Royal HaskoningDHV
Enhancing Society Together

REPORT

# 316 Hudson Parade, Clareville
# Upgraded Boatshed Works
# Estuarine Risk Management Report

Client: Mr Tony Walls

Reference: PA2731WATRP2104161227
Status: P01/S1
Date: 16 April 2021

**HASKONING AUSTRALIA PTY LTD.**

Level 14
56 Berry Street
NSW 2060 North Sydney
Water
Trade register number: ACN153656252

+61 2 8854 5000 **T**
+61 2 9929 0960 **F**
project.admin.australia@rhdhv.com **E**
royalhaskoningdhv.com **W**

| | |
|---|---|
| Document title: | 316 Hudson Parade, Clareville<br>Upgraded Boatshed Works<br>Estuarine Risk Management Report |
| Document short title: | Clareville ERMR |
| Reference: | PA2731WATRP2104161227 |
| Status: | P01/S1 |
| Date: | 16 April 2021 |
| Project name: | 316 Hudson Parade, Clareville |
| Project number: | PA2731 |
| Author(s): | Gary Blumberg |

| | |
|---|---|
| Drafted by: | Gary Blumberg |
| Checked by: | Adrian Turnbull |
| Date: | 13/4/21 |
| Approved by: | Gary Blumberg |
| Date: | 16/4/21 |

| Classification |
|---|
| Project related |

# Table of Contents

## Executive Summary

Michael Fountain Architects (MFA) have lodged the Development Application (DA) with Northern Beaches Council for a boatshed at 316 Hudson Parade, Clareville. As part of Council's deliberation on the DA, MFA have received a referral response from the Natural Environment Unit - Coastal section of Council dated 25/2/21. Amongst other considerations, the Coastal officer has determined that the proposed finished floor level for the boatshed (1.72m AHD) is below the Estuarine Planning Level (EPL) that has been adopted by Council for the property (2.63m AHD). An Estuarine Risk Management Report addressing the EPL, boatshed floor level and Section 27 of the Coastal Management Act is required.

Royal HaskoningDHV (RHDHV) prepared a report in January 2019 which examined the shoreline stability risks associated with the partial demolition and refurbishment of the boatshed (RHDHV, 2019). This established that the perimeter walls of the boatshed do not have an adverse impact on the physical estuarine environment of the site (RHDHV, 2019).

The Estuarine Risk Management Report outlines the planning and development control requirements in relation to this matter. The site condition is reported as are the estuarine hydrodynamic processes and loads. An assessment is made on the estuarine risk at the site.

It is determined that the boat shed would be designed and constructed such that it would not increase the level of risk from estuarine processes for any people, assets or infrastructure on the site or in surrounding properties. All structural elements below the EPL would be constructed from assessed wave loading compatible materials as determined by the structural engineer and demonstrated by manufactured product directions as applicable. Suitable flood resistant building materials would be selected, and waterproofed services would be provided up to the EPL. Elements designed and installed to protect against wave action or tidal inundation would be maintained over the life of the structure. While an independent wave action and tidal assessment has been carried out, it is RHDHV's recommendation that Council's nominated EPL for the boatshed of 2.63m AHD be accepted.

Form 1 attached to Appendix 7 of 21 DCP is completed and attached here at **Appendix C**. This is a declaration and certification made by RHDHV's Coastal Engineer in relation to the Estuarine Risk Management Report prepared in support of the DA.

# 1 Introduction

## 1.1 Background

Michael Fountain Architects (MFA) have lodged the Development Application (DA) with Northern Beaches Council for a boatshed at 316 Hudson Parade, Clareville. The architectural drawings for the proposed boatshed are included at **Appendix A**.

Royal HaskoningDHV (RHDHV) prepared a report in January 2019 which examined the shoreline stability risks associated with the partial demolition and refurbishment of the boatshed (RHDHV, 2019). We understand that this report was submitted as part of the DA.

As part of Council's deliberation on the DA, MFA have received a referral response from the Natural Environment Unit - Coastal section of Council dated 25/2/21 (**Appendix B**). Amongst other considerations, the Coastal officer has determined that the proposed finished floor level for the boatshed (1.72m AHD) is below the Estuarine Planning Level (EPL) that has been adopted by Council for the property (2.63m AHD). A reduction factor may apply to the EPL based on the distance from the foreshore of the proposed development.

To address this matter, applicants may seek their own professional advice on estuarine planning levels based on the design life of the proposed development, and having regard to the managerial risk due to wave action and tidal inundation, and consideration of other environmental impacts as they may affect the subject land, neighbouring properties and adjoining foreshores.

According to the Natural Environment Unit referral response, the applicant needs to submit the following:

(a) Revised Statement of Environmental Effects report addressing the requirements of the Coastal Management Act 2016 and State Environmental Planning Policy (Coastal Management) 2018.

(b) An Estuarine Risk Management Report (ERMR) addressing the EPL and boatshed floor level and requirement of Section 27 of the Coastal Management Act.

The required ERMR is contained herein.

## 1.2 Scope of work

The agreed scope of work is to prepare an ERMR. The report is set out under the following main headings:

- Introduction
- Boatshed Development Application Proposal
- Planning and Development Control Requirements for Estuarine Risk Management
- Site Condition
- Estuarine Hydrodynamic Processes and Loads
- Assessment of Estuarine Risk at the Site
- Conclusion

## 1.3 Study area

The study area includes the site of the subject boatshed and its immediate environs. The study area is shown in **Figure 1**.


*Figure 1 Study area*

# 2 Boatshed Development Application Proposal

MFA have provided architectural drawings for the proposed boatshed reconstruction, a full copy of which are attached at **Appendix A** (issued for DA, 7/12/20). These show a new boatshed structure supported by concrete footings and piers and a concrete deck slab with sandstone paving over. The deck is finished at 1.72m AHD. This level is maintained throughout the boatshed.

An 8.5m wide suspended concrete ramp, supported at the edge of the deck slab, slopes at approximately 1:5 (v:h). The ramp terminates 2m in front of the boatshed front door. Seabed levels in the line of the crest of the ramp are approximately -0.5m AHD, or approximately Mean Low Water level.

The ramp is located directly in front of a glazed panel lift door (west side) which fits between 440mm wide stone-faced corner columns. This door is 5.9m wide and 2.3m high. There are two additional glazed sliding doors on the sides of the boat shed (north and south sides). These doors join to the front corners of the building. These doors are also 2.3m high and each up to 5.8m wide (4 x 1.45m wide stacking sliders shown).

An 20m long x 2.3m wide timber jetty and steps join to the south side of the concrete deck, just beyond the southern wall of the boatshed.

The DA plan and typical section for the proposed boatshed are reproduced in **Figure 2** and **Figure 3**.

