

## Chapter 8

# Flood Prone Lands



## 8 Flood Prone Land

### 8.1 Objectives of this Chapter

1. To permit development on flood prone land that is appropriate to the degree of flooding hazard experienced on that land.
2. To minimise the risk to life and damage to property as a result of floods.
3. To provide guidelines for determination of the merit of development on flood prone land as required by Section 79C of the Environmental Planning and Assessment Act 1979.

### 8.2 Definitions

In this Chapter the following definitions apply:

*“Australian Height Datum (AHD)”* is a common national surface level datum approximately corresponding to mean sea level.

*“Average Recurrence Interval (ARI)”* is the long-term average number of years between the occurrence of a flood as big as, or larger than, the selected event. E.g. floods with a discharge as great as, or greater than, the 100 year ARI flood event will occur on average once in every 100 years.

*“Flood compatible materials”* are materials used in building construction that can withstand inundation without suffering any form of damage and which can be readily cleaned when floodwaters subside.

*“Flood liable land”* is synonymous with flood prone land, i.e. land susceptible to flooding by the probable maximum flood (PMF) event.

*“Floodplain”* is the area of land which is subject to inundation by floods up to and including the probable maximum flood event, that is all flood prone land.

*“Flood Planning Level”* is the equivalent of the 1 in 100 year ARI flood level plus freeboard. 1 in 100 year ARI flood levels for the Lismore urban area are shown on Map 2. The freeboard adopted for the purposes of this Plan is 300mm. Therefore the Flood Planning Level may be calculated by adding 300mm to the 1 in 100 ARI level for the relevant area as shown on Map 2.

*“Freeboard”* is a factor of safety typically used in relation to the setting of floor levels, levee crest levels etc. Freeboard provides a factor of safety to compensate for uncertainties in the estimation of flood levels across the floodplain, such as wave action, localised hydraulic behaviour and effects such as “greenhouse” and climate change. Freeboard is adopted as 300mm in this Plan.

*“Habitable floor area”* is that part of a residential development that is used for the purposes of a lounge or living room, dining room, rumpus room, kitchen, bedroom or workroom.

*“Preferred Excavation Area”* is an area within the floodplain in which the greatest flood velocities and flood gradients are experienced, and where, when fill material is won, the greatest benefit to floodplain management can be obtained. The identified preferred excavation area is located at the western end of Three Chain Road and is identified in the Lismore Floodplain Management Plan.

*“Probable Maximum Flood (PMF)”* is the largest flood that could conceivably occur at a particular location, usually estimated from probably maximum precipitation. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the

extent of flood prone land, that is, the floodplain. The extent, nature and potential consequences of flooding associated with the PMF event should be addressed in a Floodplain Management Study.

### 8.3 Development Controls

Development controls in this Chapter apply to various types of development on flood prone land throughout Lismore. In the urban area, the controls are based upon the degree of flooding hazard that is experienced on that land. Fine scaled modelling of flood hazards was undertaken by Patterson Britton & Partners in 2001 to define floodways and areas of differing flood hazard as a critical step in the preparation of the Lismore Floodplain Management Plan. As part of that process, various categories of flood prone land were identified for the purposes of guiding future land uses on the floodplain. Each category is based upon adopted criteria of depth and velocity likely to be experienced in the 1 in 100 year ARI flood. The criteria are listed in the Lismore Floodplain Management Plan. Areas affected by the various hazard categories are shown on Map 1 - Lismore Flood Hazard Categories. The four flood hazard categories are:

- Floodway;
- High Flood Risk Area;
- Flood Fringe Area; and
- Low Flood Risk Area

A fifth category – CBD Flood Liable, also shown on Map 1, has the same planning controls as the Flood Fringe Area. Each of the three categories represents a different level of flood hazard in terms of the potential risks posed to human life and property. Consequently varying levels of restriction on new development apply to land within each category. Controls in this Plan are listed for new residential, commercial and industrial development on flood prone land and apply only where such development is permissible in the zone under the Lismore Local Environmental Plan 2000. The controls applying to new commercial and industrial development in the High Flood Risk Area and the Flood Fringe Area are not applicable where a change of use is proposed. Where minor extensions to the existing floor space are proposed, the proposal will be considered on its merits.

