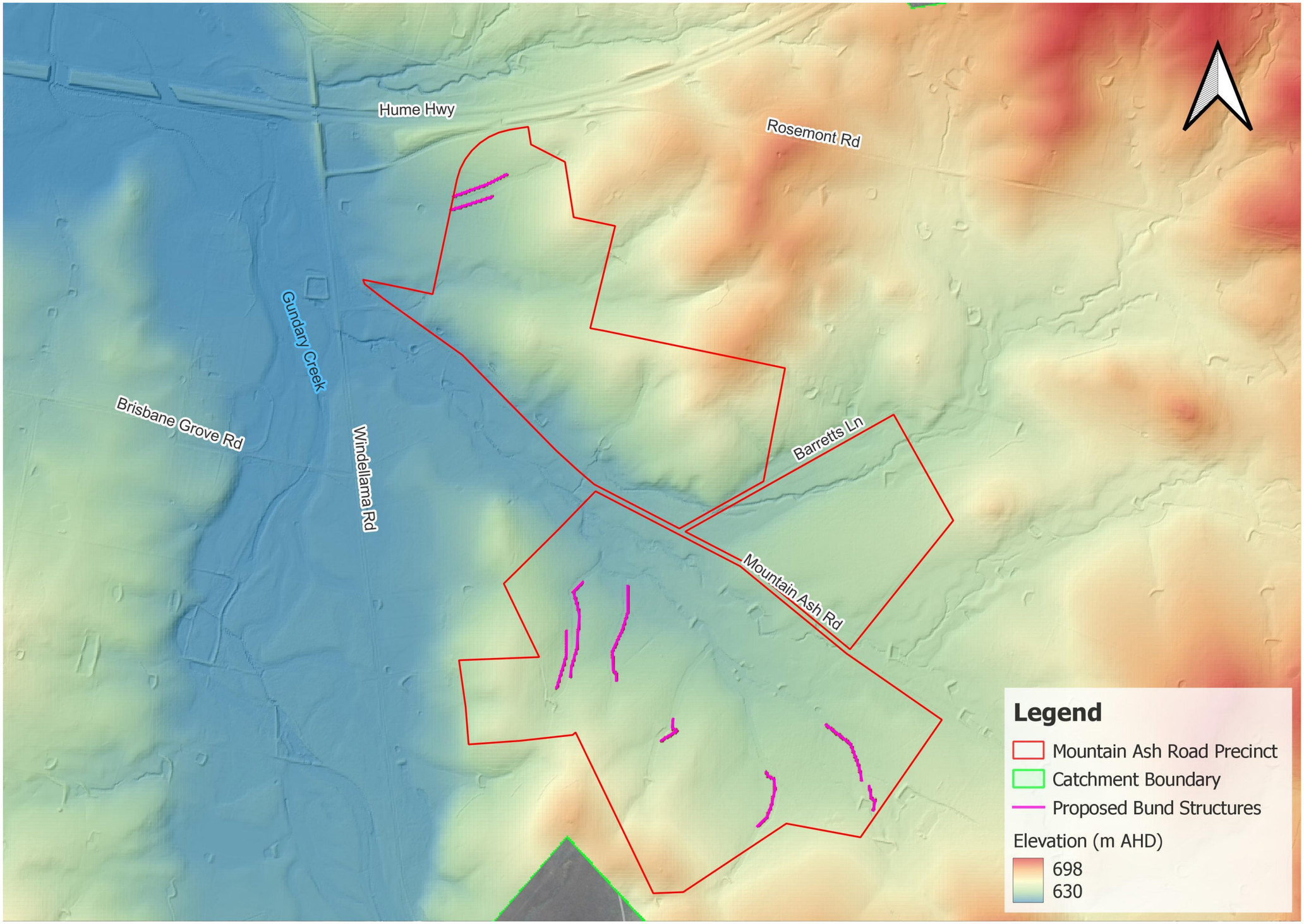

FIGURE 2.9: DEVELOPED CASE MODEL TOPOGRAPHY

2.6 Flood Results

Flood mapping predicted results for the range of simulated design events for both base and developed case are provided in Appendix C and Appendix D which includes flood depth (m), flood level (mAHD), flood velocity (m/s), flood hazard (m^2/s), and flood hazard category, based on the Australian Emergency Management Handbook 7 Guideline and ARR2019.

Figure 2.9 shows the predicted flood level result for the developed case 1% AEP 36-hour duration event including the key future crossings as determined from the proposed developed layout. The magnitude of the 1% AEP flow at the key crossing were extracted from the TUFLOW outputs. The recommended culvert configuration (number and size) for each of these crossings were determined through Manning's Open Channel Calculation. The design intent is to convey the 1% AEP flows with no overtopping of the future road, with the results tabulated in Table 2.5.

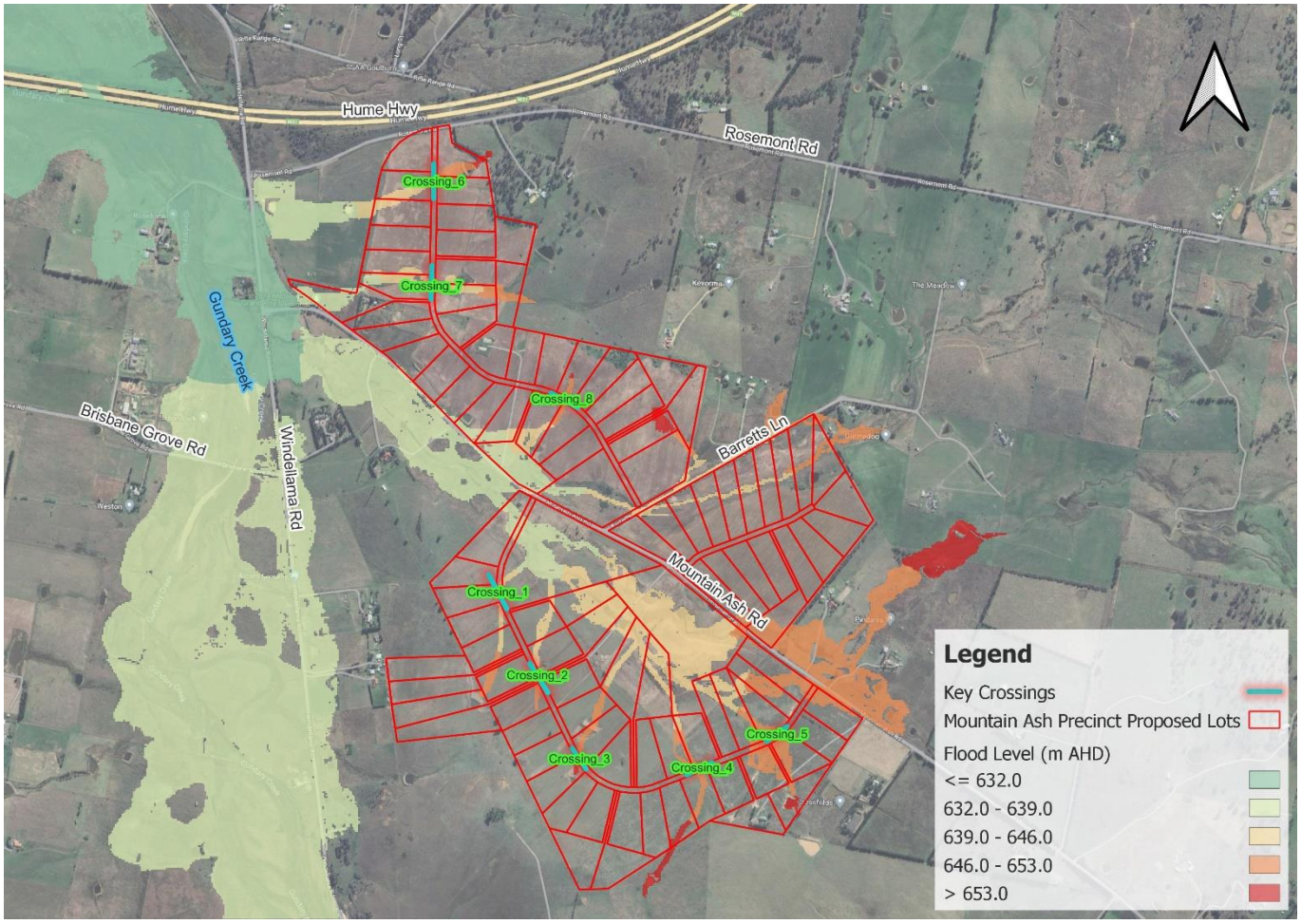

FIGURE 2.10: 1% AEP DEVELOPED CASE FLOOD LEVEL WITH KEY CROSSINGS

TABLE 2.5: ESTIMATED PIPE SIZING AT LOCAL CROSSINGS

Crossing ID	Flow (m^3/s)	Pipe Slope (%)	Recommended Pipe Size
1	0.14	2.53	1 x 375 mm RCP
2	0.15	2.35	1 x 375 mm RCP
3	0.32	2.56	1 x 450 mm RCP
4	0.62	2.36	1 x 600 mm RCP
5	0.61	2.36	1 x 600 mm RCP

Crossing ID	Flow (m^3/s)	Pipe Slope (%)	Recommended Pipe Size
6	0.56	2.80	1 x 600 mm RCP
7	0.70	2.00	1 x 675 mm RCP
8	0.16	3.80	1 x 375 mm RCP

Figure 2.10 shows the predicted flood level difference between the base and developed case for the 1% AEP 36-hour duration event and key reporting locations, with the flood level impact maps for all AEPs included in Appendix C. Flood levels at these locations were extracted and tabulated in Table 2.6.

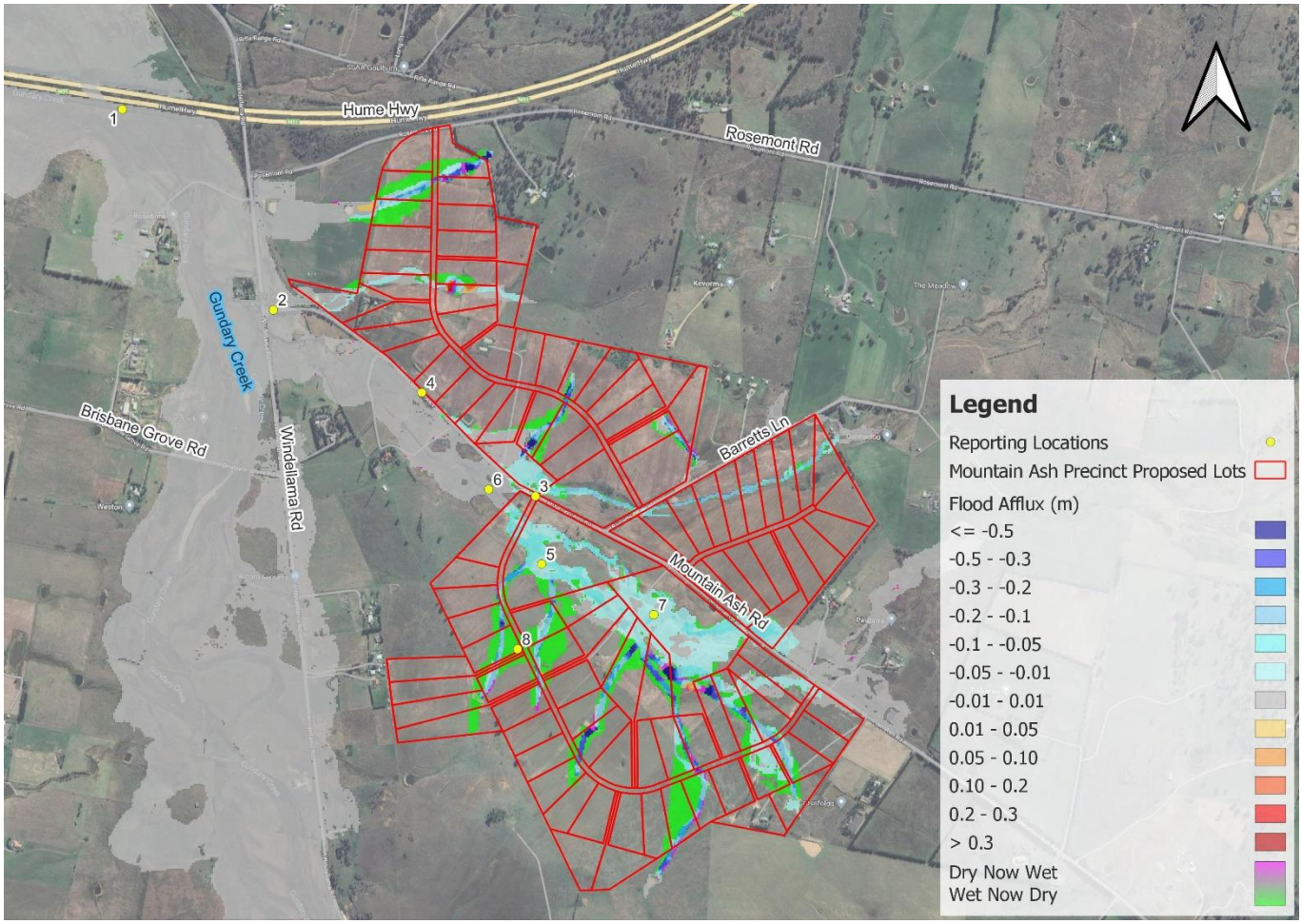

FIGURE 2.11: 1% AEP FLOOD AFFLUX WITH KEY REPORTING LOCATIONS

TABLE 2.6: DEVELOPED CASE AND BASE CASE FLOOD LEVEL COMPARISON – 1% AEP 36-HOUR

Reporting Location	Base Case Model Flood Level (m AHD)	Developed Case Model Flood Level (m AHD)	Flood Afflux (m)
1	631.21	631.21	0.00
2	631.84	631.84	0.00
3	637.68	0.00	Dry
4	634.34	634.34	0
5	638.15	638.12	-0.03
6	635.98	635.98	0
7	642.80	642.76	-0.04
8	645.43	0.00	Dry

According to Table 2.6, all key reporting locations show a reduction or remain unchanged, where Location 3 and 8 are now flood free in a 1% AEP 36-hour duration event, which means the proposed channels are functioning as designed to constrain overland flows within the channel. Based on the flood impact mappings attached in Appendix E, in the 1%, 0.2% and 0.5% AEP flood event there is a flood level increase of approximately 30mm adjacent to the Northern boundary of the site near Rosemont Road. The predicted flood increases do not cause any impact to other properties or road structures, and therefore the observed flood level increases are considered acceptable as no impact and or actionable damage is observed external to the Site.

2.7 Flood Risks

2.7.1 Flooding of the Site

The Site is predicted to be affected or isolated by two types of flooding:

- Mainstream flooding from Gundary Creek (backwater).
- Overland local flooding from the non-perennial drainage channels during intense rainfall events.

The above flooding mechanisms can occur independently or concurrently. When occurring concurrently, in most cases the timing of the peak flows will occur at various times. It is however common to have overland flooding caused by intense rain just before floodwaters rise from the creek.

Mainstream flooding and overland local flooding impacting the Site has been modelled as part of the updated sub-model detailed in Section 2.3. Council is unable to provide an *Overland Flow Flood and Floodplain Risk Management Study* in the short term due to resourcing constraints but has been scheduled for completion by 2025. Council has commissioned preliminary overland flow modelling considering emerging planning proposals within the Mountain Ash and Brisbane Grove precincts, the presence of natural drainage channels in the landscape and potential overland flow impacts. This modelling has used the same data and methodology as the riverine flood modelling and mapping within the Flood Study. This has resulted in a mapping layer which illustrates the location and likely extent of overland flow flooding and the relative risk to life and property. The overland flow mapping also includes Flood Planning Constraint Categories which have been identified by the same consultant who prepared the Flood Study. It should be noted that the overland flow model files were not made available to during the development of this FIRA. The preliminary overland mapping has been compared against Engeny's sub-model and is shown to be generally in accordance with the modelled overland flow flood extents (see Figure 2.12).

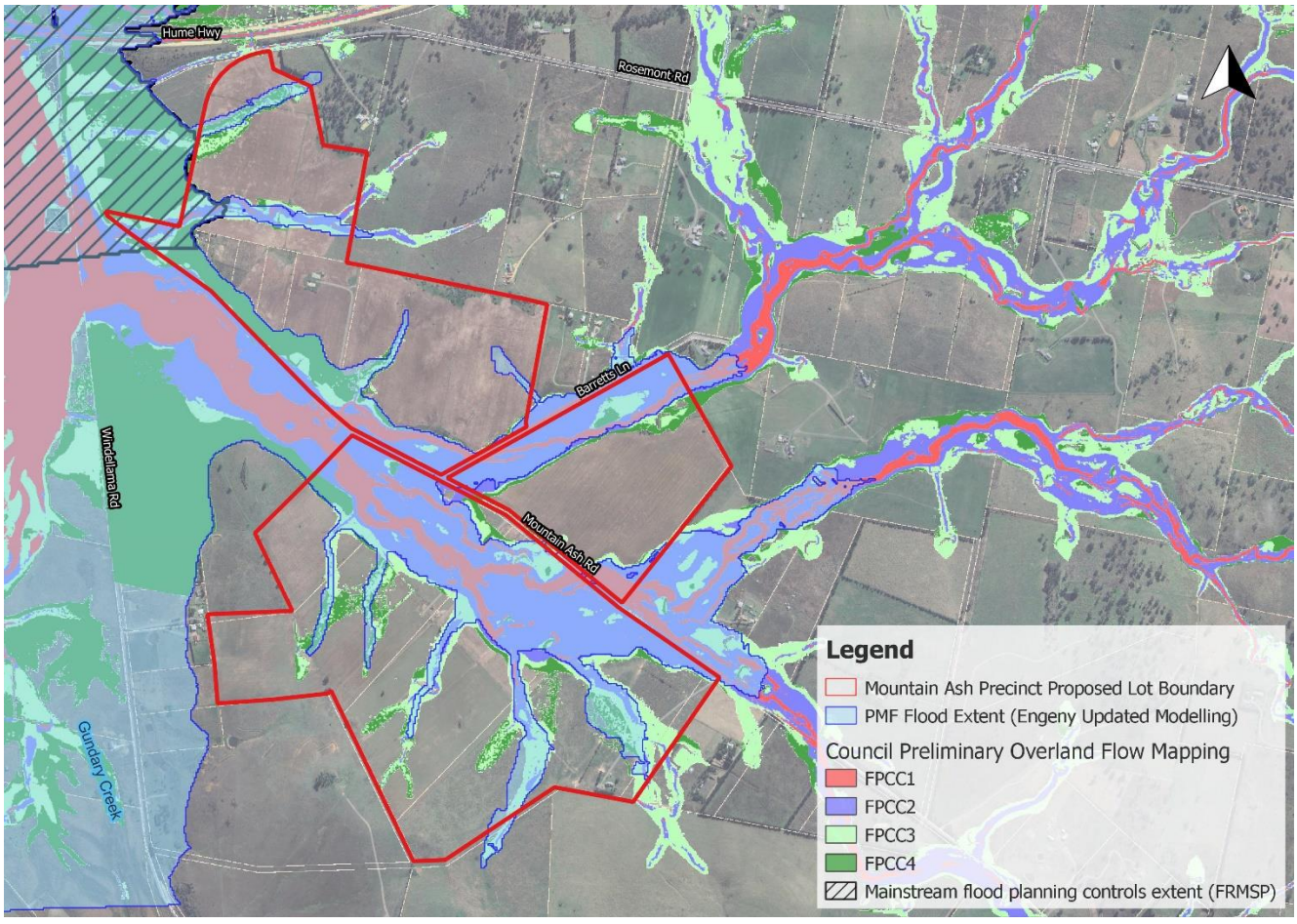

FIGURE 2.12: PRELIMINARY OVERLAND FLOW MAPPING OVERLAY

(https://www.goulburn.nsw.gov.au/files/sharedassets/public/strategic-planning/public-exhibition/figure-fpcc-v13.pdf)

2.7.2 Frequency of Flooding

There are several natural drainage channels flowing through the Mountain Ash Precinct development boundary, therefore the Site experiences flooding even in minor magnitude events, 20% AEP being the smallest event modelled as part of this FIRA. To ensure the potential flood risk to future residents is safely managed, it is proposed that all proposed lots within the development boundary that intersect with the Flood Planning area (PMF extent) have a covenant applied to restrict any building envelops to be constructed outside the Flood Planning area. It is considered this provides greater security with future ownership of the land with the restrictions applied to the Title, as opposed to spot zoning by which once under ownership rural landholders rarely address. Hence the title allocation is the best legal mechanism to address risk to assets with such a restriction.

