

## APPENDIX 14: FLOOD EMERGENCY RESPONSE SUB-PLAN



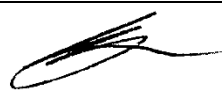
**FLOOD EMERGENCY RESPONSE PLAN**  
***OUR REF:7863-FERP***

**KYEEMAGH PUBLIC SCHOOL**  
**JACOBSON AVENUE,**  
**KYEEMAGH NSW 2261**

PREPARED BY: CAMERON AMRI  
DATE: 17/07/2020  
REVISION: **D**

## DOCUMENT VERIFICATION

<b>Project Title</b>	<b>Kyeemagh Public School</b>
<b>Document Title</b>	Flood Emergency Response Plan
<b>Project No.</b>	7863
<b>Description</b>	Flood Emergency Response Plan
<b>Client Contact</b>	Taylor Constructions

	<b>Name</b>	<b>Signature</b>
<b>Prepared by</b>	Cameron Amri	
<b>Checked by</b>	Michael Grogan	
<b>Issued by</b>	Michael Grogan	

## REPORT DELIVERABLES

This report is to meet condition B18 of the SSD Conditions.

<b>Condition</b>	<b>Condition requirements</b>	<b>Document reference</b>
<b>B18</b>	The Flood Emergency Response Sub-Plan (FERSP) must address, but not be limited to, the following:	CV Attached Appendix D
	(a) be prepared by a suitably qualified and experienced person(s);	
	(b) address the provisions of the Floodplain Risk Management Guidelines (EESG);	Section 3.2
	(c) include details of:	
	(i) the flood emergency response for construction phase of the development;	Section 5.2
	(ii) predicted flood levels;	3.5 Flood Documentation
	(iii) flood warning time and flood notification;	Section 4.2 & 4.3
	(iv) assembly points and evacuation routes;	Section 5.1 & Appendix B
	(v) evacuation and refuge protocols; and	Section 5.2
	(vi) awareness training for employees and contractors, and students.	Section 7

## DOCUMENT HISTORY

Date	Revision	Issued to	Description
17/07/20	-A	DWP Suters	For CC1
30/07/20	-B	DWP Suters	For CC1
11/09/20	-C	Taylors	Amendment
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## 1 EXECUTIVE SUMMARY

Birzulis Associates have been commissioned by Taylor Constructions to prepare a Flood Emergency Response Plan (FERP) on behalf of SINSW for the proposed stage 1 and stage 2 construction at Kyeemagh Public School. This report addresses the condition B18 in the SSD CoC, relevant Council DCP requirements and that of SES.

The aim of this FERP is for planning an evacuation (if required) due to flooding, promote situational awareness of expected flood behaviour and risks, identify measures to become flood prepared, recommend suitable course of action during and after flood events and any training required and by who.

This report will contain methodology used to support its conclusions and recommendations, a summary of the likely flood behaviours and safe exit routes from the site if required.

Stage 1 of the proposed works involves the demolition of the existing buildings to the North-East of the site and construction of the buildings on that half of the site.

Stage 2 of the proposed works will occur approximately after practical completion (PC) of the stage 1 works and the demolition of the existing buildings to the South-West half of the site.

The primary objective of this report is to define flood behaviours to Jacobson Avenue and Beehag Street. And any elements of these that contribute to the site itself.

## 2 INTRODUCTION

### 2.1 LOCATION

The site is located at 30A Jacobson Avenue, Kyeemagh NSW 2216 is broken up into two lots D.Ps (D.P.120095 & D.P. 335734). The current site is the operating site of Kyeemagh Public School. The site is generally sparsely planted and with minimal hard pavements.

To the North-West the site abuts a previous townhouse villa style development. To the South-East the site abuts Beehag Street. To the South-East the site abuts Jacobson Avenue. To the North-East the site abuts the school childcare centre which operates on the site and is not proposed to be altered. The site falls from the West to the South East at approximately 4%.

The total site area is 10 329m<sup>2</sup>.

The site is shown below represented as Figure 2.1



**Figure 2.1.1 – Total D.P. Envelope**



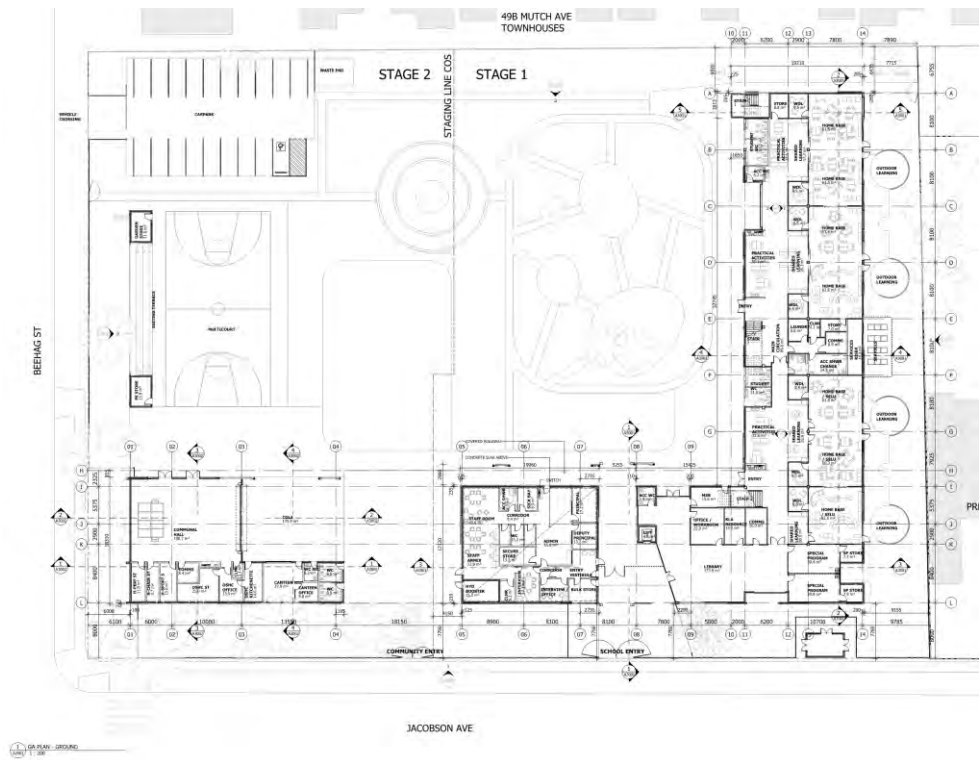
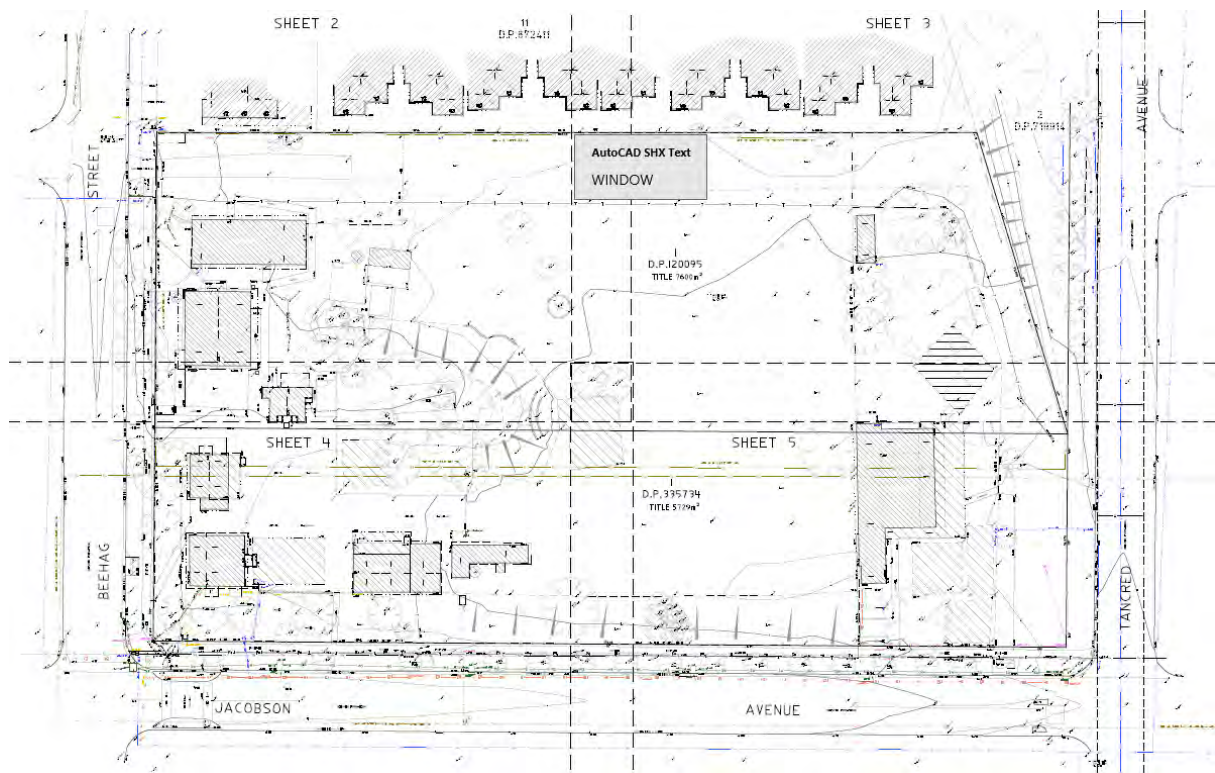