### 8.4 Floodway

Floodway is that area of the floodplain where a significant discharge of water occurs during floods and hence velocities and depths are high. Floodways are usually aligned with naturally defined channels, and include areas that even if partially blocked, would cause a significant redistribution of flood flow or a significant increase in flood levels. No new buildings or structures of any type are permitted in the area designated as Floodway except:

1. where such buildings or structures are to be used for the purpose of providing utility installations or community facilities; or
2. if the building or structure is proposed to be located within 10 metres of the boundary of the Floodway as marked on the map and a hydraulic study has been carried out for the land on which the building is proposed which demonstrates, to Council's satisfaction, that the flood impacts of the proposed building or structure and any associated works will not adversely effect flood behaviour or increase the flooding impacts on any other land; or
3. where the building or structure is located on land that forms part of the Lismore Airport and
  - a) will form part of the commercial aviation area developed in the northern precinct of the airport and such development is consistent with the adopted plan of management for the Lismore Airport and maintains the cross sectional integrity of the respective floodway; or
  - b) is development of a non-residential nature, located on the western side the Bruxner Highway between Habib Drive and the Lismore Airport passenger terminal, that has been developed consistent with the concept plan as shown in the Lismore Floodplain

Management Plan and an evacuation plan has been prepared for each development. The area closest to the airport terminal is to be developed for uses that are ancillary to the airport.

## **8.5 High Flood Risk Area**

High Flood Risk Area is the area in which there is a potential for flooding to cause danger to personal safety and/or loss or damage to light structures. Able bodied adults could have difficulty wading to safety. The adopted criteria for High Flood Risk Area has been defined in terms of two types of risk category for the 1 in 100 year ARI flood:

- a) Human Risk Categories where there is potential for flood waters to create danger to personal safety; and
- b) Property Risk Categories where there is potential for flood waters to create danger to light structures such as residential buildings.

High Flood Risk Areas also include land that would be categorised as 'flood storage' in the NSW Government Floodplain Management Manual.

*Note: For 1 in 500 year ARI flood levels ADD 1.03m to the 1 in 100 year ARI flood level*

### **8.5.1 Residential Development**

No new residential development is permitted in the area designated as High Flood Risk on Map 1 unless the application is accompanied by a flood report prepared by a suitably qualified consultant providing site specific detail relating to predicted depths and velocities in the 1 in 100 ARI flood, which demonstrates to the satisfaction of Council that the flooding characteristics of the site are less hazardous than the criteria for depth and velocity adopted for the high flood risk area in the Lismore Floodplain Management Plan.

Where extensions or additions to existing residential development are proposed, all habitable floor areas are to be at or above the Flood Planning Level, except where in the opinion of Council such a floor level requirement is impractical or unreasonable.

Where replacement of an existing residential development is proposed, all habitable floor areas are to be at or above the Flood Planning Level.

New motels, and other forms of development providing temporary accommodation only, may be permitted where a minimum of 90% of the habitable floor area is at or above the Flood Planning Level and a flood evacuation plan is approved for the development.

No new caravan parks are permitted in the High Flood Risk Area.

### **8.5.2 Commercial Development**

New commercial development to provide:

1. An equivalent of 25% of the gross floor area of the building to be at or above the Flood Planning Level.
2. A mezzanine level (with emergency exit for evacuation purposes) above the 1 in 500 yr ARI flood level as an emergency flood refuge for employees.
3. Bulk fill to within 300mm of finished surfaced level is to be sourced from on-site, from the preferred excavation area or from another area on the floodplain. Minor increases in the depth of imported fill will be considered where it can be demonstrated that this is necessary to complement the design of the footings of a future building. If bulk fill cannot be obtained on-site, from the preferred excavation area or from another area on the floodplain, Council may approve fill imported from another source providing a flood impact assessment has been

prepared by a suitably qualified consultant which demonstrates that the fill will have no adverse effects upon flood levels upstream or on flooding behaviour on adjacent properties.

4. A risk analysis report prepared by a structural engineer addressing the design criteria adopted for the building and its relative merits in each of the 1 in 500 year ARI and PMF flood events. Such report to be satisfactory to Council.