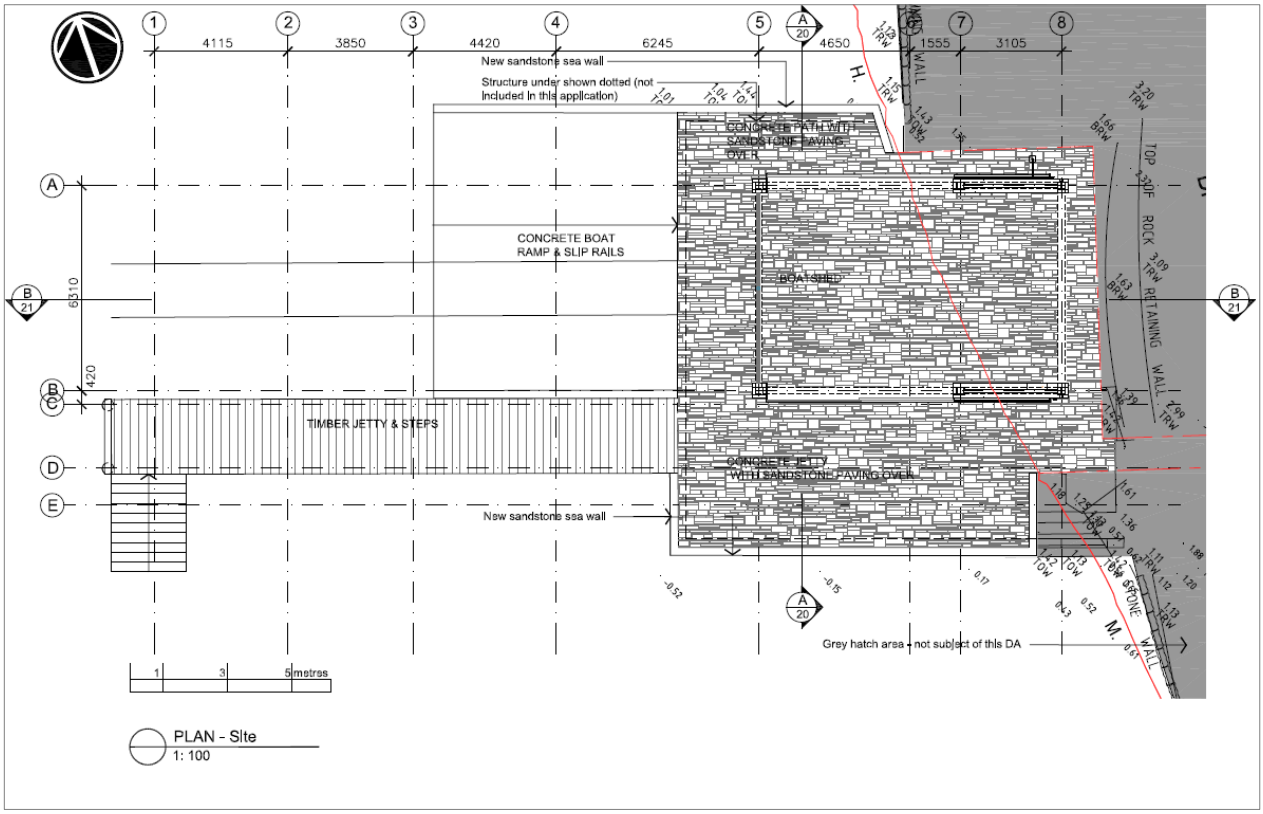



Figure 2 Proposed site plan

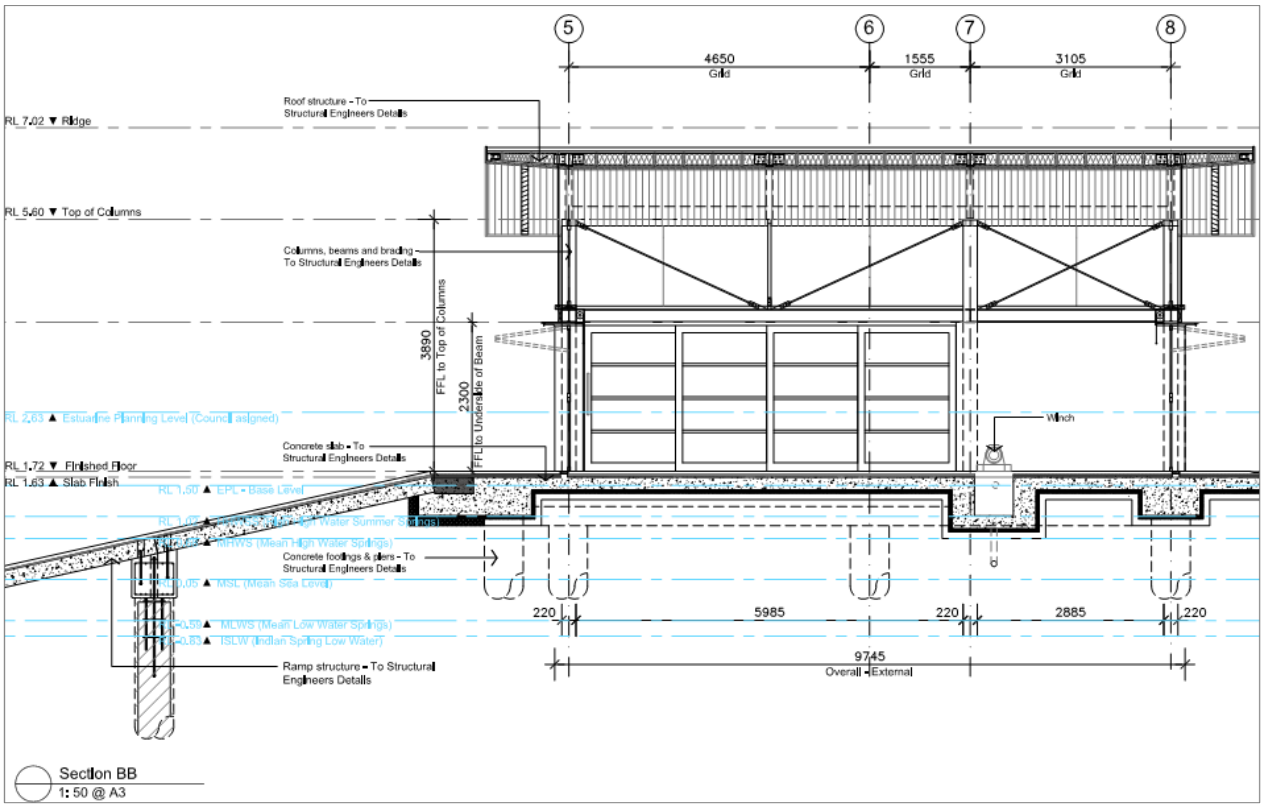



*Figure 3 Proposed typical section*

# 3 Planning and Development Control Requirements for Estuarine Risk Management

The coastal planning and development framework in relation to estuarine risk is covered in the Coastal Management Act 2016 and its accompanying State Environmental Planning Policy (Coastal Management) 2018, and the Pittwater 21 Development Control Plan (2014).

## 3.1 Coastal Management Act 2016 and State Environmental Planning Policy (Coastal Management) 2018

The proposed development is located within the coastal zone of NSW and is subject to the provisions of the Coastal Management Act 2016 (CM Act) and State Environmental Planning Policy (Coastal Management) 2018 (CM SEPP). As the proposal includes a seawall to protect the boatshed, the Section 27: granting of development consent relating to coastal protection works of the Coastal Management Act 2016 would apply for assessment of the DA. As required, the impact and risk associated with the construction of the seawall to protect boatshed must be assessed in an ERMR.

The report must address that the works would not, over the life of the works:

(i) unreasonably limit or be likely to unreasonably limit public access to or the use of a beach or headland, or

(ii) pose or be likely to pose a threat to public safety.

The report should address how these works would be maintained over the design life of the works. Based on the impact and risk identified, the maintenance condition would be applied as per Section 27(b)(ii) in granting development consent.

The risk management report must be prepared by a specialist Coastal Engineer who is a registered professional engineer with chartered professional status (CPEng) and with coastal engineering as a core competency and has an appropriate level of professional indemnity insurance.

Under the CM SEPP the subject site has been included on the Coastal Environment Area Map as well as the Coastal Use Area Maps. The objectives and requirements of both the CM Act and the CM SEPP would be addressed within the SEE as they relate to development within these coastal management areas.

## 3.2 Pittwater 21 DCP (2014)

### 3.2.1 Background

Pittwater 21 DCP is the community's vision for planning and development in Pittwater. It is a guide to the applicant as to the community's expectations for their Locality and for Pittwater as a whole. The DCP provides best practice standards for development. Before granting development consent, Council must be satisfied that the development is consistent with Pittwater LEP, the desired character of the Locality, and the development controls applicable to the development. Ecologically sustainable development (ESD) forms the basis of Pittwater 21 DCP, and it is fundamental to the environmental, social and economic objectives of the DCP.

The Natural Environment Referral Response (**Section 1.1**) identifies the subject property as being affected by estuarine wave action and tidal inundation as shown on Council's Estuarine Hazard Mapping. The Estuarine Risk Management Policy for Development in Pittwater (Appendix 7, Pittwater 21 DCP) and the relevant B3 Estuarine Hazard Controls would therefore apply to the proposed development. The requirements of other relevant controls under D15.15 Waterfront Development controls in Pittwater 21 DCP may also need to be considered.

### 3.2.2 Estuarine Risk Management Policy

#### 3.2.2.1 Background

The Estuarine Risk Management Policy for Pittwater is set out in Appendix 7 of the Pittwater DCP 21. The Policy establishes the estuarine risk management approach for development or activities on land affected by wave action and tidal inundation around the Pittwater estuary. Development must be undertaken in accordance with the acceptable risk management criteria defined in the Policy for a design project life, taken to be 100 years, unless otherwise justified by the applicant and acceptable to Council. The policy applies to land identified on Council's Estuarine Hazard Map which includes the subject site.

Once estuarine risk management measures have been proposed, approved and implemented on the land, it is the owner's responsibility to ensure that the measures are properly maintained for the design life of the development.

#### 3.2.2.2 Objectives

The objectives of Council's Estuarine Risk Management Policy are stated as follows:

(a) To ensure that wave action and tidal inundation processes (affecting development or likely to be affected by development) are adequately investigated and documented by applicants or proponents of activities prior to the lodgement of a DA or Part 5 Assessment to carry out any development/activity subject to this Policy, or wherever an application is lodged for a Building Certificate; and

(b) to establish whether or not the proposed development or activity is appropriate to be carried out having regard to the results of investigations; and

(c) to ensure effective controls exist to guarantee that a development is carried out in accordance with the requirements of this Policy; and

(d) to ensure that the preparation of wave action and tidal inundation related information and certificates required to be lodged by this Policy are carried out by suitably qualified professionals with appropriate expertise in the applicable areas of engineering; and

(e) that developments are only carried out if estuarine and related structural engineering risks are identified and can be effectively addressed and managed for the life of the development at an acceptable level of risk.

This Policy addresses both estuarine and structural engineering requirements relating to estuarine risk management issues only. Separate structural requirements will also apply for the erection of any structure in accordance with the Building Code of Australia (BCA) and best engineering practice.

#### 3.2.2.3 Independently Derived Information and Estuarine Risk Management Report

Independent information regarding wave action and tidal inundation may be sought from a suitably qualified Coastal Engineer in relation to any of the information currently available from Council, or on information not currently provided by Council.

It is the responsibility of the applicant to submit the independent wave action and tidal inundation information and risk assessment to Council in the form of a technical ERMR of adequate qualitative and quantitative detail addressing estuarine level information, the management of risk due to estuarine hazards at an acceptable level and the consideration of other environmental impacts (where applicable) as they affect the subject land, neighbouring properties and adjoining foreshore lands.

An ERMR should consider development constraints due to estuarine hazard impacts on the land, including an assessment of the degree of inundation, effects of wave action, impacts of waterborne debris, buoyancy effects, and other emergency issues during the design event. The report should also contain recommendations as to any reasonable and practical measures that can be undertaken to remove foreseeable risk associated with estuarine hazards for the design life of the development.

#### 3.2.2.4 Form 1 – Declaration and Certification made by Coastal Engineer in relation to the Estuarine Risk Management Report prepared in support of a DA

Form 1 is to be submitted with an ERMR accompanying a Development Application/ Part 5 Assessment. This form is needed to verify that the author of an ERMR is a Coastal Engineer as defined by this Policy or that the report has been technically verified by a Coastal Engineer as defined by this Policy.

### 3.2.3 Relevant Development Controls

We understand that the proposal enjoys existing use rights. This notwithstanding, Pittwater 21 DCP includes controls that relate to the whole or large areas of Pittwater defined by natural or physical attributes such as heritage, density, hazards, natural environment, water management, access and parking, and site works management. Relevant controls in relation to the proposed development are outlined below.

#### 3.2.3.1 Estuarine Hazard - Low density residential (Section B3.7)

General

Control B3.7 applies since the subject land is identified on the Estuarine Hazard Map as affected by estuarine processes.

To apply this control, the EPL must first be established by obtaining the EPL from Council, or by way of an independent assessment undertaken by a Coastal Engineer. Development is to be protected from the effects of wave action or tidal inundation either by mitigation works to protect the development or ensuring that the floor levels of the development are at or above the EPL.

The following applies to all development:

(a) All development or activities must be designed and constructed such that they will not increase the level of risk from estuarine processes for any people, assets or infrastructure in surrounding properties; they will not adversely affect estuarine processes; they will not be adversely affected by estuarine processes; and,

(b) All structural elements below the EPL shall be constructed from flood compatible materials; and,

(c) All structures must be designed and constructed so that they will have a low risk of damage and instability due to wave action and tidal inundation; and,

(d) All electrical equipment, wiring, fuel lines or any other service pipes and connections must be waterproofed to the EPL; and,

(e) The storage of toxic or potentially polluting goods, materials or other products, which may be hazardous or pollute the waterway, is not permitted below the EPL; and,

(f) For existing structures, a tolerance of up to minus 100mm may be applied to the EPL in respect of compliance with these controls.

To ensure Council's recommended flood evacuation strategy of 'shelter-in-place', it will need to be demonstrated that there is safe pedestrian access to a 'safe haven' above the EPL.