3. FLOOD EMERGENCY ASSESSMENT

3.1 Emergency Management Considerations

The two main types of responses to a flood emergency for the development are to either:

- Evacuate to an area above the reach of floodwaters in the PMF. This is the NSWSES preferred response, provided that the risks of evacuating are deemed acceptable.
- Take Shelter in Place (SIP) within the site and wait until floodwaters have receded and the emergency has passed. SIP is to be considered an alternative to evacuation only when the risks of evacuating are higher than the risks of SIP. SIP requires flood-free access to a suitable shelter above the PMF level. The shelter must be protected from the weather, be structurally stable in a PMF and have sufficient floor area for all people likely to be on site at any one time.

Both evacuation and SIP are considered as possible flood emergency response strategies for the proposed development. This section provides a summary of the flood emergency response analysis (for evacuation and SIP) that was undertaken as part of this FIRA to inform the identification of the most suitable response strategy and management actions.

3.2 Evacuation

All habitable areas are proposed to be positioned outside the PMF extent and are therefore not flood prone. As a result, flood planning controls do not apply to these areas. Evacuation is not considered necessary for the proposed development and future residents can safely remain in place but may temporarily lose access to services. Further discussion of the potential isolation times has been provided in Section 3.3. Figure 3.1 depicts the available routes for the future residents to safely evacuate from the Site to Rosemont Rd prior to inundation in an event greater than a 1% AEP event.

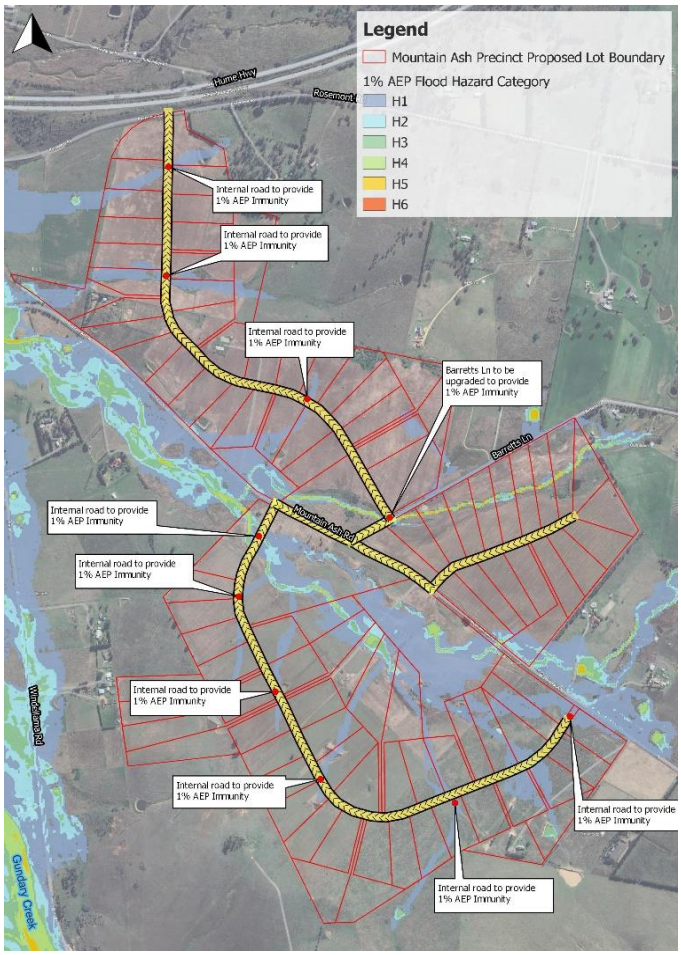

FIGURE 3.1: SITE INTERNAL EVACUATION ROUTES

While not mandatory, evacuation controls, assuming FPCC 4, has been considered for the Site.

The DCP specifies that for a Lot Subdivision for areas within FPCC 4, the following Evacuation and Refuge controls must be satisfied:

> **G2** - Reliable access for pedestrians or vehicles required during a 1% AEP flood to a publicly accessible location above the PMF.
>
> **G3** - The development is to be consistent with any relevant flood evacuation strategy or similar plan.
>
> **G4** - The evacuation requirements of the development are to be considered. An engineer's report will be required if circumstances are possible where the evacuation of persons might not be achieved within the effective warning time.

The FRMSP specifies two flood evacuation centres in Goulburn, located at the Goulburn Soldiers and Works Clubs. It is noted that both locations are predicted to become inundated during the PMF, hence the recommendation to remain in place for the future development is considered the most appropriate flood emergency strategy. The FRMSP also recommends that an alternative evacuation centre should be nominated as part of Council's Local Flood Plan (LFP). The location of the evacuation centres can be chosen in consultation between Council, the NSW SES and proposed location owners. Engeny, as part of this study, identified the Goulburn Mulwaree Council Operations Centre located in northern Goulburn, south of the Wollondilly River to be an appropriate, alternative evacuation centre.

Evacuation Route A in Figure 3.2 below demonstrates the most direct, potential route by taking Braidwood Road, crossing the Mulwaree River to the two evacuation centres located at the Goulburn Soldiers and Works Clubs. Flood free evacuation during the peak 1% AEP to these specific locations was found not feasible as crossing of the Mulwaree River is unavoidable from the site location.

Two alternative routes (B & C) have been reviewed as an alternative, which focus on reaching the Goulburn Mulwaree Council Operations Centre as a place of shelter above the PMF level and outside overland flow corridors (see Figure 3.2). The Goulburn Mulwaree Council Operations Centre is also partially inundated by the PMF extent shown in Figure 3.4. It has been assumed that the buildings and facilities outside of the PMF extent can be used as the designated shelter areas. Both routes use the internal roads within the northern portion of the development to evacuate safety, exiting onto Rosemount Road. In an emergency, Rosemount Road run parallel to the Hume Highway, and it is anticipated that an emergency connection to the highway would be potentially possible.

Evacuation Route B takes Rosemount Road west, turning north through Windellama, turning east on Rifle Range Road, before heading north to reach Goulburn Mulwaree Council by taking Long Street, Chiswick Street and Hetherington Street. This route is impacted by the PMF extent at locations leading up to the Long Street and minor areas south the Goulburn Mulwaree Council Operations Centre. The time during the rising limb of the flood event to ensure safe evacuation through these roads are between 10 - 15 hours. Figure 3.3 and Figure 3.4 show a zoomed in sections of the evacuation routes of the Mountain Ash Precinct area and the Goulburn Mulwaree Council Operations Centre, respectively.

Evacuation Route C, the longer route, takes Rosemount Rd east, before connecting to Boxers Creek Road. Boxers Creek Road subsequently connects to the Hume Highway, heading back west to reach the Goulburn Mulwaree Operations Centre. It is understood that this route is outside of the current mapped flood model extent. Considerations for additional hydraulic modelling to confirm creek flood extents of Boxer Creek (runs parallel to Boxers Creek Road) and localised overland flows should be confirmed to determine if this evacuation route is feasible.

Evacuation route A and B satisfies the G2, G3 and G4 Evacuation and Refuge control. Evacuation route C requires additional modelling to confirm if this satisfies the G2, G3 and G4 Evacuation and Refuge control.

The 0.2% and 0.5% AEP flood hazard results with the external evacuation routes have been provided in Appendix F. These results have been provided to show the evacuation potential of the intermediate events between the 1% AEP and PMF. It is understood that it is not advised to drive through flooding of any depth, however these results indicate that the flood hazard along these routes is categorised as H1 and H2, which are considered generally safe/trafficable for most vehicles (refer to Figure 3.12).

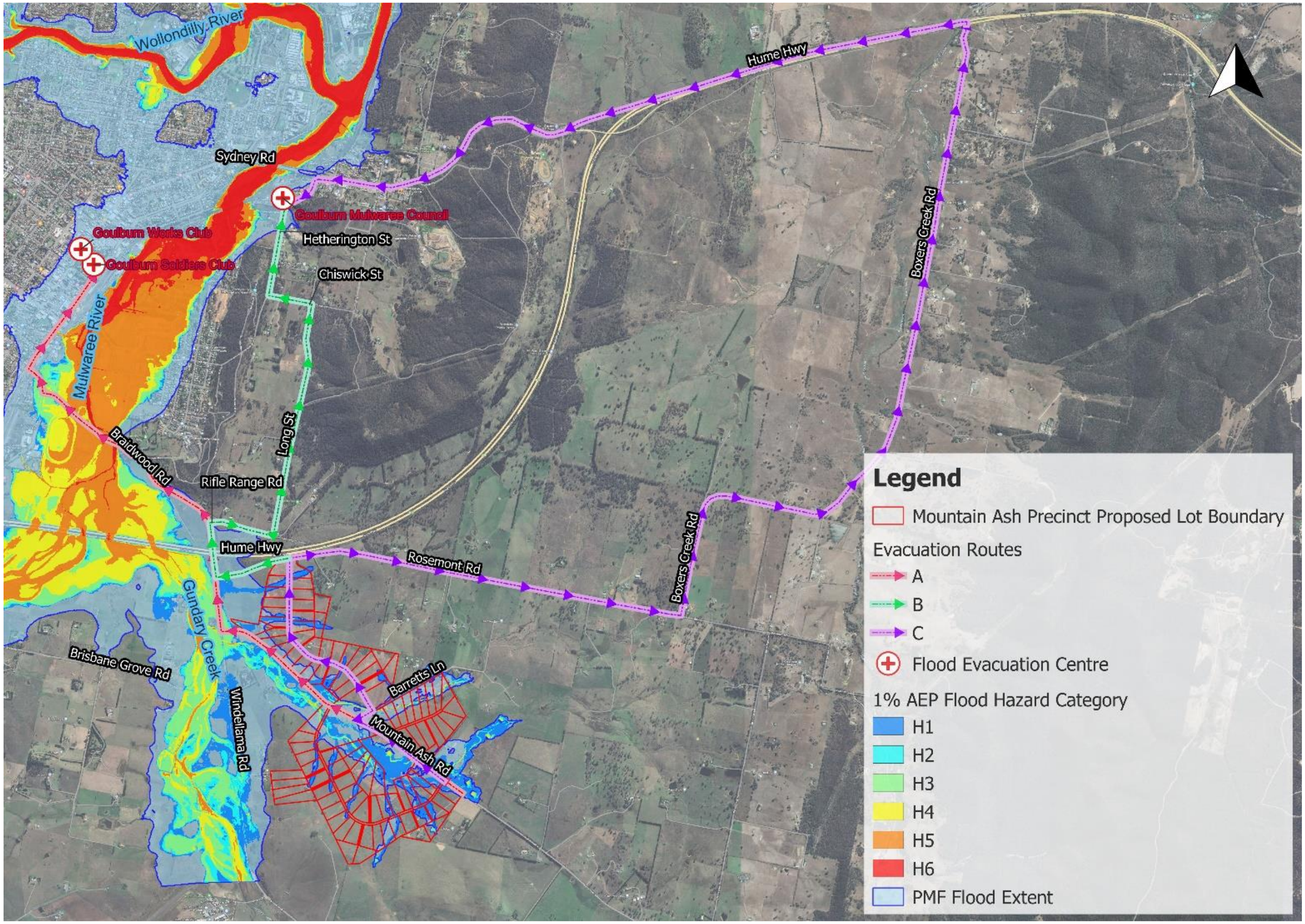

FIGURE 3.2: EXTERNAL EVACUATION ROUTES TO DESIGNATED EVACUATION CENTRES

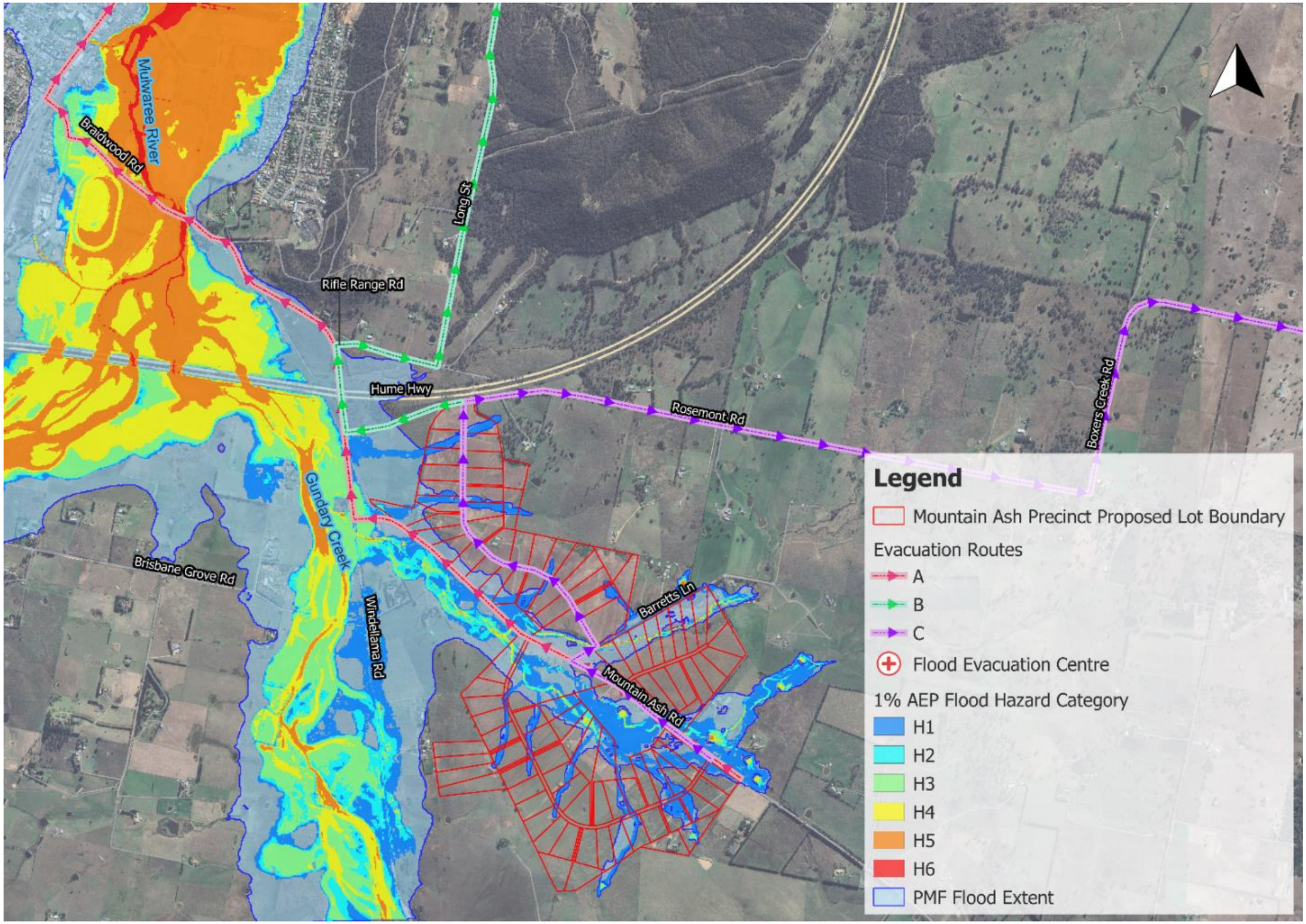

FIGURE 3.3: EXTERNAL EVACUATION ROUTES – MOUNTAIN ASH ROAD

FIGURE 3.4: EXTERNAL EVACUATION ROUTES – GOULBURN MULWAREE COUNCIL OPERATIONS CENTRE

3.3 Isolation Times

Figure 3.1 shows Council's PMF Design Event Flood Emergency Response Classification mapping. The figure demonstrates that all areas that are outside the PMF flood extent, with exception of some additional isolated areas classified as 'Isolated Elevated' the remaining areas have been classified as Indirect Consequence. As building envelops for the Site will be restricted to outside the Flood Planning area, there will be no direct impact to flood exposure. In accordance with the Goulburn Floodplain Risk Management Study (GFRMS) 2021 and Figure 3.1, the Flood Emergency Response classification for all future residents within the Site can be categorised as the following:

- **Primary Classification:** Not Flooded
  - **Secondary Classification**: Indirect Consequence (NIC), areas that are not flooded but may lose services.

It acknowledged these NIC classifications have been adopted for existing developments / residents and there should be more rigor in understanding the potential flood risk applied for new developments. Therefore, an assessment of the potential isolation risks such as isolation times over a range of flood events up to the PMF have been undertaken to understand the risk profile.

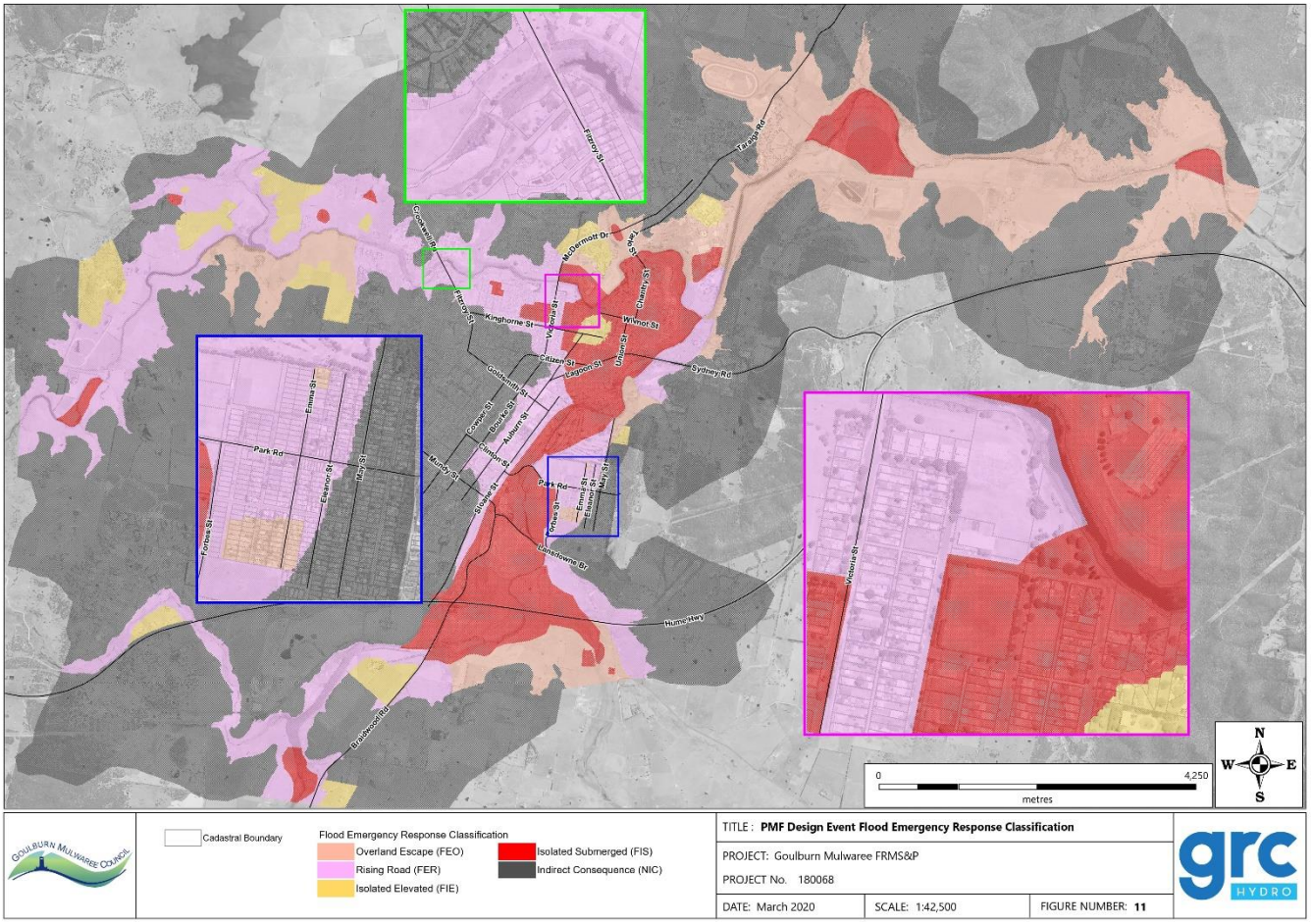

FIGURE 3.5: GMC PMF DESIGN FLOOD EMERGENCY RESPONSE CLASSIFICATION (EXCERPT FROM GOULBURN FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN 2022 (GRC HYDRO, 2022)

Making reference to the 'Support for Emergency Management Planning – Flood Risk Management Guide EM01' (Department of Planning and Environment, 2023), the flood emergency response classification for the precinct can be closely defined as 'Areas with rising access out of the floodplain'. The proposed development differs slightly from this definition as the lots are proposed to be located above the PMF flood level. Figure 3.6 shows an excerpt of the definition of classification from the guideline.