Figure 2.1.2 - Overall Site Plan Showing Staging of Works



Figure 2.1.3 - Aerial View of Kyeemagh Public School (Source: Google Map 2020)



**Figure 2.1.4 – Existing Survey (prepared by C.M.S Surveyors Pty Ltd 09/02/18)**

## **2.2 GOVERNING AUTHORITIES FOR THIS SITE**

Bayside Council

Department of Education

Emergency Services – SES – Police – Fire – Ambulance

Department of Environment Climate Change and Water

## **2.3 GLOSSARY OF TERMINOLOGY**

### **Annual Exceedance Probability (AEP):**

The chance of a flood of a given size (or larger) occurring in any one year, usually expressed as a percentage. For example, if a peak flood discharge of 500 m<sup>3</sup>/s has an AEP of 5%, it means that there is a 5% chance (i.e. a 1 in 20 chance) of a peak discharge of 500 m<sup>3</sup>/s (or larger) occurring in any one year. (see also average recurrence interval)

### **Australian Height Datum (AHD):**

National survey datum corresponding approximately to mean sea level.

### **Astronomical Tide:**

Astronomical Tide is the cyclic rising and falling of the Earth's oceans water levels resulting from gravitational forces of the Moon and the Sun acting on the Earth.

### **Attenuation**

Weakening in force or intensity.

### **Average recurrence interval (ARI):**

The long-term average number of years between the occurrence of a flood as big as (or larger than) the selected event. For example, floods with a discharge as great as (or greater than) the 20-year ARI design flood will occur on average once every 20 years. ARI is another way of expressing the likelihood of occurrence of a flood event. (see also annual exceedance probability)

### **Calibration:**

The adjustment of model configuration and key parameters to best fit an observed data set.

### **Catchment:**

The catchment at a particular point is the area of land that drains to that point.

### **Design flood event:**

A hypothetical flood representing a specific likelihood of occurrence (for example the 100-year ARI or 1% AEP floods).

### **Development:**

Existing or proposed works that may or may not impact upon flooding. Typical works are filling of land, and the construction of roads, floodway's and buildings.

### **Discharge:**

The rate of flow of water measured in terms of volume per unit time, for example, cubic meters per second (m<sup>3</sup>/s). Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving for example, meters per second (m/s).

**Flood:**

Relatively high river or creek flows, which overtop the natural or artificial banks, and inundate floodplains and/or coastal inundation resulting from super elevated sea levels and/or waves overtopping coastline defences.

**Flood behaviour:**

The pattern / characteristics / nature of a flood.

**Flood fringe:**

Land that may be affected by flooding but is not designated as floodway or flood storage

**Flood hazard:**

The potential risk to life and limb and potential damage to property resulting from flooding. The degree of flood hazard varies with circumstances across the full range of floods.

**Flood level:**

The height or elevation of floodwaters relative to a datum (typically the Australian Height Datum). Also referred to as “stage”.

**Flood liable land:**

See flood prone land

**Floodplain:**

Land adjacent to a river or creek that is periodically inundated due to floods. The floodplain includes all land that is susceptible to inundation by the probable maximum flood (PMF) event.

**Floodplain management:**

The co-ordinated management of activities that occur on the floodplain.

**Floodplain risk management plan**

A document outlining a range of actions aimed at improving floodplain management. The plan is the principal means of managing the risks associated with the use of the floodplain. A floodplain risk management plan needs to be developed in accordance with the principles and guidelines contained in the NSW Floodplain Management Manual. The plan usually contains both written and diagrammatic information describing how particular areas of the floodplain are to be used and managed to achieve defined objectives.

**Flood planning levels (FPL):**

Flood planning levels selected for planning purposes are derived from a combination of the adopted flood level plus freeboard, as determined in floodplain management studies and incorporated in floodplain risk management plans. Selection should be based on an understanding of the full range of flood behaviour and the associated flood risk. It should also consider the social, economic and ecological consequences associated with floods of different severities. Different FPLs may be appropriate for different categories of land use and for different flood plans. The concept of FPLs supersedes the “standard flood event”. As FPLs do not necessarily extend to the limits of flood prone land, floodplain risk management plans may apply to flood prone land beyond that defined by the FPLs.

**Flood prone land:**

Land susceptible to inundation by the probable maximum flood (PMF) event. Under the merit policy, the flood prone definition should not be seen as necessarily precluding development. Floodplain Risk Management Plans should encompass all flood prone land (i.e. the entire floodplain).

**Flood source:**

The source of the floodwaters.

**Flood storage:**

Floodplain area that is important for the temporary storage of floodwaters during a flood.

**Floodway:**

A flow path (sometimes artificial) that carries significant volumes of floodwaters during a flood.

