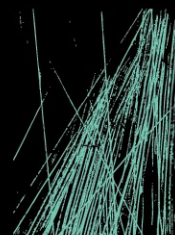


FLOOD RISK MANAGEMENT PLAN SSSA REPORT

**CARLINGFORD WEST PUBLIC SCHOOL &  
CUMBERFORD HIGH SCHOOL UPGRADES**

59-73 Felton Road and 183 Pennant Hills Road, Carlingford



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## DOCUMENT CONTROL SHEET

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# 1 EXECUTIVE SUMMARY

JHA Consulting Engineers has been engaged by NSW Department of Education (DoE) to provide a Flood Management Risk Plan (FRMP) to accompany a State Significant Development Application (SSDA) for the proposed upgrade works to Carlingford West Public School (CWPS) and Cumberland High School (CHS).

The Report has been prepared to address part item 14 of the Secretary's Environmental Assessment Requirements (SEARS), issued on the 23<sup>rd</sup> May 20022, specifically in relation to flood evacuation strategies and mitigation measures and should be read in conjunction with the Aurecon Civil Flood Impact and Risk Assessment report (ref:521485, dated 19.08.2022).

Table 1 - SEARs Report Requirement

SSDA Deliverable	Text
14. Flooding Risk	<ul style="list-style-type: none"><li>Identify any flood risk on site having regard to adopted flood studies, the potential effects of climate change and any relevant provision of the NSW Floodplain Development Manual.</li><li>Assess the impacts of the development, including any changes to flood risk on-site or off-site, and detail design solutions and operational procedures to mitigate flood risk where required.</li></ul>

The proposed development involves upgrades to Carlingford West Public School (CWPS) and Cumberland High School (CHS), collectively referred to as the Cumberland Cluster.

The upgrades to CWPS will cater for a total student population of 1,610 and include the construction of four new buildings in the north-west portion of the site known as buildings W, X, Y and Z. These buildings range from one to three storeys and contain a variety of uses including general learning spaces, library, amenities, staff rooms and combined canteen, out of school hours care (OSHC), gym and hall. The construction of a new kiss and ride off Felton Road West and a waste loading area, On-Site Detention (OSD) tank and staff carpark.

The works proposed at CHS will cater for a total student population of 2,040 and include the construction of three new buildings in the south-east portion of the site known as buildings X, Y and Z. These buildings range from one to five storeys and contain a variety of uses including a general and specialists learning spaces, library, administration, staff and student amenities, and combined lecture theatre, movement space, canteen, stage and gym/hall. The works also propose the construction of a new one-way bus link road and waste loading area from Dunmore Avenue to Pennant Hills Road.

Associated civil works and landscape works are proposed across both school sites including tree removal and planting and new play areas.

Based on the Council flood maps and the findings outlined in the Flood Impact and Risk Assessment report, the site is subjecting to flooding. In the existing case the site is subject to an overland flow from between Blenheim Road and Dunmore Avenue to the east, travelling through the low point of the site to Felton Road to the west. The flooding extends over the existing playing field. There is also a smaller overland flow path from the sag point of Pennant Hills Road to the south, which runs to the north to join the flooding occurring in the playing fields.

In the proposed case, the flooding extends further within the playing areas. Additionally, increases in flood levels are also shown to the south of the proposed Cumberland High school Building X. However, the flood engineer has shown that surface levels have not been finalised in these areas, with flooding unlikely presenting a significant hazard once finalised.

The proposed building finished floor levels are to be located above the PMF levels, as outlined in the Hills Shire Council Flood planning controls.

## 2 INTRODUCTION

### 2.1 DESCRIPTION OF THE PROPOSED DEVELOPMENT

The proposed development involves upgrades to Carlingford West Public School (CWPS) and Cumberland High School (CHS), collectively referred to as the Cumberland Cluster.

The upgrades to CWPS will cater for a total student population of 1,610 and include the construction of four new buildings in the north-west portion of the site known as buildings W, X, Y and Z. These buildings range from one to three storeys and contain a variety of uses including general learning spaces, library, amenities, staff rooms and combined canteen, out of school hours care (OSHC), gym and hall. The construction of a new kiss and ride off Felton Road West and a waste loading area, On-Site Detention (OSD) tank and staff carpark.

The works proposed at CHS will cater for a total student population of 2,040 and include the construction of three new buildings in the south-east portion of the site known as buildings X, Y and Z. These buildings range from one to five storeys and contain a variety of uses including a general and specialists learning spaces, library, administration, staff and student amenities, and combined lecture theatre, movement space, canteen, stage and gym/hall. The works also propose the construction of a new one-way bus link road and waste loading area from Dunmore Avenue to Pennant Hills Road.

Associated civil works and landscape works are proposed across both school sites including tree removal and planting and new play areas as well as public domain upgrades by widening nearby footpaths.

### 2.2 ANCILLARY WORKS SUBJECT TO SEPARATE APPROVAL

Under *State Environmental Planning Policy (Transport and Infrastructure) 2021 (T and I SEPP)*, certain works can be undertaken as exempt development (no planning approval required), complying development (complying development certificate issued for works through a private certifier or Council) or development permitted without consent (Part 5 approval). As shown in Figure X and detailed below, the following works are being undertaken separate to this SSDA and do not form part of the scope of works:

*Complying Development Certificate (CDC):* Include the location of temporary demountables. Refurbishment of CWPS buildings A and B for administration and staff purposes. Demolition of existing CWPS buildings C and J. Demolition of existing CHS buildings B and F.

*Exempt Development:* Include two new sports courts for CWPS and four new sports courts for CHS.

*Review of Environmental Factors (REF) Part 5 Approval:* Include a new kiss n ride link road from Dunmore Avenue to Blenheim Road with a connecting staff carparking and OSD tank. Key details include:

- Demolition of existing structures, including sports courts, a bus shelter and retaining walls,
- Removal of trees in the area around the car park and pruning of trees along the eastern boundary,
- Construction of new single lane one way road adjacent to the eastern boundary. Vehicles will enter the road via the Dunmore Avenue turning head and exit onto Blenheim Road,
- A 1.8m - 2.5m fence along the eastern boundary and access handle at Blenheim Road. The fence will function as a security and acoustic barrier,
- Adjustments to the turning head within the site adjoining Dunmore Avenue to create the new road connection,
- Public domain and infrastructure adjustments to Blenheim Road including new vehicle cross over, relocation of a power pole and relocation of a drainage pit,
- New stormwater infrastructure including an on-site detention tank below the car park,
- Renewal and extension of the existing staff carpark, including relocating the entry driveway to create a connection with the new road, and
- Landscaping and lighting infrastructure.

REF Part 5 Approval: Refurbishment of CHS building E, A, D, C and G.

The future appointed main works contractor will decommission services and temporary demountables to allow for them to be removed off site by others at the end of the project, with make good of the school oval once demountables are removed to be completed by the main works contractor shortly thereafter.

the school oval once demountables are removed to be completed by the main works contractor shortly thereafter.



Figure 1 – Works Outside of SSSA Approval (Source: Woods Bagot)

### 2.2.1 SITE DESCRIPTION

The site is located at 59-73 Felton Road and 183 Pennant Hills Road, Carlingford and is legally described as shown in Table 2

Table 2 – Site Descriptions and Areas

SCHOOL	LOT AND DP	LOT AREA
CWPS	Lot 1 DP 235625	0.4698ha
	Lot 2 DP 235625	2.363ha
	Lot 5 DP 235625	0.3958ha
CHS	Lot 3 DP 235625 (part CWPS)	4.736ha
	Lot 4 DP 235625	1.421ha

An aerial view of the site is provided in Figure 2. The site includes two schools, CWPS in the north of the site and CHS to the south. The school sites are separated by playing grounds in the centre of the site and the schools operate independently. The surrounding area is predominantly characterised by low density residential dwellings.

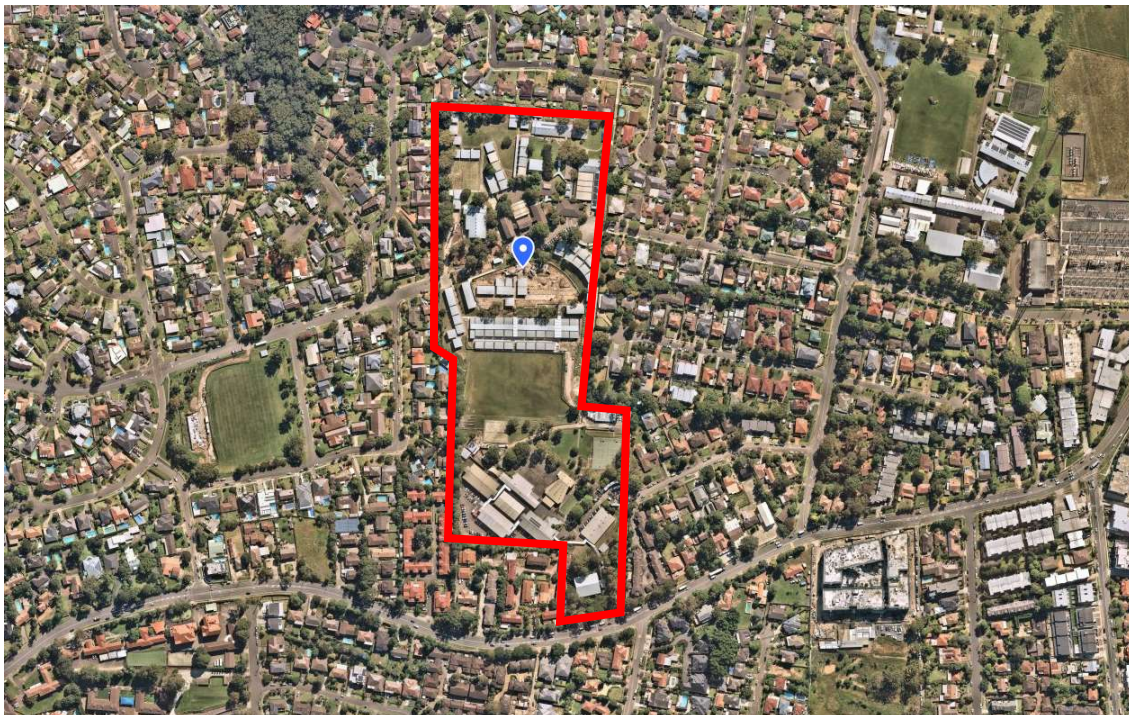


Figure 2 - Aerial view, site outlined red (Source: Nearmap)

