



Job Number: 210076
Date: 15th October 2021

GRC Hydro
Level 9, 233 Castlereagh Street
Sydney NSW 2000

ATH Projects
Mr Andrew Hodges
PO Box 367
Jannali NSW 2226

Tel: +61 413 631 447
www.grchydro.com.au

Dear Mr Hodges,

Re: Flood Management Report for 11 Oak Street, North Narrabeen, NSW, 2021

INTRODUCTION

GRC Hydro Pty Ltd are engaged by ATH Projects to carry out a Flood Management Report for the proposed development at 11 Oak Street, North Narrabeen (the subject site, see Image 1). For details of the proposed development see attached plans.

This work has been carried out and supervised by Stephen Gray. Stephen Gray holds appropriate qualifications in that he is eligible as per Engineers Australia Criteria to be a Chartered Engineer on the basis of:

- Bachelor Engineering;
- Masters Engineering Research specialising in urban flood estimation;
- 23 years working for private and government clients in the field of flood hydrology including publishing research, attending conferences and generally remaining abreast of best practice.

Stephen Gray's CV is attached at the rear of this document.

This letter addresses the following scope of works:

- Compile and review available flood information specific to the subject site.
- Characterize flood risks and behaviour present at the subject site.
- Identify LEP and DCP requirements applicable to proposed development.
- Assess suitability of proposed development in terms of flood liability, more specifically in terms of flood duration, and applicable FPL for the proposed development.



Image 1: Subject Site

TOPOGRAPHY

The average ground level at the site is 3.07 mAHD with a minimum ground level of 2.78 mAHD and a maximum ground level of 3.49 mAHD. The lowest ground levels in the west (2.6 mAHD) and highest ground levels in the east (4.5 mAHD). The subject site is located on a slope, the properties to the west and to the north are higher, the properties to the south and east are lower than the subject site.

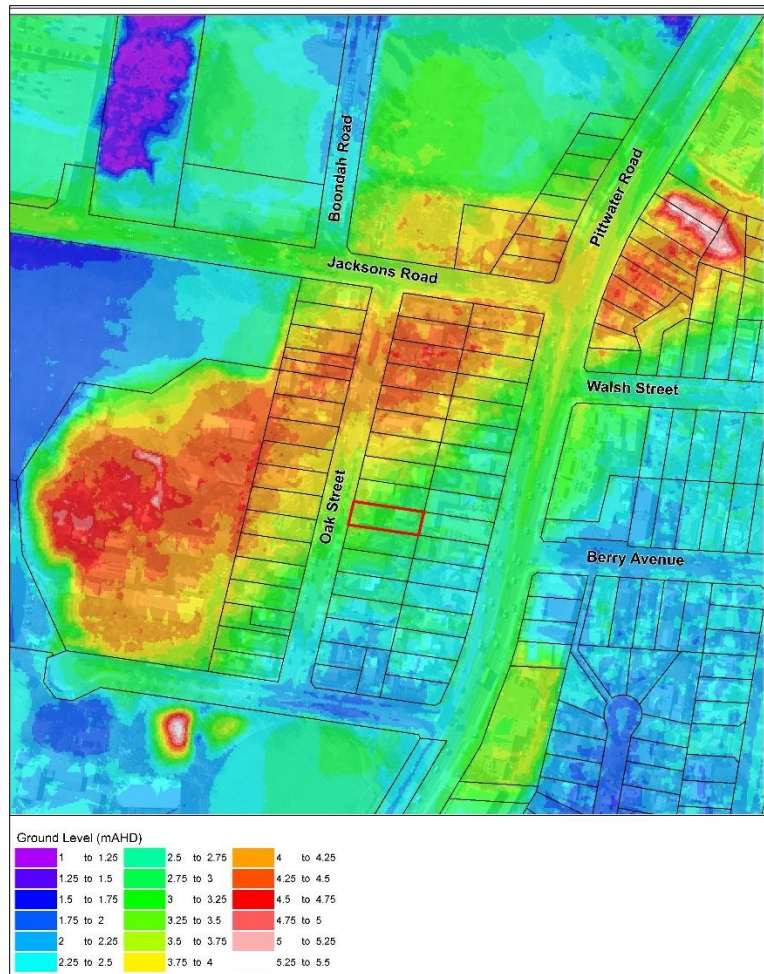


Image 1: DEM

FLOOD BEHAVIOUR

A flood information report for the residential property was obtained from the Northern Beaches Council (see Appendix). The flood information is based on the Narrabeen Lagoon Flood Study (2013) by BMT WBM. As per the report, the subject site is located in a medium flood risk precinct. The maximum flood levels at the site are 3.03 mAHD (depth of 0.20 m) for a 1% AEP event and 4.86 mAHD (depth of 2.08 m) for the PMF. The hydraulic category is flood fringe and the hazard category is low in a 1% AEP event, for a PMF event the hydraulic category is flood storage and the hazard category is high.

Next to mainstream flooding, described in the flooding information above, the subject site is also affected by overland flow. Based on the Ingleside, Elanora and Warriewood Overland Flow Study (2019), no flooding occurs in events smaller than the PMF event (see appendix for flood maps). In the PMF event flooding only occurs in the lower eastern part of the property. The hazard category is low (H1 and H2) and the hydraulic category is flood storage.

FLOOD POLICIES

Since the subject site is in a medium flood risk precinct, a Flood Management Report is required addressing the relevant parts of the Development Control Plan (DCP) and Local Environment Plan (LEP).

Pittwater Development Control Plan

The proposed development belongs to the category *Residential*. Being located in a medium flood risk precinct the following controls apply for the development.

#	DCP Requirement	Compliance
	Flood effects caused by Development	
A1	Development (including earthworks and subdivision) shall not be approved unless it can be demonstrated in a Flood Management Report that it complies with the Flood Prone Land Design Standard found on Council's webpage.	The property is nearly flood free for the 1% AEP event and the hydraulic category is flood fringe. Therefore no flood storage is lost due to the development and it is unlikely that the development cause alterations in flood conveyance or impacts on surrounding properties. Development complies.
A3	The applicant shall include in their submission, calculations to illustrate that any fill or other structures that reduce the total flood storage are replaced by Compensatory Works.	See above.
	Drainage Infrastructure and Creek Works	
B1	Flood mitigation works or stormwater devices that modify a major drainage system, stormwater system, natural water course, floodway or flood behaviour within or outside the development site may be permitted subject to demonstration through a Flood Management Report that they comply with the Flood Prone Land Design	a) See A1, there is no loss of flood storage or floodway b) The property is nearly flood free and in a flood fringe area. Therefore the development will not cause alterations in flood conveyance and will not have impacts on surrounding properties. c) Not applicable as property lies outside of riparian land and no alterations to natural streams and waterways. Development complies.
B2	A Section 88B notation under the Conveyancing Act 1919 may be required to be placed on the title describing the location and type of flood mitigation works with a requirement for their retention and maintenance.	Not applicable, as no flood mitigation works necessary.
	Building Components and Structural Soundness	
C1	All buildings shall be designed and constructed as flood compatible buildings in accordance with Reducing Vulnerability of Buildings to Flood Damage: Guidance on	Development will be constructed at the FPL (ground level at FPL of 3.53 mAHD), using flood compatible materials.

	Building in Flood Prone Areas, Hawkesbury-Nepean Floodplain Management Steering Committee (2006).	Development complies.
C2	All structures must be designed and constructed to ensure structural integrity up to the Flood Planning Level, 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 to be provided the structural integrity is to be to the Probable Maximum Flood level.	The development will be constructed at FPL. All materials up to PMF level are flood compatible (bricks). Development complies.
C3	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 Flood Planning Level. All existing electrical equipment and power points located below the Flood Planning Level must have residual current devices installed that turn off all electricity supply to the property when flood waters are detected.	Development will be constructed at Flood Planning Level and therefore complies.
	Storage of Goods	
D1	Hazardous or potentially polluting materials shall not be stored below the Flood Planning Level unless adequately protected from floodwaters in accordance with industry standards.	The building is raised to the Flood Planning Level (FPL) of 3.53 mAHD. No storage of goods below FPL. Development complies.
D2	Goods, materials or other products which may be highly susceptible to water damage are to be located/stored above the Flood Planning Level.	See above.
	Flood Emergency Response	
E1	Development shall comply with Council's Flood Emergency Response Planning for Development in Pittwater Policy and the outcomes of any Flood Risk Emergency Assessment Report where it applies to the land.	The Flood Life Hazard Category is H4. This means that Shelter in Place or Evacuation are both tolerable strategies based on Council's Policy. The first floor of the proposed development is above PMF and therefore shelter in place is the preferred strategy. Development complies.
E2	New development must provide an appropriately sized area to safely shelter in place above the Probable Maximum Flood level and appropriate access to this area should be available from all areas within the development.	First floor (6.53 mAHD) is well above PMF level (4.86 mAHD). As it is residential development sufficient space will be available for all occupants. Development complies.
	Floor Levels	
F1	New floor levels within the development shall be at or above, the Flood Planning Level.	Development will be constructed at FPL. Development complies.

	A reduced Flood Planning Level may be considered only where it is permitted in this Development Control Plan. The structure must be flood proofed (wet or dry) to the Flood Planning Level. This control cannot be applied to critical or vulnerable uses.	
F2	All development structures must be designed and constructed so as not to impede the floodway or flood conveyance on the site, as well as ensuring no loss of flood storage in a 1% AEP Event. Where the dwelling is located over a flow path it must be elevated on suspended pier/pile footings such that the level of the underside of all floors including balconies and decks within the flood affected area are at or above, or raised to the Flood Planning Level to allow clear passage of the floodwaters under the building. The development must comply with the Flood Prone Land Design Standard.	Subject site is nearly flood free in a 1% AEP event with flood fringe areas only. No loss in flood storage or impacts on flood conveyance. Development complies.
F3	Where the lowest floor has been elevated to allow the passage of flood waters, a restriction shall be imposed on the title of the land, pursuant to S88B of the Conveyancing Act confirming that the undercroft area is not be enclosed.	Not applicable.
F4	A one- off addition or alteration below the Flood Planning Level of less than 30 square metres or an increase of less than 10% of the ground floor area (whichever is the lesser) for residential development may be considered only where: (a) it is an extension to an existing room (b) the Flood Planning Level is incompatible with the floor levels of the existing room This control will not be permitted if this provision has previously been utilised since the making of this Plan. The structure must be flood proofed to the Flood Planning Level	Not applicable.
F6	Any existing floor level may be retained below the Flood Planning Level when undertaking a first floor addition provided that: (a) it is not located within a floodway; (b) there is no increase to the building footprint below the Flood Planning Level; (c) it is flood proofed to the Flood Planning Level;	Not applicable.
F8	The minimum floor level of any first floor additions shall be at or above the Probable Maximum Flood Level.	First floor will be above PMF level. Development complies.
F9	Foyers – consideration may be given to a minimum floor level of a foyer being set at the 5% AEP flood level, provided it can be demonstrated that it complies with the Flood Prone Land Design Standard.	Not applicable. Development will be constructed at FPL.
	Car Parking	
G1	Open carpark areas and carports shall not be located within a floodway.	Subject site outside of floodway, not applicable.
G6	Carports must comply with the Flood Prone Land Design Standard	Not applicable.
G7	Where a driveway is required to be raised it must be demonstrated that there is no loss to flood stage in the 1% AEP flood event and no impact on flood conveyance through the site	Subject site is nearly flood free in a 1% AEP event with flood fringe areas only. No loss in flood storage or impacts on flood conveyance. Development

		complies.
	Fencing	
H1	Fencing, including pool fencing, shall be designed so as not to impede the flow of flood waters and not to increase flood affectation on surrounding land. Appropriate fencing must comply with the Flood Prone Land Design Standard in addition to other regulatory requirements of pool fencing.	Subject site nearly flood free in 1%AEP and only flood fringe. Therefore fencing will not interfere with flow of flood waters and will not increase flood affectation on surrounding land. Development complies.
	Pools	
I1	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 or from the site. All electrical equipment associated with the pool (including pool pumps) is to be waterproofed and/or located at or above the Flood Planning Level. All chemicals associated with the pool are to be stored at or above the flood planning level.	Pool inground at FPL. Subject site is nearly flood free in a 1% AEP event with flood fringe areas only. No loss in flood storage or impacts on flood conveyance. Development complies.

Furthermore, the following controls apply regarding Flood Emergency Response Planning, based on the H4 flood life hazard category. Control 1a applies to the evacuation strategy and all other controls to the shelter-in-place strategy.

- (1a) *Requires the preparation of a Flood Risk Emergency Assessment report for the evacuation strategy as outlined in Appendix 15 – Flood Emergency Response Planning for Development in Pittwater Policy.*
- (1b) *Requires the preparation of a Flood Risk Emergency Assessment report addressing the shelter-in-place requirements as outlined in Appendix 15– Flood Emergency Response Planning for Development in Pittwater Policy.*
- (2) *Minimum floor level equal to the PMF flood event for shelter-in-place refuge.*
- (3) *Minimum floor space of the shelter-in-place refuge is:*
 - *2 m² per person is required for all long duration flooding in a PMF event unless it can be shown the development lies within an area only inundated for a “short duration” (less than 6 hours in the PMF); or,*
 - *1 m² per person is required for shelter-in-place refuge impacted by short duration flooding in a PMF event.*
- (4) *Shelter-in-place refuge must be:*

- *Intrinsically accessible to all people on the site, plainly evident, and self-directing, with sufficient capacity of access routes for all occupants.*
 - *There must be sufficient time for all occupants to access shelter-in-place refuges, with fail safe access provided with no reliance on elevators. Flood warning systems should be considered where the number of occupants is significant.*
- (5a) *Structural stability of the building is to be verified by a suitably qualified structural engineer considering lateral flood flow, buoyancy, suction effects, and debris load impact of the 1% AEP design flood depths and velocities.*
- (6a) *For developments with long duration flooding regions unless it can be shown the development lies within this region but is only inundated for a “short duration” (less than 6 hours in the PMF) shelter-in-place refuge is to provide:*
- *Sufficient clean water for all occupants; and*
 - *Portable radio with spare batteries; and*
 - *Torch with spare batteries; and*
 - *First Aid Kit.*

Local Environmental Plan

The following clauses apply according to the Pittwater LEP.

7.3 Flood planning

(1) *The objectives of this clause are as follows—*

- (a) to minimise the flood risk to life and property associated with the use of land,*
- (b) to allow development on land that is compatible with the land's flood hazard, taking into account projected changes as a result of climate change,*
- (c) to avoid significant adverse impacts on flood behaviour and the environment.*

(2) *This clause applies to land at or below the flood planning level.*

(3) *Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that the development—*

- (a) is compatible with the flood hazard of the land, and*
- (b) will not significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties, and*
- (c) incorporates appropriate measures to manage risk to life from flood, and*
- (d) will not significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses, and*
- (e) is not likely to result in unsustainable social and economic costs to the community as a consequence of flooding.*

(4) *A word or expression used in this clause has the same meaning as it has in the Floodplain Development Manual (ISBN 0 7347 5476 0) published by the NSW Government in April 2005, unless it is otherwise defined in this clause.*

(5) *In this clause—*

flood planning level means the level of a 1:100 ARI (average recurrent interval) flood event plus 0.5 metres freeboard, or other freeboard determined by an adopted floodplain risk management plan.

floodplain risk management plan has the same meaning as it has in the Floodplain Development Manual (ISBN 0 7347 5476 0), published in April 2005 by the NSW Government.

7.4 Floodplain risk management

(1) *The objectives of this clause are as follows—*

- (a) in relation to development with particular evacuation or emergency response issues—to enable evacuation of land subject to flooding in events exceeding the flood planning level,*
- (b) to protect the operational capacity of emergency response facilities and critical infrastructure during extreme flood events.*

(2) *This clause applies to land between the flood planning level and the level of the probable maximum flood, but does not apply to land subject to the discharge of a 1:100 ARI (average recurrent interval) flood event plus 0.5 metre freeboard, or other freeboard determined by an adopted floodplain risk management plan.*

(3) Development consent must not be granted to development for the following purposes on land to which this clause applies unless the consent authority is satisfied that the development will not, in flood events exceeding the flood planning level, affect the safe occupation of, and evacuation from, the land—

- (a) caravan parks,*
- (b) centre-based child care facilities,*
- (c) correctional centres,*
- (d) educational establishments,*
- (e) emergency services facilities,*
- (f) group homes,*
- (g) hospitals,*
- (h) residential care facilities,*
- (i) respite day care centres,*
- (j) seniors housing,*
- (k) tourist and visitor accommodation.*

(4) In this clause—

flood planning level means the level of a 1:100 ARI (average recurrent interval) flood event plus 0.5 metres freeboard, or other freeboard determined by an adopted floodplain risk management plan.

probable maximum flood has the same meaning as it has in the Floodplain Development Manual (ISBN 0 7347 5476 0), published in 2005 by the NSW Government.

Note—

The probable maximum flood is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation.

CONCLUSION

The proposed development complies with the DCP controls.

In general, overland flow events have shorter durations compared to mainstream events. In an overland flow PMF event, the property is only slightly flood affected and floor levels will be still higher than the PMF level for most parts of the property. Shelter-in-place is the best flood emergency response, because there is no evacuation route with rising road access.

Mainstream events have longer durations, so more warning time is available. Occupants can be evacuated prior to the event in Northern direction, as long as it is safe to do so. Shelter-in-place is another safe option, as the first floor of the proposed development is well above the PMF level. Decisions to evacuate or seek shelter-in-place should be made based on flood warnings from the BOM and the SES.

Yours Sincerely

A handwritten signature in blue ink, appearing to read 'Steve Gray', with a long horizontal line extending to the right.

