

# **SOUTH CREEK FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN**

**For the Liverpool Local Government Area**



*Cover Photo: South Creek between Elizabeth Drive and Overett Avenue, Kemps Creek*

## **Final Report**

**VOLUME 2 — TOWN PLANNING ISSUES**

**December 2004**



Bewsher Consulting Pty Ltd

**SOUTH CREEK**

**FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN**

**VOLUME 2**

**TOWN PLANNING ISSUES**

Prepared for  
**Bewsher Consulting Pty Ltd**

on behalf of  
**Liverpool City Council**

Prepared by  
*Don Fox Planning Pty Ltd*

**PROJECT NO: 5874**

**DECEMBER 2004**

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## **1.0 INTRODUCTION**

### **1.1 Background and Study Scope**

Don Fox Planning Pty Ltd has been engaged by Bewsher Consulting Pty Ltd to form part of a consultant team to prepare a Floodplain Risk Management Study (FRMS) and ultimately a Floodplain Risk Management Plan (FRMP). The FRMP is to be prepared for the South Creek floodplain within the Local Government Area (LGA) of Liverpool.

The purpose of this component of the study is to undertake the following tasks:

- Broadly describe the characteristics of the study area with regard to land use, building form and population characteristics with particular regard to implications for the management of flood risks.
- Discuss the role of planning in the preparation of the FRMS and the implications and the choice of an appropriate flood planning level (FPL) standard or standards.
- Review the existing framework of planning and development controls that are relevant to the formulation of planning instruments and the assessment of development applications within the study area.
- Discuss the proposed approach and philosophy to floodplain planning and how it may be implemented within the study area, particularly having regard to the planning responsibility of Council and recommended planning controls emanating from this FRMS.
- Discuss options and review strategic planning issues to guide the formulation of appropriate planning controls ultimately for inclusion within a Floodplain Risk Management Plan (FRMP).
- To make specific planning recommendations in regard to the above, including an outline of suggested planning controls.

The Study will review floodplain-related planning controls generally, and not just for the South Creek Catchment, as this is essential to reviewing and establishing an appropriate planning framework for all floodplains in the LGA. Further, the current Floodplain Management Manual (FMM) published by the State Government, requires major stormwater flooding (not just riverine flooding) to be assessed within the ambit of floodplain management. Accordingly, this study will aim at firstly, outlining broad recommendations to establishing an appropriate philosophical and statutory planning basis for all forms of flooding throughout the

LGA; and secondly, more detail planning recommendations to manage flood risks within the South Creek Catchment. Many of the issues relating to planning controls have been discussed within previous related reports (refer to Georges River Floodplain Management Study, Volume 2, Don Fox Planning (May 2004)) but have been reviewed and updated as part of this study.

It is recognised that the flood hazard is one component for consideration in any town planning exercise. It is not considered appropriate to recommend a variety of planning controls for inclusion within a FRMP which responds to the planning hazard identified by hydraulic studies in isolation to this strategic planning context. Accordingly, this component of the FRMS considers the strategic planning context for the study area as a prelude to formulating planning recommendations for the FRMP.

## **1.2 Study Area**

The South Creek catchment is a significant tributary of the Hawkesbury-Nepean River and is located about 40km to the west of the Sydney Central Business District. The South Creek catchment is generally bounded by the suburbs of Windsor in the north, Narellan (near Camden) in the south, Penrith in the west and Blacktown in the east. South Creek flows in a generally northerly direction for about 70km. The total catchment area of South Creek is about 490 square kilometres and is generally depicted on **Illustration 1**.

The study area of this *Floodplain Risk Management Study* covers only a small portion of the total South Creek catchment, as shown in **Illustration 1**. The study area covers only the following floodplain areas:

- those parts of the main South Creek catchment located within the Liverpool LGA;
- those parts of the Thompsons Creek catchment, a tributary of South Creek, located within the Liverpool LGA, as far upstream as The Northern Road.

A detailed plan of the study area reflecting the above, is provided as **Illustration 2**.

South Creek flows generally from south to north through the study area. The northern boundary of the study area is Elizabeth Drive, while the southern boundary is Bringelly Road and The Northern Road, approximately 7km to the south. To the north of Elizabeth Drive, is the Penrith LGA, while to the south of Bringelly Road is Camden LGA. As shown on **Illustration 2**, the western boundary of the study area is South Creek's catchment boundary with Badgerys Creek, while the eastern boundary is the catchment boundary with Kemps Creek – both of these creeks are tributaries of South Creek, joining South Creek about 2-2.5km downstream of Elizabeth Drive.

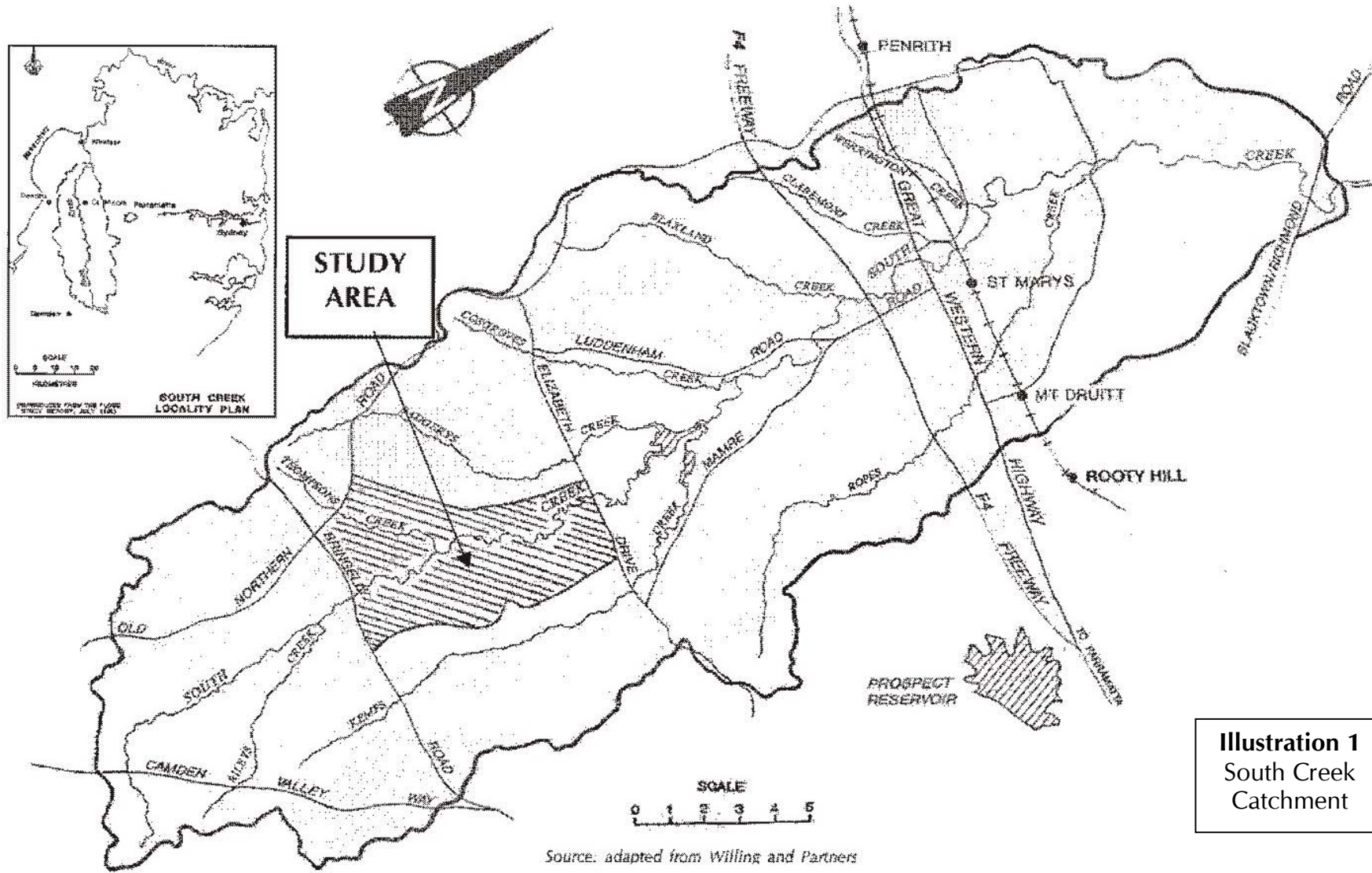
The catchment area of South Creek at Bringelly Road is about 56 square kilometres, while at Elizabeth Drive the catchment area is about 90 square

kilometres. Parts of the suburbs of Badgerys Creek, Kemps Creek, Rossmore and Bringelly are located within the study area.

Thompsons Creek joins the western floodplain of South Creek about midway through the study area. Thompsons Creek rises about 2km south of Greendale Road, Bringelly, flowing in a north-easterly direction for about 6.5km towards South Creek. The total catchment area of Thompsons Creek is about 10.3 square kilometres. A major tributary of Thompsons Creek is Bardwell Gully. Bardwell Gully flows generally from west to east, parallel to Greendale Road, before joining Thompsons Creek just upstream of The Northern Road.

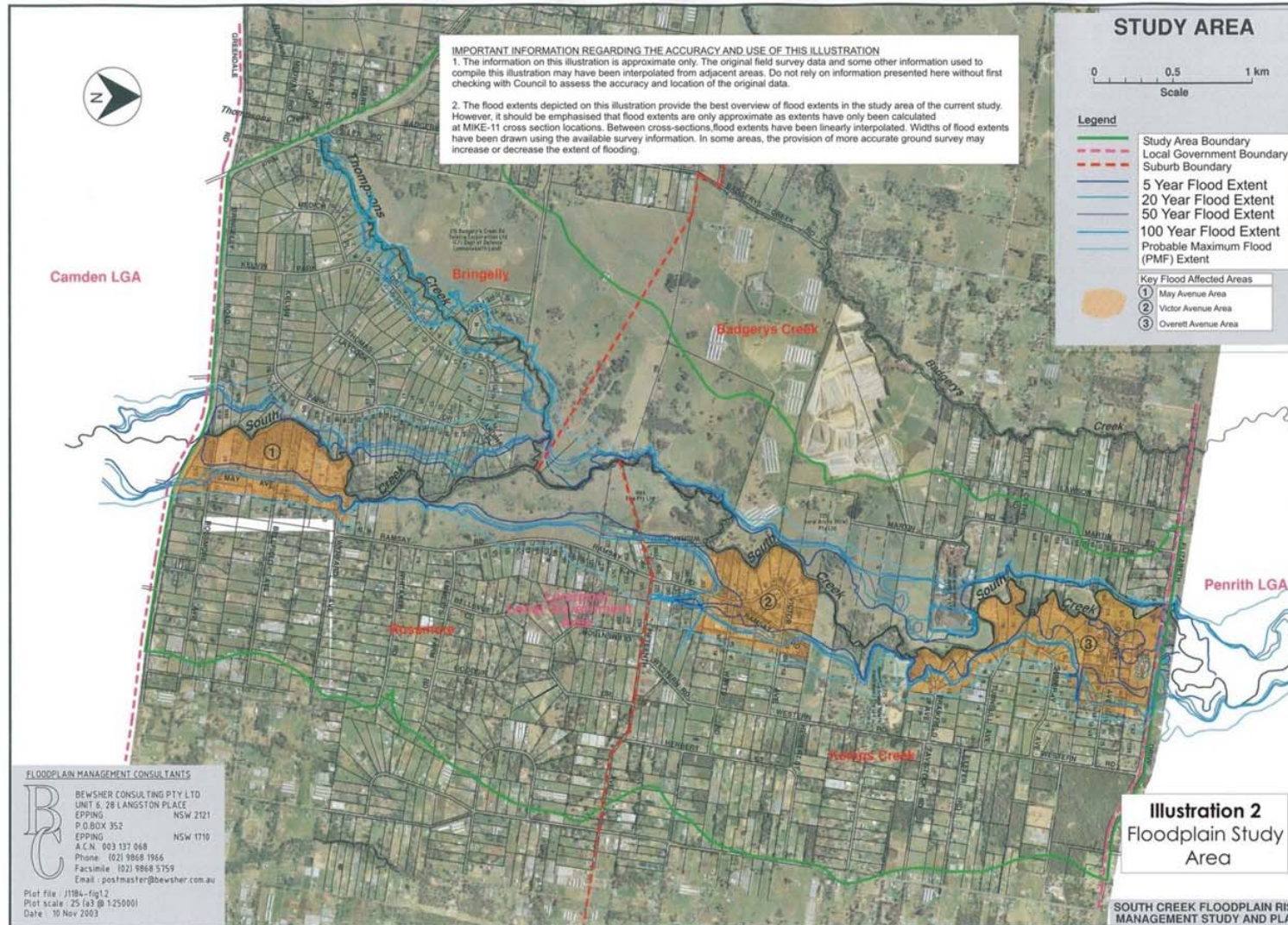
Bardwell Gully and the Thompsons Creek catchment upstream of The Northern Road, within the Liverpool LGA have not been included in the current study. However, a study for this area has been proposed in the near future, following completion of the current study.





**Illustration 1**  
 South Creek  
 Catchment

Source: adapted from Willing and Partners



## 2.0 THE PLANNING CONTEXT

### 2.1 Characteristics of the Study Area

#### 2.1.1 Topography

The subject study area forms an extensive area of the south-west section of the Cumberland Plain. Generally, the topography of the Cumberland Plain is a gentle undulating basin, dipping westward from Parramatta to the Nepean River and from Wilberforce and Richmond, south-west of Picton and Menagle.

The slopes within the study area catchment are relatively gentle, normally within the range of 0%-10%. Small pockets of steeper land exist, but generally not exceeding slopes greater than 15%. Overall, the floodplain has a relatively wide, flat topography.

Generally, the study area is underlain with Wianamatta Shales of the Triassic period with recent sands and alluvium within the South Creek drainage corridor. The Wianamatta Shales are typical in the basin of the Cumberland Plain and produce the somewhat rigid clay soils.

The soils landscape within the study area catchment have been classified by publication of the (then) Soil Conservation Service of NSW (refer to Bannerman & Hazelton, 1990). The most relevant soil type is that described as “*South Creek (sc)*”. This commonly occurring soil landscape is located within the South Creek floodplain. This soil is often very deep laid sediments over bedrock of relict soil. Red and yellow podsollic soils would be the most common. Fertility of the soil is generally low and erodability and erosion is very high. The rural capability of the soil supports both grazing and regular cultivation.

The remaining soils within the catchment, outside of the floodplain, is the commonly occurring “*Blacktown (bt) soil landscape*”. Soils in this area are generally shallow to moderately deep (less than 100cm), hard-setting and with mottled texture. The soils are generally red and brown podsollic soils on crests grading to yellow podsollic soils on lower slopes and in drainage lines. Limitations to development include moderately reactive highly plastic subsoil, low soil fertility and poor soil drainage. Blacktown soil materials are also moderately erodable. These soils are said to have a high capability for urban development with appropriate foundation design and are also capable of sustaining regular cultivation and grazing.

#### 2.1.2 Existing Vegetation

The original vegetation of the study area would have comprised mostly Cumberland Plain Woodland vegetation communities with River-Flat Forest along the creeklines, and some patches of Castlereagh Woodland. The bushland remnants today comprise mostly pockets of Cumberland Plain Woodlands and River-Flat Forest. The



remainder of the study area is either cleared for agriculture or greatly modified through underscrubbing and grazing, leaving a generally open woodland environment with scattered mature trees. Where agricultural pursuits have ceased, some regeneration of the typical Grey Box (*Eucalyptus mollucana*) and Forest Red Gum (*Eucalyptus tereticornis*) overstorey is occurring. Generally, the majority of the vegetation within the catchment is concentrated within a riparian zone along the creeks of a width varying broadly from 100 to 200 metres.

The past land habitats within the study area are generally unsuitable for most native fauna, however some of the more resilient indigenous fauna species remain in the riparian habitat and Grey Box Woodland. Farm dams also provide habitat for frogs and waterfowl. Ecological pressures from introduced predators such as foxes, dogs and cats and competition from rabbits, hares and livestock, have impacted upon the original biodiversity of the region.

The Liverpool Rural Lands Study (Don Fox Planning Pty Ltd, 1994, Appendix F, page 8) identifies the vegetation within the South Creek riparian corridor. This area was shown to have a narrow band of riparian vegetation dominated by Sheoaks, remains along much of the creekline. Some Forest Red Gums, Grey Boxes and Rough-barked Apples (*Angophora subvelutina*) were also present adjacent to the creekline. The southern extent of the South Creek corridor was found to support a range of fauna including Laser Monitors, Red Bellied Black Snakes, Sugar Gliders, waterfowl, aquatic invertebrates, frogs and birds. Remnant agricultural dams were also found to be occupied by a range of frog species and waterfowl, with the whole area having potential for bush regeneration and habitat restoration. This study recommended the protection of the riparian corridor along the creeklines due to its value as a remnant of the original riparian vegetation of the region and due to the habitat links provided for native fauna.

The National Parks & Wildlife Service 1:25,000 maps series (Map 4) provides mapping of existing native vegetation of that part of the Cumberland Plain comprising the subject study area. These maps published in October 2002 confirm similar results in regard to existing vegetation communities, as outlined above. The majority of the riparian vegetation consists of Sydney Coastal River-flat Forest–Alluvial Woodland. Other areas in the floodplain and across the catchment include Cumberland Plain Woodland Shale Plains Woodland, Shale Gravel Transition Forest and pockets of Castlereagh Swamp Woodland. Most of the riparian corridor Alluvial Woodland is mapped as having a canopy cover of greater than 10%.

The narrow band of riparian vegetation, dominated by She Oaks and some Forest Red Gums and Grey Boxes and Rough-barked Apples along South Creek are considered to be of regional significance and should be protected from further degradation (refer to Liverpool Rural Land Study, Don Fox Planning Pty Ltd, page 24). This area also provides an important habitat corridor for a range of fauna including Laser Monitors, Red-bellied Black Snakes, Sugar Gliders, waterfowl, aquatic invertebrates, frogs and birds.

### **2.1.3 Existing Land Use**

The existing land uses within the study area comprise predominantly rural residential allotments and housing, but with a variety of agricultural and other non-urban uses sporadically located.

The following three rural residential areas are identified on **Illustration 2**, and are subject to particular flood related issues warranting special consideration as part of this study:

- May Avenue rural residential area;
- Victor Avenue rural residential area; and
- Overett Avenue rural residential area.

The Overett Avenue rural residential area is located within the northern extent of the study area. The section of this area to the east of South Creek comprises approximately 90 rural residential allotments within new subdivisions created mostly within the last 20 years. These allotments are substantially occupied with rural residential dwellings, on allotments varying in size but averaging around 2 hectares.

The area to the west of the Overett Avenue rural residential area, on the opposite side of South Creek, is an older subdivided area of larger allotments mostly backing onto South Creek with frontages to Martin Road and Elizabeth Drive. This area comprises a mix of rural residential and agricultural uses, inclusive of the Australian Native Landscapes bulk materials production site.

Immediately to the south of the above areas, are larger rural properties flanking the South Creek corridor. These lot sizes vary from around 10-20 hectares. A major landowner in this area is Novartis Animal Health Australasia Pty Ltd, to the east of South Creek. To the west of South Creek stretching across closer to Badgerys Creek, is the Boral Brickworks quarry and brick production site.

Further to the south is the Victor Avenue rural residential area. This rural residential area is primarily centred around Victor Avenue and Ramsay Road on the eastern side of South Creek. Additional rural residential allotments exist further to the east within Watts Road, Western Road and Herbert Street, but are generally situated outside of the floodplain. This part of the rural residential area, located within the floodplain, comprises approximately 40 rural residential allotments. The area of these allotments varies but on average is in the order of 2 hectares. The majority of the allotments are presently occupied by rural residential dwellings, and the occasional agricultural activity.

Further south of the Victor Avenue rural residential area is a large property owned by Council called "Rossmore Grange", located between South Creek and Ramsay Road, being located mostly within the floodplain. To the west of South Creek are the rear portions of a number of rural residential allotments fronting onto Park Drive, being part of a larger rural residential area. This rural residential area to the

west of South Creek is effectively bound by South Creek to the east, Thompsons Creek to the west and Bringelly Road/Northern Road to the south.

The far southern extent of the study area, adjoining the Liverpool LGA boundary is the May Avenue rural residential area. This rural residential area is located to the east of South Creek and comprises approximately 20 allotments within the floodplain. These allotments front May Road, with the majority backing onto South Creek. They form part of an older subdivision and vary in size from around 2-5 hectares. The majority of these allotments are occupied with rural residential development.

#### **2.1.4 Heritage**

The issue of heritage is of significance in regard to the forming and understanding of the social and cultural context of the floodplain and to ensure that any flood mitigation measures do not impact upon the heritage of the study area.

Liverpool Council's LEP and relevant Regional Environmental Plans provide listings of heritage items. A number of these heritage items are located within, or adjacent to the catchment study area. These items include the following:

- Bringelly Public School Group – The Northern Road, Bringelly;
- Carnes Hill Vegetation Group – off Bringelly Road, Austral;
- Church of the Holy Innocents, Roman Catholic Group – Church Road, Rossmore;
- Kelvin Park Group – off Kelvin Park Drive, Bringelly;
- OTC Site Group – Badgerys Creek Road, Bringelly;
- Two Watertanks – Badgery's Creek Road, Bringelly.

It is also envisaged that parts of the river and creek system may retain potential Aboriginal archaeological relics and sites. These matters are relevant to the management of the river system generally by Council, and in particular in the assessment of any potential structural mitigation measures examined as part of the Floodplain Risk Management Study.

## **2.2 Population and Development Trends**

### **2.2.1 Changing Population and Characteristics and Projections**

The floodplain study area (ie. within the PMF extent) would have a resident population in the order of 900 persons. (Approximately 290 properties) The population within the overall catchment study area would be substantially greater.

Census collector district boundaries do not correlate with the study area to the extent that would allow for analysis of Census statistics on this basis. Accordingly, Census data for the Post Code Area 2171 (covering the majority of the Catchment Study area) and the LGA (and compared to the Sydney Statistical Division overall) has been reviewed to determine general trends. **Table 2.1** provides a summary of population change within the Liverpool LGA and the Sydney Statistical Division

between the 1986 and 2001 Censuses, while the proceeding discussion identifies population characteristics relevant to the post code.