Wave Action and Tidal Inundation Mitigation Works

Developments that propose mitigation works that modify the wave action or tidal inundation behaviour within the development site including the filling of land, the construction of retaining structures and the construction of wave protection walls may be permitted on a merit basis subject to demonstration through an ERMR that:

- The wave action or tidal inundation mitigation works do not have an adverse impact on any surrounding property or estuarine processes up to the EPL; and,
- The wave action or tidal inundation mitigation works result in the protection of the existing and proposed development from inundation up to the EPL.
- The wave action or tidal inundation mitigation works do not have an adverse impact on the environment (This includes but is not limited to the altering of natural flow paths and the clearing of vegetation).

Where wave action or tidal inundation mitigation works are undertaken to protect the development from inundation as set out above, the application of the EPL requirements of this control need not apply.

A Section 88B notation under the Conveyancing Act 1919 may be required to be placed on the title describing the location and type of wave action or tidal inundation mitigation works with a requirement for their retention and maintenance.

Floor Levels - Boat shed Facilities

For a new boat shed, all floor levels shall be at or above the EPL.

Specific controls apply to basement boat shed facilities however these do not apply at the site.

Variations

Innovative and alternative design in wave action and tidal inundation protection measures may be permitted on a merit basis subject to demonstration through and ERMR that the protection measures can be achieved.

Also, consideration may be given on a merit basis to a floor level of a boat shed at a level lower than the EPL where it can be demonstrated through an ERMR that the boat shed is structurally designed to withstand periodic wave action and tidal inundation up to the EPL.

#### 3.2.3.2 D15.15 Waterfront development

Locality specific development controls are addressed in Section D of Pittwater 21 DCP. Construction, access and safety matters covered in Section D15.15 are addressed in this report. Tenure, usage and amenity considerations are not relevant to estuarine risk and are not addressed in this report.

Relevant controls are stated as follows:

- Boatsheds shall be located above mean high water mark on freehold land, where practicable. Where this cannot realistically be achieved, as much of the proposed boatshed as is practical must be located above mean high water mark to minimise encroachment onto the littoral zone below mean high water mark.

- Boatsheds shall not prevent or hinder public foreshore access. Alternative access must be provided where a proposed boatshed is likely to make existing foreshore access below mean high water mark difficult.

- Boatsheds shall be constructed of low maintenance materials.

- The minimum floor level for proposed boatsheds shall be in accordance with the B3 Estuarine Hazard controls for foreshore development around the Pittwater Waterway.

- All electrical equipment and wiring shall be water tight below the designed flood/tidal inundation level.

# 4 Site Condition

Mr Gary Blumberg from RHDHV inspected the site on 26 October 2018. Observations made during the inspection are documented in RHDHV (2019). The former boatshed had been demolished and works were underway to reconstruct perimeter seawalls using a Dincel reinforced concrete foundation. The shorelines adjoining the boatshed site to the north and south were badly eroded at the time and it was proposed to repair and replace these structures with new sandstone block structures. We are advised that the foundation walls for the boatshed are at the same state of completion as inspected by Gary Blumberg in October 2018, and that outside seasonal and weather-related change in sediment depth there is no substantial difference in the site.


*Figure 4 Boatshed site showing Dincel wall foundation and piles of former jetty (Nearmap January 2021)*

Recent photos of the site are included below.

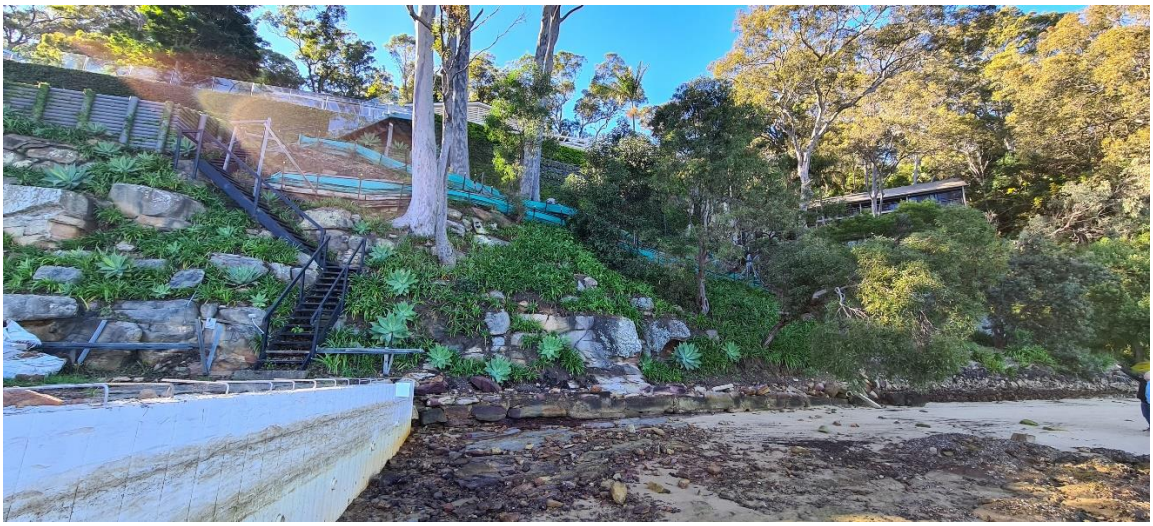


*Figure 5 Southern Dincel wall foundation for proposed boatshed and adjoining shoreline to the south (Photo by MFA 20/7/20)*

*Figure 6 Shoreline to south of proposed boatshed. Dincel wall foundation shown in the left middleground (Photo by MFA 20/7/20)*

*Figure 7 Shoreline to the north of the proposed boatshed. Dincel wall foundation clearly visible (Photo by MFA 20/7/20)*

# 5 Design Life for Boatshed

The design life of a structure is related to the typical design components, such as concrete, steel, masonry and timber. The design life used in various Australian Standards is as follows:

- AS 1170 (structural design): 50 years
- AS 2870 (residential slabs and footings): 50 years
- AS 3600 (concrete): 40 to 60 years
- AS 4678 (earth-retaining structures): 60 years
- AS 4997 (maritime structures): 50 years for a normal commercial structure.
- The cost of new residential development is amortised for tax purposes over 40 years based on Subdivision 43-25 of the Income Tax Assessment Act 1997.

The Australian Geomechanics Society (AGS) in 2007 in their National Landslide Risk Management Framework for Australia noted that a design life of at least 50 years would be considered to be reasonable for permanent structures used by people, and that there is a community expectation that a residential dwelling frequently, with appropriate maintenance, would have a functional life well in excess of 50 to 60 years. AGS state that a design should include details of required inspections and maintenance to enable risk mitigation measures to remain effective for at least the design life of the structure.

The Collaroy-Narrabeen Beach Coastal Zone Management Plan, CZMP (2016) adopted by Northern Beaches Council and certified by the State Government, adopted design criteria based on minimum 50 year Average Recurrence Interval (ARI) design storm conditions and that all new structures are at an acceptable risk of damage over a 60 year design life.

Development in the Pittwater must be undertaken in accordance with the acceptable risk management criteria defined in the Estuarine Risk Management Policy for a design project life, taken to be 100 years, unless otherwise justified by the applicant and acceptable to Council.

On the basis of the above it is proposed that the design life for the boatshed be adopted as 60 years.

# 6 Estuarine Hydrodynamic Processes and Loads

## 6.1 Water Levels

Water levels in the Pittwater are dependent on a number of processes including astronomical tide, storm surge, wave setup and freshwater flows. The combination of these during storms leads to extreme water levels within the waterway.

Tidal planes for Pittwater reported in Lawson & Treloar (2002) are summarised in **Table 1**.

*Table 1 Tidal planes*

| Tidal Plane | | Level (m AHD)[1] |
|---|---|---|
| High High Water Solstices Spring | HHWSS | 1.05 |
| Mean High Water Springs | MHWS | 0.71 |
| Mean High Water | MHW | 0.58 |
| Mean High Water Neaps | MHWN | 0.45 |
| Mean Sea Level | MSL | 0.07 |
| Mean Low Water Neaps | MLWN | -0.30 |
| Mean Low Water | MLW | -0.43 |
| Mean Low Water Springs | MLWS | -0.56 |
| Indian Spring Low Water | ISLW | -0.80 |

*Notes (1) Average of predicted levels for Newport and Mackeral Beach*

Storm surge is a result of barometric plus wind setup. Barometric setup is caused by the water surface being sucked upwards due to low atmospheric pressure. Barometric setup equates to 0.1m of water level rise for a 10hPa drop in pressure. Wind setup is caused by water piled up against the shoreline as a result of wind shear at the water surface. Wind setup is small and is predicted to be only 1cm for a 50 ARI year wind speed from the NW (CERC, 1977). Wave set up is considered in **Section 6.3**. Freshwater flows are of no consequence since the site is well removed from any riparian floodway.

Design still water levels for the site are summarised in **Table 2**. These are controlled by tides and barometric setup.

*Table 2 Design still water levels for Pittwater*

| Average Return Interval (years) | Still Water Level (m AHD) |
|---|---|
| 20 | 1.43 |
| 50 | 1.47 |
| 100 | 1.50 |

Sea level rise (SLR) is a predicted consequence of climate change. It would be due mainly to the thermal expansion of the surface layers of the ocean. Best estimate predicted SLR for Northern Beaches is reported in the Collaroy-Narrabeen Beach and Fishermans Beach CZMP (NBC, 2016) as 0.4m at 2074 (compared to 2016). Pittwater 21 DCP adopts 0.2m SLR for inclusion in its assessment of the Estuarine Planning Level in Pittwater.

## 6.2 Currents

Currents in the waterway could be generated by winds, tides and propeller wash. Wind induced currents would not exceed 2% of the wind speed up to about 7m/s after which the wind stress is transferred to wave generation rather than formation of currents. Hence wind induced currents would not exceed about 0.15m/s. Near shore tidal currents off Clareville would also be low, due to large waterway flow cross-section, and of a comparable magnitude to wind induced currents. Propeller wash however can be very high locally, up to 8m/s or more, but this would be of little consequence to movement of sand on Clareville Beach which is well removed from propeller driven vessels.

## 6.3 Waves

The site is exposed to wind and boat generated waves, but not ocean swell. Dominant wind fetches are to the NW and SW measured at 2.5km and 1.7km respectively. Hindcast wind waves at the site for these fetches are calculated for average recurrence intervals (ARIs) as shown in **Table 3**.

