



Bellingen Shire Development Control Plan 2017

Chapter 8 **Flood & Riverine Processes**

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Table of Amendments

Amendment	Date Adopted	Date Commenced
Minor review of DCP - DCP 2017 replaces DCP 2010	22 November 2017	6 December 2017

8.1 Introduction

Bellingen Shire Council, through its Floodplain Risk Management Committee, prepared and adopted a Floodplain Risk Management Study and Floodplain Risk Management Plan in 2002. Both documents were prepared in accordance with the NSW Government's Flood Prone Land Policy and the guidelines of the NSW Government's Floodplain Management Manual, 2001.

The Floodplain Risk Management Study comprises detailed consideration of viable floodplain risk management measures, while the Floodplain Risk Management Plan summarises and prioritises the recommended management strategies identified under the Study.

One of the most effective strategies for managing future flood risks is implementation of property modification measures, specifically through the implementation of appropriate zoning and development controls.

This Chapter has been prepared in response to recommendations of Council's Floodplain Risk Management Study and Floodplain Risk Management Plan. This Chapter provides an outline of appropriate control measures for development affected by flooding and land potentially affected by riverine processes. This Chapter should be read in conjunction with the requirements of Bellingen Local Environmental Plan 2010 and the Floodplain Risk Management Study and Plan, 2002.

8.2 Aims

The primary Objectives of this Chapter are to:

- a) to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone property;
- b) to reduce private and public losses resulting from floods utilizing ecologically positive methods wherever possible;
- c) alert the community to the hazard and extent of flood prone land; and
- d) inform the community of Council's policy in relation to the use and development on flood prone land.

An underlying principle of this Chapter is that any new development or modifications to existing development should always, as far as practical, result in an improvement to the existing flood risk and in no circumstances should the flood risk be made worse.

The aims of this Chapter are therefore to:

- a) outline requirements for development and building on flood prone land identified under Council's Floodplain Risk Management Study;
- b) identify requirements and matters to be considered for development and building on land potentially affected by flooding and riverine processes;
- c) prevent inappropriate development occurring on flood prone land;
- d) encourage the development and use of land which is compatible with the likely flood hazard;
- e) increase public awareness of flood hazards and appropriate responses to development on flood prone land.

8.3 Where This Chapter Applies

This Chapter applies to land affected by flooding and land affected by or potentially affected by Riverine processes to which *Bellingen Local Environmental Plan 2010* applies. It normally applies where the development is on *flood prone land*, however there are instances, such as provision of safe access to flood refuges for subdivisions, where even though the development is on flood free land, this Chapter still applies.

The extent of *flood prone land* is determined from flood studies. Council has adopted flood studies and associated mapping of flood prone land along the more intensively populated reaches of the rivers within the local government area (see Section 8.8 Flood Risk Categories).

In other areas a proponent shall undertake a flood study where the proposed development is within *potentially flood prone land* as determined in Appendix 8.1 and this flood study shall be used to determine the extent of flood prone land and flood behaviour at the subject site.

The Bellinger River Morphological Study by Cameron McNamara 1985 maps areas affected by *riverine processes* downstream of Bellingen to the ocean on the Bellinger River and from the ocean to 1.5km upstream of Newry Island (Barnett's Ruins) on the Kalang River. For areas outside the study undertaken by Cameron McNamara the proponent shall undertake a riverine processes study where the development is potentially affected by *riverine processes* (refer to section 8.12.2).

8.4 When This Chapter Applies

This Chapter applies when a development application is received by Council for development on land to which this Chapter applies. It does not apply when proposed development can be considered as exempt" or "complying" development under the provisions of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 or any other Environmental Planning Instrument applying to the land.

8.5 Relationship with other Plans

This Chapter provides an outline of the development controls adopted in Council's Floodplain Risk Management Study (2002). The provisions of this Chapter should be read in conjunction with Flood Maps contained in the Floodplain Risk Management Study, any additional approved flood studies prepared by Council for the Shire and the Bellinger River Morphological Study by Cameron McNamara 1985.

The requirements of this Chapter are additional to, and complimentary to, the provisions of Bellingen Local Environmental Plan 2010. Where there is an inconsistency between this Chapter and another environmental planning instrument, the provisions of the environmental planning instrument shall prevail.

8.6 Variations

Ad-hoc variations of any of the provisions of this Chapter may be inconsistent with the guidelines provided in the Government's 2005 Floodplain Development Manual. Any such variations may result in Council no longer being afforded the indemnity provisions as outlined in Section 733 of the Local Government Act, 1993.

Therefore this Chapter should only be varied following adoption of an amendment to Council's Floodplain Risk Management Study and Plan. Reference should be made to Section 2.7 of the 2005 Floodplain Development Manual for triggers which may lead to an amendment of the Floodplain Risk Management Study and Plan.

8.7 Acronyms & Definitions

AEP - Annual Exceedance Probability (1%)
AHD - Australian Height Datum
DCP - Development Control Plan
EP and A Act - Environmental Planning and Assessment Act, 1979
EP and A Regulation - Environmental Planning and Assessment Regulation, 2000
FPL - Flood Planning Level
GFPL - General Flood Planning Level
LEP - Local Environmental Plan
Local Policy - Local flood risk management policy
Management Committee - Floodplain Risk Management Committee
Management Plan - Floodplain Risk Management Plan FRMP
Management Study - Floodplain Risk Management Study FRMS
Manual - Floodplain Development Manual, 2005
NSW - New South Wales
PMF - Probable Maximum Flood
Policy - NSW Government's Flood Prone Land Policy
SES - State Emergency Service
ARI - Average recurrence interval (yrs)

Above ground carpark means a car park that is elevated above and does not occupy the ground floor of a building.

Annual Exceedance Probability (AEP) refers to the chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage (eg 1% AEP = 1 in 100 year event).

Appropriately qualified person means a Chartered Professional Engineer, CPEng or a Registered Professional Engineer, RPEng with a minimum of 5 years' experience relevant to the works. For flood modelling such experience is considered to be hydrologic and hydraulic investigations and design relating to larger scale whole-of-catchment investigations. For drainage such experience is considered to be hydrologic and hydraulic investigations and design relating to stormwater management plans and subdivision drainage design.

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

Below ground/basement/underground carpark means a car park that is built below ground level, either as a basement to a building or covered with structure above.

Carport is a structure used to house motor vehicles that has a minimum of two open sides and not less than one third of its perimeter being open.

Community of support refers to a cluster of four (4) or more residential dwellings located and interconnected by roads/driveways, all above the PMF, which would be a position to supply support to each other or nearby flood affected residents. A suitably cleared helicopter landing area shall also be identified within the community of support (see also flood refuges and evacuation centres).

Conceded Flood Planning Level (Conceded FPL) represents a flood planning level equivalent to the General Flood Planning Level minus 1.0metre.

Critical Facilities include buildings and services used for emergency purposes or reducing social disruption during or after a flood where inundation or loss of function in an extreme flood would represent an unacceptable level of risk, eg SES headquarters, hospital, police station, fire station (including rural bush fire brigade), ambulance station, public halls (where used for evacuation centres), intensive/critical aged care accommodation, nursing homes, telephone exchange, telecommunication repeaters, flooding evacuation centres, flood refuges, Council Chambers, critical service facility components (e.g., essential components of sewerage and water supply infrastructure).

Critical Facilities Flood Planning Level (Critical Facilities FPL) represents a flood planning level equivalent to the probable maximum flood (PMF).

Development is defined in Part 4 of the EP&A Act.

- **infill development** refers to development of vacant land that is generally surrounded by developed properties.
- **minor development** (non habitable) refers to development such as garden sheds, pergolas, non-enclosed verandas and patios, bus shelters, advertising signs, carports, amenity blocks and the like.
- **new development** refers to development of a different nature to that of the former land use, or development at another location that is not on the same footprint or immediately adjacent to former development, e.g. the urban subdivision of any area previously used for rural purposes, rebuilding at a different location, dual occupancy, change of use eg conversion of a dwelling to bed and breakfast establishment.
- **redevelopment** refers to rebuilding on the same footprint as previously or immediately adjacent to the previous development site and generally involves replacement of a structure with something similar without a change of use or extension of services. It also includes raising of the finished floor level of an existing building.

Evacuation centres are areas where flood affected residents can assemble and receive assistance under the coordination of the SES. The locations of these areas and their intended function in a flood emergency are to be determined by the SES and Council and identified in The Bellingen Local Flood Plan. Refer to Appendix 8.6 Evacuation Centres for location of evacuation centres (see also flood refuges and “community of support”).

Extension is a modification to an existing structure where it provides for an area that is a secure, lockable enclosure.

Extreme flood is often used as an approximate estimate of the PMF based on a less rigorous analysis of flood behaviour. For the purposes of this Chapter the PMF and extreme flood are synonymous

Flood refers to a relatively high stream flow that overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam. It is also the local overland flooding associated with major drainage before entering a watercourse, and/or coastal inundation resulting from superelevated sea levels and/or waves overtopping coastal defense (excluding tsunami).

Flood free area is land above the height of a probable maximum flood.

Flood fringe area is the remaining area of flood prone land after floodway and flood storage areas have been defined

Flood immunity - the level at which a road, accessway or structure becomes inundated

Flood liable land is land susceptible to flooding by a probable maximum flood. It is synonymous with flood prone land. Note that the term flood liable land covers the whole floodplain, not just that part below the FPL (see flood planning area).

Flood maps are the maps attached to Council's Floodplain Risk Management Study as amended or extended from time to time as additional approved flood data becomes available.

Flood Management Strategy is a strategy prepared for individual owners to identify the level of flood risk and a proposed response to minimise potential flood damages and risk to life. (See also Appendix 8.7 Flood Management Strategy Requirements)

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

Flood Plan (local) is a sub-plan of a disaster plan that deals specifically with flooding. They can exist at State Division and local levels. Local flood plans are prepared under the leadership of the State Emergency Service.

Flood Planning Level (FPL) is the combination of flood levels (derived from significant historical flood events or floods of specific AEPs) and freeboards selected for flood planning purposes, as determined in floodplain risk management studies. A list of FPL's used in this Chapter appears in Section 8.8 under "Flood Planning Levels".

Flood prone land is land susceptible to flooding by the PMF event. Flood prone land is synonymous with flood liable land.

Flood proofing refers to a combination of measures such as filling of a site to elevate the structure or the design, construction (and alteration) of buildings or structures with appropriate water resistant materials to reduce or eliminate flood damage to the building or structure, and its contents, and the risk to occupants.

Flood refuges are publicly accessed buildings above the PMF where flood displaced residents can assemble and receive shelter. They may include a community shelter, public hall, school or the like. A suitably cleared helicopter

landing area shall also be identified adjacent to the flood refuge (see also evacuation centres and “community of support”).

Flood risk is the potential danger to personal safety and potential damage to property resulting from flooding. The degree of risk varies with circumstances across the full range of floods.

Flood storage area an area of the floodplain that is important for reducing flood severity by providing temporary detention/storage of floodwater during the passage of a flood.

Flood Study/ Assessment refer to Appendix 8.2 and 8.3 Flood Assessment Requirements and Flood Study Requirements.

Floodway is the area of a floodplain where a significant discharge of floodwater occurs during floods. Floodways are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood level. Area specific definition of floodways is provided in Section 8.8 under “Flood Risk Categories”.

Freeboard is a factor of safety to provide reasonable certainty that the risk exposure selected in deciding on a particular flood chosen as the basis for the particular FPL is actually provided, and is incorporated into the FPL. The freeboard is the difference between the particular FPL and the flood used to derive it and may vary with different land uses, parts of the floodplain or types of mitigation works.

Garage is a private building or part of a building used to park or keep a motor vehicle and that is not defined as a carport.

General Flood Planning Level (GFPL) represents a flood planning level derived for a particular precinct based on the 1% AEP flood plus a freeboard.

