BNC Ref. DA156-23
TCC Ref. MCU25/0011

Date >> 26 August 2025

ASSESSMENT MANAGER
TOWNSVILLE CITY COUNCIL
PO BOX 1268
TOWNSVILLE QLD 4810

RE: APPLICANT RESPONSE TO ASSESSMENT MANAGER INFORMATION REQUEST & FURTHER ADVICE NOTICE
DEVELOPMENT APPLICATION FOR A MATERIAL CHANGE OF USE (ROOMING ACCOMMODATION)
94 BERGIN ROAD, CRANBROOK QLD 4814 (RPD: LOT 1 ON RP737431)

BNC Planning acting on behalf of the applicant submits this response to the *information request* and *further advice notice* issued by the Townsville City Council as assessment manager in accordance with the Development Assessment Rules. The information request is dated 25 March 2025, the further advice notice is dated 14 May 2025 and relate to a material change of use development application (Council Ref. MCU25/0011) over the above referenced premises.

The applicant has responded by providing all of the information requested or has provided a suitable alternative outcome. A detailed response to each item from the notice is provided below.

ASSESSMENT MANAGER INFORMATION REQUEST
TOWNSVILLE CITY COUNCIL

Request Item 1 – Amend Plans – Works within Drainage Easement

The applicant is requested to provide amended plans to remove proposed driveway and car parking from the existing drainage easement, as the proposed works are not consistent with the terms of the easement document.

Applicant's response

The applicant has amended the site layout to remove one of the proposed dwellings and to relocate all built form footprints from within the easement, including car parking areas and driveways. While parts of the eaves for the new dwelling extend beyond the vertical plane of the easement, this is of no consequence to the function of the easement and is not considered an intrusion given the easement is not volumetric.

Request Item 2 – Carparking

The applicant is requested to provide the following:

BNC Planning Pty Ltd
ABN 80 147 498 397
Office 7 / Ground Floor / 41 Denham Street
TOWNSVILLE CITY QLD 4810
PO BOX 5493 TOWNSVILLE Q 4810
(07) 4724 1763 or 0438 789 612
enquire@bncplaning.com.au
www.bncplanning.com.au

a. *Demonstrate that the development can be appropriately serviced without residents' reliance on the existing on-street carparking. The provision of six (6) carparking spaces for sixteen (16) rooms is not considered sufficient. The site is not considered to be in close proximity to public transport or centre facilities that will result in occupants being more reliant on private vehicles.*

b. *Demonstrate how the proposed tandem parking arrangements will be managed due to residents not being members of the same household. It is considered that tandem parking is not appropriate for rooming accommodation and would likely result in spaces being unavailable for use by occupants.*

Applicant's response

a. The parking regime for the development has been reconfigured to create a single consolidated parking area at the road frontage corner of the site. The car park will yield 10 spaces as a minimum which equates to 10 spaces for 15 rooms. To compliment this, Council is encouraged to condition the provision of bike and scooter parking facilities to account for and encourage more passive forms of transport. The combination of these elements will ensure that the development can adequately cater for the demand for parking, likely to be generated by the use.

b. Tandem parking outcomes have been removed.

Request Item 3 – Water and Sewer Demand

The applicant is requested to provide Engineering report to identify water and sewer demand associated with development and any external upgrades required to accommodate the development.

Applicant's response

The applicant provides the attached Water Supply & Sewerage Planning Report prepared by DPM Water dated 22 April 2025. The report was undertaken prior to the applicant resolving to reduce the scale of development and remove one of the proposed new dwellings. While it is noted that the other retained dwellings were amended to increase the room yield, the overall development is comparable if not lesser in scale. Given the development outcomes are comparable, the conclusions of the report remain valid, being that sufficient water and sewerage supply capacity exists to service the development.

Request Item 4 – Setbacks

The applicant is requested to provide amended plans that illustrate a setback of 3m from the Bergin Road frontage. The proposed setback to the street frontages are not considered to be consistent with the streetscape character of Bergin Road. Furthermore the applicant is requested to demonstrate that the setbacks are outside of the truncation to allow for sufficient sightlines for road users.

Applicant's response

The attached amended site layout involves the removal of the proposed dwelling at the frontage corner of the site which avoids the setback conflicts referenced in this item.

ASSESSMENT MANAGER FURTHER ADVICE NOTICE
TOWNSVILLE CITY COUNCIL

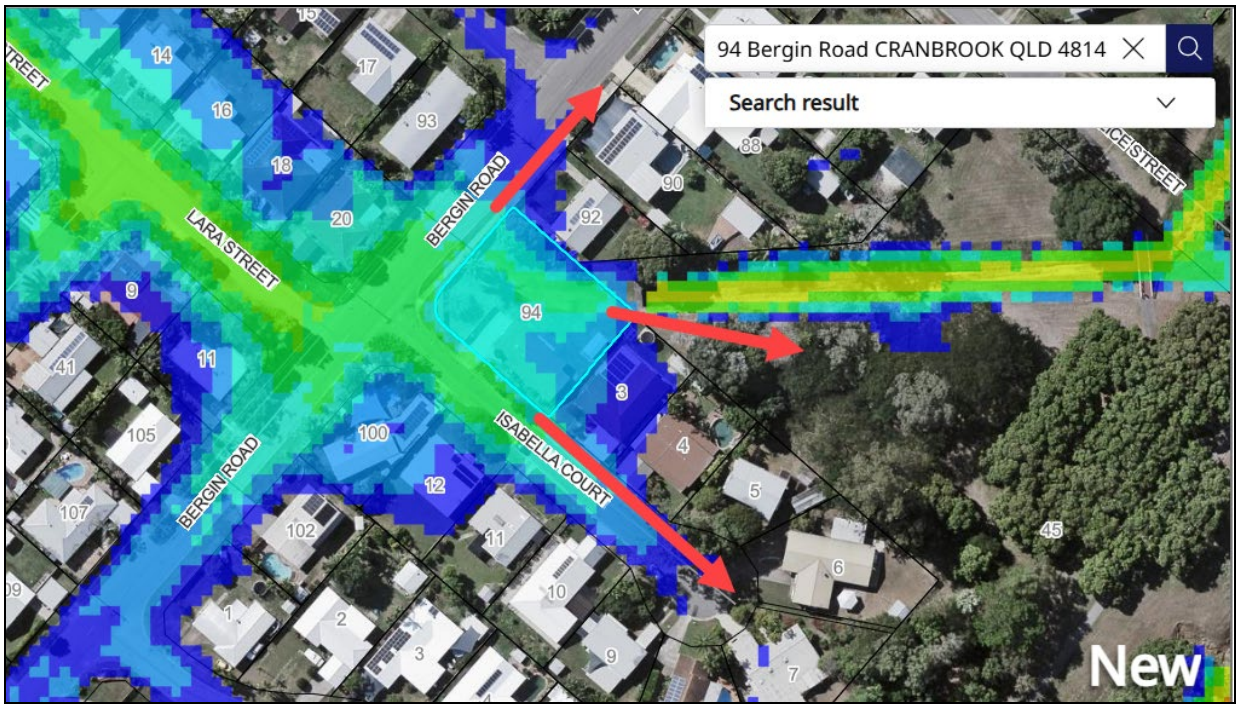
Forward

The applicant is advised that the proposed high intensity within the High Flood Hazard area poses an unacceptable level of risk to people or property which will occupy the land and requires further consideration. As per the recent flood model mapping, the development site is mapped as Very High and High Risk with average 1% AEP depth of 0.58m.

Applicant's response

The applicant has resolved to reduce the scale of the proposed development which allows for a significant improvement in the ability to manage vulnerability and reduces the risk to people and property from flood hazard to an acceptable/tolerable level. The amended proposal retains the number of rooms but significantly improves the level of vulnerability by replacing ground level floor space with second-storey space and congregating the built form in the lower risk areas of the site. The applicant also provides the attached updated Flood Impact Assessment which undertakes a detailed review of flood risk, both for the dwellings and car park areas, and concludes that the risk is tolerable. Additionally, the applicant offers the attached Emergency Evacuation Plan which outlines a range of operational and behavioral systems that will be put in place as part of managing the rooming accommodation activities. This combined physical and operational mitigation strategies, in conjunction with the design changes made to the building and car park, ensures the risk to people and property is acceptable.

The yet to be adopted new flood risk mapping is acknowledged, as is the updated 1%AEP flood depth data. It is also acknowledged that, under the current planning scheme, the site is mapped across the low, medium and high hazard areas. The attached Flood Impact Assessment reflects this latest data. It is also of significant importance to acknowledge the greater context of the site, specifically the fact that it exists on the fridge of the 1%AEP inundation area, which makes egress and refuge into community land very achievable. Mapping extract below.



The development is not considered a form of high intensity development, especially in light of the existing 5 bedroom rooming accommodation use. The development introduces 10 new rooms (15 in total). A capacity of 15 people residing on a site of this size is commensurate with a 5 unit multiple dwelling or three standard family homes each on circa 400m2 lots.

The applicant has undertaken a fit-for-purpose risk assessment to identify and achieve an acceptable and tolerable level of risk for personal safety and property in the natural hazard area. The applicant has applied the benchmarks established under both the planning scheme and the State Planning Policy with regard to demonstration of compliance and quantifying what constitutes an acceptable/tolerable risk. In this regard:

- The development directly and cumulatively avoids an increase in the exposure or severity of the hazard to the site or adjoining properties. This is verified by the Flood Impact Assessment.
- The development does not hinder disaster management capacity or capability.

- The development is compatible with flood risk when the physical and operational mitigation measures put forward are employed. Compatibility is confirmed in the Flood Impact Assessment and is complimented by the operational mitigations outlined in the Emergency Evacuation Plan.
- The development has been designed and the building located to minimise susceptibility to and potential impacts of flooding. This evident on the amended site plan and the elevations.
- Development in high hazard areas does not significantly impede the flow of flood waters through the site or worsen flood flows external to the site. This is verified by the Flood Impact Assessment.

With this context in mind, the applicant provides the following response to the items raised in the further advice notice.

Advice Item 1 – Amend Plans – Works within Drainage Easement

The applicant is advised that an amended Flood impact Assessment (FIA) is required to include the following:

a) Hazard and Risk analysis
b) Time of isolation by floodwaters
c) Emergency evacuation requirements
d) Roads trafficability for various AEP events
e) Carparking level at a maximum of 100mm below the 1%AEP is generally acceptable, to prevent the vehicles from inundation/damage by flooding.

Applicant's response

The applicant provides the attached amended Flood Impact Assessment which now addresses these matters and concludes that the risk to people and property is tolerable.

Advice Item 2 – Amended Layout and Intensity

The Applicant is advised to reduce the intensity and change the layout by having consideration towards:

- *Potential replacement of the six (6) bedroom building located in the western corner by carparking.*

Applicant's response

The applicant has removed one of the new dwellings and replaced it with car parking as suggested. See the Forward above for further detail on the scale and intensity of the development, relative to the setting and localized flood extents.

Advice Item 3 – Amended Plans

The Applicant is advised to submit amended proposal plans as resulting from Advice Items 1 and 2, above.

Applicant's response

The applicant provides the attached amended plans in response to both the information request and further advice notice.

Summary

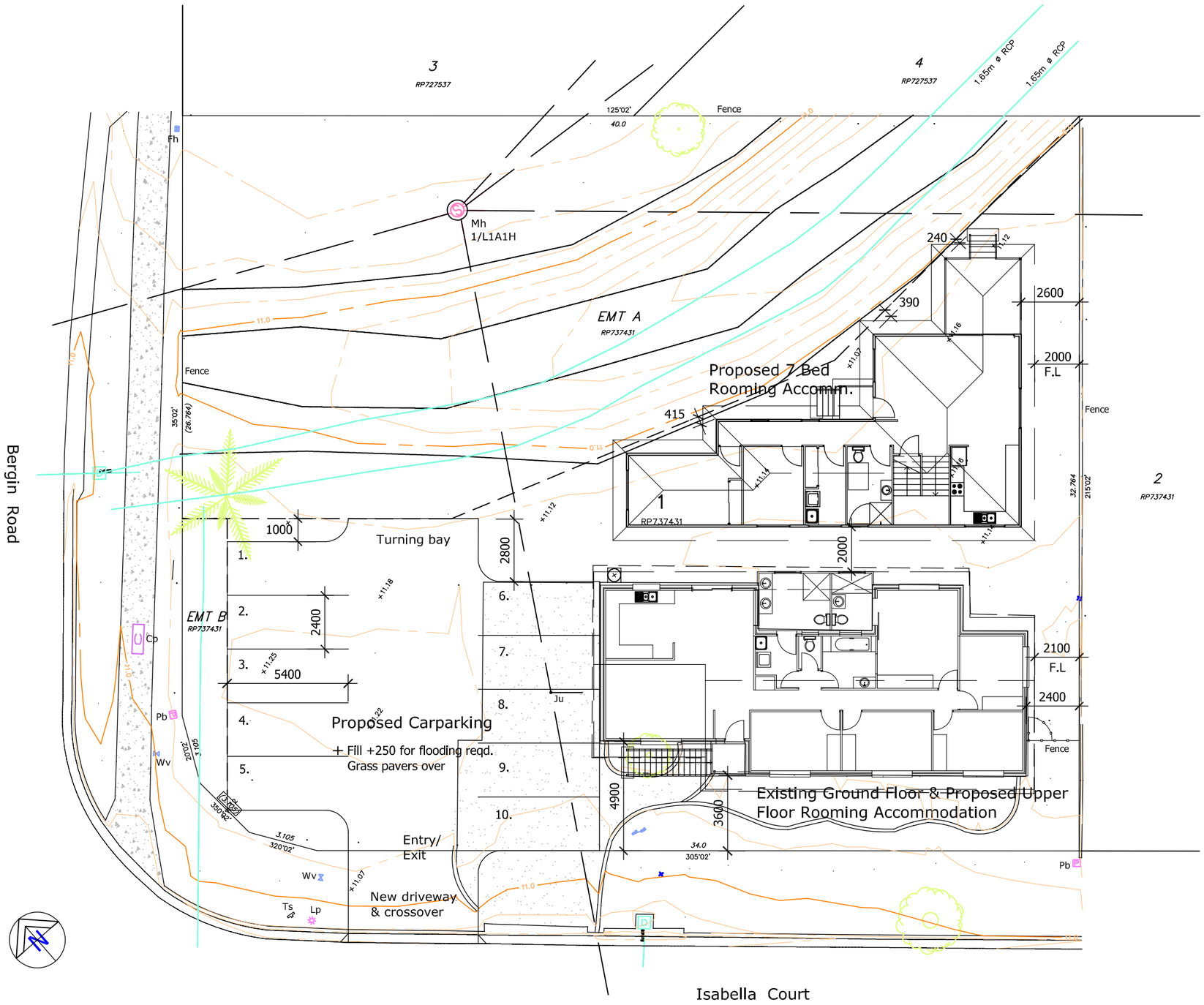
I trust the additional common material included in this response provides sufficient information to allow the assessment of the development application to proceed. Should there be any issues, or should additional information be required, please contact me.

Kind regards,

Benjamin Collings
Director

APPENDIX 1

UPDATED PLANS



Real Property Description
Lot 1 on RP 737431
Site Area : 1302 m²
Wind Classification : C1

Site Plan
Scale 1:200

General Notes

1. Do not scale off drawing check all dimensions & levels on site before commencing work, including location of all services.
2. Comply with all Local Authority & Building Code of Australia 2022 regulations & all relevant Australian Standard Codes.
3. Installation of all materials to comply with Manufacturer's Specifications.
4. Notwithstanding Inspection by an Engineer or Building Certifier, it is the Builder's responsibility to ensure that all works are constructed In accordance with the Building Approval Drawings.
5. Substitution of any structural member, & variation to any of the design, will void any responsibilities to Benson Building Designs for the performance of the building.