The main CWPS pedestrian and bicycle access points are Felton Road East and Felton Road West. A secondary pedestrian access from the north is also available from Hilar Avenue. From the south, pedestrian can also access CWPS via CHS from Pennant Hills Road, Dunmore Avenue and Blenheim Road

The main CHS pedestrian and bicycle access points are Pennant Hills Road and Dunmore Avenue. Secondary access is also from Felton Road East, Felton Road West and Hilar Avenue.

### 3 SEARS REQUIREMENTS

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The Cumberland Cluster SSDA Report is required by the Secretary's Environmental Assessment Requirements (SEARs). Table 3 identifies the relevant SSDA requirement/s and corresponding reference/s within this report.

Table 3 – SEARs Report Requirement

SSDA Deliverable	Text
14. Flooding Risk	<ul style="list-style-type: none"><li>▪ Identify any flood risk on site having regard to adopted flood studies, the potential effects of climate change and any relevant provision of the NSW Floodplain Development Manual.</li><li>▪ Assess the impacts of the development, including any changes to flood risk on-site or off-site, and detail design solutions and operational procedures to mitigate flood risk where required.</li></ul>

The flood risk management report has been written specifically in relation to flood evacuation strategies and mitigation measures and should be read in conjunction with the Aurecon Civil Flood Impact and Risk Assessment report.

## 4 BACKGROUND INFORMATION

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### 4.1 REFERENCE DOCUMENTS

This report has been based on the following documents:

- Architectural drawings by Woods Bagot
- Survey by Project Surveyors (Ref: BD4616, dated 26<sup>th</sup> November 2019)
- The Hills Shire Development Control Plan (DCP) 2012 Part C Section 6: Flood Controlled Land
- NSW Floodplain Development Manual (April 2005)
- City of Parramatta Council Flood Maps (Source: The Hills Shire Council Draft Overland Flow Study, 2015)
- Cumberland Cluster Flood Impact and Risk Assessment Report By Aurecon Civil (ref: 521485, dated 19<sup>th</sup> August 2022)

### 4.2 EXISTING FLOOD STUDIES

A number of flood studies have been undertaken for the school and are outlined below:

#### **The Hills Shire Council Draft Overland Flow Study (2014)**

Hills Shire Council commissioned Catchment Simulation Solutions to undertake an overland flow study for 68km<sup>2</sup> area. Flood mapping, specific to the school, has been provided, showing the 1% Average Exceedance Probability (AEP) flood extents and depths extending into the site

#### **Civil Concept Design Report by Stantec (Carlingford West Public School and Cumberland High School Upgrades) - 2020**

As part of the Civil Concept Design Report, Stantec provided a high-level assessment of the flood impacts of the new school upgrades, although no formal flood modelling was undertaken.

#### **Cumberland High School – Flood Assessment Technical Note (2022)**

To support the car park and access road, entered off Dunmore Avenue and/or Blenheim Road to the east, WSP were appointed by Taylor Construction to perform modelling aimed at identifying the potential flood impacts of the CHS early works upgrades.

#### **Flood Impact and Risk Assessment Report by Aurecon Civil (2022)**

As part of the Cumberland Cluster SSDA application, Aurecon Civil have prepared a Flood Impact and Risk Assessment report.

The finding of the report has generally been used to assist with the writing of this report.

## 5 FLOOD BEHAVIOUR

### 5.1 EXISTING CASE FLOOD CONDITIONS

The findings of the report highlight that there is a major overland flow path coming into the eastern part of the site from Dunmore Avenue carrying external overland flow through the site. This flow path flows from east to west through the Cumberland Cluster playing fields which is located to the south of CWPS buildings and to the north of the CHS buildings. CWPS local surface runoff generally flows west to east. CHS local surface runoff generally flows south to north, and an overland flow path exists in the eastern part of CHS which drains to the playing fields to the north.

The report also indicated that along the eastern boundary and within the playing fields area, the existing Flood Hazard Condition is identified as H3 which is deemed unsafe for all vehicles, children and elderly

### 5.2 PROPOSED CASE FLOOD CONDITIONS

In the 1% AEP flood event (equivalent to the 100 year ARI outlined in Council's flood planning controls), the depths in the playing fields area in the eastern portion of the site have increased due to lowering of the ground in the design scenario in this region by approximately 0.3m in order to tie into the recently developed games courts in the western playing field. Furthermore, there are several areas that show localised ponding in the vicinity of the proposed buildings.

It should be noted that these additional areas of ponding occurring in the proposed case, are surrounding the new CHS and CWPS school buildings. This is due to a flat design area, which can drain via a local overland flow path. However, the available flow path is relatively narrow, compared to the flood model resolution. In general, Aurecon Civil recommend that as part of detailed design these areas of isolated modelled ponding be investigated, and it be ensured that adequate flow paths and drainage are provided.

For the proposed 1% AEP Flood Hazard conditions, the extents of the H3 hazard in the central eastern part of the site has been increased in area.

In the PMF event, flooding extends into the CHS site, adjacent to the proposed Buildings X, Y and Z. There are also areas of ponding occurring in and around CWPS, but as raised above, this is likely due to the resolution of the flood model and should be resolved during detailed design.

### 5.3 COUNCIL'S FLOOD PLANNING CONTROLS

The Hills Shire Council DCP identifies control for flood-controlled land with the following aims (extracted from Part C, Section 6 – Flood Controlled Land:

- Increasing public awareness of the hazard and extent of land affected by all potential floods greater than the 100-year average recurrence interval (ARI)\*:
- Informing the community of Council's policy for the use and development:
- Managing the risk to human life and damage to property caused by flooding through controlling development on land affected by potential floods; and
- Minimising the potential impact of the development and other activity upon the amenity, aesthetic, recreational and ecological value of the waterway corridors and the surrounding environment.

\*The 100-year ARI flood event is equivalent to the 1% AEP Flood event and is a change of terminology introduced in the Australian Rainfall and Runoff (2016) guidelines.

To define the relevant flood controls, the site is classified as an educational establishment and has 'sensitive uses facilities'

### 5.3.1 FLOOD PLANNING CONTROLS

The following flood planning controls, shown in Table 4, are relevant for sensitive use developments

**Table 4 – Sensitive Uses Flood Planning Controls**

Ref:	Council Flood Planning Control	Relevant to Proposed SSDA Works
a	No development is to occur in or over a floodway area, a flowpath or a high hazard area (as defined in the FDM) generated by flooding up to FPL4 (Probable Maximum Flood)	Yes. Proposed buildings are to be located away from floodway areas, flowpaths and high hazard areas
b	Habitable Floor Levels to be no lower than the FPL4	Yes
c	Non-habitable floor levels to be no lower than FPL3 (100-year ARI + 0.5m freeboard, equivalent to 1% AEP + 0.5M) unless justified by a site specific assessment	Yes
d	All structures to have flood compatible building components below FPL4	Yes
e	Applicant to demonstrate can withstand the forces of floodwater, debris and buoyancy up to and including FPL4	Yes
f	The minimum surface level of open car parking spaces or carports shall be as high as practical and not below FPL1 (20-year ARI, equivalent to 5% AEP)	Yes
g	Garages or enclosed car parking must be protected from inundation by flood waters up to the FPL2 (100-year ARI). Where 20 or more vehicles are potentially at risk, protection shall be provided to FPL3	No. No enclosed garage parking proposed
h	Where the level of the driveway providing access between the road and parking space is lower than 0.3m below FPL2, the following condition must be satisfied – when the flood levels reach FPL2, the depth of inundation on the driveway shall not exceed: <ul style="list-style-type: none"> <li>- The depth of the road: or</li> <li>- The depth of the car parking space</li> </ul>	Yes
l	Reliable access for pedestrian or vehicles is required from the building, commencing at a minimum level equal to the lowest habitable floor level to a refuge (or Shelter In Place (SIP)) area above FPL4. In the case of alterations or additions to an existing development, this may require retro-fitting the existing structures if required to support a refuge area above FPL4.	
j	Applicant to demonstrate that area is available to store goods above FPL4.	Yes
k	Materials which may cause pollution or are potentially hazardous during any flood must not be stored externally below FPL4	Yes
l	A site Flood Emergency Response Plan should relate to the land use and site conditions in conjunction with flood behaviour up to the FPL4	Yes

	<p>expected to be experienced at the site. The plan should consider the following specific actions:</p> <ul style="list-style-type: none"> <li>- Preparing for a flood;</li> <li>- Responding when a flood is likely;</li> <li>- Responding during a flood; and</li> <li>- Recovery after a flood.</li> </ul>	
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### 5.3.1 HOW THE PROPOSED DEVELOPMENT ADDRESSES CONTROLS

Based on the flood impact and risk assessment report and additional extracts both schools have been assessed as below.

