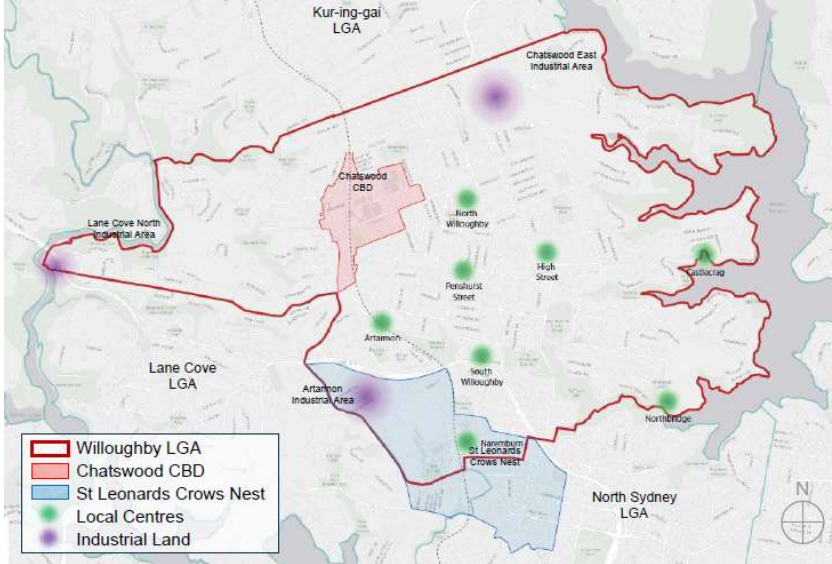


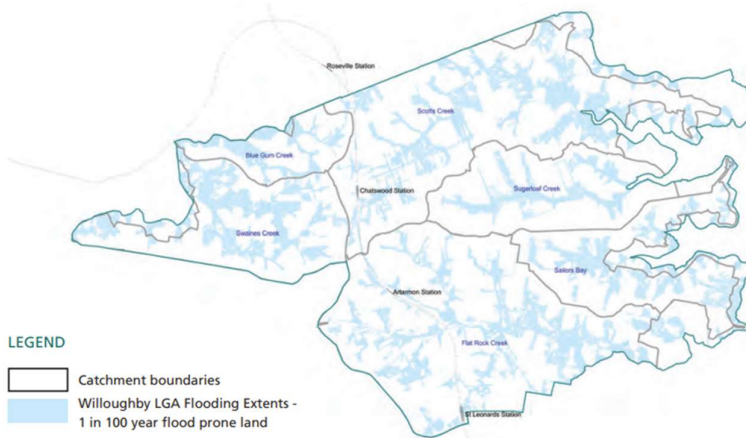
Planning Proposal – Independent Flooding Advice

Planning Proposal Details	
Planning Proposal	Willoughby Comprehensive Local Environmental Plan 2023
No.	PP-2021-6242
Proponent	Willoughby City Council
Local Government Area	Willoughby
Local Environmental Plan/Other Relevant EPI	<i>Willoughby Local Environmental Plan 2012</i> <i>Willoughby Development Control Plan</i>
Project summary	<p>The planning proposal aims to establish controls to deliver on the vision and objectives of Council's Local Strategic Planning Statement (LSPS, 2020), bringing together recommendations from a number of other planning studies as well. It involves updating a large number of provisions in the <i>Willoughby Local Environmental Plan 2012</i> (WLEP 2012) to create a new LEP (<i>Willoughby Local Environmental Plan 2023</i>), as well as proposed amendments to the <i>Willoughby Development Control Plan</i> (WDCP).</p> <p>The planning proposal includes rezoning land, changing development standards, particularly in the Chatswood CBD and other local centres and making other housekeeping amendments. The Chatswood CBD (red), St Leonards-Crows Nest (blue) local centres and industrial areas (purple) in the LGA where changes are proposed are shown on Figure 1 for context.</p>  <p>Figure 1: Willoughby LGA local context (Source: DPE Gateway Determination Report, December 2021)</p> <p>Council is seeking to create a new LEP which will specifically update zones and controls for:</p> <ul style="list-style-type: none"> • Chatswood CBD (and include an expanded boundary area) • seven local centres in the LGA, being Artarmon, North Willoughby, Naremburn, Castlecrag, Northbridge, Penshurst Street and Willoughby

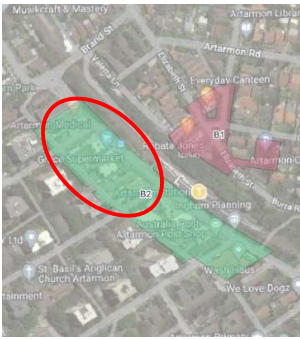


Planning Proposal Details	
Planning Proposal	Willoughby Comprehensive Local Environmental Plan 2023
	<p>South (note no changes are proposed at High Street although shown on Figure 1)</p> <ul style="list-style-type: none"> land within the Willoughby LGA portion of the land identified in the St Leonards-Crows Nest 2036 Plan three industrial zones in the LGA, being Artarmon, East Chatswood and Lane Cove North R2 Low Density Residential zone land (not in conservation areas) affordable housing requirements under Clause 6.8 of the LEP improvements to sustainability (including provisions for reducing urban heat) reclassification of Council land within the Northbridge Local Centre removing land reservations no longer needed under the Acquisition (LRA) Map and inclusion of new lands requiring acquisition land owned and used by schools to be all commonly zoned SP2 Infrastructure additional permitted uses under Schedule 1 the proposed heritage listing of two sites general housekeeping updates and improvements. <p>On 26 April 2023 the employment zone reform came into effect, updating former business and industrial zones to five new employment zones (E1 to E5) and three supporting zones (MU1, W4 and SP4). The WLEP 2012 was not amended via one of the six self-repealing State Environmental Planning Policies as part of the reform process as Willoughby City Council is introducing employment zones via this planning proposal¹. The planning proposal details existing zone names and proposed new zone names under this reform. However, to maintain clarity on what areas are intended for inclusion in the planning proposal that is the subject of this review, the reference to existing zone names i.e. (B1 to B5, etc) has largely been retained throughout this flood advice.</p> <p>Further detailed explanation on relevant proposed changes that have been assessed as part of this flood advice are as follows:</p> <ul style="list-style-type: none"> Chatswood CBD: Current zones in the Chatswood CBD (B3, B4, B5, R3 and R4) will be consolidated into B3 Commercial Core and B4 Mixed Use zones, now referred to as E2 Commercial Centre and MU1 Mixed Use, respectively, as indicated in the planning proposal amendment documentation. The Chatswood CBD will also involve changes to height of building (HOB), Floor Space Ratio (FSR) and minimum lot size, amongst other proposed changes to planning controls (i.e. deletion of 'serviced apartments' as a permissible use in E2 and removal of the additional permitted use for shop top housing from some areas i.e. certain land at Victoria Ave). Development for the purpose of residential flat buildings is also proposed to be permitted with development consent in the MU1 Mixed Use zone in the Chatswood CBD (note that residential accommodation is currently a prohibited use in the B4 Mixed Use zone under the current WLEP 2012) Local Centres: For the seven local centres there are proposed changes to HOB and FSR as well as some rezoning. At the Northbridge Local Centre,




¹Implementing employment zones – Frequently asked questions (DPE, 2022), online at: <https://www.planning.nsw.gov.au/-/media/Files/DPE/Factsheets-and-faqs/Policy-and-legislation/Planning-reforms/FAQs-Implementing-Employment-Zones-November-2022.pdf?la=en>

Planning Proposal Details	
Planning Proposal	Willoughby Comprehensive Local Environmental Plan 2023
	<p>Council's land is proposed to be rezoned from B2 Local Centre to part R3 Medium Density Residential and part R4 High Density Residential</p> <ul style="list-style-type: none"> • St Leonards-Crows Nest: There are proposed changes to HOB and FSR amongst other proposed changes to planning controls (i.e. deletion of 'serviced apartments' as a permissible use in E2) • Industrial Land: For the three industrial areas there are proposed changes to FSR, zoning changes as well as some changes to permitted land uses i.e. removal of child care centres in the IN1 and IN2 zones, now referred to as the E4 General Industrial zone • R2 Low Density Residential Zone: Comprehensive changes to FSR controls in the R2 zone for dwelling houses and dual occupancies are proposed, involving removing the FSR controls for the R2 zoned properties (not located in a conservation areas) and replacement with the gross floor area controls as defined in the Codes SEPP. Other residential uses (i.e. secondary dwellings) are also proposed to be permitted with consent. • Schools: Currently school sites in the LGA are zoned as per the adjacent zoning (often residential). Proposed changes involve rezoning certain school sites to SP2 Infrastructure (Educational Establishment). No flood analysis for these changes has been undertaken as part of this flood advice as the proposed sites are already operating as schools, so this change is merely administrative. <p>The Gateway determination for the planning proposal was issued on 24 December 2021 (later altered by DPE on 15 March 2022) and did not authorise Council as the local plan-making authority given it is a comprehensive LEP planning proposal.</p> <p>Council submitted the exhibited draft planning proposal (dated March 2022) with the amendments recommended in the Council Post Exhibition Report resolution outlined in Attachments 8 and 9 for the LEP and DCP respectively. However, Council did not update the draft planning proposal to provide a new finalised version to DPE. Council provided two tables incorporating text and map changes from Attachments 8 and 9 along with a letter to DPE on 23 February 2023 requesting finalisation. Therefore, the draft March 2022 planning proposal has been read in conjunction with all the amendment documentation (as listed below) to be understood in full.</p>
Flooding Studies Undertaken	<p>Related flood studies:</p> <ul style="list-style-type: none"> • Blue Gum Creek Flood Study (Lyll & Associates, February 2016) • Flat Rock Creek Catchment Flood Study and Overland Flow Mapping (Lyll & Associates, August 2018) • Flat Rock Creek Floodplain Risk Management Study and Plan (WMA Water, October 2020) • Sailors Bay Creek Flood Study (Lyll & Associates, March 2014a) • Scotts Creek Flood Study (Lyll & Associates, March 2008) (note that Council is currently undertaking a Floodplain Risk Management Study and Plan (FRMS&P) for the catchment) • Sugarloaf Creek Flood Study (Lyll & Associates, August 2010, amended July 2011) • Sugarloaf Creek Catchment Floodplain Risk Management Study and Plan (WMA Water, September 2013) • Swaines Creek Flood Study (Lyll & Associates, March 2014b).