No.	Revision/Issue	Date
C	Request Items 1,2 & 4 TCC Planning	24/07/25
B	Floor Level Raised to 900mm	17/02/25
A	Preliminary Design	24/09/24

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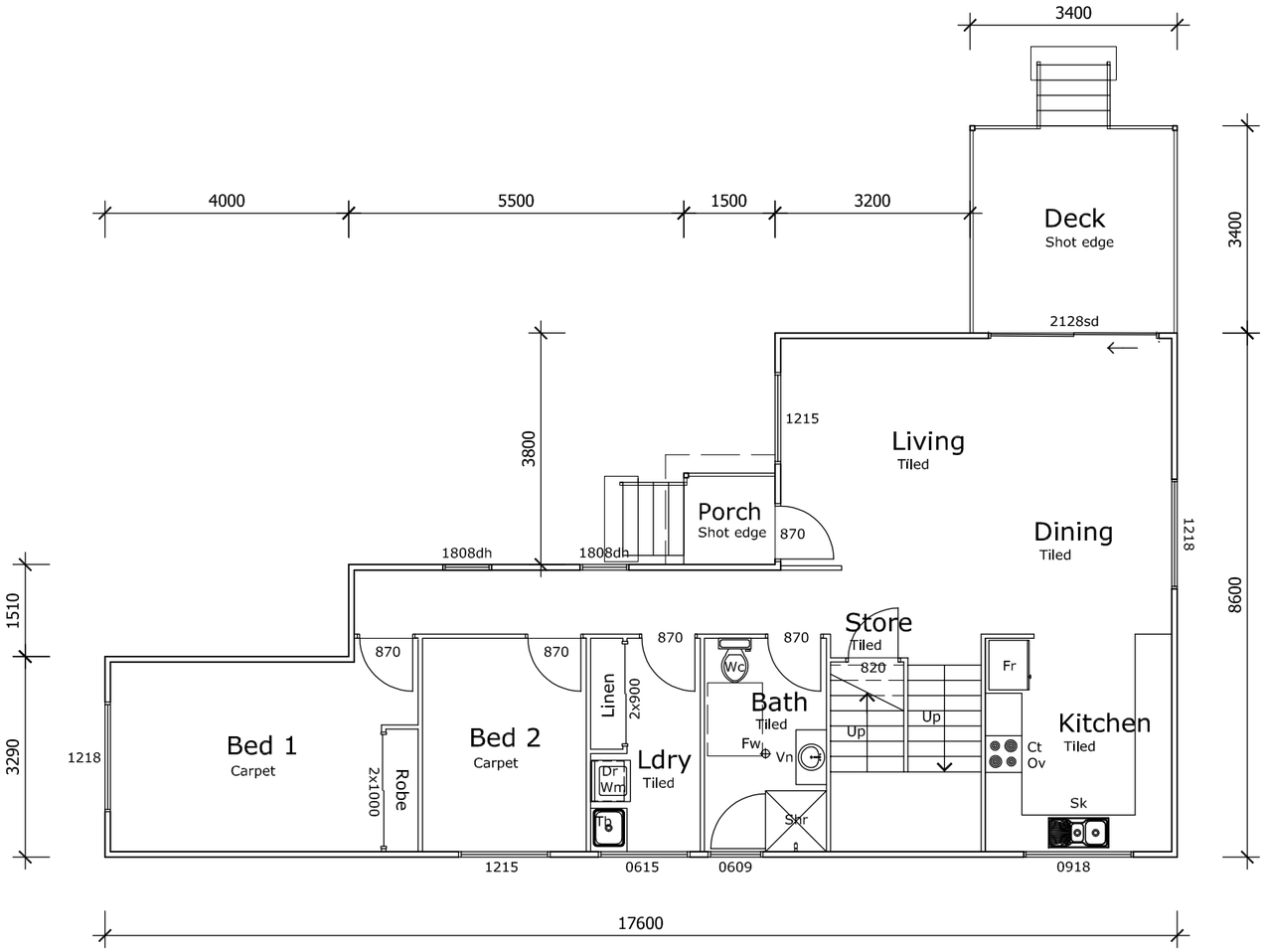
renovations / decks / patios
Gery Benson
BSc. Dip Arch Draft.
Call : 0416 936 452
QBCC Lic. No. 1256424 ABN 68 537 687 613
Email : plans@bensonbuildingdesigns.com.au
www.bensonbuildingdesigns.com.au

Project Name and Address
Proposed Rooming Accomm. Development
Abel Family Trust Pl
94 Bergin Road,
Cranbrook, Queensland

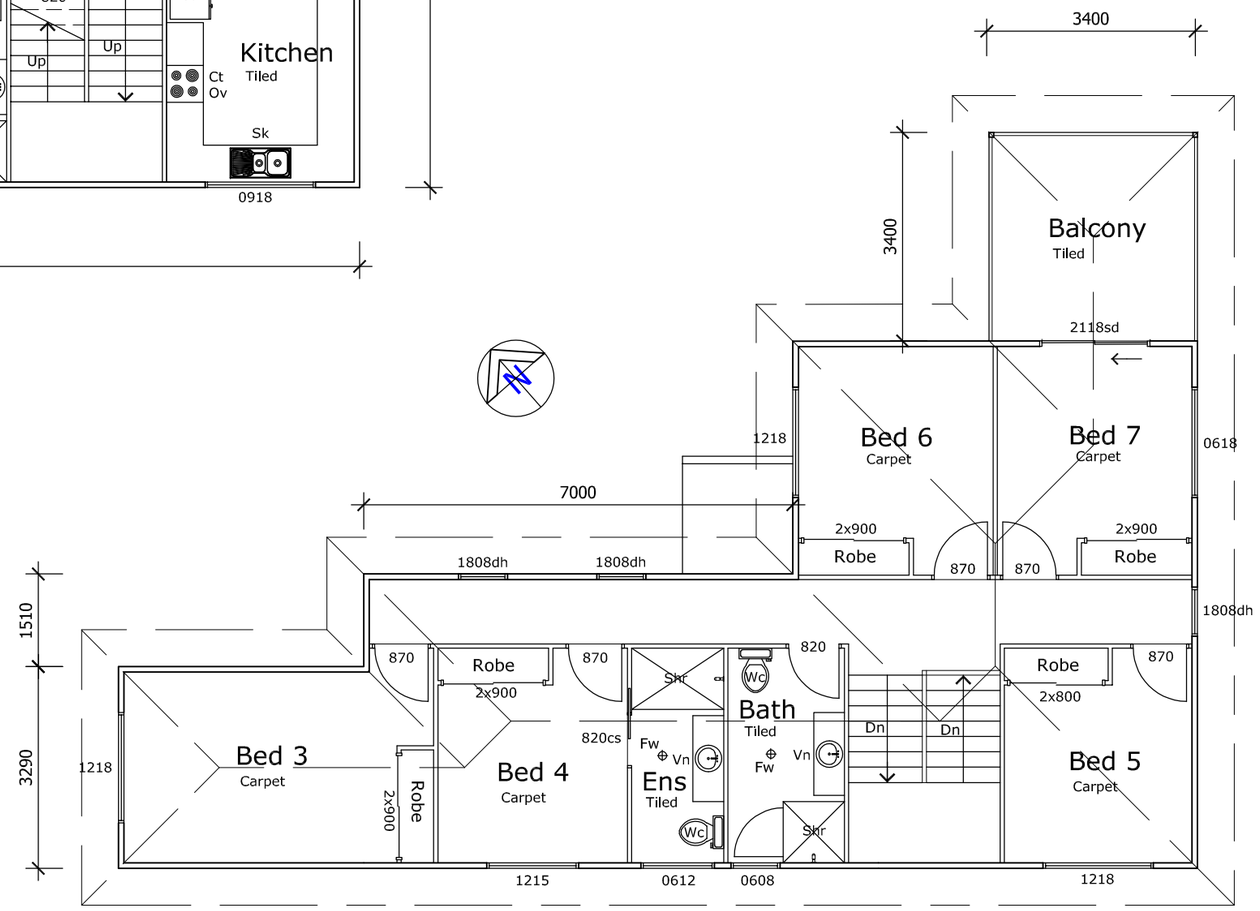
Project No.	Dwg No.	Issue
2024-12	DD01	C
Date: March, 2024	Designed: G.B	
Scale: 1:200 @ A3	Drawn: G.B	



Ground Floor Plan

Scale 1:100

Floor Areas
Living : 103.52 m²
Deck : 11.56 m²
Porch : 2.25m²
Overall : 117.32 m²



Upper Floor Plan

Scale 1:100

Floor Areas
Living : 103.52 m²
Balcony : 11.56m²
Overall : 115.08 m²

General Notes

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B	Floor Level Raised to 900mm	17/02/25
A	Preliminary Design	24/09/24

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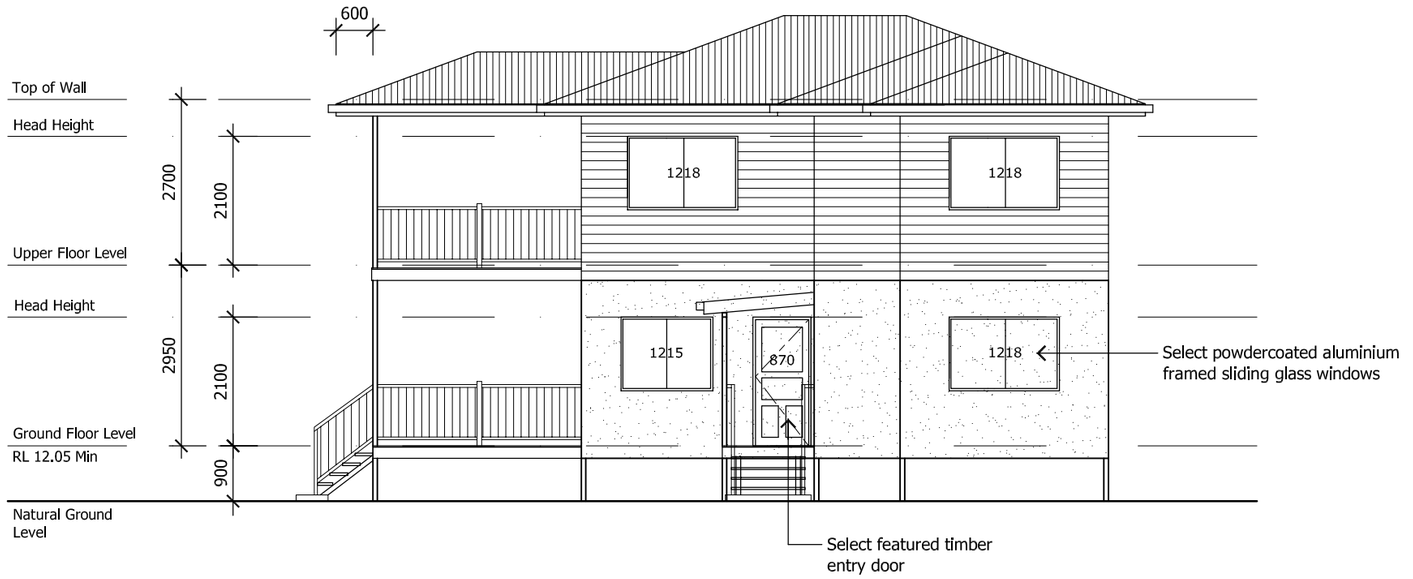
www.bensonbuildingdesigns.com.au

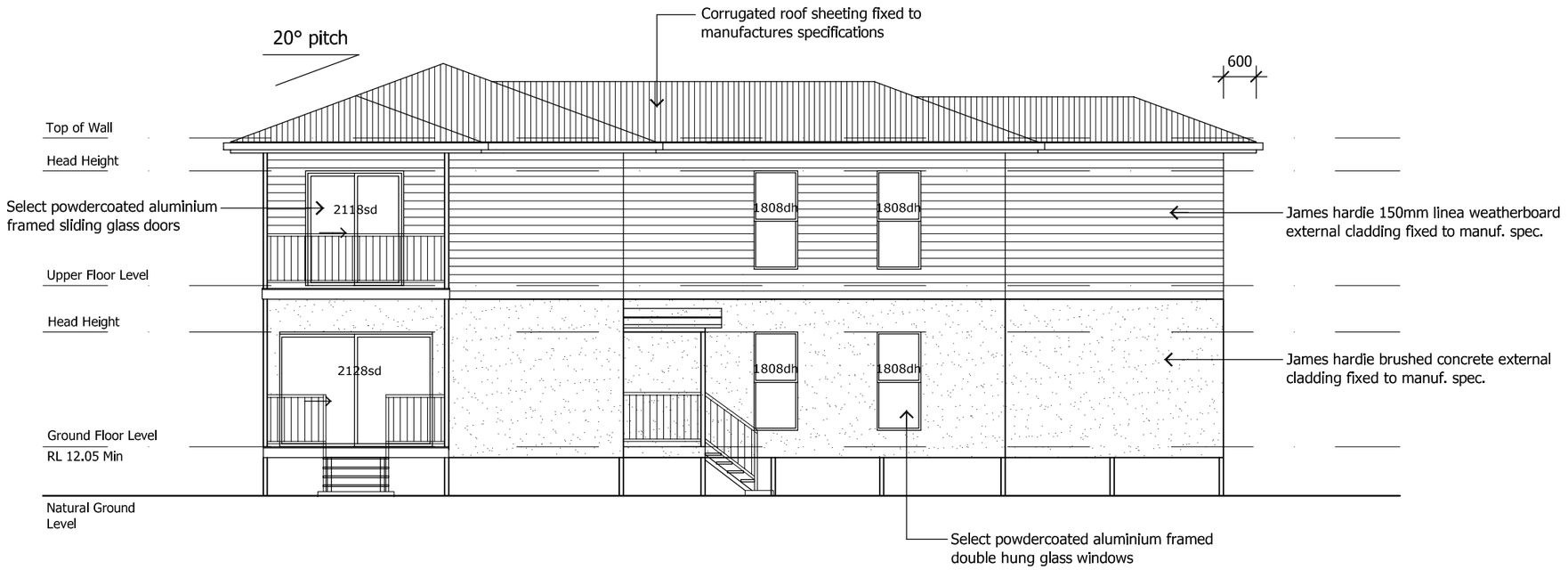
Project Name and Address
Proposed Rooming Accomm. Development
Abel Family Trust Pl
94 Bergin Road,
Cranbrook, Queensland

Project No.	Dwg No.	Issue
2024-12	DD02	C
Date: March, 2024	Designed: G.B	
Scale: 1:100 @ A3	Drawn: G.B	



North West Elevation

Scale 1:100



North East Elevation

Scale 1:100

General Notes

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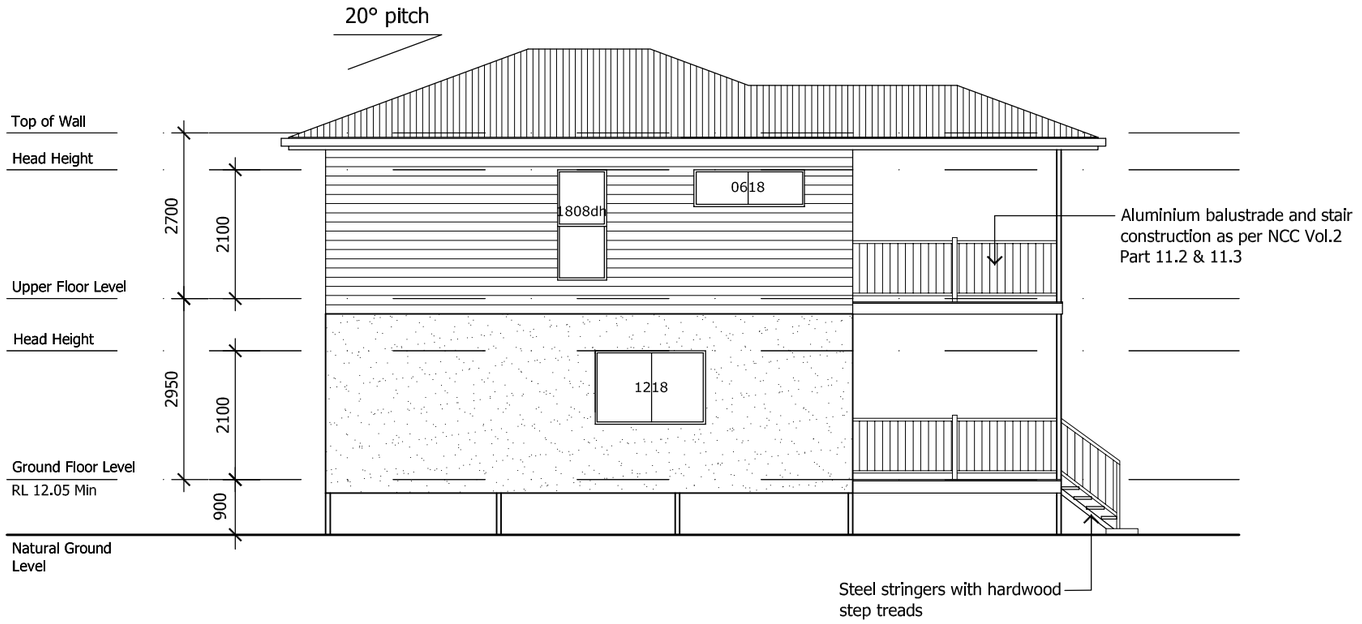
Project Name and Address

Proposed Rooming Accomm. Development

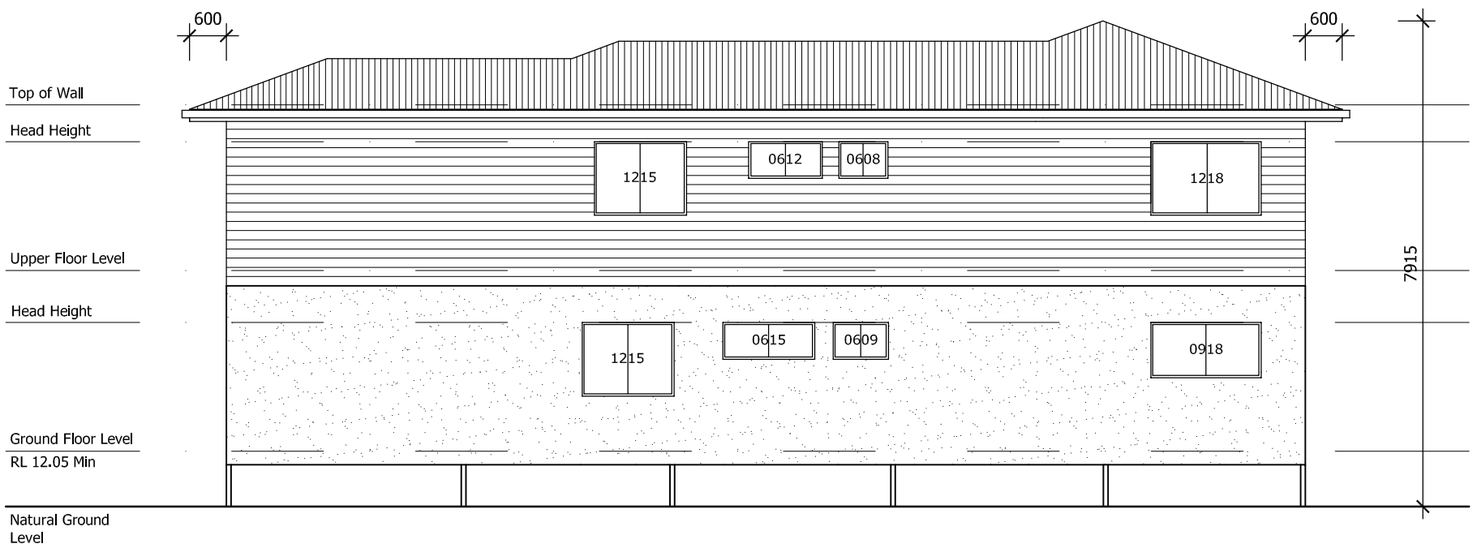
Abel Family Trust Pl
94 Bergin Road,
Cranbrook, Queensland

Project No.	Dwg No.	Issue
2024-12	DD03	C
Date: March, 2024	Designed: G.B	
Scale: 1:100 @ A3	Drawn: G.B	