#### Carlingford West Primary School

The proposed Buildings W, X, Y and Z are located away from the main overland flow path crossing the site. However, the proposal has been assessed against the flood planning controls shown in Table 5, with extracts of the 1% AEP and PMF flood levels, taken from the Flood Impact and Risk Assessment report shown in Figure 3 and Figure 4, respectively.

**Table 5 – Carlingford West Public School Flood Planning Controls**

Ref:	Council Flood Planning Control	Proposed requirements to meet Flood Planning Controls
a	No development is to occur in or over a floodway area, a flowpath or a high hazard area (as defined in the FDM) generated by flooding up to FPL4 (Probable Maximum Flood)	Buildings W, X, Y and Z shall be located away from the main overland flow path and High Hazard category
b	Habitable Floor Levels to be no lower than the FPL4	<p>Yes.</p> <p>Building W First min FFL = 89.160m AHD*</p> <p><b>Estimated PMF level = 89.160m AHD</b></p> <p>Building W Ground min FFL = 87.180m AHD*</p> <p><b>Estimated PMF level = 87.180m AHD</b></p> <p>Building X, Y and Z Ground min FFL = 87.180m AHD*</p> <p><b>Estimated PMF level = 87.180m AHD</b></p> <p>Building Y and Z Lower Ground min FFL = 81.610m AHD*</p> <p><b>Estimated PMF level = 81.610m AHD</b></p> <p>(*These are the minimum finished floor levels to meet Councils flood planning levels. Refer to architect's documentation for further details).</p>
c	Non-habitable floor levels to be no lower than FPL3 (100-year ARI + 0.5m freeboard) unless justified by a site specific assessment	N/A Buildings outside 100year ARI (1% AEP flood) extents*
d	All structures to have flood compatible building components below FPL4	Yes

e	Applicant to demonstrate can withstand the forces of floodwater, debris and buoyancy up to and including FPL4	Yes The structural is capable of withstanding forces from floodwater. There is no structural report submitted as part of the SSDA, but will be included in Aurecon's SD submission
f	The minimum surface level of open car parking spaces or carports shall be as high as practical and not below FPL1 (20-year ARI)	N/A. Car park not impacted by 20 year ARI (5% AEP) flood extents
l	Reliable access for pedestrian or vehicles is required from the building, commencing at a minimum level equal to the lowest habitable floor level to a refuge (or Shelter In Place (SIP)) area above FPL4. In the case of alterations or additions to an existing development, this may require retro-fitting the existing structures if required to support a refuge area above FPL4.	Since the buildings are to be located at a level equivalent or above the PMF, these buildings can be used as a refuge during the storm event
j	Applicant to demonstrate that area is available to store goods above FPL4.	Yes
k	Materials which may cause pollution or are potentially hazardous during any flood must not be stored externally below FPL4	Yes. The floor levels listed above are above the PMF level
l	A site Flood Emergency Response Plan should relate to the land use and site conditions in conjunction with flood behaviour up to the FPL4 expected to be experienced at the site. The plan should consider the following specific actions: <ul style="list-style-type: none"> <li>- Preparing for a flood;</li> <li>- Responding when a flood is likely;</li> <li>- Responding during a floor; and</li> <li>- Recovery after a flood.</li> </ul>	Refer to Section 5-8, as well as drawing C100



Figure 3 – 1% AEP Flood Levels and Extents for CWPS site



Figure 4 – PMF Levels and Extents for CWPS site.

## Cumberland High School

The proposed Buildings, X, Y and Z are located away from the main overland flow path crossing the site. However, the proposal has been assessed against the flood planning controls shown in Table 6, with extracts of the 1% AEP and PMF flood levels, taken from the Flood Impact and Risk Assessment report shown in Figure 5 and Figure 6 respectively.

**Table 6 - Cumberland High School Flood Planning Controls**

Ref.	Council Flood Planning Control	Proposed requirements to meet Flood Planning Controls
a	No development is to occur in or over a floodway area, a flowpath or a high hazard area (as defined in the FDM) generated by flooding up to FPL4 (Probable Maximum Flood)	Buildings X, Y and Z shall be located away from the main overland flow path and High Hazard category
b	Habitable Floor Levels to be no lower than the FPL4	Yes. Building X Ground min FFL = 87.500m AHD* <b>Estimated PMF level = 87.500 AHD</b> Building Y Lower Ground min FFL = 83.710m AHD* <b>Estimated PMF level = 83.710m AHD</b> Building Z Lower Ground min FFL = 83.710m AHD* <b>Estimated PMF level = 83.710m AHD</b>  (*These are the minimum finished floor levels to meet Councils flood planning levels. Refer to architect's documentation for further details).
c	Non-habitable floor levels to be no lower than FPL3 (100-year ARI + 0.5m freeboard) unless justified by a site specific assessment	Buildings to be outside 100year ARI (1% AEP flood) extents.
d	All structures to have flood compatible building components below FPL4	The south eastern wall of Building X shall be made of flood compatible materials to a height of 87.800m AHD
e	Applicant to demonstrate can withstand the forces of floodwater, debris and buoyancy up to and including FPL4	Yes The structural is capable of withstanding forces from floodwater. There is no structural report submitted as part of the SSDA, but will be included in Aurecon's SD submission
f	The minimum surface level of open car parking spaces or carports shall be as high as practical and not below FPL1 (20-year ARI)	The proposed car park works are to be undertaken under a REF planning pathway, not the SSDA. However, the finished car levels should be reviewed against the flood maps to confirm compliancy
h	Where the level of the driveway providing access between the road and parking space is lower than 0.3m below FPL2, the following condition must be satisfied – when the flood levels reach FPL2, the	The 1% AEP flood maps show sporadic flooding along the proposed route of the bus link road. This occurs at the entry off Dunmore Road East. Flood depths are less than 0.3m along the full width of road

	<p>depth of inundation on the driveway shall not exceed:</p> <ul style="list-style-type: none"> <li>- The depth of the road: or</li> </ul> <p>The depth of the car parking space</p>	<p>If the vertical and/or horizontal alignments are changed during the detailed design, the flood modelling will be revised to confirm the design remains valid and flood controls are met.</p>
l	<p>Reliable access for pedestrian or vehicles is required from the building, commencing at a minimum level equal to the lowest habitable floor level to a refuge (or Shelter In Place (SIP)) area above FPL4. In the case of alterations or additions to an existing development, this may require retrofitting the existing structures if required to support a refuge area above FPL4.</p>	<p>Since the buildings are to be located at a level equivalent or above the PMF, these buildings can be used as a refuge during the storm event</p>
j	<p>Applicant to demonstrate that area is available to store goods above FPL4.</p>	<p>Yes. The store area serving Building Y shall be nominated as 83.75m AHD, equivalent to the PMF level</p>
k	<p>Materials which may cause pollution or are potentially hazardous during any flood must not be stored externally below FPL4</p>	<p>Yes. The store area serving Building Y shall be nominated as 83.75m AHD, equivalent to the PMF level</p>
l	<p>A site Flood Emergency Response Plan should relate to the land use and site conditions in conjunction with flood behaviour up to the FPL4 expected to be experienced at the site. The plan should consider the following specific actions:</p> <ul style="list-style-type: none"> <li>- Preparing for a flood;</li> <li>- Responding when a flood is likely;</li> <li>- Responding during a flood; and</li> <li>- Recovery after a flood.</li> </ul>	<p>Refer to Section 5-8, as well as drawing C100</p>



Figure 5 – 1% AEP Levels and Extents for CHS site.



Figure 6 – PMF Flood Levels and Extents for CHS site.

## 6 FLOOD AND EVACUATION WARNINGS

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### 6.1 EARLY WARNING MEASURES

A network of rainfall gauges are maintained throughout the greater Sydney area, These provide information to the Bureau of Meteorology (BoM) as a source of information to assist with their flood warning system.

The BoM issues five warnings the following sources:

- Local Radio
- Television
- Websites ([www.bom.gov.au/nsw/warnings](http://www.bom.gov.au/nsw/warnings))

In addition to this the NSW State Emergency Services (SES) may issue warnings in the form of:

- Bulletins
- Evacuation Warnings or Evacuation Orders

Additional measures to assist the school of forthcoming flooding can also include installation of a dipstick flood warning system, along the western side of the playing fields to alert designated staff when flooding has reached a certain level. It is also recommended that the school register for automatic texts and email notifications from the Early Warning Network (<https://www.earlywarningnetwork.com.au>) who can provide site specific warnings. City of Parramatta also provide a free flood warning system which the school can sign up to. However, the school is currently located outside any of their defined early warning areas

### 6.2 WARNING TYPES

**Severe Weather Warning** – Given by the BoM, and are provided for potentially hazardous or dangerous weather that is not solely related to severe thunderstorm, 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

**Severe Thunderstorm Warning** – Given by BoM to alert communities of the threat of dangerous thunderstorms defined by large hail, damaging or destructive winds, heavy rainfall which may cause flash flooding and tornados.

**Flood Watch** – Given by BoM to provide early advice of a developing situation that may lead to flooding. A Flood Watch is not a warning of imminent flooding.