Planning Proposal Details	
Planning Proposal	Willoughby Comprehensive Local Environmental Plan 2023
	<p>Many of these studies were undertaken following the completion of a 'screening' overland flow study in 2009 (Lyll & Associates, 2009), which was reported in the Willoughby City LSPS (see extract Figure 35 of the LSPS, 2020).</p> <p>FIGURE 35: WILLOUGHBY CITY LGA FLOODING EXTENTS – 1 IN 100 YEAR FLOOD PRONE LAND</p>  <p>Source: Willoughby City Council</p>
Other Project Documentation	<ul style="list-style-type: none"> • Gateway Determination (DPIE, 24 December 2021) (later altered by DPE on 15 March 2022 – alternation not received or reviewed by Rhelm) • Willoughby LEP 2012 Comprehensive Review – Gateway Determination Report (PP-2021-6242) (DPIE, December 2021) • Draft Willoughby Development Control Plan (Willoughby City Council, October 2021) • Planning Proposal Review of Willoughby Local Environmental Plan 2012 (Willoughby City Council, exhibited draft version dated March 2022) • Planning proposal amendment documentation: <ul style="list-style-type: none"> ○ Willoughby City Council Ordinary Council Minutes 12 December 2022 (see Section 12.11 Post Exhibition Report on Draft Comprehensive Local Environmental Plan and Development Control Plan, pp. 20 to 22), which includes the following attachments: <ul style="list-style-type: none"> ▪ Attachment 8 Recommended Changes to the Draft LEP ▪ Attachment 9 Recommended Changes to the Draft WDCP ○ Re – Planning Proposal 2021–6242 Comprehensive LEP (letter from Willoughby City Council to DPE, dated 23 February 2023), which refers to the following documents on the planning portal: <ul style="list-style-type: none"> ▪ Table of Map changes post exhibition (pp. 1 to 81) ▪ Table of changes post exhibition (pp. 1 to 102)
Rheln Preliminary Findings	<p>Rheln has used information from Council's proposed planning maps (provided in GIS by DPE), existing published flood studies and available online mapping to inform this independent review.</p> <p>The planning proposal does not discuss flooding except to note that Council considers the planning proposal to be consistent with Ministerial Direction 4.1 Flooding because: <i>"Upzoned" land which is identified in any flood studies will be subject to water management controls within the Willoughby DCP.</i> Rhelm does not agree that this is consistent with Ministerial Direction 4.1.</p>

Planning Proposal Details	
Planning Proposal	Willoughby Comprehensive Local Environmental Plan 2023
	Portions of the land that the amendment applies to are considered to be materially flood affected (high hazard and/or floodway in the PMF). Rhelm considers that there is some flood-affected land that should be excluded from the planning proposal if it is to be finalised by DPE-Planning in order to satisfy Ministerial Direction 4.1.
Rhelm Preliminary Finding Category ¹	Part of the proposal could be approved – other part needs further redesign: The planning proposal in its current form is largely acceptable and could be approved as is at this stage, with the exception of the R2 zone changes (i.e. any changes from the use of FSR to GFA and the allowance of secondary dwellings) for flood prone land and several materially flood-affected locations where Rhelm considers that amendments are required. The recommendations below explain this preliminary finding and suggest a pathway for DPE to proceed with to finalise the planning proposal.
Rhelm Preliminary Recommendations ²	<p>The planning proposal, which includes residential zones, local centres, industrial land, Chatswood CBD and St Leonards-Crows Nest area across the Willoughby LGA, seeks to potentially significantly intensify development and dwelling density on land within the extent of the PMF (the FPA is not known). This is not consistent with Ministerial Direction 4.1.</p> <p>Based on the information available to Rhelm, the elements of the planning proposal that are located in floodways and/or high hazard areas (being H4 and above) in the PMF are considered to be unacceptable in the current form.</p> <p>Chatswood CBD</p> <p>Chatswood CBD does not have PMF mapping publicly available and no site-specific flood study has been undertaken as part of the planning proposal. Council is currently undertaking a FRMS&P for the catchment, which may provide overland flow mapping/further flood information for the Chatswood CBD. This information should be considered in a flood risk assessment of the Chatswood CBD prior to proceeding with the proposed changes, particularly to allow development for the purpose of residential flat buildings in the B4 Mixed Use (now MU1 Mixed Use) zone in the Chatswood CBD. Dwelling intensification in this area is not considered appropriate given the known overland flow and basement carpark flooding issues, without further flood risk assessment to ensure safe evacuation can occur for future residents in this area. It would be preferable to defer this aspect of the planning proposal until more contemporary flood information and an appropriate strategic planning assessment is available for the Chatswood CBD. However, if this is not possible then controls such as a site-specific flood analysis to identify suitable basement entry access points and minimum basement entry threshold/podium levels (ideally set at the FPA or PMF, whichever is the higher) and an assessment of the need for any offset flood detention storage should be a minimum requirement for the DCP. Flash flooding occurs in the CBD, with flood depths on some the roads and on some sites could potentially be in excess of 1 -2 m. As such, the potential risk of drownings within basement carparking in the flood affected portions of the CBD is present if suitable controls are not imposed.</p>

Planning Proposal Details	
Planning Proposal	Willoughby Comprehensive Local Environmental Plan 2023
	<p>Local Centres</p> <p><i>Artarmon Local Centre:</i> The northern portion of the B2 zone in the vicinity of Hampden Road contains high hazard floodway in the PMF event. Rhelm considers that intensification of development should not occur between Barham Lane and Broughton Road (circled in red), unless Council can demonstrate that evacuation planning, shelter in place requirements and risk to life has been adequately considered in this area. This aspect of the planning proposal should either be deferred until further flood risk assessment has been undertaken or additional controls imposed to ensure that access for any future basement parking is not located in a flood affected area and floor levels are set such that a suitable refuge area is available.</p>  <p><i>Willoughby South Local Centre:</i> The B2 area to the west of Willoughby Road contains some high hazard floodway in the PMF event. However, of greater significance, the roadways surrounding this B2 area contain high hazard floodway in the PMF event i.e. Willoughby Road, Penkivil Street, Julian Street and Hector Road. Rhelm considers that intensification of development should not occur in this B2 area to the west of Willoughby Road (circled in red), unless Council can demonstrate that evacuation planning, shelter in place requirements and risk to life has been adequately considered in this area. This aspect of the planning proposal should be deferred until further flood risk assessment has been undertaken.</p>  <p><i>Northbridge:</i> It is recommended that consideration of an SP2 drainage zone of an equivalent width to the PMF extent be incorporated in the proposed rezoning (ie a strip of SP2 between the R4 and R3 zones, within the proposed R3 lands, see yellow annotations).</p>  <p><i>Penshurst Street Local Centre:</i> This local centre is considered acceptable to proceed in its current format. High hazard floodway in the PMF event is contained to the roadways in the northern portion of the centre and not considered a significant constraint to proposed development of the area.</p> <p>Remaining local centres where changes are proposed (North Willoughby, Naremburn, Castlecrag) are not identified to be flood-affected and can proceed in their current format.</p> <p>St Leonards-Crows Nest</p> <p>Several lots proposed for changes in the St Leonards-Crows Nest area contain or are substantially surrounded by high hazard floodway in the PMF event in R4 and B3 areas. Provided that adequate consideration is given to floor level controls and</p>

Planning Proposal Details	
Planning Proposal	Willoughby Comprehensive Local Environmental Plan 2023
	<p>evacuation planning (which may be shelter in place with podium levels at PMF), it is considered that the proposed changes in the St Leonards-Crows Nest area can be adequately managed by proposed flood controls in the Willoughby DCP (i.e. generally in accordance with the proposed clauses in Sections 5 and 6).</p> <p>Industrial Land</p> <p><i>Artarmon:</i> The northernmost IN2 area is the most materially flood affected, containing high hazard floodway in the PMF event. George Place, the single evacuation road for the area is also materially flood affected (H6 floodway) in the PMF event, presenting evacuation issues for this area. Intensification of development in this area requires controls to manage the period of isolation. Some form of control that indicates no sensitive or critical land use can occur in this location (such as the imposition of Clause 5.22 in the Standard LEP) is recommended.</p>  <p><i>East Chatswood:</i> Scotts Creek runs through the land zoned IN2. The creek and adjacent lands are high hazard floodway in the PMF event. However, only flood function and hazard mapping for the 1% AEP event is presented in the Flood Study (Lyll & Associates, 2008). Rhelm considers that any intensification of development should not occur in the IN2 area indicated as affected by the PMF (within the dashed red lines around Scotts Creek) as it is highly likely its materially flood affected. Further, it is recommended that the opportunity be taken to zone the creek itself to a more compatible use, such as SP2 Stormwater Management (which is present upstream for Scotts Creek through portions of the R2 area) or a compatible environmental zone (such as C2, which is the zone for Scotts Creek downstream of Eastern Valley Way). This could occur using the cadastral boundaries, which align with the creek in the majority of the relevant area or between the top of bank of the creek. This should be inserted for the industrial zoned land located between the RE1 land on Penshurst Street (Muston Park) and Eastern Valley Way. A zoning of SP2 would better reinforce the flood function of the creek.</p>  <p><i>Lane Cove North:</i> The majority of the IN2 area to the west of Epping Road contains high hazard floodway in the PMF event. Rhelm considers that intensification of development should not occur in this area (circled in red) as it is materially flood affected.</p>  <p>There are a few other flood-affected areas in the PMF event in the easternmost IN2 area i.e. 2 Herbert St, St Leonards (Australia Post Office), 33 Herbert St, St Leonards as well as 5 Cleg St, Artarmon. However, these lots are largely affected by low hazard flooding in the PMF and Rhelm considers that DCP controls can be used to manage development at these identified lots. The Australia Post site will require special consideration.</p>

Planning Proposal Details	
Planning Proposal	Willoughby Comprehensive Local Environmental Plan 2023
	<p>R2 Low Density Residential Zone</p> <p>The proposed changes involve potential intensification of residential dwelling density in some flood prone areas across the LGA via a change from FSR to GFA provisions. Only a preliminary flood assessment of the R2 Low Density Residential zone has been undertaken in this flood advice, rather than a comprehensive assessment. Rhelm recommends excluding flood affected areas (being those identified to be high hazard floodway areas in the PMF event) from the proposed R2 zoning changes to avoid intensification of the population in these areas and manage the risk to life in these areas. Some R2 areas flooded in the PMF event have been specifically referenced in this advice, but not all. It is recommended that no secondary dwellings be permitted in R2 zones that are identified as flood prone as there is a very high likelihood that a secondary dwelling would be located within an overland flow path or floodway.</p> <p>Development Control Plan</p> <p>The Draft DCP, in particular Part I – Stormwater Management, does not appear to provide sufficient nexus to the objectives of Clause 5.21 of the LEP. For example, it does not include any reference to flood function or provide a definition of floodway to assist with understanding the interpretation of the LEP. It is recommended that further revision of the DCP be completed, to include these definitions and to ensure clarity on the intent of the LEP provisions.</p> <p>Other</p> <p>Other aspects of the planning proposal not mentioned above are considered acceptable to proceed in its current format from a flood risk perspective.</p>
Date Advice Completed by Rhelm	19 June 2023

Notes:

- Rhelm Preliminary Finding Categories:
 - Proposal could be approved with existing information subject to conditions,
 - Proposal requires further information,
 - Part of the proposal could be approved – other part needs further redesign, or
 - Proposal unacceptable
- Rhelm Preliminary Recommendations Colour Legend:
 - Green** – all acceptable from a flood perspective,
 - Amber** – further technical work required by the proponent to address flood constraints,
 - Red** – significant concern about some or all of the proposal with respect to flooding.

