Pittwater Data Services Pty Ltd
ABN 36098815537
27 Ashby Street
Dudley, 2290
Mobile: 0422088032
Email: pittwaterdataservices@live.com.au
Our Reference: PDS06062019:62MACTIERST:NARRABEEN

Mr and Mrs A&M Popovski
62 Mactier Street,
Narrabeen, 2102.
15/08/2019

Re: Flood Management Report for 62 Mactier Street, Narrabeen

Dear Alex and Michelle,

EXECUTIVE SUMMARY

This report details an investigation into the potential flooding hazard and risk of a proposed development at 62 Mactier Street, Narrabeen (***site***). The summary of the key findings of this investigation are:

1. The ***site*** is located on the southern foreshore of Narrabeen Lagoon as shown in Figure 1. The ***site*** is exposed to flood inundation to a depth of 0.5 to 1.3 metres (m) during a 1% AEP event, peaking at 3.05m AHD. The PMF peak flood level is predicted to be 5.02 metres AHD (Appendix C page 1).
2. The ***site*** is sheltered from flood flows and is a Flood Storage area.
3. The ***site*** is inundated when flood levels are greater than 1.7m AHD as shown in Figure1. These events have historically occurred (see Table 3.1).
4. During a major event, flood levels at the ***site*** are generated by catchment runoff and not ocean surges alone. During a 1%AEP event the critical duration for 1%ARI rainfall to generate high flood levels, is between 9 and 18 hours (Ref 1).
5. During a 1%AEP event the ***site*** will be fully inundated to a peak level of 3.05m AHD in 4 hours after the banks of the Lagoon are overtopped and flood waters enter the ***site*** (Figure 4).
6. This report provides information on the flooding characteristics of the ***site.*** The residents and visitors of the ***site*** should aware of this information to prepare for any future flood events.
7. Severe flood warnings for the Northern Beaches predicted by the Bureau of Meteorology (BoM), should be the trigger to prepare for a potential flooding at the ***site***. This information is broadcasted on ABC radio and TV and is available on BoM website. Typically, rainfall intensities in excess of 20mm/hour over 10 hours will generate flooding in the Lagoon.

8. A flood level approaching 1.7m AHD will overtop the northern boundary of the ***site***. When flood warnings continue, this is a trigger for a major event to occur; flood preparations should begin.
9. Flood evacuation from the ***site*** is not recommended and that a policy of Shelter-in-Place (SiP) be adopted. The Dwellings and Swimming Pool as detailed in Figure 7,8,9 and 10, will in most cases meet the requirements as detailed in DCP B3.11 and B3.25 as detailed in Appendix B. The Ground Floor Levels of 3.6m AHD for both Dwellings are above the FPL of 3.55m AHD as shown in Figures 9 and 10. The First Floor Level (6.6m AHD) of the main Dwelling is above PMF (5.02 m AHD) as shown in Figures 9. The First Floor level of the Main Dwelling level is to provide a Shelter in Place for all residents and visitors on the ***site***. The ***site*** is predicted to be inundated during the 1%AEP flood, for approximately 15 hours. The Action plan is detailed in Appendix A.

1.0 INTRODUCTION

I refer to your Development Application (DA) at 62 Mactier Street, Narrabeen (Lot 7 Section A in DP6445) as discussed with yourself. The design of the Dwellings is by Tullipan Homes and Swimming Pool and landscaping by Jacqui Ray are shown in Figures 7,8,9 and 8. Northern Beaches Council (NBC) has identified the property as potentially Flood Prone: High Risk Precinct and High Risk to Life H4 as shown in Appendix C Map A. NBC DCP Section B.311 and B3.25 applies to this proposed development. An assessment in relation to NBC Flood Standards is undertaken as detailed in Appendix B.

The following Flood Management Report was undertaken and submitted for your and NBC consideration as part of the DA process. Note that 62 Mactier Street, Narrabeen will be referred to as the ***site.***

2.0 SITE INSPECTION

A ***site*** inspection was undertaken on the 7th May 2019 by Mr Stephen Wyllie and yourself. There are several features of the topography of the ***site*** and the catchment generally, that are important to the potential flooding processes at the ***site***. These are:

1. The catchment boundary of the ***site*** extends from Narraweena in the south to Belrose in the west to Warriewood in the north. Five major Creek systems flow into the Lagoon which has a large storage area which absorbs these Creek Flows. The Lagoon exits to the Ocean. Flood levels in the Lagoon can be influenced by the entrance ocean levels and its berm condition (open /closed) (Ref 1).
2. The ***site*** is located on the southern foreshore and is exposed to mainstream flooding from the Lagoon during high rainfall events and elevated ocean levels. The Lagoon under normal astronomical tides experiences a range of 0.1metres in the vicinity of the ***site***.
3. The crest of the southern foreshore generally is at between 1.2 and 1.4 metres AHD (Figure 1) and is exposed to wind generated waves predominately from the northern sector, floods and ocean surges. The ***site*** is also exposed to debris loading.
4. The ***site*** varies in level from 1.7 metres on the northern boundary to 2.3 metres on the southern boundary as shown in Figure 3. The northern boundary is exposed to locally wind fetched waves from the north and debris loading during a major flood event.
5. During a major event Mactier Street will be inundated, restricting safe access to and from the ***site*** as shown during the June 2016 event (Figures 5). Figures 1 an 2 show the potential inundation limits of the 1%AEP.

3.0 REVIEW OF EXISTING DATA

The topography for this investigation used the NSW Government Land and Property Lidar 2014 Data Sydney 3406272. Contours were generated by Pittwater Data Services Pty Ltd at 0.2 metre intervals (Figure 1&2). The ***site*** survey as shown in Figure 3 was undertaken by Sydney Surveyors Ref 14750 Dated 20th August 2016.

The Narrabeen Lagoon flooding processes has been extensively studied by a number of investigations commissioned by the then Pittwater and Warringah Councils. The more recent studies are :

1. Narrabeen Lagoon Flood Study September 2013 by BMT WBM (Ref 1).
2. Narrabeen Lagoon Floodplain Risk Management Study and Plan July 2015 (Ref 2).

These studies used complex hydrological and numerical models to generate design flood conditions. The objective of the study was to determine flooding hazards under various rainfall and sea level criteria, this included the overland flow processes. Flood data for the ***site*** based on Ref 1 simulations, was obtained from NBC as shown in Appendix C. Relevant data for the ***site*** from these studies are:

1. 1%AEP design time of concentration for this ***site*** is approximately 9 to 18 hours (Ref 1).
2. At the ***site*** Maximum flood level predictions for the 1%AEP is 3.05 m AHD (Appendix C page 1) .
3. The Flood Planning Level (FPL) 3.55m AHD (1%AEP of 3.05 plus 0.5 metres freeboard)
4. The PMF flood level is 5.02 m AHD (Ref 1 Appendix C page 1).

Note the PMF level is a rare event (in excess of 10,000years recurrence) and is 2 metres higher than the 1%AEP and higher than the FPL as shown in Figures 9 and 10.

The following technical design conditions are required to assess the development proposal for the ***site***:

1. The ***site*** 1%AEP and PMF design flood levels: determine FPL and evacuation response planning.
2. The ***site*** 1%AEP and PMF design flood velocities and depth. Hazzard assessment.

3.1 Recorded Flood Levels

Table 3.1 lists the peak flood levels observed or recorded since the 1940's (Ref 1). Although the recorded flood levels are not at the ***site*** they are still indicative of the flood levels throughout the Lagoon and the ***site.***

Table 3.1: Recorded Peak Flood Levels

Date	Location	Flood Level m AHD	Comments
1942	Lagoon	2.70	Location unknown
1953	68 Wimbledon	2.19	observed
1956	78 Wimbledon	2.22	observed
1958	51 Wimbledon	2.04	observed
May 1974	27 Wimbledon	2.0	Highest ocean level recorded over 100years
March 1975	34 Wimbledon	2.18	observed
August 1986	Many sites on Wimbledon Estate	2.2	Observed by PWD staff
August 1998	Pittwater Road Bridge	1.81	Automatic continuous recorded water level data used for model calibration
April 1998	Pittwater Road Bridge	1.9	Automatic continuous recorded water level data used for model calibration
5th June 2016	Pittwater Road Bridge	2.2	Automatic continuous recorded water level Figure 5 shows the event at the ***site.***

Generally, with the exception of the 1942 event, the major flood peak levels in the vicinity of the ***site*** over the last 70 years have reached a level of approximately 2 to 2.2m AHD. These flood levels would have inundated the ***site***. The 1998 events were recorded by an official PWD automatic water level gauge recording the rising and falling stages of the floods (hydrograph) as shown typically in Figure 4. The hydrograph rate of rise and fall is a process that is important in flood planning during a major event such as the 1%AEP flood. The history of flooding places a perspective on the design events such as the 1%AEP flood.

The June 2016 flood event was caused by rain total of 114mm over 2 days (5th and 6th of June) and is the highest recorded flood event since 1986 flood event.The ***site*** experienced flood inundation as shown in Figure 5, of approximately 0.5 metres. This event although highly ranked historicaly is still 0.8 metres lower than the 1%AEP of 3.05 AHD. Modelling results show the June 2016 is a 1 in 2 year event (Ref 1).

4.0 RESULTS OF THIS INVESTIGATION

The catchment characteristics for the ***site*** as discussed in Section 2 and the numerical modelling results from Ref 1and 2, highlights several aspects of the flood processes for the 1% AEP and PMF floods. These are:

1. The inundation of the ***site*** will be a relatively slow process due to the attenuation (dampening) effect of the Lagoon . The design flood level hydrograph as shown in Figure 4 shows a simulated typical rising and falling flood level process for the 1%AEP event (Ref 1). Figure 4 also shows the associated times when the ***site*** is predicted to be inundated. The time of the peak flood level and when the ***site*** and Mactier Street are flood free. The ***site*** is inundated for approximately 13 hours. From the start of inundation to the peak is approximately 4 hours. These times may vary according to the rainfall patterns experienced in the catchment.

2. The design critical storm duration is approximately between 9 and 18 hours which provides a reasonable time period to prepare for flood evacuation as detailed in Appendix A.