**Table 2.1**  
**Summary of Population Change – Total Persons**

Area	1986 Census	1991 Census	1996 Census	2001 Census	Change 1991-01	% Change 1991-01	Compound Rate 1991-96	Compound Rate 1996-01
<b>TOTAL PERSONS</b>								
Liverpool LGA	93215	98162	120197	154287	56125	57.2%	4%	5%
Sydney Region	3364858	3538448	3741290	3997321	458873	13.0%	1.1%	1.3%
<b>TOTAL PRIVATE DWELLINGS</b>								
Liverpool LGA	29131	32068	40620	50879	18811	58.7%	5%	5%
Sydney Region	1225257	1314294	1426266	1546691	232397	17.7%	2%	2%

Source: ABS Census Data extracted via CASAS Census Program

Salient conclusions drawn from the Census data, of particular relevance to this study are outlined as follows:

- The Liverpool LGA has been subject to substantial growth over the last 15 years, the majority of this growth would have occurred outside of the subject study area.
- The Liverpool LGA has a high proportion of youths compared to the Sydney region overall (16.4% of the total population aged 5-14, compared to 13.4% for the Sydney Region). The proportion of youth within the postal area 2171 is marginally greater being 17% of the total population for that area at the 2001 Census. Conversely, the postal area 2171 has a low proportion of aged persons in comparison to the Sydney Region (6.1% of the population aged 65 or greater, compared to 11.7% for the Sydney region).

A high proportion of older persons is a potential issue associated with the ability of the population to self evacuate, if required during periods of extreme floods. This is not a major issue within the study area, relative to other parts of Sydney, but nonetheless, specific developments which provide for concentrated aged persons accommodation should be given specific consideration in regard to the issue of evacuation. In this regard, consideration should be given to excluding specific aged persons development from all parts of the floodplain, being an approach consistent with that taken within the recently published Bushfire Guidelines "Planning for Bushfire Protection, 2002" prepared by the Rural Fire Service & PlanningNSW.

- Liverpool LGA has a relatively high percentage of the population which is overseas born and poor English speaking (6.8%) in comparison to the Sydney regional overall (4.4%). A particularly high percentage of the population in the postal area 2171 is overseas born (33.4%) and speaks English poorly (59.7%).

The above trends have significant implications in regard to community awareness programs, requiring that multi-lingual information is distributed or access to interpretive facilities is provided.

- Median household incomes, in comparison to the Sydney statistical division, is only marginally lower than the average for the Liverpool LGA, but relatively higher for postal 2171. The median household for the Sydney Region at the 2001 Census was \$51,500, in comparison to postal area 2171, being \$61,100. Generally, this reflects a higher capacity for a substantial proportion of the population in the study area to recover financially subsequent to losses incurred during a major flood event, in comparison to the Sydney region generally. This however does not suggest that an economic and social impact would not arise to individual families as a consequence of flooding. The present absence of comprehensive domestic insurance against river and flood damage prevents such a safeguard against financial loss, and increase reliance on government and community assistance.

Under present planning controls, there is minimal potential for substantial urban growth in population increases in the floodplain study area. Notwithstanding, it is noted that the study area forms part of a larger area known as the Bringelly Investigation Area, currently being assessed by the Department of Infrastructure, Planning and Natural Resources (DIPNR) for potential future urban releases. The study area is generally located in the core study area of this investigation area, and previous studies such as the South Creek Valley Regional Environmental Study (Department of Planning, 1991), identified potential for future urban development in the area. This FRMS has not taken into consideration the acceptability of flood risks associated with potential for future urban releases which remain undetermined and currently under investigation at the time of preparing the report. Information from DIPNR's Managing Sydney's Urban Growth Team in December 2003 noted that *"Initial findings suggest urban development around your floodplain study area is unlikely to occur within a 10–15 year period. DIPNR has no objection to Council progressing the Study provided flood-related works do not preclude any future urban development on adjoining non-flood-affected lands"*(see Section 5.3.1 of **Volume 1** of this report for more information).

Changes to zoning controls arising from pressures for future growth and population change will need to be taken into consideration when making decisions in regard to the use of floodplains and the level of risk the community is willing to accept in the use of the floodplain.



## **2.3 Existing Planning and Development Controls**

### **2.3.1 Introduction**

This section of the report identifies and examines various forms of planning instruments and associated controls which apply to the study area and may have potential for use for the purposes of implementing planning controls to guide future development within the study area. Not all of these planning instruments will be applicable, but are reviewed for the purposes of completeness and to provide a general overview of planning controls and strategic planning direction for the area.

### **2.3.2 State Environmental Planning Policies**

A State Environmental Planning Policy (SEPP) is a planning document prepared in accordance with the Environmental Planning & Assessment Act (EPA Act) by Department of Infrastructure, Planning & Natural Resources and eventually approved by the Minister, which deals with matters of significance for environmental planning for the State. Examples of SEPPs that have been prepared include SEPP No. 19 - Bushland in Urban Areas, and SEPP No. 35 - Maintenance Dredging of Tidal Waterways. No State Environmental Planning Policy has been prepared dealing specifically with the issue of flooding.

State Environmental Planning Policy (Seniors Living) 2000 (Seniors Living SEPP) has recently replaced SEPP 5 and applies to urban land or land adjoining urban land where dwellings, hospitals and similar uses are permissible. Seniors Living SEPP would apply to the majority of the study area, and would effectively override Council's planning controls to permit residential development for older and disabled persons to a scale permitted by the SEPP. Notwithstanding, Clause 4(2)(a) of this Policy restricts its application from land identified as "floodways" or "high flooding hazard" in another environment planning instrument such as a REP or LEP (as described below).

### **2.3.3 Regional Environmental Plans (REPs)**

A Regional Environmental Plan (REP) is prepared in accordance with the EP&A Act by Department of Infrastructure, Planning & Natural Resources (DIPNR) and eventually approved by the Minister. An REP provides objectives and controls for environmental planning for a region, or part of a region. The extent of a region will vary depending upon the issue to be addressed but normally refers to more than one LGA.

The study area lies wholly within the area of application of Sydney Regional Environmental Plan No.20 – Hawkesbury-Nepean River, (SREP 20). This plan prevails over any other regional environmental plan or local environmental plan where there is an inconsistency. The plan contains planning principles to help councils prepare local environmental plans that apply to land within the catchment, and provides specific development controls in regard to various land uses.

Clause 6 of SREP 20 outlines specific planning policies and recommended strategies for Council's when assessing development applications and rezoning proposals.

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These policies and strategies relate primarily to the management of environmentally sensitive areas, water quality, protection of flora and fauna and cultural heritage. While flood risk management is not an area of focus, for SREP 20, a number of provisions of the plan nonetheless makes reference to flood related issues. These references are inclusive of the following:

- Clause 6(6)(k) – refers to the impact of flooding and the retention of flood waters for the purposes of reducing the impact on wetlands.
- Clause 11(6)(b) – refers to works required for flood mitigation when defining maintenance dredging and extractive operations.
- Clause 11(8) – refers to a “flood way” when defining hazardous or offensive industries to which the clause applies. Such industries are specified as being prohibited when located in a flood way.
- Clause 11(11) – defines various intensive animal industries and specifies that they are prohibited when they are located in a “flood way”. This clause also outlines that where such development is located on “flood prone land” the impact of the development on the river during a flood event must be considered.
- Clause 11(14) – specifies that recreational facilities located on “flood prone land” require development consent.
- Clause 11(17)(c) – requires that the onsite disposal area required for any sewerage systems must be assessed with regard to the effect on the “floodplain”.
- Clause 11(19) – deals with development within mapped wetland areas and requires under the heading of ‘Additional Matters for Consideration’, an assessment of whether the development is likely to contaminate the soil resulting the likely adverse impact on water quality when the wetland “floods”.
- The dictionary appended to SREP 20 provides various definitions relating to flood related terms as follows:

“**Floodplain** means the floodplain level nominated in a local environmental plan or those areas inundated as a result of a 1 in 100 flood event, if no such level has been nominated.

**Flood prone land** means land susceptible to inundation by the probable maximum flood event.

**Floodway** means those areas of a floodplain where a significant discharge of water occurs during floods. Floodways are areas which, even if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood levels.”

The above definitions are not wholly consistent with the provisions of the current Floodplain Management Manual or the preferred approach to the restructuring of planning controls at the local level for each individual Council (as discussed later in this report). Further, while SREP 20 is a specific regional plan relating to a river, it does not provide relevant guidance to flood risk management, and is not highly consistent with the Floodplain Management Manual recently published by the State

Government, and some rationalisation to address these issues would be appropriate. This rationalisation should include a review of definitions and appropriate recommendations are provided later in this report.

Clause 11 of the REP provides particular restrictions on the permissibility of various forms of development within the Hawkesbury-Nepean River Catchment. In particular, the provisions of Clause 11 prohibit or control certain development within different parts of the floodplain identified in accordance with the above definitions. These controls on land use within the floodplain are not, in all cases, consistent with the preference for land use distribution within the floodplain, as identified within the draft development control plan prepared for Council, as discussed later in this report. This development control plan has been prepared as part of the floodplain management process outlined within the Floodplain Management Manual and integral to the State Government Flood Policy and will ultimately be finalised by Council having regard to the specific nature of the floodplain study area. Further, the inconsistencies in the existing definitions of flood related terms is likely to lead to administrative difficulties.

Having regard to the above, it is considered desirable that some refinement be undertaken to the SREP 20 to provide definitions consistent with current best practice and the Floodplain Management Manual, specify a principle that is specifically focused on floodplain risk management, and review the planning controls contained within Clause 11 so that they would be consistent with the controls adopted by each individual council, through the floodplain risk management process. Appropriate recommendations are made later within this report.

#### **2.3.4 Advisory Circulars**

Department of Infrastructure, Planning & Natural Resources is responsible for providing advice to local councils to ensure that best practice is maintained in the planning process. A Planning and Environment Commission (PEC), being a predecessor of DIPNR, Circular was issued in 1977 advocating prescriptive floodplain planning controls and the adoption of the 100 year ARI flood standard. Subsequently, a Departmental Circular (No. 122) was issued by the former Department of Planning (DOP) and more recently as Circular No. C9 to assist Councils to relate the flood policy of the State Government and the earlier Floodplain Development Manual (FPDM) (now superseded by the 'Floodplain Management Manual'), to the requirements of the EPA Act and the Department's general approach to floodplain planning.

The current State Flood Policy (1984) disbanded the 100 year ARI flood standard and requires local Councils to implement floodplain management based on a merits based approach. The Circular states that in accordance with the FPDM, Councils should prepare single comprehensive local environmental plans to implement their Floodplain Risk Management Plans, and so avoid an ad hoc, piecemeal approach to planning within floodplains.

In recognition that the preparation of such LEPs may take some time, Councils were advised that in the interim, adequate supporting data for decision making should be obtained inclusive of:

- any relevant Floodplain Risk Management Plan or interim policy;
- details of flooding in the area;
- social and economic impact of flooding;
- environmental impacts of development in the floodplain (eg. on water quality, flood behaviour, etc);
- the availability of alternative flood free sites and reasonable alternative uses for the subject site;
- cumulative adverse impacts;
- matters of state and regional significance (eg. the impact of development on a floodplain beyond local government boundaries); and
- increased risk of flood damage to regional infrastructure, reduction in flood storage capacity, etc.

### **2.3.5 Section 117 Directions**

Ministerial directions pursuant to Section 117(2) of the EPA Act specify matters which local councils must take into consideration in the preparation of LEPs. Section 117(2) Direction No G25 (in regard to 'flood liable land') is relevant. This direction is aimed specifically at enforcing the principles contained within the FMM (previously being Floodplain Development Manual, which was relevant at the time the direction was made), and specifies a number of matters including the following:-

- LEPs should not rezone flood liable land from a zone such as rural, open space or special uses - flood, to a higher potential zone such as residential or industrial;
- the LEP should not, in respect to flood liable land, permit a significant increase of development potential or create a necessity for structural flood mitigation measures, and should require development consent for the majority of uses (other than minor development and additions);
- land defined as *high hazard flood liable or floodway* in accordance with the Floodplain Development Manual should be zoned Special Uses - High Hazard Flood Liable (or Floodway) Rural, Open Space, Scenic Protection, Conservation, Environmental Protection, Water Catchment, or Coastal Land Protection or a zone with a similar description.

The firm application of this latter principle would result in a proportion of the study area being considered within a 'high hazard' area and accordingly required to be

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zoned in a highly restrictive manner. This is likely to capture primarily rural zoned land. It is noted that no land within the study area is currently identified within a specific flood zone.

Section 117(2) directions were reviewed within a report prepared by planningNSW (*“Review of Section 117(2) Directions”*, 1997). Only minor changes to Direction G25 were proposed within the revision by planningNSW. However, the recommendations of the review have not yet been implemented.

### **2.3.6 Local Environmental Plans (LEPs)**

A Local Environmental Plan (LEP) is a plan prepared in accordance with the EPA Act which defines zones, permissible uses within those zones and specific development standards and other special matters for consideration with regard to the use or development of land.

Liverpool LEP 1997 applies to the study area, within the Liverpool LGA. The Liverpool LEP 1997 is similar to the above LEPs, providing a definition of flood liable land and a clause which provides general considerations in regard to development on flood liable land. There are a number of other clauses which make some reference to flooding.

Consistent with other findings of the Georges River FRMP, it is again recommended that the objectives of the LEP make reference specifically to floodplain risk management and the definitions and clauses associated with flooding be reviewed and updated.

### **2.3.7 Development Control Plans (DCPs)**

A Development Control Plan (DCP) is a plan prepared in accordance with Section 72 of the Environmental Planning & Assessment Act which provides detailed guidelines for the assessment of development applications. Various DCPs of some relevance apply in the study area, as discussed below.

Liverpool City Council does not have a floodplain risk management related DCP and relies on interim policy provisions. Notwithstanding, Liverpool City Council has embarked on the preparation of a comprehensive floodplain risk management DCP some years ago, which has not yet been adopted by Council, pending the outcome of other studies such as the Georges River FRMP and the subject South Creek study. The recommended floodplain risk management DCP for the Liverpool LGA, discussed later in this report, is effectively a more advanced version of Council’s original draft DCP, being also authored by Don Fox Planning in association with Bewsher Consulting.

In addition to the above, a review of DCP 32 and DCP 33 dealing with exempt and complying development, is recommended. LEP 1997 (Clauses 6A3(f) and 6B(3)(a)) excludes development being considered as “exempt” or “complying” if carried out on “flood liable land”. The redefinition of flood prone land to encompass the effective extent of land at risk of flooding (i.e. up to the PMF) would inadvertently

decrease the range of minor development which is excluded from being exempt and complying development. This would have the undesired consequence of increasing the administrative burden on Council. The increased administrative burden on Council can be minimised by:

- not excluding any development from being exempt on the basis of being on flood liable land, as such development is very minor in nature and of minimal consequence to managing flood risks; and
- tailoring complying development provisions.

We recommend that to exclude development from being “complying” only within the 100 year floodplain, as discussed later in this report.

While some of Council’s DCPs provide reference to flood related terms (eg, DCP No. 47 –Domestic onsite sewage Management, refers to locational criteria for effluent disposal systems outside of certain flood extent) references are to specific floods such as the 1 in 100 year flood or 1 in 20 year flood, and therefore no inconsistency with changes in terminology proposed as a consequence of this study, would arise. Council has also adopted DCP No. 8 – Natural Assets, which addresses environmental issues such as the retention and management of riparian vegetation, being a peripheral consideration relevant to the preparation of an FRMP.

DCP No. 4 – Environmental Responsive Residential Development, provides reference to development considerations which are of relevance to flooding (in particular cut and fill proposals) but requires compliance with the provisions of Council’s “floodplain management plan” in preference to any other provision of the DCP. (Refer to Clause 2.13). This is considered an appropriate manner in which to deal with this issue, although in the cause of reviewing the DCP recommended as part of this study, reference to Council’s “floodplain management plan” may preferably be amended to a reference to the adopted DCP recommended as part of this study, (Draft DCP No. 52). Further, the recommended DCP, incorporates specific provisions regarding site excavation works (cut and fill), in order to provide specific guidance in regard to this activity within the floodplain, with particular reference to that part of the floodplain which conveys predominate flows (referred to as the “*boundary of significant flow*” within the recommended Draft DCP).

Council has also been in the process of preparing a specific development control plan for “land fill and earth dams”. A draft of this document was provided in the course of preparing this study, which has as one of its principle aims to complement the NSW Flood Policy and Manual, to reduce the impact of flooding on private and public property losses and potential risk to life. The Draft DCP also has a number of other objectives, inclusive of minimising impacts upon environmentally sensitive land, and avoiding associated amenity and scenic quality impacts. The draft recommended DCP provided as part of this study, and discussed later, incorporates specific provisions to deal with site excavation and filling activity, focused specific in regard to flood risk management. The finalisation, and ongoing review and monitoring of any land fill DCP prepared by Council should have regard to the provisions of the recommended Draft DCP within this report, and indeed can be

referred to where appropriate to deal with flood risk management issues. These matters are of particular relevance in the rural areas of the LGA, such as the subject South Creek Floodplain Study area.

### **2.3.8 Council Policies**

In addition to formal regulations such as a DCP or an LEP, Councils may from time to time adopt specific policies with regard to their long term vision for development within the floodplain or to deal with specific matters such as flooding. Normally, such policies are translated into DCPs or other planning instruments such as an LEP.

The State Government Flood Policy introduced in 1984 specifically abandoned the application of the 100 year ARI flood standard as the designated flood standard for the State of New South Wales, and required each LGA to determine their flood standard or standards based on merit. The Floodplain Development Manual introduced in 1986 and the more recent FMM released in 2001 provide guidelines to assist councils in determining the relevant standards and policies, through the preparation of FRMSs and FRMPs.

Until the adoption of an FRMP, Councils under the 1986 FPDM were required to produce an interim flood policy, which was adopted by Liverpool City Council. The ability to rely on interim policies was removed from the 2001 FMM which increases the urgency to prepare FRMPs for flood affected areas in the LGA.

The procedures now outlined within the 2001 FMM provide Council with indemnity pursuant to the limitations provided by Section 733 of the Local Government Act 1993, and accordingly are very important to Council's overall risk management procedures. The eventual outcome of all FRMPs, including this FRMP will be to translate relevant planning recommendations of these documents into the instruments available through the EP & A Act, principally LEPs and DCPs. Recommendations for translating relevant recommendations of these documents into these instruments are made later within this report.

### **2.3.9 Development Application Assessment**

Development applications for proposals which are permissible with consent must have regard to the relevant 'Matters for Consideration' contained in Section 79C of the Environmental Planning and Assessment Act 1979.

Section 79C(1)(a)(i) of the Act requires the consent authority to take into consideration, when determining a development application, the provisions of any environmental planning instrument. Accordingly, Council is required to have regard to the provisions of the applicable LEPs which specify various matters to consider with respect to flood liable land.

Section 79C(1)(a)(iii) requires that Council also consider any DCP in force. While no DCP is presently in force which deals specifically with the issue of flooding, such an instrument would provide a desirable mechanism for Council to comprehensively assess development applications with respect to the issue of flooding.

The Environmental Planning and Assessment Act 1979 and accompanying Regulations 2000 also identify certain developments which are deemed to be “designated development”. Designated developments are generally large scale developments which have been identified as potentially causing greater impacts on the environment. Hence, designated development proposals require the preparation of an Environmental Impact Statement (EIS) and more specialised assessment procedures including statutory notification of the development application with third party rights of appeal for any objector.

**Schedule 3** of the Environmental Planning and Assessment Regulation 2000 identifies those developments which are designated development by virtue of their processing capacity, site requirements or location near environmentally sensitive features. Developments such as certain industries, local works, extractive industries, mines and the like are permissible in the zoning of the study area and adjoining land. Some of these developments may be regarded as designated development when located within a certain distance of a natural water body or wetlands or on flood prone land or a floodplain.

**Schedule 3** of the EPA Regulation 1994 defines floodplain as follows:

*“Floodplain means the floodplain level nominated in a Local Environmental Plan or those areas inundated as a result of a 100 year flood event if no level has been nominated.”*

Accordingly, there are a number of potential outcomes of the FRMP process which may have implications in regard to the manner in which Development Applications are dealt with.

### **2.3.10 Section 149 Certificates**

A Section 149 Certificate is basically a zoning certificate issued under the provisions of the EPA Act, and must be attached to a contract prepared for the sale of property. The matters to be contained within the Section 149(2) Certificate are prescribed within Schedule 4 of the Environmental Planning and Assessment Regulation, 1994, which includes the following specific matters in regard to flooding.

*“12. Whether or not the Council has by resolution adopted a policy to restrict the development of land because of the likelihood of landslip, bushfire, **flooding**, tidal inundation, subsidence or any other risk”. [Our emphasis]*

The wording of the above prescribed matter is such that inconsistencies arise between local councils in regard to the extent of information they provide on flooding. It has been argued that on literal interpretation, councils are only required to provide a ‘yes’ or ‘no’ answer as to whether such a policy exists. Further, there is potential equivocation when a council is aware of a flood risk, (eg. that a property is known to be located between the 100 year ARI and PMF extents), and there are no



policies restricting development subject to the risk. A principal issue which arises is whether there is a legal or moral obligation for council to advise of the risk (Mawson J, Prior N, and Bewsher D, 1994).

A Section 149(5) Certificate, being a more complete but more expensive certificate, requires Councils to advise of “*other relevant matters affecting the land of which it may be aware*”. These more complete certificates are not mandatory for inclusion with property sale contracts – a Section 149(2) Certificate being the minimum required. Where a Section 149(5) Certificate is obtained, this would more clearly require a Council to notify of flood risks of which it is aware.

Liverpool City Council may (now and in the future), have flood information and policies for different properties at various standards, including:

- (a) No flood studies or preliminary assessment by an engineer.
- (b) No flood studies but a preliminary assessment by an engineer indicates the property is likely to be affected by flooding but the extent of flooding will need to be determined.
- (c) A flood study has been completed but has not yet been adopted by the Floodplain Risk Management Committee and/or Council.
- (d) A flood study has been completed and has been adopted by the Floodplain Risk Management Committee and/or Council.
- (e) A floodplain risk management study and plan has been completed but has not yet been adopted by the Floodplain Risk Management Committee and/or Council.
- (f) A floodplain risk management study and plan has been completed and has been adopted by the Floodplain Risk Management Committee and/or Council.