Assessment Criteria Summary

The flooding component of the Planning Proposal has been assessed against the following:


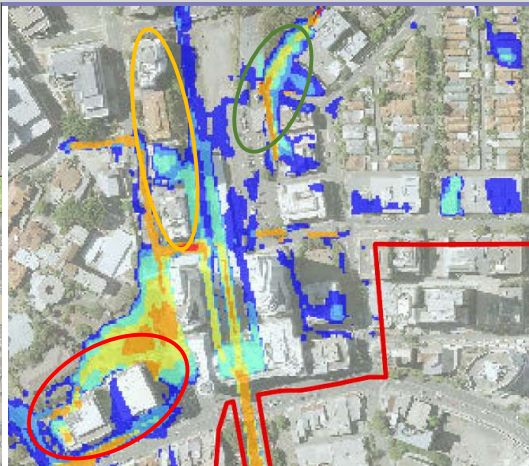
- Flood risk assessment
- Consistency with policies and plans (i.e., Provisions of the relevant Local Environmental Plan/other relevant Environmental Planning Instruments (EPI), Ministerial Direction 4.1)
- Stakeholder consultation advice (i.e., DPE-EHG, SES)
- Critique of flood information provided.


The assessment is tabulated on the following pages.


Flood Risk Assessment

Flood Risk Assessment				
Flood Risk	Yes	No	Uncertain	Justification / Comment
Flood Prone Land				
Land within the PMF	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>The planning proposal does not discuss flooding except to note that Council considers the planning proposal to be consistent with Ministerial Direction 4.1 Flooding because: <i>“Upzoned” land which is identified in any flood studies will be subject to water management controls within the Willoughby DCP.</i></p> <p>The planning proposal does not present or assess any flood mapping, in particular FPA or PMF extent mapping.</p> <p>Rhelm has reviewed available flood mapping for the 6 catchments in the LGA from the 8 flood studies and/or FRMS&Ps as listed earlier to determine flood prone areas affected by the PMF within the LGA, where relevant to the planning proposal.</p> <p>For the Local Centres and Industrial Land, preliminary assessment results are presented in Attachment 1, to determine which locations were within PMF extents and required further discussion in this flood risk assessment table. Other categories are discussed below in greater detail.</p> <p>In summary, the following areas in the planning proposal involve rezoning or changing of planning controls that affect land within the PMF extent:</p> <ul style="list-style-type: none"> Chatswood CBD – although not confirmed by PMF extent mapping, overland flow through the Chatswood CBD is a known issue which is described in text in the relevant flood study Local Centres – Artarmon, Penshurst Street (only northern portion of B5 and B2) and Willoughby South are located within PMF extents and require assessment here (see Attachment 1 Table 1) St Leonards-Crows Nest Industrial Land – Artarmon (only northernmost and easternmost IN2 areas), East Chatswood and Lane Cove North (only IN2 area to west of Epping Road) are located within PMF extents and require assessment here (see Attachment 1 Table 2) R2 Low Density Residential zone. <p>Chatswood CBD</p> <p>The Chatswood CBD is nearly wholly contained within the upper reaches of the Scotts Creek catchment. The upstream limit of flood mapping presented in the Flood Study from 2008 is Havilah Street, which is essentially where the Chatswood CBD commences, with Chatswood Chase immediately to the west of Havilah Street. As such, although there is discussion of overland flow through the Chatswood CBD, particularly heading eastwards along Victoria Avenue, which flows into the Chatswood Chase Carpark and floods the basement carpark, there is no publicly available PMF extent map</p>


Flood Risk Assessment				
Flood Risk	Yes	No	Uncertain	Justification / Comment
				<p>that covers the Chatswood CBD. Basement carpark flooding issues may potentially result in evacuation issues for the residential flat buildings proposed in the B4 (now MU1) zone in the Chatswood CBD, if basement carparks are proposed. Council is currently undertaking a FRMS&P for the catchment, which may provide overland flow mapping and further flood information for the Chatswood CBD, which should be considered in a flood risk assessment of the Chatswood CBD. If not, Rhelm suggests that stringent controls apply that impose the need for further site-specific flood investigations are for the Chatswood CBD to assess flood risk in this area for residential accommodation purposes.</p> <p>Local Centres</p> <p>See Attachment 1 Table 1 for preliminary assessment details. Further detail on the relevant local centre sites is discussed later in this table. PMF hydraulic categorisation and hydraulic hazard mapping has been analysed, where available.</p> <p>Regarding the Artarmon Local Centre, in verbal discussions with DPE Council has noted that the masterplan is currently underway. The upgrade to the Artarmon Local Centre will improve amenity and pedestrian connectivity in and around the centre and east across Hampden Road to the Artarmon train station and may improve the flooding conditions to the north of the centre.</p> <p>St Leonards-Crows Nest</p> <p>The portion of the St Leonards-Crows Nest area within the Willoughby LGA is located within the Flat Rock Creek catchment. Changes are proposed to several lots in the area, the worst flood-affected in the PMF being the southern portion of 7-13 Herbert Street, St Leonards (circled orange on the figure below) and 207 Pacific Highway, St Leonards (circled red on the figure below). In particular, these sites seem to be largely surrounded by high hazard flooding in the PMF, which may present evacuation issues at these sites if development is intensified. It is noted that the Table of Map changes post exhibition notes the development has now occurred at 7-13 Herbert Street, St Leonards. There is also a high hazard floodway in the PMF event that runs along the west of 110-120 Christie Street, St Leonards and east of 2-10 Chandos Street, St Leonards (floodway area circled green on the figure below), although it is considered that development controls in the DCP should be able to manage development near this floodway.</p>

Flood Risk Assessment				
Flood Risk	Yes	No	Uncertain	Justification / Comment
				<div>   </div> <p>Left: Proposed zoning map; Right: PMF hydraulic hazard from Figure B9B (WMA Water, 2020)</p> <p>Industrial Land</p> <p>See Attachment 1 Table 2 for preliminary assessment details. Further detail on the industrial sites is discussed later in this table. PMF hydraulic categorisation and hydraulic hazard mapping has been analysed, where available.</p> <p>R2 Low Density Residential Zone</p> <p>A preliminary flood assessment of the R2 Low Density Residential zone has been undertaken in this flood advice, rather than a comprehensive assessment of the entire LGA. A preliminary assessment of PMF mapping across the LGA indicates several flood-affected areas within the R2 zone in the PMF event – see example maps below showing some but not all flood affected R2 areas in the LGA:</p>


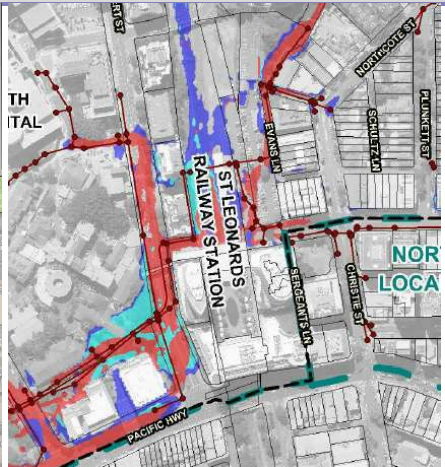
Flood Risk Assessment				
Flood Risk	Yes	No	Uncertain	Justification / Comment
				 <p>LEGEND</p> <ul style="list-style-type: none"> PMF 100 YEAR ARI 20 YEAR ARI 5 YEAR ARI HEC RAS CROSS SECTION AND RIVER STATION NUMBER <p>SCOTTS CREEK FLOOD STUDY Figure 5.2a</p> <p>INDICATIVE EXTENTS OF INUNDATION 5, 20, 100 YEAR ARI AND EXTREME FLOOD EVENTS HAMILAH STREET TO PENSHURST STREET</p> <p>R2 area affected by flooding in the PMF event in the Scotts Creek catchment (Lyll & Associates, 2008)</p>

Flood Risk Assessment				
Flood Risk	Yes	No	Uncertain	Justification / Comment
				 <p>R2 area affected by flooding in the PMF event in the Sugarloaf Creek catchment (WMA Water, 2013)</p> <p>Rhelm recommends removing materially flood-affected areas (high hazard floodway areas in the PMF event) from any proposed R2 zoning changes that would result in intensification of these areas to manage risk to life. Note that only some R2 areas flooded in the PMF event have been indicated in this advice, not all – further flood assessment is required.</p>
In a high-risk catchment (Northern Rivers, Hawkesbury-Nepean, Georges, Wilsons and Tweed rivers, Macleay, Richmond, Hunter, Clarence and Shoalhaven Rivers)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>The planning proposal is not within a high-risk catchment. The Willoughby LGA contains land within the following six catchments which drain to Sydney Harbour: Blue Gum Creek, Flat Rock Creek, Sailors Bay, Scotts Creek, Sugarloaf Creek and Swaines Creek catchments.</p>
Located in a floodway in a PMF event	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>The planning proposal does not present or assess any flood mapping, in particular PMF hydraulic categorisation (flood function) mapping.</p> <p>Rhelm has reviewed available PMF flood function mapping in relevant flood studies and/or FRMS&Ps as listed earlier for all relevant locations within the LGA. The results are discussed below in greater detail.</p>

