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Shelter-in-Place Policy Review

Proposed Motel Development

At

Armidale Ex-Services Memorial Club, Dumaresq Street, Armidale

For

Armidale Ex-Services Memorial Club

Ref.: 6126-007-sip
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TABLE OF CONTENTS

1. INTRODUCTION

With reference to my phone conversations with David Steller from Armidale Dumaresq Council I confirm that he has indicated that the development application could not be recommended for approval based on flooding issues. In particular, he identified that as there was not a suitable flood-free evacuation route from the site in the event of the 1:100 year storm event that the proposal did not meet the requirements set out in the Floodplain Development Manual.

He noted that with a flood-free pedestrian and/or vehicular egress from the site that the proposed development would be recommended for approval from his department. As stated in the third version of our Flood Impact Report, dated August 2010, a flood-free evacuation route from the subject site would require a high level bridge to an adjacent building. This option was reviewed and found not to be viable for the many reasons stated in the report.

Mr Steller nominated the following issues with respect to our Flood Impact Report that led his department not to support the proposed development based on the following flooding concerns:

1. Limited warning time available to respond to a flood event
2. The Shelter-in-Place policy that we were proposing for this development in the event of a major flood event was not in accordance with the Floodplain Development Manual
3. Appendix L6.9.2 of the Floodplain Development Manual specifically excludes motel type developments in floodplain areas. Appendix N7 & N8 of the Floodplain Development Manual points out the limitations of private flood plans as part of the development approval process

The following report is our response to these concerns raised by Mr Steller with regards to the proposed motel development during a major storm event.

2. WARNING TIME FOR A FLOOD EMERGENCY

The following is an extract from Australian Emergency Manual Series, Manual 22 - Flood Response:

The Australian Government Bureau of Meteorology is the primary source of official flood warnings in Australia. The Bureau provides the following products to flood emergency managers and the community:

- *Flood Watch.*
  A Flood Watch is a notification of the potential for a flood to occur as a result of a developing weather situation. It consists of short generalised statements about the developing weather including forecast rainfall totals, description of catchment conditions and catchments at risk. The Bureau of Meteorology attempts to estimate the magnitude of likely flooding in terms of the adopted flood classifications. Flood Watches are normally issued 24 to 36 hours in advance of likely flooding and on a catchment wide basis.
- *Preliminary Flood Warning.*
  These warnings usually predict which class of flooding (minor, moderate or major) will occur rather than providing quantitative forecasts. A Preliminary Flood Warning is the first in a series of warnings and will typically be followed by more detailed flood warnings.
- *Flood Warning.*
  A Flood Warning is a gauge-specific forecast of actual or imminent flooding. Flood Warnings specify the river valley, the likely severity of flooding (often in terms of flood heights at gauges) and when it will occur. They are provided as predicted river level heights at the locations of specified gauges.
- *Severe Weather Warning.*
  A Severe Weather Warning is issued when severe weather is expected to affect land-based communities within the next 24 hours; and:
  - *it is not directly the result of severe thunderstorms, and*
  - *it is not covered by tropical cyclone or fire weather warnings.*

  Severe Weather Warnings aim to provide advance notice of very heavy rainfall leading to flash flooding, or of a storm surge which is sometimes exacerbated by abnormally high tides.
- *Severe Thunderstorm Warning.*
  These warnings are issued whenever severe thunderstorms are occurring in an area or are expected to develop or move into the area during the ensuing few hours. The warnings describe the area under threat and the particular

In addition to the above warning systems, Armidale Dumaresq Council has a telemetry system in place on Dumaresq Creek which provides instantaneous feedback on the creek water level, flow rate & rate of rise. The following is a summary of the Council Warning System:

- **First Alert:** When the water at Stephens Bridge reaches a gauge level of 0.7 metres, protection alert is issued by phoning the Works Coordinator

- **Second Alert:** When the water at Stephens Bridge reaches a gauge level of 0.85 metres, temporary road closure alert is activated. The roads are to be closed in the following order:
    - Beardy Street West (Martins Gully)
    - Taylor Street
    - Faulkner Street
    - Dangar Street
    - Dumaresq Street near Cinema
    - Cooks Road
    - Marsh Street at Stephens Bridge

  When council staff starts closing the above roads, a member of council staff physically meet Cinema staff to make them aware of possible flooding. It is then up to Cinema staff to monitor the situation and institute any necessary evacuation.

- **Third Alert:** If the water continue to rise and reaches 2.7 metres at Stephens Bridge, the protection alert is issued to the State Emergency Services (SES)

- **Fourth Alert:** When the water at the downstream Dumaresq gauging station reaches a gauge level of metres, a flooding alert is issued to the SES. From Council experience a level of 1.85 metres at this downstream gauging station will result in a level of approximately 2.9 metres at the Stephens Bridge two hours later and cause low level flooding in Beardy Street near the new Woolworths complex.

The term “flash flooding” has been used to describe the flooding that would occur at the subject site. Flash flooding is typically related to short duration rainfall events of less than 60 minutes, but its definition allows for storms that peak up to 6 hours of the event starting.

The critical storm event for the site, that is, the storm event that was found to produce the worst flood water depths, is the 9 hour storm. Council officers indicated that the peak water depths would occur in the order of 4.5 to 9 hours after the start of the rainfall. Hence, the critical storm event for this site does fall within the definition of flash flooding.

The following examples of flash flooding were obtained from the BOM website:

Recent examples of flash flooding in New South Wales include:

- *13 October 2002 – Mudgee (Central Tablelands) - 118mm fell in 6 hrs - flash flooding occurred in the Mudgee area.*
- *16 January 2002 - The Channon (Northern Rivers) - 32mm in 15 mins - The storm also affected Grafton, Lismore and Kingscliff where 7 cm hail was reported and there were over 320 calls to the SES.*
- *26 April 2001 - Murwillumbah (Northern Rivers) - 50mm in 30 mins - 3cm hailstones were also reported.*
- *25 March 2001 - Lansdowne (Mid-North Coast) - 60mm in 20 mins - very heavy rain caused local flooding from Gloucester to Walcha.*

- *5 March 2000 - Nundle (North West Slopes) - 100mm in 60 mins. A set of sheep yards severely damaged by water and the creek levels were reported as being the highest in 50 years.*

Whilst these types of storm events (short duration with high rainfall intensity) are possible for Dumaresq Creek, they will not produce the critical flood water depths that the longer duration storms. The longer duration events up to the 9 hr storm will produce the worst effects at the motel site.

Based on the above, it is clear that it would be very unlikely for a flood event to occur without a significant amount of warning, enabling the necessary emergency response plan to be implemented.

3. SHELTER-IN-PLACE POLICY

This proposal for the subject site is most likely the critical issue for Council. The following is an extract from Australian Emergency Manual Series, Manual 20 - Flood Preparedness:

> ***Evacuation v Sheltering in Place***
>
> *Evacuation is a suitable strategy only when, by evacuating, people are not exposed to greater risks than they would face by remaining where they are. Due to the limited warning time available and the dangerous nature of flash flooding, in most flash flood catchments it may be more dangerous for people to evacuate than to shelter in place (i.e. stay inside their building and move to the highest place).*
>
> *Hazards that evacuees may be exposed to whilst evacuating are:*
>
> *• flooding of evacuation routes,*
> *• severe weather including strong winds, heavy rainfall, hail and lightning,*
> *• debris, and*
> *• fallen electricity lines.*
>
> *However, where buildings are located in floodways, it is likely that people will be exposed to high hazard conditions in which it will be more dangerous to shelter in place than to evacuate. In these circumstances an evacuation strategy should be adopted.*
>
> *It may be appropriate for a mixed strategy to be developed, with a shelter in place strategy adopted for buildings where evacuation is likely to be more dangerous than sheltering in place and an evacuation strategy where evacuation is less dangerous than sheltering in place. Areas where these strategies apply should be detailed in plans.*

The shelter in place policy has been adopted by a number of Local Councils which are subject to flooding of a similar nature to Dumaresq Creek. Tweed Shire Council in the north east of New South Wales has a functioning Shelter-in-Place policy. A copy of their DCP Section A3 – Development of Flood Prone Land, Policy Flood Risk Management & Tweed Valley Floodplain Risk Management Study may be found in Appendix A to C of this report, respectively.

I have spoken to Mr Danny Rose, Planning & Infrastructure Engineer from Tweed Shire Council and confirmed that a motel development would meet their development controls when proposed on flood prone land such as the case in Armidale. The following are extracts from the policy relating to motel developments:

1.4.2 Habitable Development

Land Use Risk Class	Development Type	Development Controls	Notes
Medium and High Density Accommodation *Multi dwelling housing, dual occupancy, residential accommodation, residential flat building, backpackers' accommodation, boarding house, hostel, hotel accommodation, moveable dwelling, caravan park, serviced apartment, tourist and visitor accommodation, and accommodation associated with an educational establishment*	***New Development (except moveable dwellings, caravan parks)***	*All new high/medium density development to have permanent high level road evacuation route(s) to land above PMF level and/or adequate PMF refuge, subject to the recommendations of an acceptable Flood Response Assessment Plan.*	*Note 3*
	Existing Development (except moveable dwellings, caravan parks)	*Minor expansion of existing facilities permitted without consideration of PMF. Major expansion below PMF level subject to provision of adequate PMF refuge.*	*Note 4*
	New Development (moveable dwellings, caravan parks)	*All new caravan/moveable dwelling parks to have permanent high level road evacuation route(s) to land above PMF level.*	
	Existing Development (moveable dwellings, caravan parks)	*No expansion of existing facilities permitted, unless permanent high level road evacuation route to high land external to the site is available, or high land internal to the site can be accessed by the additional sites via road and/or pedestrian routes*	

Note 3 - Evacuation Versus Shelter in Place for Medium and High Density Accommodation

Evacuation of occupants is the preferred risk management approach for medium and high density developments proposed below PMF level. Adoption of evacuation as the risk management response for a development requires a Flood Response Assessment Plan that specifically addresses the following evacuation requirements:

- *Expected number of occupants/evacuees*
- *Typical demographics of evacuees (families with children, retirees etc.)*
- *Mode of transportation (private vehicles, bus provided by facility etc.)*

- *Intended evacuation destination*
- *Level of service provided by evacuation centre (medical, security, accommodation etc.)*
- *Any special requirements for evacuation centre to cater for evacuees (food, water, waste, medicines etc.)*

If the above requirements are not able to be satisfied for all future occupants of the development, a PMF refuge shall be provided in accordance with design criteria in Note 4.

Note 4 - PMF Refuge for Urban and Rural Residential Development

Where PMF refuge is required, the refuge must meet the following minimum requirements:

- *Refuge may be an additional second storey, mezzanine level or other raised refuge area above the PMF level.*
- *Minimum floor level to be PMF level. No freeboard required.*
- *Minimum floor area for a single bedroom dwelling 9m^2, add 4m^2 for each additional bedroom.*
- *For unit developments may provide separate refuges within each unit, sized in accordance with the above bedroom ratio. Alternately provide a communal refuge, accessible internally by all units, floor area no less than 50% of total floor area located below PMF level, or an equivalent area that would comfortably accommodate and service the needs of the occupants for a period not less than one week.*
- *Refuge must comply with Building Code Australia requirements, with external components rated appropriately for storm, wind and moisture.*
- *Minimum 2.1m floor to ceiling/roof frame height.*
- *Refuge must be provided with permanent internal and external access (may be a fixed ladder).*
- *The external access must be unobstructed (by trees, chimneys, aerials etc.) for emergency boat access during flooding*
- *Refuge must have natural lighting and ventilation*
- *Support structures below PMF level must be capable of withstanding flood forces (water flow, debris impact, and buoyancy) and continuous submergence for up to one week, requiring an engineering certification.*
- *Refuge must meet all planning and building controls applicable to the site.*
- *Refuge must have a cupboard storage area for flood emergency kit to service all residents with provisions for isolation up to one week, consisting of food and fresh water supplies, first aid kit including medication, battery powered torch, portable radio, spare batteries, candles and water proof matches, plastic bags and rubber gloves. All such measures must be detailed in the development's Flood Response Assessment Plan.*

Based on the above it can be seen that the development would be acceptable within the Tweed Shire Council based on the Shelter in Place conditions noted in Notes 3 & 4. It is noted that the subject site & the proposed motel development meets these requirements.

Tweed Shire Council, in their policy, has separated development into the following categories:

a. Essential Community Facilities & Critical Services
b. Habitable Development
    i. Sensitive Uses
    ii. Medium & High Density
    iii. Residential Subdivision & Development
c. Non-Habitable Development

The key point here is that under b (ii) the requirements for motels have been separated from those of moveable dwellings & caravan parks. The risks associated with the moveable dwellings & caravan parks are considerably higher than those associated with a motel complex. The main difference is that the motel can & does provide significant refuge floor area above the PMF level.

4. FLOODPLAIN DEVELOPMENT MANUAL

Mr Steller has indicated that he has concerns with some key areas of the Floodplain Development Manual. The following are the areas that have been raised and discussed during the consultation period.

4.1 Occupant Awareness

Appendix L of the Floodplain Development Manual cover Hydraulic & Hazard Categorisation

> ***L6.9.2 Level of Occupant Awareness***
> *Caravan and mobile home parks, motels, hostels and hotels can all involve occupants (both short and long term) who are not conversant with flood risk management strategies for the development. The management (manager, operator or licensee) is responsible for providing advice on what to do during a flood, enabling occupants to act appropriately.*
>
> *For existing establishments this may require the preparation, maintenance and promotion of a flood emergency response plan for the site. The plan should rely on resources under control of the management and occupants, rather than on external parties, such as the SES or council. Occupants should be advised of the flood emergency response plan and their responsibilities in a flood event. Copies of the plan should be available to occupants and provided to the SES for their information and reference in the local flood plan, if SES considers this appropriate. Preparation of these plans for existing developments should be encouraged because of their potential to reduce flood risk (to both property and personal safety).*
>
> *It must be noted that flood emergency response plans, where they do work effectively, reduce the flood risk (both the property and personal safety) but not the hydraulic hazard category in specific events.*
>
> *Due to the transient nature and special needs of occupants, such plans should not be used as the basis of development consent for new developments of this type.*

The highlighted paragraph above has been interpreted by Mr Steller as indicating that developments such as motels are not suitable on a flood plain. We believe that this interpretation has been read out of context & that the intent of this section of the manual is to highlight that flood response plans for existing establishments should not be used as the basis of approval for new developments. It is highlighting that site specific and application specific flood response plans are critical for each development and these are required as part of the development approval process. The proposed motel development has a flood response plan that has been prepared specifically for the proposed development as recommended by the Floodplain Development Manual.

Based on conversations with Tweed Shire Council it is clear that they do not consider the risks of motels & caravan parks to be equal. Indeed, they have indicated that due to the mobility of guests staying in motels compared to those staying in their caravans at caravan parks is considerably lower.

Caravan owners are considered at much higher risk to want to escape a flood event to save the loss of their mobile home & possessions. Motel guests whose cars can be stored or moved above the PMF level & be safely housed in a motel room with adequate food & water are far less likely to try & evacuate the site contrary to the staff & emergency services directions.

4.2 Private Flood Plans

Appendix N of the Floodplain Development Manual covers Emergency Response Planning for Floods.

> ***N7 Private Flood Plans***
> *Private or site specific planning refers to the preparation of arrangements aimed at dealing with the impact of flooding on a particular business or household. The SES supports the idea of owners and occupiers of premises in areas of flood risk having a plan for what they should do to prepare for and respond to flooding. To this end, the SES promotes this practice in community and business education activities and continues to develop information to guide the community when they choose to prepare a private flood plan.*
>
> ***N7.1 Limitations of Private Flood Plans***
> *Any form of response planning, but private planning in particular, is unreliable as a long term risk mitigation measure. This is because all plans must be prepared using assumptions about conditions (environmental and organisational) that are expected to apply in the future and which may prove to be wrong or at least very different to the actual event.*
>
> *Floods are highly variable in frequency and severity and this influences two critical planning assumptions, available flood warning time and likely consequences. If, in an actual flood, there is a significant variation between assumptions and reality, even a well written plan may fail unless intelligent on-the-day adaptation is implemented.*
>
> *Implementation of a plan depends explicitly on a thorough understanding of the risk and of the roles and responsibilities of participants. To experienced emergency managers these are areas well known for their uncertainty and the SES trains and practices continually to minimise their impact. Businesses and households will have a much lower capacity to undertake the necessary training and practice and so the plans they own will be much more prone to failure.*
>
> ***N7.2 Private Plans as a Development Consent Condition***
> *In a naive attempt to provide some sort of protection to council when it approves a DA in a flood risk area, some councils are imposing development consent conditions requiring site specific plans. Some consent conditions require the applicant to seek SES endorsement of their plan. Taking into account the preceding discussion about limitations of private plans, the SES is opposed to this approach and some specific points related to this policy are set out below:*

- *Conditioned private flood plans will only be prepared to secure the development consent, not because of a genuine commitment to taking some personal responsibility for risk management. Unless a plan is owned, understood, and practised by the owner/occupier, it will almost certainly be forgotten and fail to be effective;*
- *There is no workable process for quality control of private plans and the SES, having no resources available to service such a huge task across NSW, has no choice other than to refuse requests by an applicant for the SES to review their plan;*
- *The SES is aware of a case where a private plan has been submitted to a LEMC in an attempt to circumvent the SES policy. The legal status of endorsement of a private flood plan by an LEMC, against the policy of the legal combat agency for flood (the SES) has not been tested; and*
- *Councils should be aware that the issue of private flood plans as a consent condition has been tested in the NSW Land and Environment Court and the policy of the SES has been recognised as valid.*

N8 Summary

Flood planning is an important element of the wider floodplain risk management process. It is also more than simply the production of a plan. The planning process enables solutions to the emergency risk management problems which floods pose to be generated before flooding occurs - by which time many potential solutions, if not previously considered, may not be able to be instituted. Planning also helps weld together the agencies which have responsibilities for flood risk management and the local flood plan itself can be used to increase the community's comprehension of the threat and what can be done to manage it.

The concerns raised by Council are based around the risk to the occupants of the development during a major flood event. The ineffective nature of private flood plans as described above can be alleviated for the proposed motel development by having the site warden educated in the response plan, aware of the warning systems in place & in contact with the emergency services.

The Shelter-in-Place policy in the event of a major storm event is far easier to coordinate by the site warden when compared to the alternative of a full site evacuation. Hence, the Shelter-in-Place policy would in fact be a lower risk option for the motel development when compared to evacuation in the event of the severe flooding.

5. REFERENCES

The following documents have been used in the development of this report:

- Armidale Flood Study 2004 - Prepared by Armidale Dumaresq Council, Version 2, dated 24 April 2006
- Armidale Dumaresq Council DCP 2007, Chapter B7 – Stormwater Drainage Code
- Armidale Dumaresq Council - Interim Flood Plan (POL038), 23 October 2000
- Department of Infrastructure, Planning and Natural Resources - Floodplain Development Manual – The Management of Flood Liable Land, April 2005
- Shelter-in-Place v. Evacuation in Flash Flood Environments – Haynes, Coates, Leigh, Gissing, McAneney & Opper, February 2009
- Future Challengers and Directions of Flood Emergency Management – Gissing, Keys & Opper
- Tweed Shire Council – Tweed Development Control Plan, Section A3 – Development of Flood Liable Land, Version 1.3, 9 June 2010
- Tweed Shire Council – Policy : Flood Risk Management, Version 1.0, 18 Dec 2007
- Tweed Shire Council – Tweed Valley Floodplain Risk Management Study, Part 3 – Habitable Land Use on the Floodplain, 18 Dec 2007

6. CONCLUSIONS

Armidale Dumaresq Council have raised an objection to the proposed Shelter-in-Place policy during severe flood events proposed for the motel development at the Armidale Ex-Services Memorial Club. This report has aimed to provide clarification and justification of this policy.

During the preparation of this report I have consulted with Armidale Dumaresq Council, Tweed Shire Council, Bureau of Meteorology, NSW State Emergency Services and the Department of Environment, Climate Change and Water. The overwhelming conclusion was that the Shelter-in-Place policy was being widely adopted by flood affected local government areas and accepted by the emergency services and state government.

The Shelter-in-Place policy clearly allows for evacuation as part of the emergency response if it is deemed feasible by the coordinating emergency response personnel. If deemed not acceptable to evacuate the site the policy of providing refuge in the suitably designed motel structure is deemed a low risk option, particularly due to the short duration of the flood event at the site.

Flood warning & prediction systems are in place and can provide significant advanced notice of potential severe flooding events. They are able to provide warnings well in advance even in flash flooding circumstances.

Tweed Shire Council has a working policy that allows the development of motels within the floodplain, provided their planning requirements are met. These include habitable levels at or above the flood planning level and suitable Shelter-in-Place areas above the PMF level.

Based on the above, we believe that the proposed Shelter-in-Place policy proposed for the Armidale Ex-Services Memorial Club motel complex is a suitable solution, based on the lack of all-weather egress above the 1:100 year ARI storm event. The policy does not increase the risk to staff, guests & their property but instead provides a suitable alternative to what is seen as a much more complicated evacuation during the extreme conditions that are likely to prevail during the severe storm event.

Please feel free to contact the undersigned should you require any additional information or clarification of any of the items in the preceding report.

Yours faithfully,
ECLIPSE Consulting Engineers Pty Ltd

Stephen Healey
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PRINCIPAL

APPENDIX A

Tweed Shire Council – Tweed Development Control Plan, Section A3 – Development of Flood Liable Land, Version 1.3, 9 June 2010

TWEED
SHIRE COUNCIL

Tweed Development Control Plan

SECTION A3 - Development of Flood Liable Land

VERSION 1.3

Amendments

Version	Effective	Description	Authorised
Original Version DCP No.5	18 June 1986		Council Resolution
First Amendment	16 September 1987	Changes to caravan park requirements	Council Resolution
Second Amendment	15 June 1988	To reflect changes to recently approved TLEP 1987	Council Resolution
Third Amendment	14 September 1988	Design flood levels at Murwillumbah	Council Resolution
Fourth Amendment	19 December 1990	Amended flood levels	Council Resolution
Fifth Amendment	15 July 1992	Industrial land south of Ozone Street, Chinderah 50% rule	Council Resolution
Sixth Amendment	21 April 1993	Tyalgum flood levels	Council Resolution
Seventh Amendment	6 March 1996	To permit genuine "granny flats" in low flood hazard areas, but prohibit "dual occupancy" and revised schedule of flood levels	Council Resolution
Draft Version 2.2	Not Adopted	Acknowledges the 2001 NSW Government Floodplain Management Manual, addresses issue of PMF, amends definition of Chinderah and Kingscliff areas, defines localities, clarifies filling and structures permitted on residential, rural and industrial land, minor amendments to flood levels and definitions.	
Version 2.3	15 March 2006	Adoption of amended flood planning levels for residential development arising from Tweed Valley Flood Study 2005 and Tweed Valley Floodplain Risk Management Study Part 1 - Flood Planning Levels.	Council Resolution
Original Version DCP Section A3	4 June 2008	Consolidated DCP, DCP No.5 becomes Section A3	Council Resolution
Version 1.1	27 August 2008	Implementation of Tweed Valley Floodplain Risk Management Study Part 2 - High Flow Areas and Part 3 - Habitable Land Use on the Floodplain by incorporation of new development controls.	Council Resolution
Draft Version 1.2	Withdrawn	Amendment to reflect new land zonings, definitions and flood clauses in Tweed LEP 2010	Council Resolution
Current Version 1.3	9 June 2010	Amendment to reflect new land zonings, definitions and flood clauses in Tweed LEP 2010, plus updates to implement Tweed Valley Flood Study Update 2009 and Coastal Creeks Flood Study 2009, including climate change predictions and areas behind levees. Increase all residential freeboard to 0.5m, including those areas outside of flood study areas. Add Seabreeze Levee to structural controls. Backdate amendments table to include DCP5.	Council Resolution 18 May 2010

Table of Contents

TWEED SHIRE COUNCIL

Table of Contents

A3 - DEVELOPMENT OF FLOOD LIABLE LAND

A3.1 INTRODUCTION

A3.1.1 Aims of this Section

- Present Council's Flood Mitigation Strategy; and
- Set detailed standards for land development in order to minimise the adverse effect of flooding on the community.
- Progressively implement the provisions of the NSW Floodplain Development Manual (April 2005)
- Implement Part 1 of the Tweed Valley Floodplain Risk Management Plan 2005 – Establish Appropriate Flood Planning Levels for Residential Development.
- Implement Part 2 of the Tweed Valley Floodplain Risk Management Plan 2005 - Planning Controls for High Flow Areas.
- Implement Part 3 of the Tweed Valley Floodplain Risk Management Study – Habitable Land Use on the Floodplain
- Implement the Flood Risk Management Policy

A3.1.2 Land to which the Section applies

This Section applies to all flood liable land within the Shire of Tweed.

