FLOOD-PRONE LAND POLICY

Environmental Services Division

DUBBO
CITY COUNCIL

Operational: 6 May 2013

This page is left blank

CONTENTS

This page is left blank

1 Introduction

The city of Dubbo enjoys a range of benefits associated with its location on the banks of the Macquarie River. However, the Macquarie River as well as the Talbragar River and a number of other tributaries all present a hazard to development in times of flood.

It is important that any potential developer of land and Council, as the consent authority and custodian of land, acknowledge the risk of flooding and consider the economic, environmental, social and safety implications and seek to mitigate the effect of development on flooding and vice-versa.

With these considerations in mind, this chapter has been prepared with the aim of setting out Council's requirements for subdivision, building and other development proposals where they apply to flood-prone land in urban Dubbo.

Photograph 1: Looking south along Macquarie Street from the Talbragar Street intersection – 1955

Council has made a decision to view the 1% Annual Exceedence Probability (AEP) (previously referred to as the '1 in 100 year flood') as a development constraint - that is the 1% AEP is the 'Flood Standard' for Dubbo. To cater for anomalies in the flood profile, wave action and the like, the level to be used for planning purposes in urban Dubbo, known as the 'Flood Planning Level' (FPL), is 500 mm above the 1% AEP year level.

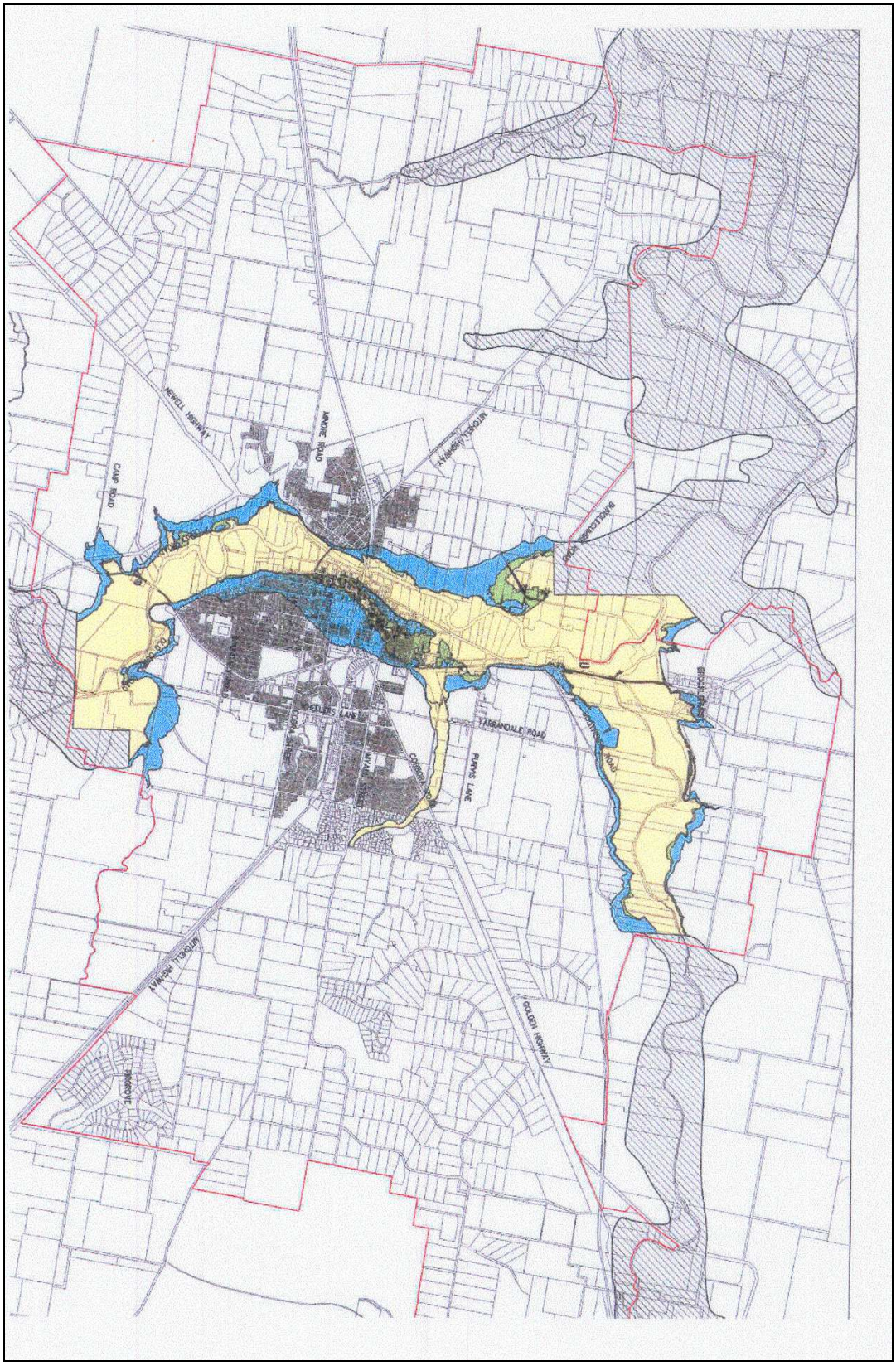
Note: Referring to the 1% AEP as the '1 in 100 year flood' is misleading. The 1% AEP refers to the probability that the 'flood standard' will occur each year, not that an event equalling the 'flood standard' will only occur once every 100 years.

A distinction is made for emergency services for which the FPL is that of the 'Probable Maximum Flood' (PMF).

All lands in the urban area that are located below the FPL are subject to flood-related planning requirements throughout this chapter.

Figure 1: Flood Management Plan Urban Areas - Flood Map

→N

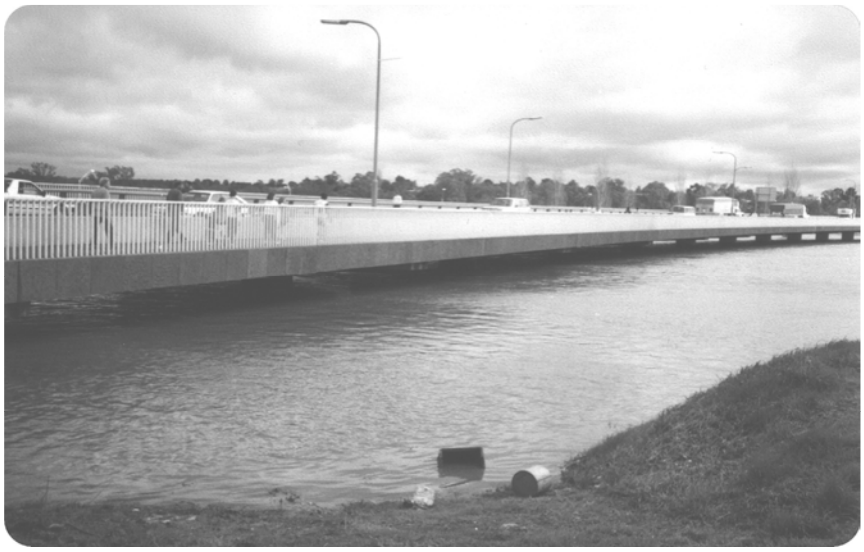


Section 3 of this chapter explains how to determine whether a site in the area is subject to controls and if so how to determine the appropriate flood levels. The controls that apply depend in part upon whether a site is in a high hazard area, low hazard area or flood standard fringe area and also explains the basis used to determine the hazard 'category' for a site.

Section 4 of this chapter explains the planning requirements that apply for different types of development and for the different parts of the floodplain (ie high hazard area, low hazard area and the flood standard fringe area - see Figure 1).

Section 5 of this chapter identifies those sites that were identified as exceptions in the Flood Management Plan (FMP) and details the unique requirements for development of these areas.

Photograph 2: L H Ford Bridge – August 1990



1.1 Context of this chapter

This chapter has been prepared having regard to the principles and policies contained in Part A of the Dubbo City Flood Management Plan 2000 - Urban Areas. Any proposed changes to this chapter shall be in accordance with the principles and policies of the FMP.

Figure 1 shows the extent of available flooding data or, more specifically:

- The flood standard area (defined as the 1% AEP) in yellow;
- The flood standard fringe area (which is defined as the FPL) in green. Note: The detailed requirements of this chapter principally apply to these areas;
- The urban area is outlined in red;
- The peak maximum flood (PMF), which is a constraint for emergency services (see 4.7), in blue; and
- The extent of the 1955 flood (extreme event), hatched area.

