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: **A**

DOCUMENT VERIFICATION

Project Title	Kyeemagh Public School
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Client Contact	Taylor Constructions

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REPORT DELIVERABLES

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

DOCUMENT HISTORY

Date	Revision	Issued to	Description
17/07/20	-A	DWP Suters	For CC1

Table of Contents

1 EXECUTIVE SUMMARY

Birzulis Associates have been commissioned by Taylor Constructions to prepare a Flood Emergency Response Plan (FERP) on behalf of 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 coarse 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 329m².

The site is shown below represented as Figure 2.1

Figure 2.1.1 – Total D.P. Envelope

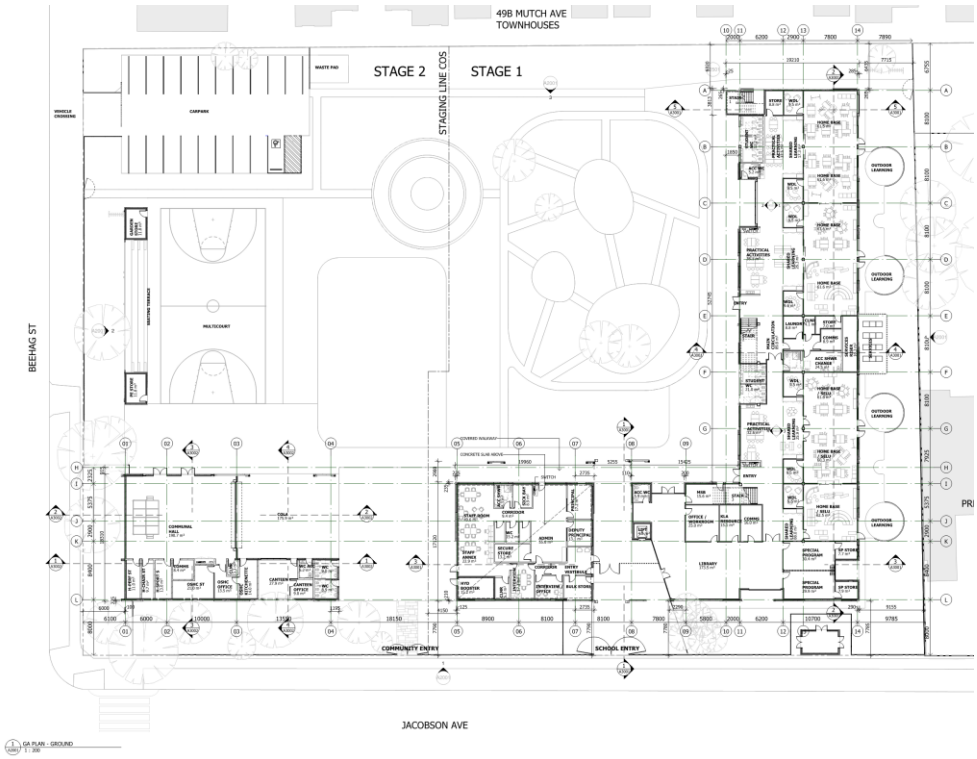

Figure 2.1.2 - Overall Site Plan Showing Staging of Works

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

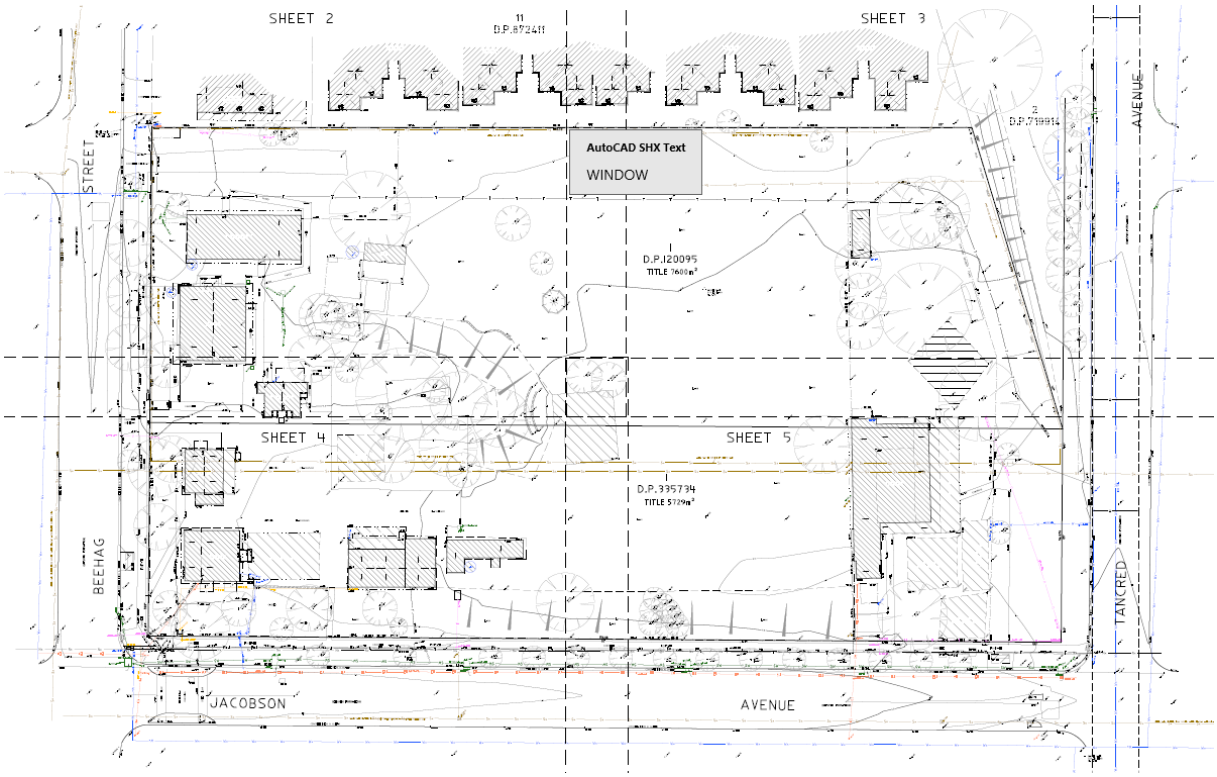