**Flood Warnings** – Given by BoM; with defined minor, moderate and major flooding indicated. The warnings are regularly updated and define water levels and whether the flood levels are rising or falling

### 6.3 EVACUATION ORDERS

**Evacuation Warning** - SES may issue an evacuation warning to indicate that you should get prepared to evacuate. The school should monitor the situation and be prepared to evacuate when instructed to do so.

**Evacuation Order** - SES will issue an evacuation order to immediately evacuate at risk sections of the community from a flood threatened area and advises the safest actions to take.

**All Clear** - SES will issue an alle clear to advise the evacuated community that it is safe for people to return to the area and any residual risks.

## 7 FLOOD RESPONSE PREPARATION

A suitable Flood Emergency Response Plan (FERP) should be put in place by the school and address the safety and wellbeing of the school users. This should be undertaken in accordance with the recommendations of the report

### 7.1 FLOOD REPNSE PERSONNEL

The assumed key personal involved in the FERP below in Table 7. The below should be used as a guide with the DoE and CWPS and CHS to confirm.

**Table 7 – Flood Response Personnel**

Personnel	Location	Responsibilities
DoE WHS Directorate	TBC	Coordinate preparation of school specific Emergency Management Plan implementing recommendations of this report
Chief Flood Warden	On-site	<p>Coordinate Flood evacuation drills</p> <p>Provide and coordinate flood response emergency induction training for all personnel</p> <p>Monitor weather daily for upcoming extreme rainfall events</p> <p>Receive notifications from Early Warning Network and Dipstick Flood Alert System</p>
Deputy Chief Flood Warden	On-site	<p>Undertake Chief Flood Warden duties when Chief Warden unavailable</p> <p>Receive notifications from Early Warning Network and Dipstick Flood Alert System</p>
School Wardens	On-site	<p>Receive notifications from Early Warning Network and Dipstick Flood Alert System</p> <p>Assist Chief Wardens with evacuations</p>
First Aid Officer	On-site	<p>Prepare and maintain Flood Emergency Kit</p> <p>Manage individual Health Care Plans for students and staff as required</p> <p>Coordinate assistance for staff and students with mobility difficulty</p>
Staff	On-site	<p>Maintain calm and direct students through evacuation process.</p> <p>Follow all directions provided by Chief Flood Warden</p>
Emergency Meeting Place for Cumberland High School	N/A	Teachers and students to remain within Buildings X, Y and Z
Primary SIP for Cumberland High School		Teachers and students to SIP within Buildings X, Y and Z

Emergency Meeting Place for Carlingford West Primary School	N/A Teachers and students to remain within Buildings W, X, Y and Z
Primary SIP for Carlingford West Primary School	Teachers and students to SIP within Buildings W, X, Y and Z

## 7.2 FLOOD EMERGENCY KIT

A Flood emergency kit should be prepared and stored in all areas of SIP, prior to the flood event taking place. This should be regularly checked and maintained by the Chief Flood Warden and should consist of the following:

- Radio with spare batteries;
- Torch with spare batteries;
- First aid kit and other medicines;
- Candles and waterproof matches
- Waterproof bags
- A copy of the school's Emergency management Plan; and
- Emergency contact numbers

## 7.3 REGULAR TRAINING EXERCISES

It is recommended that the school conduct regular training exercises, including the participation of the local emergency services. Regularly feedback should be provided and the FERP updated to implement areas of improvement

## 7.4 MAINTENANCE AND OPERATION PROGRAMME

To assist with limiting opportunities of blockages/debris occurring the site stormwater system. There should be a regular maintenance program in place to ensure that the stormwater systems are regularly cleared and maintained.

The location of storage of hazardous materials/substances should be reviewed and relocated away from any estimated locations of flow paths and flood plains.

All portable machinery (ie lawn mowers, cleaning apparatus) should be relocated and stored at higher levels away from the flood extents.

In addition, detailed documentation of the event, e.g. maintaining a log book documenting alarm stages, internal communication and actions, photos of measures taken on site and of the event before, upon and arrival onsite will not only facilitate the post-event loss adjustment exercise but also support the emergency response team and site management in improving the FERM.

## 8 FLOOD RESPONSE ACTIONS

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### 8.1 CANCELLATION OF SCHOOL

The Chief and Deputy Flood Warden should review all weather forecasts, SES and BOM warnings and have a plan in place to advise the school users of cancellations. In addition, they should also consider:

- Securing floatable objects;
- Turning off mains power, water and gas,
- Relocating hazardous materials/substances away from estimate flood extents; and
- Ensuring emergency kits are available at the nominated evacuation/SIP points.

### 8.2 EVACUATION OF NORMAL OPERATING HOURS

Once BOM/SES have provided a flood warning for the area has been issued and/or the dipstick Flood Alert System has been triggered, the following needs to be undertaken:

- Sound evacuation tone and make announcements;
- Chief and Deputy Flood Warden attends the Emergency Meeting Point
- Staff direct all students/visitors to the Emergency Meeting Point
- Flood Wardens to enter and ensure all affected buildings are clear
- Roll call to ensure everyone is accounted for;
- Chief and Deputy Flood Warden to undertake a controlled evacuation to higher ground
- Wait at the designated SIP location
- Review SES/BOM weather/flood warnings and Flood evacuation warnings/orders
- Maintain regular communication with staff and students providing updated to the situation.

### 8.3 EVACUATION OUTSIDE NORMAL OPERATING HOURS

Should flooding occur outside normal hours and the school facilities are being used, then:

- Maintain register of all persons on-site;
- The Chief and Deputy Flood Warden should nominate the Flood Wardens to receive all text messages and notifications for the site in after-hour events:
- Sound evacuation tone and make announcements
- Direct everyone to Emergency Meeting Point
- Roll call to ensure everyone is accounted for;
- Chief and Deputy Flood Warden or Flood Wardens to control evacuation to higher ground
- Wait at the designated SIP location
- Review SES/BOM weather/flood warnings and Flood evacuation warnings/orders
- Maintain regular communication with staff and students providing updated to the situation.

### 8.4 EMERGENCY SERVICES ATTENDING SITE

If the NSE SES and/or Emergency services attend site they are to assume control from the Chief and Deputy Fire Warden. Once this has occurred, the SES/Emergency Services are responsible for all operations.

A Flood Evacuation Plan has been nominated in Appendix A. This is to be reviewed regular by all personnel highlighted in Section 7.1

## 9 AFTER A FLOOD EVENT

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Once a Final Flood Warning or SES All Clear message/instructions has been received, then measures can be undertaken to get back to normal service.

### 9.1 SCHOOL PICK UP

Parents are to collect students from the following collection points:

#### **Carlingford West Public School**

Students to be collected at the drop off/pick up collection point off Felton Road, to the east of the site.

#### **Cumberland High School**

Students to be collected at the drop off/pick up collection point off Dunmore Avenue Road, to the east of the site.

### 9.2 FLOOD CLEAN UP

Once the flood has been subsided and it is safe to access all parts of a school, an inspection of the school should be undertaken. In the event of any damage to buildings and infrastructure, advice should be sought from a suitably qualified structure engineer, prior to further uses. A thorough check of all services such as electricity, sewer, water and gas should be undertaken by a suitably qualified person.

During any clean up, appropriate personal protective equipment should be made available and used.

## 10 LIMITATIONS AND REVISION OF THE FLOOD RISK MANAGEMENT PLAN

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This report, along with the Flood Evacuation Plan, shown in Appendix A, addresses the flood impacts of the new building works to CHS and CWPS, based on the modelling by Aurecon Civil and how Councils' Flood Planning Controls are met, along with recommendations for flood response to assist with the schools own FEMP

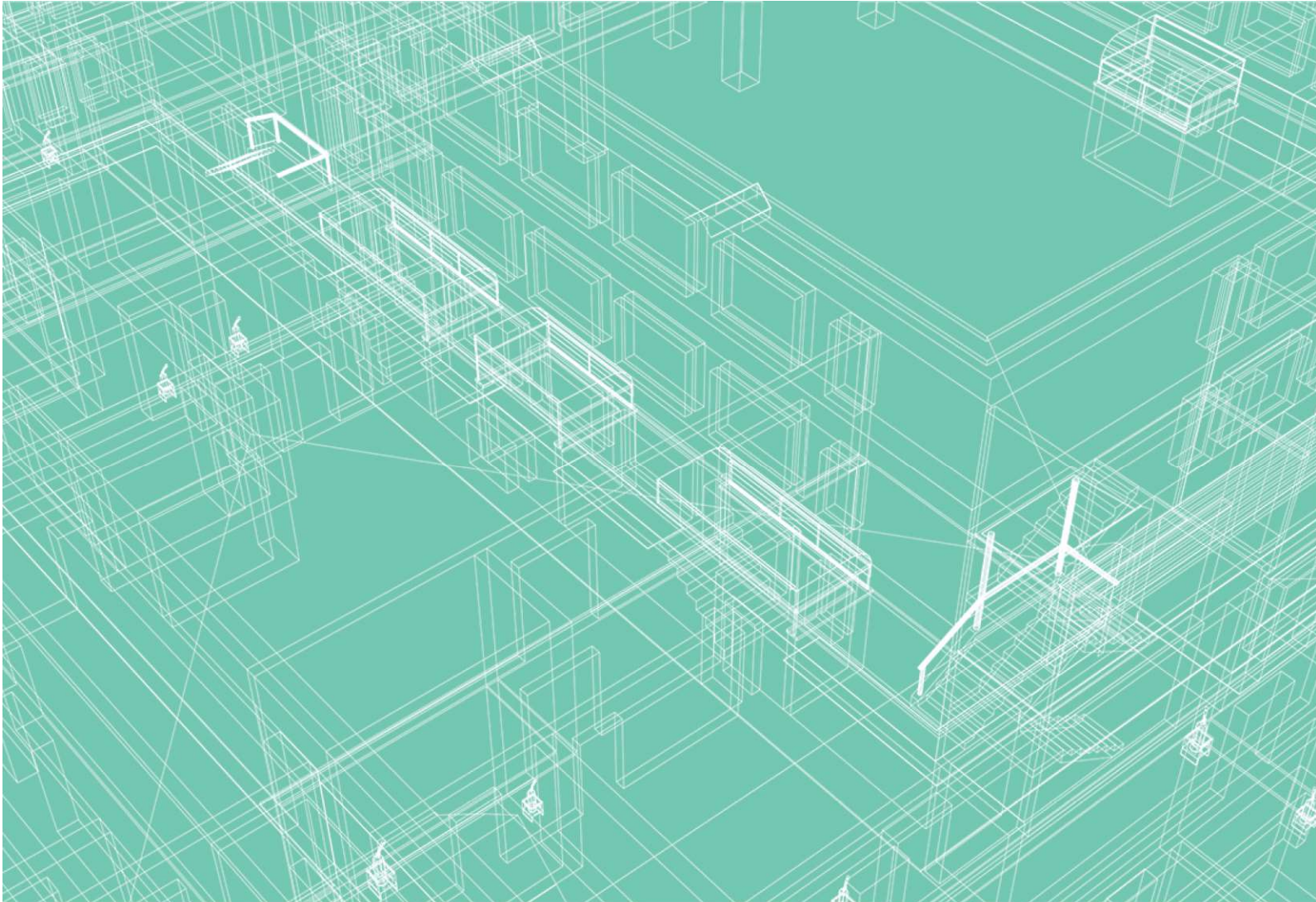
The evacuation strategies should be considered as a guide and should be integrated into the school's FEMP. It does not cover students and staff individual safe travel arrangements on their way to and from school when flooding outside the school site occurs, resulting in road closures.