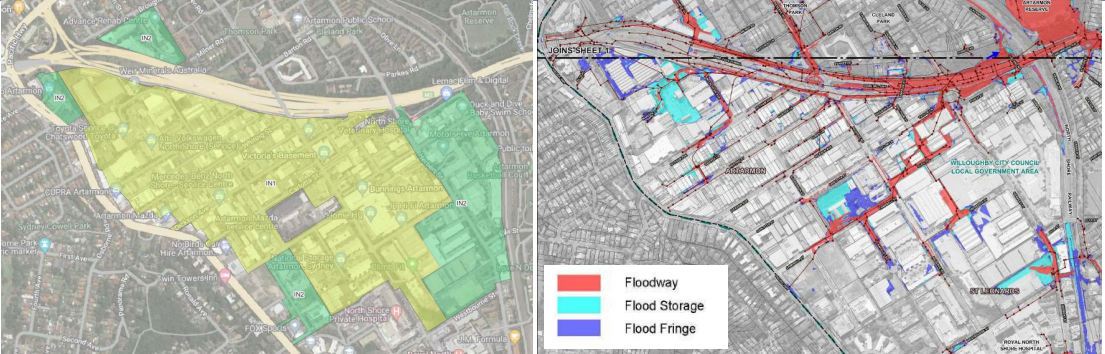
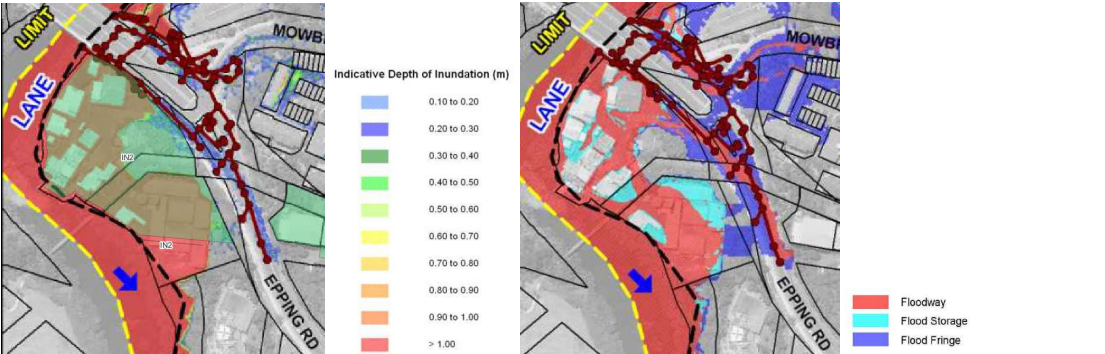
Flood Risk Assessment				
Flood Risk	Yes	No	Uncertain	Justification / Comment
				<p>In summary, the following areas in the planning proposal involve rezoning or changing of planning controls that affect land located within a floodway in the PMF event:</p> <ul style="list-style-type: none"> Chatswood CBD (has been reasonably assumed, as explained below) Local Centres – Artarmon, Penshurst Street (floodway is generally contained to roadways) and Willoughby South St Leonards-Crows Nest Industrial Land – Artarmon, East Chatswood and Lane Cove North R2 Low Density Residential zone – given the scale of the extent of this change, this was not assessed in detail in this flood advice (only preliminary assessment showing some areas are affected in the PMF). <p>Chatswood CBD</p> <p>There is no publicly available flood mapping that covers the Chatswood CBD as this is currently under revision as part of the preparation of the Scotts Creek Floodplain Risk Management Study and Plan (FRMSP, in progress as at May 2023). Therefore, there is no formal confirmation of flood extent and flood function located within the Chatswood CBD in the PMF event. However, given the presence of overland flow paths along Victoria Avenue as discussed in the 2008 Flood Study and information available to Rhelm that is currently under revision as part of the FRMSP, the west-east road alignment of Victoria Road and parallel roads were traversed by the alignment of the upper reaches of Scotts Creek which have since been piped. However, the capacity of the pipes is not sufficient to carry floodwaters up to and including the PMF and this instead flows overland through the CBD.</p> <p>It can also be reasonably assumed there is informal flood storage located within the Chatswood CBD in the PMF event as the Flood Study discusses “the potential storage of overland flows traversing eastwards along Victoria Avenue in the basement car park of Chatswood Chase”.</p> <p>Local Centres</p> <p>Artarmon: The Artarmon Local Centre contains both floodway and flood storage in the PMF event in the B2 area, based on PMF hydraulic categorisation mapping presented in the Flood Study (Lyll & Associates, 2018) as shown below. Note that PMF hydraulic categorisation mapping is not presented in the more recent FRMS&P for this catchment, which shows a greater PMF extent in this area, however the 1% AEP hydraulic categorisation mapping in the FRMS&P confirms the presence of floodway and flood storage at this site.</p>

Flood Risk Assessment				
Flood Risk	Yes	No	Uncertain	Justification / Comment
				 <p>Left: Proposed zoning map; Right: PMF hydraulic categorisation from Figure 6.17 (sheet 1 of 3) (Lyll & Associates, 2018)</p> <p>Penshurst Street: In the Sugarloaf Creek catchment, WMA Water (2013) reported: "Overland flow paths, generally along roads, are classified as high hazard/floodways as a significant portion of floods is conveyed along these flow paths. There are no areas considered as flood storage in the catchment with all remaining inundated land flood classified as low hazard/flood fringe." As such, the Penshurst Street Local Centre contains floodway but not flood storage in the PMF event in the north of the B2 and B5 areas, based on PMF hydraulic hazard mapping presented in the FRMS&P (WMA Water, 2013) as shown later in this table. Areas of floodway appear wholly contained to roadways within the local centre.</p> <p>Willoughby South: The Willoughby South Local Centre contains both floodway and flood storage in the PMF event in the B2 area, particularly to the west of Willoughby Road, based on PMF hydraulic categorisation mapping presented in the Flood Study (Lyll & Associates, 2018) as shown below. Note that PMF hydraulic categorisation mapping is not presented in the more recent FRMS&P for this catchment, which shows a greater PMF extent in this area, however the 1% AEP hydraulic categorisation mapping in the FRMS&P confirms the presence of floodway and flood storage at this site.</p>


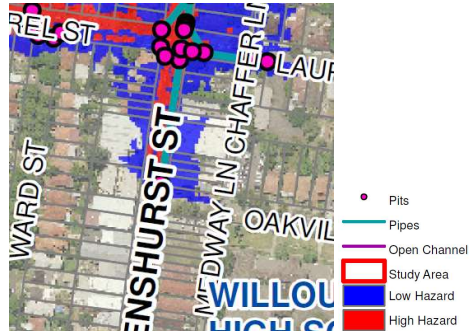
Flood Risk Assessment				
Flood Risk	Yes	No	Uncertain	Justification / Comment
				<div> </div> <p>Left: Proposed zoning map; Right: PMF hydraulic categorisation from Figure 6.17 (sheet 1 of 3) (Lyll & Associates, 2018)</p> <p>St Leonards-Crows Nest</p> <p>St Leonards-Crows Nest contains both floodway and flood storage in the PMF event in the B3 and R4 areas where changes are proposed, based on PMF hydraulic categorisation mapping presented in the Flood Study (Lyll & Associates, 2018) as shown below. Note that PMF hydraulic categorisation mapping is not presented in the more recent FRMS&P for this catchment, which shows a greater PMF extent in this area, however the 1% AEP hydraulic categorisation mapping in the FRMS&P confirms the presence of floodway and flood storage at this site.</p>

Flood Risk Assessment				
Flood Risk	Yes	No	Uncertain	Justification / Comment
				<div>   </div> <p>Left: Proposed zoning map; Right: PMF hydraulic categorisation from Figure 6.17 (sheet 2 of 3) (Lyll & Associates, 2018)</p> <p>Industrial Land</p> <p>Artarmon: Artarmon contains both floodway and flood storage in the PMF event in the northernmost and easternmost IN2 areas, based on PMF hydraulic categorisation mapping presented in the Flood Study (Lyll & Associates, 2018) as shown below. Note that PMF hydraulic categorisation mapping is not presented in the more recent FRMS&P for this catchment, which shows a greater PMF extent in this area, however the 1% AEP hydraulic categorisation mapping in the FRMS&P confirms the presence of floodway and flood storage at this site.</p>

Flood Risk Assessment

Flood Risk	Yes	No	Uncertain	Justification / Comment
				 <p>Left: Proposed zoning map; Right: PMF hydraulic categorisation from Figure 6.17 (sheet 2 of 3) (Lyll & Associates, 2018)</p> <p>East Chatswood: PMF hydraulic categorisation mapping is not presented in the Flood Study (Lyll & Associates, 2008) for this catchment, however the 100 Year ARI hydraulic categorisation mapping presented indicates floodway only within the IN2 zone in the 1% AEP event. It is uncertain if the site may contain flood storage in the PMF event.</p> <p>Lane Cove North: Lane Cove North contains both floodway and flood storage in the PMF event in the IN2 area to the west of Epping Road, based on PMF hydraulic categorisation mapping presented in the Flood Study (Lyll & Associates, 2014b) as shown below.</p>  <p>Left: Proposed zoning map overlaid over PMF extent mapping from Figure 6.13 (Lyll & Associates, 2014b); Right: PMF hydraulic categorisation from Figure 6.17 (Lyll & Associates, 2014b)</p>

Flood Risk Assessment				
Flood Risk	Yes	No	Uncertain	Justification / Comment
Located in a flood storage area in a PMF event	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>In summary, the following areas in the planning proposal involve rezoning or changing of planning controls that affect land located within a flood storage area in the PMF event:</p> <ul style="list-style-type: none">• Chatswood CBD (has been reasonably assumed, as explained above)• Local Centres – Artarmon and Willoughby South• St Leonards Crows Nest• Industrial Land – Artarmon and Lane Cove North. It is uncertain if East Chatswood may contain flood storage in the PMF event, as explained above• R2 Low Density Residential zone – not assessed in this flood advice (only preliminary assessment showing some areas are affected in the PMF)
Evacuation				
Flood free evacuation out of the floodplain provided	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The planning proposal does not include any information regarding flood evacuation planning or routes.
Flood free evacuation out of the floodplain is possible	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	As above.
Is Shelter in Place proposed	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	As above.
If Shelter in Place proposed what is the duration of the flooding and time to peak?			<input checked="" type="checkbox"/>	As above.
Flood Hazard				
Low flood hazard in the PMF (H1-H3)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>The planning proposal does not present or assess any flood mapping, in particular PMF hydraulic hazard mapping. Rhelm has reviewed available PMF hydraulic hazard mapping in relevant flood studies and/or FRMS&Ps as listed earlier for all relevant locations within the LGA. The results are discussed below in greater detail.</p> <p>In summary, the following areas in the planning proposal involve rezoning or changing of planning controls that affect land located within flood hazard categories H1-H3/low in the PMF event:</p> <ul style="list-style-type: none">• Chatswood CBD – unknown• Local Centres – Artarmon, Penshurst Street and Willoughby South• St Leonards Crows Nest• Industrial Land – Artarmon, East Chatswood (reasonably assumed) and Lane Cove North