Figure 2.1.4 – Existing Survey (prepared by C.M.S Surveyors Pty Ltd 09/02/18)

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 m3/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 m3/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 (m3/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 BEHAIVIOUR

3.1 POSSIBLE FLOOD SOURCE/S

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 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)

3.3 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 4.1.1 - Site and Detention Hydrology

3.4 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)

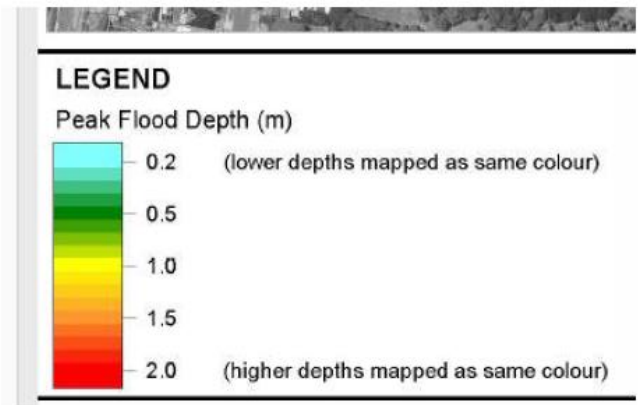

Figure 3.4.1 – Shows the 100 year flooding for this immediate area and the site (Source: Cardno)

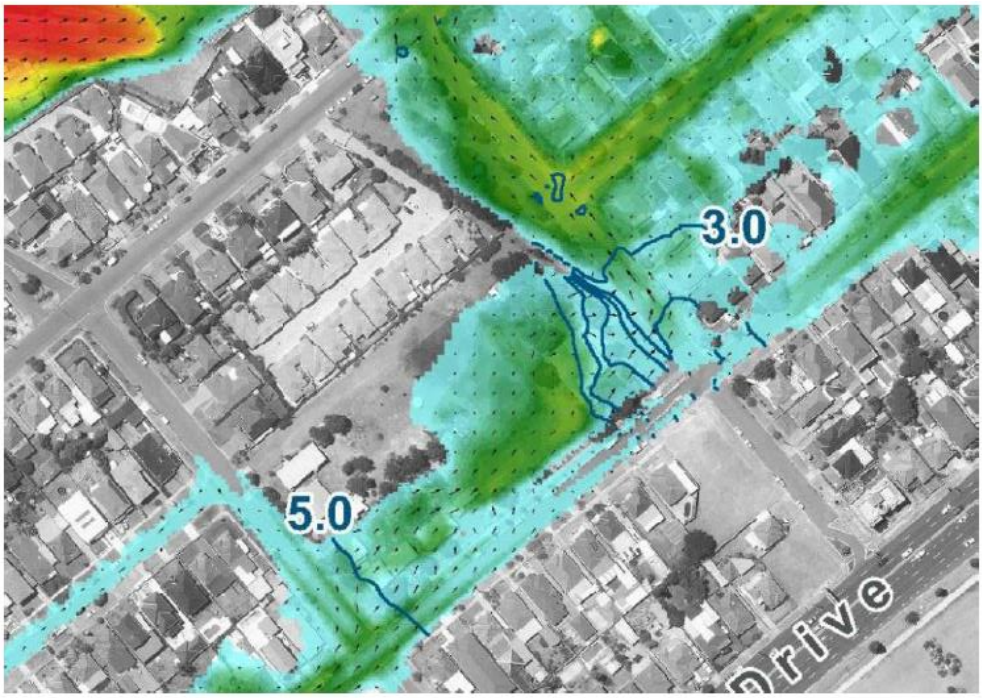

Figure 1 – Kyeemagh Public School – PMF (approximately 0.3-1.0m depth)

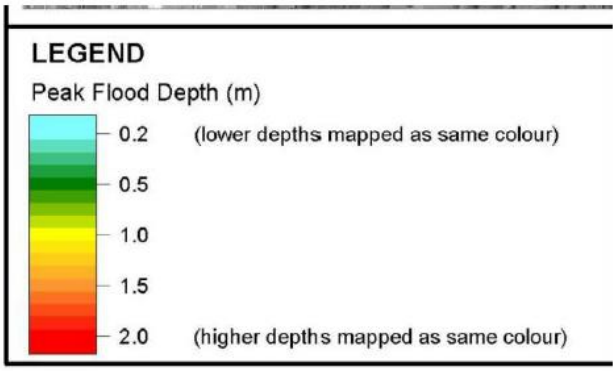

Figure 3.4.2 – Shows the PMF flooding for this immediate area and the site (Source: Cardno)

3.5 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)