Ground level carpark means a car park that is located at the street level.

Habitable (room) means:

- in a residential situation; a living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom.
- in an industrial or commercial situation; an area used for offices or to store possessions susceptible to flood damage.

Land use categories refers to specific land uses and/or activities applicable to this Chapter. More than one type of land use and/or activity may be applicable to a development application. The categories (include but not limited to) are:

- **Caravan Parks and Manufactured Home Estates** refers to all types of development within the site including offices, managers residence, workshops, amenities, mobile homes, cabins, caravans (with and without rigid annexes), camp sites and the like.
- **Commercial** refers to shops, offices, clubs, recreation facilities and the like.
- **Critical Facilities** refers to uses where any inundation or loss of function in an extreme flood would represent an unacceptable level of risk. It includes SES HQ, Police Stations, Fire Stations (including rural bushfire), Ambulance Stations, Hospitals, Public Halls (where used for flood evacuation centre), Intensive Aged Care, Nursing Homes, Telephone Exchanges, Telecommunication Repeaters, Flood Evacuation Centres and Flood Refuges,

and Critical Service Facility Components (e.g. essential components of sewage treatment works, essential water supply reservoirs).

- **Industrial** refers to industrial related activities including factories, engineering workshops, warehouses and the like.
- **Minor Development** refers to non-habitable development such as domestic swimming pools, garden sheds, non enclosed verandahs and patios, pergolas, bus shelters, advertising signs, carports, picnic shelters, amenity blocks, change rooms and the like.
- **Residential development including units, dual occupancy, tourist accommodation and the like** refers to residential dwellings, including houses, duplexes, flats, units and motels.
- **Special Purpose Facilities** applies to development such as infrastructure where use of the General FPL is considered to represent an unacceptable level of risk for the type of development. Included in this category are developments such as generating works, sub stations, liquid fuel depots, units for aged persons (other than self-care), retirement villages (other than self-care), schools, and hazardous industries.

Mainstream Flooding - inundation of normally dry land when water over flows the banks of a river. It excludes consideration of minor tributaries and local drainage paths.

Measurable means, in relation to effect on flood behaviour, 0.01m for flood heights and 0.1m/sec for average channel and overbank velocities.

Potentially Flood Prone Land refer to Appendix 8.1 Potentially Flood Prone Land.

Probable Maximum Flood (PMF) is a flood calculated to be the maximum which is likely to occur at a particular location. The PMF defines the extent of flood prone land, that is, the floodplain.

Riverine processes refers to the effect of flowing water on the riverbank and surrounding landscape, and can include impacts such as river bank erosion, river bank slumping, meandering migration of the main stream bed and the like.

Safe access refers to the safe velocity and depth relationships for pedestrians and vehicles as shown in Figure L1 of the NSW Governments Floodplain Management Manual 2005 (copy shown in Appendix 8.4 Safe Access)

Undercroft carpark means an unenclosed car park that occupies the area below the footprint of a building or plaza.

8.8 Development Criteria - General

General

The criteria for determining applications potentially affected by flooding are structured in recognition that different controls are applicable to different levels of flood inundation and flood risk, and different land uses.

The procedure to determine which controls apply to proposed development involves:

- a) Determination of which part of the floodplain the land is located within (Section 8.8 "Flood Risk Categories")

- b) Identification of the land use category/categories associated with the development
- c) Determination of the flood planning level(s) applicable to the development
- d) Application of the prescriptive controls as outlined at Sections 8.10 or 8.11 as applicable.

Flood Risk Categories

For the purposes of this Chapter, flood prone land within the local government area is divided up into three hydraulic categories, each reflecting different hydraulic behaviour and function. They are:

- Flood Fringe,
- Flood Storage, and
- Floodway

Different development controls apply to each of these categories in order to preserve their function and in recognition of their respective flood risks.

A flood assessment or flood study is required to determine the hydraulic categories and provide mapping of these categories. Council has adopted flood studies for the following areas:

- Lower Bellinger River (flood level and indicative mapping for mainstream flooding from Bellingen to the mouth of the Bellinger)
- Lower Kalang River (flood level and indicative mapping of mainstream flooding from Picket Creek to the confluence of the Bellinger)
- Upper Bellinger River (flood levels and indicative mapping of mainstream flooding (in preparation) from The Dardanelles to Bellingen)
- Lower Never Never River (flood levels and indicative mapping of mainstream flooding (in preparation) from Capararo's Bridge to the confluence with the Bellinger River)
- Upper Kalang River (flood levels and indicative mapping of mainstream flooding (in preparation) from Picket Hill Creek to Kopsens Bridge)
- Bielsdown River through Dorrigo and an unnamed tributary to the Bielsdown River (flood levels and indicative mapping of mainstream flooding)

The hydraulic category applicable for a particular development shall be determined according to its locality as follows:

Lower Bellinger and Lower Kalang Rivers

Flood Fringe	the area shown on mapping held by Council which generally reflects those parts of flood prone land that are not Floodway nor Flood Storage.
Flood Storage	the area shown on mapping held by Council which generally reflects those parts of flood prone land below the 1% AEP flood extents that are not Floodway and that are important for the temporary storage of floodwaters during the passage of a flood.
Floodway	the area shown on mapping held by Council which generally reflects those parts of flood prone land below the 1% AEP flood extents where significant discharge of floodwater occurs during floods.

Upper Bellinger and Lower Never Never Rivers

Flood Fringe	the indicative area shown on mapping held by Council (in preparation) which generally reflects those parts of flood prone land that are not Floodway.
Floodway	those parts of flood prone land where, in a 1% AEP flood event, the product of flood depth and velocity exceeds 1 m ² /s as determined from site specific survey and the flood study held by Council

Upper Kalang River

Flood Fringe	the indicative area shown on mapping held by Council (if available) which generally reflects those parts of flood prone land which are not Floodway.
Floodway	those parts of flood prone land where, in a 1% AEP flood event, the product of flood depth and velocity exceeds 1 m ² /s as determined from site specific survey and the flood study held by Council.

Bielsdown River at Dorrigo

Flood Fringe	the area shown on mapping held by Council which generally reflects those parts of flood prone land which are not Flood Storage nor Floodway.
Flood Storage	the area shown on mapping held by Council which generally reflects those parts of land below the 1% AEP flood level that are not Floodways and that are important for the temporary storage of floodwaters during the passage of a flood.
Floodway	the area shown on mapping held by Council which generally reflects those parts of land below the 1% AEP flood level where significant discharge of floodwater occurs during floods.

Elsewhere in the Local Government Area

Flood Fringe	those parts of flood prone land that are not Flood Storage nor Floodway.
Flood Storage	those parts of flood prone land that are not Floodway and where, in a 1% AEP flood event, the depth of flooding exceeds 1m as determined from site specific survey and a Flood Study.
Floodway	those parts of flood prone land where, in a 1% AEP flood event, the product of flood depth and velocity exceeds 1 m ² /s as determined from site specific survey and a Flood Study

If Council holds adopted Flood Assessments or Flood Studies at the locality of the proposed development they may be used in the above category determination.

Where Council does not hold an adopted Flood Assessment or Flood Study of the subject land, the proponent shall undertake the following procedure:

- a) Determine if any part of the proposed development or its intended evacuation route, is Potentially Flood Prone (see Appendix 8.1 Potentially Flood Prone Land). If not, this Chapter does not apply.
- b) If Potentially Flood Prone, undertake a Flood Assessment or Flood Study (see Appendix 8.1 Potentially Flood Prone Land or Appendix 8.2 Flood Assessment Requirements respectively) to determine if any part of the proposed development or its intended evacuation route, is within Flood Prone Land. If not, this Chapter does not apply.
- c) If flood prone submit a certified Flood Assessment or Flood Study as applicable with the development application.

Note: Under normal circumstances, a Flood Assessment would be undertaken in the first instance. If after completing the Flood Assessment it is found that all proposed development and access/ evacuation route is above the 1% AEP flood level there is no need to proceed with a more detailed Flood Study.

Land Use Categories

For the purposes of this Chapter, the following land use categories have been identified. It should be noted that more than one land use category may be associated with a development application:

- Residential development including units, dual occupancy, tourist accommodation and the like
- Commercial, Industrial and Other Non-Habitable Development
- Critical Facilities
- Special Purpose Facilities
- Minor Development
- Filling
- Fencing
- Subdivisions
- Boundary Adjustments, and
- Caravan Parks and Manufactured Home Estates.

Different development controls apply to each land use. Definitions have been provided in the Glossary for land use categories unique to this Chapter or not otherwise included in other Environmental Planning Instruments.

Flood Planning Levels

The following flood planning levels (FPL's) are applicable to this Chapter:

- Critical Facilities FPL
- Special Purpose FPL
- General FPL or GFPL
- Conceded FPL
- Non Specified FPL

The **Critical Facilities FPL** is the probable maximum flood (PMF) level or other approved extreme flood event level.

The **Special Purpose FPL** is the GFPL plus 1.0 metre.

The **General FPL** (also referred to as GFPL) is based upon the 1% AEP flood level plus freeboard. Where Council has mapping depicting the GFPL, that mapping shall be used. In other areas, the General FPL shall be equivalent to the 1% AEP flood level plus freeboard applicable to that area.

The **Conceded FPL** is the GFPL minus 1.0 metre.

The **Non Specified FPL** has no specific level requirement and shall be assessed on practical site constraints for each specific development.

The **freeboard** shall be 0.5 metres unless noted otherwise below:

- 1.0 metre for the Upper Bellinger River from Thora Bridge to the Dardanelles in the area covered by Council's adopted Preliminary Flood Assessment, Upper Bellinger River 2005.
- 0.75 metre for the Never Never River upstream of Buffer Creek in the area covered by Council's adopted Preliminary Flood Assessment, Upper Bellinger River 2005.
- 0.75 metre for the Fitzroy Street catchment in Urunga

Prescriptive Controls

The prescriptive controls which apply to particular flood risk category and land use are detailed in Sections 8.10 and 8.11. They include:

- Floor Level
- Flood Proofing
- Flood Effect on Others, and
- Access, Management and Design.

8.9 Development Criteria for Determining Applications for Land Affected by Riverine Processes

8.9.1 General

The Bellinger River Morphological Study by Cameron McNamara 1985 maps areas affected by riverine processes and depicts area of projected erosion and accretion in the next 100 years. The mapping extends downstream of Bellingen to the ocean on the Bellinger River and from the ocean to 1.5km upstream of Newry Island (Barnett's Ruins) on the Kalang River.

Due to a lack of data outside the Bellinger River Morphological Study proponents are required to undertake a riverine process study for individual development proposals in areas potentially affected by Riverine processes.

8.9.2 What land is potentially affected by riverine processes?

Areas identified on the Soil Landscapes - Alluvial and Swamp Landscapes mapping (plus 100m), undertaken by the Department of Land and Water Conservation, is considered to be *potentially affected by riverine processes* and will generally require further assessment as outlined below. The Alluvial and Swamp Landscapes mapping is available for inspection at Council's office.

(Council may grant exemption to undertake a detailed assessment if it considers the site would not be affected by riverine processes. Such exemption would be merit based and determined by site inspection, and tests as necessary, by a suitably qualified person. The site inspection must, amongst other things, clearly demonstrate that the site is not an Alluvial and Swamp Landscape or have similar propensity to riverine erosion.)

Outside these areas, further investigation will generally not be required unless there is a history of bank erosion in the area.

8.9.3 Prescriptive controls

Section 8.12 details the prescriptive controls for land that is identified as being affected or potentially affected by riverine processes.

8.10 Development in Flood Fringe and Flood Storage Area

Development in Flood Fringe Areas generally has no effect on flood behaviour. The main consideration in these areas is the minimisation of flood damages and risk to life. Structures may be subject to uplift forces due to buoyancy or settling / subsidence associated with inundation in flood fringe areas.