It is the NSW DoE and Communities responsibility to ensure the School's FEMP is currently updated as necessary to be in line with relevant standards, directorate, legislation and the Regional's State Emergency Plan to ensure the health, safety and welfare of all staff, students and others.

## 11 APPENDICIES

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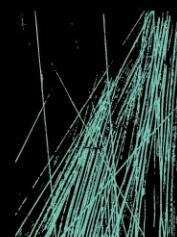
Appendix A - Flood Risk Management Plan



FLOOD RISK MANAGEMENT PLAN SSSA REPORT

**CARLINGFORD WEST PUBLIC SCHOOL &  
CUMBERFORD HIGH SCHOOL UPGRADES**

59-73 Felton Road and 183 Pennant Hills Road, Carlingford



**JHA**

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## DOCUMENT CONTROL SHEET

Project Number	220083
Project Name	Carlingford West Public School & Cumberland High School Upgrades
Description	Flood Risk Management Plan SSDA Report
Key Contact	Matthew Beament

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# 1 EXECUTIVE SUMMARY

JHA Consulting Engineers has been engaged by NSW Department of Education (DoE) to provide a Flood Management Risk Plan (FRMP) to accompany a State Significant Development Application (SSDA) for the proposed upgrade works to Carlingford West Public School (CWPS) and Cumberland High School (CHS).

The Report has been prepared to address part item 14 of the Secretary's Environmental Assessment Requirements (SEARS), issued on the 23<sup>rd</sup> May 20022, specifically in relation to flood evacuation strategies and mitigation measures and should be read in conjunction with the Aurecon Civil Flood Impact and Risk Assessment report (ref:521485, dated 19.08.2022).

Table 1 - SEARs Report Requirement

SSDA Deliverable	Text
14. Flooding Risk	<ul style="list-style-type: none"><li>Identify any flood risk on site having regard to adopted flood studies, the potential effects of climate change and any relevant provision of the NSW Floodplain Development Manual.</li><li>Assess the impacts of the development, including any changes to flood risk on-site or off-site, and detail design solutions and operational procedures to mitigate flood risk where required.</li></ul>

The proposed development involves upgrades to Carlingford West Public School (CWPS) and Cumberland High School (CHS), collectively referred to as the Cumberland Cluster.

The upgrades to CWPS will cater for a total student population of 1,610 and include the construction of four new buildings in the north-west portion of the site known as buildings W, X, Y and Z. These buildings range from one to three storeys and contain a variety of uses including general learning spaces, library, amenities, staff rooms and combined canteen, out of school hours care (OSHC), gym and hall. The construction of a new kiss and ride off Felton Road West and a waste loading area, On-Site Detention (OSD) tank and staff carpark.

The works proposed at CHS will cater for a total student population of 2,040 and include the construction of three new buildings in the south-east portion of the site known as buildings X, Y and Z. These buildings range from one to five storeys and contain a variety of uses including a general and specialists learning spaces, library, administration, staff and student amenities, and combined lecture theatre, movement space, canteen, stage and gym/hall. The works also propose the construction of a new one-way bus link road and waste loading area from Dunmore Avenue to Pennant Hills Road.

Associated civil works and landscape works are proposed across both school sites including tree removal and planting and new play areas.

Based on the Council flood maps and the findings outlined in the Flood Impact and Risk Assessment report, the site is subject to flooding. In the existing case the site is subject to an overland flow from between Blenheim Road and Dunmore Avenue to the east, travelling through the low point of the site to Felton Road to the west. The flooding extends over the existing playing field. There is also a smaller overland flow path from the sag point of Pennant Hills Road to the south, which runs to the north to join the flooding occurring in the playing fields.

In the proposed case, the flooding extends further within the playing areas. Additionally, increases in flood levels are also shown to the south of the proposed Cumberland High school Building X. However, the flood engineer has shown that surface levels have not been finalised in these areas, with flooding unlikely presenting a significant hazard once finalised.

The proposed building finished floor levels are to be located above the PMF levels, as outlined in the Hills Shire Council Flood planning controls.

## 2 INTRODUCTION

### 2.1 DESCRIPTION OF THE PROPOSED DEVELOPMENT

The proposed development involves upgrades to Carlingford West Public School (CWPS) and Cumberland High School (CHS), collectively referred to as the Cumberland Cluster.

The upgrades to CWPS will cater for a total student population of 1,610 and include the construction of four new buildings in the north-west portion of the site known as buildings W, X, Y and Z. These buildings range from one to three storeys and contain a variety of uses including general learning spaces, library, amenities, staff rooms and combined canteen, out of school hours care (OSHC), gym and hall. The construction of a new kiss and ride off Felton Road West and a waste loading area, On-Site Detention (OSD) tank and staff carpark.

The works proposed at CHS will cater for a total student population of 2,040 and include the construction of three new buildings in the south-east portion of the site known as buildings X, Y and Z. These buildings range from one to five storeys and contain a variety of uses including a general and specialists learning spaces, library, administration, staff and student amenities, and combined lecture theatre, movement space, canteen, stage and gym/hall. The works also propose the construction of a new one-way bus link road and waste loading area from Dunmore Avenue to Pennant Hills Road.

Associated civil works and landscape works are proposed across both school sites including tree removal and planting and new play areas as well as public domain upgrades by widening nearby footpaths.

### 2.2 ANCILLARY WORKS SUBJECT TO SEPARATE APPROVAL

Under *State Environmental Planning Policy (Transport and Infrastructure) 2021 (T and I SEPP)*, certain works can be undertaken as exempt development (no planning approval required), complying development (complying development certificate issued for works through a private certifier or Council) or development permitted without consent (Part 5 approval). As shown in Figure X and detailed below, the following works are being undertaken separate to this SSDA and do not form part of the scope of works:

*Complying Development Certificate (CDC):* Include the location of temporary demountables. Refurbishment of CWPS buildings A and B for administration and staff purposes. Demolition of existing CWPS buildings C and J. Demolition of existing CHS buildings B and F.

*Exempt Development:* Include two new sports courts for CWPS and four new sports courts for CHS.

*Review of Environmental Factors (REF) Part 5 Approval:* Include a new kiss n ride link road from Dunmore Avenue to Blenheim Road with a connecting staff carparking and OSD tank. Key details include:

- Demolition of existing structures, including sports courts, a bus shelter and retaining walls,
- Removal of trees in the area around the car park and pruning of trees along the eastern boundary,
- Construction of new single lane one way road adjacent to the eastern boundary. Vehicles will enter the road via the Dunmore Avenue turning head and exit onto Blenheim Road,
- A 1.8m - 2.5m fence along the eastern boundary and access handle at Blenheim Road. The fence will function as a security and acoustic barrier,
- Adjustments to the turning head within the site adjoining Dunmore Avenue to create the new road connection,
- Public domain and infrastructure adjustments to Blenheim Road including new vehicle cross over, relocation of a power pole and relocation of a drainage pit,
- New stormwater infrastructure including an on-site detention tank below the car park,
- Renewal and extension of the existing staff carpark, including relocating the entry driveway to create a connection with the new road, and
- Landscaping and lighting infrastructure.

REF Part 5 Approval: Refurbishment of CHS building E, A, D, C and G.

The future appointed main works contractor will decommission services and temporary demountables to allow for them to be removed off site by others at the end of the project, with make good of the school oval once demountables are removed to be completed by the main works contractor shortly thereafter.

the school oval once demountables are removed to be completed by the main works contractor shortly thereafter.