South East Elevation

Scale 1:100



South West Elevation

Scale 1:100

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A	Preliminary Design	24/09/24

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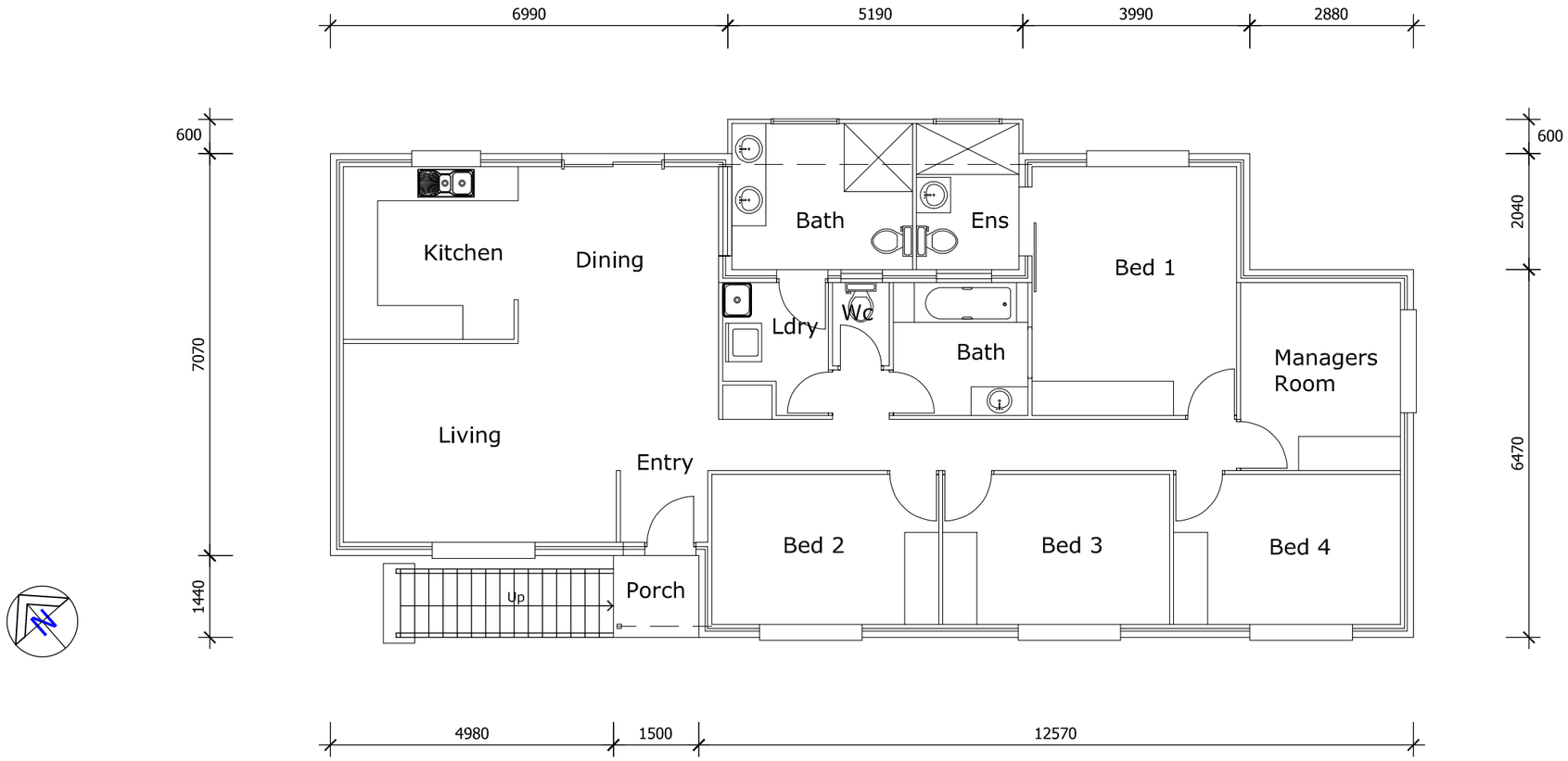
Project Name and Address

Proposed Rooming Accomm. Development

Abel Family Trust Pl
94 Bergin Road,
Cranbrook, Queensland

Project No.	Dwg No.	Issue
2024-12	DD04	C
Date: March, 2024	Designed: G.B	
Scale: 1:100 @ A3	Drawn: G.B	



Floor Areas

Living : 149.02 m²
Porch : 2.16m²
Overall : 151.18 m²

Existing Ground Floor Plan

Scale 1:100

General Notes

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No.	Revision/Issue	Date
B	Request Items 1,2 & 4 TCC Planning	13/05/25
A	Preliminary Design	24/09/24

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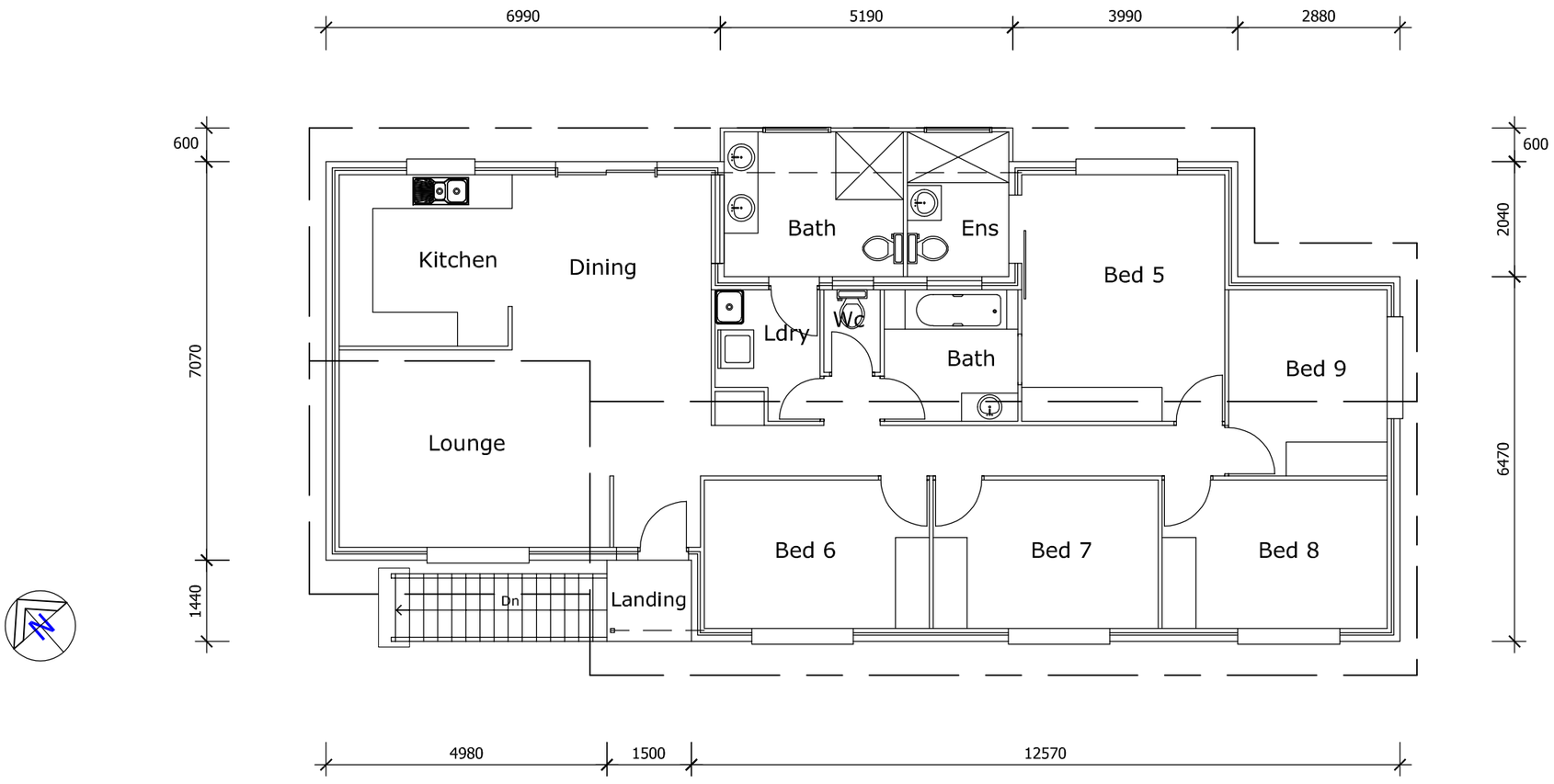
Project Name and Address

Proposed Rooming Accomm. Development

Abel Family Trust Pl
94 Bergin Road,
Cranbrook, Queensland

Project No.	Dwg No.	Issue
2024-12	DD05	B
Date: March, 2024	Designed: G.B	
Scale: 1:100 @ A3	Drawn: G.B	



Floor Areas
Living : 149.02 m²
Porch : 2.16m²
Overall : 151.18 m²

Proposed Upper Floor Plan
Scale 1:100

General Notes

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A	Preliminary Design	24/09/24

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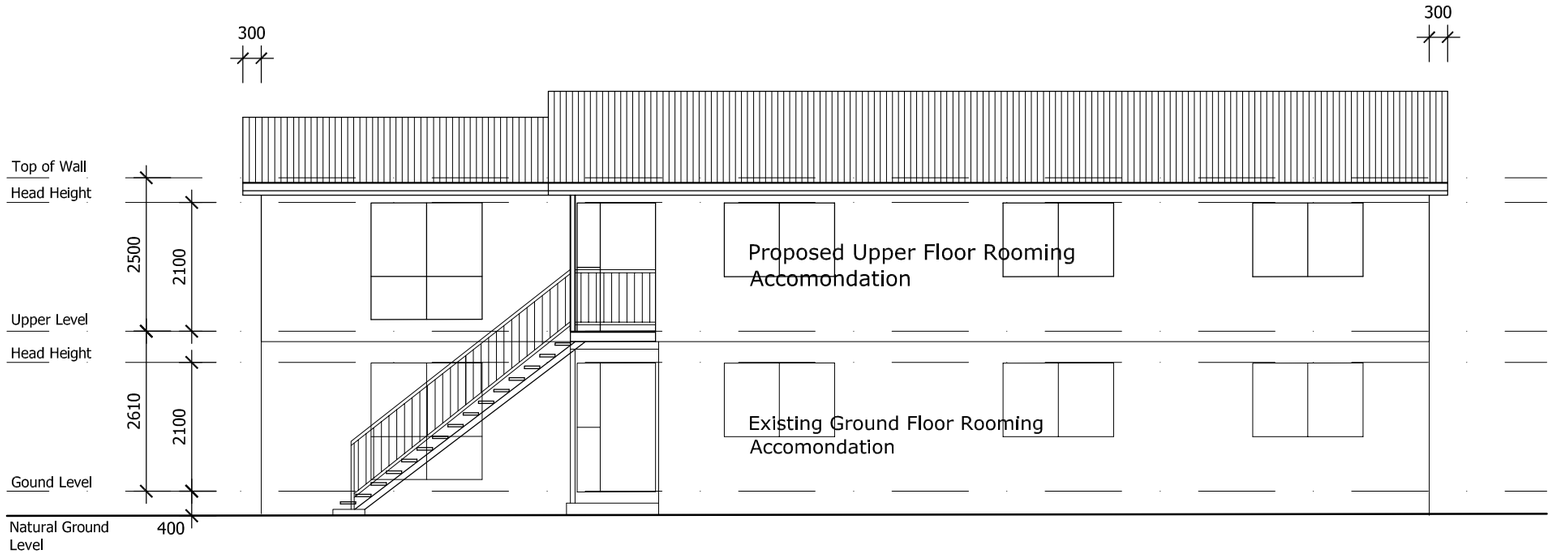
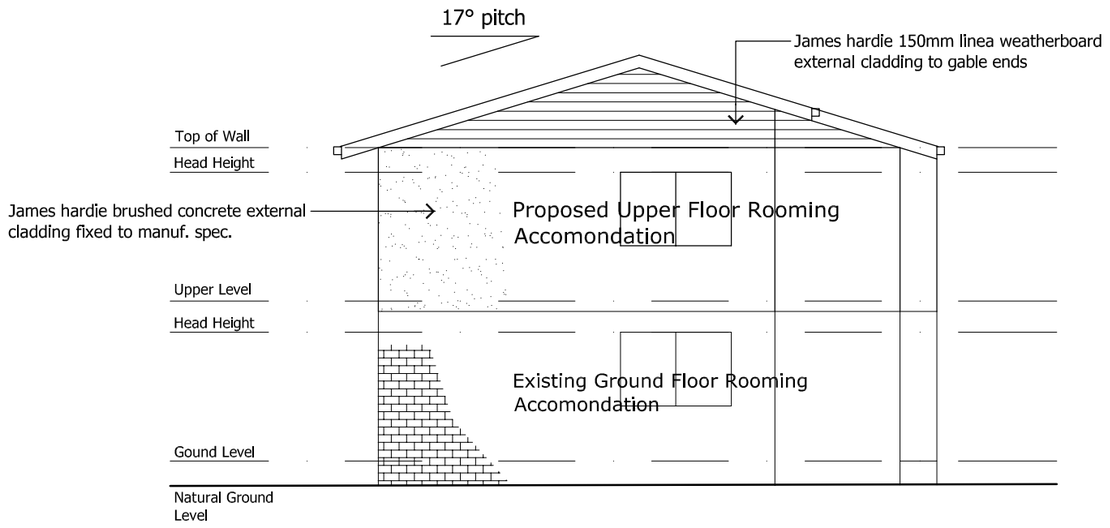
Project Name and Address
Proposed Rooming Accomm. Development
Abel Family Trust Pl
94 Bergin Road,
Cranbrook, Queensland

Project No.	Dwg No.	Issue
2024-12	DD06	B
Date: March, 2024	Designed: G.B	
Scale: 1:100 @ A3	Drawn: G.B	



South West Elevation

Scale 1:100



South East Elevation

Scale 1:100

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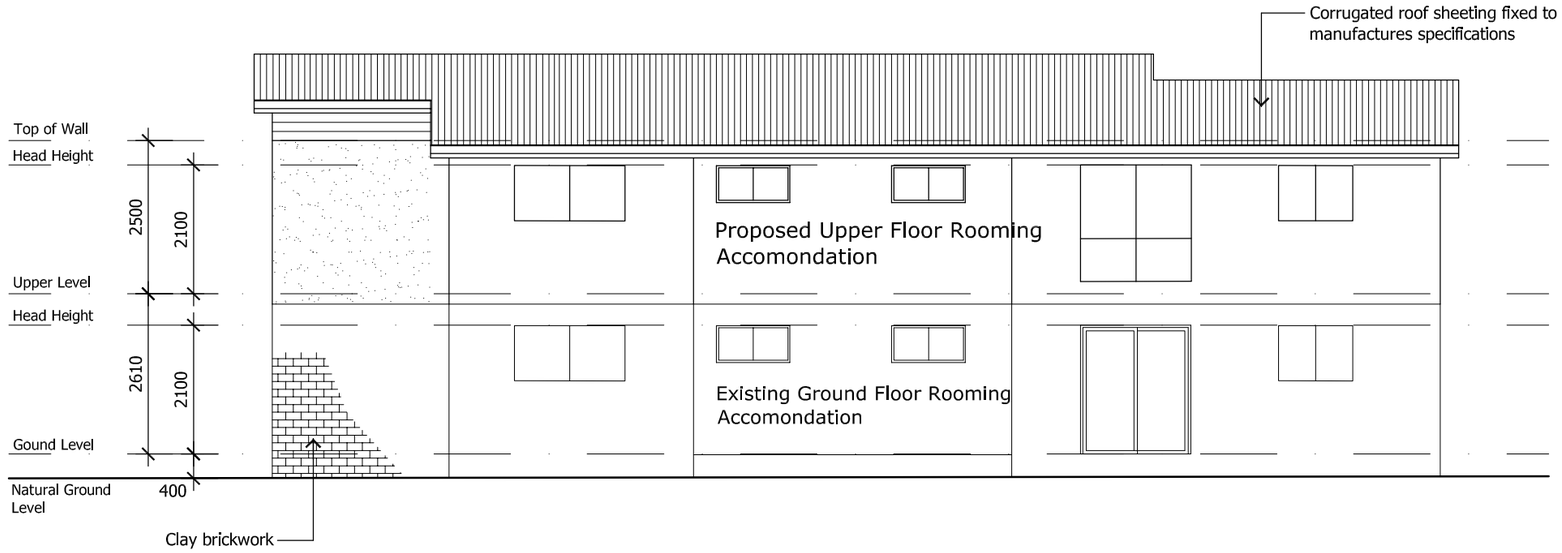
Project Name and Address

Proposed Rooming Accomm. Development

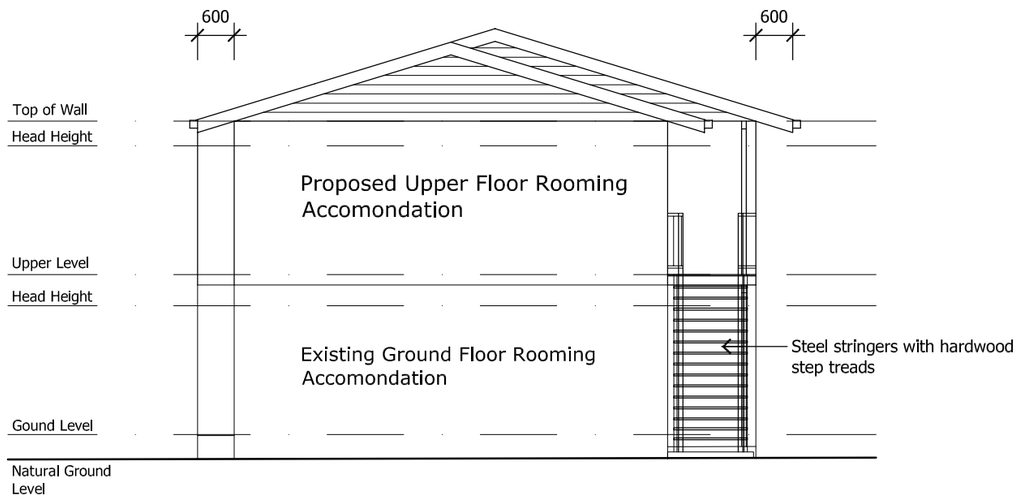
Abel Family Trust Pl
94 Bergin Road,
Cranbrook, Queensland

Project No.	Dwg No.	Issue
2024-12	DD07	B
Date: March, 2024	Designed: G.B	
Scale: 1:100 @ A3	Drawn: G.B	



North East Elevation

Scale 1:100



North West Elevation

Scale 1:100

General Notes

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A	Preliminary Design	24/09/24

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www.bensonbuildingdesigns.com.au

Project Name and Address

Proposed Rooming Accomm. Development

Abel Family Trust Pl
94 Bergin Road,
Cranbrook, Queensland

Project No.	Dwg No.	Issue
2024-12	DD08	B
Date: March, 2024	Designed: G.B	
Scale: 1:100 @ A3	Drawn: G.B	

APPENDIX 2

FLOOD IMPACT ASSESSMENT

NORTHERN CONSULTING engineers

Phone: 07 4725 5550
Fax: 07 4725 5850
Email: engineers@nceng.com.au
Web: www.nceng.com.au
50 Punari Street Currajong Qld 4812

Our Ref: **BNC0091/02:IG**
Your Ref: **94 Bergin Rd FIA**

18 July 2025

Abel Family Trust
104 / 2A Wilbar Ave
CRONULLA NSW 2230

Attention: Clayton Abel
Email: clay.abel@outlook.com

Dear Clayton,

RE: MULTIPLE DWELING DEVELOPMENT AT 94 BERGIN ROAD, CRANBROOK – MINOR 2D FLOOD IMPACT ASSESSMENT (FIA) – FLOOD HAZARD AND TRAFFICABILITY UPDATE

In accordance with our engagement please find herein the 2D flood impact assessment (FIA) for the above-mentioned development. This report is amended to include responses to Advice Notice in association with MCU25/0011 dated 14th May 2025. The purpose of this FIA is to demonstrate that the proposed development, inclusive of a proposed 5-bed detached dwelling and carpark (in lieu of the previously proposed 6-bed dwelling), achieves a non-worsening outcome.

