CAMDEN HAVEN FLOODPLAIN
RISK MANAGEMENT PLAN

Looking westwards along the Camden Haven River and its entry into the Pacific Ocean.

Final Report
March 2004
Hastings Council

CAMDEN HAVEN FLOODPLAIN RISK MANAGEMENT PLAN

FINAL REPORT
MARCH 2004

Prepared by:
BEWSHER CONSULTING PTY LTD
P O BOX 352 EPPING NSW 1710
Telephone (02) 9868 1966
Facsimile (02) 9868 5759
Email postmaster@bewsher.com.au
ACN 003137068
PREFACE

The Camden Haven Floodplain Risk Management Study and Plan was prepared by Bewsher Consulting Pty Ltd for Hastings Council. Funding and technical assistance was provided for the study through the Department of Infrastructure, Planning and Natural Resources (formerly Department of Land and Water Conservation) under the State Government’s Floodplain Management Program. Funding was also provided by the Commonwealth Department of Transport and Regional Services, through its National Landcare and Natural Disaster Risk Management Programs.

On 21st March 2004, Council resolved to adopt the Plan as follows:

1. That the Camden Haven Floodplain Risk Management Study and Plan 2004 (excluding the planning measures) prepared on Council’s behalf by Bewsher Consulting Pty Ltd be adopted.

2. That the Draft Camden Haven Floodplain DCP be adopted in principle and processed in accordance with Part III of the EPA Act.

3. That the Hastings LEP 2001 be amended to incorporate the model floodplain management clauses as recommended by the Camden Haven Floodplain Management Plan.

4. That there be further consultation with landowners in the Camden Haven on the Plan, particularly in relation to the risk mapping and the wording connected to the risk classifications.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EXECUTIVE SUMMARY</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>1. OVERVIEW</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>2. RECOMMENDED MEASURES</strong></td>
<td>7</td>
</tr>
<tr>
<td>2.1 Planning &amp; Development Controls</td>
<td>7</td>
</tr>
<tr>
<td>2.2 Public Awareness Program</td>
<td>8</td>
</tr>
<tr>
<td>2.3 Improved Flood Information</td>
<td>9</td>
</tr>
<tr>
<td>2.4 Flood Warning System</td>
<td>10</td>
</tr>
<tr>
<td>2.5 Emergency Management Issues</td>
<td>12</td>
</tr>
<tr>
<td>2.6 Improved Flood Access</td>
<td>13</td>
</tr>
<tr>
<td>2.7 Voluntary House Raising</td>
<td>14</td>
</tr>
<tr>
<td>2.8 Small Levee in Lakewood Village</td>
<td>15</td>
</tr>
<tr>
<td>2.9 Seal North Training Wall</td>
<td>16</td>
</tr>
<tr>
<td><strong>3. FUNDING AND IMPLEMENTATION</strong></td>
<td>18</td>
</tr>
<tr>
<td>3.1 Estimated Costs</td>
<td>18</td>
</tr>
<tr>
<td>3.2 Funding Sources</td>
<td>18</td>
</tr>
<tr>
<td>3.3 The Next Steps</td>
<td>19</td>
</tr>
<tr>
<td><strong>4. ON-GOING REVIEW OF PLAN</strong></td>
<td>20</td>
</tr>
<tr>
<td><strong>5. REFERENCES</strong></td>
<td>21</td>
</tr>
<tr>
<td><strong>6. GLOSSARY</strong></td>
<td>24</td>
</tr>
<tr>
<td><strong>APPENDICES</strong></td>
<td></td>
</tr>
<tr>
<td>Appendix A – Recommended Changes to Existing Planning Instruments</td>
<td></td>
</tr>
<tr>
<td>Appendix B – General Provisions for Inclusion in Council’s Flood Prone</td>
<td></td>
</tr>
<tr>
<td>Land Policy</td>
<td></td>
</tr>
<tr>
<td>Appendix C – Proposed Flood Risk Management Development Control Plan</td>
<td></td>
</tr>
<tr>
<td><strong>LIST OF TABLES</strong></td>
<td></td>
</tr>
<tr>
<td>Table 1 – Recommended Floodplain Risk Management Measures</td>
<td>17</td>
</tr>
<tr>
<td><strong>LIST OF FIGURES</strong></td>
<td></td>
</tr>
<tr>
<td>Figure 1 – Recommended Floodplain Risk Management Plan</td>
<td>30</td>
</tr>
<tr>
<td>Figure 2 – Camden Haven Flood Risk Areas</td>
<td>31</td>
</tr>
<tr>
<td>Figure 3 – Camden Haven Planning Matrix</td>
<td>32</td>
</tr>
<tr>
<td>Figure 4 – Sample Flood Certificate</td>
<td>33</td>
</tr>
</tbody>
</table>
EXECUTIVE SUMMARY

Responsibilities

The prime responsibility for planning and management of flood prone lands in New South Wales rests with local government. The NSW Government provides assistance on state-wide policy issues and technical support. Financial assistance is also provided to undertake flood and floodplain management studies, such as the current study, and for the implementation of works identified in these studies.

Hastings Council commissioned Bewsher Consulting Pty Ltd to prepare a floodplain risk management study and plan for the Camden Haven River catchment in October 1999.

The Camden Haven Estuary Management Committee’s Flood Working Party oversaw the study. This working party consists of Councillors and staff from Hastings Council, officers from the Department of Land and Water Conservation (since July 2003, incorporated into the Department of Infrastructure, Planning and Natural Resources) and State Emergency Service, representatives from the Camden Haven Protection Society, the North Haven Progress Association, Laurieton Chamber of Commerce, Queens Lake Sailing Club, and other community representatives.

The Catchment

The Camden Haven catchment is located on the mid north coast of New South Wales about 375km north of Sydney. It has a total catchment area of approximately 640 km², which drains to the ocean via the Camden Haven River. Other major drainage systems include Stewarts River, Stingray Creek and Herons Creek.

Most development in the catchment is located towards the downstream end of the river, at Dunbogan, North Haven, Laurieton and West Haven. Much of the land in these localities is particularly low-lying, with many properties as low as RL2.0m AHD. Subsequently, many of the properties are exposed to high flood risks. Other development is located further upstream, at Kew and Kendall.

Flooding can be caused by high ocean levels; high rainfall over the catchment (as was the case for the 1929 flood); or a combination of both (as was the case for the 1963 flood).

Objectives of the Study and Plan

The current Floodplain Risk Management Study is presented as a separate document.

The objective of the study is to prepare a floodplain risk management plan that will minimise the effects of flooding. Specific objectives of the study include:

► a review of previous flood investigations;
► quantification of the flood problem in Camden Haven;
► a review of potential floodplain management measures to reduce the risks of flooding, especially catchment-wide measures such as flood warning, emergency management and planning controls;
a consultation program that involves the community through the progress of the study; and

the development of a recommended floodplain risk management plan for the study area outlining the best measures to reduce flood risks, based on consideration of environmental, social, economic and engineering issues.

**Reporting**

A number of working papers were prepared during the course of investigations. These working papers were prepared to allow the Flood Working Party to monitor the project, and to provide direction where required. Working paper titles are listed below:

- Community Consultation;
- Environmental and Planning Issues;
- Flood Damages;
- Emergency Management, Flood Warning and Flood Awareness;
- Flood Prone Land Policy and Development Control Plan;
- Evaluation of Management Strategies.

The various working papers have been consolidated into the Floodplain Risk Management Study report. In doing so, information provided in the original working papers have been amended to include comments received from the Flood Working Party and from the public display, information day and public meeting, which were held in July/August 2001.

**Consultation**

Community consultation has been an important component of the current study. Consultation has aimed to inform the community about the development of the floodplain management plan, and to collect feedback and ideas on flood behaviour, potential floodplain management measures, and other related issues.

The key elements of the consultation process have been as follows:

- regular meetings of the Camden Haven Estuary Management Committee’s Flood Working Party;
- advertising the study through local papers, distributing newsletters, and providing details on the Internet;
- distribution of a questionnaire to residents and business owners within the study area;
- distribution of a questionnaire to relevant Agencies and Interest Groups;
- a poster display, information day and public meeting during the course of the study; and
- public exhibition of the recommended floodplain risk management plan, prior to formal consideration by Council.
The Flood Problem

A flood damages database of potentially flood affected buildings has been prepared for the study area. The database provides details of those properties likely to be inundated in different sized floods and allows the quantification of potential flood damages. Key results from the database indicate that:

- 1,106 residential homes and 70 commercial buildings would be flooded above floor level in a probable maximum flood;
- 653 residential homes and 46 commercial buildings would be flooded above floor level in a 100 year flood;
- Of those homes flooded in a 100 year flood, 380 are located at North Haven, 156 located at Dunbogan, 61 located at Laurieton, 49 located at Kendall and rural surrounds, and 7 located elsewhere;
- The majority of homes in Dunbogan (103) are inundated by over 1.0m in the 100 year flood;
- The predicted flood damage in the 100 year flood is $34M, whilst the average annual flood damage is estimated at $2.8M and the present value of flood damages is estimated at $30M.

Flood Risk Mapping & Development Controls

The Camden Haven floodplain has been divided into three flood risk areas (high, medium and low). Different development controls are proposed for the catchment, depending on the type of development and the flood risk area that the development is located.

The high flood risk area is where high flood damages, potential risk to life, or evacuation problems are anticipated. It is recommended that most development is restricted within this area.

The medium flood risk area is where there is still a significant risk of flood damage, but where these damages can be minimised by the application of appropriate development controls.

The low flood risk area is that area where the risk of flood damage is low. Most land uses would be permitted within this area (subject to other considerations).

The Floodplain Management Plan

The preferred measures have been determined after a review of potential measures previously considered, and other measures that have been suggested in the course of the current investigations. The measures have been assessed in terms of impacts on flooding, environmental implications, economic considerations and other social issues.

The recommended measures comprise predominantly non-structural measures. These measures include those that seek to modify property in order to minimise flood damage (for example controls on new development and house raising), and
those that seek to improve the community’s response to flooding (for example flood awareness, improved flood warning, and evacuation procedures). These measures were all well supported by the local community. Some minor structural measures are also proposed.

A summary of the draft Floodplain Risk Management Plan is presented in Table 1, and is also represented on Figure 1. The principal components of the Plan are as follows:

- implementation of planning & development Controls, including amendments to the Hastings LEP, a general floodprone land policy and a more specific flood risk management development control plan (DCP);
- the development and implementation of a public awareness program, including the issue of flood certificates, an information brochure and the establishment of one or more flood markers in the lower part of the catchment;
- improved flood level information in certain parts of the catchment;
- implementation of a comprehensive flood warning scheme, including additional catchment instrumentation (already implemented), development of predictive computer software (largely completed) and a flood warning dissemination study;
- improved emergency management measures, including the development of an evacuation strategy and flood action plans for caravan parks and motels located within the floodplain;
- improved flood access provisions for Dunbogan and North Haven, to remove low points in the main access roads and provide a constant grade to higher ground;
- a voluntary house raising scheme, commencing with the trial of a pilot scheme of say 10 houses;
- construction of a small levee in Lakewood Village; and
- works to seal the northern training wall;

**Timing and Funding**

The total cost of implementing the Camden Haven Flood Risk Management Plan is approximately $1.4M, plus additional expenditure for road raising and house raising.

