



NEPEAN RIVER FLOODPLAIN RISK MANAGEMENT STUDY & PLAN INCLUDING NARELLAN CREEK

APPENDIX E – DEVELOPMENT CONTROLS

Final Report (13 November 2022)

Nepean River Draft Floodplain Development Control Matrix

1. Land to which the Floodplain Development Controls Apply

These development controls apply to any development for which consent is required that is located on land affected by flooding (flood liable or flood-prone land) within the Nepean River catchment including its tributaries located within the Camden LGA, as illustrated on the maps in **Figures 1**.

The Floodplain Development Manual (2005) defines flood-prone land to be one of the following three hydraulic categories:

- Floodway - Areas that convey a significant portion of the flow. These are areas that, even if partially blocked, would cause a significant increase in flood levels or a significant redistribution of flood flows, which may adversely affect other areas.
- Flood Storage - Areas that are important in the temporary storage of the floodwater during the passage of the flood. If the area is substantially removed by levees or fill it will result in elevated water levels and/or elevated discharges. Flood Storage areas, if completely blocked would cause peak flood levels to increase by 0.1 m and/or would cause the peak discharge to increase by more than 10%.
- Flood Fringe - Remaining area of flood-prone land, after Floodway and Flood Storage areas have been defined. Blockage or filling of this area will not have any significant effect on the flood pattern or flood levels.

The extent of the floodways in a 1% AEP flood are mapped in **Figure 2**.

The Flood Risk Precincts for the Nepean River catchment mainstream flooding are mapped in **Figure 3** and overland flooding are mapped in **Figure 4**. These figures define the extents of High, Medium and Low Flood Risk Precincts for the mainstream and low and high flood risk precincts for overland flows.

A development control matrix has been prepared based on these Flood Risk Precincts and the land use categories described below.

2. Objectives of the Floodplain Development Controls

The purpose of these development controls is to ensure that development is consistent with the NSW Flood Prone Land Policy and the 2005 Floodplain Development Manual and relevant Camden Council controls and guidelines. Specific objectives of the development controls are to:

- Provide a mechanism for the responsible control of development on flood-prone land;
- Ensure the safety of people and property during floods;
- Provide detailed but user-friendly controls for flood-prone or flood liable lands for the preparation and assessment of development applications lodged under the State Environmental Planning Policy (Sydney Region Growth Centres) 2006 or the Camden Local Environmental Plan 2010; and
- To ensure a sustainable and holistic catchment-wide approach is taken to development on flood-prone land in the Nepean River catchment within the Camden LGA.

3. Land Use Categories

Different land uses experience different risks from flooding. Consequently, land uses have been grouped into major land use categories based on their sensitivity to flood risks as follows:

Critical Infrastructure

Includes emergency services facilities such as: hospitals; administration buildings or public administration buildings that may be important for the notification or evacuation of the community during flood events (e.g. SES Headquarters, Police Stations, Ambulance Stations, Evacuation Centres).

Sensitive Uses and Facilities

Includes community facilities that would provide services to sensitive persons such as children and seniors during floods or if inundated would unreasonably affect the ability of the community to return to normal activities after flood events. May include seniors housing; childcare centres; aged care centres; schools; liquid fuel depots; public utilities (including electricity generating works and utility installations).

Precinct Planning and Land Subdivision

Refers to the subdivision of land for the purpose of urban development. This definition also encompasses the subdivision of land in Urban Release Areas where multiple land uses are proposed.

Low Density Residential

Includes dwelling houses, rural workers' dwellings, secondary dwellings, exhibition home, exhibition village, home-based childcare, home business, home industry, home occupation and caravan parks (approved long-term sites).

Medium and High Density Residential

Includes dual occupancies, attached dwellings, boarding houses, multi dwelling housing, residential flat buildings, semi-detached dwellings, shop top housing, hostels, and community facilities.

Commercial and Industrial

Refers to all commercial and industrial development, commercial additions and subdivision of land for commercial purposes. Tourist developments also fall within this category and will be given special consideration by Council based on the assessed risk.

Commercial and Industrial development is only permitted in areas located outside the floodways mapped in **Figure 2**.

Concessional Development

Concessional development is only permitted in areas located outside the floodways mapped in **Figure 2**.

In the case of Low, Medium or High-Density Residential development:

- (i) a single habitable addition or alteration only to an existing dwelling of not more than 10% or 30 m² (whichever is the lesser) of the habitable floor area which existed at the date of commencement of this policy. No further habitable additions are permitted

as concessional development, further development must comply with the applicable controls for relevant land use categorisation. No additions are permitted, as

concessional development, if a one-off addition has been approved under any previous policy; or

- (ii) the construction of a single non-habitable outbuilding only with a maximum floor area of 30 m². No further non-habitable outbuildings are permitted as concessional

development, further development must comply with the applicable controls for relevant land use categorisation. No additions are permitted, as concessional development, if a one-off addition has been approved under any previous policy; or

- (iii) Rebuilding a dwelling that substantially reduces the extent of flood affectation to the rebuilt building; and

In the case of development other than Low, Medium and High Density Residential:

- (i) rebuilding of a development which substantially reduces the extent of flood risks to the rebuilt development; or
- (ii) a change of use which does not increase flood risk having regard to property damage and personal safety; and
- (iii) subdivision that does not involve the creation of new allotments with potential for further development.

In the case of development within the Camden heritage Conservation Precinct:

- (i) All Commercial and Industrial, Low, Medium and High-Density Residential developments (as categorised in this policy) located only within the Camden Heritage Conservation Precinct shown in **Figure 5**.

Rural & Recreation

Refers to the construction of farm sheds and non-habitable outbuildings. Includes animal boarding establishment; agricultural facility; biosolid waste application; biosolids treatment facility; caravan park (with no approved long term sites and no “annuals”) short term sites, camping grounds; environmental facility; environmental protection works; information facility; horticulture; kiosk; landscape and garden supplies; recreation area; recreation facility; research station; water recreation structure; water recycling facility and water storage facility.

4. Definition of Terms

Freeboard provides reasonable certainty that the risk exposure selected in deciding on a particular flood chosen as the basis for the Flood Planning Level (FPL) is actually provided. It is a factor of safety typically used in relation to the setting of floor levels, levee crest levels, etc. Freeboard is included in the flood planning level. A freeboard of 500 mm applies in the Low, Medium and High Mainstream Risk Precincts and High Overland Flow Risk Precinct; and no freeboard applies in the Low Overland Flow Risk Precinct.