The 1%AEP flood extent is shown in Appendix C Map A is based on flood simulations generated by Ref 1. In summary the 1%AEP and PMF events inundates the ***site*** from overtopping of Mactier Street. The flood velocities area maximum of 0.5 metre/second at a depth of approximately 1metre which is a medium to high hazard H4: unsafe for people and vehicles.

5.0 IMPACT OF THE DEVELOPMENT

The location of the ***site*** on the southern foreshore of the Lagoon, as discussed in Section 2, is a Flood Storage area with relatively low flood velocities (on the ***site***) are experienced during the flooding and draining process. Therefore the proposed developments (Two level Dwelling, Secondary Dwelling and Swimming Pool) potential impact on the storage capacity of the ***site*** was investigated.

The combined volume (from ground level 2.0 m AHD to the 1%AEP 3.05m AHD) of the existing developments (Dwelling, garage and assortment of small buildings as shown in Figure 3) is approximately 230 cubic metres. It should be noted that Main Dwelling subfloor is bricked in with small air vents as shown in Figure 6. The proposed Dwellings sub floors (Figures 9 and 10) are open to allow flood waters to flood and drain unattenuated. Allowing for peirs and walls the combined sub floor

volume for both Dwellings is approximately 60 cubic metres. The proposed Swimming Pool does reduce the flood storage volume by 38 cubic metres as the coping is at the 1%AEP level. Overall the development has the net gain of Flood Storage of 132 cubic metres(230 m3Existing -98m3 Proposed) for the 1%AEP event.

The proposed Main Dwelling, Swimming Pool and Secondary Dwelling are shown in Figures 7, 8,9, and 10. The Main Dwellings Ground Floor Level (GFL) is 3.60 metres AHD which is above the FPL of 3.55 m AHD. The First Floor Level (FFL) of the Main Dwelling is at 6.6 m AHD ; above the PMF level of 5.05m AHD. The FFL should be used as a Shelter- in- Place. The carport level is at 2.14 m AHD approximately 0.3 metres above the natural ground level. The carport is inundated by 900mm at the peak of the 1% AEP. Bollards to the FPL will need to be installed to secure vehicles during a major flood event.

The sub floor openings for both dwellings meet the flood standard whereby the openings are approximately 55% of the perimeter area below FPL. The openings dimensions will adequately flood and drain the subfloor area considering the rate of rise and fall of the simulated 1%AEP hydrograph (Figure 4). The swimming pool (Figure 8) coping is approximately 900mm above ground level and electrical services to the pool will need isolation switching. The proposed Swimming Pool coping level is above NBC flood standard, however as discussed its potential impact on Flood Storage for the ***site*** is compensated by the net gain of Flood Storage for the whole development.

The Secondary Dwelling floor level is 3.6 metre AHD and is above FPL. The sub floor accommodates opening to the flood standard. Occupants of the Secondary Dwelling are to evacuate to the FFL of the Main Dwelling.

6.0 FLOOD MANAGEMENT PLAN

The ***site*** is flood prone for the 1% AEP and PMF events and is potentially hazardous, therefore a Flood Risk Assessment and Plan is discussed in this Section.

The flooding process during an extreme event results in the surrounding access roads and pedestrian ways inundated over a period of several hours. The ***site*** is inundated once the Mactier Street kerb is overtopped. Mactier Street is inundated from the Lagoon flooding processes for 15 hours during a major event as shown in the 1%AEP hydrograph (Figure 4).

During the lead up to an event there are a number of flood prediction services available which should be used to ensure sufficient planning and action. The sequence of information available are:

1. This report provides information on the flooding processes of the ***site.*** The residents of the ***site*** should aware of this information and key processes and actions. Appendix A lists

a sequence of actions that should be posted in a visible location: BoM warning process, inundation process of the ***site*** and The Action Plan (Appendix A).

2. Severe flood warnings for the Northern Beaches predicted by the Bureau of Meteorology (BoM), should be the trigger to prepare for a potential flooding at the ***site***. This information is broadcasted on ABC radio and TV and is available on BoM website. Typically, rainfall intensities in an excess of 20mm/hr over a period of several hours will generate flooding in the Lagoon.
3. Flood levels approaching the top of the Mactier Street kerb will overtop and flow to the ***site***. Evidence of overland flows on the ***site***, should be a trigger to prepare. When rain is predicted to continue a major event may occur, particularly if flood warnings continue to be issued by BoM.
4. As discussed in Section 4, the 1%AEP flood will rise to its peak value in approximately 4 hours from the time of ***site*** inundation (Figure 4). During that time, final preparations should be concluded to secure items on the ***site*** and ensure the safety of all persons at the FFL of the Main Dwelling. Loose items, are to be stored above the PMF. The vehicles should secured within the bollards. It should be noted that an option to move the vehicles to flood free part of Mactier Street only 200 metres east of the ***site*** (Figure 2) is feasible, considering the rate of rise of the Lagoon. However this is not the primary option as events can occur randomly and at inconvenient times.

The access to any flood free haven for people away from the ***site*** is not considered as a option: considering the rate of rise of the flood levels, general frequency of warnings from BoM and the low levels of surrounding access roads and pedestrian ways. As such, the FFL of the main Dwelling should be used as a "Shelter- in-Place" (SiP) for both the Main and Secondary Dwellings.

The basic requirements of a SiP are:

1. The FFL at or above the PMF flood peak level of 5.05 m AHD. The FFL is 6.6 m AHD and to be used as SiP.
2. Floor space has to be 2 square metres /person. The complies with these guidelines.
3. Access to the ground floor. This is provided staircase as shown
4. There is a bathroom and sufficient storage in the SiP for items that need to be raised above flood levels. This is provided.
5. Hazardous materials that can be dislodged by floodwaters and should not be stored below PMF flood level. This process can be satisfied.

In conclusion, considering the flooding processes at the ***site*** the proposed Dwellings as detailed in Figures 7,8,9 and 10, it is my opinion the design and this flood evacuation plan as detailed in Appendix

A will satisfy NBC DCP requirements Sections B3.11 and B3.25. The flood standard has been met except for the Swimming Pool as detailed in Appendix A and discussed in Section 5.

Yours Sincerely

Stephen Wyllie Bsc(Eng) FMA Member

Director 15/8/2019

7.0 REFERENCES

1. Narrabeen Lagoon Flood Study Sept 2013, BMT WBM .
2. Narrabeen Floodplain Risk Management Study and Plan July 2015 Cardno.
3. Pittwater LGA Flood Risk to Life Classification Study Jan 2015 Cardno
4. Home Emergency Plan State Emergency Service.

Appendix A

FLOODING WARNING

AWARENESS

- Heavy rain predicted by the Bureau of Metrology (BoM) : flood warning /flash flooding
- Monitor media reports for flood warnings in the Sydney Metropolitan Area.
- Observe local rainfall and road inundation.

ACTION BoM WARNINGS ISSUED

- Inform all residents and visitors of procedures the potential flood situation. Account for all residents visitors in both Dwellings.
- Any items transportable by floods move above PMF 5 m AHD.
- Secure vehicles within bollards. Option to move vehicles to flood free section of Mactier Street (200metres east of ***site*** Figure 2).
- Observe overland flows through ***site*** assemble residents visitors to First Floor Level of the main Dwelling (Shelter- in- Place). This is important as there is only hours to organize this action.
- Continue to monitor BoM reports and inundation on the ***site***.
- If rainfall continues and BoM issue warnings remain at First Floor Level.

POST FLOOD

- Account for all residents and visitors.
- Inspect vehicles and ***site*** generally for safety.
- Monitor BoM reports to ensure no further flood warnings.

NOTE THIS ACTION PLAN NEEDS TO BE DISCUSSED AT YEARLY INTERVALS.

Appendix B: Development Matrix for High Risk Residential Development

Flood Impacts	Design Standard	Description	Comment
A: Flood Effects caused by Development	A1 A3	Complies with Flood Standard Loss of flood storage compensated	Yes No. There is a nett gain of 132 m3 Section 5
B:Drainage Infrastructure and Creek Works	B1 B2	Flood mitigation works Section 88B Notice	Not Applicable Not Applicable
C:Building Components and Structural	C1 C2 C3	Constructed of flood compatible materials Structural stability under flood loads Services flood proofed or above FPL	Yes Structural report required Yes see Section 5
D: Storage of Goods	D1 D2	Hazardous stored above FPL Goods/ materials stored above FPL	Yes Section 6 Yes Section 6
E: Flood Emergency Response	E1 E2	Complies with NBC Planning Shelter In Place requirement and above PMF	Yes Section 5 and 6 Yes Section 5 and 6
F:Floor Levels	F1 F2 F3 F6 F8	Floor levels above FPL Sub floor not impede flow Pursuant of S88B Existing floor level retained below FPL First level Additions above PMF	Yes Ground Floor Level above FPLsee Figures 9 and 10 Not Applicable Not Applicable Yes Figure 9
G: Car Parking	G1 G2 G3 G4 G5 G6 G7	Open carpark not in floodway Floor level above ground level Enclosed carparks protected from inundation Vehicle barriers for d >300mm Enclosed garages at 1%AEP Comply with flood standard Raised driveways no impact	Yes Yes see Figure 9 Not Applicable Yes See Figure 9 Not Applicable Yes Not Applicable
H: Fencing	H1	Designed not to impede flow	Not Applicable
I:Pools	I1	Coping flush pumps and electrical	No Figure 8 Section 5 no net loss of Flood Storage

APPENDIX C

northern beaches council

FLOOD INFORMATION REQUEST - COMMON

Property: 62 Mactier Street, Narrabeen
Issue Date: 31/05/2019
Flood Study Reference: Narrabeen Lagoon Flood Study 2013, BMT WBM

Flood Information for lot:

Flood Life Hazard Category – See Map A

1% AEP – See Flood Map B

1% AEP Maximum Water Level[3]: 3.05 m AHD

1% AEP Maximum Peak Depth from natural ground level[3]: 1.33 m

1% AEP Maximum Velocity: 0.47 m/s

1% AEP Provisional Flood Hazard: High **See Flood Map E**

1% AEP Hydraulic Categorisation: Flood storage **See Flood Map F**

Flood Planning Area – See Flood Map C

Flood Planning Level (FPL) [1, 2, 3 & 4]: 3.55 m AHD

Probable Maximum Flood (PMF) – See Flood Map D

PMF Maximum Water Level[2]: 5.02 m AHD

PMF Maximum Depth from natural ground level: 3.30 m

PMF Maximum Velocity: 0.29 m/s

Flood Risk Precinct – See Map G

[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.
[3]Intensification of development in the former Pittwater LGA requires the consideration of climate change impacts which may result in higher minimum floor levels than those indicated on this flood advice.
[4]Vulnerable/critical developments require higher minimum floor levels using the higher of the PMF or Flood Planning Level

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 LIFE HAZARD CATEGORY

Notes:

- Refer to 'Flood Emergency Response Planning for Development in Pittwater Policy' for additional information on the Flood Life Hazard Categories and Pittwater 21 DCP Control B3.25.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study) and aerial photography (Source Near Map 2014) are indicative only.