At present, Council does not have a completed Floodplain Risk Management Study and Plan for the South Creek Floodplain. Liverpool City Council does have (e) and (f) for areas outside of the subject study area, including tributaries of the South Creek.

*The Floodplain Management Manual* now defines flood prone land as all land potentially affected by inundation during a PMF. This includes both riverine flooding and now flooding from major overland flow paths.

Flood mapping, such as that being undertaken by Bewsher Consulting as part of this study, will identify the areas subject to riverine flooding in the study area. However this typically does not extend to contributing local catchments where water courses and overland flow paths are located within pipes or narrowly formed channels or are not evident except during major storms. In our experience of current practice in NSW, Councils may have additional detailed flood mapping for the top catchment

areas, some have maps or local knowledge of these affected areas (e.g. through a history of complaints) and some have no specific documented knowledge of potentially affected areas. Whilst it is desirable, we would expect that all Councils will never be able to unequivocally confirm that they have mapped all areas subject to potential flooding (mainly due to the unreasonable resources that would be required to map all overland flow paths), although they would be able to say that they confidently believe they have identified the majority of properties affected by significant flooding.

Generally, the recommendations of this study are to advise all persons, through the use of Section 149 Certificates (and other methods) of all potential flooding (ie. up to the PMF). Liverpool City Council has a number of notations for Section 149 Certificates on flood affected land. These Section 149 notices should ultimately be reviewed upon adoption of the FRMP, to recognise the existence of the FRMP and any policies emanating from that document, as well as the findings of the flood study preceding the FRMP. This is consistent with the current provisions of the Floodplain Management Manual and the recommended new definition for flood liable land to be incorporated within LEPs.

While there may be some concern about property owners having such a notation, there is an expectation by prospective purchasers that it would be provided, as indicated by the legislation and Manual. Further, it should be recognised that this revised approach for notifications on Section 149 Certificates, inclusive of the definitional change in LEPs, DCPs and Policies will not lead to any significant alteration to the permissibility of development but is more directed towards increasing awareness of the potential flood risk known to Council and the relative degree of such risk.

Suggested Section 149 Certificate notations for consideration by Council are provided later in this report. The various options for notations will need to take into consideration flooding from both riverine and overland flow situations. Such notations should be ultimately determined by Council having regard to the particular circumstances of individual floodplains and the subject of separate legal advice.

### **2.3.11 Section 94 Contributions Plans**

Section 94 Contributions Plans under the EPA Act provide a basis for the levying of development contributions to construct drainage and flood mitigation works required as a result of future development. Section 94 contributions can only be applied to fund works associated with the new development and cannot be applied for the purposes of rectifying past inadequacies.

As structural flood mitigation options are limited and potential development growth in the subject floodplain is minimal under current zoning controls, it is unlikely that a Section 94 Contributions Plan would be a feasible fund raising mechanism for such measures. This should however be monitored by Council and reviewed should expected development rates increase or if large individual developments or urban releases would warrant a site specific Section 94 Contributions Plan.

## **2.4 Changes to Environmental Plan Making in NSW**

The State Government had committed funding for the first stage rollout of a major review of the plan making provisions of the NSW Environmental Planning and Assessment Act, 1979 and associated Regulation, although recently stalled pending reassessment by the new Minister for Planning.

Notwithstanding the above, this review was to be based on a discussion paper which described a proposed new approach to plan making termed “planFIRST”. The approach basically involves rationalising planning controls into two document sources. The first document is to be a regional environmental plan produced by Department of Infrastructure, Planning & Natural Resources for a number of local government areas (a “region”) which addresses major planning issues that can only effectively be dealt with at a regional level (eg. public transport) and to provide broader planning principles to guide local plans. The second document source is the local environmental plan produced by local government and combines all previous SEPP, REP, LEP and DCP controls which affects local development into a “place based” focused planning document, similar to that produced by Warringah Council.

At this stage, it is understood that the “planFIRST” approach is not to be proceeded with, subject to a further review of plan making processes in NSW. Notwithstanding, it is not appropriate to delay current plan making projects, to provide for their integration into a “planFIRST” style document or some other preferred alternative plan format which may arise from the review of the plan making processes. However, having reviewed other LEPs in NSW which have adopted less conventional approaches such as the current Warringah LEP. It is considered that the planning controls recommended as part of this FRMP can be translated into the structure of alternative LEP frameworks at a later date, if required.

## **3.0 APPROACH TO FLOODPLAIN PLANNING**

### **3.1 General Philosophy**

Council will need to ensure that the planning outcomes derived from this study are integrated with all other existing and future FRMPs currently under preparation in their LGA to provide a consistent platform for dealing with the issue of flooding with future development.

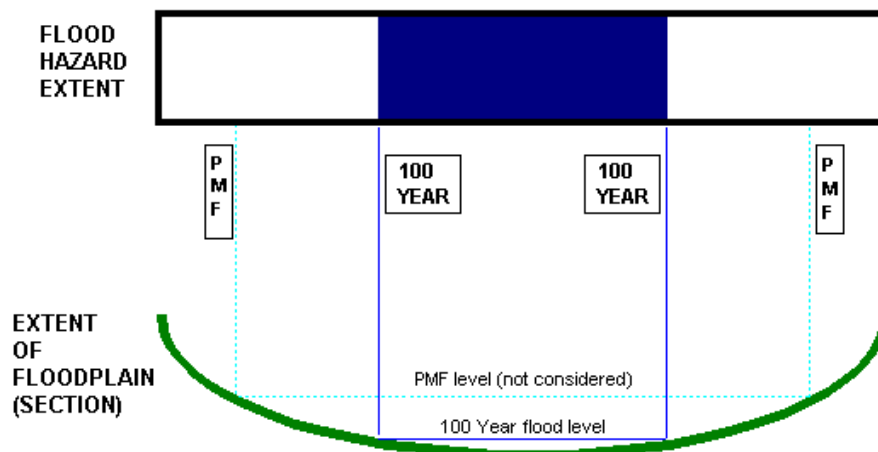
Accordingly, it is considered appropriate to provide a general discussion regarding an appropriate approach to floodplain planning generally which can be adopted by Council, before identifying how the South Creek floodplain specifically fits into this framework. The following sub-sections of this report describe both the traditional approach to floodplain planning and an alternative preferred approach which was first introduced with the Eastern Creek and Tributaries Floodplain Management Plan (Blacktown City Council), has since been adopted by many other councils in NSW, and is being considered by Liverpool City Council at present as part of other FRMPs.

### 3.1.1 Traditional Approach to Floodplain Planning

In general terms, the real flood hazard within floodplains is poorly understood and appreciated by the community.

Often the community considers there to be a flood hazard only on land below the flood planning level (FPL) which is the level below which councils place restrictions on development. This FPL is commonly the 100 year ARI flood. In fact, floods can occur well above this level within the study area. A 100 year ARI is a flood that occurs, on average, once every 100 years - it is not a measure of hazard. For planning purposes we can identify the existence of various hazards such as bushfire and landslip and when identified proceed to manage their potential consequences. Ironically, because probabilities are able to be calculated for flooding, planners have traditionally only selectively managed the hazard based on a nominal FPL based on one probability.

**Illustration 3** presents the view of flood hazard generally held by the community. The flood hazard extent relates only to the FPL (in this case the 100 year ARI flood). In the community's mind, there is no flood hazard above the 100 year ARI flood level.



#### Illustration 3: Typical View of Flood Hazard Currently Held by Community

Confusion over the nature of the flood hazard has not been helped by the current procedures for flood notations on Section 149 Certificates and the wording of flood related controls produced under the EPA Act. These controls are often misinterpreted by the community as a statement of whether or not a flood hazard exists at the property. Most importantly, when a council does not mention flooding on a Section 149 certificate or specify that flood planning controls apply, the community may incorrectly assume that there is no flood hazard when in fact (eg. for properties just above the FPL), the flood hazard may be significant in dimension albeit slightly more rare in occurrence.

### **3.1.2 Objectives of Floodplain Planning**

Floodplain risk management is about occupying the floodplain and optimising its use in a manner which is compatible with the flood hazard and at a level of risk which is accepted by the community.

Risk can be simply defined as a product of frequency and consequence. The frequency (or probability of a flood) is a natural phenomenon which cannot be controlled by structural mitigation works to any substantial degree in the South Creek floodplain. The consequence of a flood varies with the nature of the hazard (depth, velocity, warning time, etc) and what it impacts (property and people). The control and management of land use provides the most effective means of managing the consequences of flood and, hence, minimising flood risks. For example, the consequences of a hospital being subject to increased depths of fast moving floodwaters with no warning could be an unacceptable risk to the community, while shallow backwater flooding of a plant nursery with adequate warning times may be an acceptable risk.

Floodplain risk management involves more than setting a FPL. It is about comprehensively managing the risk to people and assets (both below and above the FPL if it is lower than the PMF) by applying and integrating a range of available measures.

There are different types of flood risks and a range of ways in which each type of flood risk can be managed. This includes floor level controls, flood awareness and warning, evacuation facilities, building design, distributing land uses in a flood compatible manner, subdivision design (eg. road layouts), structural works, etc.

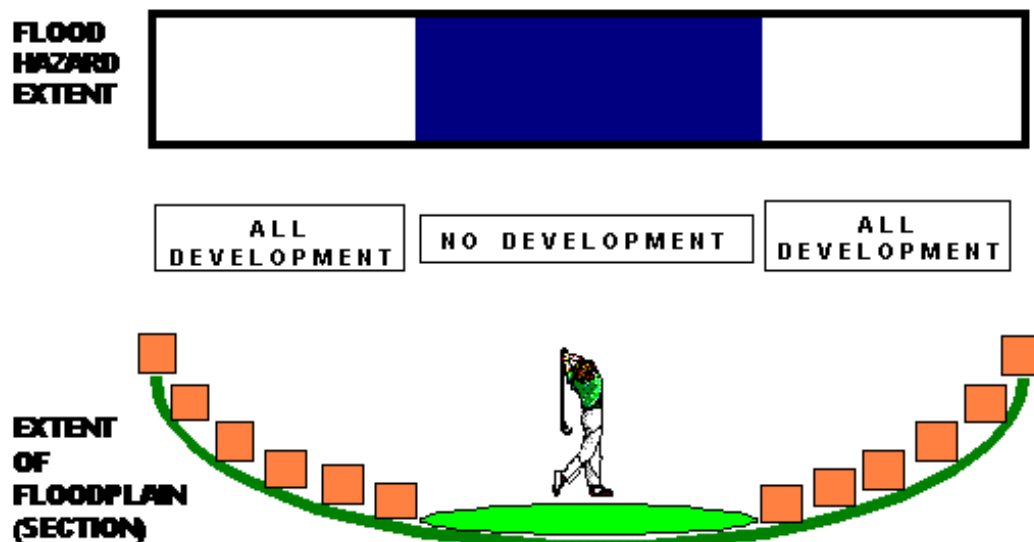
Traditional floodplain planning has relied almost entirely on the definition of a singular FPL, which has usually been the 100 year ARI flood level for the purposes of applying floor level controls. While such an approach has often been adequate, the approach has not worked well everywhere and has led to a number of problems including:

- creation of a 'hard edge' to development at the FPL;
- distribution of development within the floodplain in a manner which does not recognise the risks to life or the economic costs of flood damage;
- unnecessary restriction of some land uses from occurring below the FPL, while allowing other inappropriate land uses to occur immediately above the FPL;
- polarisation of the floodplain into perceived 'flood prone' and 'flood free' areas;
- lack of recognition of the significant flood hazard that may exist above the FPL (and as a result, there are very few measures in place to manage the consequences of flooding above the FPL);

- creation of a political climate where the redefinition of the FPL (due to the availability of more accurate flood behaviour data, or for other reasons) is fiercely opposed by some parts of the community, due to concern about significant impacts on land values. ie. land which was previously perceived to be 'flood free' will now be made 'flood prone' (despite the likelihood that such concerns may only be short term). Councils have a undeniable duty to disclose such knowledge. There is a reasonable expectation by people with an interest to be fully advised of such risks by Council, and flood awareness and preparedness is recognised as a significant measure in reducing flood damages and risk to life.

Accordingly, continuation of the sole reliance on the 100 year ARI FPL is inappropriate if a generic flood risk management approach is to be developed for the subject South Creek Councils.

The current approach to floodplain planning discussed above may be typified by the example shown in **Illustration 4** which flows from the inappropriate view of flood hazard presented in **Illustration 3**. No development is permitted below the FPL (ie. 100 year ARI flood) because of an acknowledgment of some degree of flood hazard. Above the FPL, no flood hazard is perceived and therefore there are no flood-related controls on development. Thus an abrupt change in development control occurs at the FPL.



#### **Illustration 4: Current Floodplain Planning**

*(Derived from an inappropriate view of flood hazard and the use of a singular flood planning level)*

In addition, it is rare to find councils which have determined their FPL using the procedures suggested in the State Government's FMM (2001) or previous FPDM (1986). That is, by balancing the social, economic and ecological considerations

against the consequences of flooding, with a view to minimising the potential for property damage and the risk to life and limb.

By default, most councils have adopted the 100 year ARI FPL, given that this FPL has been widely used across the State and internationally. Having regard to the NSW Flood Prone Land Policy and the FMM, the use of the 100 year ARI as the FPL, or in the formulation of various FPLs, together with other criteria, does not in itself warrant criticism provided that the implications associated with residual risk, or the sterilisation and constraining of land for alternative uses, is understood and accepted by the community. Unless the PMF is chosen as the singular and only FPL, then some decisions will need to be made by the community in regard to what residual risks they are willing to accept.

### **3.1.3 Flood Planning Levels (FPLs)**

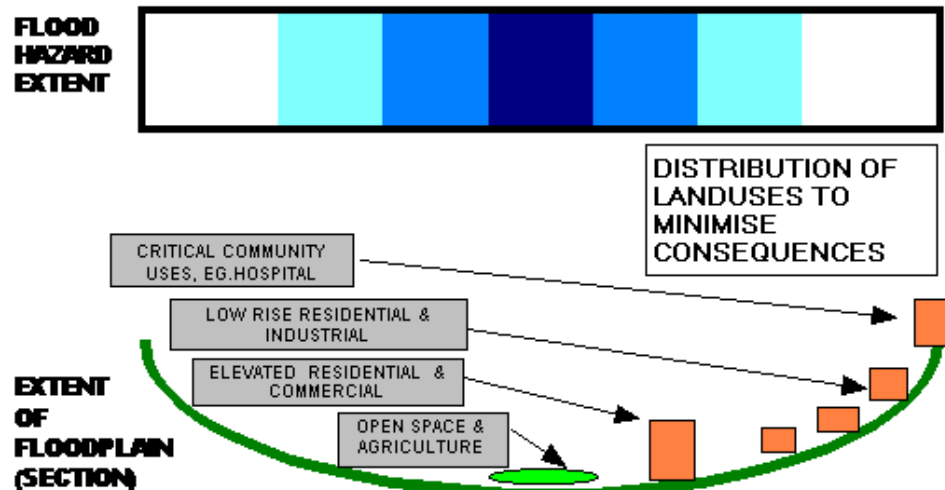
The flood planning level (FPL) is the level below which a Council places restrictions on development due to the hazard of flooding. FPL is the current preferred terminology in place of the flood standard or the designated flood, which were used by the previous FPDM (1986).

Consistent with the above philosophy, the danger in adopting FPLs below the PMF is that they are recognised by the community as definitive advice as to whether a flood hazard exists or not. Further, there has traditionally been an approach where a singular FPL (or flood standard) has been chosen which creates significant limitations on a holistic approach to managing the flood risk in the floodplain. The reality is that various land uses are subject to alternative consequences (risks) from the flood hazard. Accordingly, there needs to be a simplistic approach of reflecting the different flood risk to different land uses within the floodplain, while maintaining an understanding that flood risks still occur, regardless that flood controls may not be imposed. The planning matrix approach discussed below is one such methodology of addressing these issues.

### **3.1.4 The Planning Matrix Approach**

Given that some floodplains have an extensive flood range, and given the difficulty in addressing the associated variability in flood risks with simple rules, the use of the planning matrix approach (D. Bewsher and P. Grech, 1997) is recommended.

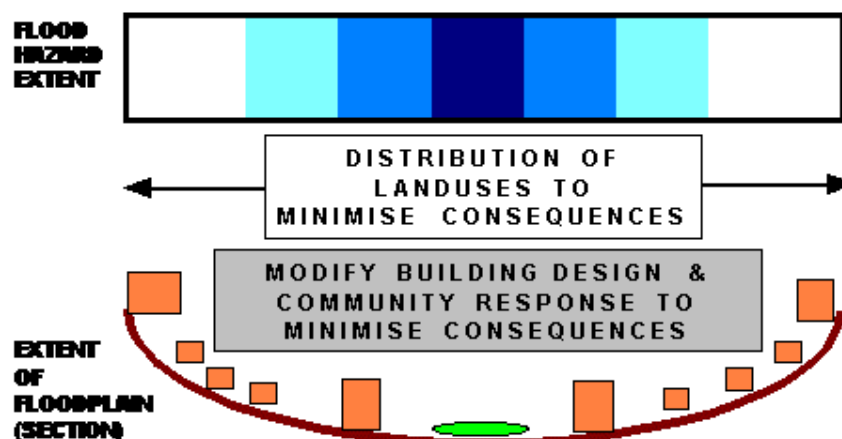
The approach distributes land uses within the floodplain and controls development to minimise the flood consequences as depicted in **Illustration 5** below.



**Illustration 5: Distributing Land Uses under the Planning Matrix Approach**

Using this approach, a matrix of development controls, based on the flood hazard and the land use, can be developed which balances the risk exposure across the floodplain. This approach has been adopted as part of the Hawkesbury–Nepean Flood Management Strategy (1997). After its original application in the Eastern Creek and Tributaries Floodplain Management Plan, this approach has also now been applied within the Upper Parramatta River Catchment (4 Councils), Blacktown, Narrabri, Cabramatta Creek, Patterson River, North Wentworthville, Haslams Creek (Auburn), Towradgi (Wollongong) and Molong Floodplain Management Studies, and the resulting matrix of planning controls has been pivotal in the new draft DCPs and LEPs recommended for implementation as part of these FRMPs.

The approach is summarised in **Illustration 6**. It is fully consistent with the Floodplain Management Manual.



**Illustration 6: The Planning Matrix Approach to Floodplain Planning**



## **3.2 Preparing a Planning Matrix**

### **3.2.1 Step 1 – Categorising the Floodplain**

The first stage in developing a matrix of flood planning controls is to identify each of the floodplains to which the overall policy document is to be applied, while the second stage is to divide the floodplains into different areas subject to similar levels of risk.

In regard to the first stage, it is noted that this FRMP relates only to the South Creek Floodplain. Notwithstanding, it is our approach that Council would benefit considerably by having a singular policy document which applies to all floodplains within its LGA, consistent with the approach being pursued in the Georges River FRMP. The approach advocated in this report is based on the principles outlined in the NSW Floodplain Management Manual and could be adequate for use in other floodplains (including stormwater floodplains). However, other approaches towards floodplain management may also be appropriate provided they are generally in accordance with the NSW Floodplain Management Manual.

The approach intended to be adopted to satisfy the above objective, is to prepare a singular DCP which has a common preamble, objectives and general policies, while specific controls for each floodplain are reflected within a planning matrix prepared for each individual floodplain and annexed to the principal document.

The second stage in the preparation of the planning matrix is to identify different flood risk precincts (FRPs), reflective of the variable flood risk within each of the separate floodplains.

The 100 year flood level has been retained as the principal floor level control for residential land uses in the study area. The 100 year flood has also been used as the basis of defining the three Flood Risk Precincts. This adoption of the use of the 100 year flood has been an important consideration for the development of planning controls for the study area and has been based on consideration of the following issues:

- recognition that the community is most familiar with the term ‘100 year flood’ and any variation from the use of a flood of this magnitude may undermine the current good work done in improving community awareness of flood-related issues;
- assessment of the impacts of floods between a 100 year flood and a probable maximum flood (PMF). The level of the PMF is only about 1.0m–1.5m above the level of the 100 year flood. For floods larger than a 100 year flood, there would be no significant changes in flood behaviour of flood affection, for example, no new significant overland flow paths would develop and no areas would become inaccessible islands with rising floodwaters;
- recognition that the community views the residential floor level control as the principal component of the council floodplain controls, and that changes to

the level of this control should not be made unless very strong arguments exist;

- the unacceptable increase in flood risks and damages, should a level lower than the 100 year flood be adopted;
- an unacceptable impost on future development, should a level higher than a 100 year flood be adopted;
- inconsistencies with recent development approvals if a level different from the 100 year flood was adopted.

In regard to the subject study, the following three FRPs are proposed:

- **High Flood Risk**                      This has been defined as the area of land below the 100 year flood that is either subject to a high hydraulic hazard or where there are significant evacuation difficulties. The high flood risk precinct is where high flood damages, potential risk to life, or evacuation problems would be anticipated. Most development should be restricted in this precinct as there would be a significant risk of flood damages without compliance with flood related building and planning controls.
- **Medium Flood Risk**                This has been defined as land below the 100 year flood that is not subject to a high hydraulic hazard and where there are no significant evacuation difficulties. Accordingly, the area in this precinct is all the land lower than the 100 year flood level that is not in the High FRP. In this precinct there would still be a significant risk of flood damage or risk to life, but these damages or risk to life can be minimised by the application of appropriate development controls.
- **Low Flood Risk**                      This has been defined as all other land within the floodplain (ie. within the extent of the probable maximum flood) but not identified as either a high flood risk or medium flood risk precinct. There will be a low cost benefit to compulsorily apply flood related development controls, where risk of damages are low for most land uses. The low flood risk precinct is that area above the 100 year flood and below the PMF, and most land uses would be permitted within this precinct.

