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

Our Reference: 230422_Flood Impact (REV B)

No.179 RUSSELL AVENUE, DOLLS POINT 'DOLLS POINT CAFÉ'

FLOOD IMPACT MODELLING REPORT

Prepared by: Daniel Cheng ***BE (Civil)***
Checked by: Robert Eltobbagi ***BE(Civil) MIE Aust CPEng NER (1052208) RPEQ (25464)***
Dated: 20th February 2024

Contents

EXECUTIVE SUMMARY

This Report analyses the Local Overland Flooding for the subject site at No.179-183 Russell Avenue, Dolls Point ('Dolls Point Café') for the existing condition and the Planning Proposal.

The Planning Proposal for 179-183 Russell Avenue, Dolls Point NSW 2219 seeks to include additional permitted land use of 'Restaurant/Café.

Following the amendment of the Bayside Local Environmental Plan 2021 (BLEP 2021), Council will lodge a Development Application for the redevelopment of the 'Le Beach Hut'. This will include the demolition of the existing building and construction of a new restaurant, separate kiosk public toilets, and associated landscaping. This will be subject to separate processes outside of the Planning Proposal.

Notwithstanding, the proposed redevelopment forms a 'proof of concept' of the potential redevelopment should the amendments to the BLEP 2021 be adopted.

In summary, our assessment report concluded:

1. ***Proposed flood conditions relative to the Planning Proposal are largely unchanged from the existing conditions;***

2. ***Planning Proposal does not materially affect local flood characteristics;***

3. ***Planning Proposal & respective conceptual design has negligible offsite flood impacts;***

4. ***Planning Proposal & respective conceptual design does not exacerbate the flood regime;***

5. ***Comprehensive Assessment of Councils 'Flood Controls', indicates the Planning Proposal complies with Council requirements;***

6. ***Low Flood Hazard Category over existing/proposed building area identified during 1% AEP.***

1 INTRODUCTION

1.1 Background

Quantum Engineers was engaged by to produce analysis of the existing flood behaviours of Local Overland Flooding for the subject site at No.179-183 Russell Avenue, Dolls Point.

A 'flood impact' and 'risk assessment' of the Planning Proposal for the renewal development from an existing café/restaurant to contemporary restaurant.

The Conceptual Proposed Site Plan for the proposed development is presented in ***Figure 1.1*** below.

Figure 1.1: Proposed Site Plan

The Overland Flow Study incorporates the following:

- *Addressing the flood planning controls from local Council and design considerations in accordance with NSW Flood Risk Management Manual;*
- *An assessment of the overland flood from local upstream catchment affecting the subject site;*
- *Modelling of overland flow behaviours comparing pre & post flood impact from the development.*

1.2 Project Context

Per Bayside Council's DCP requirements, flood modelling is to be undertaken. TUFLOW model of council's current 'Sans Souci Flood Study Review' Report was received by Quantum Engineers on 13th November 2023 & the analysis was based on the received TUFLOW model data.

The purpose of this Overland Flow Study is to provide a detailed modelling assessment of the potential Local Overland Flooding and to determine the flood impact (if any) on the subject site. Furthermore, assessment has been undertaken of the potential impact (if any) on the surrounding properties based on the pre to post development scenario conditions.

In summary, the objectives are as follows:

- ***Replicate 2-D computer model (TUFLOW) based on Bayside Councils 'Sans Souci' Flood Study Review and the received TUFLOW model that is currently used to predict the magnitude and extent of future flood events;***
- ***Modify received TUFLOW model for any site-specific variations to provide accurate results;***
- ***Amend the model to include the proposed development footprint and investigate if the proposed development affects the flood characteristics;***
- ***Propose mitigation measures to eliminate any impacts (if required & necessary); and***
- ***Address the requirements of Bayside Council's DCP***

1.3 FIRA Requirements

The following Authority requirements have been addressed:

- **Bayside Council DCP:**
  Part 3.10 – Flood Prone Land
  Part 9.5 – Flood Prone Land Requirements

- **Environmental Planning and Assessment Act 1979 Section 9.1(2)** – *Local Planning Direction Focus Area 4.1 Flooding*

- **NSW Government Flood Risk Management Manual (2023)**

2 BACKGROUND

2.1 Study Area

The site is affected by overland flooding from the local upstream catchment. The runoff from the localised upstream catchment traverse's overland through the low-lying areas of the catchment towards Waradiel Creek via multiple residential properties & road reserves.

The subject development site is within proximity to the catchment 'gully' and is deemed to be categorised 'flood fringe' during the 1% AEP flood event based on the 'Flood Information' provided by Bayside Council.

The applicable upstream catchment is predominantly residential area of approximately 7.35Ha and is characterised by gentle slope of less than 1% fall.

Refer to ***Appendix A1 - Figure A.1.1*** for the ***Upstream Catchment Plan***

2.2 Know Flood Behaviour

Based on the flood study conducted by Cardno (2015), the 10th March 1975 historical storm event has been used to calibrate the Tuflow model.

Based on the historical event:

> *'a number of residential areas are affected by flooding associated with Waradiel Creek including properties between Park Road and Chuter Avenue in all events greater than 20% AEP and properties between Alfred Street and The Grand Parade with up to 1.0m expected in a 1% AEP event. Areas of high provisional hazard are generally confined to the open channel itself or a number of trapped low points.'* (Cardno 2015).

2.3 Emergency Management

Bayside Council provides 'online interactive mapping' which indicates the subject site is within flood planning area. As such, the State Emergency Service (SES) which provides flood emergency information for preparation, evacuation and recovery processes, is applicable as outlined in the below website:

https://www.ses.nsw.gov.au/flood-resources/during-a-flood/be-aware/

https://www.ses.nsw.gov.au/flood-resources/during-a-flood/prepare-your-home-and-business/

3 AVAILABLE INFORMATION

3.1 Rainfall Data

The design rainfall intensity-frequency-duration (IFD) data for the catchment site were obtained from the 'ARR Data Hub' as part of the received TUFLOW model.

A summary of the design rainfall depth adopted in this study is provided in ***Table 3.1*** below.

IFD

-33.995S 151.145E

DURATION	63.2%	50%	20%	10%	5%	2%	1%	AEP
5 mins	97.4	125.	160.	180.	206.	240.	266.	
6 mins	91.2	117.	150.	168.	193.	225.	250.	
10 mins	74.7	96.1	124.	140.	161.	188.	209.	
20 mins	54.7	70.8	92.5	105.	122.	144.	160.	
30 mins	44.5	57.8	76.1	86.9	101.	120.	134.	
1 hour	30.1	39.2	52.0	59.6	69.5	82.7	92.7	
2 hours	19.6	25.5	33.8	38.7	45.1	53.6	60.1	
3 hours	15.1	19.6	25.9	29.6	34.4	40.8	45.7	
6 hours	9.63	12.5	16.3	18.5	21.4	25.3	28.2	
12 hours	6.18	7.98	10.3	11.7	13.5	15.9	17.7	
24 hours	4.01	5.18	6.70	7.58	8.75	10.3	11.4	
48 hours	2.56	3.31	4.29	4.86	5.62	6.62	7.37	
72 hours	1.90	2.46	3.19	3.61	4.17	4.90	5.46	mm/hr

Table 3.1: IFD Design Rainfall Depth

The following data was also utilised as part of the Sans Souci TUFLOW model package and was adopted in this assessment:

- LiDAR topographical survey data;
- GIS data including cadastre; and
- Aerial photography.

4. FLOOD RELATED REQUIREMENTS

4.1 The Bayside Council DCP

The Controls for the development in flood liable land are detailed in **Bayside Councils DCP** under **Part 3 Section 10 'Flood Prone Land' & Part 9 Section 5 'Flood Prone Land Requirements'.**

4.1.1 Council Objective of 'controls' (Part 3 Section 10.5):

i. *To ensure that flood risk is considered as early as possible in the planning and development process and is based on the best available flood information.*
ii. *To establish guidelines for the use and development of flood prone land that are consistent with the NSW Flood Policy and the FDM.*
iii. *To minimise the risk to human life and damage to property by controlling development on flood prone land, taking into account projected changes as a result of climate change.*
iv. *To ensure that all land uses and essential services are appropriately sited and designed in recognition of potential floods.*
v. *To provide detailed controls for the assessment of applications lodged in accordance with the Environmental Planning and Assessment Act 1979 on flood-prone lands.*
vi. *To ensure that the development or use of floodplains does not adversely impact flood behaviour which creates a detrimental increase in flood affectation on other properties or developments.*
vii. *To ensure that the development incorporates measures to minimise the risk of life and ensure the safe occupation and efficient evacuation of people in the flood event.*
viii. *To apply a merit-based approach to development decisions that consider flood risk, social, economic and ecological considerations.*
ix. *To control development and other activity within all the stormwater catchments within the LGA having regard to the characteristics and level of information available for each of the catchments, in particular the FRMS and FRMP.*

4.1.2 Council Objective and Performance Criteria (Part 3 Section 10.8)

Development Aspect	Objective	Performance Criteria
Floor Levels	• To minimise the damage to properties from flooding. • To minimise risk to life from the inundation of properties. • To minimise the economic cost to the community resulting from flooding.	• Proposed building must be free from flooding up to and including the flood planning level (FPL) requirement. • Proposed building should not increase the likelihood of flooding on other developments, properties or infrastructure.
Car parking	• To minimise risk to life from the inundation of the basement and other car parking areas. • To minimise the damage to motor vehicles from flooding. • To ensure that vehicles do not become moving debris during floods.	• The proposed garage or car park should not increase the risk of vehicle damage by flooding. • The proposed garage or car park should not increase the likelihood of flooding on other developments, properties or infrastructure. • The proposed garage or car park must meet the Flood Planning Level Requirements. • Open car parking - The minimum surface level of open space car

		parking subject to flooding should be designed giving regard to vehicle stability in terms of depths and velocity during flooding.
Building components and method	• To minimise the damage to building and structures during a flood event.	• Buildings are to be designed and constructed to a standard that is compatible with the flood risk and will not result in significant structural or material damage during or after a flood event.
Fencing	• To ensure that fencing does not result in any significant obstruction to the free flow of floodwaters. • To ensure that fencing will remain safe during floods and not become moving debris.	• Fencing is to be designed and constructed in such a manner that it will not modify the flow of floodwaters and cause damage to surrounding properties.
Evacuation	• To ensure that there is no increase in risk to life to people in a flood event.	• To ensure that there is a plan in place for people to follow during a flood event that will not increase the risk to life of people on site or result in an increased reliance on the SES or emergency services personnel.
Earthworks and building on flood prone land	• To ensure that the natural function of floodplains and overland flow paths to convey and store floodwater is not compromised.	• Any earthworks or development proposal must be supported by a flood impact assessment report (refer to Sub-section 9.5.4) from a qualified civil engineer.
Storage of hazardous substances	• To prevent the potential spread of pollution from hazardous substances.	• The storage of products which, may be hazardous or pollute floodwaters, must be placed above the 1% AEP flood level plus 0.5m freeboard or placed within an area protected by bunds or levels such that no floodwaters can enter the bunded area.

4.1.3 Flood Planning Prescriptive Controls (Part 3 Section 10.13):

Per Bayside Development Control Plan 2022 Section 9.5.1 – Land Use Categories, the subject site is to be categorized as Commercial or Industrial:

Commercial or Industrial
Abattoir, Amusement centre and Amusement park; Boat building and repair facilities; Bulky goods sales room or showroom; Business premises; Community Facility Depots; Freight transport facilities; Entertainment facilities; Heavy industry storage establishments; Heliports; Heighway service centre; Hotel; Industries; Industrial retail Outlet; Industrial training facility; Junk yard; Medical Centre; Mortuaries; Motel; Motor showroom; Passenger transport facilities; Place of public worship; Plant hire; Recreation facility (indoor, major or outdoor); Registered club; **Restaurant;** Restricted premises; Roadside stall; Rural industry; Sawmill; Service station; Sex services premises Shop; Storage premises; Transport Depot; Truck depots; Vehicle body repair station; Veterinary hospital; Warehouse or Distribution centre; Waste or resource management facility

Based on the produced Flood Hazard Mapping for 1% AEP event, the site is considered as **Low Flood Hazard (Hazard Category H1 & H2).**

As such, the following prescriptive 'controls' for the Planning Proposal have been adopted:

Planning Consideration	**Land Use Category (Development Type)**					
	Critical & Sensitive Uses & Facilities	Subdivision	Residential	Commercial & Industrial	Recreation and non urban	Concessional Development
A. Floor level	A2, A3	G3	A1, A3	A1, A3	A4	A5
B. Building Components	B2, B3, B4		B1, B3, B4	B1, B3, B4	B1, B3, B4	B1, B3, B4
C. Structural Soundness	C2		C1	C1	C1	C1
D. Flood Effects	D1		D1	D1	D1	D1
E. Car Parking & Driveway Access	E1, E2, E4		E1, E2, E3	E1, E2, E3	E1, E2, E3	E1, E2, E3
F. Evacuation	F2		F1	F1	F1	F1
G. Management and Design	G2, G4, G5		G2, G4, G5	G2, G4, G5	G2, G4, G5	G2, G4, G5

Planning Consideration	**Criteria**	
Floor Level	A1	Habitable floor levels to be no lower than the 1% AEP flood level plus 0.5m freeboard
	A3	Non-habitable floor levels to be no lower than 1% AEP flood level
Building components	B1	All structures to have flood compatible building materials (Schedules – Chapter 9.5.3) below the 1% AEPflood level plus 0.5m freeboard. Any part of the building that is erected at or below the 1% AEP flood level +0.5m freeboard shall be constructed of flood compatible material.
	B3	Flow-through open form fencing (louvres or pool fencing) is required for all new fencing and all new gatesup to the 1% AEP flood level to allow floodwaters to flow through.
	B4	All new electrical equipment, power points, wiring, fuel lines, sewerage systems or any other service pipes and connections must be waterproofed and/or located above the 1% AEP flood level plus 0.5m freeboard. All existing electrical equipment and power points located below the 1% AEP flood level plus 0.5m freeboardwithin the subject structure must have residual current devices installed that turn off all electricity supply tothe property when floodwaters are detected.
Structural soundness	C1	All new development must be designed and constructed to ensure structural integrity up to the 1% AEP flood level plus 0.5m freeboard, taking into account the forces of floodwater, wave action, flowing water with debris, buoyancy and immersion. Structural certification shall be provided confirming the above. Where shelter-in-place refuge is required, the structural integrity for the refuge is to be up to the PMF level.Structural certification shall be provided confirming the above

Flood Effects	D1	The development must not result in increased flooding elsewhere in the floodplain. A flood assessment report (refer to Schedules – Chapter 9.5.4) shall be provided to demonstrate that the development: • does not divert floodwaters to the detriment of elsewhere on the floodplain. • does not increase flood level or velocity elsewhere on the floodplain. • does not result in a detrimental loss of flood storage. • reduces the existing flood hazard, where possible. A flood impact assessment for a site is not required where the flood storage and floodway capacity are retained. For example, a building can be elevated to retain the existing floodway and flood storage to permit the free flow of water under the building.
Car Parking & Driveway Access	E1	The minimum finished floor level of open car parking spaces or carports shall be at or above natural ground level. A flow-through roller door (or horizontal louvers) is permitted for a carport structure. Carports must be of open design, with at least 2 sides completely open such that flow is not obstructed up to the 1% AEP flood level. Otherwise, it will be considered to be enclosed. Open car parking areas shall not be located within a floodway.
	E2	For above ground level garages, the minimum surface level shall be no lower than the 1% AEP flood level
	E3	Basement garages/storage/car parking, low-level driveways must be physically protected from inundation by floods equal to or greater than the 1% AEP flood level plus 0.5m freeboard. The crest of the driveway shall be located within the property boundary. All access, ventilation, driveway crests and any other potential water entry points to any enclosed car parking shall be above the 1% AEP flood level plus 0.5m freeboard level. Council will not accept any options that rely on the electrical, mechanical or manual exclusion of the floodwaters from entering the enclosed carpark for new development. Flood barriers may be accepted for an existing development to improve flood protection.
Evacuation	F1	Reliable access for pedestrians or vehicles is required from the building, commencing at the minimum level equal to the lowest habitable floor level to an area of refuge above the PMF level, or minimum of 20% of the gross floor area of the dwelling to be above the PMF level.
Management and Design	G2	Storage of materials that may cause pollution or are potentially hazardous during any flood is not permitted below the 1% AEP plus 0.5m freeboard
	G4	Where a building is elevated to retain the existing floodway, overland flow path and flood storage, the undercroft area is to remain open to permit the free flow of water under the building. A positive covenant isrequired.
	G5	Pools located within the 1% AEP flood extent are to be in-ground, with coping flush with natural ground level. Where it is not possible to have pool coping flush with natural ground level, it must be demonstrated that the development will result in no net loss of flood storage and no impact on flood conveyance on orfrom the site.All electrical equipment associated with the pool (including pool pumps) is to be waterproofed and/orlocated at or above the 1% AEP plus 0.5m freeboard level. All chemicals associated with the pool are to be stored at or above the 1% AEP plus 0.5m freeboard level.

Table 4.1.3: Low Hazard Planning Considerations (DCP - Table 11)

4.1.4 Flood Assessment Reporting (Part 9 Section 5.4):

Per Bayside Development Control Plan 2022 Section 9.5.4 requirements, where a new development (*building or earthworks*) may impact on the flood behaviour (*e.g. filling within the flood affected area or obstruction to the overland flow path*), flood impacts for the existing and proposed development is to be conducted to validate the flood depth afflux is within 10mm for the 1% AEP and within 50mm for the PMF event.

TUFLOW model received from Bayside Council was modified and calibrated to conduct the impact assessment based on the potential building layout if the planning proposal is to be approved.

Based on the TUFLOW modelling results illustrated in Appendix A2 Figures A2.2.4 & A2.2.13, it is demonstrated that the flood impact is within Council's allowed depth increase.

4.2 Environmental Planning and Assessment Act 1979 Section 9.1(2)

4.2.1 Direction 4.1

The following items are as set by Direction 4.1 which is assessed against the Planning Proposal:

(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.

✓ ***Planning Proposal is consistent with the abovementioned guidelines & policies & the latest Flood Risk Management Manual 2023 which replaces the Floodplain Development Manual 2005.***

(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.

✓ ***No rezoning of land is proposed for this Planning Proposal.***

(3) A planning proposal must not contain provisions that apply to the flood planning area which:
- *(a)* permit development in floodway areas, ***development is not within floodway areas***
- (b) permit development that will result in significant flood impacts to other properties, ***based on TUFLOW modelling, the impact is within allowance of council requirements and the general acceptance of flood impact of most authorities in NSW***
- (c) permit development for the purposes of residential accommodation in high hazard areas, ***subject site within Low Hazard area and no residential accommodation proposed.***
- (d) permit a significant increase in the development and/or dwelling density of that land, ***redevelopment of café/restaurant proposed only, no increase in dwelling density***
- (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, ***no such development proposed***
- (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, ***no such development proposed***

(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 ***redevelopment will provide additional refugee area during extreme flood event which is an improvement to current flood emergency management***

(h) permit hazardous industries or hazardous storage establishments where hazardous materials cannot be effectively contained during the occurrence of a flood event. ***No hazardous storage establishment is proposed***

(4) 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.

✓ ***Planning Proposal is generally in accordance with Flood Risk Management Manual 2023 which replaces the Floodplain Development Manual 2005. Furthermore the Management guidelines & flood extent & results is consistent with the adopted Bayside Council's Sans Souci Flood Study Review by Cardno (2015)***

5. PRE-DEVELOPED MODELLING AND ANALYSIS

5.1 Existing Flood Modelling

5.1.1 Hydrology

A hydrologic model combines rainfall information with local catchment characteristics to estimate a runoff hydrograph. For this study, 'TUFLOW' model was used for the local catchment using direct rainfall model to convert rainfall hyetograph to runoff hydrographs.

5.1.2 Catchment Definition

The catchment was defined based on topographic feature (*using the DEM data supplied by Bayside Council*) and anticipated overland flow paths.

The following 'critical' estimated design rainfall was applied to the hydrological model to predict design upstream catchment runoff hydrograph based on the received TUFLOW model from Bayside Council.

- *1% AEP (100YR ARI) design rainfalls - 60min duration storm event - temporal pattern 8*
- *PMF design rainfalls - 60min duration storm event - temporal pattern 8*
- *1% AEP (100YR ARI) design rainfalls + 0.9m sea level rise - 60min duration storm event - temporal pattern 8*

5.1.3 Hydraulic

5.1.3.1 Definition

A hydraulic model converts runoff (*traditionally from a hydrological model*) to 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 develop when the capacity of the channels is exceeded. The model is established in

conjunction with boundary conditions, which include upstream runoff hydrographs generated by 'TUFLOW' model and appropriate downstream boundary including the initial foreshore sea level.

A 2D fully dynamic hydraulic model was established for the study area. TUFLOW, a dynamic hydraulic modelling system developed by BMT, was utilised for the purposes of this modelling study. TUFLOW is used world-wide and has been shown to provide reliable, robust simulation of flood behaviour in urban and rural areas through a vast number of applications.

5.1.3.2 Model Topographic Surface

The DEM data included in the model was received from package received from Bayside Council as part of the TUFLOW Model.