### **8.5.3 Industrial Development**

South Lismore (south of Hollingworth Creek) is isolated in the event of the South Lismore levee overtopping and has a lengthy evacuation route via Union Street, the Ballina St Bridge and Ballina Street or Conway Street to Wyrallah Road. The Hollingworth Creek Bridge represents a low point on the evacuation route that would be cut immediately when flood waters overtop the levee. Planning controls seek to reduce the need for owners of industrial buildings to access their premises during a flood by requiring minimum fill levels of new industrial subdivisions to be at the 1 in 100 year ARI flood level in areas south of Hollingworth Creek.

#### *Industrial Development South of Hollingworth Creek*

New industrial development located in South Lismore on the southern side of Hollingworth Creek is to provide the following:

1. A Minimum floor level at or above Flood Planning Level is preferred.
2. A mezzanine level (with emergency exit for evacuation purposes) above the 1 in 500 yr ARI flood level as an emergency flood refuge for employees.
3. Lots to be filled equivalent to the 1 in 100yr ARI flood level, subject to maintaining existing flood flow paths. For infill development in existing industrial areas, Council prefers that lots be filled to a level equivalent to the 1 in 100yr ARI flood level but will consider on its merits a fill level equivalent to that of surrounding lots or in accordance with any previous Council consent for filling. Where buildings are constructed on land that has not been filled to the 1 in 100 yr ARI flood level, an equivalent of at least 10% of gross floor area is to be at or above Flood Planning Level and those parts of the building below the 1 in 100 yr ARI flood level are to be constructed of flood compatible materials. Grading of site fill to street and/or to adjoining property boundary levels will be permitted where appropriate.
4. Bulk fill to within 300mm of finished surfaced level is to be sourced from on-site, from the preferred excavation area or from another area on the floodplain. Minor increases in the depth of imported fill will be considered where it can be demonstrated that this is necessary to complement the design of the footings of a future building. If bulk fill cannot be obtained on-site, from the preferred excavation area or from another area on the floodplain, Council may approve fill imported from another source providing a flood impact assessment has been prepared by a suitably qualified consultant which demonstrates that the fill will have no adverse effects upon flood levels upstream or on flooding behaviour on adjacent properties.
5. A risk analysis report prepared by a structural engineer addressing the design criteria adopted for the building and its relative merits in each of the 1 in 500 year ARI and PMF flood events. Such report to be satisfactory to Council.

#### *Industrial Development – All other Areas*

New Industrial development located in all areas other than south of Hollingworth Creek is to provide the following:

1. An equivalent of 25% of gross floor area to be at or above the 1 in 100 year ARI flood level.
2. A mezzanine level (with emergency exit for evacuation purposes) above the 1 in 500 yr flood level as an emergency flood refuge for employees.

3. Bulk fill to within 300mm of finished surfaced level is to be sourced from on-site, from the preferred excavation area or from another area on the floodplain. Minor increases in the depth of imported fill will be considered where it can be demonstrated that this is necessary to complement the design of the footings of a future building. If bulk fill cannot be obtained on-site, from the preferred excavation area or from another area on the floodplain, Council may approve fill imported from another source providing a flood impact assessment has been prepared by a suitably qualified consultant which demonstrates that the fill will have no adverse effects upon flood levels upstream or on flooding behaviour on adjacent properties.
4. A risk analysis report prepared by a structural engineer addressing the design criteria adopted for the building and its relative merits in each of the 1 in 500 year ARI and PMF flood events. Such report to be satisfactory to Council.

#### **8.5.4 Controls Applying to All Developments**

1. Where a minimum floor level is specified, a certificate from a registered surveyor will be required certifying that the floor has been constructed to the required level.
2. All applications involving new building work are to be accompanied by a certificate of structural adequacy prepared by a qualified structural/civil engineer stating that the building has been designed to withstand structural damage from the forces of floodwaters and associated debris.
3. For non-habitable floors constructed below the Flood Planning Level, the applicant will be required to demonstrate that:
  - a) the new structure will not have an adverse affect upon the existing flow of floodwaters, and
  - b) that all materials used below the Flood Planning Level are flood compatible.