Road raising costs to improve flood access for Dunbogan and North Haven is subject to further investigation and will be dependent on the extent to which access is to be improved and the cost to adjust services and private driveways.

An allowance has been provided in the project cost to raise 10 houses as part of a pilot house raising scheme. However, the total number of houses to be included in the overall scheme and the level of financial subsidy to be provided to home owners is still subject to determination.

The estimated flood benefits of the project (excluding road raising and house raising) is estimated to be about $8M in a major flood, which represents an average annual flood benefit of approximately $650,000, or a net present value of $6.8M.
The timing of the proposed works will depend on Council’s overall budgetary commitments and the availability of funds. Funding may be available through a number of sources, as indicated in Table 1. It is likely that the majority of external financial assistance would be through the Department of Land and Water Conservation.
1. OVERVIEW

A draft floodplain management plan showing preferred floodplain risk management measures for Camden Haven is presented in Chapter 2.

The preferred measures have been determined after a review of potential measures previously considered, and other measures that have been suggested in the course of the current investigations. The measures have been assessed in terms of impacts on flooding, environmental implications, economic considerations and other social issues.

The recommended measures comprise predominantly non-structural measures. These measures include those that seek to modify property in order to minimise flood damage (for example controls on new development and house raising), and those that seek to improve the community’s response to flooding (for example flood awareness, improved flood warning, and evacuation procedures). These measures were all well supported by the local community. Notwithstanding, some low-key structural measures are also proposed.

The major structural measures that were considered and subsequently discounted include:

- major levee schemes around North Haven, Dunbogan and Laurieton;
- filling and development of large areas of low-lying land;
- removal of the rock bar near the entrance of the river;
- major dredging of the Camden Haven River and/or Stingray Creek; and
- provision of a channel from either Queens Lake or Watson Taylors Lake to the ocean.

These measures were discounted for one or more of the following reasons:

- practical problems in implementing these measures;
- marginal flood benefits for high capital costs;
- adverse flood impacts elsewhere;
- environmental problems;
- poor community support.

The recommended floodplain risk management measures are shown on Figure 1 and also summarised in Table 1.

Timing of the proposed works will depend on Council’s overall budgetary commitments, and the availability of funds from other sources. Funding will be available through a number of sources, as identified in Table 1.
2. RECOMMENDED MEASURES

Detailed consideration of all floodplain risk management measures is presented in the Floodplain Risk Management Study. The recommended measures for inclusion in this draft Plan are presented in this Chapter.

2.1 Planning & Development Controls

Priority: High
Estimated Cost: Current Council responsibility
Maintenance Cost: Current Council responsibility

The application of effective land use planning and development controls will ensure that the potential for flood damage does not increase. There is also an opportunity to reduce existing flood damages over time, as flood compatible redevelopment gradually occurs.

The recommended planning and development controls for Camden Haven include:

a) **Recognition of the different flood risks** that exist across the floodplain. For this purpose, the Camden Haven floodplain has been divided into three flood risk areas (high, medium and low), as shown on Figure 2.

b) **The application of a graded set of planning controls** for Camden Haven that recognises both the type of development and the flood risk of the area. The proposed planning controls are summarised on Figure 3. The effect of these controls is to generally restrict most new development within the *High Flood Risk Area*; allow new development subject to appropriate flood related controls within the *Medium Flood Risk Area*; and to allow most uses within the *Low Flood Risk Area* (subject to consideration of other matters).

c) **Amendments to the Hastings LEP** (see Appendix A) be considered, which introduce a standard clause for the consideration of development applications on floodprone land (referring to Council’s Floodprone Land Policy and the Flood Risk Management DCP). It would also be desirable to define or identify high flood risk areas within the LEP and provide a standard clause that restricts the majority of development in such areas.

d) **A general Floodprone Land Policy** for the whole of the LGA be considered, which establishes a broad policy structure for all flood risk management issues relevant to Council, recognising that more detailed contributions are to be made by the LEP and DCP to guide the assessment of development applications. Some recommended inclusions are provided in Appendix B.

e) **A Flood Risk Management DCP** be adopted to implement the planning controls for Camden Haven, as provided in Appendix C. This DCP has general conditions that could apply to the whole LGA, with provision for specific planning controls for individual areas, such as those that have been derived for the Camden Haven floodplain, attached as a separate schedule.

f) **Notations upon Section 149(2) Certificates** are provided that identify the flood affectation by the DCP.
2.2 Public Awareness Program

As the last significant flood that occurred in Camden Haven was the 1963 flood, community awareness of the risks of flooding will be low. Raising flood awareness will provide residents with information on the level of flooding that can be expected, and measures that can be considered to reduce flood damage. A flood-aware community will be able to better respond to any future flood warning or flood event.

A flood awareness and education program is proposed with the following tasks:

a) Update Council’s GIS

Priority: High
Estimated Cost: Council Staff Costs
Maintenance Cost: Council Staff Costs

The update of Council’s GIS computer-based system to include flood information contained in the flood damages database is recommended. This could include details of properties potentially affected by flooding, the estimated depth of inundation, and the provisional flood hazard for each property. This will provide a valuable tool to facilitate the issue of Section 149 Certificates and/or flood certificates, and is also likely to be a valuable component in emergency management plans (e.g. prioritising flood evacuations).

b) Flood Certificates/Information Brochure

Priority: Medium
Estimated Cost: $15,000
Maintenance Cost: $1,500

The provision of flood certificates to residents within the catchment is recommended. The certificates would provide information on the likely depth of flooding at the property for a range of floods. The certificates could be appended to Section 149 Certificates; provided when requests for flood information are made; or provided to all owners, residents, and accommodation houses on a regular basis (say biannually). A sample flood certificate is provided on Figure 4. An information brochure could also accompany the certificate to provide additional explanation and other information to improve flood awareness.

c) Establishment of Flood Markers

Priority: Medium
Estimated Cost: $20,000
Maintenance: $2,000

The construction of several flood markers within the catchment is recommended. The markers will act as a reminder of the heights of previous floods, and could also be used to relate future flood warning predictions. They could be located in a prominent location, such as in local parks, near road bridges in the lower estuary, or adjacent to low points on critical roads. Local schools could be encouraged to help develop an “interesting” concept for the design of these flood markers, which in itself will be a valuable public awareness task.
2.3 Improved Flood Information

It has been previously noted [Willing & Partners, 1991] that flood level estimates in the vicinity of Kendall may be less accurate than that for other areas, presumably due to limited calibration data upstream of Watson Taylors Lake and the wider spacing of cross sections. There are also no studies that define flood levels within the study area on Herons Creek (upstream of Queens Lake), or in Stewarts River (upstream of Watson Taylors Lake).

The following flood level investigations are recommended to improve/extend information on flooding within the catchment.

a) Upper Camden Haven River Flood Investigations

Priority: Medium
Estimated Cost: $70,000
Maintenance: Nil

It is recommended that further investigations of flooding be undertaken for the Camden Haven River, between Watson Taylors Lake and Logans Crossing. These investigations would review existing flood data and results; collect additional survey to verify and supplement previous data; seek additional calibration data; and establish a revised model of flood behaviour.

b) Herons Creek Flood Investigations

Priority: Low
Estimated Cost: $40,000
Maintenance: Nil

No flood information is available for Herons Creek, upstream of Queens Lake. Whilst there does not appear to be a large number of properties presently affected by flooding in this area, improved flood data will provide data necessary to assess any future development applications. Survey of creek cross sections will be required, and a relatively simple flood model should be sufficient for this area.

c) Stewarts River Flood Investigations

Priority: Low
Estimated Cost: $40,000 (Taree Council)
Maintenance: Nil

No flood level information is available for Stewarts River, upstream of Watson Taylors Lake. This part of the catchment is located within the Taree City Council area. It would appear that approximately 10 houses are potentially affected by flooding along Wharf Road, and at least 5 houses affected at Johns River. Taree Council should be encouraged to undertake a flood investigation between Watson Taylors Lake and the highway at Johns River.
2.4 Flood Warning System

Flood warning, combined with emergency management measures and flood awareness activities, could reduce flood damage for a 100 year flood in the Camden Haven catchment by up to $8M, which equates to an average annual flood benefit of approximately $650,000.

A comprehensive flood warning scheme is recommended for the Camden Haven catchment. Tasks involved with establishing the flood warning scheme are outlined below.

a) Establish Additional Instrumentation

*Priority:* High  
*Estimated Cost:* Completed  
*Maintenance:* $10,000

Catchment instrumentation was reviewed at an early stage of these investigations and recommendations provided on additional instrumentation that could be incorporated in an improved flood warning scheme. A network comprising six water level recorders, five rainfall pluviometers, repeater station and base station was subsequently adopted and installed throughout the catchment. On-going operation and maintenance of this equipment will be required.

b) Model Prediction Software

*Priority:* High  
*Estimated Cost:* $20,000  
*Maintenance:* $ 2,000

Development of a predictive computer model to automatically retrieve and analyse rainfall and water level data within the catchment was recommended during the floodplain risk management study. It was recommended that the model incorporate simple hydrologic and hydraulic routines to predict flood heights at one or more points within the catchment. Ocean tide heights and tidal anomalies could also be incorporated in the model.

Council instigated this measure during the progress of the study and substantial implementation has recently been achieved. The model still needs to be fine-tuned (or calibrated) as data from real events become available.

Flood level predictions are currently available using the new model for the lower estuary at Laurieton. It is recommended that consideration be given to expanding the model to also provide a prediction for Kendall.