5.1.3.3 2D Model Set-up

TUFLOW hydraulic modelling was carried out to determine the flood behaviour within the catchment area. Grid spacing of **2.0m x 2.0m** was adopted for the whole model and deemed satisfactory to define the flood extent through the developed areas in the vicinity of the subject property.

5.1.3.4 Model 2D Roughness

Material ID	Land Use	Manning's Roughness Coefficient (n)
1	Sea	0.012
2	Road	0.020
3	Open Space	0.030
4	Bush	0.050
5	Residential	0.100
6	Building	0.100
7	Creel	0.045
8	Road Median Strip	0.035
9	Paved Surface	0.020
10	Georges River Foreshore	0.018

Table 5.1.3.4: Manning's Roughness Coefficient

5.1.3.5 Building Blockage & Drainage Network Blockages

Building 'Structure' Blockages

To replicate The Bayside Council's existing flood model, the building blockage from the received Council's TUFLOW model was adopted with minor site-specific modification to best match the detailed survey information and the proposed development layout.

- Upstream buildings have been modelled as 'increased Mannings value' adopted per modelling by The Bayside TUFLOW model.

- Existing café structure within subject site have been modified and modelled as 'Removed from Grid' per methodology consistent with recommendations from *Australian Rainfall and Runoff Revision Project 15: Two-dimensional simulations in urban areas – Representation of buildings in 2D numerical flood models.* The building footprint is based on the survey and satellite imagery.

Drainage Network Blockages

The pits, pipes and drainage channel data are adopted from received TUFLOW Model from Bayside Council without any modifications.

Pit blockage factor of 50% is considered per the received TUFLOW Model.

5.1.3.6 Upstream & Downstream Boundary Condition

The rainfall hyetograph from BOM was applied the entire upstream catchment to simulate the runoff behaviour over the larger catchment that subject property is with-in.

A fixed tailwater level for Botany Bay is set based on interpolation by Cardno per the 'Sans Souci Flood Study Review' & 1D to 2D linking node was adopted as the downstream boundary condition in this study.

5.2 Existing Flood Impacts

5.2.1 Pre-Development Design Flood Modelling Discussions

The pre-development model was first replicated to verify the model was correct, then the modification to pre-development model was implemented including revising the building blockage for site specific results, a comparison between the revised pre-development Flood Models with the modification as illustrated below.

The flood depth levels for 1% AEP were not impacted as the café building footprint is outside of the 1% AEP Flood extent.

The pre-Development flood depth, flood velocity, V x D hazard and ARR 2019 Hazard generated by the TUFLOW model are presented in Appendix A 'Figures A.2.2, A.2.5, A.2.7, A.2.9, A.2.11, A.2.14, A.2.16, A.2.18, A.2.20, A.2.23, A.2.25, A.2.27'.

Figure 5.2.1: Received 'Council's' Building Blockage – Increased Manning (n = 0.10)
(Building indicated in yellow)

Figure 5.2.2: Adjusted 'model' Building Blockage – Removed from Grid
(Building indicated in pink)

6. POST-DEVELOPED MODELLING AND ANALYSIS

6.1 Proposed Development Flood Modelling & Assessment

6.1.1 Design Flood Modelling Results

'2D TUFLOW' hydraulic models were undertaken for the 1% AEP (100YR ARI) design flood event, PMF design flood event and 0.9 metre sea level rise design flood event. The peak water level, depth, and velocity for each 2.0m x 2.0m grid cell in the study area were determined.

The flood depth, flood velocity, V x D hazard and ARR 2019 Hazard generated by the TUFLOW model are presented in ***Appendix A 'Figures A.2.2 – A.2.28'***.

Flood depth cut off is set at 100mm.

6.2 Flood Impacts of Proposed Development

6.2.1 Flood Planning Level (Proposed Café)

According to Bayside Council's DCP, the floor levels for the habitable floor area of Commercial/Industrial Development MUST be set no lower than 1%AEP + 500mm freeboard to ensure protection from impeding flood waters.

However, for evacuation purposes, the proposed café is also to be used for 'on-site evacuation purposes', as such, the minimum Habitable floor level must be set at no lower than PMF Flood Level.

As the existing café is to be demolished, it is considered reasonable to accept that based on Councils 'Flood Planning Controls', all habitable floor levels of the proposed Dolls Point Café should be considered for freeboard requirements and to comply with Flood Control Requirements.

In summary, our TUFLOW modelling results can be tabled as follows for the **proposed 'Dolls Point Café'**:

- **Min Habitable Floor Level (*Dolls Point Café*)** - **FFL 2.80mAHD**
  - **must be set at no lower than PMF level**

Locations	Freeboard Requirements (mm)	Post Development 1% AEP Flood Level (m AHD)	Post Development PMF Flood Level (m AHD)	Flood Planning Level (m AHD)	Adopted Habitable Floor Level (m AHD)
Habitable Floor Level *(Proposed Dolls Point Café)*	**Must be no lower than PMF Level or 1% AEP + 500mm**	**RL2.25**	**RL2.80**	**RL 2.80**	**FFL 3.00**

Table 6.2 – Minimum Finished Floor Level: 'Proposed Alterations & Additions'

6.2.2 Climate Change Impact

Due to the close proximity of site to the coast, the Sea Level Rise is to be considered, projected sea level rise of 0.9m by 2100 is modelled for both pre & post development scenario.

As such, the increased sea level in consideration of Climate Change will be approx. RL2.50mAHD based on the TUFLOW model. The proposed finished floor level of FFL3.00m AHD achieves 500mm freeboard with respect to the raised sea level.

Therefore, the proposed habitable floor level is deemed satisfactory in regards to 'climate change impact'.

6.2.3 Hazard Assessment

Safety of people & residences in floods is of major concern. As such, an assessment of the ARR 2019 flood hazard (Velocity & Depth product at 0.1 m^2/s interval) is presented in ***Appendix A - Figure A.7 & A.8, A.16 & A.17, A.25 & A.26.***

Based on the ARR 2019 Flood Hazard Classification ***Figure 9.4.1***, General Flood Hazard Vulnerability Curves ***(Refer to Appendix A - Figure A.9 & A.10, A.18 & A.19, A.27 & A.28)*** is generated for both the pre-development and post development scenarios to investigate any relevant flood hazard.

It is noted the flood hazard categorisation in the pre-development the flood extent and post-development scenarios are largely unchanged.
There are local impacts from the proposed landscape works including filling & battering of land near the proposed new café area and the construction of new bioretention basin to the north of the café.

6.2.3.1 1% AEP Event

As result of compact fill and battering of the land to elevate the café floor level to meet freeboard requirements, the raised ground in close proximity of the proposed café remained unimpacted for both pre and post development scenario. There was some localised ponding of less than 150mm and hazard category H1 observed to the south of proposed café in post development scenario which can be considered negligible.

The proposed bioretention basin during 1% AEP Storm Event resulted in increased Hazard category from H1 to H2, however the area is in landscaped/pond area and is designed as non-trafficable for public pedestrians. As such the impact is deemed acceptable

6.2.3.2 PMF Event & 1% AEP + 0.9m Sea Rise Event

As result of compact fill and battering of the land to elevate the café floor level to meet freeboard requirements, the raised ground in close proximity of the proposed café is now above the flood level in the post-development scenario. Furthermore, the H3 hazard category region(s) to the east of café is reduced and small region is now converted to H2 hazard category as flood depth reduced due to filling of land.

The proposed bioretention basin during post-development event resulted in larger H3 category region compared to pre-development, as discussed above for the proposed land use of the region, the impact is deemed acceptable.

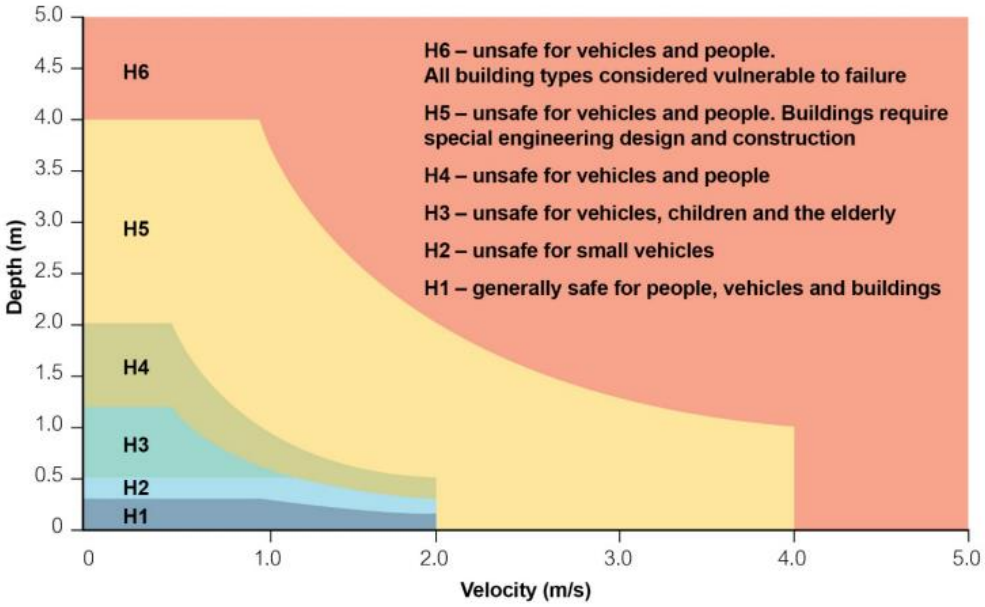


Figure 6.2.3 – General Flood Hazard Vulnerability Curves
(Figure 6 of AIDR 2017b)

6.2.4 Flood Affection

The 2D 'TUFLOW' flood modelling results undertaken for this Overland Flow Study indicate that the Proposed Development will not increase flood depth upstream nor downstream of the subject development in excess to the guidelines outlined in council's requirement during the 1% AEP, PMF and the 0.9m sea level rise scenario flood event. Furthermore, there is generally no exacerbation of the flood regime.

The Flood Impact Map (*refer to Appendix A Figure A.10*) demonstrates that there is no cumulative impact in the vicinity of the subject site with the maximum differential change in flood depth is less 10mm for the 1% AEP and 1% AEP + 0.9m sea rise. Furthermore, the cumulative impact is less than 50mm within subject lot boundaries for the PMF event.

The main overland flow traversed through Waradiel Creek which is approximately 150m away. Considering the gentle catchment sloped terrain and the distance the development is from the main flowpath, the proposed filling in the vicinity of the proposed café does not exacerbate the overall flood regime as demonstrated by the flood model results.

As such the proposed café and associated earthworks/landscape works is deemed acceptable.

7. KEY RISKS TO BE MANAGED

7.1 Flood Evacuation Strategy

To minimise risk to personal safety of occupants, evacuation strategies shall be prepared and implemented in order to mitigate the flood water impacts due to the land use nature of the proposed development.

This section of the report identifies and discusses the strategies applicable to the subject site in accordance with ***The Bayside Councils DCP*** and ***Local Floodplain Risk Management Plan***.

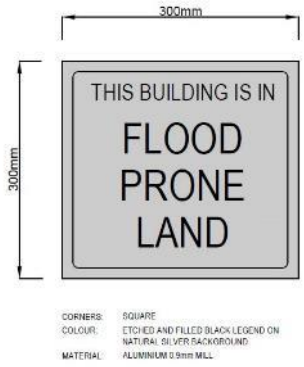
In reference to our Flood Modelling Results for the subject site (***Refer to Appendix A***), the PMF (Probable Maximum Flood) extent encompasses all frontages of the Proposed Dolls Point Café of No.179 Russell Street.

In the event of the PMF flood event, all frontages of the site will be cut off by the flood water. In this instance, offsite evacuation will no longer be practical. As such, **Shelter-In-Place strategy shall be implemented.**

The highest flood level during the PMF flood event within the subject site is RL2.80m AHD per Council Flood Advise Letter. The Proposed Ground Floor level at FFL 3.00mAHD is above the PMF flood level. Therefore, the Ground floor of proposed café will provide safe refuge area provided the building is constructed of flood compatible material for up to PMF Flood Level.

7.2 Signage

Personnel occupying and visiting the subject site shall be made aware of the 'flood prone' nature of this site, as well as the emergency evacuation routes during the 1% AEP event. As such, signages must be displayed at noticeable location. Signage(s) shown (as indicated below) shall be displayed and made visible to all personnel entering the building.



'FLOOD PRONE LAND' SIGNAGE
NTS

7.3 Procedure In Case Of Flooding

1. During floods, many local and major streets/ roads will be cut off by floodwaters that may make the escape by vehicle extremely difficult. Travelling through floodwaters on foot or in a vehicle can be very dangerous as obstructions can be hidden under the floodwaters, or you could be swept away, even if in a car, or the water may be polluted. **Council recommends staying within the building as much as practical as this is the safest option.**

If you urgently need to leave the building, do so early in the flood event & before the flood level reaches the top kerb at frontage of site.

2. Develop your own flood plan and be prepared if flooding should occur while the kids are coming home from school, or when you are returning from work. Make arrangements with neighbours or family members to look after children if there are no adults at home.

3. As flood levels appear to approach the ground floor level of the property:

a) Move important documents, personal effects, precious photographs and vital medical supplies to a safe and easily accessible place with your emergency flood kit.
b) Gather medicines, special requirements for babies or the elderly, mobile phones, first aid kit, special papers, battery operated torch and radio, fresh water, canned food and opener, waterproof clothing and small valuables into a backpack or bag in one location.
c) Locate your pets and gather any special requirements for them.
d) Put on strong shoes, raise any items within the property that may be damaged by water to as high a level as possible, with electrical items on top. Turn off any large electrical items at the power point that cannot be raised.

Note: Suitable storage areas may be on top of desks/tables/bench tops.

4. In the rare event that flood waters appear that they may enter the property:

a) Switch off electricity at switchboard.
b) Turn off gas at the meter.
c) Turn off water at the meter.
d) Block toilet bowls with a strong plastic bag filled with earth or sand.
e) Cover drains in showers, baths, laundries etc with a plastic bag filled with earth/ sand.

5. In the event that flood waters have risen up to the building, do not evacuate the building at this time unless instructed to do so by the SES or the Police. Floodwaters are much deeper, run much faster and are more dangerous outside.

6. Continue to monitor Bureau of Meteorology forecasts and warnings, listen to **ABC 702 radio**.

7. In the case of a medical or life threatening emergency, **PHONE 000** as normal, but explain about the flooding.

8. A laminated copy of this flood plan should be permanently attached to noticeboards and to the inside of the electrical meter box.

9. This flood management plan should be reviewed every 5 years, particularly with the potential sea level rise due to the greenhouse effect.

Important Phone Numbers	
State Emergency Service:	Emergency Phone - 132 500
Police, Fire, Ambulance:	Emergency Phone - 000
Bureau of Meteorology (Website):	http://www.bom.gov.au/weather
Land, Weather & Flood Warnings:	Phone - 1300 659 218

7.4 If You Need to Evacuate

- Pack warm clothing, essential medications, valuables, personal papers, mobile phones, photos and mementos in waterproof bags to be taken with your emergency kit
- Decide on how to look after your pets if you cannot take them with you
- Raise furniture, clothing and valuables on tables and shelf top spaces
- Empty freezers and refrigerators, leaving doors open
- Turn off power, water and gas
- Whether you leave or stay, put sandbags in the toilet bowl and over all laundry/bathroom drain holes to prevent sewage back-flow
- Lock your home and proceed to Russell Avenue.
- Don't drive in water of unknown depth and current
- Remember that walking through floodwaters is very dangerous.

7.5 After the Flood

- Stay tuned to ABC 702 on a battery powered radio for official advice and warnings
- Don't return home until authorities have said it is safe to do so
- Don't allow children to play in or near flood waters
- Avoid entering flood waters, it is dangerous. If you must, wear solid shoes and check depth and current with a stick
- Stay away from drains, culverts and water over knee-deep
- Don't turn on your gas and electricity until it has been checked by a professional/licensed repairer
- Avoid using gas or electrical appliances which have been in flood water until checked for safety
- Don't eat food that has been in flood waters
- Boil tap water until supplies have been declared safe
- Watch for trapped animals
- Beware of fallen power lines
- Take lots of photos for all damage for insurance purposes
- Notify family and friends of your whereabouts

8. CONCLUSIONS AND RECOMMENDATIONS

The Flood Planning Level for the PMF Flood Level applies to Proposed Dolls Point Café and was determined to be **MIN FFL2.80mAHD.** The 'Flood Planning Level' is to be no lower than PMF level to provide satisfactory 'shelter in place' evacuation.

The site has been classified as within **'Low' Hydraulic Hazard Category during 1% AEP**.

The **off-site flood impact to the neighbouring properties is negligible (*less than 10mm*)** as indicated in **Flood Impact Mapping** (***Appendix A Figure A.4, A.13 & A.22***). Hence, it is within Council's allowable impact and is deemed acceptable.

We note the following **Summary & Risk Assessment** measures which have been proposed and must be implemented to mitigate any potential flood risk(s):

- ***Proposed Habitable Floor Area for Dolls Point Café to be constructed at MINIMUM FFL2.80mAHD (PMF Level);***
- ***Adopted Habitable Floor Level FFL3.00mAHD;***
- ***Any proposed structures independent of the Proposed Dolls Point Café structure and located below the 1% AEP flood level + 500mm freeboard, must be of flood compatible building components;***
- ***All structural components of Proposed Dolls Point Café up to PMF Flood Level (RL2.80m AHD) are to be constructed with flood-compatible materials and should withstand the forces of floodwater debris, wave action, buoyancy and immersion for a prolonged duration;***
- ***All proposed structures/foundation earthworks of the proposed building structure to be designed and certified by structural engineer/geotechnical engineer to withstand the force of floodwater, debris and buoyancy up to and including RL2.80m AHD;***
- ***'Flood Warning Sign' to be installed in an appropriate location to inform customers/occupants of the danger of imminent flooding;***
- ***All goods and materials that may cause pollution or are potentially hazardous must be stored above the Flood Planning Level of RL2.75m AHD (1%AEP + 500mm freeboard);***
- ***All new electrical equipment and wirings are to be above Flood Planning Level of RL2.75m AHD or waterproofed;***

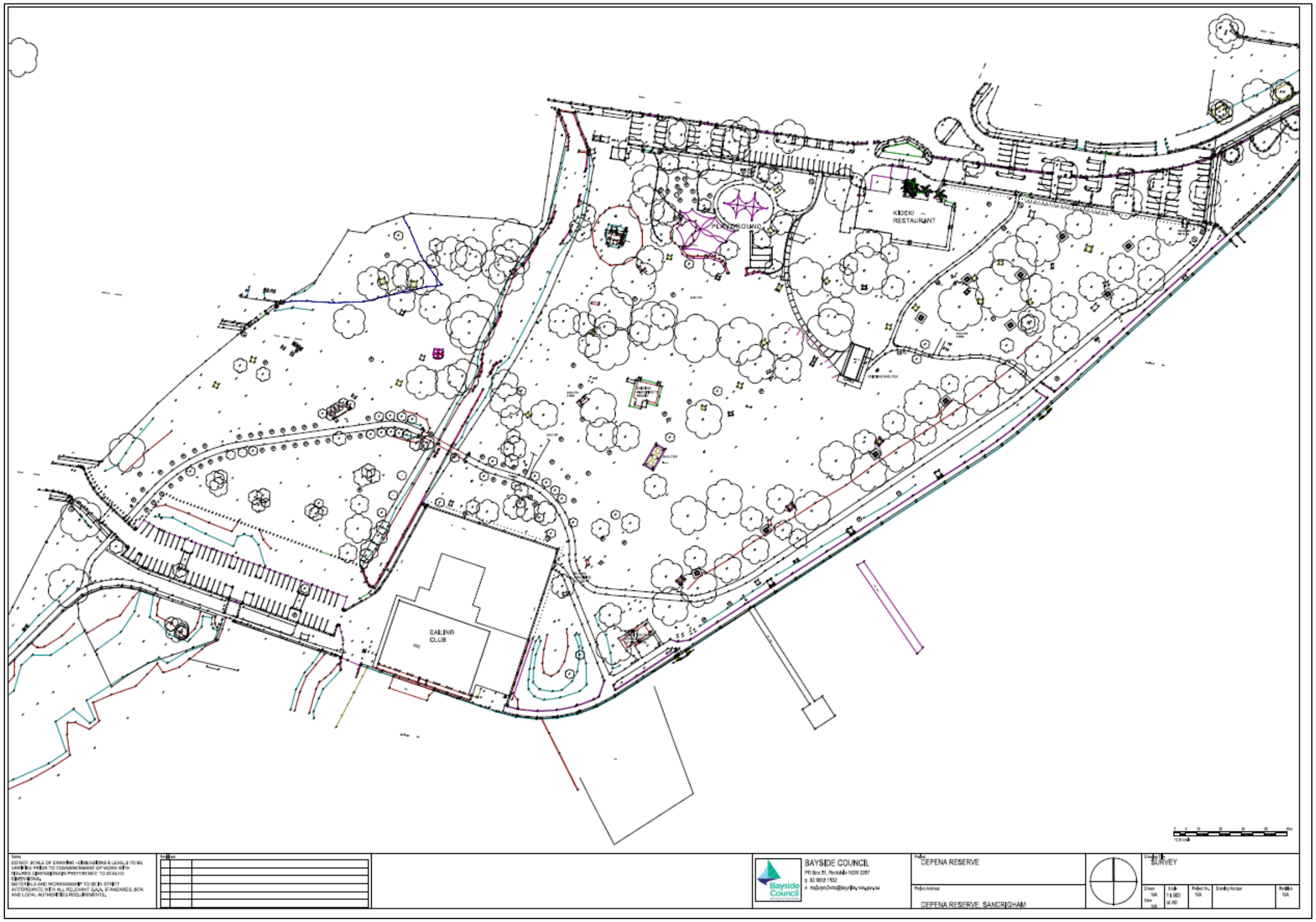
As stated above, there is no direct impact nor exacerbation of the catchment flood characteristics during the 1% AEP (100YR ARI) and the PMF storm event.