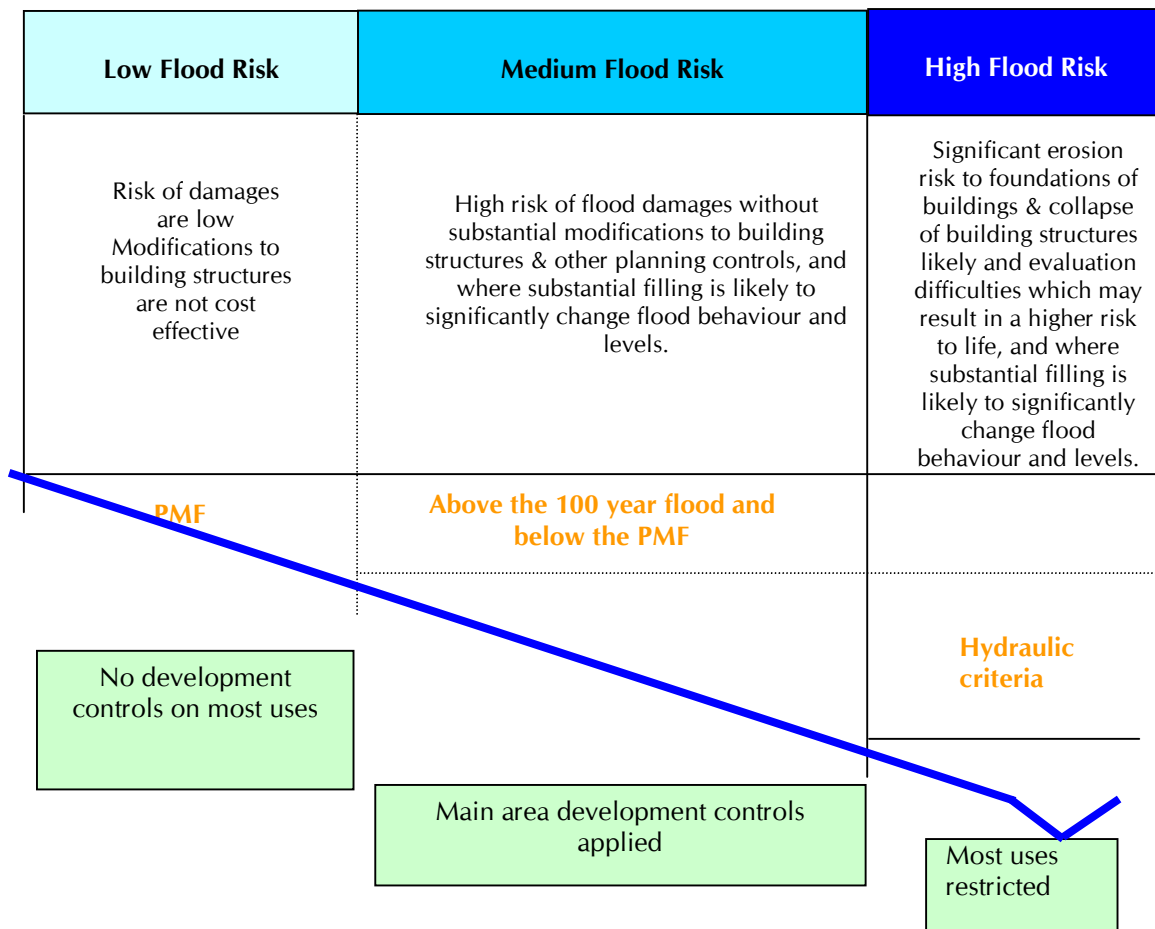
Flood maps prepared by Council for individual floodplains may identify the boundary of flood storage areas with a distinctive line. Within this area of the

floodplain, filling is likely to have an unacceptable impact on flood levels or flows. Notwithstanding, unacceptable impacts on other properties in the floodplain may also occur, due to development outside of these flood storage areas, and the need to assess this impact may also be imperative in some circumstances. The situation where such impacts must be assessed, and the manner in which to assess the impacts, are incorporated within the recommended DCP, discussed later in this report.

The FRPs delineated above have been formulated to provide a basis for strategic planning and development control having regard to the specific characteristics of the South Creek Floodplain. While the above criteria may be transferable to other floodplains, the particular characteristics of each floodplain need to be considered when preparing a Floodplain Risk Management Plan.

For the South Creek Floodplain, the Low Flood Risk precinct is that area above the 100 year ARI flood which is potentially subject to flooding, but is not included in any of the other FRPs. This area is still subject to some flood-related risk and those uses which may be considered critical or should be afforded maximum protection against risk from flooding, are to be identified as undesirable land uses in this precinct. The other major purpose for this FRP is to identify and recognise the potential flood risk for all persons and properties affected by the PMF, regardless of whether any specific development controls are to be applied. This provides a basis for flood awareness programs, evacuation and emergency planning and to maximise the preparedness of the community.

The diagrammatic definition of the precincts and their implications for planning controls are depicted on **Illustration 7** below.



**Illustration 7: Definition of Planning Precincts**

An individual property may be subject to more than one Flood Risk Precinct. In such situations, more than one set of controls apply depending upon the Flood Risk Precinct of that part of the site subject to a development proposal. This is consistent with the manner in which zoning controls are applied, but more importantly provides a mechanism to encourage appropriate forms of development across sites which may be affected by a range of flood risks. For example, on a site affected by multiple Flood Risk Precincts, a development can be encouraged to concentrate on that part subject to lower risk.

**3.2.2 Step 2 – Prioritising Land Uses in the Floodplain**

The next component in the preparation of the planning matrix is to prioritise land uses within the floodplain. This is achieved by identifying discreet categories of land uses, of similar levels of sensitivity to the flood hazard. In this case the following categories have been adopted:

- Critical uses and facilities
- Sensitive uses and facilities
- Subdivisions
- Residential

- Commercial and industrial
- Tourist related development
- Recreation or non-urban
- Concessional development.

Defined land uses, as specified by the relevant LEPs, are included within each of the above categories (and further described where necessary). These categories are subsequently listed under each FRP in the planning matrix dependent upon the level of flood risk which is considerable acceptable. This provides a basis to specifying whether certain categories are unsuitable land uses in different parts of the floodplain or whether they are suitable subject to varying degrees of development control. This approach is basically the application of the philosophy previously described within this report.

### **3.2.3 Step 3 – Controls to Modify Building Form and Community Response**

The next component in the preparation of the planning matrix is to assign different planning controls to seek to modify building form and the ability of the community to respond in times of flooding, depending upon the type of land use and the location of that land use within the floodplain. The type of controls can be categorised under seven main headings, being:

- Floor levels
- Building components and methods
- Structural soundness
- Flood effects on others
- Car parking and driveway access
- Evacuation
- Flood management and design.

There should be variance to the stringency of development controls reflecting the attitudes of the community, the sensitivity of the land use category to the flood hazard, and the location of the land use within the floodplain. This has been determined having regard to the characteristics of the study area and with reference to existing research. (refer also to Volume 1).

## **3.3 Implementation of the Planning Matrix Approach**

The most appropriate mechanism for the implementation of the proposed flood policy is its adoption as a DCP.

The residual floodplains, being those floodplains for which FRMPs have not been prepared to date, should be the subject of interim guidelines incorporated into the DCP. Notwithstanding, we note that the current FMM does not now recognise interim policies adopted while awaiting the preparation of a FRMP and Councils should seek further legal advice regarding the status of such guidelines for the purposes of Section 733 of the Local Government Act, 1993.

In addition to the preparation of the DCPs, Council will need to undertake discreet changes to its LEP in order to ensure consistency with definitions, special flood development control clauses, and to adjust exclusions to exempt and complying development. These changes are outlined and discussed further in a later section of this report.

## **4.0 REVIEW OF PLANNING OPTIONS**

### **4.1 General**

There are a number of alternative mechanisms by which land use planning may have a role in implementing non-structural measures for the control of development within the floodplain. These measures may vary from a fairly broad strategic overview of future and intended development or detailed building and development controls applicable to various forms of development in different zones.

Town planning can also have an input in regard to providing appropriate mechanisms for the implementation of structural measures, such as the adoption of a Section 94 contributions plan to provide developer funding towards broader scale flood mitigation works (although not likely to be a worthwhile mechanism for the subject floodplain study area under current zoning controls). Town planning can also assist in regard to flood awareness initiatives through notations on Section 149 Certificates (zoning information certificates).

It is noted that the Plan making processes under the EPA Act (such as for LEPs and DCPs) operate independently to the preparation of FRMPs under the FMM. While these 2 processes could be overlapped, it has been the usual practice to undertake the processes separately. This will provide for extended opportunities for public participation. Accordingly, once the FRMP has been adopted by the Council, they will subsequently implement the recommendations of the FRMP as they relate to that Council, which will include the preparation of LEPs and DCPs under the EPA Act. During this later plan making process further refinement and adjustment to the recommended LEPs and DCPs can be undertaken.

The following is an outline of planning measures considered appropriate for consideration for the study area.

### **4.2 State Environmental Planning Policies (SEPPs)**

As the State Government's FMM is aimed at encouraging a merit based approach to floodplain planning for individual areas, it is unlikely to be desirable to establish a global policy for floodplain development through the application of a SEPP. Accordingly, the pursuance of this option is not discussed further.

### **4.3 Regional Environmental Plans (REPs)**

As outlined previously, it is considered appropriate that some of the provisions and terminology adopted by the Hawkesbury-Nepean River REP, should appropriately be amended to provide a consistent framework for flood planning for the Liverpool

LEP. It is considered that these changes are independently desirable, and will also benefit the planning outcomes in areas covered by the REP, other than in the Liverpool LGA. The recommended changes to this REP are included as **Appendix A**.

#### **4.4 Local Environmental Plans (LEPs)**

There are various aspects of Council's LEP which can be appropriately restructured to form a component in the application of the FRMP. It is noted that the structure of the LEP should be such that it provides the necessary flexibility for the adoption of other FRMPs and their associated planning recommendations which may be prepared from time to time elsewhere within the LGA. In this regard, the importance of the LEP can be summarised as follows.

- To provide objectives for the application of floodplain management principles in the assessment of development applications.
- To appropriately identify areas subject to flooding in order that development applications in such areas may be specially considered and that Council has a basis for notifying the public of the potential for flooding on individual parcels of land in accordance with Section 149 Certificates issued under the Act.
- To outline general matters for consideration with more detailed controls being the subject of a DCP in accordance with accepted practice.
- To clearly define terminology used in the LEP, which relates to floodplain management.
- To ensure that the permissibility and prohibition of uses is consistent with the FRMP, in order that flood sensitive land uses are clearly prohibited within areas subject to significant and hazardous levels of flooding. In this regard we note that the prohibition of land uses is a matter which must be clearly outlined within the LEP as this function cannot legally be transferred to a DCP.

There are various standard refinements to the Council LEPs which could be considered to ensure consistency with the potential outcomes of all FRMPs prepared under the ambit of the current FMM, including that for the South Creek. These inclusions are generally outlined as follows:

- An additional objective to be inserted within the initial clauses of the plan which identifies flood risk management as an objective of the plan. This would reinforce the intent of the plan to deal with flood risk management, and the weight given to such provisions if challenged in the Court. For the purposes of simplicity, it would generally be preferable for the LEP to adopt a singular objective regarding the management of all natural hazards, inclusive of flood risk management.
- It is recommended that an alternative definition of flood liable land be adopted, which includes the whole of the floodplain, that is, up to the probable maximum flood. This would be consistent with the provisions of the current FMM, would

resolve issues of confusion with the public in regard to why there is land not deemed to be flood liable (ie. above the FPL but still at risk of flooding), and provide a more appropriate framework for more detailed planning controls to be embodied within a development control plan.

- The replacement of existing Clause 21 within the LEPs which outlines matters for consideration in the assessment of development applications on flood liable land. The proposed clause is effectively an updated version of what most councils in NSW presently provide within their LEPs, which is consistent with the FMM, flags the need for the assessment of general issues such as cumulative impact if ever challenged in the Court, and provides an appropriate framework for more detailed controls to be embodied within a development control plan.
- A refinement of Council's exempt and complying development provisions to generally retain the status quo in regard to such minor development. That is, it is recommended that the exempt and complying development provisions of Council be amended to exclude from being classed as exempt or complying development, only that part of the flood liable land (to be redefined as up to the PMF) that is affected by the 100 year ARI flood.
- The final matter to be dealt with by Council's LEP is the restriction of most forms of development within that part of the floodplain considered to be high risk. One approach considered, (which has been applied within LGAs outside of the study area) is to identify the High Risk Flood Precinct and to insert a special clause within the LEP to exclude the majority of forms of development within that area. The unfettered application of such an approach to the subject floodplain is unlikely to be appropriate on economic and social grounds, due to the potential alteration of substantial land presently developed, and inconsistencies with controls that would apply to other floodplains in the LGA.

An alternative approach is to adopt or refine Council's existing foreshore building lines (refer to Clause 23 of LEP 1997), to accord with the outer extent of the High Flood Risk Precinct. In some cases, the High Flood Risk Precinct represents a narrow band along the river and creek foreshores, which in the majority of cases is an area within which Council would not endorse the construction of new buildings. The use of the foreshore building line can have multiple objectives inclusive of flood risk management, riparian corridor conservation, public access and scenic protection.

Generally, some reliance could be placed on the proposed DCP to indicate where certain types of development would be undesirable in the High FRP. Although the DCP would not provide a statutory prohibition, it would identify the issue for resolution and provide a degree of flexibility for Council. As a separate exercise, it would also be appropriate for Councils to review the land uses permissible in High FRPs having regard to all relevant planning issues (not just flooding) and undertake a broader strategic review of the zoning controls applying to these areas.



At present Council has no particular provision within its LEP to prohibit a particular land use within a dangerous part of the floodplain (eg. such as the High FRP). Flooding will always remain just one issue to be dealt with in the assessment of a development application, and Council will have different existing land use patterns and topographic conditions in each of its floodplains, necessitating different approaches in regard to achieving a balance between stringency and flexibility.

While no specific preference has been expressed by the officers of Liverpool City Council, it is our conclusion that the use of a FSBL provision in their case would not be essential. The use of a special clause or not to prohibit the majority of uses within the High FRP, would be a matter for Council's further consideration having regard to other matters inclusive of their experience and practice in dealing with applications in the area and their perceived necessity for flexibility verses stringency. These recommendations may require review with regard to FRMPs prepared for other floodplains in the LGA.

The primary question to consider, is whether Council would, in most cases, advise development applicants that the majority of uses are not acceptable in a High FRP and would subsequently refuse development applications, regardless of whether there was a special clause pre-notifying the applicant. This is unlikely to be the case within the study area, in our view, as there are often many competing factors to be considered. Further, the more stringent approach would prevent an applicant being able to mitigate the risk through, for example, filling which would have the consequence of altering the applicable FRP, if an absolute prohibition was applied through the provisions of an LEP. Accordingly, it would be our view that Council rely upon the provisions of the DCP, but undertake a more strategic review of its zoning plans to determine whether flood risk sensitive uses should be excluded from high FRPs, having regard to the broad ambit of planning issues, and not just flooding.

This process should also involve a review of the appropriateness of the zoning of individual land parcels, should the combined flood risk and environmental criteria result in a restricted development area which substantially affects reasonable development expectations for individual properties.

The standard recommended LEP changes, as discussed above, are outlined within **Appendix B**. More detailed discussion in regard to the changes required for this are provided below.

During the conduct of the FRMS for the Georges River Catchment, an interim recommendation was provided to Liverpool City Council in regard to amendments to its LEP, to coincide with its review of the LEP at that time. Those recommendations are consistent with the recommendations contained within **Appendix B** and are summarised as follows:

- Replace the existing definition of *flood liable land* provided at Clause 6 with that contained within **Appendix B**.

- Add the definition of *probable maximum flood* contained within **Appendix B** to those contained within Clause 6.
- Consider replacing the objective provided at Clause 2(g) within LEP 1997 with that contained at **Appendix B** to provide clearer intent in regard to the management of risk associated with natural hazards. It was indicated that the inclusion of this objective was not critical, but nonetheless desirable.
- Replace Clause 21 with the updated clause providing general considerations in the assessment of development applications on flood liable land, outlined at **Appendix B**. It was noted that Clause 21 as presently exists within LEP 1997 is reasonably comprehensive and, therefore, it is not essential that it be changed. Notwithstanding, it is recommended that the clause at **Appendix B** is simpler and clear and will be consistent with that recommended for many other Councils and comprehensively covers all relevant matters.
- In regard to Council's exempt and complying development provisions, it is recommended that Clauses 6A(3)(f) and 6B(3)(a) of the LEP be review consistent with the recommendations outlined at **Appendix B**.

## **4.5 Development Control Plans (DCPs)**

### **4.5.1 General**

The appropriate mechanism for specifying detailed controls, to be applied for new development to manage floodplain risk management issues would be a DCP. This document could form an overall comprehensive and broader flood management policy. The DCP should be accompanied by a map which identifies all FRPs, which are provided as an outcome of the FRMP.

The proposed DCP will generally involve a preamble of provisions which establishes a framework to allow for the outcomes of multiple FRMPs to be incorporated into the document, of which the South Creek FRMP will be one. Where possible, existing controls from other Floodplains in the Liverpool LGA are integrated into the proposed documents, to increase the convenience for Council to accelerate the adoption of the plan. Accordingly, it is recommended that the model DCP provided at **Appendix E** be adopted for consideration by Council

### **4.5.2 Specific DCP Considerations**

There are seven areas of development control consideration relevant to floodplain planning which may be applied to development in the study area. The following provides a discussion of the controls that would be appropriately considered under each of these headings.

### **4.5.3 Floor Area**

All habitable floor levels of dwellings should be no lower than the 100 year ARI flood level plus freeboard. Additionally, where practical, extended floors associated with minor additions to existing development should be provided at the 100 year ARI flood level plus freeboard but should never be at a level lower than the existing floor level where that does not comply with the standard.

Similarly, the floor levels of industrial and commercial development should be at the 100 year ARI flood level plus freeboard, where possible. An alternative floor level control is provided for commercial uses in order to allow for floor and street levels to relate in a manner consistent with existing development in a centre, subject to elevated storage space being provided. This as it relates to commercial and industrial development will be of limited relevance in the context of the study area, but is included for the purposes of completeness.

Less “flood sensitive” land uses such as buildings associated with *recreation areas* or *non-urban uses* (where permitted outside of the High FRP) could have buildings located with floor levels at the 5 year ARI flood level (plus freeboard) sufficient to avoid nuisance flooding. (In some circumstances, it may be appropriate to vary this requirement and where a site specific analysis was carried out). Sensitive uses and facilities (such as communication facilities and schools) should have floor levels above the PMF as these will be essential to ensuring minimal disruption to the community during major floods. Critical uses and facilities (such as hospitals and nursing homes) should be located outside of the floodplain to provide for potential refuge during major floods and minimal impact to the community.

### **4.5.4 Flood Compatible Building Components**

All structures below the design flood level for individual land uses should be constructed of flood compatible materials. With regard to the identification of appropriate flood compatible materials, an appropriate general list of materials and fittings is provided within the recommended DCP. However, we note that the Department of Infrastructure, Planning and Natural Resources has commissioned a detailed study by the CSIRO and the University of Newcastle which will identify appropriate flood compatible materials (including methods of construction) applicable to Australian conditions (in particular, the Hawkesbury-Nepean Floodplain). It is understood that this study is yet to be completed. It is recommended that the DCP be reviewed upon completion and availability of this study.

### **4.5.5 Structural Soundness**

An engineer’s report is considered to be appropriate to ensure structures located within High Flood Risk FRPs are capable of withstanding the forces of floods including debris and buoyancy factors.

The issue of structural soundness should also be considered elsewhere within the floodplain, but it is not considered that an engineering report would be necessary in

each case. The applicant would still need to demonstrate that the issue has nonetheless been addressed, by either explaining how such an issue is not relevant in any particular case, or that the design has minimised any impacts to the maximum practical extent. Council engineers may require an engineer's report once the matter is assessed or the applicant could elect to provide such a report in recognition of the issue.

#### **4.5.6 External Flood Effects**

An appropriate principle in floodplain management is to ensure that development within the floodplain does not increase the flood affectation or hazard upon other properties or persons. Hence, it is recommended that an engineer's report is provided for any development within the High Flood Risk FRP or for any subdivision works and filling in the Medium Flood Risk FRP to prove that the development will not increase flood affectation elsewhere. This matter will also need to be considered with regard to other land uses in the floodplain but an engineering report may not be necessary in each case. As above, the applicant would be required to demonstrate that the issue has been addressed and Council engineers will assess the matter and determine whether an engineering report is nonetheless required in any particular case.

The current version of the DCP, recommended as part of this study, incorporates specific procedures for assessing flood effects (refer to Schedule 2 of DCP). This process provides a codified methodology for the purposes of undertaking an engineering assessment which addresses the following:

- Changes in flood storage volume
- Changes in flood conveyance, and
- Cumulative impacts.

The necessity to assess these matters are specified within the DCP, depending upon the type of land use and the flood risk precinct effecting the land.

#### **4.5.7 Car Parking and Driveway Access**

Damage to vehicles during floods can often be a major component of total damage costs. Enclosed car parking areas (eg. basements) are potentially dangerous during floods due to their ability to inundate quickly and unexpectedly when entrance points are over topped. Inappropriately designed driveways can also often constrain evacuation from individual properties. Accordingly, controls are proposed to address these issues in a practical way.

#### **4.5.8 Evacuation**

These controls are aimed at ensuring that human life is protected by maximising opportunities to safely evacuate people outside of or above the floodplain. The direction of evacuation will be dependent on warning times, duration of floods and available evacuation routes. For example, if warning times and flood duration are short, and roads out of the floodplain are blocked early in a flood, it can be more

appropriate to require a refuge on-site above the PMF. In the case of the South Creek Floodplain the ability to reach an area of refuge above the PMF, outside of the floodplain is appropriate. The refuge must always be above the PMF when considering issues of human life, to avoid situations where persons evacuate to locations early during a flood which are eventually inundated as the flood becomes more extreme.

Having regard to available warning times and the relatively narrow floodplain corridors throughout the study area, regional evacuation is not a major issue. Notwithstanding, the structure of the DCP provides for this issue to be addressed within other floodplains as appropriate, and general matters associated with access are addressed within appropriate controls.

#### **4.5.9 Management and Design**

Special consideration of the design and management of individual proposals can also reduce the flood risk and potential damage to property and persons. These measures may involve the provision of a flood plan for individual sites which ensures that individuals consider and plan means to minimise the likelihood of flood damage, including providing for the movement of goods above the flood level within the likely available flood warning time. Other specific considerations are for the storage of certain goods above the design flood level and requiring the implementation of mitigating measures to prevent pollution of the waterway and floodplain potentially occurring during floods.