Steve Gray

Director

Email: gray@grchydro.com.au

Tel: +61 413 631 447

APPENDIX

11 Oak Street, North Narrabeen

DRAWING REGISTER			
Drawing No.	Revision	Date	Sheet Name
A000	K	31.08.2021	COVER SHEET
A001	K	31.08.2021	SITE PLAN
A002	K	31.08.2021	SITE ANALYSIS
A003	K	31.08.2021	DEMOLITION PLAN
A011	K	31.08.2021	EX. SHADOW DIAGRAMS - JUNE 22
A012	K	31.08.2021	SHADOW DIAGRAMS - JUNE 22
A101	K	31.08.2021	GROUND FLOOR PLAN
A102	K	31.08.2021	FIRST FLOOR PLAN
A103	K	31.08.2021	ROOF PLAN
A201	K	31.08.2021	WEST ELEVATION (FACADE)
A202	K	31.08.2021	EAST ELEVATION
A203	K	31.08.2021	NORTH ELEVATION
A204	K	31.08.2021	SOUTH ELEVATION
A301	K	31.08.2021	LONG SECTION
A302	K	31.08.2021	CROSS SECTION
A501	K	31.08.2021	3D PERSPECTIVE
A502	K	31.08.2021	3D PERSPECTIVE
A503	K	31.08.2021	3D PERSPECTIVE



LOCATION MAP (SOURCE: SIX MAPS)

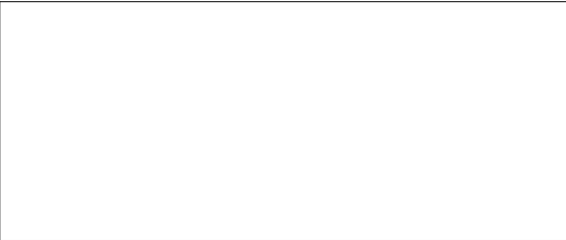
DSA

DANIEL SIRIC ARCHITECTS

Nominated Architect: Daniel Siric NSW ARB No. 9115 (M) 0414 670 218

REV	DATE	DESCRIPTION
D	31.03.2021	DRAFT FLOOR PLANS
E	07.05.2021	DRAFT FLOOR PLANS
F	24.05.2021	DRAFT FLOOR PLANS
G	30.06.2021	DRAFT FLOOR PLANS
H	08.07.2021	DRAFT CONCEPT
J	13.07.2021	DRAFT CONCEPT
K	31.08.2021	DRAFT DA

NORTH:



PROJECT:

PROPOSED NEW SINGLE DWELLING

11 OAK STREET
NORTH NARRABEEN NSW 2101
LOT 27 IN DP6544

COVER SHEET

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Date: 31.08.2021

A000K

11 OAK STREET, NORTH NARRABEEN

LOT 27 IN DP6544
SITE AREA: 693.0m²

AREA BREAKDOWN

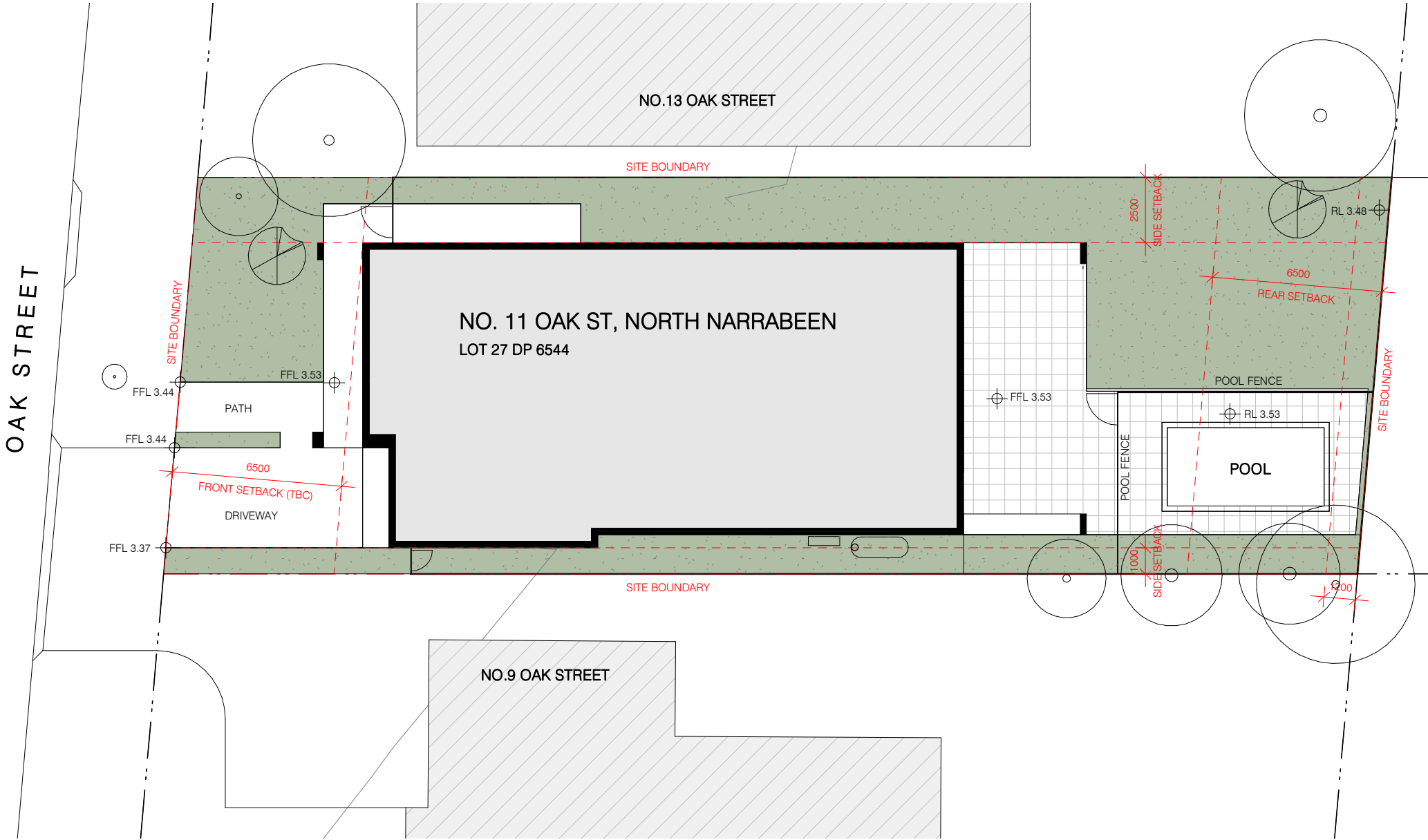
GROUND FLOOR 201.7m²
FIRST FLOOR 153.6m²
TOTAL 355.3m²

LANDSCAPING

PROPOSED LANDSCAPED AREA 254.2m² 36.7%
AREA BETWEEN FRONT BOUNDARY AND DWELLING 113.5m²
PROPOSED LANDSCAPED FRONT YARD 54.1m² 39.1%
REQUIRED LANDSCAPED FRONT YARD 68.1m² 60%

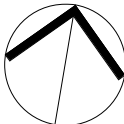
EXISTING TREE

PROPOSED TREE



REV	DATE	DESCRIPTION
D	31.03.2021	DRAFT FLOOR PLANS
E	07.05.2021	DRAFT FLOOR PLANS
F	24.05.2021	DRAFT FLOOR PLANS
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SITE PLAN

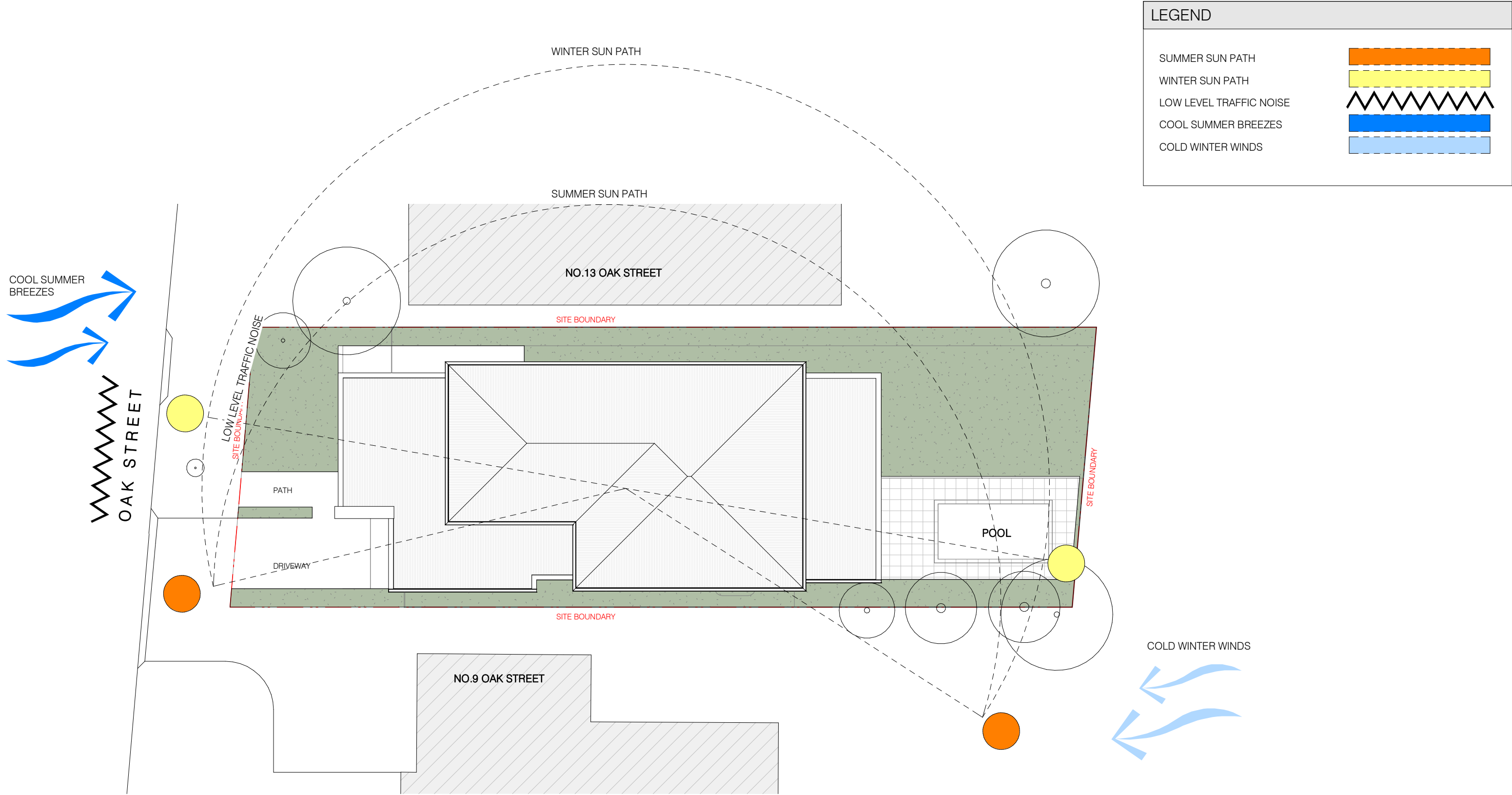
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Date: 31.08.2021

A001

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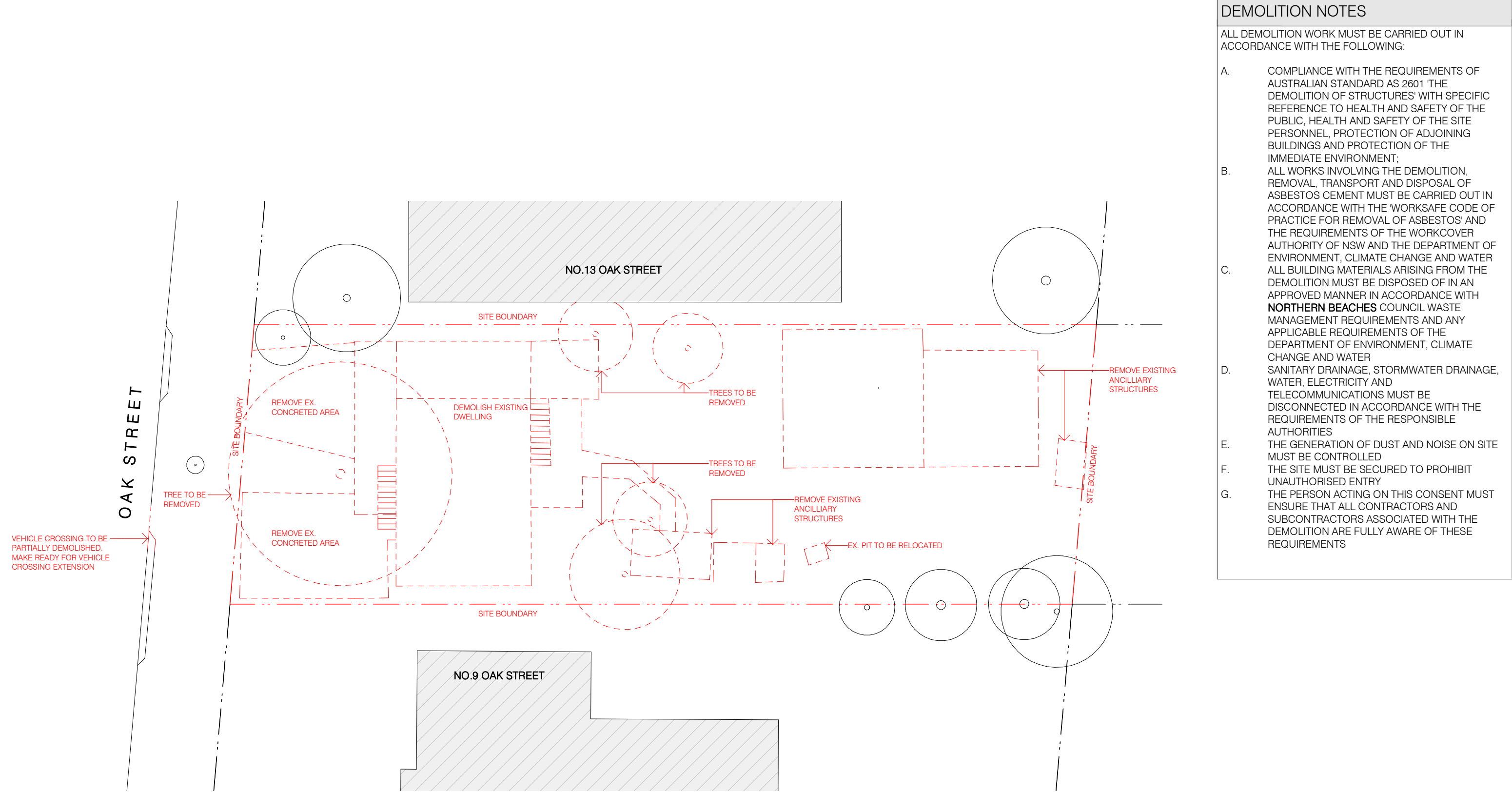
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SITE ANALYSIS	
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Date: 31.08.2021	A002 K



DEMOLITION NOTES

ALL DEMOLITION WORK MUST BE CARRIED OUT IN ACCORDANCE WITH THE FOLLOWING:

- A. COMPLIANCE WITH THE REQUIREMENTS OF AUSTRALIAN STANDARD AS 2601 'THE DEMOLITION OF STRUCTURES' WITH SPECIFIC REFERENCE TO HEALTH AND SAFETY OF THE PUBLIC, HEALTH AND SAFETY OF THE SITE PERSONNEL, PROTECTION OF ADJOINING BUILDINGS AND PROTECTION OF THE IMMEDIATE ENVIRONMENT;
- B. ALL WORKS INVOLVING THE DEMOLITION, REMOVAL, TRANSPORT AND DISPOSAL OF ASBESTOS CEMENT MUST BE CARRIED OUT IN ACCORDANCE WITH THE 'WORKSAFE CODE OF PRACTICE FOR REMOVAL OF ASBESTOS' AND THE REQUIREMENTS OF THE WORKCOVER AUTHORITY OF NSW AND THE DEPARTMENT OF ENVIRONMENT, CLIMATE CHANGE AND WATER
- C. ALL BUILDING MATERIALS ARISING FROM THE DEMOLITION MUST BE DISPOSED OF IN AN APPROVED MANNER IN ACCORDANCE WITH **NORTHERN BEACHES** COUNCIL WASTE MANAGEMENT REQUIREMENTS AND ANY APPLICABLE REQUIREMENTS OF THE DEPARTMENT OF ENVIRONMENT, CLIMATE CHANGE AND WATER
- D. SANITARY DRAINAGE, STORMWATER DRAINAGE, WATER, ELECTRICITY AND TELECOMMUNICATIONS MUST BE DISCONNECTED IN ACCORDANCE WITH THE REQUIREMENTS OF THE RESPONSIBLE AUTHORITIES
- E. THE GENERATION OF DUST AND NOISE ON SITE MUST BE CONTROLLED
- F. THE SITE MUST BE SECURED TO PROHIBIT UNAUTHORISED ENTRY
- G. THE PERSON ACTING ON THIS CONSENT MUST ENSURE THAT ALL CONTRACTORS AND SUBCONTRACTORS ASSOCIATED WITH THE DEMOLITION ARE FULLY AWARE OF THESE REQUIREMENTS

DSA

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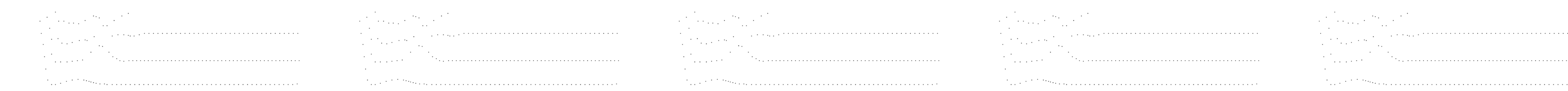
DEMOLITION PLAN

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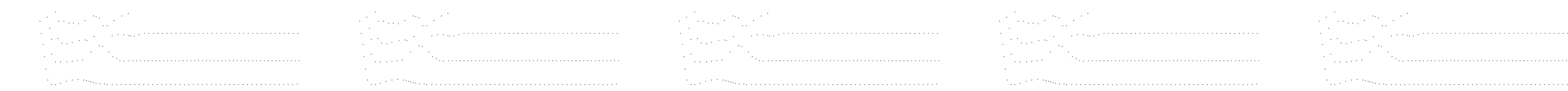
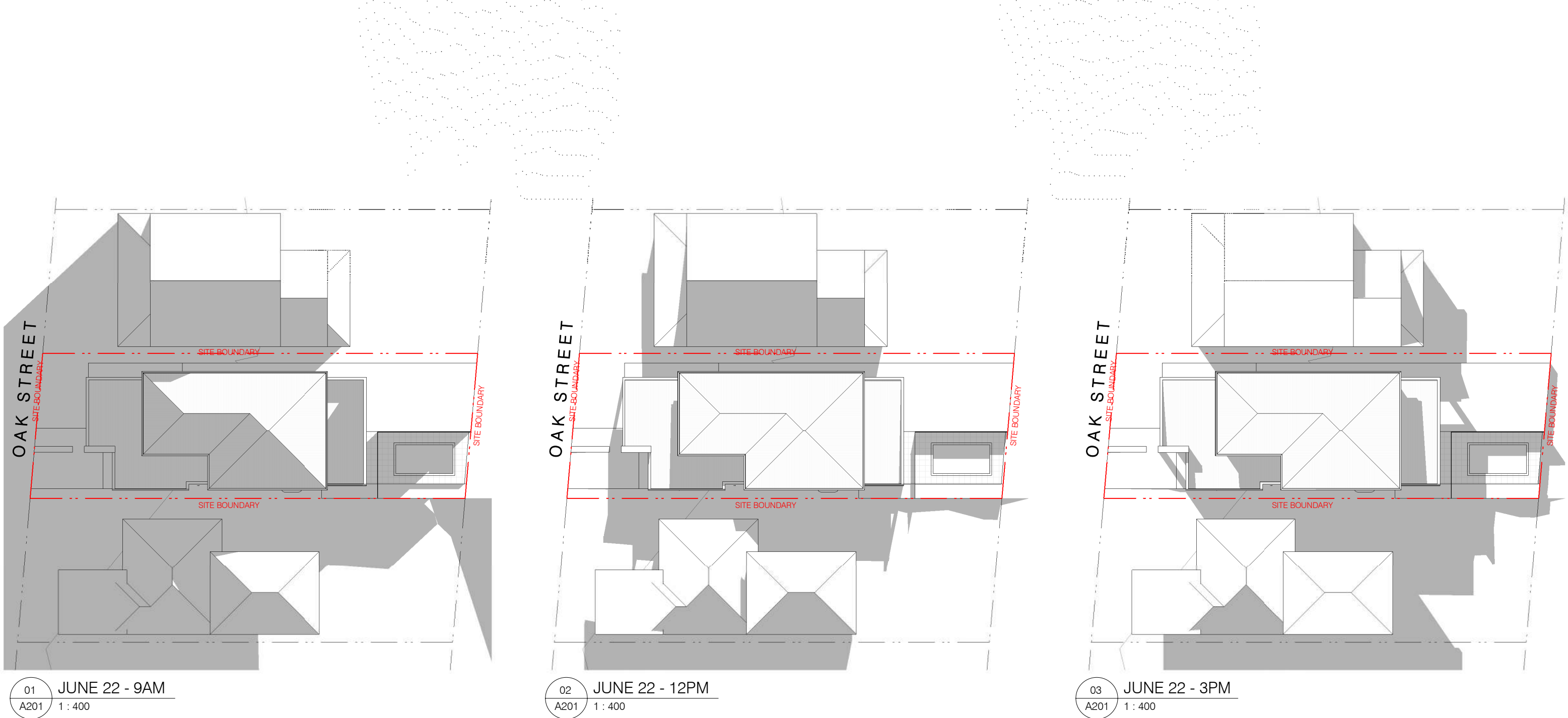
EX. SHADOW DIAGRAMS - JUNE 22