9. REFERENCES

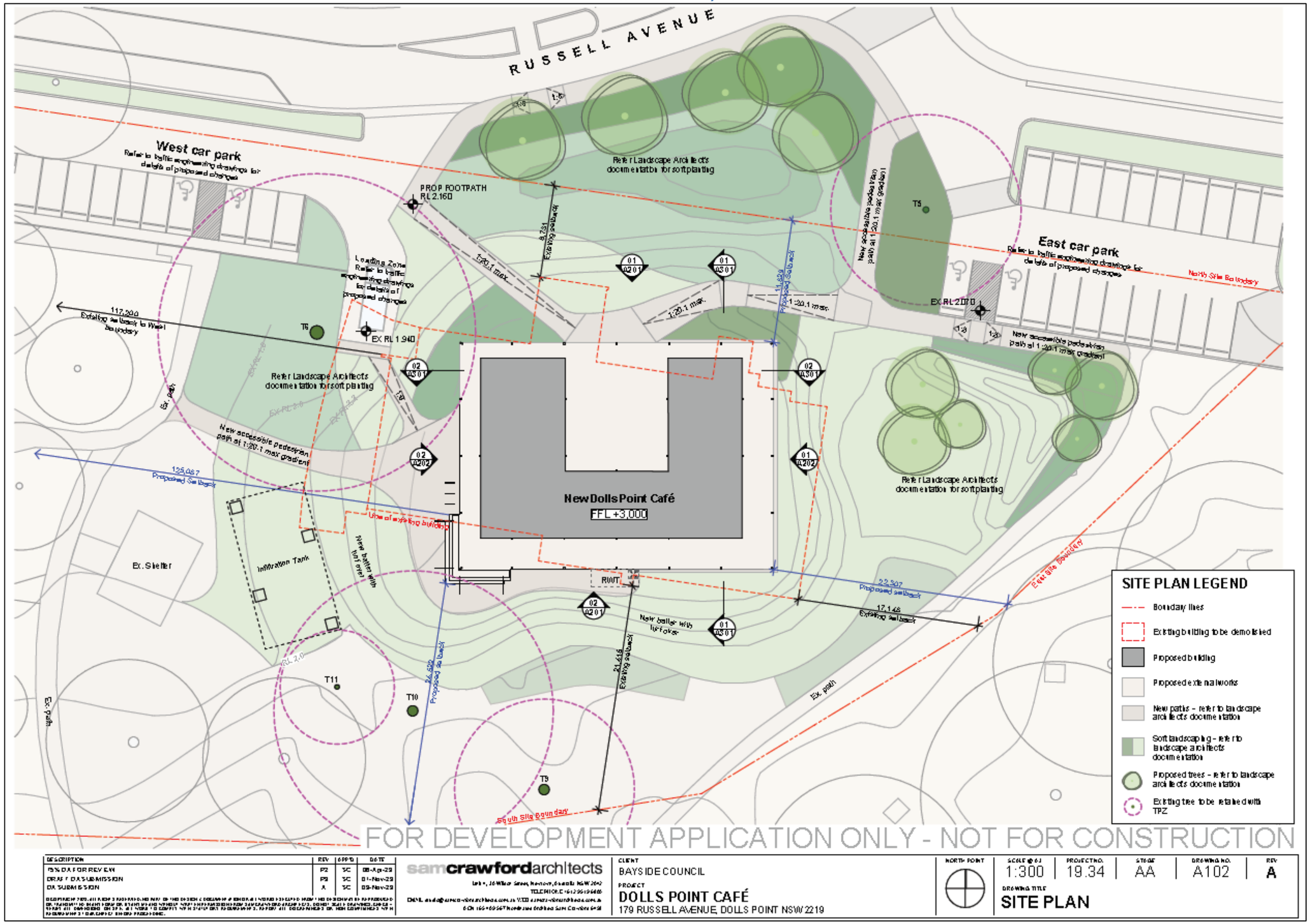
The following documents have been referred in this Overland Flow Study:

1. *Site Survey Plan provided by 'Bayside Council'*
2. *Architectural Plans prepared by 'Sam Crawford Architects'*
3. *NSW Government Flood Risk Management Manual (2023)*
4. *The Bayside Council DCP 2022 – Part 3, Section 10 & Part 9 Section 5*
5. *Flood Information Plan provided Bayside Council dated 25th November 2019*
6. *Australian Rainfall and Runoff (AR&R 1987/1998)*
7. *'Sans Souci' TUFLOW Flood Model provided by 'Bayside Council'*

APPENDIX A1


KIOSK/
RESTAURANT
SAILING
CLUB
BAYSIDE COUNCIL
CEPENA RESERVE
CEPENA RESERVE, SANDRINGHAM
SURVEY

Item 1.1.1: Survey Plan



FOR DEVELOPMENT APPLICATION ONLY - NOT FOR CONSTRUCTION

DESCRIPTION	REV	APPD	DATE
75% DRAFT FOR REVIEW	P2	SC	08-Aug-22
DRAFT DA SUBMISSION	P3	SC	01-Nov-22
DA SUBMISSION	A	SC	09-Nov-22

samcrawfordarchitects

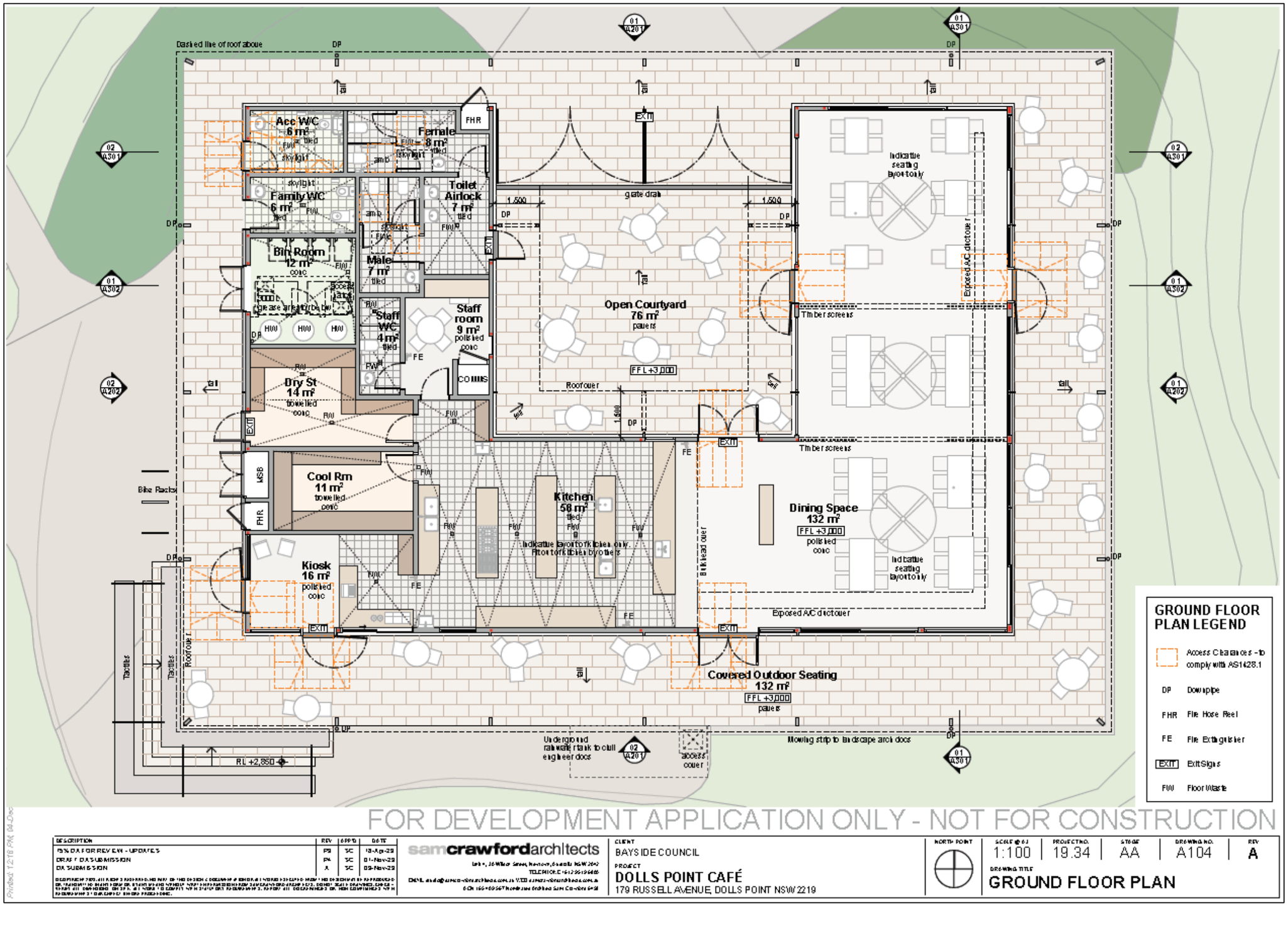
CLIENT: BAYSIDE COUNCIL

PROJECT: DOLLS POINT CAFÉ
179 RUSSELL AVENUE, DOLLS POINT NSW 2219

NORTH POINT | SCALE @ A3: 1:300 | PROJECT NO.: 19.34 | STAGE: AA | DRAWING NO.: A102 | REV: A

DRAWING TITLE: SITE PLAN

Item 1.1.2: Site Plan



FOR DEVELOPMENT APPLICATION ONLY - NOT FOR CONSTRUCTION

DESCRIPTION	REV	APP'D	DATE
75% DA FOR REVIEW - UPDATES	P2	SC	18-Aug-21
DRAFT DA SUBMISSION	P1	SC	01-Nov-21
DA SUBMISSION	A	SC	09-Nov-21

samcrawfordarchitects

CLIENT
BAYSIDE COUNCIL

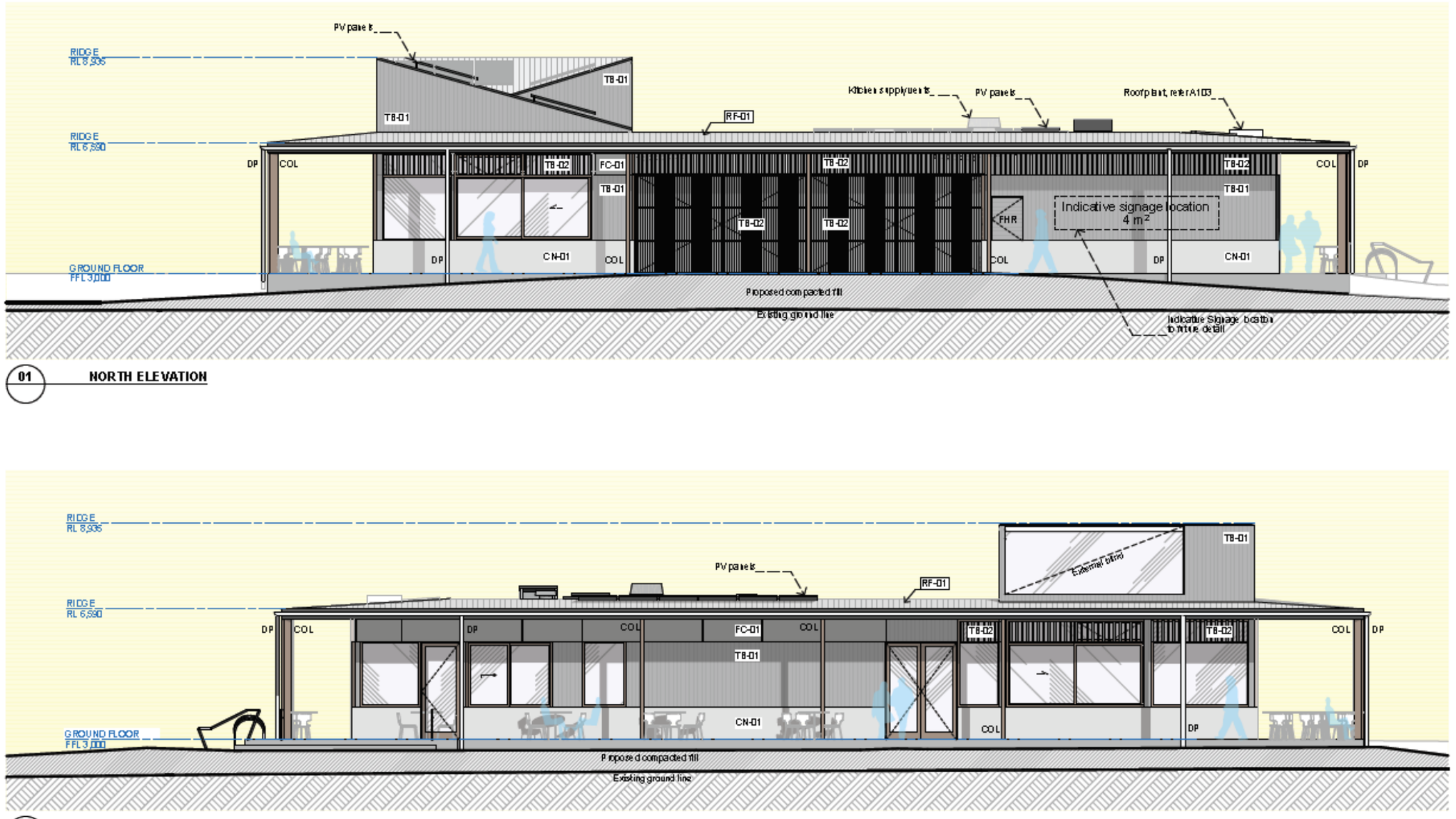
PROJECT
DOLLS POINT CAFÉ
179 RUSSELL AVENUE, DOLLS POINT NSW 2219

NORTH POINT

SCALE @ A3	PROJECT NO.	STAGE	DRAWING NO.	REV
1:100	19.34	AA	A104	A

DRAWING TITLE
GROUND FLOOR PLAN

Item 1.1.3: Proposed Ground Floor Plan



01 **NORTH ELEVATION**

02 **SOUTH ELEVATION**

ELEVATIONS & SECTIONS LEGEND
Refer to A401 External Materials Palette for external materials & finishes
DP Downpipe FHR Fire Hose Reel COL Structural Columns

FOR DEVELOPMENT APPLICATION ONLY - NOT FOR CONSTRUCTION

DESCRIPTION	REV	APPD	DATE
75% DA FOR REVIEW	P2	SC	08-Aug-29
DRAFT DA SUBMISSION	P3	SC	01-Nov-29
DA SUBMISSION	A	SC	09-Nov-29

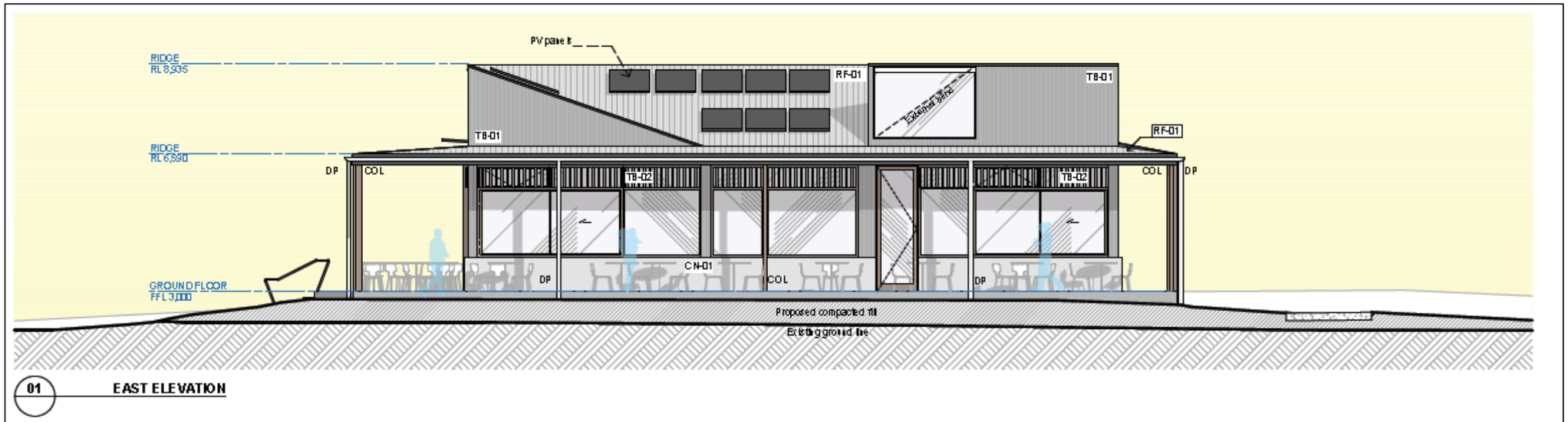
samcrawfordarchitects
Unit 1, 16 Wilson Street, Newtown, Sydney NSW 2042
TELEPHONE +61 2 9519 5605
EMAIL studio@samcrawfordarchitects.com.au WEB samcrawfordarchitects.com.au
ACN 165 659 567 Nominated Architect Sam Crawford 6958

CLIENT: BAYSIDE COUNCIL
PROJECT: **DOLLS POINT CAFÉ**
179 RUSSELL AVENUE, DOLLS POINT NSW 2219

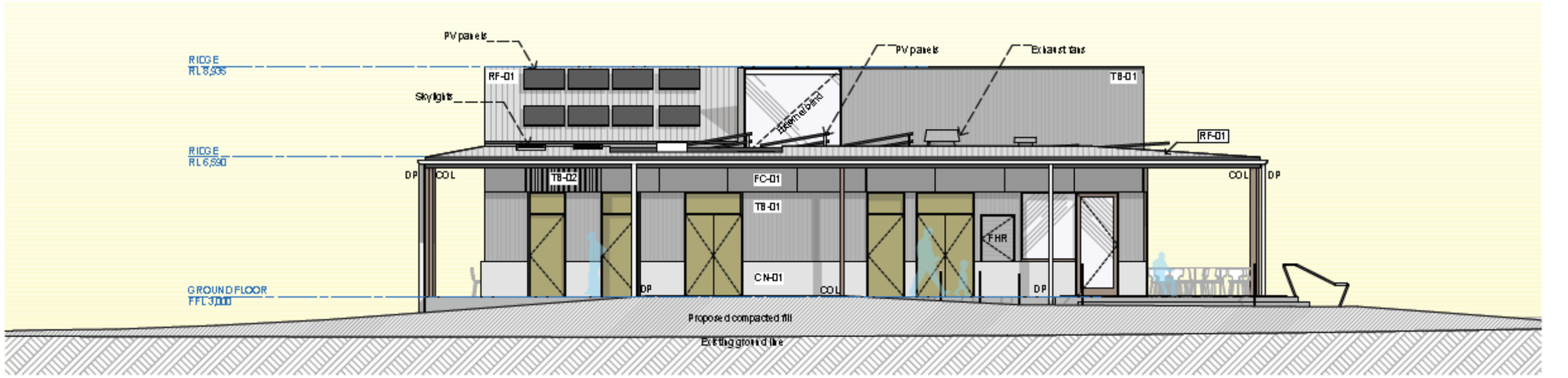
NORTH POINT | SCALE @ A3: 1:100 | PROJECT NO.: 19.34 | STAGE: AA | DRAWING NO.: A201 | REV: A