Flood Planning Levels (FPL) are the combinations of flood levels (derived from significant historical flood events or floods of specific Annual Exceedance Probability and freeboards selected for floodplain risk management purposes.

Floodplain Development Manual supports the Flood Prone Land policy and guides councils through the floodplain risk management process. The manual helps councils develop and implement local floodplain risk management plans and outlines the technical assistance provided by the NSW Government.

Habitable Floor Area in a Low, Medium and High-Density Residential situation is a living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom.

Habitable in an industrial or commercial situation is an area used to store valuable goods, materials and equipment, and hazardous materials susceptible to flood damage in the event of a flood.

Non-Habitable Floor Area in a residential, commercial and industrial situation is any area that does not classify as Habitable Area. See definition of Habitable Area.

Mainstream High Flood Risk Precinct includes all floodway areas and all areas of the floodplain subject to mainstream flooding which would be provisionally high hazard in a 1% AEP event (based on Figure L2 of the Floodplain Development Manual). In addition to including the 1% AEP provisionally high hazard areas in the high flood risk precinct, other parts of the floodplain are also included where:

- (a) In a 1% AEP event, significant evacuation difficulties exist (e.g. flood islands surrounded by provisionally high hazard conditions); or
- (b) In floods rarer than a 1% AEP event, the potential for significant or extreme consequences exist which are not otherwise apparent from consideration of the 1% AEP flood only. These consequences might arise due to catchment diversions or in areas subject to overtopping of levees and embankments, or to severe bank or bed erosion. Whilst the probabilities of these events might be low, the consequences can in some cases be extreme and thus are viewed as a high risk.

Mainstream Medium Flood Risk Precinct is the remaining area below the FPL, not defined as the 'high' flood risk precinct. For reasons similar to those discussed above in the preceding considerations under (a) and (b), it is possible but rare for some otherwise 'low' flood risk areas to be classified as 'medium' risk when warranted by the flood conditions.

Mainstream Low Flood Risk Precinct comprises all remaining areas of the floodplain above the FPL to the limit of inundation in the Probable Maximum Flood (PMF) but not identified as either a high flood risk or medium flood risk precinct, and where the risk of damages is low for most land uses.

Overland Flow is the local runoff, travelling through properties and /or roads, before it discharges into a stream, river, estuary, lake or dam.

Overland High Flood Risk Precinct includes all floodway areas and all areas of the floodplain subject to overland flooding with flood depths greater than 0.5m in a 1% AEP event.

Overland Low Flood Risk Precinct comprises all the remaining areas of the floodplain subject to overland flooding in the 1% AEP event (**i.e., with flood depths between 0.3m to 0.5m**) and above the 1% AEP event and within the PMF extent.

Note: 300mm flood depth filter has been applied for overland flow mapping.

5 Addressing Climate Change Risks

Potential impacts from climate change were assessed by modelling the flood behaviour arising from a 10% increase in rainfall, which may be considered as estimates of flood behaviour at 2050.

The results showed that the Study Area is prone to large flood level increases as a result of the increased rainfall, **especially because of the topography, the gorge downstream of the LGA boundary**. Under the 10% rainfall increase, levels increased by 0.5m to 0.75m at Camden CBD, with levels increasing downstream to over 1.5 at the confluence of Bringelly Creek as mapped in **Figure 6**.

These results suggest that if rainfall intensities increase in line with the current assumptions, 1% AEP peak flood levels will have increased in 2030 to the point where there will no longer be any freeboard available to existing properties. Based on these impacts, it is suggested that Council consider adopting the following FPL for precinct development, major subdivisions, major infrastructure such as transport infrastructure and for sensitive uses and facilities, to address the climate change impacts.

For redevelopment and infill development the following FPL to address the climate change impacts should be considered on merit base with the surrounding environment.

Based on the significance of climate change impacts the mainstream floodplain up to the 1% AEP has been classified as Zone A and Zone B, as in **Figure 7**.

For Zone A, Flood Risk Precinct maps for current conditions (**Figure 3**) should be used for development.

For Zone B, climate change should be considered in development using Flood Risk Precinct maps for the climate change scenario as provided in **Figure 8**,

- For Zone A, a freeboard (500mm) above the 1% AEP flood level applies to mainstream flooding:
- For Zone B, a freeboard (500mm) above the climate change 1% AEP flood level applies to mainstream flooding.
- Overland Flow Flood Risk Precincts:
a freeboard (500mm) above the 1% AEP flood level applies to overland flow High Flood Precinct (**Figure 4**)

The Flood Risk Precincts for the Nepean River catchment mainstream flooding 1% AEP with 10% rainfall increase are mapped in **Figure 8**. These figures define the extents of High, Medium and Low Flood Risk Precincts for the with 10% increase in rainfall intensity within the Precinct.

6. Floodplain Development Controls

The Floodplain Development Controls Matrix

The Floodplain Development Control Matrix provides a correlation of the above land use and flood risk categories, applicable controls and risk management measures to be followed in the preparation and assessment of development in the Nepean River catchment and its tributaries. The numbers in the matrix refer to the requirements listed in the Development Controls below the Matrix.

Floodplain Development Controls Matrix

Mainstream Flooding

			Floor Level	Building Components	Structural Soundness	Flood Affection	Emergency Management	Car Parking	Management & Design
Flood Risk Precincts	High Flood Risk	Critical Infrastructure and Facilities							
		Sensitive Uses and Facilities							
		Precinct Planning & Land Subdivision							
		Low Density Residential							
		Medium and High Density Residential							
		Commercial and Industrial Uses							
		Concessional Development	1,4,5	1	1	1	1,2,3	1,4	1,3
		Rural & Recreation	1,6	1	1	1	1	1,4	1,3
	Medium Flood Risk	Critical Infrastructure							
		Sensitive Uses and Facilities							
		Precinct Planning & Land Subdivision				1	1,3		2,5,6,7
		Low Density Residential	1,2	1	1	2	1	1,2,3	
		Medium and High Density Residential	1,2	1	1	1	1,2	1,2,3	1
		Commercial and Industrial Uses	1,2	1	1	1	1,2,3	1,2,3	1,3
		Concessional Development	1,4,5	1	1	2	1,2,3	1,4	1,3
		Rural & Recreation	1,6	1	2	2	1,2	1,4	1,3
	Low Flood Risk	Critical Infrastructure							
		Sensitive Uses and Facilities	3	2	3	2	1	1	1,4
		Precinct Planning & Land Subdivision				1	1		2,6,7
		Low Density Residential					1		
		Medium and High Density Residential					1,2		1
		Commercial and Industrial					1,2,3	1	1
		Concessional Development					1,2,3		1
		Rural & Recreation					1,2	1	1