Flood Storage Areas require additional consideration as any loss of storage has the potential to increase flood levels elsewhere in the catchment. Development in Flood Storage Areas is therefore subject to the same general provisions for development in Flood Fringe Areas, along with additional specific requirements as detailed herein.

The requirements for specific land uses in Flood Fringe and Flood Storage Areas are outlined below.

8.10.1 Residential development (including units, dual occupancy, tourist accommodation and the like)

New Development and Redevelopment

Floor levels

With the exception of applications for voluntary house raising, floor levels, including non-habitable rooms, shall be equal to or above the GFPL.

Consent will not be granted to convert existing sheds, garages or the like that are sited below the GFPL for habitable purposes unless the floor level is above the GFPL.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the GFPL. Flood proofing shall be achieved by filling the site if practical or by the provision of other approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

In **Flood Storage Areas** there shall be no net loss of flood storage at any level below the GFPL from any works associated with the development. Compensatory works such as excavation will be considered if practical and where there is no increase in flood levels over the full range of floods.

Access, Management and Design

Flats, unit type development, detached dual occupancies and tourist accommodation and the like involving a more intensive habitation of the site shall have safe access at minimum General FPL minus freeboard to land above the PMF.

Attached dual occupancies shall, as far as practical, have safe access at minimum of General FPL minus freeboard to land above the PMF.

New dwellings on rural properties shall be sited, where practical or desirable, to have safe pedestrian or vehicular access at General FPL minus freeboard to land above the PMF. In addition, the internal road access shall be at a minimum level of the flood immunity (the level the road gets cut) of the adjoining public road (or its proposed upgrade level). This last provision does not apply where the only possible (and normal) access to the site is by aircraft or watercraft and this form of access remains safe and viable during flooding (eg, island access in the lower estuary sections of the Bellinger and Kalang Rivers).

Redevelopment shall be sited to provide safe access (vehicular and pedestrian) at the highest level practical for the site.

Infill Development

Floor Levels

Floor levels, including non-habitable rooms, shall be equal to or above the GFPL.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the GFPL. Flood proofing shall be achieved by filling the site if possible or by the provision of other approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

In **Flood Storage Areas** there shall be no net loss of flood storage at any level below the GFPL from any works associated with the development. Compensatory works such as excavation will be considered if practical and where there is no increase in flood levels over the full range of floods.

Access, Management and Design

Infill residential development for a single residence (including Bed and Breakfast establishments) in existing residential/village zones shall be sited to provide access from the dwelling to the adjoining public road at a level that is no lower than the flood immunity of the public road.

Flats, unit type development, detached dual occupancies and tourist accommodation and the like involving a more intensive habitation of the site shall have safe access at minimum of the General FPL minus freeboard to land above the PMF.

Attached dual occupancies shall, as far as practical, have safe access at minimum of the General FPL minus the freeboard to land above the PMF.

Extensions

Floor Levels

Other than as provided below, floor levels shall be equal to or above the GFPL.

Consideration will be given to floor levels for minor extensions or modifications below this level provided:

- the floor level of the extension or modification shall be as high as practical without modifying the existing roofline;
- the extension or modification being no lower than the Conceded FPL; and
- the extension or modifications being no more than 15% of the existing floor level (as at 2 April 2002) or 30m², whichever is the greater, or 60m² where above the 1% AEP.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the GFPL. Flood proofing shall be achieved by filling the site if possible or by the provision of other approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

In **Flood Storage Areas** there shall be no net loss of flood storage at any level below the GFPL from any works associated with the development. Compensatory works such as excavation will be considered if practical and where there is no increase in flood levels over the full range of floods.

8.10.2 Commercial and Industrial Development

New Development and Redevelopment

Floor Levels

Floor levels for **Commercial and Industrial Development** shall be equal to or above the GFPL.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the GFPL. Flood proofing shall be achieved by filling the site if practical or by the provision of other approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Furthermore, if a **floor level below the GFPL** is justified, a storage area of 10% of the total floor area for urban areas, and 20% of the total floor area for rural areas, shall be provided at or above the GFPL. Consideration shall also be given for the provision of equipment to lift heavy or bulky items to this storage area.

Flood Effect on Others

In **Flood Storage Areas** there shall be no net loss of flood storage at any level below the GFPL from any works associated with the development. Compensatory works such as excavation will be considered if practical and where there is no increase in flood levels over the full range of floods.

Access, Management and Design

As far as practical, development shall be sited to provide safe vehicular access at the GFPL minus freeboard to land above the PMF.

Where the access is over land that is lower than GFPL minus freeboard a Flood Management Strategy shall be prepared for the site in accordance with Appendix 8.7 Flood Management Strategy Requirements.

Infill Development

Floor Levels

Other than as provided below, floor levels shall be equal to or above the GFPL.

Consideration will be given to floor levels below the GFPL provided it is no lower than the Conceded FPL and no lower than the floor level of adjoining development.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the GFPL. Flood proofing shall be achieved by filling the site if possible or by the provision of other approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Furthermore, if infill development with a **floor level below the GFPL** is permitted, a storage area of at least 20% of the final floor area (below the GFPL) shall be provided at or above the GFPL. Consideration shall also be given for the provision of equipment to lift heavy or bulky items to this storage area.

Flood Effect on Others

In **Flood Storage Areas** there shall be no net loss of flood storage at any level below the GFPL from any works associated with the development. Compensatory works such as excavation will be considered if practical and where there is no increase in flood levels over the full range of floods.

Access, Management and Design

Development should be sited to provide safe vehicular access as far as practical at the GFPL minus freeboard to land above PMF.

A Council approved Flood Management Strategy (see Appendix 8.7 Flood Management Strategy Requirements) shall be provided where the extension has a floor level below the GFPL and where access from the development traverses land that is lower than the GFPL minus freeboard to land above the PMF.

Furthermore, where a Flood Management Strategy is required, appropriate measures shall be investigated for notification of the existence of the Strategy (for example notification on the Certificate of Title for the property, Section 149 or Flood Certificate advice).

Extensions

Floor Levels

Other than as provided below, floor levels shall be equal to or above the GFPL.

Floor levels below the GFPL are permitted provided:

- the floor level of the extension is as high as practical; and
- the floor level of the extension is no lower than the existing floor level.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the GFPL. Flood proofing shall be achieved by filling the site if possible or by the provision of other approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Furthermore, if an extension with **floor level below the GFPL** is permitted, a storage area of at least 20% of the final floor area (below the GFPL) shall be provided at or above the GFPL. Consideration shall also be given for the provision of equipment to lift heavy or bulky items to this storage area.

Flood Effect on Others

In **Flood Storage Areas** there shall be no net loss of flood storage at any level below the GFPL from any works associated with the development. Compensatory works such as excavation will be considered if practical and where there is no increase in flood levels over the full range of floods.

Access, Management and Design

As far as practical, development shall be sited to provide safe vehicular access.

A Council approved Flood Management Strategy (see Appendix 8.7 Flood Management Strategy Requirements) shall be provided where the extension has a floor level below the GFPL and where access from the development traverses land that is lower than GFPL minus freeboard to land above the PMF.

Furthermore, where a Flood Management Strategy is required, appropriate measures shall be investigated for notification of the existence of the Strategy (for example notification on the Certificate of Title for the property, Section 149 or Flood Certificate advice).

8.10.3 *Below ground/basement/underground carparking*

Ingress level

All possible ingress points into the car park such as vehicle entrances and exits, ventilation ducts, windows, light wells, lift shaft openings, risers and stairwells shall be constructed to or above the GFPL.

Additional requirements

Carparks that will accommodate more than 3 vehicles with a floor level below the Conceded Flood Planning Level (Conceded FPL) shall have adequate warning systems, signage, exits and drainage pumping systems.

8.10.4 *Ground level, undercroft and above ground carparks*

Floor levels

The minimum surface level of enclosed car parks shall be at or above the GFPL minus freeboard.

The minimum surface level of open carparks shall be at or above the Conceded FPL.

8.10.5 *Critical Facilities*

New Development, Infill Development and Redevelopment

Floor Levels

Floor levels shall be at or above the Critical Facilities FPL.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the Critical Facilities FPL. Flood proofing shall be achieved by filling the site if possible or by the provision of other approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

In **Flood Storage Areas** there shall be no loss of flood storage at any level below the GFPL from any works associated with the development. Compensatory works such as excavation will be considered if practical and where there is no increase in flood levels over the full range of floods.

Access, Management and Design

Safe access shall be provided at the PMF.

A structural engineers report shall be provided certifying that the structure can withstand the force of floodwater, debris and buoyancy in a PMF flood.

Extensions

Floor Levels

Floor levels for attached extensions should be at or above the Critical Facilities FPL if practical, and at a minimum of height of the GFPL.

The floor level for detached extensions shall be at the PMF.

Flood Proofing

Flood proofing shall be provided to all parts of the extension up to the Critical Facilities FPL. Flood proofing shall be achieved by filling the site if possible or by the provision of other approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

In **Flood Storage Areas** there shall be no loss of flood storage at any level below the GFPL from any works associated with the development. Compensatory works such as excavation will be considered if practical and where there is no increase in flood levels over the full range of floods.

Access, Management and Design

Where practical, safe access shall be provided above the Critical Facilities FPL to land above the PMF level.

A structural engineers report shall be provided certifying that the structure can withstand the force of floodwater, debris and buoyancy in a PMF flood.

8.10.6 Special Purpose Facilities

New Development, Infill Development and Redevelopment

Floor Level

Floor levels shall be at or above the Special Purpose FPL.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the Special Purpose FPL. Flood proofing shall be achieved by filling the site if possible or by the provision of other approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

In **Flood Storage Areas** there shall be no loss of flood storage at any level below the GFPL from any works associated with the development. Compensatory works such as excavation will be considered if practical and where there is no increase in flood levels over the full range of floods.

Access, Management and Design

Safe access shall be provided at the Special Purpose FPL to land above the PMF level.

A structural engineers report shall be provided certifying that the structure can withstand the force of floodwater, debris and buoyancy in a PMF flood.

Extensions

Floor Levels

Floor levels for attached extensions shall be at or above the Special Purpose FPL if practical, and at a minimum of height of the GFPL.

The floor level for detached extensions shall be at or above the Special Purpose FPL.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the Special Purpose FPL. Flood proofing shall be achieved by filling the site if possible or by the provision of other approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Access, Management and Design

Where practical, safe access shall be provided above the Special Purpose FPL to land above the PMF level.

A structural engineers report shall be provided certifying that the structure can withstand the force of floodwater, debris and buoyancy in a PMF flood.

8.10.7 Minor Development

Floor Level

Minor development has a Non-Specified FPL. Floor levels shall be as close as practical to the GFPL and will be assessed on site specific practical constraints for each specific type of development.

Flood Proofing

Flood proofing appropriate to the type of development shall be provided to all parts of the structure up to the GFPL. Flood proofing should be achieved by filling the site if possible or by the provision of other approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

In **Flood Storage Areas** there shall be no loss of flood storage at any level below the GFPL from any works associated with the development. Compensatory works such as excavation will be considered if practical and where there is no increase in flood levels over the full range of floods.

Access, Management and Design

Minor development has no specific access requirements however it is to be provided with the highest level of flood immunity practical for the site.

8.10.8 Filling

Flood Effect on Others

Filling requires the development consent of Council. If filling of land is proposed (as a development in its own right, or as a flood proofing measure required for other types of development discussed in this DCP), an assessment shall be carried out by an appropriately qualified person to ensure that the fill:

- a) does not affect drainage or surface run-off, or
- b) have a measurable impact on flood behaviour beyond the property boundary, and
- c) that appropriate compaction can be achieved.

This assessment shall be submitted to Council with the supporting documentation for the development application.