Together, these areas represent the approximate extent of flood-prone land in urban Dubbo.

The other sources for the material contained in this chapter are:

- Dubbo City Council Floodplain Management Study (PPK 1992 as amended);
- The Talbragar River Flood Study (PPK 1995);
- The Hydraulic Analysis for the CBD (Terra Sciences 1998);
- The NSW Floodplain Development Manual (1986); and
- Council's existing codes and policies.

In accordance with NSW Government policy, each application or proposal for development on flood-prone land will be considered on its merits, having regard to the flood policies of the State Government, the intent of Council's FMP, the requirements of Dubbo Local Environmental Plan (DLEP) 2011, this chapter and those of other relevant chapters which have been adopted by Council.

Photograph 3: An aerial view of Dubbo (looking north) - December 2010

2 How this Policy operates

2.1 Land to which this plan applies

This chapter applies to all land that is shown as the 'Flood planning area' on the Flood Planning Maps and other land at or below the flood planning level.

Appendix C contains Flood Planning Maps sheets 07A, 07C, 08A and 08B showing the 'Flood planning area' as green which incorporates the 'Flood Planning Level'.

Although based on information contained in the PPK report and (where that report does not apply), information from earlier flood studies, the lines on these maps should still only be considered as approximate.

In the absence of better information, the 'Flood planning maps' will be used by Council to determine the area in which development proposals will have to address flood issues.

2.2 Objectives

The aim of this Policy is to clearly set out Council's flood-related requirements for subdivision, building and other development proposals for land that is flood-prone in the Dubbo Local Government Area (LGA).

The objectives of this Policy are to:

(1) Give statutory effect to the policies contained in Council's Floodplain Management Plan 2000 - Urban Areas;
(2) Reduce the impact of flooding and flood liability on individual owners and occupiers and reduce private and public losses resulting from flooding;
(3) Ensure construction and development is compatible with the flood risk of the area;
(4) Ensure that buildings and other structures built in flood-prone areas, where permitted, are designed and constructed to withstand the likely stresses of the 1% AEP and not impede the flow of floodwater in high risk areas including the impact of debris;
(5) Manage the riverine environment so as to protect and enhance flora and fauna communities;
(6) Facilitate development which contributes to the function of the Dubbo Central Business District (CBD) as a commercial, tourist, recreation and entertainment centre;
(7) Manage the river corridor as a high quality recreation area and ensure adjoining development recognises and enhances the high visual quality of the river corridor;
(8) Discourage inappropriate development below the Flood Standard Reference Level (FSRL); and
(9) Recognise and consider the cumulative impact of development in the floodplain.

2.3 How to use this chapter

Development proposals shall satisfy the objectives (above) of this chapter as relevant, as well as the more detailed requirements as applicable, that are in Sections 4 or 5. Consideration should also be given to the provisions of any current NSW Government policy on flood-prone land.

Note: The requirements of this chapter are in addition to the requirements of DLEP 2011 and those of any other chapters applying to the land.

2.4 Departures

If a proposal does not comply with one or more of the specific requirements of this chapter, the proposal may be refused. An applicant can request Council grant a departure from a specific requirement. In such cases, the applicant will be required to:

(1) Demonstrate that there is insufficient land elsewhere in the city to satisfy the demand for the particular proposal that allows for the proposed use and is above the FSRL;
(2) Submit an hydraulic analysis, including the effect of the proposal in isolation and also the cumulative impacts of the same or similar development extending along the full length of the Macquarie and/or Talbragar Rivers on lands zoned to allow development in a like manner; and
(3) Demonstrate that the proposal is otherwise consistent with the aims and objectives of this chapter and the intent of the FMP.

It is strongly recommended that the applicant has a meeting with Council's Environmental Services officers where a departure is to be sought.

Note: The decision to allow or refuse a departure is at Council's discretion and should not be assumed.

2.5 Floodplain management committee

The role of Council's Floodplain Management Committee is to assist Council in the development and adoption of the FMP.

3 Determining flood levels and hazards for specific sites

3.1 Adopted flood standard and the flood planning level

There are varying degrees of risk associated with different flood events. The rarer the flood event, the larger the scale and extent of flooding and the greater the danger and potential for damage. Council has made a decision that the flood standard will be the 1% AEP. The level of this flood is called the Flood Standard Reference Level (FSRL).

However, to allow for variation in the flood profile, the level to be used for most planning purposes is the FPL, being 500 mm above the 1% AEP. That is, the FPL is equivalent to the FSRL + 500 mm (see Appendix B, Figure 8).

Exceptions to the application of the FPL are identified in Section 5 including development in Brocklehurst and commercial development in the CBD. An exception to the FPL is also made for emergency services, where due to their unique role, they are encouraged to site, build and operate clear of the PMF.

3.2 Identifying the flood planning level for specific sites

The best available figures on flood levels along the river profile are contained in a series of technical reports prepared by PPK consultants. These reports provide data on the FSRL as well as information on the Extreme Event at a number of cross sections. The complete list and cross sections are attached as Appendix B.

Note: As these levels are indicative, a detailed site survey should still be undertaken for each development site.

In locations beyond those listed in the cross sections in Appendix B and/or where the FSRL has not been established, the following will apply:

(1) For the Macquarie and Talbragar Rivers, the 1955 flood level will be assumed to be equivalent to the FSRL; and

Note: The information from the Macquarie Flood Atlas on the extent of the 1955 flood is indicative.

(2) For Troy Gully, the 1% AEP as shown on the Flood Planning Maps will be assumed to be the FSRL unless it can be shown by a hydraulic study undertaken in accordance with the principles as set out in the NSW Floodplain Development Manual that a different level should apply.

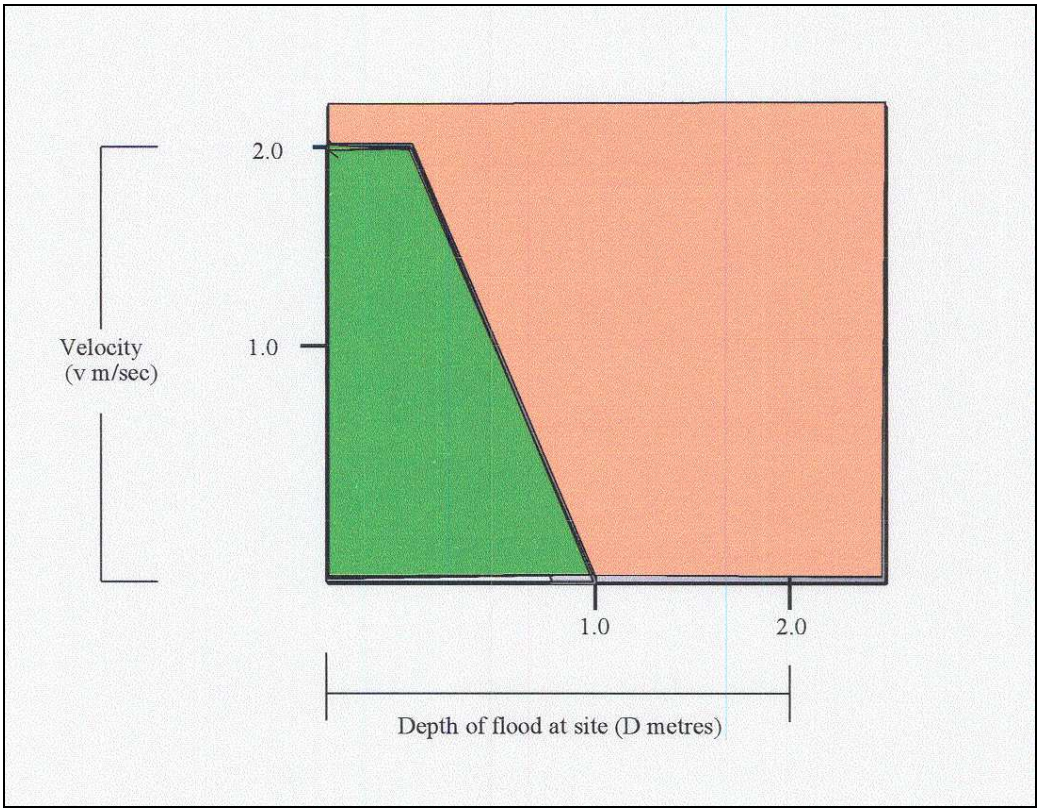
The larger scale flood maps called 'Dubbo Floodplain Management Plan, Urban Areas, Floodmap (sheets 1 and 2)' which are held in the Council offices show the approximate extent of the 1% AEP.