NCE have developed a new site-specific 1D/2D TUFLOW model within the existing Ross Creek flood model catchment for the assessment of proposed residential development at 94 Bergin Road, Cranbrook. A review of the Ross Creek and Ross River flood studies indicates that during the 1% AEP event, flood waters do not break the northern bank of the Ross River, subsequently, flooding at the site during the 1% AEP event is associated with the local catchment only. The local catchment is generally bounded by the Ross River high bank to the east and south, Ross River Road to the west and Irving Street to the north, resulting in an area of ~105 ha which forms the model extent. The model has adopted a staged-discharge (rating curve) boundary at suitable locations downstream of the site (over 500m) to ensure there is no influence on flooding characteristics at the site.

The model has been developed using the readily available TCC 2016 LiDAR. The 2016 LiDAR has been adopted in-lieu of the 2019 LiDAR as we understand Councils new model (Ross River 2021) has been developed using 2016 LiDAR. The 2016 LiDAR has a 1m grid resolution which was transposed onto a 5m grid and supplemented by TUFLOW's sub-grid sampling (SGS) feature. The existing buildings located on Lara Street and Isabella Court have been stamped into the baseline model due to being on the critical flow path for the development. Underground drainage infrastructure has been included as a 1D network (data sourced from TCC's open data portal) and as the 1D network extends beyond the model extents, a 1D boundary has been included so that flows in the drainage networks are simulated and transferred outside the 2D domain. The 1D boundaries have been model as HT (water level versus time) with a constant water level equal to the pipe obvert.

Intensity-Frequency-Duration (IFD) data, in accordance with Australian Rainfall and Runoff 2019 (ARR2019), were used for the full suite of design events (50%, 20%, 10%, 5%, 2%, and 1% AEP). The critical storm durations and associated temporal patterns, as defined in the Ross River Flood Study for the development site, are presented in **Table 1**. These parameters were used to generate the total rainfall time series for the rain-on-grid (ROG) hydrologic modelling.

Table 1: Design Events, Critical Duration and Temporal Patterns

Design Event (%AEP)	Critical Duration (min)	Temporal Pattern
50	30	8675
20	90	8750
10	60	8716
5	45	8685
2	90	8731
1	90	8731

Rainfall losses are applied via infiltration which is dependent on the land use / impervious percentage areas as the model adjusts losses in line with the specified fraction impervious to determine the rainfall run-off excess at each time step. The initial and continuing losses adopted in the model for the pervious and impervious areas are in accordance with the Ross River flood study. The land uses adopted for the baseline and development scenarios are shown in **Map A02**, which correlate with those of Council's model.

NCE have carried out an overarching verification by assessing the baseline model against the new Ross River 2021 model and found that the flood depths and height within the model extents are generally in agreement with the TCC's depths. Also, the flood extents show good correlation between the baseline model and TCC's flood mapping for 1% AEP storm event, refer **Figure 1**. Subsequently, the site-specific model is deemed fit for purpose, i.e. assessing potential impact associated with the development.

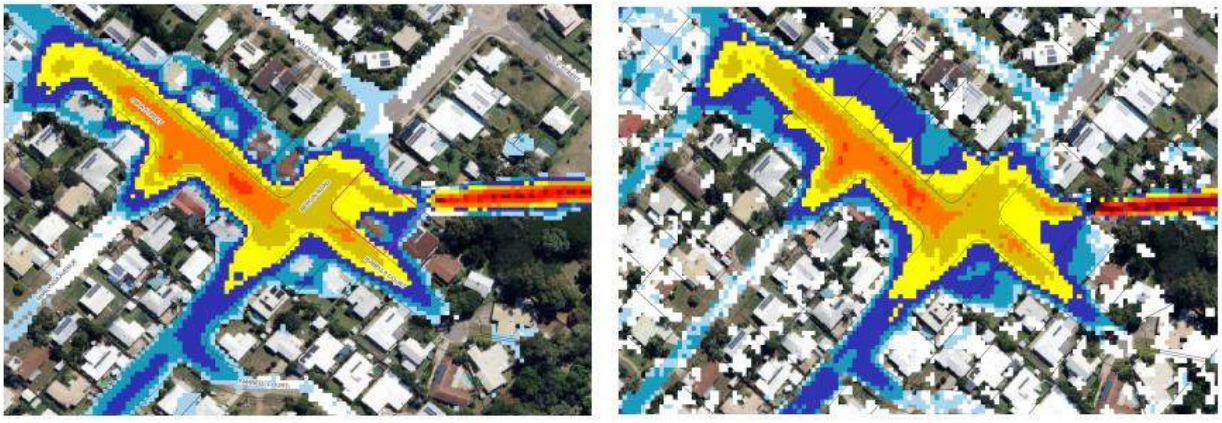


Figure 1 - 1% AEP Flood Depth Extent Comparison

Following verification, the baseline model was modified to simulate the developed case which included the following:

- The 5-bed detached dwelling is modelled a minimum 300mm above the 1% AEP flood levels. Footprint of the building pad is 2.6m offset from southeast (rear) boundary, 2.0m offset from the existing building and modelled as slab on ground.

- The proposed carpark is filled 250mm above the natural ground. Note that after several iterations of filling the carpark extent, the best achievable outcome that does not create afflux is found to be 250mm.

- Imperviousness of the proposed carpark increased to 100% to represent paved pavement.

- The remaining footprint was maintained at 65% impervious as the proposal does not exceed the allowable fraction impervious/site coverage for residential zones.

The results from each developed scenario were adopted in the flood impact assessment, which is best analysed by assessing the afflux. Afflux is defined as the relative change in a flooding characteristic, namely water surface level (WSL) or velocity, between the baseline and developed scenario. This is determined by subtracting the baseline peak results from the developed peak results, where a positive value represents an increase in the flood characteristic and a negative value is a decrease.

The WSL afflux has been assessed for the major 1% AEP and minor 50% AEP flood events. TCC parameters for acceptable development is +/- 10 mm change in WSL (shown as white in the result mapping). Depending on the circumstances, we are of the opinion that up to +20mm (aqua) is also acceptable in some environments where the impacted areas are not sensitive, and the increase is immaterial. With this in mind, the following commentary is provided.

The inclusion of the building pad and carparks within the developed model for 1% AEP storm does not result in actionable impacts to the adjacent properties or Council's infrastructure, which is illustrated in **Map B01**. The isolated increase between the neighbouring lots is considered nonactionable due to the model resolution and grid positioning. The impacts observed within the development are a direct result of the existing flow path (**Figure 2**) through the site being impeded by the development extent.

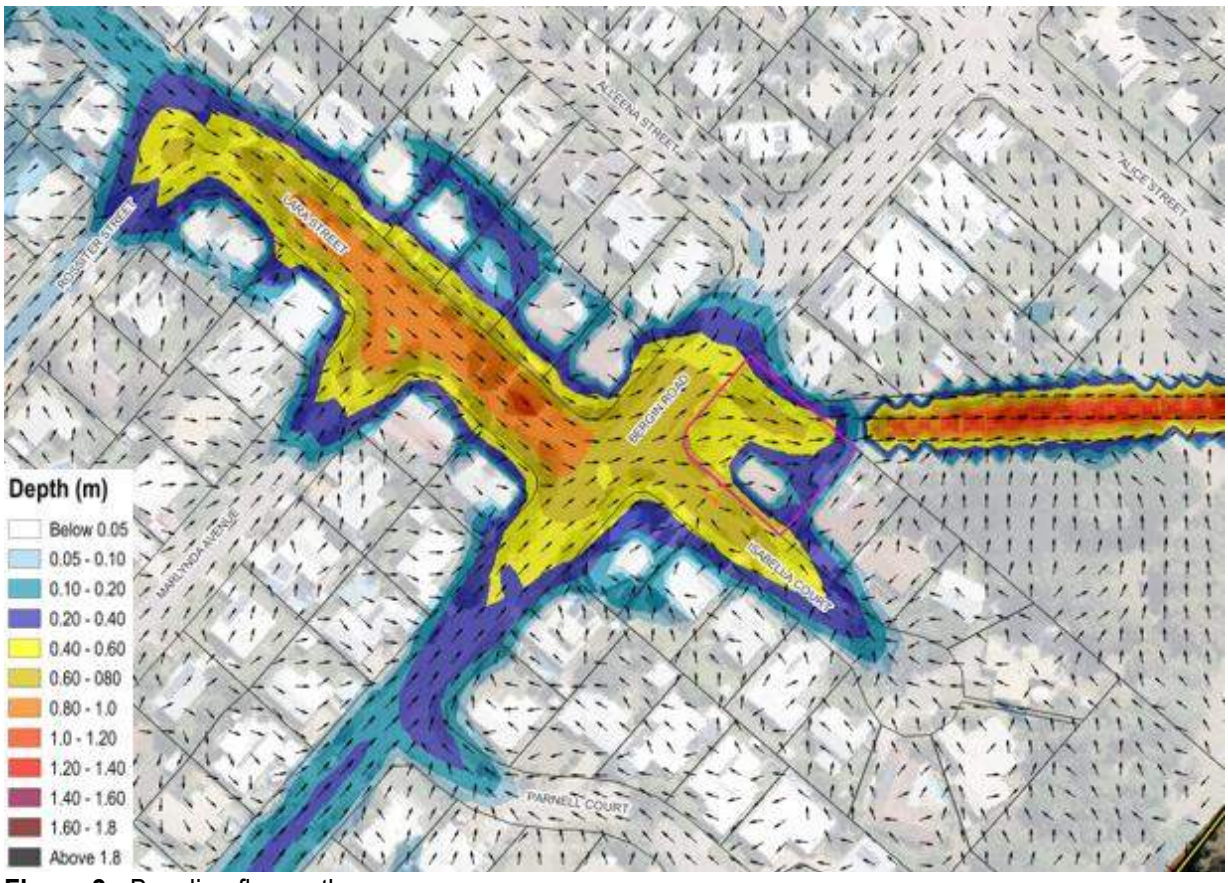


Figure 2 - Baseline flow paths

As shown in **Map B02**, inclusion of the building pads and carpark within the developed model for 50% AEP frequent storm event does not result in any impacts to the adjacent properties or Council's infrastructure.

In the assessments, there are cells that are shown to be wet now when previously dry. This is due to the filtering applied such that the baseline results were removed when filtered but remained in the developed results. This was confirmed by undertaking an assessment on the unfiltered results where it was observed that changes at these cells were 5 mm or less. Furthermore, the assessment has ensured any increase in run-off due to the change in impervious area is accounted for in the assessment. Subsequently, as there is no impacts downstream of the development, and on-site storage is not required.

Finished floor levels (FFL) of the habitable floors are required to be 300mm above the 1% AEP flood level. Therefore, it is recommended that as a minimum the FFL is above the highest 1% AEP flood level, namely 12.00m AHD (300mm above 11.70m AHD) for the 5-bed detached, refer Table 1.

Table 1 – Recommended Finished Floor Levels

Proposal	Recommended Floor Levels (m AHD)
5-bed detached dwelling	12.00

HAZARD AND RISK ANALYSIS

The proposed development is dwelling development within Rooming Accommodation land use in Council's Planning Scheme. In the 1% AEP flood event, the baseline flood hazard classification for the site H1 and H2 in the locations that the dwelling and car park are proposed, respectively, refer **Map D01**. At the intersection Isabella/Lara/Bergin, the flood hazard classification is H3. Based on Australian Rainfall and Run-off (ARR) Book 1, Chapter 5 (Flood Risk):

- H1 (Very Low Hazard):
    - Generally safe for vehicles, people, and buildings.
    - Minor inconvenience with shallow depths and low velocities.
- H2 (Low Hazard):
    - Generally safe for vehicles, people, and buildings.
    - Evacuation is possible for able-bodied persons, though caution is required due to increased depths or velocities.
- H3 (Medium Hazard):
    - Unsafe for small vehicles.
    - Evacuation becomes difficult.
    - Potential structural damage to buildings not designed for flood impacts.
    - Represents a significant hazard to vulnerable persons.

Flood Risk to Development

1. Dwelling and Car Park Area (H1/H2):
    - The dwelling is subject to H1-H2 hazards, indicating:

- Low direct risk to life safety for occupants during design flood if flood.
- Manageable structural risk if the building is designed in accordance with flood-resilient construction standards, including minimum habitable floor levels.
- Car park is subject to shallow flooding, which may:
    - Affect parked vehicles.
    - Create slip/trip hazards but is generally not life-threatening in H1/H2 zones.

2. Access Road (H3):
    - Presents a medium hazard classification with significant implications:
        - Evacuation routes may become unsafe for small vehicles and vulnerable occupants during flood events.
        - Residents may be isolated during flood events, increasing reliance on emergency services.

Overall Flood Risk Assessment

- The dwelling and car park are located in areas where the risk is generally tolerable if the habitable floor levels are designed and constructed at 300mm above the flood level.
- Access inundation (H3) increases flood risk to generally intolerable for evacuation of vulnerable persons; unsafe for small vehicles, subsequently risk mitigation is required.

Risk Mitigation Recommendations

1. Habitable floor level of dwelling to be constructed 300mm above the flood level as detailed in **Table 1**.
2. Assess duration and depth of inundation over the access road and car park to determine realistic evacuation timelines. This has been undertaken and discussed in the following sections, which has led to the development of emergency evacuation requirements, considering the potential for isolation, particularly for vulnerable occupants.
3. There is no alternative access route; however, emergency vehicles are not considered to be a small vehicle and have the potential to navigate the H3 classification.

Implementation of the above mitigations reduces the risk to acceptable/tolerable for the development.

TIME OF ISOLATION UNDER FLOODWATERS

The proposed driveway access and carparks are not trafficable in the major (1% AEP) event if the surface levels left at the natural ground due to flood depth up to 600mm, refer **Map C01**. Therefore, the carparks surface levels have been raised to increase the duration of accessibility and trafficability within the development. The maximum fill that does not cause afflux is determined as 250mm. Subsequently, the maximum flooding depth at the carpark is ~250mm that improves the flood/risk profile lowering from H2 (unsafe for small vehicles) to H1 (generally safe for people, vehicles and buildings). However, for the period that flood depth is above 200mm, it is suggested that flood depth warning signs are installed at the carpark

and an emergency plan is in place for the proposed development. The time of isolation is discussed as follows:

Primary access to the development is expected to occur via Ross River Road – Alice Street – Bergin Road. The trafficability and site access assessment has been based on the critical access route along Bergin Road, with particular focus on the intersection at Isabella Court. The flood hazard maps (**D01** to **D06**) depicts the primary access road to development site. The period of development inaccessibility has been determined by assessing when flood depths at the Bergin Road–Isabella Court intersection exceed 200 mm and flood hazard classifications exceed H1. Subsequently, the roads trafficability during 1% AEP, 2% AEP, 5% AEP, 10% AEP, 10% AEP and 50% AEP storm has been analysed via depth and flood hazard hydrographs derived from TUFLOW for **Location 1** (proposed carpark) and **Location 2** (road intersection) which are also marked on maps **B01** and **B02**.

ROADS TRAFFICABILITY FOR VARIOUS AEP EVENTS

Figure 3 and **Figure 4** depicts the depth hydrograph and the hazard classification during various AEP events, specifically on **Location 2** shown in **B01** - the road intersection. As seen, during a 1% AEP and 2% AEP event, the road intersection is inundated to a depth exceeding 200 mm for approximately 1.5 hours. In the case of 5 % AEP to 20% AEP storm event, inundation above 200 mm lasts for approximately 0.5 hours, with the carpark continuing to provide safe access for pedestrians and small cars. For the 50% AEP storm event, no inundation occurs at the road intersection or within the proposed carparks, ensuring uninterrupted trafficability for all users.