#### **8.5.5 Variation of Boundary between High Flood Risk Area and Flood Fringe Area**

The boundaries of the High Flood Risk Area have been determined on the basis of flood modelling undertaken by Patterson Britton & Partners. The accuracy of the modelling at the individual property level is dependant upon the accuracy and level of information that was available at the time to generate the model. Any application that seeks to vary the boundary line between the High Flood Risk Area and the Flood Fringe Area must be justified by a flood report prepared by a suitably qualified consultant providing site specific detail relating to predicted depths and velocities in the 1 in 100 year ARI flood, with specific reference to the criteria for depth and velocity adopted for the High Flood Risk Area in this Plan.

### **8.6 Flood Fringe Area (including the CBD Flood Liable)**

Flood Fringe Area is defined by the limit of the 1 in 100 year ARI flood level contour but excludes areas within the Floodway or High Flood Risk Area.

(N.B: For 1 in 500 year ARI flood levels ADD 1.03m to the 1 in 100 year ARI flood level).

#### **8.6.1 Residential Development**

1. Site filling is permitted to the equivalent of the Flood Planning Level provided material is sourced from the preferred excavation area or on-site. If fill cannot be obtained from the preferred excavation area, Council may approve fill imported from a source another source providing a flood impact assessment has been prepared by a suitably qualified consultant which demonstrates that the fill will have no adverse effects upon flood levels upstream or on flooding behaviour on adjacent properties.
2. Habitable floor areas for new residential development are to be at or above the Flood Planning Level.

3. New motels permitted where a minimum of 90% of the habitable floor area is at or above the Flood Planning Level and a flood evacuation plan is approved for the development.

### **8.6.2 Commercial Development**

New commercial development to provide the following:

1. An equivalent of 25% of gross floor area of the building to be at or above the Flood Planning Level
2. A risk analysis report prepared by a structural engineer certifying that the design criteria adopted for the building will withstand the impact of flood waters and debris up to the 1 in 500 year flood ARI event. Such report to be submitted to Council with the Construction Certificate.
3. Bulk fill to within 300mm of finished surfaced level is to be sourced from on-site, from the preferred excavation area or from another area on the floodplain. Minor increases in the depth of imported fill will be considered where it can be demonstrated that this is necessary to complement the design of the footings of a future building. If bulk fill cannot be obtained on-site, from the preferred excavation area or from another area on the floodplain, Council may approve fill imported from another source providing a flood impact assessment has been prepared by a suitably qualified consultant which demonstrates that the fill will have no adverse effects upon flood levels upstream or on flooding behaviour on adjacent properties.

### **8.6.3 Industrial Development**

South Lismore (south of Hollingworth Creek) is isolated in the event of the South Lismore levee overtopping and has a lengthy evacuation route via Union Street, the Ballina St Bridge and Ballina Street or Conway Street to Wyrallah Road. The Hollingworth Creek bridge represents a low point on the evacuation route that would be cut immediately when flood waters overtop the levee. Planning controls seek to reduce the need for owners of industrial buildings to access their premises during a flood by requiring minimum fill levels of new industrial subdivisions to be at the 1 in 100 year ARI flood level in areas south of Hollingworth Creek.

#### *Industrial Development – South of Hollingworth Creek*

New industrial development located in South Lismore on the southern side of Hollingworth Creek is to provide the following:

1. A Minimum floor level at or above Flood Planning Level is preferred.
2. A mezzanine level (with emergency exit for evacuation purposes) above the 1 in 500 yr ARI flood level as an emergency flood refuge for employees.
3. Lots to be filled equivalent to the 1 in 100yr ARI flood level, subject to maintaining existing flood flow paths. For infill development in existing industrial areas, Council prefers that lots be filled to a level equivalent to the 1 in 100yr ARI flood level but will consider on its merits a fill level equivalent to that of surrounding lots or in accordance with any previous Council consent for filling. Where buildings are constructed on land that has not been filled to the 1 in 100 yr ARI flood level, an equivalent of at least 10% of gross floor area is to be at or above Flood Planning Level and those parts of the building below the 1 in 100 yr ARI flood level are to be constructed of flood compatible materials. Grading of site fill to street and/or to adjoining property boundary levels will be permitted where appropriate.
4. Bulk fill to within 300mm of finished surfaced level is to be sourced from on-site, from the preferred excavation area or from another area on the floodplain. Minor increases in the depth of imported fill will be considered where it can be demonstrated that this is necessary to complement the design of the footings of a future building. If bulk fill cannot be obtained on-site, from the preferred excavation area or from another area on the floodplain, Council may approve fill imported from another source providing a flood impact assessment has been prepared by a suitably qualified consultant which demonstrates that the fill will have no adverse effects upon flood levels upstream or on flooding behaviour on adjacent properties.