However, they should still only be considered as approximate. They do not provide adequate information for detailed assessment of the flood aspects of subsequent development applications and so applicants seeking to develop land below the FPL should consult a surveyor to determine the precise level of inundation of the property. Such calculations should be based on the levels provided in Appendix B.

3.3 Determining the hazard category for specific sites

'Hazard' refers to the depth and velocity of floodwater and is used as an indicator of the potential danger of using the land and the implications for evacuation (see Figure 2).

Figure 2: Determining high and low hazards



Council has also prepared maps that (for the purpose of this chapter) indicate areas of high and low hazard for some parts of the city (Figure 3). This information is necessary to determine which development requirements in Section 4 will apply.

However, the flood hazard maps do not extend over the entire 1% AEP floodplain. In the absence of information identifying land that is below the FSRL as either high or low hazard, Council will assume the land to be within the high hazard area (see Section 5 - Exceptions). The onus is on the proponent to demonstrate otherwise in accordance with the definitions and procedures in the manual and the Dubbo Floodplain Management Study, (PPK 1992).

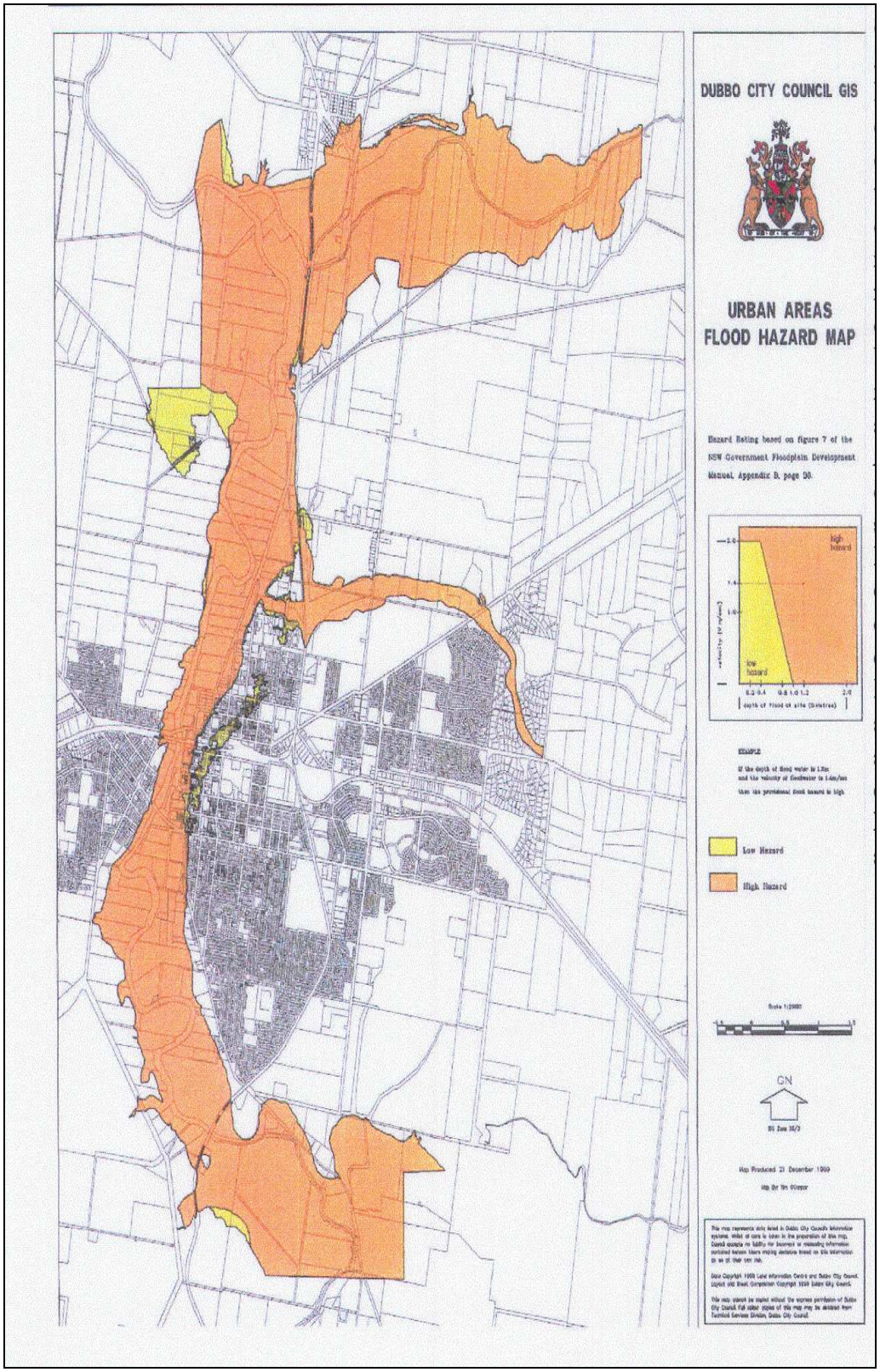
Photograph 4: Showing the depth and velocity of the flood waters at the corner of Macquarie and Erskine Streets - December 2010

3.4 Updating of the model and cumulative impact

To account for cumulative effects, the impact of new development should be factored into the flood model on a regular basis. In determining flood levels and hazard categories, consideration is to be given to any revised levels available as a consequence of the updating of the flood model.

To mitigate a gradual creep in flood levels past the point of significant impact, Council in assessing the impact of development will compare any potential increases in flood levels or extent of hazard caused by the proposal and like development against the levels applicable in this Policychapter (ie compare the revised FPL, resulting from any incremental development and updating of the flood model, to the original FPL).

Figure 3: Urban areas flood hazard map



4 Development requirements

4.1 Development

The requirements of this section will apply in addition to those of DLEP 2011 (particularly Clause 7.1 Flood liable land) and those of other applicable chapters of Development Control Plan 2011.

4.1.1 General requirements

Where an application is lodged for new development, irrespective of whether the site is in the high hazard, low hazard or flood standard fringe area, the following general requirements shall be met.

Applications for development on land below the FPL shall be accompanied by:

(1) A contoured survey plan prepared by a registered surveyor showing ground levels, the FSRL and the location of existing and proposed buildings on the site relative to the Australian Height Datum;
(2) A flood analysis prepared by a suitably qualified person to demonstrate impact on flood levels, threat to life and accessibility from a public road; and
(3) An assessment of the cumulative impact of the proposed development, prepared by a suitably qualified person, as well as the impact of the same or similar development also occurring along the full length of the Macquarie River, Talbragar River and/or Troy Gully corridor (ie on land that has the potential for development of a similar nature) on flood levels, property and existing development.

4.1.2 General notes

No building or work, including land-filling by way of the deposition of any material, will be permitted on land lying below the FPL where, in the opinion of Council, such building or work (including fencing, excavation, land-filling, reshaping or vegetation) is likely to exacerbate flood risk to other property.

For the purpose of more accurately identifying the boundary of high hazard, low hazard and flood standard fringe areas, Council may require detailed survey and hydraulic information to be submitted by the applicant prior to determination of any application for development.

Council will periodically update the flood model to help account for the cumulative impact of new development and to incorporate more detailed survey data. The revised FPL (if any) is to be used as the FPL by applicants when preparing applications for Council.

Prior to the occupation of new development, alterations or additions to existing development, Council will require the submission of a certificate by a registered surveyor showing the floor levels of the completed building or work and the finished ground levels on the site.

In the event that the development has the potential to cause a significant increase in flood hazard, the application may not be approved. Alternatively, Council may require the applicant to provide adequate and acceptable compensating works to offset the increase. Exceptions may be made where the development is demonstrably for a public purpose.

4.1.3 Specific requirements for development in high and low hazard areas

Land uses

Development shall not be undertaken in the high or low hazard areas unless it is in accordance with the requirements of DLEP 2011.

The majority of land in the high and low hazard areas is zoned RU2 Rural Landscape, E3 Environmental Management and RE1 Public Recreation. However, some lands may be subject to residential, business or industrial zoning and applicants are referred to DLEP 2011 to ascertain what land uses are permissible in the relevant zone.

Note: No fill is to be deposited on land in the high hazard area (see Section 4.6 – Landfilling and Reshaping).