The model incorporates a small allowance for increased ocean levels due to potential wave set-up across the mouth of the river. However, there is still some debate within the scientific field concerning the actual increases in water level possible from this source. This aspect should be reviewed when further research or other data becomes available.
Responsibilities for the operation, maintenance, and subsequent response operations need to be clearly agreed between Council, the SES and the Bureau of Meteorology.

c) Flood warning dissemination study

*Priority:* Medium  
*Estimated Cost:* $30,000  
*Maintenance:* Nil

Flood warnings need to be effectively disseminated to the public if they are to be of any value. A comprehensive flood warning dissemination study is recommended to investigate the best means of communicating flood warnings with the public, and for identifying the magnitude of particular flood level predictions.
2.5 Emergency Management Measures

Emergency management measures will be an important supplement to the Camden Haven Flood Warning Scheme. Tasks involved are summarised below.

a) Update Local Flood Plan

Priority: High
Estimated Cost: SES responsibility
Maintenance: Minimal

It is recommended that the SES Local Flood Plan for Camden Haven be updated by inclusion of additional flood maps and flood data developed through the current study. Further updating of the local flood plan will be required to include recent (and subsequent) improvements to the flood warning system and as future flood investigations are undertaken. It is recommended that the Camden Haven Flood Working Party provide assistance in the continued development of the local flood plan.

b) Evacuation Strategy

Priority: High
Estimated Cost: $40,000
Maintenance: Nil

Development of a comprehensive evacuation strategy is recommended for Camden Haven. The strategy should consider the total number of residents that need to be evacuated for a range of floods; which parts of the floodplain need to be evacuated first; where and when roads are likely to be cut; means of evacuating visitors from caravan parks; and what facilities are required to temporarily accommodate evacuees. Much of the data necessary to develop the strategy is available from the flood damages database and other information provided through the current investigations.

c) Flood Action Plans

Priority: High
Estimated Cost: Proprietor’s expense
Maintenance: Nil

Development of site-specific flood action plans is recommended for all caravan parks, holiday units, motels and other accommodation houses within the floodplain. The flood action plan includes a list of procedures or instructions to be followed at a particular site in the event of flooding. The plan would be similar to those for fire emergencies or first aid. It would include details concerning action to be taken to evacuate visitors and their vans from caravan parks, and include consideration for the temporary relocation of semi-permanent vans. The plans would be developed by the proprietors of such facilities, in consultation with Council and the SES. The plans could be made a condition of their operational license.
2.6 Improved Flood Access

A number of main access roads to flood affected communities are cut by floodwaters at an early stage of flooding. Particular risk areas include access to/from Dunbogan and North Haven, and to a lesser degree Kendall and Johns River. Some limited road raising would reduce the frequency of road closures and provide additional time for evacuation. Recommended tasks are listed below.

a) Feasibility/Preliminary design

Priority: High  
Estimated Cost: $40,000  
Maintenance: Nil

A feasibility/preliminary design investigation is recommended to assess the opportunities to improve flood access to both Dunbogan and North Haven. The investigation should consider the feasibility and costs of raising existing access roads to remove low points in the road, and to provide a constant grade to higher ground wherever possible. Alternative access routes should also be considered for Dunbogan (for example to the south of Dunbogan and linking up with Scarborough Way).

b) Implementation

Priority: Medium  
Estimated Cost: To be advised  
Maintenance: Nil

Pending the results of the feasibility investigations, flood access improvements for Dunbogan and North Haven are recommended. This is likely to involve some areas of road raising; signposting of inundation depths; and/or providing guard rails along inundated roads to help define their actual location during flood events.
2.7 Voluntary House Raising

The raising of existing low-lying buildings can be effective in reducing the potential damage due to floods. Many of the homes built in low-lying areas, such as in Dunbogan, have been constructed, or recently redeveloped, as elevated homes with car parking underneath. The adoption of a house raising scheme could substantially accelerate the redevelopment of flood affected homes, in a manner more compatible with the flood risk. Recommended tasks are listed below.

a) Audit of potential houses

<table>
<thead>
<tr>
<th>Priority:</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Cost:</td>
<td>$20,000</td>
</tr>
<tr>
<td>Maintenance:</td>
<td>Nil</td>
</tr>
</tbody>
</table>

It has been estimated [Willing & Partners, 1991] that about 320 homes within the study area could be included in a house raising scheme. However, a comprehensive and up-to-date list of properties that could be included in such a scheme is not available. An audit of existing low-lying property within the study area is recommended as a prelude to further consideration of the house raising scheme. The audit would identify the number and location of potential houses to be raised; accurate ground and floor level surveys; the construction material of houses; and the owners’ views on house raising. The flood damages database will provide a good starting point for the audit.

b) Development & Implementation of Pilot Program

<table>
<thead>
<tr>
<th>Priority:</th>
<th>Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Cost:</td>
<td>$400,000</td>
</tr>
<tr>
<td>Maintenance:</td>
<td>Nil</td>
</tr>
</tbody>
</table>

Following the audit of potential houses that may qualify for house raising, it is recommended that a pilot program be established to set guidelines for the scheme and to trial these guidelines with a small sample of houses (say 10 houses). The pilot program would consider such issues as the level of subsidy to be provided (ie how much the individual owner would be expected to contribute); what to do with houses that are difficult to raise (because of their construction type); and other administrative procedures (eg establishing priorities, and responsibilities).

c) Evaluation/On-going Implementation

<table>
<thead>
<tr>
<th>Priority:</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Cost:</td>
<td>Up to $12M (subject to audit &amp; scheme evaluation)</td>
</tr>
<tr>
<td>Maintenance:</td>
<td>Nil</td>
</tr>
</tbody>
</table>

The house raising scheme can be re-evaluated following the success, or otherwise, of the pilot program. Should the scheme continue, remaining houses within the scheme will need to be prioritised and funds set aside on an annual basis for on-going implementation. Depending on the actual number of houses included in the scheme, the level of subsidy to be provided towards the work, and financial assistance provided by the State and Commonwealth Governments, implementation could take as long as 10-20 years to complete.
2.8 Small Levee in Lakewood Village

A small landscaped levee, up to 0.8m in height, is recommended for the protection of low-lying houses in Lakewood Village, principally in the vicinity of Mahogany Close and Honeysuckle Avenue. Whilst only one house is estimated to be flooded above floor level in a 100 year flood, the grounds of some 21 properties are flood affected. Recommended tasks are outlined below.

a) Survey and Design

Priority: Medium
Estimated Cost: $20,000
Maintenance: Nil

Survey and design will be required to test the feasibility of a levee at this location. An important consideration will be the disposal of local drainage behind the levee. The preferred alignment and actual height of the levee can be determined once site constraints are established.

b) Implementation

Priority: Low
Estimated Cost: $200,000
Maintenance: $2,000

Construction of the landscaped levee could proceed subject to a satisfactory design.
2.9 Seal North Training Wall

This measure is intended to protect existing development in North Haven, to the east of Ocean Drive, from backwater inundation from the Camden Haven River. The proposal is to seal the training wall to prevent infiltration, or alternatively to construct an adjacent impervious wall beside the existing wall. Up to 126 residential homes (to be verified as part of further investigations) could potentially benefit from these works. The recommended tasks are outlined below.

a) Feasibility & Design

<table>
<thead>
<tr>
<th>Priority:</th>
<th>Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Cost:</td>
<td>$40,000</td>
</tr>
<tr>
<td>Maintenance:</td>
<td>Nil</td>
</tr>
</tbody>
</table>

The feasibility of sealing the training wall to prevent infiltration, as previously proposed [Willing & Partners, 1991], should be verified. If this is not possible, then an alternative design for an impermeable wall beside the existing training wall should be investigated. Any alternate design will need to carefully assess environmental issues and any community concerns. A review of the number of properties directly benefiting from the works is also recommended.

b) Implementation

<table>
<thead>
<tr>
<th>Priority:</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Cost:</td>
<td>$400,000</td>
</tr>
<tr>
<td>Maintenance:</td>
<td>$10,000</td>
</tr>
</tbody>
</table>

Measures to seal the northern training wall, or otherwise construct an adjacent impermeable wall, could be undertaken subject to a satisfactory design being achieved.
### Table 1
Summary of Recommended Floodplain Risk Management Measures

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Estimated Cost ($)</th>
<th>Potential Funding Sources</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Capital</td>
<td>Maintenance (pa)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Planning &amp; Development Controls</td>
<td>Council Staff Costs</td>
<td>Council Staff Costs</td>
<td>Current Council Responsibility</td>
</tr>
<tr>
<td>2</td>
<td>Public Awareness Program</td>
<td>Council Staff Costs</td>
<td>Council Staff Costs</td>
<td>Council</td>
</tr>
<tr>
<td></td>
<td>a) Update Council GIS</td>
<td>15,000</td>
<td>1,500</td>
<td>Council, DLWC</td>
</tr>
<tr>
<td></td>
<td>b) Issue Flood Certificates / Information Brochure</td>
<td></td>
<td></td>
<td>Council, DLWC, Volunteers</td>
</tr>
<tr>
<td></td>
<td>c) Establishment of Flood Markers</td>
<td>20,000</td>
<td>2,000</td>
<td>Council, DLWC</td>
</tr>
<tr>
<td>3</td>
<td>Improved Flood Information</td>
<td></td>
<td></td>
<td>Council, DLWC</td>
</tr>
<tr>
<td></td>
<td>a) Upper Camden Haven River Flood Investigations</td>
<td>70,000</td>
<td>Nil</td>
<td>Council, DLWC</td>
</tr>
<tr>
<td></td>
<td>b) Herons Creek Flood Investigations</td>
<td>40,000</td>
<td>Nil</td>
<td>Council, DLWC</td>
</tr>
<tr>
<td></td>
<td>c) Stewarts River Flood Investigations</td>
<td>40,000</td>
<td>Nil</td>
<td>Taree Council, DLWC</td>
</tr>
<tr>
<td>4</td>
<td>Flood Warning System</td>
<td></td>
<td></td>
<td>Council, DLWC</td>
</tr>
<tr>
<td></td>
<td>a) Establish additional Instrumentation</td>
<td>Completed</td>
<td>10,000</td>
<td>Council, DLWC</td>
</tr>
<tr>
<td></td>
<td>b) Model Prediction Software (additional)</td>
<td>20,000</td>
<td>2,000</td>
<td>Council, DLWC</td>
</tr>
<tr>
<td></td>
<td>c) Flood Warning Dissemination Study</td>
<td>30,000</td>
<td>Nil</td>
<td>Council, DLWC</td>
</tr>
<tr>
<td>5</td>
<td>Emergency Management Measures</td>
<td></td>
<td></td>
<td>SES</td>
</tr>
<tr>
<td></td>
<td>a) Update Local Flood Plan</td>
<td>Staff costs</td>
<td>Minimal</td>
<td>Council, DLWC</td>
</tr>
<tr>
<td></td>
<td>b) Evacuation Strategy</td>
<td>40,000</td>
<td>Nil</td>
<td>Council, DLWC</td>
</tr>
<tr>
<td></td>
<td>c) Flood Action Plans</td>
<td>Staff costs</td>
<td>Nil</td>
<td>Proprietor’s expense</td>
</tr>
<tr>
<td>6</td>
<td>Improved Flood Access</td>
<td></td>
<td></td>
<td>Council, DLWC</td>
</tr>
<tr>
<td></td>
<td>a) Feasibility/preliminary design</td>
<td>40,000</td>
<td>Nil</td>
<td>Council, DLWC</td>
</tr>
<tr>
<td></td>
<td>b) Implementation</td>
<td>To be advised</td>
<td>Nil</td>
<td>Council, DLWC</td>
</tr>
<tr>
<td>7</td>
<td>Voluntary House Raising</td>
<td></td>
<td></td>
<td>Council, DLWC</td>
</tr>
<tr>
<td></td>
<td>a) Audit of Potential Houses</td>
<td>20,000</td>
<td>Nil</td>
<td>Council, DLWC, Owner</td>
</tr>
<tr>
<td></td>
<td>b) Development &amp; Implementation of Pilot Program</td>
<td>400,000</td>
<td>Nil</td>
<td>Council, DLWC, Owner</td>
</tr>
<tr>
<td></td>
<td>c) Evaluation/On-going Implementation</td>
<td>To be advised</td>
<td>Nil</td>
<td>Council, DLWC, Owner</td>
</tr>
<tr>
<td>8</td>
<td>Small Levee in Lakewood Village</td>
<td></td>
<td></td>
<td>DLWC, Council</td>
</tr>
<tr>
<td></td>
<td>a) Survey &amp; Design</td>
<td>20,000</td>
<td>Nil</td>
<td>DLWC, Council</td>
</tr>
<tr>
<td></td>
<td>b) Implementation</td>
<td>200,000</td>
<td>2,000</td>
<td>DLWC, Council</td>
</tr>
<tr>
<td>9</td>
<td>Seal North Training Wall</td>
<td></td>
<td></td>
<td>DLWC, Council</td>
</tr>
<tr>
<td></td>
<td>a) Feasibility &amp; Design</td>
<td>40,000</td>
<td>Nil</td>
<td>DLWC, Council</td>
</tr>
<tr>
<td></td>
<td>b) Implementation</td>
<td>400,000</td>
<td>10,000</td>
<td>DLWC, Council</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>$1,395,000</td>
<td>$27,500</td>
<td></td>
</tr>
</tbody>
</table>

