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Our Reference: 210470_Flood (REV A)

"PROPOSED ALTERATIONS & ADDITIONS"

Lot 94 DP 224300
No.121 BRIDGE ROAD, RYDE

'As Executed'
Flood Impact Assessment

Dated: ***22nd March 2023***

Prepared by: ***Daniel Cheng*** ***BE (Civil) MIEAust***

Checked by: ***Robert Eltobbagi*** ***BE(Civil) MIE Aust CPEng NER (1052208) RPEQ (25464)***

Contents

1 EXECUTIVE SUMMARY

This Report analyses the **Local Overland Flooding** for the **development** at ***No.121 Bridge Road, Ryde***.

The client had an Alterations & Additions development on this site. The Ground Floor Plan for the development is presented in ***Figure 1.2*** below as prepared by 'Whittle Architects'. The development involved alterations and first floor addition to an existing dwelling.

Figure 1.1: Property Street View (Google Map)

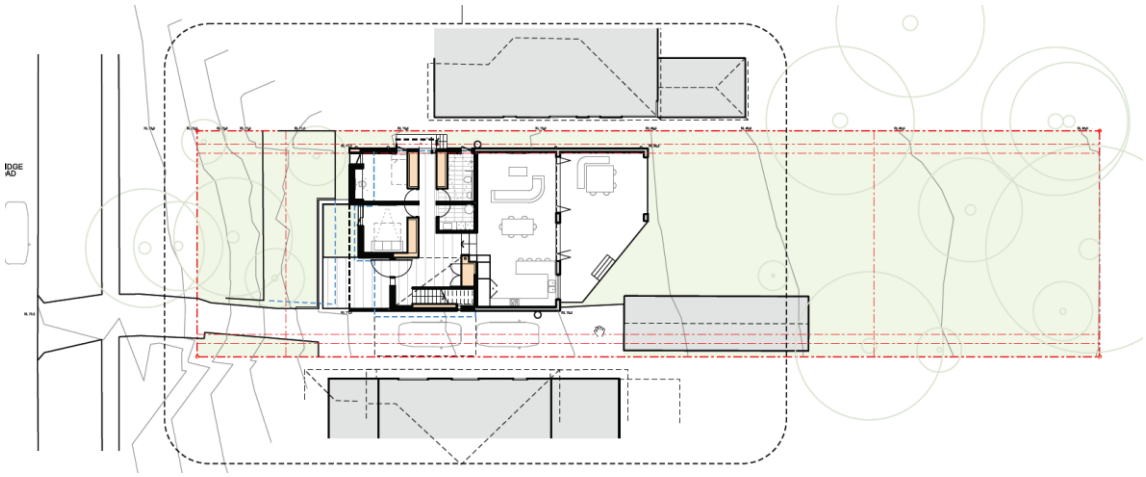


Figure 1.2: Proposed Ground Floor Plan

The **Overland Flow 'Flood' Study** incorporates the following:

- ***Addressing the 'flood planning controls' per City of Ryde Councils LEP & DCP;***
- ***Design considerations pursuant to 'NSW Floodplain Development Manual';***
- ***An assessment of the potential overland flooding from local upstream catchment;***
- ***Modelling of overland flow flood behaviours & review flood impact on the subject site utilising 2D 'TUFLOW' Flood Model***

The building footprint encroaches into the 1% AEP flood extent, as such, the building is required to comply with City of Ryde Council's 'flood planning requirements'.

The post-development 2D TUFLOW model was conducted for the 'as executed' building & retaining/flood diversion walls to evaluate the post-development flood behaviour.

Note the following resulting outcomes based on the 'as-executed' development layout including retaining walls in the front landscaping area. 2D TUFLOW modelling results (1% AEP storm event):

- **<u>Ground Floor Level</u>:**
  - **Original DA Approval** - **MIN FFL71.12mAHD** (*300mm freeboard + 1%AEP Flood Level RL70.82mAHD*)
  - **'As-executed' Works** - **FFL71.18mAHD**; 360mm above corresponding flood level

- **<u>Front Porch/Decking Level</u>**
  - **Original DA Approval** - **MIN RL70.97mAHD** (*150mm freeboard + 1%AEP Flood Level RL70.82mAHD*)
  - **'As-executed' Works - RL71.17mAHD;** 350mm above corresponding flood level

Our analysis and results conclude that the 'as executed' building structure had generally exceeded the flood mitigation intent (freeboard) of City of Ryde Council's DCP.

The required flood freeboard based on City of Ryde Council's 'Flood Management Policy' for overland flow is 300mm above 1% AEP, whereas the 'as executed' works have achieved flood freeboard of 360mm above the 1% AEP.

2 INTRODUCTION

This analysis & report documents the procedures and findings of the hydraulic modelling relative to the 'as executed' works for the subject site.

In summary, our assessment concluded:

1. ***The 'as executed' development experiencing overland flood is mitigated by two retaining walls in the front landscaping area acting as flood diversion walls.***

2. ***The flood level within vicinity of front porch is approximately RL70.82m AHD. Hence, the 'as executed' porch level at RL71.17m AHD & Habitable Floor Level at the front portion of ground floor at RL71.18m AHD met City of Ryde Council's 'Flood Planning Level' requirements for properties in an overland flow risk precinct.***

3. ***General building layout & floor levels are consistent with Council's DA Approved Documentation (DA Number: LDA2018/0150)***

3 REFERENCE DOCUMENTS

The following documents have been adopted as reference documents in this Flood Impact Assessment:

1. *Site Survey Plan prepared by 'Stephen R. Carr', dated 10th October 2017*
2. *Stormwater Management System and Flood Mitigation Measures (As Executed Survey Plan) by 'Stephen R. Carr', dated 23rd February 2023*
3. *Architectural Plans prepared by 'Whittle Architects', dated 20th February 2018*
4. *NSW Government Floodplain Development Manual – The Management of Flood Liable Land (2005)*
5. *City of Ryde Council's Notice of Determination LDA2018/0150 dated 4th September 2018*
6. *City of Ryde Council DCP-2014-8.2 'Stormwater Management Technical Manual*
7. *City of Ryde Council DCP-2014-Part: 8.2 Stormwater and Floodplain Management*
8. *'Flood Information Letter' from City of Ryde Council, dated 20th May 2022*
9. *Australian Rainfall and Runoff (AR&R 2019)*
10. *Macquarie Park 'Floodplain Risk Management Study & Plan' by Bewsher Consulting, dated April 2010*

4 LOCAL CATCHMENT

The site is affected by overland flooding from the local upstream catchment. The runoff from the localised upstream catchment traverses overland through the low-lying areas of the catchment until it reaches Shrimptons Creek. A sub-catchment from the southern side of the site has concentrated overland flow traversing through No.125 Bridge Road, with the extent of floodwater spreading through the frontage of subject site.

As the upstream contributing catchment runoff exceeds the capacity of the street drainage system and the subsequent capacity of the existing inground easement drainage infrastructure (Ø525mm) through No.125 Bridge Road, overland flooding will prevail and traverse through from No.121 - No.125 Bridge Road site frontage towards the rear yard of the properties & flow towards Shrimptons Creek.

The contributing upstream catchment is predominantly 'urban residential' and is characterised by an average slope of 6.5% (approximately).

Figure 4 Upstream Catchment Plan

4.1 Objective

The purpose of this Flood Impact Statement is to provide a detailed assessment of the potential Local Overland Flooding and to determine the flood impact on the subject site and the 'as executed' works scenario.

In summary, the objectives are as follows:

- ***Define design flood levels, velocities and depths for the 'as executed' development;***
- ***Investigate if the 'as executed' development complied with City of Ryde Council's DCP;***
- ***Propose any further mitigation measures to protect development from inundation; and***
- ***Address the requirements of City of Ryde Council's DCP***

5 GLOSSARY

Annual Exceedance Probability (AEP)
The chance of a flood of a given or a larger size occurring in any one year, usually expressed as a percentage.

Australian Height Datum (AHD)
A common national surface level datum approximately corresponding to mean sea level.

Catchment
The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.

Flood
Relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse.

Flood Planning Levels (FPLs)
Are the combinations of flood levels and freeboards selected for floodplain risk management purposes.

Freeboard
Is a factor of safety typically used in relation to the setting of floor levels.

Habitable Room
In industrial or commercial situation: an area used for offices or to store valuable possessions susceptible to damage in the event of a flood.

Peak Discharge
The maximum discharge occurring during a flood event.

Probable Maximum Flood
PMF is the largest flood that could conceivably occur at a location, usually estimated from probable maximum precipitation.

High Flood Risk Precinct
Land below the 1% AEP (100-year) flood that is either subject to a high hydraulic hazard or where there are significant evacuation difficulties.

Medium Flood Risk Precinct
Land below the 1% AEP (100-year) flood that is not subject to a high hydraulic hazard and where there may be some evacuation difficulties.

Low Flood Risk Precinct
All other land within the floodplain (i.e. within the extent of the probable maximum flood) but not identified within either the High Flood Risk or the Medium Flood Risk Precinct.

Hazard
Is a source of potential harm or a situation with a potential to cause loss. In relation to this plan, the hazard is flooding which has the potential to cause harm or loss to the community.

Hydraulic Hazard
Is the hazard as determined by the provisional criteria outlined in the FMM in a 1% Annual Exceedance Probability (AEP) flood event.

Local Overland Flooding
Local overland flooding means inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.

6 AUTHORITIES REQUIREMENTS

6.1 City of Ryde Council DCP

The Controls for the development in flood liable land are detailed in Ryde Councils DCP under **PART 8.2 'Stormwater Management Technical Manual' & 'Stormwater and Floodplain Management'**
The objective of controls:

a) site specific conditions are taken into consideration of the development with respect to flooding impacts;
b) the objectives and controls of Councils DCP and Technical Manual are appropriately addressed;
c) the statement is to provide recommendations to be implemented during the detailed design and construction phase, as well as during ongoing operation of the development.

Heads of considerations:

(a) Description of the Flood Regime
To establish the applicant and consultant has a full understanding of the flood affectation and its relation to the development, the Flood Impact Statement must include a summary of the flood affectation and its relation to the proposed development which is site specific. This may be way of plan or description however should be site specific. Where detailed flood level information is not available, the report is to present an analysis of overland flow in accordance with Section 4 (HYDROLOGY).Whether the building extent and/or location is such that it will minimise the flood risk to the property and surrounding properties

(b) Floor Levels
Development should provide a freeboard above flood levels resulting from the 100yr ARI storm event in order to protect it from inundation. Refer to DCP Section 2.1 in regard to the freeboard requirements

(c) Building Components
Any new development works subject to flooding and overland flows should be constructed of flood compatible materials to ensure the structural integrity of the works is maintained throughout and after a flood event. For a majority of development, this is not a crucial aspect to be addressed prior to development consent however will be enforced as a condition of consent. It is then warranted this aspect be considered in the design phase

(d) Flood Effects
Due regard is to be given to the location and shape of proposed buildings on the site with respect to the diversion of overland flow and flood depth, not only on the site but also to neighbouring properties

7 HYDROLOGY

7.1 'Upstream Inflow' Method

Based on Council's Flood Information Letter (*Ref No. D22/63443 dated 20th May 2022)*, the peak 1% AEP overland flow rate immediately upstream of the property travelling westly in the road is **0.943m³/s & 0.097m³/s**, whilst the overland flow rate from the eastern direction (along easement pipe path) is **2.25 m³/s** that is mainly traversing through No.125 Bridge Road & flood extent encroaches into the subject site.

Hence, for the purposes of our flood modelling, the above indicated peak flowrates have been applied in line with the council provided 'DRAINS' results. Refer to Figure 8.3.2 TUFLOW Model Setup for Upstream Inflow Locations.