Photograph 5: Showing the inundation of the Hans Clavan soccer fields on the western side of Bligh Street - December 2010

Development standards

Council shall not grant consent for development on land in the high or low hazard areas unless the Council:

(1) Has taken into account the objectives and policies of the FMP;
(2) Has considered details that demonstrate how the proposal is consistent with the general requirements in 4.1.1 of this chapter; and
(3) Is satisfied that:
    (a) There is no alternate location for the development on the subject site, that is of a lesser hazard;

(b) The finished floor level of the proposed development is above the FPL and the underside of the floor support beams/members and service pipe work are above the FSRL;

(c) The development is designed in accordance with the Flood-Proofing Guidelines (Appendix A) so as to ensure that the risks of structural failure or damage in the event of flood, including damage to other property, are minimised; and

(d) The development is designed to withstand the effects of inundation by floodwaters including the incorporation of measures to seal or flood-proof buildings to avoid activities or fittings susceptible to flood damage or to store the contents of buildings above the FPL.

Note: The applicant will be required to submit detailed drawings, reports and certification by a qualified practising consulting structural engineer to show that the building or structure can withstand the force of flowing floodwaters, including debris and buoyancy forces, as appropriate and will not sustain unacceptable damage from the impact of floodwaters and debris in times of major flooding.

Other information required

In high and low hazard areas the applicant will also be required to satisfactorily demonstrate:

(1) What potential impact the proposed development may have on the character of floodwaters in the event of a major flood;

(2) That there will be no potential for detrimental changes to the flow of floodwater as a result of the proposed development nor potential harm to human life, animal welfare, or property;

Note: The applicant will be required to submit a detailed report from an appropriately qualified engineer, prior to the determination of the application, that explains that the development will not increase the flood hazard or flood damage to other properties or adversely affect flood behaviour.

(3) That provision is made for the safe evacuation of people and the storage of the contents of buildings above the FPL.

Note: The development shall incorporate permanent, fail-safe, maintenance-free measures to ensure the timely, orderly and safe evacuation of people from the area should a flood occur. In addition, applicants will also be required to demonstrate that the displacement of these people will not significantly add to the overall cost and community disruption caused by the flood.

4.1.4 Specific requirements for development in flood standard fringe areas

Land uses

Development in the flood standard fringe area being land located between the Flood Standard (1% AEP) and the Flood Planning Level (500 mm above the 1% AEP) is permitted in accordance with the zoning of the land and the applicable development requirements of DLEP 2011.

Development standards

(1) Dwelling houses and tourist and visitor accommodation:

Where dwelling houses or tourist and visitor accommodation may be erected in the applicable zone, the finished floor levels of all habitable rooms shall be above the FPL.

(2) All development:

Where development may be erected in the applicable zone, Council shall not grant consent unless it is satisfied that the development:

(a) Is designed in accordance with the Flood-Proofing Guidelines (Appendix A) in order that the risks of structural failure or damage in the event of a flood including damage to other property are minimised;

(b) Is designed to withstand the effects of inundation by floodwaters including the incorporation of measures to seal or flood-proof buildings to avoid activities or fittings susceptible to flood damage or to store the contents of buildings above the FPL; and

(c) Wherever practicable incorporates measures designed to assist evacuation in the event of a flood, to ensure access by emergency services, or to otherwise facilitate emergency services operations.

Whilst it is not mandatory, applicants proposing development other than residential or tourist development in the flood standard fringe area are strongly advised to elevate the finished floor level to the FPL.

4.2 Additions, alterations and replacement of existing development

Maintenance and minor repairs to existing developments are permitted where they do not require Council consent.

Note: Although expansion of incompatible development is not encouraged on sites below the FSRL it should be noted that 'Existing Use' provisions contained in the Act may allow for the continued operation of existing land uses, extensions and changes in use.

Photograph 6: Lack of flood-free access - December 2010

4.2.1 General requirements

Where an application is to be lodged for additions or alterations to, or replacement of, existing development, irrespective of whether the site is in the high hazard, low hazard or flood standard fringe area, the following general requirements shall be met:

All applications for development on land below the FPL shall be accompanied by:

(1) A contoured survey plan prepared by a registered surveyor showing ground levels, FSRLs and the location of existing and proposed buildings on the site relative to the Australian Height Datum;
(2) A flood analysis prepared by a suitably qualified person to demonstrate impact on flood levels, threat to life or property and accessibility from development to public road; and
(3) An assessment of the cumulative impact of any additional development as well as the impact of the same or similar additions also occurring along the full length of the Macquarie and Talbragar Rivers and/or Troy Gully corridor (ie on land that has the potential for development of a similar nature) on flood levels, property and existing development.

4.2.2 General notes

No building or work, including land-filling by way of the deposition of any material, will be permitted on land lying below the FPL where, in the opinion of Council, such building or work (including fencing, excavation, land-filling, reshaping or vegetation) is likely to exacerbate flood risk to other property.

For the purpose of more accurately identifying the boundary of high hazard, low hazard and flood standard fringe areas, Council may require detailed survey and hydraulic information to be submitted by the applicant prior to determination of any application for development.

Council will periodically update the flood model to account for the cumulative impact of new development and to incorporate more detailed survey data. The revised FPLs (if any) are to be used as the FPL by applicants when preparing their application.

Prior to occupation of new development or alterations and additions to existing development, a certificate by a registered surveyor showing the floor levels of the completed building/work and the finished ground levels on the site shall be submitted to Council.

In the event that the development has the potential to cause a significant increase in flood hazard, the application may be refused. Alternatively, Council may require the applicant to provide adequate and acceptable compensating works to offset the increase. Exceptions may be made where the development is demonstrably for a public purpose.

4.2.3 Specific requirements for additions, alterations or replacement of development in high hazard areas

Land uses

Additional development, alterations or replacement shall not be undertaken in high hazard areas unless it is in accordance with the requirements of DLEP 2011.

Note: No fill is to be deposited on land in high hazard areas (see 4.5 – landfilling and reshaping).

Development standards

Council shall not grant consent to additions or replacement of existing developments in high hazard areas unless Council:

(1) Has taken into account the objectives and policies of the FMP;
(2) Has considered details that demonstrate how the proposal is consistent with the general requirements of 4.2.1;
(3) Is satisfied that there is no alternate location for the development on the subject site that is not high hazard;
(4) In respect of additions is satisfied that:
    (a) The finished floor level of the proposed additional development is at or above the FPL and the underside of the floor support beams/members and service pipe work are above the FSRL; or
    (b) Where the finished floor level of the existing building is below the FPL but at or above the FSRL and the addition is also proposed to be below the FPL but at or above the FSRL - subject to adequate justification the floor need not be raised to the FPL. The maximum increase in habitable floor space shall be considered on merit but shall not generally exceed 100 m^2. Note: Incremental additions to the building over time will all be counted as part of the 100 m^2 allowance; or

(c) Where the finished floor level of the existing building is below the FSRL and the proposed addition is also proposed to be located below the FSRL, applicants will need to justify why the proposed floor level should not be raised to the FPL and if justified, the maximum increase in floor area is not to exceed 10% of the floor area of the original building or 30 m^2, whichever is the lesser;

(5) In respect of replacement is satisfied that:

(a) The floor area of the new development does not exceed that of the development being replaced (plus any allowable additions as provided by (4) above);

(b) The finished floor level of the new development is above the FPL and the underside of the floor support beams/members and service pipe work are above the FSRL;

(c) Provision is made for the safe evacuation of people and the storage of the contents of buildings above the FPL;

(6) The development is designed in accordance with the Flood-Proofing Guidelines (Appendix A) in order that the risks of structural failure or damage in the event of flood, including damage to other property, are minimised; and

(7) The development is designed to withstand the effects of inundation by floodwaters, including the incorporation of measures to seal or flood-proof buildings, to avoid activities or fittings susceptible to flood damage, or to store the contents of buildings above the FPL.

Note: Applicants are required to submit detailed drawings, reports and certification by a qualified practising consulting structural engineer to show that the building will not sustain unacceptable damage from the impact of floodwaters and debris in times of major flooding.

Other information required

In high hazard areas the applicant will also be required to satisfactorily demonstrate:

(1) What potential impact the proposed development may have on the character of floodwaters in the event of a major flood;

(2) That there will be no potential for detrimental changes to the flow of floodwater as a result of the proposed development nor potential harm to human life, animal welfare or property;

Note: Council will require the submission of a detailed report from an appropriately qualified engineer prior to the determination of the application that explains that the development will not increase the flood hazard or flood damage to other properties or adversely affect flood behaviour.