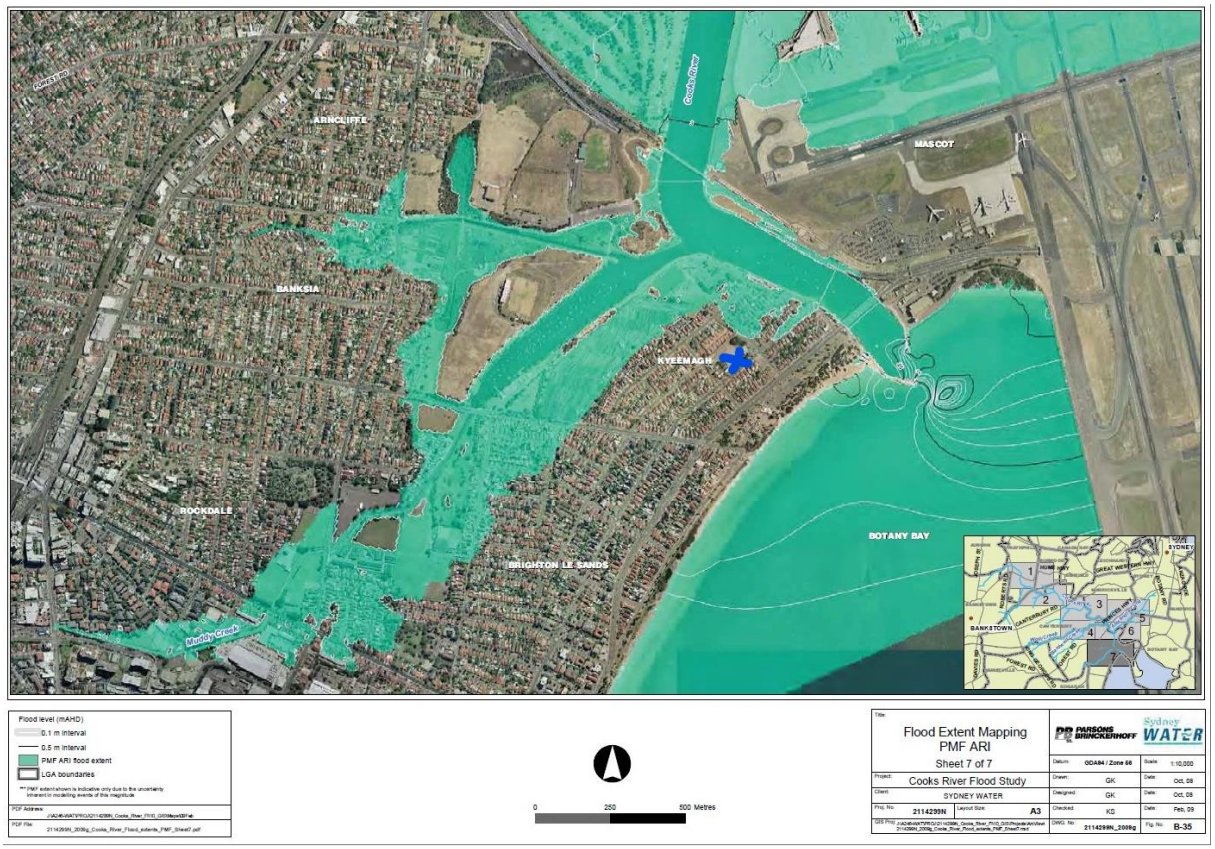

Figure 3.5.2 – Shows the PMF flooding for Botany Bay & Cooks River (Source: Cardno)

3.6 FLOOD BEHAVIOUR & FLOOD HAZARD CATEGORYS

Given the elimination of the Cooks River flood source the site should have a relatively short response time less than 1 hour. Basically this site will be performing more of a flash flooding style performance in lieu of a long response time where flood waters need time to drain from significant upstream catchments. Hence, it is imperative that prompt action is taken to avoid adverse impacts to exposure to flood hazards.

Flood modelling and VxD governs the ability of evacuation. As can be seen above, even in the MPF flood the carpark exit will not be flood affected. Also it has been previously noted that General Holmes Drive is not flood affected. Evacuation and response to the site is possible through that exit and main road.

Modelling along Jacobson Avenue suggest the maximum water flow above ground (assuming 80% pit blockages) could be up to 0.620m³ per second. This equates to a flow depth of 0.168mm, 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.