In **Flood Storage Areas** there shall be no net loss of flood storage at any level below the GFPL from filling. Compensatory works such as excavation will be considered if practical and where there is no increase in flood levels over the full range of floods.

8.10.9 Fencing

There are no flood related development controls relating to fencing in Flood Fringe and Flood Storage Areas.

8.10.10 Subdivisions

Flood Proofing

Each lot shall have, unless as provided through application to Council, a minimum area of 400m² (residential/urban) or 1000m² (rural) above a level of the GFPL minus freeboard.

Note: Where Chapter 3 (or similar) allows for subdivision of land below 600m² (in conjunction with an approved dwelling design) and the development application demonstrates that the house, the required car parking area, and a suitable area of land for relocation of children's play equipment, garden tools etc... will be above the GFPL, then subdivision shall not be restricted by this provision.

Flood Effect on Others

In **Flood Storage Areas** there shall be no net loss of flood storage at any level below the GFPL from any works associated with the development. Compensatory works such as excavation will be considered if practical and where there is no increase in flood levels over the full range of floods.

Access, Management and Design

Safe vehicular access shall be provided at a minimum level of the GFPL minus freeboard to each allotment within the subdivision.

Safe access shall be provided from the subdivision to a designated flood evacuation centre, flood refuge or community of support. Access shall be such that it will not create an isolated area of development as floodwaters continue to rise above the GFPL minus freeboard, i.e. all sections of the access route are to be higher than the development. If safe vehicular access cannot be achieved, consideration may be given to safe pedestrian access provided the evacuation centre, flood refuge or community of support is within a 500 metre walking route from each such development, and that the walking route is sufficiently cleared and at a grade where an able bodied person can negotiate the route without fear of slipping or falling in wet conditions.

Furthermore, safe vehicular access must be provided from each development to a suitable helicopter landing site located above the PMF, which shall remain permanently cleared - such as a road cul-de-sac.

Filling associated with the subdivision must comply with the Filling requirements above.

For commercial and industrial subdivision the internal road access shall be at a minimum level of the flood immunity (the level the road gets cut) of the adjoining public road (or its proposed upgrade level).

8.10.11 Boundary Adjustments

Flood Proofing

As far as practical each lot shall have a minimum area of 400m² (residential/urban) or 1000m² (rural) above a level of the GFPL minus freeboard.

For an allotment that has land above the GFPL, a boundary adjustment shall not create any allotment without a functionally useful area of land above the GFPL.

For rural land, the boundary adjustment shall retain raised land or access to stock in times of flood. Where land above the GFPL or PMF is available, such land shall be partially retained on any allotment resulting from the boundary adjustment.

Access, Management and Design

The boundary adjustment shall not reduce the flood immunity of existing vehicular or pedestrian flood access to any allotment.

8.10.12 Caravan Parks and Manufactured Home Estates

New Development, Infill Development and Redevelopment

Floor levels

Floor levels, including non-habitable rooms, shall be equal to or above the GFPL. NB: Consent will not be granted to convert existing sheds, garages or the like that are sited below the GFPL for habitable purposes.

Flood Proofing

Flood proofing appropriate to the type of development shall be provided to all parts of the structure up to the GFPL. Flood proofing should be achieved by filling the site if possible or by the provision of other approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

In **Flood Storage Areas** there shall be no net loss of flood storage at any level below the GFPL from any works associated with the development. Compensatory works such as excavation will be considered if practical and where there is no increase in flood levels over the full range of floods.

Access, Management and Design

All development, including caravans (if permitted), shall have safe pedestrian and vehicular access at minimum of the GFPL minus freeboard within the park. Furthermore, safe access is required from the GFPL to a designated flood evacuation centre or refuge.

Consideration may be given to reducing access requirements for short term tourist accommodation where appropriate management and evacuation strategies are approved and Council is satisfied the development is not for long term residential accommodation.

All caravans and habitable structures (if permitted) that are sited below the GFPL shall be capable of being moved at short notice to storage areas above the GFPL.

Rigid annexes, landscaping and enclosures around and beneath a caravan or mobile home are not permitted below the GFPL.

On land between the GFPL and PMF new permanent vans and structures should be designed (tied down) to prevent uplift and flotation in floods that exceed the GFPL.

An Approved Flood Management Strategy, prepared in accordance with Appendix 8.7, shall be lodged with all development applications where development is proposed to be sited below the GFPL.

Extensions

Floor Levels

Other than as provided below, floor levels for extensions should be equal to or above the GFPL.

Consideration will be given to floor levels for minor extensions or modifications below this level provided:

the floor level of the extension or modification shall be as high as practical without modifying the existing roofline;

- the extension or modification being no lower than the Conceded FPL; and
- the extension or modifications being no more than 15% of the existing floor level (as at 2nd April 2002) or 30m² whichever is the greater.

Flood Proofing

Flood proofing appropriate to the type of development shall be provided to all parts of the structure up to the GFPL. Flood proofing for should be achieved by filling the site if possible or by the provision of other approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

In **Flood Storage Areas** there shall be no loss of flood storage at any level below the GFPL from any works associated with the development. Compensatory works such as excavation will be considered if practical and where there is no increase in flood levels over the full range of floods.

8.11 Development in Floodways

Development in floodways has the potential to have an adverse effect on flood levels and velocities due to the potential to block or divert flow. There is also the potential for structures to be damaged or undermined due to the flow of water. In general, it is preferable that structures not be located in a floodway.

The requirements for specific land uses in Floodways are outlined below.

8.11.1 Residential development (including units, dual occupancy, tourist accommodation and the like)

New Development and Infill Development

New development and infill development is not permitted in floodways (unless the site has been filled to a minimum level of the GFPL minus freeboard and in accordance with the provisions below, in which case the provisions for development in Flood Fringe areas shall apply).

Redevelopment

Redevelopment will only be permitted for legal / authorised structures. Consideration will be given to redevelopment where it can be demonstrated that there is a net public benefit or net reduction to existing potential damages or risk of life (see Appendix 8.8).

Floor levels

With the exception of applications for voluntary house raising, floor levels, including non-habitable rooms, shall be equal to or above the GFPL.

Consent will not be granted to convert existing sheds, garages or the like that are sited below the GFPL for habitable purposes.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the GFPL by the provision of approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

As far as practical redevelopment shall be elevated to allow free flow of floodwaters beneath the structure. The underside shall not be enclosed except

with open mesh of sufficient openings to minimise accumulation of debris (see conditions for fencing). Open stairways are required to minimise any measurable impact on flood behaviour.

Any filling of the site or enclosed foundation may be permitted where it can be demonstrated there will be no change to flood behaviour beyond the property boundary.

Where filling or enclosed sides are proposed below the GFPL the proposal shall be accompanied by a certified flood study report (see Appendix 8.3), which demonstrates that there will be no measurable adverse affect on flood behaviour, over the full range of floods, beyond the property boundary.

Furthermore, the flood study report shall demonstrate that there will not be measurable adverse affects to drainage or surface runoff of adjoining properties.

Access, Management and Design

A structural engineer's report shall be provided certifying that the structure/s can withstand the force of floodwater, debris and buoyancy in a PMF flood and that cladding and other non-structural components are designed to cater for the force of floodwater, debris and buoyancy up to the GFPL.

Redevelopment shall be sited to provide safe access (vehicular and pedestrian) at the highest level practical for the site.

Extensions

Extensions will only be permitted for legal / authorised structures.

Consideration will be given to extensions where it can be demonstrated that there is a net public benefit or net reduction to existing potential damages or risk of life (see Appendix 8.8).

Floor Levels

Floor levels shall be equal to or above the GFPL.

Consideration will be given to extensions *at a lower level* where it can be demonstrated that there is a net public benefit or net reduction to existing potential damages or risk of life (see Appendix 8.8).

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the GFPL by the provision of approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

As far as practical extensions to development shall be elevated to allow free flow of floodwaters beneath the structure. The underside shall not be enclosed except with open mesh of sufficient openings to minimise accumulation of debris (see conditions for fencing). Open stairways are required to minimise any measurable impact on flood behaviour.

Any filling of the site or enclosed foundation may be permitted where it can be demonstrated there will be no change to flood behaviour beyond the property boundary.

Where filling or enclosed sides are proposed below the GFPL the proposal shall be accompanied by a certified flood study report (see Appendix 8.3), which demonstrates that there will be no measurable adverse affect on flood behaviour, over the full range of floods, beyond the property boundary.

Furthermore, the flood study report shall demonstrate that there will be not measurable adverse affects to drainage or surface runoff of adjoining properties.

Access, Management and Design

A structural engineer's report shall be provided certifying that the structure can withstand the force of floodwater, debris and buoyancy in a PMF flood and that cladding and other non-structural components are designed to cater for the force of floodwater, debris and buoyancy up to the GFPL.

8.11.2 Commercial and Industrial Development

New and Infill Development

New and infill development is not permitted in floodways, except on Crown or Council land for public purposes such as public amenities, pump stations, building associated with public purposes and the like (unless the site has been filled to a minimum level of the GFPL minus freeboard and in accordance with the provisions below, in which case the provisions for development in Flood Fringe areas shall apply).

Floor Levels

Other than as provided below, development of Crown or Council land for public purposes shall have floor levels equal to or above the GFPL.

The floor level requirements may be lowered where it can be demonstrated that it is not practical to build at a higher level.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the GFPL by the provision of approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

If the floor level is below the GFPL, consideration shall be given to a storage area at or above the GFPL (and provision of lifting equipment if appropriate).

Flood Effect on Others

Where practical, the development shall be elevated to allow free flow of floodwaters beneath the structure. The underside shall not be enclosed except with open mesh of sufficient openings to minimise accumulation of debris (see conditions for fencing). Open stairways are required to minimise any measurable impact on flood behaviour.

Any filling of the site or enclosed foundation may be permitted where it can be demonstrated there will be no change to flood behaviour beyond the property boundary.

Where filling or enclosed sides are proposed below the GFPL the proposal shall be accompanied by a certified flood study report (see Appendix 8.3), which demonstrates that there will be no measurable adverse affect on flood behaviour, over the full range of floods, beyond the property boundary.

Furthermore, the flood study report shall demonstrate that there will be not measurable adverse affects to drainage or surface runoff of adjoining properties.

Access, Management and Design

A structural engineer's report shall be provided certifying that the structure can withstand the force of floodwater, debris and buoyancy in a PMF flood and that

cladding and other non-structural components are designed to cater for the force of floodwater, debris and buoyancy up to the GFPL.

The development shall be sited to provide safe access (vehicular and pedestrian) at the highest level practical for the site.

A Council approved Flood Management Strategy (see Appendix 8.7) shall be provided where the development has a floor level below the GFPL and where access from the development traverses land that is less than the GFPL minus freeboard to land above the PMF.

Redevelopment

Redevelopment will only be permitted for legal / authorised structures.

Consideration will be given to redevelopment where it can be demonstrated that there is a net public benefit or net reduction to existing potential damages or risk of life (see Appendix 8.8).

Floor Levels

Floor levels for **Commercial and Industrial Redevelopment** shall be equal to or above the GFPL.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the GFPL by the provision of approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

If the floor level is below the GFPL, consideration shall be given to a storage area at or above the GFPL (and provision of lifting equipment if appropriate).

Flood Effect on Others

Where practical, the redevelopment shall be elevated to allow free flow of floodwaters beneath the structure. The underside shall not be enclosed except with open mesh of sufficient openings to minimise accumulation of debris (see conditions for fencing). Open stairways are required to minimise any measurable impact on flood behaviour.

Any filling of the site or enclosed foundation may be permitted where it can be demonstrated there will be no change to flood behaviour beyond the property boundary.

Where filling or enclosed sides are proposed below the GFPL the proposal shall be accompanied by a certified flood study report (see Appendix 8.3), which demonstrates that there will be no measurable adverse affect on flood behaviour, over the full range of floods, beyond the property boundary.