A3.1.3 How does this Section relate to other Sections and Environmental Planning Instruments?

Within Part A

This Section is generally consistent with the other Sections from Part A of this DCP. Where there is an inconsistency then the higher standard/requirement shall prevail.

Between Part A and Part B

In the event of any inconsistency between this Section and a Section from Part B of this DCP, the provisions of the Section from Part B shall prevail.

This Section contains development standards and other provisions in respect of floodplain management in Tweed Shire and relates to:

Tweed Local Environmental Plan 2000

which is the principal planning instrument governing development in the Shire.

Where an inconsistency arises between this Section and any environmental planning instrument applying to the same land, the provisions of the environmental planning instrument prevail. An environmental planning instrument means a State Environmental Planning Policy, a Regional Environmental Plan or a Local Environmental Plan.

A3.1.4 How to use this Section

Where a development is proposed in respect of land to which this plan applies, Council shall take the provisions of this Section into consideration in determining the application.

Compliance with the provisions of this Section does not necessarily imply that Council will grant consent to an application. Council must, in relation to development applications, also take into consideration those matters listed under Section 79C of the Environmental Planning and Assessment Act, 1979.

In preparing an application for development there are a number of specific steps that should be followed:

Step 1: Check the zoning of the site under Tweed LEP 2000 to ensure that the proposed development is permissible and to determine what related provisions apply.

Step 2: Establish what other Sections of this DCP or Policies apply to the site.

Step 3: Determine using this Section:
a) the flood levels pertaining to the site; and
b) whether the site is in a high flood flow area; and
c) whether emergency response provisions are required; and
d) the development controls applying to the subject locality

and refer to other applicable Sections and Policies to prepare your application. It is these components that Council will use to assess any development proposal.

Step 4: Discuss your final application with Council staff then lodge it for determination.

A3.1.5 Interpretation

For the purposes of this Section:

"Australian Height Datum (A.H.D.)" means the common national plane of level corresponding approximately to mean sea level.

"Average Recurrence Interval (ARI)" - ARI is the long-term average number of years between the occurrence of a flood as big as (or larger than) the selected event.

"caravan parks" means a property used for the placement of caravans (or of caravans and other movable dwellings) as defined by the Tweed LEP.

"compatible development" means development appropriate to both the flood hazard at the development site and to the impact of the development on existing flood levels and flood flows.

"design flood" means the flood selected as a basis for design of mitigation works, normally based on the 1:100 year flood event.

"discharge" means the rate of flow of water measured in terms of volume over time. It is to be distinguished from the speed or velocity of flow which is a measure of how fast the water is moving rather than how much is moving.

"dual occupancy" means any development which results in two (2) dwellings as defined by Tweed LEP.

"flood" means a relatively high stream flow which overlaps the natural or artificial banks in any part of a stream or river.

"flood conveyance zone" means those high flow areas of the Tweed Valley and Coastal Creeks floodplains that are not defined as floodway, but still provide an essential flood water conveyance function.

"flood fringe" means the remaining area of land affected by flooding, after flood storage and floodway areas have been defined.

"flood hazard" means the potential for damage to property or persons due to flooding. In determining whether hazard is high or low account has been taken of the depth and velocity of floodwaters, effective evacuation times and evacuation difficulties including isolation of some areas as floodwaters rise.

"flood liable land", "floodplain", "flood prone land" means area of land which is subject to inundation by floods. For areas of the Tweed Valley and the Coastal Creeks floodplains, designated on Flood Maps in Appendix C it includes land subject to inundation in the probable maximum flood (PMF).

"flood planning levels (FPLs)" are the combinations of flood levels (typically derived from the 100 year ARI flood for habitable purposes) and freeboards selected for floodplain risk management purposes, as determined in management studies and incorporated in management plans.

"flood storages" means those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood.

"floodways" means those areas, often aligned with obvious, naturally defined channels, where a significant passage of water flows during floods. They are often the deepest area where the highest velocities occur. Also, they are areas which, even if only partially blocked, would cause a significant redistribution of flood flow, which may in turn adversely affect other areas.

"granny flat" means a "secondary dwelling" as defined by the Tweed LEP.

"greenfield subdivision" means subdivision of urban zoned land 5 hectares or greater in area.

"habitable area" means a living or working area, such as a lounge room, living room, dining room, rumpus room, kitchen, bedroom, office or the like, and includes rooms constructed and furnished for these purposes. Rooms containing a bath and/or shower are considered habitable. Rooms containing a toilet or basin are not considered habitable if additional to a main bathroom.

"habitable land use" means development that facilitates the occupation or use of buildings or rooms by persons for accommodation. Includes residential accommodation; moveable dwellings; caravan parks; residential care facilities; tourist and visitor accommodation; hospitals; correctional facilities.

"high flow area" means those areas of the Tweed Valley and Coastal Creeks floodplains coloured red in Flood Maps in Appendix C. As defined by Part 2 of the Tweed Valley Floodplain Risk Management Study, flood prone land is classified as being subject to high flow if the product of flood velocity and depth at the peak of the ARI 100 year flood event exceeds 0.3 (vxd > 0.3). Areas coloured blue on the Flood Maps are classified as "low flow

areas", and have a velocity-depth product less than 0.3. High flow areas convey the majority of flood waters, and consist of floodways and flood conveyance zones.

"high island" means an area above the PMF that is surrounded on its entire perimeter during a PMF event. A high island can either be a natural landform such as a high ridge (local examples are Terranora, Bilambil Heights and Hospital Hill in Murwillumbah); or can be created by raised dwellings, fill pads and upper storey refuges.

"high land" means land that is situated above PMF level.

"high level evacuation route" means a road or footway (as applicable based on the development type), whose entire length has a level (measured at top of kerb for roads) of not less than the design flood level and, which provides a route to enable people to evacuate to land above the PMF. Ideally a high level evacuation route will have a rising grade that ensures users will not be cut off as floodwaters rise. Overland stormwater flow paths on high level evacuation routes must be designed to remain trafficable when conveying the 100 year ARI design stormwater flow. High level evacuation routes should have levels that in combination with effective warning time, development type and flood duration, provide adequate time for evacuation to land above the PMF.

"locality" is as defined by the Geographical Names Board.

"long term resident" in relation to a caravan park, means a person (other than any person who is caretaker, manager or employee of the licensee or anyone living with any such person) whose principal place of residence is a movable dwelling placed in the park.

"low island" means an area that is above the FPL and surrounded on its entire perimeter during and 100 year ARI event, but is inundated by the PMF. When flood levels exceed the FPL, in events up to the PMF, low islands become totally inundated, posing significant risk to isolated residents without flood free access to high land or shelter. Local examples include filled residential estates in Banora Point, West Kingscliff, and Pottsville, and raised dwellings in Chinderah, South Murwillumbah and Rural Villages.

"map" means one of a series of plans depicting flood levels in the Tweed Valley Flood Study Update 2009 and Coastal Creeks Flood Study 2009. Coloured areas are predicted to be inundated in a 100 Year ARI flood, hatched areas are additional areas predicted to be inundated in the PMF. Numerical contours are the predicted levels (Metres AHD) for the 100 Year ARI flood. Other flood liable areas (uncoloured or unhatched) on these plans may be outside the hydraulic boundary of the Flood Studies and no information is given of their flood status.

"minor extension or expansion" for of an existing single dwelling, means the addition of not more than $35m^2$. For other habitable development, means the addition of not more than 10% of existing gross floor area.

"peak discharge" means the maximum discharge occurring during a flood event.

"PMF refuge" means a habitable area, being an upper storey, mezzanine level or other refuge located above PMF level, to provide residents of developments without high road access for evacuation with a means of sheltering safely in place until flood waters subside. PMF refuges must be structurally safe and accessible by boat during floods up to the PMF and contain sufficient facilities and supplies to sustain occupants for the expected duration of a PMF. PMF refuges are a form of high island, isolated from external essential services.

"probable maximum flood" (PMF) means the largest flood that could conceivably occur at a particular location. PMF extents and levels are shown for areas of the Tweed Valley and Coastal Creeks floodplains in Flood Maps in Appendix C. For all other localities, PMF levels will be determined on a case by case basis, and may require a separate flood study.

"reduced flood level (RL)" means the level of a point above a surveying datum.

"residential flat building" means a building containing three or more dwellings, as defined by Tweed LEP.

"runoff" means the amount of rainfall which actually ends up as stream flow.

"short term resident" means any person accommodated on a caravan park, other than a long term resident.

"stormwater flooding" means inundation resulting from the incapacity of urban stormwater drainage works to handle runoff.

"urban zoned land" includes residential, business and industrial zones in the Tweed LEP and also includes any associated, adjacent open space and special uses zones and any included/adjacent roads.

A3.2 THE FLOOD MITIGATION STRATEGY

A3.2.1 General

Flooding within the Shire occurs when rainfall exceeds the capacity of creeks and rivers to convey the runoff water to the ocean. Flooding can generate rapid rises in water levels and warning times are often very short. The coastal creeks and the lower reaches of the Tweed River can also be flooded from the affects of a cyclone or its remnant rain depression that creates extraordinarily high tide or ocean levels combined with heavy local rain. Flooding of this type will generally occur with little warning except for weather forecasts predicting cyclones and rain depressions.

Residents in flood prone areas should be very conscious of their situation, be alert during any periods of predicted high rainfalls and be prepared to evacuate all possessions that are located on land liable to flooding.

Information on the flood liability of most urban land within the Shire is available from the Engineering and Operations Division on request.

Council's flood mitigation strategy is to ensure that only appropriate compatible development occurs on flood prone land in the future, by implementing both structural protection and planning controls, to minimise future potential flood damage and ensure safe occupation without undue reliance on emergency response agencies.

It is expected that future mitigation works will be limited to possible modifications of the existing levees. The often discussed Flood Storage Dams are not feasible in the Tweed Valley.

In newer release areas, the land should already be filled to the design flood level current at the time of subdivision, however the design flood level changes from time to time as more up to date flood studies are completed. Proponents are advised to obtain a Section 149 Certificate to determine the actual design flood levels of specific parcels of land.

A3.2.2 Rural Areas

Minor flooding is controlled by leveeing and floodgated outlets in many areas on the Tweed River Floodplain downstream of Murwillumbah, where the agricultural use and potential flood damage has justified the expenditure.

Many other areas of the floodplain, adjacent to local creeks and streams, as well as the Tweed River upstream of Murwillumbah, are liable to rapid flood inundation with little warning. Records and information in many of these areas are very limited. Persons proposing new developments on areas near rivers and streams that could be flood liable should seek out and heed reliable local historical information.

A3.2.3 Urban Areas

Levees at Murwillumbah and Tweed Heads South provide structural protection against flood inundation to varying degrees. In other areas, planning controls are used to contain future flood damage. In 2009, a levee was retrofitted along Cudgera Creek to protect the Seabreeze Estate at Pottsville. In the event of a flood exceeding the levee height, the protected areas will flood quickly with little warning time and very rapid rises in water levels.

Council's design flood is based on the 100 year ARI event; that is a flood with a 1 in 100 (or 1%) chance of occurring in any one year.

Table 2.1 sets out the degree of protection of structural controls within the Shire.

Locality	Chance of Flooding in Any Year	Anticipated Warning Time	Expected Time to Fill to Levee Height	Design Flood Level for Properties Behind Levee
Murwillumbah - Main Street	1 in 80*	3-4 hrs	3-4 hrs	7.0m AHD
Murwillumbah - South	1 in 5^	3-4 hrs	1-2 hrs	Refer Flood Maps Appendix C
Murwillumbah - East	1 in 100#	3-4 hrs	1-2 hrs	Refer Flood Maps Appendix C
Murwillumbah - Dorothy/William Streets	1 in 100#	3-4 hrs	1-2 hrs	4.6m AHD
Tweed Heads South	1 in 20	21 hrs for river flood but possibly very little warning from a Cyclonic Surge	1-2 hrs	Refer Flood Maps Appendix C
Pottsville - Seabreeze Estate	1 in 100 + ~	3-4 hrs	1-2 hrs	Refer Flood Maps Appendix C

* Estimate only. The Murwillumbah levee is approximately 200mm lower than the predicted ARI 100 year flood event.
^ Estimate only. Levee was raised to level of Alma Street in accordance with 1989 Murwillumbah Floodplain management Plan.
# Raised in 2006. Previously provided 1 in 10 year protection.
~ Seabreeze levee designed to June 2005 flood of record plus freeboard.

Table 2.1 The Degree of Protection Afforded by Structural Controls of Flooding in Tweed Shire.

A3.2.4 Design Flood Levels

Design flood levels (DFLs) are determined by 100 year ARI flood level contours at the 0.1m contour interval, based on flood studies (Tweed Valley Flood Study Update 2009 and Coastal Creeks Flood Study 2009) as shown on Flood Maps in Appendix C.

Minimum DFL in Tweed Shire is RL 2.6m AHD.

Land outside the coloured areas of these maps may be at a level that is above the floodplain (that is, not flood liable) or that is outside of the hydraulic boundaries of flood studies (and may be flood liable). Applicants should satisfy themselves as to the flood liability of uncoloured land.

A freeboard of 0.5m shall be added to the DFL, to determine the minimum habitable floor level for development.

Variations to Habitable Floor Levels - For dwellings with existing floor levels below the adopted minimum floor level, "minor extensions" for habitable uses are permissible, with the concurrence of the Director Planning & Regulation.

Larger additions will only be considered for recreational rooms constructed of flood compatible materials, and provided furnishings therein are readily removable and can be relocated to an on-site storage area above the minimum habitable floor level. Concurrence of the Development Assessment Panel is required.

Climate change scenarios were investigated in the Tweed Valley Flood Study Update 2009 and Coastal Creeks Flood Study 2009. A "high level" impact scenario consisting of 0.91m sea level rise and 10% increased rainfall intensity was applied to the 100 year ARI design flood to determine "climate change DFLs". The results are shown on Climate Change Flood Maps in Appendix D.

Climate change DFLs shall be applied to "greenfield subdivision" for residential purposes (defined as subdivision of urban zoned land 5 hectares or greater in area). In particular, development controls requiring filling of residential allotments to a minimum DFL in Sections A3.3-A3.10 (as applicable) shall apply the climate change DFL.

The following flowchart summarises the process for determining DFLs for the localities of Tweed Shire.

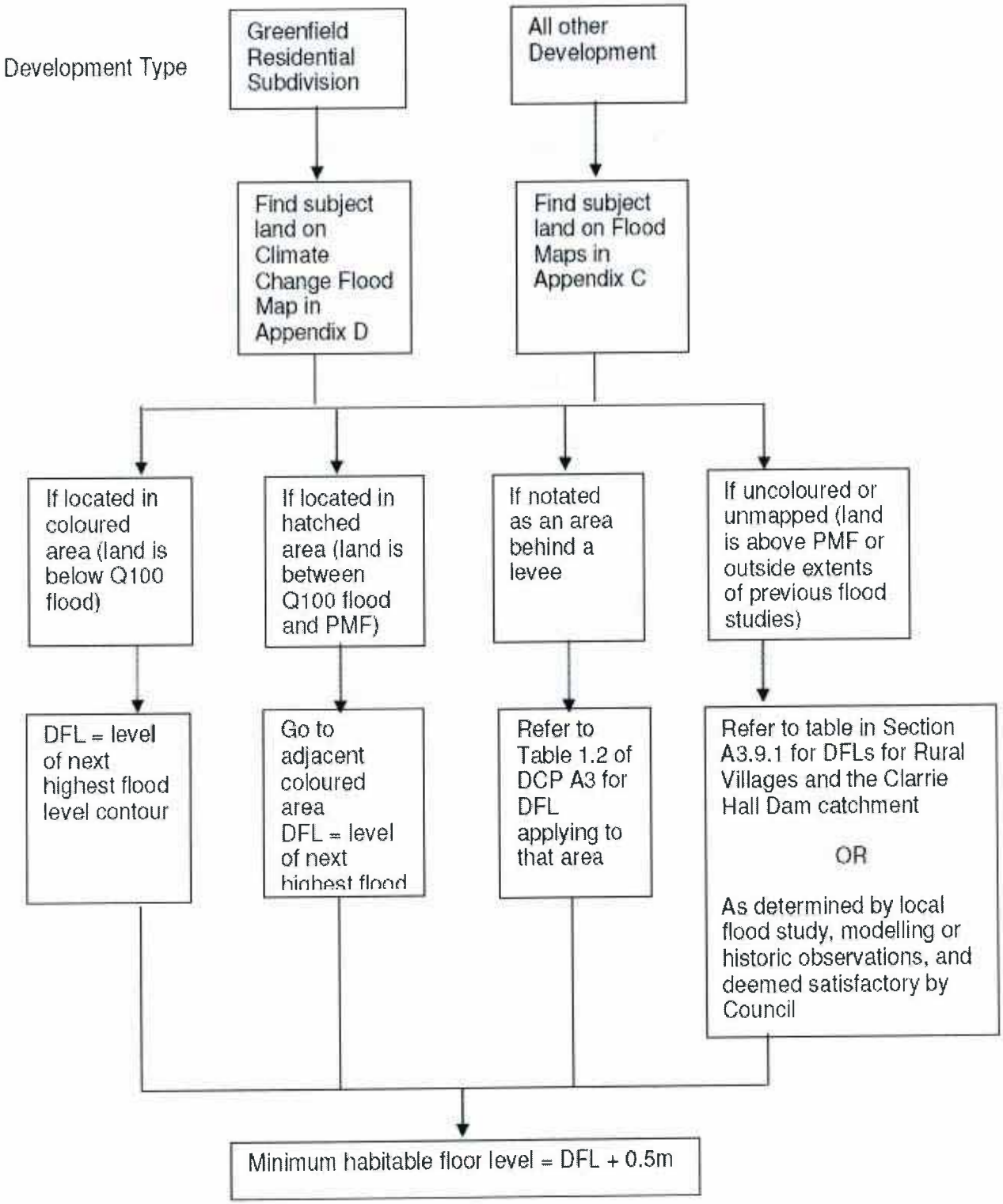

Figure 2.1 Determining Design Flood Levels

A3.2.5 High Flow Areas

The following development controls apply to all land falling within the mapped high flow areas of the Tweed Valley and Coastal Creeks floodplains. High flow area maps are provided in Appendix C.

Development controls for high flow areas take precedence over the locality specific clauses in Section A3 of the DCP.

Land Zone (from Tweed LEP 2000 and DRAFT Tweed LEP 2010 respectively)	**Development Controls**
1(a) Rural and 1(b) Agricultural Rural Zones RU1 and RU2 and Residential Zone R5 (Large Lot Residential), and Environmental Protection Zones E1 and E2	Permit dwelling houses within the mapped high flow areas provided total enclosure below design flood level is 50m^2 or less. Other development, including structures ancillary to a dwelling house, only permissible within high flow areas if the development will not change ground levels by more than 300mm (for local drainage purposes) or obstruct flood flows. Examples of permissible development include: • Buildings with footprints less than 80m^2, and separated from other structures by no less than 30m, oriented to maximise the through flow of water; • Levees, bunds or road formations no more than 300mm above natural ground level; • Wire strand fencing.
2(a) Low Density Residential Rural Zone RU5 (Village) and Residential Zones R1, R2, and R3	Permit residential development within the mapped high flow areas provided total enclosure below design flood level is 50m^2 or less.
3(c) & 3(d) Business (Commerce and Trade and Waterfront Enterprise) Business Zones B1, B2, B3, B4, B5	Permit development in mapped high flow areas, subject to maximum 50% site coverage for buildings and other obstructions to flow on each lot. At least 50% of any cross section for each lot, transverse to the direction of flood flow, must be preserved clear of flow obstructions down to natural ground level. Fencing must be permeable to allow the passage of flood flows (minimum 90% void space), or be collapsible under flood flow (e.g. timber palings).
4(a) Industrial Industrial Zones IN1 and IN4	Exclude all development from Lot 4 DP 591604. Permit development in all remaining mapped high flow areas, subject to maximum fill height to ARI 20 year flood level, and maximum 50% site coverage for buildings and other obstructions to flow. At least 50% of any cross section for each lot, transverse to the direction of flood flow, must be preserved clear of flow obstructions above the ARI 20 year flood level. Fencing must be permeable to allow the passage of flood flows (minimum 90% void space), or be collapsible under flood flow (e.g. timber palings).

5(a) Special Uses (School) Special Purpose Zones SP1, SP2, SP3, Recreation Zones RE1 and RE2,	Permit development in mapped high flow areas, subject to maximum 50% site coverage for buildings and other obstructions to flow on each lot. At least 50% of any cross section for each lot, transverse to the direction of flood flow, must be preserved clear of flow obstructions down to natural ground level. Fencing must be permeable to allow the passage of flood flows (minimum 90% void space), or be collapsible under flood flow (e.g. timber palings).
Waterway Zones W1, W2 and W3.	Development only permissible if it will not result in significant adverse impact on local flood behaviour or net loss in flood conveyance function, as demonstrated by a hydraulic assessment / flood study by a suitably qualified professional. The assessment must consider the impact of the development in isolation as well as in a cumulative development scenario.

A3.2.6 Emergency Response Provisions

(a) Essential Community Facilities & Critical Services

Critical infrastructure and emergency response facilities in all localities shall comply with the following development controls.

Development controls for emergency response provisions take precedence over the locality specific clauses in Section A3 of the DCP.

Land Use Risk Class	Development Type	Development Controls	Notes
Critical Development *Emergency services facilities and hospitals as defined by Tweed LEP, and critical infrastructure such as major telephone exchanges as per Appendix K3.1 of the Floodplain Development Manual.*	**New Development**	All new critical infrastructure and facilities to be located above PMF level, unless exceptional circumstances can be justified, such as servicing existing flood prone communities where no practical alternative exists. In such cases, and where the development is a habitable land use, adequate PMF refuge must be provided.	Note 1
	Existing Development	Minor expansion of existing facilities permitted without consideration of PMF. Major expansion below PMF level subject to provision of adequate PMF refuge, where the development is a habitable land use.	Note 1

Note 1 - PMF Refuge for Critical Development
The PMF refuge must meet the following minimum requirements:

- Refuge must be above the PMF level. PMF levels can be determined from Flood Maps in Appendix C.
- Minimum floor level to be PMF level. No freeboard required.
- For extensions to new facilities, minimum floor area of refuge to be no less than 50% of the incremental increase in total floor area located below the PMF due to the extension, or an equivalent area that would comfortably accommodate and service the needs of occupants for a period of not less than one week.
- Refuge must comply with Building Code Australia requirements, with external components rated appropriately for storm, wind and moisture.
- Permanent internal access via permanent staircase, minimum 1.2m wide.
- External access to the refuge must also be provided. Access must remain unobstructed for emergency boat access during flooding (i.e. clear of trees, services).
- Refuge must have natural lighting and ventilation.
- Support structures below PMF level must be capable of withstanding flood forces (water flow, debris impact, and buoyancy) and continuous submergence for up to one week, requiring an engineering certification.
- Refuge must meet all planning and building controls applicable to the site.
- All services provided as part of normal operations are to be continued undiminished during all flood events. This includes food, water, shelter, power via back up generators, medical services and hygiene of residents and facilities. All excess sewage, food and medical waste is to be collected and stored until such time as normal disposal can be undertaken. Facility management must make provision for staff to be rostered on and accommodated for the flood period. All such measures must be detailed in the development's Flood Response Assessment Plan.

(b) Habitable Development

New habitable development in all localities shall comply with the following development controls.

Development controls for emergency response provisions take precedence over the locality specific clauses in Section A3 of the DCP.