* Costs do not include estimates for Voluntary House Raising (apart from the pilot scheme) or road raising/construction costs for improved flood access
3. FUNDING AND IMPLEMENTATION

3.1 Estimated Costs

The total cost of implementing the Camden Haven Flood Risk Management Plan is approximately $1.4M, plus additional expenditure for road raising and house raising.

Road raising costs to improve flood access for Dunbogan and North Haven are not yet known. This will be subject to further investigation and will be dependent on the extent to which access is to be improved (by necessity this will be somewhat lower than a 20 year flood). Costs to adjust services and private driveways will also be a significant factor. Alternate routes may also be considered in conjunction with other planning considerations.

An allowance has been provided in the project cost to raise 10 houses as part of a pilot house raising scheme. However, the total number of houses to be included in the overall scheme and the level of financial subsidy to be provided to home owners is still subject to determination. Typically, a full cost subsidy could only be justified on an economic basis if it is restricted to houses that are located below the 20 year flood level. Should a full cost subsidy be provided to the estimated 320 houses that may qualify for house raising, the total cost could be as high as $12M, and take some 10-20 years to implement. A partial subsidy scheme could significantly lower this amount and accelerate the scheme.

The estimated flood benefits of the project (excluding road raising and house raising) are estimated to be about $8M in a major flood, which represents an average annual flood benefit of approximately $650,000, or a net present value of $6.8M. The economic benefits of road raising are more difficult to estimate, with the main benefits being the increased time for evacuation and reduced risk to life for residents and rescue personnel. The benefits of house raising will be dependent on the amount of subsidy to be provided and the frequency of inundation of the houses that are included in the scheme.

3.2 Funding Sources

A variety of sources of potential funding can be considered for implementation of the Camden Haven Floodplain Risk Management Plan. These include:

► State and Commonwealth funding for flood risk management measures through the Department of Land and Water Conservation;
► Council funds;
► Contributions from affected residents (eg as a share of the costs associated with house raising or other flood proofing measures);
► Volunteer labour (eg school programs and activities to increase public awareness);
► Section 94 Contributions from future development where a nexus can be established between that development and flooding.

Council can expect to receive the majority of financial assistance through the Department of Land and Water Conservation. These funds are available to
implement measures that contribute to reducing existing flood problems. Funding assistance is usually provided on a 2:1 basis (State:Council) or a 1:1:1 basis (Commonwealth:State:Council). Special grant money may also be available in some cases.

Although much of the Plan may be eligible for Government assistance, funding can not be guaranteed. Government funds are allocated on an annual basis to competing projects throughout the State. Measures that receive Government funding must be of significant benefit to the community. Funding of investigation and design activities as well as any works and ongoing programs such as voluntary house raising, is normally available. Maintenance, however, is normally the responsibility of Council.

3.3 The Next Steps

The steps in progressing the floodplain management process are as follows:

► Council determines a program of works, based on overall priority, available Council funds and any other constraints;
► Council submits an application for funding assistance to the Department of Land and Water Conservation and negotiates other sources of funding;
► implementation of the Plan proceeds, as funds become available and in accordance with established priorities.
4. ON-GOING REVIEW OF PLAN

The Plan should be regarded as a dynamic instrument requiring review and modification over time. The catalyst for change could include new flood events and experiences, legislative change, alterations in the availability of funding, or changes to the area’s planning strategies. In any event, a thorough review every five years is warranted to ensure the ongoing relevance of the Plan.
5. REFERENCES


Bewsher Consulting Pty Ltd in association with Don Fox Planning Pty Ltd and others, 1996, “Assessment of Floodplain Controls, Carinya Road, Picnic Point”, prepared for Bankstown City Council.


Commissioner Kevin Cleland, October 1992, “Residential Canal Development proposed by Gimneva Properties Pty Ltd, Dunbogan, Municipality of Hastings”, Report to the Honorable Robert Webster, Minister for Planning and Minister for Housing.

Department of Land & Water Conservation, 1999, “Acid Sulphate Soil Priority Management Areas on the Lower Hastings Camden Haven Floodplains”.


Institution of Engineers, Australia, 1987, “Australian Rainfall & Runoff”.


North Coast Regional Environmental Plan (formerly North Coast Regional Environmental Plan 1988).


Smith, D., “Beyond the Design Flood - Implications for Urban Floodplains”.


6. GLOSSARY

Note that terms shown in bold are described elsewhere in this Glossary.

100 year flood

A flood that occurs on average once every 100 years. Also known as a 1% flood. See annual exceedance probability (AEP) and average recurrence interval (ARI).

50 year flood

A flood that occurs on average once every 50 years. Also known as a 2% flood. See annual exceedance probability (AEP) and average recurrence interval (ARI).

20 year flood

A flood that occurs on average once every 20 years. Also known as a 5% flood. See annual exceedance probability (AEP) and average recurrence interval (ARI).

afflux

The increase in flood level upstream of a constriction of flood flows. A road culvert, a pipe or a narrowing of the stream channel could cause the constriction.

annual exceedance probability (AEP)

AEP (measured as a percentage) is a term used to describe flood size. AEP is the long-term probability between floods of a certain magnitude. For example, a 1% AEP flood is a flood that occurs on average once every 100 years. It is also referred to as the ‘100 year flood’ or 1 in 100 year flood’. The terms 100 year flood, 50 year flood, 20 year flood etc, have been used in this study. See also average recurrence interval (ARI).

Australian Height Datum (AHD)

A common national plane of level approximately equivalent to the height above sea level. All flood levels, floor levels and ground levels in this study have been provided in metres AHD.

average annual damage (AAD)

Average annual damage is the average flood damage per year that would occur in a nominated development situation over a long period of time.

average recurrence interval (ARI)

ARI (measured in years) is a term used to describe flood size. It is a means of describing how likely a flood is to occur in a given year. For example, a 100 year ARI flood is a flood that occurs or is exceeded on average once every 100 years. The terms 100 year flood, 50 year flood, 20 year flood etc, have been used in this study. See also annual exceedance probability (AEP).

catchment

The land draining through the main stream, as well as tributary streams.

Development Control Plan (DCP)

A DCP is a plan prepared in accordance with Section 72 of the Environmental Planning and Assessment Act, 1979, that provides detailed guidelines for the assessment of development applications.

discharge

The rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second (m$^3$/s). Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving.
DLWC

Department of Land and Water Conservation. This was the name given to the Department of Water Resources (DWR), the Department of Conservation and Land Management (CALM) and flood sections of the Public Works Department (PWD) from May 1995. DLWC was incorporated into the Department of Infrastructure, Planning and Natural Resources (DIPNR) from 1 July 2003. DLWC has been used in this report, except for work and/or studies carried out by the departments prior to May 1995.

DUAP

The former Department of Urban Affairs and Planning (NSW). Previously the Department of Planning (NSW). Superseded by Planning NSW, which was incorporated into the Department of Infrastructure, Planning and Natural Resources from 1 July 2003.

DWR

The former Department of Water Resources. This department became a major component of the Department of Land and Water Conservation (DLWC) in May 1995.

ecologically sustainable development (ESD)

Using, conserving and enhancing natural resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be maintained or increased. A more detailed definition is included in the Local Government Act 1993.

effective warning time

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.

emergency management

A range of measures to manage risks to communities and the environment. In the flood context it may include measures to prevent, prepare for, respond to and recover from flooding.