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A011 K



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NORTH NARRABEEN NSW 2101
LOT 27 IN DP6544

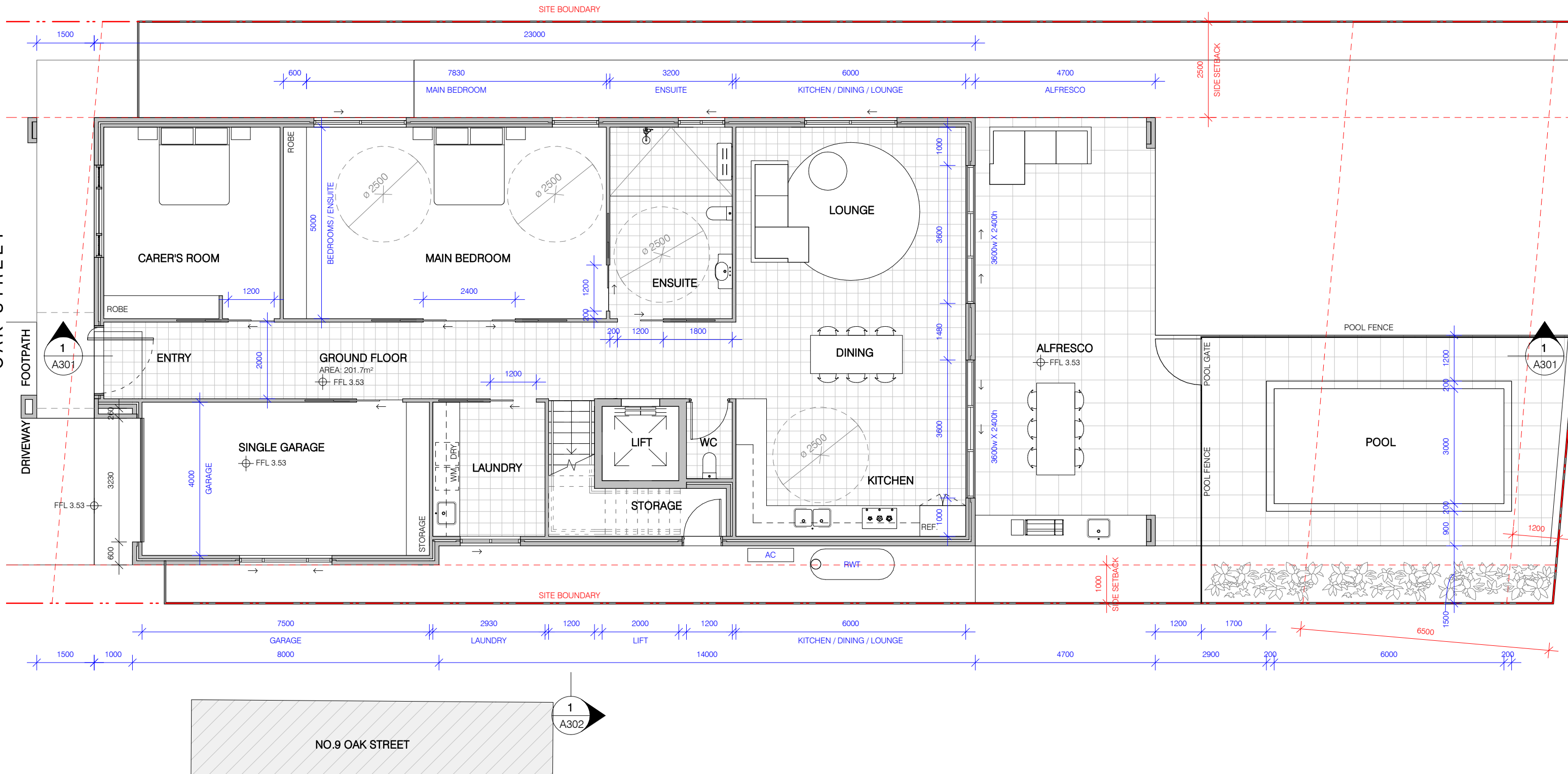
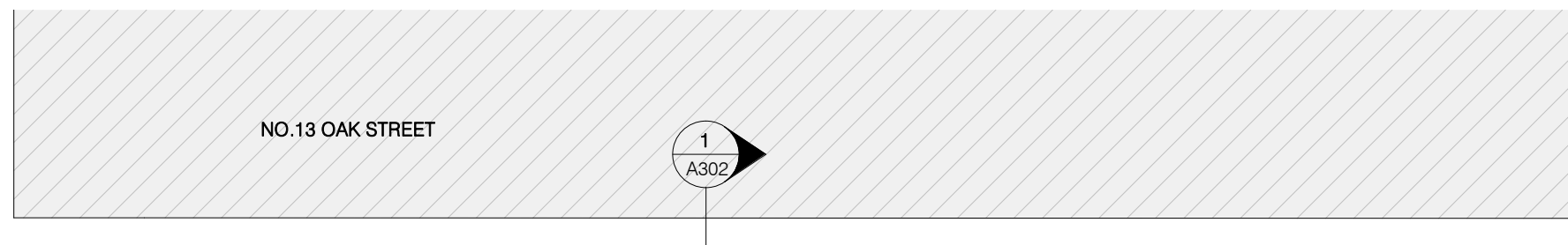
SHADOW DIAGRAMS - JUNE 22

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Scale: 1 : 400@ A3

Date: 31.08.2021

A012 K



REV	DATE	DESCRIPTION
D	31.03.2021	DRAFT FLOOR PLANS
E	07.05.2021	DRAFT FLOOR PLANS
F	24.05.2021	DRAFT FLOOR PLANS
G	30.06.2021	DRAFT FLOOR PLANS
H	08.07.2021	DRAFT CONCEPT
J	13.07.2021	DRAFT CONCEPT
K	31.08.2021	DRAFT DA

NORTH:



PROJECT:

PROPOSED NEW SINGLE DWELLING

11 OAK STREET
NORTH NARRABEEN NSW 2101
LOT 27 IN DP6544

GROUND FLOOR PLAN

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Scale: 1 : 100@ A3

Date: 31.08.2021

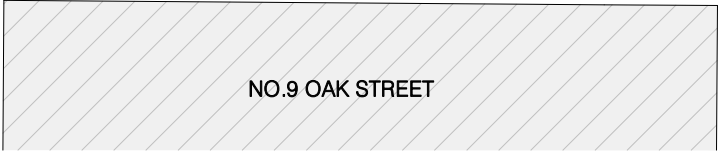
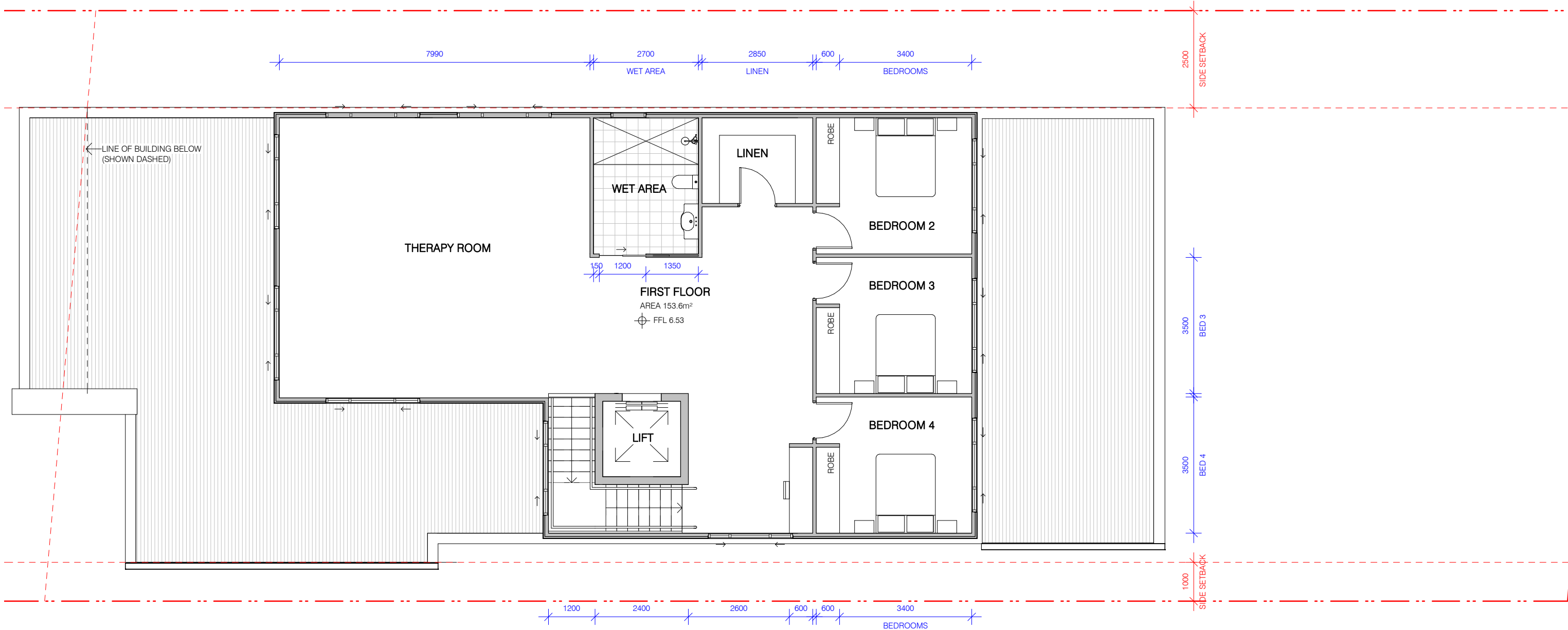
A101

K



NO.13 OAK STREET

OAK STREET



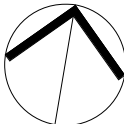
NO.9 OAK STREET



Nominated Architect: Daniel Siric NSW ARB No. 9115 (M) 0414 670 218

REV	DATE	DESCRIPTION
D	31.03.2021	DRAFT FLOOR PLANS
E	07.05.2021	DRAFT FLOOR PLANS
F	24.05.2021	DRAFT FLOOR PLANS
G	30.06.2021	DRAFT FLOOR PLANS
H	08.07.2021	DRAFT CONCEPT
J	13.07.2021	DRAFT CONCEPT
K	31.08.2021	DRAFT DA

NORTH:



PROJECT:

PROPOSED NEW SINGLE DWELLING

11 OAK STREET
NORTH NARRABEEN NSW 2101
LOT 27 IN DP6544

FIRST FLOOR PLAN

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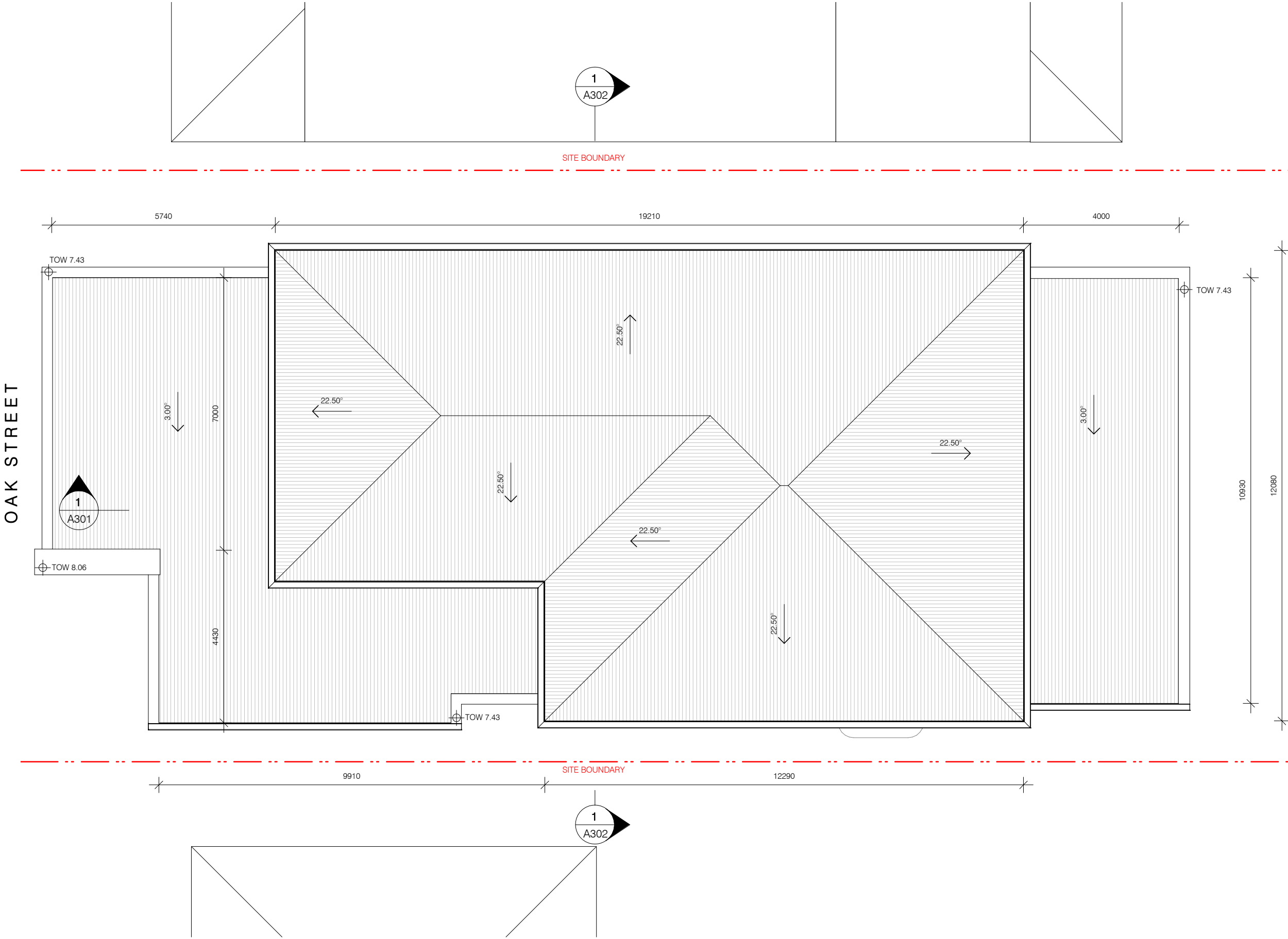
Scale: 1 : 100@ A3

Date: 31.08.2021

A102

K

OAK STREET



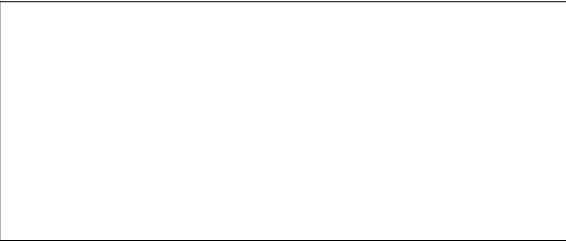
DSA

DANIEL SIRIC ARCHITECTS

Nominated Architect: Daniel Siric NSW ARB No. 9115 (M) 0414 670 218

REV	DATE	DESCRIPTION
H	08.07.2021	DRAFT CONCEPT
J	13.07.2021	DRAFT CONCEPT
K	31.08.2021	DRAFT DA

NORTH:



PROJECT:

PROPOSED NEW SINGLE DWELLING

11 OAK STREET
NORTH NARRABEEN NSW 2101
LOT 27 IN DP6544

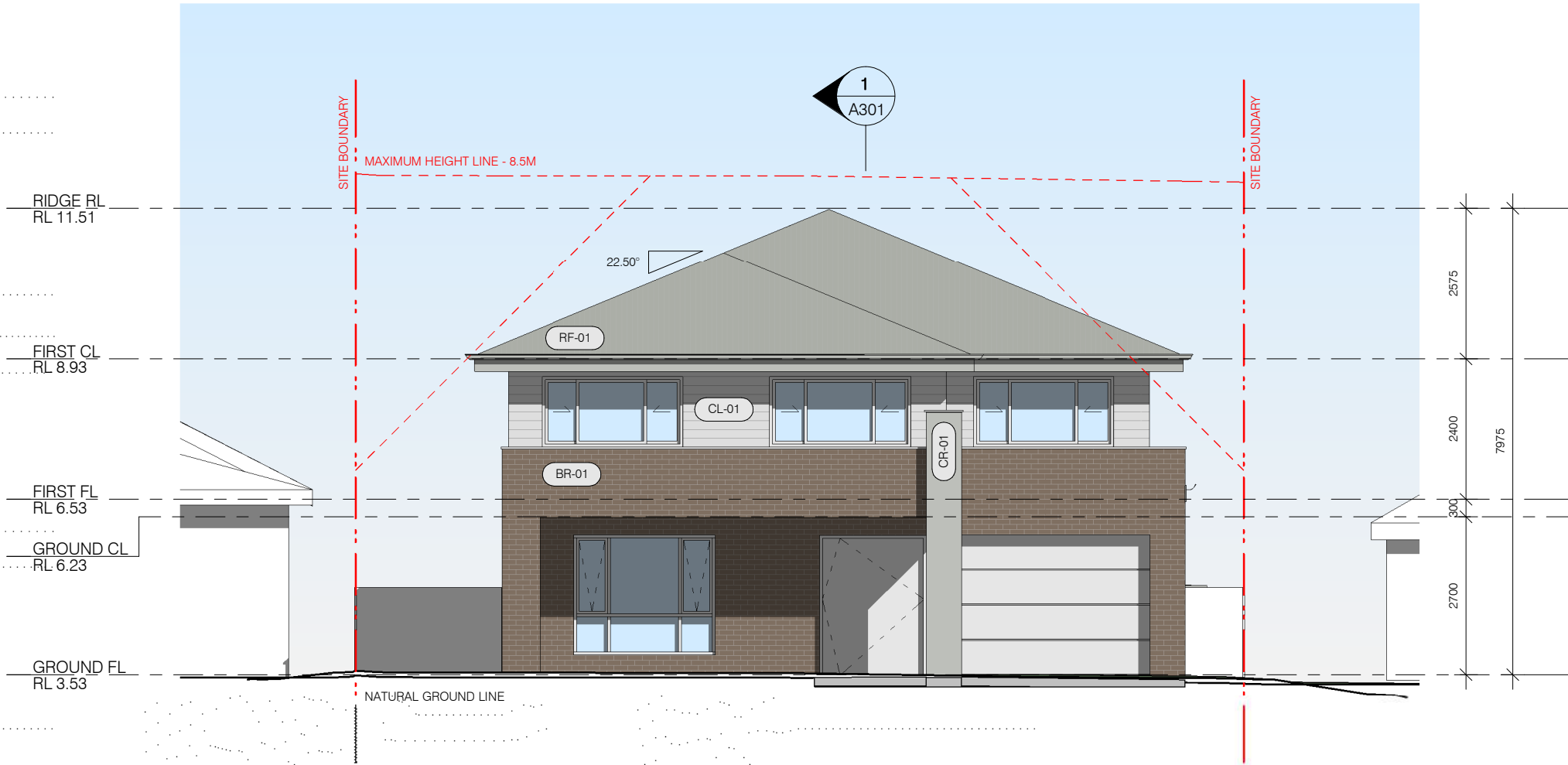
ROOF PLAN

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Scale: 1 : 100@ A3

Date: 31.08.2021

A103K



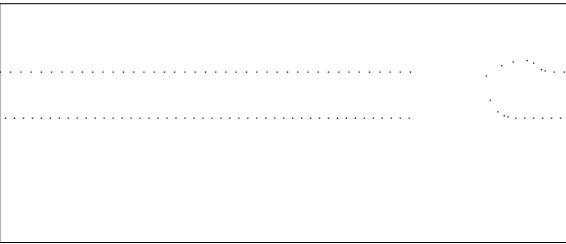
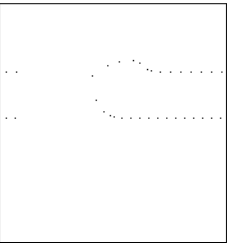
MATERIALS AND FINISHES			
BR-01	BRICK TYPE 01	AUSTRAL "BOWRAL BROWN"	
CL-01	CLADDING TYPE 01	JAMES HARDIE LINEA WEATHERBOARD CLADDING PAINT FINISH - DULUX "VIVID WHITE"	
CR-01	CEMENT RENDER TYPE 01	PAINT FINISH - DULUX "WOMBAT FOREST"	
RF-01	ROOFING TYPE 01	LYSAGHT SPANDEK ROOFING FINISH - COLORBOND "SHALE GREY"	
NOTE: GUTTERS AND FASCIAS TO MATCH COLORBOND "SHALE GREY" WINDOW FRAMES TO BE POWDERCOATED WHITE			