Land Use Risk Class	Development Type	Development Controls	Notes
Sensitive Development *Residential care facilities, group homes (that provide accommodation to people with a disability), as defined by the Tweed LEP*	**New Development**	All new sensitive development to have permanent high level road evacuation route(s) to land above PMF level and/or adequate PMF refuge, subject to the recommendations of an acceptable Flood Response Assessment Plan.	Note 1
	Existing Development	Minor expansion of existing facilities permitted without consideration of PMF. Major expansion below PMF level subject to provision of adequate PMF refuge.	Note 2

Land Use Risk Class	Development Type	Development Controls	Notes
Residential Development *Residential accommodation (except for dwelling houses , secondary dwellings or dual occupancies in Zone RU5 Village, Zone R1 General Residential, Zone R2 Low Density Residential, Zone R3 Medium Density Residential or Zone R5 Large Lot Residential), tourist and visitor accommodation, caravan parks (including moveable dwellings), correctional facilities, as defined by the Tweed LEP.* *Note: Above exemption for dwelling houses, secondary dwellings and dual occupancies also applies to mixed use developments where the habitable component contains no more than two (2) habitable units.*	**New Development (except caravan parks and moveable dwellings)**	All new development to have permanent high level road/pedestrian evacuation route(s) to land above PMF level and/or adequate PMF refuge, subject to the recommendations of an acceptable Flood Response Assessment Plan.	Note 3
	Existing Development (except caravan parks and moveable dwellings)	Minor expansion of existing facilities permitted without consideration of PMF. Major expansion below PMF level must meet new development criteria above.	Note 4
	New caravan park development	All new caravan parks and the moveable dwelling sites within to have permanent high level road evacuation route(s) to land above PMF level.	
	Development of existing caravan parks	No expansion of existing facilities by the addition of moveable dwelling sites permitted, unless permanent high level road evacuation route to high land external to the site is available, or high land internal to the site can be accessed by the additional sites via road and/or pedestrian routes. Expansion of caravan park amenities and other non-habitable facilities permitted without consideration of PMF.	
Residential Subdivision *Urban Residential Subdivision (including small lot rural subdivision where the average lot size, excluding residual and non-residential lots is less than 5000m^2), Rural Subdivision,*	**New Subdivisions** (where total area of urban zoned subdivision land, including residual lots, exceeds 5 hectares)	All new subdivisions to have high level road evacuation route(s) to land above PMF level, accessible to all allotments via (as a minimum) pedestrian access at or above design flood level not exceeding 100m in length.	

Land Use Risk Class	Development Type	Development Controls	Notes
Other Habitable Development	**All** (except for dwelling houses , secondary dwellings or dual occupancies in Zone RU5 Village, Zone R1 General Residential, Zone R2 Low Density Residential, Zone R3 Medium Density Residential or Zone R5 Large Lot Residential)	Flood Response Assessment Plans are required to be submitted with Development Applications for all habitable land uses in the floodplain.	Note 5

Note 1 - Evacuation Versus Shelter in Place for Sensitive Development

Evacuation of occupants is the preferred risk management approach for sensitive developments proposed below PMF level. Adoption of evacuation as the risk management response for a development requires a Flood Response Assessment Plan that specifically addresses the following evacuation requirements:

- Typical demographics of evacuees (age, gender etc)
- Typical medical conditions and/or disabilities of evacuees (dialysis, dementia, paralysis etc)
- Mode of transportation (private bus, ambulance etc)
- Intended evacuation destination
- Level of service provided by evacuation centre (medical, security, accommodation etc)
- Required staffing for evacuation centre to cater for evacuees
- Special supply measures for evacuation centre to cater for evacuees (food, water, waste, medicines etc)

If the above requirements are not able to be satisfied for all future occupants of the development, a PMF refuge shall be provided in accordance with design criteria in Note 2.

Note 2 - PMF Refuge for Sensitive Development

The PMF refuge must meet the following minimum requirements:

- Refuge must be above the PMF level. PMF levels can be determined from Flood Maps in Appendix C
- Minimum floor level to be PMF level. No freeboard required.
- For new facilities, minimum floor area of refuge to be no less than 50% of the total floor area located below the PMF, or an equivalent area that would comfortably accommodate and service the needs of the occupants for a period not less than one week. For extensions to new facilities, minimum floor area of refuge to be no less than 50% of the incremental increase in total floor area located below the PMF due to the extension.
- Refuge must comply with Building Code Australia requirements, with external components rated appropriately for storm, wind and moisture.
- Permanent internal access via permanent staircase, minimum 1.2m wide.
- External access to the refuge must also be provided. Access must remain unobstructed for emergency boat access during flooding (i.e. clear of trees, services).
- Refuge must have natural lighting and ventilation.

- Support structures below PMF level must be capable of withstanding flood forces (water flow, debris impact, and buoyancy) and continuous submergence for up to one week, requiring an engineering certification.
- Refuge must meet all planning and building controls applicable to the site.
- All services provided as part of normal operations are to be continued undiminished during all flood events. This includes food, water, shelter, power via back up generators, medical services and hygiene of residents and facilities. All excess sewage, food and medical waste is to be collected and stored until such time as normal disposal can be undertaken. Facility management must make provision for staff to be rostered on and accommodated for the flood period. All such measures must be detailed in the development's Flood Response Assessment Plan.

Note 3 - Evacuation Versus Shelter in Place for Residential Development

Evacuation of occupants is the preferred risk management approach for residential developments proposed below PMF level. Adoption of evacuation as the risk management response for a development requires a Flood Response Assessment Plan that specifically addresses the following evacuation requirements:

- Expected number of occupants/evacuees
- Typical demographics of evacuees (families with children, retirees etc)
- Mode of transportation (private vehicles, bus provided by facility etc)
- Intended evacuation destination
- Level of service provided by evacuation centre (medical, security, accommodation etc)
- Any special requirements for evacuation centre to cater for evacuees (food, water, waste, medicines etc)

If the above requirements are not able to be satisfied for all future occupants of the development, a PMF refuge shall be provided in accordance with design criteria in Note 4.

Note 4 - PMF Refuge for Residential Development

Where PMF refuge is required, the refuge must meet the following minimum requirements:

- Refuge may be an additional second storey, mezzanine level or other raised refuge area above the PMF level. Minimum floor level to be PMF level. No freeboard required. PMF levels can be determined from Flood Maps in Appendix C.
- Minimum floor area for a refuge is $9m^2$ based on a single bedroom occupancy. Add $4m^2$ for each additional bedroom.
- For unit developments, may provide separate refuges within each unit, sized in accordance with the above bedroom ratio. Alternately provide a communal refuge, accessible internally by all units, floor area no less than 50% of total floor area located below PMF level, or an equivalent area that would comfortably accommodate and service the needs of the occupants for a period not less than one week.
- Refuge must comply with Building Code Australia requirements, with external components rated appropriately for storm, wind and moisture.
- Minimum 2.1m floor to ceiling/roof frame height.
- Refuge must be provided with permanent internal and external access, (may be a fixed ladder).
- The external access must be unobstructed (by trees, chimneys, aerials etc) for emergency boat access during flooding
- Refuge must have natural lighting and ventilation

- Support structures below PMF level must be capable of withstanding flood forces (water flow, debris impact, and buoyancy) and continuous submergence for up to one week, requiring an engineering certification.
- Refuge must meet all planning and building controls applicable to the site.
- Refuge must have a cupboard storage area for flood emergency kit to service all residents with provisions for isolation up to one week, consisting of food and fresh water supplies, first aid kit including medication, battery powered torch, portable radio, spare batteries, candles and water proof matches, plastic bags and rubber gloves. All such measures must be detailed in the development's Flood Response Assessment Plan.

Note 5 - Flood Response Assessment Plan

A Flood Response Assessment Plan provides a means by which a developer can assess and nominate the most applicable flood emergency response option for a habitable development (whether it be avoidance, evacuation, or shelter in place), and for Council officers to consider during assessment of the development application.

The Flood Response Plan is not intended to be a document that provides details for the site specific management of flood preparation and response for a habitable development. Such private flood plans should be developed and implemented by owners and occupants following completion of the development. Information available on the NSW State Emergency Services (SES) website www.ses.nsw.gov.au may assist in the preparation of private flood plans.

As a minimum requirement, a Flood Response Assessment Plan for a proposed development must provide the following details:

- Expected number of occupants
- Typical demographics of occupants (families with children, retirees etc)
- 100 year ARI flood level and PMF level for the development site (obtainable from Council)
- Nominated Flood Risk Management Approach for the development (avoidance, evacuation, shelter in place. Note that rescue is not an appropriate response for any development type)
- For evacuation, provide detail of nearest evacuation centre (refer to SES Local Flood Plan), the intended mode of transport to the centre, and indicative ground/road levels at significant points along the nominated evacuation route.
- Any special requirements for evacuation centre to cater for evacuees (food, water, waste, medicines etc)
- If shelter in place, provide details of refuge in accordance with Note 2 or Note 4 as applicable.

A3.3 LOWER TWEED

Area Included: Urban zoned localities of Banora Point, Terranora, Bilambil Heights, Cobaki Lakes, Tweed Heads West, Tweed Heads and Tweed Heads South, being coloured or hatched (PMF) on Flood Maps in Appendix C.

A3.3.1 Flood Behaviour

Flooding in the Tweed Heads area is complex and major flooding is only expected as a result of an interaction between river flooding and ocean surge conditions. Progressive changes to the hydraulics of the river mouth and land-use have affected the historical flood pattern.

In 1954, which is the highest recorded flood in this locality, inundation levels were experienced in Tweed Heads varying from RL 2.51 metres AHD near the river mouth to RL 2.05 metres AHD in the town centre. On this historical basis, Council originally adopted a flood level of RL 2.19 metres AHD and required residential floors to be above this level.

Subsequent analysis resulted in Council revising its policy and specifying a design flood level of RL 2.15 metres AHD and a minimum floor level of RL 2.45 metres AHD for dwellings.

Following further investigations and advice from the Department of Public Works, Council on 5 September 1984, adopted a 1 in 100 year design flood level of RL 2.65 AHD and a minimum floor level of RL 2.95 AHD for dwellings.

Design flood levels and freeboard requirements for minimum floor levels of dwellings are revised in this Section following completion of the Tweed Valley Flood Study 2005 and its 2009 update.

The subject localities have been identified as comprising flood fringe areas. These categories are shown on an independent series of maps held by Council and available for public examination during normal office hours.

A3.3.2 Development Generally on Flood Liable Land

Design Flood Levels	Refer to A3.2.4 for design flood levels for this locality.
High Flow Areas	Refer to A3.2.5 for development controls applicable to land in mapped high flow areas. The development controls in A3.2.5 take precedence over other controls in A3.3.
Emergency Response Provisions	Refer to A3.2.6 for development controls applicable to the provision of adequate emergency response for habitable development. The development controls in A3.2.6 take precedence over other controls in A3.3.
Filling	All filling is to be graded so that it drains to the street or other approved permanent drainage system.
Building Materials	All materials used below Council's adopted design flood level must not be susceptible to water damage.

Electrical Supply

Subject to the requirements of Northern Rivers Electricity, all electrical wiring, power outlets, switches, etc, should, to the maximum extent possible, be located above the design flood level. All electrical wiring installed below the design flood level should be suitably treated to withstand continuous submergence in water.

Car Parking

Car parking in the form of basement parking will not be approved below the design flood level unless it is protected against the inflow of water to a level of 500 mm above the design flood.

A3.3.3 Residential Development on Flood Liable Land

Subdivision

All land, other than public roads and reserves, to be filled to a minimum level of the design flood where an additional allotment is created. This does not apply to consolidations of allotments, boundary adjustments and the like.

Filling

Land to be developed for the purpose of residential flat buildings/dual occupancy shall be filled to a minimum level of the design flood level.

Land to be developed for other residential purposes shall be filled to a minimum level of the road centre line in front of the allotment.

While filling of all allotments to a minimum level of the design flood level is recommended consideration may be given to the erection of single dwellings without filling above the road centre line level provided the habitable area is above Council's adopted minimum floor level.

Development

The habitable areas of all residential buildings are to be at a level of not less than Council's adopted minimum floor level for development.

Areas for recreational purposes only may be approved below Council's minimum floor level in flood fringe areas provided that furnishings therein are readily removable.

Movable Dwelling Parks

Movable dwelling parks will not be approved unless it can be demonstrated that the land can be filled to a level of not less than the adopted design flood level for the locality without adversely affecting the current flood levels and patterns in the area.

A3.3.4 Commercial And Industrial Development on Flood Liable Land

Development

Commercial and industrial development will be required to make adequate provision of flood free storage areas

for stock and equipment susceptible to water damage.

Caravan Parks

All caravans are to be maintained in a condition that will allow removal of them at short notice.

Each site occupant is to be provided with a flood information leaflet for display in each caravan which sets out information on water depths likely to be experienced in the park, sources of flood information, public warning procedures, evacuation routes and advice on when to take action. Such information will be required to be displayed prominently in the park office, amenities block and ensuite structures.

Strict limitations will be placed on site development and structures in parks that will impede the free flow of floodwater.

New caravan parks or additions to existing caravan parks will not be permitted to accommodate long term residents unless the development site is at a level of not less than the design flood level or it can be shown that the site will be filled to the design flood level without impeding the free flow of floodwater.

Motels

The habitable areas of motels are to be at a level of not less than Council's adopted minimum floor level for residential development.

A3.4 CHINDERAH & FINGAL ROAD (South of No 45 Fingal Road)

Area Included: Urban zoned localities of Chinderah and Fingal Head (south of No 45 Fingal Road), being coloured or hatched (PMF) on Flood Maps in Appendix C.

A3.4.1 Flood Behaviour

Flooding in these localities has been identified as relatively low velocity flood storage, with small areas of floodway. These categories are shown on an independent series of maps held by Council and available for public examination during normal office hours.

A3.4.2 Development Generally On Flood Liable Land

Design Flood Levels	Refer to A3.2.4 for design flood levels for this locality.
High Flow Areas	Refer to A3.2.5 for development controls applicable to land in mapped high flow areas. The development controls in A3.2.5 take precedence over other controls in A3.4.
Emergency Response Provisions	Refer to A3.2.6 for development controls applicable to the provision of adequate emergency response for habitable development. The development controls in A3.2.6 take precedence over other controls in A3.4.
Building Materials	All building materials used below Council's adopted design flood level must not be susceptible to water damage.
Electrical Supply	Subject to the requirements of Northern Rivers Electricity, all electrical wiring, power outlets, switches, etc, should, to the maximum extent possible, be located above the design flood level. All electrical wiring installed below the design flood level should be suitably treated to withstand continuous submergence in water.
Filling	For drainage purposes only, land will be required to be filled to the approximate level of the centre line of the adjacent road unless adequate alternative stormwater drainage is provided. In areas outside the residential zones, applications for filling above the level of the adjacent road will be considered where the applicant can satisfy Council that there will be no interference to local drainage nor any material adverse affect on adjacent land.
Structures	Where, on flood liable land a proposed development could be damaged by flooding, no work may be commenced until a certificate of structural adequacy with regard to stability as a result of flooding has been submitted to Council by a qualified structural/civil engineer.

Fencing must be of a form that will either allow the free passage of flood water or of a light construction such as timber paling that will collapse as a result of any build up of debris or floodwater.

A3.4.3 Residential Development On Flood Liable Land

Subdivision

Subdivision to existing roads only, where an additional allotment is created, with a minimum seventeen (17) metre frontage prohibiting battle axe blocks. This clause does not apply to consolidation of existing allotments or boundary adjustments.

The habitable areas of all residential buildings are to be at a level of not less than Council's adopted floor level for development.

Development

The area below Council's design flood level is not to be totally enclosed. Consideration will be given on application, to permitting the enclosure of laundry, stairway entry and double garage space, provided that such an enclosure does not significantly restrict flood flows.

An area of $50m^2$ will generally encompass these facilities. Any larger enclosures will only be considered when the application can demonstrate that the additional area enclosed will not provide any greater restriction to flood flow.

The free flow of flood water must be a major consideration in the design of any area to be enclosed.

In fill development of residentially zoned land will be permitted with the exception of allotments within the extreme hazard zones identified in the Cameron McNamara report of September, 1984.

Movable Dwelling Parks

New movable dwelling parks will not be approved unless it can be demonstrated that the land can be filled to a level of not less than the adopted design flood level for the locality without adversely affecting the current flood levels and patterns in the area.

A3.4.4 Commercial and Industrial Development on Flood Liable Land

Filling & Development

For drainage purposes only, land will be required to be filled to the approximately level of the centre line of the adjacent road (excluding the Pacific Highway) unless adequate alternative stormwater drainage is provided.

Lots with existing levels less than RL 2.2m AHD may be filled to a maximum height of RL 2.2m AHD

Development proposals for buildings, structures, stockpiles and/or filling above RL 2.2m AHD shall be considered if accompanied by flood impact modelling, including consideration of a cumulative development scenario provided by Council. The flood assessment must demonstrate that the development, when considered in isolation and cumulatively, will not result in significant adverse impact on local flood behaviour or adjoining land.

The following deemed to comply solution may be implemented on each allotment as an alternative to providing flood modelling:

(i) On each allotment a maximum of 50% of the plan area of the lot may be occupied by structures, buildings, stockpiles and/or fill that exceeds RL 2.2m AHD, and

(ii) On each allotment, flow obstructions (defined as fill, structures, buildings, stockpiles and the like above RL 2.2m AHD) are to be located so that at least 50% of any cross section of the lot, transverse to the direction of flood flow, is clear of flow obstructions. This is to provide a local flood path on each allotment.

Commercial and industrial development will be required to make adequate provision of flood free storage areas for stock and equipment susceptible to water damage.

Caravan Parks

All caravans are to be maintained in a condition that will allow removal of them at short notice.

Each site occupant is to be provided with a flood information leaflet for display in each caravan which sets out information on water depths likely to be experienced in the park, sources of flood information, public warning procedures, evacuation routes and advice on when to take action. Such information will be required to be displayed prominently in the park office amenities blocks and ensuite structures.

Strict limitations will be placed on site development and structures in parks that will impede the free flow of floodwater.

New caravan parks or additions to existing caravan parks will not be permitted to accommodate long term residents unless the development site is at a level of not less than the design flood level or it can be shown that the site will be filled to the design flood level without impeding the free flow of floodwater.

Motels	The habitable areas of motels are to be at a level of not less than Council's adopted minimum floor level for residential development.

A3.4.5 Inappropriate Development Of Flood Liable Land

The following table lists development considered by Council to be inappropriate to the applicable categories of flood hazard in the Chinderah and Fingal Road localities.

Flood Hazard Category	Inappropriate Development
Floodway & High Hazard Flood Storage Areas	Dual Occupancy and Granny Flat, Movable Dwelling Parks and Caravan Parks making provision for long term residents.

A3.5 FINGAL HEAD (North of and including No 45 Fingal Road)

Area Included: Urban zoned localities of Fingal Head north of and including No.45 Fingal Road, being coloured or hatched (PMF) on Flood Maps in Appendix C.

A3.5.1 Flood Behaviour

Flooding in this locality has been identified as comprising low and high hazard flood storage areas and floodways. These categories are shown on an independent series of maps held by Council and available for public examination during normal office hours.

A3.5.2 Development Generally On Flood Liable Land

Design Flood Levels	Refer to A3.2.4 for design flood levels for this locality.
High Flow Areas	Refer to A3.2.5 for development controls applicable to land in mapped high flow areas. The development controls in A3.2.5 take precedence over other controls in A3.5.
Emergency Response Provisions	Refer to A3.2.6 for development controls applicable to the provision of adequate emergency response for habitable development. The development controls in A3.2.6 take precedence over other controls in A3.5.
Filling	All filling is to be graded so that it drains to the street or other approved permanent drainage systems.
Structures	Where, on land within floodways or high hazard flood storage areas a proposed development could be damaged by flooding no work may be commenced until a certificate of structural adequacy with regard to stability as a result of flooding has been submitted to Council by a qualified structural/civil engineer.
Building Materials	All building materials used below Council's adopted design flood level must not be susceptible to water damage.
Electrical Supply	Subject to the requirements of Northern Rivers Electricity, all electrical wiring, power outlets, switches, etc, should, to the maximum extent possible, be located above the design flood level. All electrical wiring installed below the design flood level should be suitably treated to withstand continuous submergence in water.
Car Parking	Car parking in the form of basement parking will not be approved below the design flood level unless it is protected against the inflow of water to a level of 500 mm above the design flood level.

A3.5.3 Residential Development On Flood Liable Land

Subdivision

"Subdivision" refers to any additional allotments created and does not apply to consolidations, boundary adjustments and the like.

Further subdivision for residential purposes is considered by Council to be inappropriate to the flood hazard of these localities unless it can be shown that the land can be filled to the design flood level without creating any adverse effect.

Development

The habitable areas of all residential buildings are to be at a level of not less than Council's adopted minimum floor level for development.

The area below Council's design flood level is not to be totally enclosed. Consideration will be given on application, to permitting the enclosure of laundry, stairway entry and double garage space, provided that such an enclosure does not significantly restrict flood flows.

An area of $50m^2$ will generally encompass these facilities. Any larger enclosures will only be considered when the application can demonstrate that the additional area enclosed will not provide any greater restriction to flood flow.

The free flow of flood water must be a major consideration in the design of any area to be enclosed.

Movable Dwelling Parks

Movable dwelling parks will not be approved unless it can be demonstrated that the land can be filled to a level of not less than the adopted design flood level for the locality without adversely affecting the current flood levels and patterns in the area.

A3.5.4 Commercial And Industrial Development On Flood Liable Land

Development

Commercial and industrial development will be required to make adequate provision of flood free storage areas for stock and equipment susceptible to water damage.

It is recommended that areas below Council's adopted minimum floor level not be enclosed and that the free flow of flood waters be permitted at all times.

Caravan Parks

All caravans are to be maintained in a condition that will allow removal of them at short notice.

Each site occupant is to be provided with a flood information leaflet for display in each caravan which sets out information on water depths likely to be experienced

in the park, sources of flood information, public warning procedures, evacuation routes and advice on when to take action. Such information will be required to be displayed prominently in the park office, amenities blocks and ensuite structures.

Strict limitations will be placed on site development and structures in parks that will impede the free flow of floodwater.

New caravan parks or additions to existing caravan parks will not be permitted to accommodate long term residents unless the development site is at a level of not less than the design flood level or it can be shown that the site will be filled to the design flood level without impeding the free flow of floodwater.

Motels

The habitable areas of motels are to be at a level of not less than Council's adopted minimum floor level for residential development.

A3.5.5 Inappropriate Development of Flood Liable Land

The following table lists development considered by Council to be inappropriate to the relevant categories of flood hazard in these localities.

Flood Hazard Category	Inappropriate Development
Floodway & High Hazard Flood Storage Areas	Dual Occupancy and Granny Flat, Movable Dwelling Parks and Caravan Parks making provision for long term residents.

A3.6 THE COASTAL VILLAGES

Area Included: Urban zoned localities of South Kingscliff, Salt, Seaside, Casuarina, Kings Forest, Tanglewood, Cabarita Beach, Bogangar, Hastings Point, Koala Beach, Seabreeze, Pottsville, Pottsville Waters, Black Rocks and Wooyung, being coloured or hatched (PMF) on Flood Maps in Appendix C.

A3.6.1 Flood Behaviour

Areas within these villages which have historically been or which are expected in the future to be subject to inundation as a consequence of river flooding are shown on an independent series of maps held by Council and available for public examination during normal office hours. These maps have been prepared on the basis of information available to Council.

The subject localities have been identified as comprising flood fringe areas.

A3.6.2 Development Generally on Flood Liable Land

Design Flood Levels	Refer to A3.2.4 for design flood levels for this locality.
High Flow Areas	Refer to A3.2.5 for development controls applicable to land in mapped high flow areas. The development controls in A3.2.5 take precedence over other controls in A3.6.
Emergency Response Provisions	Refer to A3.2.6 for development controls applicable to the provision of adequate emergency response for habitable development. The development controls in A3.2.6 take precedence over other controls in A3.6.
Development	Applicants will be required to provide details of studies that demonstrate the proposed development will not adversely affect the current flood patter and levels in the area.
Filling	All filling is to be graded so that it drains to the street or other approved permanent drainage systems.
Building Materials	All building materials used below Council's adopted design flood level must not be susceptible to water damage.
Electrical Supply	Subject to the requirements of Northern Rivers Electricity, all electrical wiring, power outlets, switches, etc, should, to the maximum extent possible, be located above the design flood level. All electrical wiring installed below the design flood level should be suitably treated to withstand continuous submergence in water.
Car Parking	Car parking in the form of basement parking will not be approved below the design flood level unless it is protected against the inflow of water to a level of 500 mm above the design flood level.

A3.6.3 Residential Development On Flood Liable Land

Subdivision

All land, other than public roads and reserves, is to be filled to a minimum level of the design flood where an additional allotment is created and not for consolidations, boundary adjustments and the like.

Filling

Land to be developed for the purpose of residential flat buildings/dual occupancy shall be filled to a minimum level of the design flood level.

Land to be developed for other residential purposes shall be filled to a level of the road centre line in front of the allotment.

While filling of all allotments to a minimum level of the design flood level is recommended consideration may be given to the erection of single dwellings without filling above the road centre line level provided the habitable area is above Council's adopted minimum floor level.

Development

The habitable areas of all residential buildings are to be at a level of not less than Council's adopted minimum floor level for development.

Areas for recreational purposes only may be approved below Council's minimum floor level in flood fringe areas provided that furnishings therein are readily removable.

Movable Dwelling Parks

Movable dwelling parks will not be approved unless it can be demonstrated that the land can be filled to a level of not less than the adopted design flood level for the locality without adversely affecting the current flood levels and patterns in the area.

A3.6.4 Commercial and Industrial Development on Flood Liable Land

Development

Commercial and industrial development will be required to make adequate provision of flood free storage areas for stock and equipment susceptible to water damage.