EP&A Act

Environmental Planning and Assessment Act, 1979.

extreme flood

An estimate of the probable maximum flood (PMF), which is the largest flood likely to occur.

flood

A relatively high stream flow that 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 before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunami.

flood awareness

An appreciation of the likely effects of flooding and a knowledge of the relevant flood warning, response and evacuation procedures.

flood hazard

The potential for damage to property or risk to persons during a flood. Flood hazard is a key tool used to determine flood severity and is used for assessing the suitability of future types of land use.

flood level

The height of the flood described either as a depth of water above a particular location (eg. 1m above a floor, yard or road) or as a depth of water related to a standard level such as Australian Height Datum (eg the flood level was 7.8m AHD). Terms also used include flood stage and water level.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>flood liable land</td>
<td>Land susceptible to flooding up to the probable maximum flood (PMF). Also called flood prone land. Note that the term flood liable land now covers the whole of the floodplain, not just that part below the flood planning level, as indicated in the superseded Floodplain Development Manual (NSW Government, 1986).</td>
</tr>
<tr>
<td>flood planning levels (FPLs)</td>
<td>The combination of flood levels and freeboards selected for planning purposes, as determined in floodplain management studies and incorporated in floodplain management plans. The concept of flood planning levels supersedes the designated flood or the flood standard used in earlier studies.</td>
</tr>
<tr>
<td>flood prone land</td>
<td>Land susceptible to flooding up to the probable maximum flood (PMF). Also called flood liable land.</td>
</tr>
<tr>
<td>flood proofing</td>
<td>A combination of measures incorporated in the design, construction and alteration of individual buildings or structures subject to flooding, to reduce or eliminate damages during a flood.</td>
</tr>
<tr>
<td>flood stage</td>
<td>see flood level.</td>
</tr>
<tr>
<td>Flood Study</td>
<td>A study that investigates flood behaviour, including identification of flood extents, flood levels and flood velocities for a range of flood sizes.</td>
</tr>
<tr>
<td>floodplain</td>
<td>The area of land that is subject to inundation by floods up to and including the probable maximum flood event, that is, flood prone land or flood liable land.</td>
</tr>
<tr>
<td>Floodplain Risk Management Plan</td>
<td>The outcome of a Floodplain Management Risk Study.</td>
</tr>
<tr>
<td>Floodplain Risk Management Study</td>
<td>The current study. These studies are carried out in accordance with the Floodplain Management Manual (NSW Government, 2001) and assess options for minimising the danger to life and property during floods. These measures, referred to as 'floodplain management measures/options', aim to achieve an equitable balance between environmental, social, economic, financial and engineering considerations. The outcome of a Floodplain Risk Management Study is a Floodplain Risk Management Plan.</td>
</tr>
<tr>
<td>floodway</td>
<td>Those areas of the floodplain where a significant discharge of water occurs during floods. Floodways are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood levels.</td>
</tr>
<tr>
<td>flow</td>
<td>see discharge</td>
</tr>
<tr>
<td>freeboard</td>
<td>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.</td>
</tr>
<tr>
<td>high flood hazard</td>
<td>For a particular size flood, there would be a possible danger to personal safety, able-bodied adults would have difficulty wading to safety, evacuation by trucks would be difficult and there would be a potential for significant structural damage to buildings.</td>
</tr>
</tbody>
</table>
**hydraulics**
Term given to the study of water flow in waterways; in particular, the evaluation of flow parameters such as water level and velocity.

**hydrology**
Term given to the study of the rainfall and runoff process; in particular, the evaluation of peak discharges, flow volumes and the derivation of hydrographs (graphs that show how the discharge or stage/flood level at any particular location varies with time during a flood).

**km**
kilometres. 1km = 1,000m = 0.62 miles.

**km²**
square kilometres. 1km² = 1,000,000m² = 100ha ≈ 250 acres.

**Local Environmental Plan (LEP)**
A Local Environmental Plan is a plan prepared in accordance with the Environmental Planning and Assessment Act, 1979, that defines zones, permissible uses within those zones and specifies development standards and other special matters for consideration with regard to the use or development of land.

**low flood hazard**
For a particular size flood, able-bodied adults would generally have little difficulty wading and trucks could be used to evacuate people and their possessions should it be necessary.

**m**
metres. All units used in this report are metric.

**m AHD**
metres Australian Height Datum (AHD).

**m/s**
metres per second. Unit used to describe the velocity of floodwaters. 10km/h ≈ 2.8m/s.

**m²**
square metres. 1m² = 10.8 square feet.

**m³/s**
Cubic metres per second or 'cumecs'. A unit of measurement for creek flows or discharges. It the rate of flow of water measured in terms of volume per unit time.

**merit approach**
The principles of the merit approach are embodied in the Floodplain Management Manual (NSW Government, 2001) and weigh up social, economic, ecological and cultural impacts of land use options for different flood prone areas together with flood damage, hazard and behaviour implications, and environmental protection and well being of the State’s rivers and floodplains.

**MIKE-11**
The software program used to develop a computer model that analyses the hydraulics of the waterways within a catchment and calculates water levels (flood levels) and flow velocities. Known as a hydraulic model.

**mm**
millimetres. 1m = 1,000mm

**overland flow path**
The path that floodwaters can follow if they leave the confines of the main flow channel. Overland flow paths can occur through private property or along roads. Floodwaters travelling along overland flow paths, often referred to as ‘overland flows’, may or may not re-enter the main channel from which they left — they may be diverted to another water course.

**peak discharge**
The maximum flow or discharge during a flood.
present value
In relation to flood damage, is the sum of all future flood damages that can be expected over a fixed period (usually 20 years) expressed as a cost in today’s value.

probable maximum flood (PMF)
The largest flood likely to ever occur. The PMF defines the extent of flood prone land or flood liable land, that is, the floodplain. The extent, nature and potential consequences of flooding associated with the PMF event are addressed in the current study.

reliable access
During a flood, reliable access means the ability for people to safely evacuate an area subject to imminent flooding within the effective warning time, having regard to the depth and velocity of floodwaters, the suitability of the evacuation route, and other relevant factors.

risk
Chance of something happening that will have an impact. It is measured in terms of consequences and likelihood. In the context of this study, it is the likelihood of consequences arising from the interaction of floods, communities and the environment.

RORB
The software program used to develop a computer model that analyses the hydrology (rainfall–runoff processes) of the catchment and calculates hydrographs and peak discharges. Known as a hydrological model.

runoff
The amount of rainfall that ends up as flow in a stream, also known as rainfall excess.

SES
State Emergency Service of New South Wales.

stage–damage curve
A relationship between different water depths and the predicted flood damage at that depth.

velocity
The term used to describe the speed of floodwaters, usually in m/s (metres per second). 10km/h = 2.7m/s.

water level
see flood level.

water surface profile
A graph showing the height of the flood (flood stage, water level or flood level) at any given location along a watercourse at a particular time.
FIGURE 2
CAMDEN HAVEN FLOOD RISK AREAS

LEGEND

HIGH FLOOD RISK AREA

This area is not considered a flood-prone area and any flood events that occur are not anticipated to cause significant structural damage or loss of life.

MEDIUM FLOOD RISK AREA

This area is considered to be at risk of flooding during the 2050 flood event that is not anticipated to cause significant structural damage or loss of life.

LOW FLOOD RISK AREA

This area is considered to be at risk of flooding during the 2050 flood event but not as high risk as the medium flood risk area.

LOWEST FLOOD RISK AREA

This area is considered to be at risk of flooding during the 2050 flood event but not as high risk as the medium flood risk area.

MANAGEMENT PLAN

1. The extent of flood inundation shown is approximate only.

2. This is based on results provided in the Camden Haven Flood Study Report (1990) and a detailed survey and topographic data

3. Additional flood level investigations are recommended in the following areas to prevent potential flood risk:

- Camden Haven River (upstream of Pacific Highway)
- Camden Creek
- Bethania Creek

CAMDEN HAVEN FLOODPLAIN
RISK MANAGEMENT PLAN

Scale

0 1 2

km

South Pacific Ocean

Grenfell Shoal

Gang Gang Shoal

Dunbogan

North Brother

Queens Lake

West Haven

Laureton

Watson Taylors Lake

Dunbogan shoal

Dunbogan
## Schedule 3 - Camden Haven Planning Matrix
### Planning & Development Controls

#### Flood Risk Area

<table>
<thead>
<tr>
<th>DEVELOPMENT CONTROL CONSIDERATION</th>
<th>LOW FLOOD RISK</th>
<th>MEDIUM FLOOD RISK</th>
<th>HIGH FLOOD RISK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essential Comm Facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical Utilities</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Subdivision</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Residential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial Or Ind.</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Recreational or Agriculture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tourist Related Development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Existence unlinked</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Vacant Lots</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor Development</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Essential Comm Facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical Utilities</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Subdivision</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Residential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial Or Ind.</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Recreational or Agriculture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tourist Related Development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Existence unlinked</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Vacant Lots</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor Development</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Essential Comm Facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical Utilities</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Subdivision</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Residential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial Or Ind.</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Recreational or Agriculture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tourist Related Development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Existence unlinked</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Vacant Lots</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor Development</td>
<td>3</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Flood Effect on Others</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Evacuation/Access</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flood Awareness</td>
<td>3</td>
<td>1,3</td>
<td>3</td>
</tr>
<tr>
<td>Management &amp; Design</td>
<td>1</td>
<td>4</td>
<td>2,3</td>
</tr>
</tbody>
</table>

#### Notes
- **Not Relevant**
- **Unsuitable Land Use**

**Flood Planning Level categories**
- **FPL1** based upon 20 year flood level
- **FPL2** based upon 20 year flood level plus 0.8m freeboard east of Pacific Highway, or plus 0.5m freeboard west of the Highway
- **FPL3** based upon 100 year flood level
- **FPL4** based upon 100 year flood level plus 0.8m freeboard east of Pacific Highway, or plus 0.5m freeboard west of the Highway
- **FPL5** not used
- **FPL6** based upon an approximation of the Probable Maximum Flood as defined in the Glossary

**Flood Level**
1. All floor levels to be equal or greater than FPL2 unless justified by a site specific assessment.
2. Habitable floor levels to be equal to or greater than FPL4 and other floor levels (incl. Covered/uncovered car spaces) to be equal to or greater than FPL1.
3. All floor levels to be equal to or greater than FPL6.
4. Floor levels to be as close to FPL4 as practical & no lower than the existing floor level when rebuilding or adding to an existing building.
5. Floor levels of shops to be as close to FPL4 as practical, with more than 30% of the floor area or equivalent storage space to be above this level, or floodproof the building to this level using shutters.

**Flood Compatible Materials**
1. All structures to be constructed of flood compatible materials below FPL4.
2. All structures to be constructed of flood compatible materials below FPL6.

**Structural Soundness**
1. Engineers report to certify any structure subject to a flood up to FPL3 can withstand the force of floodwater, debris & buoyancy.
2. Applicant demonstrates that any structure subject to a flood up to FPL3 can withstand the force of floodwater, debris & buoyancy.
3. Applicant demonstrates that any structure subject to a flood up to FPL6 can withstand the force of floodwater, debris & buoyancy.
4. Floodproofing of the structure in remote rural sites by provision of an earth mound up to FPL3.

**Flood Effect on Others**
1. Engineers report required to certify that the development of an existing allotment will not increase flood affectation elsewhere for all floods up to FPL6.
2. The impact of the development on flooding elsewhere for all floods up to FPL6 to be assessed.
3. Filling or raising of site levels will be restricted to the requirements of the Health Commission under the provisions of Section 55 of the Public Health Act. Any filling above this level shall only be permitted with the concurrence of Council. Such filling will be restricted to the building footprint plus a maximum 3m wide perimeter around the footprint.

**Evacuation/Access**
1. Reliable access for pedestrians required above FPL3 or the floor level of the building where a lower level is approved.
2. Reliable access for pedestrians & vehicles required at or above FPL6.
3. Council approved flood evacuation strategy & pedestrian/vehicular access route for both before and during a flood.

**Flood Awareness**
1. Flood action plans required where floor levels are below FPL3.
2. S149(2): Certificates to notify affectation by flooding & Council’s Policy, DCP AND LEP flood related provisions.