DRAWING TITLE: **NORTH & SOUTH ELEVATIONS**

Item 1.1.4: Elevation Sections



01 EAST ELEVATION



02 WEST ELEVATION

ELEVATIONS & SECTIONS LEGEND

Refer to A401 External Materials Palette for external materials & finishes

DP Downpipe FHR Fire Hose Reel COL Structural Columns

FOR DEVELOPMENT APPLICATION ONLY - NOT FOR CONSTRUCTION

DESCRIPTION	REV	APP'D	DATE
75% DA FOR REVIEW	P2	SC	08-Aug-23
DRAFT DA SUBMISSION	P3	SC	01-Nov-23
DA SUBMISSION	A	SC	09-Nov-23

samcrawfordarchitects

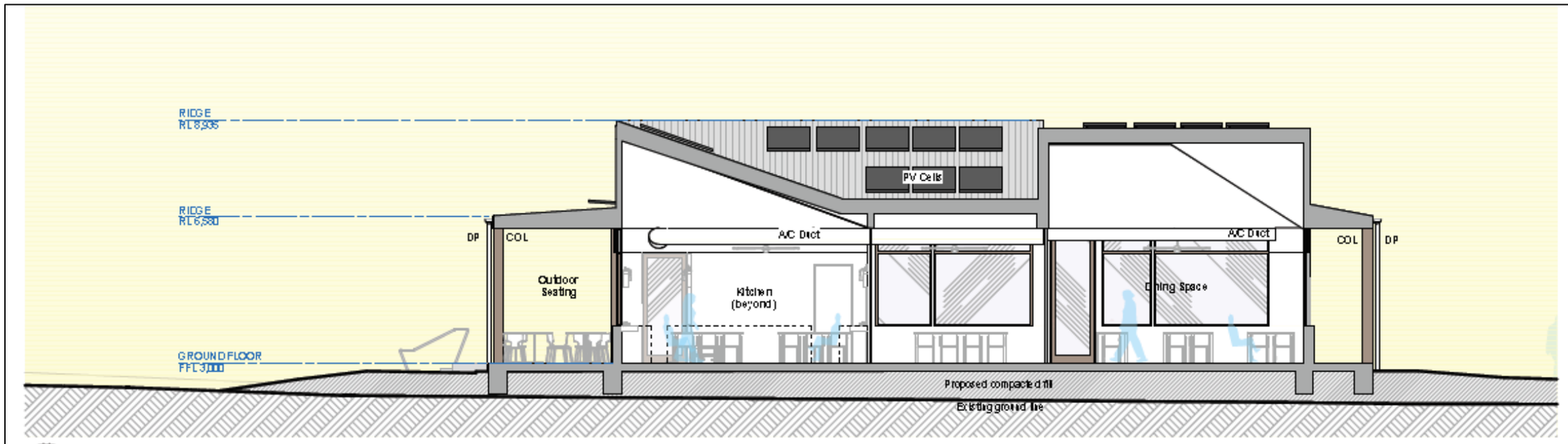
CLIENT: BAYSIDE COUNCIL

PROJECT: DOLLS POINT CAFÉ
179 RUSSELL AVENUE, DOLLS POINT NSW 2219

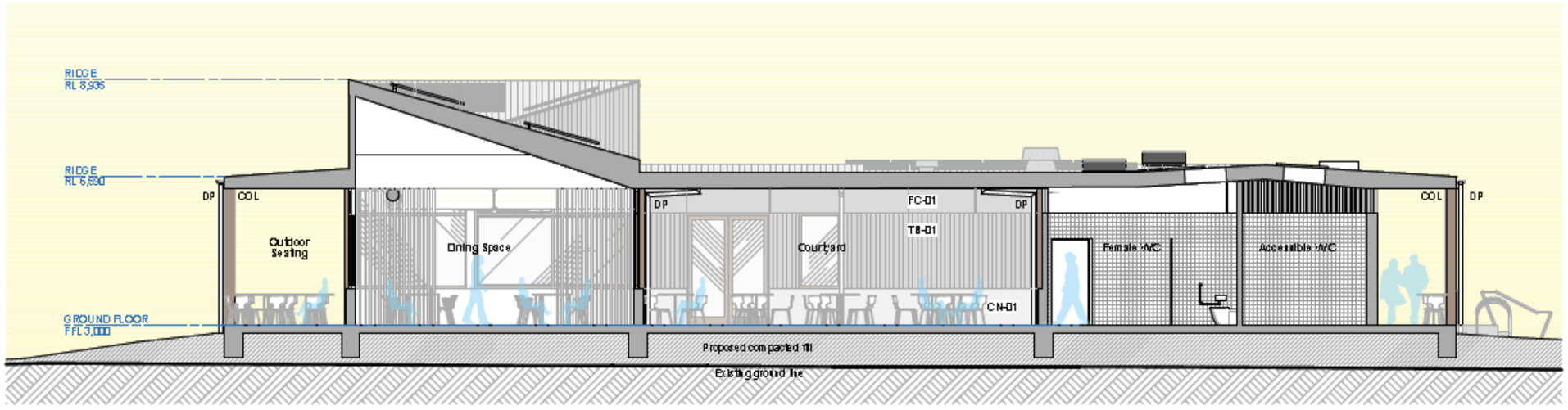
NORTH POINT | SCALE @ A3: 1:100 | PROJECT NO.: 19.34 | STAGE: AA | DRAWING NO.: A202 | REV: A

DRAWING TITLE: EAST & WEST ELEVATIONS

Item 1.1.5: Elevation Section



01 NORTH-SOUTH SECTION A



02 EAST-WEST SECTION B

ELEVATIONS & SECTIONS LEGEND

Refer to A401 External Materials Palette for external materials & finishes

DP Downpipe FHR Fire Hose Reel COL Structural Columns

FOR DEVELOPMENT APPLICATION ONLY - NOT FOR CONSTRUCTION

DESCRIPTION	REV	APP'D	DATE
15% DA FOR REVIEW	P2	SC	08-Aug-23
DRAFT DA SUBMISSION	P3	SC	01-Nov-23
DA SUBMISSION	A	SC	03-Nov-23

samcrawfordarchitects

CLIENT: BAYSIDE COUNCIL

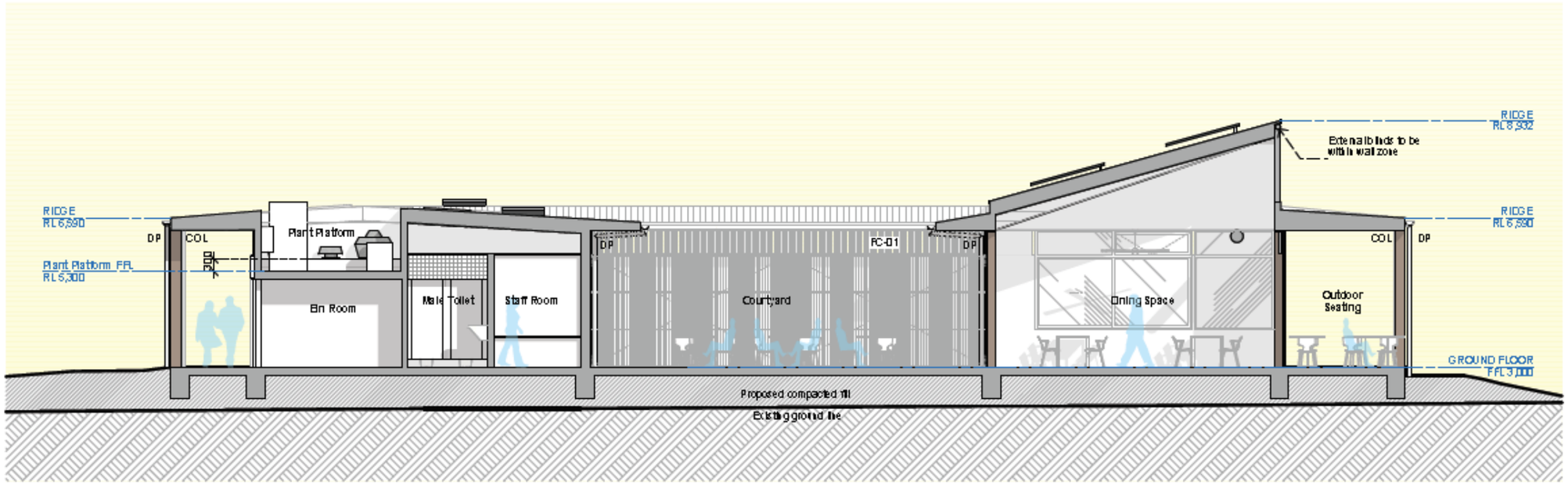
PROJECT: DOLLS POINT CAFÉ
179 RUSSELL AVENUE, DOLLS POINT NSW 2219

NORTH POINT

SCALE @ A3	PROJECT NO.	STAGE	DRAWING NO.	REV
1:100	19.34	AA	A301	A

DRAWING TITLE: SECTIONS A & B

Item 1.1.6: Elevation Section



01 **EAST-WEST SECTION C**

ELEVATIONS & SECTIONS LEGEND
Refer to A401 External Materials Palette for external materials & finishes
DP Downpipe FHR Fire Hose Reel COL Structural Columns

DESCRIPTION	REV	APPD	DATE
75% DA FOR REVIEW	P1	SC	08-Aug-22
DRAFT DA SUBMISSION	P2	SC	01-Nov-22
DA SUBMISSION	A	SC	09-Nov-22

samcrawfordarchitects
Unit 1, 36 Wilson Street, Newtown, Sydney, NSW 2042
TELEPHONE +61 2 9519 9488
EMAIL studio@samcrawfordarchitects.com.au WEB samcrawfordarchitects.com.au
ACN 165 469 567 Nominated Architect Sam Crawford 6458

CLIENT
BAYSIDE COUNCIL

PROJECT
DOLLS POINT CAFÉ
179 RUSSELL AVENUE, DOLLS POINT NSW 2219

NORTH POINT

SCALE @ A3	PROJECT NO.	STAGE	DRAWING NO.	REV
1:100	19.34	AA	A302	A

DRAWING TITLE
SECTION C

Item 1.1.7: Elevation Section

APPENDIX A2

TUFLOW Flood Modelling Flood Result Mapping for Pre & Post Development
(Prepared by Quantum Engineers)

Flood Mapping

QUANTUM ENGINEERS
Suite 401, 5-9 Devlin Street,
RYDE, NSW 2112
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au

Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.

North:

Scale:
0 100 200 m

Title:
UPSTREAM CATCHMENT AREA

QUANTUM ENGINEERS
Suite 7A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au

Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.

North:

Scale:
0 10 20 m

Title:
1% AEP Pre-Development Flood Depth

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 10 20 m

Title:
1% AEP Post Development Flood Depth

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

Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.

North:

Scale:
0 10 20 m

Title:
1% AEP Flood Level Afflux

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

Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.

North:

Scale:
0 10 20 m

Title:
1% AEP Pre-Development Flood Velocity

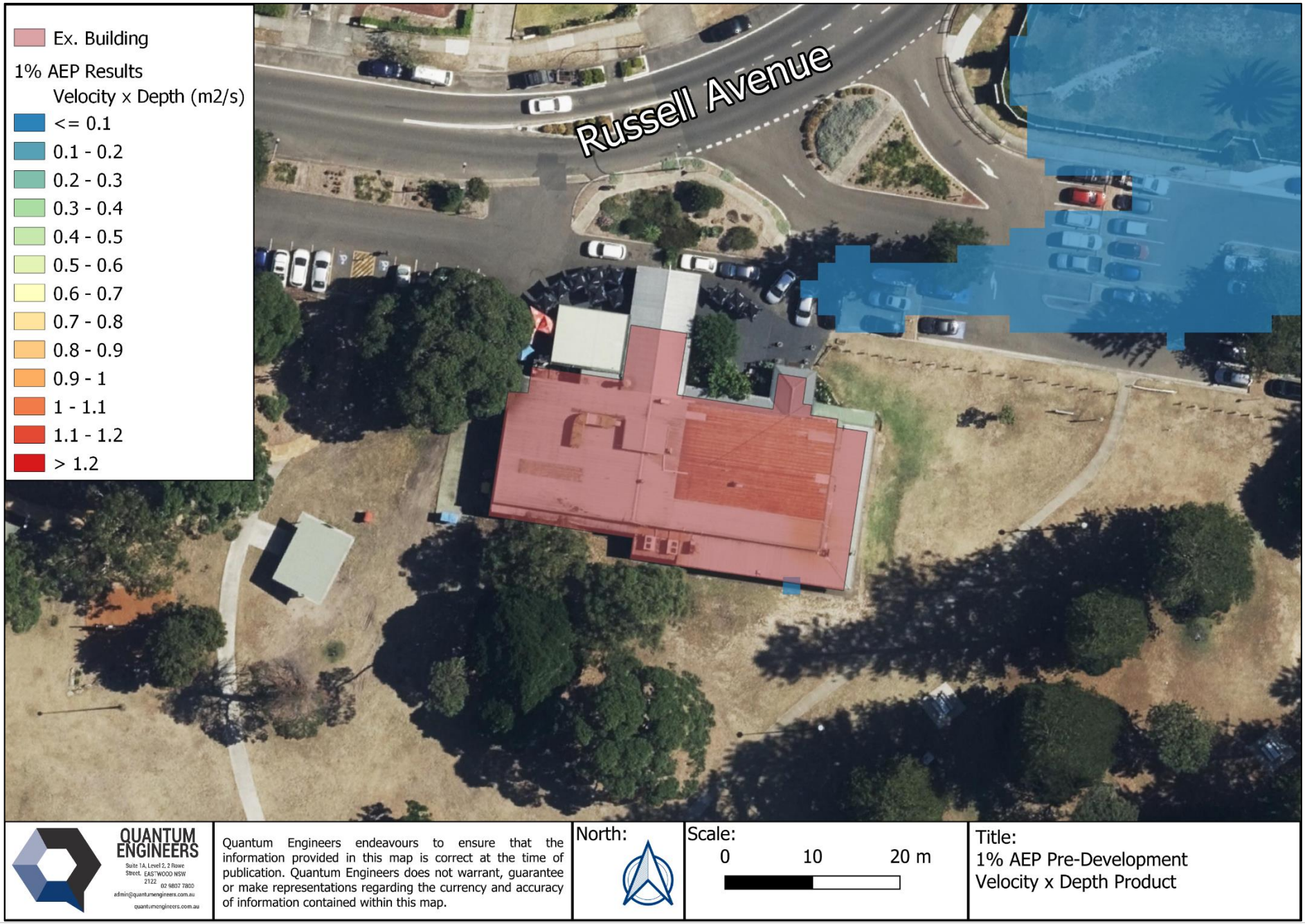
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au

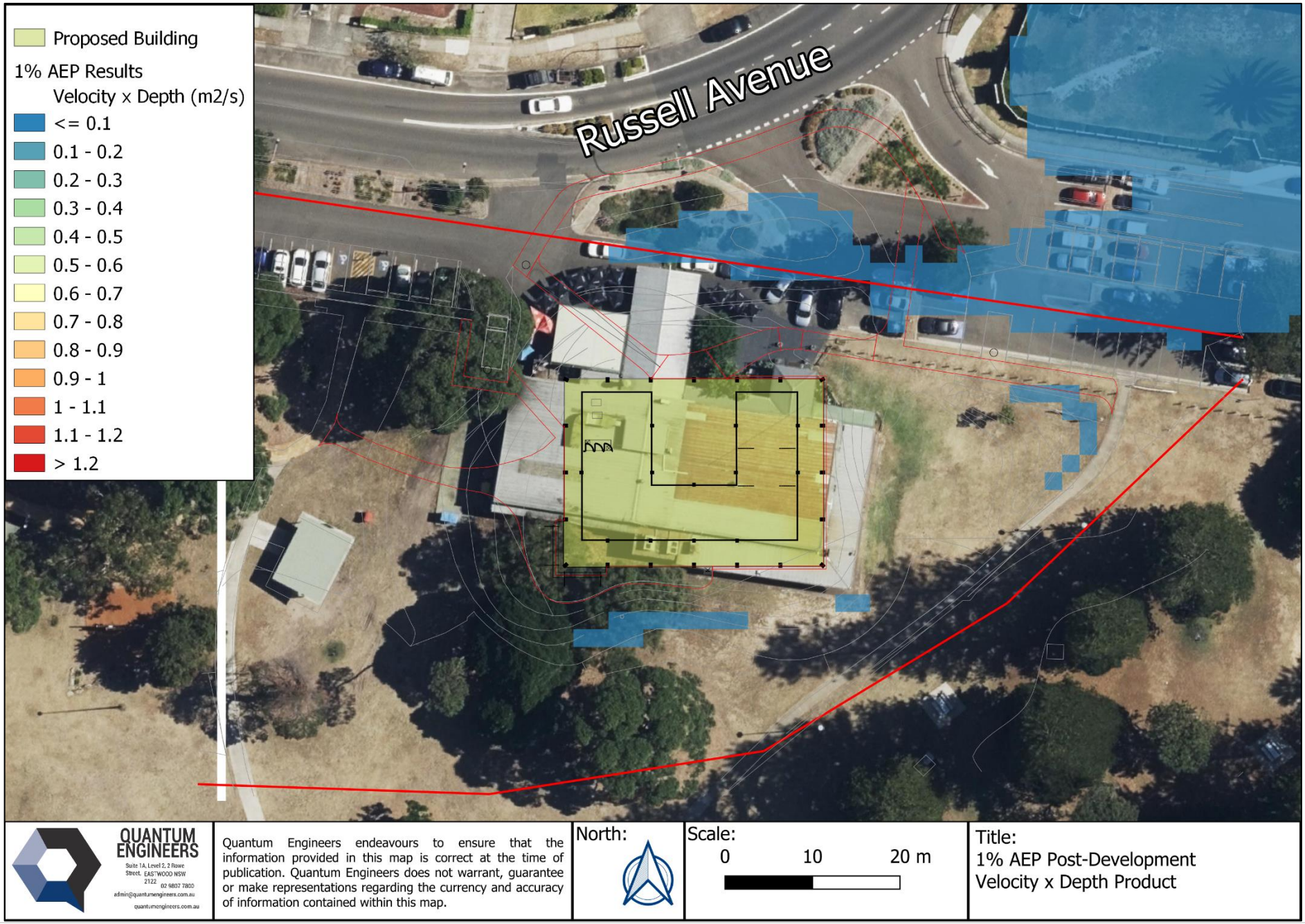
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.

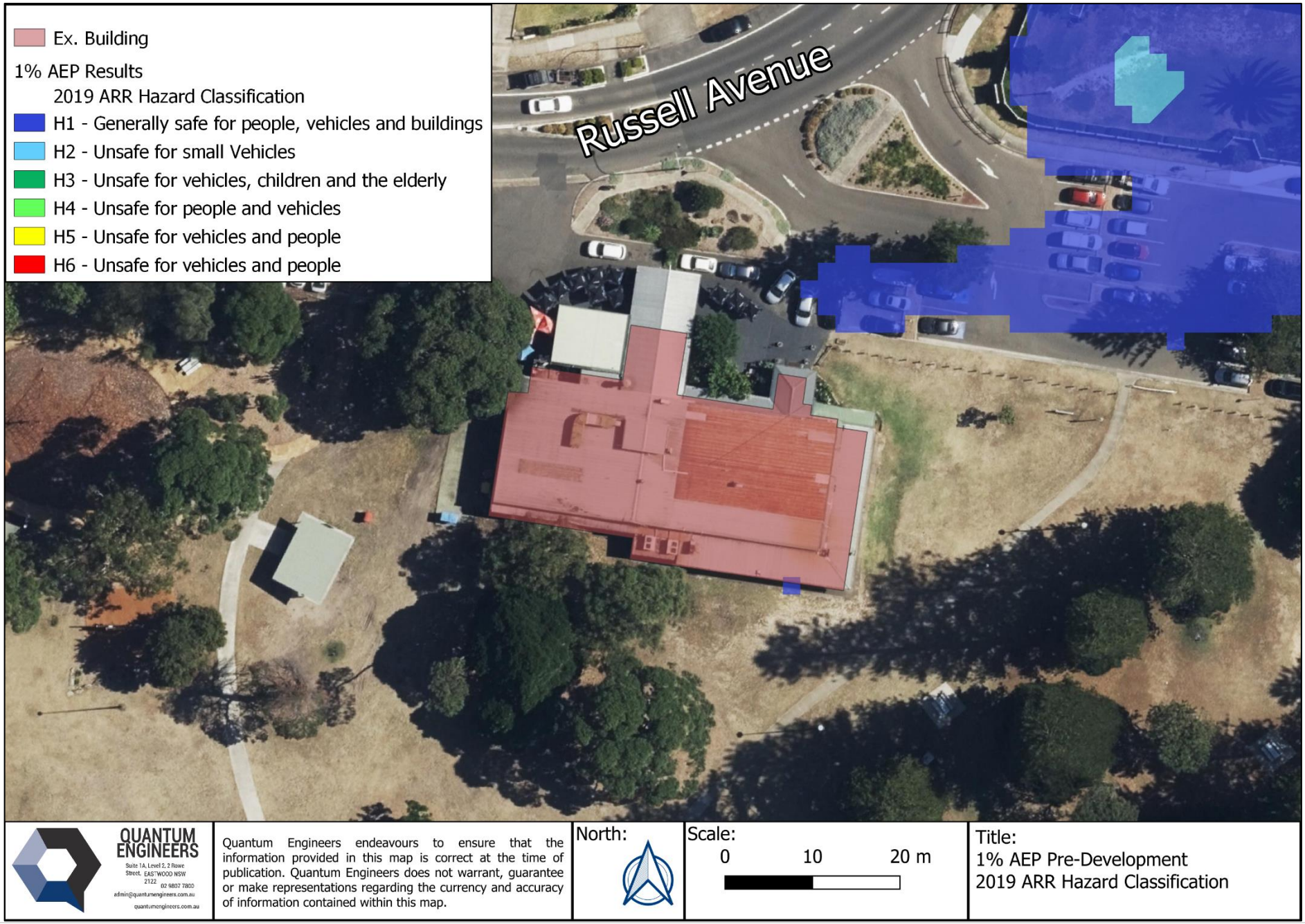
North:

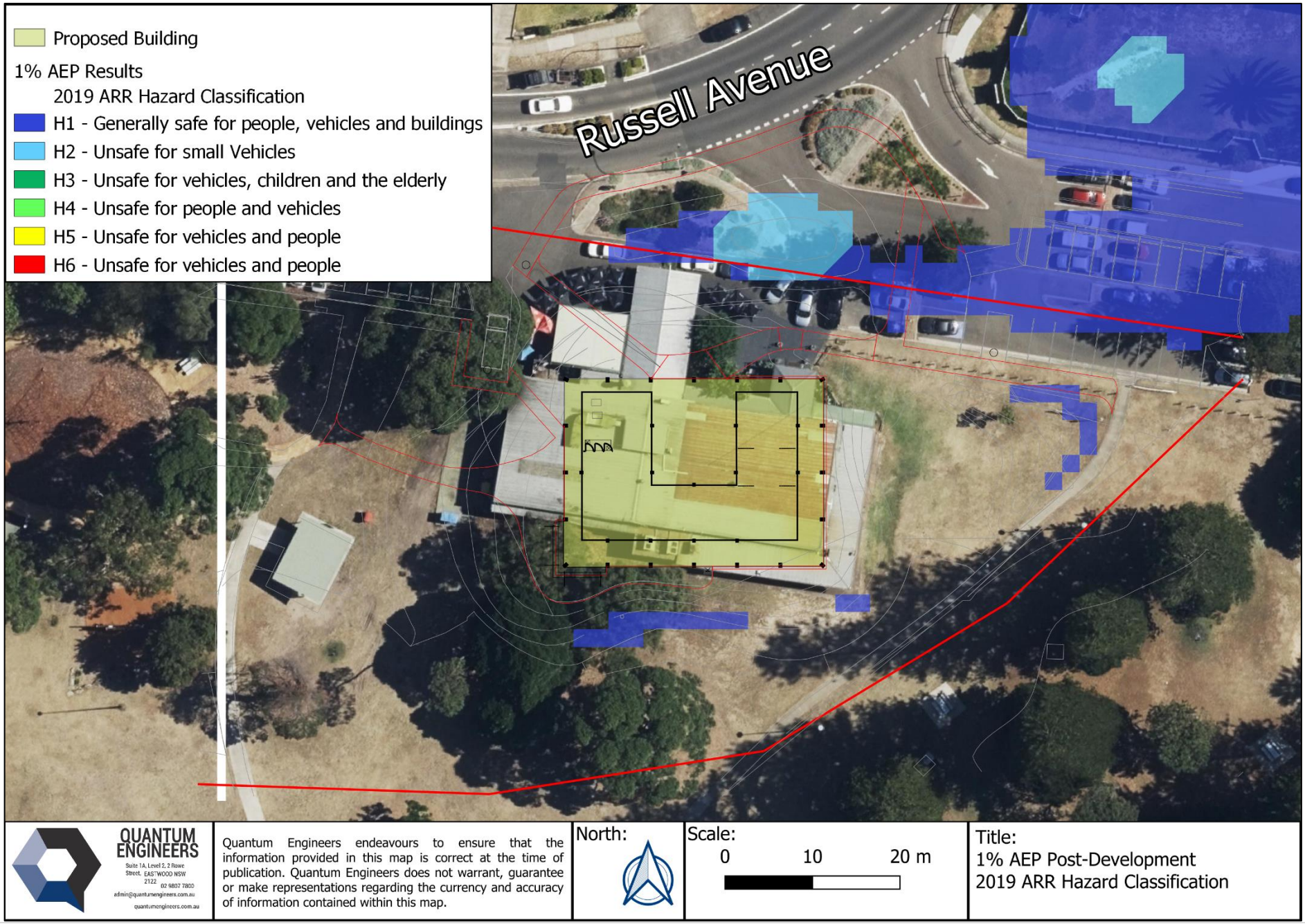
Scale:
0 10 20 m

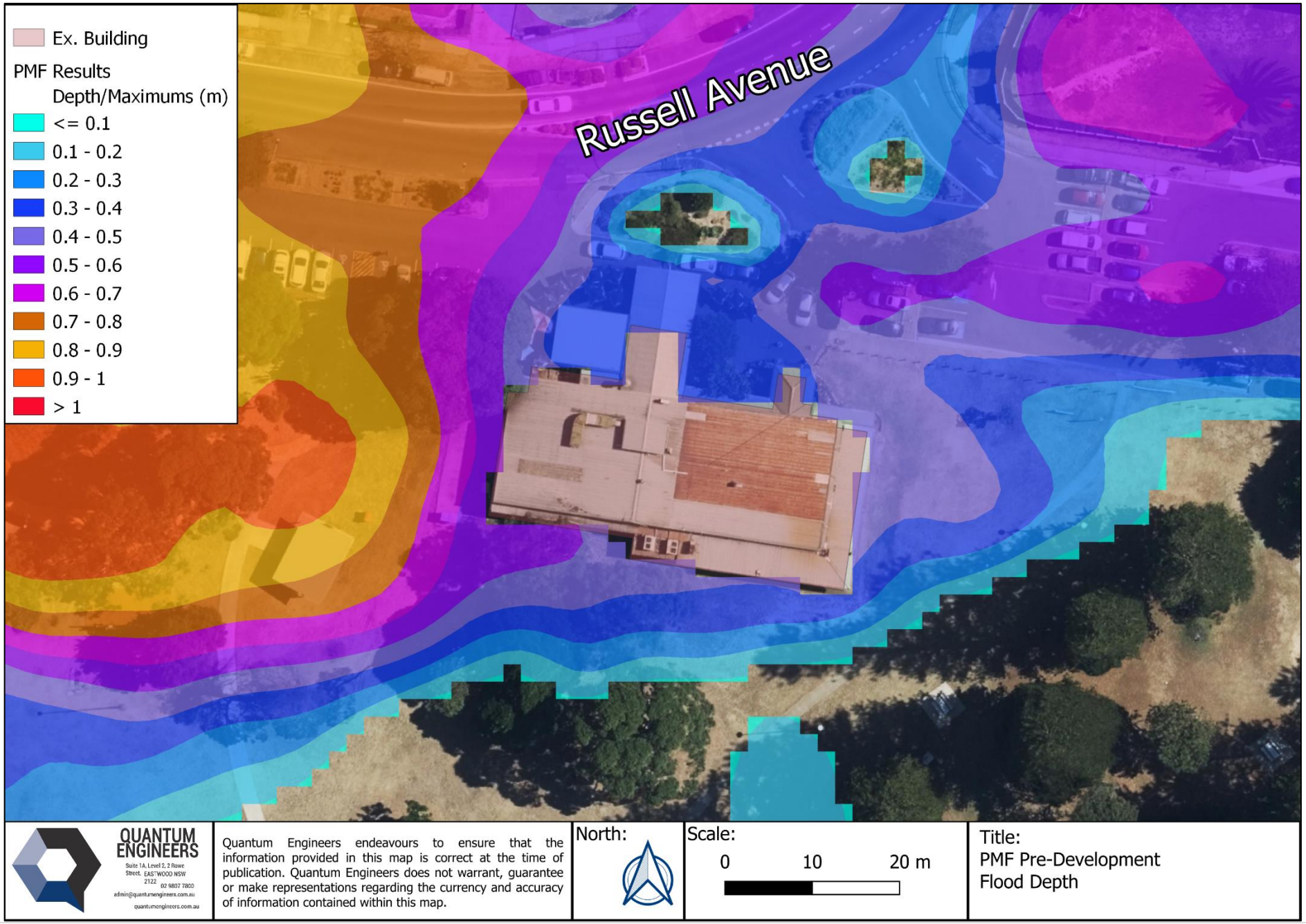
Title:
1% AEP Post Development Flood Velocity

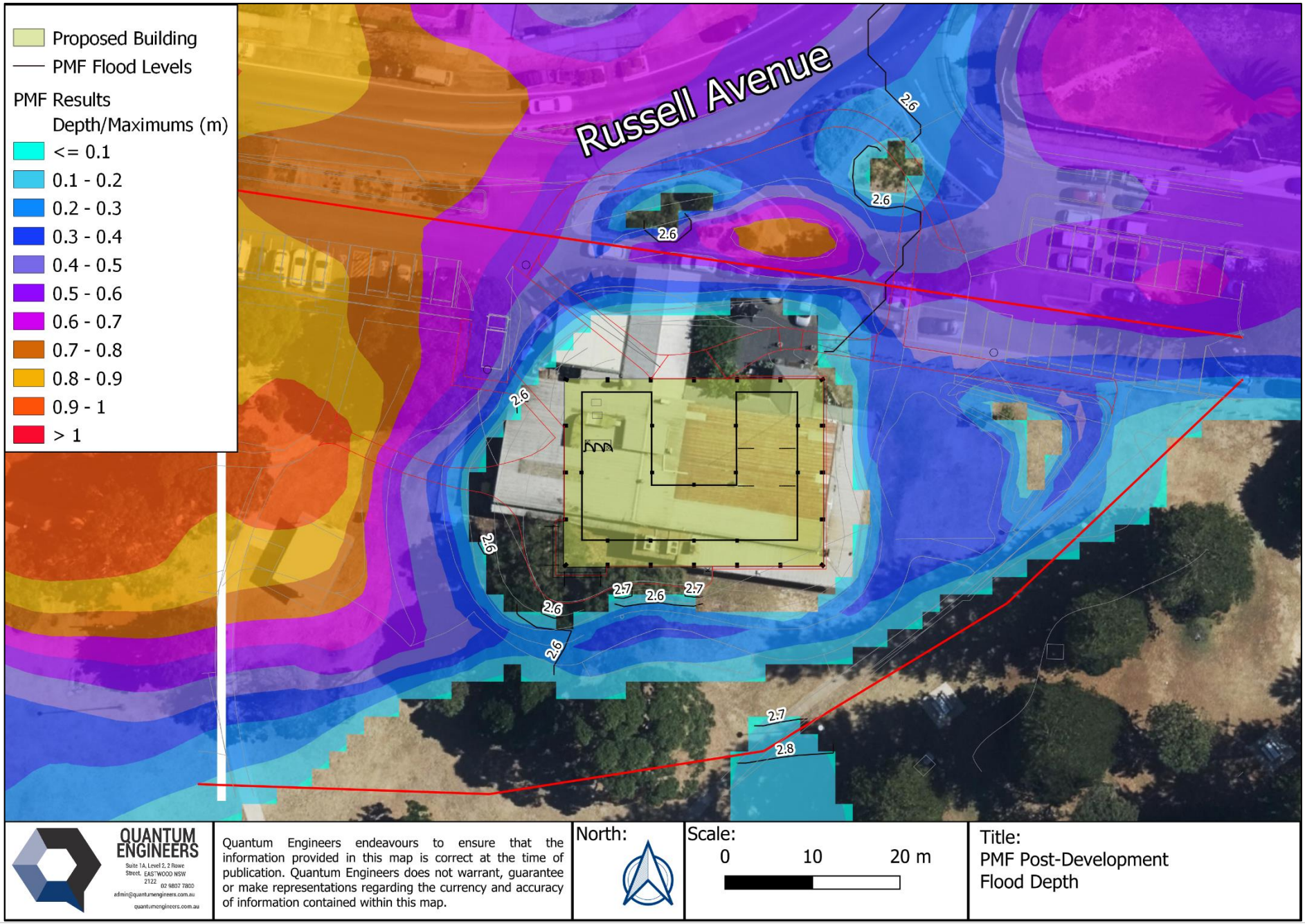

Ex. Building
1% AEP Results
Velocity x Depth (m2/s)
<= 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
0.5 - 0.6
0.6 - 0.7
0.7 - 0.8
0.8 - 0.9
0.9 - 1
1 - 1.1
1.1 - 1.2
> 1.2
Russell Avenue
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
1% AEP Pre-Development
Velocity x Depth Product

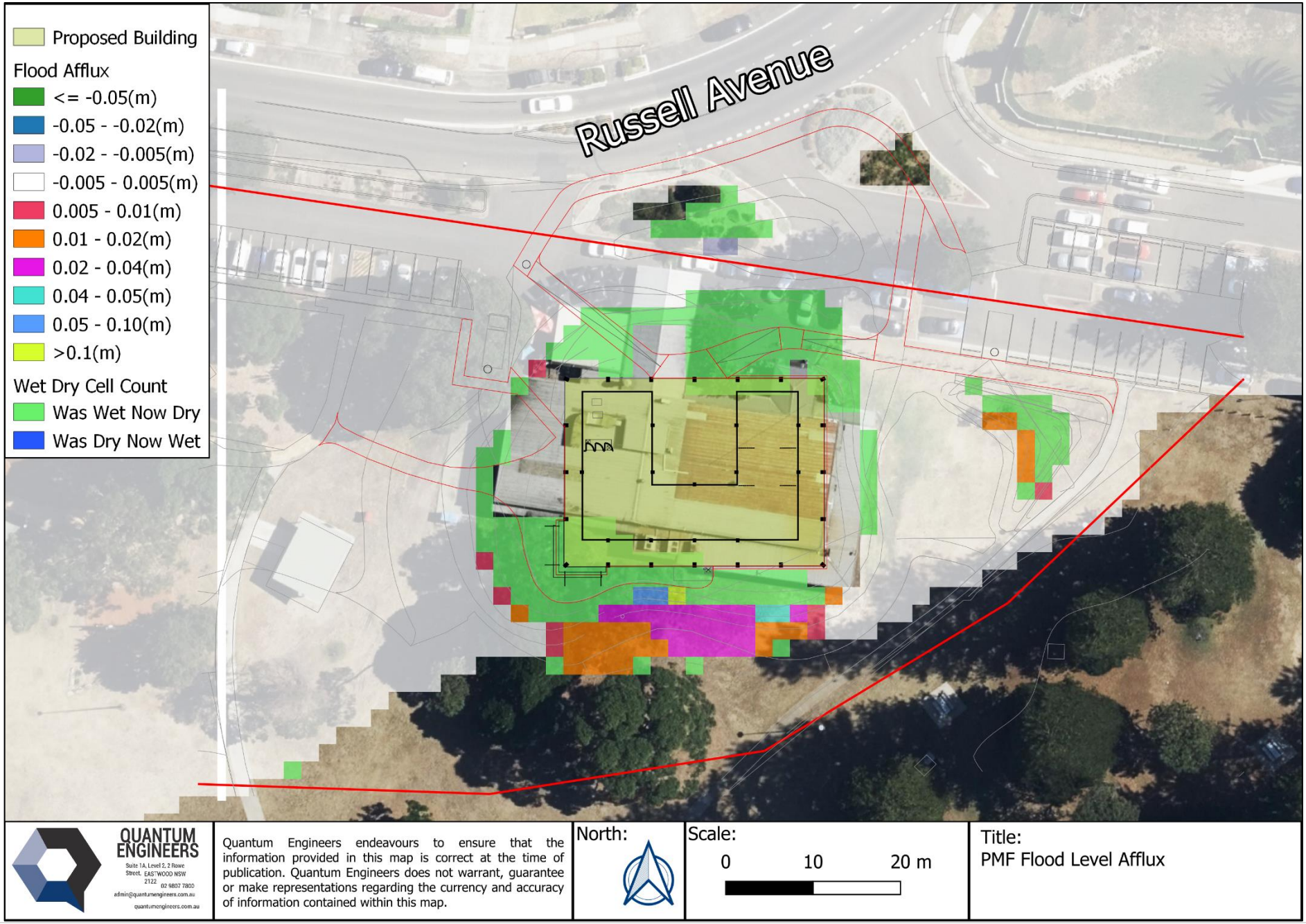

Proposed Building
1% AEP Results
Velocity x Depth (m2/s)
<= 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
0.5 - 0.6
0.6 - 0.7
0.7 - 0.8
0.8 - 0.9
0.9 - 1
1 - 1.1
1.1 - 1.2
> 1.2
Russell Avenue
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
1% AEP Post-Development
Velocity x Depth Product

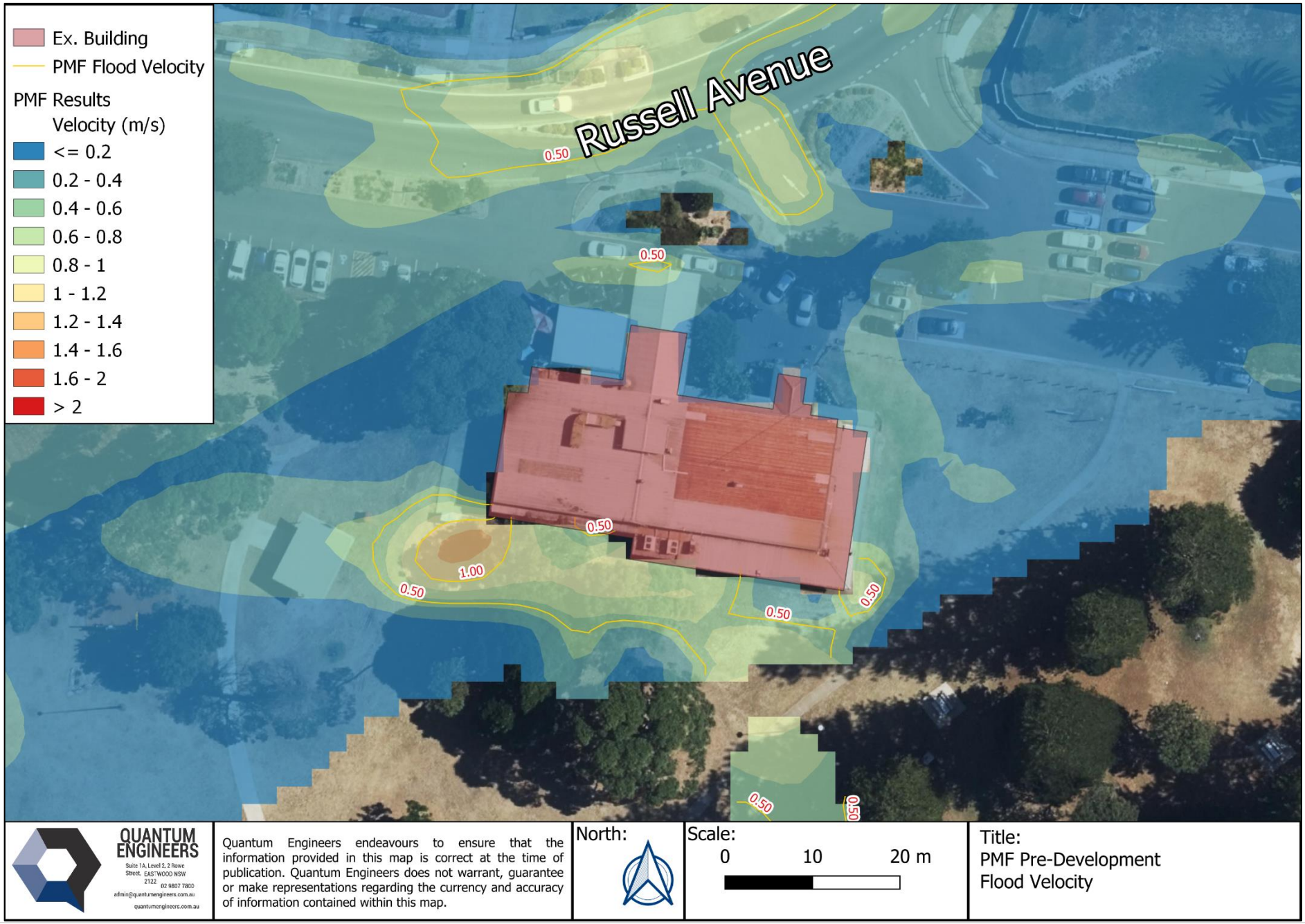

Ex. Building
1% AEP Results
2019 ARR Hazard Classification
H1 - Generally safe for people, vehicles and buildings
H2 - Unsafe for small Vehicles
H3 - Unsafe for vehicles, children and the elderly
H4 - Unsafe for people and vehicles
H5 - Unsafe for vehicles and people
H6 - Unsafe for vehicles and people
Russell Avenue
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
1% AEP Pre-Development
2019 ARR Hazard Classification