It is recommended that areas below Council's adopted minimum floor level not be enclosed and that the free flow of flood waters be permitted at all times.

Caravan Parks

All caravans are to be maintained in a condition that will allow removal of them at short notice.

Each site occupant is to be provided with a flood information leaflet for display in each caravan which sets out information on water depths likely to be experienced in the park, sources of flood information, public warning procedures, evacuation routes and advice on when to

take action. Such information will be required to be displayed prominently in the park office, amenities blocks and ensuite structures.

Strict limitations will be placed on site development and structures in parks that will impede the free flow of floodwater.

New caravan parks or additions to existing caravan parks will not be permitted to accommodate long term residents unless the development site is at a level of not less than the design flood level or it can be shown that the site will be filled to the design flood level without impeding the free flow of floodwater.

Motels

The habitable areas of motels are to be at a level of not less than Council's adopted minimum floor level for residential development.

A3.6.5 Inappropriate Development of Flood Liable Land

The following table lists development considered by Council to be inappropriate to the relevant categories of flood hazard in these localities.

Flood Hazard Category	Inappropriate Development
Floodway & High Hazard Flood Storage Areas	Dual Occupancy and Granny Flat, Movable Dwelling Parks and Caravan Parks making provision for long term residents.

A3.7 KINGSCLIFF SOUTH OF WAUGH STREET

Area Included: Urban zoned localities of Kingscliff and Cudgen, being coloured or hatched (PMF) on Flood Maps in Appendix C.

A3.7.1 Flood Behaviour

Flooding in this locality has been identified as comprising low and high hazard flood storage areas. These categories are shown on an independent series of maps held by Council and available for public examination during normal office hours.

A3.7.2 Development Generally On Flood Liable Land

Design Flood Levels	Refer to A3.2.4 for design flood levels for this locality.
High Flow Areas	Refer to A3.2.5 for development controls applicable to land in mapped high flow areas. The development controls in A3.2.5 take precedence over other controls in A3.7.
Emergency Response Provisions	Refer to A3.2.6 for development controls applicable to the provision of adequate emergency response for habitable development. The development controls in A3.2.6 take precedence over other controls in A3.7.
Filling	All filling is to be graded so that it drains to the street or other approved permanent drainage systems.
Building Materials	All building materials used below Council's adopted design flood level must not be susceptible to water damage.
Electrical Supply	Subject to the requirements of Northern Rivers Electricity, all electrical wiring, power outlets, switches, etc, should, to the maximum extent possible, be located above the design flood level. All electrical wiring installed below the design flood level should be suitably treated to withstand continuous submergence in water.
Car Parking	Car parking in the form of basement parking will not be approved below the design flood level unless it is protected against the inflow of water to a level of 500 mm above the design flood level.

A3.7.3 Residential Development On Flood Liable Land

Subdivision	All land, other than public roads and reserves, to be filled to a minimum level of the design flood where an additional allotment is created and not for consolidation, boundary adjustments and the like.
Filling	Land to be developed for the purpose of residential flat buildings/dual occupancy shall be filled to a minimum

level of the design flood level.

While filling of all allotments to a minimum level of the design flood level is recommended consideration may be given to the erection of single dwellings without filling above the road centre line level provided the habitable area is above Council's adopted minimum floor level.

Development

The habitable area of all residential buildings is to be at a level of not less than Council's adopted minimum floor level for development.

Areas for recreational purposes only may be approved below Council's minimum floor level in flood fringe areas provided that furnishings therein are readily removable.

Movable Dwelling Parks

Movable dwelling parks will not be approved unless it can be demonstrated that the land can be filled to a level of not less than the adopted design flood level for the locality without adversely affecting the current flood levels and patterns in the area.

A3.7.4 Commercial and Industrial Development On Flood Liable Land

Development

Commercial and industrial development will be required to make adequate provision of flood free storage areas for stock and equipment susceptible to water damage.

Caravan Parks

All caravans are to be maintained in a condition that will allow removal of them at short notice.

Each site occupant is to be provided with a flood information leaflet for display in each caravan which sets out information on water depths likely to be experienced in the park, sources of flood information, public warning procedures, evacuation routes and advice on when to take action. Such information will be required to be displayed prominently in the park office, amenities blocks and ensuite structures.

Strict limitations will be placed on site development and structures in parks that will impede the free flow of floodwater.

New caravan parks or additions to existing caravan parks will not be permitted to accommodate long term residents unless the development site is at a level of not less than the design flood level or it can be shown that the site will be filled to the design flood level without impeding the free flow of floodwater.

Motels

The habitable areas of motels are to be at a level of not less than Council's adopted minimum floor level for

development.

A3.7.5 Inappropriate Development Of Flood Liable Land

The following table lists development considered by Council to be inappropriate to the relevant categories of flood hazard experienced in Kingscliff.

Flood Hazard Category	Inappropriate Development
Floodway & High Hazard Flood Storage Areas	Dual Occupancy and Granny Flat, Movable Dwelling Parks and Caravan Parks making provision for long term residents.

A3.8 MURWILLUMBAH, CONDONG & TUMBULGUM

Area Included: Urban zoned localities of Tumbulgum, Condong, Murwillumbah, South Murwillumbah, and Bray Park, being coloured or hatched (PMF) on Flood Maps in Appendix C.

A3.8.1 Flood Behaviour

Flooding in these localities has been identified as comprising low and high hazard flood fringe areas, low and high hazard flood storage areas and floodways. These categories are shown on an independent series of maps held by Council and available for public examination during normal office hours.

A3.8.2 Development Generally on Flood Liable Land

Design Flood Levels	Refer to A3.2.4 for design flood levels for this locality.
High Flow Areas	Refer to A3.2.5 for development controls applicable to land in mapped high flow areas. The development controls in A3.2.5 take precedence over other controls in A3.8.
Emergency Response Provisions	Refer to A3.2.6 for development controls applicable to the provision of adequate emergency response for habitable development. The development controls in A3.2.6 take precedence over other controls in A3.8.
Filling	Where practicable, all sites will be required to be filled to a level of not less than the level of the centre line of the road in front of the allotment. All filling is to be graded so that it drains to the street or other approved permanent drainage systems.
Structures	Where, on land within floodways or high hazard flood storage areas a proposed development could be damaged by flooding no work may be commenced until a certificate of structural adequacy with regard to stability as a result of flooding has been submitted to Council by a qualified structural/civil engineer.
Fencing	Fencing must be of a form that will either allow the free passage of flood water or of a light construction such as timber paling that will collapse as a result of any build up of debris or flood water.
Building Materials	All building materials used below Council's adopted design flood level must not be susceptible to water damage.
Electrical Supply	Subject to the requirements of Northern Rivers Electricity, all electrical wiring, power outlets, switches, etc, should, to the maximum extent possible, be located above the design flood level. All electrical wiring

installed below the design flood level should be suitably treated to withstand continuous submergence in water.

A3.8.3 Residential Development on Flood Liable Land

Subdivision

"Subdivision" refers to any additional allotments created and does not apply to consolidations, boundary adjustments and the like.

Further subdivision for residential purposes is considered as inappropriate to the flood hazard of these localities unless it can be shown that the land can be filled to the design flood level without creating any adverse affect.

Development

The habitable areas of all residential buildings are to be at a level of not less than Council's adopted minimum floor level for development in each locality.

In those localities from and including South Murwillumbah to Condong and Tumbulgum the area below Council's design flood level is not to be totally enclosed. Consideration will be given on application, to permitting the enclosure of laundry, stairway entry and double garage space, provided that such an enclosure does not significantly restrict flood flows.

An area of 50m^2 will generally encompass these facilities. Any larger enclosures will only be considered when the application can demonstrate that the additional area enclosed will not provide any greater restriction to flood flow.

The free flow of flood water must be a major consideration in the design of any area to be enclosed.

Movable Dwelling Parks

Movable dwelling parks will not be approved unless it can be demonstrated that the land can be filled to a level of not less than the adopted design flood level for the locality without adversely affecting the current flood levels and patterns in the area.

A3.8.4 Commercial and Industrial Development on Flood Liable Land

Subdivision

Industrial subdivision may be approved where it can be demonstrated that the proposed development will not adversely affect the current flood patterns and levels in the locality.

Development

Commercial and industrial development will be required to make adequate provision of flood free storage areas for stock and equipment susceptible to water damage.

Caravan Parks	All caravans are to be maintained in a condition that will allow removal of them at short notice. Each site occupant is to be provided with a flood information leaflet for display in each caravan which sets out information on water depths likely to be experienced in the park, sources of flood information, public warning procedures, evacuation routes and advice on when to take action. Such information will be required to be displayed prominently in the park office, amenities blocks and ensuite structures. Strict limitations will be placed on site development and structures in parks that will impede the free flow of floodwater. New caravan parks or additions to existing caravan parks will not be permitted to accommodate long term residents unless the development site is at a level of not less than the design flood level or it can be shown that the site will be filled to the design flood level without impeding the free flow of floodwater.
Motels	The habitable areas of motels are to be at a level of not less than Council's adopted minimum floor level for residential development.

A3.8.5 Inappropriate Development Of Flood Liable Land

The following table lists development considered by Council to be inappropriate to the relevant categories of flood hazard in these localities.

Flood Hazard Category	Inappropriate Development
Floodway & High Hazard Flood Storage Areas	Dual Occupancy and Granny Flats in Residential "A" and Rural Village zones; Movable Dwelling Parks and Caravan Parks making provision for long term residents.

A3.9 THE RURAL VILLAGES AND THE CLARRIE HALL DAM CATCHMENT

Area Included: Urban zoned localities of Bilambil, Uki, Tyalgum, Chillingham, Mooball, Burringbar, Clarrie Hall Dam Catchment and Doon Doon Catchment.

A3.9.1 Flood Behaviour

The following Clauses of this Section deal with the rural villages of Bilambil, Uki, Tyalgum, Chillingham, Burringbar and Mooball and the catchment areas of the Clarrie Hall Dam and Doon Doon Creek. Burringbar and Mooball were included in the Coastal Creeks Flood Study 2009, and design flood levels can be determined from Flood Maps in Appendix C. For other areas included in this Section, Table 9.1 lists the known flood levels for these localities. Flood records and information in these villages is limited and there is little mapping information available from Council. It is recommended that interested persons seek information on the possible extent of flood affect of any property, if any, by local enquiry.

Locality	Highest Recorded Flood Level	Predicted High Flood Level	Adopted Design Flood Level	Adopted Min. Floor Level for Residential Development
Bilambil	3.48m AHD	-	3.5m AHD	4.0m AHD
Uki	22.40m AHD	-	22.7m AHD	23.2m AHD
Braeside (Uki)	-	19.7m AHD	19.7m AHD	20.2m AHD
Tyalgum Tyalgum - upstream of bridge	55.11m AHD 55.8m AHD	- -	55.2m AHD As determined by the Director, Engineering Services	55.7m AHD As determined by the Director, Engineering Services + 500mm
Chillingham Flood Gauge Levels at other locations in village will be supplied by the Shire Engineer	29.9m AHD	-	29.95m AHD	30.45m AHD
Catchment Clarrie Hall Dam	-	-	67.1m AHD	67.6m AHD
Doon Doon Catchment	-	-	67.1m AHD	67.6m AHD
Terranora/Bilambil Naponyah and Beunavista	-	-	4.1m AHD	4.6m AHD
Other Places	HFL + 500 mm as determined by Council			

Table 9.1 Flood Levels in Rural Areas

A3.9.2 Development Generally on Flood Liable Land

Design Flood Levels	Refer to A3.2.4 and Table 9.1 above for design flood levels for this locality.
High Flow Areas	Refer to A3.2.5 for development controls applicable to land in mapped high flow areas (where such information is known). The development controls in A3.2.5 take precedence over other controls in A3.9.
Emergency Response Provisions	Refer to A3.2.6 for development controls applicable to the provision of adequate emergency response for habitable development. The development controls in A3.2.6 take precedence over other controls in A3.9.
Structures	Where, on land within floodways or high hazard flood storage areas a proposed development could be damaged by flooding no work may be commenced until a certificate of structural adequacy with regard to stability as a result of flooding has been submitted to Council by a qualified structural/civil engineer.
Building Materials	All building materials used below Council's adopted design flood level must not be susceptible to water damage.
Electrical Supply	Subject to the requirements of Northern Rivers Electricity, all electrical wiring, power outlets, switches, etc, should, to the maximum extent possible, be located above the design flood level. All electrical wiring installed below the design flood level should be suitably treated to withstand continuous submergence in water.

A3.9.3 Residential Development on Flood Liable Land

Development	The habitable areas of all residential buildings are to be at a level of not less than Council's adopted minimum floor level for development.
Movable Dwelling Parks	Movable dwelling parks will not be approved unless it can be demonstrated that the land can be filled to a level of not less than the adopted design flood level for the locality without adversely affecting the current flood levels and patterns in the area.

A3.9.4 Commercial and Industrial Development on Flood Liable Land

Development	Commercial and industrial development will be required to make adequate provision of flood free storage areas for stock and equipment susceptible to water damage.
Caravan Parks	Caravan parks will not be approved unless it can be demonstrated that the land can be filled to a level of not less than the adopted design flood level for the locality

	without adversely affecting the current flood levels and patterns in the area.
Motels	The habitable areas of motels are to be at a level of not less than Council's adopted minimum floor level for residential development.

A3.9.5 Inappropriate Development of Flood Liable Land

The following table lists development considered by Council to be inappropriate to the relevant categories of flood hazard in these localities.

Flood Hazard Category	Inappropriate Development
Floodway & High Hazard Flood Storage Areas	Dual Occupancy and Granny Flats, Movable Dwelling Parks, Caravan Parks and Residential Flat Buildings.

A3.10 RURAL AREAS

Area Included: Any areas not included in Clauses A3.3 – A3.9 of this Section.

A3.10.1Flood Behaviour

The Tweed Valley and Coastal Creeks Flood Studies cover large areas of flood prone rural land. Generally these floodplains are broad and flat, and provide significant flood storage and out of river flood flow conveyance paths.

Council holds limited flood records and information for rural areas in the upper Tweed River catchment, including the Rous and Oxley Rivers. In these areas, floodplains are steep and narrow, and are liable to rapid flood inundation with little warning.

Persons proposing new developments in rural areas near rivers, streams and gullies that could be flood liable should seek out and heed reliable local historical information. Catchment flood studies may be required to establish design flood levels, flow rates for structural design, and to assess the potential impact of the development on local flood behaviour.

A3.10.2Development Generally on Flood Liable Land

Design Flood Levels	Refer to A3.2.4 for design flood levels for this locality.
High Flow Areas	Refer to A3.2.5 for development controls applicable to land in mapped high flow areas. The development controls in A3.2.5 take precedence over other controls in A3.9.
Emergency Response Provisions	Refer to A3.2.6 for development controls applicable to the provision of adequate emergency response for habitable development. The development controls in A3.2.6 take precedence over other controls in A3.10.

A3.10.3Residential Development on Flood Liable Land

Subdivision	A flood free dwelling site must exist on each new allotment created. The construction of a flood free dwelling site will be permitted only where it can be demonstrated that such work will not have any adverse effects on floodwaters in the locality. Where a flood free access exists to the land being subdivided the proposed subdivision shall, as far as practicable, be designed so that a flood free access is provided to the proposed lot or lots.
Development	The habitable area of all residential buildings is to be at a level of not less than the level specified in any building approval having regard to the availability of flood information for the particular locality.
Movable Dwelling Parks	Movable dwelling parks will not be approved unless it can be demonstrated that the land can be filled to a level

of not less than the adopted design flood level for the locality without adversely affecting the current flood levels and patterns in the area.

A3.10.4Commercial and Industrial Development on Flood Liable Land

Development

Commercial and industrial development will be required to make adequate provision of flood free storage areas for stock and equipment susceptible to water damage.

Caravan Parks

All caravans are to be maintained in a condition that will allow removal of them at short notice.

Each site occupant is to be provided with a flood information leaflet for display in each caravan which sets out information on water depths likely to be experienced in the park, sources of flood information, public warning procedures, excavation routes and advice on which to take action. Such information will be required to be displayed prominently in the park office, amenities blocks and ensuite structures.

Strict limitations will be placed on site development and structures in parks that will impede the free flow of floodwater.

New caravan parks or additions to existing caravan parks will not be permitted to accommodate long term residents unless the development site is at a level of not less than the design flood level or it can be shown that the site will be filled to the design flood level without impeding the free flow of floodwater.

Motels

The habitable areas of motels are to be at a level of not less than the flood level that would be specified for residential development having regard to the availability of flood information for the locality.

A3.10.5Inappropriate Development Of Flood Liable Land

The following table lists development considered by Council to be inappropriate to the relevant categories of flood hazard in rural areas.

Flood Hazard Category	Inappropriate Development
Floodway & High Hazard Flood Storage Areas	Movable Dwelling Parks and Caravan Parks making provision for long term residents.

APPENDIX A - Historic Flood Levels

These are historic flood levels saved from the Flood Level Tables of superseded versions of the original Development Control Plan No 5 relating to development of Flood Liable Land.

Section 3 - Locality	Highest Recorded Flood Level
T. Heads T. Heads West T. Heads South	2.15m AHD
Banora Point Oxley Cove	3.09m AHD
Bimbadeen Ave & Barneys Pt. Bridge to Waugh St	3.09m AHD

Section 4 - Locality	Highest Recorded Flood Level
Chinderah	3.09m AHD
Fingal Rd to Barneys Pt Bridge (Wommin Lake)	2.94m AHD

Section 5 - Locality	Highest Recorded Flood Level
Fingal (Village) & Southward to No 52 (Lot 19) Fingal Road	2.45m AHD

Section 7 - Locality	Highest Recorded Flood Level
Kingscliff	3.09m AHD
Kingscliff West (Section B4)	-

Section 8 Locality	Highest Recorded Flood Level
Tumbulgum	3.94m AHD
Condong	4.05m AHD
Norths Lane (Condong)	-
Mur-bah - Buchanan St to Stand. Sawmill	5.15m AHD
Mur-bah	6.58m AHD
Mur-bah East & Mooball Street	5.40-5.05m AHD
Dorothy/William	4.65m AHD
Mur-bah South	6.53-5.84m AHD
Bray Park	7.40m AHD
Mur-bah South - Sth of Rose Ln	6.30m AHD

Section 8 Locality	Highest Recorded Flood Level
Mur-bah South - Railway Street/ Buchanan Est.	5.25m AHD
Bray Pk/Byangum/River Oak Drive	-
Murwillumbah Bellevue Heights/North Arm Road Department of Housing/ Riveroak Drive	 - -
Cobaki	-
Byangum Bridge	-
Dallis Park Bakers Road/ Dallis Court/ Amarillo Drive	 - -
Glenock Farm Uki end Murwillumbah end	 - -
Murwillumbah Golden Links Haley Place Hall Drive Lundberg Drive Mountain View Retirement Home Reserve Creek Road to Cane Road, Condong Nunderi – (Norths Lane) Murwillumbah Showground/ Dorothy/ William Standard Sawmill to Condong	 - - - - - - - 4.65m AHD

APPENDIX B – References

- Part 1 of the adopted Tweed Valley Floodplain Risk Management Plan – Establish Appropriate Flood Planning Levels for Residential Development
- Part 2 of the adopted Tweed Valley Floodplain Risk Management Plan - Planning Controls for High Flow Areas
- Part 3 of the adopted Tweed Valley Floodplain Risk Management Study – Habitable Land Use on the Floodplain
- Adopted Flood Risk Management Policy
- Floodplain Risk Management Guideline - Practical Consideration of Climate Change, 25 October 2007, Department of Environment and Climate Change.
- Floodplain Development Manual - The Management of Flood Liable Land, April 2005, Department of Infrastructure, Planning and Natural Resources.

APPENDIX C - Flood Maps

Note - Flood Maps may also be accessed in electronic and GIS formats on Council's website www.tweed.nsw.gov.au

APPENDIX D - Climate Change Flood Maps

Note - Climate Change Flood Maps may also be accessed in electronic and GIS formats on Council's website www.tweed.nsw.gov.au

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APPENDIX B

Tweed Shire Council – Policy : Flood Risk Management, Version 1.0, 18 Dec 2007

TWEED
SHIRE COUNCIL

Policy

Flood Risk Management

Version 1.0

Adopted by Council at its meeting on 18 December 2007

Minute No: 201

Division: Engineering and Operations
Section: Infrastructure and Planning
File Reference:
Historical Reference:

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Flood Risk Management

1.0 FOREWORD

Flooding within the Shire occurs when rainfall exceeds the capacity of creeks and rivers to convey the runoff water to the ocean. Flooding can generate rapid rises in water levels and warning times are often very short, particularly in the upper tributaries of the Tweed River. The coastal creeks and the lower reaches of the Tweed River can also be flooded from the affects of a cyclone or its remnant rain depression that creates extraordinarily high tide or ocean levels combined with heavy local rain. Flooding of this type will generally occur with little warning except for weather forecasts predicting cyclones and rain depressions.

Since installation of the Murwillumbah Flood Gauge in 1928, eighteen (18) major floods have been recorded, the largest occurring in 1931, 1954, 1956, 1974, and 1989. The flood of record for the Tweed River is the 1954 event, with a gauge reading of 6.04m AHD at Murwillumbah. 1954 flood levels varied in Tweed Heads from 2.51m AHD near the river mouth to 2.05m AHD in the town centre. Anecdotal evidence suggests, however, that earlier floods in 1887 and 1893 were higher than the 1954 flood.

Considerable time can pass between major floods, with the potential for major growth in population and floodplain usage in the intervening years. In the period since the 1989 flood, Tweed Shire has experienced one of the highest population growth rates in New South Wales, with approximately 1800 new residents per year. This had led to the creation of entire new communities via widescale residential subdivision, many of which have occurred on the floodplain.

In rural floodplains, minor flooding is controlled by levees and floodgated drainage outlets, where the agricultural use and potential flood damage has justified the expenditure. Council is responsible for the management of approximately 250 floodgates across the Shire.

In urban areas of Murwillumbah (CBD, East Murwillumbah, Dorothy / William Streets and South Murwillumbah) and Tweed Heads South, levees provide structural protection against flood inundation to varying degrees. In the event of a flood exceeding the levee height, the protected areas will flood quickly with little warning time and very rapid rises in water levels. In other areas, planning controls are used to contain future flood damage and address emergency response issues to minimise risk to life.

Residents in flood prone areas should be very conscious of their situation, be alert during any periods of predicted high rainfall, be prepared to relocate possessions from areas liable to inundation, and respond to emergency services directions.

Council's flood mitigation strategy is to maximise community safety and minimise future potential damage due to flooding, both by structural protection and by planning controls to ensure that only appropriate compatible development occurs on floodplains in the future.

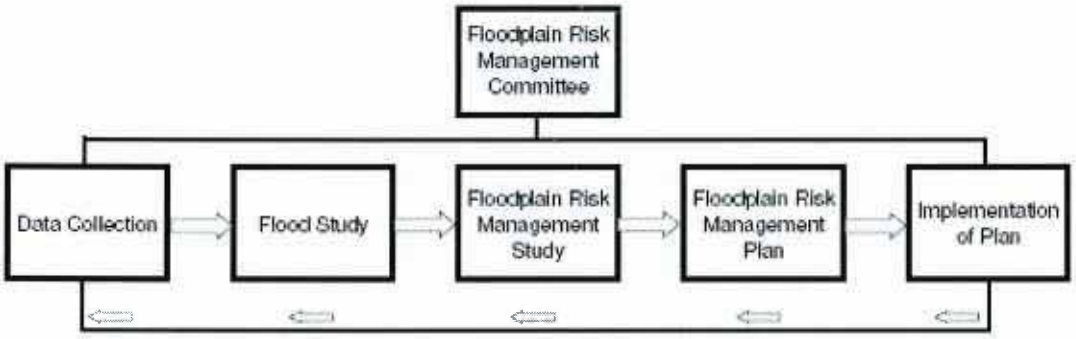
1.1 AIMS AND OBJECTIVES OF THE POLICY

- to alert the community to the extent of flood prone land and the severity of flood risk;
- to inform the community of Council policy in relation to the development and use of flood prone land, with reference to the Local Environment Plan, Development Control Plan and Floodplain Risk Management Studies and Plans;
- to reduce flood risk and damage to existing areas of development;
- to ensure that future land use and development is compatible with flood risk;
- to reduce flood risk to future development to an acceptable level through appropriate land use controls, including flood planning levels;
- to complement flood warning procedures and local flood plans for the protection of and/or evacuation of flood prone areas, the relief of evacuees and the recovery of flooded areas;
- to ensure that buildings and services required for evacuation and emergency needs are sited appropriately for the flood risk;
- to put in place emergency response measures to protect essential infrastructure and services during a flood, and to ensure rapid restoration of services following flood events;
- to progressively implement the NSW Government's Flood Prone Land Policy, in accordance with the Floodplain Development Manual;
- to progressively implement the recommendations of the Tweed Valley Floodplain Risk Management Study.