#### **4.6 Section 149 Certificates**

Section 149 (S149) certificates should not be used as broad community education tools as they have only limited circulation. The majority of flood-affected properties would not be reached in a given year. Further, with the existing system of notifications on S149 (2) certificates, if no notification appears, then it is often misunderstood to mean that property is “flood-free” rather than it has no development controls. On the other hand, S149 certificates should not confuse or mislead those people who have access to them, with regard to understanding whether there are any risks of floods affecting a particular property.

It is desirable that all properties in the floodplain (i.e. up to the probable maximum flood) be notified. Notification may include the Flood Risk Precinct if known and the existence of the relevant DCP. If the property is ‘potentially flood affected’ this could also be notified. A notation should be provided that states that while all reasonable efforts are employed to identify lands subject to any potential flood risk, all properties so affected may not have been identified (eg. in local catchments). While it is considered that along the South Creek the majority of potentially flood affected properties have been identified, Council may determine that a site-specific flood study is required on land not currently identified as flood affected, for the purposes of determining what flood risk precinct applies to the site and assessing a development application.

There are two potential sources of inundation that need to be addressed on the S149 certificate notifications. These are listed below. 'Inundation' refers to inundation in any flood up to the probable maximum flood (PMF):

- Inundation from creeks and rivers
- Inundation from local catchment "major drainage" stormwater and overland flow. (Generally inundation from local catchment "local drainage", as defined in Section 1.9 of the 2001 Floodplain Management Manual, would not be included here).

It should be recognised that inundation could occur from either or both sources and the S149 certificates can reflect this. Usually the most severe form of inundation will dominate the planning controls to be applied to new development.

For each of the two types of inundation listed above, it is suggested that the inundation status can be defined in one of three ways:

**Category A** Inundation of property has been defined by a flood study, ie, the flood behaviour at the property has been quantified and velocities and depths are known for a range of floods. Sufficient information is available to define the flood risk as 'low', 'medium' or 'high'

**Category B** The property may be inundated but the flood behaviour has not been quantified to the extent noted in Category A above or a flood study is needed to determine if the property is flood affected. For example, there may be anecdotal evidence of flooding but no formal flood study has yet been carried out; or

**Category C** The property is not thought to be inundated having regard to available information.

Guidance on the wording of Section 149(2) and 149(5) certificates is provided in Appendix L of the 2001 Floodplain Management Manual. The wording proposed for consideration for S149 (2) certificates for Liverpool City Council is presented in **Appendix D**. For any property generally within the LGA, one of the three categories A, B or C may apply in respect of flooding from creeks/ivers and another of the categories for stormwater/overland flow from local catchments. A matrix of possible outcomes is possible as indicated in **Appendix D**. Only a portion of these outcomes will normally apply within the study area, however all possible outcomes have been included for completeness.

For S149 (5) certificates, it is recommended that consideration be given to providing a flood certificate appended to the S149 (5) certificate, as discussed within the main FRMP report. In addition, where Category B applies (for creek/river flooding or stormwater/overland flow from local catchments) the certificate could provide additional details of the potential flood affectation and/or suggest that the Applicant contact Council's Stormwater/Flooding Engineer for further details.

## **5.0 CONCLUSION AND SUMMARY OF RECOMMENDED PLANNING MEASURES**

Having regard to the above discussion, the following planning measures are recommended for consideration by Council. Council will need to review each recommendation having regard to a broad range of issues, inclusive of comments received during public exhibition, prior to adopting the final Floodplain Risk Management Plan:

- (a) That the Floodplain Management Committee (FMC) endorse the planning approach outlined within this report. This approach basically requires a graded set of planning controls for different land uses relative to different levels of flood risk within the study area, be adopted, consistent with the requirements of the current NSW Floodplain Management Manual.
- (b) That the FMC formally endorses the recommended changes to the Hawkesbury-Nepean River REP (Sydney REP 20) provided at **Appendix A**, for referral to Department of Infrastructure, Planning & Natural Resources.
- (c) That Council considers amending their LEP in the manner outlined above and summarised in **Appendix B**, to provide a consistent framework for more detail controls to be provided in a DCP.
- (d) That Council adopts the Model DCP appended to this report (refer to **Appendices C**), and provides for its formal preparation and adoption in accordance with the procedures outlined by the EPA Act.
- (e) That Council considers the need to include flooding advice on S149 Certificates that includes the flood risk of a property and the existence of any policies affecting development. Any such notation should have regard to both local overland flooding and creek/riverine flooding and should preferably provide for notification up to the PMF. A suggested wording for S149 notations is included in **Appendix D**.

It is considered that the above recommendations provide appropriate responses to the issues raised and evaluated within the context of the FRMP and the legislative framework associated with planning.

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# **APPENDIX A**

## **GENERAL PROVISIONS REGARDING RECOMMENDED AMENDMENTS TO SYDNEY REP NO. 20 – HAWKESBURY-NEPEAN**

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**OBJECTIVES**

Insert as Objective 1(g) the following:

*To minimise the risk to human life and damage to property caused by flooding.*

**GENERAL AND SPECIFIC PLANNING PRINCIPLES**

Add the following general principle to clause 8:

*(f1) Any floodplain risk management plan prepared and adopted by Council in accordance with the State Government's Floodplain Management Manual dated 2001.*

Replace sub-clause 8(3) with the following:

*(3) All development on flood liable land should avoid the following:*

- A diminution of the benefits of periodic flooding to wetland and other riverine ecosystems.*
- Pollution hazards resulting in the event of a flood.*
- Any detrimental increase in the potential flood affectation of other development or property.*
- An unacceptable increased risk to human life.*
- The potential for additional economic and social cost to arise as a result of flooding, which could not reasonably be managed by potentially affected persons and the general community.*
- An adverse affect on the environment of the floodplain resulting from avoidable erosion, siltation, unnecessary destruction of riverbank vegetation or reduction in the stability of the river bank.*
- The development having an unacceptable impact when considered in combination with the cumulative impact of development which is likely to occur in the future, within the same floodplain.*

**PLANNING CONTROL AND CONSULTATION TABLE**

Where the planning controls specify that a development is prohibited where proposed on flood liable land, the following words to be placed thereafter such a reference within a provision:

*(unless otherwise consistent with a floodplain risk management plan, adopted by Council, and prepared in accordance with the Floodplain Management Manual dated 2001 as published by the State Government.*

## DEFINITIONS

Review the definition of terms provided within the Dictionary at the conclusion of the REP, by:

- Deleting the definitions of **floodplain**, **flood liable land** and **flood prone land** and replace with the following:

**Flood liable land** (being synonymous with **flood prone land** and **floodplain**) means land identified in an environmental planning instrument as flood liable land

Amend the definition of **floodway** so to insert the following after the word "floods" in the first sentence:

, or identified as subject to a high flood risk (using this term or cognate words) in a floodplain risk management plan adopted by Council and prepared in accordance with the Floodplain Management Manual dated 2001 (published by the State Government).

# **APPENDIX B**

## **STANDARD RECOMMENDED LEP INCLUSIONS (Amendments relevant for Liverpool LEP 1997)**

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## DEFINITIONS

**Flood liable land** (being synonymous with **flood prone land** and **floodplain**) is the area of land which is subject to inundation by floods up to and including a probable maximum flood (PMF).

[Replace existing definition in Clause 6]

**Probable maximum flood (PMF)** is the largest flood that could conceivably occur at a particular location.

[Add definition in Clause 6]

## OBJECTIVES

(...) To minimise the risk to human life and damage to property caused by natural hazards such as bushfire, land instability and flooding and to allow for more detailed controls for development on flood prone land to be implemented within a Development Control Plan.

[Inclusion of this objective is desirable but not critical, and could replace objective at Clause 2(g)]

## STANDARD CLAUSE

### ... **Development in Flood Prone land**

(1) Notwithstanding any other provisions of this Plan, the Council may refuse consent to the carrying out of any development on flood prone land where, in its opinion, the development may:

- (a) be inconsistent with any floodplain risk management plan adopted by Council in accordance with the Manual entitled "Floodplain Management Manual" dated 2001 (as published by the State Government);
- (b) detrimentally increase the potential flood effect on other development or property;
- (c) result, to a substantial degree, in an increased risk to human life;
- (d) be likely to result in additional economic and social cost which could not reasonably be managed by potentially affected persons and the general community; or
- (e) adversely affect the environment of the floodplain by causing avoidable erosion, siltation, unnecessary destruction of river bank vegetation or a reduction in the stability of the river bank;

(2) When undertaking an assessment required by this clause, Council shall take into consideration the impact of the development in combination with the cumulative impact of development which is likely to occur within the future, within the same floodplain.

(3) For the purposes of this Plan, the Council may consult with and take into consideration, any advice of the Department of Infrastructure, Planning and Natural Resources, any relevant constituted Catchment Management Authority, and the State Emergency Service in relation to the nature of the flood hazard, the necessity and capacity to evacuate persons, and the consequence and suitability of the development.

[Inclusion of this clause is desirable but not critical and could replace Clause 21]

### **EXEMPT & COMPLYING DEVELOPMENT**

Amend exempt and complying development provisions so as to exclude the following from being classed as exempt development:

*“..... is within that part of the flood liable land that is affected by the 100 year average recurrence interval (ARI) flood ....”*

[Insert as appropriate within Clauses 6A(3)(f) and 6B(3)(a)]

# **APPENDIX C**

## **DRAFT DEVELOPMENT CONTROL PLAN (DCP) NO. 52**

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**Liverpool**city council  
creating our future together



*“..... all about managing our flood risks emanating from rivers, creeks, major drains and overland flow.”*

# **FLOOD RISK MANAGEMENT**

## **Draft Development Control Plan (DCP) No. 52**

Environmental Planning and Assessment Act, 1979

# FLOOD RISK MANAGEMENT

## Draft Development Control Plan (DCP) No. 52

Environmental Planning and Assessment Act, 1979

Prepared by *Don Fox Planning*

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Date: December 2004

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### **LIST OF ATTACHED SCHEDULES**

- 1 Flood Compatible Materials
- 2 Procedures for Assessing Flood Effects
- 3 Land Use Categories
- 4 Prescriptive Controls – Georges River Floodplain (including Lower Cabramatta Creek)
- 5 Prescriptive Controls – Kemps/Bonds Creeks Floodplain (Austral area) [To be inserted by Council at a later date]
- 6 Prescriptive Controls - South Creek Floodplain
- 7 Prescriptive Controls – Upper Nepean River Floodplain [To be inserted by Council at a later date]
- 8 Prescriptive Controls – Upper Cabramatta Creek Floodplain [To be inserted by Council at a later date]
- 9 Prescriptive Controls – All Other Floodplains Including Areas Affected by Local Overland Flooding

## 1.0 GENERAL

### 1.1 What is the Plan?

This document is to be known as the "Liverpool Flood Risk Management Development Control Plan" (DCP) No..... This Plan has been adopted by Council at its meeting of ..... in accordance with Section 72 of the Environmental Planning and Assessment Act, 1979 (Development Control Plans).

### 1.2 Why is This Plan Required?

In 1984, the State Government introduced its current flood prone land policy applicable to New South Wales. The first *Floodplain Development Manual* (FDM) was published in 1986, providing guidelines for the implementation of the government's flood prone land policy and the merit approach which underpins its application.

Revised guidelines were released in 2001 and are now embodied in the *Floodplain Management Manual* (FMM). The FMM continues to support the NSW Government's Flood Prone Land Policy. 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 floods, utilising ecologically positive methods wherever possible."*

To achieve this objective the FMM acknowledges a broad risk management hierarchy of:

- avoidance of flood risk;
- minimisation of flood risk using appropriate planning controls; and
- flood risk mitigation.

Flood risk mitigation is the least preferred option, being costly and most likely to adversely affect the natural environment. Avoidance and minimisation of flood risk are the options most likely to be acceptable and are primarily reliant on land use planning and development control for implementation.

Local Government is the primary authority responsible for both flood risk management and land use planning in New South Wales. The State Government's flood policy provides for a flexible merit based approach to be followed by local government when dealing with planning, development and building matters on flood prone land. For Council to fully carry out its responsibilities for management of flood prone land, it is necessary to prepare a local "*Floodplain Risk Management Plan*" (FRMP).

The FMM requires that Councils prepare *Floodplain Risk Management Studies* (FRMS) as a prelude to the formulation of a FRMP which, among other things, would control development and other activity within the floodplain. The process for preparing a FRMS and FRMP is depicted by **Figure 1**.

This Plan is consistent with the State Government's "Flood Prone Land Policy" and the FMM. This Plan is an application of the State Policy which reflects local circumstances, as identified for some floodplains, through the preparation of FRMS's and FRMP's.

### 1.3 To Which Applications Does the Plan Apply?

Council will take into consideration this Plan when determining development applications received in accordance with the Environmental Planning and Assessment Act, 1979.

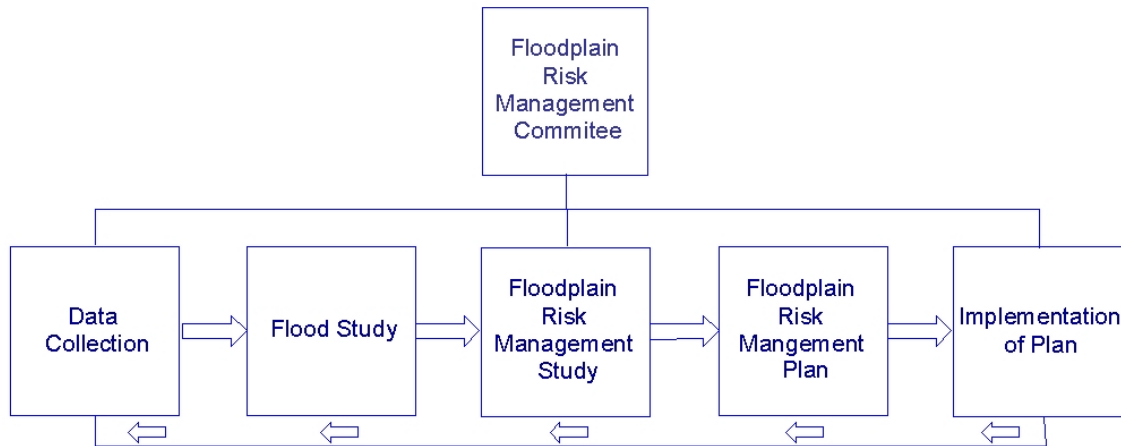


Figure 1: Floodplain Risk Management Process (FMM, 2001)

This Plan does not propose to exempt any applications from the necessity to obtain a particular approval of the Council or other government agencies, where such a requirement would otherwise exist.

#### 1.4 Where Does the Plan Apply?

The Plan applies to whole of the Local Government area, as depicted upon the DCP Map.

There are a number of floodplains within the LGA, and this DCP will provide general provisions relating to all the floodplains and specific provisions relating to individual floodplains.

#### 1.5 How Does the Plan Relate to Other Legislation and Regulations?

This Plan should be read in conjunction with the relevant provisions of the NSW Government Flood Prone Lands Policy and Floodplain Management Manual (FMM 2001), the Environmental Planning and Assessment Act, 1979, and Regulations thereto, applicable Environmental Planning Instruments (in particular Liverpool Local Environmental Plan (LEP) 1997, the Greater Metropolitan Regional Environmental Plan No. 2 – Georges River Catchment and other relevant Development Control Plans and policies adopted by Council.

#### 1.6 How to Use this Plan

Please read this document carefully and seek assistance from Council officers as required. The following is a summary of the major steps you should address:

- (a) Check the proposal is permissible in the zoning of the land by reference to any applicable Environmental Planning Instrument (eg. Liverpool Local Environment Plan 1997).
- (b) Consider any other relevant planning controls of Council (eg. controls in any other applicable DCP which governs the size and setback of development).
- (c) Determine the floodplain (eg. Georges River, Cabramatta Creek, etc.) and flood risk precinct (low, medium or high) within which your site is situated. Enquire with Council regarding existing flood risk mapping or whether a site specific assessment may be warranted in your case (for example, if local overland flooding is a potential problem). A property may be located in more than one Precinct and the assessment must consider the controls for each Precinct where relative to where located on the site. The flow diagram illustrated at **Figure 1.1** below summarises this consideration process.



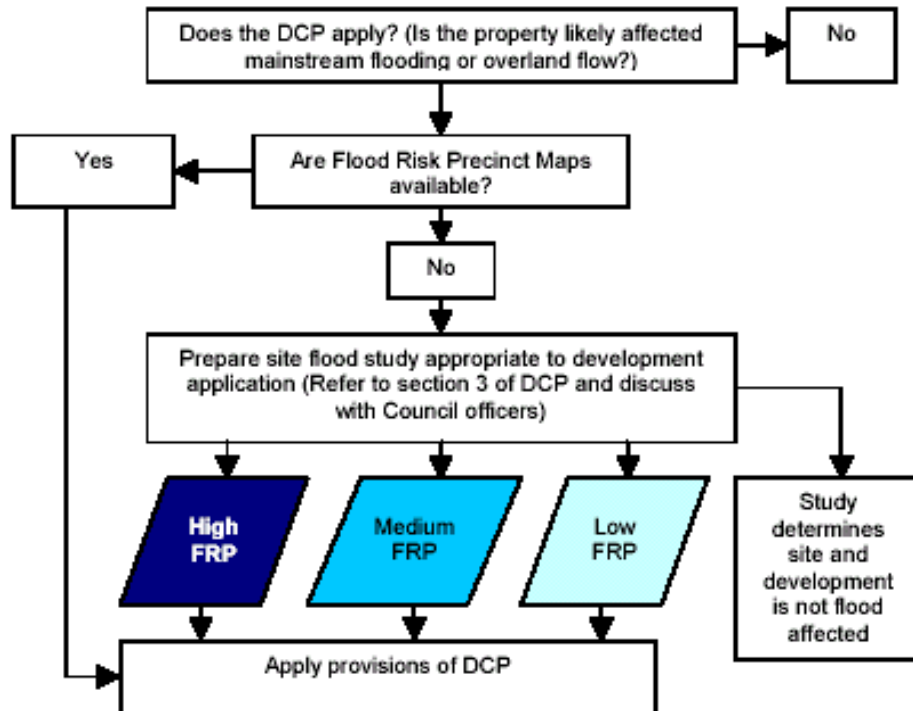


Figure 1.1: Flowchart for the determination of floodplain and flood risk

(d) Determine the land use category relevant to your development proposal, by firstly confirming how it is defined by the relevant environmental planning instrument and secondly by ascertaining the land use category from Schedule 2 of this Plan.

(e) Assess and document how the proposal will achieve the performance criteria for development and associated fencing provided by Clauses 2.4.2 and 2.5.2 of this Plan.

(f) Check if the proposal will satisfy the prescriptive controls for different land use categories in different flood risk precincts, as specified in Schedule 4 to 9 of this Plan depending on which floodplain the site is located.

If the proposal does not comply with the prescriptive controls, determine whether the performance criteria are nonetheless achieved.

The assistance of Council staff or an experienced floodplain consultant may

be required at various steps in the process to ensure that the requirements of this Plan are fully and satisfactorily addressed.

### 1.7 What are the Aims of the Plan?

This Plan aims to:-

(a) Minimise the potential impact of development and other activity upon the aesthetic, recreational and ecological value of the waterway corridors.

(b) Increase public awareness of the hazard and extent of land affected by all potential floods, including floods greater than the 100 year average recurrence interval (ARI).

(c) Ensure essential services and land uses are planned in recognition of all potential floods.

(d) Inform the community of Council's policy for the use and development of flood prone land.

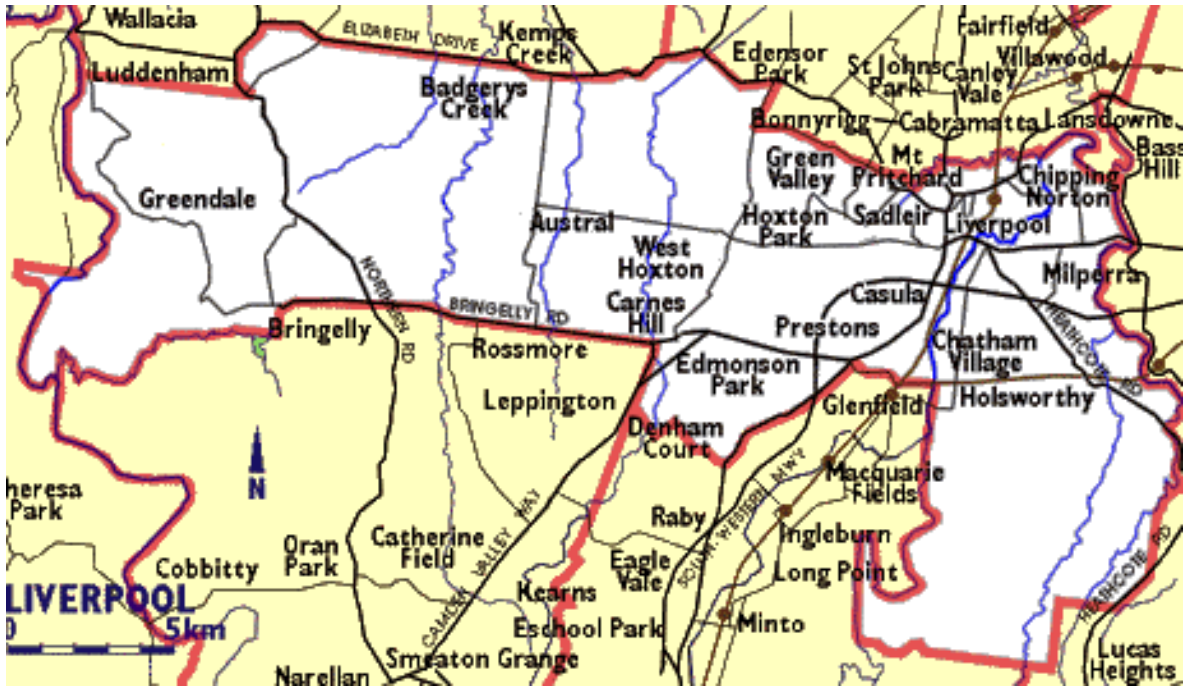
(e) Reduce the risk of loss to human life and damage to property

caused by flooding through controlling development on land affected by potential floods.