Furthermore, the flood study report shall demonstrate that there will be not measurable adverse affects to drainage or surface runoff of adjoining properties.

Access, Management and Design

A structural engineers report shall be provided certifying that the structure can withstand the force of floodwater, debris and buoyancy in a PMF flood and that cladding and other non-structural components are designed to cater for the force of floodwater, debris and buoyancy up to the GFPL.

The development shall be sited to provide safe access (vehicular and pedestrian) at the highest level practical for the site.

A Council approved Flood Management Strategy (see Appendix 8.7) shall be provided where the development has a floor level below the GFPL and where access from the development traverses land that is less than the GFPL minus the freeboard to land above the PMF.

Furthermore, where a Flood Management Strategy is required, appropriate measures shall be investigated for notification of the existence of the Strategy (for example notification on the Certificate of Title for the property, Section 149 or Flood Certificate advice).

Extensions

Extensions will only be permitted for legal / authorised structures.

Consideration will be given to extensions of development where it can be demonstrated that there is a net public benefit or net reduction to existing potential damages or risk of life (see Appendix 8.8).

Floor Levels

Floor levels shall be equal to or above the GFPL.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the GFPL by the provision of approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

If the floor level is below the GFPL, consideration shall be given to a storage area at or above the GFPL (and provision of lifting equipment if appropriate).

Flood Effect on Others

Where practical, the development shall be elevated to allow free flow of floodwaters beneath the structure. The underside shall not be enclosed except with open mesh of sufficient openings to minimise accumulation of debris (see conditions for fencing). Open stairways are required to minimise any measurable impact on flood behaviour.

Any filling of the site or enclosed foundation may be permitted where it can be demonstrated there will be no change to flood behaviour beyond the property boundary.

Where filling or enclosed sides are proposed below the GFPL the proposal shall be accompanied by a certified flood study report (see Appendix 8.3), which demonstrates that there will be no measurable adverse affect on flood behaviour, over the full range of floods, beyond the property boundary.

Furthermore, the flood study report shall demonstrate that there will be not measurable adverse affects to drainage or surface runoff of adjoining properties.

Access, Management and Design

A structural engineer's report shall be provided certifying that the structure can withstand the force of floodwater, debris and buoyancy in a PMF flood and that cladding and other non-structural components are designed to cater for the force of floodwater, debris and buoyancy up to the GFPL.

The development shall be sited to provide safe access (vehicular and pedestrian) at the highest level practical for the site.

A Council approved Flood Management Strategy (see Appendix 8.7) shall be provided where the development has a floor level below the GFPL and where access from the development traverses land that is lower than the GFPL minus freeboard to land above the PMF.

Furthermore, where a Flood Management Strategy is required, appropriate measures shall be investigated for notification of the existence of the Strategy (for example notification on the Certificate of Title for the property, Section 149 or Flood Certificate advice).

8.11.3 *Critical Facilities*

New Development and Infill Development

New development and infill development is not permitted in floodways (unless the site has been filled to a minimum level of the GFPL minus freeboard and in accordance with the provisions below, in which case the provisions for development in Flood Fringe areas shall apply).

Redevelopment

Redevelopment will only be permitted for legal / authorised structures.

Consideration will be given to redevelopment where it can be demonstrated that there is a net public benefit or net reduction to existing potential damages or risk of life (see Appendix 8.8).

Floor Levels

Floor levels shall be at or above the Critical Facilities FPL.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the Critical Facilities FPL by the provision of approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

Where practical, the development shall be elevated to allow free flow of floodwaters beneath the structure. The underside shall not be enclosed except with open mesh of sufficient openings to minimise accumulation of debris (see conditions for fencing). Open stairways are required to minimise any measurable impact on flood behaviour.

Any filling of the site or enclosed foundation may be permitted where it can be demonstrated there will be no change to flood behaviour beyond the property boundary.

Where filling or enclosed sides are proposed below the GFPL the proposal shall be accompanied by a certified flood study report (see Appendix 8.3), which demonstrates that there will be no measurable adverse affect on flood behaviour, over the full range of floods, beyond the property boundary.

Furthermore, the flood study report shall demonstrate that there will be not measurable adverse affects to drainage or surface runoff of adjoining properties.

Access, Management and Design

Safe access shall be provided at the PMF level.

A Council approved Flood Management Strategy (see Appendix 8.7) shall be provided where access from the development traverses land below the PMF level. Furthermore, appropriate measures shall be investigated for notification of the existence of the Strategy (for example notification on the Certificate of Title for the property, Section 149 or Flood Certificate advice).

A structural engineers report shall be provided certifying that the structure can withstand the force of floodwater, debris and buoyancy in a PMF flood and that cladding and other non-structural components are designed to cater for the force of floodwater, debris and buoyancy up to the GFPL.

Extensions

Floor Levels

Floor levels for attached extensions should be at or above the Critical Facilities FPL if practical, and at a minimum of height of the GFPL.

The floor level for detached extensions shall be at or above the Critical Facilities FPL.

Flood Proofing

Flood proofing shall be provided to all parts of the extension up to the Critical Facilities FPL by the provision of approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

Where practical, the development shall be elevated to allow free flow of floodwaters beneath the structure. The underside shall not be enclosed except with open mesh of sufficient openings to minimise accumulation of debris (see conditions for fencing). Open stairways are required to minimise any measurable impact on flood behaviour.

Any filling of the site or enclosed foundation may be permitted where it can be demonstrated there will be no change to flood behaviour beyond the property boundary.

Where filling or enclosed sides are proposed below the GFPL the proposal shall be accompanied by a certified flood study report (see Appendix 8.3), which demonstrates that there will be no measurable adverse affect on flood behaviour, over the full range of floods, beyond the property boundary.

Furthermore, the flood study report shall demonstrate that there will be not measurable adverse affects to drainage or surface runoff of adjoining properties.

Access, Management and Design

Safe access shall be provided at the Critical Facilities FPL to land above the PMF level where practical.

A Council approved Flood Management Strategy (see Appendix 8.7) shall be provided where access from the development traverses land below the PMF level. Furthermore, appropriate measures shall be investigated for notification of the existence of the Strategy (for example notification on the Certificate of Title for the property, Section 149 or Flood Certificate advice).

A structural engineers report shall be provided certifying that the structure can withstand the force of floodwater, debris and buoyancy in a PMF flood and that cladding and other non-structural components are designed to cater for the force of floodwater, debris and buoyancy up to the GFPL.

8.11.4 *Special Purpose Facilities*

New Development and Infill Development

New development and infill development is not permitted in floodways (unless the site has been filled to a minimum level of the GFPL minus freeboard and in accordance with the provisions below, in which case the provisions for development in Flood Fringe areas shall apply).

Redevelopment

Redevelopment will only be permitted for legal / authorised structures.

Floor Level

Floor levels shall be at or above the Special Purpose FPL.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the Special Purpose FPL by the provision of approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

Where practical, the development shall be elevated to allow free flow of floodwaters beneath the structure. The underside shall not be enclosed except with open mesh of sufficient openings to minimise accumulation of debris (see conditions for fencing). Open stairways are required to minimise any measurable impact on flood behaviour.

Any filling of the site or enclosed foundation may be permitted where it can be demonstrated there will be no change to flood behaviour beyond the property boundary.

Where filling or enclosed sides are proposed below the GFPL the proposal shall be accompanied by a certified flood study report (see Appendix 8.3), which demonstrates that there will be no measurable adverse affect on flood behaviour, over the full range of floods, beyond the property boundary.

Furthermore, the flood study report shall demonstrate that there will be not measurable adverse affects to drainage or surface runoff of adjoining properties.

Access, Management and Design

Safe access shall be provided at the Special Purpose FPL to land above the PMF level where practical.

A Council approved Flood Management Strategy (see Appendix 8.7) shall be provided where access from the development traverses land below the Special Purpose FPL. Furthermore, appropriate measures shall be investigated for notification of the existence of the Strategy (for example notification on the Certificate of Title for the property, Section 149 or Flood Certificate advice).

A structural engineers report shall be provided certifying that the structure can withstand the force of floodwater, debris and buoyancy in a PMF flood and that cladding and other non-structural components are designed to cater for the force of floodwater, debris and buoyancy up to the GFPL.

Extensions

Floor Levels

Floor levels for attached extensions shall be at or above the Special Purpose FPL if practical, and at a minimum of height of the GFPL.

The floor level for detached extensions shall be at or above the Special Purpose FPL.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the Special Purpose FPL. Flood proofing shall be achieved by filling the site if possible or by the provision of other approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

Where practical, the development shall be elevated to allow free flow of floodwaters beneath the structure. The underside shall not be enclosed except with open mesh of sufficient openings to minimise accumulation of debris (see conditions for fencing). Open stairways are required to minimise any measurable impact on flood behaviour.

Any filling of the site or enclosed foundation may be permitted where it can be demonstrated there will be no change to flood behaviour beyond the property boundary.

Where filling or enclosed sides are proposed below the GFPL the proposal shall be accompanied by a certified flood study report (see Appendix 8.3), which demonstrates that there will be no measurable adverse affect on flood behaviour, over the full range of floods, beyond the property boundary.

Furthermore, the flood study report shall demonstrate that there will be not measurable adverse affects to drainage or surface runoff of adjoining properties.

Access, Management and Design

Safe access shall be provided at the Special Purpose FPL to land above the PMF level where practical.

A Council approved Flood Management Strategy (see Appendix 8.7) shall be provided where access from the development traverses land below the Special Purpose FPL. Furthermore, appropriate measures shall be investigated for notification of the existence of the Strategy (for example notification on the Certificate of Title for the property, Section 149 or Flood Certificate advice).

A structural engineers report shall be provided certifying that the structure can withstand the force of floodwater, debris and buoyancy in a PMF flood and that cladding and other non-structural components are designed to cater for the force of floodwater, debris and buoyancy up to the GFPL.

8.11.5 Minor Development

Floor Level

Minor development has a Non-Specified FPL. Floor levels shall be as close as practical to the GFPL and will be assessed on site specific practical constraints for each specific type of development.

Flood Proofing

Flood proofing appropriate to the type of development shall be provided to all parts of the structure up to the GFPL by the provision of other approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

Where practical, structures shall be designed and sited in locations where they are unlikely to adversely affect flood behaviour.

Other than as exempted below, the proposal shall be accompanied by a certified flood study report (see Appendix 8.3), which demonstrates that there will be no measurable adverse affect on flood behaviour, over the full range of floods, beyond the property boundary.

Furthermore, the investigation report shall demonstrate that there will be not measurable adverse affects to drainage or surface runoff of adjoining properties.

The following forms of development in floodways are exempt from the foregoing flood study requirements:

- Car parks where the site is not filled and curbs and landscaping does not exceed 150 mm height.
- Enclosed oyster depuration sheds, boat sheds, pump houses, garden sheds, amenity blocks, change rooms and the like less than 20 sq m in rural areas or 10 sq m for urban. These structures are to be oriented to minimise any hydraulic impact.
- Boat ramps where filling and landscaping are less than 150 mm.
- Wharves, jetties and boardwalks and the like where supported on piles and the substructure is open for the free flow of floodwater.
- Access roads to private property where the fill is less than 150 mm.
- Swimming pools where the height of the pool and surrounds does not exceed 150 mm above the natural surface.
- Landscaping and garden beds and the like where the height does not exceed 150 mm above the natural surface.
- Minor development (non-habitable) such as pergolas, non enclosed bus shelters, elevated advertising signs, carports, non-enclosed picnic shelters and the like.

Access, Management and Design

Minor development has no specific access requirements however it is to be provided with the highest level of flood immunity practical for the site.

A structural engineer's report shall be provided certifying that the structure can withstand the force of floodwater, debris and buoyancy in a PMF flood and that cladding and other non-structural components are designed to cater for the force of floodwater, debris and buoyancy up to the GFPL.