**Management & Design**
1. No external storage of materials below FPL4 which may be potentially hazardous during floods.
2. Applicant to demonstrate that there is an area where goods may be stored above FPL4 during floods.
3. Applicant to demonstrate that the ultimate development of the subdivision, as a consequence of the subdivision proposal, can be undertaken in accordance with this policy.
Flood Certificate

Certificate Issued for Property at:  14 Waterside Crescent, North Haven  
Lot 14, DP 25843

Owners Name:    Mr A.B. Smith

Classification of Flood Risk

Council records indicate that the above property is located within a Low Flood Risk area.

Land that is potentially subject to inundation is classified as low, medium or high flood risk. Council has prepared a development control plan known as “Flood Risk Management” that provides details of flood related development controls that may be applicable.

Known Floor and Ground Levels

The lowest floor level of the main building on this property is : unknown
Source of information : N/A

The lowest ground level on this property is : 3.7m AHD
Source of information : Estimate from plans

If the floor level is currently unknown and you would like to know what the level is, this can be surveyed by a qualified surveyor. Alternatively, Hastings Council can arrange this for a fee of $90.

Estimated Flood Levels

Flood levels in the vicinity of the above property have been extracted from the “Camden Haven Flood Study” report (Willing & Partners, 1989).

<table>
<thead>
<tr>
<th>Size of Flood*</th>
<th>Flood Level</th>
<th>Depth over Lowest Floor Level</th>
<th>Depth over Lowest Ground Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probable Maximum Flood</td>
<td>4.6m AHD</td>
<td>Not known</td>
<td>0.9m</td>
</tr>
<tr>
<td>100 Year Flood</td>
<td>3.5m AHD</td>
<td>Not known</td>
<td>Not flooded</td>
</tr>
<tr>
<td>50 Year Flood</td>
<td>3.0m AHD</td>
<td>Not known</td>
<td>Not flooded</td>
</tr>
<tr>
<td>20 Year Flood</td>
<td>2.5m AHD</td>
<td>Not known</td>
<td>Not flooded</td>
</tr>
</tbody>
</table>

*The Probable Maximum Flood (or PMF) is extremely rare. A 100 year flood is a large flood. It has a 1 in 100 (ie 1%) chance of occurring in any year. A 20 year flood is more frequent. It has a 1 in 20 (ie 5%) chance of occurring in any year.

Issued by Hastings Council
8th December 2000.

Sample Flood Certificate (unknown floor level)
FIGURE 4
APPENDIX A

RECOMMENDED CHANGES TO EXISTING PLANNING INSTRUMENTS
APPENDIX A

STANDARD INCLUSIONS FOR LEP’s

DEFINITIONS

*Australian Rainfall and Runoff* means the latest edition of the Institution of Engineers, Australia’s publication “*Australian Rainfall and Runoff – A Guide to Flood Estimation*”.

*High Flood Risk Areas* means land indicated on the map as ‘High Flood Risk Areas’, being those parts of flood prone land where the depth and velocity of floodwaters and evacuation difficulties would pose a significant risk to people that may reside in such areas.

*Flood Prone land* means land susceptible to flooding by the probable maximum flood event as indicated on the map(s) marked ‘Flood Prone Land’ deposited in the office of Council as amended from time to time, or as determined in accordance with the procedures described in *Australian Rainfall and Runoff* for locations outside these mapped areas.

OBJECTIVES

To reduce the risk to human life and damage to property caused by flooding and to allow for more detailed controls for development on flood prone land to be implemented within a Flood Risk Management Development Control Plan.

STANDARD CLAUSES

Development in High Flood Risk Areas

Notwithstanding any other provision of this plan, development other than for the following purposes are prohibited:

- Agriculture
- Demolition
- Dwelling houses on vacant lots existing at the relevant date
- Extractive Industries
- Forestry
- Helipad
- Maintenance
- Mines
- Miscellaneous Forestry
- Public Utility Undertaking
Development in Flood Prone land

... (1) Notwithstanding any other provisions of this plan, the Council shall not consent to the carrying out of any development on flood prone land where such development:

(a) is inconsistent with the Hastings Flood Prone Land Policy, the Flood Risk Management DCP, or any other floodplain management plan adopted by Council in accordance with the principles contained in the Manual entitled ‘Floodplain Management Manual’ dated January 2001;

(b) detrimentally increase the potential flood affectation on other development or property;

(c) results in an increased risk to human life;

(d) is 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 affects the environment of the floodplain by causing avoidable erosion, siltation, destruction of conservation value river bank vegetation, or reduction in the stability of the river bank;

... (2) Where Council is unable to assess the flood risk of a proposal from available flood information and guidelines, it may consult with and take into consideration, any advice of the Department of Land and Water Conservation 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.
APPENDIX B

GENERAL PROVISIONS FOR INCLUSION IN COUNCIL’S FLOOD PRONE LAND POLICY
APPENDIX B

PROPOSED FLOOD PRONE LAND POLICY

During the course of the current study, Hastings Council sought advice concerning the preparation of a broad policy document to provide overriding guidance in regard to Council’s corporate position regarding flood risk management. The policy would deal with matters at a general and broad level and incorporate considerations for matters other than development control, such as voluntary purchase of land, rezoning of land, allocation of funding towards flood mitigation works, and flood awareness strategies. Some suggested general provisions for inclusion within Council’s policy are outlined below.

Objectives

► Reduce the risk to human life and damage to property caused by flooding;
► Implement and periodically review Council’s Floodplain Risk Management Plans;
► Alert the community to the hazard and extent of land affected by potential floods;
► Inform the community of Council’s policy in relation to the use and development of land affected by potential floods;
► Deal equitably and consistently with all matters requiring Council’s approval on land affected by potential floods, in accordance with the principles contained in the Floodplain Management Manual issued by the NSW Government.
► Increase public awareness of the full range of floods up to the probable maximum flood level and to ensure that essential services and land uses are planned in recognition of the flooding risks.

Area of Application

This Policy applies to all flood prone land within the Hastings Local Government Area.

Definitions

*Australian Rainfall and Runoff* means the latest edition of the Institution of Engineers, Australia’s publication “*Australian Rainfall and Runoff – A Guide to Flood Estimation*”.

*Flood prone land* means land susceptible to flooding by the probable maximum flood event as indicated on the map(s) marked “Flood Prone Land” deposited in the office of Council and amended from time to time, or as determined in accordance with the procedures described in *Australian Rainfall and Runoff* for locations outside the these mapped areas.

Floodplain Risk Management Plan means a plan prepared for one or more floodplains in accordance with the requirements of the Floodplain Management Manual.

Floodplain Risk Management Study means a study prepared for one or more floodplains in accordance with the requirements of the Floodplain Management Manual.

High Flood Risk Area means land indicated as “High Risk Flood Area” on a map marked “Flood Prone Land” deposited in the office of Council, or where not mapped being those parts of potentially flooded areas where the depth and velocity of floodwaters and evacuation difficulties would pose an unacceptable risk to types of development and activity.

Probable Maximum Flood (PMF) means the flood calculated to be the maximum likely to occur.

Hastings Local Environmental Plan

Hastings LEP will provide a basis for the following:

► Establish broad objectives for land use planning in the LGA;

► Provide a consistent set of objectives relevant to the assessment of development proposals;

► Outline general matters for consideration by Council when assessing development applications on flood prone land;

► Rely on detailed development controls for flood prone land to be implemented through a Development Control Plan;

► Identify land known to be a high risk flood area;

► Prohibit the majority of development on areas identified in high flood risk areas due to the potential for excessive property damages and risk to human life.

Development Control Plan

Council’s Development Control Plan for managing flood risk in the Hastings LGA will provide the following:

► Outline matters for consideration in the assessment of development applications on flood prone land generally within the Hastings LGA;
- Provide detailed development controls relevant to individual floodplains or generally of flood prone areas in the LGA, where no detail controls have been formulated for individual floodplains;

- Provide for the delineation of individual floodplains based on flood risk and the categorisation of land uses based upon their sensitivity to the flood risk;

- Provide different guidelines for the use and development of land subject to potential floods which reflect the sensitivity of the particular development and use of land having regard to the flood risk associated with individual sites (this is to be achieved by the formulation of a planning matrix which demonstrates the interrelationship between different flood risk areas, land uses and development controls).

**Rezoning Proposals**

In determining proposals for the rezoning of land, Council will assess all proposals in accordance with the relevant matrix of planning and development controls provided within the above mentioned Development Control Plan.

**Voluntary Purchase**

In certain high flood risk areas in the urban floodplain where it is impractical or uneconomic to mitigate the flood hazard, it may be appropriate to cease occupation of the land to minimise risk to both residents and potential rescuers. In such situations, Council may instigate a voluntary purchase scheme of affected properties in consultation with the Department of Land & Water Conservation and the affected landowners, after consideration of other relevant matters outlined by the Floodplain Management Manual.

Where the LEP and DCP indicate that Council will consider minor developments within areas subject to voluntary purchase schemes, the following shall apply:

(a) In the event that house alterations or additions are approved by Council, the applicant will need to provide a written agreement to Council to the effect that any increase in the value of the property will not be included in any possible acquisition valuation.

(b) Such properties are to be placed at the end of the voluntary acquisition list.

**Community Flood Awareness Programs**

[to be inserted in consultation with Council]

**Flood Mitigation Works Funding**

[to be inserted in consultation with Council]
APPENDIX C

PROPOSED
FLOOD RISK MANAGEMENT
DEVELOPMENT CONTROL PLAN
DRAFT

FLOOD RISK MANAGEMENT
DEVELOPMENT CONTROL PLAN

Hastings Council
Development Control Plan (DCP) No. ........
(Environmental Planning and Assessment Act, 1979)

Prepared by

Don Fox Planning

November 2002
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 GENERAL</td>
<td>3</td>
</tr>
<tr>
<td>1.1 What is the Plan?</td>
<td>3</td>
</tr>
<tr>
<td>1.2 Why is This Plan Required?</td>
<td>3</td>
</tr>
<tr>
<td>1.3 To Which Applications Does the Plan Apply?</td>
<td>3</td>
</tr>
<tr>
<td>1.4 Where Does the Plan Apply?</td>
<td>3</td>
</tr>
<tr>
<td>1.5 How Does the Plan Relate to Other Legislation and Regulations?</td>
<td>3</td>
</tr>
<tr>
<td>1.6 What are the Aims and Objectives of the Plan?</td>
<td>4</td>
</tr>
<tr>
<td>1.7 Glossary</td>
<td>5</td>
</tr>
<tr>
<td>2.0 WHAT ARE THE CRITERIA FOR DETERMINING APPLICATIONS?</td>
<td>6</td>
</tr>
<tr>
<td>2.1 General</td>
<td>6</td>
</tr>
<tr>
<td>2.2 Land Use Categories</td>
<td>7</td>
</tr>
<tr>
<td>2.3 Flood Risk Precincts</td>
<td>7</td>
</tr>
<tr>
<td>2.4 Which Controls Apply to Proposed Developments?</td>
<td>7</td>
</tr>
<tr>
<td>2.5 Are There Special Requirements for Fencing?</td>
<td>8</td>
</tr>
<tr>
<td>2.6 Special Considerations</td>
<td>9</td>
</tr>
<tr>
<td>3.0 WHAT INFORMATION IS REQUIRED WITH AN APPLICATION TO ADDRESS THIS PLAN?</td>
<td>9</td>
</tr>
</tbody>
</table>

## LIST OF ATTACHED SCHEDULES

1. Flood Compatible Materials
2. Land Use Categories
3. Planning Matrix Controls – Camden Haven Floodplain
4. Planning Matrix Controls – Other Floodplains
   
   [to be inserted by Council]
1.0 GENERAL

1.1 What is the Plan?

This document is to be known as the Flood Risk Management Development Control Plan" (DCP). This Policy 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 Context of this Plan

In 1984, the State Government introduced the current 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."