Colour Legend

	Unsuitable land use
	No Controls
	1,2 Flood related controls apply

	Engineers report may not be required
	Based on development type excluding low density residential

Floodplain Development Controls Matrix

Overland Flooding

		Floor Level	Building Components	Structural Soundness	Flood Affection	Emergency Management	Car Parking	Management & Design	
Flood Risk Precincts	High Flood Risk	Critical Infrastructure and Facilities							
		Sensitive Uses and Facilities							
		Precinct Planning & Land Subdivision							
		Low Density Residential							
		Medium and High Density Residential							
		Commercial and Industrial Uses							
		Concessional Development	1,4,5	1	1	1	1,2	1,4	1,3
	Rural & Recreation	1,6	1	1	1	1	1,4	1,3	
	Low Flood Risk	Critical Infrastructure							
		Sensitive Uses and Facilities							
		Precinct Planning & Land Subdivision				1	1,3		2,5,6,7
		Low Density Residential	1,2	1	1	2	1	1,2,3	
		Medium and High Density Residential	1,2	1	1	1	1,2	1,2,3	1
		Commercial and Industrial Uses	2	1	1	1	1,2,3	1,2,3	1,3,8
Concessional Development		1,4,5	1	1	2	1,2	1,4	1,3	
Rural & Recreation	1,6	1	2	2	1,2	1,4	1,3		

Colour Legend

	Unsuitable land use
	No Controls
	Flood related controls apply

	Engineers report may not be required
	Based on development type excluding low density residential

Development Controls

Floor Levels

- 1 Habitable floor levels are to be no lower than the applicable Flood Planning Level (see Section 5).
- 2 Non-habitable floor levels are to be no lower than the applicable 1% AEP flood level (see Section 5) with no freeboard.
- 3 Habitable floor levels are no lower than the PMF level with no freeboard.
- 4 Where garages, sheds and minor additions are proposed, floor levels lower than the above 1 to 3 may be considered in cases that comply with the definitions of concessional development. The highest practical floor level is to be designed in all cases except in the case of minor additions where the existing floor level is to be maintained at a minimum.
- 5 If the development proposes the retention of an existing commercial, industrial or residential building in the Camden Heritage Conservation Precinct, for this development, non-habitable floor levels are to be no lower than the applicable 1% AEP flood level (see Section 5) with no freeboard. Where this is not possible, floor levels should be as high as practical with consideration of the environs / adjacent development., The non-habitable floor levels are to be no lower than the floor level of the existing structure. The applicant must demonstrate why a non-habitable floor level at or higher than the 1% AEP floor level cannot be achieved.
- 6 Non-habitable floor levels are to be at the applicable 1% AEP flood level with no freeboard. Where this is not possible, floor levels should be as high as practical with consideration of the environs / adjacent development. The applicant must demonstrate why a non-habitable floor level at or higher than the 1% AEP floor level cannot be achieved.

Building Components

- 1 Any part of a building, services, foundations and/or sub-structure located below the applicable FPL (refer Section 5) is to be constructed of flood compatible materials (refer Table 7.5 in Camden Council's Flood Risk Management Policy 3.19).
- 2 All parts of a sensitive uses building are to be constructed of flood compatible materials below the level of the PMF.

Structural Soundness

- 1 A structural engineering report is to be provided that demonstrates the structure(s) can withstand floodwater forces including debris and buoyancy up to the applicable FPL (see Section 5).
- 2 Applicant to demonstrate that the structure can withstand floodwater forces including debris and buoyancy up to the applicable FPL(see Section 5). An Engineers Report may be required.
- 3 A structural engineering report is to be provided that demonstrates the structure(s) can withstand floodwater forces including debris and buoyancy up to the PMF.

Flood Affection

- 1 An engineering report to be submitted that demonstrates that development is outside the floodway and will not increase the flood affection outside of the development site, for the 20%, 5% and 1% AEP event, having regard to
 - a) loss of flood storage,
 - b) any significant changes in flood levels, peak flows and velocities upstream, downstream and adjacent to the site, and
 - c) any significant impacts on flood hazards.

Consideration should be also given to the cumulative impact of multiple developments in the vicinity if applicable.

The report is to be prepared either using Council's flood model for the relevant catchment, or an alternative proposed 2D model, which is compatible with Council's floodplain model and agreed with the Council.

- 2 The flood impact of the development is outside the floodway and is to be considered for the 20%, 5% and 1% AEP event, having regard to
 - a) loss of flood storage,
 - b) any significant changes in flood levels, peak flows and velocities upstream, downstream and adjacent to the site, and
 - c) any significant impacts on flood hazards.

Emergency Management

- 1 Appropriate methods of reaching safety from floodwaters during the PMF are to be demonstrated with reference to the emergency management strategy for the wider Nepean River floodplain. An Engineer's report is required.
- 2 A Flood Emergency Management Response Plan (FERP) is to be developed by the business director/manager or property owner/manager, with consideration of the SES Camden Local Flood Plan and the emergency management strategy for the wider Nepean River floodplain. The Flood Emergency Management Response Plan is to be updated every 2 years. The FERP is to be supported by signage which describes how to respond to a flood, and which is displayed prominently around the premises.
- 3 Council may consider the impacts of cumulative increases in the number of persons at risk as a result of the development and the impact this may have on evacuation capacity. An assessment of the impact of the evacuation capacity may be required to ensure that the additional persons on the site as a result of the development are able to be appropriately and safely evacuated during floods.

Car Parking

- 1 Where basement car parking is proposed, the entry crest level is to be no lower than the applicable flood planning level (see Section 5). If the level of the PMF is higher than the proposed entry crest level, then a Flood Emergency Management Response Plan is to be provided that demonstrates how flood risk in the car park will be managed.
- 2 The level of above-ground car parking and of garages are to be no lower than 150 mm below the applicable 1% AEP flood level (see Section 5).

- 3 In cases where Requirement 2 is not achievable, above-ground car parking including carports and garages are to be set at the highest level practical. The exit from the car park should be located at the highest access point on the site boundary.
- 4 Above-ground car parking including carports and garages are to be set at the highest level practical.