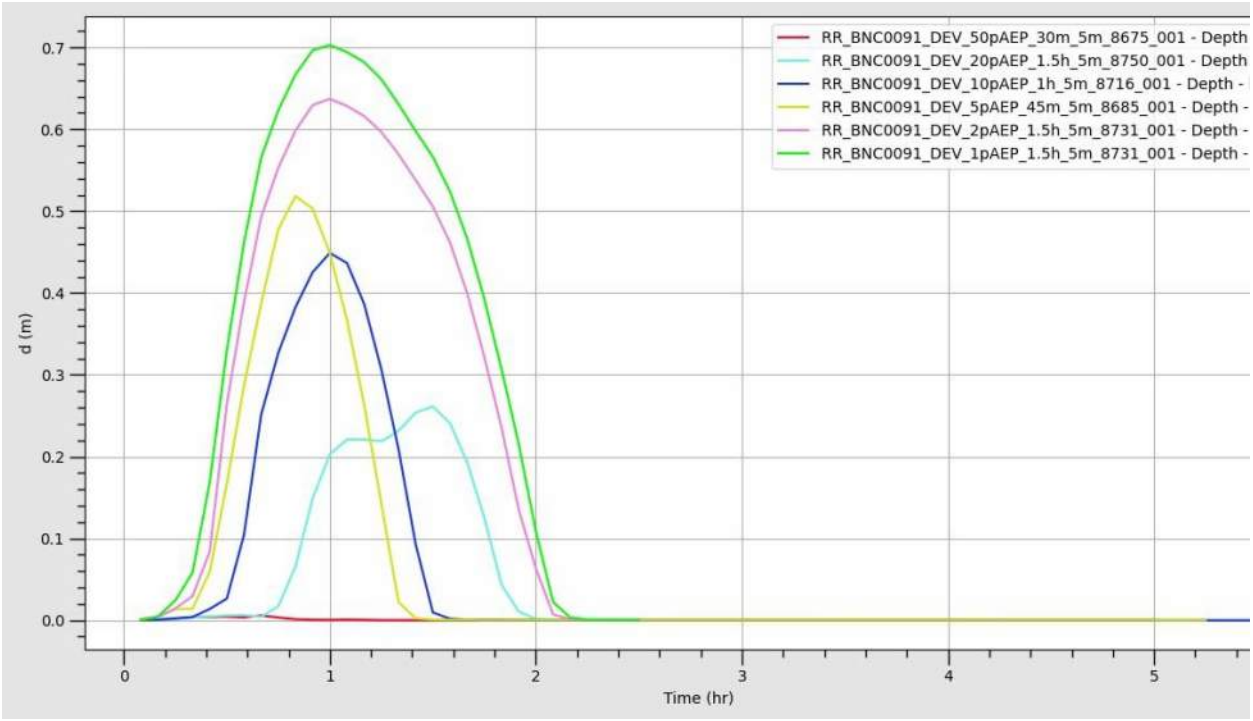


Figure 3 – Various AEP Events Flood Depth Hydrograph (Location 2 – road)

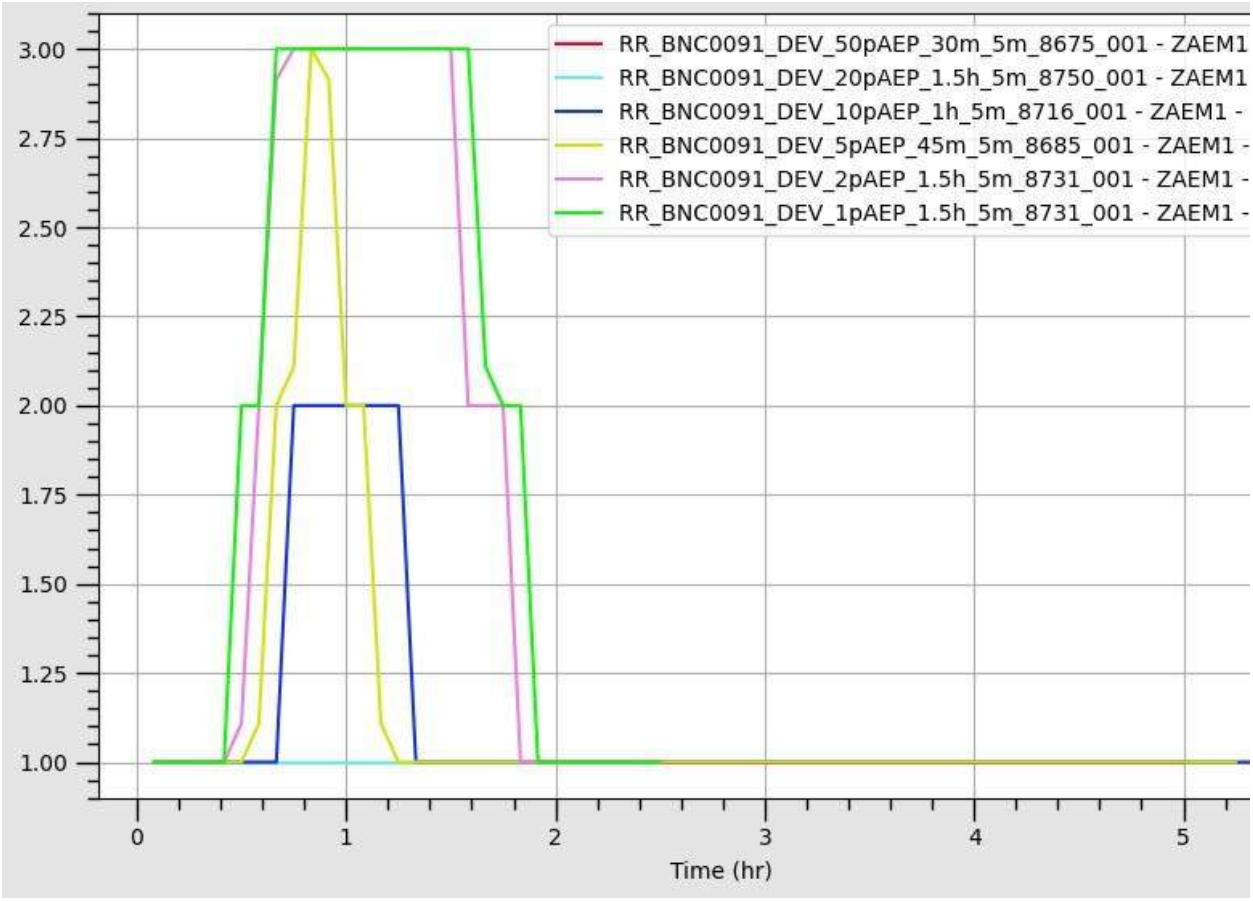


Figure 4 - 1% AEP Flood Hazard Classification (Location 2 – road)

In addition, the velocity hydrograph for the road intersection is shown on **Figure 5**. As expected, the peak velocities generally increase with decreasing AEP, indicating higher storm severity. The 1% AEP event (orange line) records the highest peak velocity of approximately 0.35 m/s, followed closely by the 2% and 5% AEP events, which also exhibit elevated velocities above 0.3 m/s. In contrast, the 50% AEP event (pink line) maintains significantly lower velocities, remaining below 0.15 m/s for the entire duration, reflecting its relatively minor hydraulic impact. All events demonstrate a similar trend of rapid rise to peak velocity within the first hour, followed by a steady decline toward negligible levels by approximately 3 hours.

Overall, there is only a 1.5 hour period in which emergency access; however, occupants can remain safe in the dwelling during this period.

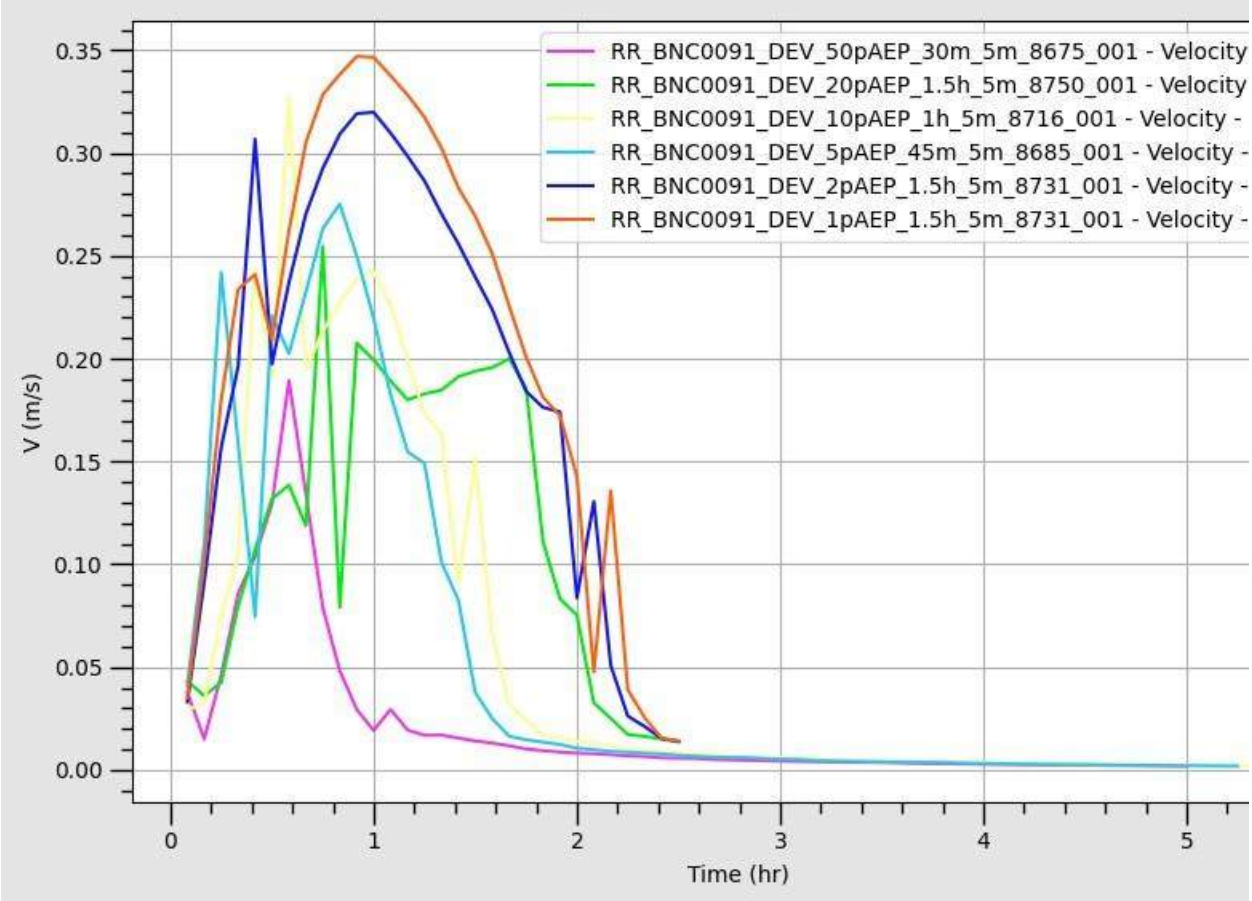


Figure 5 - 1% AEP Flood Velocity Hydrograph (Location 2 – road)

CARPARK VULNERABILITY

Figure 6 shows the flooding depth at the carpark after being filled 250mm, specifically on **Location 1** on map **B01,** for all events; 50% AEP, 20% AEP, 10% AEP, 5% AEP, 2% AEP and 1% AEP. As seen, the carpark is trafficable up to 1% AEP event where the flooding depth reaches above 200mm. As a result, the carpark is trafficable and safe for travel during the majority of storm events, with conditions remaining suitable up to the 2% AEP event. Exceedances are limited to the more extreme 1% AEP event, which is a relatively rare occurrence. Therefore, the carpark can be considered safe for travel under typical weather conditions.

Although the carpark is generally safe, it is recommended that signage be installed advising that the car park is subject to flooding, up to 250mm in significant rainfall events and vehicles should be relocated to high ground near the intersection of Bergin/Alleena.

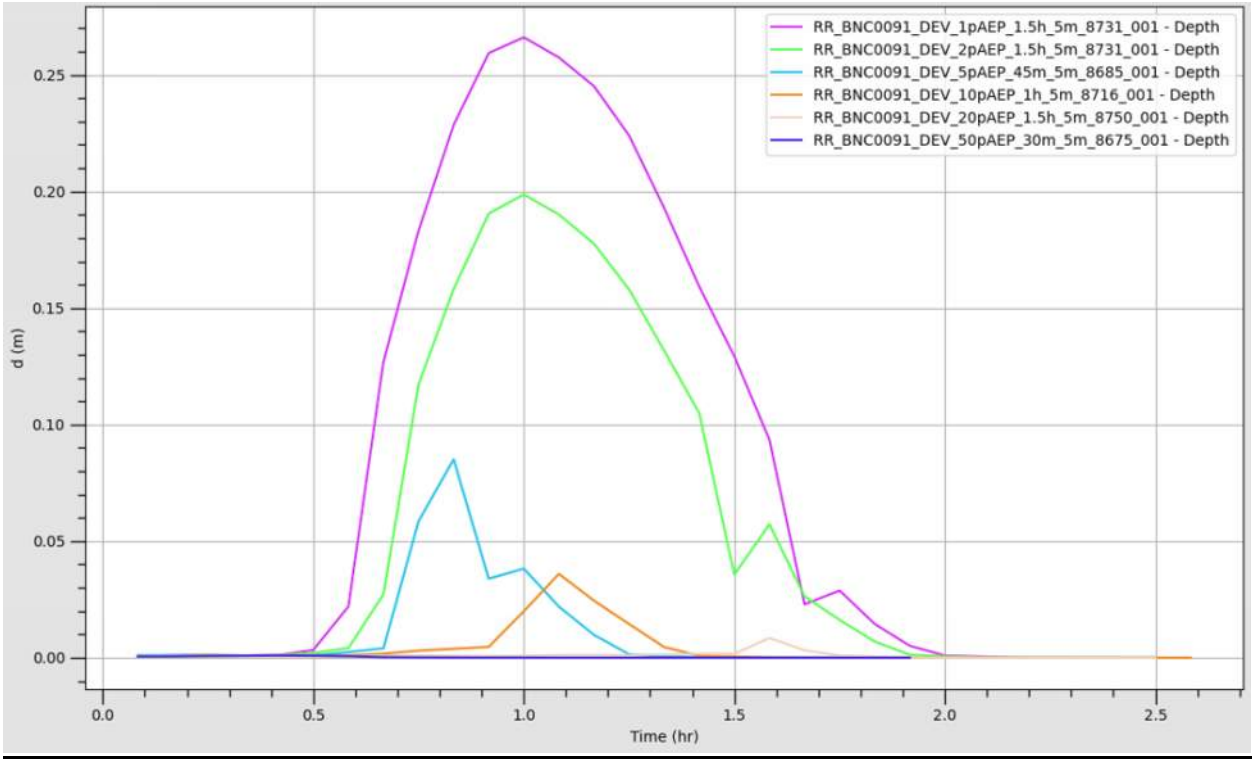


Figure 6 – All Events Flood Depth Hydrograph

Figure 7 illustrates the hazard classification over time and **Figure 8** shows the velocity hydrograph for the carpark. The location only transitions into a potentially hazardous condition for people or vehicles during the most extreme event (1% AEP) however it is still trafficable with flood depth under 200 mm and velocity is under 0.6 m/s. For all other storm events, the hazard level remains at or near the baseline value of 1.0, indicating minimal flood-related safety concerns under those conditions.