C2.2 Areas with rising access out of the floodplain

These are inhabited areas on flood prone ridges jutting into the floodplain or on the valley side that are able to be evacuated; however, their categorisation depends upon the type of evacuation access that is available to an area of safety with adequate services and accommodation available, as follows.

Areas with rising road access are those areas where access roads rise steadily uphill and away from the rising floodwaters (Figure 12 and Figure 13). The community will not be completely isolated before inundation reaches its maximum extent, even in the PMF. Evacuation can take place by vehicle or on foot along the road as floodwater advances. People should not be trapped unless they delay their evacuation from their homes; for example, people living in 2 storey homes may initially decide to stay but reconsider after water surrounds them.

These communities contain low-lying areas from which people will be progressively evacuated to higher ground as the level of inundation increases. This inundation could be caused either by direct flooding from the river system or by localised flooding from creeks.

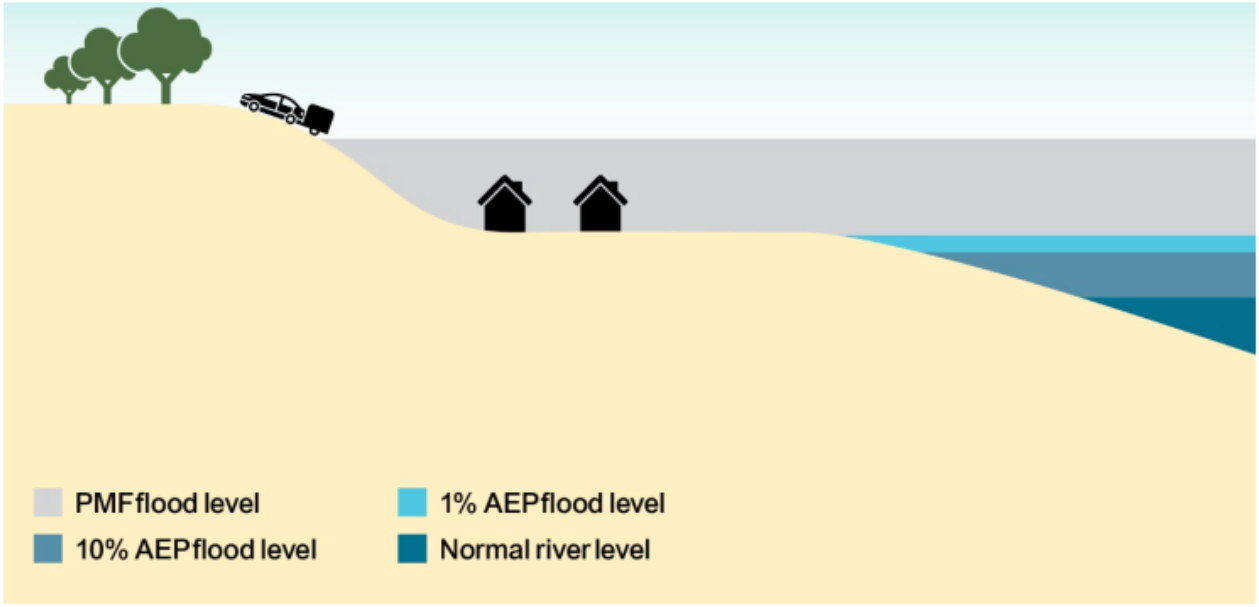

Figure 12 Area with rising road access

FIGURE 3.6: FLOOD EMERGENCY RESPONSE CLASSIFICATION (EXCERPT FROM SUPPORT FOR EMERGENCY MANAGEMENT PLANNING – FLOOD RISK MANAGEMENT GUIDE EM01)

For events larger than the 1% AEP event, a shelter in place strategy has been identified to be the only viable option to ensure the safe refuge of residents. Three critical locations along the Site's internal evacuation route have been identified to restrict external evacuation in events larger than the 1% AEP event. These locations have been presented on Figure 3.7 below. Table 3.1 shows the estimated duration and depth of the inundation of the road crossing, and consequently, isolation time of the residents in these rare storm events. It should be noted that the flood modelling at key crossing specified in Table 3.1 do not have the proposed 1% AEP immunity upgrades explicitly modelled. The 1% AEP flood level therefore has been adopted to represent the proposed upgraded road level.

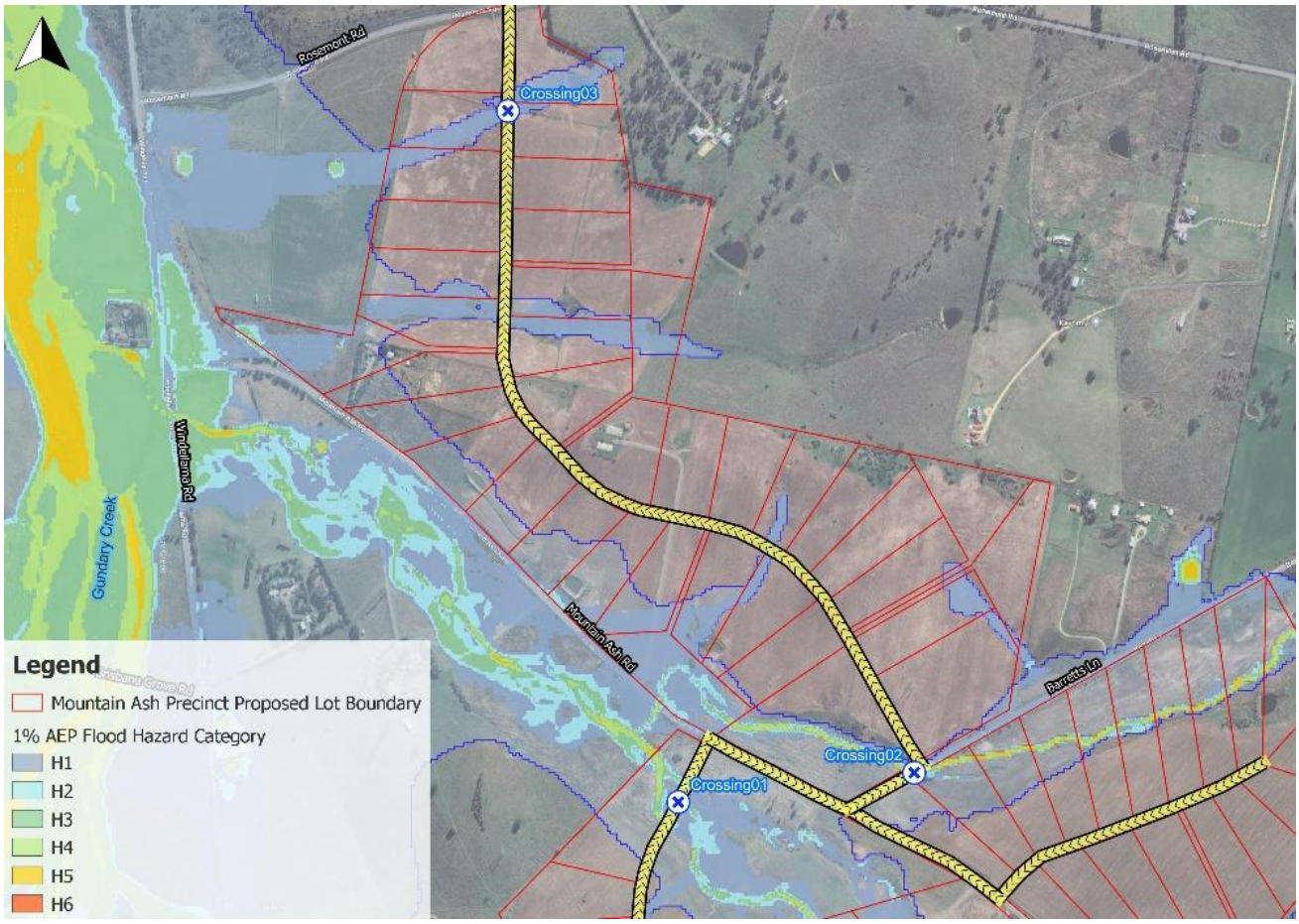

FIGURE 3.7: KEY ROAD CROSSING LOCATIONS

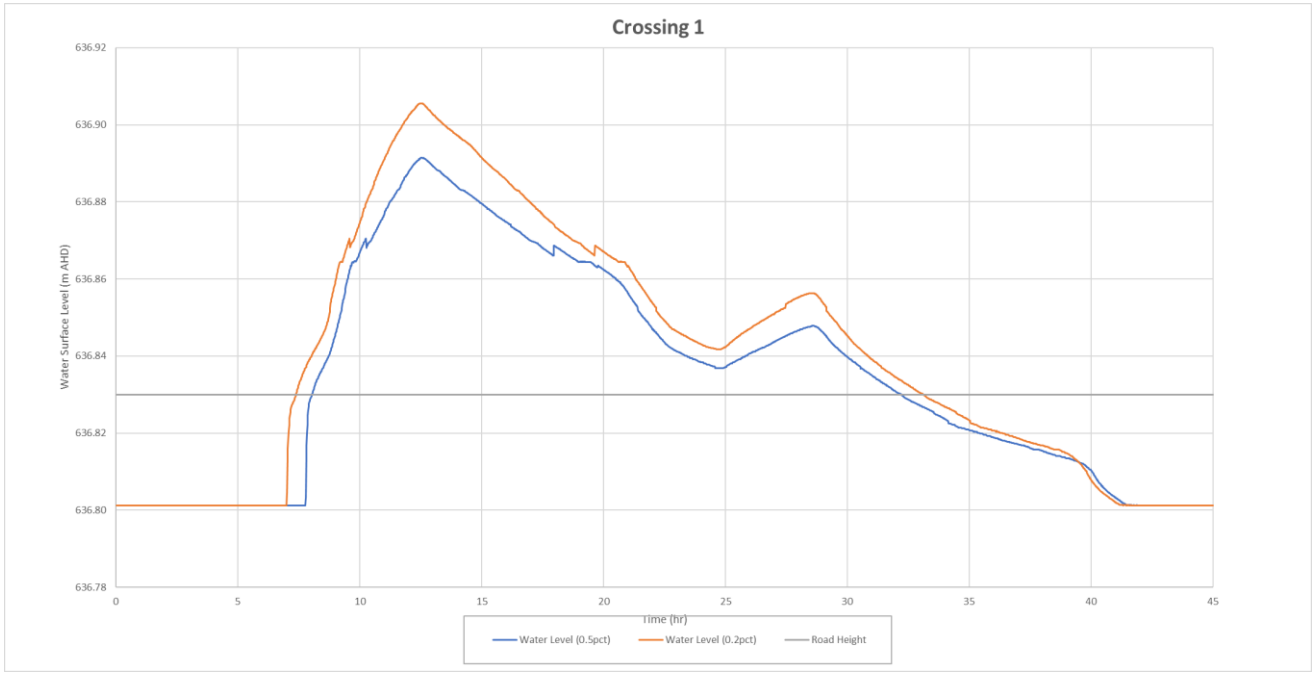

FIGURE 3.8: CROSSING 1 ROAD INUNDATION HYDROGRAPH

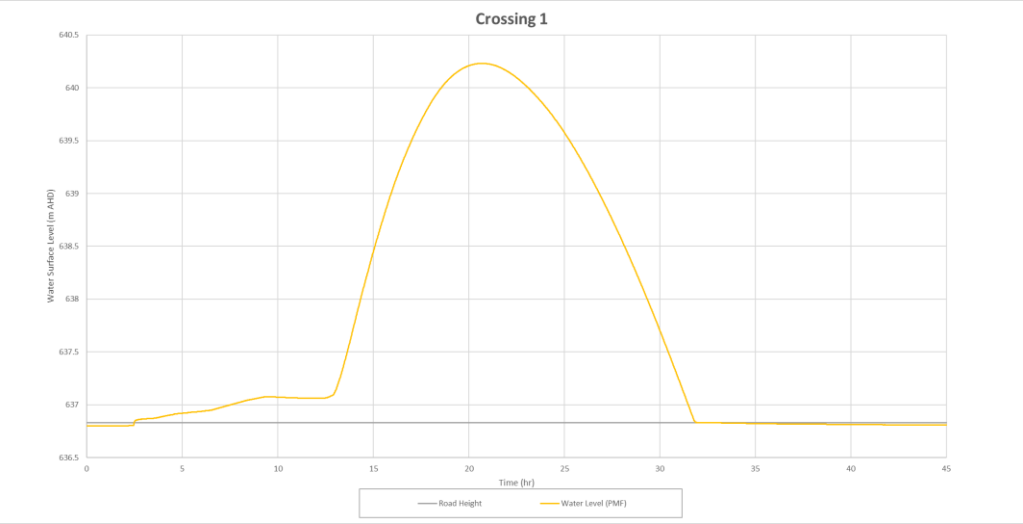

FIGURE 3.9: CROSSING 1 ROAD INUNDATION HYDROGRAPH (PMF)

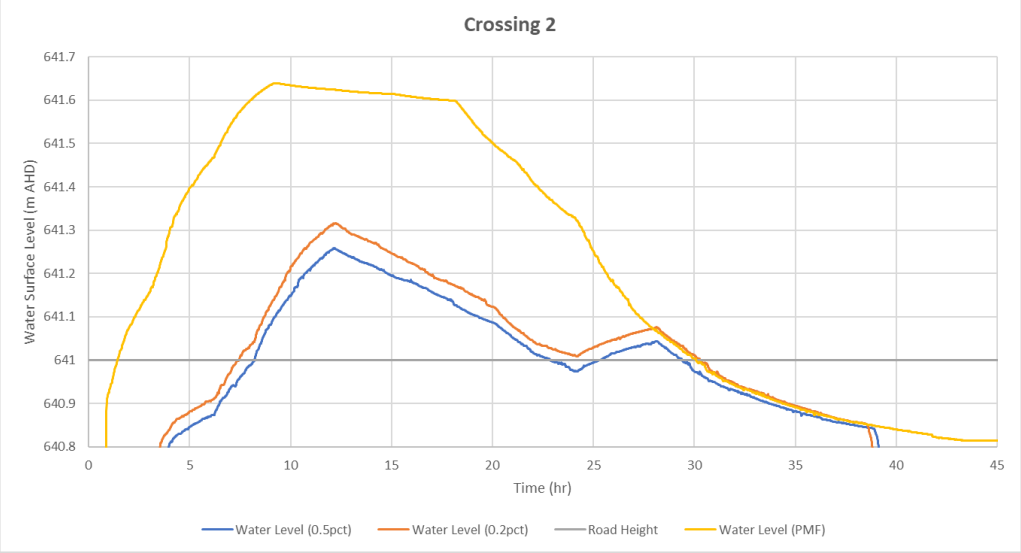

FIGURE 3.10: CROSSING 2 ROAD INUNDATION HYDROGRAPH

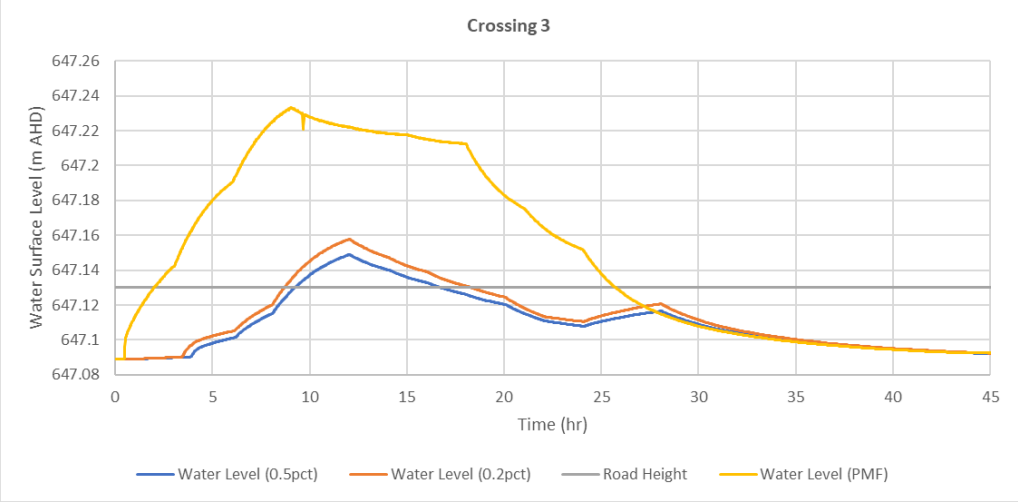

FIGURE 3.11: CROSSING 3 ROAD INUNDATION HYDROGRAPH

TABLE 3.1: KEY ROAD CROSSING DEPTHS AND INUNDATION TIMES

Crossing ID	Road Elevation[1]	0.5% AEP			0.2% AEP			PMF		
		Warning Time (hr)[2]	Duration of Inundation (hr)	Road Inundation Flood Depth (m)	Warning Time (hr)	Duration of Inundation (hr)	Road Inundation Flood Depth (m)	Warning Time (hr)	Duration of Inundation (hr)	Road Inundation Flood Depth (m)
Crossing01	636.83	7.9	25	0.06	7.3	26	0.08	2.5	30	3.40
Crossing02	641.00	8.1	22	0.26	7.1	24	0.32	1.4	29	0.64
Crossing03	647.13	9.1	9	0.02	8.6	11	0.03	2.1	24	0.10

Table Notes:

1- Road elevations have been assumed to be the 1% AEP event. Revised road levels are expected to change in later stages of design.

2- Warning times have been estimated from the start of the storm event to the time of the road inundation.

Table 3.1 shows that for all events above the 1% AEP, there is expected to be isolation times between 9 – 30 hours. From the start of the storm event, the storm events show there is potential between a 1.4 to 9.1 hr warning time before each crossing becomes inundated.

It is noted that for some crossings, in particular Crossing01 and Crossing03, though the road is anticipated to be inundated in the 0.2% and 0.5% AEP events, the flood depth over the road is low (<100 mm). It is understood that it is not recommended that vehicles drive through floodwater, however it is worth noting that roads in these events greater than the 1% AEP remain trafficable, according to depth and velocity relationships specified in the Australian Emergency Management Handbook 7, see Figure 3.12. The results indicate that Crossing02 will be the 'bottleneck' along the internal evacuation route with flood depths of 260 mm to 640 mm in the events analysed.