**Freeboard:**

Factors of safety usually expressed as a height above the adopted flood level thus determine the flood planning level. Freeboard tends to compensate for factors such as wave action, localised hydraulic effects and uncertainties in the design flood levels.

**Geomorphology:**

The study of the origin, characteristics and development of landforms.

**Gauging (tidal and flood)**

Measurement of flows and water levels during tides or flood events.

**Historical flood:**

A flood that has actually occurred.

**Hydraulic:**

Relating to water flow in rivers, estuaries and coastal systems; in particular,

the evaluation of flow parameters such as water level and velocity.

Hydrodynamic:

Pertaining to the movement of water.

Hydrograph:

A graph showing how a river or creek's discharge changes with time.

Hydrographic survey:

Survey of the bed levels of a waterway

Hydrologic:

Pertaining to rainfall-runoff processes in catchments

Hydrology:

The term given to the study of the rainfall-runoff process in catchments

Hyetograph:

A graph showing the distribution of rainfall over time.

Intensity Frequency Duration (IFD) Curve:

A statistical representation of rainfall showing the relationship between rainfall intensity, storm duration and frequency (probability) of occurrence.

Isohyets:

Equal rainfall contour.

Morphological:

Pertaining to geomorphology

Peak flood level, flow or velocity:

The maximum flood level, flow or velocity that occurs during a flood event.

Pluviometer:

A rainfall gauge capable of continuously measuring rainfall intensity

Probable maximum flood (PMF):

PMF is an extreme flood event or the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation, and where applicable, (such as snow / hail melt, blockages), coupled with the maximum flood that is likely to occur. Producing the worst flood for that catchment.

Probability:

A statistical measure of the likely frequency or occurrence of flooding.

Riparian:

The interface between land and waterway. Literally means “along the river margins”

Runoff:

The amount of rainfall from a catchment that ends up as flowing water in the river or creek

Stage:

See flood level.

Stage hydrograph:

A graph of water level over time.

Sub-critical:

Refers to flow in a channel that is relatively slow and deep.

Topography:

The shape of the surface features of land

Velocity:

The speed at which the floodwaters are moving. A flood velocity predicted by a computer flood model is quoted as the depth averaged velocity, i.e. the average velocity throughout the depth of the water column or velocity across the whole river or creek section, or roadway.

Validation:

A test of the appropriateness of the adopted model configuration and parameters (through the calibration process) for other observed events.

Water level:

The level of the top of the water being described.

## **2.4 SCOPE OF METHODOLOGY**

This report was based on flood information provided by Bayside Council and from Flooding Advice completed by Cardno 31 October 2018

In addition to this, a DRAINS model with overland flow capabilities was prepared to determine the capacity of the Council trunk drainage system to cope with upstream flows for any serious incident of pit surcharging in vicinity of the school.



### 3 FLOOD BEHAVIOUR

#### 3.1 **POSSIBLE FLOOD SOURCE/S AND MECHANISMS**

The site may be impacted by two flood mechanisms/types of flooding:

1. Fluvial flooding – flooding from Cooks River (rising river waters); and
2. Pluvial flooding (overland flow) – flooding from rainfall within the local catchment. It is important to understand both types of flooding as they pose different risks, have different consequences and evacuation & refuge response.

There is not a significant upstream catchment for this site given the site is located somewhat on a peninsula where the lands falls towards the water on all sides.

Also, the site is not significantly far from the mouth of the Cooks River and Botany Bay.

The main source is the stormwater and runoff running down Jacobson Avenue and towards Jacobson avenue from the upstream blocks.

It is important to note that the area is a marine sand area with moderate infiltration capacity and as such runoff generated will mainly be from imperious areas and are not significantly contributed to by the pervious areas.

#### 3.2 **NSW OEH FLOODPLAIN RISK MANAGEMENT GUIDELINES**

The NSW Office of Environment and Heritage (OEH) has released a range of standard documents to support the implementation of the NSW Government's Flood Prone Land Policy through the development and implementation of FRM plans by local government through the FRM process as outlined in the Floodplain Development Manual (2005).

##### 3.2.1 Flood Emergency Response Planning (ERP) – Classification of Communities

Of relevance to the CRC FRP is the guideline Flood Emergency Response Planning (ERP) – Classification of Communities. The guideline recommends that the ERP classification of the floodplain be undertaken for the probable maximum flood (PMF) and 20 and 100 year average recurrence interval (ARI) events. Classifications are to be provided for each event with reference back to the event.

The Site is classified according to NSW OEH definitions as shown in Table 3.2.1 below.



ARI	NSW OEH classification	NSW OEH definition
<b>20 year ARI – River Flood</b>	Area with rising road accessible (RRA)	Areas with Rising Road Access (RRA) are those areas where access roads rising steadily uphill and away from the rising floodwaters. The community cannot be completely isolated before inundation reaches its maximum extent, even in the PMF. Evacuation can take place by vehicle or on foot along the road as floodwater advances. People should not be trapped unless they delay their evacuation from their homes. For example people living in two storey homes may initially decide to stay but reconsider after water surrounds them.
<b>20 year ARI – Pluvial flood (overland flow)</b>	High Flood Island (HFI)	High Flood Island (HFI). The flood island includes enough land higher than the limit of flooding (i.e. above the PMF) to cope with the number of people in the area. During a flood event the area is surrounded by floodwater and property may be inundated. However, there is an opportunity for people to retreat to higher ground above the PMF within the island and therefore the direct risk to life is limited. The area will require resupply by boat or air if not evacuated before the road is cut. If it will not be possible to provide adequate support during the period of isolation, evacuation will have to take place before isolation occurs.
<b>100 year ARI</b>		
<b>PMF</b>		

Table 3.2.1

### 3.2.2 State Emergency Services Requirements from the Floodplain Risk Management Process

Also of relevance to the site's FERP is the State Emergency Services Requirements from the Floodplain Risk Management Process which describes how the FRM process assists State Emergency Service (SES) in effective emergency response planning (ERP).

For HFI's, the key considerations are:

- External access cut, area becomes isolated;
- Transport infrastructure shutdown (railways/airports);
- Risk Of Flooding Of Key Public Utilities (Water/Sewage/Gas/Power) Starts; and
- Whole area flooded or max flood extents occur.

### 3.3 EXISTING STORMWATER DRAINAGE

The property is currently developed as a public school with an existing pit and pipe drainage system located on site. All current overland flows travel towards the east eventually discharges onto Tancred avenue and then to the crook s river located approximately 200m to the North. The indicative external stormwater network is shown in Figure 2.3.1 and is the Council trunk drainage system and is believed to be in a satisfactory condition.



Figure 2.3.1 – Indicative External Stormwater system (Source: Bayside Council)

### 3.4 PROPOSED SITE DRAINAGE SYSTEMS

The proposed site drainage system is to install infiltration systems to capture and infiltrate the site runoff onsite with only minimal discharge offsite. This will significantly reduce any flooding impact of hydraulic stress on the existing stormwater drainage system in Jacobson Avenue. The table below shows the post construction site runoff to be significantly less than the pre-development condition reducing peak discharge in the 100 year event from 225 litres per second to 81 litres per second.