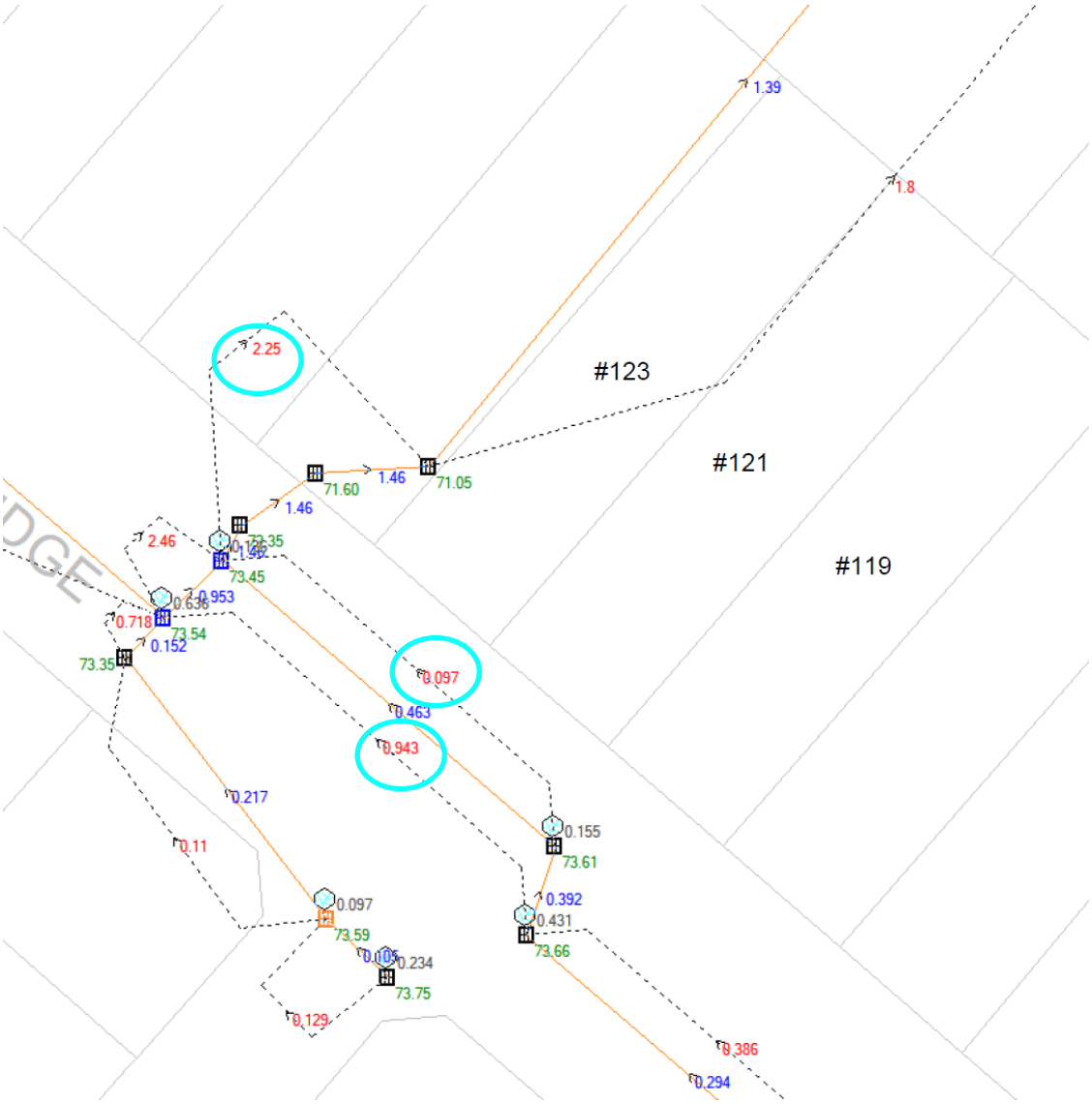


Figure 7.1.1: Council 'DRAINS' model Peak 1% AEP overland flow rate

7.2 'Rain on Grid' Method

The simulation adopting 'upstream inflow' had been evaluated against the simulation using 'rain on grid' method to verify the flood results developed using Council's 'DRAINS' results.

7.2.1 Catchment Definition

The catchment was defined based on topographic feature (using the contours data supplied by ELVIS and topographic feature identified on department of lands topographic maps) and anticipated overland flow paths.

The estimated 1% AEP (100YR ARI) design rainfalls were applied to the hydrological model to predict the design upstream catchment runoff hydrograph. Design upstream catchment flow were included for the 10min, 20min, 25min, 30min, 45min, 60min and 120min duration storm events.

Based on the 'TUFLOW' model simulation results, the 'critical' design storm duration was 10min. Hence, adopted for our assessment.

The total upstream 'inflow Hydrograph' of 1% AEP (including 10min – 120min storm events) was presented in **Figure 7.2.1**

The peak runoff flow rate through the site frontage was determined to be 0.481m^3/s which occurred at 10 minutes. Hence considered acceptable to adopt the 10min storm for the purposes of our modelling.

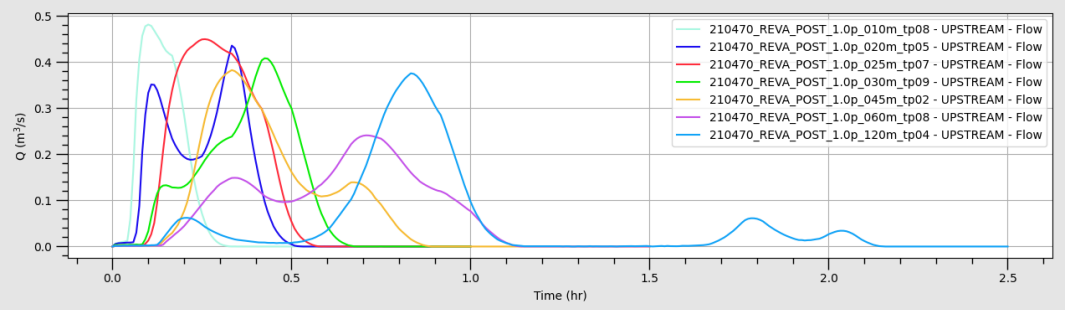


Figure 7.2.1: 1% AEP (100YR ARI) upstream catchment overflow runoff hydrograph ('TUFLOW' Model)

7.2.2 Rainfall Data

The design rainfall intensity-frequency-duration (IFD) data for the catchment site were obtained from the Bureau of Meteorology (BOM).

A summary of the design rainfall depth adopted in this study is provided in ***Table 7.2.2***

	Annual Exceedance Probability (AEP)						
Duration	**63.2%**	**50%#**	**20%***	**10%**	**5%**	**2%**	**1%**
1 min	2.30	2.57	3.43	4.02	4.61	5.40	6.02
2 min	3.78	4.17	5.42	6.30	7.19	8.45	9.48
3 min	5.26	5.81	7.60	8.85	10.1	11.9	13.3
4 min	6.61	7.33	9.65	11.3	12.9	15.2	16.9
5 min	7.83	8.71	11.5	13.5	15.5	18.1	20.3
10 min	12.4	13.9	18.6	21.9	25.1	29.5	32.8
15 min	15.5	17.4	23.3	27.4	31.5	36.8	41.0
20 min	17.8	20.0	26.7	31.4	36.0	42.1	46.9
25 min	19.7	22.0	29.3	34.4	39.5	46.2	51.4
30 min	21.2	23.6	31.5	36.9	42.3	49.5	55.2
45 min	24.6	27.4	36.3	42.5	48.7	57.1	63.7
1 hour	27.3	30.3	39.9	46.7	53.4	62.8	70.1
1.5 hour	31.3	34.7	45.5	53.2	61.0	71.8	80.5
2 hour	34.6	38.2	50.2	58.7	67.3	79.5	89.2

Table 7.2.2: IFD Design Rainfall Depth

The rain on grid model results provided equal to or greater inflows and flood levels in comparison to the model based of Councils Flood Information, as such, 'rain on grid' flood results was adopted for analysis.

8 HYDRAULIC

8.1 Definition

A hydraulic model converts runoff (traditionally from a hydrological model) into water levels and velocities throughout the major drainage/creek systems in the study area (known as the model 'domain', which includes the definition of both terrain and roughness).

The model simulates the hydraulic behaviour of the water within the study area as potential overland flow paths, which develops when the capacity of the channel(s) is exceeded. The model is established in conjunction with boundary conditions, which include upstream runoff hydrographs generated by 'TUFLOW' model and appropriate downstream boundary.

8.2 Model Topographic Surface

The DEM data included in the model was extrapolated from Digital Elevation Model (DEM) created from the LiDAR data (Airborne Laser Scanning) received from ELVIS (*Geoscience Australia's elevation information system*).

8.3 2D Model Set-up

'TUFLOW' hydraulic modelling was carried out to determine the flood behaviour within the catchment area. Grid spacing of **0.5m x 0.5m** was adopted for the flood model and deemed satisfactory to define the flood extent through the developed areas in the vicinity of the subject property.

The 'as executed' retaining walls were modelled as blockages with the height of wall adopted from WAE survey dated 23.02.2023. The buildings were modelled as full blockages.

8.4 Model 2D Roughness

Material ID	Land Use	Manning's Roughness Coefficient (n)	Infiltration Parameters (IL, CL)
1	Residential Area & Open space	0.05	0,0
2	Buildings	0.05 if depth < 0.2 3 if depth > 0.2	0,0
3	Road & Carpark	0.025	0,0
4	Park	0.04	0,0

Table 8.4: Manning's Roughness Coefficient

8.5 Upstream & Downstream Boundary Condition

Two separate simulations were conducted using two different upstream boundary conditions.

- **First simulation was conducted incorporating 'upstream inflow' generated by Councils 'DRAINS' result and then applied at three upstream inflow locations are as shown in Figure 8.6.1 *(in purple).***
- **Second simulation was conducted incorporating 'rain on grid' method where the rainfall data from BOM website was applied to the active domains for the different storm durations. Refer to figure 8.6.2 for the active domain.**

The resultant peak flood depth, velocity and V x D are similar for both simulation methods, with the 'rain on grid' simulation displaying slightly worse flood results. **To provide a more conservative approach, the more severe flood results from the 'rain on grid' method was adopted for the purpose of the simulation & analysis.**

A free tailwater level was adopted as the downstream boundary condition in this study. This was a control based on the significant distance from the subject site; hence there will be no impact to the study area caused by this tailwater level.

Refer to Figure 8.5.2 for Downstream Discharge boundary condition 'location' (orange line)

Figure 8.5.1: TUFLOW Model Setup - 'Upstream Inflow'

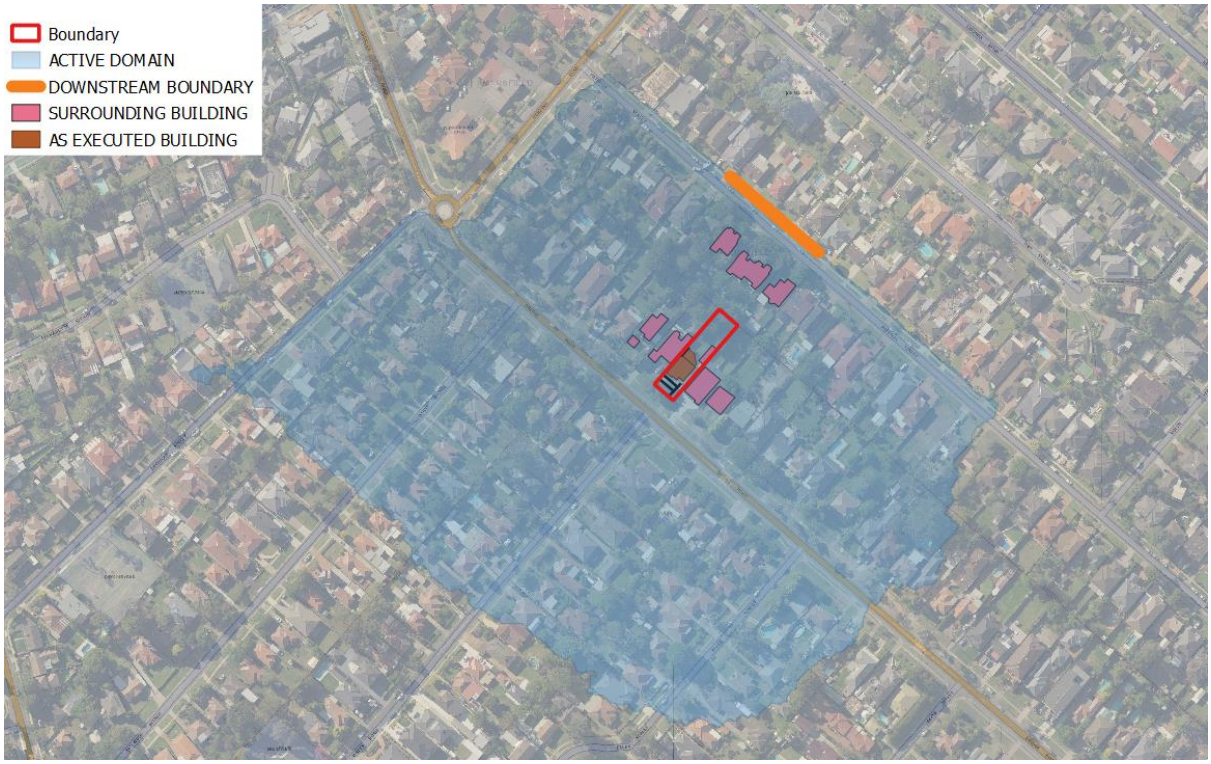


Figure 8.5.2: TUFLOW Model Setup - 'Rain on Grid'

9 RESULTS

9.1 Design Flood Modelling Results

'2D TUFLOW' hydraulic models were undertaken for the 1% AEP (100YR ARI) design flood event. The peak water level, depth, and velocity for each 0.5m x 0.5m grid cell in the study area were determined. The 'as executed' flood extent, flood level contours, flood velocity & hazard classification generated by the TUFLOW model are presented in ***Appendix A 'Figures A.1 – A.5'***

9.2 Hazard Assessment

Safety of people/residence in floods is of major concern. As such, an assessment of the provisional flood hazard (Velocity & Depth product at 0.1 m^2/s interval) is presented in ***Appendix A - Figure A.4. The Velocity Depth Product within the subject site for the 'as executed' scenario is Low-High Hazard. The building footprint is largely classified as Low Hazard.*** The hazard category was higher between the building footprint of No.121 Bridge Road and No.123 Bridge Road near the existing building structure as a result of narrowed flowpath between the two buildings.

Based on the Hazard criteria ***Table 9.2.1 & 9.2.2***, Hazard Classification Map ***(Refer to Appendix A -*** Figure ***A.3)*** is generated for 'as executed' scenario's to investigate any relevant flood hazard. It is noted that the 'Hazard Classification Map' for 'as executed' building at the front generally is within **H1-H2** class near the new works as shown in ***Appendix A - Figure A.5***

Hazard Vulnerability Classification	Description
H1	Generally safe for vehicles, people and buildings.
H2	Unsafe for small vehicles.
H3	Unsafe for vehicles. children and the elderly.
H4	Unsafe for vehicles and people.
H5	Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
H6	Unsafe for vehicles and people. All building types considered vulnerable to failure.