*Table 3 Wind wave conditions at the site*

| ARI | NW | | SW | |
|---|---|---|---|---|
| | Hs (m) | Tp (s) | Hs (m) | Tp (s) |
| 1 week | 0.2 | 1.5 | 0.2 | 1.6 |
| 1 year | 0.6 | 2.4 | 0.6 | 2.2 |
| 50 years | 1.0 | 2.9 | 0.9 | 2.6 |

Based on long term Sydney wind statistics and hindcast methods after CERC (1984)
ARI = average recurrence interval
Hs = significant wave height (average height of highest of 1/3 of waves in a wave train). Hmax approximately equals 1.8Hs
Tp = peak wave period

Boat generated wave heights at the site would exceed wind wave heights on a daily basis but are unlikely to control the wave energy environment at the shoreline in relation to shoreline stability and sediment transport. Although there is an 8 knot speed limit inside of a line joining Taylors Point and Salt Pan Point, design incident boat wave conditions which could occur daily are estimated as follows:

H max (maximum wave height) = 0.4m
Tp (peak wave period) = 2.5s

Wave setup is the superelevation of the water surface over normal surge elevation due to onshore mass transport of water by wave action alone. Wave setup at the site developed during a 50 year ARI storm from the NW is predicted to reach 0.14m (CERC, 1984).

## 6.4 Estuarine Hydrodynamic Loads

### 6.4.1 Wave runup and overtopping

Waves in a 50 year ARI storm from the NW are predicted to develop significant heights to 1.0m with peak periods of 2.9s (**Table 3**). These waves are directed straight up the ramp in front of the boatshed. Design significant wave runup is estimated at 0.68m extending to a level of 2.53m AHD, calculated as follows:

- 100 yr SWL (**Table 2**) 1.5m AHD
- SLR (21 DCP value used for EPLs) 0.2m

- Wind setup (local) 0.01m
- Wave setup (local) 0.14m
- Wave runup 0.68m

**Total 2.53m AHD**

The 50 year ARI breaking wave height on the ramp is estimated at 1.1m.

In Pittwater a freeboard must be added to the design wave runup level to account for uncertainties in the wave runup level assessment. This is a “factor of safety” expressed as a height above the design water level (refer **Section 7.1**).

Wave overtopping refers to the passing of water over the top of a structure as a result of wave runup or surge action. For the design event described above, significant wave overtopping is estimated at up to 10L/s per m (procedure after Eurotop 2018).

### 6.4.2 Wave loads

Incident waves would break on the ramp loading the structure. During storms these waves potentially runup and overtop the crest of the ramp. The runup flows would impinge on the perimeter walls and doors of the boatshed.

For the design case with significant wave runup to 2.53m AHD, broken waves would rush up the ramp as a bore of water. It is estimated that the speed of the bore at the ramp crest would be approximately 2.5m/s in the design case, reducing as the water height increases and the water is translated landward towards the boat shed. The broken wave load on the perimeter walls and doors of the boat shed would range up to 5kN/m, applied between the boatramp finished floor level of 1.72m AHD (5kN/m applies) and the design significant wave runup level of 2.53m AHD (0kN/m applies).

It is possible that flotsam and other waterborne debris could be mobilised by the storm waves. Detailed design of the perimeter walls and doors of boatshed would account for buoyancy effects.

# 7 Assessment of Estuarine Risk at the Site

## 7.1 Estuarine Planning Level

In accordance with 21 DCP, the Estuarine Planning Level (EPL) is the water level selected for planning purposes as determined for Pittwater based on the 100 year ARI storm tide, 200mm sea level rise due to climatic conditions, associated wind setup, wave run up plus a freeboard allowance (0mm to 300mm depending on adopted foreshore edge treatment and height of wave run up). Council have identified the EPL as 2.63m AHD for the site.

RHDHV recommends that 2.63m AHD be accepted as the base EPL for the subject boatshed.

The base EPL can vary dependent upon the existing/ proposed foreshore edge treatment, less a reduction factor based on the distance to the development from the foreshore edge treatment. 40m is adopted for full attenuation of the wave runup above the existing surface level. It is proposed that factored EPL's would apply to the boatshed structure having regard to the geometry of the structure as summarised in **Table 4**.

*Table 4 Proposed factored EPL's applicable at boatshed*

| Location | EPL |
|---|---|
| Crest of the ramp | 2.63m AHD |
| Boatshed seaward wall/ door | 2.58m AHD |
| Boatshed landward wall | 2.36m AHD |

For existing structures, a tolerance of up to minus 100mm may be applied to the EPL in respect of compliance with these controls. Since the boat shed is being rebuilt, the 100mm tolerance would not apply.

## 7.2 Interaction with Estuarine Processes

The boat shed would be designed and constructed such that it would not increase the level of risk from estuarine processes for any people, assets or infrastructure on the site or in surrounding properties.

RHDHV previously investigated the influence of the then new foundation works that had been commenced for the proposed boatshed on the coastal environment of the site. Consideration was given to the physical coastal and marine processes operating at the site, in particular morphologic, hydrodynamic and sedimentary processes. It was found that wave reflection behaviour at the new perimeter walls was unlikely to be significantly different from that which occurred with the former boatshed and its perimeter seawall. If slightly more reflection did occur, it was RHDHV's opinion that this would have no material influence on beach or shoreline stability to the north or south of the new walls. An assessment was also made of the potential for the new foundation works to behave as a groyne and it was found that no impact or damage on longshore sediment transport would occur (RHDHV, 2018).

Any storage inside the boatshed of toxic or potentially polluting goods, materials or other products, which may be hazardous or pollute the waterway, would be undertaken above 2.58m AHD throughout the boatshed, i.e. at least 860mm above the finished floor level.

## 7.3 Structure stability and durability

To ensure the boat shed has a low risk of damage and instability due to wave action and tidal inundation, it would be designed for an inundation regime and wave loading as follows:

- Full inundation by static water up to 1.7m AHD (100 year SWL + 21 DCP SLR allowance)
- Periodic wetting by wave runup to 2.58m AHD (maximum EPL inclusive of freeboard)
- Up to 5kN/m wave load applied as a UDL (uniformly distributed load) between 1.72m AHD and 2.53m AHD (i.e. 3.1kPa).

All structural elements below the EPL would be constructed from flood compatible materials as determined by the structural engineer and demonstrated by manufactured product directions as applicable.

## 7.4 Public Access

The rebuilt boatshed would not, over the life of the structure, unreasonably limit public access along the foreshore. Passing of pedestrians behind the boatshed would continue to occur as was the case with the former boat shed.

## 7.5 Personal and Public Safety

In accordance with Pittwater 21 DCP, all electrical equipment, wiring, fuel lines or any other service pipes and connections would be waterproofed up to 2.58m AHD (maximum EPL inclusive of freeboard).

Since the boatshed would be designed and constructed such that it not increase the level of risk from estuarine processes for any people, assets or infrastructure in surrounding properties

Any flooding that occurs in the Pittwater would develop over many hours governed by the progression of astronomical tide (**Section 6.1**). The boatshed is not a habitable space and there would always be ample warning time for persons using the boatshed to evacuate to a ‘safe haven’ away from any developing floodwaters. The main house on the property is located well above the effects of any wave action or flooding and ready evacuation would always be available to this location.

# 8 Conclusion

A previous investigation has established that the perimeter walls of the boatshed do not have an adverse impact on the physical estuarine environment of the site (RHDHV, 2019)

The boat shed would be designed and constructed such that it would not increase the level of risk from estuarine processes for any people, assets or infrastructure on the site or in surrounding properties. All structural elements below the EPL would be constructed from assessed wave loading compatible materials as determined by the structural engineer and demonstrated by manufactured product directions as applicable. Suitable flood resistant building materials would be selected, and waterproofed services would be provided up to the EPL. Elements designed and installed to protect against wave action or tidal inundation would be maintained over the life of the structure.

While an independent wave action and tidal assessment has been carried out, it is RHDHV's recommendation that Council's nominated EPL for the boatshed of 2.63m AHD be accepted.

Completed Form 1 is submitted with this ERMR, attached at **Appendix C**. This form verifies that the author of the ERMR is a Coastal Engineer as defined by this Policy.

# 9 References

CERC (2003)
Coastal Engineering Manual
US Army Corps of Engineers

CERC (1984)
Shore Protection Manual
Fourth Edition
US Army Corps of Engineers

CERC (1977)
Shore Protection Manual
Third Edition
US Army Corps of Engineers

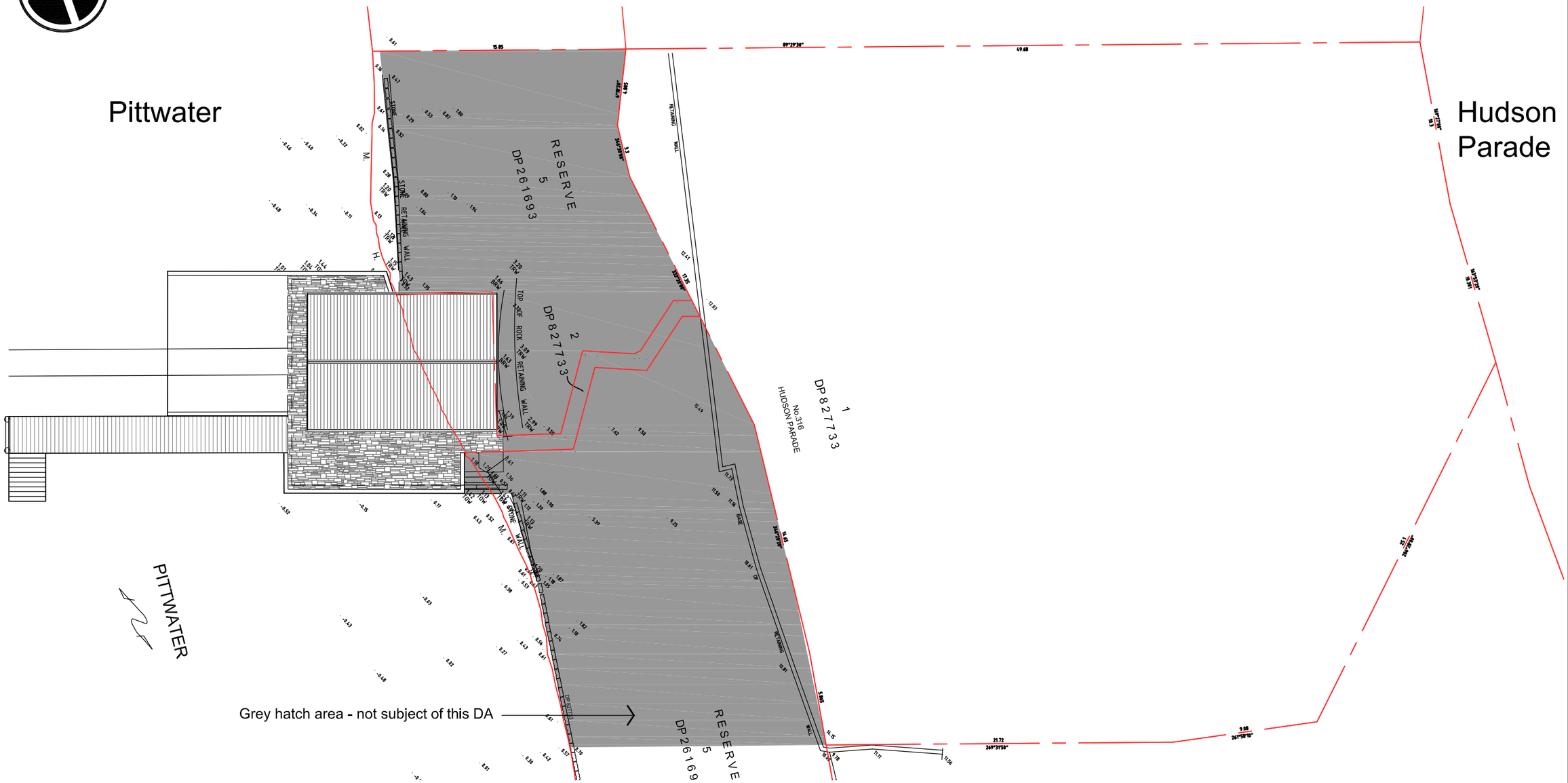
Eurotop (2018)
Manual on Wave Overtopping of Sea Defences and Related Structures – Second Edition
An overtopping manual largely based on European research, but for worldwide application. Van der Meer, J.W., Allsop, N.W.H., Bruce, T., De Rouck, J., Kortenhaus, A., Pullen, T., Schüttrumpf, H., Troch, P. and Zanuttigh, B., www.overtopping-manual.com