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) and aerial photography (Source Near Map 2014) are indicative only.

FLOOD MAP C: FLOOD PLANNING AREA EXTENT

Notes:

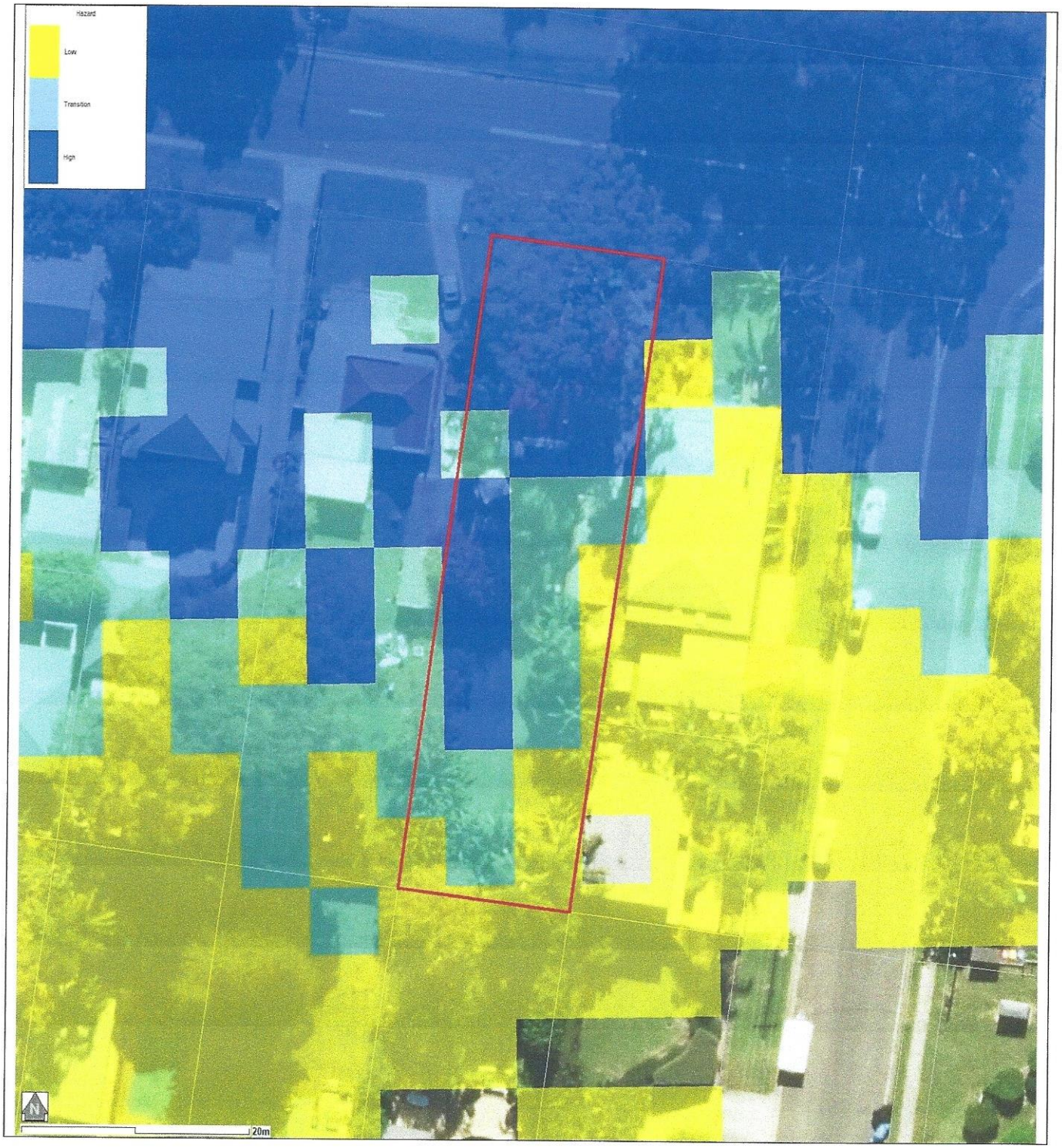
- Extent represents the 1% annual Exceedance Probability (AEP) flood event + freeboard.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study) and aerial photography (Source Near Map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

FLOOD MAP D: PROBABLE MAXIMUM FLOOD EXTENT

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) and aerial photography (Source Near Map 2014) are indicative only.

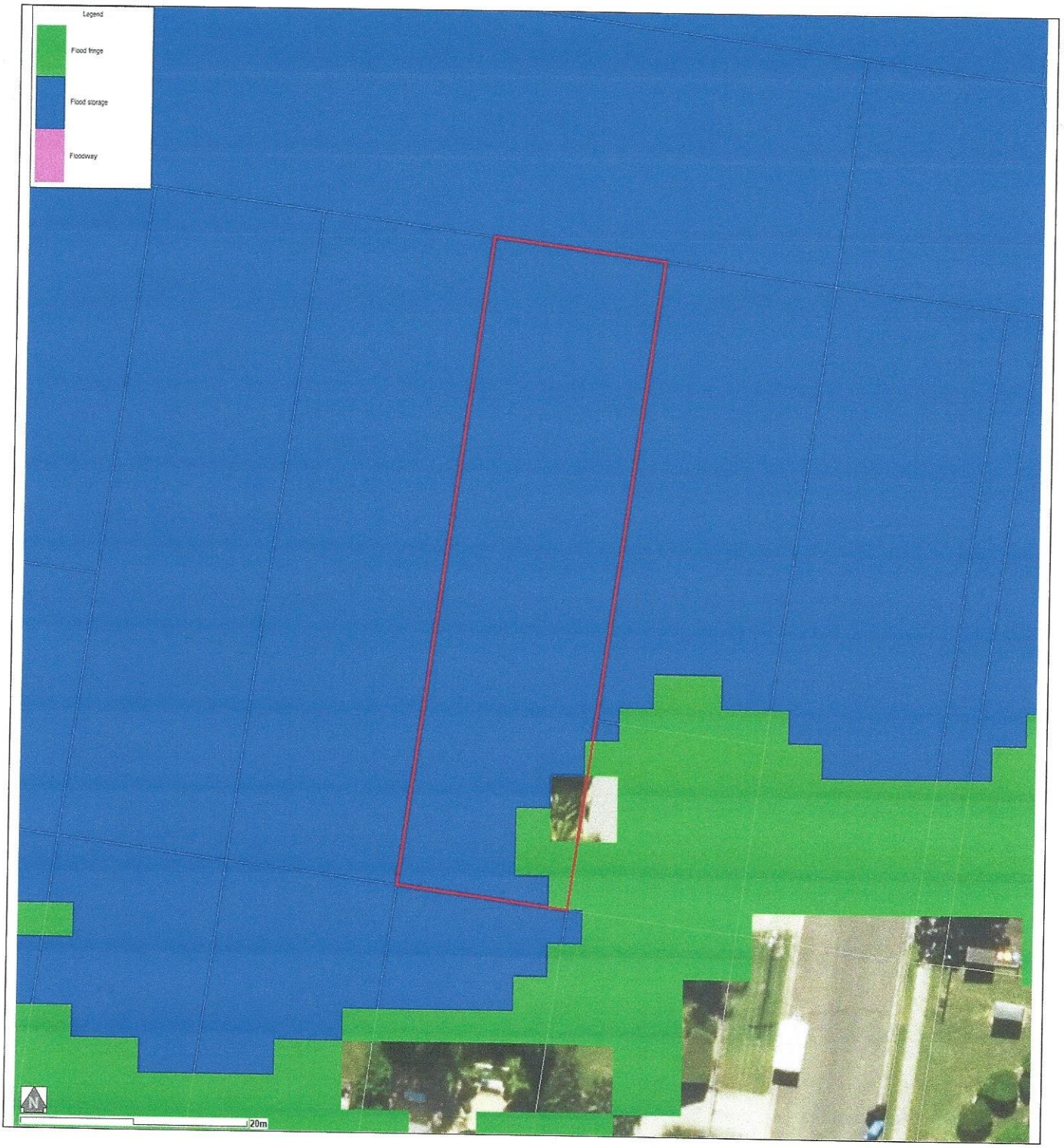
FLOOD MAP E – 1% AEP FLOOD HAZARD EXTENT MAP



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) and aerial photography (Source: NearMap 2014) are indicative only.