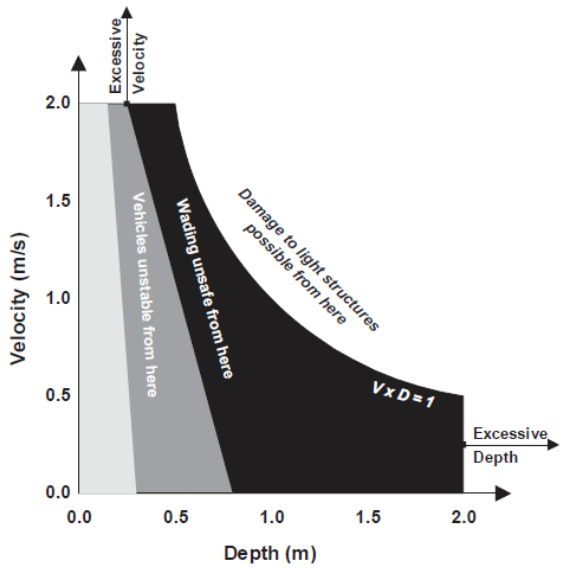

Figure 3.6.1 – Velocity & Depth relationships

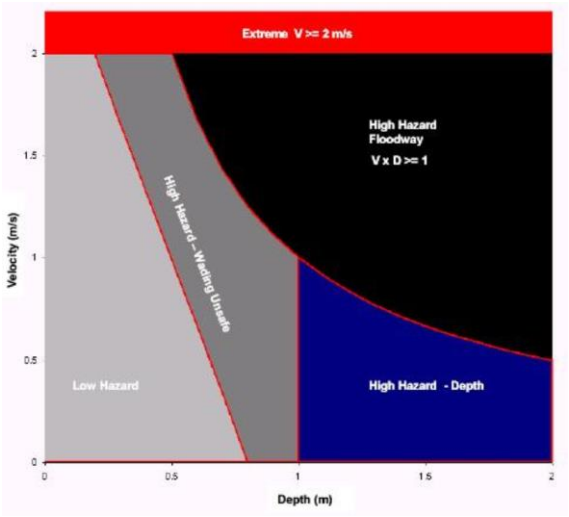

Figure 3.6.2 – Hazard Categories

4 FLOOD EVEACUATION WARNINGS

Rainfall guage stations are maintained by the Beuro of Meterology (BOM) throught 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

4.1 WARNING TYPES

4.1.1 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.

4.1.2 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.

4.1.3 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

4.1.4 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.

4.1.5 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.

4.1.6 SES Flood Bulletins

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

4.1.7 Evacuation Warning

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

4.1.8 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.

4.1.9 Early Warning Network Automated Text and Email Service

The property can register for automatic alerts with the Early Warning Network (www.ewn.com.au) 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.

4.1.10 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.

4.1.11 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.

4.1.12 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 OPERATIONAL PHASE

5.1 CONSTRUCTION PHASE- FLOOD RESPONSE PERSONNEL

Table 5.2

	Location	**Responsibilities**
Department of Education WHS Directorate	Blacktown	Coordinate the Emergency Management Plan into the specific school procedures and implementing recommendations of this report into the school procedures.
Chief Flood Warden – Principle	On-Site	Organise flood management drills for school and staff not less than yearly Register duty phone for Early Warning Network and Dipstick (if recommended to be installed) Decide if evacuation is required (only in an emergency) Decide when it is safe for onsite persons to leave after a flood event Liaise with emergency services if and when they attend site
First Aid Officer	On-Site	Prepare and maintain a Flood Emergency Kit Assist in coordinate the movement of limited mobility persons to the assemble points during such times Manage Individual Health Care Plans for students
Deputy Chief Flood Warden	On-Site	Assist the First Aid Officer where required or fill those responsibilities if that appointment is not available Receive text notifications from Early Warning Network and Dipstick (if recommended to be installed)
Flood Warden	On-Site	Assist the Deputy Chief Flood Warden where required or fill those responsibilities if that appointment is not available Receive text notifications from Early Warning Network and Dipstick (if recommended to be installed)
Staff	On-Site	Maintain calm in students and other staff Know who the flood relevant appointments are for advice
Primary Refuge	On-Site	Ground floor of the library/home base building
Secondary Refuge	On-Site	First floor of the Home Base Building

6 ASSEMBLY POINT AND SAFE EVACUATION RESPONSE ROUTES

6.1 EMERGENCY ASSEMBLY POINT

The ground floor of the library/home base building has been nominated as the emergency assembly point once a significant flood event has been identified. The levels for the ground floor FFL is 4.65m which is significantly above the PMF flood level of RL2.98 and the flood planning level of RL 2.65m.

The location is easily accessible from anywhere in the school and has good visual on the rest of the school for situational awareness.

Once everyone is accounted for, the students can be controlled in that location for the rest-in place strategy until it is safe to leave. Should any emergency arrive and evacuation need to occur there is direct access to the school carpark (without walking through flood waters) to that location which would be the emergency evacuation point for coordinating with first responders.