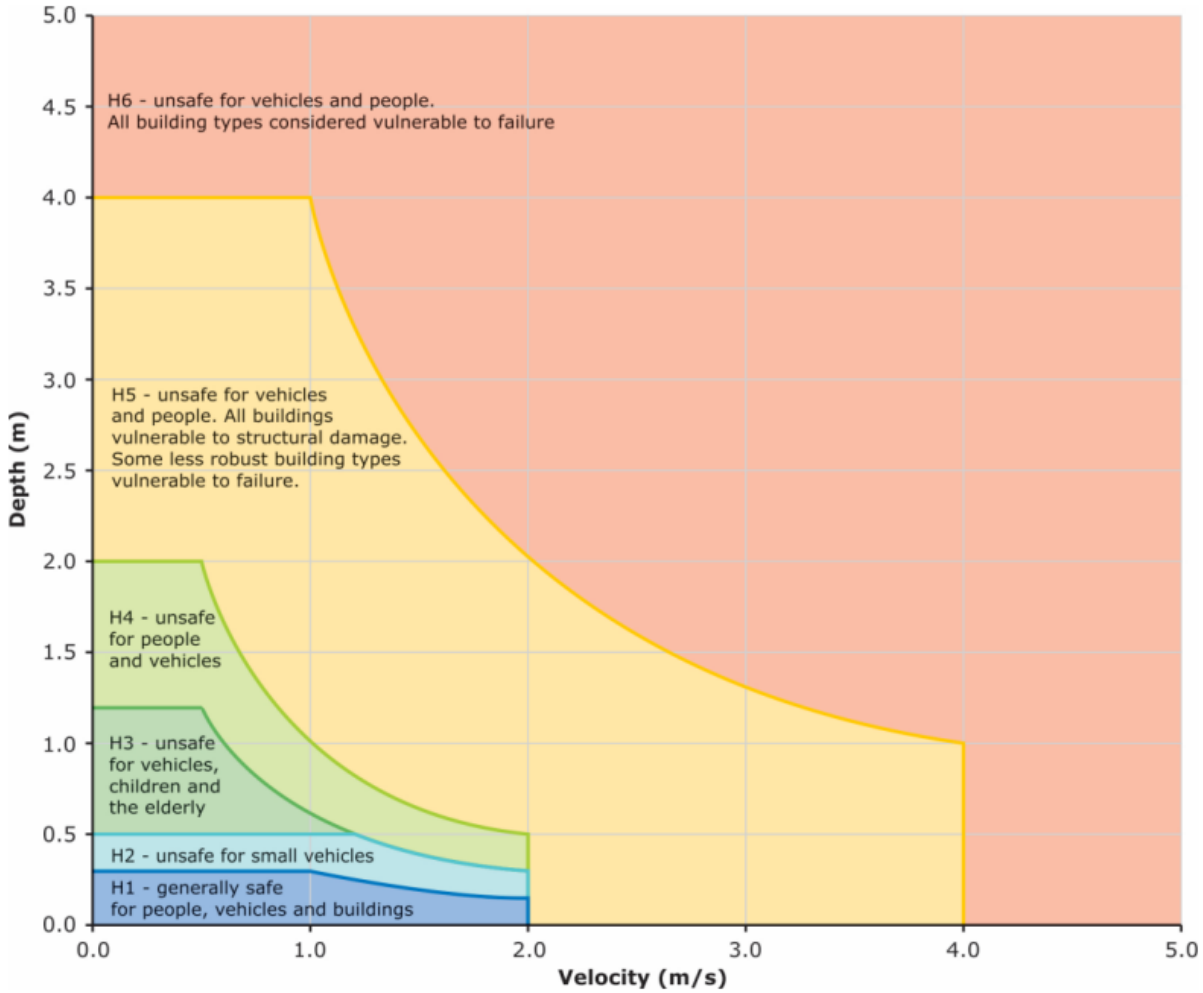

FIGURE 3.12: FLOOD HAZARD CURVES (AUSTRALIAN EMERGENCY MANAGEMENT HANDBOOK 7)

3.4 Flood Risk Mitigation Strategy

3.4.1 Overview

While resident building envelops will be positioned outside the flood planning area and proposed internal, precinct roads are only affected by mainstream and overland events greater than the 1% AEP, the evacuation routes may become cut within 10 hours after the beginning of a rainfall event by overland flooding or mainstream flooding. It is acknowledged, though considered low, there is an inherent isolation risk to the future residents in events greater than the 1% AEP event. These present potential indirect risks because of maintaining essential services and supplies, the chance of medical and fire emergencies not being able to be responded to, and the likelihood that stranded building occupants will want to be rescued or try and traverse floodwaters themselves in these rare storm events. There is also the risk that people will try and traverse floodwaters to reach their dwelling which is isolated but not flooded.

For this development, the flood risk posed for the shelter in place strategy is dependent on the probability of a PMF event (estimated to be a 1 in 10,000,000 AEP), coupled with the resident's requirement for services and supplied or need for emergency services in the event of a flood event. From this, it is acknowledged flood risk to the residents is low, there remains an inherent low risk. There is currently no guidance on what an acceptable risk profile or minimal risk reduction targets should be, regardless, the following are considerations made to avoid and migrate some of the inherent low risks because of this development.

3.4.2 Flood Warning Signage

Flood warning signs and depth markers could be positioned in roads that are subjected to flooding, to inform drivers and prevent potential accidents. Signage should also be implemented to discourage cars from driving through flood waters in streets. Signage at the three (3) crossing locations shown in Figure 3.7 shall be installed. It is recommended that signs should be erected, visible to all cars coming into the precinct.

This is to ensure that residents and visitors are aware that the road is subject to flood in extreme weather event.

3.4.3 Flood Education Material

Community awareness and behaviour is an important aspect of reducing flood risk for the proposed development. If the future residents are aware of how flood risks develop within their local area, and the correct ways in which to respond, risk to life can be substantially reduced. It is recommended that a flood education strategy be developed by council to educate the wider community. The strategy should detail the potential flood risk and isolation times for the floodplain. This should be prepared together with the SES, as they have a joint responsibility for community awareness.

Preparation of a flood education brochure relevant for the Goulburn Shire, in collaboration with the SES is recommended. Once prepared, the flood education brochure can then be uploaded to the Council and SES websites in a suitable format, where it would be made available under the flood information sections of the website. the developer would also include these with the sales documents for any sales provided in the future. If the future residents of the development understand the existing flood risk of the overall floodplain management strategy for the study area, they can be prepared and respond quickly and effectively to an emergency.

3.4.4 Flood Evacuation Benefits

The proposed development will provide benefits to the existing flood evacuation routes. The current route along Mountain Ash Road will become inundated and impassable in events less than the 1% AEP, generally north of the site. The future internal evacuation route for the proposed development residents shown in Section 3.2 will provide alternative access from vehicles travelling west on Mountain Ash Road. This provides an opportunity for improved connectivity to the proposed evacuation centre in events larger than the 1% AEP event.

3.5 Existing Infrastructure Review

All habitable areas are proposed to be positioned outside the PMF extent and are therefore not flood prone. As a result, flood planning controls do not apply to these areas. Evacuation is not considered necessary for the proposed development and future residents can safely remain in place but may temporarily lose access to services. An upgrade to the existing Barretts Ln culvert crossing is required to achieve the desired 1% AEP flood immunity.

Section 3.1 demonstrated two potential evacuation routes that have satisfied the safe evacuation and planning controls assuming development within the FPCC 4 to the DCP. Notably, the assessment affirmed that residents from the Site can safely evacuate to the

designated evacuation centre via existing roads for 10 hours during the rising limb of the flood event. This would also remove the necessity for any infrastructure upgrades.

As this management is considered for extreme events, the Site has the internal evacuation to gain access to Rosemont Road, which runs parallel to the Hume Highway, and thus it is feasible that an emergency access through to the highway within existing road reserves could be considered if additional connectively is considered necessary beyond the management approaches already demonstrated. Figure 3.13 presents a location to potentially form an emergency connection between Rosemount Rd and the Hume Hwy. It is anticipated that connection road would be gated, only allowing access for emergency/evacuation purposes.

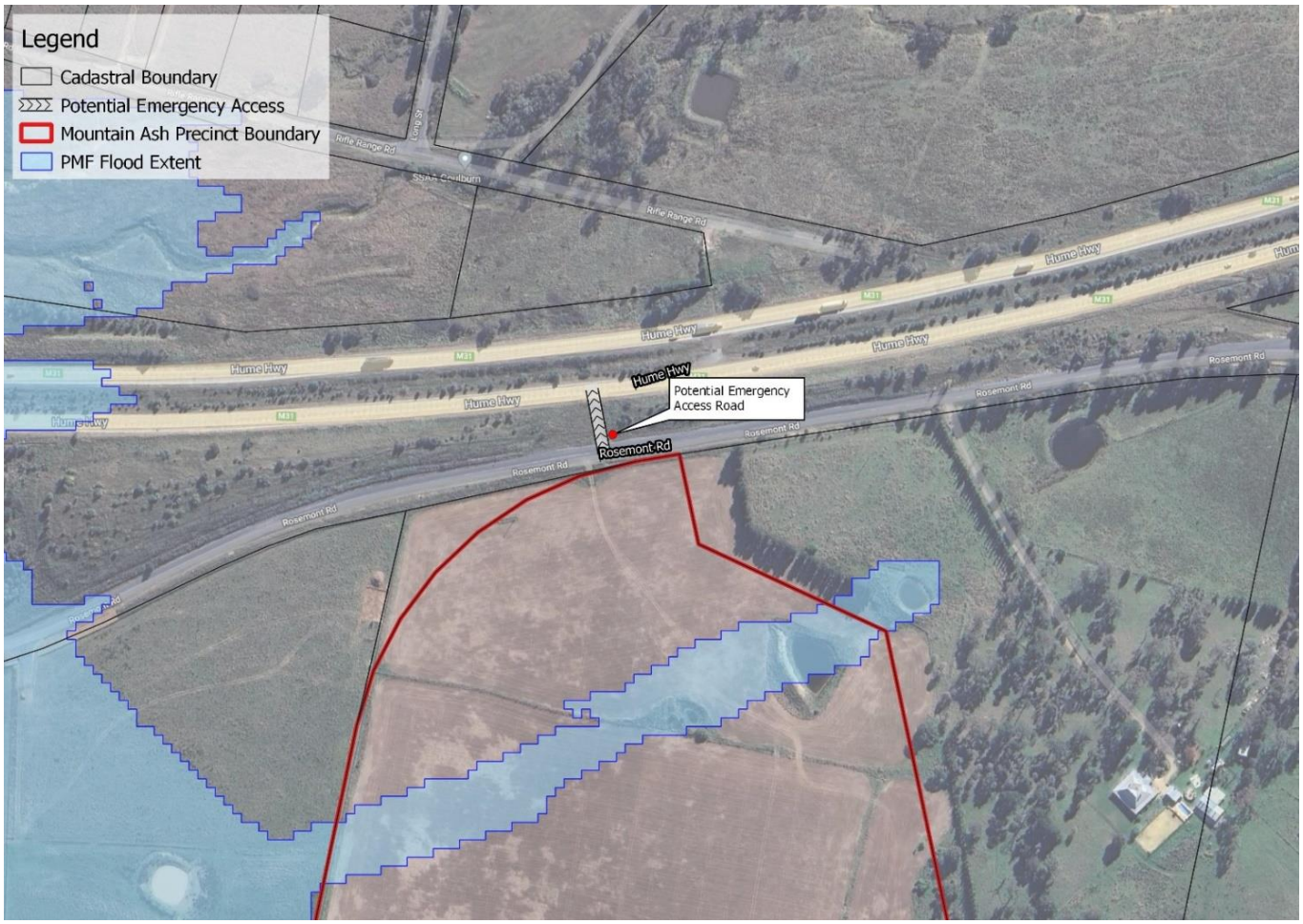

FIGURE 3.13: POTENTIAL EMERGENCY ACCESS ROAD CONNECTION

4. PLANNING CONTROL REVIEW

This section discusses the flooding related planning controls that currently apply to this Site to meet the principles of the *Flood Risk Management Manual: The management of flood liable land* (State of NSW and Department of Planning and Environment , 2022) under:

1. Local Planning Direction 4.1 Flooding (LPD).
2. Goulburn Mulwaree Local Environmental Plan (LEP) 2009.
3. Goulburn Mulwaree Development Control Plan (DCP) 2009.

To achieve these principles, the following key approaches were adopted for the site:

- Minor shaping overland flow paths through the site to contain the PMF.
- Provision of sufficient land within future lots above the PMF to construct improvements (residential homes, sheds etc).
- Sizing of internal roads to achieve 1% AEP flood immunity.

4.1 Local Planning Direction 4.1 Flooding

In accordance with Section 9.1(2) of the Environmental Planning and Assessment Act 1979, the Minister has directed that Councils have the responsibility to facilitate the implementation of the NSW Government's Flood Prone Land Policy. The objectives of LPD 4.1 Flooding are:

(a) ensure that development of flood prone land is consistent with the NSW Government's Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005, and

(b) ensure that the provisions of an LEP that apply to flood prone land are commensurate with flood behaviour and includes consideration of the potential flood impacts both on and off the subject land.

Table 4.1 sets out how LPD 4.1 are addressed by the proposed development:

TABLE 4.1: RESPONSES TO LOCAL PLANNING DIRECTION 4.1 FLOODING

Local Planning Direction 4.1 Flooding	
Clause	Response
***(1)** A planning proposal must include provisions that give effect to and are consistent with:* *(a) the NSW Flood Prone Land Policy,* *(b) the principles of the Floodplain Development Manual 2005,* *(c) the Considering flooding in land use planning guideline 2021, and* *(d) any adopted flood study and/or floodplain risk management plan prepared in accordance with the principles of the Floodplain Development Manual 2005 and adopted by the relevant council.*	This report has been prepared to be consistent with the NSW Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005, Considering flooding in land use planning guideline 2021 and the adopted Goulburn Floodplain Risk Management Study and Plan 2022.
(2) A planning proposal must not rezone land within the flood planning area from Recreation, Rural, Special Purpose or Conservation Zones to a Residential, Employment, Mixed Use, W4 Working Waterfront or Special Purpose Zones.	This planning proposed is not seeking to rezone rural land within the Flood Planning Area to residential, business, industrial or a special purpose zone. The site is currently zoned as RU1 Primary Production which is a rural zone primary intended to promote agricultural production and environmental protection. Figure 4.1 below illustrates the PMF flood extent as it relates to the subject site and illustrates the proposed R5 Large Lot Residential and limited development area within the PMF flood extent. No residential zoning use is proposed within the PMF extent or within any part of the overland flow corridor identified through the overland flow modelling.

Local Planning Direction 4.1 Flooding

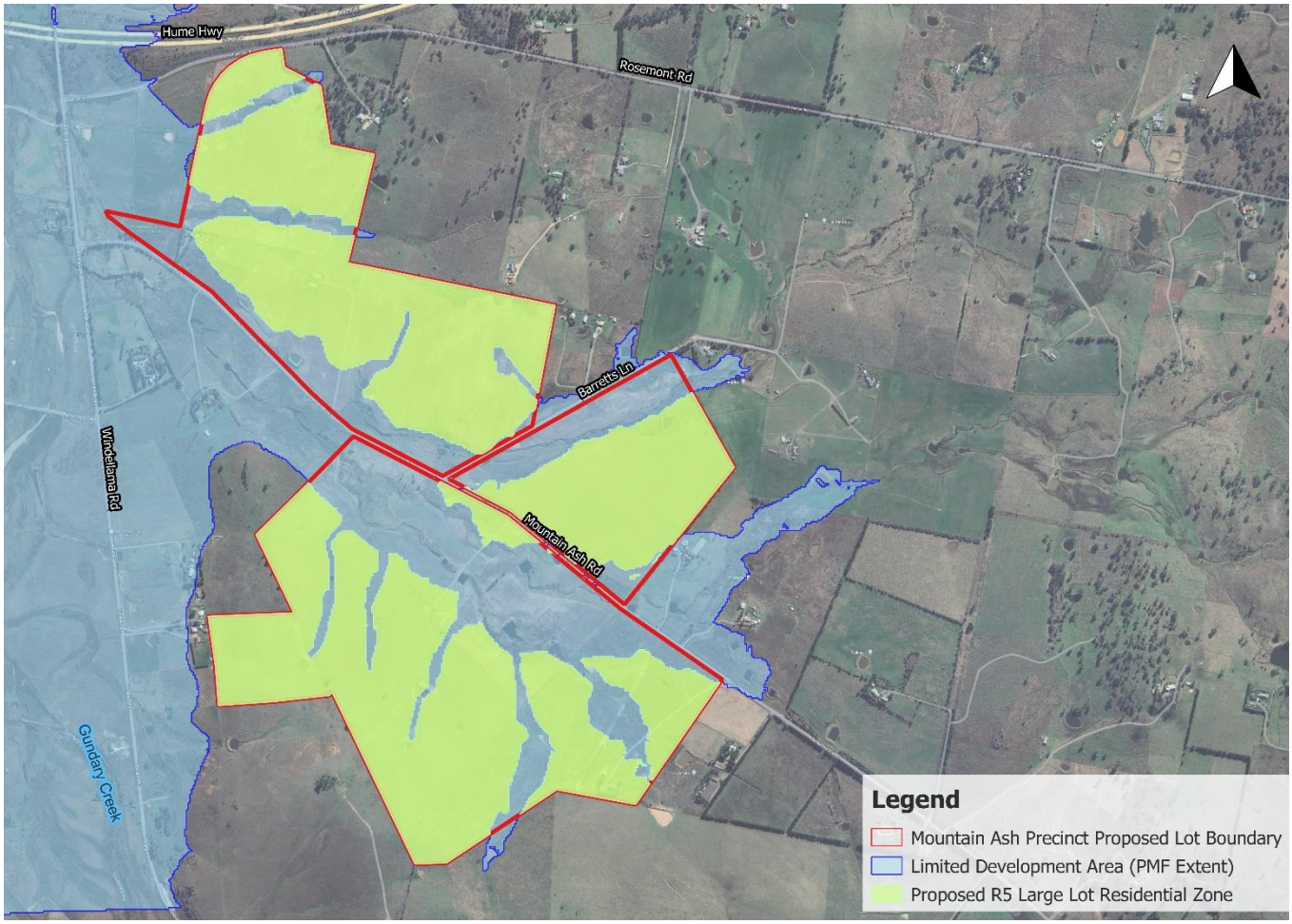

FIGURE 4.1: PROPOSED REZONING OF THE SITE

***(3)** A planning proposal must not contain provisions that apply to the flood planning area which:* *(a) permit development in floodway areas,*	All areas of the subject site within the flood planning area are proposed to be rezoned to R5 Large Lot Residential, utilising areas which are affected by Flood for those (minimal number of) lots to contain a building envelope beyond the flood extent with a covenant applied to each of those (minimal) number of affected allotments. This provides greater security with future ownership of the land with the restrictions applied to the Title. It is considered that using C2 Environmental Conservation zone in this area is not appropriate for the intent of C2 lands as that is not what is sought in the avoidance of utilising the lands to ensure no risk to life or property in time of flood, hence the covenant and titling impacts apply a stronger and better-defined legal obligation for these landholders, insurers, and any legal jurisdiction.
(b) permit development that will result in significant flood impacts to other properties,	The flood impacts have been addressed in Section 2.6, which demonstrate that there are no significant impacts predicted due to the proposed development.
(c) permit development for the purposes of residential accommodation in high hazard areas,	Development potential is limited in the flood impacted lands zone and ensures residential accommodation is prevented from being in the PMF floodway or high hazard areas.