DSA

DANIEL SIRIC
ARCHITECTS

Nominated Architect: Daniel Siric NSW ARB No. 9115 (M) 0414 670 218

REV	DATE	DESCRIPTION
H	08.07.2021	DRAFT CONCEPT
J	13.07.2021	DRAFT CONCEPT
K	31.08.2021	DRAFT DA



PROJECT:

PROPOSED NEW SINGLE DWELLING

11 OAK STREET
NORTH NARRABEEN NSW 2101
LOT 27 IN DP6544

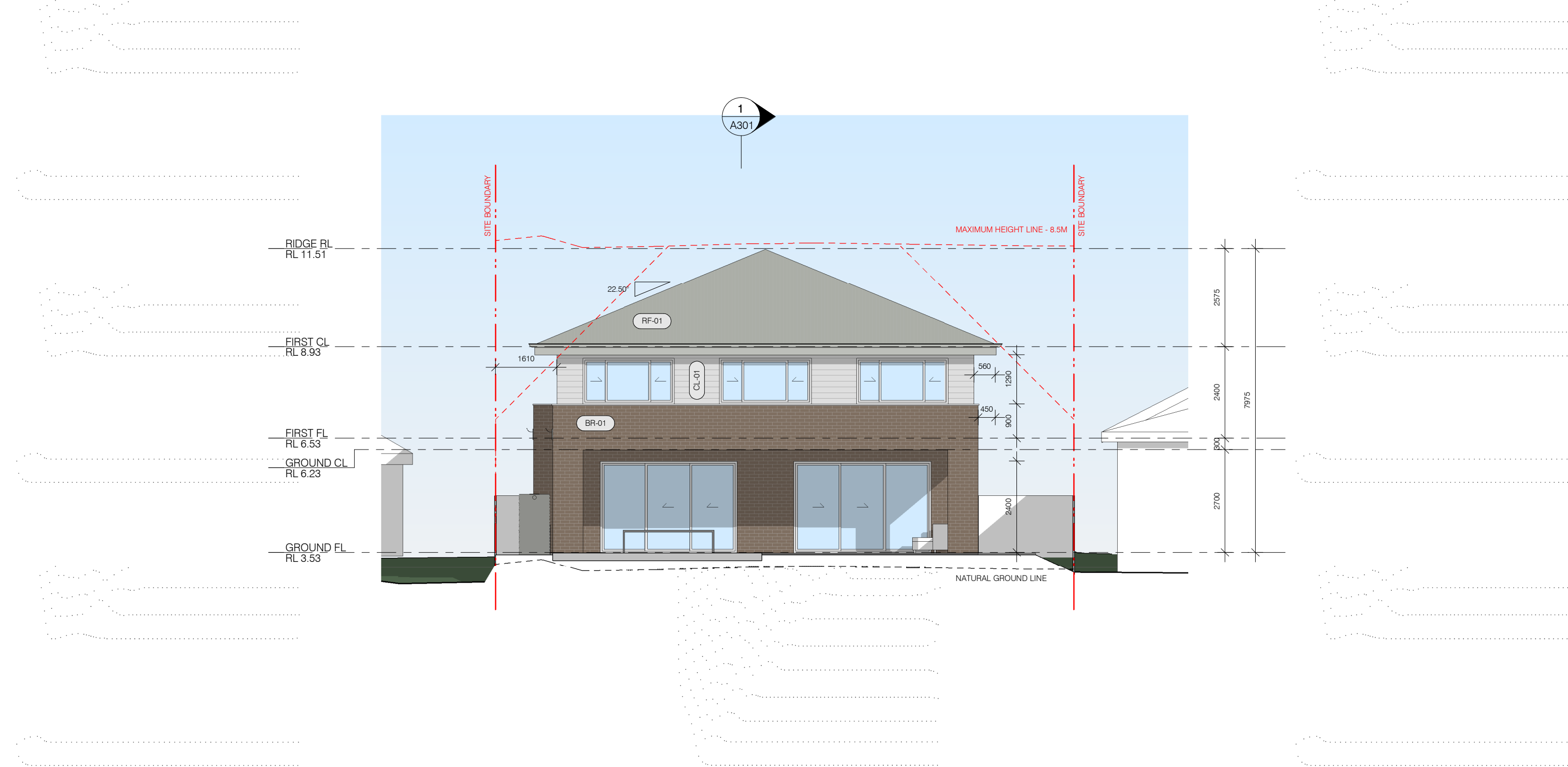
WEST ELEVATION (FACADE)

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Scale: 1 : 100@ A3

Date: 31.08.2021

A201 K



MATERIALS AND FINISHES			
BR-01	BRICK TYPE 01	AUSTRAL "BOWRAL BROWN"	
CL-01	CLADDING TYPE 01	JAMES HARDIE LINEA WEATHERBOARD CLADDING PAINT FINISH - DULUX "VIVID WHITE"	
CR-01	CEMENT RENDER TYPE 01	PAINT FINISH - DULUX "WOMBAT FOREST"	
RF-01	ROOFING TYPE 01	LYSAGHT SPANDEK ROOFING FINISH - COLORBOND "SHALE GREY"	
NOTE: GUTTERS AND FASCIAS TO MATCH COLORBOND "SHALE GREY" WINDOW FRAMES TO BE POWDERCOATED WHITE			

DSA

DANIEL SIRIC ARCHITECTS

Nominated Architect: Daniel Siric NSW ARB No. 9115 (M) 0414 670 218

REV	DATE	DESCRIPTION
H	08.07.2021	DRAFT CONCEPT
J	13.07.2021	DRAFT CONCEPT
K	31.08.2021	DRAFT DA

PROJECT:

PROPOSED NEW SINGLE DWELLING

11 OAK STREET
NORTH NARRABEEN NSW 2101
LOT 27 IN DP6544

EAST ELEVATION

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Scale: 1 : 100@ A3

Date: 31.08.2021

A202K



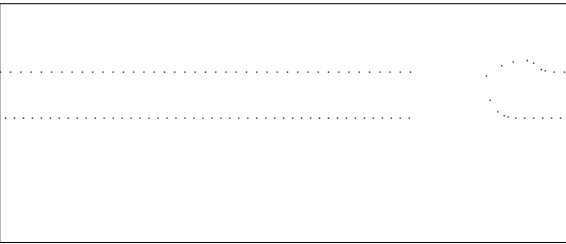
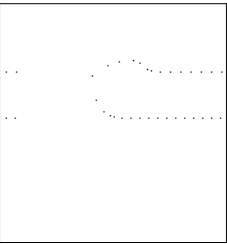
MATERIALS AND FINISHES			
BR-01	BRICK TYPE 01	AUSTRAL "BOWRAL BROWN"	
CL-01	CLADDING TYPE 01	JAMES HARDIE LINEA WEATHERBOARD CLADDING PAINT FINISH - DULUX "VIVID WHITE"	
CR-01	CEMENT RENDER TYPE 01	PAINT FINISH - DULUX "WOMBAT FOREST"	
RF-01	ROOFING TYPE 01	LYSAGHT SPANDEK ROOFING FINISH - COLORBOND "SHALE GREY"	
NOTE: GUTTERS AND FASCIAS TO MATCH COLORBOND "SHALE GREY" WINDOW FRAMES TO BE POWDERCOATED WHITE			

DSA

DANIEL SIRIC
ARCHITECTS

Nominated Architect: Daniel Siric NSW ARB No. 9115 (M) 0414 670 218

REV	DATE	DESCRIPTION
H	08.07.2021	DRAFT CONCEPT
J	13.07.2021	DRAFT CONCEPT
K	31.08.2021	DRAFT DA



PROJECT:

PROPOSED NEW SINGLE DWELLING

11 OAK STREET
NORTH NARRABEEN NSW 2101
LOT 27 IN DP6544

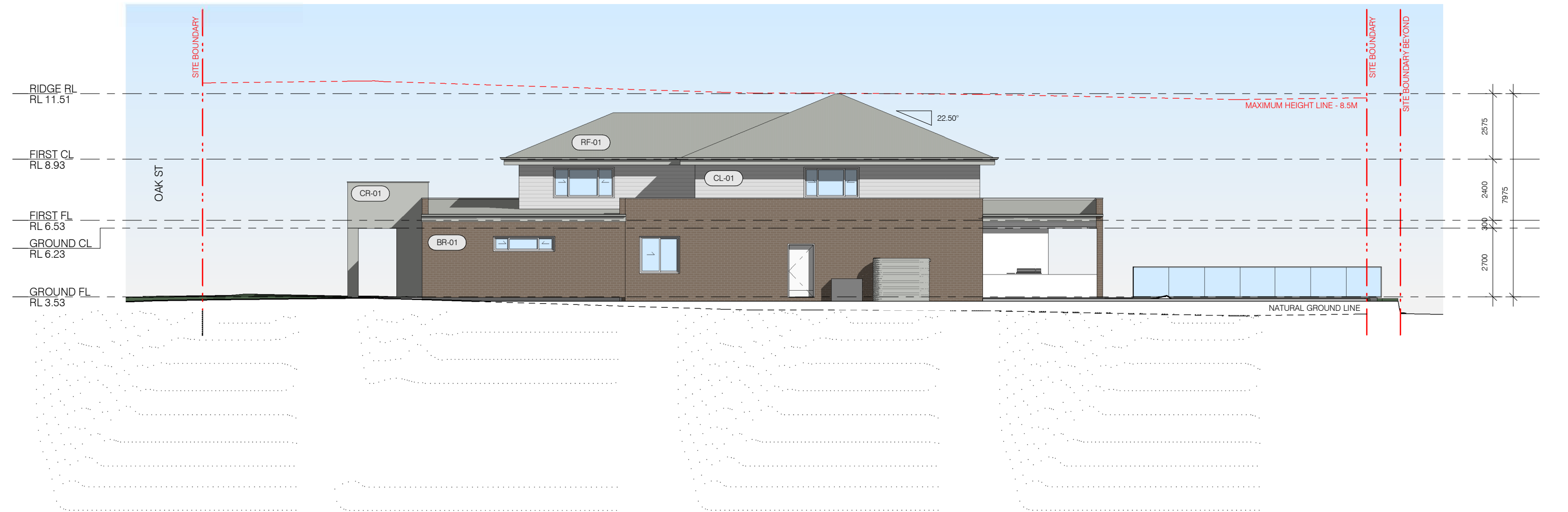
NORTH ELEVATION

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Scale: 1 : 150@ A3

Date: 31.08.2021

A203 K



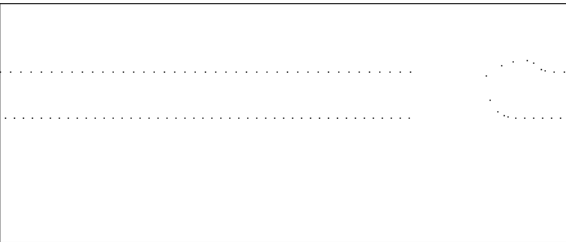
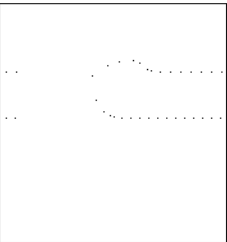
MATERIALS AND FINISHES		
BR-01	BRICK TYPE 01	AUSTRAL "BOWRAL BROWN"
CL-01	CLADDING TYPE 01	JAMES HARDIE LINEA WEATHERBOARD CLADDING PAINT FINISH - DULUX "VIVID WHITE"
CR-01	CEMENT RENDER TYPE 01	PAINT FINISH - DULUX "WOMBAT FOREST"
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NOTE: GUTTERS AND FASCIAS TO MATCH COLORBOND "SHALE GREY" WINDOW FRAMES TO BE POWDERCOATED WHITE		

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DANIEL SIRIC
ARCHITECTS

Nominated Architect: Daniel Siric NSW ARB No. 9115 (M) 0414 670 218

REV	DATE	DESCRIPTION
H	08.07.2021	DRAFT CONCEPT
J	13.07.2021	DRAFT CONCEPT
K	31.08.2021	DRAFT DA



PROJECT:

PROPOSED NEW SINGLE DWELLING

11 OAK STREET
NORTH NARRABEEN NSW 2101
LOT 27 IN DP6544

SOUTH ELEVATION

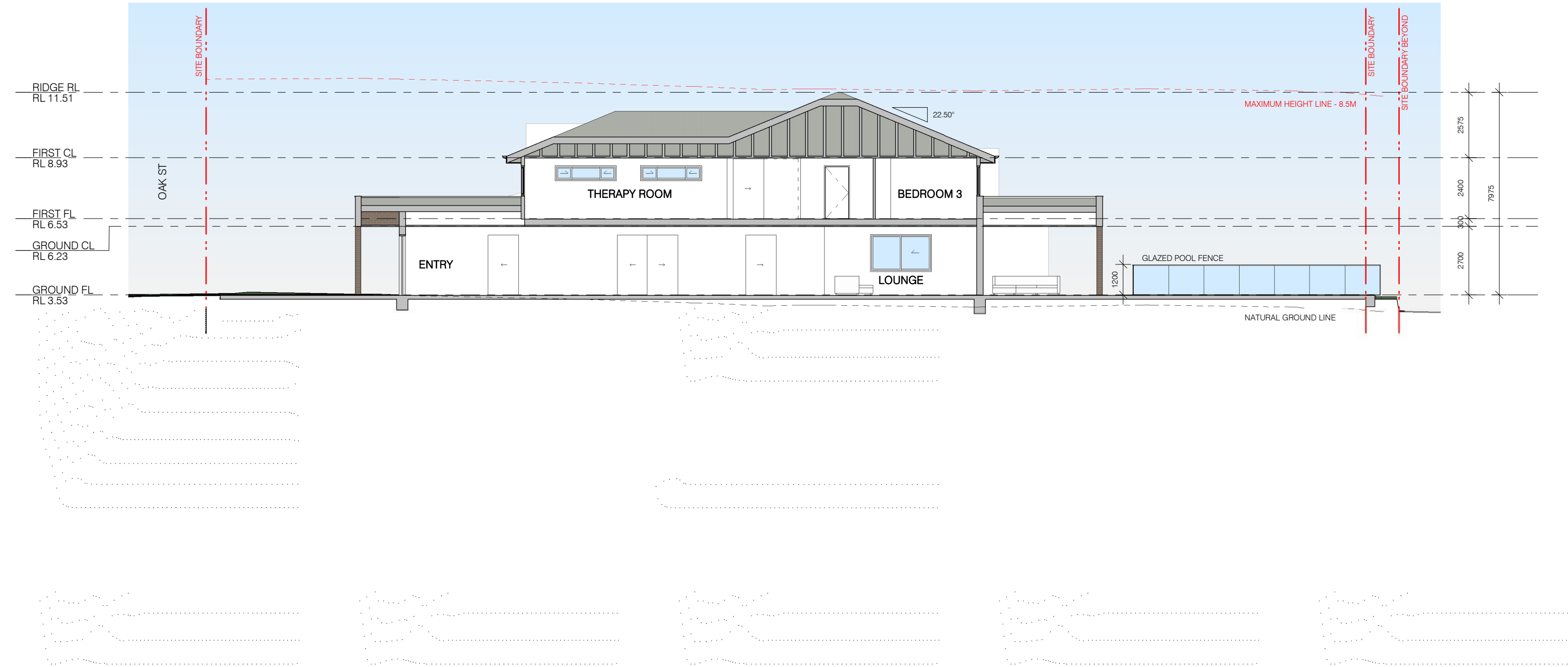
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Scale: 1 : 150@ A3

Date: 31.08.2021

A204

K



DSA

DANIEL SIRIC ARCHITECTS

Nominated Architect: Daniel Siric NSW ARB No. 9115 (M) 0414 670 218

REV	DATE	DESCRIPTION
H	08.07.2021	DRAFT CONCEPT
J	13.07.2021	DRAFT CONCEPT
K	31.08.2021	DRAFT DA

PROJECT:

PROPOSED NEW SINGLE DWELLING

11 OAK STREET
NORTH NARRABEEN NSW 2101
LOT 27 IN DP6544

LONG SECTION

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Scale: 1 : 150@ A3

Date: 31.08.2021

A301

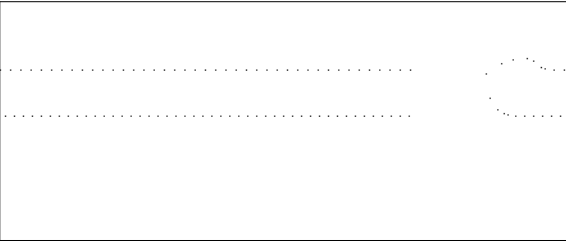
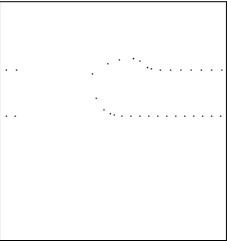
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DSA

DANIEL SIRIC
ARCHITECTS

Nominated Architect: Daniel Siric NSW ARB No. 9115 (M) 0414 670 218

REV	DATE	DESCRIPTION
H	08.07.2021	DRAFT CONCEPT
J	13.07.2021	DRAFT CONCEPT
K	31.08.2021	DRAFT DA



PROJECT:

PROPOSED NEW SINGLE DWELLING

11 OAK STREET
NORTH NARRABEEN NSW 2101
LOT 27 IN DP6544

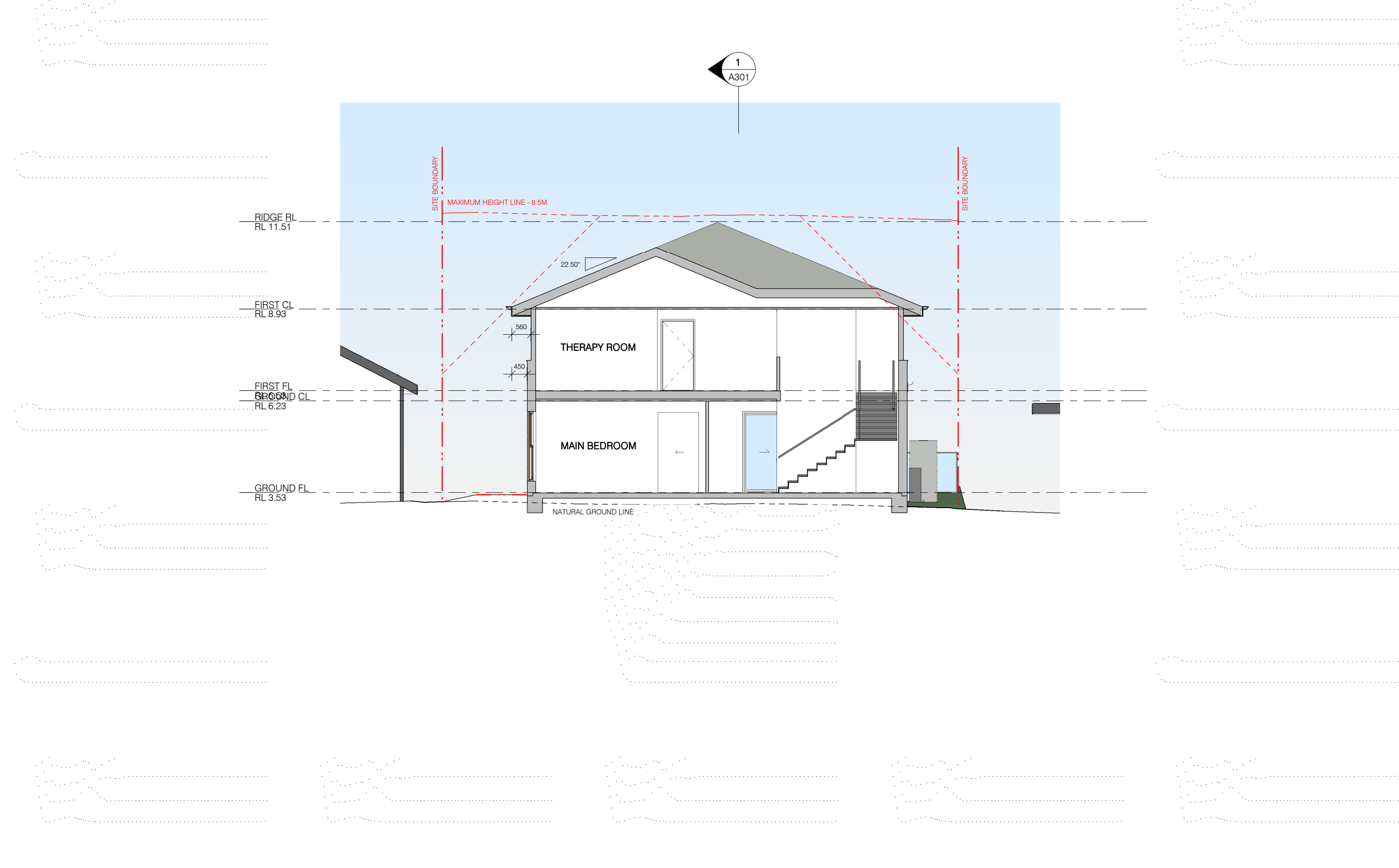
CROSS SECTION

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Scale: 1 : 100@ A3

Date: 31.08.2021

A302K



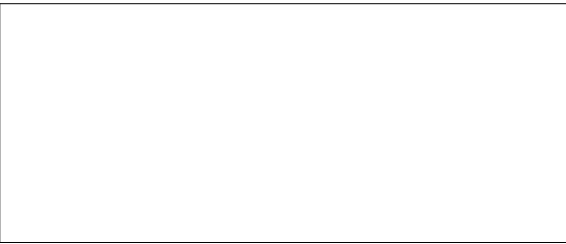
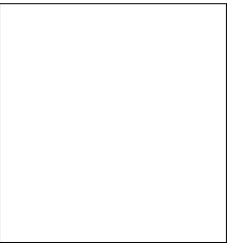


DSA

DANIEL SIRIC
ARCHITECTS

Nominated Architect: Daniel Siric NSW ARB No. 9115 (M) 0414 670 218

REV	DATE	DESCRIPTION
H	08.07.2021	DRAFT CONCEPT
J	13.07.2021	DRAFT CONCEPT
K	31.08.2021	DRAFT DA



PROJECT:

PROPOSED NEW SINGLE DWELLING

11 OAK STREET
NORTH NARRABEEN NSW 2101
LOT 27 IN DP6544

3D PERSPECTIVE

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Scale: N.T.S.

Date: 31.08.2021

A501

K

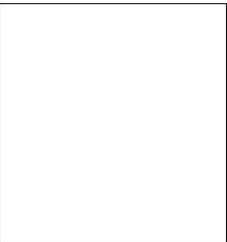


DSA

DANIEL SIRIC
ARCHITECTS

Nominated Architect: Daniel Siric NSW ARB No. 9115 (M) 0414 670 218

REV	DATE	DESCRIPTION
H	08.07.2021	DRAFT CONCEPT
J	13.07.2021	DRAFT CONCEPT
K	31.08.2021	DRAFT DA



PROJECT:

PROPOSED NEW SINGLE DWELLING

11 OAK STREET
NORTH NARRABEEN NSW 2101
LOT 27 IN DP6544

3D PERSPECTIVE

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Scale: N.T.S.

Date: 31.08.2021

A502

K

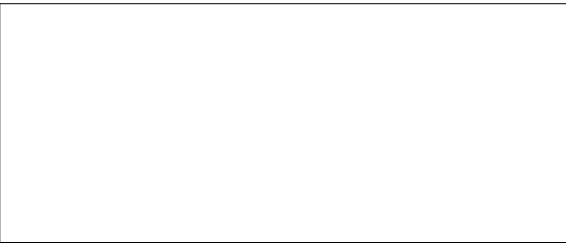
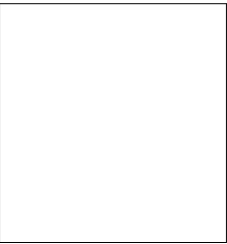


DSA

DANIEL SIRIC
ARCHITECTS

Nominated Architect: Daniel Siric NSW ARB No. 9115 (M) 0414 670 218

REV	DATE	DESCRIPTION
H	08.07.2021	DRAFT CONCEPT
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PROJECT:

PROPOSED NEW SINGLE DWELLING

11 OAK STREET
NORTH NARRABEEN NSW 2101
LOT 27 IN DP6544

3D PERSPECTIVE

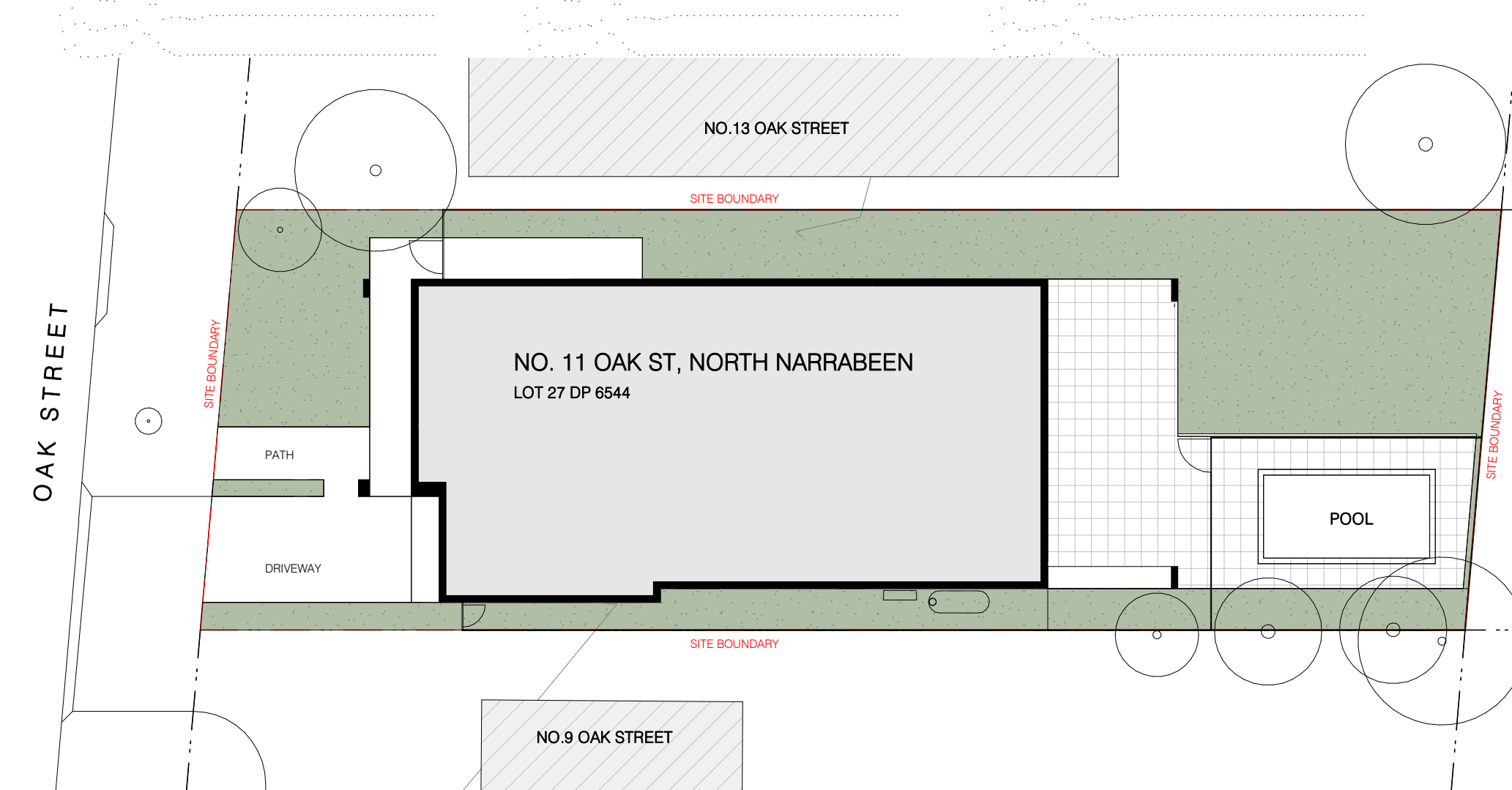
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Scale: N.T.S.

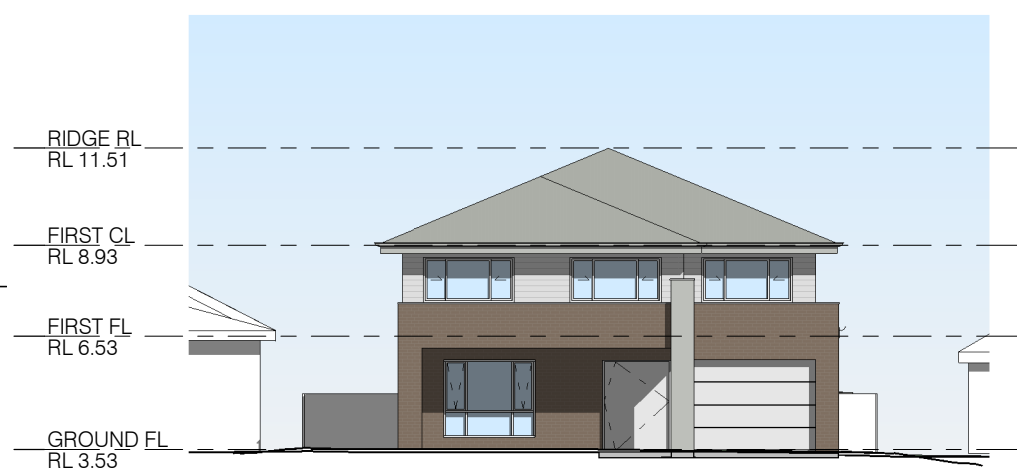
Date: 31.08.2021

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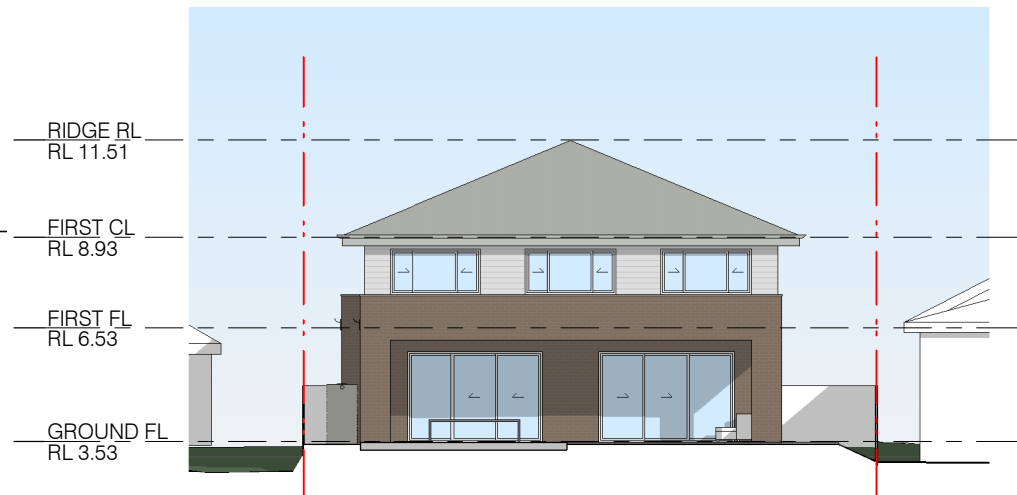
K



01 SITE PLAN
A201 1 : 200



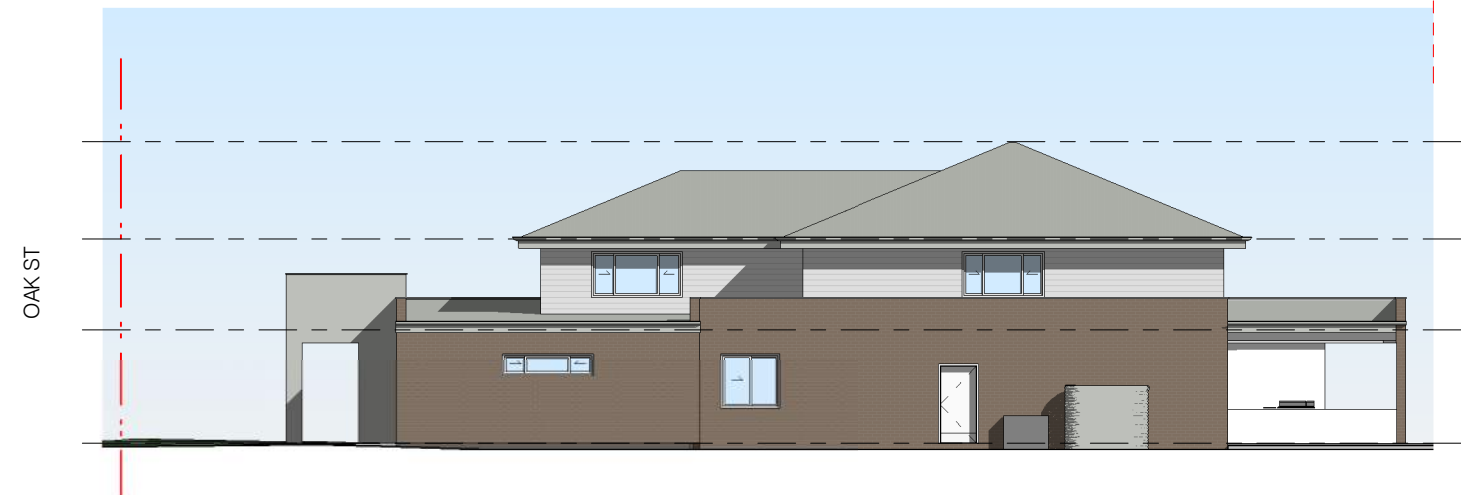
A WEST ELEVATION
1 : 200



B EAST ELEVATION
1 : 200



C NORTH ELEVATION
1 : 200



D SOUTH ELEVATION
1 : 200

DSA
DANIEL SIRIC
ARCHITECTS

Nominated Architect: Daniel Siric NSW ARB No. 9115 (M) 0414 670 218

NORTH:

PROJECT:

PROPOSED NEW SINGLE DWELLING

11 OAK STREET
NORTH NARRABEEN NSW 2101
LOT 27 IN DP6544

NEIGHBOUR NOTIFICATION

Scale: 1 : 200@ A3

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Date of Birth:
13 July 1974

Nationality:
Australian

Profession:
Water Resources
Engineer (hydrologist)

Qualifications:
Bachelor of Engineering
(Res. Eng) University of
New England, 1997

Masters of Engineering
(Research) University of
Technology Sydney,
2009

PROFILE

Steve has twenty years' experience working in the field of hydrology with a principle focus on flooding. Steve's primary area of technical expertise is in the field of flooding and he has worked in the Supreme Court of NSW and the NSW Land and Environment Court as a modelling expert. Steve would reasonably be considered an expert in the fields of: flood hydrology; flood modelling (1D and 2D models); stormwater, riverine and urban modelling; floodplain management works design; GIS integration into flooding work and floodplain management as it integrates with council planning. Steve also has a variety of experience in other water resource related fields including yield analysis, water balance and water quality related studies.