1.2 INTRODUCTION

This policy applies to all flood liable land in Tweed Shire.

This policy establishes Council's framework for management of the existing, future and continuing flood risk for property affected by flooding within the Tweed Shire. The policy recognises the need for a balanced approach to floodplain management, including works and planning controls, as recommended by the NSW Floodplain Development Manual and its Floodplain Risk Management Process (see below).



Floodplain Risk Management Process
(NSW Floodplain Development Manual 2005)

This policy has been developed in accordance with Clause C9.3 and Clause I6 of the NSW Floodplain Development Manual.

This policy supersedes the following Council Policies:

- "Flood Liable Land" (Version 1.0, December 2004)
- "Flood and Floor Levels for Residential Buildings - Flood Prone Areas" (Version 1.0, December 2004)
- "Building Extensions in Flood Prone Areas" (Version 1.0, December 2004)

This Policy should be read in conjunction with the LEP, DCP, Parts 1, 2 and 3 of the Tweed Valley Floodplain Risk Management Study, and Parts 1 and 2 of the Tweed Valley Floodplain Risk Management Plan.

Where an inconsistency arises with the Policy and an environmental planning instrument (SEPPs, REPs or LEPs), the EPI provisions prevail. Where inconsistencies with the DCP or other policy documents arise, then the higher standard/requirement shall prevail.

Tweed Shire Council is committed to the floodplain risk management process for the management of flood liable land as prescribed by the NSW Floodplain Development Manual, the NSW Flood Prone Land Policy and the relevant sections of the Local Government Act 1993.

Council will therefore review and update this policy from time to time as improved knowledge and higher learning evolves from further development and review of Floodplain Risk Management Studies and Plans in accordance with the requirements of the NSW Floodplain Development Manual.

1.3 FLOOD EXTENTS AND FLOOD PLANNING LEVELS

Flood Planning Levels (FPL's) are prescribed by DCP Section A3 - Development of Flood Liable Land. Refer also to Tweed Valley Floodplain Risk Management Study Part 1 - Establish Appropriate Flood Planning Levels for Residential Development (December 2005).

Council has acquired information on predicted flood extents, levels and velocities over many localities from a variety of flood studies. Flooding information may be obtained from the Engineering and Operations Division by enquiry. Fees and charges may apply.

Flood planning levels may change from time to time, as new flood predictions or observations of real events come to hand. While older developments may have met Council's flooding standards at the time of approval (such as minimum fill or floor levels), changes to flood planning levels may render these developments non-compliant in terms of current policy and development controls. This may affect the ability of owners to obtain flood insurance or further develop the property.

Proponents are advised to obtain a Section 149 Certificate to determine the flood planning levels applicable to specific parcels of land.

1.3.1 Variations to Habitable Floor Levels

For dwellings with existing floor levels below the adopted minimum floor level, "minor extensions" for habitable uses are permissible, with the concurrence of the Director Planning & Regulation.

Larger additions will only be considered for recreational rooms constructed of flood compatible materials, and provided furnishings therein are readily removable and can be relocated to an on-site storage area above the minimum habitable floor level. Concurrence of the Development Assessment Panel is required.

1.3.2 Section 149 Certification

Amongst other things, Clause 279 and Schedule 4(7) of the Regulations to the Environmental Planning and Assessment Act 1979 state that a Section 149(2) Certificate must contain information relating to:
"*Whether or not the land is affected by a policy … that restricts the development of the land because of the likelihood of land slip, bushfire, flooding, tidal inundation, subsidence, acid sulphate soils or any other risk.*"

The primary function of the Section 149 Certificate Notation is as a planning tool for notification that the land is affected by a policy that restricts development due to the likelihood of a risk, in this instance, flooding. The Section 149 Certificate can play a role in community awareness but should not be relied on to provide detailed flood information.

Part of Council's statutory responsibility is to update Section 149 Certificates as new information, that poses a risk to the community, becomes available.

For the purpose of flood risk, Section 149(2) and Section 149(5) Certificates are used to inform property owners, prospective property buyers and property developers of the flood risk associated with any particular property and that development may be restricted.

1.4 APPLICATIONS FOR THE DEVELOPMENT OF FLOOD PRONE LAND

Exempt and complying development on flood prone land must satisfy Section A10 of the DCP.

Flood prone development requiring consent must satisfy the LEP, DCP Section A3, and the following policy considerations:

1.4.1 Essential Community Facilities & Critical Services

a) Flood Emergency Response
In accordance with Tweed Valley Floodplain Risk Management Study Part 3 - Habitable Land Use on the Floodplain, critical infrastructure and emergency response facilities shall comply with the following development controls:

Land Use Risk Class	Development Type	Development Controls	Notes
Critical Infrastructure and Emergency Response Facilities *As per Appendix K3.1 of the FPDM - Police and ambulance stations, hospitals, SES headquarters, evacuation centres and civil infrastructure such as major telephone exchanges and power sub-stations.*	**New Development**	All new critical infrastructure and facilities to be located above PMF level, unless exceptional circumstances can be justified, such as servicing existing flood prone communities where no practical alternative exists. In such cases, adequate PMF refuge must be provided.	Note 1
	Existing Development	Minor expansion of existing facilities permitted without consideration of PMF. Major expansion below PMF level subject to provision of adequate PMF refuge.	Note 1

Note 1 - PMF Refuge for Critical Development

The PMF refuge must meet the following minimum requirements:

- Refuge must be above the PMF level.
- Minimum floor level to be PMF level. No freeboard required.
- For extensions to new facilities, minimum floor area of refuge to be no less than 50% of the incremental increase in total floor area located below the PMF due to the extension, or an equivalent area that would comfortably accommodate and service the needs of occupants for a period of not less than one week.
- Refuge must comply with Building Code Australia requirements, with external components rated appropriately for storm, wind and moisture.
- Permanent internal access via permanent staircase, minimum 1.2m wide.
- External access to the refuge must also be provided. Access must remain unobstructed for emergency boat access during flooding (i.e. clear of trees, services).
- Refuge must have natural lighting and ventilation.
- Support structures below PMF level must be capable of withstanding flood forces (water flow, debris impact, and buoyancy) and continuous submergence for up to one week, requiring an engineering certification.
- Refuge must meet all planning and building controls applicable to the site.
- All services provided as part of normal operations are to be continued undiminished during all flood events. This includes food, water, shelter, power via back up generators, medical services and hygiene of residents and facilities. All excess sewage, food and medical waste is to be collected and stored until such time as normal disposal can be undertaken. Facility management must make provision for staff to be rostered on and accommodated for the flood period. All such measures must be detailed in the development's Flood Response Assessment Plan.

1.4.2 Habitable Development

a) Flood Emergency Response
In accordance with Tweed Valley Floodplain Risk Management Study Part 3 - Habitable Land Use on the Floodplain, new habitable development shall comply with the development controls below.

Savings
Applications submitted within six (6) months of the date of adoption of Version 1.0 of this Policy for single dwellings, medium and high density accommodation (as defined below) may be exempted from the development controls in 1.4.2(a).

Land Use Risk Class	Development Type	Development Controls	Notes
Sensitive Uses *Housing (including group homes) and residential care facilities for seniors and disabled persons.*	**New Development**	All new sensitive development to have permanent high level road evacuation route(s) to land above PMF level and/or adequate PMF refuge, subject to the recommendations of an acceptable Flood Response Assessment Plan.	Note 1
	Existing Development	Minor expansion of existing facilities permitted without consideration of PMF. Major expansion below PMF level subject to provision of adequate PMF refuge.	Note 2
Medium and High Density Accommodation *Multi dwelling housing, dual occupancy, residential accommodation, residential flat building, backpackers' accommodation, boarding house, hostel, hotel accommodation, moveable dwelling, caravan park, serviced apartment, tourist and visitor accommodation, and accommodation associated with an educational establishment*	**New Development (except moveable dwellings, caravan parks)**	All new high/medium density development to have permanent high level road evacuation route(s) to land above PMF level and/or adequate PMF refuge, subject to the recommendations of an acceptable Flood Response Assessment Plan.	Note 3
	Existing Development (except moveable dwellings, caravan parks)	Minor expansion of existing facilities permitted without consideration of PMF. Major expansion below PMF level subject to provision of adequate PMF refuge.	Note 4
	New Development (moveable dwellings, caravan parks)	All new caravan/moveable dwelling parks to have permanent high level road evacuation route(s) to land above PMF level.	

Land Use Risk Class	Development Type	Development Controls	Notes
	Existing Development (moveable dwellings, caravan parks)	No expansion of existing facilities permitted, unless permanent high level road evacuation route to high land external to the site is available, or high land internal to the site can be accessed by the additional sites via road and/or pedestrian routes.	
Residential Subdivision and Development *Urban Residential Subdivision (including small lot rural subdivision where the average lot size, excluding residual and non-residential lots is less than 5000m^2), Urban Residential Dwellings, Rural Subdivision, Rural Residential Dwellings*	**New Subdivisions**	All new subdivisions to have high level road evacuation route(s) to land above PMF level, accessible to all allotments via (as a minimum) pedestrian access at or above 100 year ARI flood level not exceeding 100m in length.	
	Infill Subdivisions (subdivision of land less than 5 hectares in area, surrounded by existing urban development and/or constrained by the urban land form from further expansion)	Infill subdivision permitted subject to the creation of covenants on land titles of all new allotments that cannot achieve suitable high level road/pedestrian evacuation route(s) to land above PMF level, requiring adequate PMF refuges in all future dwellings.	Note 4
	New Single Dwellings	Adequate PMF refuges required in all new dwellings on existing allotments that are located below PMF level and that are without suitable high level road/pedestrian evacuation route(s) to land above PMF level, unless that land is protected by a 1 in 100 year levee (Murwillumbah CBD, East Murwillumbah, Dorothy/William Street).	Note 4

Land Use Risk Class	Development Type	Development Controls	Notes
	Existing Single Dwellings	Minor extensions to existing dwellings permitted without consideration of the PMF. Dwellings undergoing major extensions must meet new single dwelling criteria.	Note 4
Other Habitable Development	**All**	Flood Response Assessment Plans are required to be submitted with Development Applications for all habitable land uses in the floodplain.	Note 5

Note 1 - Evacuation Versus Shelter in Place for Sensitive Development

Evacuation of occupants is the preferred risk management approach for sensitive developments proposed below PMF level. Adoption of evacuation as the risk management response for a development requires a Flood Response Assessment Plan that specifically addresses the following evacuation requirements:

- Typical demographics of evacuees (age, gender etc)
- Typical medical conditions and/or disabilities of evacuees (dialysis, dementia, paralysis etc)
- Mode of transportation (private bus, ambulance etc)
- Intended evacuation destination
- Level of service provided by evacuation centre (medical, security, accommodation etc)
- Required staffing for evacuation centre to cater for evacuees
- Special supply measures for evacuation centre to cater for evacuees (food, water, waste, medicines etc)

If the above requirements are not able to be satisfied for all future occupants of the development, a PMF refuge shall be provided in accordance with design criteria in Note 2.

Note 2 - PMF Refuge for Sensitive Development

The PMF refuge must meet the following minimum requirements:

- Refuge must be above the PMF level.
- Minimum floor level to be PMF level. No freeboard required.
- For new facilities, minimum floor area of refuge to be no less than 50% of the total floor area located below the PMF, or an equivalent area that would comfortably accommodate and service the needs of the occupants for a period not less than one week. For extensions to new facilities, minimum floor area of refuge to be no less than 50% of the incremental increase in total floor area located below the PMF due to the extension.
- Refuge must comply with Building Code Australia requirements, with external components rated appropriately for storm, wind and moisture.
- Permanent internal access via permanent staircase, minimum 1.2m wide.
- External access to the refuge must also be provided. Access must remain unobstructed for emergency boat access during flooding (i.e. clear of trees, services).

- Refuge must have natural lighting and ventilation.
- Support structures below PMF level must be capable of withstanding flood forces (water flow, debris impact, and buoyancy) and continuous submergence for up to one week, requiring an engineering certification.
- Refuge must meet all planning and building controls applicable to the site.

- All services provided as part of normal operations are to be continued undiminished during all flood events. This includes food, water, shelter, power via back up generators, medical services and hygiene of residents and facilities. All excess sewage, food and medical waste is to be collected and stored until such time as normal disposal can be undertaken. Facility management must make provision for staff to be rostered on and accommodated for the flood period. All such measures must be detailed in the development's Flood Response Assessment Plan.

Note 3 - Evacuation Versus Shelter in Place for Medium and High Density Accommodation

Evacuation of occupants is the preferred risk management approach for medium and high density developments proposed below PMF level. Adoption of evacuation as the risk management response for a development requires a Flood Response Assessment Plan that specifically addresses the following evacuation requirements:

- Expected number of occupants/evacuees
- Typical demographics of evacuees (families with children, retirees etc)
- Mode of transportation (private vehicles, bus provided by facility etc)
- Intended evacuation destination
- Level of service provided by evacuation centre (medical, security, accommodation etc)
- Any special requirements for evacuation centre to cater for evacuees (food, water, waste, medicines etc)

If the above requirements are not able to be satisfied for all future occupants of the development, a PMF refuge shall be provided in accordance with design criteria in Note 4.

Note 4 - PMF Refuge for Urban and Rural Residential Development

Where PMF refuge is required, the refuge must meet the following minimum requirements:

- Refuge may be an additional second storey, mezzanine level or other raised refuge area above the PMF level.
- Minimum floor level to be PMF level. No freeboard required.
- Minimum floor area for a single bedroom dwelling $9m^2$, add $4m^2$ for each additional bedroom.
- For unit developments, may provide separate refuges within each unit, sized in accordance with the above bedroom ratio. Alternately provide a communal refuge, accessible internally by all units, floor area no less than 50% of total floor area located below PMF level, or an equivalent area that would comfortably accommodate and service the needs of the occupants for a period not less than one week.
- Refuge must comply with Building Code Australia requirements, with external components rated appropriately for storm, wind and moisture.
- Minimum 2.1m floor to ceiling/roof frame height.
- Refuge must be provided with permanent internal and external access, (may be a fixed ladder).
- The external access must be unobstructed (by trees, chimneys, aerials etc) for emergency boat access during flooding
- Refuge must have natural lighting and ventilation

- Support structures below PMF level must be capable of withstanding flood forces (water flow, debris impact, and buoyancy) and continuous submergence for up to one week, requiring an engineering certification.
- Refuge must meet all planning and building controls applicable to the site.
- Refuge must have a cupboard storage area for flood emergency kit to service all residents with provisions for isolation up to one week, consisting of food and fresh water supplies, first aid kit including medication, battery powered torch, portable radio, spare batteries, candles and water proof matches, plastic bags and rubber gloves. All such measures must be detailed in the development's Flood Response Assessment Plan.

Note 5 - Flood Response Assessment Plan

A Flood Response Assessment Plan provides a means by which a developer can assess and nominate the most applicable flood emergency response option for a habitable development (whether it be avoidance, evacuation, or shelter in place), and for Council officers to consider during assessment of the development application.

The Flood Response Plan is not intended to be a document that provides details for the site specific management of flood preparation and response for a habitable development. Such private flood plans should be developed and implemented by owners and occupants following completion of the development. The SES may provide assistance to occupants in the preparation of private flood plans.

As a minimum requirement, a Flood Response Assessment Plan for a proposed development must provide the following details:

- Expected number of occupants
- Typical demographics of occupants (families with children, retirees etc)
- 100 year ARI flood level and PMF level for the development site (obtainable from Council)
- Nominated Flood Risk Management Approach for the development (avoidance, evacuation, shelter in place. Note that rescue is not an appropriate response for any development type)
- For evacuation, provide detail of nearest evacuation centre (as advised by the NSW State Emergency Service), the intended mode of transport to the centre, and indicative ground/road levels at significant points along the nominated evacuation route.
- Any special requirements for evacuation centre to cater for evacuees (food, water, waste, medicines etc)
- If shelter in place, provide details of refuge in accordance with Note 2 or Note 4 as applicable.

1.4.4 Non-Habitable Development

DCP Section A3 requires flood compatibility of commercial and industrial development, in terms of building materials, electrical installations, and the provision of flood free storage above the 100 year ARI flood level.

Council has not adopted minimum floor levels for non-habitable development, with the exception of self-storage units, which must achieve floor levels at least 300mm above the 100 year ARI flood level.

1.4.5 Planning Controls for High Flow Areas

In accordance with Tweed Valley Floodplain Risk Management Study Part 2 - Planning Controls for High Flow Areas (September 2006), the following development controls shall be applied to future development in mapped "high flow" areas of the floodplain:

Land Zone	Development Controls
1(a) Rural and 1(b) Agricultural	Exclude all new residential development from the mapped high flow areas. Other development only permissible within high flow areas if the development will not change ground levels by more than 300mm (for local drainage purposes) or obstruct flood flows. Examples of permissible development include: • buildings with footprints less than $80m^2$, and separated from other structures by no less than 30m; • levees, bunds, or road formations no more than 300mm above natural ground level; • wire strand fencing.
2(a) Low Density Residential	Permit residential redevelopment within the mapped high flow areas provided total enclosure below design flood level is less than $50m^2$.
3(c) & 3(d) Business (Commerce and Trade and Waterfront Enterprise)	Permit development in mapped high flow areas, subject to maximum 50% site coverage for buildings and other obstructions to flow on each lot. At least 50% of any cross section for each lot, transverse to the direction of flood flow, must be preserved clear of flow obstructions down to natural ground level. Fencing must be permeable to allow the passage of flood flows (minimum 90% void space), or be collapsible under flood flow (e.g. timber palings).
4(a) Industrial	Exclude all development from Lot 4 DP 591604. Permit development in all remaining mapped high flow areas, subject to maximum fill height to ARI 20 year flood level, and maximum 50% site coverage for buildings and other obstructions to flow. At least 50% of any cross section for each lot, transverse to the direction of flood flow, must be preserved clear of flow obstructions above the ARI 20 year flood level. Fencing must be permeable to allow the passage of flood flows (minimum 90% void space), or be collapsible under flood flow (eg. timber palings).
5(a) Special Uses (School)	Permit development in mapped high flow areas, subject to maximum 50% site coverage for buildings and other obstructions to flow on each lot. At least 50% of any cross section for each lot, transverse to the direction of flood flow, must be preserved clear of flow

Land Zone	Development Controls
	obstructions down to natural ground level. Fencing must be permeable to allow the passage of flood flows (minimum 90% void space), or be collapsible under flood flow (eg. timber palings).

1.5 LEP AMENDMENTS AND REZONING APPLICATIONS

In accordance with Tweed Valley Floodplain Risk Management Study Part 3 - Habitable Land Use on the Floodplain, the acceptability of applications to amend the Tweed Local Environment Plan to permit habitable uses or intensified residential development on the floodplain shall be assessed on the basis of topographic characteristics of the subject land, according to Figure 1 below and the related risk management approach to flood events in Table 1.

Figure 1 - Land Classification

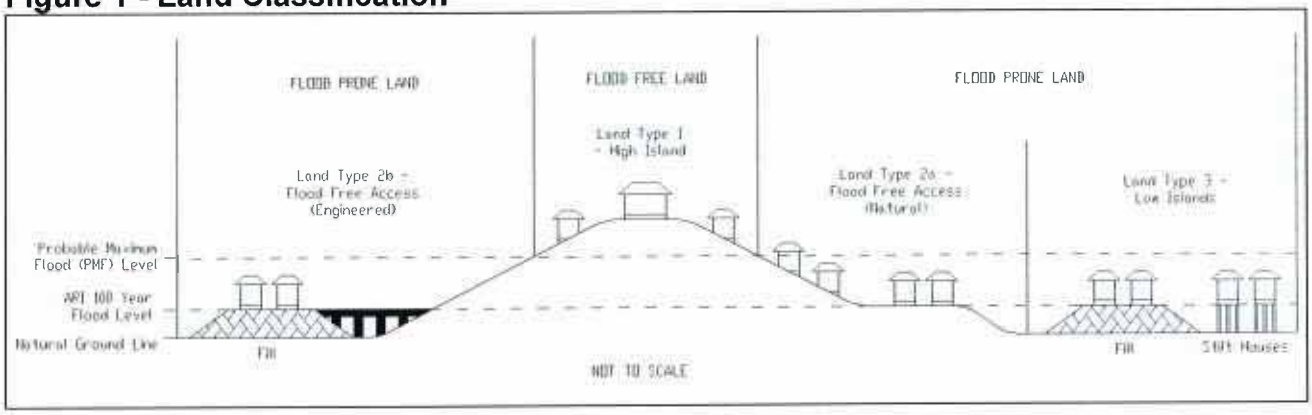


Table 1 - Assessment Criteria for TLEP Amendments that Facilitate Additional Habitable Land Use on the Floodplain

Land Classification	Description	Risk Management Approach	Comments	Is Application Acceptable for Further Consideration?
Land Type 1 - High Islands	Land is above PMF level	Shelter in Place - Flood Free Refuge	Residents remain in situ for duration of the flood emergency. High islands may or may not be serviced by critical infrastructure such as hospitals.	Yes
Land Type 2a - Flood Free Access (Natural)	Topography naturally grades to land that is above PMF level	Evacuation	Residents relocate to flood free areas as flood levels rise above design flood level for local roads and dwellings. Evacuation efficiency is dependent upon mode of transport (road or pedestrian evacuation), services available at the destination (evacuation centre, medical	Yes

Land Classification	Description	Risk Management Approach	Comments	Is Application Acceptable for Further Consideration?
			facilities), and ability of residents to travel (aged, infirmed, disabled, young children).	
Land Type 2b - Flood Free Access (Engineered)	Land is linked to land above PMF level by fill, roads, bridges and the like	Evacuation	As for 2a	Yes
Land Type 3 - Low Islands	Land and dwellings are constructed at design flood level but below PMF level, with no flood free access to land above PMF	Rescue	Relies on emergency services to remove residents from the flood risk for events that cut local access routes. This is contrary to Tweed LEP 2000 and the NSW Floodplain Development Manual and is not a valid risk management approach.	No

The above table provides criteria for the exclusion of LEP amendment proposals that contain unacceptable flooding risks to human life. Applications that pass this test and are eligible for further consideration will still be required to deal with other flood related risks (e.g. impact on flood behaviour, floodplain environment or flood conveyance function) in accordance with this Policy, DCP Section A3 and Floodplain Risk Management Studies, as well as non-flood related planning issues.

1.6 COMMUNITY AWARENESS & EDUCATION

1.6.1 Provision of Flood Level Information

Flood levels are determined as part of the Flood Studies carried out for the individual floodplains within the Tweed Shire. Flood levels can assist property owners and their representatives in assessing possible flood risk on properties and should be used in conjunction with a detailed topographic ground survey.

Flood Level information is available by contacting Council's Engineering & Operations Division. Fees and charges may apply.

In rural areas where Council does not have any flooding records, it is recommended that interested parties satisfy themselves as to the possible extent of flood affect on the property, if any, by seeking out and heeding reliable local historical information.

1.6.2 Community Awareness

Community awareness and appreciation of the existing flood risk on the floodplain will promote appropriate land use and development in flood affected areas. A well informed community will more readily understand the need for protection of life and property and general building and development controls imposed by Council.

One aspect of a community's preparedness for flooding is the "flood awareness" of individuals. This includes awareness of the flood risk in their area and how to protect their family and property when an event occurs. It is fair to assume that the level of awareness drops as individuals' memories of previous experience dim with time. Community awareness of flood risks can be maintained or increased by measures including:-

- Distribution of flood safe publications to residences and businesses, prepared in conjunction with the SES;
- Community workshops and displays;
- Media releases and advertisements;
- Provision of additional flood information at community outlets, such as Libraries and Community Centres and on Council's webpage.

Other measures may also be identified and implemented as part of the Floodplain Risk Management Study and Plan process.

1.6.3 Management of Emergency Response

The State Emergency Service is the primary combat agency responsible for emergency response during a flood event. The SES, with assistance from Council's Local Emergency Management Officer (LEMO), facilitates an appropriate emergency response and evacuation strategy, co-ordinated through the Tweed Shire Local Emergency Management Committee (LEMC). The SES and the LEMC, with the assistance of Council, is responsible for the preparation and review of Local Flood Plans to develop an appropriate disaster response plan.

Due to local topography and demographics, and the expected intensity of flood producing weather events, emergency response in Tweed Shire may be significantly constrained. Flood modelling shows that even urban areas, such as the Murwillumbah CBD, which are protected by a levee, can be rapidly inundated with little warning should overtopping and/or failure of the levee occur. A high intensity rainfall event in June 2005 demonstrated that many urban areas in the Lower Tweed, including contemporary subdivisions and filled housing estates, can be subject to stormwater flash flooding that rapidly cuts evacuation routes and access roads.