- (f) Apply a “merit-based approach” to all development decisions which takes account of social, economic, ecological and flooding considerations.
- (g) Control development and other activity within each of the individual floodplains within the LGA having regard to the characteristics and level of information available for each of the floodplains, in particular the availability of FRMS's and FRMP's prepared in accordance with the FMM and its predecessor, the FDM.
- (h) Deal equitably and consistently with development applications on land affected by potential floods, in accordance with the principles contained in the FMM.



### DCP MAP



[COUNCIL TO INSERT BETTER MAP SHOWING CATCHMENT AREAS WHERE EACH MATRIX APPLIES]

## 1.8 Glossary

For the purpose of this Plan, the following definitions have been adopted:

**Adequate Warning Systems, Signage and Exits** is where the following is provided:

- (a) an audible and visual alarm system which alerts occupants to the need to evacuate, sufficiently prior to likely inundation to allow for the safe evacuation of pedestrians and vehicles;
- (b) signage to identify the appropriate procedure and route to evacuate; and
- (c) exits which are located such that pedestrians evacuating any location during any flood do not have to travel through deeper water to reach a place of refuge above the 100 year flood away from the enclosed car parking.

**Australian Height Datum (AHD)** is a common national plain of level corresponding approximately to mean sea level.

**Average Recurrence Interval (ARI)** means the long-term average number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods with a discharge as great as, or greater than, the 20 year ARI flood event will occur on average once every 20 years. ARI is another way of expressing the likelihood of occurrence of a flood event.

**Basement car parking** means car parking areas generally below ground level, or above natural ground level and enclosed by bunding, where inundation of the surrounding areas may raise water levels above the entry level to the basement, resulting in rapid inundation of the basement to depths greater than 0.8 metres. Basement car parks are areas where the means of drainage of accumulated water in the car park has an outflow discharge capacity significantly less than the potential inflow capacity.

**Boundary of Significant Flow** defines that area of the floodplain where a significant discharge of water occurs during floods. Should the area within this boundary be fully or partially blocked, a significant distribution of flood flows or increase in flood levels would occur.

**Note:** Flood maps prepared by Council for individual floodplains may identify this boundary with a distinctive line (see Schedules 4 to 9). This line identifies an area of the floodplain within which any obstruction such as a building, fence or filling is likely to have an unacceptable impact on flood levels or flows. Notwithstanding, unacceptable impacts on other properties in the floodplain may also occur due to development outside of the area, and the need to assess this may be required by Council. Schedule 2 provides the 'Procedures for Assessing Flood Effects.'

**Compensatory Works** refers to earthworks where material is excavated (or "cut") from one location in the floodplain and placed (or "filled") at another location in the floodplain, with no net importation of fill material, such that the volume available for storage of flood waters is not altered for all floods.

**Conveyance** is a direct measure of the flow carrying capacity of a particular cross-section of a stream or stormwater channel. (For example, if the conveyance of a channel cross-section is reduced by half, then the flow carrying capacity of that channel cross-section will also be halved).

**Design floor level or ground level** means the minimum floor level that applies to the development. If the development is concessional development, this level is determined based on what land use category would apply if it was not categorised as Concessional Development. The floor level standards specified for the relevant land use category (excluding Concessional Development) in the

low flood risk precinct are to be applied.

**Effective warning time** is the time available after receiving advice of an impending flood and before the floodwaters prevent appropriate flood response actions being undertaken. The effective warning time is typically used to move farm equipment, move stock, raise furniture, evacuate people and transport their possessions.

**Extreme flood** means an estimate of the probable maximum flood, which is the largest flood likely to ever occur.

**Enclosed Car Parking** means car parking which is potentially subject to rapid inundation, which consequently increases risk to human life and property (such as basement of bunded car parking areas). The following criteria apply for the purposes of determining what is enclosed car parking:

- (a) Flooding of surrounding areas may raise water levels above the perimeter which encloses the car park (normally the entrance) resulting in rapid inundation of the car park to depths greater than 0.8m, and
- (b) Drainage of accumulated water in the car park has an outflow discharge capacity significantly less than the potential inflow capacity.

**Filling** is the placement of earth material onto a site above existing ground levels. This is excluding where this results in the increase in ground levels by up to 100mm across 50 % of the site or 250 square metres (whichever is the lesser), or the raising of ground levels across part of a site as a result of compensatory earthworks. Such works are to form part of a proposed use, which is otherwise permitted and assessed as part of that proposal.

**Flood** is a relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage as defined by the FMM before entering a watercourse.

**Note:** Consistent with the FMM, this DCP does not apply in the circumstances of local drainage inundation as defined in the FMM and determined by Council. Local drainage problems can generally be minimised by the adoption of urban building controls requiring a minimum difference between finished floor and ground levels.

**Flood awareness** is an appreciation of the likely effects of flooding and a knowledge of the relevant flood warning and evacuation procedures.

**Flood compatible building components** means a combination of measures incorporated in the design and/or construction and alteration of individual buildings or structures subject to flooding, and the use of flood compatible materials for the reduction or elimination of flood damage (see Schedule 1).

**Flood compatible materials** include those materials used in building which are resistant to damage when inundated. A list of flood compatible materials is attached in **Schedule 1**.

**Flood Effects** (refer to the definition of the term 'not increase flood effects elsewhere').

**Flood evacuation strategy** means the proposed strategy for the evacuation of areas within effective warning time during periods of flood as specified within any policy of Council, the FRMP, the relevant SES Flood Plan, by advices received from the State Emergency Services (SES) or as determined in the assessment of individual proposals.

**Flood prone land** (being synonymous with **flood liable** and **floodplain**) is the area of land which is subject to inundation by the probable maximum flood (PMF).

**Floodplain Management Manual** (FMM) refers to the document dated January 2001, published by the New South Wales Government and

entitled “*Floodplain Management Manual: the management of flood liable land*”.

**Floodplain Risk Management Plan (FRMP)** means a plan prepared for one or more floodplains in accordance with the requirements of the FMM or its predecessor.

**Floodplain Risk Management Study (FRMS)** means a study prepared for one or more floodplains in accordance with the requirements of the FMM or its predecessor.

**Flood Storage Areas** are those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation.

**Note:** Flood maps prepared by Council for individual floodplains may identify this boundary with a distinctive line (see Schedules 4 to 9). Within this area of the floodplain filling is likely to have an unacceptable impact on flood levels or flows. Notwithstanding, unacceptable impacts on other properties in the floodplain may also occur due to development outside of these areas, and the need to assess this may be required by Council. Schedule 2 provides the ‘Procedures for Assessing Flood Effects.’

**Freeboard** is a factor of safety expressed as the height above the design flood level. Freeboard provides a factor of safety to compensate for uncertainties in the estimation of flood levels across the floodplain, such as wave action, localised hydraulic behaviour and impacts that are specific event related, such as levee and embankment settlement, and other effects such as “greenhouse” and climate change.

**Habitable floor area** means:

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

**Hazard** is a source of potential harm or a situation with a potential to cause loss. In relation to this plan, the hazard is flooding which has the potential to cause harm or loss to the community.

**Increase Flood Effects** (refer to the definition of the term ‘not increase flood effects elsewhere’).

**Local overland flooding** means inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.

**Merit approach** is an approach, the principles of which are embodied in the FMM which weighs social, economic and ecological impacts of land use options for different flood prone areas together with flood damage, hazard and behaviour implications, environmental protection and well being of the State’s rivers and floodplains.

**Not increase flood effects elsewhere, or No increase in flood effects elsewhere** means, for land beyond the site the subject of the proposal:

- (a) no increase in flood levels or velocities in all floods up to and including the 100 year ARI flood; and
- (b) for the probable maximum flood (PMF), and all floods between the PMF and the 100 year flood, no significant increase in flood levels and velocities.

(Refer to Schedule 2 for details and procedures for assessing flood effects)

**Outbuilding** means a building which is ancillary to a principal residential building and includes sheds, garages, car ports and similar buildings.

**Probable maximum flood (PMF)** is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation.



**Probable maximum precipitation (PMP)** is the greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year, with no allowance made for long-term climatic trends (World Meteorological Organisation, 1986). It is the primary input to the estimation of the probable maximum flood.

**Probability** is a statistical measure of the expected chance of flooding (see ARI).

**Rebuilt dwelling** refers to the construction of a new dwelling on an allotment where an existing dwelling is demolished.

**Reliable access** during a flood means the ability for people to safely evacuate an area subject to flooding, having regard to the depth and velocity of flood waters, the suitability of the evacuation route, and without a need to travel through areas where water depths increase.

**Risk** means the chance of something happening that will have an impact. It is measured in terms of consequences and probability (likelihood). In the context of this plan, it is the likelihood of consequences arising from the interaction of floods, communities and the environment.

**Site Emergency Response Flood Plan** (not being an SES Flood Plan) is a management plan that demonstrates the ability to safely evacuate persons and include a strategy to move goods above the flood level within the available warning time. This Plan must be consistent with any flood evacuation strategy, flood plan or similar plan adopted by Council.

**Survey plan** is a plan prepared by a registered surveyor which shows the information required for the assessment of an application in accordance with the provisions of this Policy.

## 2.0 WHAT ARE THE CRITERIA FOR DETERMINING APPLICATIONS?

### 2.1 General

The criteria for determining applications for development potentially affected by

flooding are structured in recognition that different controls are applicable to different land uses and levels of potential flood inundation and hazard.

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

- firstly, identifying the land use category of the development (from Schedule 3);
- secondly, determine which floodplain and which part of that floodplain the land is located within (refer to Clause 2.3 and relevant flood risk mapping); and
- then apply the controls outlined under Clause 2.4.

Clause 2.5 provides specific requirements for fencing in the floodplain, while Clause 2.6 identifies special considerations which will apply only to some development in specific circumstances.

Clauses 2.4 and 2.5 which provide controls for development and fencing in the floodplain contain objectives, performance criteria and prescriptive controls, with the following purpose:

- **The objectives** represent the outcomes that the Council wishes to achieve from each control.
- **The performance criteria** represent a means of assessing whether the desired outcomes will be achieved.
- **The prescriptive controls** are preferred ways of achieving the outcome. While adherence to the prescriptive controls may be important, it is paramount that the objectives and the performance criteria are clearly satisfied.

## 2.2 Land Use Categories

Eight major land use categories have been adopted. The specific uses, as defined by the applicable Environmental Planning Instruments, which may be included in each category, are listed in Schedule 3.

## 2.3 Flood Risk Precincts

Each of the floodplains within the local government area can be divided based on different levels of potential flood risk. The relevant Flood Risk Precincts (FRP's) for each of the floodplains are outlined below.

### ▪ High Flood Risk Precinct

This has been defined as the area of land below the 100 year flood that is either subject to a high hydraulic hazard or where there are significant evacuation difficulties.

**Note:** The high flood risk precinct is where high flood damages, potential risk to life, evacuation problems would be anticipated or development would significantly and adversely effect flood behaviour. Most development should be restricted in this precinct. In this precinct, there would be a significant risk of flood damages without compliance with flood related building and planning controls.

### ▪ Medium Flood Risk Precinct

This has been defined as land below the 100 year flood that is not subject to a high hydraulic hazard and where there are no significant evacuation difficulties. Accordingly, the area in this precinct is all the land lower than the 100 year flood level that is not in the High Flood Risk Precinct.

**Note:** In this precinct there would still be a significant risk of flood damage, but these damages can be minimised by the application of appropriate development controls.

### ▪ Low Flood Risk Precinct

This has been defined as all other land within the floodplain (ie. within the extent of the probable maximum flood) but not identified within either the High Flood Risk or the Medium Flood Risk Precinct.

**Note:** The Low Flood Risk Precinct is where risk of damages are low for most land uses. The Low Flood Risk Precinct is that area above the 100 year flood and not within a flood storage area, and most land uses would be permitted within this precinct.

## 2.4 Which Controls Apply to Proposed Developments?

The development controls apply to all land within a Flood Risk Precinct described above. The type and stringency of controls have been graded relative to the severity and frequency of potential floods, having regard to categories determined by the relevant Floodplain Risk Management Study and Plan or, if no such study or plan exists, Council's interim considerations. The categories applicable to each floodplain are depicted on the planning matrices contained in the following schedules:

- **Schedule 4** –Georges River Floodplain (including Lower Cabramatta Creek)
- **Schedule 5** – Kemps/Bonds Creeks Floodplain
- **Schedule 6** – South Creek Floodplain
- **Schedule 7** – Upper Nepean River Floodplain
- **Schedule 8** – Upper Cabramatta Creek Floodplain
- **Schedule 9** – All other floodplains including areas affected by local overland flooding. (Note these controls are interim only until catchment specific Flood Risks Management Plan are prepared as required by the Floodplain Management Manual).

**[Council to insert controls for other floodplains as FRMP's are prepared]**

2.4.1 Objectives

- (a) To minimise the risk to life by ensuring the provision of appropriate access from areas affected by flooding up to extreme events.
- (b) To ensure the proponents of development and the community in general are fully aware of the potential flood hazard and consequent risk associated with the use and development of land within the floodplain.
- (c) To require developments with high sensitivity to flood risk (eg. critical public utilities) be sited and designed such that they are subject to no or minimal risk from flooding and have reliable access.
- (d) Allow development with a lower sensitivity to the flood hazard to be located within the floodplain, subject to appropriate design and siting controls, provided that the potential consequences that could still arise from flooding remain acceptable having regard to the State Government's Flood Policy and the likely expectations of the community in general
- (e) To prevent any intensification of the use of High Flood Risk Precinct, and wherever appropriate and possible, allow for their conversion to natural waterway corridors.
- (f) To ensure that design and siting controls required to address the flood hazard do not result in unreasonable impacts upon the amenity or ecology of an area.
- (g) To minimise the damage to property, including motor vehicles arising from flooding.
- (h) To ensure that proposed development does not expose existing development to increased risks associated with flooding.

2.4.2 Performance Criteria

- (a) The proposed development should not result in any increased risk to human life.
- (b) The additional economic and social costs which may arise from damage to property from flooding should not be greater than that which can reasonably be managed by the property owner and general community.
- (c) The proposal should only be permitted where effective warning time and reliable access is available for evacuation from an area potentially affected by floods to an area free of risk from flooding. Evacuation should be consistent with any relevant or flood evacuation strategy where in existence.
- (d) Development should not detrimentally increase the potential flood effects on other development or properties either individually or in combination with the cumulative impact of development that is likely to occur in the same floodplain.
- (e) Motor vehicles are able to be relocated undamaged, to an area with substantially less risk from flooding, within effective warning time.
- (f) Procedures would be in place, if necessary, (such as warning systems, signage or evacuation drills) so that people are aware of the need to evacuate and relocate motor vehicles during a flood and are capable of identifying the appropriate evacuation route.
- (g) Development should not result in significant impacts upon the amenity of an area

by way of unacceptable overshadowing of adjoining properties, privacy impacts (eg. by unsympathetic house-raising) or by being incompatible with the streetscape or character of the locality.

- (h) Proposed development must be consistent with ecologically sustainable development principles.
- (i) Development should not prejudice the economic viability of any Voluntary Acquisition Scheme.

#### 2.4.3 Prescriptive Controls

**Schedules 4 to 9** outline the controls relevant to each of the floodplains to which this Plan applies.

---

### **2.5 Are There Special Requirements for Fencing?**

---

#### 2.5.1 Objectives

- (a) To ensure that fencing does not result in the undesirable obstruction of the free flow of floodwaters.
- (b) To ensure that fencing does not become unsafe during floods and potentially become moving debris which threatens the integrity of structures or the safety of people.

#### 2.5.2 Performance Criteria

- (a) Fencing is to be constructed in a manner which does not affect the flow of floods so as to detrimentally increase flood affection on surrounding land.
- (b) Ability to be certified by a suitably qualified engineer, that the proposed fencing is adequately constructed so as to withstand the forces of floodwaters, or collapse in a controlled manner to prevent the undesirable impediment of flood waters.

#### 2.5.3 Prescriptive Controls

2.5.3.1 Fencing within a floodway or High FRP will not be permissible except for security/ permeable/ open type/safety fences of a type approved by Council.

2.5.3.2 Council will require a Development Application for all new solid (non-porous) and continuous fences, in the High and Medium FRP's unless otherwise stated by exempt and complying development provisions which may be incorporated into Council's Environmental Planning Instruments from time to time.

2.5.3.3 An applicant will need to demonstrate that the fence would create no impediment to the flow of floodwaters. Appropriate fences must satisfy the following:-

- (a) An open collapsible hinged fence structure or pool type fence;
- (b) Other than a brick or other masonry type fence (which will generally not be permitted); or
- (c) A fence type and siting criteria as prescribed by Council.

2.5.3.4 Other forms of fencing will be considered by Council on merit.

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### **2.6 Special Considerations**

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When assessing proposals for development or other activity within the area to which this Policy applies, Council will take into consideration the following specific matters.



- (a) The proposal does not have a significant direct or cumulative detrimental impact on:
- i) water quality;
  - ii) native bushland vegetation;
  - iii) riparian vegetation;
  - iv) estuaries, wetlands, lakes or other water bodies;
  - v) aquatic and terrestrial ecosystems;
  - vi) indigenous flora and fauna; or
  - vii) fluvial geomorphology.
- (b) Development pursued to mitigate the potential impact of flooding (eg. house raising) must be undertaken in a manner which minimises the impact upon the amenity and character of the locality.
- (c) The design of car parking (covered or uncovered) and associated driveways should not result in unacceptable environmental or amenity impacts. These unacceptable impacts would include elevated driveways and parking structures which are visually intrusive and overshadowing of adjoining residential properties which exceeds Council's normal standards.
- (d) The proposal must not constrain the orderly and efficient utilisation of the waterways for multiple purposes.
- (e) The proposal must not adversely impact upon the recreational, ecological, aesthetic or utilitarian use of the waterway corridors, and where possible, should provide for their enhancement, in accordance with ecologically sustainable development principles.
- (f) Proposals for house raising must provide appropriate documentation including a report from a suitably qualified engineer to demonstrate the raised structure will not be at risk of failure from the forces of floodwaters and the provision of details such as landscaping and architectural enhancements which

ensure that the resultant structure will not result in significant adverse impacts upon the amenity and character of an area.

- (g) Notwithstanding any other provision where a property is identified within a Voluntary Acquisition Scheme area, Council will only consent to further development for 'concessional' development and 'recreation or non-urban'; provided:
- (i) the development is for only minor works such as small awnings over existing floor balconies; and
  - (ii) the capital investment intended for the property is not greater than the minimum required to provide an acceptable proposal.

**Note:** Council will not permit any type of development that would be inconsistent with the objective of discouraging further development in areas of high risk and with Council's commitment to the Voluntary Acquisition Scheme.

### 3.0 WHAT INFORMATION IS REQUIRED WITH AN APPLICATION TO ADDRESS THIS PLAN?

- 3.1 Applications must include information which addresses all relevant matters listed above, and the following matters as applicable.
- 3.2 Applications for Concessional Development (see Schedule 3) to an existing dwelling on Flood Prone Land shall be accompanied by documentation from a registered surveyor confirming existing floor levels.

- 3.3 Development applications affected by this plan shall be accompanied by a survey plan showing:-
- (a) The position of the existing building/s or proposed building/s;
  - (b) The existing ground levels to Australian Height Datum around the perimeter of the building and contours of the site; and
  - (c) The existing or proposed floor levels to Australian Height Datum.
- 3.4 Applications for earthworks, filling of land and subdivision shall be accompanied by a survey plan (with a contour interval of 0.25m) showing relative levels to Australian Height Datum.
- 3.5 For large scale developments, or developments in critical situations, particularly where an existing catchment based flood study is not available, a flood study using a fully dynamic one or two dimensional computer model may be required. For smaller developments the existing flood study may be used if available and suitable (eg it contains sufficient local detail), or otherwise a flood study prepared in a manner consistent with the publication entitled "*Australian Rainfall and Runoff – A Guide To Flood Estimation*" (Institution of Engineers, Australia, Revised Edition 1987)", Council's Drainage Design Code and the Floodplain Management Manual, will be required.

Schedule 2 lists the details to be provided in such studies for assessing flood effects.

- 3.6 Where the controls for a particular development proposal require an assessment of structural soundness during potential floods, the following impacts must be addressed:
- (a) hydrostatic pressure;
  - (b) hydrodynamic pressure;
  - (c) impact of debris; and
  - (d) buoyancy forces.

Foundations need to be included in the structural analysis.

**SCHEDULE 1  
 FLOOD COMPATIBLE MATERIALS**

<b>BUILDING COMPONENT</b>	<b>FLOOD COMPATIBLE MATERIAL</b>	<b>BUILDING COMPONENT</b>	<b>FLOOD COMPATIBLE MATERIAL</b>
<b>Flooring and Sub-floor Structure</b>	" concrete slab-on-ground monolith construction " suspension reinforced concrete slab.	<b>Doors</b>	" solid panel with water proof adhesives " flush door with marine ply filled with closed cell foam " painted metal construction " aluminium or galvanised steel frame
<b>Floor Covering</b>	" clay tiles " concrete, precast or in situ " concrete tiles " epoxy, formed-in-place " mastic flooring, formed-in-place " rubber sheets or tiles with chemical-set adhesives " silicone floors formed-in-place " vinyl sheets or tiles with chemical-set adhesive " ceramic tiles, fixed with mortar or chemical-set adhesive " asphalt tiles, fixed with water resistant adhesive	<b>Wall and Ceiling Linings</b>	" fibro-cement board " brick, face or glazed " clay tile glazed in waterproof mortar " concrete " concrete block " steel with waterproof applications " stone, natural solid or veneer, waterproof grout " glass blocks " glass " plastic sheeting or wall with waterproof adhesive
<b>Wall Structure</b>	" solid brickwork, blockwork, reinforced, concrete or mass concrete	<b>Insulation</b>  <b>Windows</b>	" foam (closed cell types) " aluminium frame with stainless steel rollers or similar corrosion and water resistant material.
<b>Roofing Structure (for Situations Where the Relevant Flood Level is Above the Ceiling)</b>	" reinforced concrete construction " galvanised metal construction	<b>Nails, Bolts, Hinges and Fittings</b>	" brass, nylon or stainless steel " removable pin hinges " hot dipped galvanised steel wire nails or similar

<p><b>Electrical and Mechanical Equipment</b></p> <p>For dwellings constructed on land to which this Policy applies, the electrical and mechanical materials, equipment and installation should conform to the following requirements.</p>	<p><b>Heating and Air Conditioning Systems</b></p> <p>Heating and air conditioning systems should, to the maximum extent possible, be installed in areas and spaces of the house above the relevant flood level. When this is not feasible every precaution should be taken to minimise the damage caused by submersion according to the following guidelines.</p>
<p><b>Main power supply -</b></p> <p>Subject to the approval of the relevant authority the incoming main commercial power service equipment, including all metering equipment, shall be located above the relevant flood level. Means shall be available to easily disconnect the dwelling from the main power supply.</p>	<p><b>Fuel -</b></p> <p>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.</p>
<p><b>Wiring -</b></p> <p>All wiring, power outlets, switches, etc., should, to the maximum extent possible, be located above the relevant flood level. All electrical wiring installed below the relevant flood level should be suitable for continuous submergence in water and should contain no fibrous components. Earth core linkage systems (or safety switches) are to be installed. Only submersible-type splices should be used below the relevant flood level. All conduits located below the relevant designated flood level should be so installed that they will be self-draining if subjected to flooding.</p>	<p><b>Installation -</b></p> <p>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 millimetres above the relevant flood level.</p>
<p><b>Equipment -</b></p> <p>All equipment installed below or partially below the relevant flood level should be capable of disconnection by a single plug and socket assembly.</p>	<p><b>Ducting -</b></p> <p>All ductwork located below the relevant flood level 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 floor below the relevant flood level, the ductwork should be protected by a closure assembly operated from above relevant flood level.</p>
<p><b>Reconnection -</b></p> <p>Should any electrical device and/or part of the wiring be flooded it should be thoroughly cleaned or replaced and checked by an approved electrical contractor before reconnection.</p>	

## **SCHEDULE 2** **PROCEDURES FOR ASSESSING FLOOD EFFECTS**

[Note: Terms in italics are defined in the glossary of this DCP.]