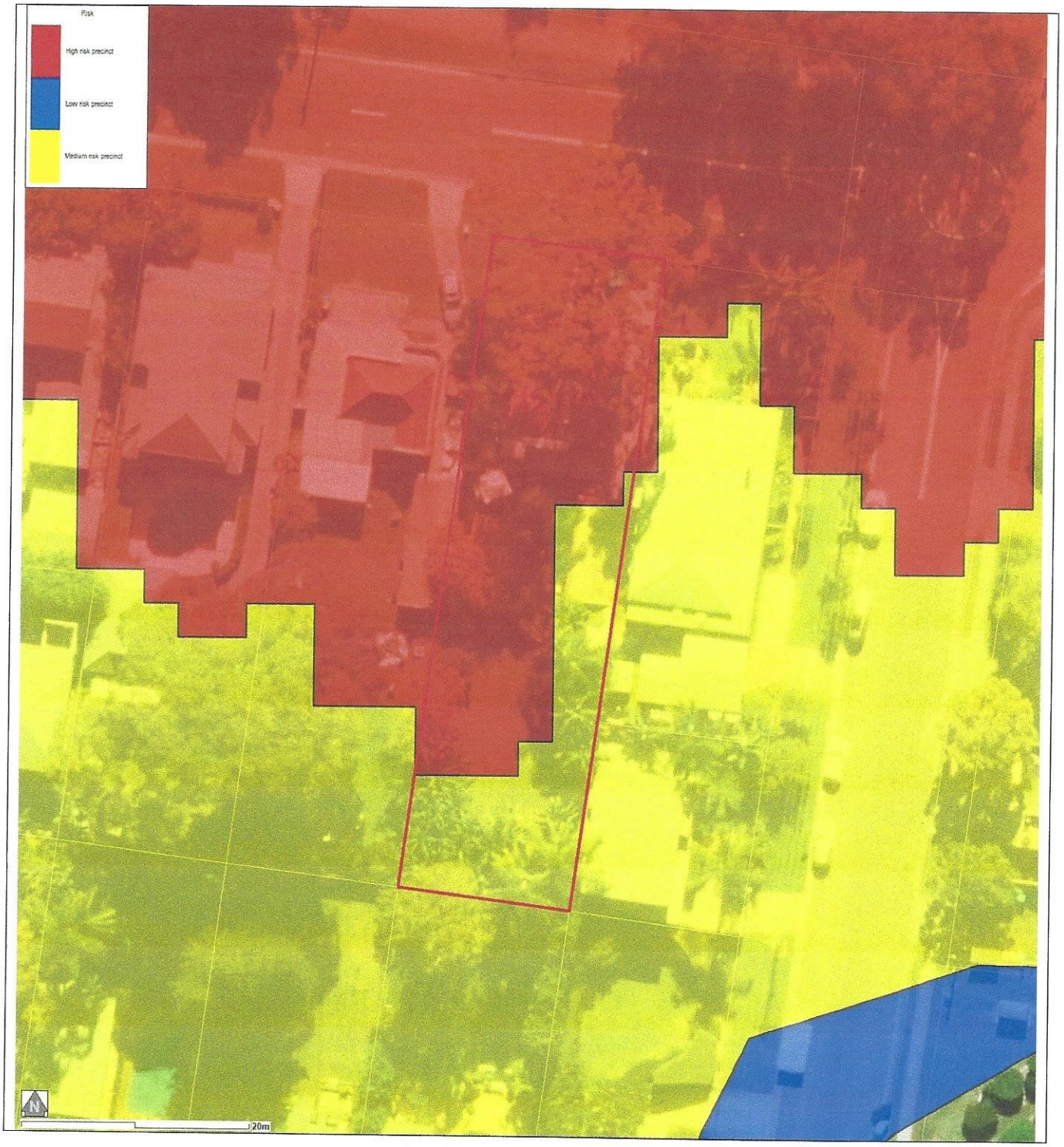
FLOOD MAP F – 1% AEP FLOOD HYDRAULIC CATEGORY EXTENT MAP



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) and aerial photography (Source: NearMap 2014) are indicative only.

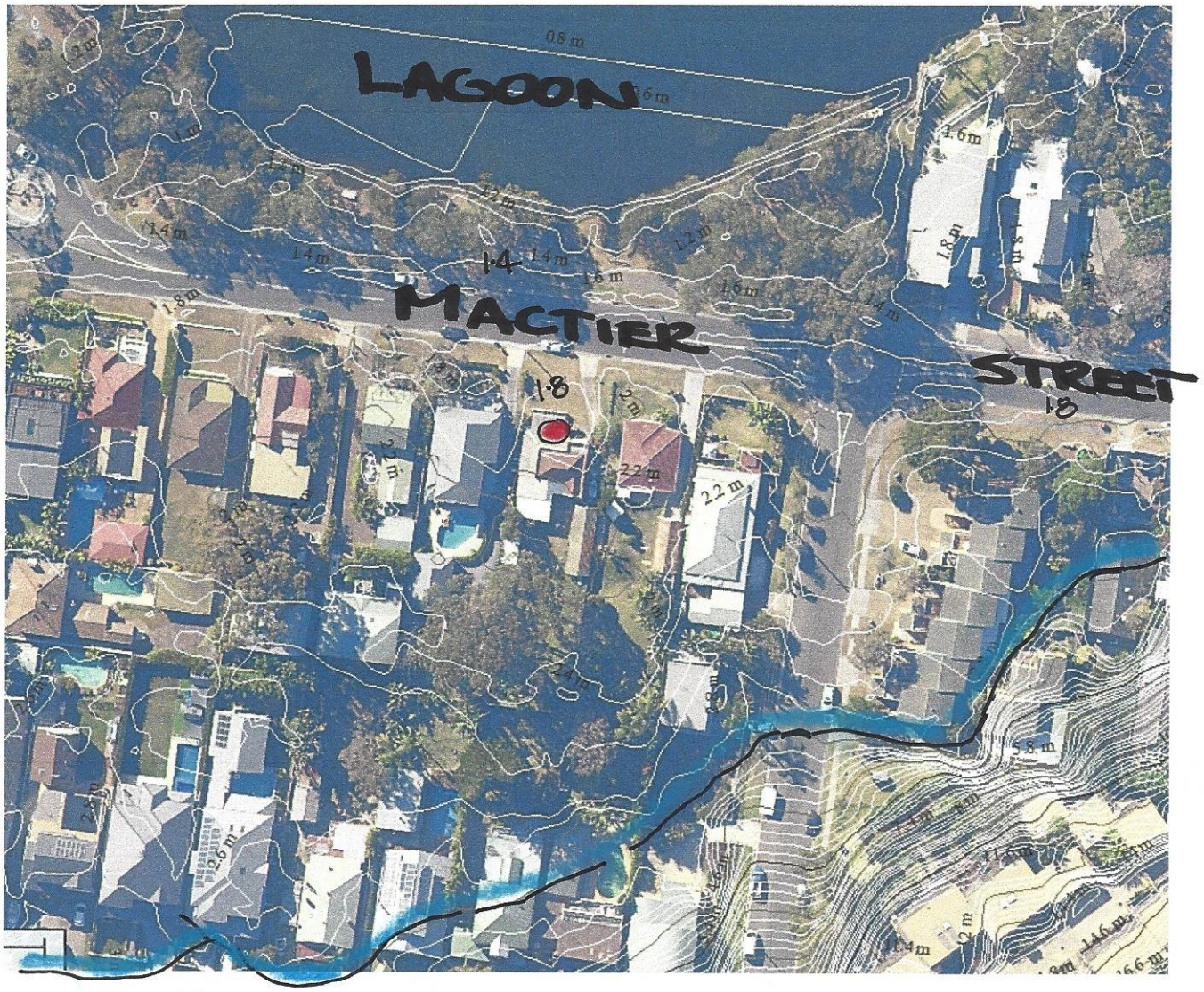
FLOOD MAP G – FLOOD RISK PRECINCT MAP



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 and or H6 Life Hazard Classification).

FIGURES

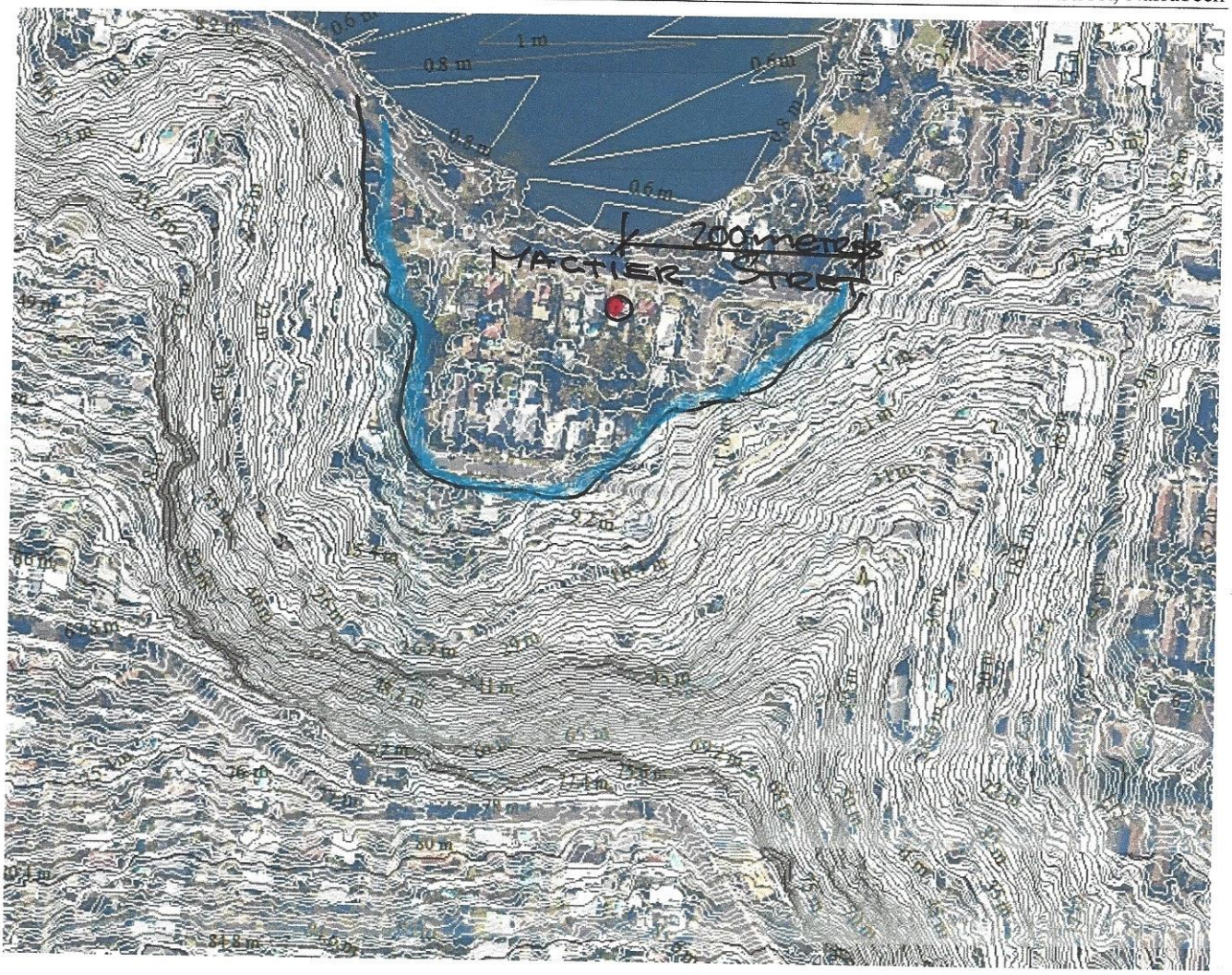


LEGEND.