PROFESSIONAL EXPERIENCE

GRC Hydro (Director) - 2017 and ongoing

- Yarralumla Creek flood study review and mitigation works development
- ACT Light Rail Flood Impact Design and Assessment
- Rich Street Marrickville – Flood Management Report
- Yallah Road OSD Review – Expert Opinion
- Chatswood Freemans Road Stormwater Impact Assessment
- Wallacia Golf Course Flood Study
- North Bexley Stormwater Assessment
- Private Hospital Site Flood Risk Assessment – Johnstons Creek
- Austral Flood Risk Management Report
- Appian Way L&E Court Report
- Appian Way Supreme Court Expert Report
- Gladesville – Hillcrest Avenue Supreme Court Expert Court
- Kingsgrove – L&E Court – Flood Expert
- Snowy Mountains Flood and FRMS&P Studies
- University of Sydney – Health Precinct Project – Reviewer
- University of Sydney – Engineering Precinct Project – Reviewer
- North Sydney - LGA FRMS&P
- Hunters Hill - LGA Flood Study
- Burwood Council – Expert Advice re: 149(2) and FPA for Overland Flow Catchments

WMAwater (Director) - 2009 to 2017

- Hawthorne and Dobroyd Canal FRMS&P
- Alexandria and Johnstons Creek Flood Studies
- Tuggerah Lake Overland Flow Studies
- Ourimbah Creek FRMS&P
- Wagga FRMS&P Revision
- Exile Bay and Powell's Creek Flood Studies
- Culcairn, Holbrook and Henty Flood and FRMS&P Studies
- Rushcutters Bay, Centennial Park and Woolloomooloo Flood and FRMS&P Studies
- Gundagai Flood Study
- Currumbene and Moona Moona Creeks FRMS&P
- Milperra Riverside Development Modelling
- CBD and Darling Harbour FRMS&P
- L&E Court – Ashfield Council
- North Sydney Overland Flow Flood Study
- Detailed Model Review – Wagga Wagga

- Lockhart and The Rock – Flood and FRMS&P Studies
- Blackwattle Bay and Johnstons Creek FRMS&P
- Medowie FRMS&P
- Harold Park Flooding, Stormwater and WSUD Review
- Commission into Brisbane River Floods of January 2011
- SES – Griffith 2012 Flood Review
- Griffith CBD FRMS&P
- Griffith CBD Flood Study
- Dobroyd Canal Flood Study
- Hawthorne Canal Flood Study
- Astrolabe Park Flood Impact Study and Design Project
- Middle Bays Floodplain Risk Management Study and Plan
- Woolaware Bay Flood Study
- Eastern Creek Hydrological Assessment – RAFTS Model Build
- Parken Pregar Road Improvement Impact Assessment
- SES - Murrumbidgee River December 2010 Flood Data Collection
- Wagga LGA Murrumbidgee River 2D Modelling
- Griffith Aerodrome Floodplain Risk Management Study and Plan
- RTA Narara to Lisarow Flood Impact Analysis and Review of Modelling
- Wagga Wagga Caravan Park Flood Impact Assessment
- Marrickville Valley Flood Study
- Jugiong Floodplain Risk Management Study and Plan
- Oura to Braehour Flood Mapping, WWCC
- Holbrook Road Development Impact Assessment – Wagga
- ANU Flood Study – ACT
- Flower Power Flood Impact Study and Floodplain Management Advice
- Medowie Drainage Study
- Upper South Creek Flood Study
- Wagga Wagga Major Overland Flow Study
- Box Hill Impact Assessment, LPMA – Sydney
- L&E Court - Timbumburi Creek Flood Study
- Boral Moorebank Impact Assessment and Floodplain Management Advice
- Murray Area 2D Modelling Review
- Hay Overland Flow Study
- Cotter MIKE She Post Bushfire Yield Review
- Young Street Residential Development – Surface Water Study
- Wagga Wagga 1D to 2D Model Conversion Project
- Griffith Airport Overland Flow Study
- Sandy Beach Development Proposal Environmental Assessment – Review of Findings

DHI Malaysia SDN. BHD, KL (Water Resources Manager)

Flooding and Floodplain Management

- Thurgoona Dam Break Study
- Tanoui NZ MIKE Flood Modelling
- Chowilla Velocity Impact Analysis
- Chowilla Water Use Analysis
- Wyong Economic Zone Hydrologic and Hydraulic Study
- Haslams Ck Tooheys Site MIKE Flood Investigation
- Thurgoona and Airport Flood Study
- Bungambrawatha Dam Break Study
- MIKE Flood Model Review – Greater Wellington Regional Council
- Bankstown Airport MIKE Flood Impact Study
- Chowilla Wetlands 2D Modelling Project
- MIKE Flood Development – Denmark

- Phulbari Open Cut Coal Mines Levee Design – Bangladesh
- East Lavington Drainage Study
- Benalla Model Conversion – MIKE21/MIKE11
- ACT Yield Modelling – MIKESHE/MIKE11
- Poulton Park 2D Drainage Study
- Huon valley Dam Break
- Iberia Street 2D Drainage Study
- Elanora 2D Drainage Study
- SMEC Laos 2D/1D Flood Diversion Project
- Bulimba Creek 2D Preliminary Flood Study
- Buttonderry Creek Development Impact Study
- Hume Dam Catchment Hydrology
- Tenterfield Flood Study
- Orange Flood Study
- RTA Tamworth Road Works
- Brisbane City Council Sewer Study
- Townsville Flood Study

Training Carried Out

- Software Support
- MIKE Product Training – Gui and Partners Sdn Bhd Training
- Papakura Council SHE/MIKE STORM Training
- MIKE Flood Advanced Training – Auckland NZ
- MIKE21 Training – Auckland NZ
- Greater Wellington Regional Council – MIKE21/Mike11 Training
- University of Canberra CRC for Freshwater Ecology – MIKE21/MIKE11 Training
- HydroTasmania MIKE21/MIKE11
- MIKE FLOOD (2D/1D) Training Course

ERM Australia PTY LTD (Senior Engineer)

- Canungra Army Base Re-development Water Strategy Study
- Parramatta Rail Link Soil and Water Sub-plans
- Hoxton Park Flood Impact Assessment
- Rolleston Coal Mine Environmental Impact Assessment
- Rhodes Peninsula Soil Rehabilitation Project EIS
- AUSTEEL Steel Mill and Harbour Facilities EIS

WBM Oceanics Australia (Water Resources Engineer)

- Hexham Swamp Tide Gate Re-Opening Impact Analysis
- East Hills Flood Mitigation Work Analysis
- Singleton Stormwater Management Plan and Infrastructure Design Report
- Cudgera Creek, Yelgun NSW
- Riverlink Canal Estate Development Impact Study
- Steel St, Newcastle NSW
- Cottage Creek Flood Study
- Ulmarra Floodplain Management Study, Ulmarra NSW
- Newcastle Flood Data Collection Study

Ecowise Environmental LTD (Water Resources Engineer)

- Flood Inundation Mapping, Benalla VIC
- ACT Flood Plan
- Flood Forecasting Operations
- Flood Study for the Ginninderra Catchment, ACT

Water Resource Related Civil Works

- Installation of Discharge Monitoring Sites, Dampier WA
- Design of Sedimentation Ponds and Pipe Network, Dampier WA

Water Yield Analysis

- Proposed Lake Jerrambombera Aquatic Facility
- Cotter Dam – SHE Modelling Assessment
- Gold Creek Golf Club – Water Balance Assessment
- Department of Social Services – Basin Leak Assessment
- Preliminary Water Balance Investigation, Tuggeranong
- Water Supply Study for ACTEW

Water Quality Modelling

- Proposed Lake Jerrambombera Aquatic Facility
- GIS Land Capability Mapping and CMSS Modelling

Dam Break Modelling

- Kenyir Dam Break Assessment
- Thurgoona Dam Break Study
- Bungambrawatha Dam Break Study
- Huon Valley Dam Break Modelling
- Hume Dam Hydrology and Failures Scenarios

PUBLICATIONS

- Gray, S.D, Ball, J.E. and M.K. Babister (2011). The Direct Rainfall Method – A Critical Discussion of Current Practice. Proceedings 51st Floodplain Management Association Floodplain Managers Conference Tamworth , February 2011
- Gray, S.D and Ball, J.E. (2010). Coupled One and Two Dimensional Modelling in Urban Catchments – Reducing Uncertainty in Flood Estimation. Proceedings 32nd Hydrology and Water Resources Symposium, December 2009
- Beavis, S. G., A. J. Jakeman, L. Zhang and S. D. Gray (1997). Erosional History of Selected Upland Subcatchments in the Liverpool Plains, New South Wales. Proceedings International Congress on Modelling and Simulation, MODSIM97, University of Tasmania, 8-11 December 1997. A. D. McDonald. (Eds). Vol. 1 pp. 277

FLOOD INFORMATION REQUEST – COMPREHENSIVE

Property: 11 Oak Street NORTH NARRABEEN NSW 2101

Lot DP: Lot 27 DP 6544

Issue Date: 28/01/2021

Flood Study Reference: Narrabeen Lagoon Flood Study 2013, BMT WBM

Flood Information for lot ¹:

Flood Risk Precinct – See Map A

Flood Planning Area – See Map A

Maximum Flood Planning Level (FPL) ^{2, 3, 4}: 3.53 m AHD

1% AEP Flood – See Flood Map B

1% AEP Maximum Water Level ^{2, 3}: 3.03 m AHD

1% AEP Maximum Depth from natural ground level³: 0.20 m

1% AEP Maximum Velocity: 0.03 m/s

1% AEP Provisional Flood Hazard: Transition See Flood Map D

1% AEP Hydraulic Categorisation: Flood fringe See Flood Map E

Probable Maximum Flood (PMF) – See Flood Map C

PMF Maximum Water Level ⁴: 4.86 m AHD

PMF Maximum Depth from natural ground level: 2.08 m

PMF Maximum Velocity: 0.38 m/s

PMF Flood Hazard: High See Flood Map F

PMF Hydraulic Categorisation: Flood storage See Flood Map G

Flooding with Climate Change (See Flood Map H)

The following is for the 30% Rainfall intensity increase and 0.9m Sea Level Rise Scenario:

1% AEP Maximum Water Level with Climate change ³: 3.90 m AHD

1% AEP Maximum Depth with Climate Change³: 1.12 m

Flood Life Hazard Category – See Map I

Indicative Ground Surface Spot Heights – See Map J

¹ The flood information does not take into account any local overland flow issues nor private stormwater drainage systems.

² Overland flow/mainstream water levels may vary across a sloping site, resulting in variable minimum floor/flood planning levels across the site. The maximum Flood Planning Level may be in a different location to the maximum 1% AEP flood level.

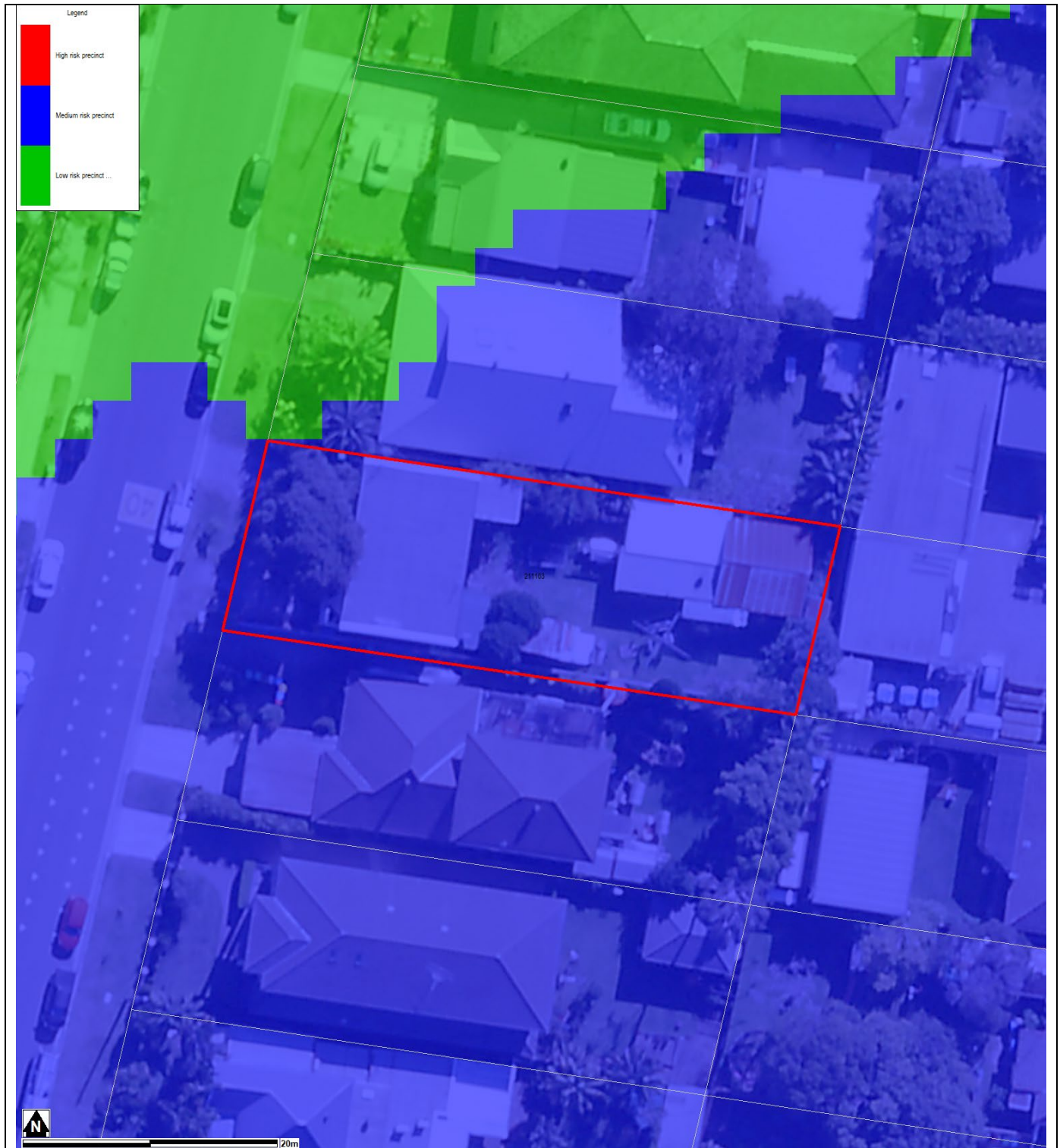
³ Intensification of development in the former Pittwater LGA requires the consideration of climate change impacts which may result in higher minimum floor levels.

⁴ Vulnerable/critical developments require higher minimum floor levels using the higher of the PMF or FPL.

General Notes:

- All levels are based on Australian Height Datum (AHD) unless otherwise noted.
- This is currently the best available information on flooding; it may be subject to change in the future.
- Council recommends that you obtain a detailed survey of the above property and surrounds to AHD by a registered surveyor to determine any features that may influence the predicted extent or frequency of flooding. It is recommended you compare the flood level to the ground and floor levels to determine the level of risk the property may experience should flooding occur.
- Development approval is dependent on a range of issues, including compliance with all relevant provisions of Northern Beaches Council's Local Environmental Plans and Development Control Plans.
- Please note that the information contained within this letter is general advice only as a detail survey of the property as well as other information is not available. Council recommends that you engage a suitably experienced consultant to provide site specific flooding advice prior to making any decisions relating to the purchase or development of this property.
- The Flood Studies on which Council's flood information is based are available on Council's website.

FLOOD MAP A: FLOOD RISK PRECINCT MAP



Notes:

- **Low Flood Risk precinct** means all flood prone land not identified within the High or Medium flood risk precincts.
- **Medium Flood Risk precinct** means all flood prone land that is (a) within the 1% AEP Flood Planning Area; and (b) is not within the high flood risk precinct.
- **High Flood Risk precinct** means all flood prone land (a) within the 1% AEP Flood Planning Area; and (b) is either subject to a high hydraulic hazard, within the floodway or subject to significant evacuation difficulties (H5 or H6 Life Hazard Classification).
- The **Flood Planning Area** extent is equivalent to the Medium Flood Risk Precinct extent, and includes the High Flood Risk Precinct within it. The mapped extent represents the 1% annual Exceedance Probability (AEP) flood event + freeboard.
- None of these mapped extents include climate change.

FLOOD LEVEL POINTS



Note: Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only.

Flood Levels

ID	5% AEP Max WL (m AHD)	5% AEP Max Depth (m)	1% AEP Max WL (m AHD)	1% AEP Max Depth (m)	1% AEP Max Velocity (m/s)	Flood Planning Level (m)	PMF Max WL (m AHD)	PMF Max Depth (m)	PMF Max Velocity (m/s)
1	N/A	N/A	N/A	N/A	N/A	3.53	4.86	1.35	0.11
2	N/A	N/A	3.03	0.14	0.00	3.53	4.85	1.96	0.19
3	N/A	N/A	3.03	0.01	0.00	3.53	4.85	1.82	0.08
4	N/A	N/A	N/A	N/A	N/A	3.53	4.86	1.51	0.19
5	N/A	N/A	3.03	0.15	0.03	3.52	4.85	1.97	0.21
6	N/A	N/A	3.03	0.21	0.03	3.53	4.85	2.04	0.35

Climate Change Flood Levels (30% Rainfall intensity and 0.9m Sea Level Rise)

ID	CC 1% AEP Max WL (m AHD)	CC1 % AEP Max Depth (m)
1	3.90	0.38
2	3.90	1.00
3	3.90	0.86
4	3.90	0.55
5	3.90	1.01
6	3.90	1.08

WL – Water Level

PMF – Probable Maximum Flood

N/A = no peak water level/depth/velocity available in flood event.

A variable Flood Planning Level might apply. Freeboard is generally 0.5m above the maximum 1% AEP water level. However for overland flow with a depth less than 0.3m and a VelocityxDepth product less than $0.3\text{m}^2/\text{s}$, a freeboard of 0.3m may be able to be justified.

FLOOD MAP B: FLOODING - 1% AEP EXTENT



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event.
- Flood events exceeding the 1% AEP can occur on this site.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source Near Map 2014) are indicative only.

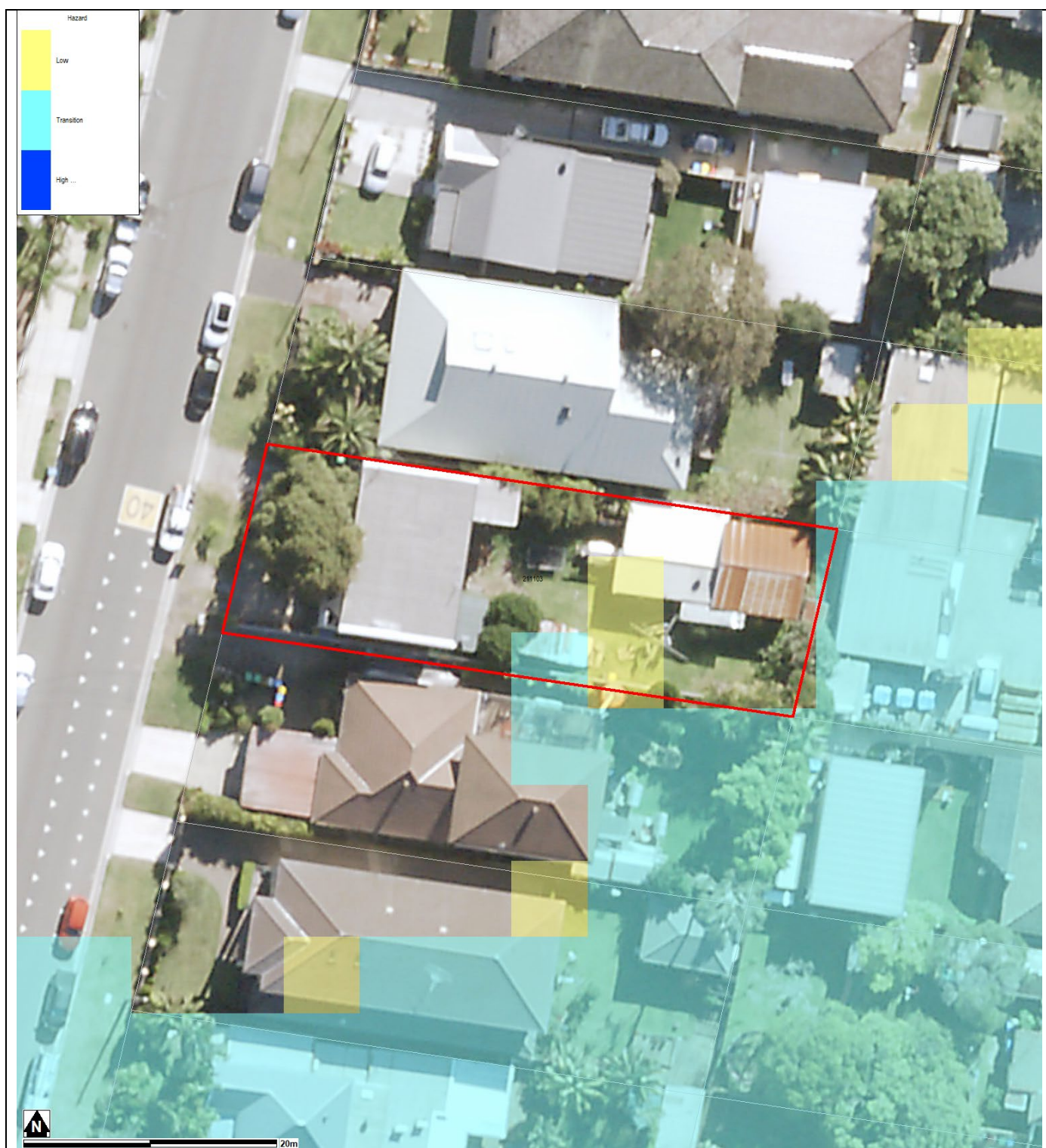
FLOOD MAP C: PMF EXTENT MAP



Notes:

- Extent represents the Probable Maximum Flood (PMF) flood event
- Extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

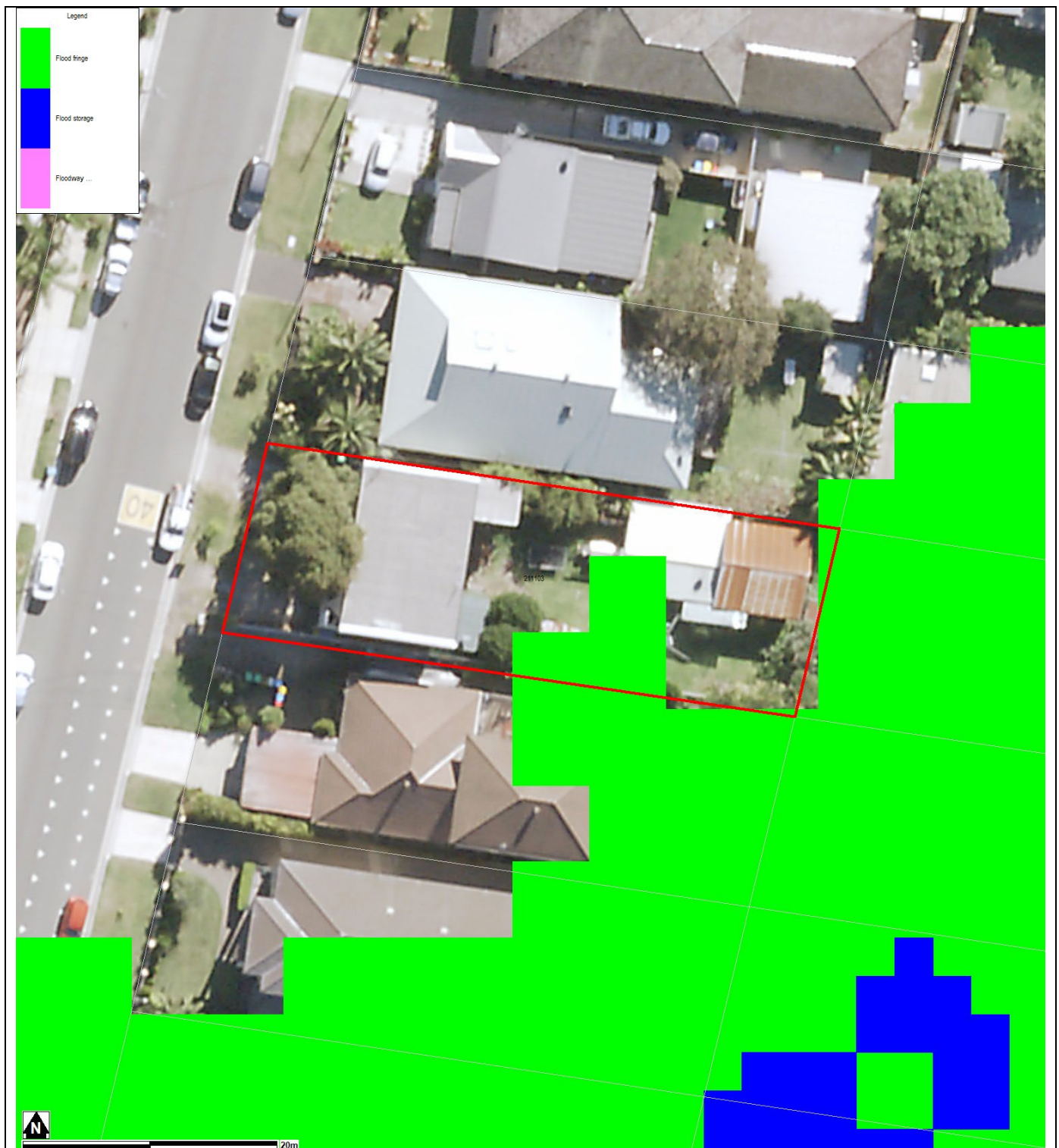
FLOOD MAP D: 1% AEP FLOOD HAZARD EXTENT MAP



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event
- Extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP E: 1% AEP FLOOD HYDRAULIC CATEGORY EXTENT MAP



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event
- Extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

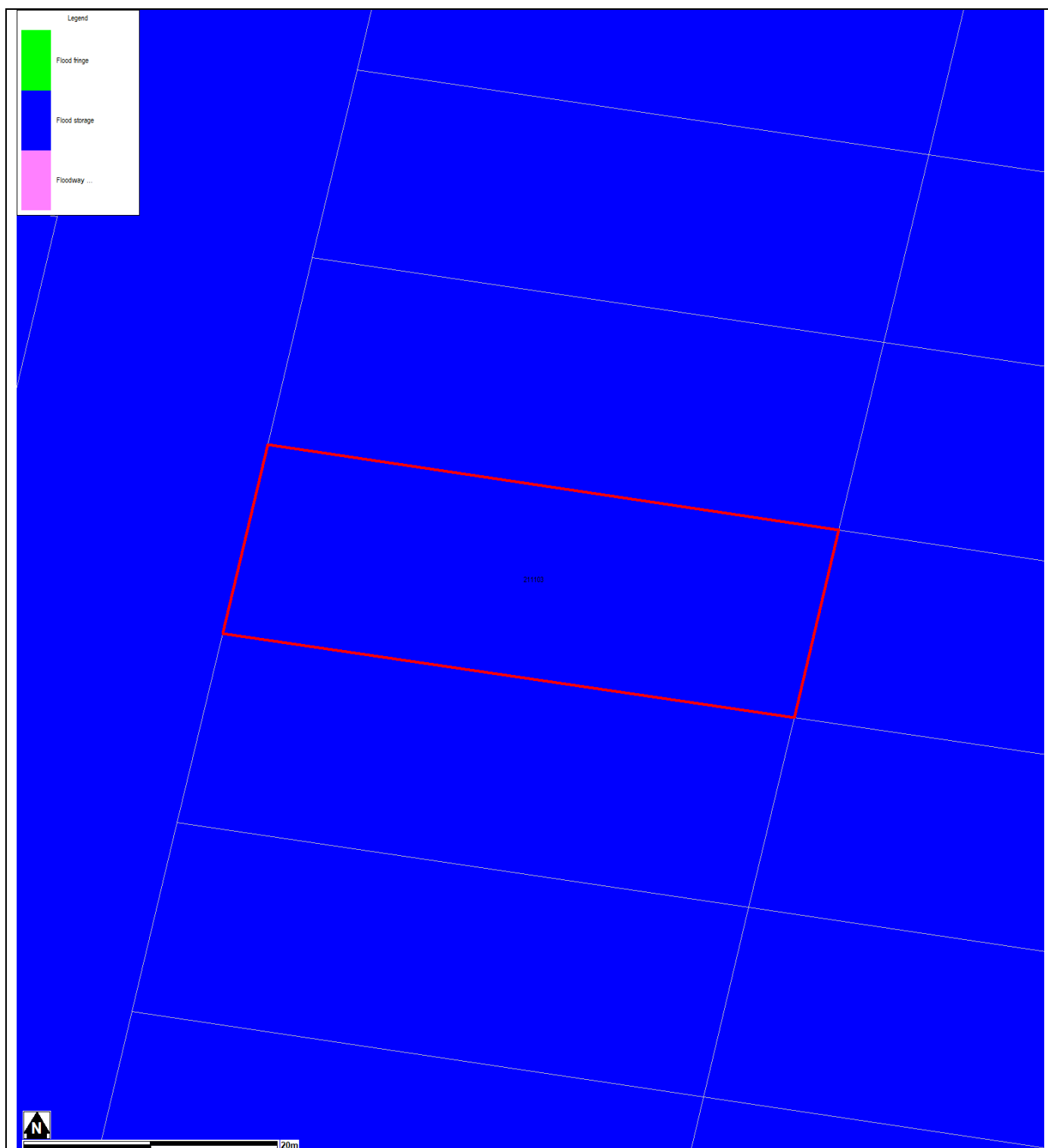
FLOOD MAP F: PMF FLOOD HAZARD EXTENT MAP



Notes:

- Extent represents the Probable Maximum Flood (PMF) event
- Extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP G: PMF FLOOD HYDRAULIC CATEGORY EXTENT MAP



Notes:

- Extent represents the Probable Maximum Flood (PMF) event
- Extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

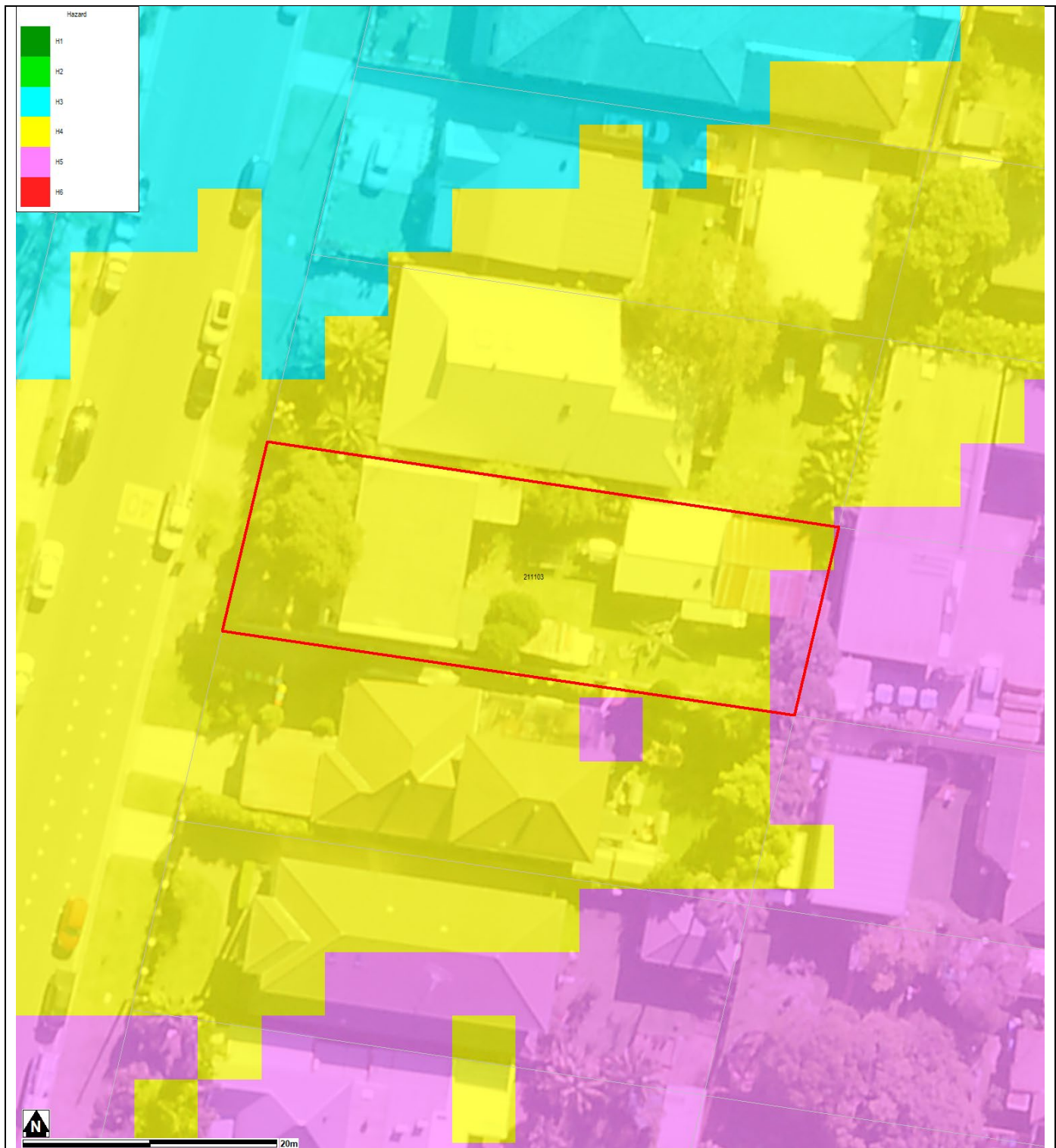
FLOOD MAP H: FLOODING – 1% AEP EXTENT PLUS CLIMATE CHANGE



Note:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event including 30% rainfall intensity and 0.9m Sea Level Rise climate change scenario
- Flood events exceeding the 1% AEP can occur on this site.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP I: FLOOD LIFE HAZARD CATEGORY



Notes:

- For additional information on Flood Life Hazard Categories, refer to the 'Flood Emergency Response Planning for Development in Pittwater Policy'.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source Near Map 2014) are indicative only.

- The surface spot heights shown on this map were derived from Airborne Laser Survey and are indicative only.
- Accuracy is generally within $\pm 0.2\text{m}$ vertically and $\pm 0.15\text{m}$ horizontally, and Northern Beaches Council does not warrant that the data does not contain errors.
- If accuracy is required, then survey should be undertaken by a registered surveyor.

Preparation of a Flood Management Report

Introduction

These guidelines are intended to provide advice to applicants on how to determine what rules apply on flood prone land, and how to prepare a Flood Management Report. The purpose of a Flood Management Report is to demonstrate how a proposed development will comply with flood related planning requirements.

Planning Requirements for Flood Prone Land

Development must comply with the requirements for developing flood prone land set out in the relevant Local Environment Plan (LEP) and Development Control Plan (DCP). There are separate LEPs and DCPs for each of the former Local Government Areas (LGAs), although preparation of a LGA-wide LEP and DCP is currently under way.

The clauses specific to flooding in the LEPs and DCPs are as follows:

LEP Clauses	DCP Clauses
Manly LEP (2013) – 6.3 Flood Planning	Manly DCP (2013) – 5.4.3 Flood Prone Land
Warringah LEP (2011) – 6.3 Flood Planning Warringah LEP (2000) – 47 Flood Affected Land *	Warringah DCP (2011) – E11 Flood Prone Land
Pittwater LEP (2014) – 7.3 Flood Planning Pittwater LEP (2014) – 7.4 Flood Risk Management	Pittwater 21 DCP (2014) – B3.11 Flood Prone Land Pittwater 21 DCP (2014) – B3.12 Climate Change

* The Warringah LEP (2000) is relevant only for the “deferred lands” which affects only a very small number of properties, mostly in the Oxford Falls area.

Development on flood prone land must also comply with Council's Water Management for Development Policy, and if it is in the Warriewood Release Area, with the Warriewood Valley Water Management Specification. Guidelines for Flood Emergency Response Planning are available for addressing emergency response requirements in the DCP. These documents can be found on Council's website on the [Flooding page](#).

Note that if the property is affected by estuarine flooding or other coastal issues, these need to be addressed separately under the relevant DCP clauses.

When is a Flood Management Report required?

A Flood Management Report must be submitted with any Development Application on flood prone land (with exceptions noted below), for Council to consider the potential flood impacts and applicable controls. For Residential or Commercial development, it is required for development on land identified within the Medium or High Flood Risk Precinct. For Vulnerable or Critical development, it is required if it is within any Flood Risk Precinct.

There are some circumstances where a formal Flood Management Report undertaken by a professional engineer may not be required. However the relevant parts of the DCP and LEP would still need to be addressed, so as to demonstrate compliance. Examples where this may apply include:

- If all proposed works are located outside the relevant Flood Risk Precinct extent
- First floor addition only, where the floor level is above the Probable Maximum Flood level
- Internal works only, where habitable floor areas below the FPL are not being increased

Note that development on flood prone land will still be assessed for compliance with the relevant DCP and LEP, and may still be subject to flood related development controls.

What is the purpose of a Flood Management Report?

The purpose of a Flood Management Report is to demonstrate how a proposed development will comply with flood planning requirements, particularly the development controls outlined in the relevant LEP and DCP clauses. The report must detail the design, measures and controls needed to achieve compliance, following the steps outlined below.

A Flood Management Report should reflect the size, type and location of the development, proportionate to the scope of the works proposed, and considering its relationship to surrounding development. The report should also assess the flood risk to life and property.

Preparation of a Flood Management Report

The technical requirements for a Flood Management Report include (where relevant):

1. Description of development

- Outline of the proposed development, with plans if necessary for clarity
- Use of the building, hours of operation, proposed traffic usage or movement
- Type of use, eg vulnerable, critical, residential, business, industrial, subdivision, etc

2. Flood analysis

- 1% AEP flood level
- Flood Planning Level (FPL)
- Probable Maximum Flood (PMF) level
- Flood Risk Precinct, ie High, Medium or Low
- Flood Life Hazard Category
- Mapping of relevant extents
- Flood characteristics for the site, eg depth, velocity, hazard and hydraulic category, and the relevance to the proposed development

If the property is affected by an Estuarine Planning Level (EPL) which is higher than the FPL, then the EPL should be used as the FPL. If the FPL is higher than the PMF level, then the FPL should still be used as the FPL, as it includes freeboard which the PMF does not.

3. Assessment of impacts

- Summary of compliance for each category of the DCP, as per the table below.