Table 9.2.1 – Combined Hazard Curves – Vulnerability Thresholds
(Smith et al.2014)

Hazard Vulnerability Classification	Classification Limit (D and V in combination)	Limiting Still Water Depth (D)	Limiting Velocity (V)
H1	D*V ≤ 0.3	0.3	2.0
H2	D*V ≤ 0.6	0.5	2.0
H3	D*V ≤ 0.6	1.2	2.0
H4	D*V ≤ 1.0	2.0	2.0
H5	D*V ≤ 4.0	4.0	4.0
H6	D*V > 4.0	-	-

Table 9.2.2 – Combined Hazard Curves – Vulnerability Thresholds Classification Limits
(Smith et al.2014)

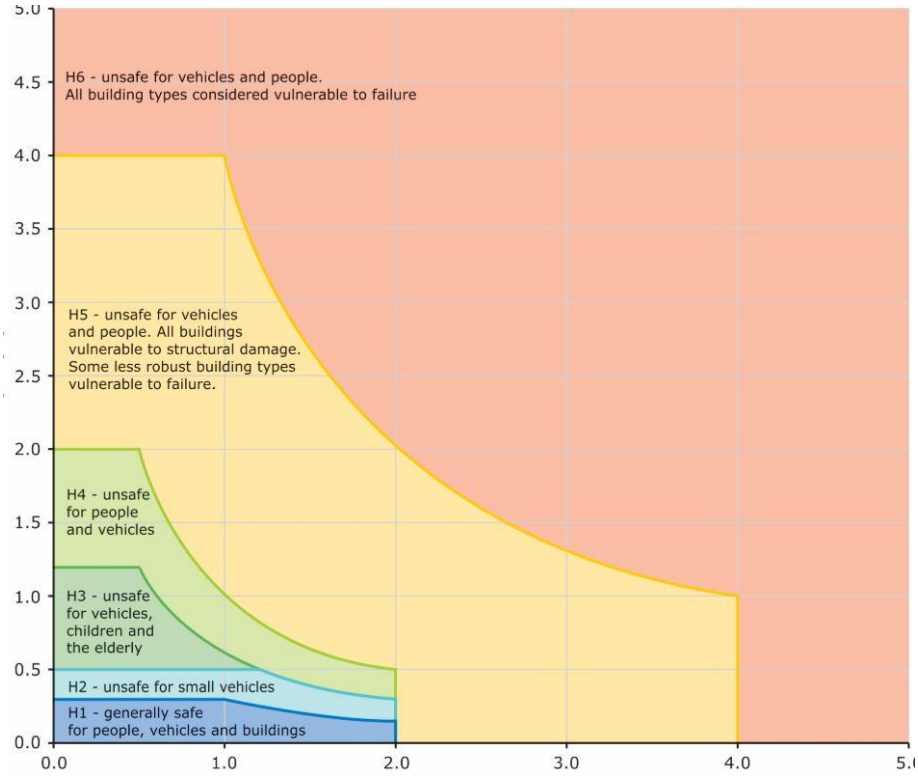


Figure 9.2.3 – Combined Hazard Curves
(Smith et al.2014)

9.3 Council Requirements

Eight major development categories have been adopted in Councils document *Part: 8.2 of the Stormwater and Floodplain Management - City of Ryde Development Control Plan 2014*.

The *development* type relevant to the subject site can be categorised as Residential Development use as below:

Residential Development
Attached dwelling, backpackers' accommodation; bed and breakfast accommodation; boarding house; caravan park (with permanent occupants); child care centre; Dwelling; dwelling; dwelling house; exhibition home; group home; home-based child care centre; home business; home industry; home occupancy; home occupation (sex services); hostel; hotel or motel accommodation; moveable dwelling; multi dwelling housing; neighbourhood shop; permanent group home; residential accommodation; residential flat building; secondary dwelling; semi detached

9.3.1 Floor Level Constraints

In accordance with **City of Ryde Council DCP-2014-Part: 8.2 'Stormwater and Floodplain Management'**:

1. ***Habitable floor levels to be equal to or greater than the 1% AEP (100YR ARI) flood level plus 300mm freeboard***
2. ***Non-habitable floor level to be 150mm above 1% AEP (100YR ARI) Flood level***

Location	1%AEP Flood Level - TUFLOW Model (mAHD)	Minimum Freeboard Required (mm)	Minimum Floor Level Required (mAHD)	'As Executed' Floor Level (mAHD)	'As Executed' Freeboard Provided (mm)
Ground Floor Level	RL70.82	300	**FFL71.12**	**FFL71.18**	360
Decking	RL70.82	150	**RL70.92**	**RL71.17**	350

Table 9.3.1 Flood Planning Levels

9.3.2 Flood Evacuation Strategy

To minimise risk to personal safety of occupants, evacuation strategies shall be prepared and implemented to mitigate the flood water impacts due to the land use nature of the proposed buildings. As evacuating through the floodwaters outside the Dwelling may present a higher risk of danger, evacuation should only be undertaken BEFORE THE STORM EVENT or on instruction by SES, Police or other authorities. Flood warning and the implementation of evacuation procedures by the SES are widely used throughout NSW.

Access for leaving the site is via frontage **from eastern side only** to Bridge Road. **Floodplain Management Guidelines** suggest that persons evacuating a flood affected area should be moving away from the flood affected area.

PMF flood mapping is extracted from Macquarie Park Floodplain Risk Management Study & Plan by Bewsher Consulting dated April 2021, file number Fig9_MP_ExgPMF_02. Residents shall walk toward the street frontage and head south-east on Bridge Road till reaching the frontage of **No.101 Bridge Road, Ryde**. No.101 Bridge Road, Ryde is the recommended evacuation point and is considered above possible flood level.

During extreme flood events, the off-site evacuation can be cut off by upstream runoff, it is recommended to stay put on First Floor which is above highest flood level and wait for flooding to recede.

Figure 9.3.2 – Evacuation Route

9.3.3 Landform

The proposed development is within the overland flow path, based on the DA approval dated 4th September 2018, the building layout & footprint has been assessed & accepted by council as to the variations to the landform & flood affectation caused by the development.

For landform alterations which may be in the future be proposed, the following must be considered:

- *Any proposed boundary fences within the overland flow path are to be permeable, open or otherwise a* frangible *structure, such to permit the conveyance of floodwaters below the* ***'1% AEP'*** *flood event/level;*

- *No unauthorised filling is permitted on site. The post development external area must be generally matching* existing *ground levels.*

10 CONCLUSION

This site-specific flood report has been undertaken on the subject site (***No.121 Bridge Road, Ryde***) and the 'as executed' building form.

A two-dimensional hydraulic model 'TUFLOW' was constructed for this study, which modelled the overland flow from the local upstream catchment with a cell size of 0.5m x 0.5m. The 'rain on grid' method was adopted as flow boundary and applied to the catchment to simulate the flood behaviours at the subject site.

Utilising the 2D TUFLOW software, the flood behaviour for the **1% AEP storm event** was developed and modelled. The flood water depth, flood levels, VxD product and flood hazard class generated by the 'TUFLOW' model were assessed in this study.

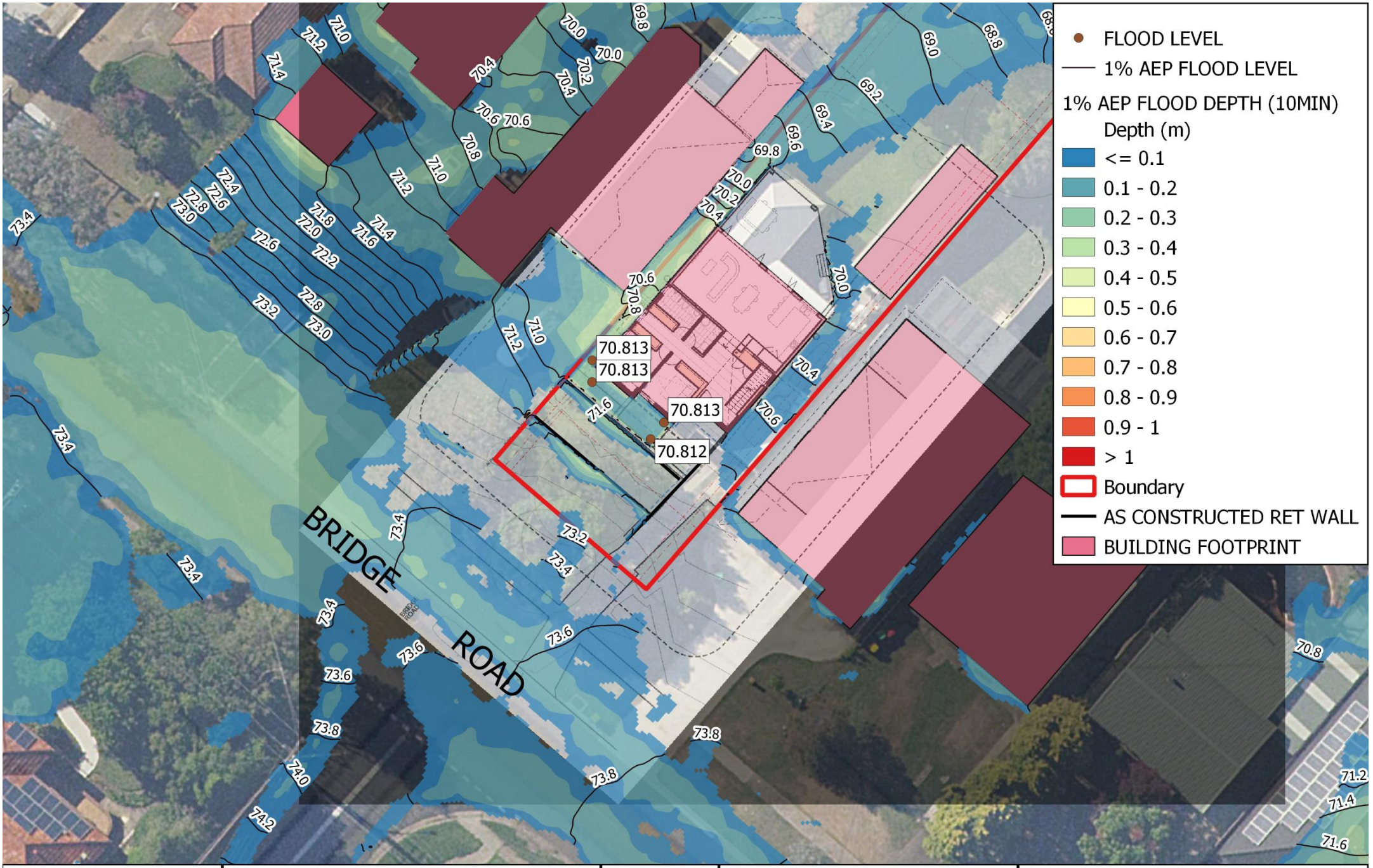
The 'as executed' development's has achieved the freeboard requirement & flood mitigation requirements for the development (specifically front yard) and is deemed acceptable pursuant to City of Ryde Council's DCP. We note the 'as executed' existing flood diversion walls as observed on our site inspection dated 21st July 2022 and also indicated on the WAE Survey dated 23rd February 2023, are a masonry wall structure with rendering.