ARI	Design Storm Duration	Peak Flow (m3/s)		
		Pre-developed	Post-developed	
		Site	Site (no atten.)	Site (+ atten.)
5	5	0.112	0.143	0.009
20	5	0.191	0.221	0.063
100	5	0.225	0.257	0.081

Table 3.2.2 - Site and Detention Hydrology

### 3.5 FLOOD DOCUMENTATION

Flood design guidance has been provided by Bayside Council and Cardno using a review of relevant flood studies. The following is relevant:

- The design flood level for the site is RL 2.65m AHD provided by Bayside Council
- The Probable Maximum flood (PMF) level is RL 2.98m AHD provided by Bayside Council.
- Flood planning level is RL 3.15m AHD provided by Bayside Council.
- The site has been assessed as Low Hazard by Bayside Council.
- The water table is probable at RL 1.5m – 2m AHD.
  - The proposed building floor level of RL4.65m AHD is sufficiently located above the design flood level.

A small floor storage area presents in the 1:100 year ARI event with a depth approximately 0.1m to 0.3m located in vicinity of RL 3.5m on the site.

Cardno's Flooding Advice letter dated 20 May 2020 for the site states

"Further to our letter dated 31 October 2018 in regard to Kyeemagh Public School and the effect on flooding on the proposed development we confirm that we have reviewed the report prepared by BMT WBM dated February 2017- Spring Street Drain, Muddy Creek and Scarborough Ponds Catchments Flood Study Review.

Kyeemagh Public School is located at the corner of Jacobson Avenue and Beehag Street, Kyeemagh and a CORE 14 school development is proposed. The proposed development is a combination of single and double storey buildings with a constant proposed ground floor level of RL4.65m AHD.

Cardno have reviewed available flood mapping of the area surrounding the school as documented in the above report.

Flood extent mapping was reviewed for both the 1% AEP and PMF storm events. The Kyeemagh Public School site is shown to be affected by both the 1% AEP and PMF flood extents. A copy of relevant flood mapping is attached. The Kyeemagh Public School proposed floor level of RL4.65m is in our opinion, well above the expected 1% AEP and PMF flood levels based on the existing ground levels as documented in the attached part survey plan.

We have also received the attached Flood Advice letter from Bayside Council dated 18 May 2020 that confirms that the property is affected by the 1% Annual Exceedance Probability (AEP) flood. The provided 1% AEP Flood level is RL 2.65m AHD and the Probable Maximum flood (PMF) level is RL 2.98m AHD. The letter also provides a Flood Planning level (FPL) RL 3.15m AHD which is a minimum height to be used for the setting of habitable floor levels. All of the provided flood levels in the Flood Advice letter are below the proposed building floor level of RL 4.65m AHD.

Further inspection shows that main roads near the site, such as General Holmes Drive, are not flood affected during the 1% AEP and PMP storm events. These roads are therefore expected to be available for use as an evacuation route if required."



Figure 2 – Kyeemagh Public School -1:100 year (approximately 0.1 to 0.3m depth)

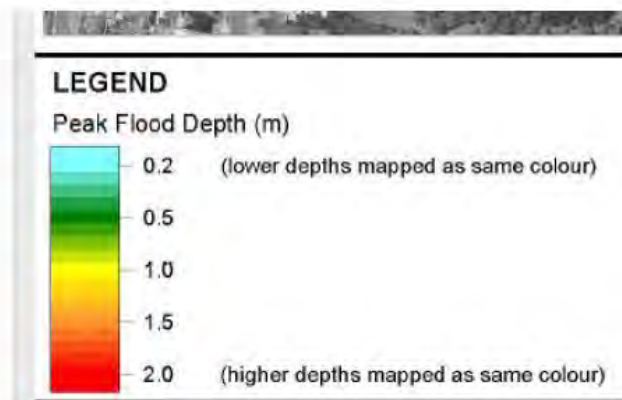


Figure 3.4.1 – Shows the 100 year flooding for this immediate area and the site (Source: Cardno)



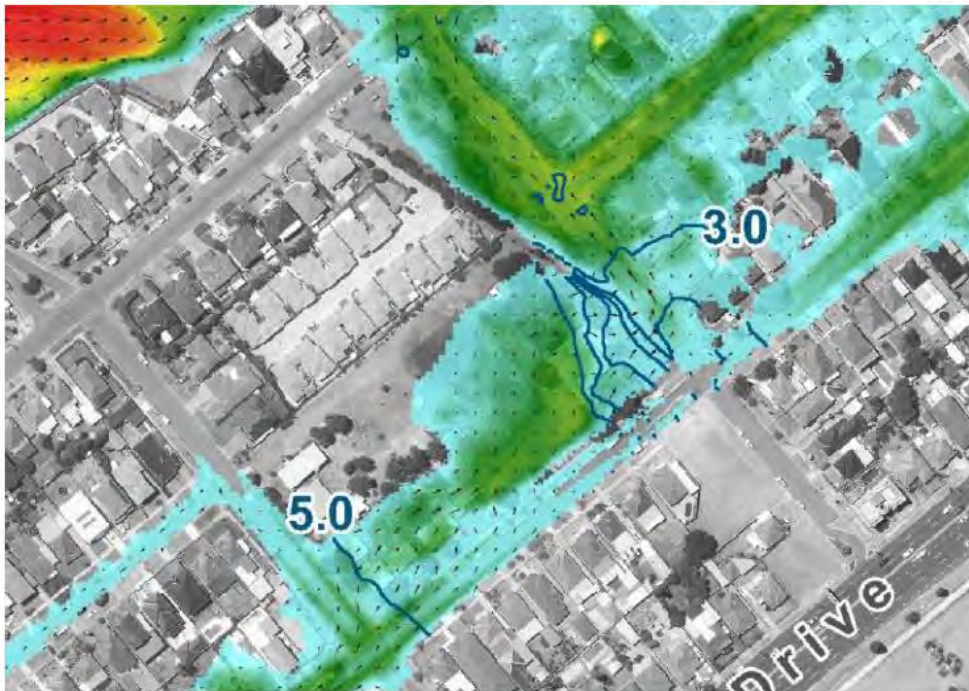


Figure 1 – Kyeemagh Public School – PMF (approximately 0.3-1.0m depth)

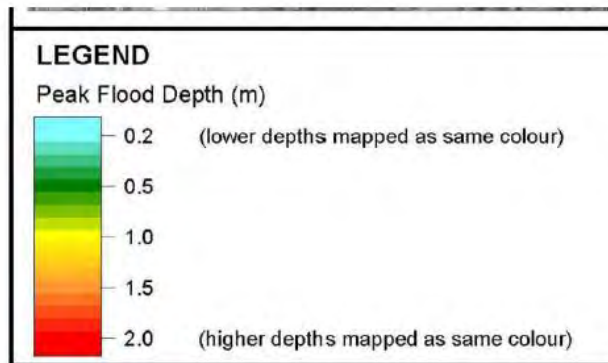


Figure 3.4.2 – Shows the PMF flooding for this immediate area and the site (Source: Cardno)

### 3.6 FLOOD SOURCE ELIMINATION

The mapping below shown the surge water level as a result of the flood source from the Cooks River does not affect the site in the 100 year rain event or the PMF event. This can be ruled out as a flood source for the site and it can be concluded the only flood source is local stormwater runoff.