(3) That the building or structure can withstand the force of flowing floodwaters including debris and buoyancy forces as appropriate. Building works/structures undertaken below the design floor level shall comply with the Flood-Proofing Guidelines (Appendix A); and

(4) That provision is made for the safe evacuation of people and the storage of contents of buildings above the FPL.

Note: The development shall incorporate permanent, fail-safe, maintenance-free measures to ensure the timely, orderly and safe evacuation of people from the area should a flood occur. In addition applicants will also be required to demonstrate that the displacement of these people will not significantly add to the overall cost and community disruption caused by the flood.

4.2.4 Specific requirements for additions, alterations or replacement of development in low hazard areas and flood standard fringe areas

Land uses

Additional development, alterations or replacement shall not be undertaken in low hazard or flood standard fringe areas unless it is in accordance with the requirements of DLEP 2011.

Development standards

Council shall not grant consent to additions, alterations or replacement of existing developments in low hazard or flood standard fringe areas unless the Council:

(1) Has taken into account the objectives and policies of the FMP;
(2) Has considered details that demonstrate how the proposal is consistent with the general requirements of the chapter in 4.2.1;
(3) Additions to existing buildings or developments in the low hazard area or flood standard fringe area comply with the following criteria:
    (a) Where the finished floor level of the existing building is at or above the FPL or where the addition is freestanding, the finished floor level of additional habitable rooms shall also be at or above the FPL and the underside of the floor support beams/members and service pipe work shall be above the FSRL;
    (b) Where the finished floor level of the existing building is below the FPL but at or above the FSRL and the addition is also proposed to be below the FPL but at or above the FSRL, applicants will need to justify why the floor should not be raised to the FPL and if justified, the maximum increase in habitable floor space shall be considered on merit but shall not generally exceed 100 m^2; or
    Note: Incremental additions to the building over time will all be counted as part of the 100 m^2 allowance.
    (c) Where the finished floor level of the existing building is below the FSRL and the proposed addition is also proposed to be located below the FSRL, applicants will need to justify why the floor should not be raised to the FPL and if justified, the maximum increase in floor area is not to exceed 10% of the floor area of the original building or 30 m^2, whichever is the lesser;
    Note: Where rebuilding of part of an existing building in a tourist development is proposed, exemptions to the requirements contained in this clause may be permitted provided the part being rebuilt exists as an integral part of the building and is being rebuilt solely because of:
        (i) Rationalisation of function within the building; or
        (ii) The form of construction to be used for any additions requires the rebuilding of that section of the development.
(4) Any materials used in the construction of additions or renovations to existing development shall be flood compatible and wherever possible of a similar type to the main structure;
(5) All renovations, reconstructions and additions shall comply with Council's Flood-Proofing Guidelines (Appendix A);
(6) In the case of extensions to existing heritage buildings, floor levels as specified above will apply except where this would be contrary to recognised heritage practise; and

(7) In low hazard areas the applicant shall demonstrate that the building or structure can withstand the force of flowing floodwaters including debris and buoyancy forces as appropriate. Building works/structures undertaken below the design floor level shall comply with Council's Flood-Proofing Guidelines (Appendix A).

4.3 Parking

Open sealed parking areas are considered a flood compatible use for land below the FPL provided parking construction does not adversely affect flood behaviour or create drainage problems on adjoining properties.

4.4 Development in open space zones

(1) Environmental improvement on lands zoned RE1 Public Recreation, RE2 Private Recreation and E3 Environmental Management which lie below the FPL may be undertaken but only in accordance with Council's codes and policies;

(2) Proposed structures are to be designed so as to minimise flood impact (see 4.1.3); and

(3) Proposals for intense/dense forest plantings, which when mature may have the capability to alter flood flows, are to be modelled using HEC Hydraulic Model (or similar) to ensure the likely impact on flood characteristics is minimal. Where these proposals have the potential to impact on flooding (in Council's opinion) they shall be accompanied by a hydraulic assessment.

4.5 Land-filling and reshaping

(1) Land-filling by way of the deposition of any material on land below the FPL shall not be carried out except with the consent of the Council.

(2) Land-filling within high hazard areas is not permitted. Reshaping of land using existing material from within the site is permitted provided it is for the purpose of improving floodwater flow or flood drainage or is to facilitate public/community use of the land in accordance with the zone (eg recreational fields) and maintains sufficient clearance between the ground and any structures upon it for the passage of floodwaters.

(3) All applications for land-filling shall be accompanied by a survey plan prepared by a registered surveyor or engineer showing the contour levels of existing land and designed contour levels for the finishing work.

(4) All applications for land-filling shall be accompanied by a report certified by a suitably qualified engineer detailing the impact of the proposed fill on flooding (including the cumulative impact of similar fill in comparable parts of the floodplain) and where levee banks are proposed, the method of internal drainage proposed.

(5) On completion of approved land-filling work, a certificate by a registered surveyor that the finished levels conform to approved design levels shall be submitted to Council.

Photograph 7: Library and Tourist Visitor Information Centre car park between Macquarie and Bligh Streets - December 2010

(6) In dealing with any application for land-filling or the deposition of waste materials, Council shall have regard to the nature of such material, its suitability for land-fill and the potential for contamination of floodwaters.

4.6 Requirements for emergency service infrastructure

In considering applications for new and upgraded facilities and services which are considered to be essential in times of an extreme flood event, consideration shall be given to locating such facilities above the level of the PMF. Where such a requirement cannot be achieved, measures shall be taken to ensure the facility or service can operate at the required capacity during a PMF. Such facilities include: hospitals; emergency services facilities; designated emergency operations centres; communications facilities; and police and ambulance services.

4.7 Non-habitable rural buildings

(1) These buildings will not be approved in high hazard areas except under exceptional circumstances and with appropriate justification. The justification is to include an assessment of the following:

(a) Any detrimental changes to the flow of floodwater which may potentially result from carrying out the proposed development;

(b) Any possible harm to human life, animal welfare or property;

(c) The potential impact the proposed development may have on the character of floodwaters in the event of a major flood such as threats to the habitats of native fauna;

(d) Any flood-free access route between a public road and the site of the proposed development.

(2) Where it is not practical to locate floor levels above the FPL and the building is required for genuine agricultural purposes, Council may consent to floor levels being below the FPL. In these cases materials used in the construction of the building should be capable of withstanding inundation by floodwaters and flood forces (see 4.1.3).

(3) In considering whether to grant consent Council shall have regard to the bulk of the building, the cumulative impact and the potential for the structure to impact on floodwaters in the locality.

4.8 Other developments on land below the flood planning level

Development of land below the FPL for purposes other than those specifically addressed elsewhere in this chapter may be 'permitted with consent' in accordance with DLEP 2011. Applications for such development shall be accompanied by survey certificates and detailed engineering information as set out in Section 4.

For all such development Council will be guided by this chapter, the objectives and the principles of the Dubbo Floodplain Management Plan 2000 (Part A) and the NSW Floodplain Development Manual.

Nevertheless, where the development applies to a site that is partially affected by the 1% AEP, Council will require such structures to be located on the 'flood-free' portion of the site. Exceptions to this requirement will only be made where Council is satisfied that the merits of the case warrant a departure (see subsection 2.4).

4.9 Dangerous substances

The following items and products are examples of substances extremely vulnerable to flood conditions. Where consent is required and the proposal relates to flood-prone land involving these or any other substance which in the opinion of Council is potentially dangerous, the proposal will be assessed on merit. Whilst consideration will be given to any mitigation techniques and construction the use of these or similar dangerous substances in quantities other than for isolated or occasional household use will generally not be supported on land below the FPL.

Industrial storage or retailing businesses dealing with these products in quantity will generally not be supported on land below the FPL:

Acetone
Ammonia
Benzine
Carbon Disulfide
Celluloid
Chlorine
Hazardous wastes (as defined by NSW EPA)
Hydrochloric Acid
Magnesium
Nitric Acid
Petrol
Phosphorus
Potassium
Sodium
Sulphur

Photograph 8: Industrial property along Darling Street indicating the problems of storage below the flood level - December 2010

4.10 Electrical, oil and gas installations

Special consideration should be given to the design and siting of electrical, petroleum, oils and gas fuel installations (eg bulk fuel stores) including those by servicing authorities on flood-prone land. Such installations where not constituting an emergency service shall be located above the FPL.