APPENDIX A

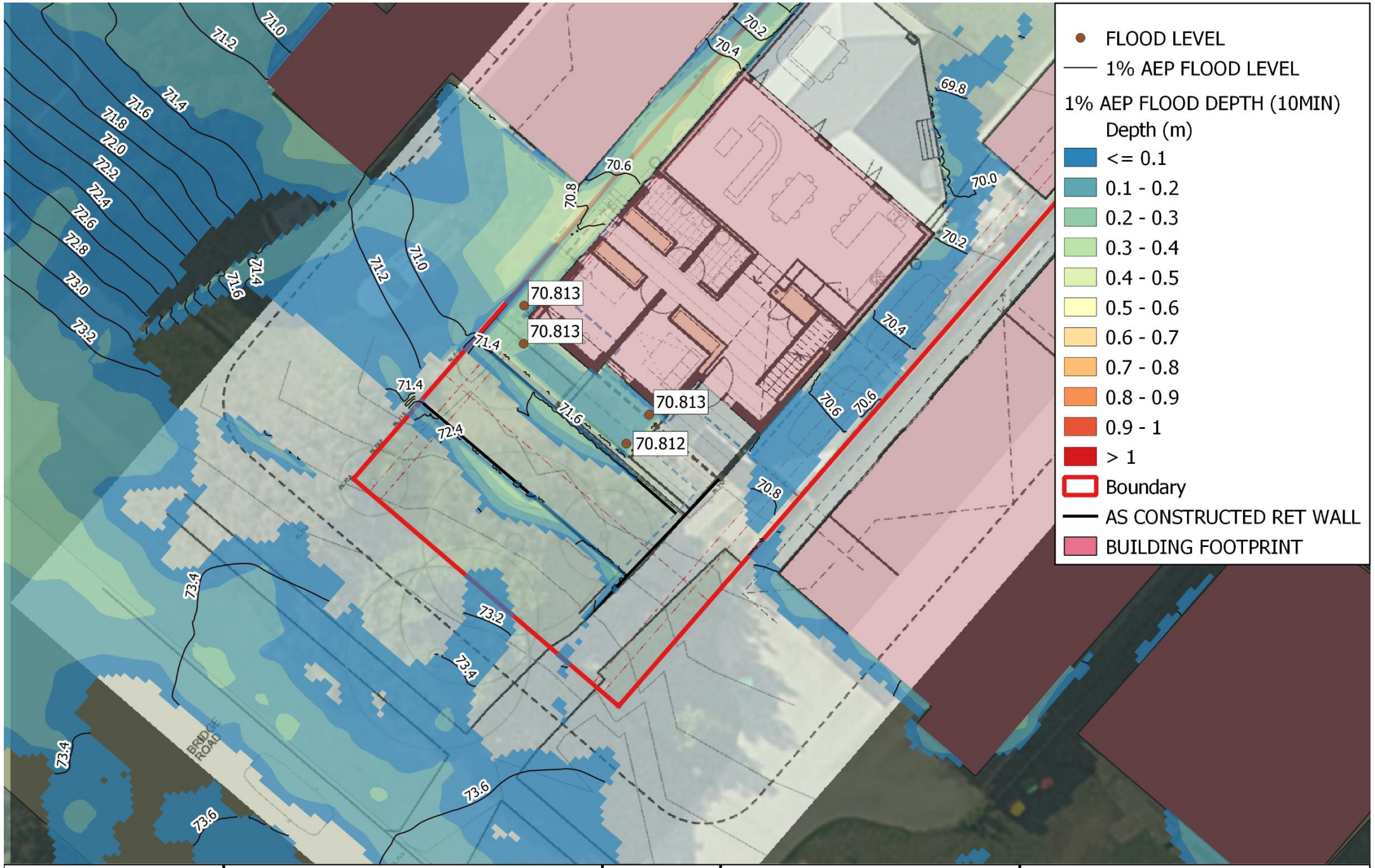
'TUFLOW' Flood Modelling Flood Results

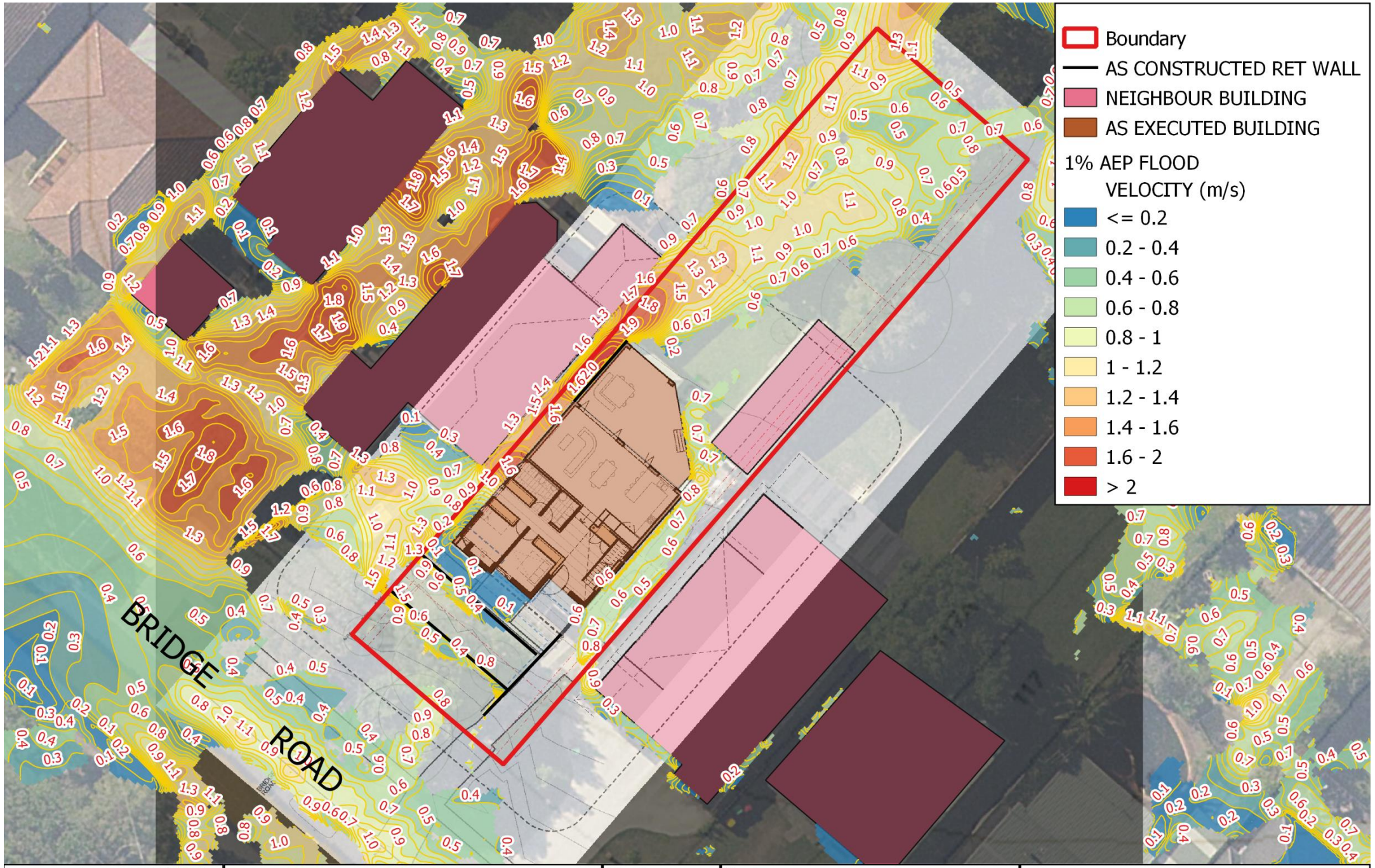
(prepared by Quantum Engineers)

Flood Mapping:



		North:	Scale:	Title:
			0 5 10 m	1% AEP FLOOD DEPTH & CONTOUR


FLOOD LEVEL
1% AEP FLOOD LEVEL
1% AEP FLOOD DEPTH (10MIN)
Depth (m)
<= 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
0.5 - 0.6
0.6 - 0.7
0.7 - 0.8
0.8 - 0.9
0.9 - 1
> 1
Boundary
AS CONSTRUCTED RET WALL
BUILDING FOOTPRINT
70.813
70.813
70.813
70.812
BRIDGE ROAD
North:
Scale:
0
5
10 m
Title:
1% AEP FLOOD DEPTH & CONTOUR
ZOOMED IN



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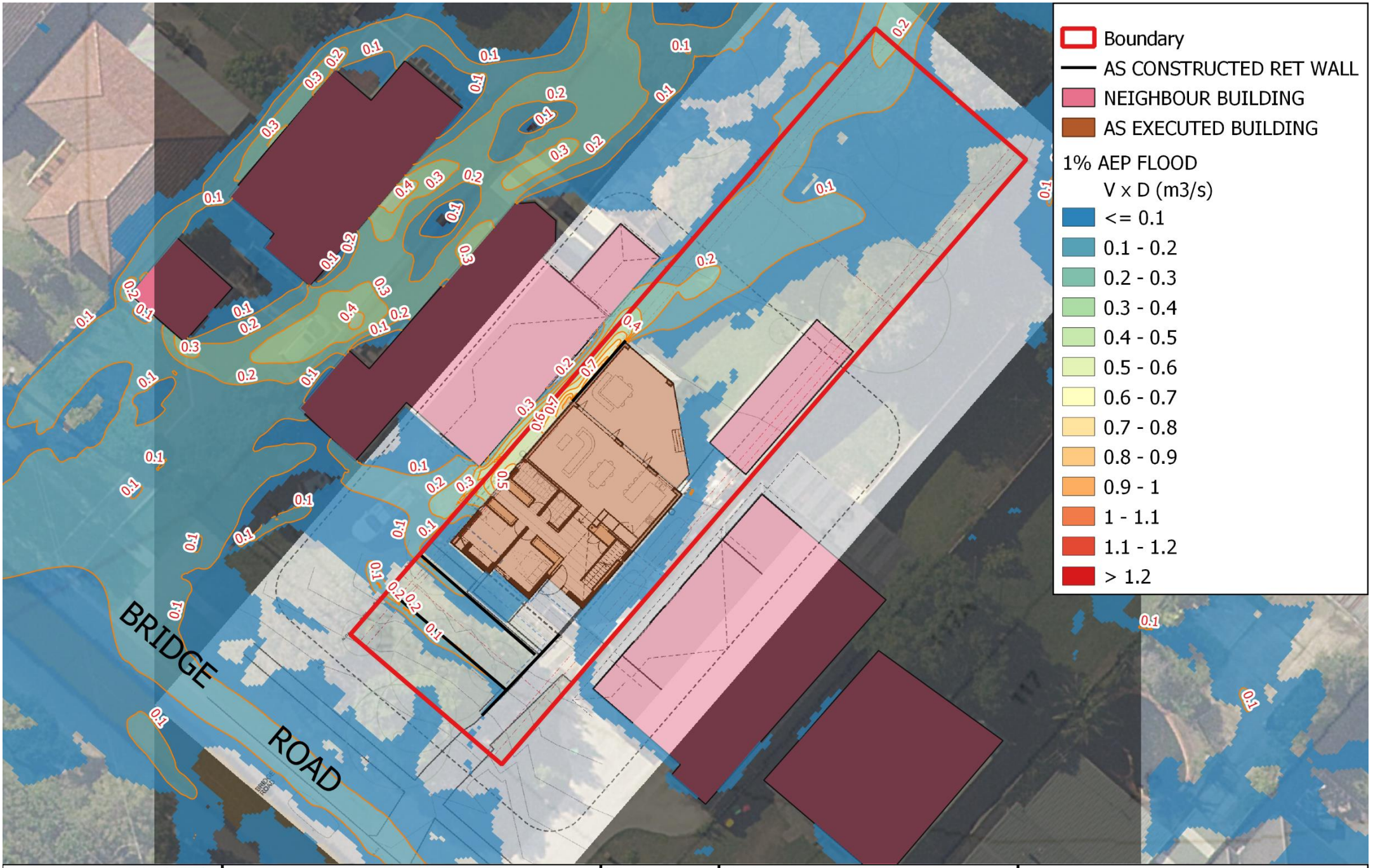
North:

Scale:
0 5 10 m

Title:
1% AEP FLOOD VELOCITY



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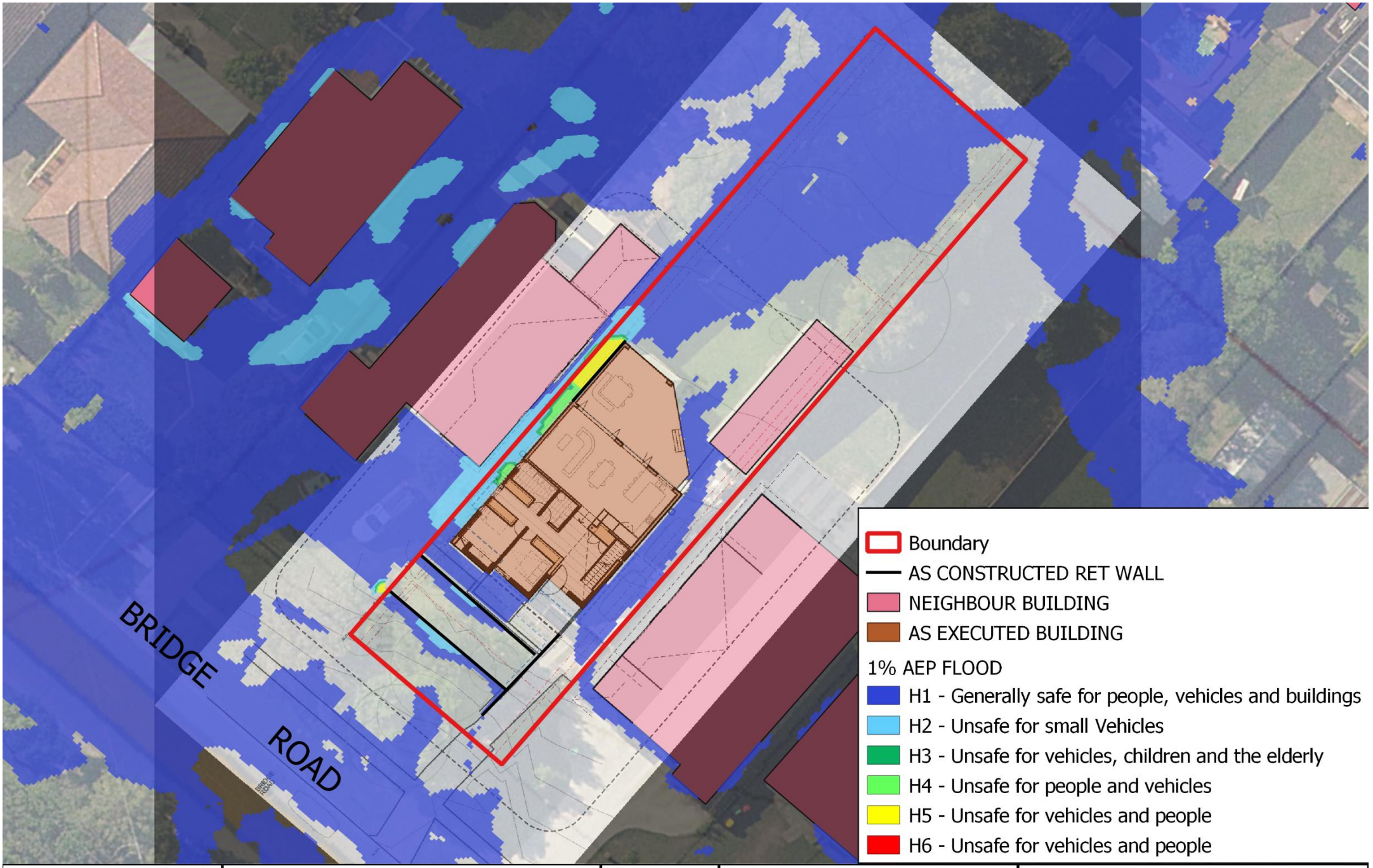
North:

Scale:
0 5 10 m

Title:
1% AEP FLOOD V x D



QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au

North:

Scale:
0 5 10 m

Title:
1% AEP FLOOD HAZARD

APPENDIX B

Flood Information dated 14th March 2022

Site Plan & Architectural Plans

Survey Plan dated 10th October 2017

WAE Survey Plan dated 23rd February 2023

City of Ryde

Lifestyle and opportunity @ your doorstep

Nathan Perkins
121 Bridge Road
RYDE NSW 2112

20 May 2022 Our ref: D22/63443

Dear Mr. Perkins,

RE: Request for Flood Information – No. 121 Bridge Road, Ryde

Reference is made to your application received on 13th May 2022 seeking flood level information pertaining to the above-mentioned address.