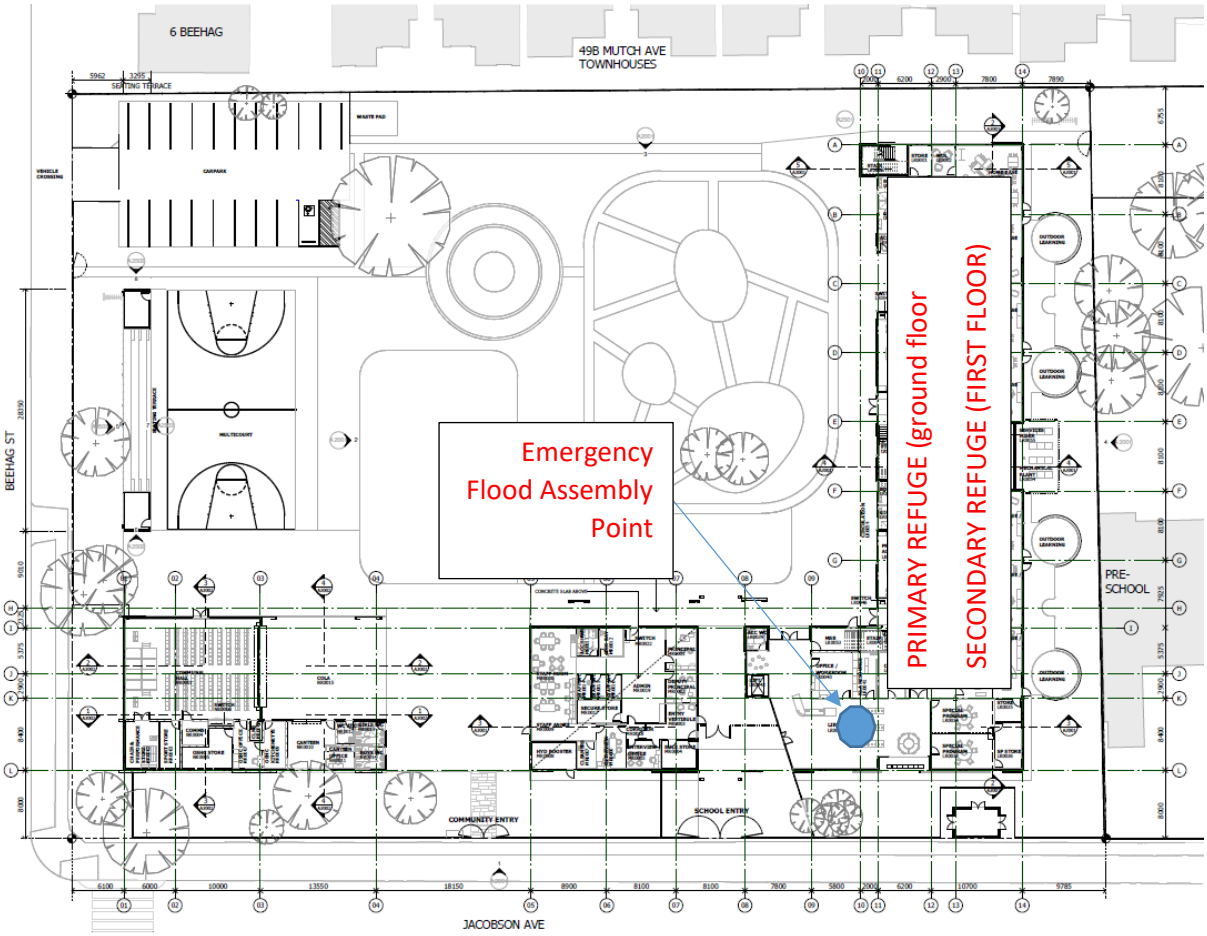

Figure 6.1.1 – Assembly Point and Refuges

7 EMERGENCY FLOOD STRATEGY

The lowest floor level is RL 4.65 as noted above which is approximately 2m above the 100 year flood level given for the site and 1.67m above the PMF flood level given for the site.

The primary refuge has a floor level of RL 4.65 and the secondary refuge has a level of approximately RL 8.25

Given the above, **the strategy of rest-in-place (onsite refuge) is recommended for this site during major flood events**. The site is not cut off by flood water and has access to main roads unaffected in a major flood event however where possible, evacuation during a significant flood event should be discouraged.

No building onsite will be completely cut-off by flood water given the modelling.

As a result of the rest-in-place strategy and the buildings are proposed for construction the following recommendations are relevant:

- Heating and air-conditioner units should be placed above the RL of 2.98
- All wiring or electrical elements below RL 2.98 shall be suitable for being submerged in water.
- A Flood Emergency Kit shall be prepared. See 9.3 for what is required.
- During major rain events, the key flood appointments are to keep up-to-date with relevant developments by listening to radio and television.
- If occupants are cut off they should ring the SES and register the situation with them.
- Heating and air-conditioner units should be placed above the RL of 2.98
- Create an Emergency Business Co

Bollards in car-parking areas are not required given the carpark will not be affected by flood water and cars are not at risk of becoming buoyant and floating downstream.

There is no suitable location onsite that will likely receive flood water after the buildings are constructed with the high floor level. As such the installation of a Dipstick is not recommended. Nor is a Flood Depth Gauge.

8 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

9 FLOOD RESPONSE PREPARATION AND TRAINING

9.1 EMERGENCY ASSEMBLY DRILLS

Emergency assembly drills are designed to increase awareness of standard procedures during a major flood event. These drills are to be undertaken not less than annually to familiarise staff and appointments of the procedures when responding to a major flood event.

It is also an opportunity to outline expected flood levels and the dangers of entering flood water. Lessons held after drills could be based on material designed by the SES available from https://www.ses.nsw.gov.au/resources-folder/school-resources/.

For students enrolling from other schools they should be made familiar of the emergency auditble tone and the basic initial procedures.

9.2 TRIGGER/ACTION

Key decision points need to be made during a major flood event. These often overlap the normally items part-in-parcel of the function of a school.

Are parent pick/up drop off permitted and if so where?

Are students permitted to leave the school alone?

Are staff permitted to leave the school and is so from where?

The key monitoring for the site should be the southern most corner (corner of Beehag Street and Jacobson Avenue). If water is jumping the kerb and locally flooding the southern corner and is presenting a water depth of 200mm or so, it is an indicator that the flood event is exceeding the 100 year event. If not already done so occupants of the site should be moved to the flood refuge via the emergency assembly point and accounted for. Parents should be communicated the situation and notified to either not drop their kids off or to wait until safe to pick up their children. The school should register it's action with SES and monitor the situation. Students should not be permitted to leave the school (unless an emergency) until this flood level has subsided to the 100 year levels as shown in this report. This report will be in the Flood Emergency Kit noted below.