5 Exceptions

Despite any other requirements contained within this chapter, the following exceptions shall apply to the extent to which they apply to the proposed development.

5.1 Commercial development in the CBD

Commercial development of the portion of the CBD as defined by Cobra, Bligh, Erskine and Darling Streets (as shown in Figure 5) may be undertaken in accordance with the FMP which is based upon the findings of the Dubbo Floodplain Management Study 1992 and the Hydraulic Analysis for the CBD (Terra Sciences 1998). The studies concluded that increased development could occur in this area with negligible impact on flood levels and velocity.

High and low hazard areas

(1) Any development along Bligh Street which extends into the high or low hazard areas shall be constructed on piers with the underside of the support beams being above the FSRL and as far as possible not inconsistent with existing levels in Macquarie Street. Flood-proofing to the finished floor level and evacuation plans will also be required.

Photograph 9: Showing the floor levels of the businesses along Macquarie Street and the piering of the structure over the car park – December 2010

(2) The space below the floor beams shall be clear and not enclosed by walls or curtain walls so as not to prevent easy inundation and flows through that area.

(3) A certificate from a suitably qualified consulting structural engineer will be required to show that:

(a) All piers and other portions of the structure which are subject to the force of flowing water or debris has been designed to resist the stresses thereby induced by floodwaters. Pier spacing (ie centre-to-centre) should generally be not less than 15.5 m facing the flow;

(b) The foundations and ground conditions existing on the site can adequately withstand forces transmitted through the supports; and

(c) The structure as designed will have negligible effect on the flood levels both at and upstream from the site of the subject building and that there will be no increase in stream velocity downstream of any part of the structure which will cause erosion or instability to any other structure or to the ground surface. If scouring is likely to occur, the method of controlling such scourings is to be documented.

Figure 4: Exception areas in the CBD

(4) Commercial developments extending into the high hazard area shall meet the following design principles:

(a) Permit pedestrian movement between Bligh and Macquarie Streets; and

(b) Give architectural recognition to the Bligh Street frontage as well as the Macquarie Street frontage. This may include a combination of quality architectural design features, facade articulation, variation in building height, window treatments, verandahs, public use or access to the west side of the building and landscaping.

5.2 Residential development within Brocklehurst

Residential development of the lands shown in Figure 6 may be undertaken in accordance with the FMP. The FMP concluded that some further infill development could be facilitated subject to the following criteria being met (in addition to the general requirements):

(1) The site is demonstrated to be low hazard as defined in the FMP;
(2) The dwelling house is on an existing allotment as shown on Figure 6 (ie land located below the FSRL is not permitted to be further subdivided);
(3) The finished floor level of the dwelling house being above the FPL; and
(4) The provision of access that is above the FPL or is at least low hazard access to a public facility (ie a structure providing shelter and basic services) that is above the FSRL.

Fill may be used within the area shown on Figure 6 to obtain the elevation required to comply with the above requirements but such fill is to be limited to the dwelling house area and is not to extend to the rest of the site.

Note: New residential development within the flood standard fringe area in the village of Brocklehurst is permitted subject to Council consent but only where the finished floor levels of all habitable rooms are above the FPL.

Figure 5: Exception area in Brocklehurst

Appendix A: Dubbo Flood-Proofing Guidelines

Adequate flood-proofing of buildings in flood liable areas is an effective and equitable means of reducing flood damage to the structure or buildings. It is essential that flood-proofing be required as appropriate in conditional development consents in flood liable areas.

A draft flood-proofing code (as stated below) is incorporated in Appendix F of the NSW Floodplain Development Manual. It is included as an example of the type of information and conditions that should be required for buildings on land below the FPL.

Flood-proofing of buildings is to be undertaken to the finished floor level unless specified otherwise.

F1 Construction methods and materials

Construction methods and materials are graded into four classes according to their resistance to floodwaters.

Suitable - the materials or products which are relatively unaffected by submersion and unmitigated flood exposure and are the best available for the particular application.

Mild effects - where the most suitable materials or products are unavailable or economic considerations prohibit their use. These materials or products are considered the next best choice to minimise the damage caused by flooding.

Marked effects - as for 'mild effects' but considered to be more liable to damage under flood conditions.

Severe effects - the materials or products listed here are seriously affected by floodwaters and in general have to be replaced if submerged.

For the purpose of this chapter the first two categories will be used (subject to the circumstances) as an indication of adequate flood-proofing.

F2 Electrical and mechanical equipment

For buildings constructed on land below the flood planning level, the electrical and mechanical materials, equipment and installation should conform to the following requirements:

Main power supply - subject to the approval of the relevant electricity supplier, the incoming main commercial power service equipment, including all metering equipment, shall be located above the FPL. Means shall be available to easily disconnect the building from the main power supply.

Wiring - all wiring, power outlets, switches etc should, to the maximum extent possible, be located above the FPL. All electrical wiring installed below the FPL should be suitable for continuous submergence in water and should contain no fibrous components. Only submersible-type splices should be used below the FPL. All conduits located below the FPL should be so installed that they will be self-draining if subjected to flooding.

Equipment - all equipment installed below or partially below the FPL should be capable of disconnection by a single plug and socket assembly.

Reconnection - should any electrical device and/or part of the wiring be flooded, it should be thoroughly cleaned and replaced and checked by an approved electrical contractor before reconnection.

F3 Heating and air conditioning systems

Heating and air conditioning systems should, to the maximum extent possible, be installed in areas and spaces of the house above the FPL. Where this is not feasible, every precaution should be taken to minimise the damage caused by submersion according to the following guidelines:

Fuel - heating systems using gas or oil as a fuel should have a manually-operated valve located in the fuel supply line to enable fuel cut-off.

Installation - the heating equipment and fuel storage tanks should be mounted on and securely anchored to a foundation pad of sufficient mass to overcome buoyancy and prevent movement that could damage the fuel supply line. All storage tanks should be vented to an elevation of 600 mm above the FPL.

Ducting - all ductwork located below the FPL should be provided with openings for drainage and cleaning. Self-draining may be achieved by constructing the ductwork on a suitable grade. Where ductwork must pass through a water-tight wall or flood below the FPL, the ductwork should be protected by a closure assembly operated from above the FPL.

Appendix B: Cross Sections – Macquarie and Talbragar Rivers

Table 1 – Planning flood levels along the Macquarie River (refer to Figure 6)

Cross Section (Number)	Chainage (KM)	Location	1% AEP (m AHD)	1% AEP + 0.5m (m AHD)	Extreme Flood (m AHD)
1	0	Downstream of Talbragar Jn	261.9	262.4	265.6
2	0.54	Upstream of Talbragar Jn	261.9	262.4	265.7
3	1.82		262.0	262.5	265.7
3.1	2.12	Troy Bridge	262.0	262.5	265.7
3.01	2.52		262.0	262.5	265.7
3.02	2.52		262.0	262.5	265.7
3.03	2.53		262.0	262.5	265.7
3.04	2.54		262.0	262.5	265.7
3.2	2.64		262.0	262.5	265.7
5	3.83	Bourke/Brisbane Streets	262.0	262.5	265.7
6	4.63		262.0	262.5	265.7
7	-		262.0	262.5	265.7
8	6.44	River Street	262.0	262.5	265.7
9	6.81		262.0	262.5	265.7
10	7.26	Macleay Street	262.1	262.6	265.7
11.1	7.54		262.3	262.8	265.8
11.2	7.63		262.3	262.8	265.9
11	7.64	Erskine Street	262.3	262.8	266.0
11.3	7.65		262.3	262.8	266.0
11.4	7.66		262.3	262.8	266.0
11.5	7.71		262.5	263.0	266.0
12	7.71	Dubbo Railway Bridge	262.4	262.9	266.0
12.01	7.75		262.4	262.9	266.0
12.02	7.76		262.4	262.9	266.5
12.03	7.82		262.4	262.9	266.6
13	7.83	Talbragar Street	262.4	262.9	266.6
14	8.06	Church Street	262.5	263.0	266.7
15.2	8.13		262.6	263.1	266.8
15.1	8.26	Wingewarra Street	262.6	263.1	266.9
16	8.32		262.7	263.2	266.9
16.1	8.43	Bultje Street	262.8	263.3	267.0
17.1	8.50		262.9	263.4	267.3
17	8.60	L H Ford Bridge	262.9	263.4	267.3
17.11	8.62		263.0	263.5	267.7
17.3	8.66		263.0	263.5	267.7
18	8.78	Mitchell Street	263.1	263.6	267.8
19.1	10.0		263.3	263.8	268.0
19.2	10.0		263.3	263.8	268.0
19.3	10.06	Tamworth Street	263.3	263.8	268.0
19	10.06		263.3	263.8	268.0
20	11.02	Naman Street	263.4	263.9	268.1
21	12.46	Pump Station Gauge	263.6	264.1	268.2
22	14.22		263.8	264.3	268.5
23.1	14.43		263.8	264.3	268.5
23.2	14.58	Dundullimal Railway Bridge	263.9	264.4	268.5
23.4	14.59		263.9	264.4	268.8
23.5	14.69		264.0	264.5	269.0
24	14.98		264.2	264.7	269.1
26	15.70		264.4	264.9	269.2
26.0	16.80		264.7	265.2	269.4
27.0	17.68		264.9	265.4	296.6