Please find attached flood level data sheet providing flood levels for the 100 year ARI (Average Recurrence Interval) flood event and the PMF (Probable Maximum Flood) event.

The DRAINS model 100 Year ARI (Average Recurrence Interval) peak overland flow rate near the site is approximately 0.943 m^3/s (0.463 m^3/s pipe flow). For more detailed information, refer to DRAINS model extract at the end of this report.

This information is derived from models established as part of the Macquarie Park Flood Study and Floodplain Risk Management Study and Plan.

Council's database indicates the presence of a Ø525mm drainage pipe near the site.

Please be advised that flood models are approximate. Care and expertise is required in the interpretation of these flood levels. In addition, this flood information does not take into account any local overland flow issues.

Any person or organisation who acts on the information provided does so at his / her / its own risk. To the extent permitted by law, the City of Ryde accepts no responsibility and excludes all liability whatsoever in respect of any use of or reliance upon this information.

Should you require any further information, please feel free to contact me on (02) 9952 8222.

Yours sincerely,

Amandeep Singh
Civil Engineer

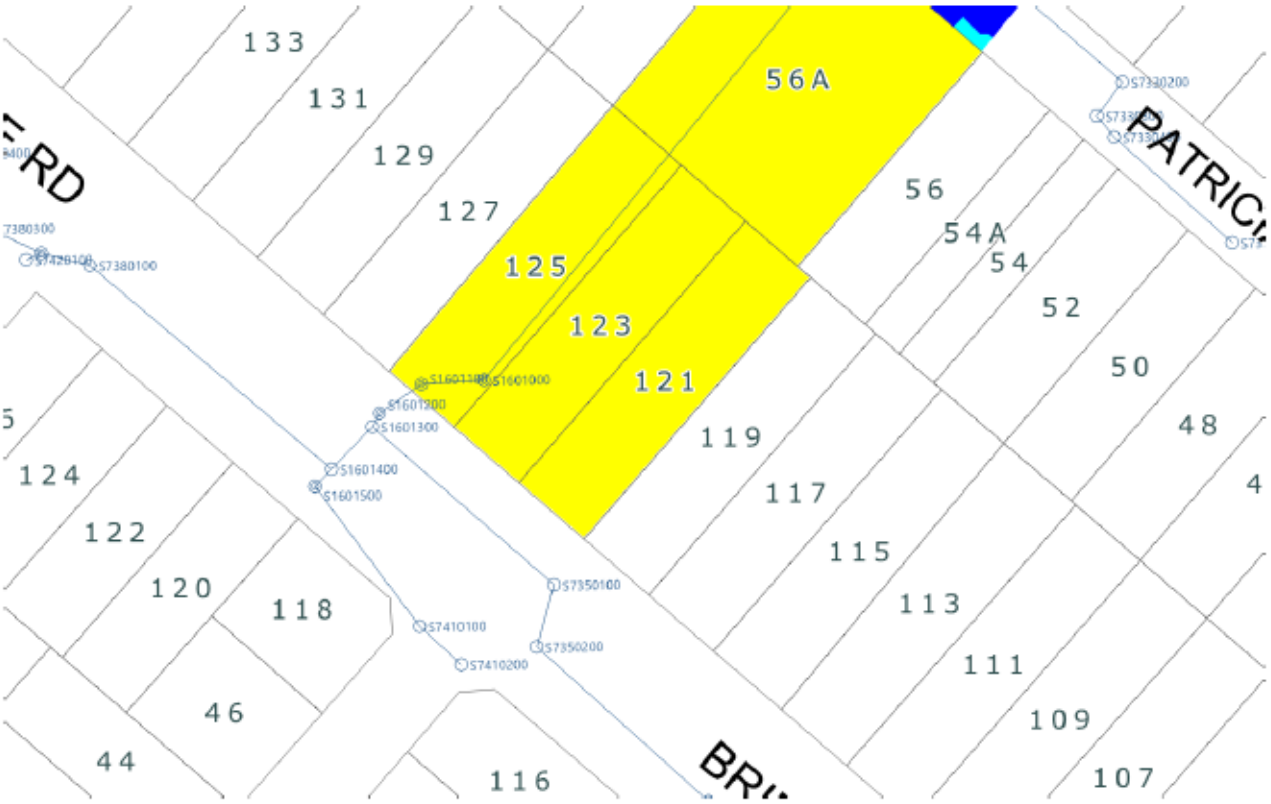
City of Ryde

Lifestyle and opportunity @ your doorstep

Notes:

- All levels are based on Australian Height Datum (AHD).
- Flood levels are indicative only.
- The flood levels were derived using Aerial Laser Survey (ALS) data which is considered as approximate.
- This flood level information is for existing site conditions only.
- Concept plans are required for all new development proposals.
- The floor levels of the proposed habitable floor area should be set with a freeboard of 300 mm (Overland Flow and Low Risk) and 500 mm (Medium Risk and High Risk) to the 100 year ARI flood level. A freeboard of 150 mm (Overland Flow and Low Risk) and 300 mm (Medium Risk and High Risk) is applicable for non-habitable floor areas. Refer City of Ryde Development Control Plan 2014.
- A site specific flood study / risk assessment may be required for any future development. Engage a suitably qualified engineer to assist you in this matter. Any study or assessment shall be in accordance with the NSW Government's Floodplain Development Manual 2005 and the City of Ryde Development Control Plan 2014.
- Site specific ground and building survey levels should be used to relate flood levels and to assess the impact of flooding.

Flood Risk Map



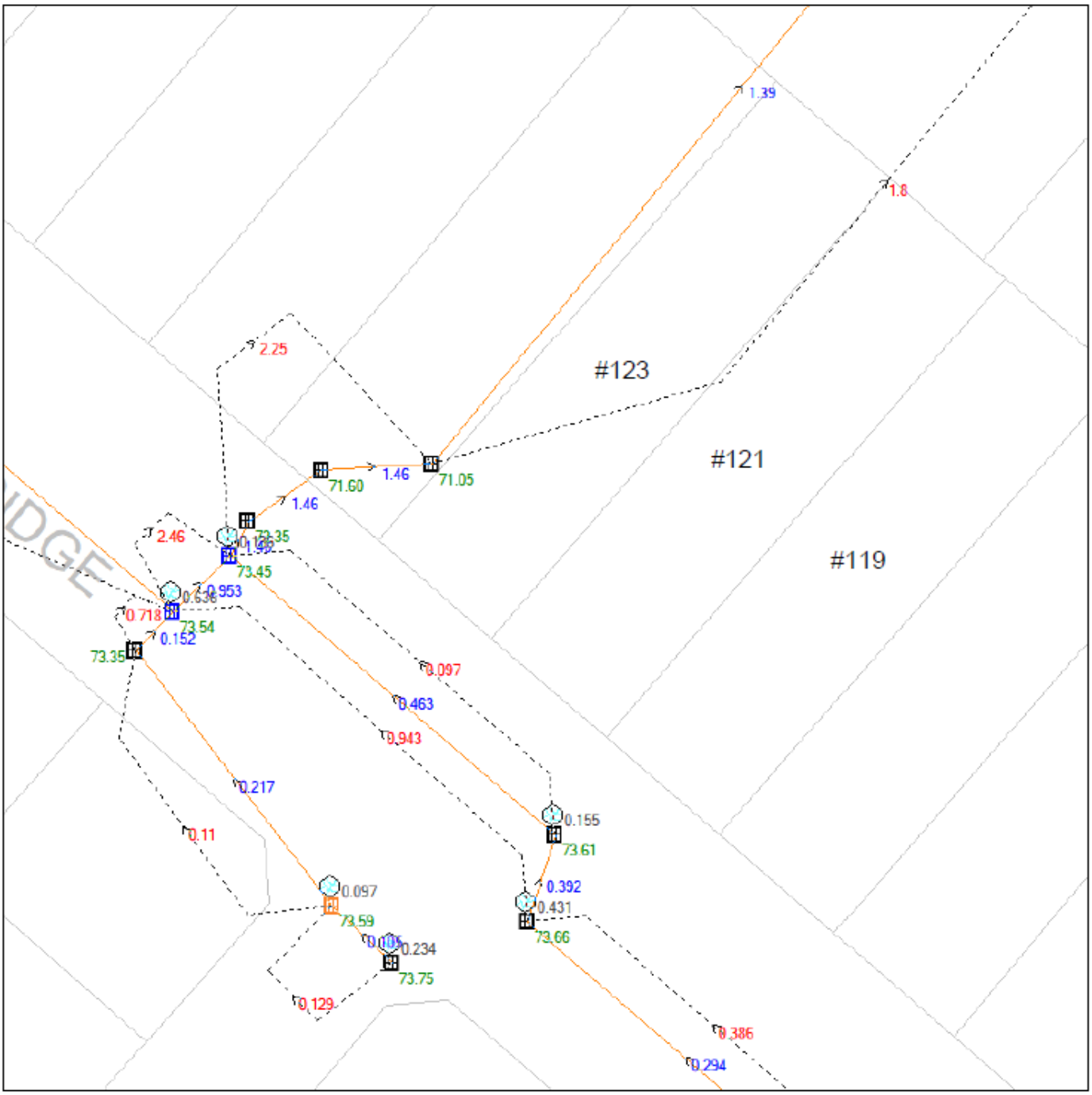
Flood Risk Precincts

- *Low Risk*
- *Overland Flow*
- *Medium Risk*
- *High Risk*

City of Ryde

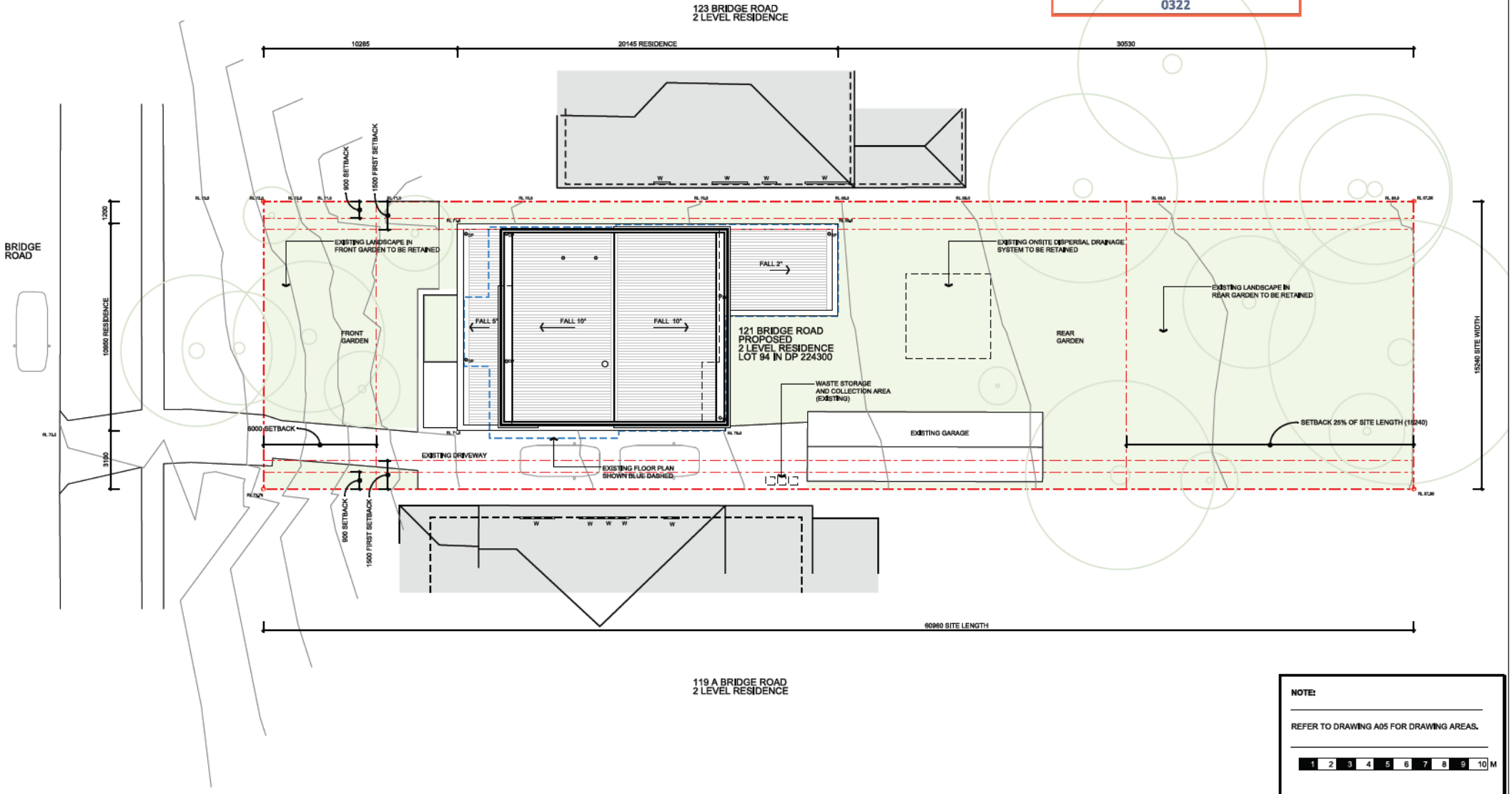
Lifestyle and opportunity @ your doorstep

DRAINS Model Peak Flow Rates for the 100 year ARI (Average Recurrence Interval)



Residential Certifying Specialists
Reference: 387/18/01
Date: 06/12/2018

Paul Pearce
Certifier
0322



NOTE:

REFER TO DRAWING A05 FOR DRAWING AREAS.