9.3 FLOOD EMERGENCY KIT

This kit shall consist of not less than the following and also what is recommended by SES and at www.floodsafe.com.au:

- Portable radio with spare batteries
- Torch with spare batteries
- A first aid kit
- LED lights and spare batteries
- List of emergency contacts
- Copy of this report
- Chemical register
- Air horn and handheld loudspeaker
- Candles with waterproof matches
- A waterproof bag for valuables

If leaving the site in the event of a full evacuation, the following items should also be taken:

- Sign in book for visitors and contractors as well as the list of students and staff
- Individual Health care Plans and relevant treatments elements

This kit should be kept in a location within the school administration area in a position known to the relevant appointments that may seek to use the kit appropriately. The contents of the kit are the responsibility of the Principle or any person they delegate this to.

This kit should be checked every three months ensuring items are present and working adequately. This is the responsibility of the Chief Flood Warden and First Aid officer.

9.4 MONITORING OF WEATHER SITURTATION

It is the responsibility of the Chief Flood Warden to monitor the weather situation if a weather warning has been issued. This can be delegated once an Emergency SMS or warning has been received and communicated to key flood appointments.

The key monitoring for the site should be the southern most corner (corner of Beehag Street and Jacobson Avenue).

It is recommended a Duty phone should be established and linked to any early warning systems. This is the responsibility of the Chief Flood Warden

9.5 FLOOD RESPONSE ACTIONS

To minimise the foreseeable risk to students in transit to school it is recommended that school be cancelled when rain greater than 240mm is forecast in the area over a 24 hour period. This value roughly equates to the rainfall rate of the 100 year event. Even though the school would be relatively unaffected in this event there is risk to students traveling from areas that may not be so favourable in this storm event.

The Chief Flood Warden is responsible for reviewing the weather forecasts daily and storm warnings and distributing notification of cancellation to parents/guardians via appropriate means.

As noted it is recommended that school attendance be cancelled when forecast rain for greater than 240mm in a 24 hour period is forecast. The responsibility of this is with the Chief Flood Warden.

9.6 EVACUATING TO EMERGENCY ASSEMBLY POINT DURING SCHOOL HOURS

Once a Flood Warning has been issued and a Flood Bulletin received a member shall confirm the water level in Jacobson Avenue at the Southern corner. Should this be forming greater depth than 200mm over the site, the school should evacuate to the emergency assembly area. This is achieved using the following steps:

- Sound evacuation tone or audible message over loud speaker system
- Chief Flood warden does to Emergency Assembly Point and checks all external gates of the school are closed
- Staff directs all students and assists all students to the Emergency Assembly Point
- Flood Wardens clear all non used classrooms within other buildings.
- Roll call of all students and staff is issued. All pers should be accounted for.
- Clear students from this point into the other areas of this building but control the exits.
- Notify parents of situation and inform to wait until told it is safe to come pick up kids.
- Notify SES of situation at school. Follow any relevant instructions from SES
- Control access in and out of the Emergency Assembly Point and the Refuge Area. If there are too many students in the Primary Refuge Area, students are safe to move to the Secondary Refuge Area subject to adequate supervision.

As noted above, this is not recommended and is unnecessary given the design of the school. It is anticipated evacuation should only be for medical or other exceptional needs during a flood event. This would be organised and by the relevant emergency service responding.

9.7 EMERGENCY SERVICES ATTENDING SITE

If emergency services are requested for site for any reason during a flood event the caller of Chief Flood Warden should confirm that the relevant responder is aware the vehicle access point is along the entrance on Beehag Street not Jacobson Avenue. This is the ultimate responsibility of the Chief Flood warden.

9.8 AFTER A FLOOD EVENT

Once a SES "All Clear" has been received the following should occur:

- Parents are to be notified it is safe to come pick up their kids from the refuge area.
- A thorough check of services should be undertaken by relevant licenced contractors looking for damage.
- If there is any clean up it is recommended personal protective equipment is worn.

9.1 FLOOD EMERGENCY RESPONSE DURING CONSTRUCTION

Given construction does not occur safely during major rain events the contingency for this is minimalistic. The recommendations of the Soil and Water Management Plan should be followed. The Foreman should also stop all works on the site and account for all workers signed in. They should rest-in-place in the site shed which is proposed to be located approximately centrally in the site which will not be affected by flood water including the PMF flood.

10 CONCLUSION

The site is not flood prone up to the 100 year flood event. The DCP does not stipulate a ceiling flood for consideration in the risk management report so as such we have included the PMF flood into the recommendations. The main risk to staff and students during flood events will be offsite in the form of traveling to and from school.

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 he 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 area also satisfied the foreseeable flood related risks are adequately identified and managed by this report.