Flood Risk Assessment				
Flood Risk	Yes	No	Uncertain	Justification / Comment
				<ul style="list-style-type: none"> R2 Low Density Residential zone – not assessed in this flood advice <p>Chatswood CBD</p> <p>There is no flood mapping that covers the Chatswood CBD in the Scotts Creek Flood Study. Therefore, at this stage hazard categorisation within the Chatswood CBD in the PMF event is unknown.</p> <p>Council is currently undertaking a FRMS&P for the catchment, which may provide hazard categorisation mapping and further flood information for the Chatswood CBD, which should be considered in a flood risk assessment of the Chatswood CBD. If not, Rhelm suggests that further site-specific flood investigations are required for the Chatswood CBD to assess flood risk in this area for residential accommodation purposes.</p> <p>Local Centres</p> <p>Artarmon: The Artarmon Local Centre contains H1 to H6 flood hazard in the PMF event in the B2 area, based on PMF hydraulic hazard mapping presented in the FRMS&P (WMA Water, 2020) as shown in map extracts in Attachment 1 Table 1. In particular, lots north of Broughton Road in the B2 area are quite substantially affected by high hazard (H5) flooding.</p> <p>Penshurst Street: Provisional hydraulic hazard (high and low categories rather than H1 to H6) is presented in the Sugarloaf Creek Catchment FRMS&P (WMA Water, 2013). As such, the Penshurst Street Local Centre contains low and high flood hazard in the PMF event in the north of the B5 and B2 areas, based on PMF hydraulic hazard mapping presented in the FRMS&P, as shown below.</p> <div style="display: flex; justify-content: space-around;">   </div> <p>Left: Proposed zoning overlaid over PMF extent mapping from Figure 6 (WMA Water, 2013); Right: PMF provisional hydraulic hazard from Figure 8 (WMA Water, 2013)</p>

Flood Risk Assessment				
Flood Risk	Yes	No	Uncertain	Justification / Comment
				<p>Willoughby South: The Willoughby South Local Centre contains H1 to H5 as well as one small area of H6 flood hazard in the PMF event in the B2 area, particularly to the west of Willoughby Road, based on PMF hydraulic hazard mapping presented in the FRMS&P (WMA Water, 2020) as shown in map extracts in Attachment 1 Table 1.</p> <p>St Leonards-Crows Nest</p> <p>Several lots proposed for changes in St Leonards Crows Nest contain H1 to H6 flood hazard in the PMF event in R4 and B3 areas, as discussed earlier, based on PMF hydraulic hazard mapping presented in the FRMS&P (WMA Water, 2020) as shown in map extracts presented earlier this this table.</p> <p>Industrial Land</p> <p>Artarmon: Artarmon contains H1 to H6 flood hazard in the PMF event in the northernmost and easternmost IN2 areas, based on PMF hydraulic hazard mapping presented in the FRMS&P (WMA Water, 2020) as shown in map extracts in Attachment 1 Table 1. The northernmost IN2 area appears to be the worst affected, however the worst of the high hazard flooding (H6) appears to be contained to the roadway in the IN2 area in the PMF.</p> <p>East Chatswood: PMF hydraulic hazard mapping is not presented in the Flood Study (Lyll & Associates, 2008) for this catchment, however the 100 Year ARI provisional flood hazard mapping presented indicates both low and high flood hazard within the IN2 zone in the 1% AEP event. Based on this it can be reasonably assumed the IN2 zone might contain both low and high flood hazard in the PMF event.</p> <p>Lane Cove North: Provisional hydraulic hazard (high and low categories rather than H1 to H6) is presented in the Swaines Creek Flood Study (Lyll & Associates, 2014b). As such, Lane Cove North contains predominately high but also low flood hazard in the PMF event in the IN2 area to the west of Epping Road, based on PMF hydraulic hazard mapping presented in the Flood Study as shown below.</p> <div> <p>Indicative Depth of Inundation (m)</p> <ul style="list-style-type: none"> 0.10 to 0.20 0.20 to 0.30 0.30 to 0.40 0.40 to 0.50 0.50 to 0.60 0.60 to 0.70 0.70 to 0.80 0.80 to 0.90 0.90 to 1.00 > 1.00 <p>High Provisional Hydraulic Hazard</p> <p>Low Provisional Hydraulic Hazard</p> </div> <p>Left: Proposed zoning map overlaid over PMF extent mapping from Figure 6.13 (Lyll & Associates, 2014b); Right: PMF provisional flood hazard from Figure 6.15 (Lyll & Associates, 2014b)</p>

Flood Risk Assessment				
Flood Risk	Yes	No	Uncertain	Justification / Comment
Medium / High Flood Hazard in PMF (H4)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>In summary, the following areas in the planning proposal involve rezoning or changing of planning controls that affect land located within flood hazard category H4/high in the PMF event:</p> <ul style="list-style-type: none"> • Chatswood CBD – unknown • Local Centres – Artarmon, Penshurst Street (high hazard is contained to roadways) and Willoughby South • St Leonards Crows Nest • Industrial Land – Artarmon, East Chatswood (reasonably assumed) and Lane Cove North • R2 Low Density Residential zone – not assessed in this flood advice
High Hazard in PMF (H5-H6)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>In summary, the following areas in the planning proposal involve rezoning or changing of planning controls that affect land located within flood hazard category H5-H6/high in the PMF event:</p> <ul style="list-style-type: none"> • Chatswood CBD – unknown • Local Centres – Artarmon, Penshurst Street (high hazard is contained to roadways) and Willoughby South • St Leonards Crows Nest • Industrial Land – Artarmon, East Chatswood (reasonably assumed) and Lane Cove North • R2 Low Density Residential zone – not assessed in this flood advice
Filling of the Floodplain				
Filling proposed of land on the floodplain	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>This level of detail of the proposed future developments is unknown at this stage. Council proposes to assess this at DA stage, as the planning proposal notes: “Upzoned” land which is identified in any flood studies will be subject to water management controls within the Willoughby DCP.</p> <p>Proposed Willoughby DCP Section 5.3 in Part I Stormwater Management states: <i>Generally, filling of the land is not supported by Willoughby City Council and filling of flood affected land or land in the flood path is strictly prohibited.</i></p>

Flood Risk Assessment				
Flood Risk	Yes	No	Uncertain	Justification / Comment
Other				
Flood impact to other land/properties?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>This level of detail of the proposed future developments is unknown at this stage. Council proposes to assess this at DA stage, as the planning proposal notes: <i>"Upzoned" land which is identified in any flood studies will be subject to water management controls within the Willoughby DCP.</i></p> <p>Proposed Willoughby DCP Section 5.2 in Part I Stormwater Management states: <i>For all developments on main stream or local overland flooding property, these further requirements should be considered:... c. cumulative effect of any encroachment and analysis on the impact to adjacent areas and the catchment as a whole.</i></p> <p>Proposed Willoughby DCP Section 6 (Redevelopment) in Part I Stormwater Management states: <i>To reduce the impact of flooding on flood affected properties, all redevelopment must be located within the footprint of the existing structures, preferably clear of the 1% AEP event or the overland flow path. Any encroachment on these paths is not permissible unless a cumulative impact study of the floodwaters to both upstream and downstream properties is done by the applicant. Willoughby City Council must also be satisfied that there is no adverse impact to other land owners. A flood study, including an afflux analysis, will be required for any works beyond the existing building footprint.</i></p> <p><i>Willoughby City Council will generally not support the filling of main stream or overland flow path on flood affected land unless it is shown that other upstream and downstream property owners are not affected by similar cumulative filling of adjoining and adjacent properties. Willoughby City Council must also be satisfied there are no adverse effects to other land owners.</i></p> <p>Reconsideration of the wording of this portion of the DCP is recommended as elsewhere the DCP imposes more stringent controls, stating that filling of flood affected land or land in the flow path is strictly prohibited.</p>
Sensitive/hazardous land uses proposed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>Land affected by the planning proposal already contains the sensitive and hazardous development type 'educational establishments', although some sites are not currently zoned as such. Where land zoning is proposed to change existing zoning to SP2 Infrastructure (Educational Establishment), the proposed sites are already operating as schools, so this is considered an administrative change. No additional sensitive/hazardous land uses are proposed. An analysis of all of the relevant sites has not been completed. The application of appropriate controls has not been completed. The imposition of Clause 5.22 of the standard instrument would aid in the control of flood risks associated with any affected school.</p>
Type of land uses proposed?				<p>The planning proposal involves residential zone land uses (in particular R2 Low Density Residential), employment zone land uses (in particular E2 Commercial Centre and MU1 Mixed Use) as well as special purpose zone land uses (in particular SP2 Infrastructure (Educational Establishment)). Note that this list is not exhaustive.</p>
Residential development proposed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>Yes, as well as changes to residential development planning controls. The planning proposal notes the number of dwellings in the Willoughby LGA is expected to grow by over 6,700 from 2016 to 2036, although it is not clear if/how this planning proposal will provide these 6,700 dwellings.</p> <p>Development for the purpose of residential flat buildings is proposed to be permitted with development consent in the MU1 Mixed Use zone in the Chatswood CBD. Residential accommodation is currently a prohibited use in the B4 Mixed</p>

Flood Risk Assessment				
Flood Risk	Yes	No	Uncertain	Justification / Comment
				<p>Use zone under the current WLEP 2012. The planning proposal notes: <i>Chatswood CBD is the main focus where future additional residential accommodation will be located.</i></p> <p>The planning proposal notes: <i>The B3 [now E2] zone does not permit dwellings. For some sites in Chatswood and St Leonards, shop top housing is permissible by a Schedule 1 provision. The planning proposal includes a deletion of these Schedule 1 provisions in order to strengthen the employment roles of these centres and are consistent with the Chatswood CBD Strategy and St Leonards Crows Nest 2036 Plan. The loss of dwelling potential on these sites is more than compensated by the uplift in zoning in other parts of Chatswood, St Leonards and the local centres... The planning proposal also allows a more generous floor space controls to residents in the R2 zone. This will apply to 8,674 lots.</i></p> <p>It is assumed that the floor space control increase applies to all R2 zoned lands within the LGA, with the effect being potentially a greater number of people overall within the LGA, but having the unintended consequence of intensifying the population exposed to flood risk for those R2 areas that are flood prone. It is recommended that the more generous floor space controls be excluded from application in flood prone areas. This would better align with the controls incorporated in the proposed DCP.</p> <p>It is recommended that no secondary dwellings be permitted on flood prone land.</p>
SES/DPE-EHG consultation required?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>Consultation with the DPE Biodiversity and Conservation Division (BCD) is required by Condition 4 of the Gateway Determination dated 24 December 2021 (specifying consultation with Environment, Energy and Science (EES)) and has been undertaken.</p> <p>Consultation with the NSW State Emergency Services (SES) was not required by the Gateway Determination.</p>