### **INTRODUCTION**

In order to satisfy the requirement that the development will “*not increase flood effects elsewhere*”, the applicant must demonstrate (and in some cases be certified by an engineer) that:

- (a) for a range of *flood* sizes:
  - (i) up to and including the 100 year ARI flood; and
  - (ii) greater than the 100 year ARI flood, and including the *probable maximum flood* (PMF);
- (b) the requirements of **Table 1** (at the end of this Schedule) are satisfied having regard to:
  - (i) changes in flood storage volume;
  - (ii) changes in flood conveyance; and
  - (iii) cumulative impacts.

This schedule describes the methods for assessing flood effects of all proposed developments. The two methods are:

- ▶ **Assessment Method 1** — Cross-section Analysis (No Computer Modelling);
- ▶ **Assessment Method 2** — Use of Existing Flood Study or Preparation of Site-Specific Flood Study (Computer Modelling).

Method 1 will be used for all assessments. For larger developments, developments in sensitive areas, or where special circumstances exist, both Methods 1 and 2 must be used.

Both Assessment Methods need to be carried out by an experienced flood engineer using method(s) as appropriate to the development. In some circumstances, Council may determine the method(s) to be used.

### **ASSESSMENT METHOD 1 — Cross-section Analysis (No Computer Modelling)**

This method does not require computer modelling. It checks for changes in conveyance and flood storage volume at critical cross sections only through the proposed development.

This approach, whilst simpler than computer modelling, assumes a thorough knowledge of the flood behaviour. This ensures the cross-section locations are representative of the principal impacts of the development.

In addition to the survey plan to be prepared in accordance with Section 3.3 of this DCP, the following information shall be submitted in plan form, accompanied by appropriate supporting written information:

- ▶ **flood levels and extents** — for this method, this information would be normally available from previous studies or Council’s GIS data base. All available flood sizes would be shown;

- ▶ **Flood Risk Precincts** — this information would be normally available from previous studies or Council’s GIS data base;
- ▶ **cross-sections through site** — as a guide, the following cross-section information would be provided:
  - a minimum of 5 cross-sections, at a maximum distance of 20m apart, should be taken through the site, perpendicular to the likely flow path (i.e. the direction of the cross-section may not necessarily be in a single straight line);
  - one cross-section should be at the upstream end and one cross-section at the downstream end of the proposed development site;
  - cross-sections should extend at least as high as the highest flood level available at the site and be wide enough to cover the full width of the floodplain at that location;
  - the cross-sections should be plotted at a suitable exaggerated scale (i.e. the vertical scale is not necessarily the same as the horizontal scale).
- ▶ **pre-development and post development ground surface levels** — this information should be shown on each cross-section, with areas of cut and fill clearly shown.
- ▶ **check on “Loss of Flood Storage Volume”** — the total cut and fill volumes should be calculated using the ground surface information on the cross-sections described above.

If there is NO NET FILLING as part of the proposed development, then the development will “*NOT INCREASE FLOOD EFFECTS ELSEWHERE*” due to “LOSS OF FLOOD STORAGE VOLUME”.

If there is NET FILLING because of the proposed development, refer to Table 1 determine if the development will “*increase flood effects elsewhere*”.

If there is NET FILLING because as part of the proposed development, Council may not consider the development further, particularly if the site lies within a *Flood Storage Area*.

If Council is to consider the development further, then Assessment Method 2 is likely to be required.

- ▶ **check on “Loss of Flood Conveyance”** — the flood *conveyance* should be calculated at each cross-section for pre-development and post-development conditions. Flood *conveyance* should be calculated at a range of water levels (say 5), at each cross-section, including the 100 year and PMF. All assumptions, particularly those relating to hydraulic roughness, must be documented, especially where the development results in a change in hydraulic roughnesses.

If there is NO CHANGE IN THE FLOOD CONVEYANCE because of the proposed development, it is unlikely that the development will “*INCREASE FLOOD EFFECTS ELSEWHERE*” due to a “LOSS OF FLOOD CONVEYANCE”.

If there is a CHANGE IN THE FLOOD CONVEYANCE because of the proposed development, refer to Table 1 to determine if the development will “*increase flood effects elsewhere*”.

If the proposed development lies within the *Boundary of Significant Flow*, then there is likely to be an “*increase in flood effects elsewhere*” and Council will not consider it further, unless there are special circumstances.

If there is a CHANGE IN THE FLOOD CONVEYANCE because of the proposed development, Council may not consider the development further.

If Council is to consider the development further, then Assessment Method 2 is likely to be required.

## **ASSESSMENT METHOD 2 — Use of Existing Flood Study or Preparation of Site-Specific Flood Study (Computer Modelling)**

This method requires computer modelling. An existing flood study model may be used if available and suitable (e.g. it contains sufficient local detail).

For large scale developments or developments in critical situations, a flood study using a fully dynamic one or two dimensional hydraulic computer model may be required. Such a flood study would be prepared in a manner consistent with Australian Rainfall and Runoff — A Guide to Flood Estimation (Institution of Engineers, Australia, 1987), Council’s Drainage Design Code and the Floodplain Management Manual.

In addition to the survey plan information to be submitted in accordance with Section 3.3 of this DCP, the following information shall be submitted in plan form for both pre-development and post-development scenarios for a range of flood sizes:

- ▶  **water surface contours** — these should be provided in metres to Australian Height Datum (mAHD);
- ▶  **flood profiles** — these should be provided at a suitable vertical and horizontal scale such that any changes in flood levels are easily identified; .
- ▶  **velocity vectors** — these show direction and relative size of flood velocities and should be provided in metres per second (m/s);
- ▶  **contours of flood velocities multiplied by depth of flooding over ground level** — these should be provided to one decimal place;

A range of flood sizes should be chosen so that the full impacts of the development can be assessed. Typically, the flood sizes to be considered would be: a 5 year ARI, 20 year ARI, 50 year ARI, 100 year ARI, 200 year ARI, 500 year ARI and a probable maximum flood.

For the post-development scenario, all proposed works and structures, including any revegetation and enhancements should be included in the analysis.

The delineation of flood risk precincts relevant to the individual floodplains should also be depicted in plan form.

All assumptions relating to hydraulic roughness should be clearly documented.



Refer to **Table 1** (at the end of this Schedule) to determine if the development will “*increase flood effects elsewhere*”. Note that flood levels and velocities need to be computed not only at the site but also at an appropriate distance upstream and downstream to allow the principal impacts of the development to be determined.

Note that when reporting and comparing flood levels, levels should be quoted in mAHD to two decimal places (i.e. to the nearest 10mm) (e.g. 7.56 mAHD, 67.45 mAHD, 567.35 mAHD, etc). Differences in flood levels should also be provided to two decimal places. Similarly velocities should be quoted to one decimal place in metres per second (e.g. 1.2m/s, 3.4m/s, etc). Differences in flood velocities should also be provided to one decimal place.

Note that a zero difference in flood level or flow velocity may not necessarily imply that the development will “*not increase flood effects elsewhere*” — only that the change is less than 10mm for flood levels or 0.1m/s for flow velocities.

Similarly, establishing that the change in level or velocity is within the accuracy of the modelling does not, by itself, establish that there is “*no increase in flood effects elsewhere*”.



**TABLE 1: ASSESSMENT OF FLOOD EFFECTS**

CONSIDERATION	FLOOD SIZES FOR ASSESSMENT	
	100 Year ARI and Smaller Floods	PMF and Floods between the 100 Year ARI and the PMF
<b>Change in Flood Storage Volume</b> — leading to an increase in downstream flood flows and/or flood levels	<ol style="list-style-type: none"> <li><b>No reduction in the existing flood storage volume</b> will be permitted as this will lead to an increase in flood flows and flood levels downstream for these floods.</li> <li>Where a <i>Flood Storage Area</i> has been defined, any development involving filling inside this area will be unsuitable, except for 'net filling' (see Note 2).</li> <li>Elsewhere within the Medium and High Flood Risk Precincts, any development involving filling will be unsuitable except for 'net filling' (see Note 2) or where permitted under a filling policy approved by Council.</li> <li>If the development is wholly located within the Low Flood Risk Precinct, it will not be inundated by these floods and therefore assessment for 100 year ARI and smaller floods is not required.</li> </ol>	<ol style="list-style-type: none"> <li><b>No significant increases</b> in downstream flood flows and/or flood levels will be permitted. Council will determine the definition of 'significant' on a case-by-case basis.</li> </ol>
<b>Change in Flood Conveyance</b> — leading to redistribution of flood velocities and/or an increase in upstream flood levels	<ol style="list-style-type: none"> <li><b>No reduction in the existing flood conveyance</b> will be permitted as this will lead to an increase in upstream flood levels and/or redistribution of flood velocities.</li> <li>See Assessment Procedures in this Schedule to determine <i>conveyance</i> changes and flood changes resulting from the development.</li> <li>Where a <i>Boundary of Significant Flow</i> has been defined, any development inside this area will be unsuitable (see Note 1).</li> <li>If the development is wholly located within the Low Flood Risk Precinct, it will not be inundated by these floods and therefore assessment for 100 year ARI and smaller floods is not required.</li> </ol>	<ol style="list-style-type: none"> <li><b>No significant increases</b> in upstream flood levels and/or significant changes in velocity distributions will be permitted. Council will determine the definition of 'significant' on a case-by-case basis.</li> <li>See Assessment Procedures in this Schedule to determine conveyance changes and flood changes resulting from the development.</li> </ol>
<b>Cumulative Impacts</b> —of multiple potential developments	<ol style="list-style-type: none"> <li>An assessment of cumulative impacts will not be required if there is no loss of flood storage volume and there is no reduction in flood conveyance. In addition, where the development is located wholly in the Low Flood Risk Precinct, cumulative impact assessment will generally not be required, except in special circumstances.</li> <li>The nature of the cumulative development scenario to be tested will need to be determined in consultation with Council.</li> <li>Generally, any increase in flood levels for floods up to the 100 year ARI will be unacceptable as it will exacerbate existing flood problems.</li> <li>For these and larger floods, Council, by reference to its Floodplain Management Committee, may accept some increase after consideration of the social, economic and environmental issues and the requirements of the Floodplain Management Manual.</li> <li>Such cumulative assessments are best carried out as part of Council's <i>Floodplain Management Studies</i></li> </ol>	

Notes:

- In special circumstances, small size developments inside the Boundary of Significant Flow may not reduce conveyance (e.g. minor alterations or additions carried out in the 'lee' of an existing dwelling). In such cases, Council may require assessment using Assessment Method 1 and 2 of this Schedule to demonstrate that conveyance is not being reduced.
- 'Net Filling' is filling obtained by compensatory excavation in the floodplain such that the available flood storage volume is not altered in any flood.
- Council will determine the definition of 'significant' on a case-by-case basis.

**SCHEDULE 3**  
**LAND USE CATEGORIES**

<b>Critical Uses and Facilities</b>	<b>Sensitive Uses and Facilities</b>	<b>Subdivision</b>	<b>Residential</b>
Community facility which may provide an important contribution to the notification or evacuation of the community during flood events; Hospitals; Nuclear activities; Nuclear facility; and Nursing Homes.	Assisted accommodation; Communications facility; Hazardous or offensive industry or storage establishment; Housing for older persons or persons with a disability (or aged or disabled persons); Institutions; Educational establishments; Liquid fuel depot; Utility installations or undertakings (including generating works) undertakings which are essential to evacuation during periods of flood or if affected would unreasonably affect the ability of the community to return to normal activities after flood events; Telecommunication facilities; and Waste disposal.	Subdivision of land that involves the creation of new allotments, with potential for further development.	Bed and breakfast premises; Boarding houses; Camp or caravan park– long-term sites only (1); Cottage industry; Dual occupancy housing; Dwelling; Dwelling house; Exhibition home; Exhibition village; Family day care centre; Group homes; Health consulting rooms; Home-based child care service; Home business; Home occupation; Integrated housing; Multiple dwellings; Permanent group home; Residential flat building; Serviced apartments; Transitional group home; and Utility installations or undertakings (other than critical utilities)

(1) As defined by the Local Government (Caravan Park and Camping Grounds) Transitional Regulation 1993.

Commercial or Industrial	Tourist Related Development	Recreation or Non-urban Uses	Concessional Development
<p>Abattoir; Animal boarding or training establishment; Brothels; Bulky goods salesroom or showroom; Business premises; Child care centre; Commercial facilities; Heliports; Heavy Industry; Highway service centre; Hotel; Industry; Light Industry; Materials recycling yard; Medical centre; Motel; Motor showroom; Office premises; Passenger transport terminal; Place of public worship; Plant hire; Public building; Recreation facility; Registered club; Research establishment; Research facility; Restaurant; Road transport terminal; Roadside stall; Rural industry; Sawmill; Service station; Shop; Transport depot; Vehicle body repair workshop; Vehicle repair station; Veterinary hospital; and Warehouse or distribution centre.</p>	<p>Caravan park - short term sites (1) only</p>	<p>Agriculture; Aquaculture; Dam; Extractive industry; Forestry; Helicopter landing site; Intensive livestock agriculture; Intensive plant agriculture; Leisure area; Mine; Marina; Recreation areas and minor ancillary structures (eg. toilet blocks or kiosks); Retail plant nursery; stock and sale yard; and Turf farming.</p>	<p>(a) In the case of residential development:</p> <p>(i) An addition or alteration to an existing dwelling of not more than 30m<sup>2</sup> (or 50 m<sup>2</sup> on land not zoned for urban purposes) or 10% (whichever is the lesser) of the habitable floor area which existed at the date of commencement of this Plan;</p> <p>(ii) The construction of an outbuilding with a maximum floor area of 20m<sup>2</sup> (or 50m<sup>2</sup> on land not zoned for Urban purposes); or</p> <p>(iii) Rebuilt dwellings which substantially reduces the flood risk having regard to property damage and personal safety; or</p> <p>(b) In the case of other development:</p> <p>(i) an addition to existing premises of not more than 10% of the floor area which existed at the date of commencement of the DCP;</p> <p>(ii) Rebuilding of an development which substantially reduces the flood risk having regard to property damage and personal safety;</p> <p>(iii) A change of use which does not increase flood risk having regard to property damage and personal safety; or</p> <p>(iv) Subdivision that does not involve the creation of new allotments with potential for further development.</p>

(1) As defined by the Local Government (Caravan Park and Camping Grounds) Transitional Regulation 1993.

**Schedule 4**  
**Georges River (including Lower Cabramatta Creek) Floodplain**

Planning & Development Controls

Planning Consideration	Flood Risk Precincts (FRP's)																								
	Low Flood Risk							Medium Flood Risk							High Flood Risk										
	Critical Uses & Facilities	Sensitive Uses & Facilities	Subdivision	Residential	Commercial & Industrial	Tourist Related Development	Recreation & Non-Urban	Concessional Development	Critical Uses & Facilities	Sensitive Uses & Facilities	Subdivision	Residential	Commercial & Industrial	Tourist Related Development	Recreation & Non-Urban	Concessional Development	Critical Uses & Facilities	Sensitive Uses & Facilities	Subdivision	Residential	Commercial & Industrial	Tourist Related Development	Recreation & Non-Urban	Concessional Development	
Floor Level	3	2,6,7	5,6,7	2,6,7	1,6	4,7				2,6,7	5,6,7	2,6,7	1,6	4,7										1,6	4,7
Building Components	2	1	1	1	1	1	1			1	1	1	1	1	1	1								1	1
Structural Soundness	3	2	2	2	2	2	2			1	1	1	1	1	1	1								1	1
Flood Effects	2	2	2	2	2	2	2			1	2	2	2	2	2	2								1	1
Car Parking & Driveway Access	1,3,5,6,7	1,3,5,6,7	1,3,5,6,7	1,3,5,6,7	2,4,6,7	6,7,8				1,3,5,6,7	1,3,5,6,7	1,3,5,6,7	2,4,6,7	6,7,8									2,4,6,7	6,7,8	
Evacuation	2,3,4	6	2,3	1 or 2,3	2,3	4,3	2,3			6	2,3	1,3	2,3	4,3	2,3								4,3	2,3	
Management & Design	4,5	1		2,3,5	2,3,5	2,3,5	2,3,5			1		2,3,5	2,3,5	2,3,5	2,3,5								2,3,5	2,3,5	

General Notes

COLOUR LEGEND :

Not Relevant

Potentially Unsuitable Land Use

- Freeboard equals an additional height of 500mm.
- The relevant environmental planning instruments (generally the Local Environmental Plan) identify development permissible with consent in various zones in the LGA. Notwithstanding, constraints specific to individual sites may preclude Council granting consent for certain forms of development on all or part of a site. This matrix identifies where flood risks are likely to determine where certain development types will be considered "potentially unsuitable" due to flood related risks.
- Filling of the site, where acceptable to Council, may change the FRP considered to determine the controls applied in the circumstances of individual applications.
- Refer to Section 2.5 of the DCP for planning considerations for proposals involving only the erection of a fence. Any fencing that forms part of a proposed development is subject to the relevant flood effects and Structural Soundness planning considerations of the applicable landuse category.
- Refer to section 2.7 of the DCP for special considerations such as for house raising proposals and development of properties identified for voluntary acquisition.
- Terms in italics are defined in the glossary of this plan and Schedule 2 specifies development types included in each land use category. These development types are generally as defined within Environmental Planning Instruments applying to the LGA.
- From time to time, Council may adopt mapping showing the *Boundary of Significant Flow* and/or *Flood Storage Areas* for this floodplain. Refer to Council to find out if these areas have been defined and mapped for this floodplain.

Floor Level

- All floor levels to be no lower than the 20 year flood unless justified by site specific assessment.
- Habitable floor* levels to be no lower than the 100 year flood level plus freeboard.
- Habitable floor* levels to be no lower than the *PMF* level. *Non-habitable floor* levels to be no lower than the *PMF* level unless justified by a site specific assessment.
- Floor levels to be no lower than the *design floor level*. Where this is not practical due to compatibility with the height of adjacent buildings, or compatibility with the floor level of existing buildings, or the need for access for persons with disabilities, a lower floor level may be considered. In these circumstances, the floor level is to be as high as practical, and, when undertaking alterations or additions, no lower than the existing floor level.
- The level of *habitable floor areas* to be equal to or greater than the 100 year *flood* level plus *freeboard*. If this level is impractical for a development in a Business zone, the floor level should be as high as possible.
- Non-habitable floor* levels to be no lower than the 20 year flood unless justified by site specific assessment.
- A restriction is to be placed on the title of the land, pursuant to S.88B of the Conveyancing Act, where the lowest *habitable floor area* is elevated more than 1.5m above finished ground level, confirming that the undercroft area is not to be enclosed.

Building Components & Method

- All structures to have *flood compatible building components* below the 100 year flood level plus *freeboard*.
- All structures to have *flood compatible building components* below the *PMF* level.

Structural Soundness

- Engineer's report to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a 100 year flood plus *freeboard*.
- Applicant to demonstrate that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a 100 year flood plus *freeboard*. An engineer's report may be required.
- Applicant to demonstrate that any structure can withstand the forces of floodwater, debris and buoyancy up to and including a *PMF*. An engineers report may be required.

Flood Effects

- Engineer's report required to certify that the development will not increase flood effects elsewhere, having regard to: (i) loss of flood storage; (ii) changes in flood levels and velocities caused by alterations to the flood *conveyance*; and (iii) the cumulative impact of multiple potential developments in the floodplain.
  - The flood impact of the development to be considered to ensure that the development will not increase flood effects elsewhere, having regard to: (i) loss of flood storage; (ii) changes in flood levels and velocities caused by alterations to the flood *conveyance*; and (iii) the cumulative impact of multiple potential developments in the floodplain. An engineer's report may be required.
- Note:** (1) If a *Boundary of Significant Flow* has been defined for this floodplain, any development inside this area will normally be unacceptable as it will reduce flood conveyance and increase flood effects elsewhere. (2) If a *Flood Storage Area* has been defined for this floodplain, any filling of the floodplain inside this area (except where this occurs by compensatory excavation), will normally be unacceptable as it will reduce the volume of flood storage available on the floodplain and increase flood effects elsewhere. (3) Even where a *Boundary of Significant Flow* and/or a *Flood Storage Area* have been defined, development outside these areas may still increase flood effects elsewhere and therefore be unacceptable.