Figure 1 – Works Outside of SSSA Approval (Source: Woods Bagot)

### 2.2.1 SITE DESCRIPTION

The site is located at 59-73 Felton Road and 183 Pennant Hills Road, Carlingford and is legally described as shown in Table 2

Table 2 – Site Descriptions and Areas

SCHOOL	LOT AND DP	LOT AREA
CWPS	Lot 1 DP 235625	0.4698ha
	Lot 2 DP 235625	2.363ha
	Lot 5 DP 235625	0.3958ha
CHS	Lot 3 DP 235625 (part CWPS)	4.736ha
	Lot 4 DP 235625	1.421ha

An aerial view of the site is provided in Figure 2. The site includes two schools, CWPS in the north of the site and CHS to the south. The school sites are separated by playing grounds in the centre of the site and the schools operate independently. The surrounding area is predominantly characterised by low density residential dwellings.



Figure 2 - Aerial view, site outlined red (Source: Nearmap)

The main CWPS pedestrian and bicycle access points are Felton Road East and Felton Road West. A secondary pedestrian access from the north is also available from Hilar Avenue. From the south, pedestrian can also access CWPS via CHS from Pennant Hills Road, Dunmore Avenue and Blenheim Road

The main CHS pedestrian and bicycle access points are Pennant Hills Road and Dunmore Avenue. Secondary access is also from Felton Road East, Felton Road West and Hilar Avenue.

### 3 SEARS REQUIREMENTS

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The Cumberland Cluster SSDA Report is required by the Secretary's Environmental Assessment Requirements (SEARs). Table 3 identifies the relevant SSDA requirement/s and corresponding reference/s within this report.

Table 3 – SEARs Report Requirement

SSDA Deliverable	Text
14. Flooding Risk	<ul style="list-style-type: none"><li>▪ Identify any flood risk on site having regard to adopted flood studies, the potential effects of climate change and any relevant provision of the NSW Floodplain Development Manual.</li><li>▪ Assess the impacts of the development, including any changes to flood risk on-site or off-site, and detail design solutions and operational procedures to mitigate flood risk where required.</li></ul>

The flood risk management report has been written specifically in relation to flood evacuation strategies and mitigation measures and should be read in conjunction with the Aurecon Civil Flood Impact and Risk Assessment report.

## 4 BACKGROUND INFORMATION

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### 4.1 REFERENCE DOCUMENTS

This report has been based on the following documents:

- Architectural drawings by Woods Bagot
- Survey by Project Surveyors (Ref: BD4616, dated 26<sup>th</sup> November 2019)
- The Hills Shire Development Control Plan (DCP) 2012 Part C Section 6: Flood Controlled Land
- NSW Floodplain Development Manual (April 2005)
- City of Parramatta Council Flood Maps (Source: The Hills Shire Council Draft Overland Flow Study, 2015)
- Cumberland Cluster Flood Impact and Risk Assessment Report By Aurecon Civil (ref: 521485, dated 19<sup>th</sup> August 2022)

### 4.2 EXISTING FLOOD STUDIES

A number of flood studies have been undertaken for the school and are outlined below:

#### **The Hills Shire Council Draft Overland Flow Study (2014)**

Hills Shire Council commissioned Catchment Simulation Solutions to undertake an overland flow study for 68km<sup>2</sup> area. Flood mapping, specific to the school, has been provided, showing the 1% Average Exceedance Probability (AEP) flood extents and depths extending into the site

#### **Civil Concept Design Report by Stantec (Carlingford West Public School and Cumberland High School Upgrades) - 2020**

As part of the Civil Concept Design Report, Stantec provided a high-level assessment of the flood impacts of the new school upgrades, although no formal flood modelling was undertaken.

#### **Cumberland High School – Flood Assessment Technical Note (2022)**

To support the car park and access road, entered off Dunmore Avenue and/or Blenheim Road to the east, WSP were appointed by Taylor Construction to perform modelling aimed at identifying the potential flood impacts of the CHS early works upgrades.

#### **Flood Impact and Risk Assessment Report by Aurecon Civil (2022)**

As part of the Cumberland Cluster SSDA application, Aurecon Civil have prepared a Flood Impact and Risk Assessment report.

The finding of the report has generally been used to assist with the writing of this report.

## 5 FLOOD BEHAVIOUR

### 5.1 EXISTING CASE FLOOD CONDITIONS

The findings of the report highlight that there is a major overland flow path coming into the eastern part of the site from Dunmore Avenue carrying external overland flow through the site. This flow path flows from east to west through the Cumberland Cluster playing fields which is located to the south of CWPS buildings and to the north of the CHS buildings. CWPS local surface runoff generally flows west to east. CHS local surface runoff generally flows south to north, and an overland flow path exists in the eastern part of CHS which drains to the playing fields to the north.

The report also indicated that along the eastern boundary and within the playing fields area, the existing Flood Hazard Condition is identified as H3 which is deemed unsafe for all vehicles, children and elderly

### 5.2 PROPOSED CASE FLOOD CONDITIONS

In the 1% AEP flood event (equivalent to the 100 year ARI outlined in Council's flood planning controls), the depths in the playing fields area in the eastern portion of the site have increased due to lowering of the ground in the design scenario in this region by approximately 0.3m in order to tie into the recently developed games courts in the western playing field. Furthermore, there are several areas that show localised ponding in the vicinity of the proposed buildings.

It should be noted that these additional areas of ponding occurring in the proposed case, are surrounding the new CHS and CWPS school buildings. This is due to a flat design area, which can drain via a local overland flow path. However, the available flow path is relatively narrow, compared to the flood model resolution. In general, Aurecon Civil recommend that as part of detailed design these areas of isolated modelled ponding be investigated, and it be ensured that adequate flow paths and drainage are provided.

For the proposed 1% AEP Flood Hazard conditions, the extents of the H3 hazard in the central eastern part of the site has been increased in area.

In the PMF event, flooding extends into the CHS site, adjacent to the proposed Buildings X, Y and Z. There are also areas of ponding occurring in and around CWPS, but as raised above, this is likely due to the resolution of the flood model and should be resolved during detailed design.

### 5.3 COUNCIL'S FLOOD PLANNING CONTROLS

The Hills Shire Council DCP identifies control for flood-controlled land with the following aims (extracted from Part C, Section 6 – Flood Controlled Land:

- Increasing public awareness of the hazard and extent of land affected by all potential floods greater than the 100-year average recurrence interval (ARI)\*:
- Informing the community of Council's policy for the use and development:
- Managing the risk to human life and damage to property caused by flooding through controlling development on land affected by potential floods; and
- Minimising the potential impact of the development and other activity upon the amenity, aesthetic, recreational and ecological value of the waterway corridors and the surrounding environment.

\*The 100-year ARI flood event is equivalent to the 1% AEP Flood event and is a change of terminology introduced in the Australian Rainfall and Runoff (2016) guidelines.

To define the relevant flood controls, the site is classified as an educational establishment and has 'sensitive uses facilities'

### 5.3.1 FLOOD PLANNING CONTROLS

The following flood planning controls, shown in Table 4, are relevant for sensitive use developments

**Table 4 – Sensitive Uses Flood Planning Controls**

Ref:	Council Flood Planning Control	Relevant to Proposed SSDA Works
a	No development is to occur in or over a floodway area, a flowpath or a high hazard area (as defined in the FDM) generated by flooding up to FPL4 (Probable Maximum Flood)	Yes. Proposed buildings are to be located away from floodway areas, flowpaths and high hazard areas
b	Habitable Floor Levels to be no lower than the FPL4	Yes
c	Non-habitable floor levels to be no lower than FPL3 (100-year ARI + 0.5m freeboard, equivalent to 1% AEP + 0.5M) unless justified by a site specific assessment	Yes
d	All structures to have flood compatible building components below FPL4	Yes
e	Applicant to demonstrate can withstand the forces of floodwater, debris and buoyancy up to and including FPL4	Yes
f	The minimum surface level of open car parking spaces or carports shall be as high as practical and not below FPL1 (20-year ARI, equivalent to 5% AEP)	Yes
g	Garages or enclosed car parking must be protected from inundation by flood waters up to the FPL2 (100-year ARI). Where 20 or more vehicles are potentially at risk, protection shall be provided to FPL3	No. No enclosed garage parking proposed
h	Where the level of the driveway providing access between the road and parking space is lower than 0.3m below FPL2, the following condition must be satisfied – when the flood levels reach FPL2, the depth of inundation on the driveway shall not exceed: <ul style="list-style-type: none"> <li>- The depth of the road: or</li> <li>- The depth of the car parking space</li> </ul>	Yes
l	Reliable access for pedestrian or vehicles is required from the building, commencing at a minimum level equal to the lowest habitable floor level to a refuge (or Shelter In Place (SIP)) area above FPL4. In the case of alterations or additions to an existing development, this may require retro-fitting the existing structures if required to support a refuge area above FPL4.	
j	Applicant to demonstrate that area is available to store goods above FPL4.	Yes
k	Materials which may cause pollution or are potentially hazardous during any flood must not be stored externally below FPL4	Yes
l	A site Flood Emergency Response Plan should relate to the land use and site conditions in conjunction with flood behaviour up to the FPL4	Yes

	<p>expected to be experienced at the site. The plan should consider the following specific actions:</p> <ul style="list-style-type: none"> <li>- Preparing for a flood;</li> <li>- Responding when a flood is likely;</li> <li>- Responding during a flood; and</li> <li>- Recovery after a flood.</li> </ul>	
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### 5.3.1 HOW THE PROPOSED DEVELOPMENT ADDRESSES CONTROLS

Based on the flood impact and risk assessment report and additional extracts both schools have been assessed as below.