Management and Design

- 1 Adequate emergency response information and advice is to be provided to residents, employees, attendants, guests and /or visitors at all times.
- 2 Applicant to demonstrate that any development resulting from a subdivision can be undertaken in accordance with Camden Council's Flood Risk Management Policy 3.19.
- 3 Applicant to demonstrate that hazardous storage is available for goods above the applicable Flood Planning Level (see Section 5).
- 4 Applicant to demonstrate that hazardous and emergency storage is available for goods above the level of the PMF.
- 5 Ground levels for new release subdivisions should be higher than the applicable 1% AEP flood level (see Section 5).
- 6 Floodplain mapping is to be updated for the precinct development in the form of flood extents, flood levels, flood depths, flood velocities, provisional hazards, hydraulic categories and the extents of the flood planning area. Flood risk precincts are to be amended to reflect the development scenario using the same method as was used to delineate the flood risk precincts (refer Section 4).
- 7 If the land subdivision changes from precinct planning, then floodplain mapping is to be updated for the precinct development in the form of flood extents, flood levels, flood depths, flood velocities, provisional hazards, hydraulic categories and the extent of the flood planning area. Flood risk precincts are to be amended to reflect the development scenario using the same method as was used to delineate the flood risk precincts (refer Section 4).
- 8 All development must provide for suitable storage of valuable goods, and goods susceptible to flood damage, above the FPL. This can be on or off site. Where storage is proposed off site, it must demonstrated that relocation of valuable goods can be realistically achieved in the lead up to and during flood events with reference to the amount of warning time prior to floods, availability of flood free routes of travel and methods of transport required

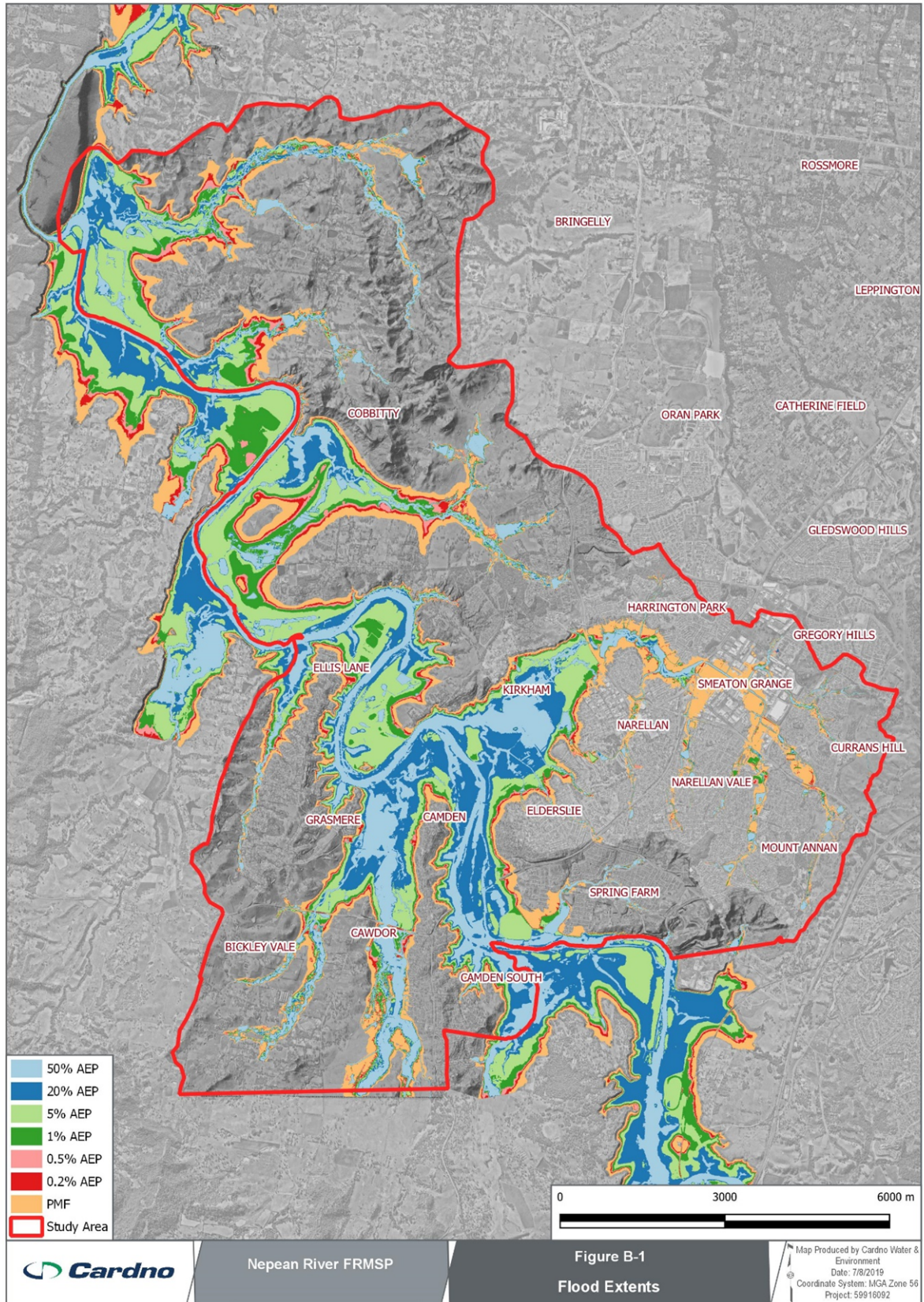


Figure 1 Flood prone land within Nepean River catchment - Nepean River Catchment including Tributaries