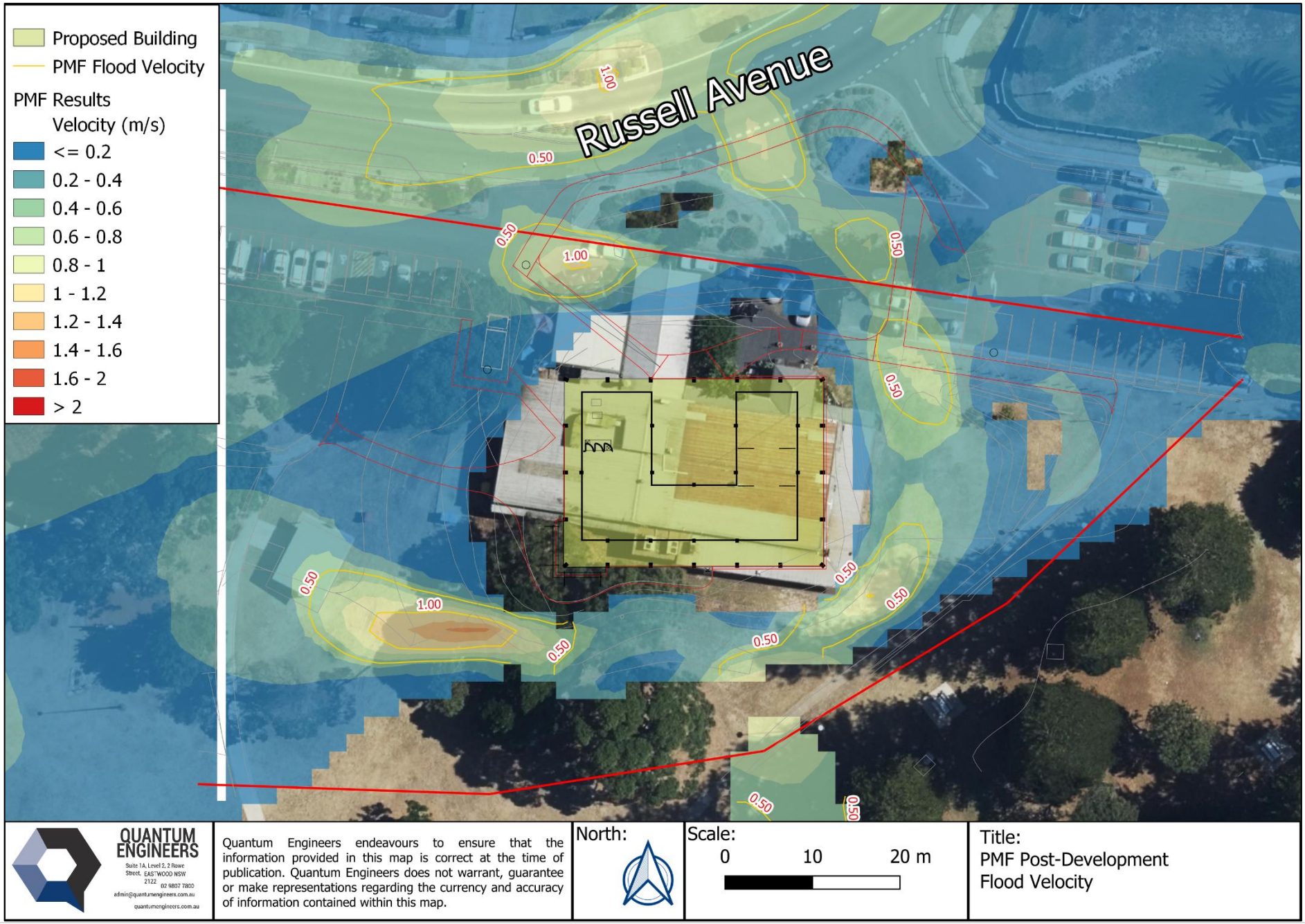

Proposed Building
1% AEP Results
2019 ARR Hazard Classification
H1 - Generally safe for people, vehicles and buildings
H2 - Unsafe for small Vehicles
H3 - Unsafe for vehicles, children and the elderly
H4 - Unsafe for people and vehicles
H5 - Unsafe for vehicles and people
H6 - Unsafe for vehicles and people
Russell Avenue
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
1% AEP Post-Development
2019 ARR Hazard Classification

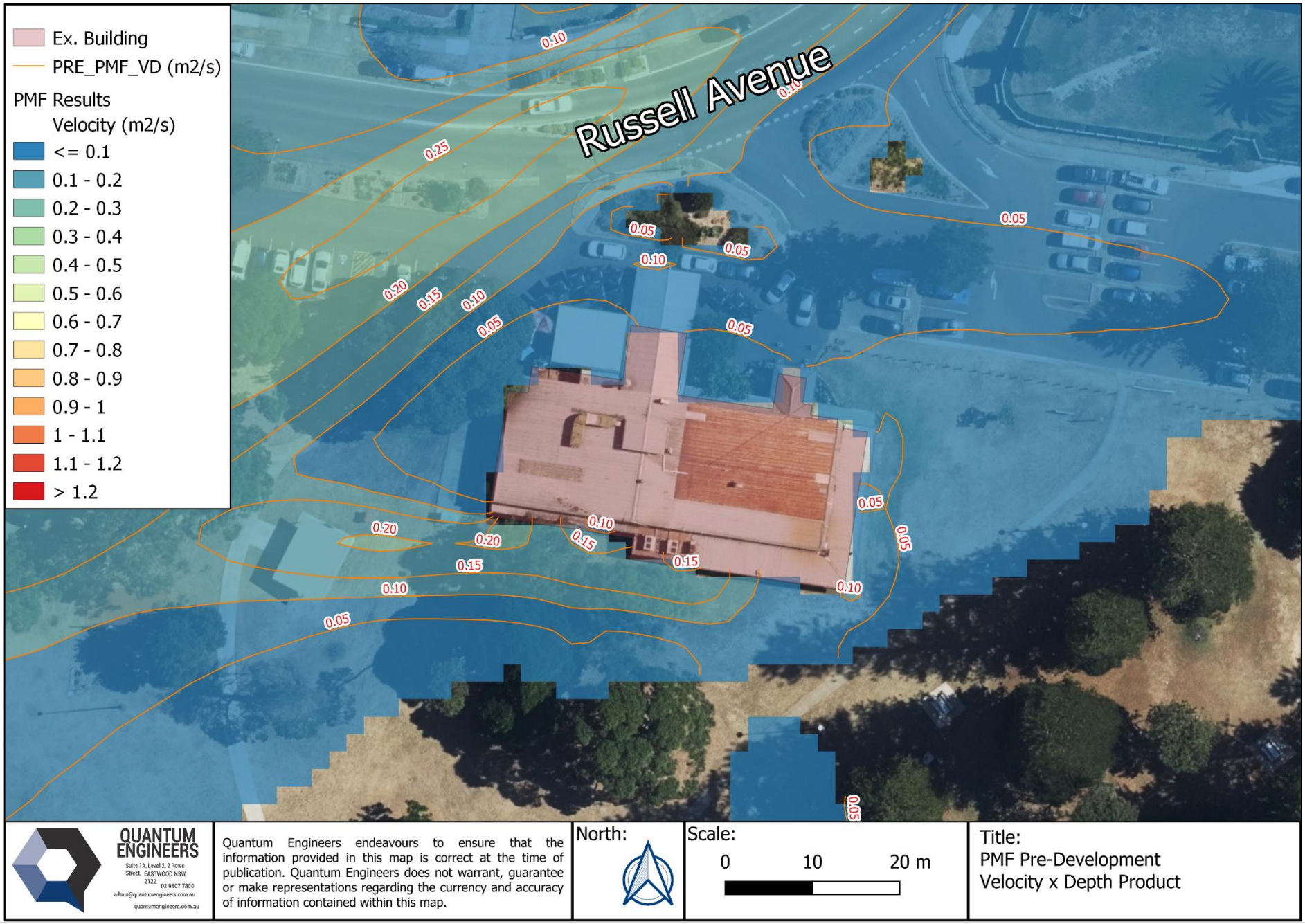

Ex. Building
PMF Results
Depth/Maximums (m)
<= 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
0.5 - 0.6
0.6 - 0.7
0.7 - 0.8
0.8 - 0.9
0.9 - 1
> 1
Russell Avenue
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
PMF Pre-Development
Flood Depth

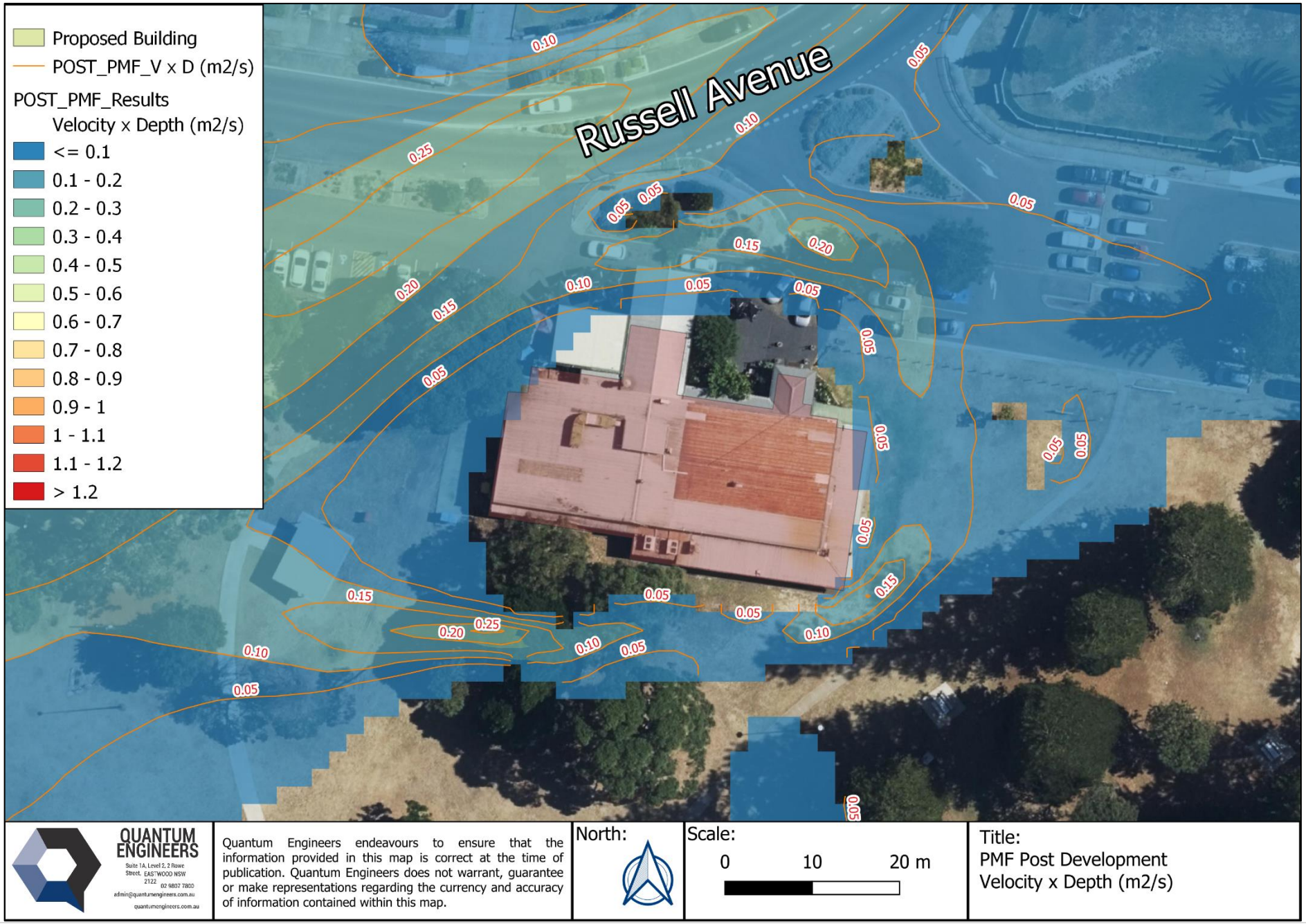

Proposed Building
PMF Flood Levels
PMF Results
Depth/Maximums (m)
<= 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
0.5 - 0.6
0.6 - 0.7
0.7 - 0.8
0.8 - 0.9
0.9 - 1
> 1
Russell Avenue
2.6
2.6
2.6
2.6
2.6
2.7
2.6
2.7
2.6
2.6
2.7
2.8
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
PMF Post-Development
Flood Depth

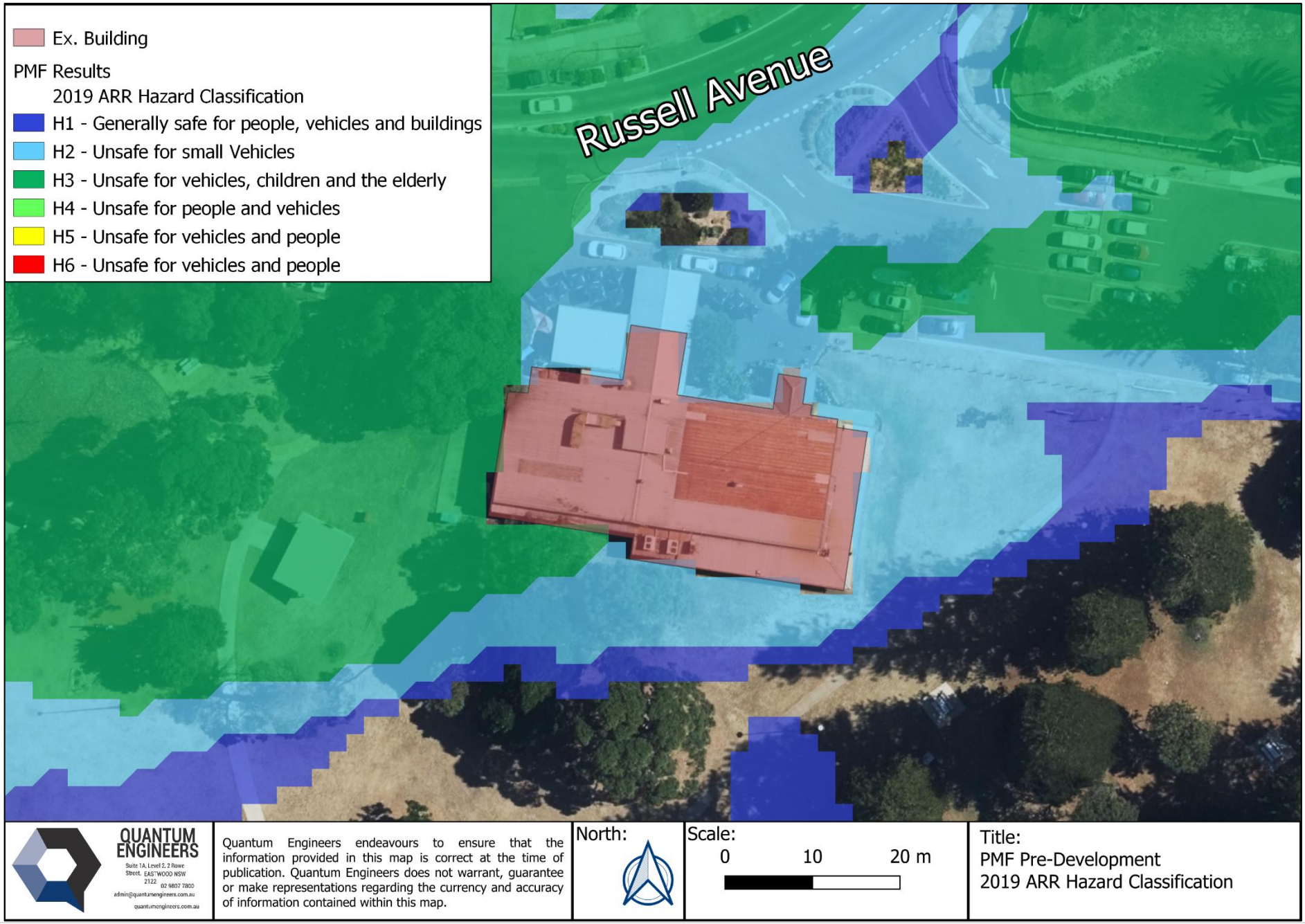

Proposed Building
Flood Afflux
<= -0.05(m)
-0.05 - -0.02(m)
-0.02 - -0.005(m)
-0.005 - 0.005(m)
0.005 - 0.01(m)
0.01 - 0.02(m)
0.02 - 0.04(m)
0.04 - 0.05(m)
0.05 - 0.10(m)
>0.1(m)
Wet Dry Cell Count
Was Wet Now Dry
Was Dry Now Wet
Russell Avenue
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
PMF Flood Level Afflux

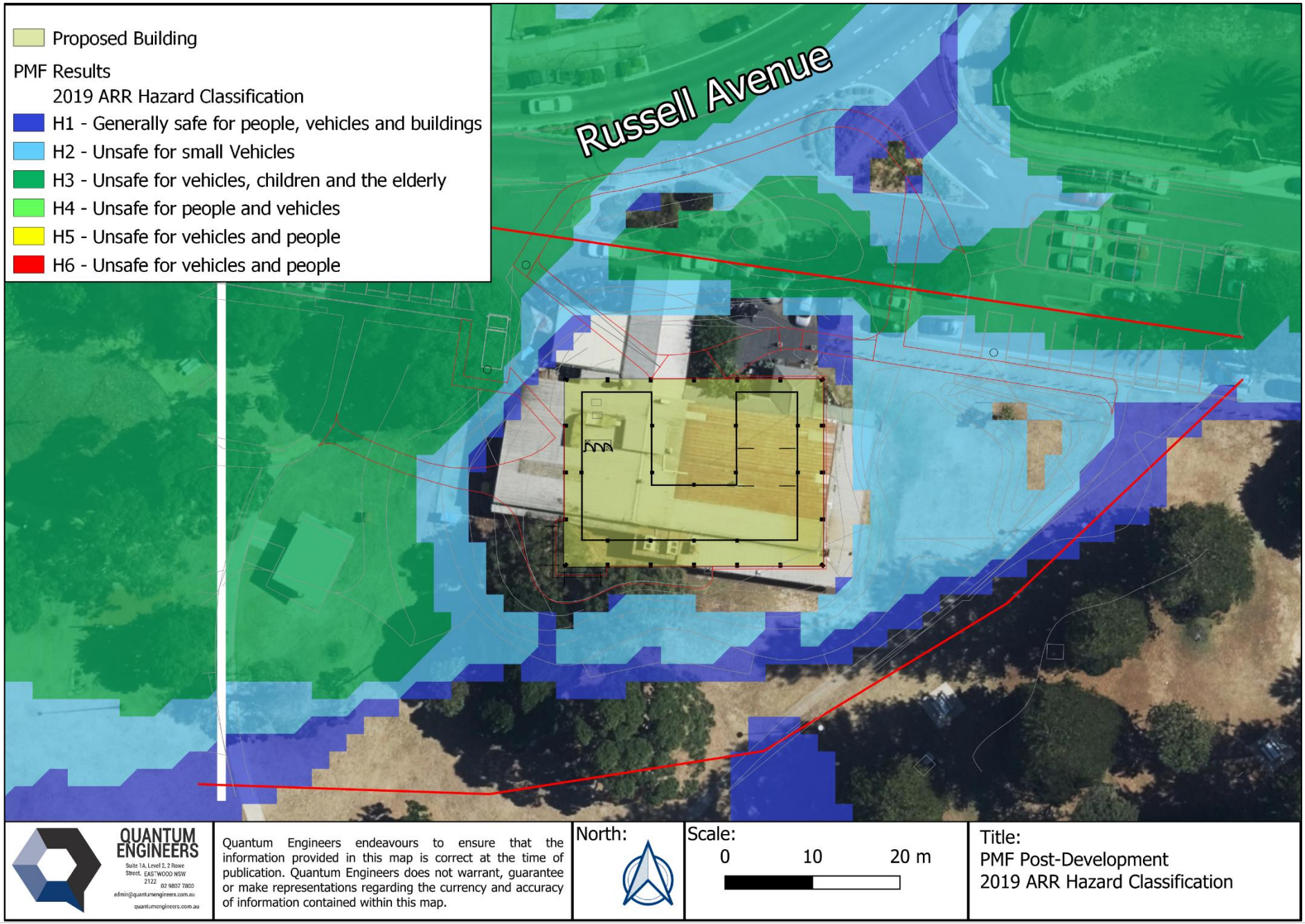

Ex. Building
PMF Flood Velocity
PMF Results
Velocity (m/s)
<= 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
1 - 1.2
1.2 - 1.4
1.4 - 1.6
1.6 - 2
> 2
Russell Avenue
0.50
0.50
0.50
1.00
0.50
0.50
0.50
0.50
0.50
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
PMF Pre-Development
Flood Velocity