#### Carlingford West Primary School

The proposed Buildings W, X, Y and Z are located away from the main overland flow path crossing the site. However, the proposal has been assessed against the flood planning controls shown in Table 5, with extracts of the 1% AEP and PMF flood levels, taken from the Flood Impact and Risk Assessment report shown in Figure 3 and Figure 4, respectively.

**Table 5 – Carlingford West Public School Flood Planning Controls**

Ref:	Council Flood Planning Control	Proposed requirements to meet Flood Planning Controls
a	No development is to occur in or over a floodway area, a flowpath or a high hazard area (as defined in the FDM) generated by flooding up to FPL4 (Probable Maximum Flood)	Buildings W, X, Y and Z shall be located away from the main overland flow path and High Hazard category
b	Habitable Floor Levels to be no lower than the FPL4	<p>Yes.</p> <p>Building W First min FFL = 89.160m AHD*</p> <p><b>Estimated PMF level = 89.160m AHD</b></p> <p>Building W Ground min FFL = 87.180m AHD*</p> <p><b>Estimated PMF level = 87.180m AHD</b></p> <p>Building X, Y and Z Ground min FFL = 87.180m AHD*</p> <p><b>Estimated PMF level = 87.180m AHD</b></p> <p>Building Y and Z Lower Ground min FFL = 81.610m AHD*</p> <p><b>Estimated PMF level = 81.610m AHD</b></p> <p>(*These are the minimum finished floor levels to meet Councils flood planning levels. Refer to architect's documentation for further details).</p>
c	Non-habitable floor levels to be no lower than FPL3 (100-year ARI + 0.5m freeboard) unless justified by a site specific assessment	N/A Buildings outside 100year ARI (1% AEP flood) extents* TBC by Aurecon Civil
d	All structures to have flood compatible building components below FPL4	Yes

e	Applicant to demonstrate can withstand the forces of floodwater, debris and buoyancy up to and including FPL4	Yes. To be confirmed by Structural Engineer
f	The minimum surface level of open car parking spaces or carports shall be as high as practical and not below FPL1 (20-year ARI)	N/A. Car park not impacted by 20 year ARI (5% AEP) flood extents
l	Reliable access for pedestrian or vehicles is required from the building, commencing at a minimum level equal to the lowest habitable floor level to a refuge (or Shelter In Place (SIP)) area above FPL4. In the case of alterations or additions to an existing development, this may require retro-fitting the existing structures if required to support a refuge area above FPL4.	Since the buildings are to be located at a level equivalent or above the PMF, these buildings can be used as a refuge during the storm event
j	Applicant to demonstrate that area is available to store goods above FPL4.	Yes
k	Materials which may cause pollution or are potentially hazardous during any flood must not be stored externally below FPL4	Yes. The floor levels listed above are above the PMF level
l	<p>A site Flood Emergency Response Plan should relate to the land use and site conditions in conjunction with flood behaviour up to the FPL4 expected to be experienced at the site. The plan should consider the following specific actions:</p> <ul style="list-style-type: none"> <li>- Preparing for a flood;</li> <li>- Responding when a flood is likely;</li> <li>- Responding during a floor; and</li> <li>- Recovery after a flood.</li> </ul>	Refer to Section 5-8, as well as drawing C100



Figure 3 – 1% AEP Flood Levels and Extents for CWPS site



Figure 4 – PMF Levels and Extents for CWPS site.

## Cumberland High School

The proposed Buildings, X, Y and Z are located away from the main overland flow path crossing the site. However, the proposal has been assessed against the flood planning controls shown in Table 6, with extracts of the 1% AEP and PMF flood levels, taken from the Flood Impact and Risk Assessment report shown in Figure 5 and Figure 6 respectively.

**Table 6 - Cumberland High School Flood Planning Controls**

Ref:	Council Flood Planning Control	Proposed requirements to meet Flood Planning Controls
a	No development is to occur in or over a floodway area, a flowpath or a high hazard area (as defined in the FDM) generated by flooding up to FPL4 (Probable Maximum Flood)	Buildings X, Y and Z shall be located away from the main overland flow path and High Hazard category
b	Habitable Floor Levels to be no lower than the FPL4	Yes. Building X Ground min FFL = 87.500m AHD* <b>Estimated PMF level = 87.500 AHD</b> Building Y Lower Ground min FFL = 83.710m AHD* <b>Estimated PMF level = 83.710m AHD</b> Building Z Lower Ground min FFL = 83.710m AHD* <b>Estimated PMF level = 83.710m AHD</b> (*These are the minimum finished floor levels to meet Councils flood planning levels. Refer to architect's documentation for further details).
c	Non-habitable floor levels to be no lower than FPL3 (100-year ARI + 0.5m freeboard) unless justified by a site specific assessment	Buildings to be outside 100year ARI (1% AEP flood) extents.
d	All structures to have flood compatible building components below FPL4	The south eastern wall of Building X shall be made of flood compatible materials to a height of 87.800m AHD
e	Applicant to demonstrate can withstand the forces of floodwater, debris and buoyancy up to and including FPL4	Yes. To be confirmed by Structural Engineer
f	The minimum surface level of open car parking spaces or carports shall be as high as practical and not below FPL1 (20-year ARI)	The proposed car park works are to be undertaken under a REF planning pathway, not the SSDA. However, the finished car levels should be reviewed against the flood maps to confirm compliancy
h	Where the level of the driveway providing access between the road and parking space is lower than 0.3m below FPL2, the following condition must be satisfied – when the flood levels reach FPL2, the depth of inundation on the driveway shall not exceed:	The 1% AEP flood maps show sporadic flooding along the proposed route of the bus link road. This occurs at the entry off Dunmore Road East. Generally flood depths are less than 0.3m along the full width of road

	<ul style="list-style-type: none"> <li>- The depth of the road: or</li> </ul> <p>The depth of the car parking space</p>	The flood model shall be refined during detailed design to ensure the flood controls are met.
l	Reliable access for pedestrian or vehicles is required from the building, commencing at a minimum level equal to the lowest habitable floor level to a refuge (or Shelter In Place (SIP)) area above FPL4. In the case of alterations or additions to an existing development, this may require retrofitting the existing structures if required to support a refuge area above FPL4.	Since the buildings are to be located at a level equivalent or above the PMF, these buildings can be used as a refuge during the storm event
j	Applicant to demonstrate that area is available to store goods above FPL4.	Yes. The store area serving Building Y shall be nominated as 83.75m AHD, equivalent to the PMF level
k	Materials which may cause pollution or are potentially hazardous during any flood must not be stored externally below FPL4	Yes. The store area serving Building Y shall be nominated as 83.75m AHD, equivalent to the PMF level
l	<p>A site Flood Emergency Response Plan should relate to the land use and site conditions in conjunction with flood behaviour up to the FPL4 expected to be experienced at the site. The plan should consider the following specific actions:</p> <ul style="list-style-type: none"> <li>- Preparing for a flood;</li> <li>- Responding when a flood is likely;</li> <li>- Responding during a flood; and</li> <li>- Recovery after a flood.</li> </ul>	Refer to Section 5-8, as well as drawing C100

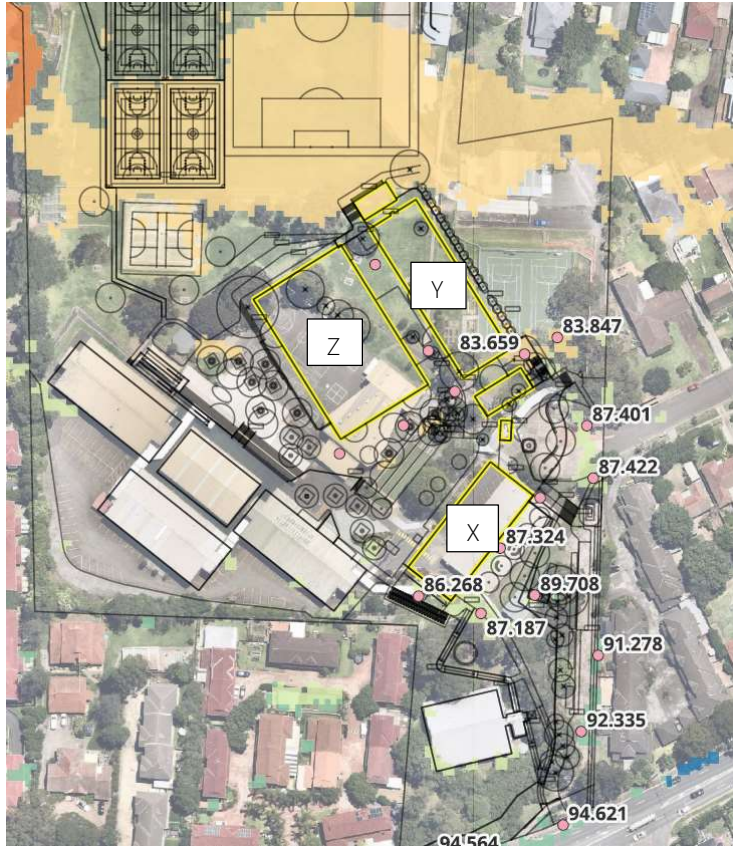


Figure 5 – 1% AEP Levels and Extents for CHS site.



Figure 6 – PMF Flood Levels and Extents for CHS site.

## 6 FLOOD AND EVACUATION WARNINGS

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### 6.1 EARLY WARNING MEASURES

A network of rainfall gauges are maintained throughout the greater Sydney area, These provide information to the Bureau of Meteorology (BoM) as a source of information to assist with their flood warning system.