The potential lack of suitable lead time for flood emergency response means that individual property owners need to be prepared in their own right, and be able to act wisely without assistance. Where properties are within an area that can be affected by any flood event, occupants should ensure that they have in place an appropriate evacuation plan known to all household members. This plan should ensure that any chosen evacuation route will be available in such an event. The evacuation plan should consider the safety of the family pets and the preservation of important items such as legal documents and family memorabilia such as photographs. Residences should also

maintain an emergency kit, containing items including a portable radio, torch, spare batteries, candles and waterproof matches, a first aid kit, medication supplies, fresh food and water, strong shoes, rubber gloves, and waterproof bags for valuables. The SES may provide advice to home and business owners as to appropriate emergency response measures in their area.

During flood emergencies, community enquiries should be directed to the SES. The Bureau of Meteorology is responsible for issuing all watches and warnings associated with severe weather and flood events, for dissemination by local media outlets.

1.7 FLOOD MITIGATION WORKS

1.7.1 Implementation of Structural Works

The purpose of flood mitigation measures is to modify the behaviour of a flood by reducing flood levels or velocities or by excluding floodwaters from areas at risk.

Flood mitigation measures, by their structural nature, may have environmental and ecological impacts (positive or negative) and so any proposal for such works must be subject to strict and detailed assessment in accordance with the existing planning and assessment legislation.

Structural works such as detention basins, levees and drainage amplifications, are determined through assessment within the Floodplain Risk Management Studies and preferred works are nominated through the Floodplain Risk Management Plans. Council currently has a Floodplain Management Plan for Murwillumbah (1989), which outlines a number of structural flood mitigation works recommended for the locality. Many such measures, such as the raising of the Murwillumbah levee, have already been completed.

The implementation of works is undertaken through Council's works programs and is subject to the availability of funding from various sources including Council's revenue, government grant funding, Section 94 Contributions and developer direct contributions.

1.7.2 Voluntary House Raising and Voluntary Purchase

Voluntary house raising and voluntary purchase of flood affected dwellings, where justified by a Floodplain Management Plan, are valid strategies for minimising the risk to life and property.

Council will continue to investigate these strategies, along with other works and planning measures, as part of its future preparation of floodplain management studies and plans.

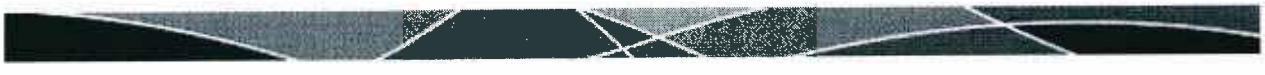
1.8 INTERACTION WITH THE LOCAL FLOOD PLAN

Implementation of management measures can impact on the emergency management planning for floods documented in the local flood plan. (refer Appendix N of the NSW Floodplain Development Manual 2005)

Changes in flood behaviour, flood warning systems, or critical levels for evacuation can impact upon flood response and associated planning.

Therefore, it is important that the SES and LEMC be informed of any such changes, as and when they occur so adjustments, as necessary, can be made to the local flood plan.

Council will continue to interact with the SES and other relevant agencies through the Floodplain Management Committee and the Local Emergency Management Committee to ensure compatibility with local flood plans and procedures.



APPENDIX A - Definitions

Average Recurrence Interval (ARI) - ARI is the long-term average number of years between the occurrence of a flood as big as (or larger than) the selected event.

Design Flood Level - Flood level selected as a basis of design in flood prone areas, as defined by Tweed Development Control Plan Section A3 - Development of Flood Liable Land.

Flood Conveyance Zone - Those high flow areas of the Tweed Valley floodplain that are not defined as floodway, but still provide an essential flood water conveyance function.

Flood Planning Levels (FPLs) - Are the combinations of flood levels (typically derived from the 100 year ARI flood for habitable purposes) and freeboards selected for floodplain risk management purposes, as determined in management studies and incorporated in management plans.

Flood Prone Land (Flood Liable Land) - Land susceptible to flooding by the PMF event. Defines the extent of floodplains. Flood Prone Land is synonymous with flood liable land.

Habitable Area - A living or working area, such as a lounge room, living room, dining room, rumpus room, kitchen, bedroom, office or the like, and includes rooms constructed and furnished for these purposes. Rooms containing a bath and/or shower are considered habitable. Rooms containing a toilet or basin are not considered habitable if additional to a main bathroom.

Habitable Land Use - Development that facilitates the occupation or use of buildings or rooms by persons for accommodation. Includes residential accommodation; backpackers accommodation; bed & breakfast accommodation; boarding houses; dwellings; hostels; hotel accommodation; moveable dwellings; caravan parks; residential care facilities; seniors housing; services apartments; tourist and visitor accommodation; hospitals; accommodation, residences or dwellings associated with educational establishments.

High Flow Area - Those areas of the Tweed Valley floodplain coloured red in Figures 1, 2 and 3 of Part 2 of the Tweed Valley Floodplain Risk Management Study. As defined by the Part 2 Study, flood prone land is classified as being subject to high flow if the product of flood velocity and depth at the peak of the ARI 100 year flood event exceeds 0.3 (vxd > 0.3). Areas coloured blue in Figures 1, 2 and 3 are classified as "low flow areas", and have a velocity-depth product less than 0.3. High flow areas convey the majority of flood waters, and consist of floodways and flood conveyance zones.

High Island - A high island is an area above the PMF that is surrounded on its entire perimeter during a PMF event. A high island can either be a natural landform such as a high ridge (local examples are Terranora, Bilambil Heights and Hospital Hill in Murwillumbah); or can be created by raised dwellings, fill pads and upper storey refuges.

High Land - Land that is situated above PMF level.

High Level Evacuation Route - A road or footway (as applicable based on the development type), whose entire length has a level (measured at top of kerb for roads) of not less than the design flood level and, which provides a route to enable people to evacuate to land above the PMF. Ideally a high level evacuation route will have a rising grade that ensures users will not be cut off as floodwaters rise. Overland stormwater flow paths on high level evacuation routes must be designed to remain trafficable when conveying the 100 year ARI design stormwater flow. High level evacuation routes should have levels that in combination with effective warning time, development type and flood duration, provide adequate time for evacuation to land above the PMF.

Low Island - An area that is above the FPL and surrounded on its entire perimeter during and 100 year ARI event, but is inundated by the PMF. When flood levels exceed the FPL, in events up to the PMF, low islands become totally inundated, posing significant risk to isolated residents without flood free access to high land or shelter. Local examples include filled residential estates in Banora Point, West Kingscliff, and Pottsville, and raised dwellings in Chinderah, South Murwillumbah and Rural Villages.

Major Flood - in Murwillumbah, is classified by the NSW State Emergency Service as an event with a level exceeding 4.8m AHD on the Murwillumbah Gauge.

Minor Extension or Expansion - For of an existing single dwelling, means the addition of not more than 15% in floor area or $30m^2$, whichever is the lesser. For other habitable development, means the addition of not more than 10% of existing gross floor area.

Probable Maximum Flood (PMF) - The largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation, coupled with the worst flood producing catchment conditions. The PMF defines the extent of flood prone land, that is, the floodplain. The PMF has been calculated for the Tweed River Floodplain from Byangum and Boat Harbour upstream of Murwillumbah to the river mouth in the Tweed Valley Flood Study 2005. In the Lower Tweed, PMF levels were approximately 1.8m above 100 year ARI flood levels. In Murwillumbah, the difference was approximately 4.4m. PMF levels for other coastal floodplains (Cudgen Creek, Cudgera Creek and Mooball Creek) are yet to be modelled, however for the purposes of this policy, an assumed interim PMF level 2.0m above 100 year ARI flood level will be used for these other floodplains.

PMF Refuge - A habitable area, being an upper storey, mezzanine level or other refuge located above PMF level, to provide residents of developments without high road access for evacuation with a means of sheltering safely in place until flood waters subside. PMF refuges must be structurally safe and accessible by boat during floods up to the PMF and contain sufficient facilities and supplies to sustain occupants for the expected duration of a PMF. PMF refuges are a form of high island, isolated from external essential services.

APPENDIX B - References

1. Floodplain Development Manual - The Management of Flood Liable Land, New South Wales Government, April 2005
2. Murwillumbah Floodplain Management Plan, Tweed Shire Council, April 1989
3. Tweed Shire Council Development Control Plan, Section A3 - Development of Flood Liable Land
4. Tweed Shire Local Flood Plan, State Emergency Service
5. Tweed Valley Floodplain Risk Management Study, Part 1 - Establish Appropriate Planning Levels for Residential Development
6. Tweed Valley Floodplain Risk Management Study, Part 2 - Planning Controls for High Flow Areas
7. Tweed Valley Floodplain Risk Management Study, Part 3 - Habitable Land Use on the Floodplain

APPENDIX C - Flood Maps

APPENDIX C

Tweed Shire Council – Tweed Valley Floodplain Risk Management Study, Part 3 – Habitable Land Use on the Floodplain, 18 Dec 2007

TWEED SHIRE COUNCIL

Tweed Valley Floodplain Risk Management Study

Part 3
Habitable Land Use on the Floodplain

18 December 2007

TWEED SHIRE COUNCIL
Engineering & Operations Division
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The Study is on the web at:
www.tweed.nsw.gov.au

APPENDICES

Tweed Valley Floodplain Risk Management Study, Part 3
Habitable Land Use on the Floodplain

3.0 General

Part 3 of the Floodplain Risk Management Study examines existing policy and planning controls for habitable land use on the floodplain. The study considers development techniques used to reduce flood risk for different community profiles and discusses emergency responses to flooding. This study identifies options for habitable development of flood prone land to reduce flooding risk for different land uses.

3.1 Objectives

The objectives of Part 3 of the Tweed Valley Floodplain Risk Management Study are to:

- Assess existing policies and planning controls applying to habitable land use on the floodplain;
- Examine options to amend the Tweed Local Environment Plan 2000 (TLEP) to reflect policy contained within the NSW Floodplain Development Manual 2005 (FPDM);
- Identify options for guidelines to allow Council to assess applications to amend the TLEP that would facilitate additional habitable development on the floodplain;
- Identify and assess options for assessment criteria and development control measures for habitable land uses on the floodplain to ensure practical provision for emergency response and protection of life for occupants for all floods up to the Probable Maximum Flood (PMF) level.
- Recommend preferred options for inclusion in Council's Flood Risk Management Policy.

Council is required by the FPDM to consider floods greater than the flood planning level (FPL) for habitable land use, up to the PMF level in its risk management process. This Part 3 Risk Management Study examines the safety of occupants of habitable developments for this full range of flood events.

3.2 Structure

The study will address these issues in the following context:

Section A Strategic Land Use Issues

- Need for specific floodplain management clauses in TLEP.
- Matters to be considered when assessing proposals to amend the TLEP to permit additional areas to be used for habitable purposes on flood prone land (e.g. amendments to land use tables, rezoning applications).

Section B Development Controls

- Development standards or prohibitions required to control habitable land uses on flood prone land to ensure practical emergency response to flooding.

3.3 Scope

Part 3 of the Floodplain Risk Management Study applies to all flood prone land in the Tweed Shire, including the Coastal Creek Floodplains (Cudgen, Cudgera and Mooball Creeks), with implementation of its outcomes not limited to the Tweed Valley Floodplain.

3.4 Tweed Valley Floodplain Risk Management Study Framework

Council resolved at its meeting of 7 September 2005 that the Tweed Valley Floodplain Risk Management Study be prepared in separable priority parts. This enables, where possible, priority localities and land use issues to be dealt with earlier in the process than would be possible with a single large study that would take a number of years to complete, without sacrificing the rigour of the project.

Based on recent issues that have come before Council, the following separable "Floodplain Risk Management Studies" were included in a priority list:

Table 1 - Separable Parts of Tweed Valley Floodplain Risk Management Study 2005

Part	Title	Description	Status
1	Establish Appropriate Flood Planning Levels for Residential Development	Establish appropriate Flood Planning Levels having regard to the findings of the Flood Study	Completed
2	Planning Controls For High Flow Areas	Examine options for appropriate development controls for high flow areas of the floodplain, identified in the flood study. These controls should be those necessary to minimise the cumulative impacts of developments that have the potential to restrict flood flows and adversely impact on the flooding of other properties.	Completed
3	**Habitable Land Use On The Floodplain**	**Examine options for development control measures for subdivisions and other habitable uses on the floodplain to ensure there is practical provision for emergency evacuation, particularly in large floods up to the PMF level.**	**Current**
4	Enclosures Below Flood Planning Level	Examine options for allowable development beneath elevated dwellings on the floodplain and associated ancillary buildings and structures.	Future
5	S149 certificates	Provision of flood information on s149 certificates, particularly with regard to the flood plain being defined as the inundated area in the PMF	Future
6	Chinderah and West Kingscliff Floodplain Management	Examine options for Floodplain Management of the Chinderah and West Kingscliff areas	Future

Part	Title	Description	Status
7	Large Developments and Rezoning Within The Floodplain	Examine options for assessment procedures and acceptance criteria for large development and rezoning proposals in the floodplain. Particularly regarding the cumulative impacts to be included in assessment, ranking of competing proposals where there are unacceptable combined/cumulative impacts and emergency evacuation needs for larger events up to the PMF.	Future
8	Review of Murwillumbah Floodplain Management Plan	Recommendation of Part 2 - Update Plan having regard to the findings of the Tweed Valley Flood Study 2005 and preceding parts of the Risk management Study	Future

Council is considering combining this approach of undertaking separable priority parts of the risk management study with an overarching consultancy to complete a holistic and complete floodplain risk management study in accordance with the FPDM. Progressive implementation of the outcomes of each part or stage of the study remains integral to Council's floodplain risk management process.

3.5 Existing Policies and Planning Controls

Refer to Appendix B for Policy Extracts.

3.5.1 NSW Floodplain Development Manual 2005

The NSW Floodplain Development Manual 2005 (FPDM) provides the policy framework for Council's local flood related policies and planning controls and enacts the NSW Government's Flood Prone Land Policy.

The FPDM outlines Council's requirements in reducing the impact of flooding by using a merit based risk management approach to sustainable development that identifies flood mitigation techniques and emergency management measures. (FPDM Section 1.1.1)

The FPDM acknowledges that it is reasonable for Councils to determine development limits, up to and including the exclusion of development within the floodplain, based upon an understanding of flood behaviour and emergency response as a method of reducing risk. (FPDM Section G6.2)

Development within the floodplain is considered acceptable if the perceived risk from flooding behaviour can be mitigated through the selection of appropriate flood risk control measures for the development types, without creating unacceptable cumulative impacts on flood behaviour or floodplain ecosystems. (FPDM Section G6.3)

While the PMF is unlikely to be adopted as a flood planning level (FPL), a continuing risk to personal safety from floods exceeding the FPL remains, and needs to be managed through emergency response and community education. (FPDM Section G7.1.2)

Although emergency planning and education is appropriate from a flood response perspective, these methods cannot be relied upon to provide a permanent reduction in flood risk. Should education programs lapse and emergency response be lacking or under resourced, communities relying upon these methods may be adversely

impacted. As such, planned and engineered controls to provide permanent measures to reduce flood risk to a community are supported by the FPDM. (FPDM L6.8)

3.5.2 Section 117 Ministerial Directions

On 30 September 2005, the NSW Government Department of Planning issued Section 117 Ministerial Directions, under the Environmental Planning & Assessment Act 1979. Direction No.15 applies to Flood Prone Land.

The objectives of this Direction are:

- To ensure that development of flood prone land is consistent with the NSW Government's Flood Prone Land Policy and the principles of the Floodplain Development Manual, 2005.
- To ensure that the provisions of an LEP on flood prone land is commensurate with flood hazard and includes consideration of the potential flood impacts both on and off the subject land.

This Direction applies when Council prepares a draft LEP that creates, removes or alters a zone or provision that affects flood prone land.

According to this Direction, a draft LEP shall not rezone land within the flood planning areas from Special Area, Recreation, Rural or Environmental Protection Zones to a Residential, Business, Industrial or Special Area Zone, unless Council can satisfy the Director-General that the rezoning is in accordance with a floodplain risk management plan prepared in accordance with the principles and guidelines of the FPDM.

3.5.3 Guideline on Development Controls on Low Flood Risk Areas

Planning Circular PS07-003 "New Guideline and Changes to Section 117 Direction and EP&A Regulation on Flood Prone Land" was issued by the NSW Government Department of Planning on 31 January 2007. This circular provides advice on a package of changes concerning flood-related development controls on residential development on land above the residential flood planning level (1 in 100 year flood level plus 0.5m freeboard in the Tweed Valley) and up to the PMF, referred to in some constituencies as "low-risk flood areas".

This package consists of

- an amendment to the EP&A Regulation 2000 (concerning Section 149 planning certificates for properties in "low-risk flood areas")
- a new "Guideline on Development Controls on Low Flood Risk Areas", to be read in conjunction with the Floodplain Development Manual
- a revised Section 117 Ministerial Direction (referencing the Guideline's requirements for draft LEPs, development controls and flood planning levels for "low-risk flood areas"), and
- a notice under s733 Local Government Act 1993 that extends the definition of the Manual to include the Guideline in matters of legal indemnity for Councils.

The Guideline confirms that unless there are exceptional circumstances, the 100 year ARI flood level (plus freeboard) should be adopted as the flood planning level for residential development, to reduce the frequency of exposure of people and property to flood risk and the associated danger and damage.

The Guideline goes on to state that unless there are exceptional circumstances, Councils should not impose flood related development controls on residential development on land above the residential FPL.

The Guideline does acknowledge that consideration of the safety of people and associated emergency response management may result in controls to be applied to critical infrastructure and response facilities (major utilities, hospitals and evacuation routes etc) and vulnerable developments (aged care facilities etc) in areas above the 100 year ARI flood.

Variations to the Guideline require the concurrence of Department of Environment and Climate Change (DECC) and Department of Planning (DoP) prior to their implementation in an LEP or DCP.

3.5.4 Tweed Local Environmental Plan 2000

The Tweed LEP 2000 (TLEP) principally addresses flooding issues in Clause 34. Clause 34 is limited and out of date to the extent that it does not adequately implement Section 117 Ministerial Direction No.15, requiring consistency with the NSW Government's Flood Prone Land Policy and the FPDM.

Specifically it does not:

- Prioritise the protection of human life as the overriding principle
- Limit use of the floodplain commensurate with the flooding risk and land use type
- Require the existing flood regime to be maintained

3.5.5 Tweed Shire Development Control Plan, Section A3 – Development of Flood Liable Land

The aims of Section A3 of the Tweed Shire Development Control Plan are to:

- Present Council's Flood Mitigation Strategy; and
- Set detailed standards for land development in order to minimise the adverse effect of flooding on the community
- Progressively implement the provisions of the FPDM
- Implement completed Parts of the Tweed Valley Floodplain Risk Management Plan.

The DCP requires all habitable areas of new development be built to a minimum floor level (ARI 100 year flood level plus freeboard). To date there has been little or no consideration of evacuation or the consequences of larger floods in the DCP. Such planning controls have resulted in the proliferation of residential developments on "low islands", with inherent flood emergency response limitations.

A recent review of the Tweed Local Flood Plan by the NSW State Emergency Service (SES) attempts to quantify the extent of the existing emergency response problems that face Tweed Shire in a major flood, via a risk analysis process. The outcomes of this risk analysis were the subject of an interim report to Council in July 2006, and are summarised as follows:

- Up to 28,000 people would be affected by the 100 year ARI flood, either by the inundation of their homes, or by isolation due to flood waters.
- Up to 13,000 of these people would require the assistance of emergency services to evacuate.
- Approximately 450 "critical care" patients in various flood liable facilities would require evacuation in the 100 year ARI event.
- Flood warning times can be as little as 6 hours under certain conditions, which does not allow adequate evacuation time for this many evacuees.
- The SES is not currently resourced with enough staff or flood boats to undertake an evacuation of this magnitude.

As the development approval authority, Council has a responsibility to ensure that new subdivisions and infill development provides long term contingencies for emergency response in floods up to the PMF without undue reliance on emergency services, by mandating suitable measures in the DCP.

3.5.6 Flood Risk Management Policy

As stated in Section 3.4, the progressive implementation of the recommended outcomes from the floodplain risk management study is integral to Council's floodplain risk management process. Council is obliged to continue to control floodplain development during the floodplain management process, to duly consider new information on flooding behaviour, changes in Council's development strategies, other planning reforms, and continuing development pressures on flood prone land.

Council has prepared a local flood risk management policy in accordance with Sections C9 and I6 of the FPDM. It is intended that the recommended outcomes of the flood risk management study shall be implemented in the policy as appropriate, pending completion of the study and Tweed Valley Floodplain Risk Management Plan.

SECTION A Strategic Land Use Issues

3.6 Objectives

The objectives of this section are to:

- Address the deficiencies in the current TLEP Provisions (Clause 34) with respect to flooding by recommending a draft TLEP amendment (refer Section 3.7); and
- Determine assessment criteria to be used for applications to amend the TLEP that facilitate additional habitable land use on the floodplain (refer Section 3.8).

3.7 Draft TLEP Amendment

3.7.1 Background

In June 2005 the NSW Parliament assented to the *Environmental Planning and Assessment Amendment (Infrastructure and Other Planning Reform) Act 2005* (the Reform Act). The Reform Act contains a number of new provisions that together require the preparation of new local environmental plans (LEPs) across NSW that are more consistent in format and content. (Department of Planning, Planning Circular PS05-008)

The *Standard Instrument (Local Environment Plans) Order 2006* prescribes a standard form and content of a principal LEP for the purposes of Section 33(a) of the Environment and Planning Assessment Act 1979. (DoP Planning Circular PS06-008)

In addition to mandatory provisions, local provisions may be incorporated into the standard instrument. Local provisions may be prepared by councils to address matters that are relevant to their local area and which are not covered by provisions in the standard instrument. This may include issues that are the subject of state or regional planning guidance requiring councils to develop tailored provisions that are appropriate to their local area, e.g. developing flood planning provisions using the NSW Floodplain Development Manual (FPDM). (DoP Planning Circular PS06-008)

Section 117 Ministerial Direction No.15 - Flood Prone Land requires consistency with the NSW Government's Flood Prone Land Policy and the FPDM. The primary objectives of the NSW Flood Prone Land Policy and the FPDM is to

- Reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone property; and to
- Reduce private and public losses resulting from floods, while not unnecessarily precluding development from the floodplain (FPDM Section 1.1.1).

3.7.2 Clause 34 Amendment

It is proposed that the following draft clause, based on the Draft LEP Template of 20 September 2005 (underlined text is additional), be incorporated into an amendment of the Tweed LEP to replace and address the deficiencies of current Clause 34 of the LEP.

"Development on flood prone land
(1) The objectives of this clause are:

(a) to maintain the existing flood regime and flow conveyance capacity, and
(b) to enable safe occupation of flood prone land; and
(c) to avoid significant adverse impacts upon flood behaviour; and
(d) to avoid significant adverse affects on the floodplain environment that would cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of the river bank/watercourse; and
(e) to limit uses to those compatible with flow conveyance function and flood hazard.

(2) This clause applies to land shown as flood prone land in maps, flood studies and/or floodplain management plans.

(3) Development consent is required for the following:

(a) subdivision of land,
(b) filling and earthworks,
(c) the erection of a building,
(d) the carrying out of a work,
(e) flood mitigation works,
on land to which this clause applies (but excluding works covered by Clause xxx of this plan).

(4) Consent required by subclause (3) must not be granted unless the consent authority is satisfied that the development:

(a) when assessed on both an individual and cumulative basis, will not adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties; and
(b) when assessed on both an individual and cumulative basis, will not significantly alter flow distributions and velocities to the detriment of other properties or the environment of the floodplain; and
(c) will enable safe occupation of the flood prone land; and
(d) when assessed on both an individual and cumulative basis, will not significantly detrimentally affect the floodplain environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of the riverbank/watercourse; and
(e) when assessed on both an individual and cumulative basis, will not be likely to result in unsustainable social and economic costs to the flood affected community or general community, as a consequence of flooding; and
(f) when assessed on both an individual and cumulative basis, is compatible with the flow conveyance function of the floodway; and
(g) when assessed on both an individual and cumulative basis, is compatible with the flood hazard within the floodway; and
(h) will not significantly increase the requirement for emergency services in times of flood."