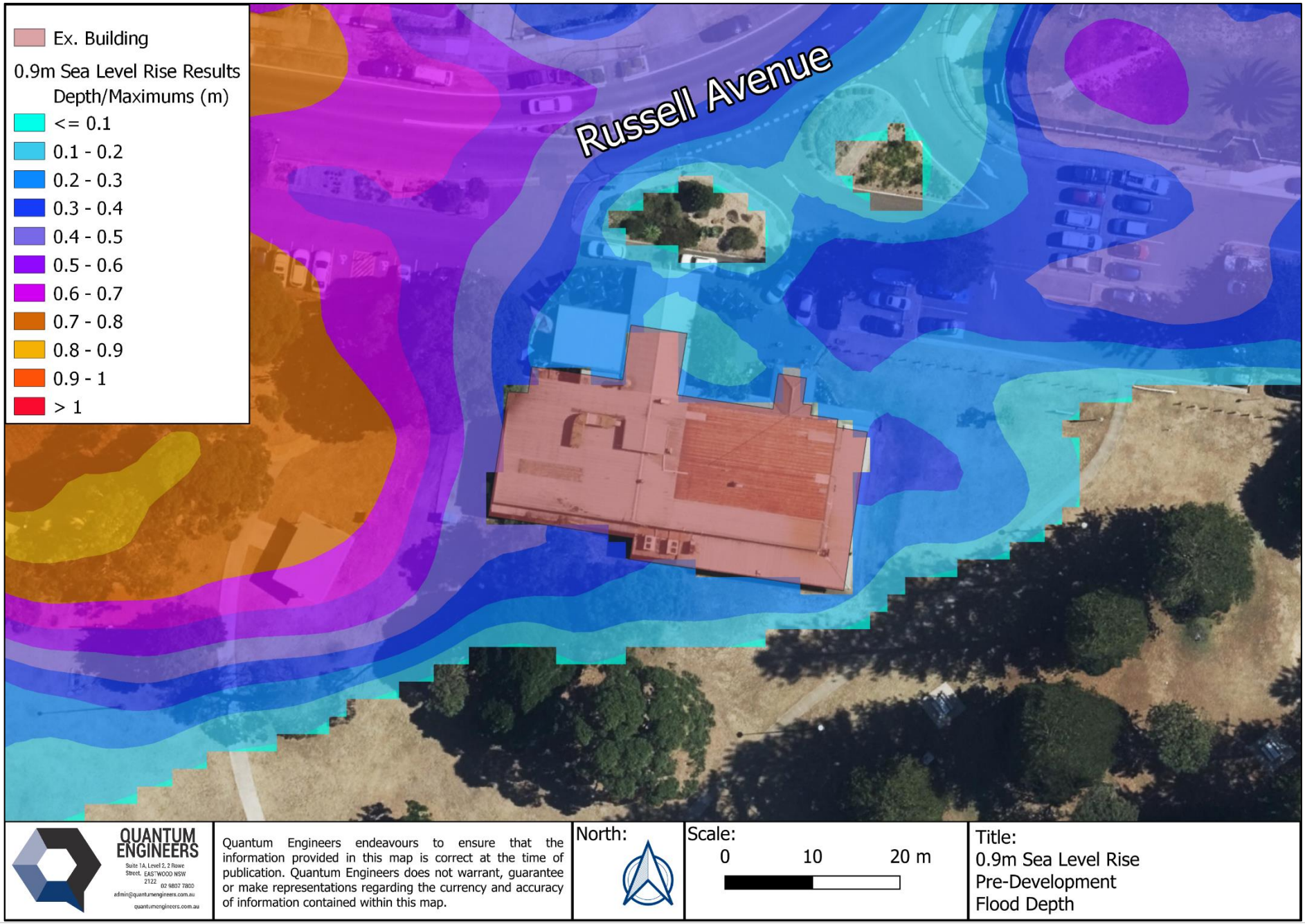

Proposed Building
PMF Flood Velocity
PMF Results
Velocity (m/s)
<= 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
1 - 1.2
1.2 - 1.4
1.4 - 1.6
1.6 - 2
> 2
Russell Avenue
1.00
0.50
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
PMF Post-Development
Flood Velocity

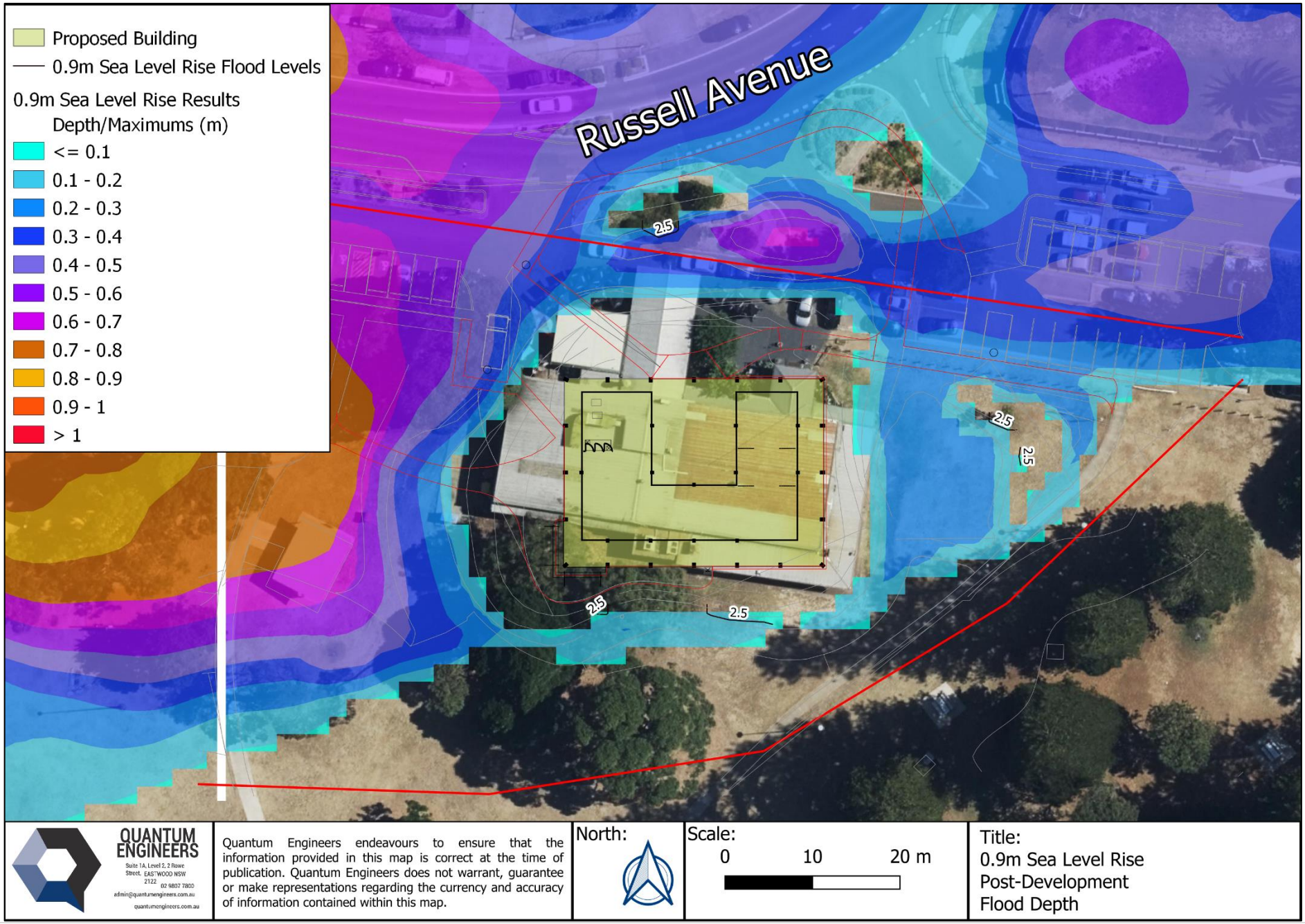

Ex. Building
PRE_PMF_VD (m2/s)
PMF Results
Velocity (m2/s)
<= 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
0.5 - 0.6
0.6 - 0.7
0.7 - 0.8
0.8 - 0.9
0.9 - 1
1 - 1.1
1.1 - 1.2
> 1.2
Russell Avenue
0.10
0.25
0.05
0.20
0.15
0.10
0.05
0.10
0.05
0.05
0.05
0.20
0.20
0.15
0.10
0.15
0.15
0.10
0.10
0.05
0.05
0.05
0.05
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
PMF Pre-Development
Velocity x Depth Product

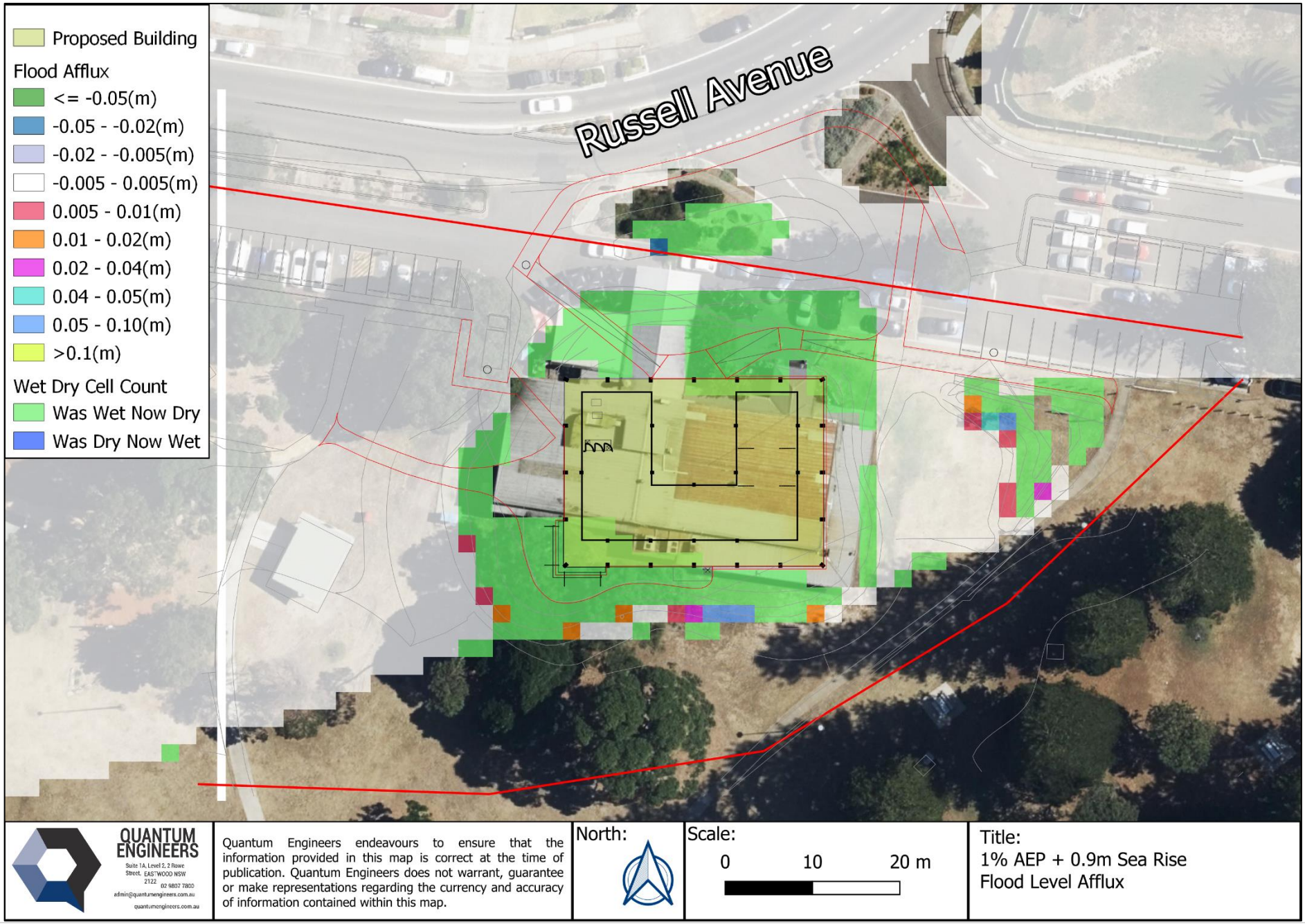

Proposed Building
POST_PMF_V x D (m2/s)
POST_PMF_Results
Velocity x Depth (m2/s)
<= 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
0.5 - 0.6
0.6 - 0.7
0.7 - 0.8
0.8 - 0.9
0.9 - 1
1 - 1.1
1.1 - 1.2
> 1.2
Russell Avenue
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
PMF Post Development
Velocity x Depth (m2/s)

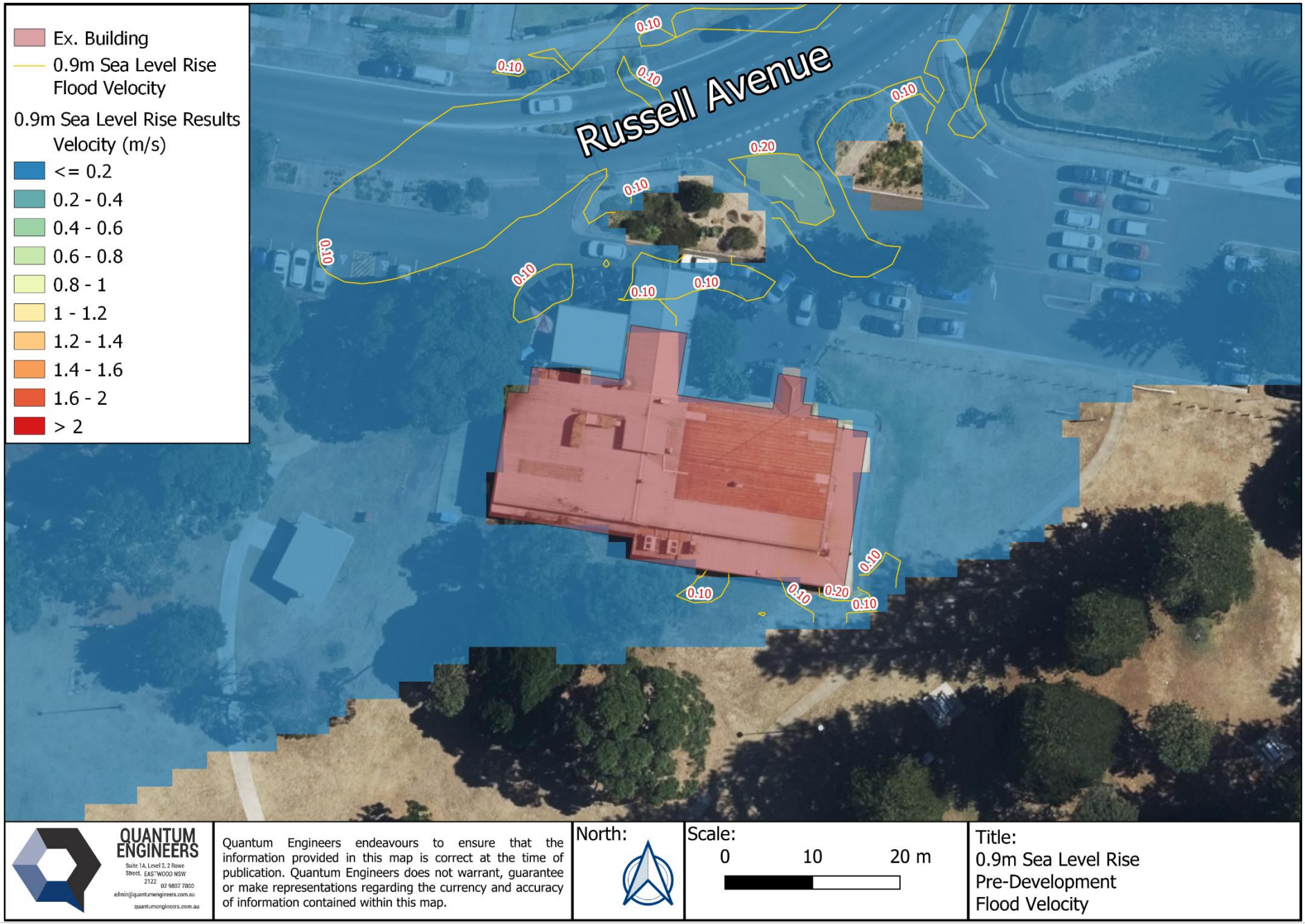

Ex. Building
PMF Results
2019 ARR Hazard Classification
H1 - Generally safe for people, vehicles and buildings
H2 - Unsafe for small Vehicles
H3 - Unsafe for vehicles, children and the elderly
H4 - Unsafe for people and vehicles
H5 - Unsafe for vehicles and people
H6 - Unsafe for vehicles and people
Russell Avenue
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
PMF Pre-Development
2019 ARR Hazard Classification

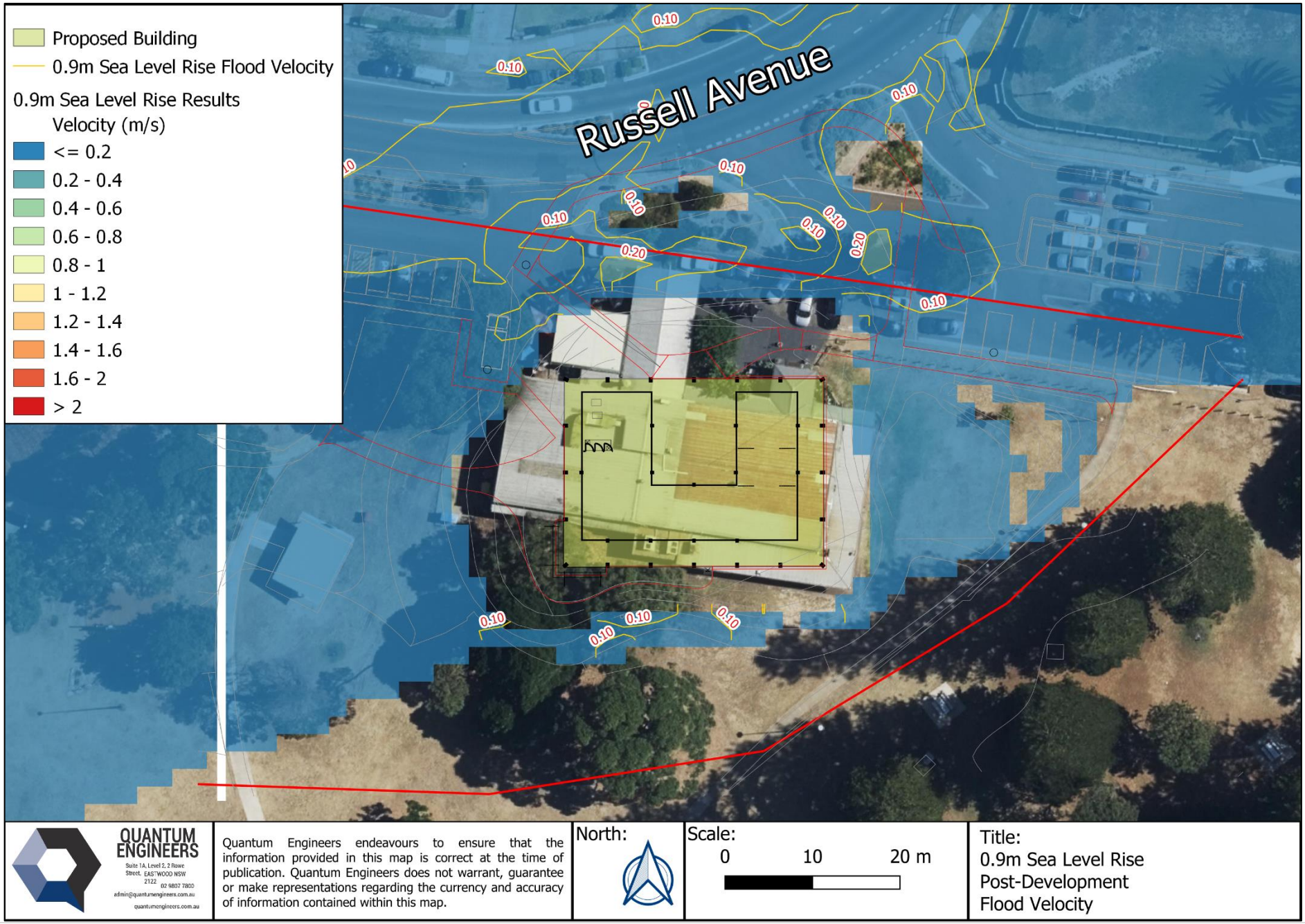

Proposed Building
PMF Results
2019 ARR Hazard Classification
H1 - Generally safe for people, vehicles and buildings
H2 - Unsafe for small Vehicles
H3 - Unsafe for vehicles, children and the elderly
H4 - Unsafe for people and vehicles
H5 - Unsafe for vehicles and people
H6 - Unsafe for vehicles and people
Russell Avenue
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
PMF Post-Development
2019 ARR Hazard Classification

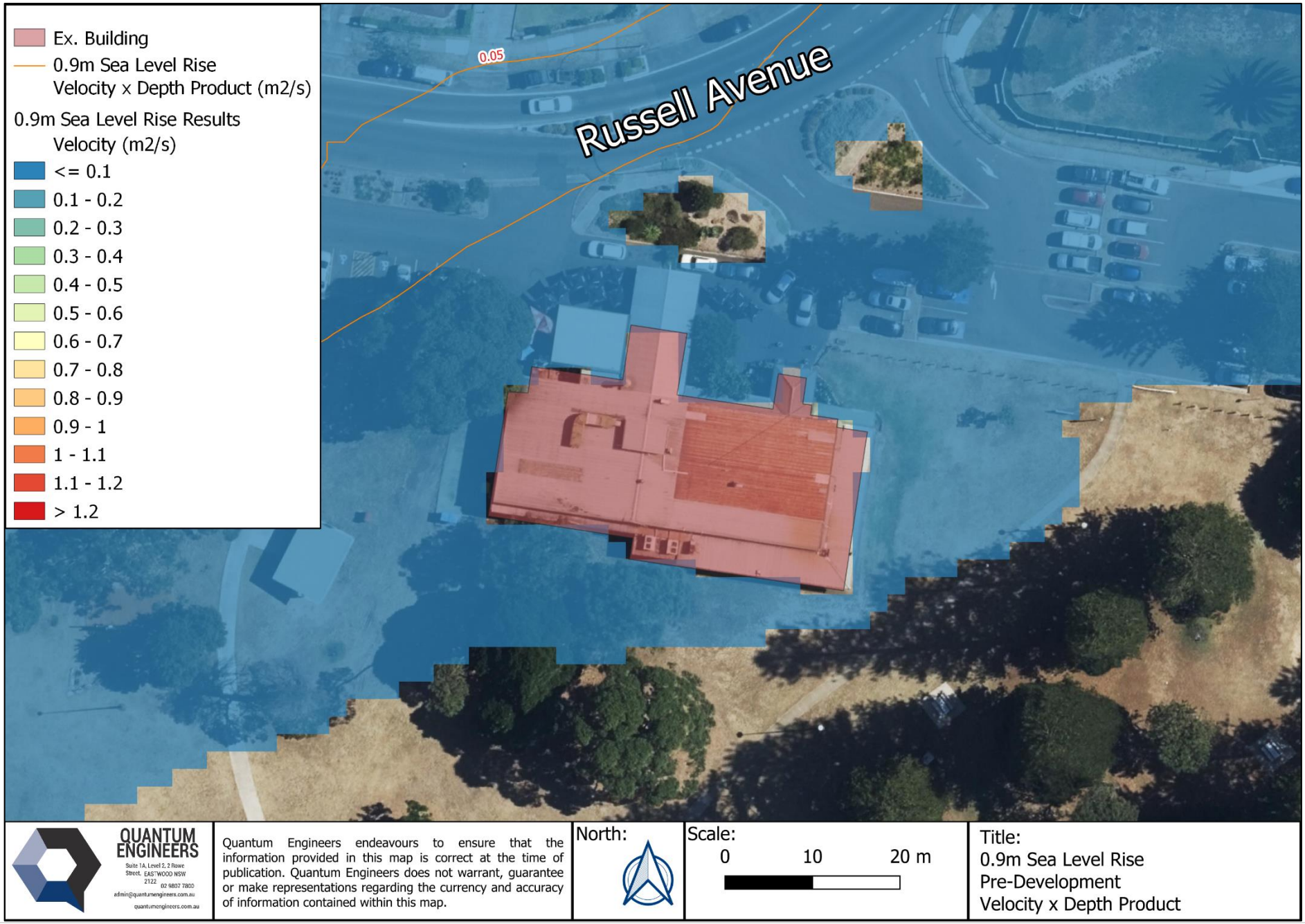

Ex. Building
0.9m Sea Level Rise Results
Depth/Maximums (m)
<= 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
0.5 - 0.6
0.6 - 0.7
0.7 - 0.8
0.8 - 0.9
0.9 - 1
> 1
Russell Avenue
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
0.9m Sea Level Rise
Pre-Development
Flood Depth