11 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

12 APPENDIX A – GROUND LEVEL FLOOR PLAN

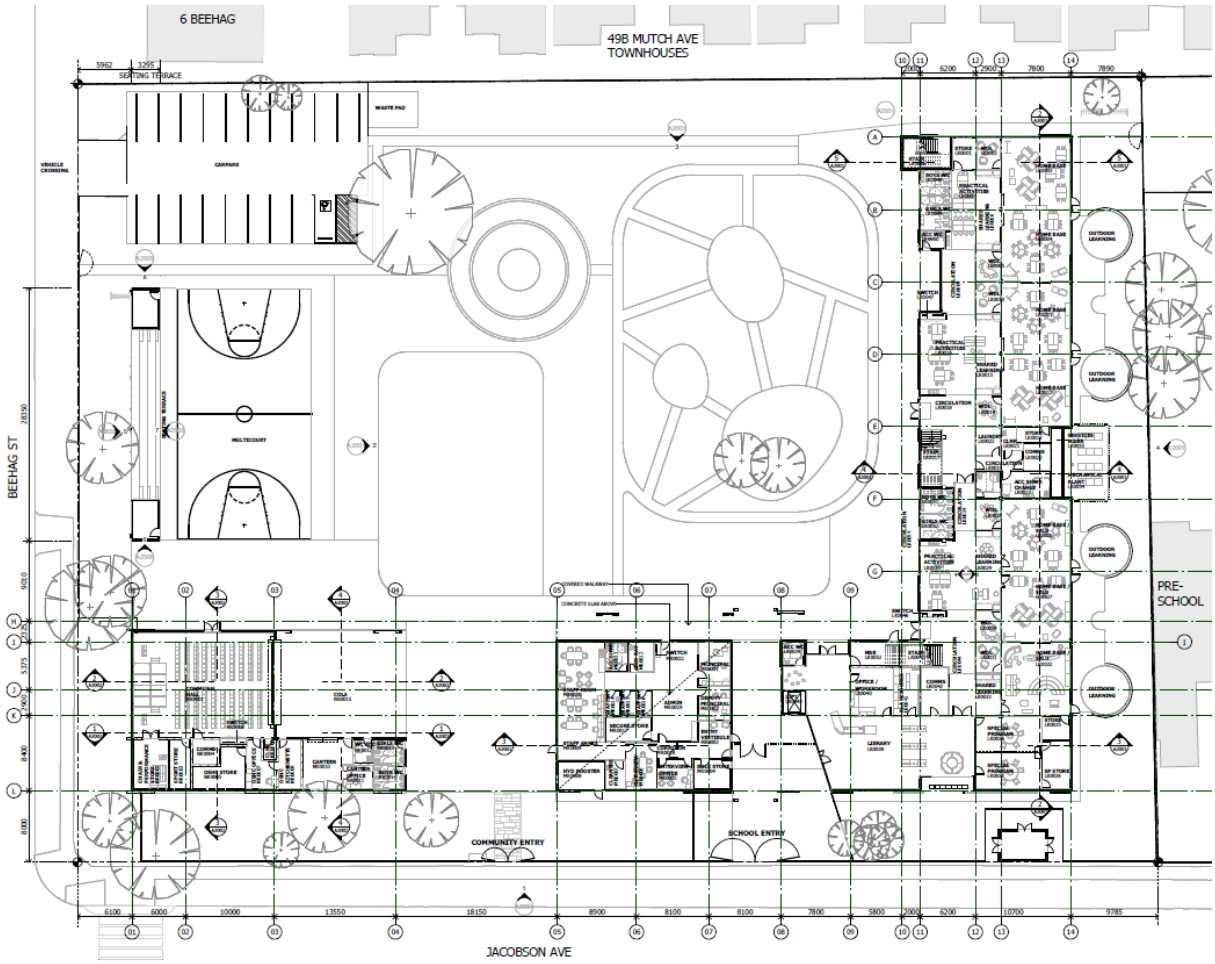

Figure A.1 – Ground Level Floor Plan

13 APPENDIX B – FLOOD EVACUATION ROUTE

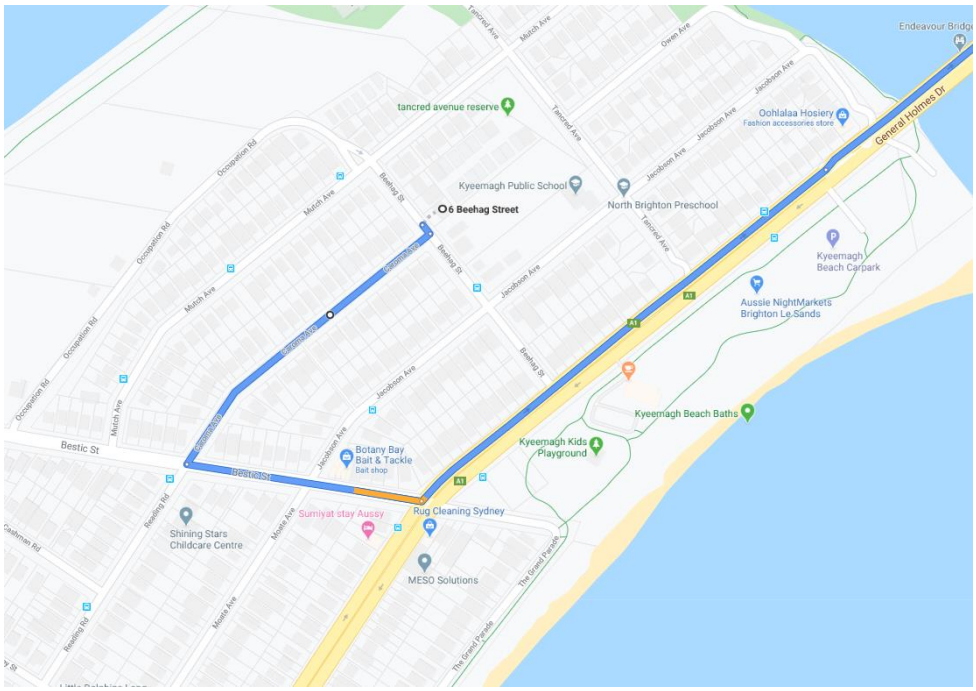

Figure B.1 – Flood Evacuation Route North (only for emergencies during a major flood event)