Local Planning Direction 4.1 Flooding	
(d) permit a significant increase in the development and/or dwelling density of that land,	Development potential is limited in the flood impacted lands and ensures residential accommodation is prevented from being in the PMF floodway or high hazard areas.
(e) permit development for the purpose of centre-based childcare facilities, hostels, boarding houses, group homes, hospitals, residential care facilities, respite day care centres and seniors housing in areas where the occupants of the development cannot effectively evacuate,	The development is not proposed to be zoned as centre-based childcare facilities, hostels, boarding houses, group homes, hospitals, residential care facilities, respite day care centres and seniors housing.
(f) permit development to be carried out without development consent except for the purposes of exempt development or agriculture. Dams, drainage canals, levees, still require development consent,	Development potential within the flood planning area and the overland flow corridors are proposed to be restricted by the flood impacted lands where, firstly the range of permissible uses are very limited and secondly where the Local Environmental Plan (LEP) does not permit development without consent. The LEP only permits home occupations and roads without consent for R5 large lots. The planning proposal does not contain provisions which permit development to be conducted without development consent.
(g) are likely to result in a significantly increased requirement for government spending on emergency management services, flood mitigation and emergency response measures, which can include but are not limited to the provision of road infrastructure, flood mitigation infrastructure and utilities, or	Development is proposed to be outside of the PMF flood extent and a suitable evacuation route has been identified to satisfy the DCP requirements ensures the future dwellings would not become inundated a flood event up to the PMF. Hence, increased government spending on emergency response measures, emergency management services and flood mitigation is not anticipated to be required. It is noted as part of the development, the existing culverts under Barratts Ln near Mountain Ash Road will be upgraded to cater for the 1% AEP immunity. These culverts are currently a Council owned asset/infrastructure.
(h) permit hazardous industries or hazardous storage establishments where hazardous materials cannot be effectively contained during the occurrence of a flood event.	The proposed R5 Large Lot Residential zone prohibit heavy industrial storage establishments which is the parent definition for hazardous storage establishments. Hazardous industries fall under the parent definition of Industries which is prohibited from the R5 This proposal does not contain provisions which permit hazardous industries or hazardous storage establishments.
***(4)** A planning proposal must not contain provisions that apply to areas between the flood planning area and probable maximum flood to which Special Flood Considerations apply which:*	Future dwelling houses are proposed for areas outside of the PMF flood extent.
(a) permit development in floodway areas,	Development is proposed to be outside of the PMF flood extent. Thus, the development is out of the floodway area.
(b) permit development that will result in significant flood impacts to other properties,	The flood impacts have been addressed is Section 2.6, which demonstrate that there are no significant impacts predicted due to the proposed development.
(c) permit a significant increase in the dwelling density of that land,	Development potential is limited in the flood impacted lands and ensures residential accommodation is prevented from being in the PMF floodway or high hazard areas.
(d) permit the development of centre-based childcare facilities, hostels, boarding houses, group homes, hospitals, residential care facilities, respite day care centres and seniors housing in areas	The development prohibits the use of these within flood planning area and PMF.

Local Planning Direction 4.1 Flooding	
where the occupants of the development cannot effectively evacuate,	
(e) are likely to affect the safe occupation of and efficient evacuation of the lot, or	Flood evacuation is not anticipated necessary because the development is protected from the PMF. Regardless, evacuation was considered in the event a future resident wishes to evacuate. Evacuation routes from the Site that satisfies areas impacted by the Flood Planning Constraints 4 (FPCC 4) in the DCP have been documented in Section 3.23.2, which is to provide flood free in the 1% AEP and evacuates to a publicly assessable location above the PMF over a 10 hour period.
(f) are likely to result in a significantly increased requirement for government spending on emergency management services, and flood mitigation and emergency response measures, which can include but not limited to road infrastructure, flood mitigation infrastructure and utilities.	Development is proposed to be outside of the PMF flood extent and a suitable evacuation route has been identified to satisfy the DCP requirements ensures the future dwellings would not become inundated or isolated in a flood event. Hence, increased government spending on emergency response measures, emergency management services and flood mitigation is not anticipated to be required.
***(5)** For the purposes of preparing a planning proposal, the flood planning area must be consistent with the principles of the Floodplain Development Manual 2005 or as otherwise determined by a Floodplain Risk Management Study or Plan adopted by the relevant council.*	This report has been prepared to be consistent with the NSW Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005.

4.2 Goulburn Mulwaree Local Environmental Plan 2009

The Land Zoning Map specified in Section 2.2 of the LEP (Sheet LZN_001E) indicates that the Site is zoned as RU1 Rural Zone - (Primary Production).

The LEP addresses flooding in Section 5.21: Flood planning. Clause 1 is as follows:

1. *The objectives of this clause are as follows—*
   - a) *to minimise the flood risk to life and property associated with the use of land,*
   - b) *to allow development on land that is compatible with the flood function and behaviour on the land, taking into account projected changes as a result of climate change,*
   - c) *to avoid adverse or cumulative impacts on flood behaviour and the environment,*
   - d) *to enable the safe occupation and efficient evacuation of people in the event of a flood.*

Table 4.2 sets out how the clauses 2 and 3 of Section 5.21 are addressed by the proposed development.

TABLE 4.2: RESPONSES TO SECTION 5.21 OF GOULBURN MULWAREE LEP 2009

Clause	Response
(2) Development consent must not be granted to development on land the consent authority considers to be within the flood planning area unless the consent authority is satisfied the development—	
(a) is compatible with the flood function and behaviour on the land, and	The minimum flood levels have been designed to exclude all floods, up to the PMF and would therefore only be impacted by floods of greater magnitude than this event, which is compatible with the behaviour of the land and the existing city of Goulburn

Clause	Response
(b) will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties, and	Section 2.6 summaries the modelling results demonstrating no detrimental increases in the potential flooding impact to external developments or properties because of this development.
(c) will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood, and	All habitable areas are proposed to be outside the PMF extent. Section 7.3 of the FRMSP specifies the emergency response classifications for areas outside the PMF extent as 'Indirect Consequence (NIC)'. NIC refers to areas that are not flooded but may lose services.
(d) incorporates appropriate measures to manage risk to life in the event of a flood, and	All habitable areas are proposed to be outside the PMF extent. Areas situated outside of the PMF extent (FPCC4) are not flood prone and flood planning controls do not apply to these areas.
(e) will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses.	All habitable areas are proposed to be outside the PMF extent. Areas situated outside of the PMF extent (FPCC4) are not flood prone and flood planning controls do not apply to these areas.
(3) In deciding whether to grant development consent on land to which this clause applies, the consent authority must consider the following matters—	
(a) the impact of the development on projected changes to flood behaviour as a result of climate change,	The minimum flood levels have been designed to exclude all floods, up to PMF.
(b) the intended design and scale of buildings resulting from the development,	The R5 Large Lot development intends to hold 110 Rural Residential lots All these proposed areas would be protected against the PMF Flood Level.
(c) whether the development incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood,	All habitable areas are proposed to be restricted by building envelope outside the PMF extent and covenant area restricting use within the PMF extent.
(d) the potential to modify, relocate or remove buildings resulting from development if the surrounding area is impacted by flooding or coastal erosion.	The Site is not subject to coastal erosion and the minimum flood levels have been designed to exclude all floods, up to the PMF Flood Level.

4. *A word or expression used in this clause has the same meaning as it has in the Considering Flooding in Land Use Planning Guideline unless it is otherwise defined in this clause.*

5. *In this clause—*

   ***Considering Flooding in Land Use Planning Guideline** means the Considering Flooding in Land Use Planning Guideline published on the Department's website on 14 July 2021.*

   ***flood planning area has** the same meaning as it has in the Floodplain Development Manual.*

   ***Floodplain Development Manual** means the Floodplain Development Manual (ISBN 0 7347 5476 0) published by the NSW Government in April 2005.*

4.3 Goulburn Mulwaree Development Control Plan 2009

Council have recently updated the DCP which adopts the Goulburn Floodplain Risk Management Study and Plan (FRMSP) 2022 (GRC Hydro, 2022). The key updates relating to flooding matters include:

- Amendment to Chapter 3.8 "Flood Affected Land'.
- Inclusion of Appendix J Flood Policy:
  - This draft flood policy defines planning controls to be applied to development on flood prone land within the Goulburn Mulwaree Local Government Area (LGA).

Figure 2.1 shows the Site relative to the adopted flood study extent completed as part of the Goulburn FRMSP. The proposed development is located outside of the adopted flood study area. Section 3.8.2.1 of the Amended Chapter 3.8 of the DCP states that *"Properties not yet identified in Council studies may still be flood affected. An assessment will be required to be submitted with any development application for potentially flood prone land".* Council's hydraulic flood model has been updated to include the Project area and to undertake a Flood Impact and Risk Assessment to satisfy the DCP requirement. Details of the updates to Councils flood model are summarised in Section 2.3. The following objectives of the DCP sets out what should be followed:

Objectives

- Provide specific flood planning controls for the identified area within the Goulburn Floodplain Risk Management Study (GFRMS) 2021 and Plan.
- Provide additional flood related development controls to support those already included within the Goulburn Mulwaree Local Environmental Plan 2009.
- Introduce and implement the Flood Policy and apply its Flood Planning Constraint Categories (FPCC) and specific development controls for certain development on land identified within the Goulburn Floodplain Risk Management Study.
- Impose development controls for sensitive and hazardous development that occurs within the Probable Maximum Flood (PMF).
- Have an overall aim to minimise impacts from flooding for development occurring within flood prone land both within and outside of an adopted flood study or floodplain risk management study and plan.

Section 3.8.2.2 of the DCP defines the controls for development outside of the adopted Flood Study Areas which applies to the project site. The DCP requires the submission of a *Flood Impact and Risk Assessment Report* that provides information on existing flood risk for a catchment and is to be commensurate with the latest version of the NSW Floodplain Development Manual. This FIRA demonstrates meeting the objectives of the DCP, with the specific responses provided in Table 4.3.

TABLE 4.3: RESPONSES TO THE GOULBURN MULWAREE DEVELOPMENT CONTROL PLAN 2009

Clause	Response
(a) A description of the creek or drainage system that is relevant to the flood characteristics of the site, whether located on, adjacent to or remote from the development site;	See Section 1.1 of this FIRA which provides this description.
(b) Flood levels must be defined for the PMF, 1%, 5%, 10% and 20% AEP events for the climate change pre-development scenario (all assumptions, calculations and modelling output tables must be provided). From this information the FPL and FPA is to be determined (note for areas outside an adopted Council Flood Study a freeboard of 0.5m is to be applied to the 1% AEP to determine the FPL);	Details of the updated hydraulic modelling are documented in Section 2. Flood level maps for the PMF, 0.2%, 0.5%, 1%, 5%, 10% and 20% AEP events for the climate change pre-development scenario have been provided in Appendix A – Figures 1-7. The proposed development has adopted the PMF for the FPL.
(c) Flood velocities and vectors for the 1% AEP event for the climate change pre- development scenario (all assumptions, calculations and modelling output tables must be provided);	Details of the updated hydraulic modelling are documented in Section 2. Flood velocity mapping for the PMF, 1%, 5%, 10% and 20% AEP events for the climate change pre-development scenario have been provided in Appendix A Figures 15-21.

Clause	Response
(d) Provisional Hazard categories based on depth and velocity as well as obvious other hazards such as evacuation difficulties as per the requirements of the 2005 NSW Floodplain Development Manual;	Provisional flood hazard is determined through a relationship developed between the depth and velocity of floodwaters and is based strictly on hydraulic considerations. Further definition is not considered necessary as all development is proposed outside of the PMF. Historically, the criteria for these relationships have been taken from the NSW FDM (Appendix L; NSW Government, 2005). The Manual defines two major categories for provisional hazard – high and low. A third minor transitional category is also included that requires further investigation of the site in question to define the hazard category. The provisional hazard curves are shown in Figure 4.2. The current FRMSP has calculated the flood hazard in accordance with the Australian Emergency Management Handbook 7 Guideline and ARR2019. The method considers the threat to people of various ages (children, adults) and to the community interacting with floodwaters (pedestrians, vehicles, and those within buildings). Figure 3.1 presents the relationship between the velocity and depth of floodwaters and the corresponding classification. Flood hazard category mapping adopting the Australian Emergency Management Handbook 7 Guideline and ARR2019 (consistent with the FRMSP) for the PMF,0.2%, 0.5%, 1%, 5%, 10% and 20% AEP events for the pre-development scenario have been provided in Appendix A Figure 29-35.

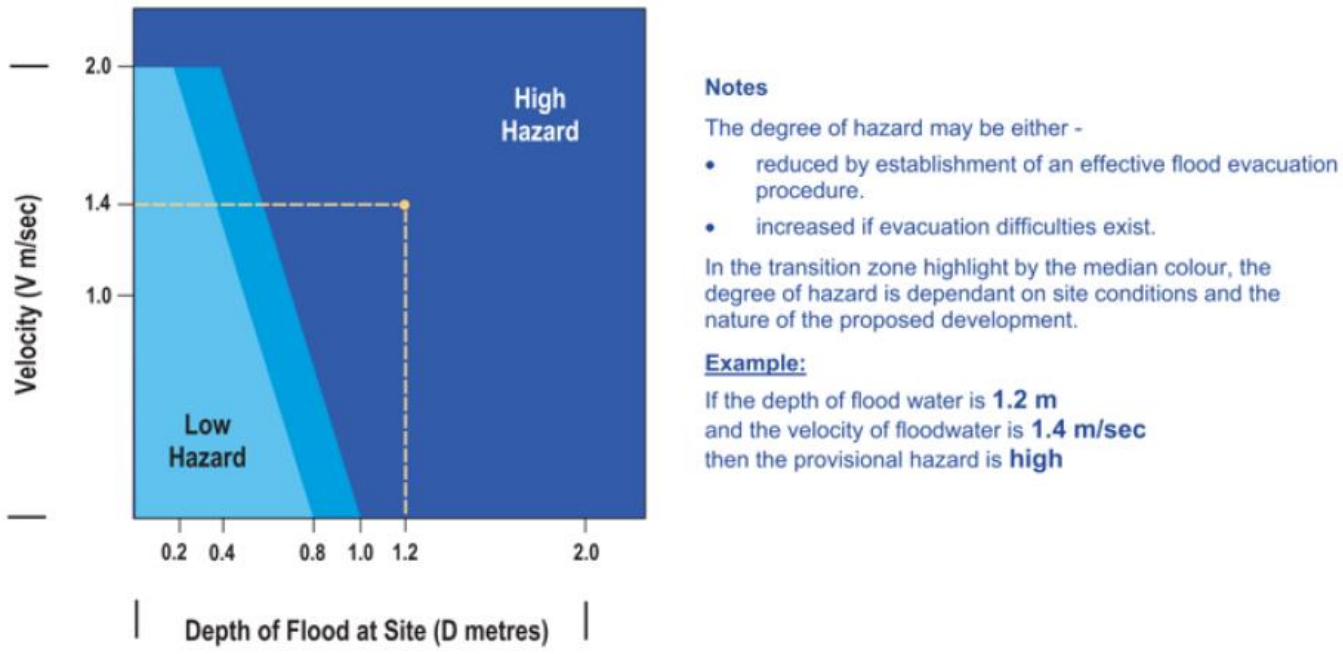

FIGURE 4.2: PROVISIONAL HAZARD CURVES FROM APPENDIX L OF THE FLOODPLAIN DEVELOPMENT MANUAL 2005

Clause	Response

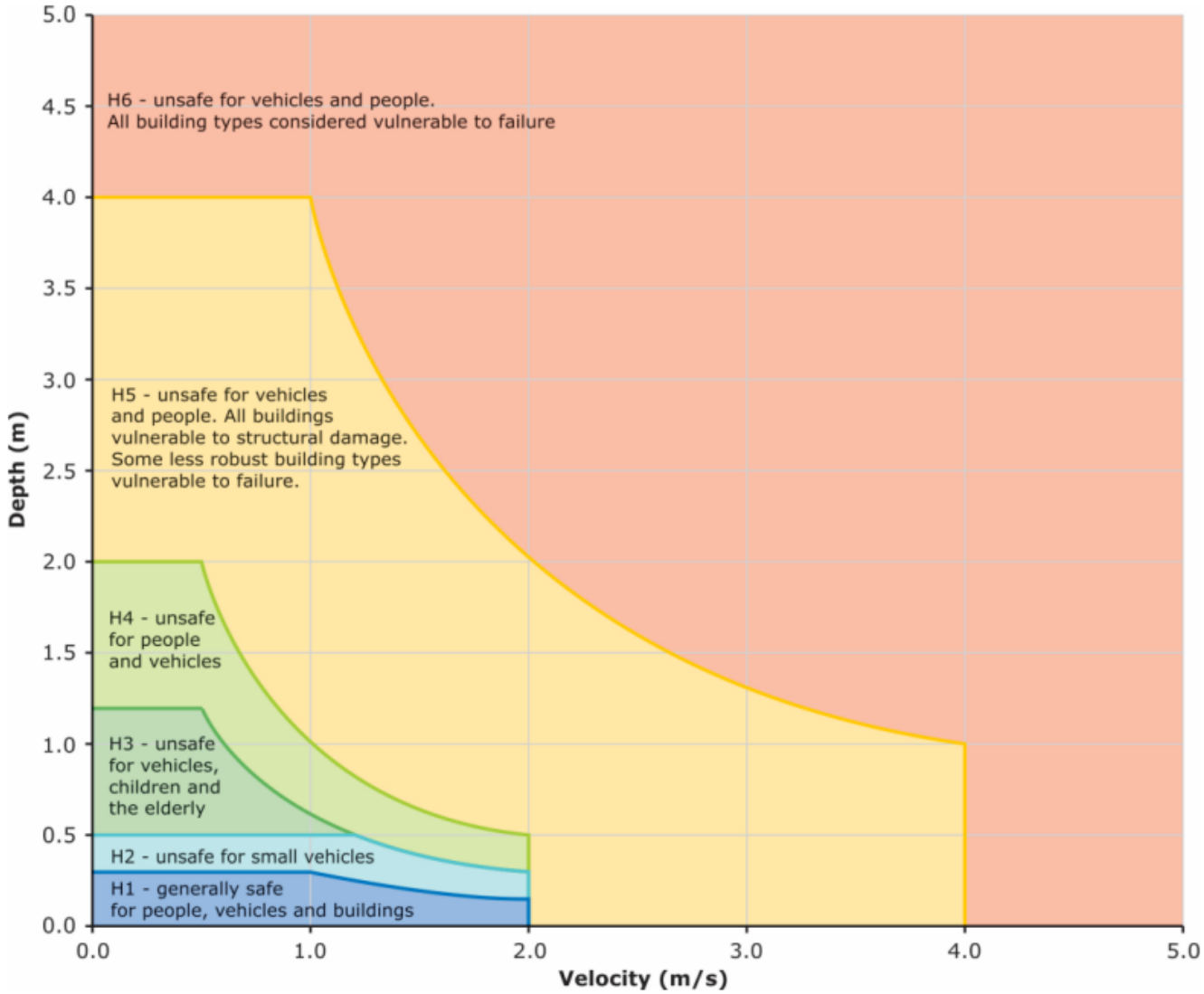

FIGURE 4.3: FLOOD HAZARD CURVES (AUSTRALIAN EMERGENCY MANAGEMENT HANDBOOK 7)

(e) Provisional Hydraulic categories based on depth and velocity as per the requirements of the latest version of the NSW Floodplain Development Manual; and	As per Clause (d)
(f) Flood Planning Constraint Categories based on the definitions provided in the latest adopted version of the Goulburn Floodplain Risk Management Study and Plan or an adopted Floodplain Risk Management Study and plan more relevant to the site. Once determined the relevant FPCC controls in the Flood Policy matrix can be applied (albeit with a 0.5m freeboard for areas outside an adopted Council Flood Study Refer to Appendix J).	Flood Planning Constraint Categories have not been determined for the purposes of this FIRA because all habitable areas for the development are proposed to be situated outside the PMF extent and hence outside of any flood planning constraint category. Council has released preliminary FPPC mapping of overland flows outside of the area reported in the FRMSP. It should be noted that the data from this mapping is currently not made available for development applications. Figure 4.2 below shows the PMF extent modelled from updated modelling overlayed with Council's preliminary FPPC overland flow mapping. The updated modelling for the Site is generally within preliminary overland flow extents developed by Council.