8.11.6 Filling

Flood Effect on Others

Filling requires the development consent of Council.

Filling can cause a significant redistribution of flood flow or a significant increase in flood levels. Therefore, unless compensatory works are undertaken, no fill is permitted in floodways.

Where fill and or associated compensatory works are proposed, the development application shall be accompanied by a certified flood study report (see Appendix 8.3), which demonstrates that there will be no measurable adverse affect on flood behaviour, over the full range of floods, beyond the property boundary, unless it can be demonstrated that there is no adverse impact for floods less than 1% on existing buildings and infrastructure.

Furthermore, the flood study report shall demonstrate that there will be no measurable adverse affects to drainage or surface runoff of adjoining properties.

8.11.7 *Fencing*

Fencing in floodways shall be permeable to the flow of flood water and designed to minimise the accumulation of debris.

Post and wire or collapsible fencing is preferred. Alternatively, fencing shall have a maximum obstruction at 90° to the flow of 15%, openings of no less than 125mm and a maximum height of 1.2m (the use of open mesh with 100mm minimum openings is permitted for swimming pool fences).

8.11.8 *Subdivisions*

Subdivisions in floodways are generally undesirable. Notwithstanding, where the floodway represents the residual portion of lots and the following provisions are complied with, subdivisions in floodways is permitted.

Flood Proofing

Each lot shall have a minimum area of 400m² (residential/urban) or 1000m² (rural) above the GFPL minus freeboard.

Note: Where Chapter 3 (or similar) allows for subdivision of land below 600m² (in conjunction with and approved dwelling design) and the development demonstrates that the house, the required car parking area, and a suitable area of land for relocation of children's play equipment, garden tools etc... will be above the GFPL, then subdivision shall not be restricted by this provision.

Flood Effect on Others

Where applicable, the provisions of other sections apply. For example, fill in floodways.

Access, Management and Design

Safe vehicular access shall be provided at a minimum level of the GFPL minus freeboard to each of the allotments within the subdivision.

Safe access shall be provided from the subdivision at a minimum level of the GFPL minus freeboard to a designated flood evacuation centre, flood refuge or community of support. Access shall be such that it will not create an isolated area of development as floodwaters continue to rise, i.e. all sections of the access route are to be higher than the development. If vehicular access cannot be achieved, consideration may be given to pedestrian access is to be provided as above provided the evacuation centre, flood refuge or community of support is within a 500 metre walking route from each such development, and that the

walking route is sufficiently cleared and at a grade where an able bodied person can negotiate the route without fear of slipping or falling in wet conditions.

Furthermore, safe vehicular access must be provided from each development to a suitable helicopter landing site located above PMF, which shall remain permanently clearly - such as a road cul-de-sac.

Filling associated with the subdivision must comply with the Filling requirements above.

For commercial and industrial subdivision the internal road access shall be at a minimum level of the flood immunity (the level the road gets cut) of the adjoining public road (or its proposed upgrade level).

8.11.9 Boundary Adjustments

Flood Proofing

As far as practical each lot shall have a minimum area of 400m² (residential/urban) or 1000m² (rural) above a level of the GFPL minus freeboard.

For an allotment that has land above the GFPL, a boundary adjustment shall not create any allotment without land above the GFPL.

For rural land, the boundary adjustment shall retain raised land or access to stock in times of flood. Where land above the GFPL or PMF is available, such land shall be partially retained on any allotment resulting from the boundary adjustment.

Access, Management and Design

The boundary adjustment shall not adversely impact (eg reduce flood immunity) on existing vehicular or pedestrian flood access to any allotment.

8.11.10 Caravan Parks and Manufactured Home Estates (includes extensions)

New Development and Infill Development

New development and infill development is not permitted in floodways (unless the site has been filled to a minimum level of the GFPL minus freeboard and in accordance with the provisions below, in which case the provisions for development in Flood Fringe areas shall apply).

Redevelopment

Redevelopment will only be permitted for legal / authorised caravan parks, manufactured home estates and structures.

Consideration will be given to redevelopment where it can be demonstrated that there is a net public benefit or net reduction to existing potential damages or risk of life (see Appendix 8.8).

Floor levels

Floor levels, including non-habitable rooms, shall be equal to or above the GFPL.

NB: existing sheds, garages or the like sited below the GFPL shall not be converted for habitable purposes.

Flood Proofing

Flood proofing appropriate to the type of development shall be provided to all parts of the structure up to the GFPL by the provision of approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

As far as practical redevelopment shall be elevated to allow free flow of floodwaters beneath the structure. The underside shall not be enclosed except with open mesh of sufficient openings to minimise accumulation of debris (see conditions for fencing). Open stairways are required to minimise any measurable impact on flood behaviour.

Where filling or enclosed sides are proposed below GFPL the proposal shall be accompanied by a certified flood study report (see Appendix 8.3), which demonstrates that there will be no measurable adverse affect on flood behaviour, over the full range of floods, beyond the property boundary.

Furthermore, the flood study report shall demonstrate that there will be no measurable adverse affects to drainage or surface runoff of adjoining properties.

Access, Management and Design

A structural engineer's report shall be provided certifying that the structure can withstand the force of floodwater, debris and buoyancy in a PMF flood and that cladding and other non-structural components are designed to cater for the force of floodwater, debris and buoyancy up to the GFPL.

Redevelopment shall be sited to provide safe access (vehicular and pedestrian) at the highest level practical for the site.

All caravans and habitable structures (if permitted) that are sited in floodways shall be capable of being moved at short notice to storage areas above the GFPL.

Rigid annexes, landscaping and enclosures around and beneath a caravan or mobile home are not permitted below the GFPL.

An Approved Flood Management Strategy, prepared in accordance with Appendix 8.7, shall be lodged with all development applications.

Extensions

Floor Levels

Floor levels shall be equal to or above the GFPL.

Flood Proofing

Flood proofing shall be provided to all parts of the structure up to the GFPL by the provision of approved flood proofing measures (see Appendix 8.5 Flood Proofing Guidelines).

Flood Effect on Others

Extensions to development shall be elevated to allow free flow of floodwaters beneath the structure. The underside shall not be enclosed except with open mesh of sufficient openings to minimise accumulation of debris (see conditions for fencing). Open stairways are required to minimise any measurable impact on flood behaviour.

The proposal shall be accompanied by a certified flood study report, prepared by a professional civil/hydraulic engineer with qualifications suitable for admission as a corporate member of the Institution of Engineers, Australia, which demonstrates

that there will be no measurable adverse affect on flood behaviour, over the full range of floods, beyond the property boundary.

Furthermore, the flood study report shall demonstrate that there will be not measurable adverse affects to drainage or surface runoff of adjoining properties.

Access, Management and Design

A structural engineers report shall be provided certifying that the structure can withstand the force of floodwater, debris and buoyancy in a PMF flood and that cladding and other non-structural components are designed to cater for the force of floodwater, debris and buoyancy up to the GFPL.

8.12 Development of Land Affected by Riverine Processes

8.12.1 *Development in areas affected by riverine processes (projected erosion areas)*

In the absence of a site specific investigation or the construction of appropriate protective works, it is considered that development should not be sited in areas identified in the Bellinger River Morphological as a projected area of erosion”.

Extensions to existing development, redevelopment and infill development in areas of projected erosion hazard will be considered on merit.

Any protective works proposed will require a detailed assessment to demonstrate to the satisfaction of Council that there will be no adverse affect to the riverine processes including the property in question and land beyond the property boundary.

It should be noted that other issues such as environmental considerations and statutory requirements may also apply.

8.12.2 *Development in areas potentially affected by riverine processes*

Development proposals in areas *potentially affected by riverine processes* shall require a site specific assessment of riverine processes based on the following guidelines:

- a minimum setback of 40m is generally recommended from the top of the riverbank to any structure. Exceptions may include community infrastructure, minor development, landscaping, wharves, jetties, boardwalks, pump houses, riverbank restoration works, etc.
- the riverine processes assessment shall be undertaken by an experienced Geo-technical Engineer or Geomorphologist
- a report shall be prepared that recommends an appropriate setback from the river bank, along with other conditions as appropriate, to reasonable ensure the proposed development will not be adversely affected by river bank erosion, land slip or subsidence
- the assessment is to include consideration of structures and access routes associated with the development
- an analysis of historical aerial photography should be undertaken to identify trends in riverbank movement
- consideration of short-term fluctuations and long-term trends in riverbank movement and meandering over an appropriate stream length, and the possibility of the river bypassing bends and isolating the development
- details on the nature of materials at the site including the existence of bedrock or other controls

- consideration of the possibility of man-made structures or activities affecting historical trends
- a management plan should be prepared for land within 40m of the riverbank to identify proposed activities and management strategies to minimise bank erosion associated with use of the site, including consideration of stormwater and sewage disposal, controlled access for pedestrians, control of animals and vegetation management.

APPENDICES

APPENDIX 8.1- Potential Flood Prone Land

The extent of flood prone land is determined from flood studies. Council has adopted flood studies and associated mapping of flood prone land along the more intensively populated reaches of the rivers within the local government area (see Section 8.8).

In areas outside those covered by Council's adopted flood studies, the proponent shall undertake the following process to determine if the subject site is Potentially Flood Prone, and if it is, undertake a Preliminary Flood Assessment to determine the extent of flood prone land at the subject site.

What is Potentially Flood Prone Land?

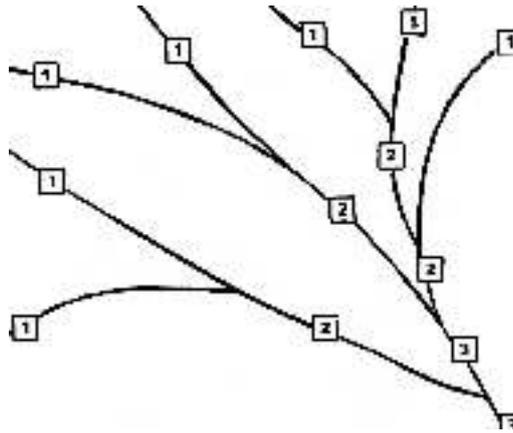
In localities not covered by Council's adopted flood studies and associated mapping of flood prone land, land is considered to be Potentially Flood Prone if:

- i. the subject land is adjacent to or under the influence of flooding from any 3rd order or higher order watercourse (refer below) and is either:
 - a) less than 20m above the normal water level of the watercourse (when measured perpendicular to the direction of flow), or
 - b) less than 10m above the normal level of the watercourse where the catchment area is less than 100 square kilometres, or;
- ii. the subject land is less than 5.0m above any adjacent 1st or 2nd order watercourse.

The Strahler System of Ordering Watercourses

Watercourses are shown on NSW Land and Property Information's topographic maps as broken or continuous blue lines.

- starting at the top of a catchment, any watercourse which has no other watercourses flowing into it is classed as a 1st order watercourse (1)
- where two 1st order watercourses join, the watercourse becomes a 2nd order watercourse (2)
- if a 2nd order is joined by a 1st order watercourse, it remains a 2nd order watercourse
- when two or more 2nd order watercourses join, they form a 3rd order watercourse (3)
- a 3rd order watercourse does not become a 4th order watercourse until it is joined by another 3rd order watercourse, and so on as illustrated on the following diagram.



This Plan does not apply if it can be shown that the subject site is not Potentially Flood Prone.

If the above assessment determines that the subject site is Potentially Flood Prone, a preliminary Flood Assessment shall be undertaken to determine if the site is Flood Prone (see Appendix 8.2).

APPENDIX 8.2 - Flood Assessment Requirements

A Flood Assessment shall be undertaken where development lies within Potentially Flood Prone land or where required otherwise by this Plan.

The primary objective is to determine a reasonable assessment of the extent of flood prone land and the 1% AEP flood level, to identify what development controls may apply and whether a more detailed Flood Study is required (see Appendix 8.3).