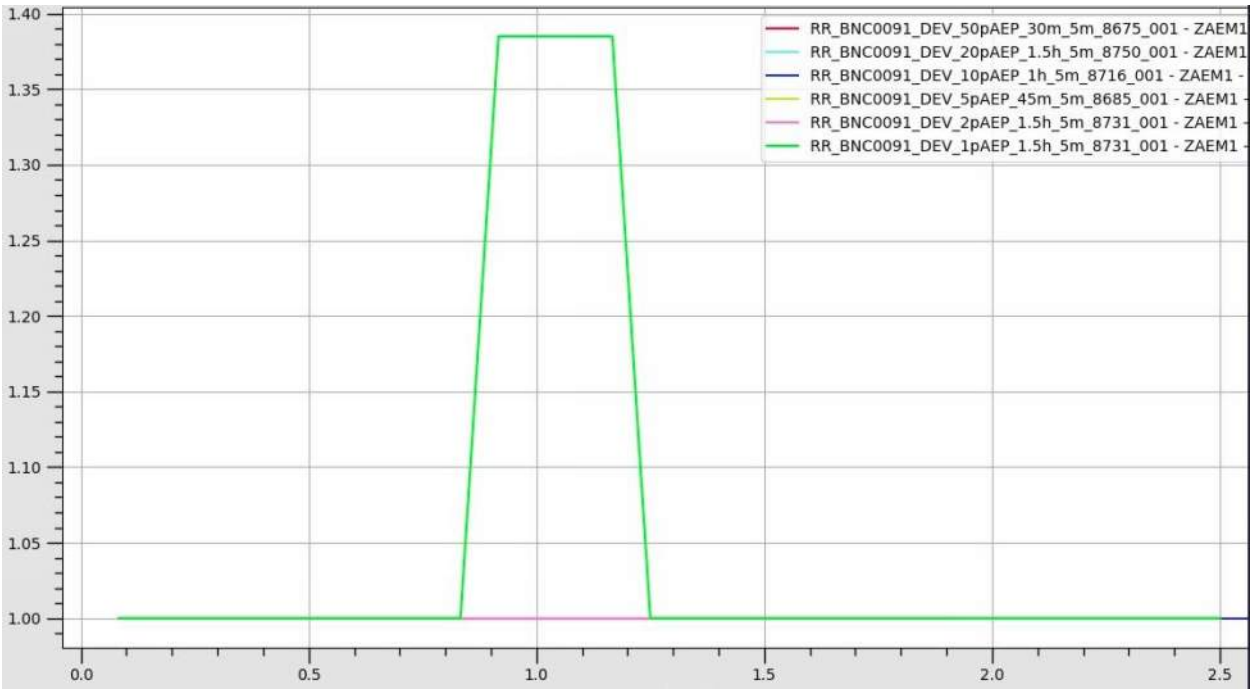


Figure 7 – All Events Flood Hazard Classification

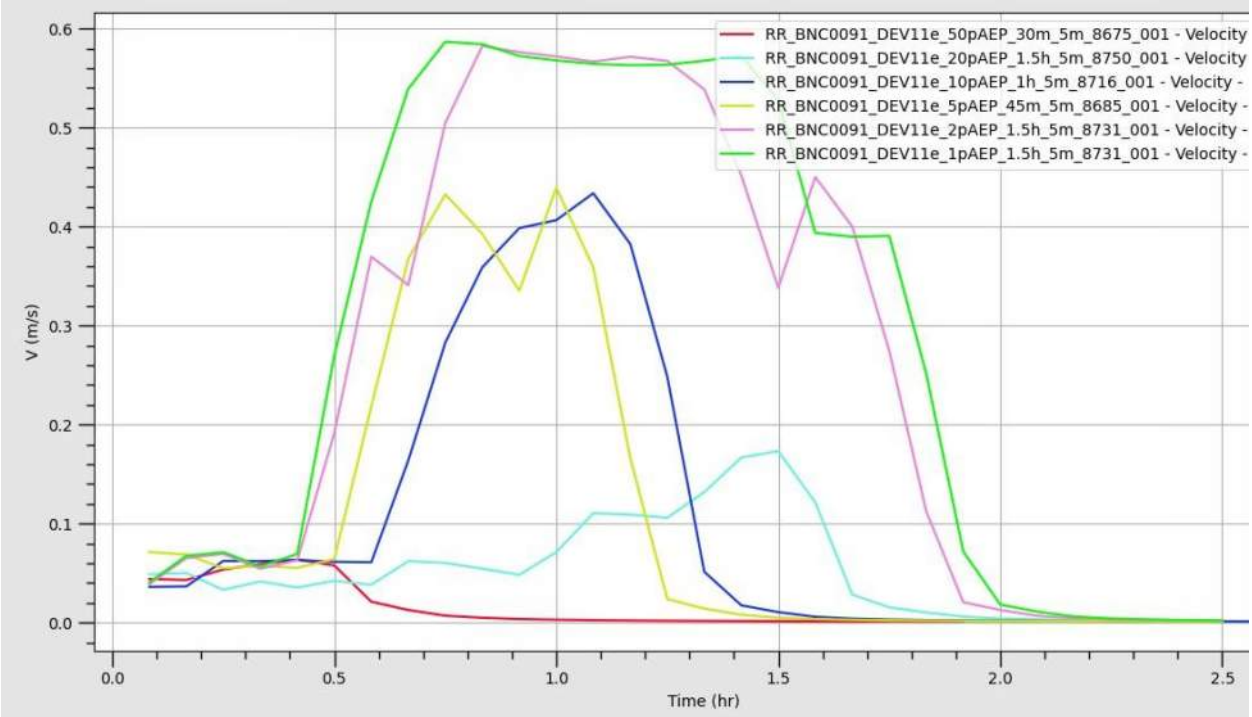


Figure 8 – All Events Flood Velocity Hydrograph

EMERGENCY EVACUATION REQUIREMENTS

In the context of practical flood emergency measures to reduce any damage and ensure public safety suggested measures prior to flood events are provided in **Appendix F**. As detailed on the redline markup installing flood warning signs and a communication protocol (e.g., SMS or app-based alerts) should be established to inform users of the potential flood risks including time of inundation and isolation period.

Based on the flood modelling results, the proposed carparks remain accessible and free from hazardous conditions during all assessed storm events, including up to the 1% AEP event. Velocity and depth conditions within the carpark area remain below critical thresholds for pedestrian and vehicle safety, and hazard classifications stay at or near the baseline level, except for brief periods during the most extreme event. As such, the carparks can be considered suitable for safe vehicle storage and pedestrian movement.

Given the above, the flood modelling demonstrates the proposed development can achieve an acceptable outcome that is aligned with the intent of the flood hazard overlay code.

Please do not hesitate to contact the undersigned on 07 4725 5550 if you have any questions regarding this response.

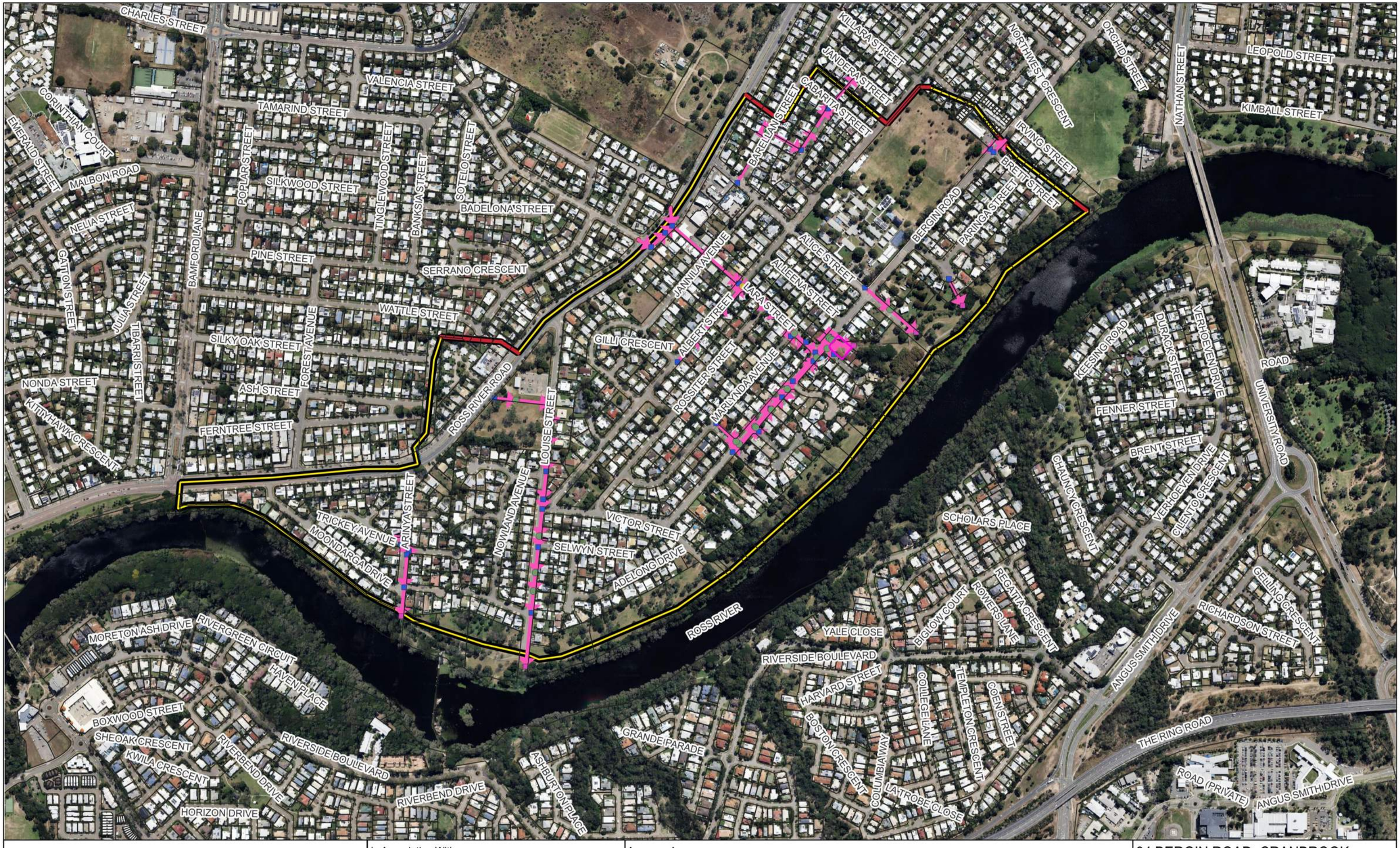
Yours sincerely,

IREM GUNEY
Civil Engineer

Approved,

JOHN SINGLE
Senior Civil Engineer (RPEQ 24378)

Encl. Appendix A: TUFLOW Model Setup – Model Materials, Appendix B: Afflux Mapping, Appendix C: Flood Depth Mapping, Appendix D: Flood Hazard Mapping, Appendix E: Velocity-Depth Product, Appendix F: Flood Warning Mark Up by NCE



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0 50 100 150 200 250 m

1:7,500

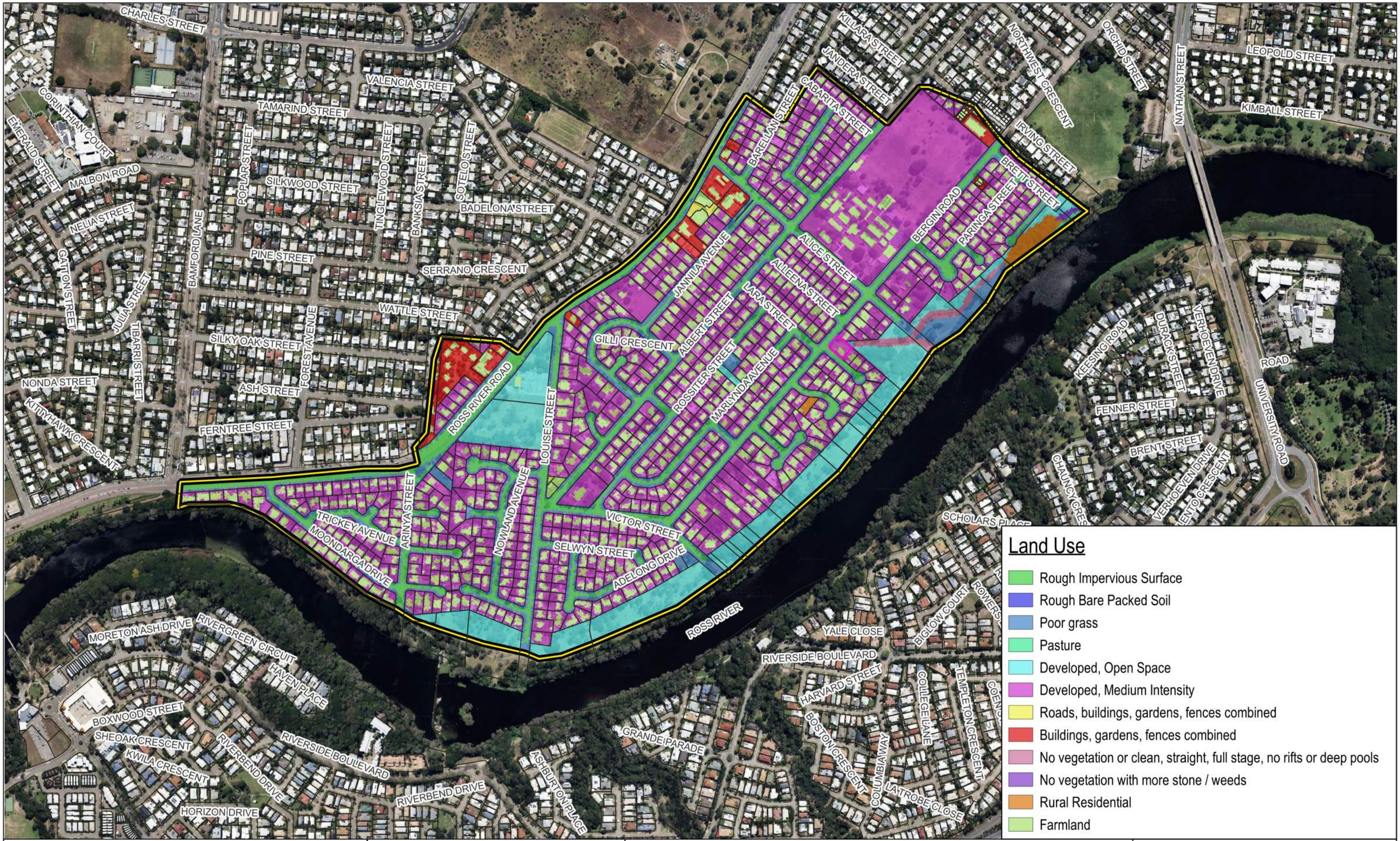
Legend

- Hydraulic Model Extent
- Development Site
- TCC Land Parcels
- External Inflows
- Staged Discharge Boundary
- Flow vs Time Pipe Inflows
- Constant Height Pipe Outflows
- TCC's Stormwater Pipes
- TCC's Stormwater Outlets
- TCC's Stormwater Inlets

94 BERGIN ROAD, CRANBROOK MULTIPLE DWELLING DEVELOPMENT

TUFLOW MODEL SETUP

Prepared By: IG Reviewed by: JS	Date: **13/12/2024** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **A01**



Land Use

- Rough Impervious Surface
- Rough Bare Packed Soil
- Poor grass
- Pasture
- Developed, Open Space
- Developed, Medium Intensity
- Roads, buildings, gardens, fences combined
- Buildings, gardens, fences combined
- No vegetation or clean, straight, full stage, no rifts or deep pools
- No vegetation with more stone / weeds
- Rural Residential
- Farmland

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Legend

Hydraulic Model Extent | Development Site | TCC Land Parcels

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

MODEL MATERIALS

Prepared By: IG Reviewed by: JS	Date: **13/12/2024** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **A02**

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0 5 10 15 20 25 m

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Legend

- Development Site
- TCC Land Parcels
- Existing Buildings
- Proposed 5 Bed Detached Dwelling on Slab
- Proposed Carpark
- Hydrograph Locations

94 BERGIN ROAD, CRANBROOK MULTIPLE DWELLING DEVELOPMENT

1% AEP WSL AFFLUX

Prepared By: IG Reviewed by: JS	Date: **26/06/2025** Revision: **B** NCE Ref: **BNC0091**	Size **A3**	Map **B01**

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Legend

- Development Site
- TCC Land Parcels
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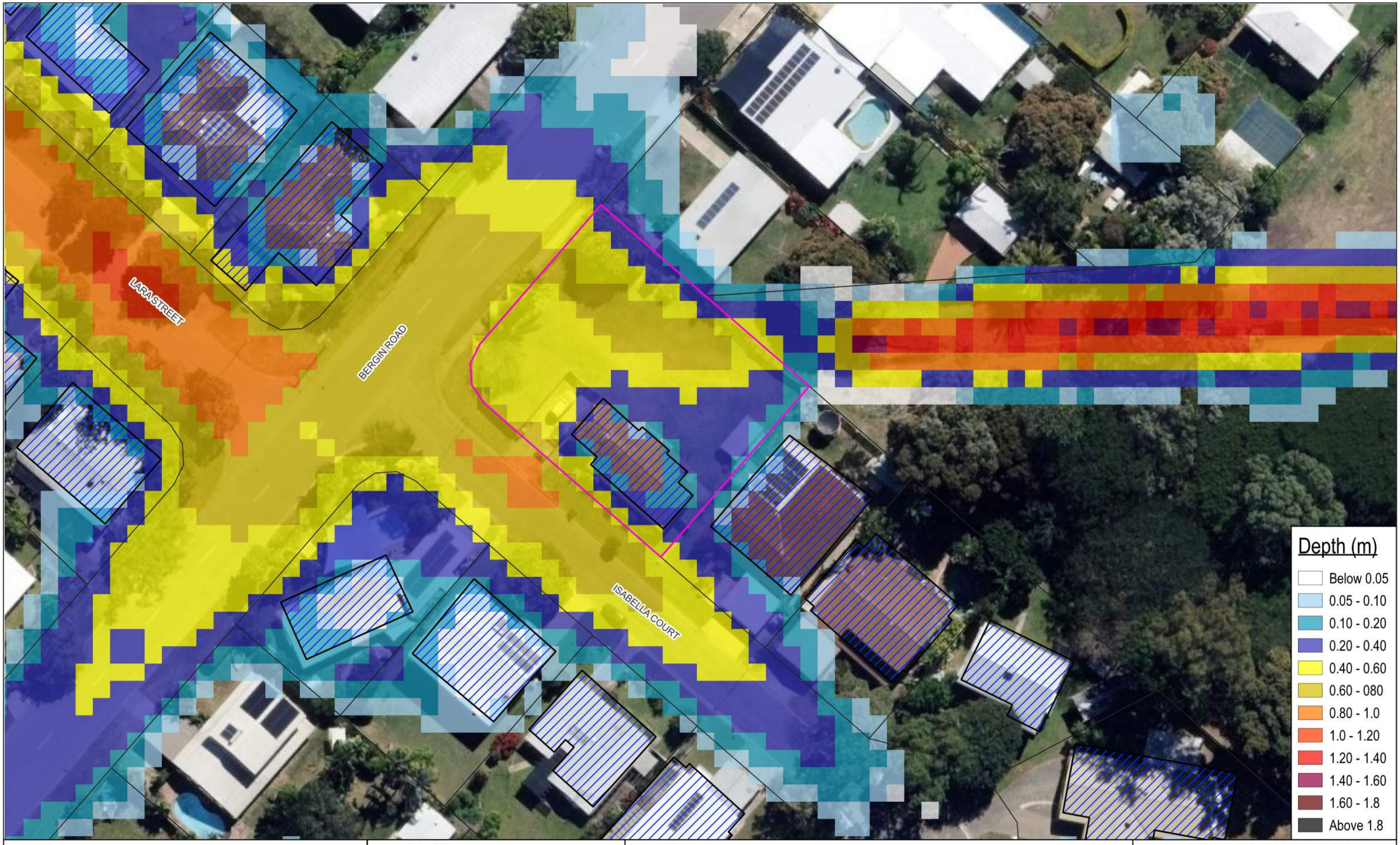
- Proposed 5 Bed Detached Dwelling on Slab
- Proposed Carpark
- Hydrograph Locations

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

50% AEP WSL AFFLUX

Prepared By: IG Reviewed by: JS	Date: **26/06/2025** Revision: **B** NCE Ref: **BNC0091**	Size **A3**	Map **B02**