Clause	Response

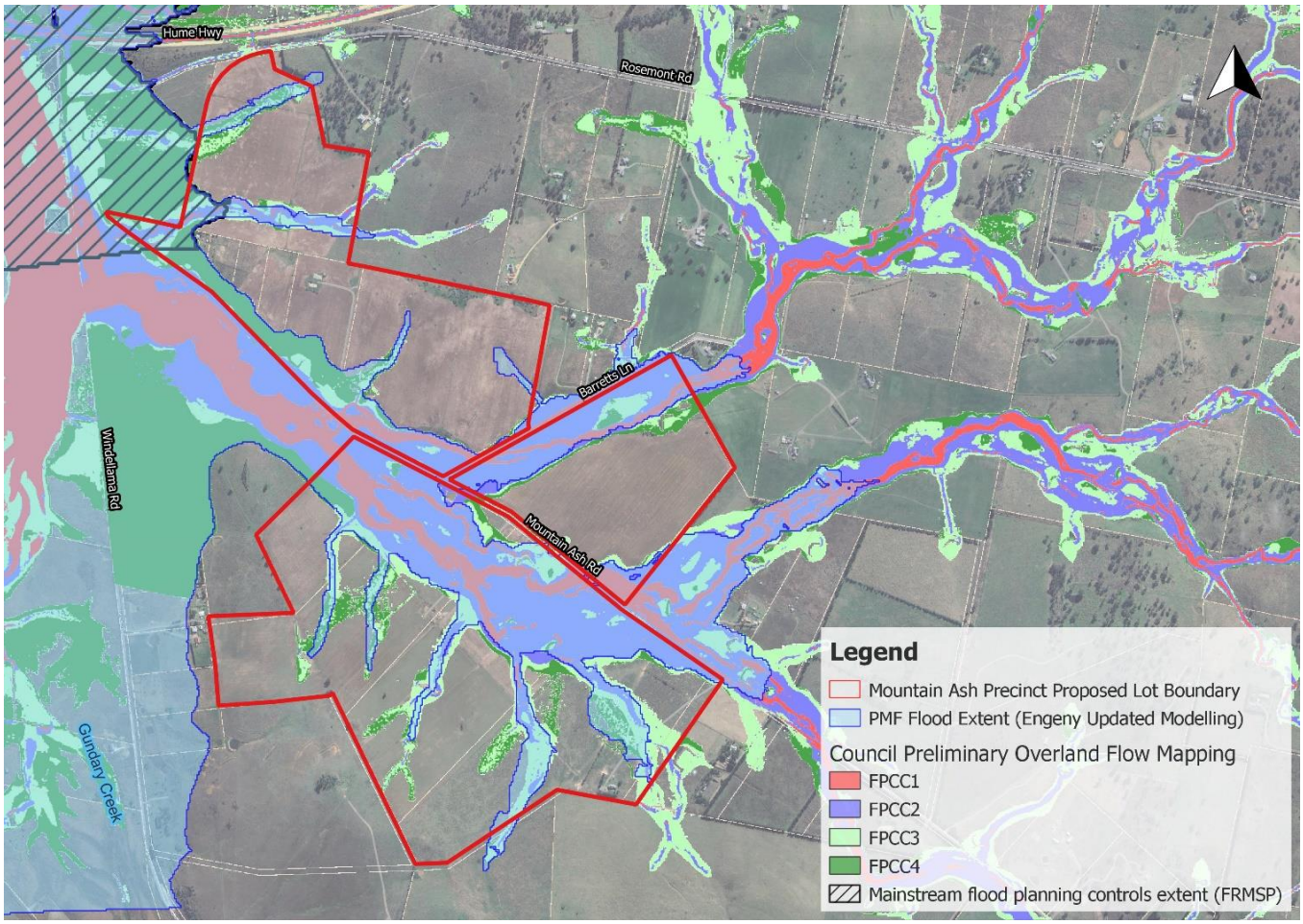

FIGURE 4.4: PRELIMINARY OVERLAND FLOW MAPPING OVERLAY

(https://www.goulburn.nsw.gov.au/files/sharedassets/public/strategic-planning/public-exhibition/figure-fpcc-v13.pdf)

(g) Plans showing the results of (c) to (f) as well as the location of the proposed development.	Flood level, velocity and required hazard mapping for the PMF,0.2%, 0.5%, 1%, 5%, 10% and 20% AEP events including the proposed development is provided in the following: Flood Levels – Appendix A Figures 36 to 42 Flood Velocity – Appendix A Figures 50 to 56 Flood Hazard Category - Appendix A Figures 64 to 69

The update to Council's model provided in Section 2.3 demonstrates the PMF extent across the proposed development. All habitable areas are proposed to be outside the PMF extent. Areas situated outside of the PMF extent (FPCC4) are not flood prone and flood planning controls do not apply to these areas.

5. SUMMARY OF CONSISTENCY

This flood impact and risk assessment (FIRA) is considered consistent with the following planning controls relevant to the Site and adequately meet the principles of the *Flood Risk Management Manual: The management of flood liable land* (ref):

- **Local Planning Direction 4.1 Flooding (LPD):**
  - Development is proposed to be outside of the PMF flood extent. Hence, the development is out of the floodway area and rest in place during a flood event is considered a safe management during a flood event.
  - No development is proposed in the flood planning area and the development does not contain provisions within the flood planning area which:
    (a) Permit development in floodway areas.
    (b) Permit development that will result in significant impacts to other properties.
    (c) Permit development for the purposes of residential accommodation in high hazard areas.
    (d) Permit development for uses in which occupants of the development cannot effectively evacuate.
    (e) Permit development to be carried out without development consent.
    (f) Are likely to result in a significantly increased requirement for government spending; or,
    (g) Permit hazardous industries or hazardous storage establishments.
  - Special Flood Considerations are not required as the development does not contain provisions that apply to areas between the Flood Planning Area and PMF.
- **Goulburn Mulwaree Local Environmental Plan (LEP) 2009:**
  - Development is proposed to be outside of the PMF flood extent:
    (a) To minimise the flood risk to life and property associated with the use of land.
    (b) To allow development on land that is compatible with the flood function and behaviour on the land, taking into account projected changes as a result of climate change.
    (c) To avoid adverse or cumulative impacts on flood behaviour and the environment.
    (d) To enable the safe occupation and efficient evacuation of people in the event of a flood.
- **Goulburn Mulwaree Development Control Plan (DCP) 2009:**
  - The proposed development is located within an area outside of the Council's adopted Flood Study Area. A Flood Impact Assessment and Risk Assessment report has been prepared by a suitably qualified and experienced engineer recognised under the National Engineers Register in this field.
  - Flood evacuation should not be necessary because the development is protected from the PMF. While not mandatory, additional evacuation controls assuming FPCC 4 has been considered for the site. Two potential routes have been identified to satisfy the Evacuation and Refuge controls.

    Residents from the Site can safely evacuate to the designated evacuation centre via existing roads, obviating the necessity for any infrastructure upgrades.

6. REFERENCES

- Australian Institute for Disaster Resilience. (2017). *Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia - Handbook 7.* Melbourne: Australian Institute for Disaster Resilience.
- Ball, J., Babister, M., Nathan, R., Weeks, W., Weinmann, E., Retallick, M., & Testoni, I. (2019). *Australian Rainfall and Runoff: A Guide to Flood Estimation.* Brisbane: Commonwealth of Australia.
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- NSW State Emergency Service. (2021). *Goulburn Mulwaree LGA Local Flood Plan.*
- State of NSW and Department of Planning and Environment . (2022). *Flood Risk Management Manual: The management of flood liable land .*

7. QUALIFICATIONS

(a) In preparing this document, including all relevant calculations, and modelling, Engeny Australia Pty Ltd (Engeny) has exercised the degree of skill, care and diligence normally exercised by members of the engineering profession and has acted in accordance with accepted practices of engineering principles.

(b) Engeny has used reasonable endeavours to inform itself of the parameters and requirements of the project and has taken reasonable steps to ensure that the works and document is as accurate and comprehensive as possible given the information upon which it has been based including information that may have been provided or obtained by any third party or external sources which has not been independently verified.

(c) Engeny reserves the right to review and amend any aspect of the works performed including any opinions and recommendations from the works included or referred to in the works if:

  (i) Additional sources of information not presently available (for whatever reason) are provided or become known to Engeny; or

  (ii) Engeny considers it prudent to revise any aspect of the works in light of any information which becomes known to it after the date of submission.

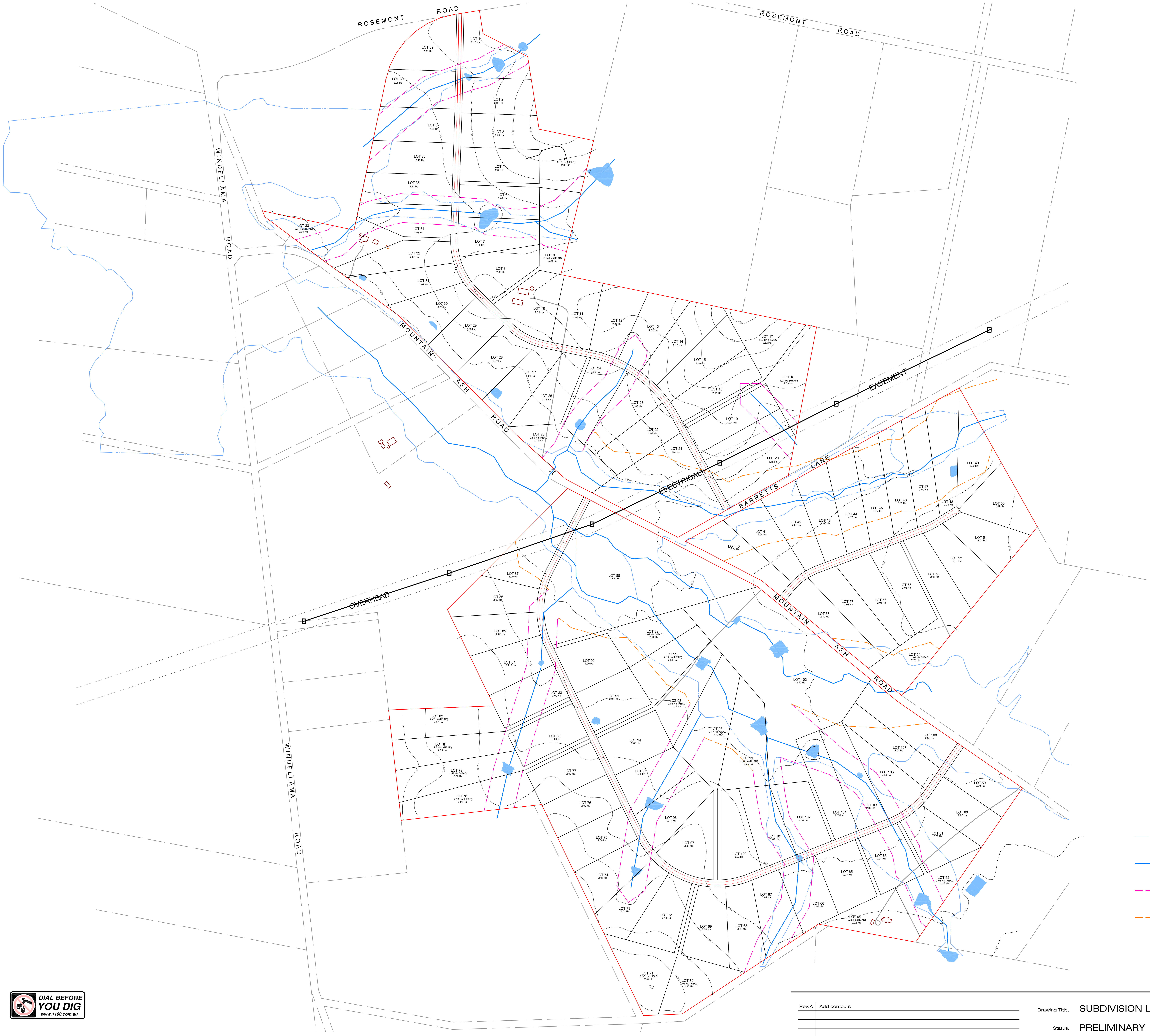
(d) Engeny does not give any warranty nor accept any liability in relation to the completeness or accuracy of the works, which may be inherently reliant upon the completeness and accuracy of the input data and the agreed scope of works. All limitations of liability shall apply for the benefit of the employees, agents, and representatives of Engeny to the same extent that they apply for the benefit of Engeny.

(e) This document is for the use of the party to whom it is addressed and for no other persons. No responsibility is accepted to any third party for the whole or part of the contents of this Report.

(f) If any claim or demand is made by any person against Engeny on the basis of detriment sustained or alleged to have been sustained as a result of reliance upon the Report or information therein, Engeny will rely upon this provision as a defence to any such claim or demand.

(g) This Report does not provide legal advice.

APPENDIX A: SITE CONCEPT PLAN



LEGEND

- 100 Year ARI
- WATERCOURSE / DAM
- WATERCOURSE 40m SETBACK
- WATERCOURSE 100m SETBACK

STUART DESIGN
- BUILDING DESIGN
- DRAFTING
- 3D PHOTO RENDERING
- PROJECT MANAGEMENT

bdaa BUILDING DESIGNERS ASSOCIATION OF AUSTRALIA

130 IRONBARK ROAD
WIRRIMBI, N.S.W. 2447
MOBILE - 0427 471670
EMAIL: paul@stuartdesign.com.au

DIAL BEFORE YOU DIG
www.1100.com.au

Rev.	Description.
Rev.A	Add contours

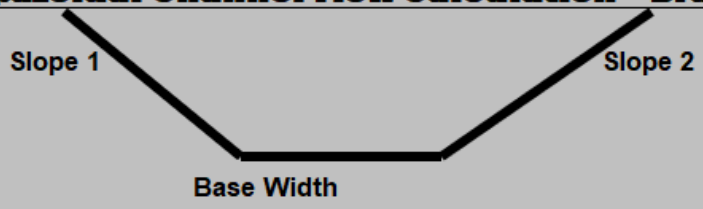
Drawing Title. SUBDIVISION LAYOUT - WINDELLAMA

Status. PRELIMINARY

Plot Date.
Scale. 1:5000 @ A1
Sheet No. 1
Job No. 22-012
Drawing No. CD-01-A

APPENDIX B: PROPOSED CHANNEL SIZING

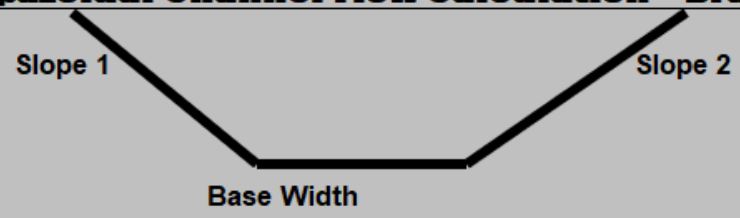
Trapazoidal Channel Flow Calculation - Drain 1



Input Parameterers		
Slope 1 =	1	1 : x Slope
Slope 2 =	1	1 : x Slope
Base Width =	10	Base Width (m)
Longitudinal Slope =	2.53%	Slope %
Mannings "n" =	0.06	roughness
Flow Depth (m) =	0.064623637	flow depth

Results		
Flow =	0.28	m3/sec
Average Depth =	0.06	m
Velocity =	0.42	m/sec
Flow Area =	0.65	m2
Top Width =	10.13	m
Perimeter =	10.18	m
Shear Stress =	15.94	N/m2
Stream Power =	6.75	W/m2

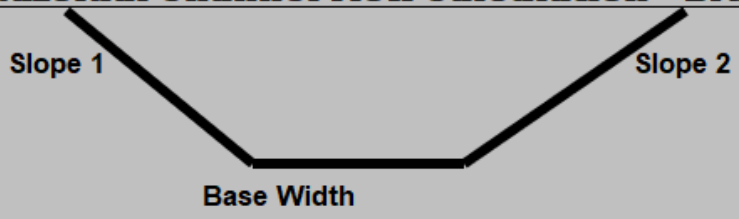
Trapazoidal Channel Flow Calculation - Drain 2



Input Parameterers		
Slope 1 =	1	1 : x Slope
Slope 2 =	1	1 : x Slope
Base Width =	10	Base Width (m)
Longitudinal Slope =	2.35%	Slope %
Mannings "n" =	0.06	roughness
Flow Depth (m) =	0.054973228	flow depth

Results		
Flow =	0.20	m3/sec
Average Depth =	0.05	m
Velocity =	0.37	m/sec
Flow Area =	0.55	m2
Top Width =	10.11	m
Perimeter =	10.16	m
Shear Stress =	12.60	N/m2
Stream Power =	4.63	W/m2

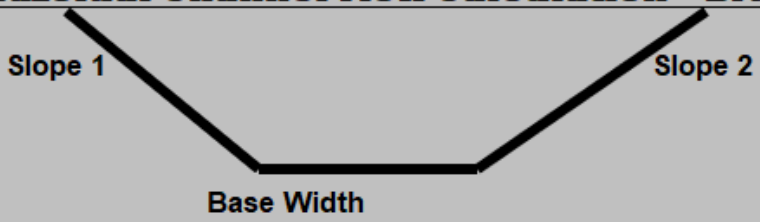
Trapazoidal Channel Flow Calculation - Drain 3



Input Parameterers		
Slope 1 =	1	1 : x Slope
Slope 2 =	1	1 : x Slope
Base Width =	10	Base Width (m)
Longitudinal Slope =	2.56%	Slope %
Mannings "n" =	0.06	roughness
Flow Depth (m) =	0.082719921	flow depth

Results		
Flow =	0.42	m3/sec
Average Depth =	0.08	m
Velocity =	0.50	m/sec
Flow Area =	0.83	m2
Top Width =	10.17	m
Perimeter =	10.23	m
Shear Stress =	20.60	N/m2
Stream Power =	10.33	W/m2

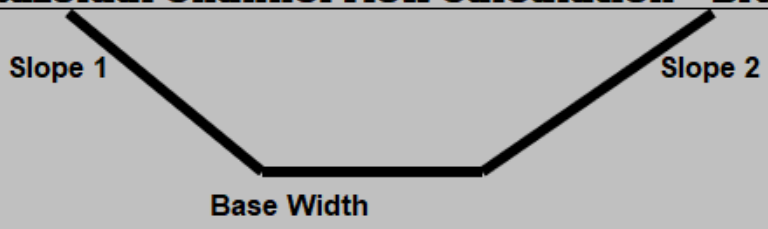
Trapazoidal Channel Flow Calculation - Drain 4



Input Parameterers		
Slope 1 =	1	1 : x Slope
Slope 2 =	1	1 : x Slope
Base Width =	10	Base Width (m)
Longitudinal Slope =	2.36%	Slope %
Mannings "n" =	0.06	roughness
Flow Depth (m) =	0.101336154	flow depth

Results		
Flow =	0.56	m3/sec
Average Depth =	0.10	m
Velocity =	0.55	m/sec
Flow Area =	1.02	m2
Top Width =	10.20	m
Perimeter =	10.29	m
Shear Stress =	23.23	N/m2
Stream Power =	12.77	W/m2

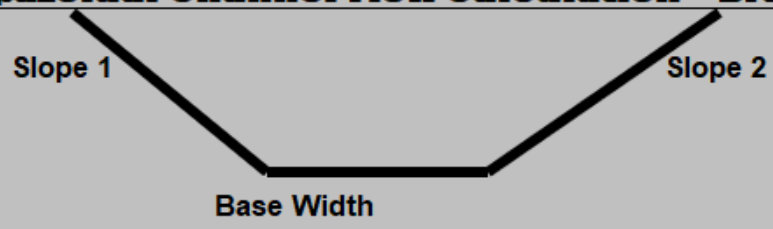
Trapazoidal Channel Flow Calculation - Drain 5



Input Parameterers		
Slope 1 =	1	1 : x Slope
Slope 2 =	1	1 : x Slope
Base Width =	10	Base Width (m)
Longitudinal Slope =	2.36%	Slope %
Mannings "n" =	0.06	roughness
Flow Depth (m) =	0.085851439	flow depth

Results		
Flow =	0.43	m3/sec
Average Depth =	0.09	m
Velocity =	0.49	m/sec
Flow Area =	0.87	m2
Top Width =	10.17	m
Perimeter =	10.24	m
Shear Stress =	19.71	N/m2
Stream Power =	9.72	W/m2