Note:
(1) Between cross-sections 0 and 10 (north of Macleay Street) planning flood levels are based on 1% AEP flood flows in the Talbragar River causing concurrent smaller flows in the Macquarie River to 'back up' to a higher level than would normally be expected; and
(2) Between cross-sections 10 and 27 (south of Macleay Street) planning flood levels are based on 1% AEP flood flows in the Macquarie River unaffected by the backwater from concurrent flows in the Talbragar River.

Table 2 - Planning flood levels along Talbragar River east-wards from the Newell Highway (refer to Figure 6)

Cross Section (Number)	Chainage (KM)	Location	1% AEP (m AHD)	1% AEP + 0.5m (m AHD)	Extreme Flood (m AHD)
T0.000	0	'Boothenba'	271.6	272.1	274.2
T0.335	0.335		270.7	271.2	273.1
T0.845	0.845		270.1	270.6	272.3
T1.555	1.555	'Waratah'	267.4	267.9	271.3
T1.950	1.950		267.8	268.3	270.7
T2.590	2.590	'Hamilton Falls'	267.0	267.5	269.8
T3.273	3.273		266.6	267.1	269.5
T4.018	4.018		265.9	266.4	269.2
T5.198	5.198	'Pine Hill'	265.2	265.7	268.9
T6.368	6.368	Yarrandale Road	264.2	264.7	268.6
T6.718	6.718	Troy STW	264.0	264.5	268.5
T7.768	7.768	Brocklehurst silo	263.4	263.9	268.3
T8.020	8.020	Brocklehurst Village	263.0	263.5	268.1
T8.058	8.058	Newell Highway	262.8	263.3	268.1

Note:
(1) These figures are quoted from the PPK Report 1992 as amended in 1998. Whilst considered accurate at the time of writing, they may be superseded by subsequent studies.
(2) The flood level is greater than upstream because flooding occurs from the Talbragar River which banks up behind the Newell Highway embankment and the road and railway bridges immediately south of Brocklehurst village.

Figure 6: Flood planning levels for the Macquarie and Talbragar Rivers

Figure 7: Key terms

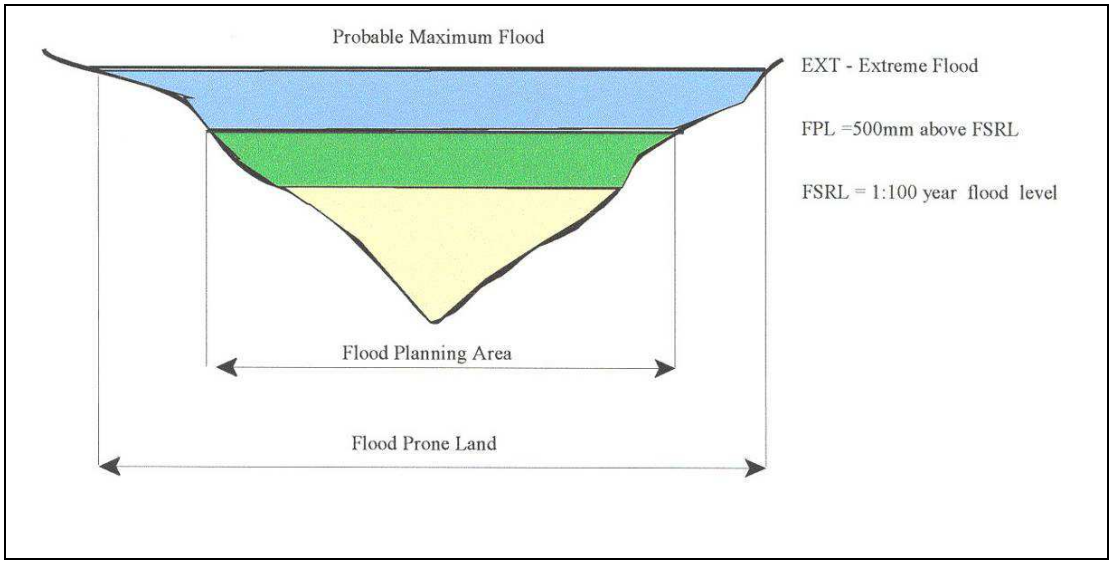
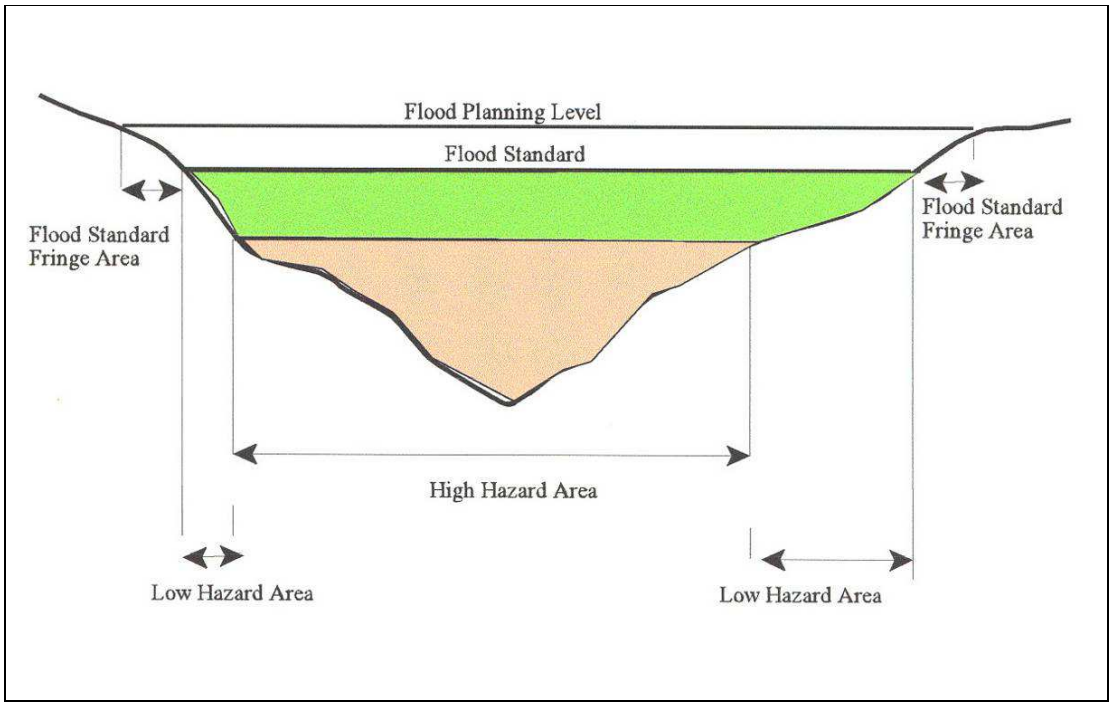