Flood Assessment Requirements

Unless instructed otherwise, site specific Flood Assessments shall be prepared under the following guidelines:

- the assessment shall be undertaken and certified by a professional Civil / Hydraulic Engineer with qualifications suitable for admission as a corporate Member of Engineers Australia.
- all levels shall be relative to Australian Height Datum (AHD).
- topographic levels shall be to an accuracy of 0.1m, structures and the like shall be to an accuracy of 0.01m.
- rainfall intensity/frequency/durations shall be determined from Australian Rainfall and Runoff (ARR) 1987 or later.
- flows shall be assessed using a rainfall-runoff hydrologic model and compared to peak flows using the Rational Method from ARR for urban or rural catchments as appropriate.
- the 1% AEP and the PMF (or other similar extreme event) flood events shall be assessed using a steady state backwater analysis technique (or better) with a sensitivity analysis on assumed or assessed parameters.
- flood heights shall be reported in metres to two (2) decimal places, while flood velocity shall be reported in metres per second to one (1) decimal place.
- the assessed flood levels shall be compared to historic flood levels in the vicinity, if available.
- anecdotal data and assessments based on extrapolating levels or flows from other parts of the catchment or adjacent catchment will generally not be accepted unless it can be demonstrated that such an assessment is clearly conservative and results in an upper bound design level.
- developers shall be requested / required to make data available to Council, free of cost, to form part of a Shire wide database.
- the Flood Assessment report shall:
 - clearly set out the objectives of the assessment, the methodology adopted and provide sufficient detail to enable easy checking of calculations and validity of assumptions used.

- present all historical rainfall and flood height data.
- present complete model results including those for sensitivity testing.
- include maps/figures of the catchment, site, model layout and cross section locations.
- include tabulations and/or figures model parameters and results.
- present the findings in sufficient detail to support the validity of the conclusions.
- identify appropriate access routes and emergency management procedures over the full range of flood up to the PMF.
- provide survey data including DTM model on MapInfo (if available) and model data files arranged in an orderly file structure.
- clearly demonstrate the flood impacts associated with the development (if applicable).

This Plan applies to Flood Prone Land as determined by this Flood Assessment.

Where development is proposed below the 1% AEP flood level or where required otherwise by this Plan, a more detailed Flood Study shall be undertaken in accordance with Appendix 8.3.

APPENDIX 8.3 - Flood Study Requirements

A Flood Study shall be undertaken in accordance with these requirements where called for by this Plan.

Flood Studies are generally required to identify the flood behaviour in the vicinity of the development; to identify what impacts the development would have upon flood storage or flood flow, adjacent properties and the like; and/or to assess the impact of the development and/or the cumulative impacts associated with further similar developments.

Flood Study Requirements

Unless instructed otherwise, Flood Studies shall be prepared under the guidelines of the NSW Government's Floodplain Development Manual 2005 and the following:

- the study shall be undertaken and certified by a professional Civil / Hydraulic Engineer with qualifications suitable for admission as a corporate Member of Engineers Australia.
- all levels shall be relative to Australian Height Datum (AHD).
- topographic levels shall be to an accuracy of 0.1m, structures and the like shall be to an accuracy of 0.01m.
- rainfall intensity/frequency/durations shall be determined from Australian Rainfall and Runoff (ARR) 1987 or later.
- flows shall be determined using an appropriate computer based hydrologic model and compared to peak flows derived from the Rational Method of ARR for rural and urban catchments as appropriate (contemporary models such as RAFTS, RORB or WBNM would be acceptable).
- local flood behaviour shall be determined using an appropriate computer based hydraulic model (steady state backwater analysis models such as HEC-RAS are acceptable where loss of flood storage is not an issue, otherwise the unsteady version of HEC-RAS or other 1D or 2D unsteady state models such as MIKE 11, ESTRY, Rubicon, RMA-2, SOBEC or TUFLOW shall be used).
- flood heights shall be reported in metres to two (2) decimal places, while flood velocity shall be reported in metres per second to one (1) decimal place.
- where sufficient historical information is available, the hydrological and hydraulic models shall be calibrated and verified.
- for the purposes of the study, design floods shall include the 5% AEP, 2% AEP, 1% AEP and PMF (or other similar extreme event) flood events.
- sensitivity analysis shall be carried out to assess the how much influence the model parametre values have on the results of the calibration, verification and design events (sensitivity analysis would normally include but not limited to variations in flow, friction, infiltration and energy losses at structures).
- where development is proposed below the 1% AEP flood level, a hydraulic quantification of the impacts of the development shall be assessed over the full

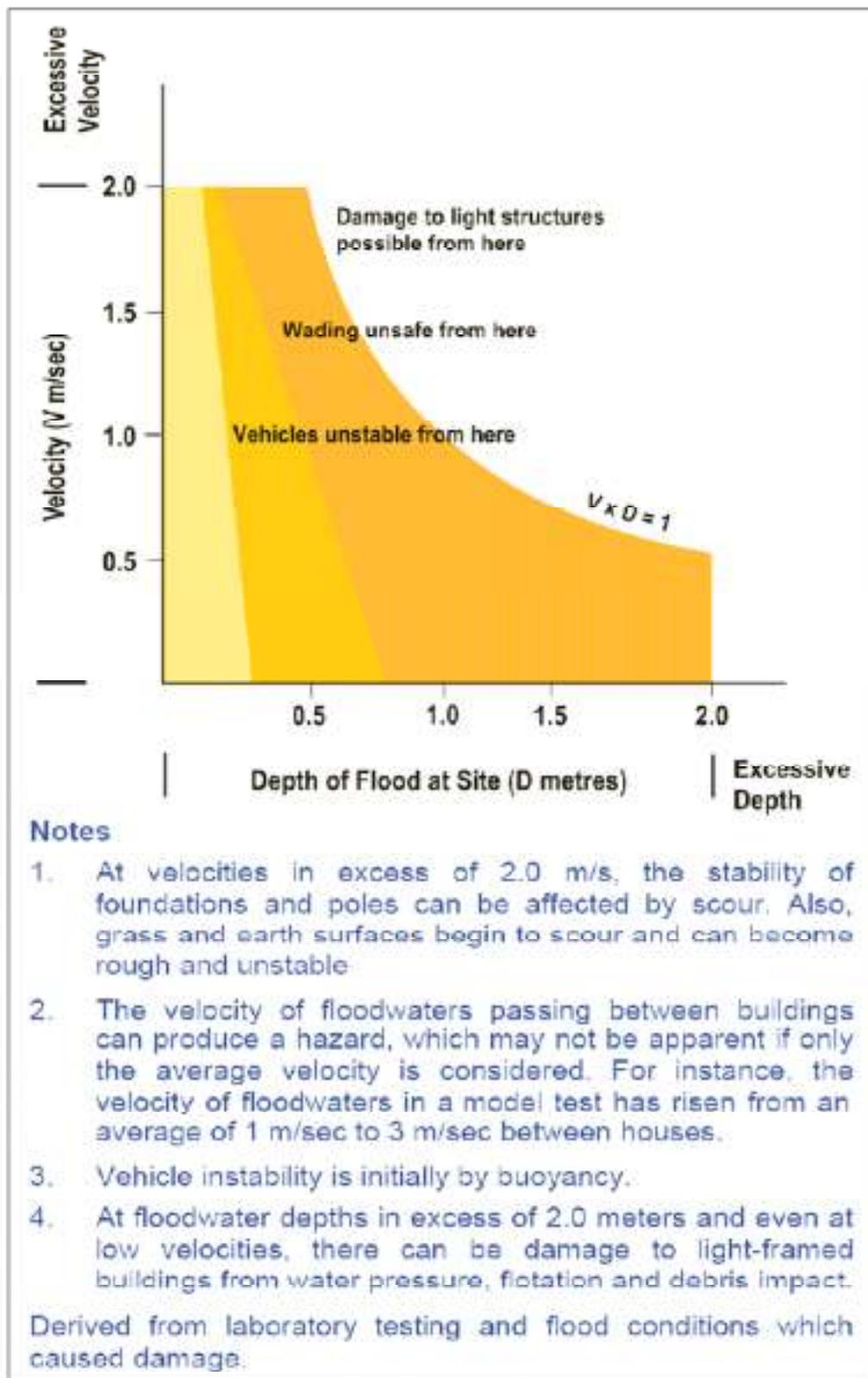
range of flood events.

- developers shall be requested / required to make data available to Council, free of cost, to form part of a Shire wide database.
- the flood study report shall:
 - clearly set out the objectives of the study, the methodology adopted and provide sufficient detail to enable easy checking of calculations and validity of assumptions used.
 - present all historical rainfall and flood height data.
 - present complete model results including flood heights (levels), flow distributions, velocities and flood storage variations for all calibration, validation and design events.
 - where development is proposed below the 1% AEP flood level, present the changes in hydraulic behaviour at the structure, at the property boundaries and all sites across the floodplain affected by the development.
 - include maps/figures of the catchment, site, model layout, cross section location, flood profiles, flood extents, flood contours, flow and velocity distribution.
 - include tabulations and/or figures depicting the spatial distribution of model parameters, flow and velocity at each section.
 - information on preliminary hydraulic categories and preliminary hazard categories.
 - present the findings in sufficient detail to support the validity of the conclusions.
 - identify appropriate access routes and emergency management procedures over the full range of flood up to the PMF.
 - provide survey data including DTM model on MapInfo (if available) and model data files arranged in an orderly file structure.
 - clearly demonstrate the flood impacts associated with the development (if applicable).

APPENDIX 8.4 - Safe Access

Velocity and Depth Relationships

The following chart shall be used to determine safe access for pedestrians and vehicles.



Source: NSW Government Floodplain Development Manual 2005

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APPENDIX 8.5 - Flood Proofing Guidelines

Flood proofing refers to any combination of measures incorporated in the design, construction and alteration of individual buildings or structures subject to flooding, to reduce or eliminate flood damages.

Flood proofing by filling of the site is generally preferable where

- practical;
- if below the GFPL, compensatory works are provided to ensure there is no net loss in flood storage at any flood level;
- if in a floodway, compensatory works are provided to ensure there is no increase in adjacent flood levels nor redistribution of flow; and
- otherwise permitted.

Retrofitting removable shutters and the like to doors and windows may be a viable option for existing development however this form of flood proofing is generally not viable for new development or extensions to development as it relies on ongoing maintenance of the equipment and timely intervention by the building occupiers. Notwithstanding, removable shutters and the like would be a valuable adjunct to the measures described below.

Therefore, when flood proofing is specified in this Plan and flood proofing by filling is not suitable, the following basic guidelines shall be complied with.

The guidelines provide an outline of basic construction standards for development below the applicable Flood Planning Level. It should be noted that compliance with these guidelines does not guarantee the performance of a structure under flood conditions. Further structural details and certification may be required by Council for specific proposals.

Electrical and Mechanical Materials

For buildings (or those parts thereof) constructed below the applicable FPL, the electrical and mechanical materials, equipment and installation shall comply with the following:

- mains power supply (subject to approval of Country Energy)
 - incoming main commercial service equipment, including metering equipment, should be located above the applicable FPL
 - buildings must be able to be easily disconnected from the main power supply
 - all circuits below the applicable FPL should be connected to Residual Current Devices
- wiring
 - wiring, power outlets, switches, etc. must be, to the maximum extent possible, located above the applicable FPL
 - all electrical wiring installed below the applicable FPL should be suitable for continuous submergence in water and is to contain no fibrous components
 - only submersible type splices are to be used below the applicable FPL

- all conduits located below the applicable FPL should be installed so that they will be self draining if subject to flooding
- equipment
 - all equipment installed below, or partially below, the applicable FPL should be capable of disconnection by a single plug and socket assembly

HEATING AND AIR CONDITIONING SYSTEMS

Heating and air conditioning systems should, to the maximum extent possible, be installed in areas and spaces of the building above the applicable FPL. Where this is not possible, every precaution is to be taken to minimise the damage caused by submersion in accordance with the following points:

- fuel
 - heating systems using oil or gas should have a manually operated valve located in the fuel supply line to enable fuel cut-off
- installation
 - heating equipment and fuel storage tanks are to be mounted on and securely anchored to a foundation pad of sufficient mass to overcome buoyancy and prevent movement that could damage the fuel supply line
 - all storage tanks are to be vented to an elevation of not less than 600mm above the applicable FPL
- ducting
 - all ductwork located below the applicable FPL is to be provided with openings for drainage and cleaning
 - self draining may be achieved by construction the ductwork on a suitable grade
 - where ductwork must pass through a watertight wall of floor below the applicable FPL, the ductwork is to be protected by a closure assembly operated from above the applicable FPL.