Consistency with Policies and Plans

Consistency with the LEP Clause 5.21 Flood Planning				
Requirements	Yes	No	Uncertain	Justification / Comment
<p>(1) <i>The objectives of this clause are as follows—</i></p> <p>(a) <i>to minimise the flood risk to life and property associated with the use of land,</i></p> <p>(b) <i>to allow development on land that is compatible with the flood function and behaviour on the land, taking into account projected changes as a result of climate change,</i></p> <p>(c) <i>to avoid adverse or cumulative impacts on flood behaviour and the environment,</i></p> <p>(d) <i>to enable the safe occupation and efficient evacuation of people in the event of a flood.</i></p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Discussed below.
<p>(2) <i>Development consent must not be granted to development on land the consent authority considers to be within the flood planning area unless the consent authority is satisfied the development—</i></p> <p>(a) <i>is compatible with the flood function and behaviour on the land, and</i></p> <p>(b) <i>will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties, and</i></p> <p>(c) <i>will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood, and</i></p> <p>(d) <i>incorporates appropriate measures to manage risk to life in the event of a flood, and</i></p> <p>(e) <i>will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.</i></p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>Council's planning proposal does not discuss or present FPA mapping. Council has an online mapping portal (Willoughby Online Mapping Application), however flood-related spatial mapping identifying flood prone land does not appear to be available within this portal. Flood information is provided by Council to residents and developers through a flood certificate process.</p> <p>(a) Additional information is required to assess consistency with this clause. Analysis undertaken by Rhelm for this advice has shown the planning proposal includes land in high hazard floodways in several locations, which presents an inconsistency with this clause as development is unlikely to be compatible with the flood function.</p> <p>(b) Additional information is required to assess consistency with this clause. This level of detail of the potential types of future development proposed is not provided in the planning proposal.</p> <p>(c) Additional information is required to assess consistency with this clause. Evacuation planning has not been considered at all in the planning proposal.</p> <p>(d) Additional information is required to assess consistency with this clause. A flood risk assessment has not been undertaken in the planning proposal to evaluate potential changes to the built form and implications for flooding (including conveyance).</p>

Consistency with the LEP Clause 5.21 Flood Planning				
Requirements	Yes	No	Uncertain	Justification / Comment
<p>(3) In deciding whether to grant development consent on land to which this clause applies, the consent authority must consider the following matters—</p> <p>(a) the impact of the development on projected changes to flood behaviour as a result of climate change,</p> <p>(b) the intended design and scale of buildings resulting from the development,</p> <p>(c) whether the development incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood,</p> <p>(d) the potential to modify, relocate or remove buildings resulting from development if the surrounding area is impacted by flooding or coastal erosion.</p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>(b) Additional information is required to assess consistency with this clause. This level of detail of the future development proposed across the LGA is not provided in the planning proposal.</p> <p>(c) Additional information is required to assess consistency with this clause. A flood risk assessment has not been undertaken in the planning proposal.</p>

Consistency with Ministerial Direction 4.1				
Requirements	Yes	No	Uncertain	Justification / Comment
<p>(1) A planning proposal must include provisions that give effect to and are consistent with:</p> <ul style="list-style-type: none"> (a) the NSW Flood Prone Land Policy, (b) the principles of the Floodplain Development Manual 2005, (c) the Considering flooding in land use planning guideline 2021, and (d) any adopted flood study and/or floodplain risk management plan prepared in accordance with the principles of the Floodplain Development Manual 2005 and adopted by the relevant council. 	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>The planning proposal does not discuss flooding except to note that Council considers the planning proposal to be consistent with Ministerial Direction 4.1 Flooding because: <i>“Upzoned” land which is identified in any flood studies will be subject to water management controls within the Willoughby DCP.</i></p> <p>The planning proposal does not discuss or acknowledge any of the required floodplain management policy documents, nor does it list the relevant adopted flood studies and/or FRMS&Ps for the LGA.</p>
<p>(2) A planning proposal must not rezone land within the flood planning area from Recreation, Rural, Special Purpose or Conservation Zones to a Residential, Business, Industrial or Special Purpose Zones.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>It is unclear if the following rezoning site is within the FPA: The former Channel 9 site at 14 Artarmon Road, Willoughby, currently zoned SP2 Telecommunications Facility, which has been granted approval by the State Government under the former Part 3A process for residential purposes. The planning proposal involves rezoning this site to R4 High Density Residential.</p>
<p>(3) A planning proposal must not contain provisions that apply to the flood planning area which:</p> <ul style="list-style-type: none"> (a) permit development in floodway areas, (b) permit development that will result in significant flood impacts to other properties, (c) permit development for the purposes of residential accommodation in high hazard areas, (d) permit a significant increase in the development and/or dwelling density of that land, (e) permit development for the purpose of centre-based childcare facilities, hostels, boarding houses, group homes, hospitals, residential care facilities, respite day care centres and seniors housing in areas where the occupants of the development cannot effectively evacuate, (f) permit development to be carried out without development consent except for the purposes of exempt development or agriculture. Dams, drainage canals, levees, still require development consent, (g) are likely to result in a significantly increased requirement for government spending on emergency management services, 	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>Rhelm considers that the following inconsistencies are apparent and amendments to the planning proposal are required to ensure consistency with the following clauses:</p> <p>(a) No mapping of flood function is presented in the planning proposal. Rhelm has undertaken an analysis as part of this advice to determine where changes are proposed in floodway areas where possible and amendments to the planning proposal are required to ensure consistency with this clause.</p> <p>(b) No assessment of potential flood impacts to other properties has been undertaken in the planning proposal. Rhelm considers consistency with this clause is unknown at this stage, however there are proposed controls in the Willoughby DCP to manage redevelopment impacts (i.e. Section 6 in Part I Stormwater Management).</p> <p>(c) No mapping of hydraulic hazard is presented in the planning proposal. Rhelm has undertaken an analysis as part of this advice to determine where changes are proposed in high hazard areas and amendments to the planning proposal are required to ensure consistency with this clause.</p>

Consistency with Ministerial Direction 4.1				
Requirements	Yes	No	Uncertain	Justification / Comment
<p><i>flood mitigation and emergency response measures, which can include but are not limited to the provision of road infrastructure, flood mitigation infrastructure and utilities, or</i></p> <p><i>(h) permit hazardous industries or hazardous storage establishments where hazardous materials cannot be effectively contained during the occurrence of a flood event.</i></p>				<p>(d) Additional information is required to assess consistency with this clause. This level of detail of the future development proposed is not provided in the planning proposal. Rhelm considers in particular that the increase in development and dwelling density in the Chatswood CBD may be considered significant and flood risk in this area is particularly unknown due to the current lack of flood mapping in this area.</p> <p>(g) Additional information is required to assess consistency with this clause.</p>
<p><i>(4) A planning proposal must not contain provisions that apply to areas between the flood planning area and probable maximum flood to which Special Flood Considerations apply which:</i></p> <p><i>(a) permit development in floodway areas,</i></p> <p><i>(b) permit development that will result in significant flood impacts to other properties,</i></p> <p><i>(c) permit a significant increase in the dwelling density of that land,</i></p> <p><i>(d) permit the development of centre-based childcare facilities, hostels, boarding houses, group homes, hospitals, residential care facilities, respite day care centres and seniors housing in areas where the occupants of the development cannot effectively evacuate,</i></p> <p><i>(e) are likely to affect the safe occupation of and efficient evacuation of the lot, or</i></p> <p><i>(f) are likely to result in a significantly increased requirement for government spending on emergency management services, and flood mitigation and emergency response measures, which can include but not limited to road infrastructure, flood mitigation infrastructure and utilities.</i></p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>Rhelm considers that the following inconsistencies are apparent and amendments to the planning proposal are required to ensure consistency with the following clauses:</p> <p>(a) As per 3(a) above.</p> <p>(b) As per 3(b) above.</p> <p>(c) As per 3(d) above.</p> <p>(e) Additional information is required to assess consistency with this clause.</p> <p>(f) As per 3(g) above.</p>
<p><i>(5) For the purposes of preparing a planning proposal, the flood planning area must be consistent with the principles of the Floodplain Development Manual 2005 or as otherwise determined by a Floodplain Risk Management Study or Plan adopted by the relevant council.</i></p>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>Council's planning proposal does not discuss or present FPA mapping. No FPA mapping is available on Council's online mapping portal (Willoughby Online Mapping Application) or on the NSW Planning Portal.</p>

Consistency with Ministerial Direction 4.1				
Requirements	Yes	No	Uncertain	Justification / Comment
<p><i>A planning proposal may be inconsistent with this direction only if the planning proposal authority can satisfy the Planning Secretary (or their nominee) that:</i></p> <ul style="list-style-type: none"> <i>(a) the planning proposal is in accordance with a floodplain risk management study or plan adopted by the relevant council in accordance with the principles and guidelines of the Floodplain Development Manual 2005, or</i> <i>(b) where there is no council adopted floodplain risk management study or plan, the planning proposal is consistent with the flood study adopted by the council prepared in accordance with the principles of the Floodplain Development Manual 2005 or</i> <i>(c) the planning proposal is supported by a flood and risk impact assessment accepted by the relevant planning authority and is prepared in accordance with the principles of the Floodplain Development Manual 2005 and consistent with the relevant planning authorities' requirements, or</i> <i>(d) the provisions of the planning proposal that are inconsistent are of minor significance as determined by the relevant planning authority.</i> 	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The planning proposal remains inconsistent with Ministerial Direction 4.1 and Rhelm consider that amendments are required by DPE in order to finalise the planning proposal.