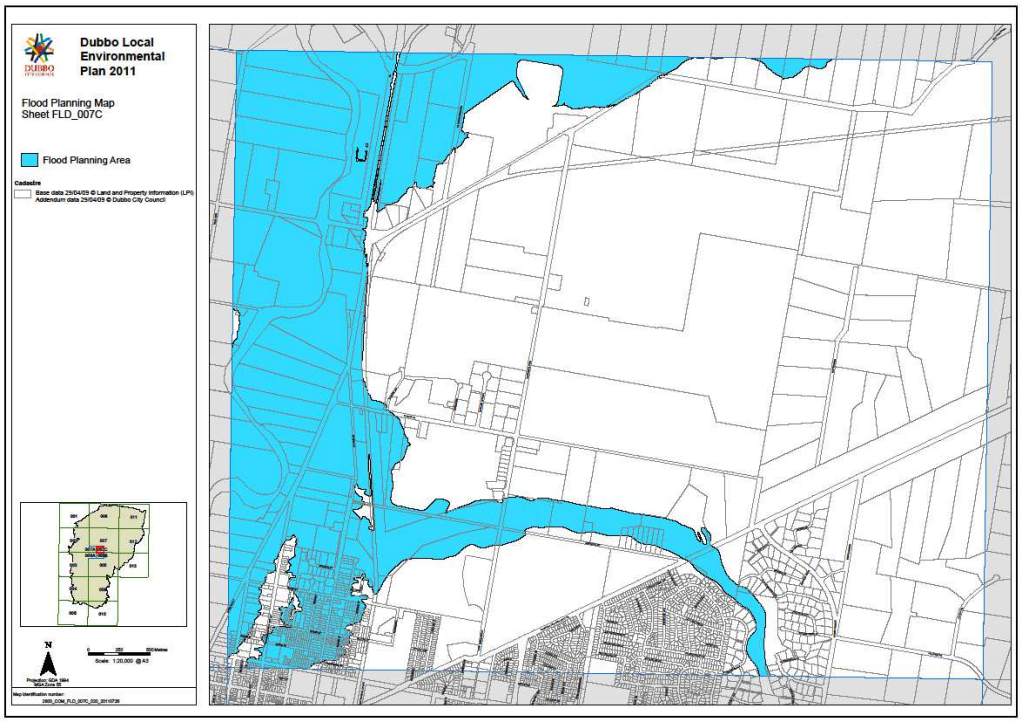
Figure 8: Hazard areas



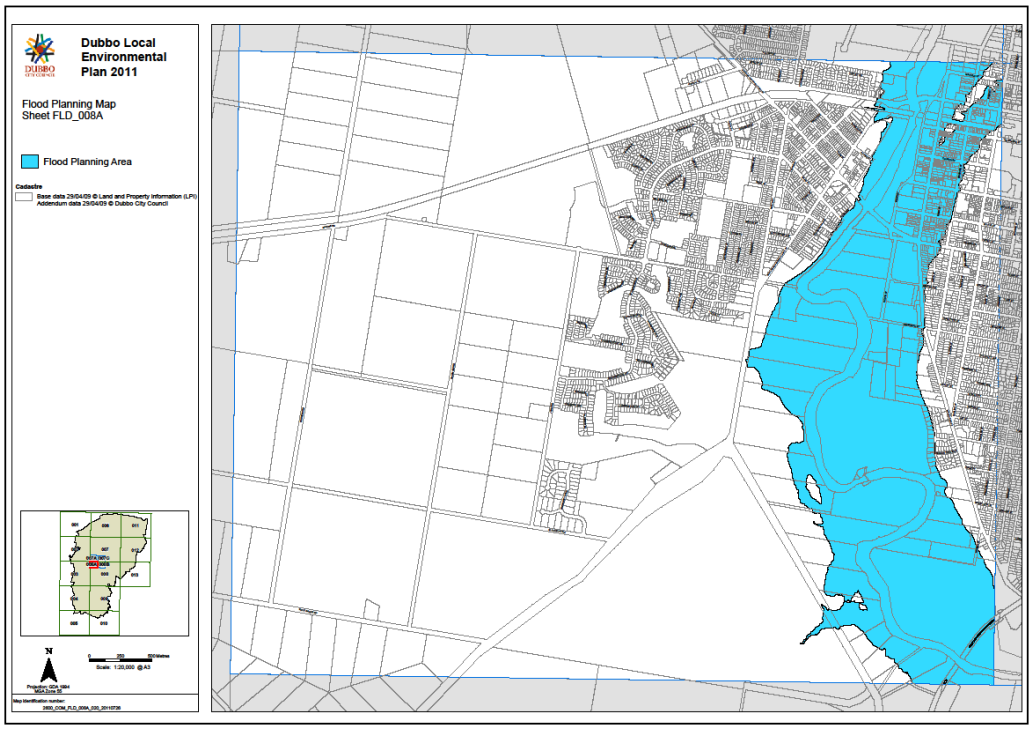
Appendix C: Flood planning maps

Flood Planning Map 7A

Flood Planning Map 7C



Flood Planning Map 8A



Flood Planning Map 8B

Dictionary

Key terms and levels that are fundamental to this chapter are shown in boxes and diagrammatically in Figures 7 and 8.

The Act - means the Environmental Planning and Assessment Act 1979.

Annual Exceedence Probability (%) (AEP) - the probability of a given flood height being equalled or exceeded in any year. For example, a 1% AEP flood has a 1% probability or a '1 in 100' chance of occurring or being exceeded in each and any year.

Australian Height Datum (AHD) - a common national plane of level corresponding approximately to mean sea level.

Certified Mound - means a mound erected at the site of a dwelling house and extending 3 m beyond the dwelling house to a minimum level of 500 mm above the 1% AEP or the highest known flood. (Where it is not practical to assess the 1% AEP in these circumstances the applicant may be required to provide a flood assessment prepared by an engineer.) Prior to release of a construction certificate permitting the erection of a building on the mound, the applicant will be required to submit a certificate from an engineer certifying that the design of the earth mound is adequate to ensure that the mound will be stable during flood conditions, will withstand the effects of flowing floodwaters and will not cause adverse effects to flood behaviour or to other property.

Compatible Development - 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.

Development - includes the erection of a building or the carrying out of work including land-fill or the use of land or a building or the subdivision of land.

Design Floor Level - means a minimum floor level specified as part of a building program.

Engineer - means a person holding qualifications acceptable for corporate membership of the Institution of Engineers, Australia.

Extreme Flood - a flood having a peak discharge of three times that of the 1% AEP event and is considered to be equivalent to the Probable Maximum Flood (PMF).

Flood Planning Level – (FPL) - is the level used for planning purposes and for most development in Dubbo other than emergency services. It is 500 mm above the 1% AEP flood contour. That is, the FPL is 500 mm above the FSRL.

Flood-prone Land - means the land susceptible to inundation by the Probable Maximum Flood (PMF) event (ie the floodplain).

Flood Standard - is the flood that will be viewed as a development constraint in the urban areas and is the 1% AEP event. The level of it is referred to as the 'flood standard reference level'.

Flood Standard Reference Level (FSRL) - the level reached by a flood standard event being the 1% AEP flood level.

Flood Standard Fringe Area - the area of land lying between the FSRL and the FPL being the land above the 1% AEP year flood level up to 500 mm above that level.

Flood Storage - those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood.

Floodways - those areas where a significant volume of water flows during floods. They are often aligned with obvious naturally defined channels. Floodways are areas which, even if only partially blocked, would cause a significant redistribution of flood flow which may in turn adversely affect other areas. They are often, but not necessarily, the areas of deeper flow or the areas where higher velocities occur.

FMP - Dubbo City Floodplain Management Plan 2000 - Urban Areas (Part A)

Habitable Room - a living area which is a lounge room, dining room, rumpus room, kitchen, bedroom or the like as defined in the Building Code of Australia (BCA) as adopted in the Act.

High Hazard - possible danger to life and limb and evacuation by truck difficult; able-bodied adults would have difficulty in wading to safety; or potential for significant structural damage to buildings, social disruption and financial losses could be high.

High Hazard Area – is the area for the bulk of the main river corridor in Dubbo as indicated on the Flood Hazard Maps held at Council's Civic Administration Building.

Low Hazard Area - a situation where, should it be necessary, people and their belongings could be evacuated by truck and able-bodied adults would have little difficulty in wading to safety.

LEP (Local Environmental Plan) - for the purpose of this chapter a reference to the LEP refers to Dubbo Local Environmental Plan 2011 which is the main regulatory planning document that, amongst other things, identifies the land use zones and the permissible uses in each zone.

Minor Additions - refers to the minor one-off extensions permitting a maximum floor increase of 10% or 30 m^2, whichever is the lesser.

Minor Development - refers to swimming pools, storage areas, sheds, carports, domestic garage, repairs to existing structures and the like.

Probable Maximum Flood - the flood calculated to be the maximum which is likely to occur for the Macquarie and Talbragar River system. It is defined, for the purpose of this chapter, as an extreme flood event (ie flood with a peak discharge of three times that of the 1% AEP flood event).

Revised FPL - the latest estimated level (from the model) that takes into account the cumulative impact of development since this Plan came into force.