Figure 3.5.1 – Shows the 100 year flooding for Botany Bay & Cooks River (Source: Cardno)







Modelling along Jacobson Avenue suggest the maximum water flow above ground (assuming 80% pit blockages) could be up to 0.620m<sup>3</sup> per second. This equates to a flow depth of 0.168m, a velocity of 1.3 meters per second and a VD relationship of 0.21 which is less than the 0.4 safe maximum.

It can thus be concluded that exiting and entry to the site from Jacobson Avenue is possible up to the 100 year event.

It should be noted that driving through flood waters is extremely hazardous and risk of vehicles being swept away downstream is shown below in the following figures.

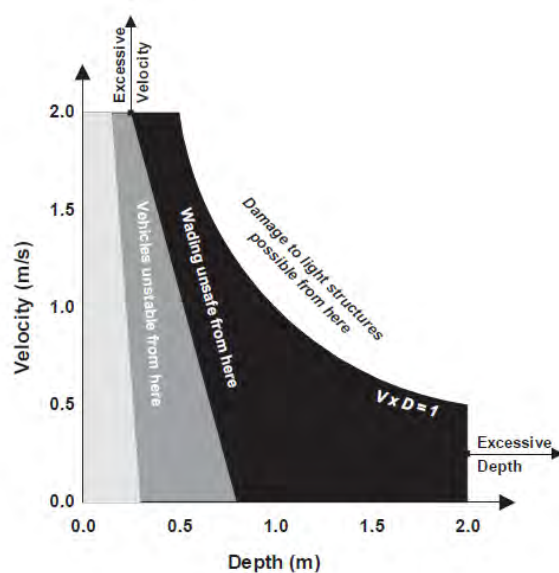


Figure 3.6.1 – Velocity & Depth relationships

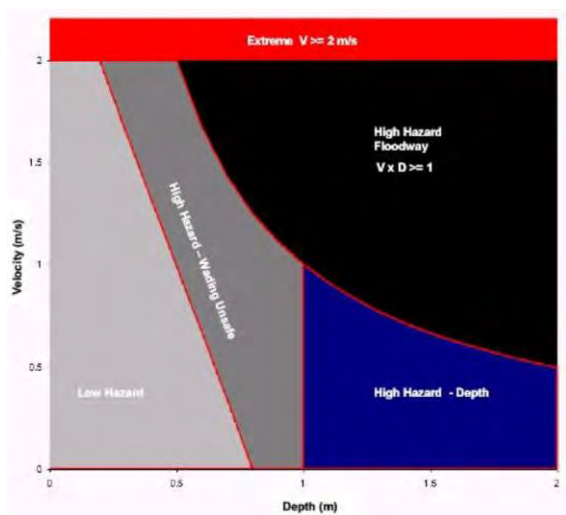


Figure 3.6.2 – Hazard Categories

## 4 FLOOD EVACUATION WARNINGS

### 4.1 **FLOOD INTELLIGENCE**

Rainfall gauge stations are maintained by the Bureau of Meteorology (BOM) throughout Sydney. These provide information to the BOM including other information sources to assist in the flood warning systems. The BOM issues five times of warnings through the following methods:

- Radio
- Television
- Websites
  - <http://www.bom.gov.au/>
  - <http://www.bom.gov.au/nsw/warnings/>

In addition to this the SES may issue warnings in the form of:

- Bulletins
- Evacuation Warnings or Evacuation Order

The critical 100-year storm event duration has been identified as approximately the 2-hour event. This does not mean that the peak flood level will occur exactly 2 hours after a heavy rainfall event commences but does provide an indication on how rapidly the water levels will rise within Jacobson Avenue.

It is recommended that a temporary flood gauge be installed in a visible location at the low point on the site corner (north eastern corner) at approximately RL 4.0 to provide indication of the rate of rise in flood levels within Jacobson Avenue for the duration of the construction works.

15 minutes after heavy rainfall commences all plant should be relocated to an area above the 100-year flood extent on the northern side of the site. All work shall cease within the flood prone area and employees and contractors shall take shelter within the site amenities as located on the site establishment plan appended to this report.

Works should not recommence within any flood prone area until 1 hour after the water level upstream of Jacobson Avenue has started to subside. At this time the site manager will issue the 'All Clear' and the exclusion zone removed.

### 4.2 **FLOOD NOTIFICATION - TRIGGER/ACTION**

Flood warning notifications are the first stage of the flood warning system implemented by the managing contractor. Flood warnings are triggered when flooding is likely to cut evacuation routes or inundate flood prone areas of the site. During any rain event the site manager and/or supervisor shall review the flood gauge at the commencement of the rainfall, 5 minutes and 10 minutes after

the rainfall event starts. If a significant rate of rise is observed (greater than 0.6m/hr) then the site manager or supervisor shall notify any workers within the flood extent to cease work immediately and relocate themselves, plant and any other loose items clear of the flood prone area.

A call shall be put over the site radio that a flood notification has been issued and the areas of the site within the 100 year flood extent shall be classified as an exclusion zone during the rainfall event. Given the location of the temporary site access road (off Jacobson Avenue) this includes the main Stage 1 entry/exit to the site.

### **4.3 WARNING TYPES**

#### **4.3.1 Severe Weather Warning**

Given by the BOM, are provided for potentially hazardous or dangerous weather that is not solely related to severe thunderstorms, tropical cyclones or bushfires. They are issued whenever severe weather is occurring in an area or is expected to develop or move into an area.

#### **4.3.2 Severe Thunderstorm Warning**

Given by the BOM, are provided to warn communities of the threat of dangerous thunderstorms. They are issued when a severe thunderstorm is occurring or likely to occur.

#### **4.3.3 Flood Alert/Watch/Advice**

A flood alert/watch/advice will be issued if flood producing rain is expected. This provides an early warning that flooding may occur

#### **4.3.4 Generalised Flood Warning**

A generalised flood warning is to be issued when flooding is expected to occur in a given area. Three hours warning time is expected from issue of warning to peak flood level as per the "Service Level Specification for Flood Forecasting and Warning Services for New South Wales – Version 2.0" (Bureau of Meteorology, 2013). This is the most likely warning type for the subject site should evacuation need to occur.

#### **4.3.5 Minor/Moderate Flood Warning**

A more detailed flood warning may be issued based on any additional information available. Three hours warning time is expected from issue of warning to peak flood level. Real time river and harbour height data is available from the Bureau of Meteorology website. As at January 2017, this link was <http://www.bom.gov.au/nsw/flood/>. All warnings will be issued through the website, radio and television. Radio frequencies include ABC Sydney (702AM, 92.9FM, 206.352MHz digital), Triple J (105.7FM), 2DayFM (104.1FM), Triple M (104.9FM), Nova (96.9FM), KIIS (106.5FM), 2GB (873AM), 2UE (954AM). All public and Commercial television stations should broadcast warnings.