5. A risk analysis report prepared by a structural engineer addressing the design criteria adopted for the building and its relative merits in each of the 1 in 500 year ARI and PMF flood events. Such report to be satisfactory to Council.

#### *Industrial Development – All other Areas*

New industrial development located in all areas other than south of Hollingworth Creek is to provide the following:

1. An equivalent of 25% of gross floor area to be at or above the Flood Planning Level.
2. A mezzanine level (with emergency exit for evacuation purposes) above the 1 in 500 yr ARI flood level as an emergency flood refuge for employees.
3. Bulk fill to within 300mm of finished surfaced level is to be sourced from on-site, from the preferred excavation area or from another area on the floodplain. Minor increases in the depth of imported fill will be considered where it can be demonstrated that this is necessary to complement the design of the footings of a future building. If bulk fill cannot be obtained on-site, from the preferred excavation area or from another area on the floodplain, Council may approve fill imported from another source providing a flood impact assessment has been prepared by a suitably qualified consultant which demonstrates that the fill will have no adverse effects upon flood levels upstream or on flooding behaviour on adjacent properties.
4. A risk analysis report prepared by a structural engineer addressing the design criteria adopted for the building and its relative merits in each of the 1 in 500 year ARI and PMF flood events. Such report to be satisfactory to Council.

#### **8.6.4 Controls Applying to All Developments**

1. Where a minimum floor level is specified, a certificate from a registered surveyor will be required certifying that the floor has been constructed to the required level.
2. All applications involving new building work are to be accompanied by a certificate of structural adequacy prepared by a qualified structural/civil engineer stating that the building has been designed to withstand structural damage from the forces of floodwaters and associated debris. Developments under \$50 000 other than restumping of dwellings are exempt from this requirement.
3. For non-habitable floors constructed below the Flood Planning Level, the applicant will be required to demonstrate that:
  - a) the new structure will not have an adverse affect upon the existing flow of floodwaters, and
  - b) that all materials used below the Flood Planning Level are flood compatible.

#### **8.6.5 Variation of Boundary between Flood Fringe Area and Low Flood Risk Area**

The boundaries of the Flood Fringe Area have been determined on the basis of flood modelling undertaken by Patterson Britton & Partners. The accuracy of the modelling at the individual property level is dependant upon the accuracy and level of information that was available at the time to generate the model. Any application that seeks to vary the boundary line between the Flood Fringe Area and the Low Flood Risk Area must be justified by a flood report prepared by a suitably qualified consultant providing site specific detail relating to the predicted probable maximum flood level contour on the property.

### **8.7 Low Flood Risk Area**

Low Flood Risk Area is defined by the limit of the probable maximum flood (PMF) level contour but excludes areas within the Floodway, High Flood Risk Area or Flood Fringe Area.