The BoM issues five warnings the following sources:

- Local Radio
- Television
- Websites ([www.bom.gov.au/nsw/warnings](http://www.bom.gov.au/nsw/warnings))

In addition to this the NSW State Emergency Services (SES) may issue warnings in the form of:

- Bulletins
- Evacuation Warnings or Evacuation Orders

Additional measures to assist the school of forthcoming flooding can also include installation of a dipstick flood warning system, along the western side of the playing fields to alert designated staff when flooding has reached a certain level. It is also recommended that the school register for automatic texts and email notifications from the Early Warning Network (<https://www.earlywarningnetwork.com.au>) who can provide site specific warnings. City of Parramatta also provide a free flood warning system which the school can sign up to. However, the school is currently located outside any of their defined early warning areas

### 6.2 WARNING TYPES

**Severe Weather Warning** – Given by the BoM, and are provided for potentially hazardous or dangerous weather that is not solely related to severe thunderstorm, 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

**Severe Thunderstorm Warning** – Given by BoM to alert communities of the threat of dangerous thunderstorms defined by large hail, damaging or destructive winds, heavy rainfall which may cause flash flooding and tornados.

**Flood Watch** – Given by BoM to provide early advice of a developing situation that may lead to flooding. A Flood Watch is not a warning of imminent flooding.

**Flood Warnings** – Given by BoM; with defined minor, moderate and major flooding indicated. The warnings are regularly updated and define water levels and whether the flood levels are rising or falling

### 6.3 EVACUATION ORDERS

**Evacuation Warning** - SES may issue an evacuation warning to indicate that you should get prepared to evacuate. The school should monitor the situation and be prepared to evacuate when instructed to do so.

**Evacuation Order** - SES will issue an evacuation order to immediately evacuate at risk sections of the community from a flood threatened area and advises the safest actions to take.

**All Clear** - SES will issue an alle clear to advise the evacuated community that it is safe for people to return to the area and any residual risks.

## 7 FLOOD RESPONSE PREPARATION

A suitable Flood Emergency Response Plan (FERP) should be put in place by the school and address the safety and wellbeing of the school users. This should be undertaken in accordance with the recommendations of the report

### 7.1 FLOOD REPNSE PERSONNEL

The assumed key personal involved in the FERP below in Table 7. The below should be used as a guide with the DoE and CWPS and CHS to confirm.

**Table 7 – Flood Response Personnel**

Personnel	Location	Responsibilities
DoE WHS Directorate	TBC	Coordinate preparation of school specific Emergency Management Plan implementing recommendations of this report
Chief Flood Warden	On-site	<p>Coordinate Flood evacuation drills</p> <p>Provide and coordinate flood response emergency induction training for all personnel</p> <p>Monitor weather daily for upcoming extreme rainfall events</p> <p>Receive notifications from Early Warning Network and Dipstick Flood Alert System</p>
Deputy Chief Flood Warden	On-site	<p>Undertake Chief Flood Warden duties when Chief Warden unavailable</p> <p>Receive notifications from Early Warning Network and Dipstick Flood Alert System</p>
School Wardens	On-site	<p>Receive notifications from Early Warning Network and Dipstick Flood Alert System</p> <p>Assist Chief Wardens with evacuations</p>
First Aid Officer	On-site	<p>Prepare and maintain Flood Emergency Kit</p> <p>Manage individual Health Care Plans for students and staff as required</p> <p>Coordinate assistance for staff and students with mobility difficulty</p>
Staff	On-site	<p>Maintain calm and direct students through evacuation process.</p> <p>Follow all directions provided by Chief Flood Warden</p>
Emergency Meeting Place for Cumberland High School	N/A Teachers and students to remain within Buildings X, Y and Z	
Primary SIP for Cumberland High School	Teachers and students to SIP within Buildings X, Y and Z	

Emergency Meeting Place for Carlingford West Primary School	N/A Teachers and students to remain within Buildings W, X, Y and Z
Primary SIP for Carlingford West Primary School	Teachers and students to SIP within Buildings W, X, Y and Z

## 7.2 FLOOD EMERGENCY KIT

A Flood emergency kit should be prepared and stored in all areas of SIP, prior to the flood event taking place. This should be regularly checked and maintained by the Chief Flood Warden and should consist of the following:

- Radio with spare batteries;
- Torch with spare batteries;
- First aid kit and other medicines;
- Candles and waterproof matches
- Waterproof bags
- A copy of the school's Emergency management Plan; and
- Emergency contact numbers

## 7.3 REGULAR TRAINING EXERCISES

It is recommended that the school conduct regular training exercises, including the participation of the local emergency services. Regularly feedback should be provided and the FERP updated to implement areas of improvement

## 7.4 MAINTENANCE AND OPERATION PROGRAMME

To assist with limiting opportunities of blockages/debris occurring the site stormwater system. There should be a regular maintenance program in place to ensure that the stormwater systems are regularly cleared and maintained.

The location of storage of hazardous materials/substances should be reviewed and relocated away from any estimated locations of flow paths and flood plains.

All portable machinery (ie lawn mowers, cleaning apparatus) should be relocated and stored at higher levels away from the flood extents.

In addition, detailed documentation of the event, e.g. maintaining a log book documenting alarm stages, internal communication and actions, photos of measures taken on site and of the event before, upon and arrival onsite will not only facilitate the post-event loss adjustment exercise but also support the emergency response team and site management in improving the FERM.

## 8 FLOOD RESPONSE ACTIONS

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### 8.1 CANCELLATION OF SCHOOL

The Chief and Deputy Flood Warden should review all weather forecasts, SES and BOM warnings and have a plan in place to advise the school users of cancellations. In addition, they should also consider:

- Securing floatable objects;
- Turning off mains power, water and gas,
- Relocating hazardous materials/substances away from estimate flood extents; and
- Ensuring emergency kits are available at the nominated evacuation/SIP points.

### 8.2 EVACUATION OF NORMAL OPERATING HOURS

Once BOM/SES have provided a flood warning for the area has been issued and/or the dipstick Flood Alert System has been triggered, the following needs to be undertaken:

- Sound evacuation tone and make announcements;
- Chief and Deputy Flood Warden attends the Emergency Meeting Point
- Staff direct all students/visitors to the Emergency Meeting Point
- Flood Wardens to enter and ensure all affected buildings are clear
- Roll call to ensure everyone is accounted for;
- Chief and Deputy Flood Warden to undertake a controlled evacuation to higher ground
- Wait at the designated SIP location
- Review SES/BOM weather/flood warnings and Flood evacuation warnings/orders
- Maintain regular communication with staff and students providing updated to the situation.

### 8.3 EVACUATION OUTSIDE NORMAL OPERATING HOURS

Should flooding occur outside normal hours and the school facilities are being used, then:

- Maintain register of all persons on-site;
- The Chief and Deputy Flood Warden should nominate the Flood Wardens to receive all text messages and notifications for the site in after-hour events:
- Sound evacuation tone and make announcements
- Direct everyone to Emergency Meeting Point
- Roll call to ensure everyone is accounted for;
- Chief and Deputy Flood Warden or Flood Wardens to control evacuation to higher ground
- Wait at the designated SIP location
- Review SES/BOM weather/flood warnings and Flood evacuation warnings/orders
- Maintain regular communication with staff and students providing updated to the situation.

### 8.4 EMERGENCY SERVICES ATTENDING SITE

If the NSE SES and/or Emergency services attend site they are to assume control from the Chief and Deputy Fire Warden. Once this has occurred, the SES/Emergency Services are responsible for all operations.

A Flood Evacuation Plan has been nominated in Appendix D. This is to be reviewed regular by all personnel highlighted in Section 7.1

## 9 AFTER A FLOOD EVENT

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Once a Final Flood Warning or SES All Clear message/instructions has been received, then measures can be undertaken to get back to normal service.

### 9.1 SCHOOL PICK UP

Parents are to collect students from the following collection points:

#### **Carlingford West Public School**

Students to be collected at the drop off/pick up collection point off Felton Road, to the east of the site.

#### **Cumberland High School**

Students to be collected at the drop off/pick up collection point off Dunmore Avenue Road, to the east of the site.

### 9.2 FLOOD CLEAN UP

Once the flood has been subsided and it is safe to access all parts of a school, an inspection of the school should be undertaken. In the event of any damage to buildings and infrastructure, advice should be sought from a suitably qualified structure engineer, prior to further uses. A thorough check of all services such as electricity, sewer, water and gas should be undertaken by a suitably qualified person.

During any clean up, appropriate personal protective equipment should be made available and used.

## 10 LIMITATIONS AND REVISION OF THE FLOOD RISK MANAGEMENT PLAN

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This report, along with the Flood Evacuation Plan, shown in Appendix D, addresses the flood impacts of the new building works to CHS and CWPS, based on the modelling by Aurecon Civil and how Councils' Flood Planning Controls are met, along with recommendations for flood response to assist with the schools own FEMP

The evacuation strategies should be considered as a guide and should be integrated into the school's FEMP. It does not cover students and staff individual safe travel arrangements on their way to and from school when flooding outside the school site occurs, resulting in road closures.

It is the NSW DoE and Communities responsibility to ensure the School's FEMP is currently updated as necessary to be in line with relevant standards, directorate, legislation and the Regional's State Emergency Plan to ensure the health, safety and welfare of all staff, students and others.

## 11 APPENDICIES

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Appendix A - Flood Risk Management Plan