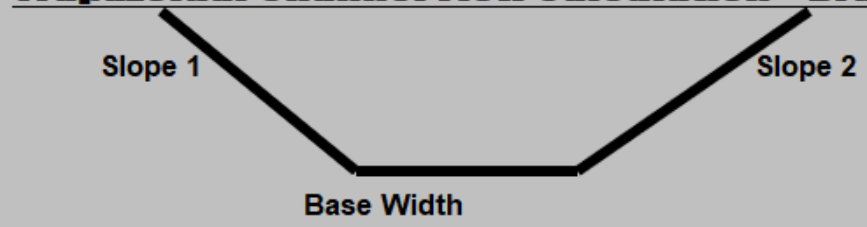
Trapazoidal Channel Flow Calculation - Drain 7



Input Parameterers		
Slope 1 =	1	1 : x Slope
Slope 2 =	1	1 : x Slope
Base Width =	10	Base Width (m)
Longitudinal Slope =	4.17%	Slope %
Mannings "n" =	0.06	roughness
Flow Depth (m) =	0.046577588	flow depth

Results		
Flow =	0.21	m3/sec
Average Depth =	0.05	m
Velocity =	0.44	m/sec
Flow Area =	0.47	m2
Top Width =	10.09	m
Perimeter =	10.13	m
Shear Stress =	18.97	N/m2
Stream Power =	8.31	W/m2

Trapazoidal Channel Flow Calculation - Drain 8



Input Parameterers		
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Slope 2 =	1	1 : x Slope
Base Width =	10	Base Width (m)
Longitudinal Slope =	6.57%	Slope %
Mannings "n" =	0.06	roughness
Flow Depth (m) =	0.032266907	flow depth

Results		
Flow =	0.14	m3/sec
Average Depth =	0.03	m
Velocity =	0.43	m/sec
Flow Area =	0.32	m2
Top Width =	10.06	m
Perimeter =	10.09	m
Shear Stress =	20.73	N/m2
Stream Power =	8.94	W/m2

APPENDIX C: BASE CASE FLOOD RESULTS

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Level (m AHD)

- <= 632.0
- 632.0 - 639.0
- 639.0 - 646.0
- 646.0 - 653.0
- > 653.0

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

DISCLAIMER
Engeny has endeavoured to ensure accuracy and completeness of the data. Engeny assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

DATA SOURCE
QLD Government Open Data Source

ENGENY

GOULBURN MULWAREE COUNCIL

Appendix C - Figure 1

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 20% AEP Flood Level

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Level (m AHD)

- <= 632.0
- 632.0 - 639.0
- 639.0 - 646.0
- 646.0 - 653.0
- > 653.0

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

DISCLAIMER
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DATA SOURCE
QLD Government Open Data Source

ENGENY

GOULBURN MULWAREE COUNCIL

Appendix C - Figure 2

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 10% AEP Flood Level

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Level (m AHD)

- <= 632.0
- 632.0 - 639.0
- 639.0 - 646.0
- 646.0 - 653.0
- > 653.0

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 3

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 5% AEP Flood Level

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Level (m AHD)

- <= 632.0
- 632.0 - 639.0
- 639.0 - 646.0
- 646.0 - 653.0
- > 653.0

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 4

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 1% AEP Flood Level

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy

Rosemont Rd

Mulwaree River

Gundary Creek

Brisbane Grove Rd

Windellama Rd

Barretts Ln

Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Level (m AHD)

- <= 632.0
- 632.0 - 639.0
- 639.0 - 646.0
- 646.0 - 653.0
- > 653.0

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 5

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 0.5% AEP Flood Level

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Level (m AHD)

- <= 632.0
- 632.0 - 639.0
- 639.0 - 646.0
- 646.0 - 653.0
- > 653.0

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 6

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 0.2% AEP Flood Level

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Level (m AHD)

- <= 632.0
- 632.0 - 639.0
- 639.0 - 646.0
- 646.0 - 653.0
- > 653.0

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 7

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - PMF AEP Flood Level

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Depth (m)

- <= 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 8

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 20% AEP Flood Depth

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Depth (m)

- <= 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 9

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 10% AEP Flood Depth

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Depth (m)

- <= 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 10

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 5% AEP Flood Depth

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Depth (m)

- <= 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 11

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 1% AEP Flood Depth

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Depth (m)

- <= 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 12

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 0.5% AEP Flood Depth

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Depth (m)

- <= 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 13

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 0.2% AEP Flood Depth

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Depth (m)

- <= 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 14

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - PMF AEP Flood Depth

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy

Rosemont Rd

Mulwaree River

Gundary Creek

Brisbane Grove Rd

Windellama Rd

Barretts Ln

Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Velocity (m/s)

- <= 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 1.5
- > 1.5

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 15

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 20% AEP Flood Velocity

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy

Rosemont Rd

Mulwaree River

Gundary Creek

Brisbane Grove Rd

Windellama Rd

Barretts Ln

Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Velocity (m/s)

- <= 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 1.5
- > 1.5

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 16

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 10% AEP Flood Velocity

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Velocity (m/s)

- <= 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 1.5
- > 1.5

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 17

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 5% AEP Flood Velocity

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Velocity (m/s)

- <= 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 1.5
- > 1.5

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 18

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 1% AEP Flood Velocity

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Velocity (m/s)

- <= 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 1.5
- > 1.5

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 19

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 0.5% AEP Flood Velocity

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Velocity (m/s)

- <= 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 1.5
- > 1.5

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 20

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 0.2% AEP Flood Velocity

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Velocity (m/s)

- <= 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 1.5
- > 1.5

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 21

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - PMF AEP Flood Velocity

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (m^3/s)

- <= 0.3
- 0.3 - 0.45
- 0.45 - 0.6
- > 0.6

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 22

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 20% AEP Flood Hazard

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (m^3/s)

- <= 0.3
- 0.3 - 0.45
- 0.45 - 0.6
- > 0.6

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

DISCLAIMER
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QLD Government Open Data Source

ENGENY

GOULBURN MULWAREE COUNCIL

Appendix C - Figure 23

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 10% AEP Flood Hazard

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (m^3/s)

- <= 0.3
- 0.3 - 0.45
- 0.45 - 0.6
- > 0.6

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 24

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 5% AEP Flood Hazard

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (m^3/s)

- <= 0.3
- 0.3 - 0.45
- 0.45 - 0.6
- > 0.6

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 25

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 1% AEP Flood Hazard

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (m^3/s)

- <= 0.3
- 0.3 - 0.45
- 0.45 - 0.6
- > 0.6

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 26

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 0.5% AEP Flood Hazard

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (m^3/s)

- <= 0.3
- 0.3 - 0.45
- 0.45 - 0.6
- > 0.6

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 27

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 0.2% AEP Flood Hazard

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (m^3/s)

- <= 0.3
- 0.3 - 0.45
- 0.45 - 0.6
- > 0.6

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 28

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - PMF AEP Flood Hazard

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (AIDR 2017)

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

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
QLD Government Open Data Source

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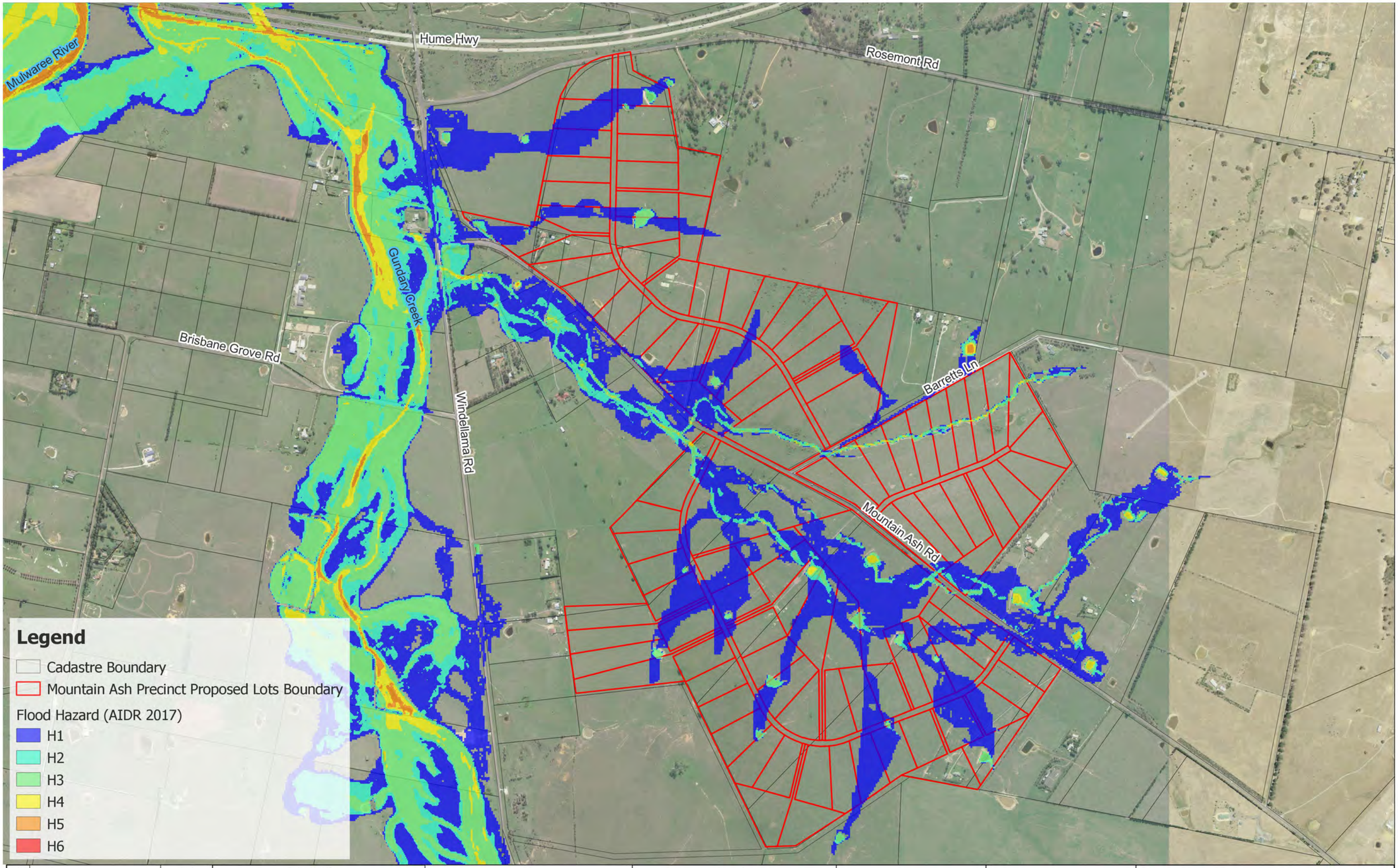
GOULBURN MULWAREE COUNCIL

Appendix C - Figure 29

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 20% AEP Flood Hazard Category

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz



R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 30

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 10% AEP Flood Hazard Category

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (AIDR 2017)

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

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 31

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 5% AEP Flood Hazard Category

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy

Rosemont Rd

Mulwaree River

Gundary Creek

Brisbane Grove Rd

Windellama Rd

Barretts Ln

Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (AIDR 2017)

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

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 32

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 1% AEP Flood Hazard Category

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (AIDR 2017)

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

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 33

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 0.5% AEP Flood Hazard Category

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (AIDR 2017)

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

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 34

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - 0.2% AEP Flood Hazard Category

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (AIDR 2017)

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

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix C - Figure 35

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Base Case - PMF AEP Flood Hazard Category

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

APPENDIX D: DEVELOPED CASE FLOOD RESULTS

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Level (m AHD)

- <= 632.0
- 632.0 - 639.0
- 639.0 - 646.0
- 646.0 - 653.0
- > 653.0

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 36

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 20% AEP Flood Level

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Level (m AHD)

- <= 632.0
- 632.0 - 639.0
- 639.0 - 646.0
- 646.0 - 653.0
- > 653.0

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 37

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 10% AEP Flood Level

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Level (m AHD)

- <= 632.0
- 632.0 - 639.0
- 639.0 - 646.0
- 646.0 - 653.0
- > 653.0

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 38

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 5% AEP Flood Level

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Level (m AHD)

- <= 632.0
- 632.0 - 639.0
- 639.0 - 646.0
- 646.0 - 653.0
- > 653.0

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 39

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 1% AEP Flood Level

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy

Rosemont Rd

Mulwaree River

Gundary Creek

Brisbane Grove Rd

Windellama Rd

Barretts Ln

Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Level (m AHD)

- <= 632.0
- 632.0 - 639.0
- 639.0 - 646.0
- 646.0 - 653.0
- > 653.0

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

DISCLAIMER
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DATA SOURCE
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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 40

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 0.5% AEP Flood Level

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Level (m AHD)

- <= 632.0
- 632.0 - 639.0
- 639.0 - 646.0
- 646.0 - 653.0
- > 653.0

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

DISCLAIMER
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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 41

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 0.2% AEP Flood Level

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Level (m AHD)

- <= 632.0
- 632.0 - 639.0
- 639.0 - 646.0
- 646.0 - 653.0
- > 653.0

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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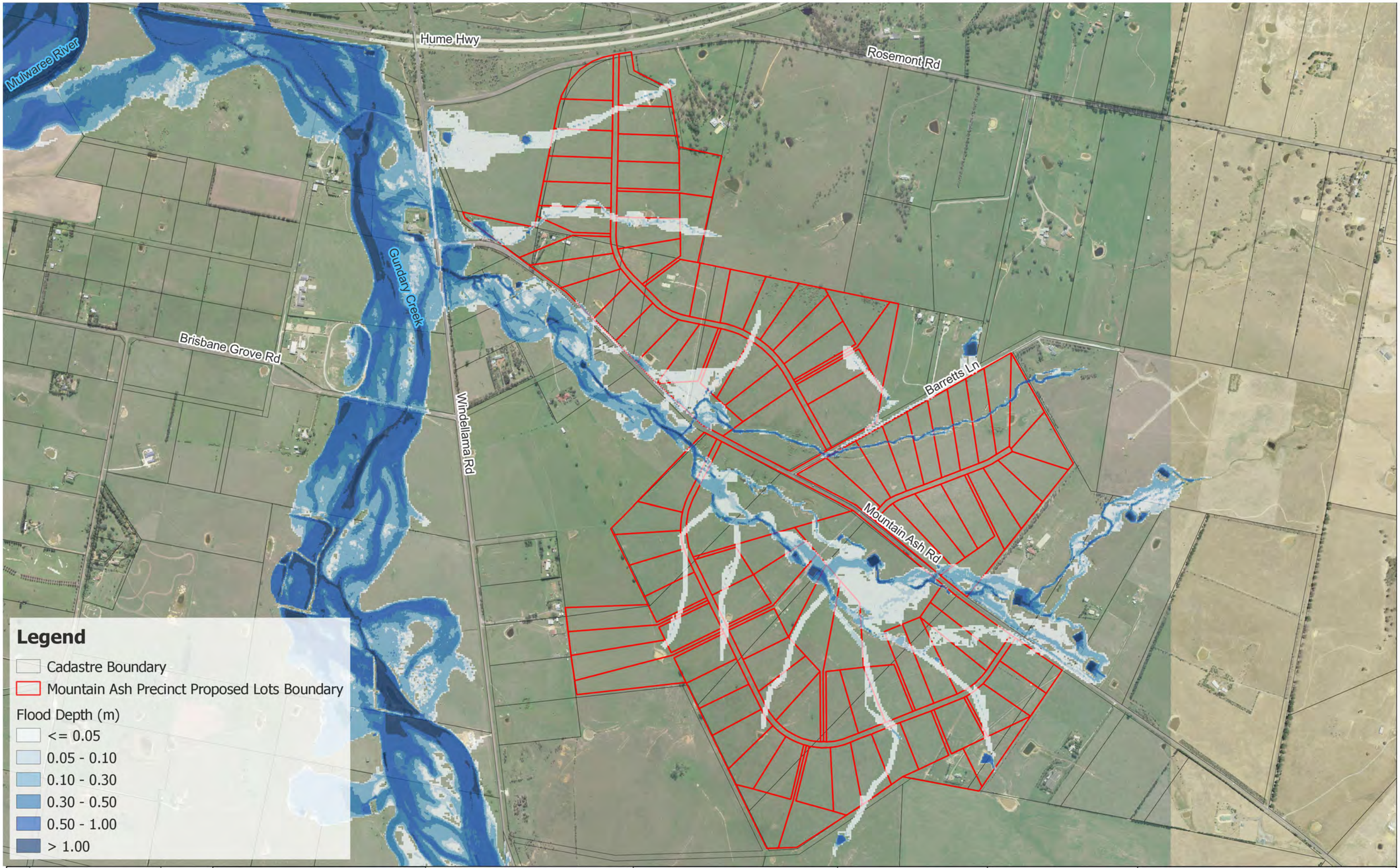
GOULBURN MULWAREE COUNCIL

Appendix D - Figure 42

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - PMF AEP Flood Level

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz



R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 43

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 20% AEP Flood Depth

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Depth (m)

- <= 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 44

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 10% AEP Flood Depth

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Depth (m)

- <= 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
QLD Government Open Data Source

ENGENY

GOULBURN MULWAREE COUNCIL

Appendix D - Figure 45

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 5% AEP Flood Depth

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Depth (m)

- <= 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
QLD Government Open Data Source

ENGENY

GOULBURN MULWAREE COUNCIL

Appendix D - Figure 46

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 1% AEP Flood Depth

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Depth (m)

- <= 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 47

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 0.5% AEP Flood Depth

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Depth (m)

- <= 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

DATA SOURCE
QLD Government Open Data Source

ENGENY

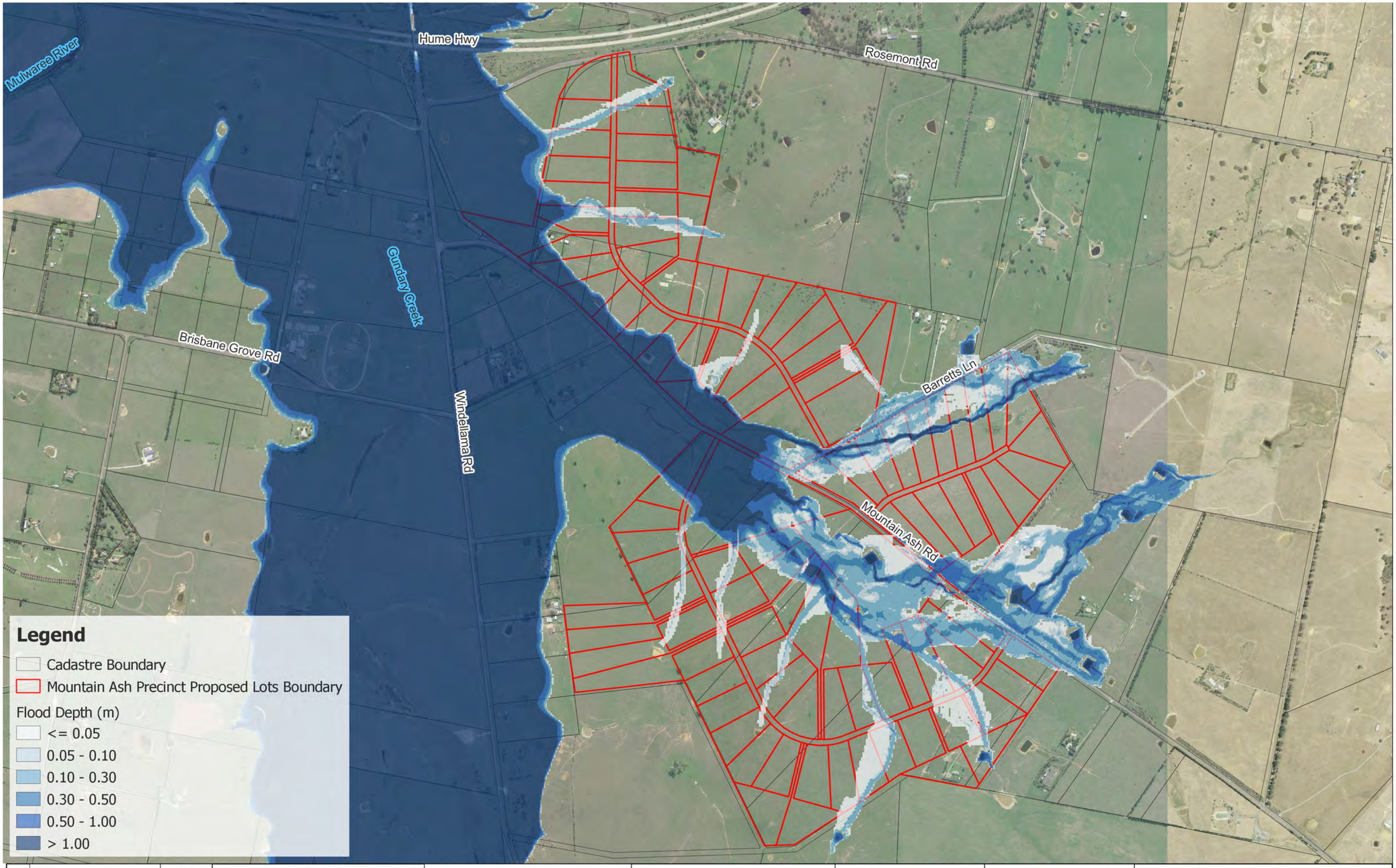
GOULBURN MULWAREE COUNCIL

Appendix D - Figure 48

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 0.2% AEP Flood Depth

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz



R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
QLD Government Open Data Source