1 2 3 4 5 6 7 8 9 10 M

DATE: 20.02.18
ISSUE NO: A
ISSUE + REVISIONS: DA

NORTH:

DRAWN: JDH

KEY:
- NEW TIMBER
- NEW MASONRY
- NEW CONCRETE
- EXISTING WALLS
- EXISTING BUILDING OUTLINE
- DEMOLITION

WHITTLE

APPLICANT:
WHITTLE ARCHITECTS
ABN: 82158274198
NSW ARB No: 8015

CONTACT:
josh@whittlearchitects.com
0432886100

PROJECT:
ALTERATION & ADDITION
121 BRIDGE ROAD
RYDE

CLIENT:
CECILIA PERKINS
NATHAN PERKINS

DATE: 20.02.18

SCALE: 1:200 @ A3

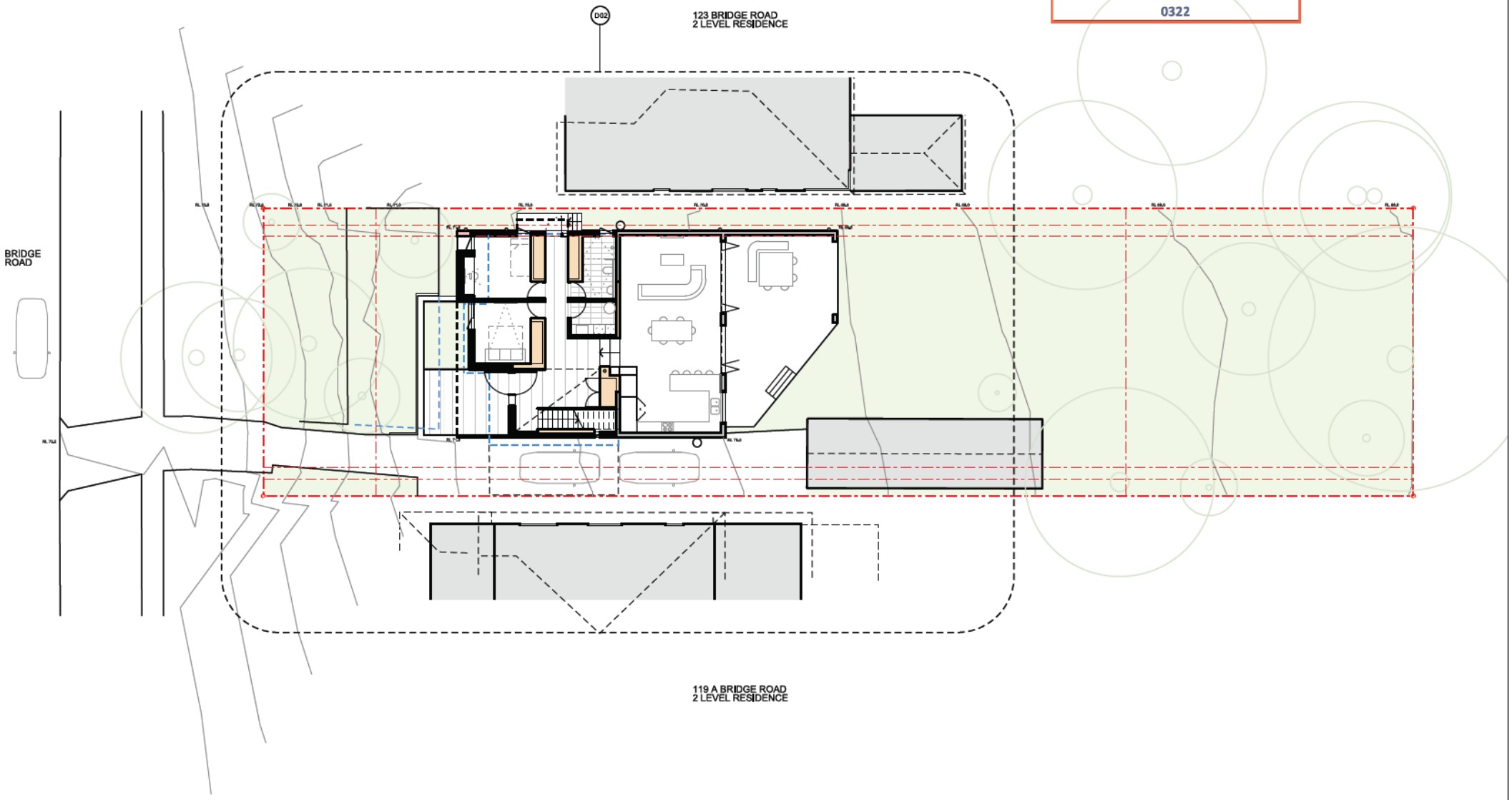
SHEET: D00

ISSUE: A

DRAWING TITLE:
PROPOSED SITE PLAN

Residential Certifying Specialists
Reference: 387/18/01
Date: 06/12/2018

Paul Pearce
Certifier
0322



DATE: 20.02.18
ISSUE NO: A
ISSUE + REVISIONS: DA

NORTH:

DRAWN: JDH

KEY:
- NEW TIMBER
- NEW MASONRY
- NEW CONCRETE
- EXISTING WALLS
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WHITTLE

APPLICANT:
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ABN: 82158274198
NSW ARB No: 8015

CONTACT:
josh@whittlearchitects.com
0432886100

PROJECT:
ALTERATION & ADDITION
121 BRIDGE ROAD
RYDE

CLIENT:
CECILIA PERKINS
NATHAN PERKINS

DATE: 20.02.18

SCALE: 1: 200 @ A3

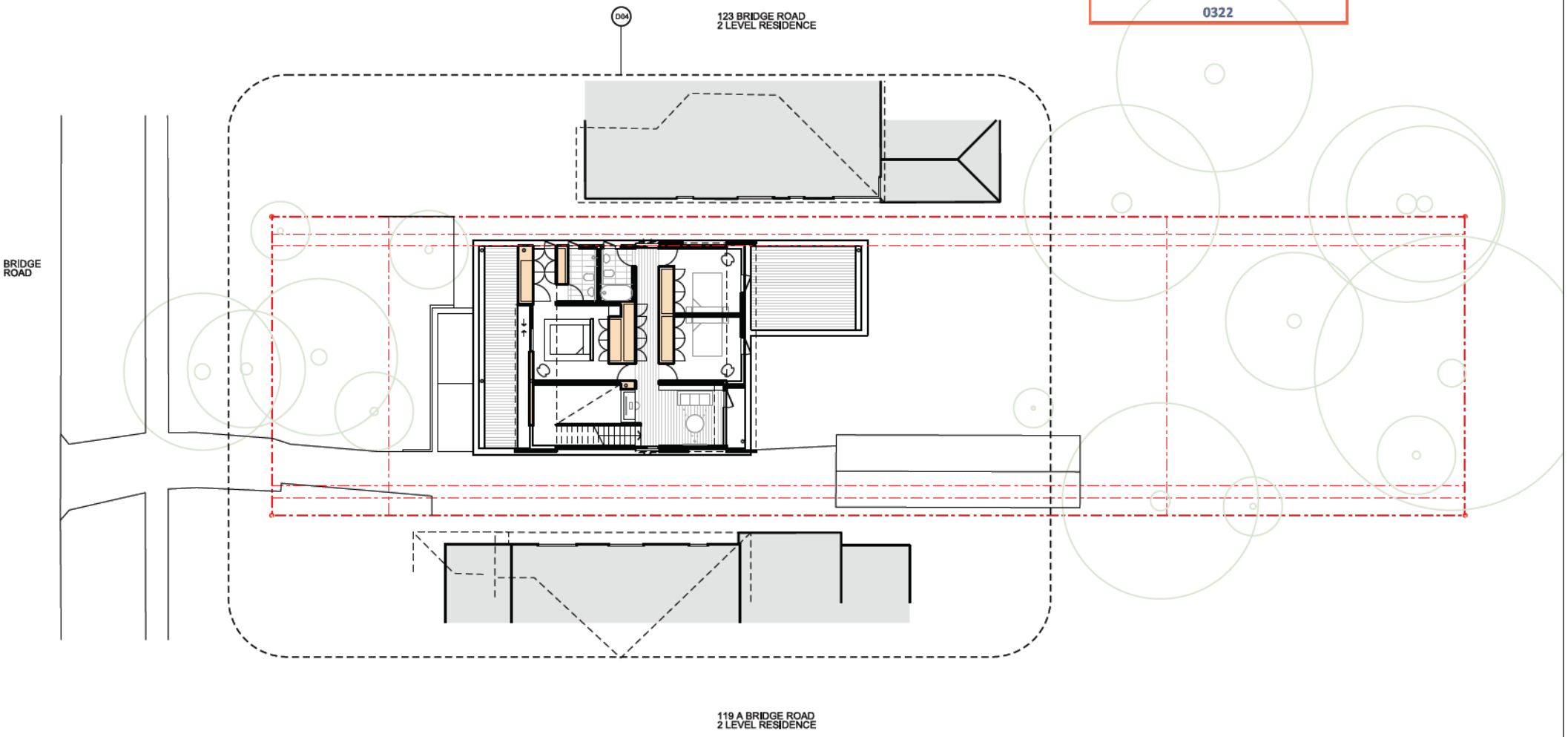
SHEET: D01

ISSUE: A

DRAWING TITLE:
PROPOSED GROUND FLOOR PLAN

Residential Certifying Specialists
Reference: 387/18/01
Date: 06/12/2018

Paul Pearce
Certifier
0322



DATE: 20.02.18
ISSUE NO: A
ISSUE + REVISIONS: DA

NORTH:

DRAWN: JDH

KEY:
- NEW TIMBER
- NEW MASONRY
- NEW CONCRETE
- EXISTING WALLS
- EXISTING BUILDING OUTLINE
- DEMOLITION

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APPLICANT:
WHITTLE ARCHITECTS
ABN: 82158274198
NSW ARB No: 8015