#### 4.3.6 SES Flood Bulletins

The SES may issue a flood bulletin providing information of the likely flood consequences and recommended actions.

#### 4.3.7 Evacuation Warning

The SES/Police may issue an evacuation warning which allows time to prepare for evacuation.

#### 4.3.8 Evacuation Order

The SES will issue an Evacuation Order if evacuation is required. If this occurs evacuation **must** be undertaken. Broadcast will be via radio/TV, door knock, automated telephone message or SMS.

#### 4.3.9 Early Warning Network Automated Text and Email Service

The property can register for automatic alerts with the Early Warning Network ([www.ewn.com.au](http://www.ewn.com.au)) which will filter the above BoM warnings and send texts and emails to the Chief Flood Warden or property owners to notify them of the situation.

#### 4.3.10 On-Site Emergency Tone

The PA system will have an uninterrupted power supply and be configured to sound an emergency tone meaning all visitors, staff and students shall assemble in the designated assembly point (the Auditorium) under the direct of staff and flood wardens. This tone will be tested every drill, or once a term. Should it be inoperable in the event of an emergency, an air horn and handheld loudspeaker is located within the Flood Emergency Kit.

#### 4.3.11 Dipstick Flood Alert System

The Dipstick Flood Alert System by Tuftec (<http://tuftec.com.au>) will provide a failsafe for notification on-site in the event that no warnings are issued by either the Bureau or the SES. This device senses when water reaches a pre-determined level and sends a text with an alert and rate of rise to nominated stakeholders including Council and all Flood Wardens.

#### 4.3.12 Flood Depth Gauge

This is a manual system where the depth gauge shows the flood depth and markings can be made on the depth to determine the flood severity. For example, 100 year event or 50 year event.

## 5 ASSEMBLY POINT AND SAFE EVACUATION RESPONSE ROUTES

### 5.1 EMERGENCY ASSEMBLY POINT

The site manager or supervisor shall notify any workers to cease work and relocate themselves to:

- Stage 1: the lunch room shed which is 400mm above ground and above PMF water flows. All workers shall be accounted for.
- Stage 2: the upper carpark off Beehag Street

In the event any worker/contractor cannot be accounted for the following steps shall be undertaken:

1. A radio call be placed across emergency site channel or appropriate site channel to identify the unaccounted-for person. This shall be made a minimum of three times. Also, their mobile phone shall be rung from the site sign in sheet.
2. The site manager or delegated person shall inspect where safe to do so the flood affected area and the site to locate the unaccounted-for person. **It is important to note that at no time shall a person enter the flooded area whilst flood waters are rising.**
3. If this fails to locate the person all other reasonable means shall be used such as email, office phone calls text messages and so on.

Workers shall remain in the refuge of the site office/s until the “all clear” has been given by the site manager.



### **5.3 SITE ACCESS ROUTES DURING FLOODING**

Stage 1: Given the main site access is from Jacobsons Avenue there are no employees or contractors will be able to leave the site in a south easterly direction during heavy rainfall.

Stage 2: Given the main site access is from Beehag Street there is no restrictions to employees or contractors leaving the site during a flood event through the upper carpark as long as they walk away from Jacobsons Avenue.

Should workers or contractor be required to leave site they shall notify the site manager and leave the site in a westerly direction.

Only once the flood risk has abated and the site manager issued the 'All Clear' shall the main site accesses be open and egress to all directions re-established.

## **6 EMERGENCY CONTACT**

For State Emergency Services (SES) which offer emergency assistance during major natural events are available by phone on 132 500

For Police, Fire or Ambulance which offer specialist first responders call 000

Once the call has been made notify the key appointments noted in Table 5.2

## **7 FLOOD RESPONSE PREPARATION AND TRAINING**

Flood Awareness training shall be provided as part of site inductions and "tool-box meetings" (not less than every 3 months) as an ongoing reminder.

The following floor awareness items shall be covered:

1. Location of assembly areas, and predicted flood levels based on flood mapping given in this report.
2. Details of the types of flood warnings and notifications
3. The refuge protocol "rest-in-place"
4. Changes to the site access during heavy rainfall

## 8 FLOOD EMERGENCY RESPONSE FOR BOTH CONSTRUCTION AND OPERATIONAL PHASE

During proposed construction works all site employees and contractors will be informed about the SINSW site wide flood evacuation/emergency management plan requirements and guidelines. Taylor Construction will work with the stakeholders prior to completion of works, to incorporate any changes required to this plan as a result of this development.

## 9 CONCLUSION

As the site is only partially affected by a PMF flood and unaffected by a 1:100 year flood the site is relatively low risk.

The following strategies have been documented and require implementation to ensure that the requirements of the SSD Condition of Consent is achieved:

- Predicated flood levels and extent of flooding on-site is as per Section 3 .
- Flood warning times and flood notification Monitoring, as per details in Section 4.
- Assembly points and refuge protocols as detailed in Section 5.
- Changes to site access as a result of flooding as detailed in Section 5.
- Ensuring employees and contractors are aware of the site-specific flood risk as outlined in Section 7.

We have examined the site, relevant documentation/reference material and the proposed development in accordance with acceptable engineering practice. We have undertaken overland flow checks to determine velocities in the road flows offsite. We declare that the proposed development will be safeguarded from flooding and flood damage associated with the design flood and will not adversely affect any other structure or property,. We are also satisfied the foreseeable flood related risks are adequately identified and managed by this report.



## 10 REFERENCES

Rockdale LEP 2011 – Flood maps

Rockdale DCP 2011

The Construction Soil and Water Management Plan for this site prepared by us.

NSW Government's 'Floodplain Development Manual 2005'.