Stakeholder Consultation

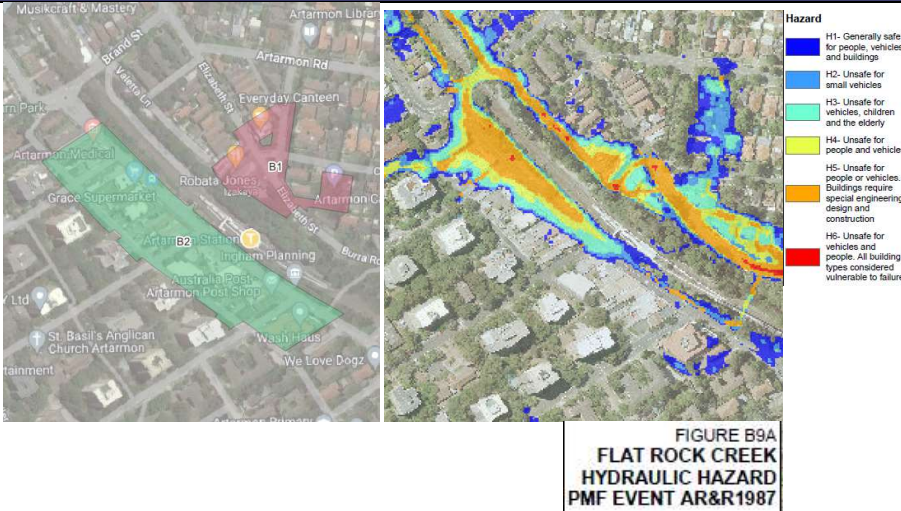
Stakeholder Consultation		
DPE BCD Comment	Proponent/Consultant Response	Rhelm Comment
<p><i>[From DPE BCD letter dated 27 May 2022:]</i></p> <p>EHG raises concern about the adequacy of the consistency assessment with Local Planning Directions 4.1 Flooding as the planning proposal states ““Upzoned” land which is identified in any flood studies will be subject to water management controls within the Willoughby DCP”.</p> <p>EHG advises that DCP controls cannot be substituted for consideration of the direction at the planning proposal stage. The planning proposal seeks to increase intensity of development and where this land is flood affected, the local planning direction must be considered. For example, Hampden Road in Artarmon is flood prone land to which the provisions of the direction would apply. EHG recommends that Council reviews the extent of flood prone land to determine where the direction is to be considered.</p>	<p><i>[From Willoughby City Council letter dated 23 February 2023:]</i></p> <p>I am writing to advise you that at its meeting of 12 December 2022, Council resolved to forward the comprehensive LEP Planning Proposal to the Department of Planning and Environment for finalisation, following certain amendments. The amendments referred to in the Council resolution are now complete.</p> <p>The Council report and resolution along with relevant documentation has been uploaded onto the Planning Portal.</p> <p>Also uploaded to the Planning Portal are two Tables explaining the written and mapping changes.</p> <p><i>[Verbal discussions – DPE also noted the following to Rhelm based on verbal discussions with Council to respond to EHG concerns:]</i></p> <ul style="list-style-type: none"> • Council is aware of the sites that are subject to overland flow and the increase in density has been taken into account in areas such as Artarmon and Willoughby South Local Centres • Flood constraints identified for specific development lots do not prohibit development of those sites under existing or proposed LEP / DCP controls • Proposed heights and FSRs are maximum controls that allow for design flexibility to respond to site specific constraints. 	<p>Rhelm supports the comments made by DPE BCD, in particular that DCP controls cannot be substituted for consideration of the direction at the planning proposal stage. Further information is required in the planning proposal to provide an assessment of flood risk across the LGA.</p>


Critique of flood information provided

Critique of the flood information		
Flood information	Consultant	Rhelm Comment – any gaps/further information/critical review of the information
Planning Proposal Review of Willoughby Local Environmental Plan 2012 (exhibited draft version dated March 2022, as amended by the planning proposal amendment documentation noted)	Willoughby City Council	<p>Flood modelling</p> <p>The planning proposal does not include any flood modelling or presentation or analysis of mapping of the PMF, including for hydraulic hazard and hydraulic categorisation in the PMF. It also does not present or discuss the FPA. Hydraulic hazard and hydraulic categorisation mapping in the PMF, as well FPA mapping, should be presented and analysed from existing flood studies to indicate areas of floodway and high hazard flooding, in particular.</p> <p>Assessment of flood risk</p> <p>The planning proposal does not include any discussion or assessment of flood risk or evacuation planning. It does not include any assessment of potential impacts to surrounding properties, as it does not discuss the proposed future developments to that level of detail.</p> <p>The planning proposal contains a statement of assessment against Ministerial Direction 4.1, noting it is consistent with the direction and that: <i>“Upzoned” land which is identified in any flood studies will be subject to water management controls within the Willoughby DCP</i>. Rhelm does not support deferral of these matters to DA stage.</p>
Willoughby LEP 2012 Comprehensive Review – Gateway Determination Report (PP-2021-6242) (dated December 2021)	DPIE	<p>Both the planning proposal and Gateway Determination Report note consistency with Ministerial Direction 4.1 stating that: <i>“Upzoned” land which is identified in any flood studies will be subject to water management controls within the Willoughby DCP</i>.</p> <p>Rhelm does not agree with this determination of ‘consistent’ with Ministerial Direction 4.1 Flooding as noted in this flood advice.</p>

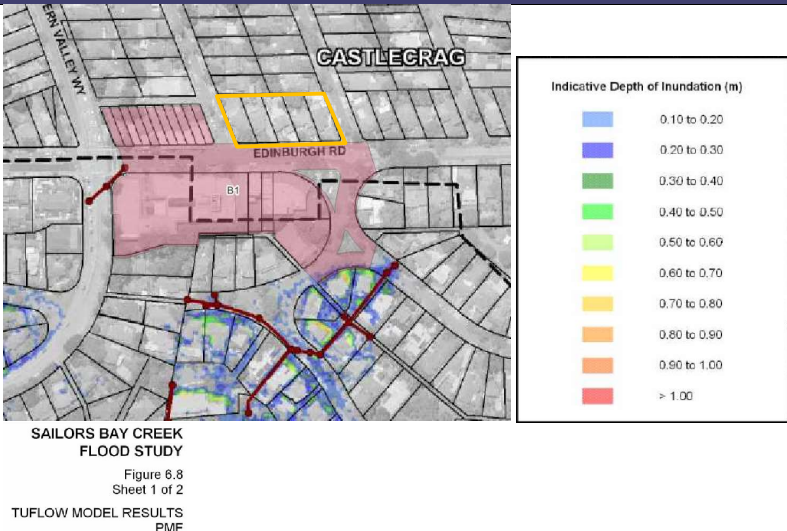

Attachment 1


Table 1 – Local Centres


Area	Affected by PMF	Catchment	Comments	Map (showing relevant proposed zoning overlaid over PMF extent mapping from relevant flood study where available)
Artarmon	Yes	Flat Rock Creek	<p>The B2 zone (on the south-west side of the rail line) is substantially affected by the PMF (with H5 hazard classification in Hampden Road). Increased HOBs and FSRs are proposed in B2. In particular HOB from 14 to 20m and FSR from 2:1 to 3:1 in the northernmost lot may present a risk to life and evacuation issues in the PMF.</p> <p>The increase represents an intensification of use in a flash flood environment. It is unlikely that the risk can be readily mitigated given the flooding is associated with a low point in the landscape and a constricted flow path associated with the railway line.</p> <p>It is recommended that the B2 portion be excised from the LEP amendments and consideration be made of potential zoning of some lots to a SP2 drainage zone for the most affected lots.</p> <p>No changes are proposed in the B1 zone (located on the north-east side of the rail line).</p>	 <p>FIGURE B9A FLAT ROCK CREEK HYDRAULIC HAZARD PMF EVENT AR&R1987</p> <p>Note: Proposed zoning in Flat Rock Creek catchment is not overlain but rather side by side with PMF hydraulic hazard mapping from the FRMS&P (WMA Water, 2020).</p>

Area	Affected by PMF	Catchment	Comments	Map (showing relevant proposed zoning overlaid over PMF extent mapping from relevant flood study where available)
North Willoughby	No	Part Sugarloaf Creek and part Scotts Creek	Not affected by PMF extent in published studies. No flood risk assessment required.	

Area	Affected by PMF	Catchment	Comments	Map (showing relevant proposed zoning overlaid over PMF extent mapping from relevant flood study where available)
Naremburn	Yes, but minimally, therefore requires no further assessment	Flat Rock Creek	Only very small and isolated PMF extents covering the proposed B1 zone, and all low hazard (H1). Therefore, no further flood risk assessment considered necessary.	 <p>FIGURE B9C FLAT ROCK CREEK HYDRAULIC HAZARD PMF EVENT AR&R1987</p> <p>Note: Proposed zoning in Flat Rock Creek catchment is not overlain but rather side by side with PMF hydraulic hazard mapping from the FRMS&P (WMA Water, 2020).</p>

Area	Affected by PMF	Catchment	Comments	Map (showing relevant proposed zoning overlaid over PMF extent mapping from relevant flood study where available)
Castlecrag	Yes, but minimally, therefore requires no further assessment	Part Sailors Bay Creek and part Sugarloaf Creek	Only very minimal PMF extent covering The Parapet Road roadway within the B1 zone. The existing R3 area within this local centre proposed for minimum lot size changes (marked with an orange box) is not affected by the PMF extent. Therefore, no further flood risk assessment considered necessary.	
Northbridge	Yes	Part Flat Rock Creek and part Sailors Bay Creek	The northern portion of the existing B2 zone that is proposed for rezoning to R3 and R4 is affected by the PMF along an overland flow path through the proposed R3 zone. This overland flow path is indicated as high hazard floodway in the PMF (Lyll & Associates, 2014a). It is likely that a stormwater diversion scheme with associated overland flow path could be accommodated on the southern and western perimeter of the R3 zone and it is recommended that consideration of an SP2 drainage zone of an equivalent width to the PMF extent be provided to accommodate this in	

Area	Affected by PMF	Catchment	Comments	Map (showing relevant proposed zoning overlaid over PMF extent mapping from relevant flood study where available)
			<p>the proposed re-zoning (i.e. a strip of SP2 between the R4 and R3 zones.</p> <p>The remainder of the existing B2 that involves HOB and FSR changes is not affected by the PMF extent in either the Sailors Bay Creek or Flat Rock Creek catchments. Therefore, no further flood risk assessment required.</p> <p>The existing R2 and R3 residential area marked by an orange box in the south of the Northbridge Local Centre is proposed for rezoning to R3 as well as HOB and FSR changes. This area is affected to a very minimal extent by the PMF (H1 only) in the Flat Rock Creek catchment and therefore no further flood risk assessment required.</p>	<p>Indicative Depth of Inundation (m)</p> <ul style="list-style-type: none"> 0.10 to 0.20 0.20 to 0.30 0.30 to 0.40 0.40 to 0.50 0.50 to 0.60 0.60 to 0.70 0.70 to 0.80 0.80 to 0.90 0.90 to 1.00 > 1.00 <p>SAILORS BAY CREEK FLOOD STUDY Figure 6.8 Sheet 1 of 2 TUFLOW MODEL RESULTS PMF</p> <p>Existing zoning (left) and proposed zoning (right) overlaid over PMF extent mapping for Sailors Bay Creek catchment</p>  <p>FIGURE B9C FLAT ROCK CREEK HYDRAULIC HAZARD PMF EVENT AR&R1987</p> <p>PMF hydraulic hazard mapping from the Flat Rock Creek FRMS&P (WMA Water, 2020).</p>