— FLOOD FRINGE FOR 1% AEP.

● SITE

FIGURE 1



LEGEND

FLOOD FRINGE FOR 1% AEP

SITE

FIGURE 2

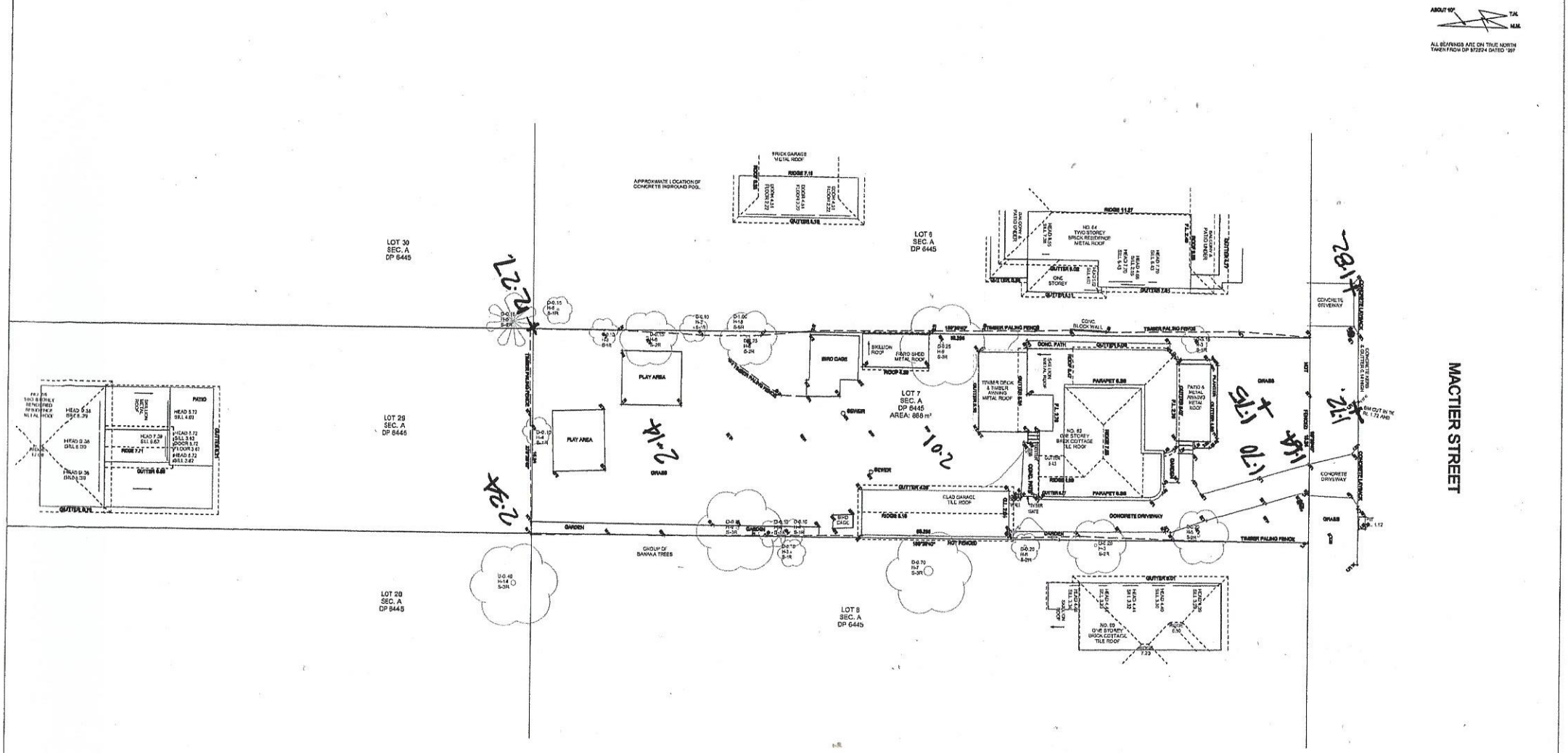


FIGURE 3

NOTE: NO BOUNDARY SURVEY HAS BEEN CARRIED OUT
IMPROVEMENTS ON OR NEAR THE BOUNDARIS ARE SHOWN DIAGRAMMATICALLY ONLY
THE EXACT LOCATION OF UNDERGROUND SERVICES ARE UNKNOWN

BENCH MARK | TELSTRA PIT | WATER METER | SEWER MANHOLE | STOP VALVE
TREES | HYDRANT | GAS METER | POWER POLE | DRAIN / GRATE

SHEET 9 OF 11

REGISTERED SURVEYOR

REF: 14756
SCALE: 1:100 @ A2
GRID:
DATUM: AHD
DATE: 20/09/2016

PLAN SHOWING DETAIL AND LEVELS AT
62 MACTIER STREET, NARRABEEN
LOT 7 SEC. A IN D.P. 6445

SUITE 7/14 FRENCH AVENUE AVENUE, BANKSTOWN
PH: 02 9708 0177 FAX: 02 9708 0255 E: info@sydneysurveyors.com.au

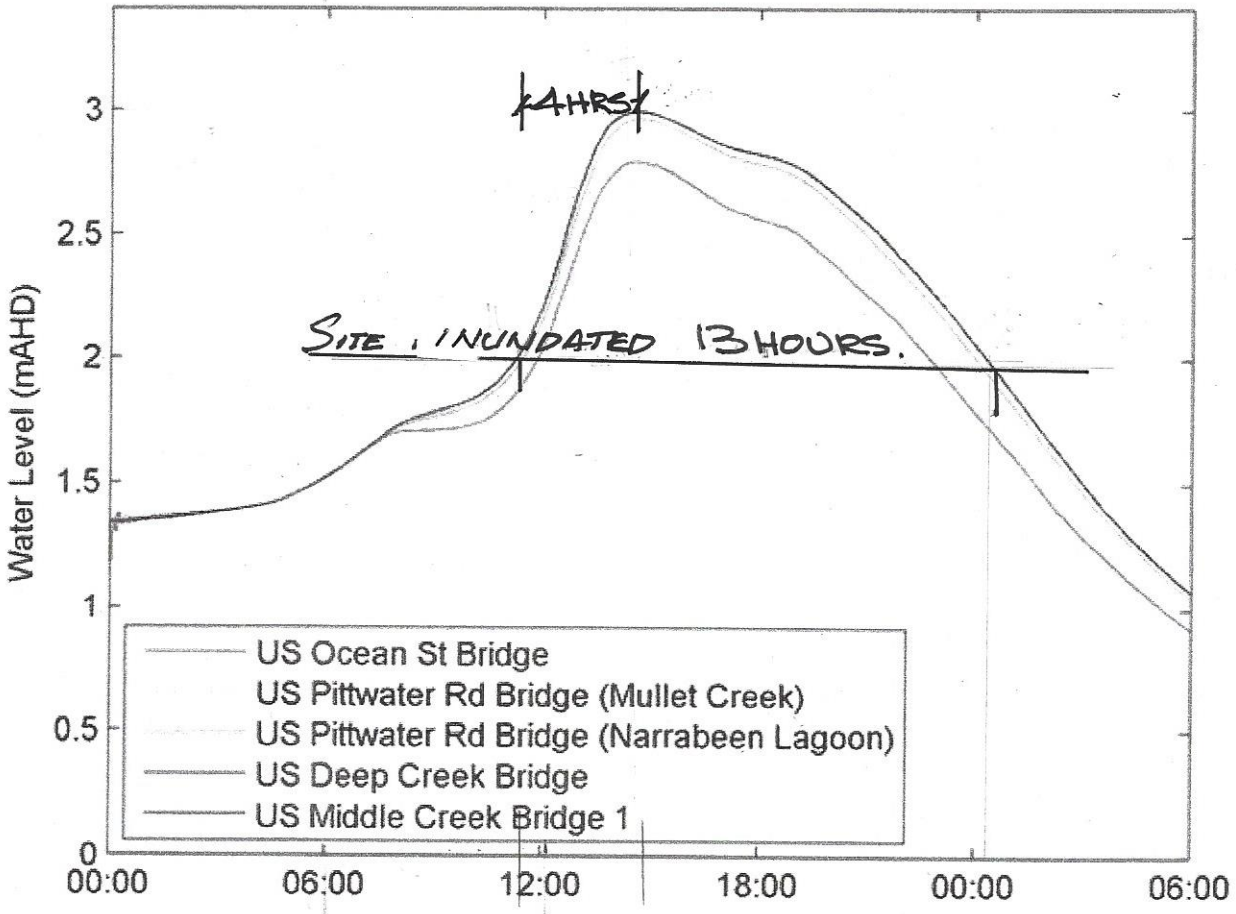


Figure 3-4 Delft3D Hydrodynamic Model Validation – 1% AEP Catchment Flood Levels

Table 3-4 shows how these results compare to the output within the Narrabeen Lagoon Flood Study. The results within the Delft 3D model are virtually identical to results obtained within the flood study.

Table 3-4 Delft3D Hydrodynamic Model Validation – 1% AEP Catchment Flood Levels (mAHD)

Location - as defined in BMT WBM (2013) – Figure 7-1.	BMT WBM (2013)	Delft3D Validation Simulation
US Ocean St Bridge	2.9	2.8
US Pittwater Rd Bridge (Mullet Creek)	2.9	2.9
US Pittwater Rd Bridge (Narrabeen Lagoon)	3.0	3.0
US Deep Creek Bridge	3.0	3.0
US Middle Creek Bridge 1	3.0	3.0

A comparison of the Delft3D modelled results with the Flood Study (BMT WBM, 2013) results through a long section of the estuary are depicted in Figure 3-5 (the location of the long Section is depicted in Figure 3-6). The comparison shows good agreement between the Delft3D and Flood Study (BMT WBM, 2013) results in terms of peak flood levels within the main body of the lagoon.