Lawson & Treloar (2002)
Pittwater Estuary Processes Study
Report J1942/R1945, November 2002

Northern Beaches Council (2016)
Coastal Zone Management Plan for Collaroy-Narrabeen Beach and Fishermans Beach
December 2016

RHDHV (2019)
316 Hudson Parade, Clareville Upgraded Boatshed Works Coastal and Marine Damages Assessment
Prepared for Mr Tony Walls, Reference PA1959MARP1901310938, Status: P02.01/Final, 31 January 2019

# APPENDIX A
# ARCHITECTURAL DRAWINGS




PLAN - Location
NTS

| ISSUE | AMENDMENT | DATE |
|---|---|---|
| A | Issued for Review | 14.10.19 |
| B | Issued for Review | 18.08.20 |
| C | Issued for Review | 18.08.20 |
| D | Issued for 3d | 26.08.20 |
| E | Issued for Development Application | 07.12.20 |
| | | |

MFA
MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757



CLIENT: Tony Walls

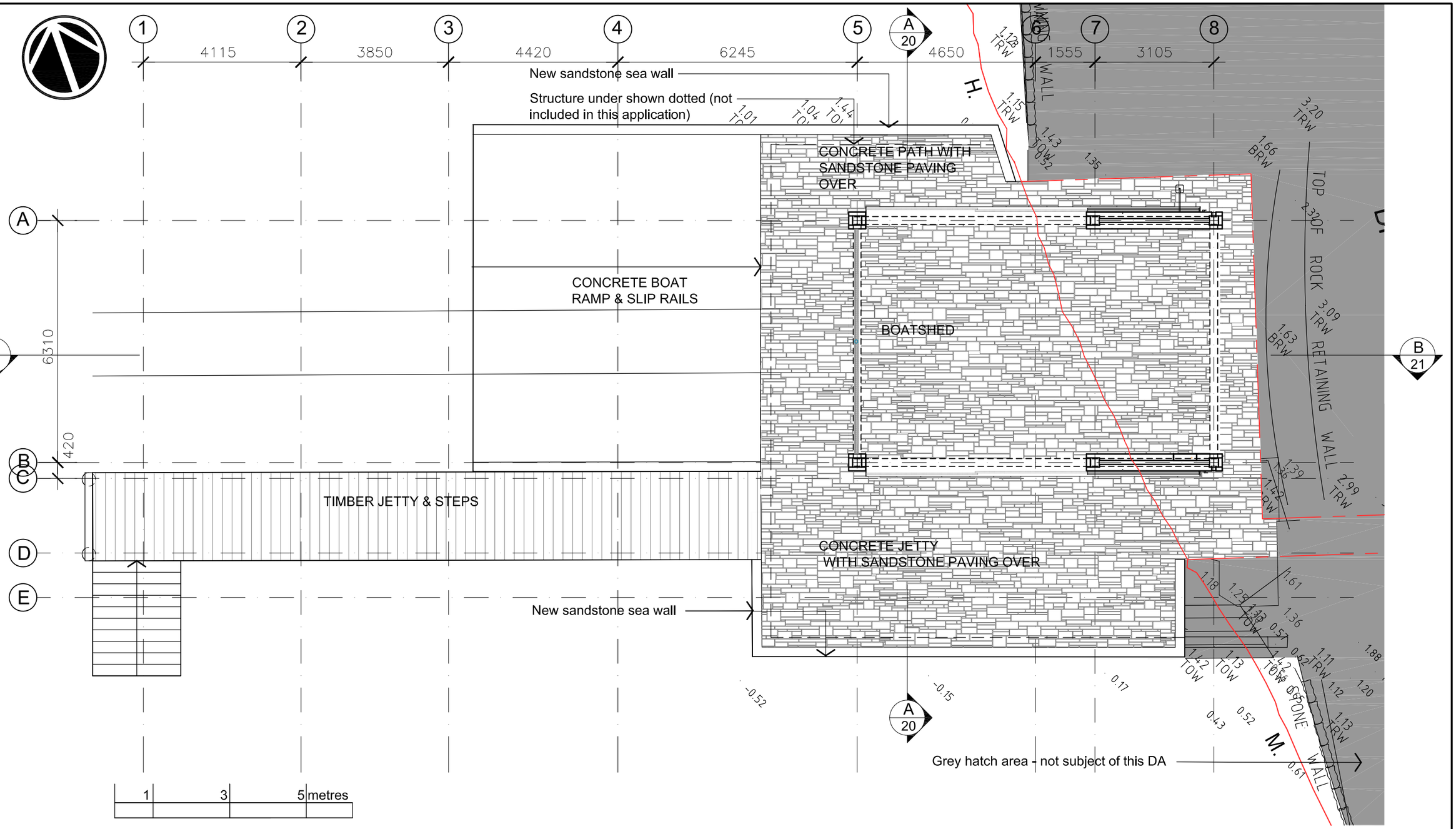
PROJECT: Maritime Structures
No. 316 Hudson Parade
Clareville NSW 2107

DRAWING: PLAN - Location

| DRAWN | CHKD | APPROVED |
|---|---|---|
| RJC | | |
| SCALE | DATE | CAD FILE No |
| Not to Scale | SEP 2019 | |
| JOB NO | DRAWING NO | ISSUE |
| 1605 | DA -000 | E |

MFA
MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757

PRINTED: Dec 09, 2020 – 2:31pm P:\WALLS – Clareville\Cadwork\MFA Drawings\025_for DA_08102019\SK–001– Plans.dwg




PLAN - Site
1: 100

| ISSUE | AMENDMENT | DATE |
|---|---|---|
| i | Issued for Information | 10.01.20 |
| J | Issued for Information | 27.07.20 |
| K | Issued for Review | 18.08.20 |
| L | Issued for Review | 18.08.20 |
| M | Issued for 3d | 26.08.20 |
| N | Issued for Development Application | 07.12.20 |
| | | |

MFA
MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757



CLIENT: Tony Walls

PROJECT: Maritime Structures
No. 316 Hudson Parade
Clareville NSW 2107

DRAWING: PLAN - Site + Floor

| DRAWN | CHKD | APPROVED |
|---|---|---|
| RJC | | |
| SCALE: 1 : 100 @ A3 | DATE: SEP 2019 | CAD FILE No |
| JOB NO: 1605 | DRAWING NO: DA -001 | ISSUE: N |