ENGENY

GOULBURN MULWAREE COUNCIL

Appendix D - Figure 49

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - PMF AEP Flood Depth

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Velocity (m/s)

- <= 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 1.5
- > 1.5

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 50

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 20% AEP Flood Velocity

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Velocity (m/s)

- <= 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 1.5
- > 1.5

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 51

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 10% AEP Flood Velocity

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Velocity (m/s)

- <= 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 1.5
- > 1.5

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 52

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 5% AEP Flood Velocity

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Velocity (m/s)

- <= 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 1.5
- > 1.5

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 53

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 1% AEP Flood Velocity

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Velocity (m/s)

- <= 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 1.5
- > 1.5

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 54

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 0.5% AEP Flood Velocity

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Velocity (m/s)

- <= 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 1.5
- > 1.5

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 55

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 0.2% AEP Flood Velocity

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Velocity (m/s)

- <= 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 1.5
- > 1.5

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 56

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - PMF AEP Flood Velocity

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (m^3/s)

- <= 0.3
- 0.3 - 0.45
- 0.45 - 0.6
- > 0.6

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 57

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 20% AEP Flood Hazard

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Windellama Rd
Brisbane Grove Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (m^3/s)

- <= 0.3
- 0.3 - 0.45
- 0.45 - 0.6
- > 0.6

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 58

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 10% AEP Flood Hazard

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (m^3/s)

- <= 0.3
- 0.3 - 0.45
- 0.45 - 0.6
- > 0.6

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 59

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 5% AEP Flood Hazard

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (m^3/s)

- <= 0.3
- 0.3 - 0.45
- 0.45 - 0.6
- > 0.6

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 60

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 1% AEP Flood Hazard

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (m^3/s)

- <= 0.3
- 0.3 - 0.45
- 0.45 - 0.6
- > 0.6

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 61

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 0.5% AEP Flood Hazard

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (m^3/s)

- <= 0.3
- 0.3 - 0.45
- 0.45 - 0.6
- > 0.6

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 62

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 0.2% AEP Flood Hazard

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (m^3/s)

- <= 0.3
- 0.3 - 0.45
- 0.45 - 0.6
- > 0.6

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

DISCLAIMER
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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 63

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - PMF AEP Flood Hazard

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (AIDR 2017)

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

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 64

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 20% AEP Flood Hazard Category

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (AIDR 2017)

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

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 65

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 10% AEP Flood Hazard Category

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (AIDR 2017)

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

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 66

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 5% AEP Flood Hazard Category

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy

Rosemont Rd

Mulwaree River

Gundary Creek

Brisbane Grove Rd

Windellama Rd

Barretts Ln

Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (AIDR 2017)

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

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

DISCLAIMER
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DATA SOURCE
QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 67

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 1% AEP Flood Hazard Category

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (AIDR 2017)

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

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 68

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 0.5% AEP Flood Hazard Category

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy

Rosemont Rd

Mulwaree River

Gundary Creek

Brisbane Grove Rd

Windellama Rd

Barretts Ln

Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (AIDR 2017)

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

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

DISCLAIMER
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DATA SOURCE
QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 69

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - 0.2% AEP Flood Hazard Category

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Hazard (AIDR 2017)

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

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix D - Figure 70

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Developed Case - PMF AEP Flood Hazard Category

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

APPENDIX E: FLOOD IMPACT MAPPING

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Afflux (m)

- <= -0.5
- -0.5 - -0.3
- -0.3 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.2
- 0.2 - 0.3
- > 0.3
- Dry Now Wet
- Wet Now Dry

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix E - Figure 1

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Devloped - Base - 20% AEP Flood Afflux

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Afflux (m)

- <= -0.5
- -0.5 - -0.3
- -0.3 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.2
- 0.2 - 0.3
- > 0.3
- Dry Now Wet
- Wet Now Dry

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix E - Figure 2

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Devloped - Base Case - 10% AEP Flood Afflux

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Afflux (m)

- <= -0.5
- -0.5 - -0.3
- -0.3 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.2
- 0.2 - 0.3
- > 0.3
- Dry Now Wet
- Wet Now Dry

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix E - Figure 3

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Devloped - Base Case - 5% AEP Flood Afflux

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Afflux (m)

- <= -0.5
- -0.5 - -0.3
- -0.3 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.2
- 0.2 - 0.3
- > 0.3
- Dry Now Wet
- Wet Now Dry

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix E - Figure 4

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Devloped - Base Case - 1% AEP Flood Afflux

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Afflux (m)

- <= -0.5
- -0.5 - -0.3
- -0.3 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.2
- 0.2 - 0.3
- > 0.3
- Dry Now Wet
- Wet Now Dry

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix E - Figure 5

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Devloped - Base Case - 0.5% AEP Flood Afflux

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy

Rosemont Rd

Mulwaree River

Gundary Creek

Brisbane Grove Rd

Windellama Rd

Barretts Ln

Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Afflux (m)

- <= -0.5
- -0.5 - -0.3
- -0.3 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.2
- 0.2 - 0.3
- > 0.3
- Dry Now Wet
- Wet Now Dry

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix E - Figure 6

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Devloped - Base Case - 0.2% AEP Flood Afflux

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Afflux (m)

- <= -0.5
- -0.5 - -0.3
- -0.3 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.2
- 0.2 - 0.3
- > 0.3
- Dry Now Wet
- Wet Now Dry

R	DETAILS	DATE
1	Draft	27-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	27-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix E - Figure 7

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Devloped - Base Case - PMF AEP Flood Afflux

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Afflux (m)

- <= -0.5
- -0.5 - -0.3
- -0.3 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.2
- 0.2 - 0.3
- > 0.3
- Dry Now Wet
- Wet Now Dry

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix E - Figure 1

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Devloped - Base - 20% AEP Flood Afflux

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Afflux (m)

- <= -0.5
- -0.5 - -0.3
- -0.3 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.2
- 0.2 - 0.3
- > 0.3
- Dry Now Wet
- Wet Now Dry

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix E - Figure 2

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Devloped - Base Case - 10% AEP Flood Afflux

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Afflux (m)

- <= -0.5
- -0.5 - -0.3
- -0.3 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.2
- 0.2 - 0.3
- > 0.3
- Dry Now Wet
- Wet Now Dry

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix E - Figure 3

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Devloped - Base Case - 5% AEP Flood Afflux

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Afflux (m)

- <= -0.5
- -0.5 - -0.3
- -0.3 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.2
- 0.2 - 0.3
- > 0.3
- Dry Now Wet
- Wet Now Dry

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

DISCLAIMER
Engeny has endeavoured to ensure accuracy and completeness of the data. Engeny assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

DATA SOURCE
QLD Government Open Data Source

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GOULBURN MULWAREE COUNCIL

Appendix E - Figure 4

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Devloped - Base Case - 1% AEP Flood Afflux

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Mulwaree River
Hume Hwy
Rosemont Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Afflux (m)

- <= -0.5
- -0.5 - -0.3
- -0.3 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.2
- 0.2 - 0.3
- > 0.3
- Dry Now Wet
- Wet Now Dry

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Appendix E - Figure 5

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Devloped - Base Case - 0.5% AEP Flood Afflux

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Afflux (m)

- <= -0.5
- -0.5 - -0.3
- -0.3 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.2
- 0.2 - 0.3
- > 0.3
- Dry Now Wet
- Wet Now Dry

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
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ENGENY

GOULBURN MULWAREE COUNCIL

Appendix E - Figure 6

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Devloped - Base Case - 0.2% AEP Flood Afflux

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

Hume Hwy
Rosemont Rd
Mulwaree River
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

Legend

- Cadastre Boundary
- Mountain Ash Precinct Proposed Lots Boundary

Flood Afflux (m)

- <= -0.5
- -0.5 - -0.3
- -0.3 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.2
- 0.2 - 0.3
- > 0.3
- Dry Now Wet
- Wet Now Dry

R	DETAILS	DATE
1	Draft	28-08-2023

DRAWN	ST	CHECKED	TS
APPROVED	TS	DATE	28-08-2023

N

0 0.2 0.4 km

SCALE @ A3 - 1:12,000
GDA94 / MGA zone 55

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DATA SOURCE
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GOULBURN MULWAREE COUNCIL

Appendix E - Figure 7

Windellama Road & GTSMF
Goulburn Flood Impact and Risk Assessment
Devloped - Base Case - PMF AEP Flood Afflux

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST.qgz

APPENDIX F: EMERGENCY EVACUATION ROUTES

747,000 748,000 749,000 750,000 751,000 752,000 753,000 754,000 755,000 756,000 757,000 758,000 759,000

6,153,000 6,152,000 6,151,000 6,150,000 6,149,000 6,148,000 6,147,000 6,146,000

Wollondilly River
Wollondilly River
Sydney Rd
Goulburn Mulwaree Council Operations Centre
Hetherington St
Chiswick St
Goulburn Works Club
Goulburn Soldiers Club
Mulwaree River
Braidwood Rd
Long St
Rifle Range Rd
Hume Hwy
Rosemont Rd
Boxers Creek Rd
Boxers Creek Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

LEGEND

- Mountain Ash Precinct Proposed Lot Boundary
- Flood Evacuation Centre

Evaculation Routes

- A
- B
- C

1% AEP Flood Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6
- PMF Flood Extent

R	DETAILS	DATE
1	Final Issue	24-01-2024

DRAWN	TS	CHECKED	DN
APPROVED	DN	DATE	24-01-2024

NOTES:

N

0 0.7 1.4 km

SCALE @ A3 - 1:32,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Goulburn Mulwaree Council
Mountain Ash Road Precinct

1% AEP Flood Event External Evacuation Routes to Designated Evacuation Centres

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST_Figure.qgz

747,000 748,000 749,000 750,000 751,000 752,000 753,000 754,000 755,000 756,000 757,000 758,000 759,000

6,153,000 6,152,000 6,151,000 6,150,000 6,149,000 6,148,000 6,147,000 6,146,000

Wollondilly River
Wollondilly River
Sydney Rd
Goulburn Mulwaree Council Operations Centre
Goulburn Works Club
Goulburn Soldiers Club
Hetherington St
Chiswick St
Mulwaree River
Long St
Braidwood Rd
Rifle Range Rd
Hume Hwy
Hume Hwy
Rosemont Rd
Boxers Creek Rd
Boxers Creek Rd
Gundary Creek
Windellama Rd
Brisbane Grove Rd
Barretts Ln
Mountain Ash Rd

LEGEND

- Mountain Ash Precinct Proposed Lot Boundary
- Flood Evacuation Centre

Evacuation Routes

- A
- B
- C

0.5% AEP Flood Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6
- PMF Flood Extent

R	DETAILS	DATE
1	Final Issue	24-01-2024

DRAWN	TS	CHECKED	DN
APPROVED	DN	DATE	24-01-2024

NOTES:

N

0 0.7 1.4 km

SCALE @ A3 - 1:32,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Goulburn Mulwaree Council
Mountain Ash Road Precinct

0.5% AEP Flood Event External Evacuation Routes to Designated Evacuation Centres

Drg Ref:

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST_Figure.qgz

747,000 748,000 749,000 750,000 751,000 752,000 753,000 754,000 755,000 756,000 757,000 758,000 759,000

6,153,000 6,152,000 6,151,000 6,150,000 6,149,000 6,148,000 6,147,000 6,146,000

Wollondilly River
Wollondilly River
Sydney Rd
Goulburn Mulwaree Council Operations Centre
Goulburn Works Club
Goulburn Soldiers Club
Mulwaree River
Hetherington St
Chiswick St
Long St
Braidwood Rd
Rifle Range Rd
Hume Hwy
Rosemont Rd
Boxers Creek Rd
Boxers Creek Rd
Gundary Creek
Brisbane Grove Rd
Windellama Rd
Barretts Ln
Mountain Ash Rd

LEGEND

Mountain Ash Precinct Proposed Lot Boundary

Flood Evacuation Centre

Evacuation Routes

A

B

C

0.2% AEP Flood Hazard Category

H1

H2

H3

H4

H5

H6

PMF Flood Extent

R	DETAILS	DATE
1	Final Issue	24-01-2024

DRAWN	TS	CHECKED	DN
APPROVED	DN	DATE	24-01-2024

NOTES:

N

0 0.7 1.4 km

SCALE @ A3 - 1:32,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Goulburn Mulwaree Council
Mountain Ash Road Precinct

0.2% AEP Flood Event External Evacuation Routes to Designated Evacuation Centres

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST_Figure.qgz

749,000 750,000 751,000 752,000 753,000 754,000

6,148,000

6,147,000

6,146,000

Rifle Range Rd

Hume Hwy

Rosemont Rd

Boxers Creek Rd

Gundary Creek

Brisbane Grove Rd

Windellama Rd

Barretts Ln

Mountain Ash Rd

LEGEND

Mountain Ash Precinct Proposed Lot Boundary

Evaculation Routes

A

B

C

1% AEP Flood Hazard Category

H1

H2

H3

H4

H5

H6

PMF Flood Extent

R	DETAILS	DATE
1	Final Issue	24-01-2024

DRAWN	TS	CHECKED	DN
APPROVED	DN	DATE	24-01-2024

NOTES:

N

0 0.3 0.6 km

SCALE @ A3 - 1:15,000
GDA94 / MGA zone 55

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DATA SOURCE
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GOULBURN MULWAREE COUNCIL

Goulburn Mulwaree Council
Mountain Ash Road Precinct

1% AEP Flood Event External Evacuation routes – Mountain Ash Road Precinct

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST_Figure.qgz

749,000 750,000 751,000 752,000 753,000 754,000

6,148,000

6,147,000

6,146,000

Rifle Range Rd

Hume Hwy

Rosemont Rd

Boxers Creek Rd

Gundary Creek

Brisbane Grove Rd

Windellama Rd

Barretts Ln

Mountain Ash Rd

LEGEND

Mountain Ash Precinct Proposed Lot Boundary

Evaculation Routes

A

B

C

0.5% AEP Flood Hazard Category

H1

H2

H3

H4

H5

H6

PMF Flood Extent

R	DETAILS	DATE
1	Final Issue	24-01-2024

DRAWN	TS	CHECKED	DN
APPROVED	DN	DATE	24-01-2024

NOTES:

N

0 0.3 0.6 km

SCALE @ A3 - 1:15,000
GDA94 / MGA zone 55

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DATA SOURCE
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ENGENY

GOULBURN MULWAREE COUNCIL

Goulburn Mulwaree Council
Mountain Ash Road Precinct

0.5% AEP Flood Event External Evacuation routes – Mountain Ash Road Precinct

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST_Figure.qgz

749,000 750,000 751,000 752,000 753,000 754,000

6,148,000

6,147,000

6,146,000

Rifle Range Rd

Hume Hwy

Rosemont Rd

Boxers Creek Rd

Gundary Creek

Brisbane Grove Rd

Windellama Rd

Barretts Ln

Mountain Ash Rd

LEGEND

Mountain Ash Precinct Proposed Lot Boundary

Evaculation Routes

A

B

C

0.2% AEP Flood Hazard Category

H1

H2

H3

H4

H5

H6

PMF Flood Extent

R	DETAILS	DATE
1	Final Issue	24-01-2024

DRAWN	TS	CHECKED	DN
APPROVED	DN	DATE	24-01-2024

NOTES:

N

0 0.3 0.6 km

SCALE @ A3 - 1:15,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Goulburn Mulwaree Council
Mountain Ash Road Precinct

0.2% AEP Flood Event External Evacuation routes – Mountain Ash Road Precinct

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST_Figure.qgz

751,000

752,000

6,152,000

6,151,000

Mulwaree River

Sydney Rd

Goulburn Mulwaree Council Operations Centre

Hetherington St

LEGEND

- Mountain Ash Precinct Proposed Lot Boundary
- Flood Evacuation Centre

Evaculation Routes

- A
- B
- C

1% AEP Flood Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6
- PMF Flood Extent

R	DETAILS	DATE
1	Final Issue	24-01-2024

DRAWN	TS	CHECKED	DN
APPROVED	DN	DATE	24-01-2024

NOTES:

N

0 0.1 0.2 km

SCALE @ A3 - 1:5,000
GDA94 / MGA zone 55

DISCLAIMER
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GOULBURN MULWAREE COUNCIL

Goulburn Mulwaree Council
Mountain Ash Road Precinct

1% AEP Flood Event External Evacuation Routes – Goulburn Mulwaree Council Operations Centre

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST_Figure.qgz

751,000

752,000

6,152,000

6,151,000

Mulwaree River

Sydney Rd

Goulburn Mulwaree Council Operations Centre

Hetherington St

LEGEND

Mountain Ash Precinct Proposed Lot Boundary

Flood Evacuation Centre

Evaculation Routes

A

B

C

0.5% AEP Flood Hazard Category

H1

H2

H3

H4

H5

H6

PMF Flood Extent

R	DETAILS	DATE
1	Final Issue	24-01-2024

DRAWN	TS	CHECKED	DN
APPROVED	DN	DATE	24-01-2024

NOTES:

N

0 0.1 0.2 km

SCALE @ A3 - 1:5,000
GDA94 / MGA zone 55

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GOULBURN MULWAREE COUNCIL

Goulburn Mulwaree Council
Mountain Ash Road Precinct

0.5% AEP Flood Event External Evacuation Routes – Goulburn Mulwaree Council Operations Centre

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST_Figure.qgz

751,000

752,000

6,152,000

6,151,000

Mulwaree River

Sydney Rd

Goulburn Mulwaree Council Operations Centre

Hetherington St

LEGEND

- Mountain Ash Precinct Proposed Lot Boundary
- Flood Evacuation Centre

Evaculation Routes

- A
- B
- C

0.2% AEP Flood Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6
- PMF Flood Extent

R	DETAILS	DATE
1	Final Issue	24-01-2024

DRAWN	TS	CHECKED	DN
APPROVED	DN	DATE	24-01-2024

NOTES:

N

0 0.1 0.2 km

SCALE @ A3 - 1:5,000
GDA94 / MGA zone 55

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DATA SOURCE
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GOULBURN MULWAREE COUNCIL

Goulburn Mulwaree Council
Mountain Ash Road Precinct

0.2% AEP Flood Event External Evacuation Routes – Goulburn Mulwaree Council Operations Centre

Drg Ref.

Q:\Projects\QC4054 Windellama Road Pty Ltd & GTSMF Pty Ltd\QC4054_001 Goulburn FIRA\05 Design\QGIS\Workspaces\QC4054_001-Goulburn_Workspace_001_A_ST_Figure.qgz