CONSTRUCTION MATERIALS

Construction materials are graded into four classes according to their resistance to flood waters. These grades are:

1. **most suitable** - materials or products which are relatively unaffected by submersion and unmitigated flood exposure and are the best available for the particular application
2. **second preference** - where the 'most suitable' materials are unavailable or economic considerations prohibit their use, these materials or products are considered the next best choice to minimise damage caused by flooding
3. **to be avoided** - as for 'second preference' but considered to be more liable to damage under flood conditions
4. **not permitted** - these materials or products are seriously affected by flood waters and in general have to be replaced if submerged

Buildings should be constructed using the 'most suitable' materials as far as practical - see Table 1. Second and lower class materials will only be considered where circumstances are warranted.

TABLE 1

ORDER OF PREFERENCE

component	most suitable	second preference	to be avoided	not permitted
flooring and sub-floor structure	<ul style="list-style-type: none"> concrete slab-on-ground monolithic construction <p><u>Note:</u> clay filling is not permitted beneath slab-on-ground construction which could be inundated</p> <ul style="list-style-type: none"> suspension reinforced concrete slab 	<ul style="list-style-type: none"> timber floor (T&G boarding, marine plywood) full epoxy sealed on joints 	<ul style="list-style-type: none"> timber floor (T&G boarding, marine plywood) with ends only epoxy sealed on joints and provision for side clearance for board swelling 	<ul style="list-style-type: none"> timber floor close tog round with surrounding base timber flooring with ceilings or soffit linings timber flooring with seal on top only
floor covering	<ul style="list-style-type: none"> clay tile concrete, precast or in situ concrete tiles epoxy, formed-in-place mastic flooring formed-in-place rubber sheets with chemical set adhesives silicone floors formed-in-place vinyl sheets with chemical set adhesives 	<ul style="list-style-type: none"> cement/bituminous formed-in-place cement/latex formed-in-place rubber tiles, with chemical set adhesive terrazzo vinyl tile with chemical set adhesive vinyl tiles asphaltic adhesive loose rugs ceramic tiles with acid and alkali resistant grout 	<ul style="list-style-type: none"> asphalt tiles with asphaltic adhesive loose fit nylon or acrylic carpet with closed cell rubber underlay 	<ul style="list-style-type: none"> asphalt tiles carpeting, glue-down type or fixed with smooth-edge or jute felts ceramic tiles chipboard / particleboard cork linoleum PVA emulsion cement rubber sheets or tiles vinyl sheets or tiles vinyl sheets or tiles coated on cork or wood backings fibre
wall structure (up to GFPL)	<ul style="list-style-type: none"> solid brickwork, blockwork, reinforced concrete or mass 	<ul style="list-style-type: none"> two skins of brickwork or blockwork with inspection 	<ul style="list-style-type: none"> brick or blockwork veneer construction with inspection 	<ul style="list-style-type: none"> inaccessible cavities large window openings

roof structure (where GFPL is above the ceiling level)	<ul style="list-style-type: none"> reinforced concrete construction galvanised metal construction 	<ul style="list-style-type: none"> timber trusses with galvanised fittings 	<ul style="list-style-type: none"> traditional timber roof construction 	<ul style="list-style-type: none"> inaccessible flat roof construction ungalvanised steelwork e.g lintels, arch bay tie rods, beams, etc. unsecured roof tiles
doors	<ul style="list-style-type: none"> solid panel with water proof adhesives flush door with marine ply filled with closed cell foam painting metal construction aluminium or galvanised steel frame 	<ul style="list-style-type: none"> flush panel or single panel with marine plywood and water proof adhesive T&G lined door, framed ledged and braced painting steel timber frame fully epoxy 	<ul style="list-style-type: none"> flywire screens standard timber frame 	<ul style="list-style-type: none"> hollow core ply with PVA adhesive and honeycomb paper core
wall and ceiling linings	<ul style="list-style-type: none"> villaboard brick - face or glazed in waterproof mortar concrete concrete block steel with waterproof application stone - natural, solid or veneer waterproof grout glass blocks glass plastic sheeting or walls with 	<ul style="list-style-type: none"> brick - common plastic wall tiles metals - non ferrous rubber mouldings and trim wood - solid or exterior grade plywood fully sealed 	<ul style="list-style-type: none"> chipboard - exterior grade hardboard - exterior grade wood - solid (boards and trim) with allowance for swelling wood, plywood - exterior grades fibrous plaster board 	<ul style="list-style-type: none"> chipboard fibreboard panels mineral boards paperboard plasterboard, gypsum plaster wall coverings - paper, burlap cloth types wood - standard plywood strawboard
insulation	<ul style="list-style-type: none"> foam or closed cell type 	<ul style="list-style-type: none"> reflective insulation 	<ul style="list-style-type: none"> bat or blanket types 	<ul style="list-style-type: none"> open cell fibre types
windows	<ul style="list-style-type: none"> aluminium frame with stainless steel or brass rollers 	<ul style="list-style-type: none"> epoxy sealed timber waterproof glues with stainless steel or brass fittings galvanised or painting steel 		<ul style="list-style-type: none"> timber with PVA glues, mild steel fittings
nails, bolts, hinges and fittings	<ul style="list-style-type: none"> brass, nylon or stainless steel removable pin hinges 		<ul style="list-style-type: none"> mild steel 	

APPENDIX 8.6 - Evacuation Centres

The usual purpose of evacuation centres is to meet the immediate needs of victims, not to provide them with accommodation. Evacuees will be advised to go to or be taken to the nearest accessible evacuation centre, which may initially be established at the direction of the Bellingen Shire SES Local Controller but managed as soon as possible by the Department of Community Services. At the date of making this Plan any or all of the following sites may be used as evacuation centres:

Evacuation Centre	Address	Remarks	Sector
Bellingen High School	East End, Bellingen	Note this site may be affected during extreme flooding greater than the 1% AEP flood.	East Bellingen
Bellingen Public School	William St, Bellingen	This site is the most appropriate during extreme flooding.	Bellingen
Bellingen Uniting Church Complex	Hyde St, Bellingen	Note this site may be affected during extreme flooding greater than the 1% AEP flood.	Bellingen
North Bellingen Children's Centre	Off Sunset Ridge, North Bellingen		North Bellingen
Urunga Public School	Bellingen St, Urunga		Urunga
Urunga Bowling Club	Bonville St, Urunga		Urunga
Bellingen Valley North Beach Surf Club	Beach Pde, Mylestom		Mylestom / North Beach
Bonville Public School	Gleniffer Road, Bonville		Repton
Raleigh Road House	Pacific Hwy, Raleigh		Raleigh

It should be noted that subsequent to the adoption of this Plan the designated Evacuation Centres may be amended by the SES or Council. Reference should be made to the Bellingen Local Flood Plan prepared by the SES for the most current list of Evacuation Centres.

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APPENDIX 8.7 - Flood Management Strategy Requirements

The flood management strategy is used as a management measure in some circumstances to deal with the increased risks associated with development or access is lower than otherwise desirable.

A site specific flood management strategy identifies appropriate responses when floodwaters are predicted to reach a particular height.

Issues to be addressed/identified in the Flood Management Strategy include:

- existing flood behaviour including the levels and velocities of the 5%, 2%, 1% AEP and PMF. As far as practical levels should be related to both AHD and local flood gauges (e.g. Bellingin Bridge) where predictions are issued by the BOM;
- the level at which access to other centres and/or high land is cut;
- an estimate of the expected rate of rise of floodwater and warning times;
- a description of the premises, it's proposed use and details of property that may need to be lifted or moved to minimise flood damage;
- details of any personnel proposed to remain and manage the site during the flood;
- details of where stock and other property is to be moved to and how and when it will be raised or transported;
- details of other flood proofing measures proposed including disconnection or power, and management of other services such as water supply and sewerage;
- measures to minimise damage to the property and its contents including the securing of loose articles to minimise both losses and the creation of flood debris;
- management of hazardous chemicals or other substances likely to have an adverse effect on the environment or personal well being;
- measures for removal or safe storage of motor vehicles, caravans, plant, equipment, etc;
- procedures for clean up following the flood including disposal of silt and debris deposited and disinfection of inundated areas;
- procedures for reoccupation of the premises including safety and health issues. (e.g. management of hazardous materials displaced during the flood);
- the plan should include details of how tenants or temporary occupants are to be advised and kept informed of the proposed procedures;
- a sunset clause specifying a period of validity is to be included requiring the plan to be regularly reviewed (every 2 years is recommended) and resubmitted for approval by Council;
- contact details of Police, SES, Council, BOM etc;

- Sources of flood intelligence eg Manly Lab, BoM, Council SES; and
- the plan is to be made available at the premises and displayed in a prominent location(s). The location(s) is to be specified in the plan.

The Flood Management Strategy prepared by a professional with experience in floodplain management shall be acceptable to Council.

APPENDIX 8.8 - Guidelines for Net Reduction in Flood Risks

The objectives of Council's **flood policy** are to reduce the impact of flooding and to reduce the public and private losses resulting from flooding.

Note: It is usually better to encourage redevelopment than to persist with the continued use of an existing development which may impede flow, be structurally unsound and/or likely to incur considerable flood losses.

Application of these Guidelines

Floodways – for redevelopment, extensions and minor development only.

Section 5.2.3 (3) of Council's adopted Floodplain Risk Management Study stated that *"Consideration will be given to these types of developments where it can be demonstrated there is a net public benefit or net reduction to existing potential damages or risk to life."*

The relevant provisions of this Plan state that *"Consideration will be given to redevelopment where it can be demonstrated that there is a net public benefit or net reduction to existing potential damages or risk of life"*.

The following explanation and/or examples of net reduction in flood risks are provided for guidance purposes only. Council will consider each application on merit.

Net Public Benefit

- Provides social/economic/tourist benefits to area (eg, Golf Club extension, redevelop part of the Butter Factory, even at a lower floor level, The Yellow Shed, amenities buildings associated with parks, sporting fields etc)
- Improved public access (eg, development may include access ramps for disabled, safety improvements etc)
- Public Infrastructure

Net Reduction to Existing Potential Damages

- Redevelopment of structurally sound building replacing inferior structure, therefore less likely to incur flood damage
- Raised floor level (equates less damage to property)
- Greater storage at GFPL (eg, extension at higher level than existing, storage provisions at GFPL)
- Less restrictions to flow conveyance (equates to reduced afflux and velocity in vicinity which may equates to less damage at adjoining property, eg redevelopment as elevated structure with open structure at lower levels, redevelopment with improved orientation building footprint offering less restriction to flow)

Net Reduction to Existing Risk to Life

- Redeveloped (higher) building or storage offers greater protection to property, therefore owner/occupier may be more inclined to safely evacuate in a timely manner.
- If the occupier fails to evacuate, a development with higher floor levels and structurally sound may be safer than existing development.

- Proposal may offer improved flood access and evacuation as part of development eg, raise low sections of evacuation route, raised bridge/walkway connecting to higher ground, guide posts along inundated evacuation route.

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