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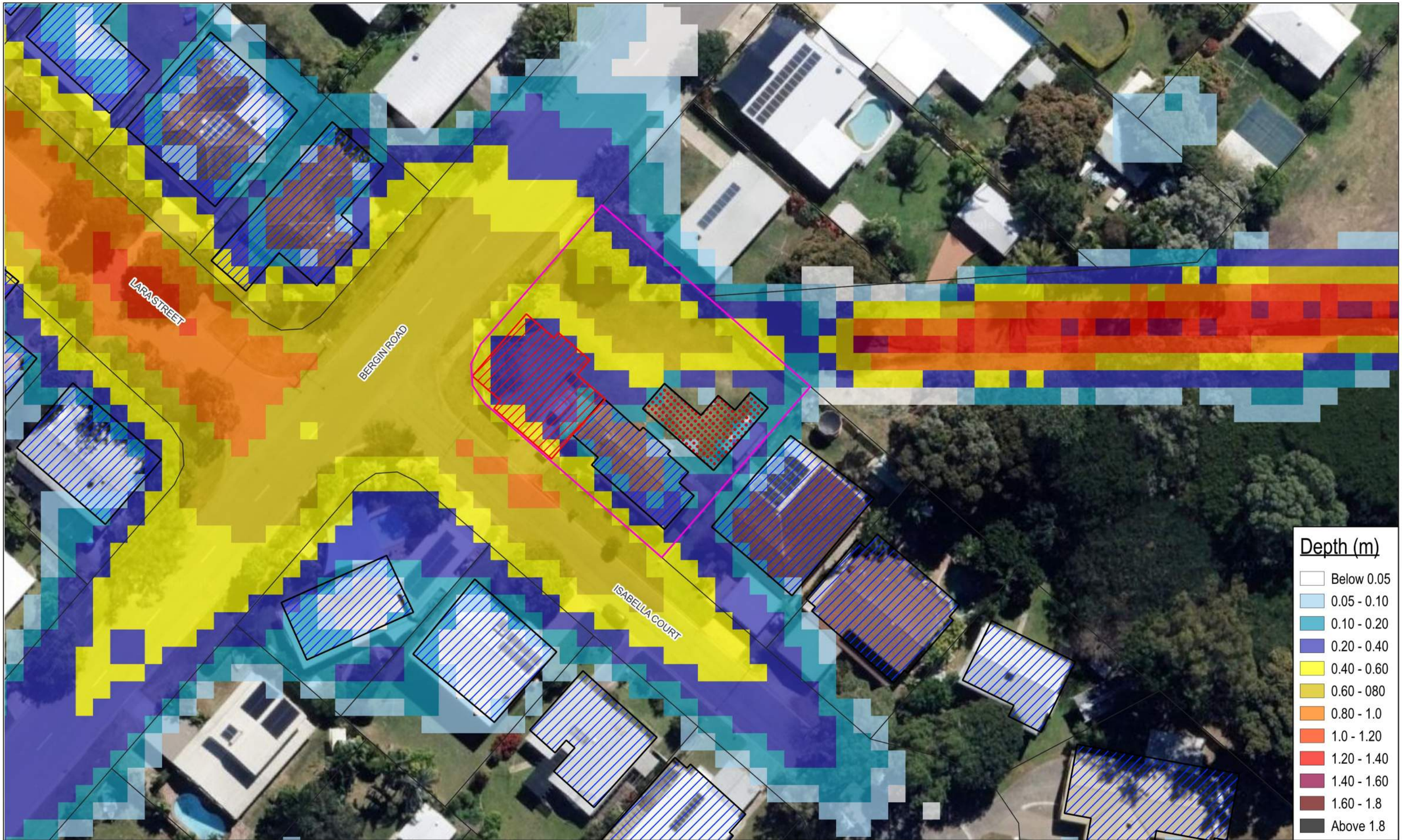
Legend

- Development Site
- TCC Land Parcels
- Existing Buildings

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

1% AEP BASELINE FLOOD DEPTH

Prepared By: IG Reviewed by: JS	Date: **09/06/2025** Revision: **B** NCE Ref: **BNC0091**	Size **A3**	Map **C01**



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Legend

- Development Site
- TCC Land Parcels
- Existing Buildings
- Proposed 5 Bed Detached Dwelling on Slab
- Proposed Carpark

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

1% AEP DEVELOPED FLOOD DEPTH

Prepared By: IG Reviewed by: JS	Date: **05/06/2025** Revision: **B** NCE Ref: **BNC0091**	Size **A3**	Map **C02**

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Legend

- Development Site
- TCC Land Parcels
- Existing Buildings

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

50% AEP BASELINE FLOOD DEPTH

Prepared By: IG Reviewed by: JS	Date: **09/06/2025** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **C03**

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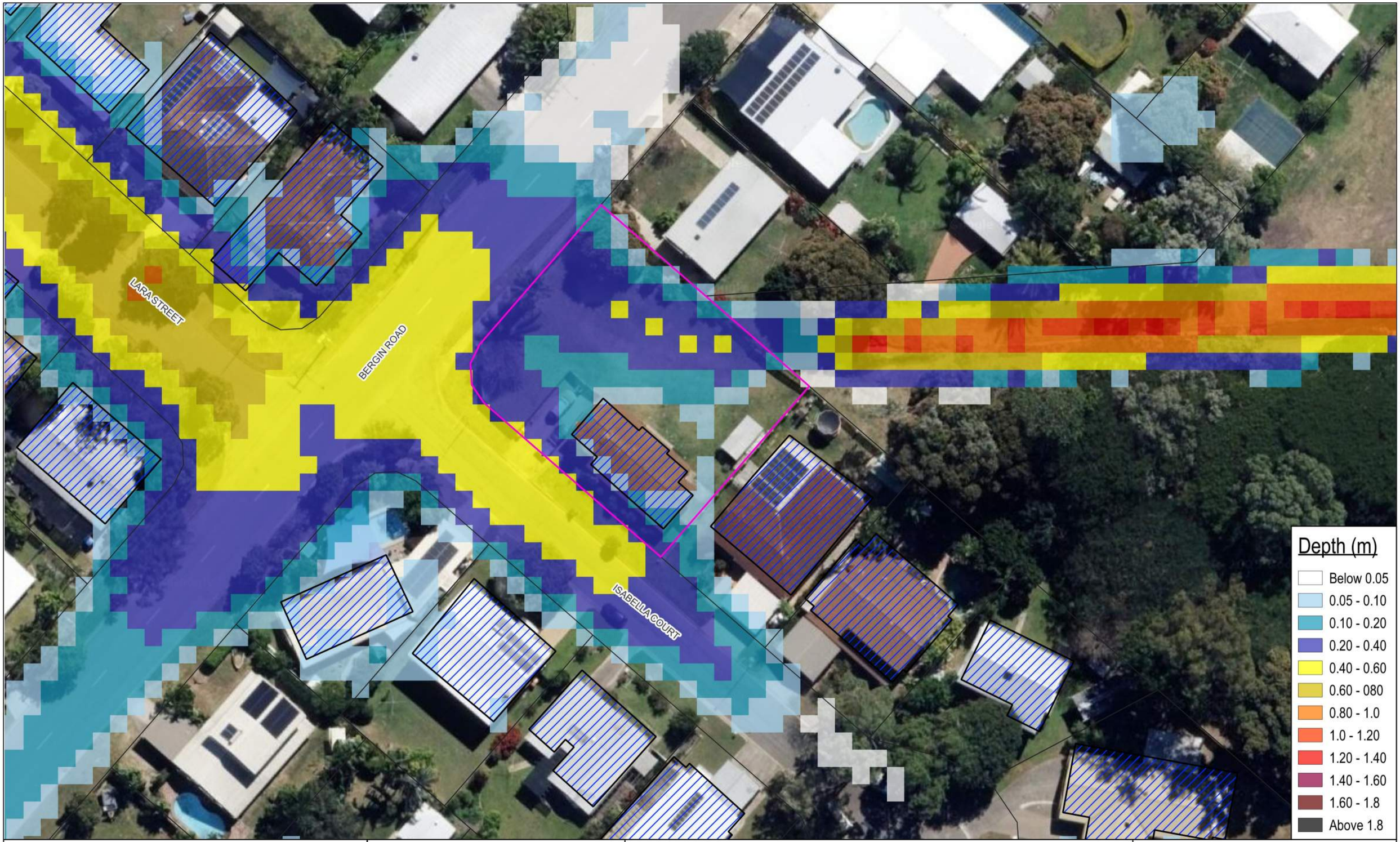
Legend

- Development Site
- TCC Land Parcels
- Existing Buildings
- Proposed 5 Bed Detached Dwelling on Slab
- Proposed Carpark

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

50% AEP DEVELOPED FLOOD DEPTH

Prepared By: IG Reviewed by: JS	Date: **05/06/2025** Revision: **B** NCE Ref: **BNC0091**	Size **A3**	Map **C04**



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0 5 10 15 20 25 m

1:500

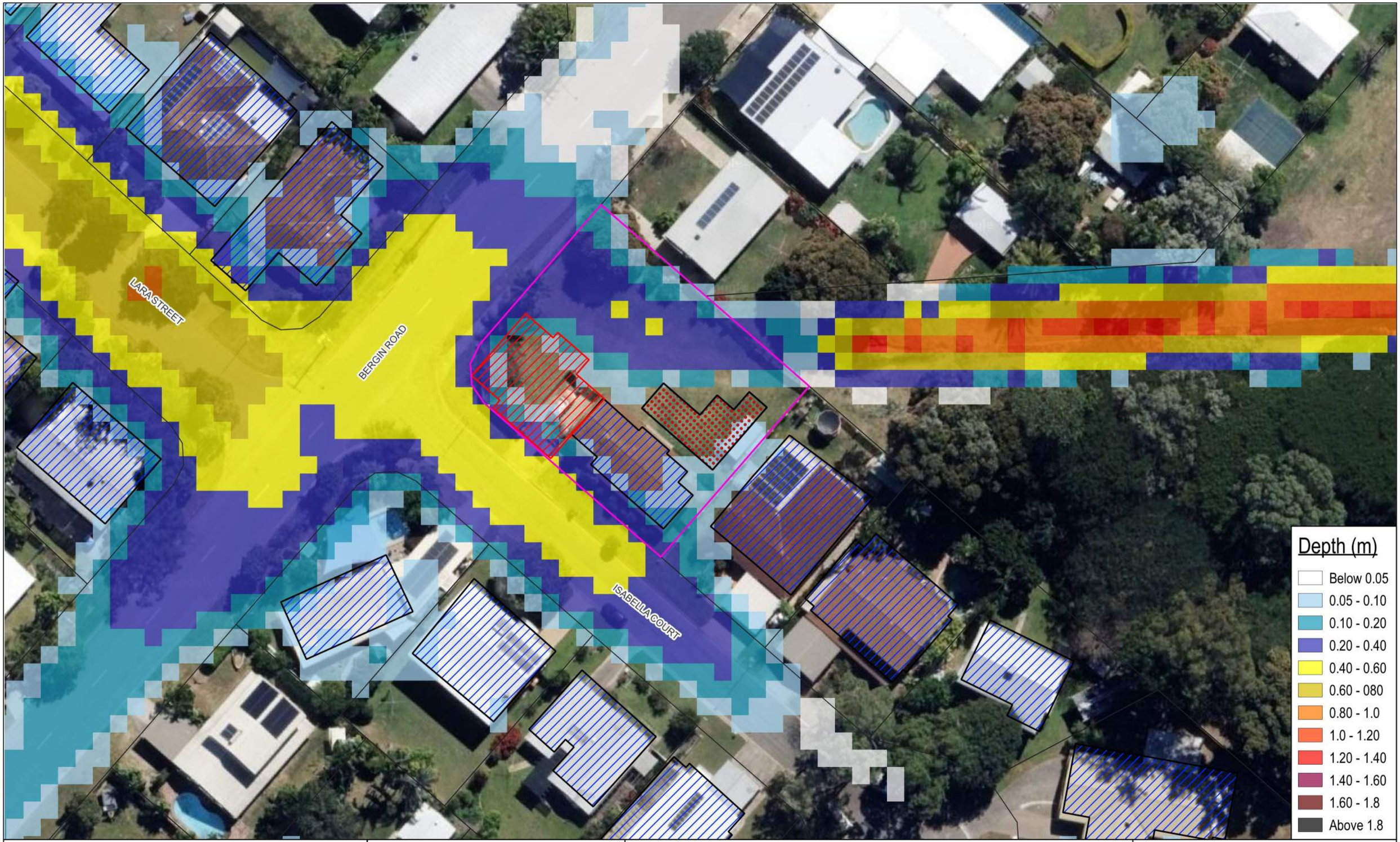
Legend

- Development Site
- TCC Land Parcels
- Existing Buildings

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

10% AEP BASELINE FLOOD DEPTH

Prepared By: IG Reviewed by: JS	Date: **06/06/2025** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **C05**



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0 5 10 15 20 25 m

1:500

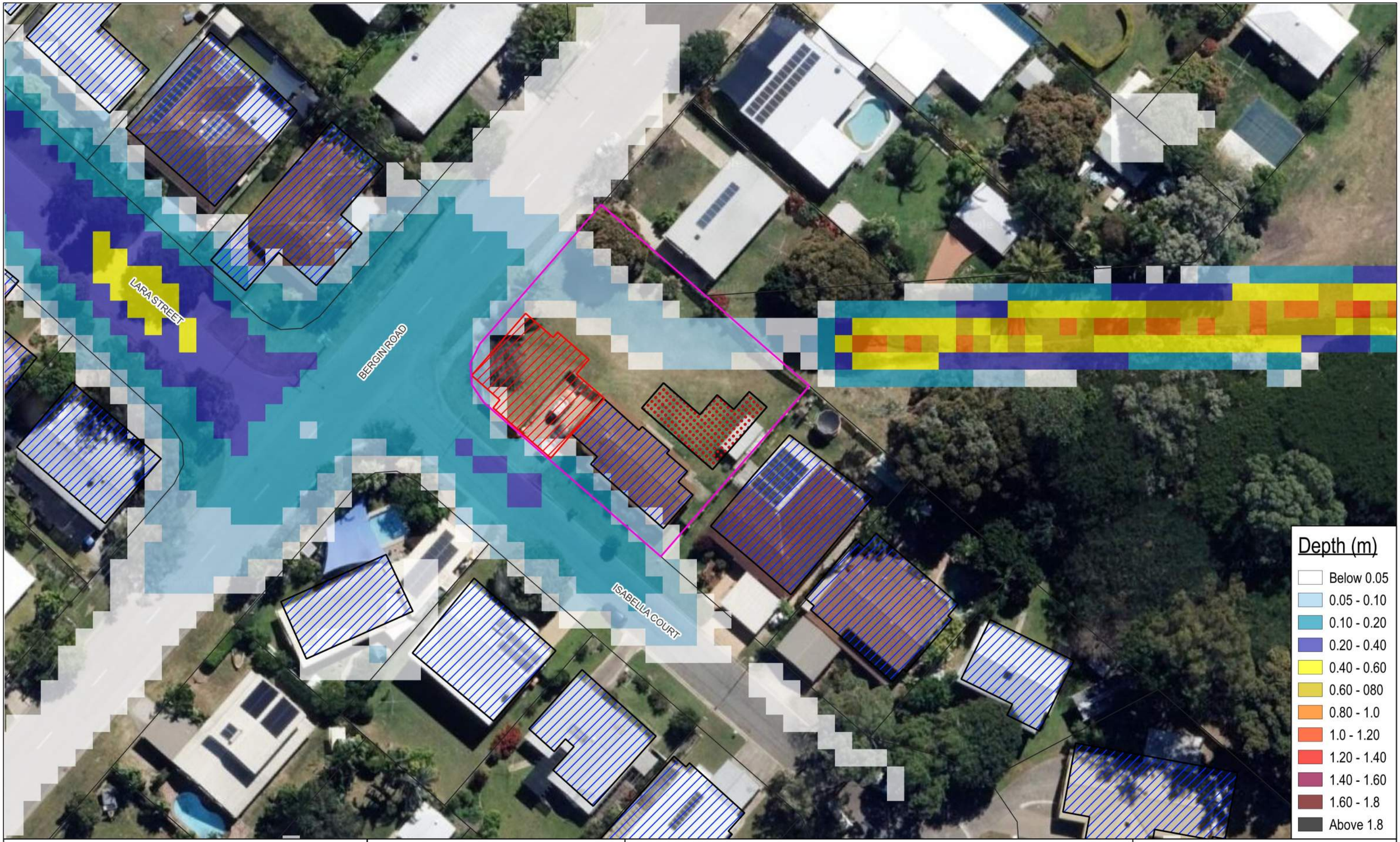
Legend

- Development Site
- TCC Land Parcels
- Existing Buildings
- Proposed 5 Bed Detached Dwelling on Slab
- Proposed Carparks

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

10% AEP DEVELOPED FLOOD DEPTH

Prepared By: IG Reviewed by: JS	Date: **09/06/2025** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **C06**