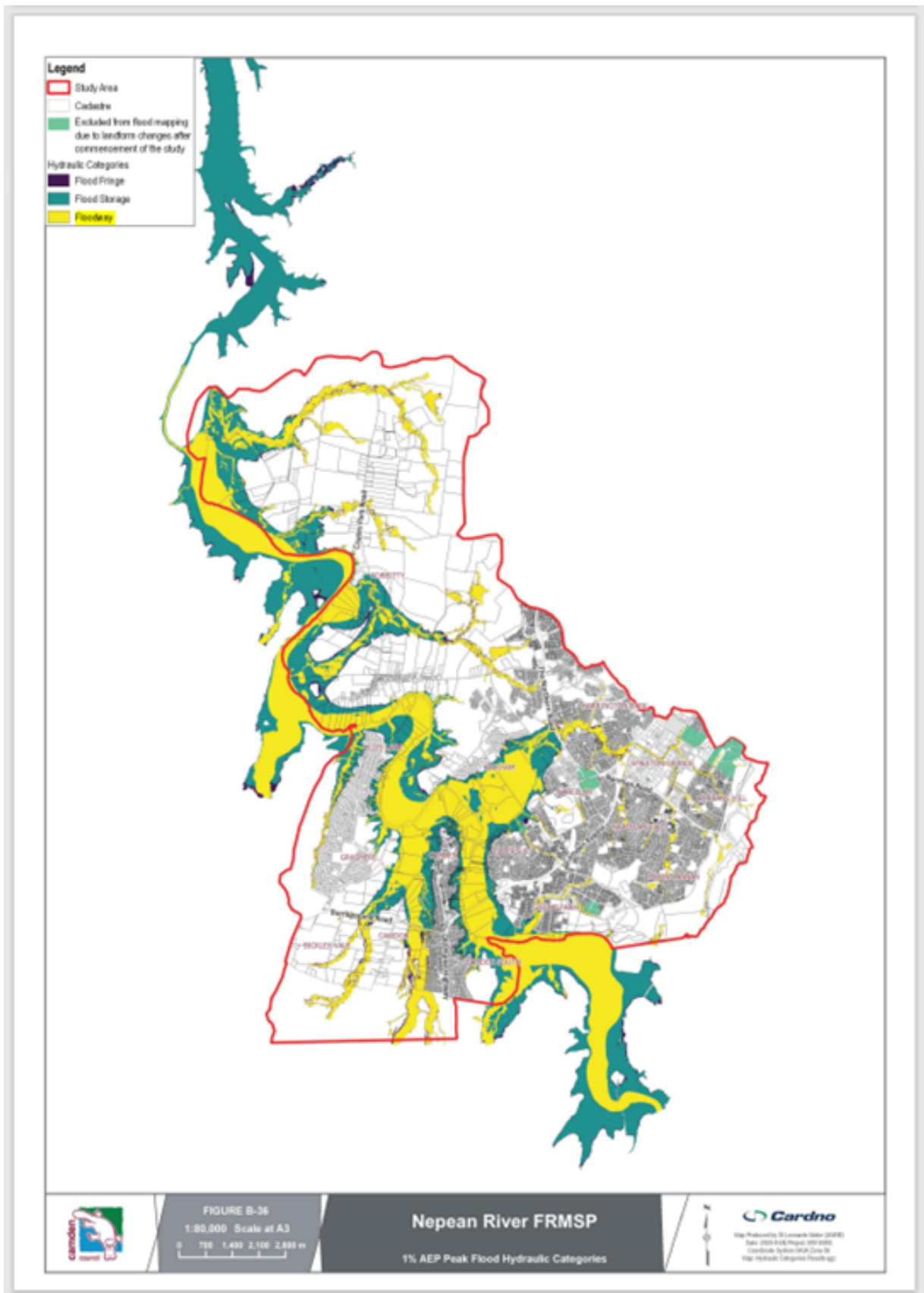


Figure 2 Floodway; Hydraulic categories

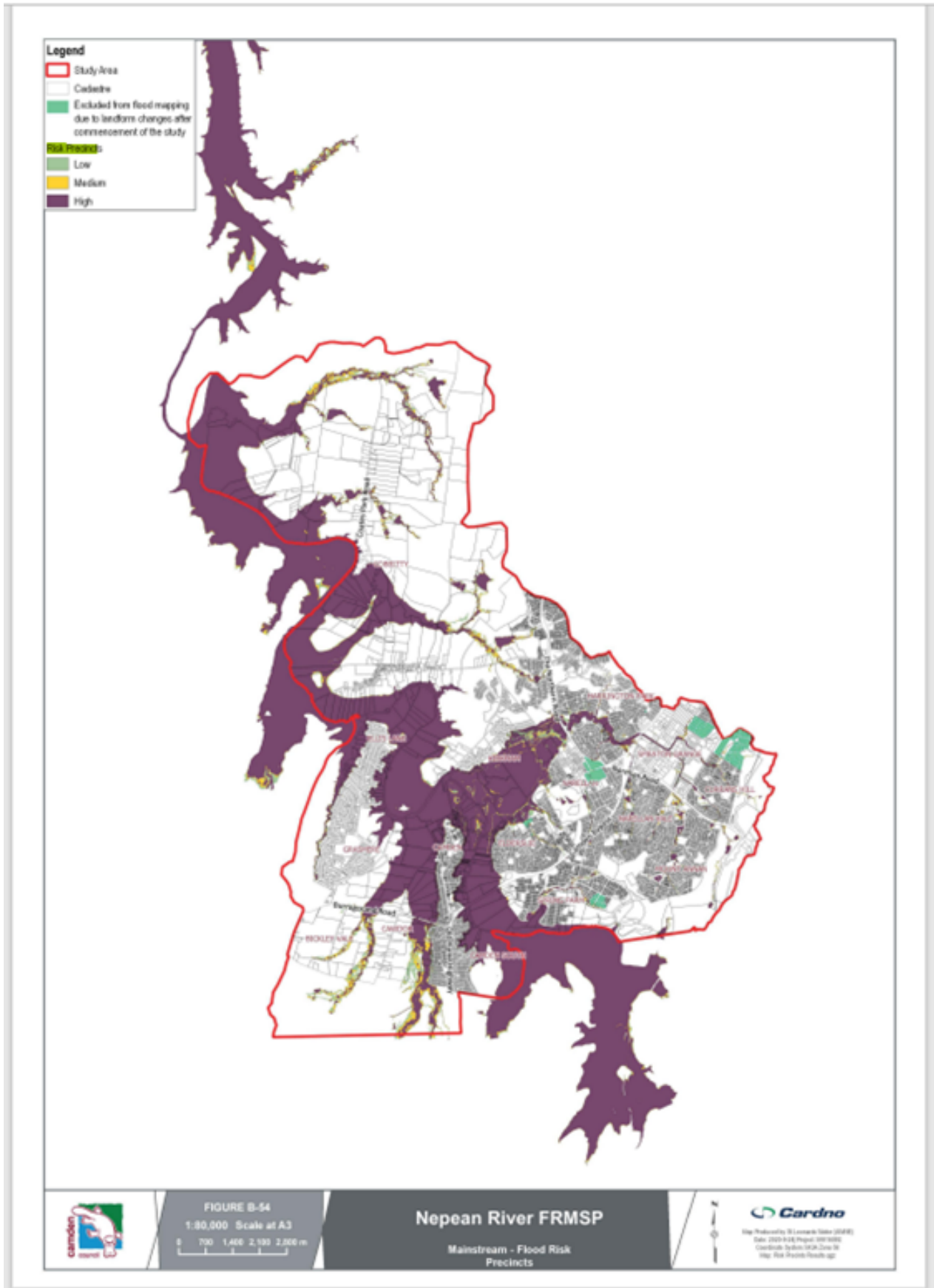


Figure 3 Flood Risk Precincts for the Nepean River catchment mainstream flooding

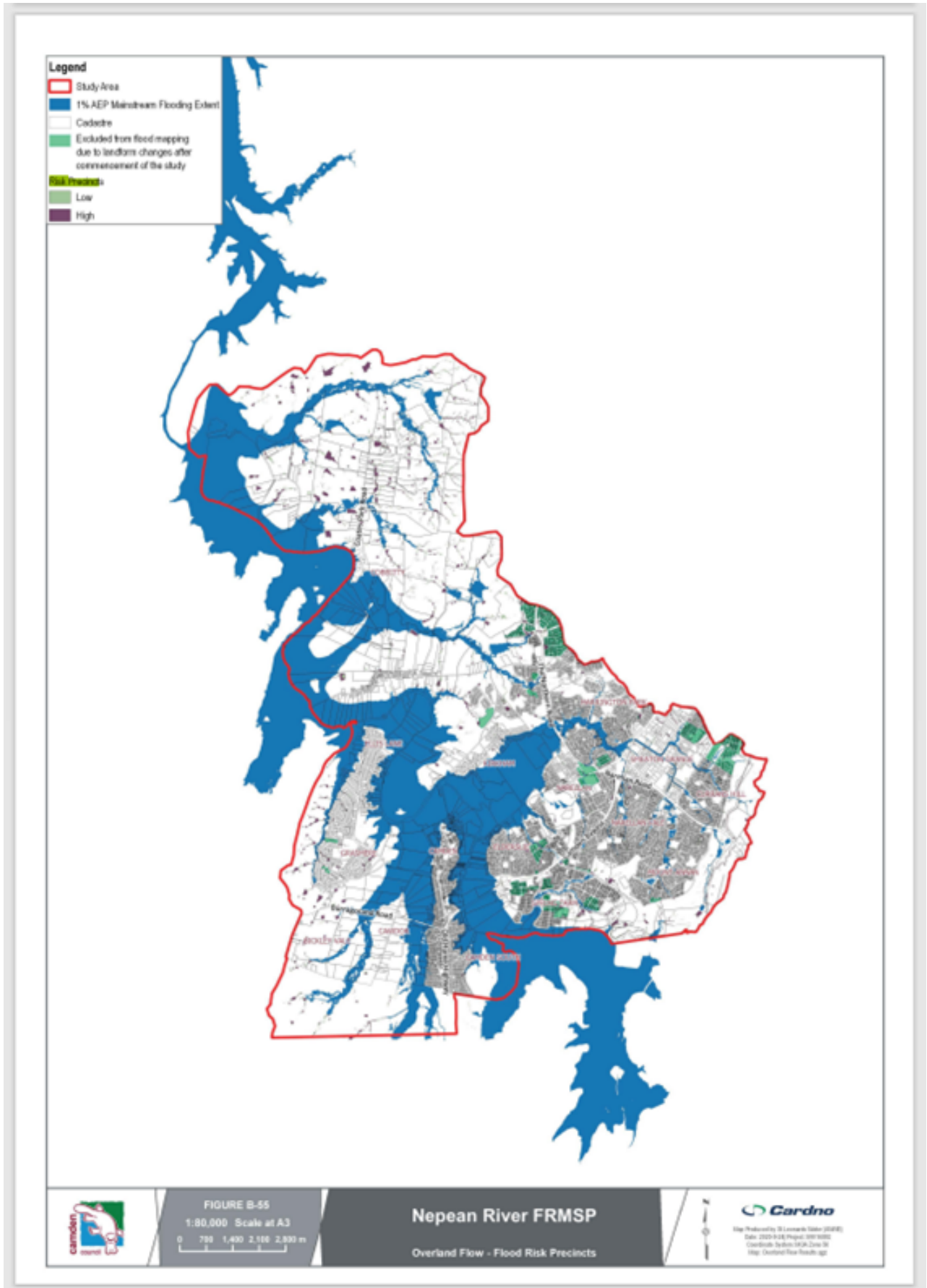