Area	Affected by PMF	Catchment	Comments	Map (showing relevant proposed zoning overlaid over PMF extent mapping from relevant flood study where available)
Penshurst Street	Yes (only northern portion of B5 and B2 to be assessed further)	Part Sugarloaf Creek and part Flat Rock Creek	<p>Small areas in the north of the B5 and B2 zones of the local centre are affected by the PMF extent in the Sugarloaf Creek catchment. Proposed changes in these flood affected areas include HOBs and FSRs changes.</p> <p>The R3 zones contained within the local centre, where FSR changes are proposed, is not affected by the PMF extent. Therefore, no further flood risk assessment required for this R3 zone.</p> <p>Small areas of B5 in the Flat Rock Creek catchment where HOBs and FSR changes are proposed (marked with orange boxes) are affected to a very minimal extent by the PMF (H1 only) and therefore no further flood risk assessment is considered necessary for this area.</p>	 <p>FIGURE B9A FLAT ROCK CREEK HYDRAULIC HAZARD PMF EVENT AR&R1987</p> <p>Left: Proposed zoning overlaid over PMF extent mapping for Sugarloaf Creek catchment; Right: PMF hydraulic hazard mapping from the Flat Rock Creek FRMS&P (WMA Water, 2020).</p>

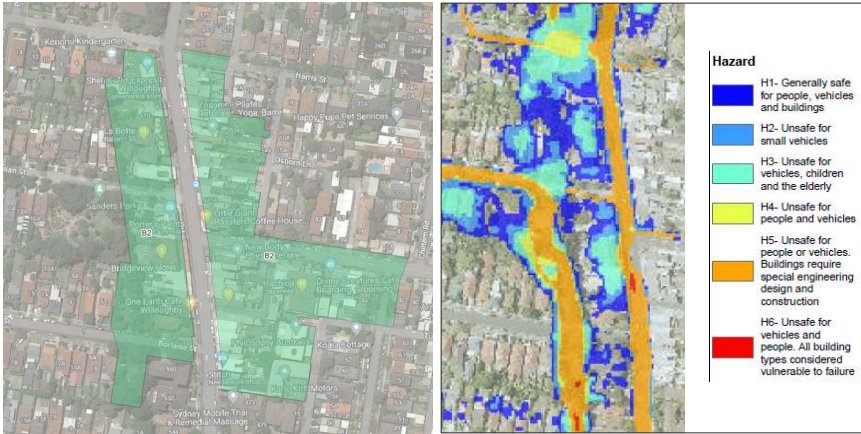
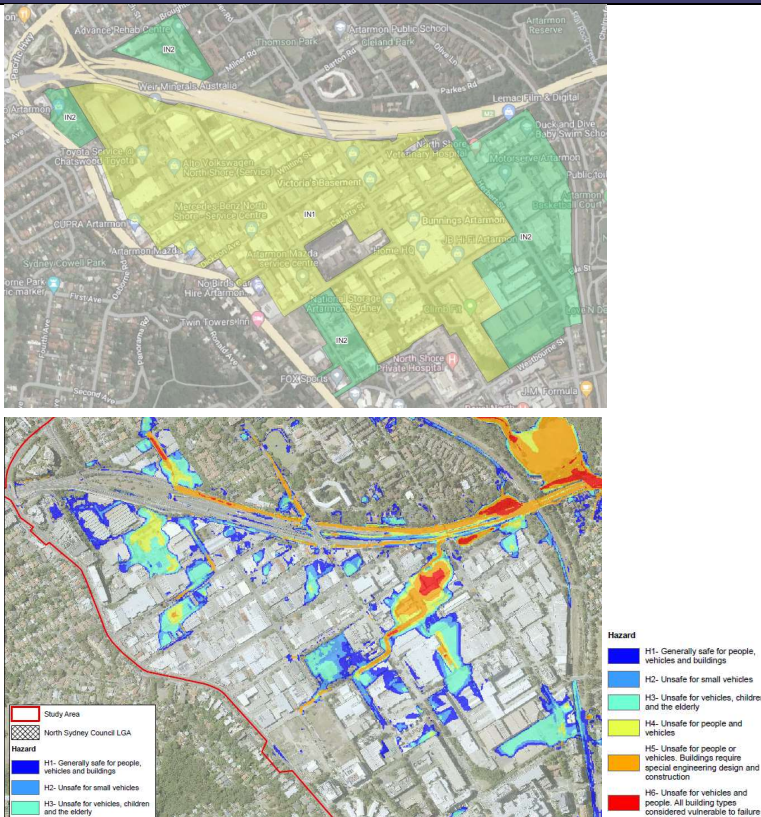
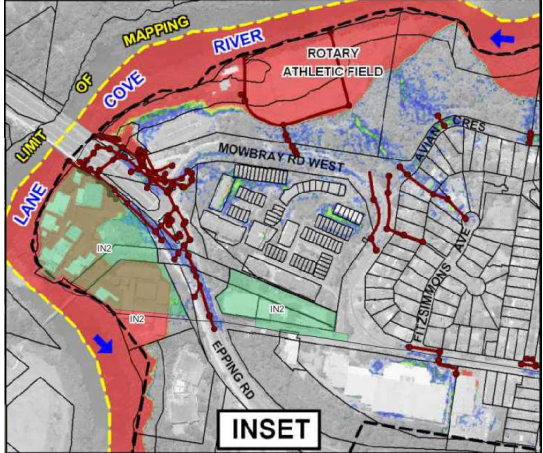
Area	Affected by PMF	Catchment	Comments	Map (showing relevant proposed zoning overlaid over PMF extent mapping from relevant flood study where available)
Willoughby South	Yes	Flat Rock Creek	The B2 area to the west of Willoughby Road is substantially affected in the PMF. The B2 zone to the east of Willoughby Road is only affected to a very minimal degree, only by low hazard (H1-H3) flooding with the exception of two roadways indicated as H5 in the PMF. Willoughby Road itself is also indicated as H5 in the PMF, which presumably would be the primary access/evacuation route for this local centre.	 <p>Note: Proposed zoning in Flat Rock Creek catchment is not overlain but rather side by side with PMF hydraulic hazard mapping from the FRMS&P (WMA Water, 2020).</p> <p>FIGURE B9A FLAT ROCK CREEK HYDRAULIC HAZARD PMF EVENT AR&R1987</p>

Table 2 – Industrial Land

Area	Affected by PMF	Catchment	Comments	Map (showing relevant proposed zoning overlaid over PMF extent mapping from relevant flood study)
Artarmon	Yes (only northernmost and easternmost IN2 areas to be assessed further)	Flat Rock Creek	<p>The PMF extent is variable within the IN1 (yellow) and IN2 (green) zone in this area. Proposed clause will change FSR from 1.5:1 to 2:1 in IN2 for sites greater than 1,000m², so only IN2 land has been considered in this flood advice.</p> <p>The northernmost IN2 area (north side of the Gore Hill Freeway, around George Place) is affected by flash flooding in the PMF. The land is steep and roadway is a high hazard (H5-H6) floodway. A shelter in place strategy will be required and controls are recommended to have a flood free elevated area for shelter in place.</p> <p>The westernmost IN2 area (around Alto Place) appears to be only affected to a lesser extent by low hazard (H1) flooding in the PMF. Therefore, no further flood risk assessment is considered necessary for this area.</p> <p>The southernmost IN2 area appears to be only affected to a very minimal extent, predominately along the roadway to the north which is affected by minor high hazard (H5) flooding. Presumably there would be alternative suitable evacuation routes from the IN2 area. Therefore, no further flood risk assessment is considered necessary for this area.</p> <p>The easternmost IN2 area (around Herbert Street) also appears to be affected in the PMF, although predominantly by low hazard (H1-H3) flooding in the PMF in the very south and very north of the IN2 area.</p>	 <p>FIGURE B98 FLAT ROCK CREEK HYDRAULIC HAZARD PMF EVENT AR&R1987</p> <p>Note: Proposed zoning in Flat Rock Creek catchment is not overlain but rather side by side with PMF hydraulic hazard mapping from the FRMS&P (WMA Water, 2020).</p>

Area	Affected by PMF	Catchment	Comments	Map (showing relevant proposed zoning overlaid over PMF extent mapping from relevant flood study)
			This low point is a sag and forms a flood storage area. Intensification of use on this site and any at-grade car parking will be very reliant on stringent application of flood-related development controls.	
East Chatswood	Yes	Scotts Creek	<p>The PMF extent is within the IN2 zone as Scotts Creek runs through the northern portion of this area. Proposed clause will change FSR from 1.5:1 to 2:1 in IN2 for sites greater than 1,000m².</p> <p>It is recommended that the opportunity be taken to zone the creek itself to a more compatible use, such as SP2 Stormwater Management (which is present upstream for Scotts Creek through portions of the R2 area) or a compatible environmental zone (such as C2, which is the zone for Scotts Creek downstream of Eastern Valley Way). This could occur between the top of bank areas, between the RE1 land on Penshurst Street (Muston Park) and Eastern Valley Way. A zoning of SP2 would better reinforce the flood function of the creek.</p>	<p>The map displays an aerial view of the East Chatswood area. A large green-shaded region represents the PMF extent, covering a significant portion of the residential and commercial areas. The Scotts Creek is visible running through the center of the mapped area. Labels include 'IN2' within the green zone and 'SCOTTS CREEK FLOOD STUDY' in the bottom right corner. A legend at the bottom left defines the symbols used, including 'PMF' and various flood levels like '60 YEAR ARI', '30 YEAR ARI', and '1 YEAR ARI'. A note at the bottom left explains the scale and purpose of the map.</p>

Area	Affected by PMF	Catchment	Comments	Map (showing relevant proposed zoning overlaid over PMF extent mapping from relevant flood study)
Lane Cove North	Yes (only IN2 area to west of Epping Road to be assessed further)	Swaines Creek	The PMF extent is within a substantial portion of the IN2 area to the west but not east of Epping Road. This site involves foreshore land on the Lane Cove River. Proposed clause will change FSR from 1.5:1 to 2:1 in IN2 for sites greater than 1,000m ² .	 <p>INSET</p> <p>Indicative Depth of Inundation (m)</p> <ul style="list-style-type: none"> 0.10 to 0.20 0.20 to 0.30 0.30 to 0.40 0.40 to 0.50 0.50 to 0.60 0.60 to 0.70 0.70 to 0.80 0.80 to 0.90 0.90 to 1.00 > 1.00 <p>SWAINES CREEK FLOOD STUDY Figure 6.13 TUFLOW MODEL RESULTS PMF</p>



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