(SOURCE REF 2)

FIGURE 4

Site 5th June 2016

FIGURE 5

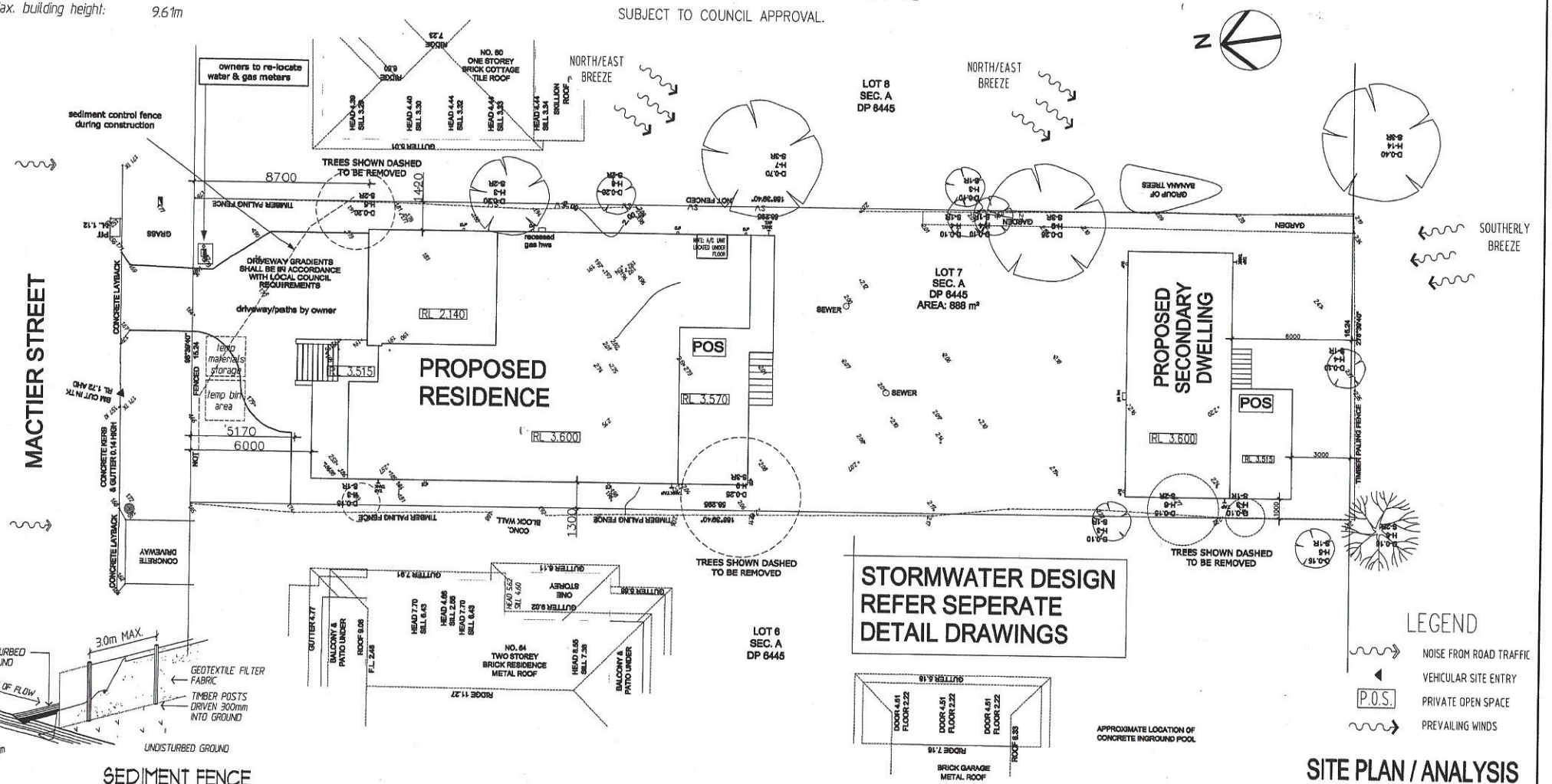
Site May 2019

FIGURE 6

CUSTOM

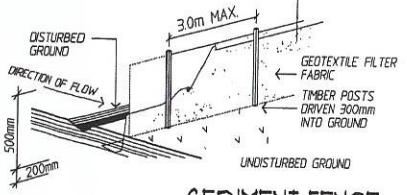
Site Area:	888m²
Driveway/paths:	70.0m²
Site Coverage:	338m² = 38.1%
Max. building height:	9.61m

NOTE: THE OWNER HAS PROVIDED TULLIPAN HOMES WITH THE REQUIRED FINISHED FLOOR LEVELS AS SHOWN ON THE PLANS. ALL PROPOSED FLOOR LEVELS ARE SUBJECT TO COUNCIL APPROVAL.



SITE PLAN / ANALYSIS

SCALE 1:200



SEDIMENT FENCE

N.T.S

SEDIMENT CONTROL NOTES

1. ALL EROSION AND SEDIMENTATION CONTROL MEASURES, INCLUDING REVEGETATION AND STORAGE OF SOIL AND TOPSOIL, SHALL BE IMPLEMENTED TO THE STANDARDS OF THE SOIL CONSERVATION OF NSW.
2. ALL DRAINAGE WORKS SHALL BE CONSTRUCTED AND STABILISED AS EARLY AS POSSIBLE DURING DEVELOPMENT.
3. SEDIMENT TRAPS SHALL BE CONSTRUCTED AROUND ALL INLET PITS, CONSISTING OF 300mm WIDE X 300mm DEEP TRENCH.
4. ALL SEDIMENT BASINS AND TRAPS SHALL BE CLEANED WHEN THE STRUCTURES ARE A 60% FULL OF SOIL MATERIALS, INCLUDING THE MAINTENANCE PERIOD.
5. ALL DISTURBED AREAS SHALL BE REVEGETATED AS SOON AS THE RELEVANT WORKS ARE COMPLETED.
6. SOIL AND TOPSOIL STOCKPILES SHALL BE LOCATED AWAY FROM DRAINAGE LINES AND AREA WHERE WATER MAY CONCENTRATE.
7. FILTER SHALL BE CONSTRUCTED BY STRETCHING A FILTER FABRIC (PROPEX OR APPROVED EQUIVALENT BETWEEN POST AT 3.0m CENTRES. FABRIC SHALL BE BURIED 150mm ALONG IT'S LOWER EDGE.

BOUNDARY NOTE
BOUNDARY INFORMATION SUPPLIED BY BUILDER. CONFIRM ALL BOUNDARY INFORMATION PRIOR TO COMMENCEMENT OF WORK.

SETOUT NOTE
BOUNDARY DIMENSIONS AND LOCATION OF DWELLING TO BE CONFIRMED AND SETOUT BY SURVEYOR PRIOR TO COMMENCEMENT OF WORK. BUILDER TO BE PRESENT TO CONFIRM PREFERENCE TO LOCATION.

COUNCIL NOTES:
- NO WATERWAYS, WATERCOURSES OR EXISTING DRAINAGE PROBLEMS
- EASEMENTS SHOWN ON SITE PLAN
- EXISTING VEGETATION SHOWN ON SITE PLAN
- STORMWATER DISPOSED OF TO COUNCIL'S REQUIREMENTS

CAUTION:

1. UTILITY SERVICES SHOWN HEREON HAVE BEEN LOCATED WHERE POSSIBLE BY FIELD SURVEY. IF NOT ABLE TO BE LOCATED, SERVICES HAVE BEEN PLOTTED FROM THE RECORDS OF RELEVANT AUTHORITIES WHERE AVAILABLE. PRIOR TO EXCAVATION OR CONSTRUCTION ON THE SITE, THE RELEVANT AUTHORITY SHOULD BE CONTACTED FOR CONFIRMATION OF LOCATION OF SERVICES. **** DIAL BEFORE YOU DIG (CALL 1100) ****
2. THE BOUNDARIES SHOWN HEREON ARE APPROXIMATE ONLY. FOR ANY CONSTRUCTION ACTIVITIES PROPOSED IN CLOSE PROXIMITY TO THE BOUNDARIES, IT IS RECOMMENDED THAT THOSE BOUNDARIES BE MARKED TO AVOID POSSIBILITY OF ENCROACHMENT.

DIAL 1100 BEFORE YOU DIG

CLIENT	A & M POPOVSKI
JOB	PROPOSED RESIDENCE
LOCATION	62 Mactier St Narrabeen

- BUILDER TO CHECK ALL DETAILS AND DIMENSIONS PRIOR TO CONSTRUCTION.
- FIGURED DIMENSIONS TAKE PREFERENCE OVER SCALE.