MFA
MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757


| ISSUE | AMENDMENT | DATE |
|---|---|---|
| | | |



CLIENT: Tony Walls

PROJECT: Maritime Structures
No. 316 Hudson Parade
Clareville NSW 2107

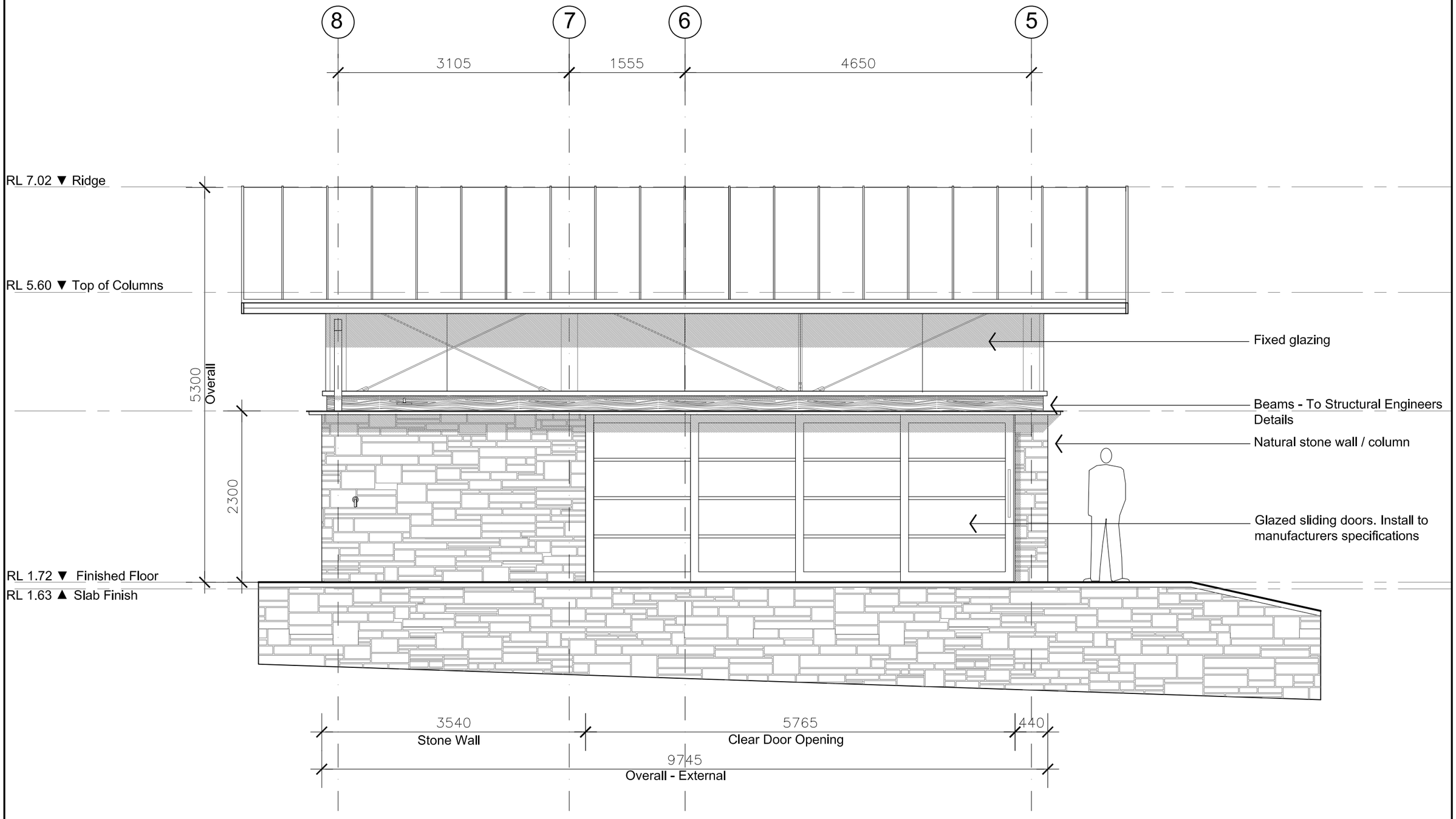
DRAWING: Site Analysis

| DRAWN | CHKD | APPROVED |
|---|---|---|
| JF | MF | MF |

| SCALE | DATE | CAD FILE No |
|---|---|---|
| 1:500 @ A3 | Nov 2020 | |

| JOB NO | DRAWING NO | ISSUE |
|---|---|---|
| 1605 | DA - 002 | |

MFA
MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757




Elevation - North
1: 50

MFA
MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757

| ISSUE | AMENDMENT | DATE |
|---|---|---|
| A | Issued for Review | 14.10.19 |
| B | Issued for Information | 27.07.20 |
| C | Issued for Review | 18.08.20 |
| D | Issued for 3d | 26.08.20 |
| E | Issued for Development Application | 07.12.20 |
| | | |



CLIENT
Tony Walls

PROJECT
Maritime Structures
No. 316 Hudson Parade
Clareville NSW 2107

DRAWING
ELEVATION - North

| DRAWN | CHKD | APPROVED |
|---|---|---|
| DMS | | |
| SCALE | DATE | CAD FILE No |
| 1 : 50 @ A3 | Sept 2019 | |

| JOB NO | DRAWING NO | ISSUE |
|---|---|---|
| 1605 | DA- 010 | E |

MFA
MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757

PRINTED: Dec 09, 2020 – 2:36pm
P:\WALLS – Clareville\Cadwork\MFA Drawings\025_for DA_08102019\SK–010 – 020 – Sections & Elevations.dwg


## Elevation - South
1: 50

| ISSUE | AMENDMENT | DATE |
|---|---|---|
| A | Issued for Review | 14.10.19 |
| B | Issued for Information | 27.07.20 |
| C | Issued for Review | 18.08.20 |
| D | Issued for 3d | 26.08.20 |
| E | Issued for Development Application | 07.12.20 |

MFA
MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757



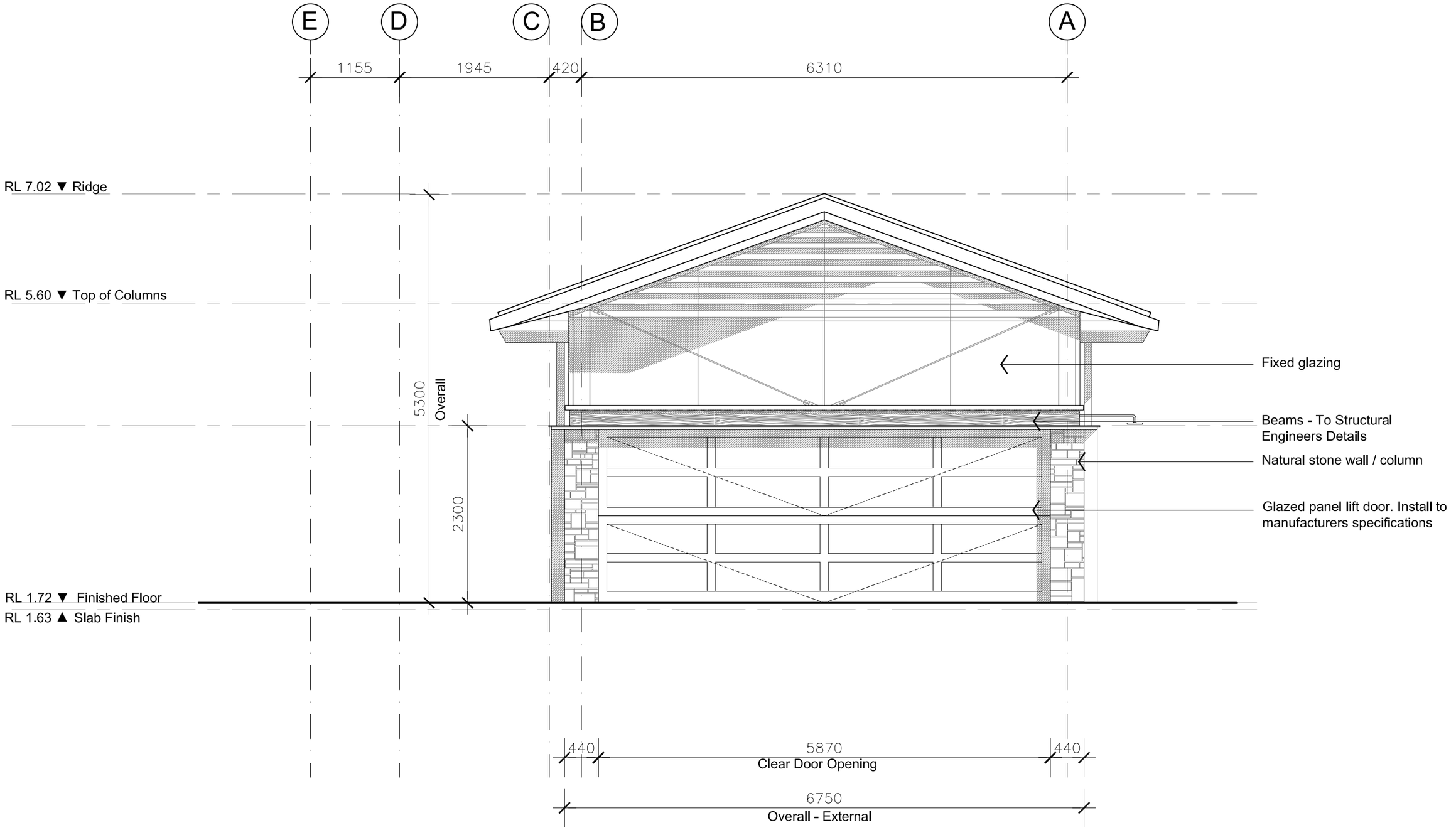
CLIENT: Tony Walls

PROJECT: Maritime Structures
No. 316 Hudson Parade
Clareville NSW 2107

DRAWING: ELEVATION - South

| DRAWN | CHKD | APPROVED |
|---|---|---|
| DMS | | |
| SCALE | DATE | CAD FILE No |
| 1 : 50 @ A3 | Sept 2019 | |
| JOB NO | DRAWING NO | ISSUE |
| 1605 | DA- 011 | D |

MFA
MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757




## Elevation - East
1: 50 @ A3

| ISSUE | AMENDMENT | DATE |
|---|---|---|
| A | Issued for Review | 14.10.19 |
| B | Issued for Information | 27.07.20 |
| C | Issued for Review | 18.08.20 |
| D | Issued for 3d | 26.08.20 |
| E | Issued for Development Application | 07.12.20 |
| | | |

MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757



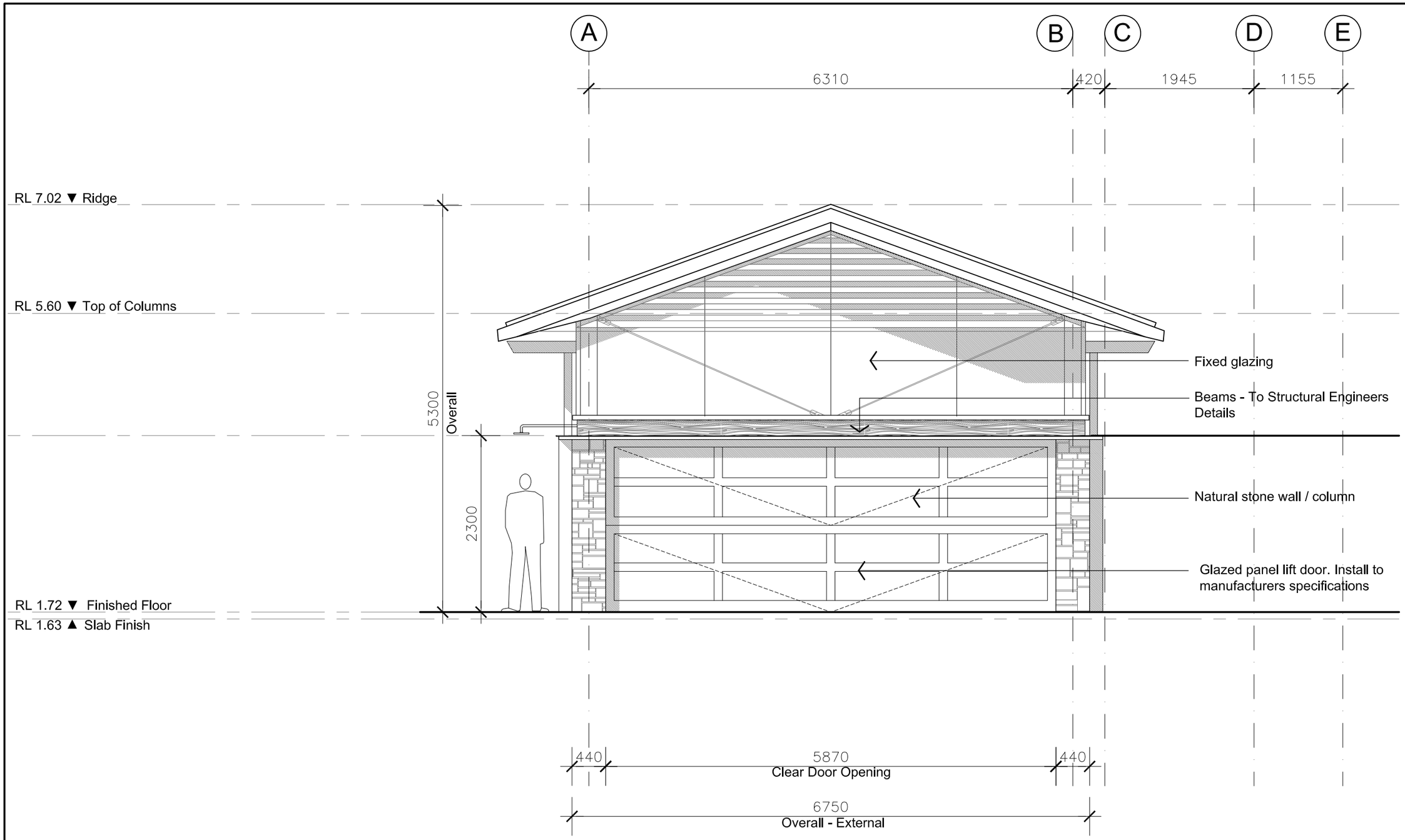
CLIENT: Tony Walls

PROJECT: Maritime Structures
No. 316 Hudson Parade
Clareville NSW 2107

DRAWING: ELEVATION - East

| DRAWN | CHKD | APPROVED |
|---|---|---|
| DMS | | |
| SCALE | DATE | CAD FILE No |
| 1 : 50 @ A3 | Sept 2019 | |
| JOB NO | DRAWING NO | ISSUE |
| 1605 | DA- 012 | E |

MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757




Elevation - West
1: 50 @ A3

MFA
MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757

| ISSUE | AMENDMENT | DATE |
|---|---|---|
| A | Issued for Review | 14.10.19 |
| B | Issued for Information | 27.07.20 |
| C | Issued for Review | 18.08.20 |
| D | Issued for 3d | 26.08.20 |
| E | Issued for Development Application | 07.12.20 |
| | | |



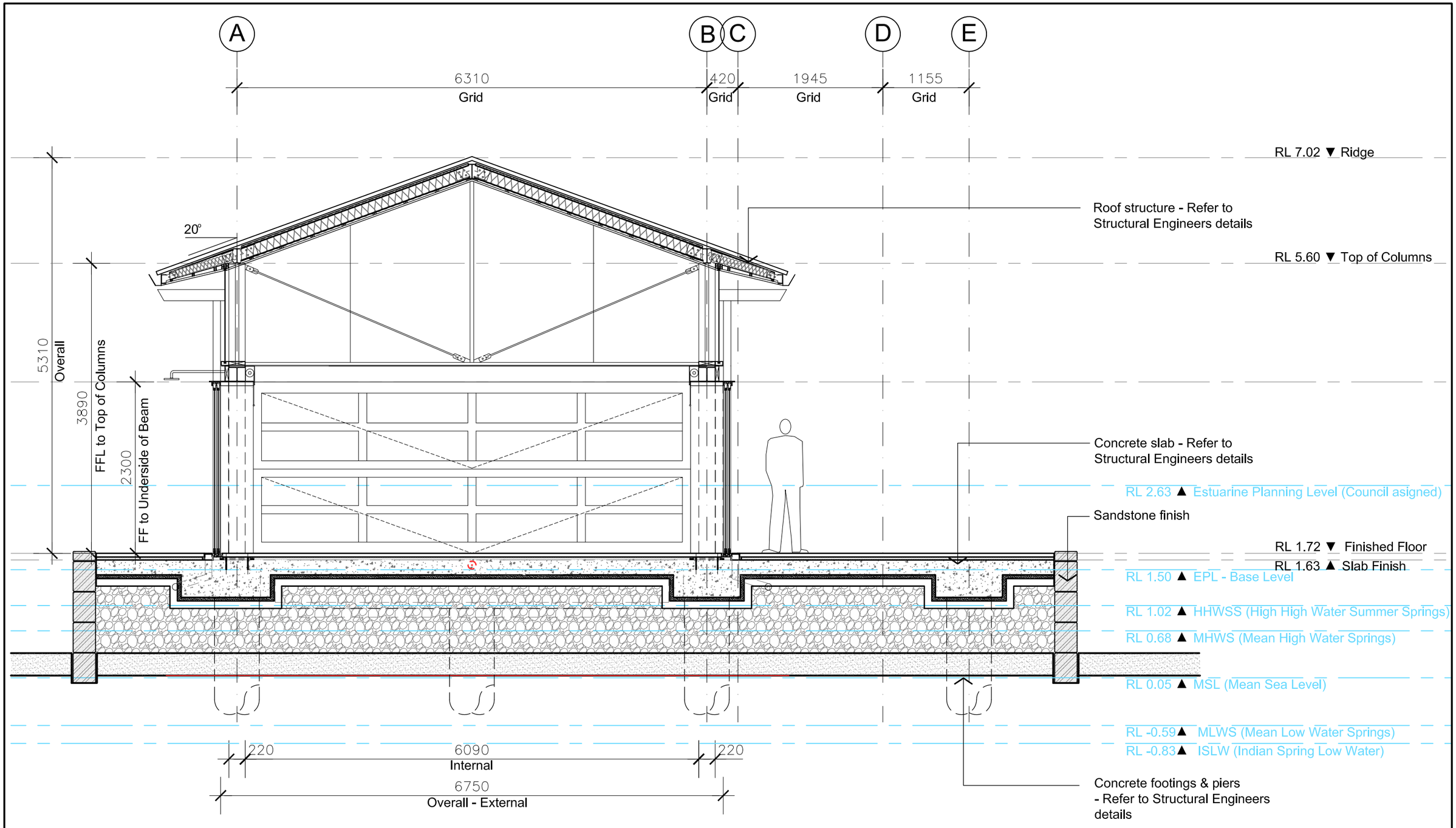
CLIENT: Tony Walls

PROJECT: Maritime Structures
No. 316 Hudson Parade
Clareville NSW 2107

DRAWING: ELEVATION - West

| DRAWN | CHKD | APPROVED |
|---|---|---|
| DMS | | |
| SCALE: 1 : 50 @ A3 | DATE: Sept 2019 | CAD FILE No |
| JOB NO: 1605 | DRAWING NO: DA- 013 | ISSUE: E |

MFA
MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757




## Section AA
1: 50 @ A3

MFA
MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757

| ISSUE | AMENDMENT | DATE |
|---|---|---|
| A | Issued for Review | 14.10.19 |
| B | Issued for Review | 05.05.20 |
| C | Issued for Information | 27.07.20 |
| D | Issued for Review | 18.08.20 |
| E | Issued for 3d | 26.08.20 |
| F | Issued for Development Application | 09.12.20 |
| G | Estuarine Planning Levels added | 10.12.20 |



CLIENT
Tony Walls

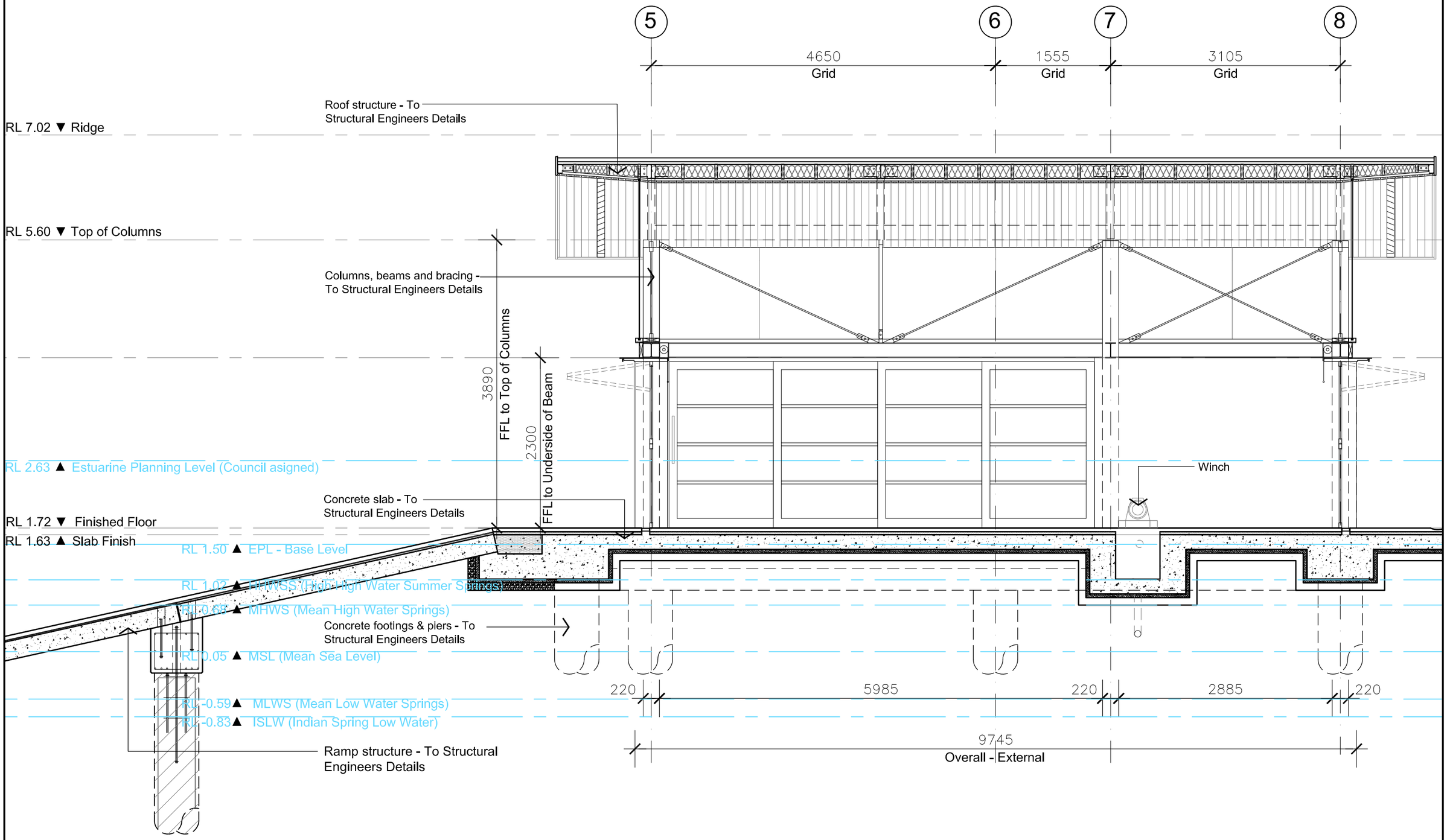
PROJECT
Maritime Structures
No. 316 Hudson Parade
Clareville NSW 2107