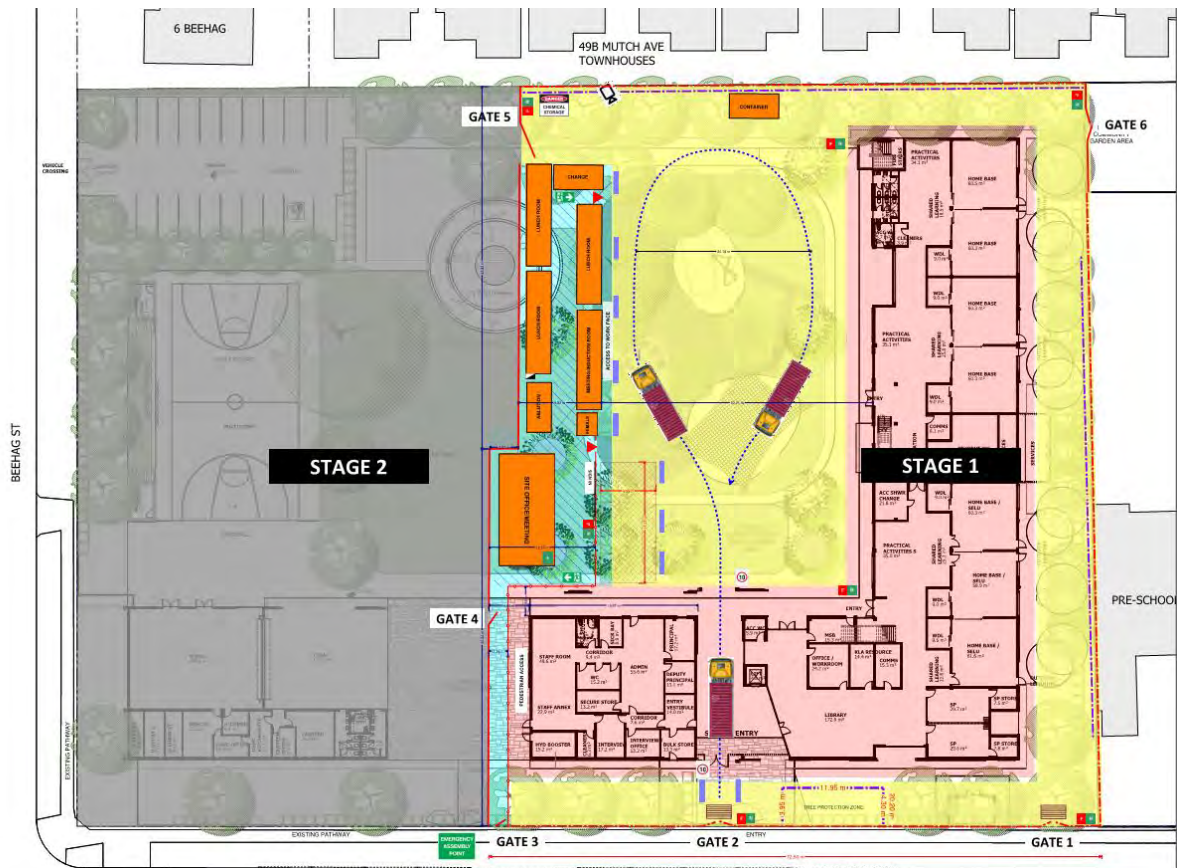
Spring Street Drain, Muddy Creek and Scarborough Ponds Catchments 2D Flood Study Review, BMT WBM, 2017