Figure 4 Flood Risk Precincts for the Nepean River catchment overland flow

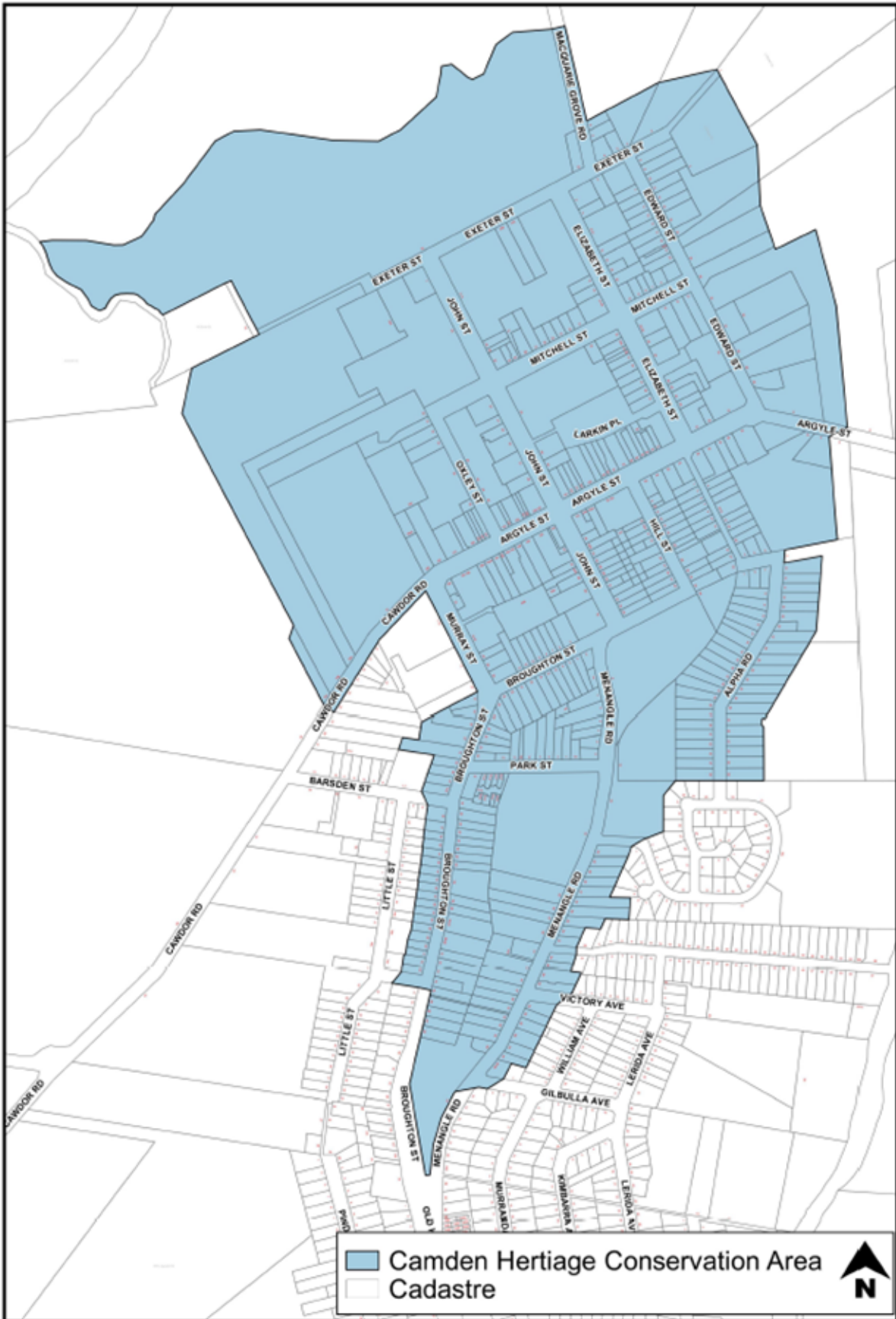


Figure 5 Extent of Camden Heritage Conservation Precinct for the purpose of Development Control Matrix