The 2001 Floodplain Management Manual provides guidelines for the implementation of this policy and merits approach, which underpins its application. The Manual 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 avoidance and minimisation are 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.

This Plan is consistent with the State Government’s “Flood Prone Land Policy” and the Manual. It is an application of the Policy reflecting local circumstances through the preparation of floodplain risk management studies and plans.

1.3 To Which Applications Does the Plan Apply?

Council will adopt the provisions of this Plan, amongst other considerations, when determining development applications received in accordance with the Environmental Planning and Assessment Act, 1979.

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 Hastings Local Government area, as depicted on the DCP map at Figure 1.

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 which are subject to a Floodplain Risk Management Plan.

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

This Plan should be read in conjunction with the following plans:

- NSW Government Flood Prone Lands Policy;
- Floodplain Management Manual;
- Environmental Planning and Assessment Act 1979 and Regulations;
- North Coast Regional Environmental Plan;
- Hastings Local Environmental Plan 2001;
- Other relevant Council Development Control Plans or Policies.
1.6 What are the Aims and Objectives of the Plan?

This Plan aims to:

(a) Provide detailed controls for the assessment of landuse and development applications.

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

(c) Specify criteria for consideration of applications lodged in accordance with the Environmental Planning and Assessment Act 1979.

(d) Alert the community to the hazard and extent of land affected by potential floods.

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

(f) Minimise the risk to human life and damage to property caused by flooding through controlling development on land affected by potential floods.

(g) Deal equitably and consistently with applications for development on land affected by potential floods, in accordance with the principles in the Floodplain Management Manual issued by the NSW Government.

(h) Increase public awareness of flooding behaviour and appropriate responses thereto for the full range potential floods up to the PMF and to ensure essential services and landuses are planned in recognition of all potential floods.
Encourage the development and use of land which is compatible with the indicated flood hazard.

Provide guidelines, for the use and development of land subject to all potential floods in the floodplain, which reflect the probability of the flood occurring and the potential hazard within different areas.

To control development and other activity within each of the individual floodplains having regard to the characteristics and level of information available for each of the floodplains, in particular the availability of floodplain risk management studies and plans prepared in accordance with the Floodplain Management Manual.

1.7 Glossary

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

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

**Australian Rainfall and Runoff** means the latest edition of the Institution of Engineers, Australia’s publication “Australian Rainfall and Runoff – A Guide to Flood Estimation”

**Camden Haven Floodplain** means the area mapped as flood prone on the map titled “Camden Haven Flood Risk Areas” attached to Schedule 3

**Effective warning time** is equal to the available warning time, less the time taken to alert flood-effected people (by radio, television, loud-hailer or word of mouth) and have them commence effective response and evacuation procedures.

**Flood awareness** is an appreciation of the likely effects of flooding and a knowledge of the relevant flood warning, response 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 as indicated in the Floodplain Management Manual.

**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 evacuation strategy** means the proposed strategy for the evacuation of areas during periods of flood as specified within any policy of Council, the Floodplain Risk Management Plan, the relevant (SES) Flood Plan, by advices received from the SES or as determined in the assessment of individual proposals.

**Flood Planning Levels (FPLs)** means the combination of flood levels and freeboards selected for planning purposes, as determined in floodplain management studies and incorporated in floodplain management plans. Flood planning levels adopted in this DCP are:

- FPL1 – based on 20 year flood
- FPL2 – based on 20 year flood plus freeboard
- FPL3 – based on 100 year flood
- FPL4 – based on 100 year flood plus freeboard
- FPL5 – based on 500 year flood
- FPL6 – based on PMF

**Flood prone land** means land susceptible to flooding by the probable maximum flood event as indicated on the map(s) marked ‘Flood Prone Land’ deposited in the office of Council as amended from time to time, or as determined in accordance with the procedures described in Australian Rainfall and Runoff for locations outside these mapped areas.

**Floodplain Risk Management Plan** means a plan prepared for one or more floodplains in accordance with the requirements of the Floodplain Management Manual.

**Floodplain Risk Management Study** means a study prepared for one or more floodplains in accordance with the requirements of the Floodplain Management Manual.

**Habitable floor area** refers to a room in a dwelling (other than a bathroom, laundry, W.C. or the like) that is constructed or adapted for domestic living such as a lounge room, dining room, rumpus room, kitchen or bedroom, or the floor space occupied by non-residential land uses for their general activities.

**High Flood Risk Area** means land indicated as “High Risk Flood Area” on a map marked “Flood Prone land” deposited in the office of Council being those parts of potentially flooded areas where the depth and velocity of floodwaters and evacuation difficulties would pose an unacceptable risk to types of development and activity.

**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)** means the flood calculated to be the maximum likely to occur.

**Reliable access** during a flood means the ability for people to safely evacuate an area subject to imminent flooding within effective warning time and without a need to travel through areas where water depths increase.

**Remote Rural Site** means a site zoned rural and used for agricultural purposes and does not adjoin existing urban land.

**Flood Action Plan** is a site-specific plan prepared in consultation with the State Emergency Services (SES) and approved by Council which demonstrates the means of ensuring the orderly evacuation of a business or tourist facility during floods. It should also demonstrate the means to minimise the likelihood of flood damage, including demonstrated ability to move goods above flood level within the likely available flood warning time and a requirement for flood drills for larger commercial/industrial premises.

**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.

**Water related activities** are those that rely on close proximity to a waterway, for eg. boatsheds, wharves, marinas, bathing pools, fisherman’s cooperatives, etc.

# 2.0 WHAT ARE THE CRITERIA FOR DETERMINING APPLICATIONS?

## 2.1 General

The criteria for determining applications for proposals 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 simply involves:

- identifying the land use category of the development (Schedule 2),
- determining the part of the floodplain the land is located within (Clause 2.3); and
- applying the controls outlined at Clause 2.4.
Clause 2.5 provides specific requirements for fencing in the floodplain.

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 of the performance criteria are clearly satisfied.

### 2.2 Land Use Categories

Nine 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 2**.

### 2.3 Flood Risk Areas

Each of the floodplains within the local government area have been divided based on different levels of potential flood hazard. The relevant Flood Risk Areas for each of the floodplains are outlined below.

**Camden Haven Floodplain**

- **High Flood Risk**
  
  Land below the 100 year ARI flood that is either subject to a high hydraulic hazard (i.e. provisional high hazard in accordance with the criteria outlined in the Floodplain Management Manual) or where there are significant evacuation difficulties.

- **Medium Flood Risk**
  
  Land below the 100 year ARI flood level that is not subject to high hydraulic hazard and where there are no significant evacuation difficulties.

- **Low Flood Risk**
  
  All other land within the floodplain (i.e. within the PMF extent) but not identified as either in a high flood risk or medium flood risk area.

**All Other Floodplains**

[to be inserted by Council – dependent on outcome of other Floodplain Risk Management Studies and Plans]

### 2.4 Which Controls Apply to Proposed Developments?

The development controls apply to all known potentially flooded areas (that is up to the largest estimated flood including the PMF when known). 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. The categories applicable to each floodplain are depicted on the planning matrices contained in the following schedules.

- **Schedule 3** – Camden Haven floodplain
- **Schedule 4** – Other floodplains
  
  (to be inserted by Council)

#### 2.4.1 Objectives

(a) 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.

(b) To require developments of high sensitivity to flood risk (e.g. critical public utilities) be sited and designed such that
they are subject to no or minimal risk from flooding.

(c) Allowing development with a lower sensitivity to the flood hazard within the floodplain, subject to appropriate design and siting controls, provided that potential consequences that could still arise from flooding remain acceptable having regard to the aims, objectives and planning controls contained in this Plan.

(d) To prevent any intensification of the use of High Flood Risk Areas, and wherever possible allow for their conversion to natural waterway corridors.

(e) 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.

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 the evacuation of an area potentially affected by floods, where likely to be required.

(d) Development should not detrimentally increase the potential flood affection on other development or properties.

(e) 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.

2.4.3 Prescriptive Controls

(i) Camden Haven Floodplain

The controls relevant to the Camden Haven Floodplain are attached at Schedule 3. This schedule defines a series of flood planning levels from FPL1 to FPL6 particular to this floodplain.

(ii) All Other Floodplains

The controls relevant to the other floodplains will be attached as additional schedules, once Floodplain Risk Management Studies and Plans are developed for these areas.

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.
2.5.3 Prescriptive Controls

2.5.3.1 Fencing within the High Flood Risk area will not be permissible except for security/permeable/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 above 0.6m high, in the Medium Flood Risk Area 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 may include:

(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 sitting criteria as prescribed by Council.

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

2.6 Special Considerations

2.6.1 Council will take into consideration the following specific matters:

(a) Development pursued to mitigate the potential impact of flooding (eg. house raising) is undertaken in a manner which minimises the impact upon the amenity and character of the locality.

(b) The proposal will not constrain the orderly and efficient utilisation of the waterways for multiple purposes.

(c) The proposal does not adversely impact upon the recreational or utilitarian use of the waterway corridors, and where possible, provides for their enhancement.

(d) 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 adverse impacts upon the amenity and character of an area.

(e) The cumulative impacts of the development, and other similar developments that could reasonably be expected, on flood behaviour.

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

3.1 Applications must include information which addresses all relevant controls listed above, and the following matters as applicable.