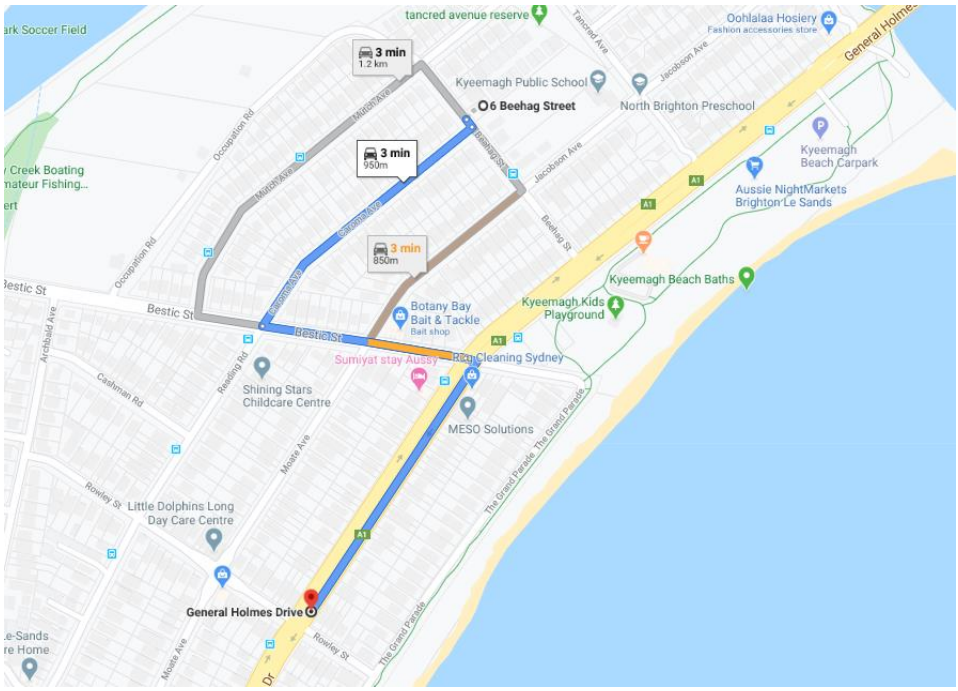

Figure B.2 – Flood Evacuation Route South (only for emergencies during a major flood event)

14 APPENDIX C – RISK MATRIX

WHEN	WHAT	BY WHO
Prior to Flooding	Assemble Emergency Kit	First Aid Officer
	Coordinate Evacuation training drills twice a year	First Aid Officer
	Post Evacuation drills and les on flood risks	Staff
	Monitor weather situation daily	Chief Flood warden
When Extreme Rainfall is likely	Rainfall greater than 240mm in a 24 hour period predicted. Cancel School and communicate.	Chief Flood Warden
	Notify Parents via appropriate means	Chief Flood Warden
	If the decision to cancel school for the day is at a time when kids have already started to arrive at school, organise food and water to the Refuge Area	Chief Flood Warden/First Aid Officer
During a flood during school times	Notification of flood event is received to duty phone or via other means	Chief Flood Warden
	Pack individual Health Care Plans and move to refuge area	First Aid Officer
	Sound Emergency Tone and or notify students and staff to move to Emergency Assembly point via loud speaker system	Chief Flood Warden
	Staff to assist students to assembly point	Staff
	Flood Wardens to clear buildings and classrooms and communicate to Chief Flood Warden	Flood Wardens
	Roll Call	All flood appointments
	Wait out at refuge point	All
	Do not attempt to drive through floodwaters until flooding has subsided and “all clear” has been given.	All
After a Flood	Parents to collect students from refuge point	Parents
	Check services and check school for damage	

15 APPENDIX D – REFERENCED DOCUMENTATION

Bayside Council
Serving Our Community

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.

FLOOD NOTATION	Council has not notated this property as being affected by the 1% Annual Exceedance Probability (AEP) flood. The 1% AEP flood means there is a 1% chance of a flood of this height, or higher occurring in any one year. 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. This property will require protection from flooding by setting minimum floor levels.
FLOOD STUDY	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
FLOOD LEVELS	**1% AEP Flood level:** 2.65m Australian Height Datum (AHD) 5% AEP Flood level: 2.62m Australian Height Datum (AHD) **Probable Maximum Flood (PMF) Level:** 2.98m AHD
FLOOD RISK EXPOSURE	The Flood Risk Exposure of the site has been assessed as Low Hazard: Land partly below flood planning level.
FLOOD COMMENTARY	No accurate information is recorded regarding the impact of tsunamis in the Bayside Local Government area.

Eastgardens Customer Service Centre
Westfield Eastgardens
152 Bunnerong Road
Eastgardens NSW 2036, Australia
ABN 80 690 785 443 Branch 004

Rockdale Customer Service Centre
444-446 Princes Highway
Rockdale NSW 2216, Australia
ABN 80 690 785 443 Branch 003
DX 25308 Rockdale

Phone 1300 581 299
T (02) 9562 1666 F 9562 1777
E council@bayside.nsw.gov.au
W www.bayside.nsw.gov.au
Postal address: PO Box 21, Rockdale NSW 2216

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

20 May 2020

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Australia

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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 RL4.65m 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.

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 9496 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.