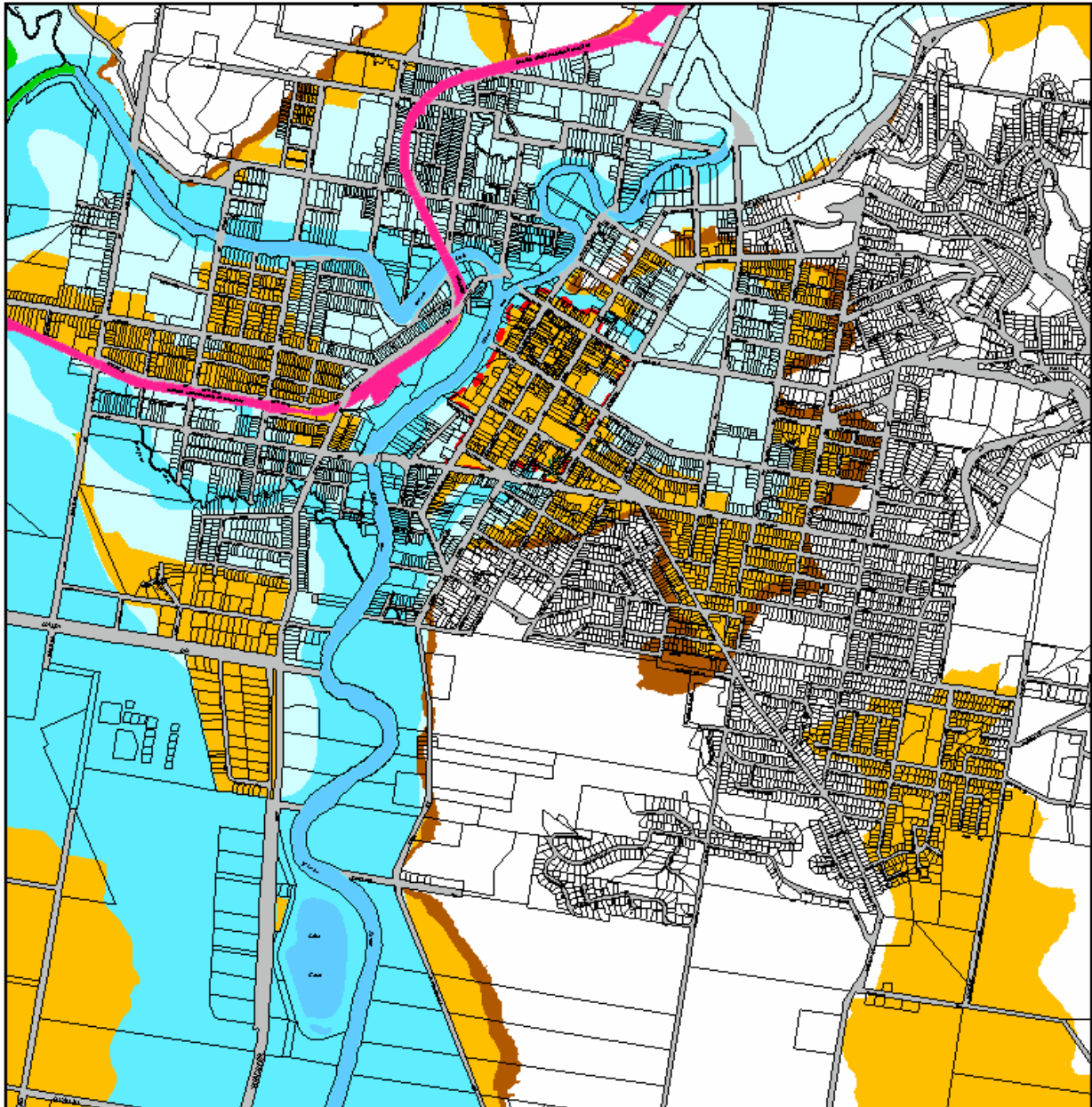


No development controls apply to residential, commercial or industrial development within the Low Flood Risk Area however the safety of people and associate emergency response management still needs to be considered and may result in:

- Restrictions on certain types of development that may be particularly vulnerable to emergency response such as aged care developments; and
- Restrictions on critical emergency response and recovery facilities and infrastructure such as evacuation centres, hospitals and major utility facilities to ensure such facilities and infrastructure can fulfil their emergency response and recovery functions during and after a flood event.

## **8.8 Rural Areas**


Flood modelling data is not available for the 1 in 100 year ARI flood in rural areas. Where development is proposed on rural land that may be considered flood prone, the applicant will be required to submit a report from a registered surveyor establishing a level at the site equivalent to the estimated 1 in 100 year ARI flood level. The habitable floor level of all new dwellings is to be at or above the Flood Planning Level.



**Disclaimer**

The information shown on this map is based upon flood modelling undertaken by Patterson Britton & Partners Pty Ltd and is provided on the understanding that Lismore City Council is not responsible for the results of action taken on the basis of any information nor for any error in or omission from the information shown on this map.

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<b>LEGEND</b>	 Rivers/Creeks	 Land not Subject to Flooding
	 Floodway	 Railway
	 High Flood Risk Area	 Roads
	 Flood Fringe Area	 CBD Flood Liabile
	 Flood Flow	 Low Flood Risk Area

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Local Government Act 1995 (Vic) s. 218(1) - Councils must prepare a Development Control Plan for their area.