	Compliance		
	N/A	Yes	No
A) Flood effects caused by Development			
B) Building Components & Structural Soundness			
C) Floor Levels			
D) Car parking			
E) Emergency Response			
F) Fencing			
G) Storage of Goods			
H) Pools			

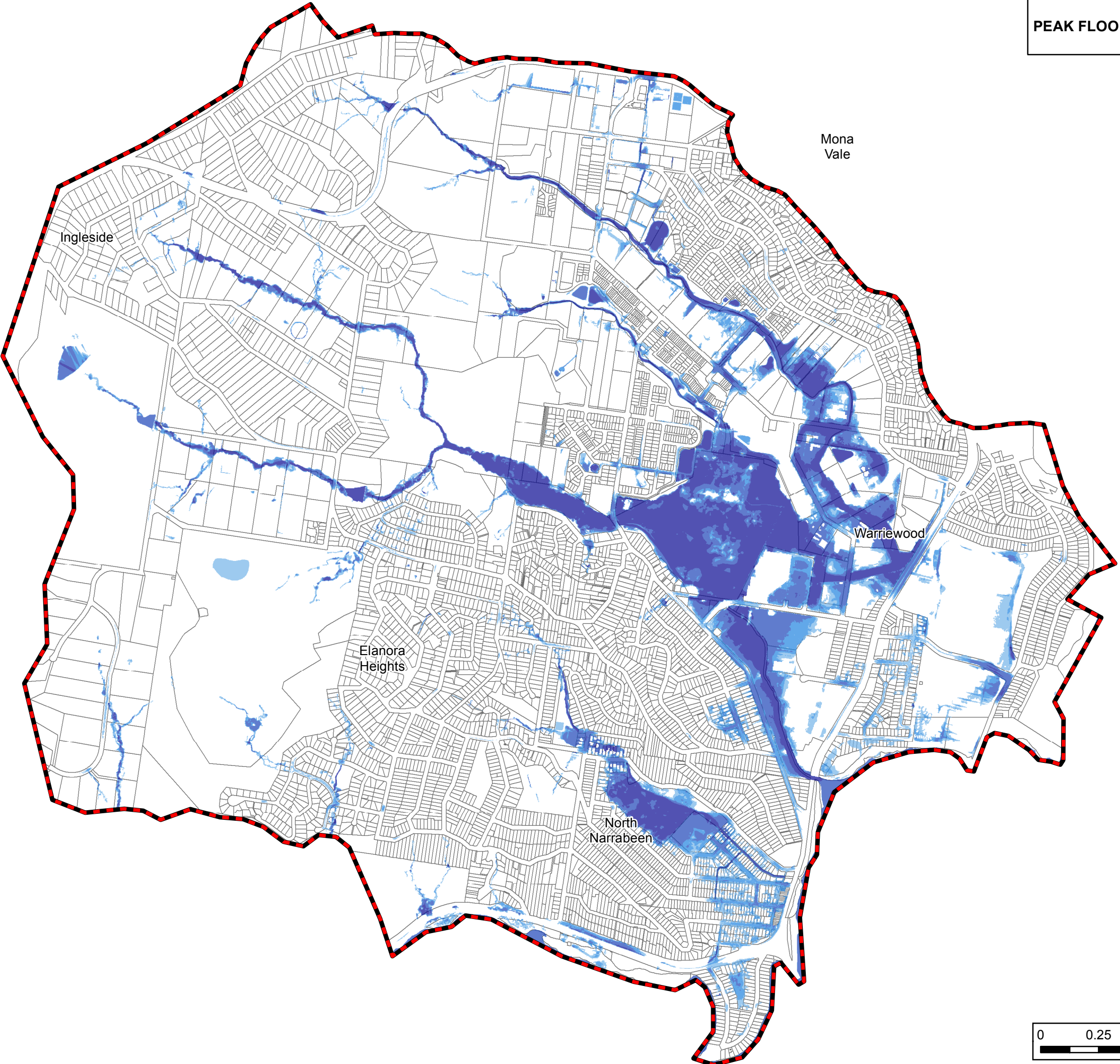
- Demonstration of how the development complies with any relevant flood planning requirements from the DCP, LEP, Water Management for Development Policy, and if it is in the Warriewood Valley Urban Land Release Area, with the Warriewood Valley Water Management Specification (2001)

- For any non-compliance, a justification for why the development should still be considered.
- Calculations of available flood storage if compensatory flood storage is proposed
- Plan of the proposed development site showing the predicted 1% AEP and PMF flood extents, as well as any high hazard or floodway affectation
- Development recommendations and construction methodologies
- Qualifications of author - Council requires that the Flood Management Report be prepared by a suitably qualified Engineer with experience in flood design / management who has, or is eligible for, membership to the Institution of Engineers Australia
- Any flood advice provided by Council
- Any other details which may be relevant

For further information please contact Council's Flood Team on 1300 434 434 or by email at floodplain@northernbeaches.nsw.gov.au .

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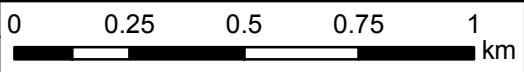
FIGURE B5
PEAK FLOOD DEPTHS AND EXTENTS
1% AEP EVENT



 Study Area

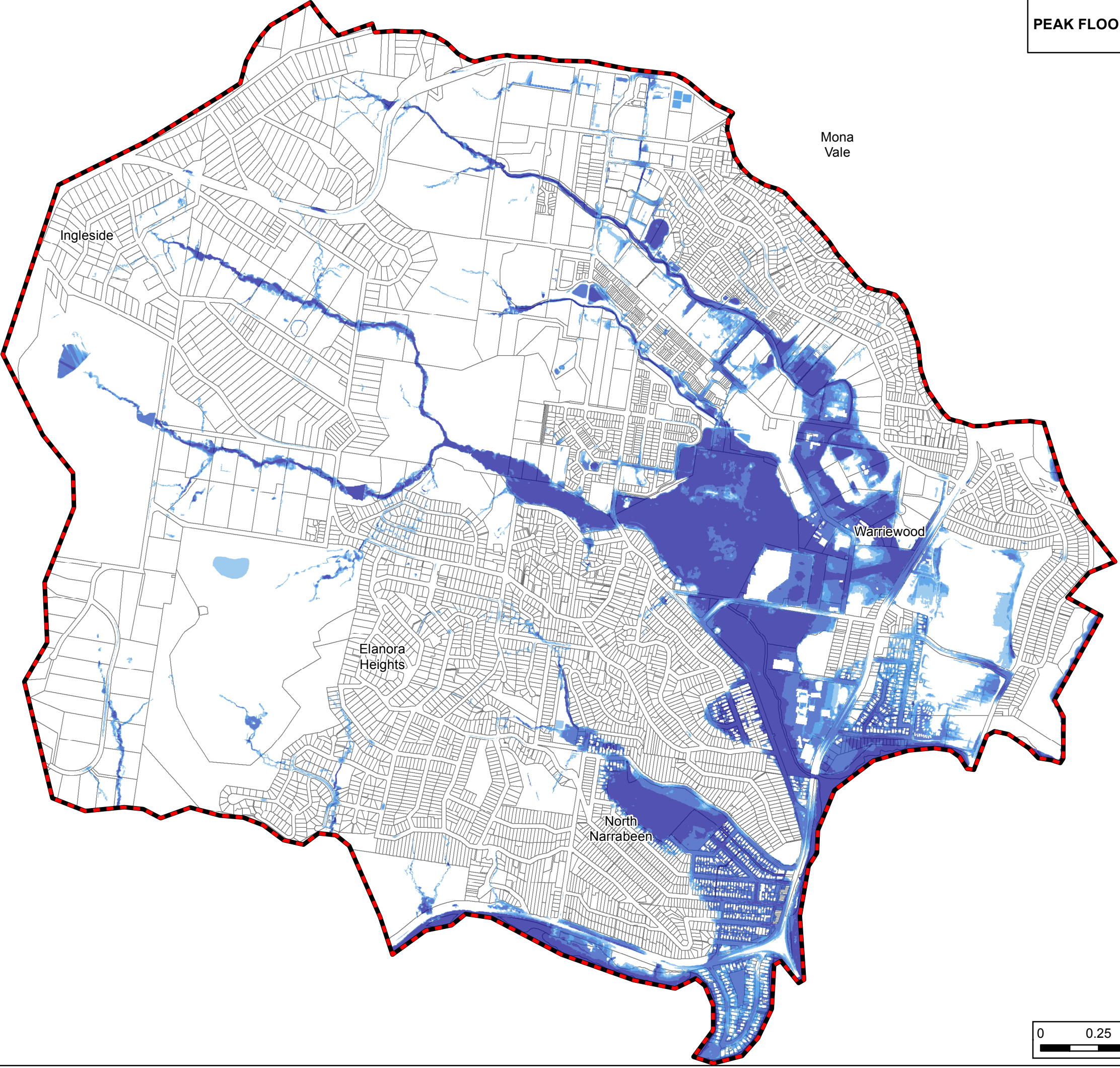
Depth (m)

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	0.50 to 1.00
	> 1.00



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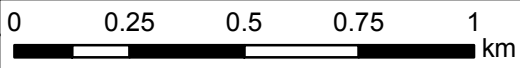
FIGURE B6
PEAK FLOOD DEPTHS AND EXTENTS
0.5% AEP EVENT



 Study Area

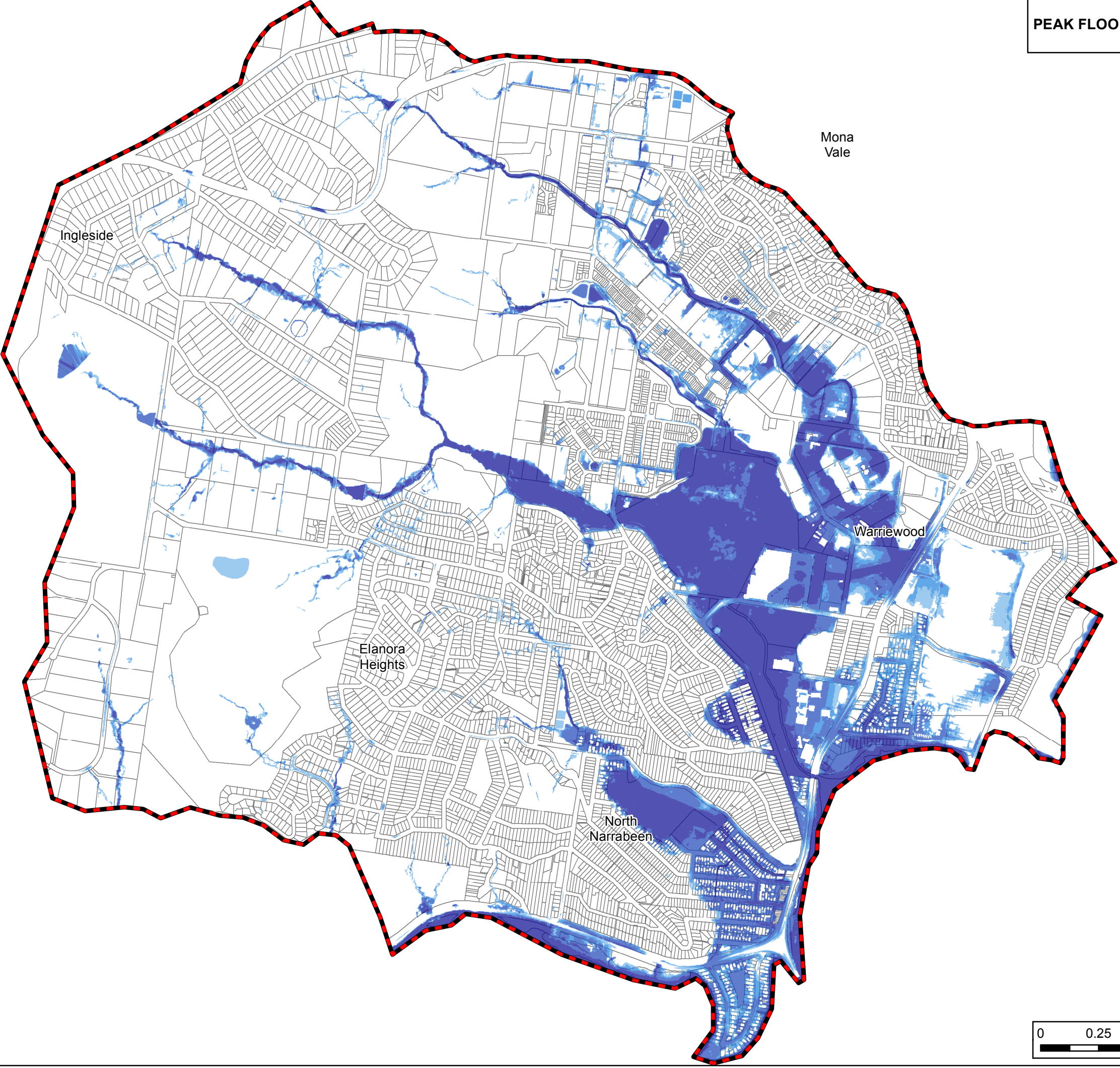
Depth (m)

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	0.15 to 0.30
	0.30 to 0.50
	0.50 to 1.00
	> 1.00



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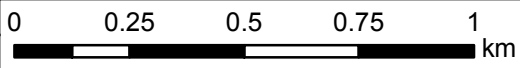
FIGURE B7
PEAK FLOOD DEPTHS AND EXTENTS
0.2% AEP EVENT



 Study Area

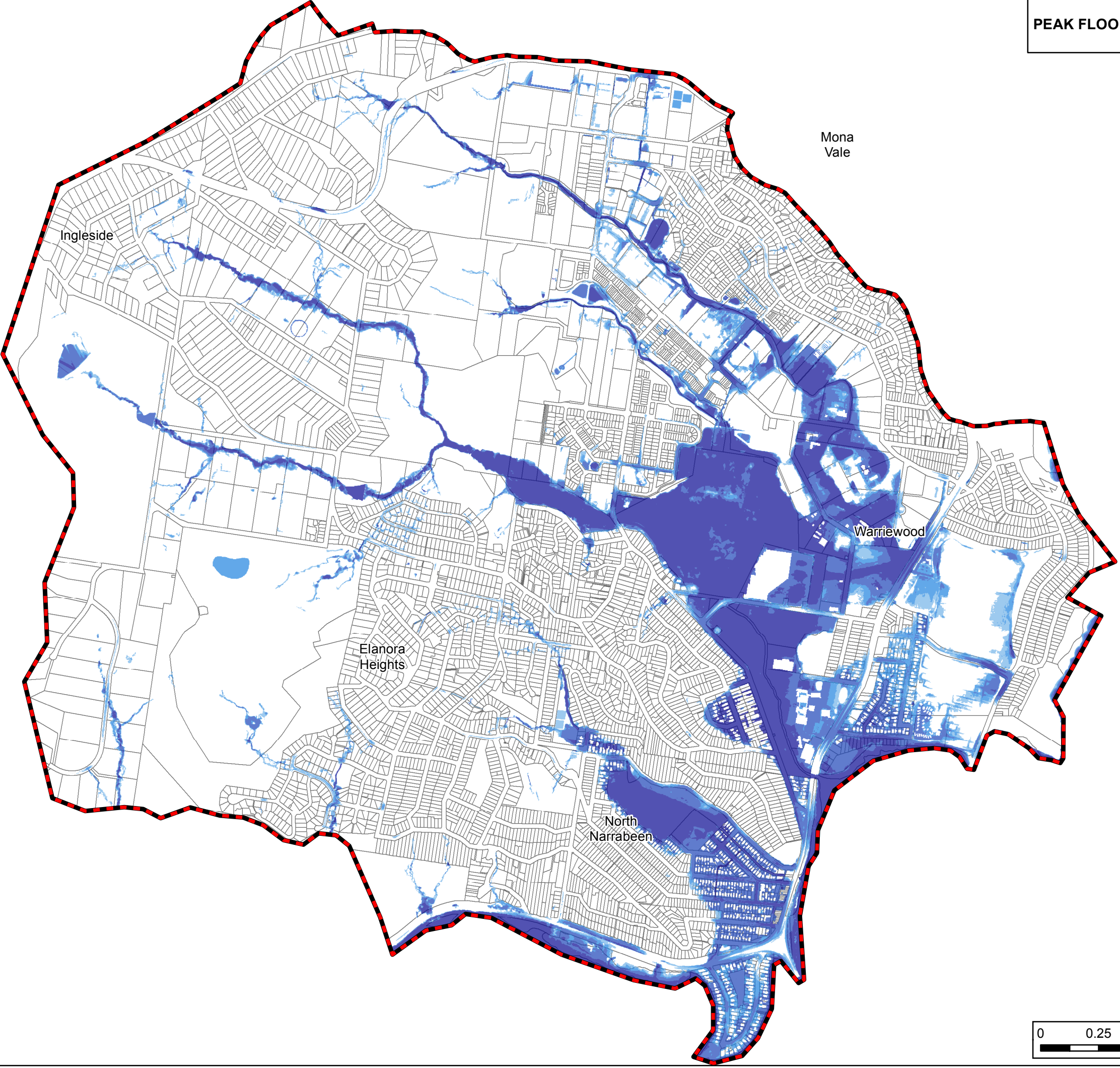
Depth (m)

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	0.30 to 0.50
	0.50 to 1.00
	> 1.00



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FIGURE B8
PEAK FLOOD DEPTHS AND EXTENTS
0.1% AEP EVENT



 Study Area

Depth (m)

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	0.15 to 0.30
	0.30 to 0.50
	0.50 to 1.00
	> 1.00

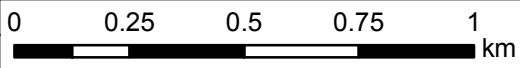
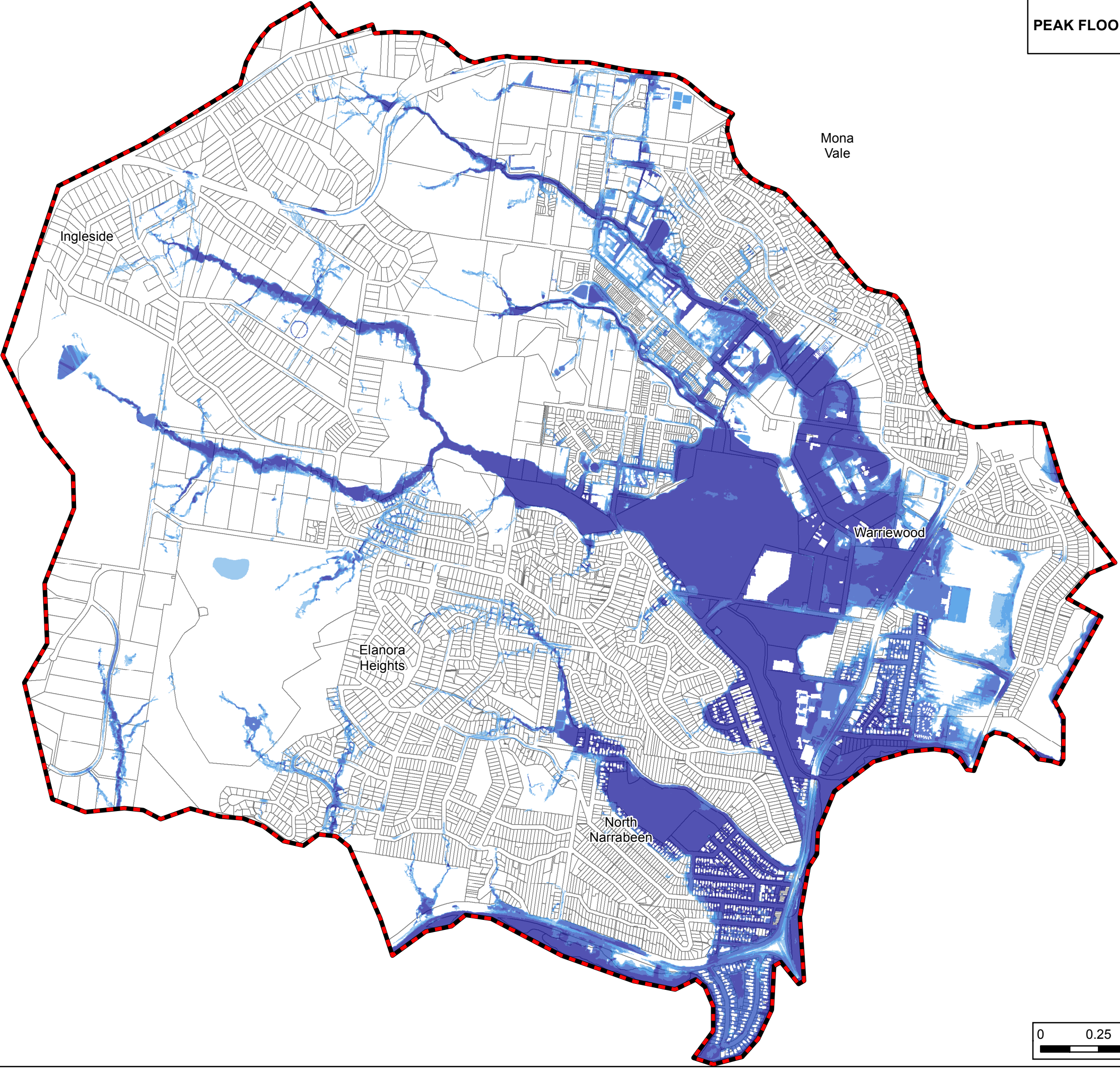


FIGURE B9
PEAK FLOOD DEPTHS AND EXTENTS
PMF EVENT



 Study Area

Depth (m)

	0.00 to 0.15
	0.15 to 0.30
	0.30 to 0.50
	0.50 to 1.00
	> 1.00