SES Flood Safe Website

SES Emergency Business Continuity Plan

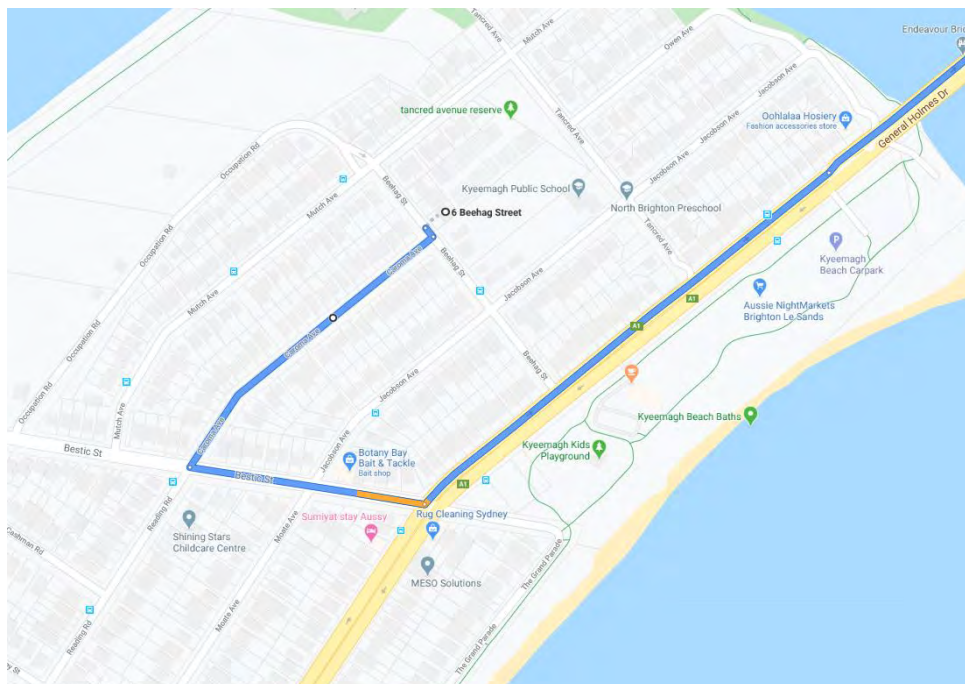
Bureau of Meteorology website

## 11 APPENDIX A – GROUND LEVEL FLOOR PLAN

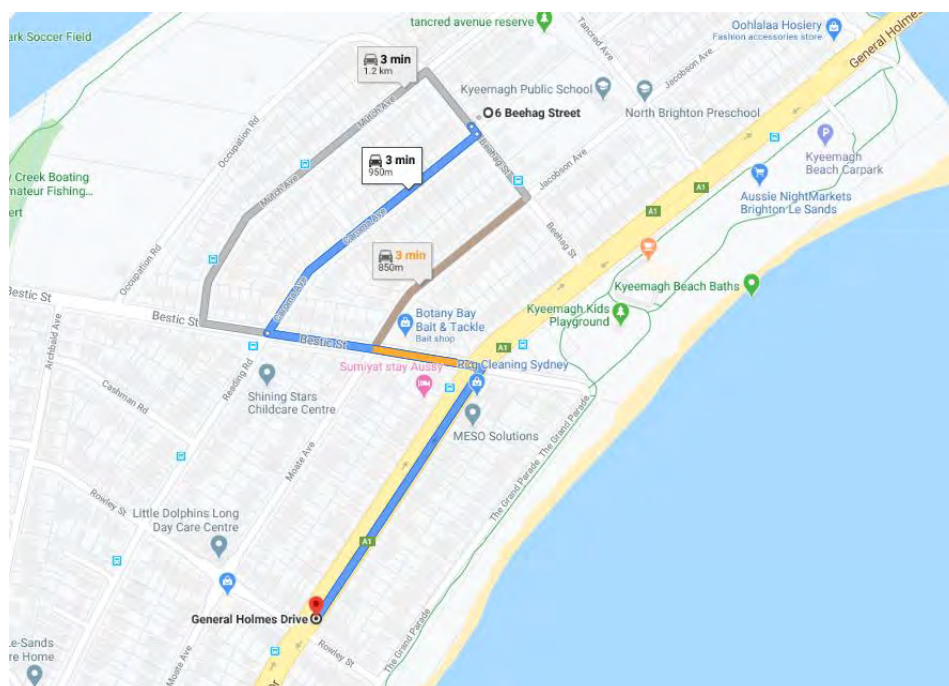


**Figure A.1 – Ground Level Floor Plan**

## 12 APPENDIX B – FLOOD EVACUATION ROUTE



**Figure B.1 – Flood Evacuation Route North (only for emergencies during a major flood event)**



**Figure B.2 – Flood Evacuation Route South (only for emergencies during a major flood event)**

## 13 APPENDIX C – REFERENCED DOCUMENTATION



18 May 2020

Our Ref: FA-2020/81  
Contact: Pulak Saha

Mr C Farinola  
203 Pacific Hwy  
ST LEONARDS NSW 2065

Dear Mr C Farinola

Re: Flood Advice Letter for 30A & 30B Jacobson Avenue, Kyeemagh

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

<b>FLOOD NOTATION</b>	<p>Council has not notated this property as being affected by the 1% Annual Exceedance Probability (AEP) flood.</p> <p>The 1% AEP flood means there is a 1% chance of a flood of this height, or higher occurring in any one year.</p> <p>This property is above the 1% AEP flood level, however it is adjacent to and/or less than 0.5 m above the 1% AEP flood level.</p> <p>This property will require protection from flooding by setting minimum floor levels.</p>
<b>FLOOD STUDY</b>	<p>The Council Flood Study applicable to the property is: Spring Street Drain, Muddy Creek and Scarborough Ponds Catchments 2D Flood Study Review, BMT WBM, 2017</p>
<b>FLOOD LEVELS</b>	<p>1% AEP Flood level: 2.65m Australian Height Datum (AHD) 5% AEP Flood level: 2.62m Australian Height Datum (AHD)</p> <p><b>Probable Maximum Flood (PMF) Level:</b> 2.98m AHD</p>
<b>FLOOD RISK EXPOSURE</b>	<p>The Flood Risk Exposure of the site has been assessed as</p> <p>Low Hazard: Land partly below flood planning level.</p>
<b>FLOOD COMMENTARY</b>	<p>No accurate information is recorded regarding the impact of tsunamis in the Bayside Local Government area.</p>

**Eastgardens Customer Service Centre**  
Westfield Eastgardens  
152 Burnerong Road  
Eastgardens NSW 2036, Australia  
ABN 60 690 785 443 Branch 004

**Rockdale Customer Service Centre**  
444-446 Princes Highway  
Rockdale NSW 2216, Australia  
ABN 60 690 785 443 Branch 003  
DX 25308 Rockdale

**Phone 1300 581 299**  
**T (02) 9562 1666 F 9562 1777**  
**E [council@bayside.nsw.gov.au](mailto:council@bayside.nsw.gov.au)**  
**W [www.bayside.nsw.gov.au](http://www.bayside.nsw.gov.au)**

**Postal address:** PO Box 21, Rockdale NSW 2216



**Telephone Interpreter Services - 131 450**

Τηλεφωνικές Υπηρεσίες Διαμετρετών

خدمة الترجمة الهاتفية

電話傳譯服務處

Служба за преводување по телефон





Our Ref: 80818157LO:01 CF  
Contact: Cosmo Farinola

20 May 2020

DWP | Design Worldwide Partnership  
Suite 2, 19 Harris Street  
Pymont NSW 2009

Attention: Cameron Martin

Dear Cameron,

#### KYEEMAGH PUBLIC SCHOOL – FLOODING ADVICE

Further to our letter dated 31 October 2018 in regard to Kyeemagh Public School and the effect on flooding on the proposed development we confirm that we have reviewed the report prepared by BMT WBM dated February 2017- Spring Street Drain, Muddy Creek and Scarborough Ponds Catchments Flood Study Review.

Kyeemagh Public School is located at the corner of Jacobson Avenue and Beehag Street, Kyeemagh and a CORE 14 school development is proposed. The proposed development is a combination of single and double storey buildings with a constant proposed ground floor level of RL4.85m AHD.

Cardno have reviewed available flood mapping of the area surrounding the school as documented in the above report.

Flood extent mapping was reviewed for both the 1% AEP and PMF storm events. The Kyeemagh Public School site is shown to be affected by both the 1% AEP and PMF flood extents. A copy of relevant flood mapping is attached. The Kyeemagh Public School proposed floor level of RL4.85m is in our opinion, well above the expected 1% AEP and PMF flood levels based on the existing ground levels as documented in the attached part survey plan.

We have also received the attached Flood Advice letter from Bayside Council dated 18 May 2020 that confirms that the property is affected by the 1% Annual Exceedance Probability (AEP) flood. The provided 1% AEP Flood level is RL 2.65m AHD and the Probable Maximum flood (PMF) level is RL 2.98m AHD. The letter also provides a Flood Planning level (FPL) RL 3.15m AHD which is a minimum height to be used for the setting of habitable floor levels. All of the provided flood levels in the Flood Advice letter are below the proposed building floor level of RL 4.85m AHD.

Further inspection shows that main roads near the site, such as General Holmes Drive, are not flood affected during the 1% AEP and PMF storm events. These roads are therefore expected to be available for use as an evacuation route if required.

Should you require any additional information, please do not hesitate to contact the undersigned.

Yours sincerely,

Cosmo Farinola  
Business Unit Manager - Buildings  
for Cardno  
Direct Line: +61 2 9498 7749  
Email: cosmo.farinola@cardno.com.au

#### Attachments

1. Flood Extent Mapping PMF ARI – BMT WBM report dated February 2017
2. Flood Extent Mapping 100 year ARI – BMT WBM dated February 2017
3. Survey Report – CMS Surveyors dated 09/02/2018
4. Bayside Council Flood Advice letter dated 18 May 2020.

Cardno (NSWI) Pty Ltd  
ABN 95 001 145 035

34/205-207 Albany Street North  
Gosford NSW 2250  
Australia

Phone +61 2 4323 2558  
Fax +61 2 4324 3251

[www.cardno.com](http://www.cardno.com)

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## 14 Appendix D – CV of Engineer



**CAMERON AMRI**  
**SENIOR CIVIL & STRUCTURAL ENGINEER**

Bachelor of Engineering in Civil Engineering  
University of Technology Sydney

### Professional memberships

Member of the Institution of Engineers, Australia  
Chartered Professional Engineer (CPEng)  
Registered on the National Engineering Register (NER)  
Registered Professional Engineer of Queensland

### Experience

Since completing his degree in 2007, Cameron has worked as a civil structural engineer for MLH, Kneebone & Beretta, E2 Design and for Birzulis Associates Pty Ltd.

### A selection of projects Cameron has been involved in:

#### Aged Care

- HammondGrove, Hammondville
- Scalabrini Village Bexley
- Scalabrini Village Drummoyne
- Scalabrini Village Austral
- Scalabrini Village Chipping Norton
- Scalabrini Village Griffith
- Scalabrini Village Yoogali

#### Religious

- Our Lady of Mount Carmel
- Catholic Parish of Mary Immaculate

#### Education

- Thomas Reddall High School
- Westmead Public School
- Springwood High School

- Chifley Campus
- Parramatta West Public School
- Blacktown Tafe
- Wiley Park Girls High School
- Chester Hill High School
- Doonside High School
- Westfield Sports High
- Ingleburn High School
- Wenona School, North Sydney
- Granville Public School
- Bellevue Hill Public School
- Riverstone High School
- Mount Annan Public School
- Matthew Pearce Primary School
- Mount Druitt Tafe
- NirimbaTafe

**Taylor Construction Group Pty Ltd**

ABN 25 067 428 344

Level 13, 157 Walker St, North Sydney NSW 2060

T 02 8736 9000 F 02 8736 9090



**taylorau.com.au**

**TAYLOR**