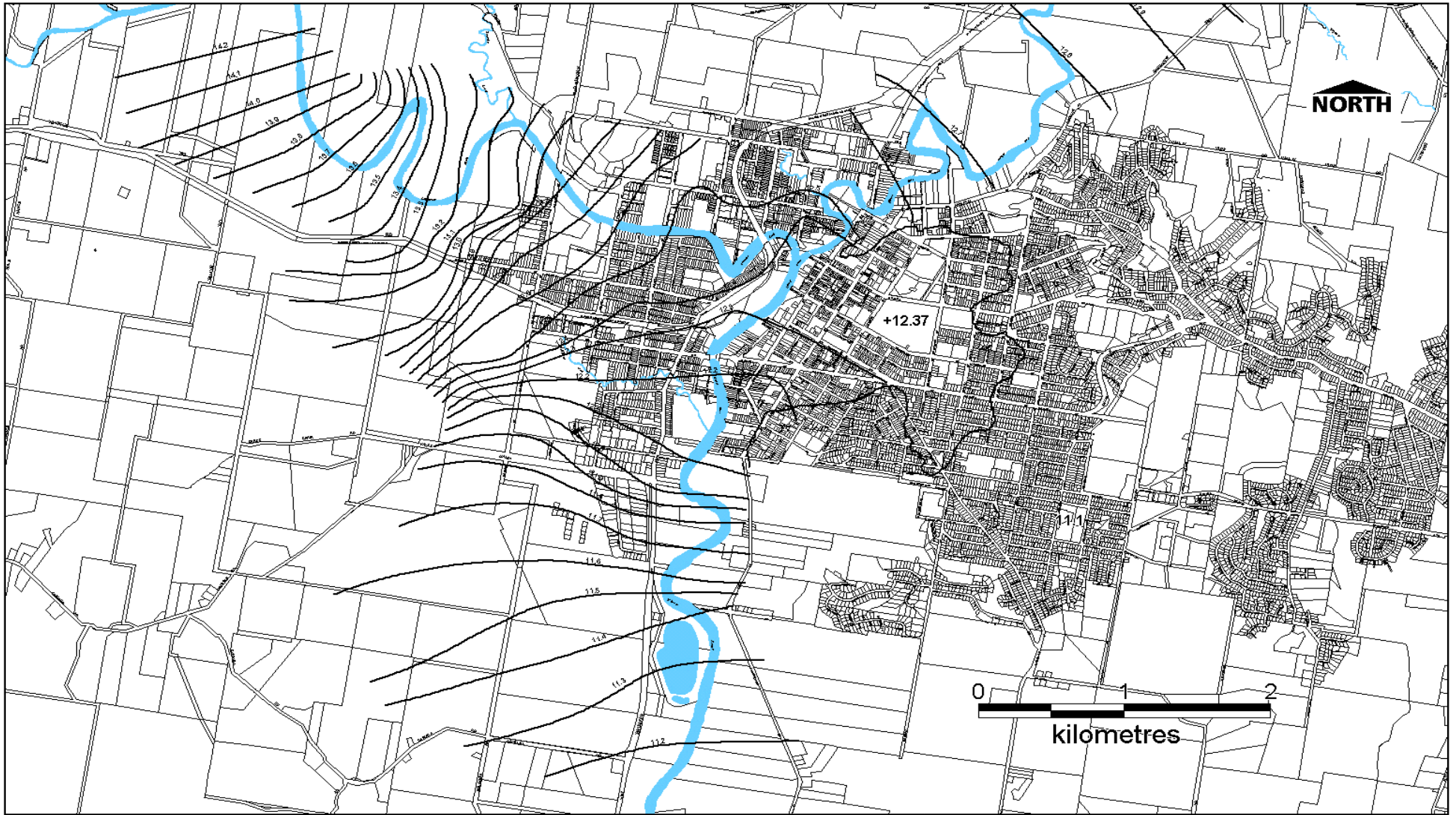

**Lismore Flood Hazard Categories**

Chapter 8 Part A

**Map 1**

Printed  
28/6/2007








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Printed 21/7/03

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**MAP 2**

**1 in 100 ARI flood levels**