CONTACT:
josh@whittlearchitects.com
0432886100

PROJECT:
ALTERATION & ADDITION
121 BRIDGE ROAD
RYDE

CLIENT:
CECILIA PERKINS
NATHAN PERKINS

DATE: 20.02.18

SCALE: 1: 200 @ A3

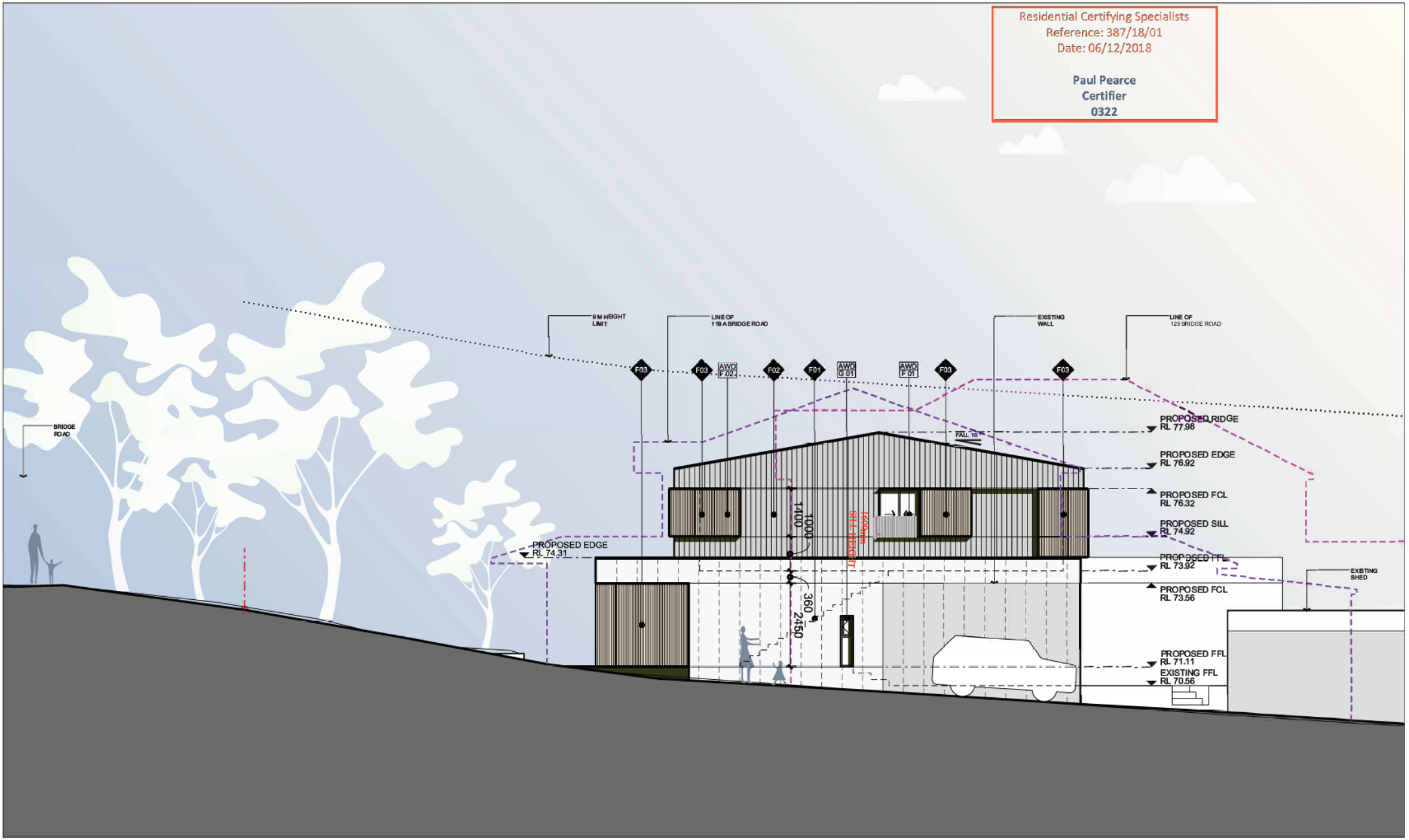
SHEET: D03

ISSUE: A

DRAWING TITLE:
PROPOSED FIRST FLOOR PLAN

Residential Certifying Specialists
Reference: 387/18/01
Date: 06/12/2018

Paul Pearce
Certifier
0322



DATE: 20.02.18
ISSUE NO: A
ISSUE + REVISIONS: DA

NORTH:

DRAWN: JDH

KEY:
- NEW TIMBER
- NEW MASONRY
- NEW CONCRETE
- EXISTING WALLS
- EXISTING BUILDING OUTLINE
- DEMOLITION

MATERIALS:
- RENDERED CEMENT CLADDING
- TIMBER CLADDING
- TIMBER SCREEN
- CONCRETE
- METAL BALUSTRADE/ FENCE
- METAL FACIA/ AWNING/ DETAIL
- METAL ROOF

WHITTLE

APPLICANT:
WHITTLE ARCHITECTS
ABN: 82158274198
NSW ARB No: 8015

CONTACT:
josh@whittlearchitects.com
0432886100

PROJECT:
ALTERATION & ADDITION
121 BRIDGE ROAD
RYDE

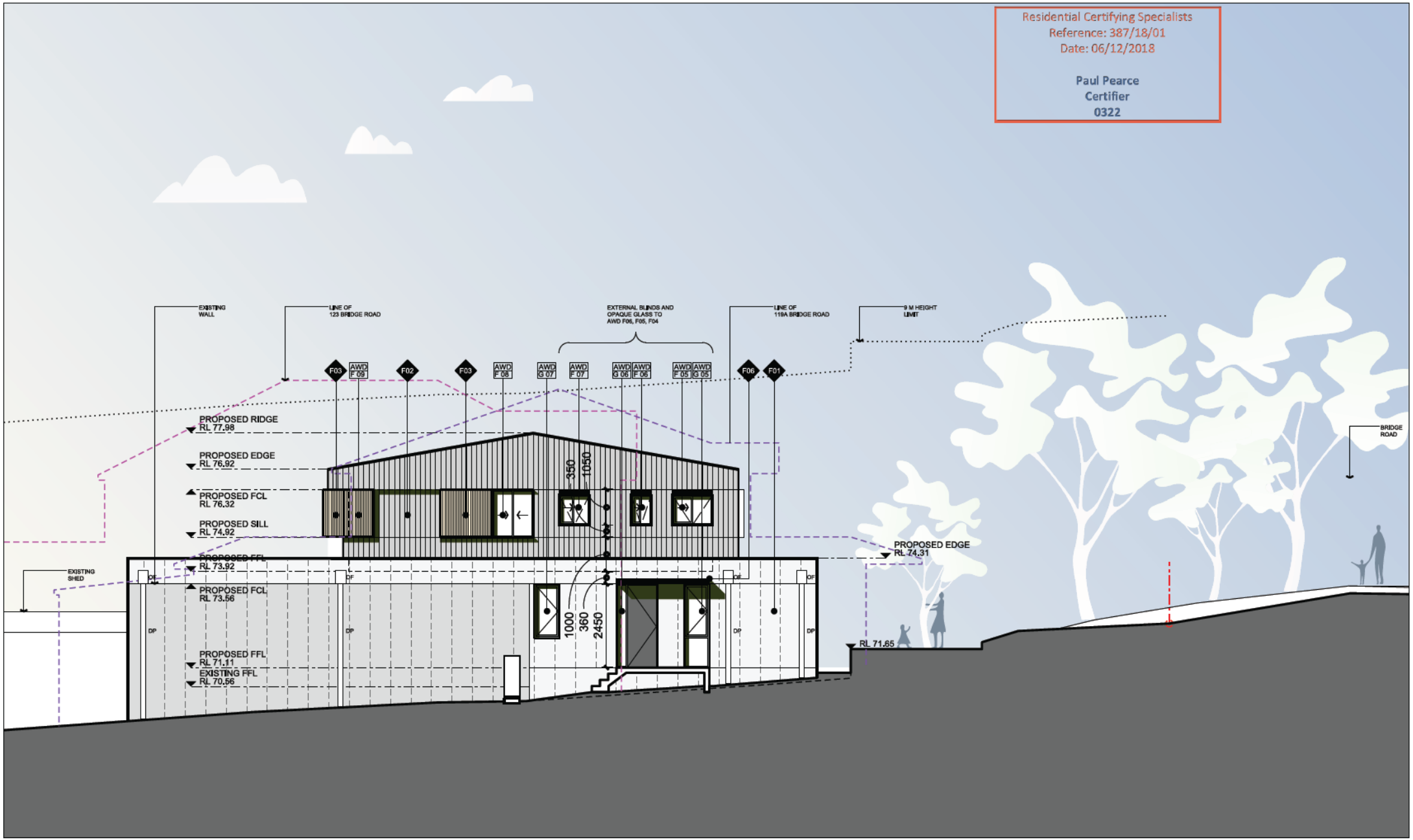
CLIENT:
CECILIA PERKINS
NATHAN PERKINS

DATE: 20.02.18
SCALE: 1: 100 @ A3
SHEET: F01
ISSUE: A

DRAWING TITLE:
PROPOSED SECTION 1 (EASTERN ELEVATION)

Residential Certifying Specialists
Reference: 387/18/01
Date: 06/12/2018

Paul Pearce
Certifier
0322



DATE: 20.02.18
ISSUE NO: A
ISSUE + REVISIONS: DA

NORTH:

DRAWN: JDH

KEY:
- NEW TIMBER
- NEW MASONRY
- NEW CONCRETE
- EXISTING WALLS
- EXISTING BUILDING OUTLINE
- DEMOLITION

MATERIALS:
- RENDERED CEMENT CLADDING
- TIMBER CLADDING
- TIMBER SCREEN
- CONCRETE
- METAL BALUSTRADE / FENCE
- METAL FACIA/ AWNING/ DETAIL
- METAL ROOF

WHITTLE

APPLICANT:
WHITTLE ARCHITECTS
ABN: 82158274198
NSW ARB No: 8015

CONTACT:
josh@whittlearchitects.com
0432886100

PROJECT:
ALTERATION & ADDITION
121 BRIDGE ROAD
RYDE

CLIENT:
CECILIA PERKINS
NATHAN PERKINS

DATE: 20.02.18

SCALE: 1: 100 @ A3

SHEET: F04

ISSUE: A

DRAWING TITLE:
PROPOSED SECTION 4 (WESTERN ELEVATION)

Residential Certifying Specialists
Reference: 387/18/01
Date: 06/12/2018

Paul Pearce
Certifier
0322

123 BRIDGE ROAD

121 BRIDGE ROAD

119 BRIDGE ROAD

DATE: 20.02.18
ISSUE NO: A
ISSUE + REVISIONS: DA

NORTH:

DRAWN: JDH

KEY:
- NEW TIMBER
- NEW MASONRY
- NEW CONCRETE
- EXISTING WALLS
- EXISTING BUILDING OUTLINE
- DEMOLITION

WHITTLE

APPLICANT:
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ABN: 82158274198
NSW ARB No: 8015

CONTACT:
josh@whittlearchitects.com
0432886100

PROJECT:
ALTERATION & ADDITION
121 BRIDGE ROAD
RYDE

CLIENT:
CECILIA PERKINS
NATHAN PERKINS

DATE: 20.02.18

SCALE: 1: 100 @ A3

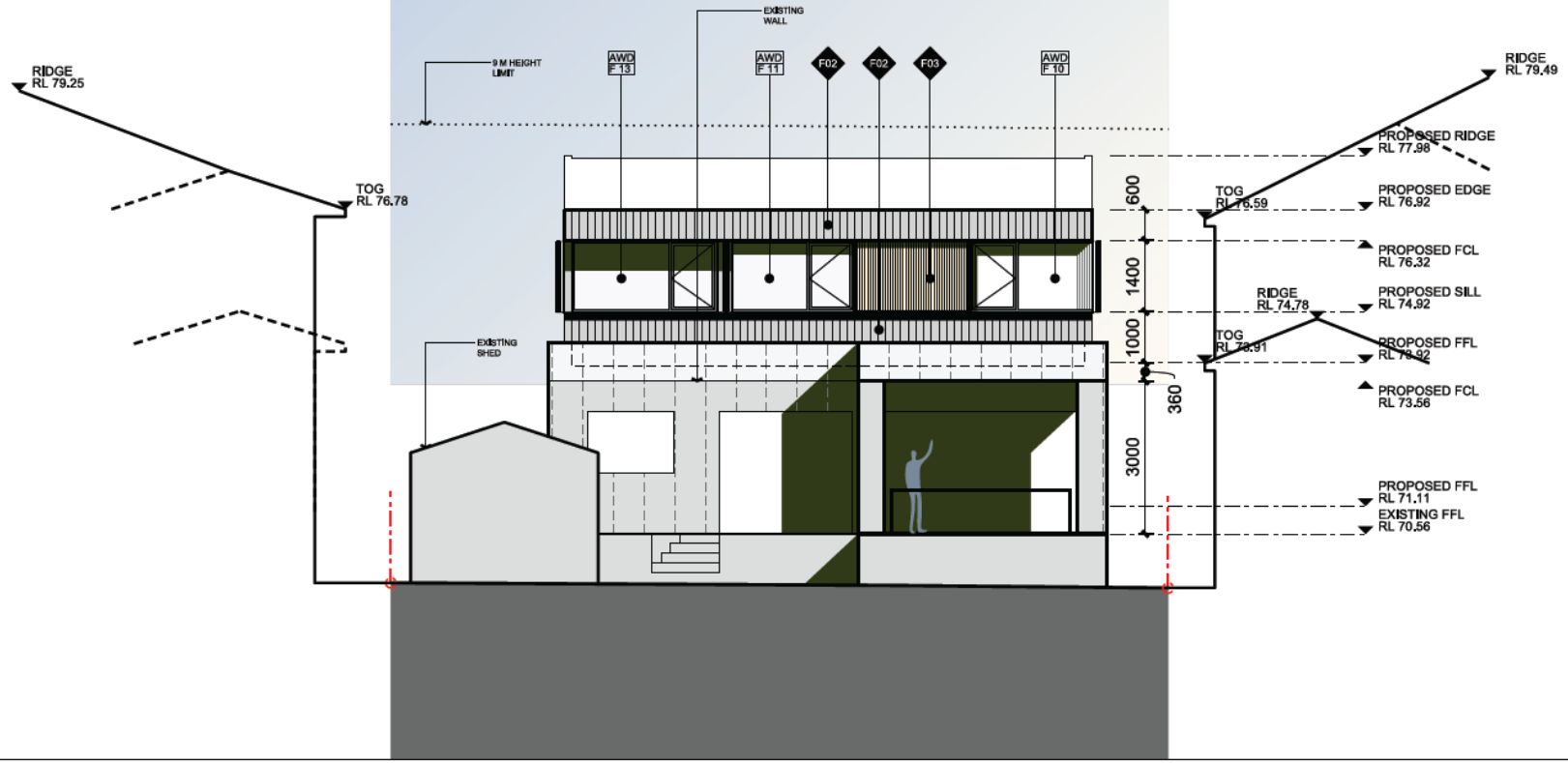
SHEET: F05

ISSUE: A

DRAWING TITLE:
PROPOSED SECTION 5 (STREET ELEVATION)

Residential Certifying Specialists
Reference: 387/18/01
Date: 06/12/2018

Paul Pearce
Certifier
0322



DATE: 20.02.18	ISSUE NO: A	ISSUE + REVISIONS: DA

NORTH:

DRAWN: JDH

KEY:
- NEW TIMBER
- NEW MASONRY
- NEW CONCRETE
- EXISTING WALLS
- EXISTING BUILDING OUTLINE
- DEMOLITION

WHITTLE

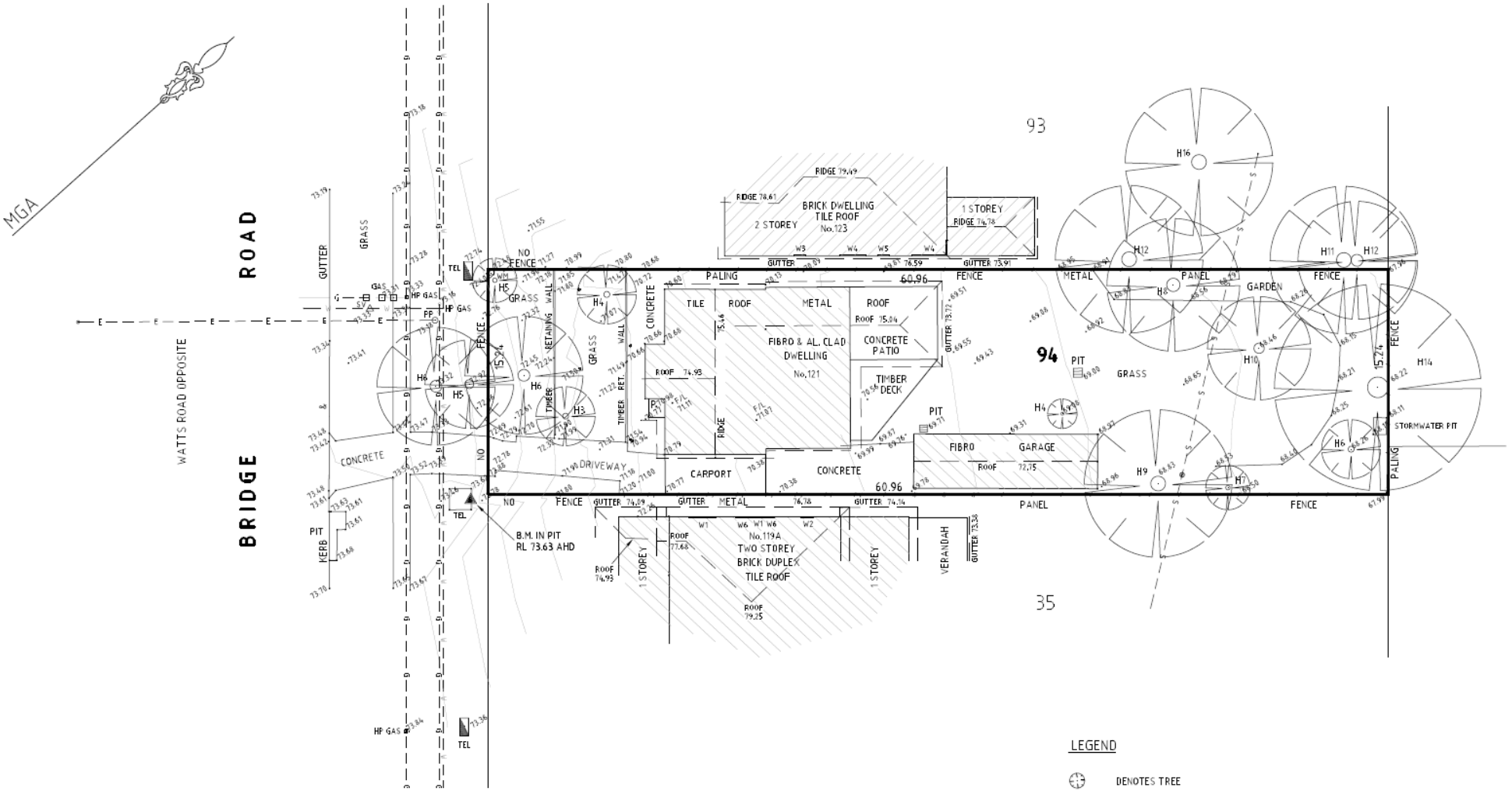
APPLICANT:
WHITTLE ARCHITECTS
ABN: 82158274198
NSW ARB No: 8015

CONTACT:
josh@whittlearchitects.com
0432886100

PROJECT:
ALTERATION & ADDITION
121 BRIDGE ROAD
RYDE

CLIENT:
CECILIA PERKINS
NATHAN PERKINS

DATE: 20.02.18	SHEET: F08	DRAWING TITLE: PROPOSED SECTION 8
SCALE: 1: 100 @ A3	ISSUE: A	



NOTES

1. NO BOUNDARY SURVEY HAS BEEN MADE.
2. BOUNDARY DIMENSIONS ARE BY TITLE ONLY AND ARE SUBJECT TO CONFIRMATION BY BOUNDARY SURVEY.
3. DATUM OF LEVELS–AHD. ORIGIN: P.M.46795 (RL 78.81 SCIMS 18/10/2012.
4. ONLY VISIBLE SERVICES HAVE BEEN LOCATED. OTHER SERVICES MAY EXIST WHICH ARE NOT SHOWN.
5. SEWER AND WATER MAIN POSITIONS TAKEN FROM SYDNEY WATER RECORDS AND ARE APPROXIMATE ONLY.
6. CONTOUR INTERVAL 0.5 METRE.
7. TREES ARE SHOWN DIAGRAMMATICALLY ONLY. WHERE PRECISE SIZE AND SHAPE ARE CRITICAL FURTHER SURVEY WILL BE REQUIRED. TREE HEIGHTS ARE APPROXIMATE ONLY.
8. RELATIONSHIP OF IMPROVEMENTS TO BOUNDARIES IS DIAGRAMMATIC ONLY. WHERE OFFSETS ARE CRITICAL THEY SHOULD BE CONFIRMED BY FURTHER SURVEY.
9. AREA BY TITLE DIMENSIONS IS 929m²

WINDOW SCHEDULE

WINDOW	HEAD	SILL
W1	73.92	72.45
W2	73.22	72.16
W3 1st	76.26	74.87
GRD	73.62	71.63
W4	76.01	74.62
W5	73.62	71.63
W6	76.60	75.40

LEGEND

- DENOTES TREE
- HYD DENOTES HYDRANT
- PP DENOTES POWERPOLE
- SV DENOTES STOP VALVE
- GAS DENOTES GAS MARKER
- TEL DENOTES TELSTRA PIT
- WM DENOTES WATER METER
- W DENOTES UNDERGROUND WATER MAIN (AS SUPPLIED BY SYDNEY WATER)
- S DENOTES UNDERGROUND SEWER MAIN (AS SUPPLIED BY SYDNEY WATER)
- E DENOTES OVERHEAD ELECTRICITY LINES
- G DENOTES UNDERGROUND GAS LINES

DIAL 1100 BEFORE YOU DIG

SCALE 1:200

AMDT B:	EXTENSION ADDED AND REVISED RETAINING WALLS	10.10.2017

DATE OF PLAN: 26.10.2012
DRAWN: W.R.C.
DATUM: SEE NOTE 3
SURVEYED: SRC 18.10.2012

REGISTERED SURVEYOR
DATE:

STEPHEN R. CARR
REGISTERED SURVEYOR
16 CASTLE CIRCUIT, WESTLEIGH. NSW. 2120.
MOBILE 0402 303 530 EMAIL carrsurv@optusnet.com.au

CLIENT: MR & MRS N. PERKINS

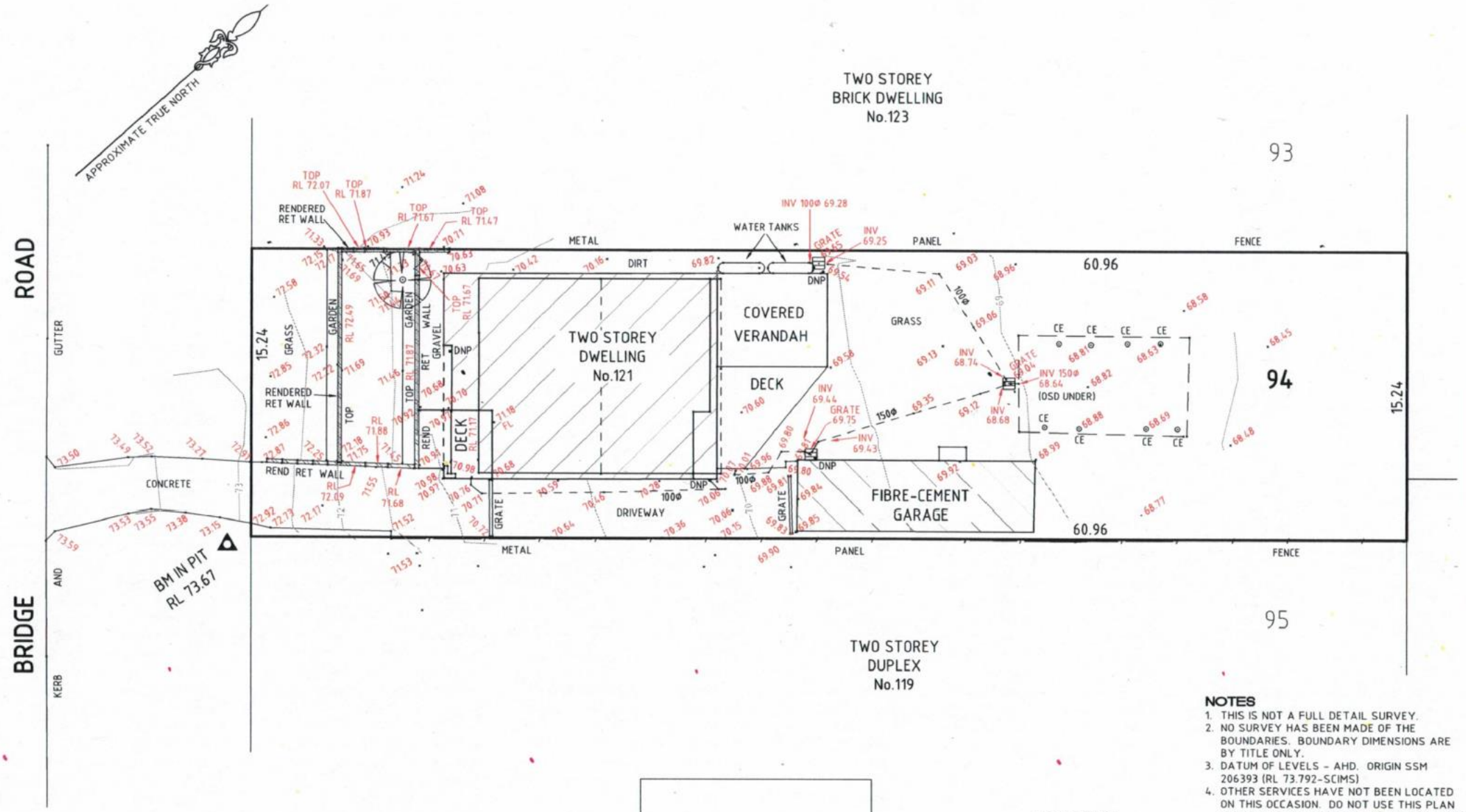
PLAN SHOWING: LEVELS AND DETAIL OVER LOT 94 IN D.P.224300 BEING No.121 BRIDGE ROAD, RYDE.

SCALE 1:200 @ A2

CAD REF. 1868_DS_001_B

1868

SHEET 1 OF 1 B



0 4 8 12m
4 2
SCALE 1:200

DIAL BEFORE YOU DIG
www.1100.com.au

REGISTERED SURVEYOR

LEGEND

TREE
DNP • DOWNPIPE
CE ⊗ CLEANING EYE
FL FLOOR LEVEL

NOTES

1. THIS IS NOT A FULL DETAIL SURVEY.
2. NO SURVEY HAS BEEN MADE OF THE BOUNDARIES. BOUNDARY DIMENSIONS ARE BY TITLE ONLY.
3. DATUM OF LEVELS – AHD. ORIGIN SSM 206393 (RL 73.792-SCIMS)
4. OTHER SERVICES HAVE NOT BEEN LOCATED ON THIS OCCASION. DO NOT USE THIS PLAN TO LOCATE UNDERGROUND INFRASTRUCTURE. GO THROUGH DBYD TO GET CURRENT MEMBER PLANS. CONFIRMATION OF THE EXACT POSITION SHOULD BE MADE PRIOR TO ANY EXCAVATION WORK.
5. TREES HAVE NOT BEEN LOCATED EXCEPT WHERE SHOWN.
6. CONTOUR INTERVAL 0.5m.

PLAN DATE: 23/2/2023	STEPHEN R. CARR REGISTERED SURVEYOR 16 CASTLE CIRCUIT, WESTLEIGH. NSW. 2120. MOBILE 0402 303 530 EMAIL carrsurv@optusnet.com.au	CLIENT: NATHAN PERKINS	SCALE 1:200 @ A3
DRAWN: RM			CAD REF. 1868-DS-A.dwg
DATUM: AHD – SEE NOTE 3		PLAN SHOWING: STORMWATER MANAGEMENT SYSTEM AND FLOOD MITIGATION MEASURES OVER LOT 94 IN DP 224300 BEING No.121 BRIDGE ROAD, RYDE	PLAN REFERENCE 1868/2
SURVEYED: S.R.C. 20/2/2023			SHEET 1 OF 1 A