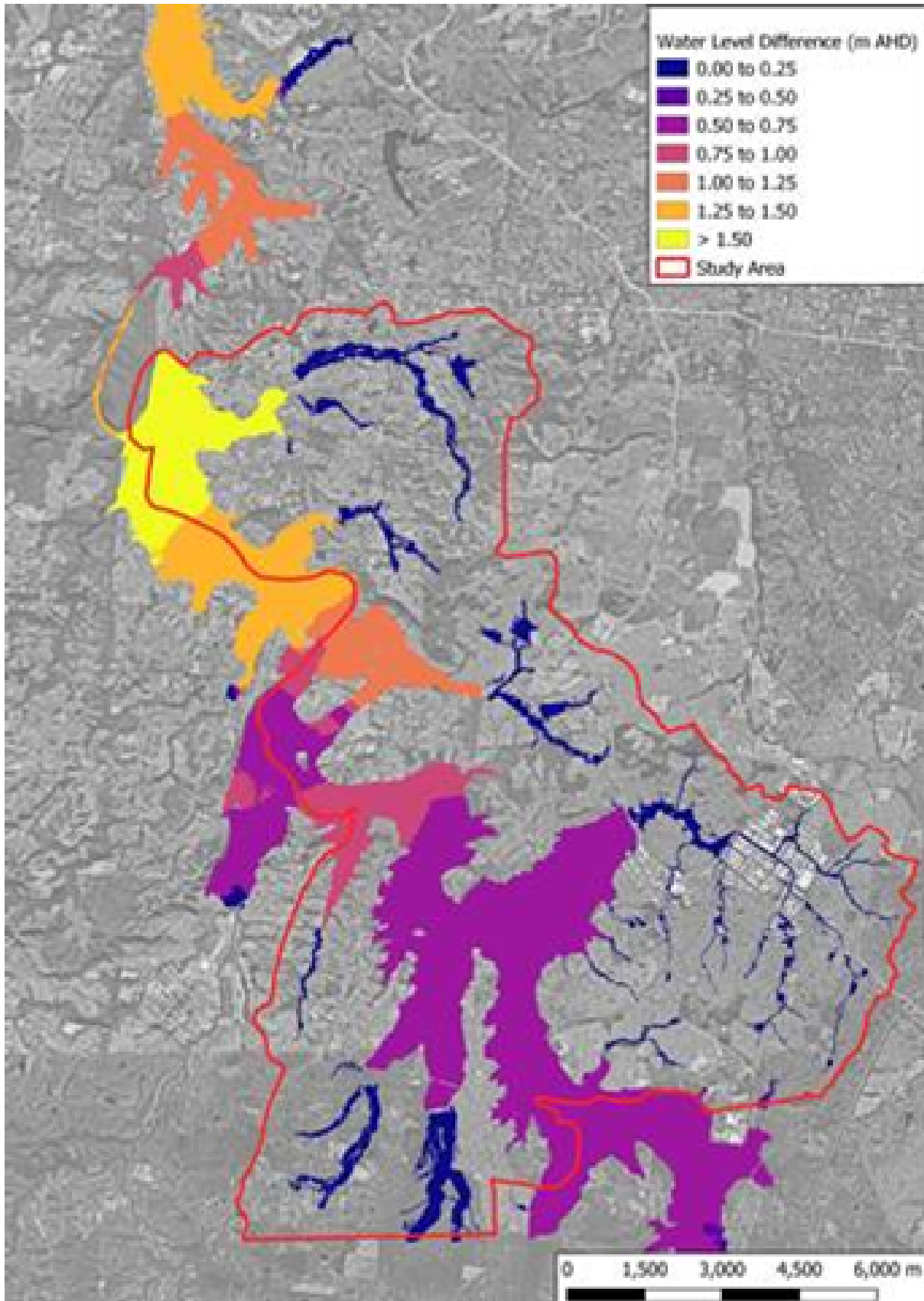


Figure 6 Climate Change Flood Level increases

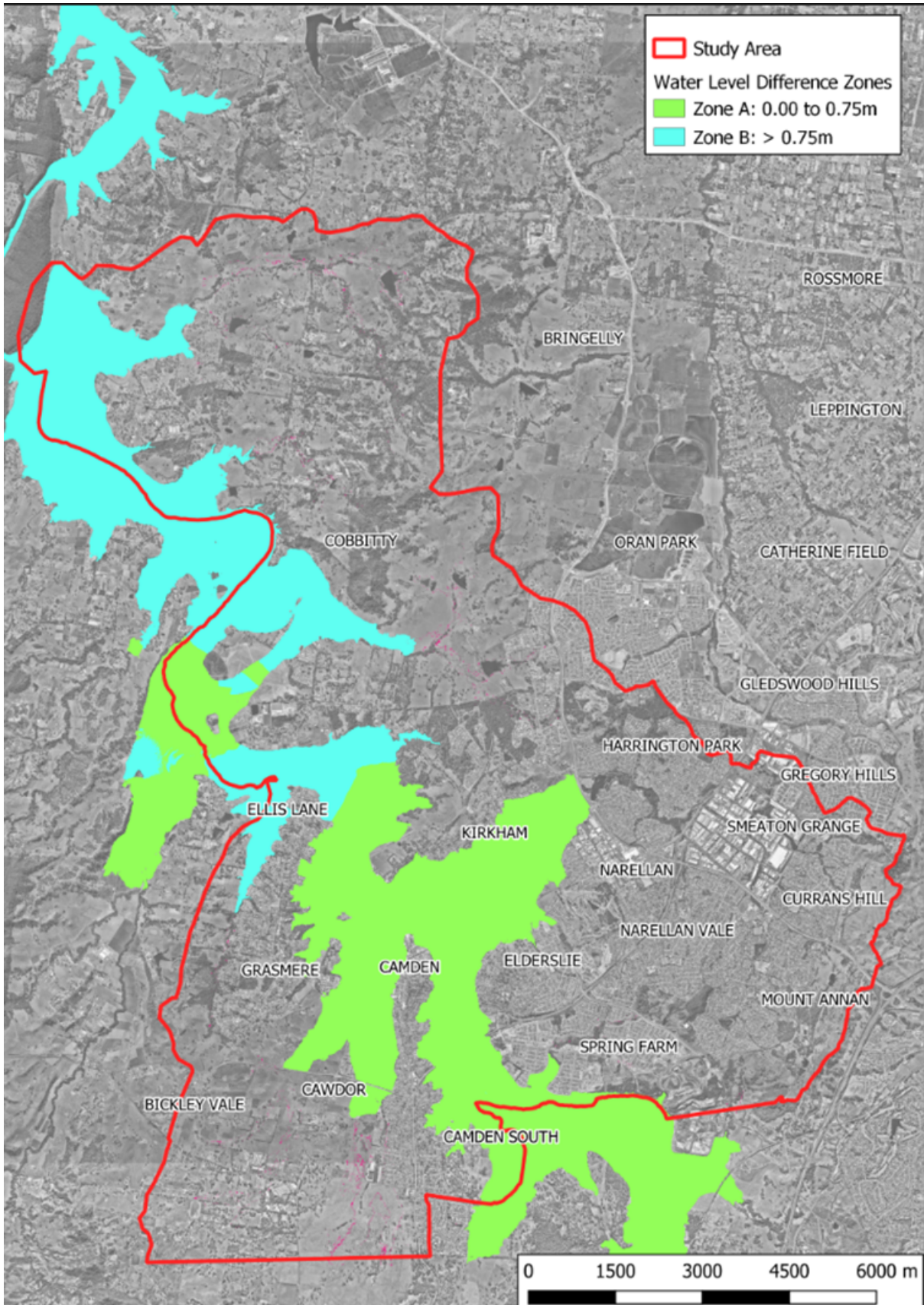


Figure 7 Zoning of Areas Subject to Existing