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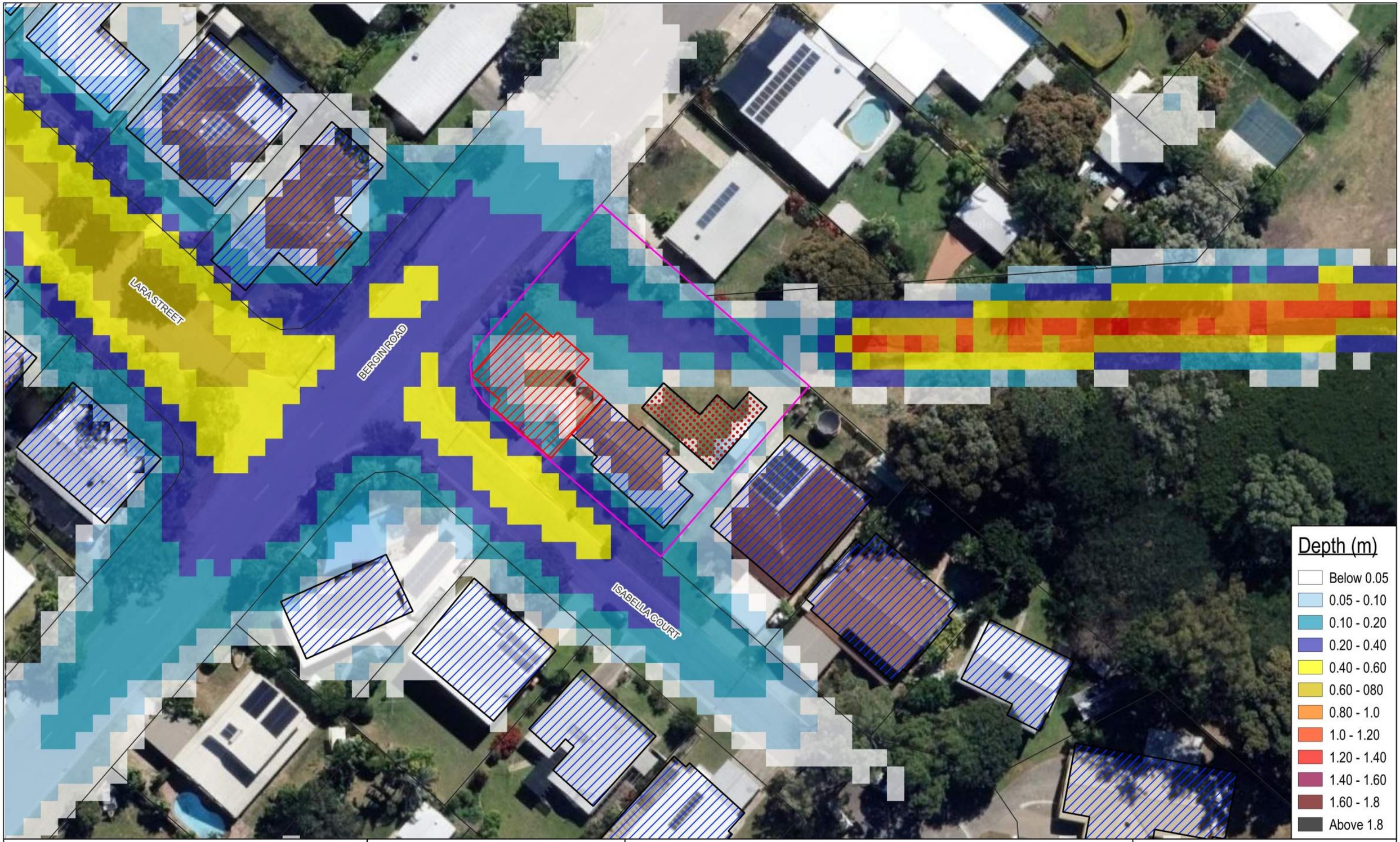
Legend

- Development Site
- TCC Land Parcels
- Existing Buildings
- Proposed 5 Bed Detached Dwelling on Slab
- Proposed Carparks

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

20% AEP DEVELOPED FLOOD DEPTH

Prepared By: IG Reviewed by: JS	Date: **24/06/2025** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **C08**



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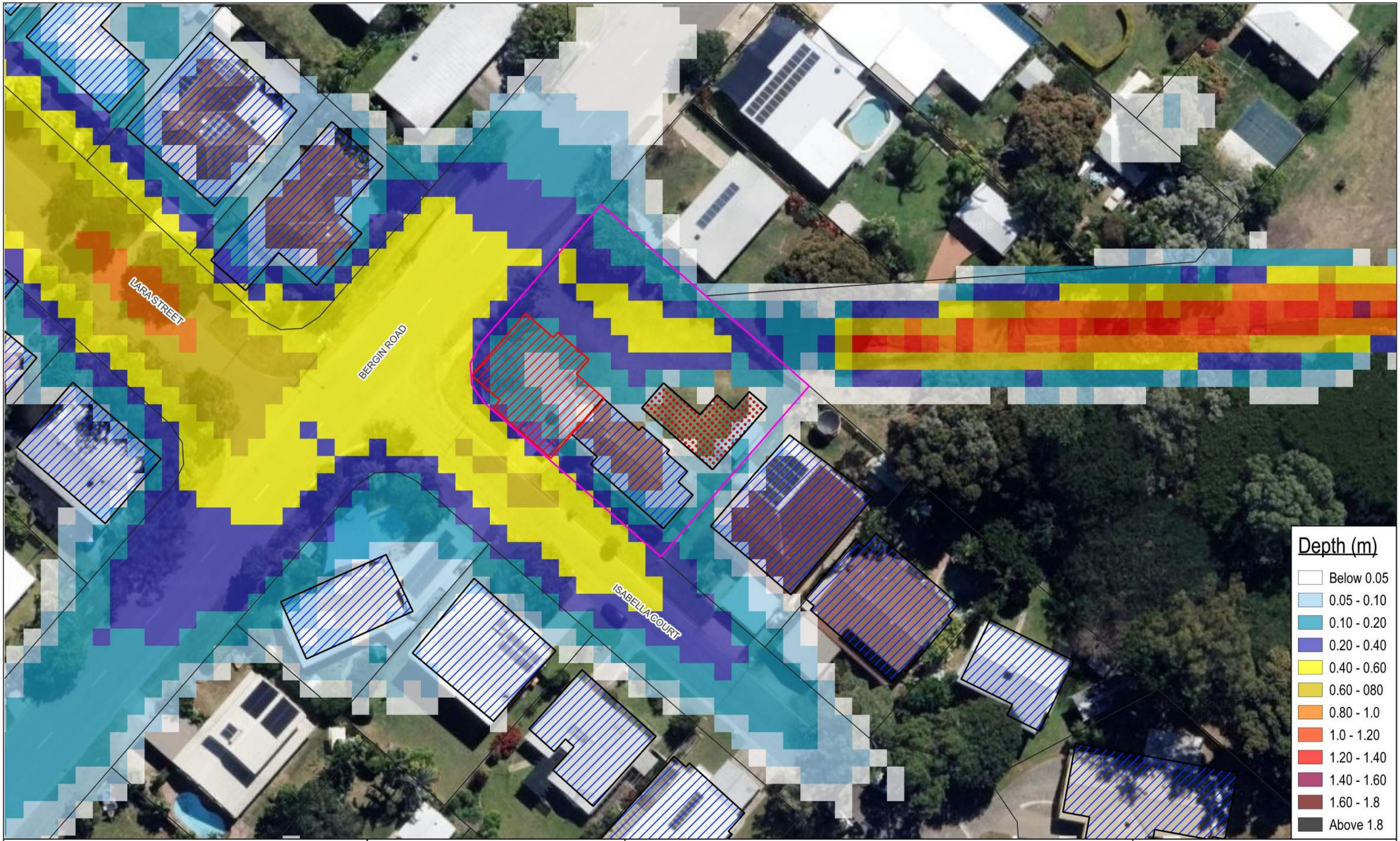
Legend

- Development Site
- TCC Land Parcels
- Existing Buildings
- Proposed 5 Bed Detached Dwelling on Slab
- Proposed Carparks

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

5% AEP DEVELOPED FLOOD DEPTH

Prepared By: IG Reviewed by: JS	Date: **24/06/2025** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **C10**



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Legend

- Development Site
- TCC Land Parcels
- Existing Buildings
- Proposed 5 Bed Detached Dwelling on Slab
- Proposed Carparks

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

2% AEP DEVELOPED FLOOD DEPTH

Prepared By: IG Reviewed by: JS	Date: **24/06/2025** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **C12**

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0 25 50 75 100 125 m

1:2,500

Legend

- Development Site
- TCC Land Parcels
- Existing Buildings
- Development Access Route

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

1% AEP BASELINE FLOOD HAZARD

Prepared By: IG Reviewed by: JS	Date: **05/06/2025** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **D01**

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1:2,500

Legend

- Development Site
- TCC Land Parcels
- Existing Buildings
- Proposed 5 Bed Detached Dwelling on Slab
- Proposed Carpark
- Development Access Route

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

1% AEP DEVELOPED FLOOD HAZARD

Prepared By: IG Reviewed by: JS	Date: **05/06/2025** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **D02**

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Legend

- Development Site
- TCC Land Parcels
- Existing Buildings
- Development Access Route

94 BERGIN ROAD, CRANBROOK MULTIPLE DWELLING DEVELOPMENT

50% AEP BASELINE FLOOD HAZARD

Prepared By: IG Reviewed by: JS	Date: **05/06/2025** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **D03**

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1:2,500

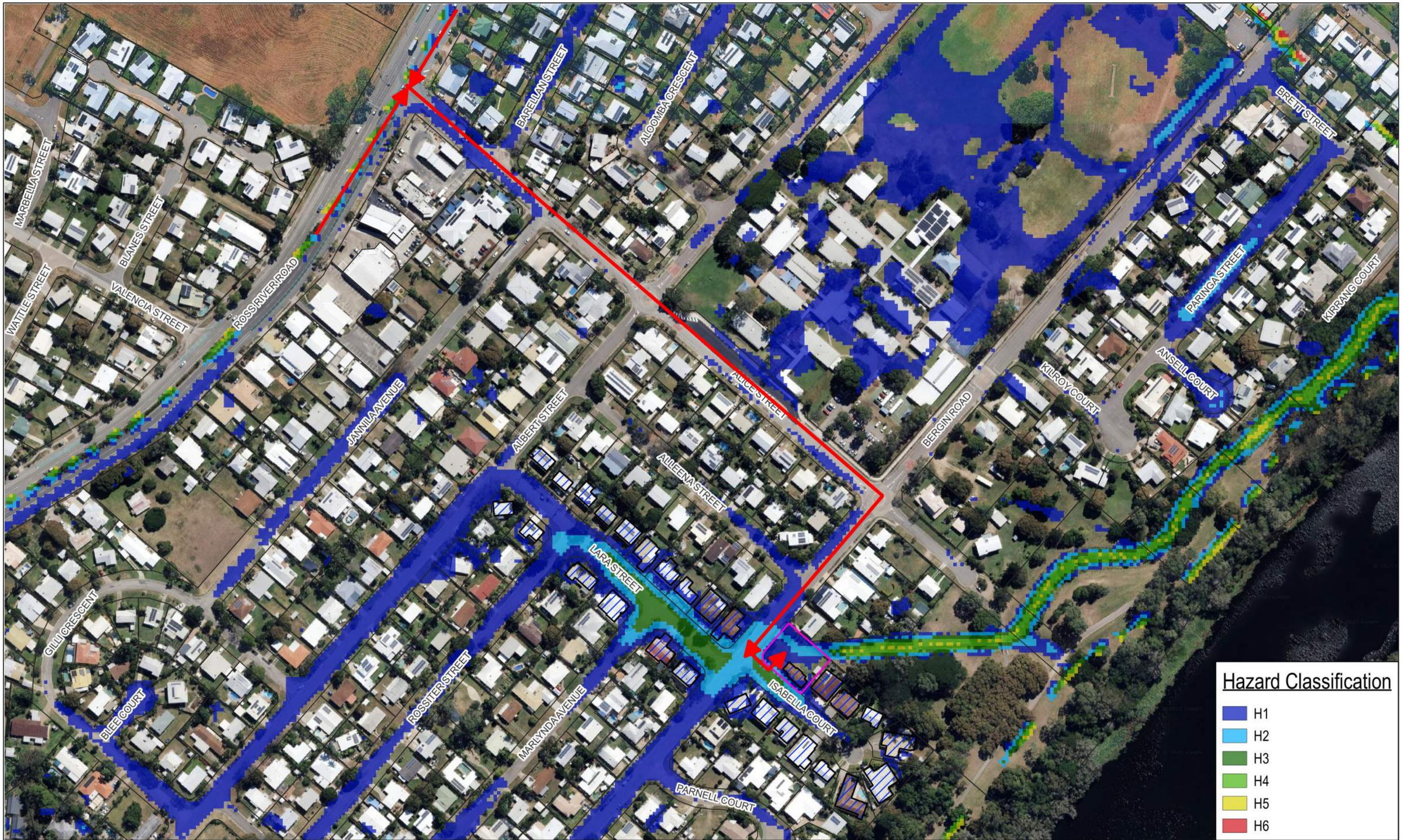
Legend

- Development Site
- TCC Land Parcels
- Existing Buildings
- Proposed 5 Bed Detached Dwelling on Slab
- Proposed Carpark
- Development Access Route

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

50% AEP DEVELOPED FLOOD HAZARD

Prepared By: IG Reviewed by: JS	Date: **05/06/2025** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **D04**



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1:2,500

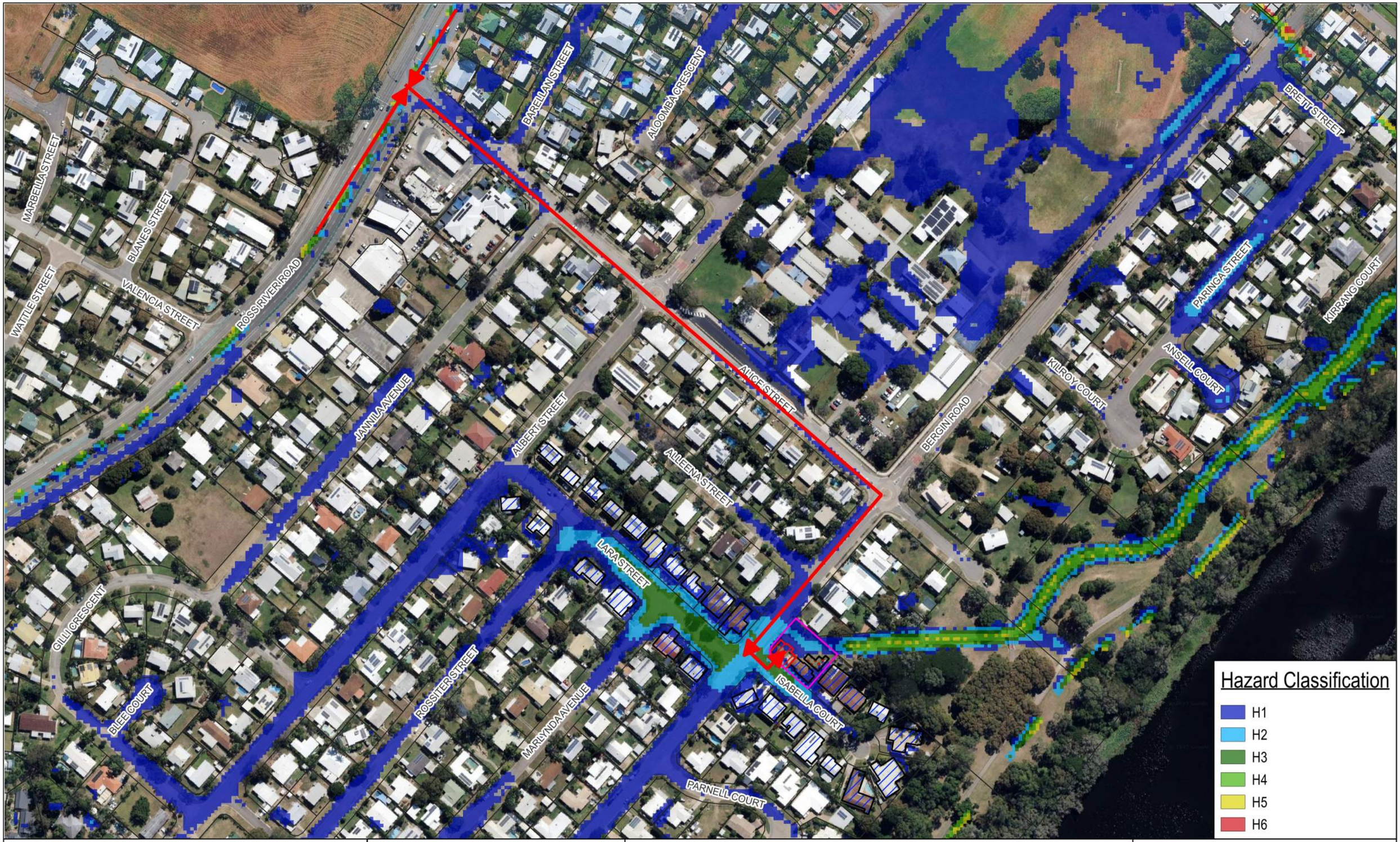
Legend

- Development Site
- TCC Land Parcels
- Existing Buildings
- Development Access Route

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

10% AEP BASELINE FLOOD HAZARD

Prepared By: IG Reviewed by: JS	Date: **05/06/2025** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **D05**



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1:2,500

Legend

- Development Site
- TCC Land Parcels
- Existing Buildings
- Proposed 5 Bed Detached Dwelling on Slab
- Proposed Carpark
- Development Access Route

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

10% AEP DEVELOPED FLOOD HAZARD

Prepared By: IG Reviewed by: JS	Date: **05/06/2025** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **D06**

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Legend

- Development Site
- TCC Land Parcels
- Existing Buildings
- Development Access Route

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

1% AEP BASELINE FLOOD HAZARD (VELOCITY DEPTH - Vd - PRODUCT)

Prepared By: IG Reviewed by: JS	Date: **05/06/2025** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **E01**

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Legend

- Development Site
- TCC Land Parcels
- Existing Buildings
- Proposed 5 Bed Detached Dwelling on Slab
- Proposed Carpark
- Development Access Route

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT
1% AEP DEVELOPED FLOOD HAZARD (VELOCITY DEPTH - Vd - PRODUCT)

Prepared By: IG Reviewed by: JS	Date: **05/06/2025** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **E02**

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Legend

- Development Site
- TCC Land Parcels
- Existing Buildings
- Development Access Route

94 BERGIN ROAD, CRANBROOK
MULTIPLE DWELLING DEVELOPMENT

50% AEP BASELINE FLOOD HAZARD (VELOCITY DEPTH - Vd - PRODUCT)

Prepared By: IG Reviewed by: JS	Date: **05/06/2025** Revision: **A** NCE Ref: **BNC0091**	Size **A3**	Map **E03**