DRAWING
SECTION AA

| DRAWN | CHKD | APPROVED |
|---|---|---|
| RJC & DMS | | |
| SCALE: 1 : 50 @ A3 | DATE: Sept 2019 | CAD FILE No |
| JOB NO: 1605 | DRAWING NO: DA- 020 | ISSUE: G |

MFA
MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757

PRINTED: Dec 22, 2020 – 10:35am P:\WALLS – Clareville\Cadwork\MFA Drawings\025_for DA_08102019\SK–010 – 020 – Sections & Elevations.dwg




## Section BB
1: 50 @ A3

| ISSUE | AMENDMENT | DATE |
|---|---|---|
| A | Issued for Review | 14.10.19 |
| B | Issued for Information | 27.07.20 |
| C | Issued for Review | 18.08.20 |
| D | Issued for 3d | 26.08.20 |
| E | Issued for Development Application | 09.12.20 |

MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757



CLIENT: Tony Walls

PROJECT: Maritime Structures
No. 316 Hudson Parade
Clareville NSW 2107

DRAWING: SECTION BB

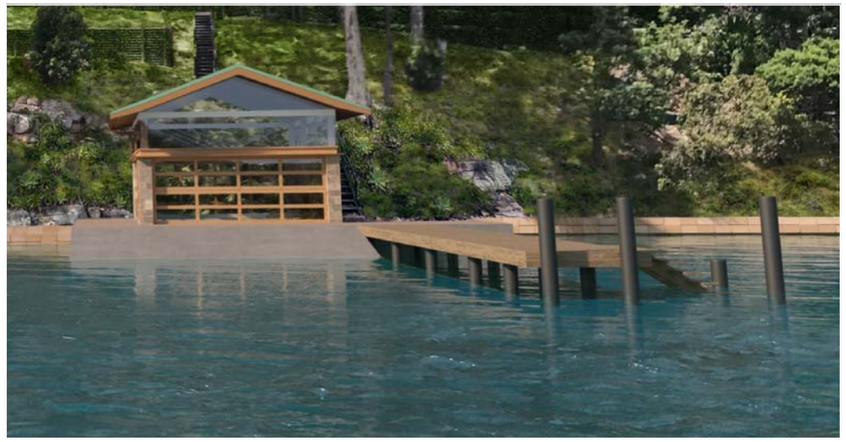
| DRAWN | CHKD | APPROVED |
|---|---|---|
| RJC & DMS | | |
| SCALE: 1 : 50 @ A3 | DATE: Sept 2019 | CAD FILE No |
| JOB NO: 1605 | DRAWING NO: DA- 021 | ISSUE: E |

MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757

Copper aesthetic - for the roof

Timber sliding doors

Sandstone walls



Sandstone retaining wall


| ISSUE | AMENDMENT | DATE |
|---|---|---|
| A | Issued for Review | 27.08.20 |
| B | Issued for Development Application | 07.12.20 |

MFA
MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757



CLIENT: Tony Walls

PROJECT: Maritime Structures
No. 316 Hudson Parade
Clareville NSW 2107

DRAWING: FINISHES/ MATERIALS

| DRAWN | CHKD | APPROVED |
|---|---|---|
| RJC | | |
| SCALE | DATE | CAD FILE No |
| | AUG 2020 | |

| JOB NO | DRAWING NO | ISSUE |
|---|---|---|
| 1605 | DA - 030 | B |

MFA
MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/ 5 NARABANG WAY BELROSE NSW 2085
TEL (02) 9450 2070 FAX (02) 94502757

PRINTED: Dec 09, 2020 – 2:55pm

P:\WALLS – Clareville\Cadwork\MFA Drawings\025_for DA_08102019\Finishes.dwg

# APPENDIX B
# REFERRAL RESPONSE FROM THE NATURAL ENVIRONMENT UNIT - COASTAL SECTION OF COUNCIL DATED 25/2/21

# Natural Environment Referral Response - Coastal

| | |
|---|---|
| **Application Number:** | DA2020/1762 |

| | |
|---|---|
| **Date:** | 25/02/2021 |
| **Responsible Officer** | Jordan Davies |
| **Land to be developed (Address):** | Lot 1 DP 827733 , 316 Hudson Parade CLAREVILLE NSW 2107<br>Lot 2 DP 827733 , 316 Hudson Parade CLAREVILLE NSW 2107<br>Lot LIC 559856 , 316 Hudson Parade CLAREVILLE NSW 2107 |

**Reasons for referral**

This application seeks consent for land located within the Coastal Zone.

And as such, Council's Natural Environment Unit officers are required to consider the likely impacts on drainage regimes.

**Officer comments**

The application has been refused for lack of required supporting information and document

1. The proposed development is located within the coastal zone of NSW and is subject to the provisions of the Coastal Management Act 2016 (CM Act) and State Environmental Planning Policy (Coastal Management) 2018 (CM SEPP) The objectives and requirements of both the CM Act and the CM SEPP must be addressed. This should be done in a revised **Statement of Environmental Effects (SEE) Report** as they relate to development within these coastal management areas.

2. As the proposal is construction of a seawall, the Section 27: granting of development consent relating to coastal protection works of the Coastal Management Act 2016 will apply for assessment of the DA. As required, the impact & risk associated with the construction of the seawall has to be addressed. in a **Risk Management Report.**

3. The subject property has been identified as being affected, among others, by estuarine wave action and tidal inundation on Council's Estuarine Hazard Mapping. The Estuarine Risk Management Policy for Development in Pittwater (Appendix 7, Pittwater 21 DCP) and the relevant B3.7 Estuarine Hazard Controls will apply to proposed development of a boatshed at the site. The requirements of other relevant controls under D15. 15 Waterfront Development Controls in Pittwater 21 DCP may also need to be considered. Consideration should be given to 'section B3 Estuarine Hazard Controls relating to boatsheds'.

In accordance with the Pittwater Estuary Mapping of Sea Level Rise Impacts Study (2015), a base estuarine planning level (EPL) of RL2.63m AHD has been adopted by Council for this property. A reduction factor (RF) based upon the distance from the foreshore of proposed development may also apply at a rate of 0.06m reduction to the EPL for every 5.00m distance from the foreshore edge up to a

maximum distance of 40.00m. No further reduction is applicable

The proposal is, among others, to construct a boatshed. According to 'section B3 Estuarine Hazard Controls relating to boatsheds' of the Pittwater DCP, 'All floor levels shall be at or above the Estuarine Planning Level'.

**The Finished Floor Level (FFL) of the proposed boatshed is 1.72 m AHD.** An Estuarine Risk Management Report is required if the FFL of the boatshed is below the EPL.

As per Appendix 7 of the Pittwater 21 DCP, applicants may also seek their own professional advice on estuarine planning levels, based on design life of proposed developments, from a suitably qualified Coastal Engineer at the expense of the individual applicant. It is the responsibility of the applicant to submit the independent wave action and tidal inundation information and risk assessment to Council in the form of a technical Estuarine Risk Management Report of adequate qualitative and quantitative detail addressing estuarine level information, the management of risk due to estuarine hazards at an acceptable level and the consideration of other environmental impacts (where applicable) as they affect the subject land neighbouring properties and adjoining foreshore lands.

The Estuarine Planning Level does not apply to Jetties, Bridging Ramps or Pontoons located on the seaward side of the foreshore edge.

An Estuarine Risk Management Report should consider development constraints due to estuarine hazard impacts on the land, including an assessment of the degree of inundation, effects of wave action, impacts of waterborne debris, buoyancy effects, and other emergency issues during the design event (100 ARI event). The report should also contain recommendations as to any reasonable and practical measures that can be undertaken to remove foreseeable risk associated with estuarine hazards for the design life of the development.

An estuarine risk management report must be prepared by a specialist coastal engineer who is a registered professional engineer with chartered professional status (CP Eng) and with and with coastal engineering as a core competency and has an appropriate level of professional indemnity insurance.

Based on above, the applicant needs to submit:
a) Revised Statement of Environmental Effects (SEE) report addressing requirements of CMA and SEPP(CM).
b) An Estuarine Risk Management Report addressing EPL and boatshed floor level and requirement of Section 27 of the CMA

**Further assessment of the DA remains pending till these reports addressing the requirements are received**

The proposal is therefore unsupported.

Note: Should you have any concerns with the referral comments above, please discuss these with the Responsible Officer.

**Recommended Natural Environment Conditions:**

Nil.

# APPENDIX C
# COMPLETED FORM NO 1

**FORM NO. 1**

**To be submitted with Estuarine Risk Management Report**

**Development Application for** Mr Tony Walls
Name of Applicant

**Address of site** 316 Hudson Parade, Clareville

***Declaration made by a Coastal Engineer as part of an Estuarine Risk Management Report***

I, Gary Blumberg (Insert Name) on behalf of Royal Haskoning DHV (Trading or Company Name)

on this the 13/4/21 (date)

certify that I am a Coastal Engineer as defined by the Estuarine Risk Management Policy for Development in Pittwater 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.

**Please mark appropriate box**

☑ I have prepared the detailed Estuarine Risk Management Report referenced below in accordance with the Estuarine Risk Management Policy for Development in Pittwater

☑ I am willing to technically verify that the detailed Estuarine Risk Management Report referenced below has been prepared in accordance with the Estuarine Risk Management Policy for Development in Pittwater

☐ I have examined the site and the proposed development/alteration in detail and, as detailed in my report, am of the opinion that the Development Application only involves Minor Development/Alterations or is sited such that a detailed Estuarine Risk Management Report is not required.

**Estuarine Risk Management Report Details:**

Report Title: 316 Hudson Parade Clareville; Upgraded Boatshed Works; Estuarie Risk Management Report

Report Date: 13 April 2021

Author: Gary Blumberg

**Documentation which relate to or are relied upon in report preparation:**

- 316 Hudson Parade, Clareville. Upgraded Boatshed Works, Coastal and Marine Damages Assessment, Prepared for T. Walls, Ref PA1959MARP1901310938, P02.01, 31/1/19
- Michael Fountain Architects, Architectural Dwgs 1605 Issued for DA 7/12/20

I am aware that the above Estuarine Risk Management Report, prepared for the above mentioned site is to be submitted in support of a Development Application for this site and will be relied on by Northern Beaches Council as the basis for ensuring that the estuarine risk management aspects of the proposed development have been adequately addressed to achieve an acceptable risk management level for the life of the structure, taken as at least 100 years unless otherwise stated and justified in the Report and that all reasonable and practical measures have been identified to remove foreseeable risk.

Signature .....

Name ..... GARY A. BLUMBERG .....

Chartered Professional Status..... CPEng NPER 3 .....

Membership No. ..... 390230 .....