3.8 Assessment Criteria for TLEP Amendments that Facilitate Additional Habitable Land Use on the Floodplain

Section 54 of The Environmental Planning and Assessment Act (1979) states that "a council may decide to prepare a draft local environmental plan...". From time to time

Council receives requests to prepare draft LEPs to increase the range of permissible habitable land uses on flood prone land. Applications may take the following form:

- Rezoning land via amendments to Zoning Maps, and/or
- Amendments to Land Use Tables, and/or
- Amendments to Local Provisions

Direction Number 15 – Flood Prone Land requires councils to ensure development of flood prone land is consistent with the NSW Government's Flood Prone Land Policy and that any development considers flood hazards (risks) and any potential flood impacts the development may have. (Section 117 Ministerial Direction)

It is considered necessary that Council adopts criteria in this part of the Floodplain Risk Management Plan that would eliminate further consideration of such requests where they would result in permitting development where the safe occupation/ evacuation of these developments in flood events could not be ensured. That is, to provide flood related "exclusion criteria" for unacceptable applications to amend the TLEP that facilitate additional habitable uses on the floodplain.

Applications to amend the TLEP that permit habitable uses or intensified residential development on the floodplain should be assessed on the basis of the topographic characteristics of the subject land in relation to the design flood level (the 100 year ARI flood level for residential development) and the probable maximum flood (PMF) level.

Figure 1 provides a diagrammatical representation of land classification.

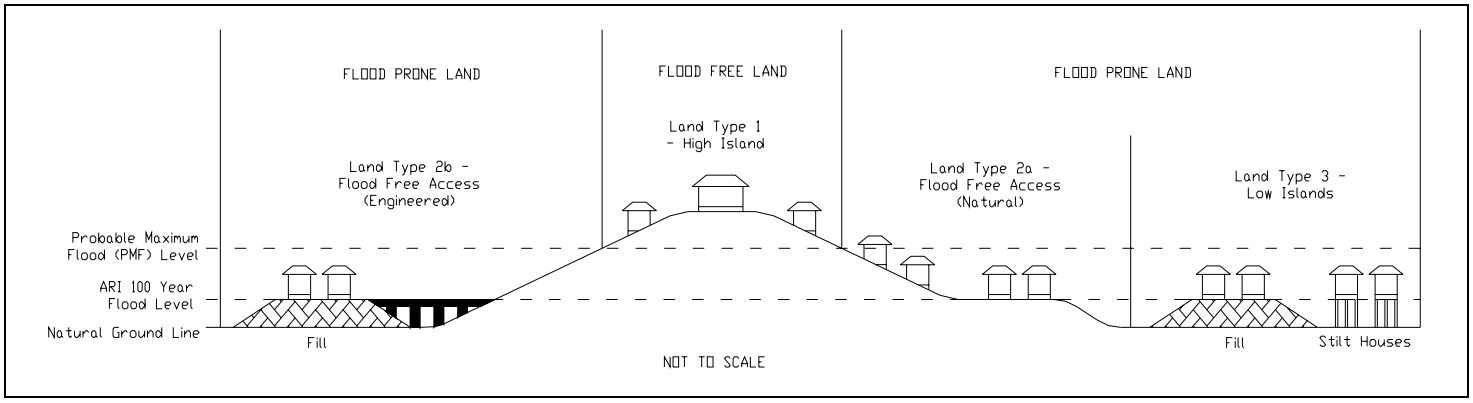

Figure 1 Land Classification

3.8.1 TLEP Amendment Assessment Criteria Options Analysis

Based on the land types in Figure 1, the applicable risk management responses for residents in a flood emergency have been assessed, with regard to floods up to the PMF. Refer to Appendix C for detailed analysis of options for assessment criteria for applications to amend the TLEP that facilitate additional habitable land use on the floodplain.

3.8.2 Preferred TLEP Amendment Assessment Criteria

Based on the options analysis in Appendix C, Table 2 summarises the preferred assessment criteria for such TLEP amendments.

Table 2 Preferred Assessment Criteria for TLEP Amendments that Facilitate Additional Habitable Land Use on the Floodplain

Land Classification	Description	Risk Management Approach	Comments	Is Application Acceptable for Further Consideration?
Land Type 1 - High Islands	Land is above PMF level	Shelter in Place - Flood Free Refuge	Residents remain in situ for duration of the flood emergency. High islands may or may not be serviced by critical infrastructure such as hospitals.	Yes
Land Type 2a - Flood Free Access (Natural)	Topography naturally grades to land that is above PMF level	Evacuation	Residents relocate to flood free areas as flood levels rise above design flood level for local roads and dwellings. Evacuation efficiency is dependent upon mode of transport (road or pedestrian evacuation), services available at the destination (evacuation centre, medical facilities), and ability of residents to travel (aged, infirmed, disabled, young children).	Yes
Land Type 2b - Flood Free Access (Engineered)	Land is linked to land above PMF level by fill, roads, bridges and the like	Evacuation	As for 2a	Yes
Land Type 3 - Low Islands	Land and dwellings are constructed at design flood level but below PMF level, with no flood free access to land above PMF level	Rescue	Relies on emergency services to remove residents from the flood risk for events that cut local access routes. **This is contrary to the TLEP and the FPDM and is not a valid risk management approach.**	No

Table 2 provides criteria for the exclusion of TLEP amendment proposals that contain unacceptable flooding risks to human life. Applications that pass this test and are eligible for further consideration will still be required to deal with other flood related risks (e.g. impact on flood behaviour, floodplain environment or flood conveyance function) in accordance with Council's Flood Risk Management Policy, DCP Section A3, and Floodplain Risk Management Study, as well as non-flood related planning issues.

SECTION B Development Control of Habitable Land Use on the Floodplain

3.9 Background

Development controls are necessary to ensure compliance of new floodplain development with the following key issues from the Floodplain Development Manual:

- Safety of people
- Management of the potential damage to property and infrastructure
- Management of the cumulative impacts of development, and
- Impact on Emergency Services

Development control options identified in this section of the study limit the type of development allowed within a specified land zoning according to the land use risk class of the development (refer Section 3.10) and the flood risk management option proposed (refer Section 3.11).

3.9.1 Objectives

The objectives of this section are as follows:

- To make the protection of human life a major consideration for habitable development within the floodplain.
- To promote development of flood prone land in accordance with the FPDM and not sterilise the floodplain by unnecessary prohibition of development
- To provide acceptance criteria / development controls to allow the assessment of development applications on a merit basis taking into account the social, environmental and economic factors associated with flooding.

The following examination of assessment criteria for floodplain development only deals with the occupation risk of development on flood prone land. A development application must address other flood related risks (e.g. impact on flood behaviour, floodplain environment or flood conveyance function), as well as non-flood related planning issues.

For example, this study does not consider controls on filling of allotments. This is currently specified in the DCP, and will be considered in more detail in a later part of the Floodplain Risk Management Study.

3.10 Flood Risks for Land Use Classes

Table 3 considers four habitable land use types in the context of the FPDM and discusses flooding risks associated with the function and demographic of the land use type.

Table 3 Land Use Risk Classes

Land Use Risk Class	Development Types	Risk Analysis
(a) Critical Infrastructure and Emergency Response Facilities	As per Appendix K3.1 of the FPDM - Police and ambulance stations, hospitals, SES headquarters, evacuation centres and civil infrastructure such as major telephone exchanges and power sub-stations.	Critical Infrastructure and Emergency Response Facilities are the essential services necessary to maintain law and order and essential and emergency services during flood events. Critical facilities must have maximum protection from flood, as they are required to remain operational during floods to provide these emergency response functions. Such facilities need to remain accessible to as large a part of the community as possible. Section K3.1 of the FPDM states that consideration should also be given for the PMF to be used as the FPL when siting and developing emergency response facilities and critical infrastructure.
(b) Sensitive Uses	Housing (including group homes) and residential care facilities for seniors and disabled persons.	Sensitive use developments are those facilities that provide accommodation and/or residential care to persons with impaired or vulnerable mental and physical health. This population may be limited in mobility and may have high care needs requiring constant supervision and specialised staff, access to services and transport. Any evacuation destination needs to be adequately accessible and equipped to accommodate high needs patients.
(c) Medium and High Density Accommodation	Multi dwelling housing, dual occupancy, residential accommodation, residential flat building, backpackers' accommodation, boarding house, hostel, hotel accommodation, moveable dwelling, caravan park, serviced apartment, tourist and visitor accommodation, and accommodation associated with an educational establishment	Medium and high-density accommodation would typically be urban or rural residential infill development but also includes short term and tourist accommodation. Residents typically have a mix of mobility capability and most are assumed to be able to evacuate unassisted. Density of the development may influence the risk profile as higher numbers place higher demands on emergency services if evacuation or re-supply during a flood is required.
(d) Residential Subdivision and Development	Urban Residential Subdivision (including small lot rural subdivision) Urban Residential Dwellings Rural Subdivision Rural Residential Dwellings	Subdivision of land which involves the creation of new allotments with potential for further residential development. Greenfield residential subdivision is unique in being able to implement best practice urban planning on green field sites to reduce flooding risk at the design phase. The NSW SES has identified provision for unassisted evacuation during an extreme flooding event as the primary flood risk option. The options for infill subdivisions in already established areas are much more constrained by existing roads and ground levels.

3.11 Flood Management Options to Control Flood Risk

A development could employ one or more of the following management approaches to reduce the ongoing risk of flood. Table 4 describes how a hierarchy of flood risk management options can be related to development controls used to reduce the risk of flooding.

Table 4 Flood Risk Management Options

Risk Management Hierarchy	Risk Management Approach	Risk Analysis
AVOIDANCE	Mandate development to be above the PMF level, on flood free land.	Provides maximum protection to development. Will result in isolation from other sections of the community below PMF level. Sterilises flood prone land from development.
EVACUATION	Mandate development to have natural or engineered access to land above the PMF level for unassisted relocation of occupants above flood level.	May utilise vehicular or pedestrian evacuation to high land (depending on development type), without reliance on emergency services. May be constrained by existing development pattern and topography in the locality, and distance to and service level (including medical services) of the evacuation destination. Reliant upon effective early warning systems, community education, and the ability of most of the community to evacuate unassisted (including aged, disabled, infirmed and young children).
SHELTER IN PLACE	Development is required to have a habitable refuge capable of accommodating and servicing the needs of in-situ occupants above the PMF level so that they can "wait out" the flood event for its duration.	Does not unnecessarily sterilise land from urban infill development, allowing unconstrained development provided it has a serviced PMF refuge. Emergency services may still be required for re-supply and for emergency (eg. medical) evacuations. May be constrained by planning restrictions (e.g. building heights, impacts on neighbours) in some areas. Difficult to ensure that reliable and appropriate long term emergency provisions are maintained by owners and understood by occupants.
RESCUE	No habitable areas within the development are located above the PMF level and occupants require rescue by emergency services to relocate them to land above PMF level.	Reliance on emergency services to rescue at risk occupants is inappropriate given the risk to occupants and rescue personnel. This is consistent with NSW SES recommendations and the FPDM. **Rescue is not considered an appropriate risk management option.**

3.12 Development Controls

Currently Section A3 of the DCP prescribes Flood Planning Levels (FPLs) and development controls for flood liable land, however these controls focus simply on property protection up to the FPL. The FPDM requires the consideration of larger floods up to the PMF, and the protection of life for occupants of new developments as a priority for floodplain risk management.

Combining the Land Use Risk Classes in Table 3 with the Flood Risk Management Options in Table 4 provides a range of Development Control Options that may be applied to habitable floodplain development. These Development Controls are needed to manage the risk of flooding to people and property without unnecessarily sterilising the floodplain from development.

The following development control options are not locality specific and are not intended to address all aspects of floodplain development, such as flood planning levels, filling requirements, building materials, restriction to flood flows, and the cumulative impact of development. The following development controls should be read in conjunction with the current clauses in Section A3 of the DCP, TLEP, Flood Risk Management Policy, and all current and future parts of the Tweed Valley Floodplain Risk Management Study.

3.12.1 Development Control Options Analysis

Refer Appendix D for detailed analysis of Development Control Options for habitable land use on the floodplain.

3.12.2 Preferred Development Control Options

Based on the Options Analysis in Appendix D, Table 5 summarises the Preferred Development Control Options identified for each Land Use Risk Class as follows:

Table 5 Preferred Development Control Options

Land Use Risk Class	Development Type	Preferred Options	Notes
(a) Critical Infrastructure and Emergency Response Facilities	New Development	Mandate all new critical infrastructure and facilities to be located above PMF level, unless exceptional circumstances can be justified, such as servicing existing flood prone communities where no practical alternative exists. In such cases, adequate PMF refuge must be provided.	Note 1
	Existing Development	Permit minor expansion of existing facilities without consideration of PMF. Major expansion below PMF level subject to provision of adequate PMF refuge.	Note 1
(b) Sensitive Uses	New Development	Mandate all new sensitive development to have permanent high level road evacuation route(s) to land above PMF level and/or adequate PMF refuge, subject to the recommendations of an acceptable Flood Response Assessment Plan.	Note 2
	Existing Development	Permit minor expansion of existing facilities without consideration of PMF. Major expansion below PMF level subject to provision of adequate PMF refuge.	Note 1

Land Use Risk Class	Development Type	Preferred Options	Notes
(c) Medium and High Density Accommodation	New Development (except moveable dwellings, caravan parks)	Mandate all new high/medium density development to have permanent high level road evacuation route(s) to land above PMF level and/or adequate PMF refuge, subject to the recommendations of an acceptable Flood Response Assessment Plan.	Note 3
	Existing Development (except moveable dwellings, caravan parks)	Permit minor expansion of existing facilities without consideration of PMF. Major expansion below PMF level subject to provision of adequate PMF refuge.	Note 4
	New Development (moveable dwellings, caravan parks)	Mandate all new caravan/moveable dwelling parks to have permanent high level road evacuation route(s) to land above PMF level.	
	Existing Development (moveable dwellings, caravan parks)	No expansion of existing facilities permitted, unless permanent high level road evacuation route to high land external to the site is available, or high land internal to the site can be accessed by the additional sites via high level road and/or pedestrian routes.	
(d) Residential Subdivision and Development	New Subdivisions	Mandate all new subdivisions to have high level road evacuation route(s) to land above PMF level, accessible to all allotments via (as a minimum) flood free pedestrian accesses not exceeding 100m in length.	
	Infill Subdivisions	Permit infill subdivision subject to the creation of covenants on land titles of all new allotments that cannot achieve suitable high level road/pedestrian evacuation route(s) to land above PMF level, requiring adequate PMF refuges in all future dwellings.	Note 4
	New Single Dwellings	Mandate adequate PMF refuges in all new dwellings on existing allotments that are located below PMF level and that are without suitable high level road/pedestrian evacuation route(s) to land above PMF level, unless that land is protected by a 1 in 100 year levee (Murwillumbah CBD, East Murwillumbah, Dorothy/William Street).	Note 4
	Existing Single Dwellings	Minor extensions to existing dwellings permitted without consideration of the PMF. Dwellings undergoing major extensions must meet new single dwelling criteria.	Note 4
(e) General	All	Flood Response Assessment Plans are required to be submitted with Development Applications for all habitable land uses in the floodplain.	Note 5

Note 1 - PMF Refuge for Critical and Sensitive Development

The PMF refuge must meet the following minimum requirements:

- Refuge must be above the PMF level.
- Minimum floor level to be PMF level. No freeboard required.
- For new facilities, minimum floor area of refuge to be no less than 50% of the total floor area located below the PMF, or an equivalent area that would comfortably accommodate and service the needs of the occupants for a period not less than one week. For extensions to new facilities, minimum floor area of refuge to be no less than 50% of the incremental increase in total floor area located below the PMF due to the extension.
- Refuge must comply with Building Code Australia requirements, with external components rated appropriately for storm, wind and moisture.
- Permanent internal access via permanent staircase, minimum 1.2m wide.
- External access to the refuge must also be provided. Access must remain unobstructed for emergency boat access during flooding (i.e. clear of trees, services).
- Refuge must have natural lighting and ventilation.
- Support structures below PMF level must be capable of withstanding flood forces (water flow, debris impact, and buoyancy) and continuous submergence for up to one week, requiring an engineering certification.
- Refuge must meet all planning and building controls applicable to the site.
- All services provided as part of normal operations are to be continued undiminished during all flood events. This includes food, water, shelter, power via back up generators, medical services and hygiene of residents and facilities. All excess sewage, food and medical waste is to be collected and stored until such time as normal disposal can be undertaken. Facility management must make provision for staff to be rostered on and accommodated for the flood period. All such measures must be detailed in the development's Flood Response Assessment Plan.

Note 2 - Evacuation Versus Shelter in Place for Sensitive Development

Evacuation of occupants is the preferred risk management approach for sensitive developments proposed below PMF level. Adoption of evacuation as the risk management response for a development requires a Flood Response Assessment Plan that specifically addresses the following evacuation requirements:

- Typical demographics of evacuees (age, gender etc)
- Typical medical conditions and/or disabilities of evacuees (dialysis, dementia, paralysis etc)
- Mode of transportation (private bus, ambulance etc)
- Intended evacuation destination
- Level of service provided by evacuation centre (medical, security, accommodation etc)
- Required staffing for evacuation centre to cater for evacuees
- Special supply measures for evacuation centre to cater for evacuees (food, water, waste, medicines etc)

If the above requirements are not able to be satisfied for all future occupants of the development, a PMF refuge shall be provided in accordance with design criteria in Note 1.

Note 3 - Evacuation Versus Shelter in Place for Medium and High Density Accommodation

Evacuation of occupants is the preferred risk management approach for medium and high density developments proposed below PMF level. Adoption of evacuation as the risk management response for a development requires a Flood Response Assessment Plan that specifically addresses the following evacuation requirements:

- Expected number of occupants/evacuees
- Typical demographics of evacuees (families with children, retirees etc)
- Mode of transportation (private vehicles, bus provided by facility etc)
- Intended evacuation destination
- Level of service provided by evacuation centre (medical, security, accommodation etc)
- Any special requirements for evacuation centre to cater for evacuees (food, water, waste, medicines etc)

If the above requirements are not able to be satisfied for all future occupants of the development, a PMF refuge shall be provided in accordance with design criteria in Note 4.

Note 4 - PMF Refuge for Urban and Rural Residential Development

Where PMF refuge is required, the refuge must meet the following minimum requirements:

- Refuge may be an additional second storey, mezzanine level or other raised refuge area above the PMF level.
- Minimum floor level to be PMF level. No freeboard required.
- Minimum floor area for a single bedroom dwelling $9m^2$, add $4m^2$ for each additional bedroom.
- For unit developments, may provide separate refuges within each unit, sized in accordance with the above bedroom ratio. Alternately provide a communal refuge, accessible internally by all units, floor area no less than 50% of total floor area located below PMF level, or an equivalent area that would comfortably accommodate and service the needs of the occupants for a period not less than one week.
- Refuge must comply with Building Code Australia requirements, with external components rated appropriately for storm, wind and moisture.
- Minimum 2.1m floor to ceiling/roof frame height.
- Refuge must be provided with permanent internal and external access, (may be a fixed ladder).
- The external access must be unobstructed (by trees, chimneys, aerials etc) for emergency boat access during flooding
- Refuge must have natural lighting and ventilation
- Support structures below PMF level must be capable of withstanding flood forces (water flow, debris impact, and buoyancy) and continuous submergence for up to one week, requiring an engineering certification.
- Refuge must meet all planning and building controls applicable to the site.
- Refuge must have a cupboard storage area for flood emergency kit to service all residents with provisions for isolation up to one week, consisting of food and fresh water supplies, first aid kit including medication, battery powered torch, portable radio, spare batteries, candles and water proof matches, plastic bags and rubber gloves. All such measures must be detailed in the development's Flood Response Assessment Plan.

Note 5 - Flood Response Assessment Plan

A Flood Response Assessment Plan provides a means by which a developer can assess and nominate the most applicable flood emergency response option for a habitable development (whether it be avoidance, evacuation, or shelter in place), and for Council officers to consider during assessment of the development application.

The Flood Response Plan is not intended to be a document that provides details for the site specific management of flood preparation and response for a habitable development. Such private flood plans should be developed and implemented by owners and occupants following completion of the development. The Tweed Local Flood Plan and Floodsafe Toolkit on the SES website may assist in the preparation of private flood plans.

As a minimum requirement, a Flood Response Assessment Plan for a proposed development must provide the following details:

- Expected number of occupants
- Typical demographics of occupants (families with children, retirees etc)
- 100 year ARI flood level and PMF level for the development site (obtainable from Council)
- Nominated Flood Risk Management Approach for the development (avoidance, evacuation, shelter in place. Note that rescue is not an appropriate response for any development type)
- For evacuation, provide detail of nearest evacuation centre (as advised by the NSW State Emergency Service), the intended mode of transport to the centre, and indicative ground/road levels at significant points along the nominated evacuation route.
- Any special requirements for evacuation centre to cater for evacuees (food, water, waste, medicines etc)
- If shelter in place, provide details of refuge in accordance with Note 1 or Note 4 as applicable.

3.13 Recommended Preferred Options

Numerous recommendations have been made in the body of this study, having identified and assessed various options for strategic planning criteria and development assessment controls for habitable land uses on the floodplain.

These recommended preferred options will be exhibited as draft additions to the Flood Risk Management Policy.

Appendix A - Glossary

Average Recurrence Interval (ARI) - ARI is the long-term average number of years between the occurrence of a flood as big as (or larger than) the selected event.

Design Flood Level - Flood level selected as a basis of design in flood prone areas, as defined by Tweed Development Control Plan Section A3 - Development of Flood Liable Land.

Flood Planning Levels (FPLs) - Are the combinations of flood levels (typically derived from the 100 year ARI flood for habitable purposes) and freeboards selected for floodplain risk management purposes, as determined in management studies and incorporated in management plans.

Flood Prone Land (Flood Liable Land)- Land susceptible to flooding by the PMF event. Defines the extent of floodplains. Flood prone land is synonymous with flood liable land.

Habitable Area - A living or working area, such as a lounge room, living room, dining room, rumpus room, kitchen, bedroom, office or the like, and includes rooms constructed and furnished for these purposes. Rooms containing a bath and/or shower are considered habitable. Rooms containing a toilet or basin are not considered habitable if additional to a main bathroom.

Habitable Land Use - Development that facilitates the occupation or use of buildings or rooms by persons for accommodation. Includes residential accommodation; backpackers accommodation; bed & breakfast accommodation; boarding houses; dwellings; hostels; hotel accommodation; moveable dwellings; caravan parks; residential care facilities; seniors housing; services apartments; tourist and visitor accommodation; hospitals; accommodation, residences or dwellings associated with educational establishments.

High Island - A high island is an area above the PMF that is surrounded on its entire perimeter during a PMF event. A high island can either be a natural landform such as a high ridge (local examples are Terranora, Bilambil Heights and Hospital Hill in Murwillumbah); or can be created by raised dwellings, fill pads and upper storey refuges.

High Land - Land that is situated above PMF level.

High Level Evacuation Route - A road or footway (as applicable based on the development type), whose entire length has a level (measured at top of kerb for roads) of not less than the design flood level and, which provides a route to enable people to evacuate to land above the PMF. Ideally a high level evacuation route will have a rising grade that ensures users will not be cut off as floodwaters rise. Overland stormwater flow paths on high level evacuation routes must be designed to remain trafficable when conveying the 100 year ARI design stormwater flow. High level evacuation routes should have levels that in combination with effective warning time, development type and flood duration, provide adequate time for evacuation to land above the PMF.

Infill Subdivision - The subdivision of land less than 5 hectares in area, surrounded by existing urban development and/or constrained by the urban land form from further expansion.

Low Island - An area that is above the FPL and surrounded on its entire perimeter during and 100 year ARI event, but is inundated by the PMF. When flood levels exceed the FPL, in events up to the PMF, low islands become totally inundated, posing significant risk to isolated residents without flood free access to high land or shelter. Local examples include filled residential estates in Banora Point, West Kingscliff, and Pottsville, and raised dwellings in Chinderah, South Murwillumbah and Rural Villages.

Minor Extension or Expansion - For of an existing single dwelling, means the addition of not more than 15% in floor area or 30m^2, whichever is the lesser. For other habitable development, means the addition of not more than 10% of existing gross floor area. Additions in excess of these criteria are considered a "major" extension / expansion.

Probable Maximum Flood (PMF) - The largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation, coupled with the worst flood producing catchment conditions. The PMF defines the extent of flood prone land, that is, the floodplain. The PMF has been calculated for the Tweed River Floodplain from Byangum and Boat Harbour upstream of Murwillumbah to the river mouth in the Tweed Valley Flood Study 2005. In the Lower Tweed, PMF levels were approximately 1.8m above 100 year ARI flood levels. In Murwillumbah, the difference was approximately 4.4m. PMF levels for other coastal floodplains (Cudgen Creek, Cudgera Creek and Mooball Creek) are yet to be modelled, however in order to implement this Part of the Study in accordance with its Scope (Section 3.2), an assumed interim PMF level 2.0m above 100 year ARI flood level will be used for these other floodplains.