and Climate Change FPLs; Zones A and B

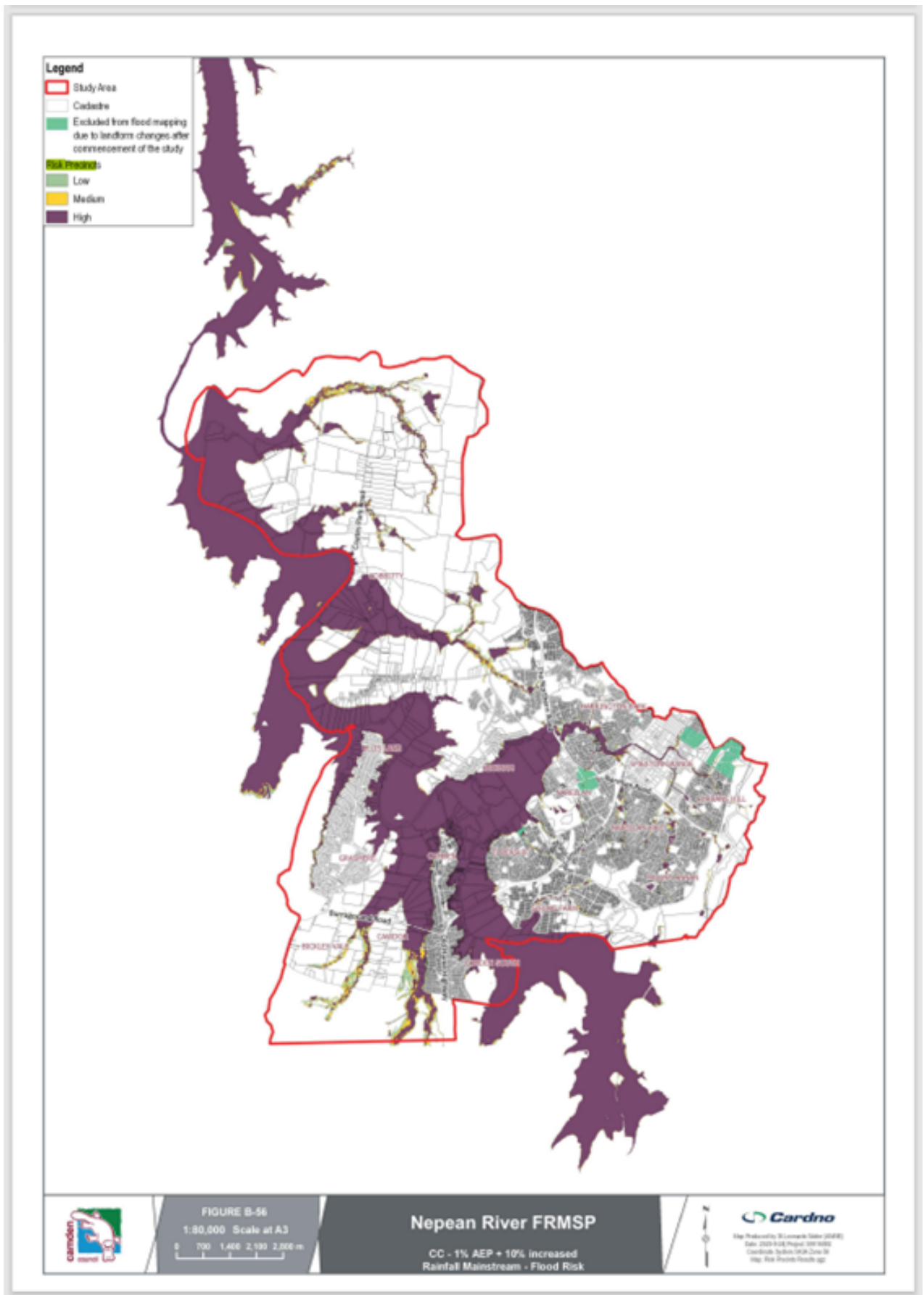


Figure 8 Climate change Flood Risk Precincts for the Nepean River catchment mainstream flooding