SHEET	DATE	DWG No.
1 of 15	28/03/2019	7292-Wd3

plan prepared by TULLIPAN HOMES

00/00/00	#	REVISION

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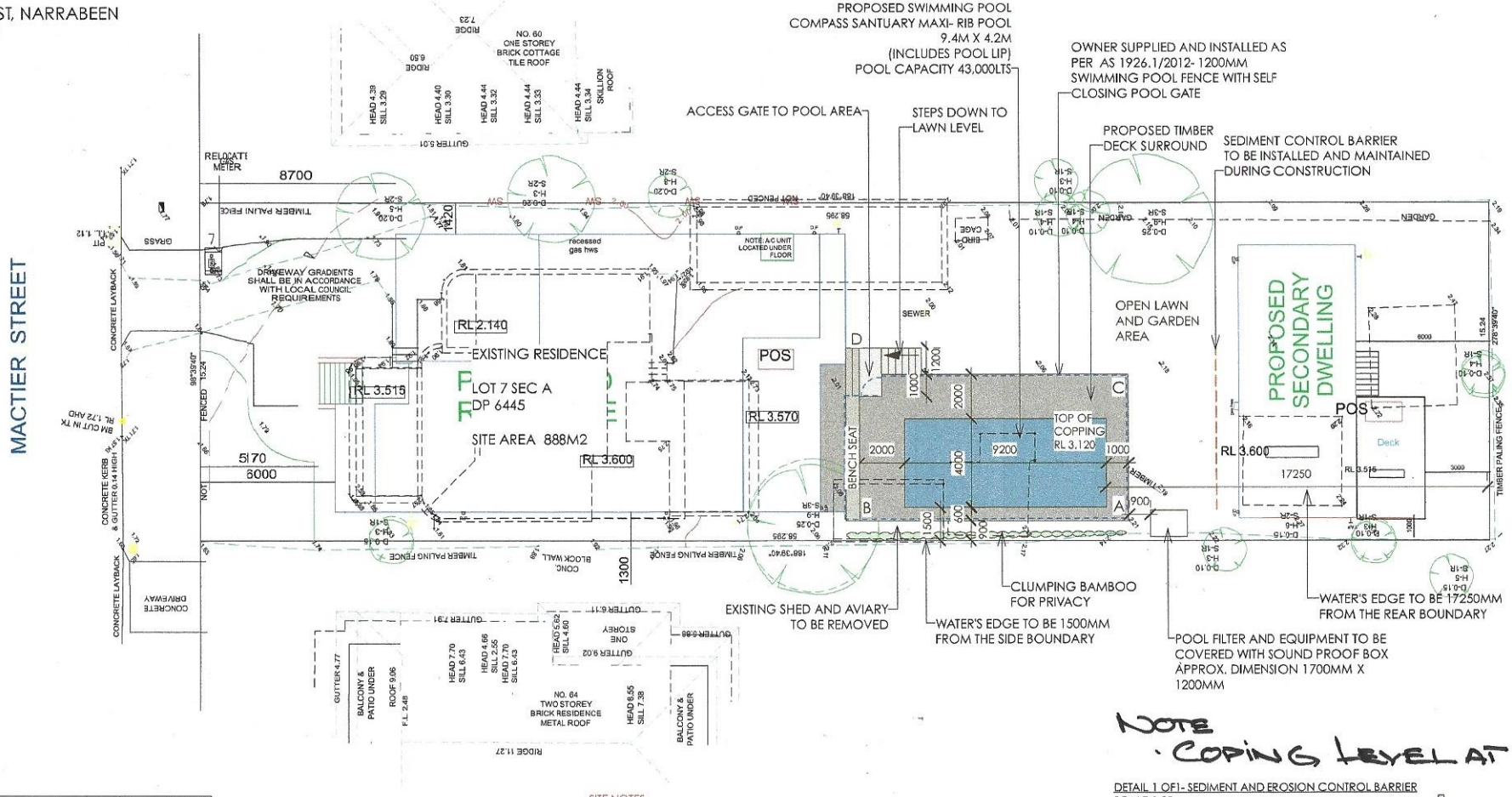
PO Box 5148
CHITTAWAY BAY NSW 2261

FIGURE 7

SITE PLAN

62 MACTIER ST, NARRABEEN

DRAFT



EXISTING GROUND LEVELS

A- EGL-2.180	
B- EGL- 2.080	
C-EGL- 2.180	
D-EGL- 2.010	

SITE CALCULATIONS

Total site area= 888m2
(Landscaped requirement- 40% of lot size=355.20m2)
Total existing hard space =317.20m2
(includes house, driveway, deck, sheds, paths,)
Percentage (%) of existing hard space=35.70%
Existing hard surface to be removed=22m2
Proposed new (hard surface) works=98m2
(including pool, surrounds and area less than 1.5m wide)
Total new hard space
(including proposed works)=415.20m2
Percentage of hard space= 47.60%
Percentage of landscaped space (balance)= 52.40%
Total landscape area=465m2

NOTES AND SPECIFICATIONS

POOL AND POOL FENCING
Installation of pool shell and surrounds to be done in accordance with manufacturers specifications and details
Installation of pool fencing to be in accordance with The Swimming Pools Act 1992 and AS 1926- the pool fence shall be not less than 1.2m all the way around with a self closing gate.
No anxcillary structures not immediately associated with the swimming pool, must be kept within the pool fenced area
Its the property owner's reponsibility to ensure the fence is maintained and the self closing pool gate is in good working order

SITE NOTES

DIMENSIONS AND LEVELS- UNLESS A CURRENT FULL SITE SURVEY HAS BEEN PROVIDED, DIMENSIONS AND MEASUREMENTS ARE INDICATIVE ONLY, AND MUST BE CONFIRMED ON SITE. MINOR ALTERATIONS MAY BE REQUIRED DEPENDING ON SITE VARIATIONS

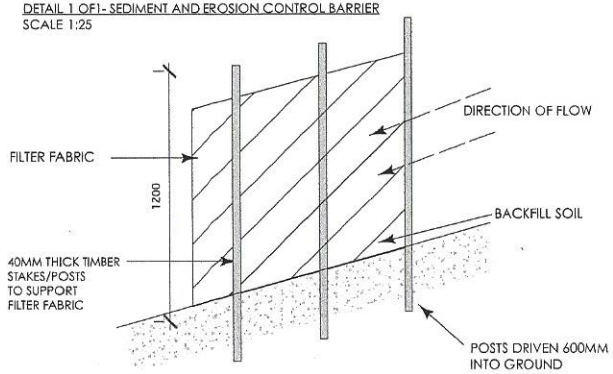
POOL FILTER EQUIPMENT- MUST BE LOCATED WITHIN SIX (6) METRES OF THE SWIMMING POOL AND MUST BE COVERED IN A SOUND PROOF BOX

BASIX REQUIREMENTS

SWIMMING POOL
- MUST INSTALL A POOL PUMP TIMER FOR THE SWIMMING POOL
-MUST INSTALL A WATERTANK WITH A MINIMUM CAPACITY OF 1782LITRES (CONNECTED TO 72.25M2 ROOF AREA)
- MUST INSTALL THE FOLLOWING HEATING SYSTEM FOR THE SWIMMING POOL- NIL

NOTE
· COPING LEVEL AT 3.1m AHD

DETAIL 1 OF1- SEDIMENT AND EROSION CONTROL BARRIER
SCALE 1:25



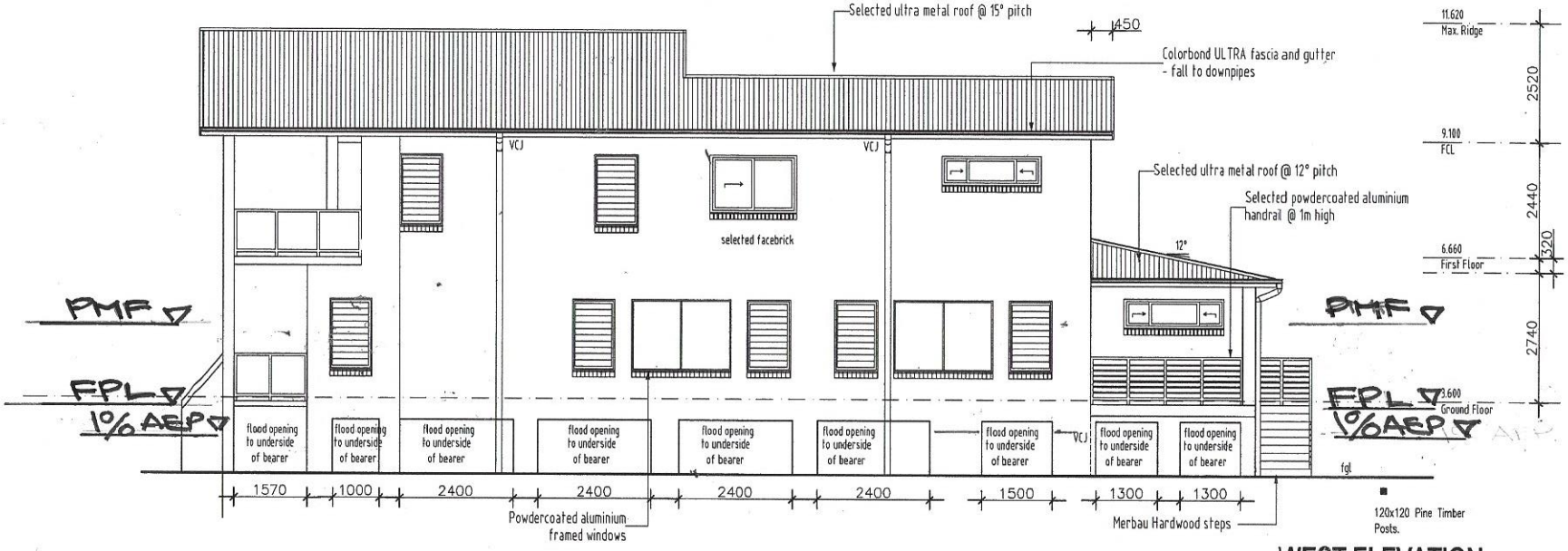
LANDSCAFER DESIGNER
LANDSCAPE DESIGN BY JACQUI RAY
PO Box 844, ST IVES, 2075
M: 0417680228 F: 43771433 E: jacqui@jacquiray.com.au

NOTES
1. Drawing not suitable for construction purposes.
2. Do not scale from drawings- use written dimensions only.
3. Contractor to verify location of all pipes and services prior to starting Works.
4. All Works to carried out in accordance with the BCA.
5. DA approved plans are required to be constructed as approved,to obtain occupancy certificate.
6. Plans are protected by Copyright Laws. No plan or part thereof may be used, copied or reperoduced in any way without the prior written permission of Dig This