PMF Refuge - A habitable area, being an upper storey, mezzanine level or other refuge located above PMF level, to provide residents of developments without high road access for evacuation with a means of sheltering safely in place until flood waters subside. PMF refuges must be structurally safe and accessible by boat during floods up to the PMF and contain sufficient facilities and supplies to sustain occupants for the expected duration of a PMF.
PMF refuges are a form of high island, isolated from external essential services.

Small Lot Subdivision - Subdivisions where the average lot size, excluding residual and non-residential lots is less than 5000m^2.

Appendix B - Policy Extracts

NSW FLOODPLAIN DEVELOPMENT MANUAL 2005

Section 1.1.1 Flood Prone Land Policy Statement states that:
The primary objective of the policy is to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone property, and to reduce private and public losses resulting from flood, utilising ecologically positive methods wherever possible. That is:

- *A merit-based approach shall be adopted for all development decisions in the floodplain to take into account social, economic and ecological factors as well as flooding considerations;*
- *Both mainstream and overland flooding shall be addressed, using the merit based approach in preparation and implementation by councils if strategically generated floodplain risk management plans;*
- *The impact of flooding and flood liability on existing areas identified in floodplain risk management plans shall be reduced by flood mitigation works and measures, including on-going emergency management measures, the raising of houses where appropriate and development controls; and*
- *The potential for flood losses in all areas for development or redevelopment shall be contained by the application of ecologically sensitive planning and development controls.*

Section G6.2 “Determining Reasonable Flood Related Development Limits” states that:
Indicative flood related development limits can be determined based upon an understanding of the flood behaviour and the impact…. There are certain areas where development would reasonably be excluded:

- *Areas where development will have significant adverse impacts on flood behaviour. This may be due to blockage of flood ways (increasing upstream flood levels or redirecting flows) or filling of flood storage areas (increasing downstream peak flood flows or redirecting flows). Assessment involves consideration of the cumulative impacts of proposed new areas on flooding…;*
- *Areas where flood hazard is too high and cannot effectively be reduced to acceptable levels by management measures. Emergency management is an important consideration as to whether an area is too hazardous for development due to flooding (e.g. islands…); and*
- *Areas of important flood dependant ecosystems.*

Section G6.3 “Flood Compatible Development Within Development Limits” states that:
Within the area where development is considered reasonable from a flood risk perspective, decisions need to be made on controls to support development by reducing flood risk to an acceptable level. This can involve determining:

- *The types of development appropriate for the location. This relates to the vulnerability of different types of development and the continuing flood risk to which the area is exposed. For example, an area considered appropriate for general residential development may not be appropriate for aged care accommodation due to the vulnerability of residents….*
- *An appropriate development density. The cumulative impacts of overall development on flooding or the ability to effectively manage emergency*

response to the area, (perhaps due to evacuation issues…) may limit development density. The management study may also consider options to overcome critical limitations, for example, upgrading external access roads to increase capacity or availability during a flood event.

- *Appropriate measures necessary to support development. This involves determining appropriate conditions to ensure future development is not exposed to an unacceptable level of continuing risk. Conditions…. may include measures such as filling of development sites and minimum floor levels (FPLs …) to reduce the likelihood of flooding or special evacuation requirements involving improvements to evacuation routes.*
- *Appropriate management plans for critical infrastructure. New infrastructure should be available and accessible, as necessary, during significant flood events or be able to be re-established readily after an event. This may require flood related design standards to reduce flood vulnerability in the expected conditions. For example, evacuation routes with better drainage can overcome local storm water issues that may otherwise inhibit performance.*

Section G7.12 states that:
As the PMF is unlikely to be adopted for protecting development from flooding, a continuing risk remains. This is principally a concern for personal safety, which generally needs to be managed through emergency response and community education.

Section L6.8 Effective Flood Access, states that:
The availability of effective access routes from flood prone areas and developments can directly influence personal danger and potential damage reduction measures. Effective access means an exit route that remains trafficable for sufficient time to evacuate people and possessions…

Section L6.8 also states that access routes extending beyond the floodplain are to be considered. Access routes "*do not have to be above the PMF level but be at a level of flood protection that, in combination with effective warning time, development type and flood duration, provides adequate time for evacuation and reduces risk to acceptable levels. Without such access, the risk to personal safety of the entrapped and their rescuers may be unacceptable."*

Section L6.8 goes on to state that
"All weather vehicular access is the preferred method of reducing flood risk with pedestrian access being problematic due to the movement of aged, children and disabled."

Council's Local Flood Risk Management Policy, as discussed in Section 3.5.6 of this study, has been developed with reference to Sections C9 and I6 of the FPDM:

C9 Controlling Development During the Management Process
…it is important for councils to control development during the preparation of management plans and associated background studies. In this regard councils need to:

- *undertake development control based upon current knowledge of the flood behaviour and hazard;*
- *improve knowledge of flood behaviour and hazard through the management process; and*

- *manage flood risk to future land use strategically considering the full range of flood risk, as this information becomes available.*

During the management process, a local flood risk management policy consistent with the principles of the manual (Section I.6) can help councils to control development whilst the management plan is completed…The policy can be updated during the process to reflect the improved knowledge and the higher degree of information available, and incorporate any management decisions made by council during this period…

SECTION 117 MINISTERIAL DIRECTION NO.15 – FLOOD PRONE LAND (30 SEPTEMBER 2005)

As revised by Planning Circular PS 07-003, 31 January 2007 (revisions are underlined):

Objective
• To ensure that development of flood prone land is consistent with the NSW Government's Flood Prone Land Policy and the principles of the Floodplain Development Manual, 2005.
• To ensure that the provisions of an LEP on flood prone land is commensurate with flood hazard and includes consideration of the potential flood impacts both on and off the subject land.

Where this direction applies
This direction applies to all councils that contain flood prone land within their LGA.

When this direction applies
This direction applies when a council prepares a draft LEP that creates, removes or alters a zone or a provision that affects flood prone land.

What a council must do if this direction applies
(1) A draft LEP shall include provisions that give effect to and are consistent with the NSW Flood Prone Land Policy and the principles of the Floodplain Development Manual, 2005 (including the *Guideline on Development Controls on Low Flood Risk Areas*).
(2) A draft LEP shall not rezone land within the flood planning areas from Special Area, Recreation, Rural or Environmental Protection Zones to a Residential, Business, Industrial or Special Area Zone.
(3) A draft LEP shall not contain provisions that apply to the flood planning areas which:
    (a) permit development in floodway areas,
    (b) permit development that will result in significant flood impacts to other properties,
    (c) permit a significant increase in the development of that land,
    (d) are likely to result in a substantially increased requirement for government spending on flood mitigation measures, infrastructure or services, or
    (e) permit development to be carried out without development consent except for the purposes of agriculture (not including dams, drainage canals, levees, buildings or structures in floodways or high hazard areas) or exempt development.

(4) A draft LEP must not impose flood related development controls above the residential flood planning level for residential development on land, unless a council provides adequate justification for those controls to the satisfaction of the Director-General (or an officer of the Department nominated by the Director-General).

(5) For the purposes of a draft LEP, a council must not determine a flood planning level that is inconsistent with the Floodplain Development Manual 2005 (including the *Guideline on Development Controls on Low Flood Risk Areas*) unless a council provides adequate justification for the proposed departure from that Manual to the satisfaction of the Director-General (or an officer of the Department nominated by the Director-General).

(6) A draft LEP may be inconsistent with this direction only if council can satisfy the Director-General (or an officer of the Department nominated by the Director-General) that any particular provision or area should be varied or excluded having regard to the provisions of section 5 of the Environmental Planning and Assessment Act, and

(a) the rezoning is in accordance with a floodplain risk management plan prepared in accordance with the principles and guidelines of the Floodplain Development Manual, 2005, or

(b) the rezoning is, in the opinion of the Director-General (or an officer of the Department nominated by the Director-General), of a minor significance.

TWEED LOCAL ENVIRONMENT PLAN 2000

LEP2000 Clause 34 Flooding states that:
(1) Objectives
• to minimise future potential flood damage by ensuring that only appropriate compatible development occurs on flood liable land.
• to minimise the adverse effect of flooding on the community.
(2) Where, in the consent authority's opinion, land is likely to be subject to flooding, then it must not grant consent to development on that land unless it has considered:
(a) the extent and nature of the flooding hazard affecting the land, and
(b) whether or not the development would increase the risk or severity of flooding of other land in the vicinity, and
(c) whether the risk or severity of flooding affecting the development could be reasonably mitigated, and
(d) the impact of the development on emergency services, and
(e) the provisions of Section A3 - Development of Flood Liable Land of Tweed Development Control Plan. "

There are also a number of other clauses in the LEP2000 that refer to other aspects of development control where flooding is an issue. These include:

- Schedule 1 - design flood level impact on definition of "finished ground level"
- Clause 10 - impact on complying development
- Various clauses relating to specific land parcels

TWEED SHIRE DEVELOPMENT CONTROL PLAN, SECTION A3 - DEVELOPMENT OF FLOOD LIABLE LAND

Section A3.2.1 of the DCP states that:

Residents in flood prone areas should be very conscious of their situation, be alert during periods of predicted high rainfall and be prepared to evacuate all possessions that are located on land liable to flooding

Appendix C - Options Analysis for Assessment Criteria for TLEP Amendments

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LAND CLASSIFICATION	FLOOD RISK MANAGEMENT OPTIONS		
	EVACUATION *Residents relocate to flood free areas as flood levels rise above design flood level for local roads and dwellings.*	***SHELTER IN PLACE*** *Residents remain in situ for duration of the flood emergency.*	***RESCUE*** *Relies on emergency services to remove residents from the flood risk for events that cut local access routes.*
Land Type 1 - High Islands *Land is above PMF level*	• Not applicable. • High islands provide a flood free destination for evacuees from other areas.	• High islands may or may not be serviced by critical infrastructure such as hospitals. • Flood free land is suitable for rezoning for habitable uses	• Not applicable.
PREFERRED OPTION	• **Permit applications for TLEP Amendments on Land Type 1 - High Islands for habitable land use**		
Land Type 2a - Flood Free Access (Natural) *Topography naturally grades to land that is above PMF level*	• Evacuation efficiency is dependant upon mode of transport (road or pedestrian evacuation), services available at the destination (evacuation centre, medical facilities), and ability of residents to travel (aged, infirmed, disabled, young children).	• Unless buildings in this zone have a refuge (eg. additional storey) above PMF level, occupants are unable to remain in situ safely for floods up to the PMF. • Large number of refuges in new residential areas are not considered suitable, due to increased building costs, isolation of large numbers of occupants, and access difficulties for emergency services for resupply or emergency evacuation of occupants (eg medical emergency). • Evacuation of occupants is therefore preferred risk management option.	• Places safety of rescuers and those being rescued at high risk. • This is contrary to the TLEP and the FPDM and is not an acceptable risk management approach.
PREFERRED OPTION	• **Permit applications for TLEP Amendments on Land Type 2(a) - Flood Free Access (Natural) for habitable land use**		
Land Type 2b - Flood Free Access (Engineered) *Land is linked to land above PMF level by fill, roads, bridges and the like*	• As for Land Type 2(a) • Provision of engineered access will typically increase land development costs, compared to "low island" development.	• As for Land Type 2(a)	• As for Land Type 2(a)
PREFERRED OPTION	• **Permit applications for TLEP Amendments on Land Type 2(b) - Flood Free Access (Engineered) for habitable land use**		
Land Type 3 - Low Islands *Land and dwellings are constructed at design flood level but below PMF level, with no flood free access to land above PMF level*	• Evacuation can only occur prior to local roads being inundated by flood waters. Relies heavily on adequate warning times, education and community response to warnings, which the FPDM does not support. • Those who do not evacuate require rescue by emergency services.	• Low island developments have no provision for refuge above the FPL up to the PMF. This makes it unsafe for occupants to shelter in place during floods exceeding the FPL, requiring rescue as evacuation routes are already inundated.	• Places safety of rescuers and those being rescued at high risk. • This is contrary to the TLEP and the FPDM and is not an acceptable risk management approach.
PREFERRED OPTION	• **Exclude applications for TLEP Amendments on Land Type 3 - Low Islands for habitable land use**		

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Appendix D - Options Analysis for Habitable Land Use Development Controls

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LAND USE RISK CLASS	FLOOD RISK MANAGEMENT OPTIONS			
	AVOIDANCE *Mandate development to be above the PMF, on flood free land.*	***EVACUATION*** *Mandate development to have natural or engineered road access to land above PMF for relocation of occupants above flood level.*	***SHELTER IN PLACE*** *Development is required to have a habitable refuge capable of accommodating and servicing the needs of in-situ occupants above the PMF so that they can "wait out" the flood event for its duration.*	***RESCUE*** *No habitable areas within the development are located above the PMF level and occupants require rescue by emergency services to relocate them to land above PMF level.*
(a) Critical Infrastructure and Emergency Response Facilities *As per Appendix K3.1 of the FPDM - Police and ambulance stations, hospitals, SES headquarters, evacuation centres and civil infrastructure such as major telephone exchanges and power sub-stations.*	• Ensures critical infrastructure and emergency response facilities remain operable for all floods up to the PMF. • Consistent with FPDM recommendations and DoP Guideline • Facilities may be isolated from sections of existing communities, including staff. A requirement for high road access will sterilize many otherwise suitable sites.	• Critical facilities are expected to provide support to evacuees and emergency personnel, so evacuation of these facilities is not considered acceptable.	• Critical facilities must be accessible during large floods, so this option can only be applicable if located on land above PMF (i.e. avoidance). • Many existing facilities are located below PMF, so need to apply provisions for extensions and upgrades relying on shelter in place option: 50% of all additional floor areas must be above the PMF to provide emergency refuge. Refuge areas must be able to cater for needs of occupants. Building height limits may apply. Flood Response Assessment Plans required with DA.	• Not supported by FPDM • Critical facilities are expected to provide support to rescuers and those being rescued.
PREFERRED OPTIONS	• **Mandate all new critical infrastructure and facilities to be located above PMF, unless exceptional circumstances can be justified.** • **Permit minor expansion of existing facilities without consideration of PMF. Major expansion below PMF subject to provision of adequate PMF refuge.**			
(b) Sensitive Uses *Housing (including group homes) and care facilities for seniors and disabled persons.*	• Ensures that no evacuation is necessary during a flood event. • May still be isolated from critical services e.g. hospitals. • Prevents any new development below PMF, which is considered too restrictive and unnecessarily sterilizes otherwise suitable land. • Mandated avoidance is not supported by FPDM.	• Connection by high road to land above PMF will ensure road evacuation is possible for all occupants during large floods. • Limited emergency evacuation destinations available to cater for high needs patients. Refer SES Tweed Flood Plan. • In some cases, relocation of sensitive occupants may place them at greater risk due to stress, exposure to elements etc. • Flood Response Assessment Plans required with DA • Effective evacuation relies heavily on early warning systems and community education • Provision of high level evacuation routes for sensitive facilities is consistent with DoP Guideline	• Reduces complexity of evacuating, accommodating and servicing needs of occupants offsite, reducing stress on high risk patients. • Access problems for additional staff once low road accesses are inundated. • Access problems for emergency services if evacuation of sheltering occupants (e.g. medical emergency) is needed once low road accesses are inundated. • Incompatible with current food and medical delivery services for many existing facilities. • Many existing facilities are located between 100 year ARI and PMF floods and are isolated by road in large floods, so need to apply provisions for extensions and upgrades relying on shelter in place option: 50% of all additional floor areas must be above the PMF to provide emergency refuge. Refuge areas must be able to cater for needs of occupants. Provides a "no worsening" case for emergency services. May conflict with building height limits. • Flood Response Assessment Plans required with DA • Provision of refuge for sensitive occupants is consistent with DoP Guideline	• Not supported by FPDM • Rescuers and those being rescued are placed at risk. • Emergency services are generally not equipped to rescue large numbers of high risk patients • Rescue operations place sensitive occupants at greater risk due to stress, exposure to elements etc.
PREFERRED OPTIONS	• **Mandate all new sensitive development to have permanent high level road evacuation route(s) to land above PMF level and/or adequate PMF refuge, subject to the recommendations of an acceptable Flood Response Assessment Plan.** • **Permit minor expansion of existing facilities without consideration of PMF. Major expansion below PMF subject to provision of adequate PMF refuge.**			

continued over - 1 of 3

LAND USE RISK CLASS	FLOOD RISK MANAGEMENT OPTIONS			
	AVOIDANCE *Mandate development to be above the PMF, on flood free land.*	***EVACUATION*** *Mandate development to have natural or engineered road access to land above PMF for relocation of occupants above flood level.*	***SHELTER IN PLACE*** *Development is required to have a habitable refuge capable of accommodating and servicing the needs of in-situ occupants above the PMF so that they can "wait out" the flood event for its duration.*	***RESCUE*** *No habitable areas within the development are located above the PMF level and occupants require rescue by emergency services to relocate them to land above PMF level.*
(c) Medium and High Density Accommodation *(i) Multi dwelling housing, dual occupancy, residential accommodation, residential flat building, backpackers' accommodation, boarding house, hostel, hotel accommodation, serviced apartment, tourist and visitor accommodation, and accommodation associated with an educational establishment*	• May still be isolated from critical services e.g. hospitals. • Prevents any new development below PMF, which is considered too restrictive and unnecessarily sterilizes otherwise suitable land. • Mandated avoidance is not supported by FPDM.	• Connection by high road to land above PMF will ensure road evacuation is possible for all occupants for large floods. • Mandating evacuation via high road considered too restrictive and unnecessarily sterilizes otherwise suitable land. • Limited emergency evacuation destinations able to cater for occupants. Refer SES Tweed Flood Plan. • Flood Response Assessment Plans required with DA • Effective evacuation relies heavily on early warning systems and community education • May not comply with DoP Guideline, requiring DECC & DoP concurrence.	• Reduces complexity of evacuating, accommodating and servicing needs of occupants offsite • Access problems for emergency services if evacuation of sheltering occupants (e.g. medical emergency) is needed once low road accesses are inundated, but risks are less than sensitive land use class, and considered acceptable. • Many existing facilities are located between 100 year ARI and PMF floods and are isolated by road in large floods, so need to apply provisions for extensions and upgrades relying on shelter in place option: All additional habitable floor areas must be connected internally to floor areas above the PMF. Refuge areas must be able to cater for needs of occupants. Provides a "no worsening" case for emergency services. • May conflict with building height limits. • May not comply with DoP Guideline, requiring DECC & DoP concurrence. • Flood Response Assessment Plans required with DA	• Not supported by FPDM • Rescuers and those being rescued are placed at risk.
PREFERRED OPTIONS	• **Mandate all new high/medium density development to have permanent high level road evacuation route(s) to land above PMF level and/or adequate PMF refuge, subject to the recommendations of an acceptable Flood Response Assessment Plan.** • **Permit minor expansion of existing facilities without consideration of PMF. Major expansion below PMF subject to provision of adequate PMF refuge**			
(c) Medium and High Density Accommodation *(ii) Moveable dwellings, caravan parks*	• May still be isolated from critical services e.g. hospitals. • Prevents any new development below PMF, which is considered too restrictive and unnecessarily sterilizes otherwise suitable land. • Mandated avoidance is not supported by FPDM.	• Connection by high road to land above PMF will ensure road evacuation is possible for all occupants for large floods. • Short term occupants are generally highly mobile and can readily relocate to high land. Are relatively self sufficient while mobile with little reliance on emergency support. • Effective evacuation relies on early warning systems and appropriate notification measures by facility management. • Flood Response Assessment Plans required with DA • Prevents any new development or expansion of existing facilities not connected by high road to land above PMF, or benefiting from high land within the site. This is considered necessary due to existing emergency response issues for such parks relating to long term residents. • May not comply with DoP Guideline, requiring DECC & DoP concurrence.	• Difficult to manage temporary occupants with no knowledge of flood risks. Management are unable to predict all emergency needs for future occupants, to provide suitably equipped shelter. • Access problems for emergency services if evacuation of sheltering occupants (e.g. medical emergency) is needed once low road accesses are inundated. • May conflict with building height limits.	• Not supported by FPDM • Rescuers and those being rescued are placed at risk.
PREFERRED OPTIONS	• **Mandate all new caravan/moveable dwelling parks to have permanent high level road evacuation route(s) to land above PMF level.** • **No expansion of existing facilities permitted, unless permanent high level road evacuation route to high land external to the site is available, or high land internal to the site can be accessed by the additional sites via high level road and/or pedestrian routes.**			

continued over - 2 of 3

LAND USE RISK CLASS	FLOOD RISK MANAGEMENT OPTIONS			
	AVOIDANCE *Mandate development to be above the PMF, on flood free land.*	***EVACUATION*** *Mandate development to have natural or engineered road access to land above PMF for relocation of occupants above flood level.*	***SHELTER IN PLACE*** *Development is required to have a habitable refuge capable of accommodating and servicing the needs of in-situ occupants above the PMF so that they can "wait out" the flood event for its duration.*	***RESCUE*** *No habitable areas within the development are located above the PMF level and occupants require rescue by emergency services to relocate them to land above PMF level.*
(d) Residential Subdivision and Development *Urban Residential Subdivision (including small lot rural subdivision)* *Urban Residential Dwellings* *Rural Subdivision* *Rural Residential Dwellings*	• May still be isolated from critical services e.g. hospitals. • Prevents any new development below PMF, which is considered too restrictive and unnecessarily sterilizes otherwise suitable land. • Mandated avoidance is not supported by FPDM.	• Connection by high road to land above PMF will ensure road evacuation is possible for all occupants for large floods. Mandating subdivision roads above 100 year ARI flood level (including stormwater overland flow paths) will increase filling requirements for subdivision developers, increasing land costs. Increased filling and high level roads provide more efficient urban stormwater systems, reducing stormwater flash flooding. • Filling requirements are reduced if flood free pedestrian accesses are mandated for subdivision design. Relies on the mobility of residents (e.g. children, aged), so pedestrian connection to high road should not exceed 100m. Also relies on the provision of buses at muster points along the high roads, which may be logistically unfeasible for large communities. Residents are unable to carry many belongings or supplies if evacuating by foot, increasing demands on emergency services and evacuation centres. • Effective evacuation relies heavily on early warning systems and community education • Limited emergency evacuation destinations able to cater for occupants. Refer SES Tweed Flood Plan. • Flood Response Assessment Plans required with DA • May not comply with DoP Guideline, requiring DECC & DoP concurrence.	• Reduces complexity of evacuating, accommodating and servicing needs of occupants offsite • Frees up land for residential development that would otherwise be sterilized should evacuation be mandated as the sole risk response - more efficient land use to cater for future growth. • In large subdivisions, potential for significantly greater numbers of dwelling occupants sheltering in place during large floods. Creates access problems for emergency services if evacuation of sheltering occupants (e.g. medical emergency) is needed once low roads are inundated. Not considered acceptable for large, new subdivisions, particularly green field sites where flood free accesses can be engineered into the landform. • Current urban development patterns have created many undeveloped urban areas that do not have evacuation connection to high land. So that otherwise suitable land is not unnecessarily sterilized, need to apply provisions for PMF refuges in all new residential dwellings within existing urban development areas not serviced by high road or pedestrian access. • PMF refuges not considered necessary for dwellings protected by 100 year ARI levees in Murwillumbah due to increased warning time and proximity to high land. Considered equivalent to high road access. • Minor extensions to existing dwellings are permitted without consideration of the PMF as they are not considered to increase risk management considerations for the property. • Apply PMF refuge requirements via covenants on land titles of all new allotments that do not have evacuation connection to high land created by infill subdivision (less than 5ha, surrounded by other areas below PMF where urban subdivision has already occurred). • Refuges may have impacts on the affordability of housing (i.e. cost of additional storey) and may conflict with building height regulations, neighbour amenity, streetscape and other planning issues. • Flood Response Assessment Plans required with DA • May not comply with DoP Guideline, requiring DECC & DoP concurrence.	• Not supported by FPDM • Rescuers and those being rescued are placed at risk.
PREFERRED OPTIONS	• **Mandate all new subdivisions to have high level road evacuation route(s) to land above PMF level, accessible to all allotments via (as a minimum) flood free pedestrian accesses not exceeding 100m in length.** • **Permit infill subdivision subject to the creation of covenants on land titles of all new allotments that cannot achieve suitable high level road/pedestrian evacuation route(s) to land above PMF level, requiring adequate PMF refuges in all future dwellings.** • **Mandate adequate PMF refuges in all new dwellings on existing allotments that are located below PMF level and that are without suitable high level road/pedestrian evacuation route(s) to land above PMF level, unless that land is protected by a 1 in 100 year levee (Murwillumbah CBD, East Murwillumbah, Dorothy/William Street).** • **Minor extensions to existing dwellings permitted without consideration of the PMF. Dwellings undergoing major extensions must meet new single dwelling criteria.**			

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