Car Parking and Driveway Access

- The minimum surface level of open car parking spaces or carports shall be as high as practical, but no lower than the 20 year flood or the level of the crest of the road at the location where the site has access. In the case of garages, the minimum surface level shall be as high as practical, but no lower than the 20 year flood.
  - The minimum surface level of open car parking spaces, carports or garages, shall be as high as practical.
  - Garages capable of accommodating more than 3 motor vehicles on land zoned for urban purposes, or *enclosed car parking*, must be protected from inundation by floods equal to or greater than the 100 year flood.
  - The driveway providing access between the road and parking space shall be as high as practical and generally rising in the egress direction.
  - The level of the driveway providing access between the road and parking space shall be no lower than 0.3m below the 100 year flood or such that the depth of inundation during a 100 year flood is not greater than either the depth at the road or the depth at the car parking space. A lesser standard may be accepted for single detached dwelling houses where it can be demonstrated that risk to human life would not be compromised.
  - Enclosed car parking and car parking areas accommodating more than 3 vehicles (other than on Rural zoned land), with a floor level below the 20 year flood or more than 0.8m below the 100 year flood level, shall have adequate warning systems, signage and exits.*
  - Restraints or vehicle barriers to be provided to prevent floating vehicles leaving a site during a 100 year flood
  - Driveway and parking space levels to be no lower than the *design ground/floor levels*. Where this is not practical, a lower level may be considered. In these circumstances, the level is to be as high as practical, and, when undertaking alterations or additions, no lower than the existing level.
- Note:** (1) A flood depth of 0.3m is sufficient to cause a typical vehicle to float. (2) *Enclosed car parking* is defined in the glossary and typically refers to carports in basements.

Evacuation

- Reliable access for pedestrians or vehicles required during a 100 year flood.
- Adequate flood warning is available to allow safe and orderly evacuation without increased reliance upon the SES or other authorised emergency services personnel.
- The development is to be consistent with any relevant *flood evacuation strategy, Flood Plan adopted by Council* or similar plan.
- The evacuation requirements of the development are to be considered. An engineers report will be required if circumstances are possible where the evacuation of persons might not be achieved within the *effective warning time*.
- Reliable access for pedestrians or vehicles required to a publicly accessible location above the *PMF*.
- Applicant to demonstrate that evacuation in accordance with the requirements of this DCP is available for the potential development flowing from the subdivision proposal.

Management and Design

- Applicant to demonstrate that potential development as a consequence of a subdivision proposal can be undertaken in accordance with this DCP.
- Site Emergency Response Flood Plan* required where floor levels are below the *design floor level*. (except for single dwelling-houses).
- Applicant to demonstrate that area is available to store goods above the 100 year flood level plus *freeboard*.
- Applicant to demonstrate that area is available to store goods above the *PMF* level.
- No storage of materials below the *design floor level* which may cause pollution or be potentially hazardous during any flood.

Schedule 6

South Creek Floodplain

Planning & Development Controls

Planning Consideration	Flood Risk Precincts (FRP's)																									
	Low Flood Risk								Medium Flood Risk								High Flood Risk									
	Critical Uses & Facilities	Sensitive Uses & Facilities	Subdivision	Residential	Commercial & Industrial	Tourist Related Development	Recreation & Non-Urban	Concessional Development	Critical Uses & Facilities	Sensitive Uses & Facilities	Subdivision	Residential	Commercial & Industrial	Tourist Related Development	Recreation & Non-Urban	Concessional Development	Critical Uses & Facilities	Sensitive Uses & Facilities	Subdivision	Residential	Commercial & Industrial	Tourist Related Development	Recreation & Non-Urban	Concessional Development		
Floor Level		3		2,6,7	5,6,7	2,6,7	1,6	4,7				2,6,7	5,6,7	2,6,7	1,6	4,7									1,6	4,7
Building Components		2		1	1	1	1	1				1	1	1	1	1									1	1
Structural Soundness		3		2	2	2	2	2				2	2	2	2	2									1	1
Flood Effects		2	2	2	2	2	2	2			1	2	2	2	2	2									1	1
Car Parking & Driveway Access		1,3,5,6,7		1,3,5,6,7	1,3,5,6,7	1,3,5,6,7	2,4,6,7	6,7,8				1,3,5,6,7	1,3,5,6,7	1,3,5,6,7	2,4,6,7	6,7,8									2,4,6,7	6,7,8
Evacuation		2,3,4	6	2,3	1 or 2,3	2,3	4,3	2,3			6	2,3	1,3	2,3	4,3	2,3									4,3	2,3
Management & Design		4,5	1		2,3,5	2,3,5	2,3,5	2,3,5			1		2,3,5	2,3,5	2,3,5	2,3,5									2,3,5	2,3,5

COLOUR LEGEND:  Not Relevant  Unsuitable Land Use

General Notes

- Freeboard equals an additional height of 500mm.
- The relevant environmental planning instruments (generally the Local Environmental Plan) identify development permissible with consent in various zones in the LGA. Notwithstanding, constraints specific to individual sites may preclude Council granting consent for certain forms of development on all or part of a site. This matrix identifies where flood risks are likely to determine where certain development types will be considered "unsuitable" due to flood related risks.
- Filling of the site, where acceptable to Council, may change the FRP considered to determine the controls applied in the circumstances of individual applications.
- Refer to Section 2.5 of the DCP for planning considerations for proposals involving only the erection of a fence. Any fencing that forms part of a proposed development is subject to the relevant flood effects and Structural Soundness planning considerations of the applicable landuse category.
- Refer to section 2.7 of the DCP for special considerations such as for house raising proposals and development of properties identified for voluntary acquisition.
- Terms in italics are defined in the glossary of this plan and Schedule 3 specifies development types included in each land use category. These development types are generally as defined within Environmental Planning Instruments applying to the LGA.
- Council has prepared mapping showing the *Boundary of Significant Flow* and the *Flood Storage Areas* for the South Creek floodplain.

Floor Level

- All floor levels to be no lower than the 5 year flood level plus freeboard unless justified by site specific assessment.
- Habitable floor* levels to be no lower than the 100 year flood level plus freeboard.
- Habitable floor* levels to be no lower than the *PMF* level. *Non-habitable floor* levels to be no lower than the *PMF* level unless justified by a site specific assessment.
- Floor levels to be no lower than the *design floor level*. Where this is not practical due to compatibility with the height of adjacent buildings, or compatibility with the floor level of existing buildings, or the need for access for persons with disabilities, a lower floor level may be considered. In these circumstances, the floor level is to be as high as practical, and, when undertaking alterations or additions, no lower than the existing floor level.
- The level of *habitable floor areas* to be equal to or greater than the 100 year *flood* level plus *freeboard*. If this level is impractical for a development in a Business zone, the floor level should be as high as possible.
- Non-habitable floor* levels to be no lower than the 5 year flood level plus *freeboard* unless justified by site specific assessment.
- A restriction is to be placed on the title of the land, pursuant to S.88B of the Conveyancing Act, where the lowest *habitable floor area* is elevated more than 1.5m above finished ground level, confirming that the undercroft area is not to be enclosed.

Building Components & Method

- All structures to have *flood compatible building components* below the 100 year flood level plus *freeboard*.
- All structures to have *flood compatible building components* below the *PMF* level.

Structural Soundness

- Engineers report to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a 100 year flood plus *freeboard*, or a *PMF* if required to satisfy evacuation criteria (see below).
- Applicant to demonstrate that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a 100 year flood plus *freeboard*, or a *PMF* if required to satisfy evacuation criteria (see below). An engineers report may be required.
- Applicant to demonstrate that any structure can withstand the forces of floodwater, debris and buoyancy up to and including a *PMF*. An engineers report may be required.

Flood Effects

- Engineers report required to certify that the development will not increase flood effects elsewhere, having regard to: (i) loss of flood storage; (ii) changes in flood levels and velocities caused by alterations to the flood *conveyance*; and (iii) the cumulative impact of multiple potential developments in the floodplain.
  - The flood impact of the development to be considered to ensure that the development will not increase flood effects elsewhere, having regard to: (i) loss of flood storage; (ii) changes in flood levels and velocities caused by alterations to the flood *conveyance*; and (iii) the cumulative impact of multiple potential developments in the floodplain. An engineers report may be required.
- Note:** (1) Any development inside the *Boundary of Significant Flow* will normally be unacceptable as it will reduce flood conveyance and increase flood effects elsewhere. (2) When assessing the loss of flood storage, filling of up to 400 square metres for a dwelling house (including driveway and/or attached garage) or 50 square metres for an *outbuilding*, may be ignored. (3) Except for the specific exemption noted in Note (2) above, any filling within the *Flood Storage Area* (except where this occurs by compensatory excavation), will normally be unacceptable as it will reduce the volume of flood storage available on the floodplain and increase flood effects elsewhere. (4) Outside the *Boundary of Significant Flow* and/or the *Flood Storage Area*, development may still increase flood effects elsewhere and therefore be unacceptable.

Car Parking and Driveway Access

- The minimum surface level of open car parking spaces or carports shall be as high as practical, but no lower than the 5 year flood level plus *freeboard* or the level of the crest of the road at the location where the site has access. In the case of garages, the minimum surface level shall be as high as practical, but no lower than the 5 year flood level plus *freeboard*.
  - The minimum surface level of open car parking spaces, carports or garages, shall be as high as practical.
  - Garages capable of accommodating more than 3 motor vehicles on land zoned for urban purposes, or *enclosed car parking*, must be protected from inundation by floods equal to or greater than the 100 year flood.
  - The driveway providing access between the road and parking space shall be as high as practical and generally rising in the egress direction.
  - The level of the driveway providing access between the road and parking space shall be no lower than 0.3m below the 100 year flood or such that the depth of inundation during a 100 year flood is not greater than either the depth at the road or the depth at the car parking space. A lesser standard may be accepted for single detached dwelling houses where it can be demonstrated that risk to human life would not be compromised.
  - Enclosed car parking* and car parking areas accommodating more than 3 vehicles (other than on Rural zoned land), with a floor level below the 5 year flood level plus *freeboard* or more than 0.8m below the 100 year flood level, shall have *adequate warning systems, signage and exits*.
  - Restraints or vehicle barriers to be provided to prevent floating vehicles leaving a site during a 100 year flood.
  - Driveway and parking space levels to be no lower than the *design ground/floor levels*. Where this is not practical, a lower level may be considered. In these circumstances, the level is to be as high as practical, and, when undertaking alterations or additions, no lower than the existing level.
- Note:** (1) A flood depth of 0.3m is sufficient to cause a typical vehicle to float. (2) *Enclosed car parking* is defined in the glossary and typically refers to carports in basements.

Evacuation

- Reliable access for pedestrians or vehicles required during a 100 year flood.
- Reliable access for pedestrians or vehicles is required from the building, commencing at a minimum level equal to the lowest *habitable floor* level to an area of refuge above the *PMF* level, or a minimum of 20% of the gross floor area of the dwelling to be above the *PMF* level.
- The development is to be consistent with any relevant *flood evacuation strategy, Flood Plan adopted by Council* or similar plan.
- The evacuation requirements of the development are to be considered. An engineers report will be required if circumstances are possible where the evacuation of persons might not be achieved within the *effective warning time*.
- Reliable access for pedestrians or vehicles required to a publicly accessible location above the *PMF*.
- Applicant to demonstrate that evacuation in accordance with the requirements of this DCP is available for the potential development flowing from the subdivision proposal.

Management and Design

- Applicant to demonstrate that potential development as a consequence of a subdivision proposal can be undertaken in accordance with this DCP.
- Site Emergency Response Flood Plan* required where floor levels are below the *design floor level*, (except for single dwelling-houses).
- Applicant to demonstrate that area is available to store goods above the 100 year flood level plus *freeboard*.
- Applicant to demonstrate that area is available to store goods above the *PMF* level.
- No storage of materials below the *design floor level* which may cause pollution or be potentially hazardous during any flood.



Schedule 9

All Other Floodplains Including Areas Affected by Local Overland Flooding

Planning & Development Controls

Planning Consideration	Flood Risk Precincts (FRP's)																								
	Low Flood Risk							Medium Flood Risk						High Flood Risk											
	Critical Uses & Facilities	Sensitive Uses & Facilities	Subdivision	Residential	Commercial & Industrial	Tourist Related Development	Recreation & Non-Urban	Concessional Development	Critical Uses & Facilities	Sensitive Uses & Facilities	Subdivision	Residential	Commercial & Industrial	Tourist Related Development	Recreation & Non-Urban	Concessional Development	Critical Uses & Facilities	Sensitive Uses & Facilities	Subdivision	Residential	Commercial & Industrial	Tourist Related Development	Recreation & Non-Urban	Concessional Development	
Floor Level		3		2,6	1,5,6	2,6	1	4,6				2,6	1,5,6	2,6	1	4,6								1	4,6
Building Components		2		1	1	1	1	1				1	1	1	1	1								1	1
Structural Soundness		3		2	2	2	2	2				1	1	1	1	1								1	1
Flood Effects		2	2		2	2					1	2	2	2	2	2								1	1
Car Parking & Driveway Access		1,3,5,6,7		1,3,5,6,7	1,3,5,6,7	1,3,5,6,7	2,4,6,7	1,3,5,6,7				1,3,5,6,7	1,3,5,6,7	1,3,5,6,7	2,4,6,7	1,3,5,6,7								2,4,6,7	1,3,5,6,7
Evacuation		2,3,4	2,3,4,5	2,3	1,2,3	2,3					2,3,4,5	2,3	1,2,3	2,3	4	2,3								4	2,3
Management & Design		4,5	1								1		2,3,5	2,3,5	2,3,5	2,3,5								2,3,5	2,3,5

Notes COLOUR LEGEND  Not Relevant  Unsuitable Land Use

- Freeboard equals an additional height of 500mm.
- The relevant environmental planning instruments (generally the Local Environmental Plan) identify development permissible with consent in various zones in the LGA. Notwithstanding, constraints specific to individual sites may preclude Council granting consent for certain forms of development on all or part of a site. The above matrix identifies where flood risks are likely to determine where certain development types will be considered "unsuitable" due to flood related risks.
- Filling of the site, where acceptable to Council, may change the FRP considered to determine the controls applied in the circumstances of individual applications.
- Refer to section 2.7 of the DCP for special considerations such as for house raising proposals and development of properties identified for voluntary acquisition.
- Refer to Section 2.5 of the DCP for planning considerations for proposals involving only the erection of a fence. Any fencing that forms part of a proposed development is subject to the relevant flood effects and Structural Soundness planning considerations of the applicable land use category.
- Terms in italics are defined in the glossary of this plan and Schedule 2 specifies development types included in each land use category. These development types are generally as defined within Environmental Planning Instruments applying to the local government area.

Floor Level

- All floor levels to be equal to or greater than the 20 year flood level unless justified by site specific assessment.
- Habitable floor levels to be equal to or greater than the 100 year flood level plus freeboard.
- All floor levels to be equal to or greater than the PMF level.
- Floor levels to be equal to or greater than the design floor level. Where this is not practical due to compatibility with the height of adjacent buildings, or compatibility with the floor level of existing buildings, or the need for access for persons with disabilities, a lower floor level may be considered. In these circumstances, the floor level is to be as high as practical, and, when undertaking alterations or additions, no lower than the existing floor level.
- The level of habitable floor areas to be equal to or greater than the 100 year flood level plus freeboard. If this level is impractical for a development in a Business zone, the floor level should be as high as possible.
- A restriction is to be placed on the title of the land, pursuant to S.88B of the Conveyancing Act, where the lowest habitable floor area is elevated more than 1.5m above finished ground level, confirming that the undercroft area is not to be enclosed.

Building Components & Method

- All structures to have flood compatible building components below the 100 year flood level plus freeboard.
- All structures to have flood compatible building components below the PMF.

Structural Soundness

- Engineers report to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a 100 year flood plus freeboard.
- Applicant to demonstrate that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a 100 year flood plus freeboard. An engineers report may be required.
- Applicant to demonstrate that any structure can withstand the forces of floodwater, debris and buoyancy up to and including a PMF. An engineers report may be required.

Flood Effects

- Engineers report required to certify that the development will not increase flood effects elsewhere, having regard to: (i) loss of flood storage; (ii) changes in flood levels, flows and velocities caused by alterations to flood flows; and (iii) the cumulative impact of multiple potential developments in the vicinity.
- The impact of the development on flooding elsewhere to be considered having regard to the three factors listed in consideration 1 above.

Car Parking and Driveway Access

- The minimum surface level of a car parking space, which is not enclosed (eg. open parking space or carport) shall be as high as practical, but no lower than the 20 year flood level or the level of the crest of the road at the location where the site has access.
- The minimum surface level of a car parking space, which is not enclosed, shall be as high as practical.
- Enclosed car parking capable of accommodating more than 3 motor vehicles on land zoned for urban purposes, must be protected from inundation by floods equal to or greater than the 100 year flood.
- The driveway providing access between the road and parking space shall be as high as practical and generally rising in the egress direction.
- The level of the driveway providing access between the road and parking space shall be a minimum of 0.3m above the 100 year flood or such that depth of inundation during a 100 year flood is not greater than either the depth at the road or the depth at the car parking space. A lesser standard may be accepted for single detached dwelling houses where it can be demonstrated that risk to human life would not be compromised.
- Enclosed car parking and car parking areas accommodating more than 3 vehicles (other than on Rural zoned land), with a floor level below the 20 year flood level or more than 0.8m below the 100 year flood level, shall have adequate warning systems, signage and exits.
- Restraints or vehicle barriers to be provided to prevent floating vehicles leaving a site during a 100 year flood

Note: A flood depth of 0.3m is sufficient to cause a typical vehicle to float

Evacuation

- Reliable access for pedestrians required during a 100 year flood.
- Reliable access for pedestrians or vehicles is required from the building, commencing at a minimum level equal to the lowest habitable floor level to an area of refuge above the PMF level, or a minimum of 40% of the gross floor area of the dwelling to be above the PMF level.
- The development is to be consistent with any relevant flood evacuation strategy, Flood Plan adopted by Council or similar plan.
- The evacuation requirements of the development are to be considered. An engineers report will be required if the evacuation of persons might not be achieved within the effective warning time.
- Reliable access for pedestrians or vehicles required to a publicly accessible location above the PMF.

Management and Design

- Applicant to demonstrate that potential development as a consequence of a subdivision proposal can be undertaken in accordance with this Plan.
- Site Emergency Response Flood plan required where floor levels are below the design floor level, (except for single dwelling-houses).
- Applicant to demonstrate that area is available to store goods above the 100 year flood level plus freeboard.
- Applicant to demonstrate that area is available to store goods above the PMF level.
- No storage of materials below the design floor level which may cause pollution or be potentially hazardous during any flood.

# **APPENDIX D**

## **SECTION 149 NOTIFICATIONS AND FLOOD CERTIFICATES**

## PROPOSED WORDING FOR FLOOD NOTATIONS ON SECTION 149(2) CERTIFICATES

		STATUS OF INUNDATION FROM CREEKS AND RIVERS				
		Category 'A' and 'Low' Flood Risk	Category 'A' And 'Medium' Flood Risk	Category 'A' and 'High' Flood Risk	Category 'B'  (ie. potentially inundated)	Category 'C'  (ie. not thought to be inundated)
<b>STATUS OF INUNDATION FROM STORMWATER AND OVERLAND FLOW</b>	<b>Category 'A' And 'Low' Flood Risk</b>	Part or all of the property is located within a Low Flood Risk area. [Plus Note 2]	Part or all of the property is located within a Medium Flood Risk area. [Plus Note 2]	Part or all of the property is located within a High Flood Risk area. [Plus Note 2]	Part or all of the property is located within a Low Flood Risk area due to overland flow. The property is also potentially affected by creek/river flooding. [Plus Note 2]	Part or all of the property is located within a Low Flood Risk area due to overland flow. [Plus Note 2]
	<b>Category 'A' and 'Medium' Flood Risk</b>	Part or all of the property is located within a Medium Flood Risk area due to overland flow. [Plus Note 2]	Part or all of the property is located within a Medium Flood Risk area. [Plus Note 2]	Part or all of the property is located within a High Flood Risk area. [Plus Note 2]	Part or all of the property is located within a Medium Flood Risk area due to overland flow. The property is also potentially affected by creek/river flooding. [Plus Note 2]	Part or all of the property is located within a Medium Flood Risk area due to overland flow. [Plus Note 2]
	<b>Category 'A' And 'High' Flood Risk</b>	Part or all of the property is located within a High Flood Risk area due to overland flow. [Plus Note 2]	Part or all of the property is located within a High Flood Risk area due to overland flow. [Plus Note 2]	Part or all of the property is located within a High Flood Risk area. [Plus Note 2]	Part or all of the property is located within a High Flood Risk area due to overland flow. The property is also potentially affected by creek/river flooding. [Plus Note 2]	Part or all of the property is located within a High Flood Risk area due to overland flow. [Plus Note 2]
	<b>Category 'B'  (ie. potentially inundated)</b>	Part or all of the property is located within a Low Flood Risk area. The property is also potentially affected by overland flow. [Plus Note 2]	Part or all of the property is located within a Medium Flood Risk area. The property is also potentially affected by overland flow. [Plus Note 2]	Part or all of the property is located within a High Flood Risk area. The property is also potentially affected by overland flow. [Plus Note 2]	Part or all of the property is potentially affected by creek/river flooding and overland flow. [Plus Note 2]	Part or all of the property is potentially affected by overland flow. [Plus Note 2]
	<b>Category 'C'  (ie. not thought to be inundated)</b>	Part or all of the property is located within a Low Flood Risk area. [Plus Note 2]	Part or all of the property is located within a Medium Flood Risk area. [Plus Note 2]	Part or all of the property is located within a High Flood Risk area. [Plus Note 2]	Part or all of the property is potentially affected by creek/river flooding. [Plus Note 2]	Based on the information available to Council, the property is not affected by creek/river flooding or overland flow from major drainage.

- Note
1. This table provides specific wording for S149(2) notations based on the status of inundation from creeks/ivers and from stormwater/overland flow.
  2. The following additional wording is to be added to each notation where indicated in the table:
    - The term "Flood Risk" relates to the potential danger to personal safety and property. Further details are provided in the NSW Government's Floodplain Management Manual, 2001, or are available from Council.
    - Council's Development Control Plan No... "Managing Our Flood Risks" applies to this property. This DCP specifies controls on development to manage potential flood risks within the property and adjacent areas
  3. The rows shown shaded in the table will not generally apply as mapping of Flood Risk Precincts may not be available for stormwater/overland flow.
  4. All S149(2) Certificates shall also include within the list of applicable Development Control Plans — "Development Control Plan No. ... Managing our Flood Risks."