3.2 Applications for minor additions (see Schedule 2) 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 for Flood Prone Land 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 (e.g., it contains sufficient local detail), or otherwise a Rational Method flood estimation, or similar method, will be required.
### SCHEDULE 1
**FLOOD COMPATIBLE MATERIALS**

<table>
<thead>
<tr>
<th>BUILDING COMPONENT</th>
<th>FLOOD COMPATIBLE MATERIAL</th>
<th>BUILDING COMPONENT</th>
<th>FLOOD COMPATIBLE MATERIAL</th>
</tr>
</thead>
</table>
| **Flooring and Sub-floor Structure** | • concrete slab-on-ground monolith construction  
• suspension reinforced concrete slab. | **Doors** | • solid panel with waterproof adhesives  
• flush door with marine ply filled with closed cell foam  
• painted metal construction  
• aluminium or galvanised steel frame |
| **Floor Covering** | • 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 | **Wall and Ceiling Linings** | • 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 |
| **Wall Structure** | • solid brickwork, blockwork, reinforced, concrete or mass concrete | **Insulation** | • foam (closed cell types)  
• aluminium frame with stainless steel rollers or similar corrosion and water resistant material. |
| **Roofing Structure** (for Situations Where the Relevant Flood Level is Above the Ceiling) | • reinforced concrete construction  
• galvanised metal construction | **Windows** | • brass, nylon or stainless steel  
• removable pin hinges  
• hot dipped galvanised steer wire nails or similar |
| **Nails, Bolts, Hinges and Fittings** | | | |
### SCHEDULE 1

#### FLOOD COMPATIBLE MATERIALS (cont)

<table>
<thead>
<tr>
<th>Electrical and Mechanical Equipment</th>
<th>Heating and Air Conditioning Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>For dwellings constructed on land to which this Policy applies, the electrical and mechanical materials, equipment and installation should conform to the following requirements.</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Main power supply -</th>
<th>Fuel -</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wiring -</th>
<th>Installation -</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Equipment -</th>
<th>Ducting -</th>
</tr>
</thead>
<tbody>
<tr>
<td>All equipment installed below or partially below the relevant flood level should be capable of disconnection by a single plug and socket assembly.</td>
<td>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.</td>
</tr>
</tbody>
</table>

| Reconnection - | |
|----------------||
| 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. | |
## SCHEDULE 2
### LAND USE CATEGORIES

<table>
<thead>
<tr>
<th>Essential Community Facilities</th>
<th>Critical Utilities</th>
<th>Subdivision and Filling</th>
<th>Residential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place of assembly; community facility which may provide an important contribution to the notification and evacuation of the community during flood events; Hospitals; Nursing Homes; Fire, Ambulance and Police Stations; SES Operational Centres; institutions; and Educational establishments.</td>
<td>Telecommunication facilities; Generating works; Liquid fuel depot or Utility installations which may cause pollution of waterways during flooding, are essential to evacuation during periods of flood or if affected during flood events would unreasonably affect the ability of the community to return to normal activities after flood events.</td>
<td>Subdivision of land which involves the creation of new allotments.</td>
<td>Bed &amp; Breakfast establishments; Boarding houses; Caravan Park site; Cluster housing; Dual occupancy housing; Dwelling; Exhibition homes; Home business; Housing for aged or disabled persons; Group homes; Residential flats; Rural workers dwelling; Single dwelling Utility installations (other than critical utilities)</td>
</tr>
</tbody>
</table>
**SCHEDULE 2**
**LAND USE CATEGORIES (cont)**

<table>
<thead>
<tr>
<th>Commercial or Industrial</th>
<th>Tourist Related Development</th>
<th>Recreation or Agriculture</th>
<th>Existing Vacant Lots</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airline terminal; Animal establishments; Brothels; Bus depot; Bus station; Car repair station; Child care centre; Club; Commercial premises; Community facilities; Depots; General store; Heliports; Hotel; Industry; Junk yards; Light industry; Medical centre; Motor showroom; Offensive or hazardous industry; Offensive or hazardous storage establishment; Place of assembly; Place of worship; Refreshment room; Recreation facility; Retailing of bulky goods; Roadside stalls; Road transport terminal; Roadside stall; Rural industries; Saw mill; Service station; Shop; Veterinary hospitals; Waste management facility; Warehouse</td>
<td>Caravan park - short term sites Rural tourist facilities; Tourist facility</td>
<td>Agriculture; Extractive industry; Forestry; Heliport; Marinas and water related activities; Mine; Mineral sand mine; Oyster farming; Race track; Recreation areas and minor ancillary structures (eg. toilet blocks or kiosks); Retail plant nursery; Sanctuary; and Stock and sale yard</td>
<td>Vacant lots that were in existence at the time of commencement of this Plan, and would have had the potential for the construction of a dwelling at that time, but remains vacant.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Minor Development</th>
</tr>
</thead>
</table>

In the case of residential development:

(i) An addition or alteration to an existing dwelling of not more than 20% or 70m² (whichever is the lesser) of the habitable floor area which existed at the date of commencement of this Plan;

(ii) The construction of an outbuilding with a maximum floor area of 20m²; or

(iii) Redevelopment for the purposes of substantially reducing the extent of flood affectation to the existing building.
### SCHEDULE 3 - CAMDEN HAVEN PLANNING MATRIX

#### Planning & Development Controls

**FLOOD RISK AREA**

<table>
<thead>
<tr>
<th>DEVELOPMENT CONTROL CONSIDERATION</th>
<th>LOW FLOOD RISK</th>
<th>MEDIUM FLOOD RISK</th>
<th>HIGH FLOOD RISK</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESSENTIAL COMM FACILITIES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRITICAL UTILITIES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUBDIVISION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESIDENTIAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMMERCIAL OR IND.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOURIST RELATED DEVELOPMENT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RECREATION OR AGRICULTURE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXISTING VACANT LOTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MINOR DEVELOPMENT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESSENTIAL COMM FACILITIES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRITICAL UTILITIES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUBDIVISION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESIDENTIAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMMERCIAL OR IND.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOURIST RELATED DEVELOPMENT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RECREATION OR AGRICULTURE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXISTING VACANT LOTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MINOR DEVELOPMENT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLOOR LEVEL</td>
<td>3 2 2 or 5 2 1 2 4</td>
<td>2 2 or 5 2 1 2 4</td>
<td>2 1 2 4</td>
</tr>
<tr>
<td>BUILDING COMPONENTS</td>
<td>2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</td>
<td>1 1 1</td>
<td>1 1</td>
</tr>
<tr>
<td>STRUCTURAL SOUNDNESS</td>
<td>3 1,2 1,2 1,2 1,2 1,2</td>
<td>1 1,2 1,2</td>
<td>1 1,2</td>
</tr>
<tr>
<td>FLOOD EFFECT ON OTHERS</td>
<td>2 2 2 2 2 2 1,3 2,3 2,3 2,3 2,3 2,3 2,3 2,3 2,3</td>
<td>1,3 1,3 1,3</td>
<td>1,3 1,3 1,3</td>
</tr>
<tr>
<td>EVACUATION/ACCESS</td>
<td>2 3 3 3 3 3 1,3 3 3 3 3 1,3 3 3 3 3</td>
<td>1,3 1,3 1,3</td>
<td>1,3 1,3 1,3</td>
</tr>
<tr>
<td>FLOOD AWARENESS</td>
<td>3 1,3 3 3 3 3 3 3 3 3 3 2 2 2 2 2 2</td>
<td>2 2 2</td>
<td>2 2 2</td>
</tr>
<tr>
<td>MANAGEMENT &amp; DESIGN</td>
<td>1 4 2,3 1,2 3 2,3 2,3 1,3 4 2,3 1,2 3 2,3 1,3 1,2 3 2,3</td>
<td>1,2 1,2 1,2</td>
<td>1,2 1,2 1,2</td>
</tr>
</tbody>
</table>

**NOTES**

- **NOT RELEVANT**
- **UNSUITEFal LAND USE**

**Flood Planning Level categories**

- FPL1 based upon 20 year flood level
- FPL2 based upon 20 year flood level plus 0.8m freeboard east of Pacific Highway, or plus 0.5m freeboard west of the Highway
- FPL3 based upon 100 year flood level
- FPL4 based upon 100 year flood level plus 0.8m freeboard east of Pacific Highway, or plus 0.5m freeboard west of the Highway
- FPL5 not used
- FPL6 based upon an approximation of the Probable Maximum Flood as defined in the Glossary

**FLOOR LEVEL**

1. All floor levels to be equal or greater than FPL2 unless justified by a site specific assessment.
2. Habitable floor levels to be equal to or greater than FPL4 and other floor levels (incl. Covered/uncovered car spaces) to be equal to or greater than FPL1.
3. All floor levels to be equal to or greater than FPL6.
4. Floor levels to be as close to FPL4 as practical & no lower than the existing floor level when rebuilding or adding to an existing building.
5. Floor levels of shops to be as close to FPL4 as practical, with more than 30% of the floor area or equivalent storage space to be above this level, or floodproof the building to this level using shutters.

**FLOOD COMPATIBLE MATERIALS**

1. All structures to be constructed of flood compatible materials below FPL4.
2. All structures to be constructed of flood compatible materials below FPL6.

**STRUCTURAL SOUNDNESS**

1. Engineers report to certify any structure subject to a flood up to FPL3 can withstand the force of floodwater, debris & buoyancy.
2. Applicant demonstrates that any structure subject to a flood up to FPL3 can withstand the force of floodwater, debris & buoyancy.
3. Applicant demonstrates that any structure subject to a flood up to FPL6 can withstand the force of floodwater, debris & buoyancy.
4. Floodproofing of the structure in remote rural sites by provision of an earth mound up to FPL3.

**FLOOD EFFECT ON OTHERS**

1. Engineers report required to certify that the development of an existing allotment will not increase flood affectation elsewhere for all floods up to FPL6.
2. The impact of the development on flooding elsewhere for all floods up to FPL6 to be assessed.
3. Filling or raising of site levels will be restricted to the requirements of the Health Commission under the provisions of Section 55 of the Public Health Act. Any filling above this level shall only be permitted with the concurrence of Council. Such filling will be restricted to the building footprint plus a maximum 3m wide perimeter around the footprint.

**EVACUATION/ACCESS**

1. Reliable access for pedestrians required above FPL3 or the floor level of the building where a lower level is approved.
2. Reliable access for pedestrians & vehicles required at or above FPL6.
3. Council approved flood evacuation strategy & pedestrian/vehicular access route for both before and during a flood.

**FLOOD AWARENESS**

1. Restrictions to be placed on Title advising of minimum floor levels required relative to the flood level.
2. S149(2) Certificates to notify affectation by flooding & Council’s Policy, DCP AND LEP flood related provisions.
3. S149(2) Certificates to notify affectation by rare flooding events & Council’s Policy, DCP AND LEP flood related provisions.

**MANAGEMENT & DESIGN**

1. Flood action plans required where floor levels are below FPL3.
2. Applicant to demonstrate that there is an area where goods may be stored above FPL4 during floods.
3. No external storage of materials below FPL4 which may be potentially hazardous during floods.
4. Applicant to demonstrate that the ultimate development of the subdivision, as a consequence of the subdivision proposal, can be undertaken in accordance with this policy.