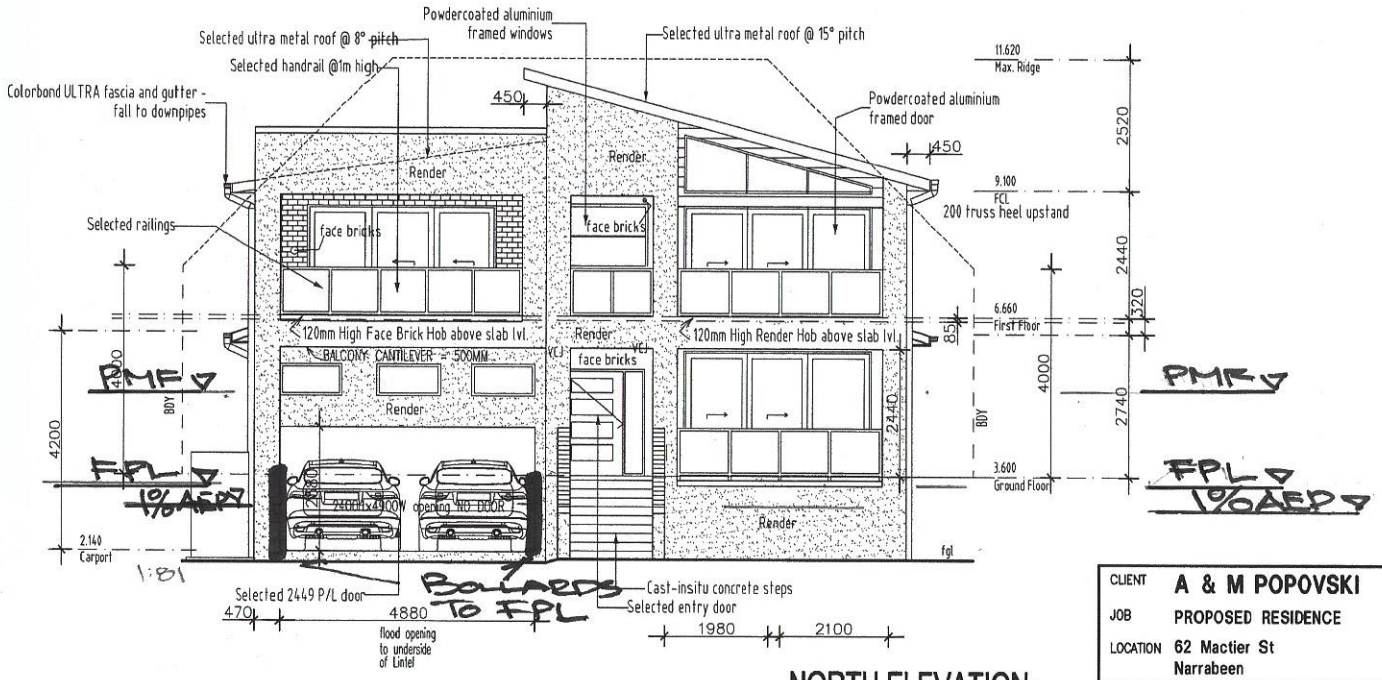
PROJECT	DRAWN	SCALE	DATE	DWG NO	REV
SWIMMING POOL AND SURROUNDS	JR	1:200@A3	13/8/19	1 of 1	E
LOCATION: POPOVSKI RESIDENCE, 62 MACTIER ST, NARRABEEN	TITLE: SITE PLAN				

FIGURE 8

CUSTOM



WEST ELEVATION
SCALE 1:100



NORTH ELEVATION
SCALE 1:100

NOTES
FPL: FLOOD PLANNING LEVEL
PMF: PROBABLE MAXIMUM FLOOD
1%AEP: 1:100 year flood.

CLIENT	A & M POPOVSKI	
JOB	PROPOSED RESIDENCE	
LOCATION	62 Mactier St Narrabeen	
- BUILDER TO CHECK ALL DETAILS AND DIMENSIONS PRIOR TO CONSTRUCTION. - FIGURED DIMENSIONS TAKE PREFERENCE OVER SCALE.		
SHEET 5 of 15	DATE 28/03/2019	DWG No. 7292-Wd3

plan prepared by TULLIPAN HOMES

00/00/00	#	REVISION

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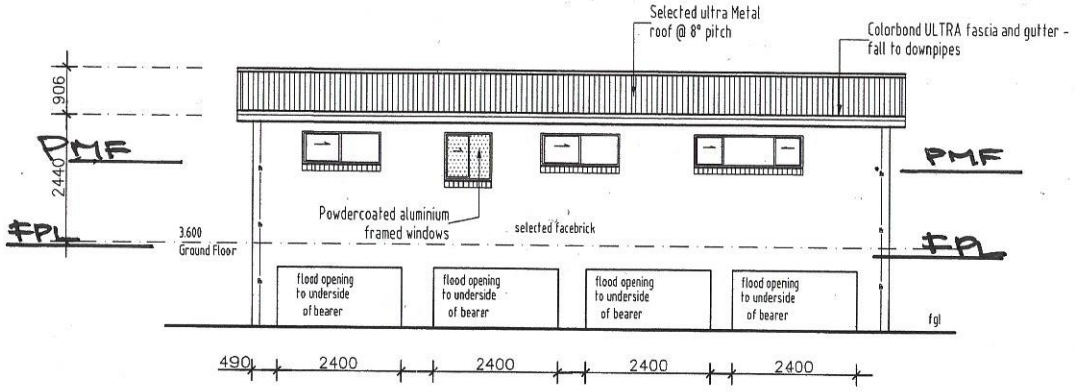
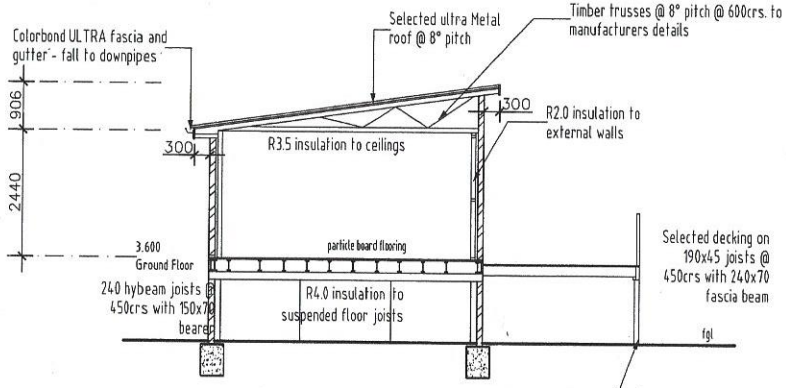
FIGURE 3

CUSTOM



NORTH ELEVATION
SCALE 1:100



SECTION B-B
SCALE 1:100

SUSPENDED TIMBER FLOORS
* GALVANISED ANT CAPPING TO BRICK PIERS & FOUNDATION WALLS
* REINF.CONC. FOUNDATIONS TO ENGINEER'S DETAIL

BULKHEAD AND STACK LOCATION TO BUILDERS DISCRETION

BRACING, TIE DOWN AND GLAZING DETAILS TO ENGINEERS SPECIFICATIONS

STAINLESS STEEL COLLARS TO ALL SLAB PENETRATIONS PERMANENT EXPOSED SLAB EDGE TERMIMESH TREATMENT AS PER SPEC.

19mm COMPRESSED FC SHEETING PLUS WET AREA WATERPROOFING INSTALLATION AS PER AS 3740 TO WET ROOMS

HANDRAILS TO BCA 3.9.2

STAINLESS STEEL WALL TIES & GALVANIZING TO ANY EXPOSED BEAMS

NOTE:
BLUE H2-F TIMBER FRAMING TO COMPLY WITH AS1684

NOTE:
Wet area waterproofing installation as per AS3740

Stainless steel collars to all slab penetrations permanent exposed slab edge termimesh treatment as per spec.

Where applicable structural concrete piers through fill to engs. details

BRICKLAYER

LOCATION OF VERTICAL CONTROL JOINTS SHOWN ON PLAN TO BE USED AS GUIDE ONLY. REFER TO BCA 3.3.1.8(b) BELOW FOR CONFIRMATION.

BCA 3.3.1.8

(b) Articulation joints must have a width not less than 10mm and be provided
(i) in straight, continuous walls having no openings, at not more than 6m centres and not closer than the height of the wall away from corners; and
(ii) where the height of the wall changes by more than 20%, at the position of change in height; and
(iii) where openings more than 900x900mm occur, at not more than 5m centres, and positioned in line with one edge of the opening; and
(iv) where walls change in thickness; and
(v) at control or construction joints in footing slabs; and
(vi) at junctions of walls constructed of different masonry materials; and
(vii) at deep chases (rebates) for service pipes.

ENGINEER

ALL STRUCTURAL REFERENCES MADE ON THIS PLAN ARE TO BE DESIGNED AND ALSO STATED ON AN ENGINEERS CERTIFICATE AS BEING WHOLLY APPROVED BEFORE COMMENCEMENT OF ANY WORKS. THESE DRAWINGS ARE TO BE THEN READ IN CONJUNCTION WITH ENGINEERS PLANS AND DOCUMENTS, WITH ENGINEERS REFERENCES TAKING PRECEDENCE.

CLIENT	A & M POPOVSKI
JOB	PROPOSED RESIDENCE
LOCATION	62 Mactier St Narrabeen

– BUILDER TO CHECK ALL DETAILS AND DIMENSIONS PRIOR TO CONSTRUCTION.
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SHEET	DATE	DWG No.
11 of 15	28/03/2019	7292-Wd3

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FIGURE 10

Attachment A

NORTHERN BEACHES COUNCIL
STANDARD HYDRAULIC CERTIFICATION FORM
FORM A/A1 – To be submitted with Development Application

Development Application for

Address of site: 62 MACTIER STREET, NARRABEEN

Declaration made by hydraulic engineer or professional consultant specialising in flooding/flood risk management as part of undertaking the Flood Management Report:

I, STEPHEN WYLLIE (Insert Name) on behalf of PITTWATER DATA SERVICES PTY LTD (Trading or Business/ Company Name)

on this the 15/8/2019 (Date) certify that I am engineer or a professional consultant specialising in flooding and I am authorised by the above organisation/ company to issue this document and to certify that the organisation/ company has a current professional indemnity policy of at least $2 million.

***Flood Management Report* Details:**

Report Title: FLOOD MANAGEMENT REPORT FOR 62 MACTIER STREET, NARRABEEN

Report Date: 15th/8/2019

Author: STEPHEN WYLLIE

Author's Company/Organisation: PITTWATER DATA SERVICES PTY LTD

I: STEPHEN WYLLIE (Insert Name)

Please tick all that are applicable (more than one box can be ticked)

☑ have obtained and included flood information from Council (must be less than 12 months old) **(This is mandatory)**

☑ have followed Council's Guidelines for Preparing a Flood Management Report

☑ have requested a variation to one or more of the flood related development controls. Details are provided in the *Flood Management Report*. COPING LEVEL OF POOL (SECTION 5)

Signature Stephen Wyllie

Name STEPHEN WYLLIE BSc(ENG) FMA MEMBER.