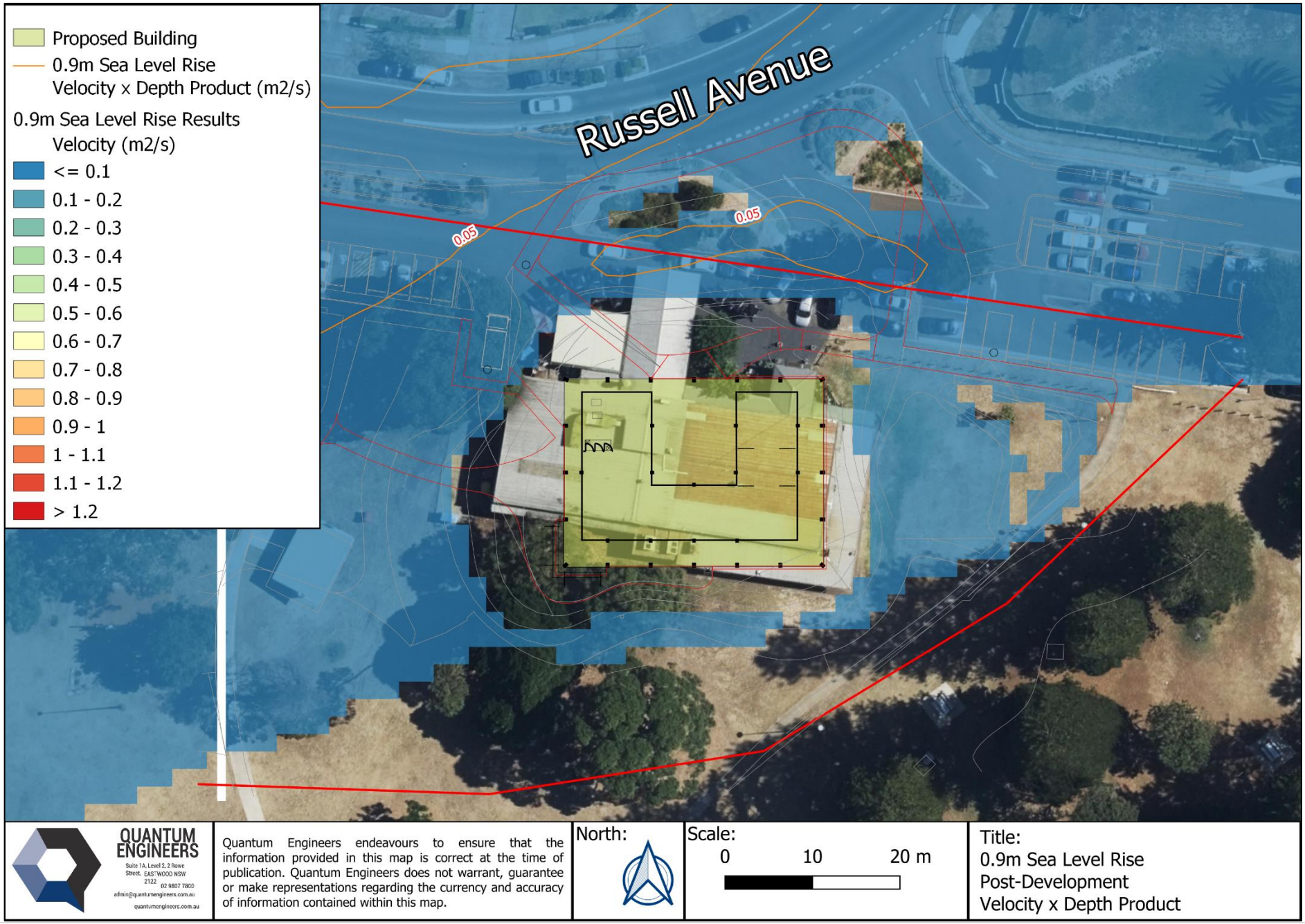

Proposed Building
0.9m Sea Level Rise Flood Levels
0.9m Sea Level Rise Results
Depth/Maximums (m)
<= 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
0.5 - 0.6
0.6 - 0.7
0.7 - 0.8
0.8 - 0.9
0.9 - 1
> 1
Russell Avenue
2.5
2.5
2.5
2.5
2.5
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
0.9m Sea Level Rise
Post-Development
Flood Depth

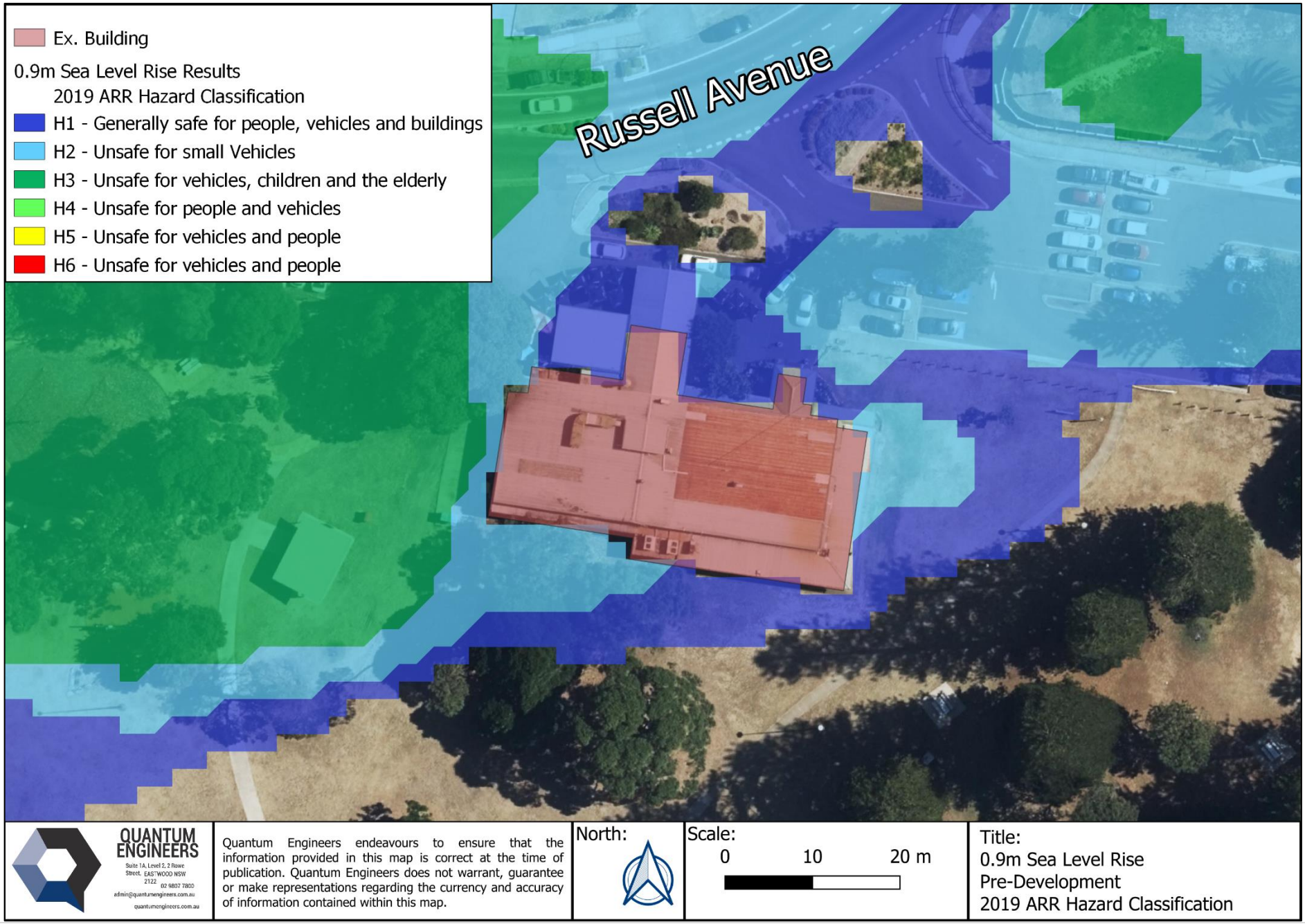

Proposed Building
Flood Afflux
<= -0.05(m)
-0.05 - -0.02(m)
-0.02 - -0.005(m)
-0.005 - 0.005(m)
0.005 - 0.01(m)
0.01 - 0.02(m)
0.02 - 0.04(m)
0.04 - 0.05(m)
0.05 - 0.10(m)
>0.1(m)
Wet Dry Cell Count
Was Wet Now Dry
Was Dry Now Wet
Russell Avenue
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
1% AEP + 0.9m Sea Rise
Flood Level Afflux

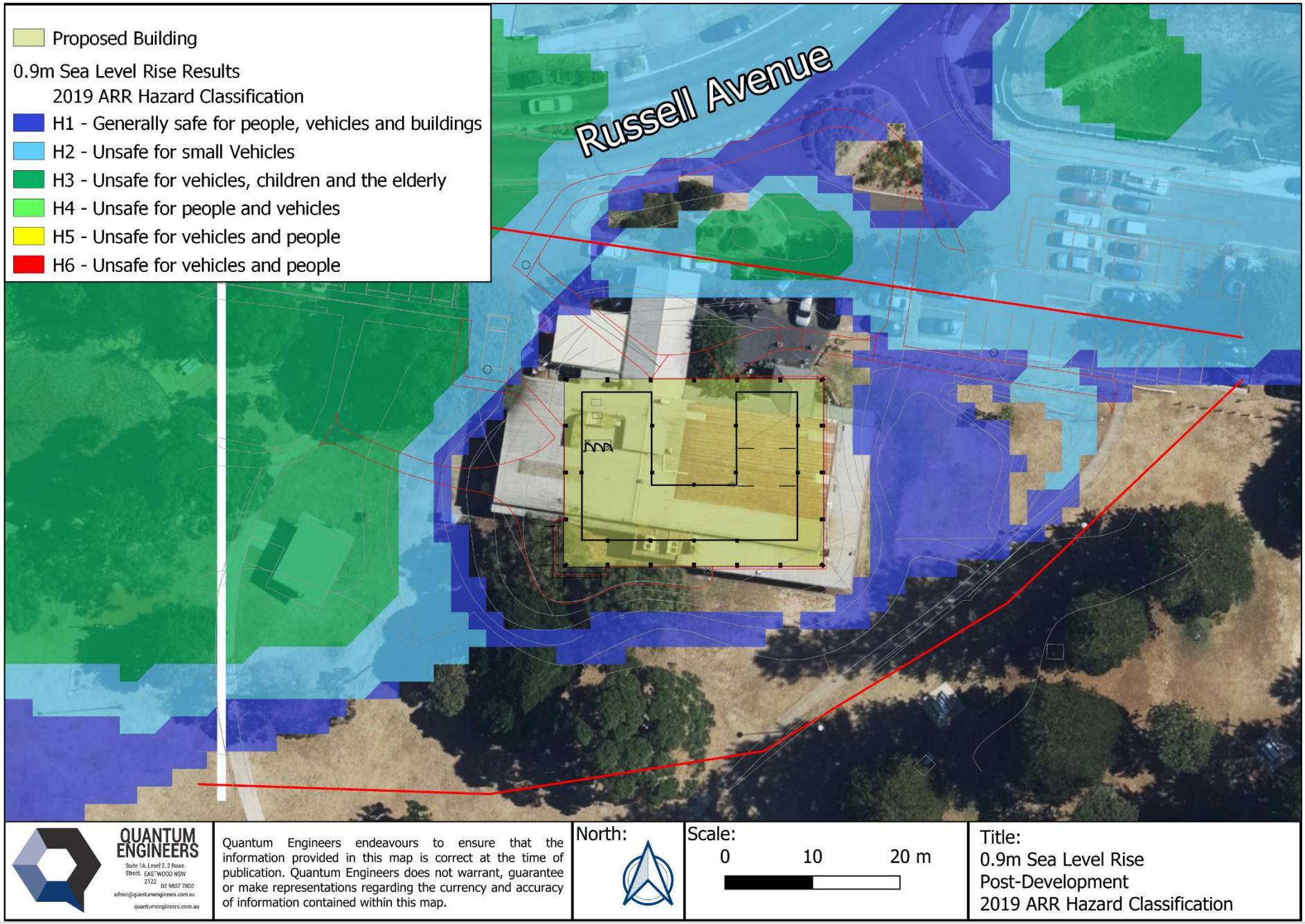

Ex. Building
0.9m Sea Level Rise Flood Velocity
0.9m Sea Level Rise Results Velocity (m/s)
<= 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
1 - 1.2
1.2 - 1.4
1.4 - 1.6
1.6 - 2
> 2
Russell Avenue
0.10
0.20
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
0.9m Sea Level Rise
Pre-Development
Flood Velocity


Proposed Building
0.9m Sea Level Rise Flood Velocity
0.9m Sea Level Rise Results
Velocity (m/s)
<= 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
1 - 1.2
1.2 - 1.4
1.4 - 1.6
1.6 - 2
> 2
Russell Avenue
0.10
0.20
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
0.9m Sea Level Rise
Post-Development
Flood Velocity


Ex. Building
0.9m Sea Level Rise
Velocity x Depth Product (m2/s)
0.9m Sea Level Rise Results
Velocity (m2/s)
<= 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 - 1.1
1.1 - 1.2
> 1.2
0.05
Russell Avenue
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
0.9m Sea Level Rise
Pre-Development
Velocity x Depth Product


Proposed Building
0.9m Sea Level Rise
Velocity x Depth Product (m2/s)
0.9m Sea Level Rise Results
Velocity (m2/s)
<= 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 - 1.1
1.1 - 1.2
> 1.2
Russell Avenue
0.05
0.05
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
0.9m Sea Level Rise
Post-Development
Velocity x Depth Product


Ex. Building
0.9m Sea Level Rise Results
2019 ARR Hazard Classification
H1 - Generally safe for people, vehicles and buildings
H2 - Unsafe for small Vehicles
H3 - Unsafe for vehicles, children and the elderly
H4 - Unsafe for people and vehicles
H5 - Unsafe for vehicles and people
H6 - Unsafe for vehicles and people
Russell Avenue
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
0.9m Sea Level Rise
Pre-Development
2019 ARR Hazard Classification


Proposed Building
0.9m Sea Level Rise Results
2019 ARR Hazard Classification
H1 - Generally safe for people, vehicles and buildings
H2 - Unsafe for small Vehicles
H3 - Unsafe for vehicles, children and the elderly
H4 - Unsafe for people and vehicles
H5 - Unsafe for vehicles and people
H6 - Unsafe for vehicles and people
Russell Avenue
QUANTUM ENGINEERS
Suite 1A, Level 2, 2 Rowe Street, EASTWOOD NSW 2122
02 9807 7800
admin@quantumengineers.com.au
quantumengineers.com.au
Quantum Engineers endeavours to ensure that the information provided in this map is correct at the time of publication. Quantum Engineers does not warrant, guarantee or make representations regarding the currency and accuracy of information contained within this map.
North:
Scale:
0
10
20 m
Title:
0.9m Sea Level Rise
Post-Development
2019 ARR Hazard Classification

APPENDIX A3

Data Collected or Input Data Used

APPENDIX B

25 November 2019

Our Ref: F18/562
Contact: Pulak Saha

Yasmin McHutchison
Major Projects – Building Project Officer
14 Rye Avenue, Bexley NSW

Dear Sir/Madam,

Re: Flood Advice Letter for 179 Russell Ave, Dolls Point (PT 67 DP 2237)

When lodging a Development Application you must enclose a copy of this letter.

FLOOD NOTATION	Council has notated this property as being affected by the 1% Annual Exceedance Probability (AEP) flood. The 1% AEP flood means there is a 1% (i.e. a 1 in 100) chance of a flood of this height, or higher occurring in any one year.
FLOOD STUDY	The Council Flood Study applicable to the property is: • Bayside Catchments Flood Tagging, WMAwater 2019 (Draft) • Sans Souci (2D) Flood Study Review (2015), Cardno • Sans Souci Drainage Catchments Floodplain Risk Management Study, (2005) Cardno (then Cardno Willing)
FLOOD LEVELS	**1% AEP Flood Level:** 2.25m AHD **Probable Maximum Flood (PMF) Level:** 2.80m AHD
FLOOD RISK EXPOSURE	The Flood Risk Exposure of the site has been assessed as **Overland Flooding: Flood Fringe: Hazard: H1**
FLOOD COMMENTARY	• 1% AEP Flood level including sea level rise of 0.9m (year 2100) is 2.60m AHD. • Refer to figure 1 for flood extent map. • An example of the flood management plan included at the end of this letter. Additional information may be required for larger/complex developments. • No accurate information is recorded regarding the impact of tsunamis in the Bayside Local Government area.

HAZARD CATEGORY DETAILS	H1 - Generally safe for vehicles, people and buildings.
FLOOD PLANNING LEVEL (FPL)	The Flood Planning Level (FPL) is a height used to set floor levels for property development in flood prone areas. It is generally defined as the 1% AEP flood level plus an appropriate freeboard. For the design of a new development on this land the minimum habitable floor level is: 2.75m AHD The minimum level, for storage shed floor, patio, deck, carport and/or garage floor is: 2.25m AHD Basements and below ground garages are to be physically protected to the minimum habitable floor level. All electrical connections, air conditioning units and external power points are to be set above the minimum habitable floor level. As noted these floor levels are minimums, floor levels higher than these are allowable subject to normal planning rules. In order to relate these levels to your property you will need to obtain a survey to determine the ground level to AHD at the site.
FLOW THROUGH FENCING	Flow through open form fencing (louvres or pool fencing) is required for all new fencing and all new gates up to the 1% AEP Flood level to allow flood water flow through.
FLOOD RELATED DEVELOPMENT CONTROLS	The following additional flood related development controls apply: 1. Any portion of the building or structure lower than the applicable flood planning level (FPL) shall be built from flood compatible materials to be specified by a Structural Engineer. 2. All services associated with the development shall be flood proofed to the applicable FPL. 3. A Flood Management Plan is required to be lodged with the DA which will detail whether evacuation procedures are required and if so how they will be initiated, warning signs and preservation of flood awareness as owners and/or occupants change through time. An example is attached.

Councils Flood Information Plan – Dated 25th November 2019

APPENDIX C

Councils Flood Compatible Materials

9.5.3 Flood Compatible Materials & Building Components

Building Component	Flood Compatible Material
Flooring and Sub-floor Structure	A. concrete slab-on-ground monolith construction B. suspension reinforced concrete slab.
Wall Structure	A. solid brickwork, blockwork, reinforced, concrete or mass concrete
Roofing Structure (for Situations Where the Relevant Flood Level is Above the Ceiling)	A. reinforced concrete construction B. galvanised metal construction
Doors	A. solid panel with waterproof adhesives B. flush door with marine ply filled with closed cell foam C. painted metal construction D. aluminium or galvanised steel frame
Wall and Ceiling Linings	A. fibro-cement board B. brick, face or glazed C. clay tile glazed in waterproof mortar D. concrete E. concrete block F. steel with waterproof applications G. stone, natural solid or veneer, waterproof grout H. glass blocks I. glass J. plastic sheeting or wall with waterproof adhesive
Insulation Windows	A. foam (closed cell types) B. aluminium frame with stainless steel rollers or similar corrosion and water-resistant material.
Nails, Bolts, Hinges and Fittings	A. brass, nylon or stainless steel B. removable pin hinges C. hot dipped galvanised steel wire, nails or similar.

1.3.2 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.

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