The topography of the lower Georges River is unique in that the floodplain downstream of East Hills is confined to a narrow gorge, which acts as a restriction during very large floods. Consequently, it has been determined that there is an unusually wide range in flood levels between the 100 year flood and more extreme events through much of the catchment. The difference between the 100 year flood and the probable maximum flood (PMF) is about 4m in the vicinity of Lower Prospect Creek, which will dominate flood behaviour along Prospect Creek at least up to the Granville Railway line.

This wide range in flood levels has a number of implications for Prospect Creek. Whilst the emphasis to date has largely been directed at flood mitigation works to alleviate flooding in the 100 year flood, it must be recognised that this is only a small portion of the potential flood problem. For instance, 407 residential dwellings have been estimated to be inundated above floor level in the 100 year flood, but this number increases to over 3,300 in the PMF event (**Table 4.1**), and the total damage bill increases from $52M to $590M (**Table 5.1**).

It is also important to note that many homes are being raised to a minimum level that is 0.5m above the 100 year flood under the Prospect Creek house raising scheme. Many of the participating residents may falsely believe that the risk of flooding has now been removed from their home, when in reality an extreme flood could still exceed the roof of their raised home. The point is illustrated in **Figure 7.5**, which shows the range in potential flood levels for a typical house in Knight Street that has been raised under the house raising scheme. Whilst the risk (to above floor inundation) has been alleviated for floods up to the 100 year event, the risk of flooding in more extreme floods still exists. Furthermore, it can be argued that the risk to personal safety has significantly increased in extreme floods due to a reluctance of home owners to evacuate their premises whilst floodwater is well below their raised floor levels (which would be required to avoid evacuation routes being cut by floodwater). Residents that fail to evacuate will become trapped in their homes, and in the event of an extreme flood, subject to significant personal danger. Early evacuation of dwellings, both low-set and raised, is required prior to evacuation routes being cut by floodwater.

Figure 7.5
Typical raised house in Knight Street, showing relative flood heights

It is improbable that structural flood mitigation works can alleviate flooding in extreme flood events. Nor is it possible to acquire or raise all homes that could potentially flood. It is therefore imperative that sound emergency management procedures are in place to appropriately respond to the risk of extreme floods. This should include:

i) maximising the use of the available flood warning scheme available for the Georges River, and expanding this into Lower Prospect Creek where feasible;

ii) development of appropriate flood intelligence, flood evacuation plans and resources to evacuate those residents most at risk; and

iii) maintaining community awareness of the risk of flooding that could potentially occur in all floods (including the PMF), so that residents know how to most appropriately respond in large floods.

The State Emergency Service (SES) has formal responsibility for emergency management operations in response to flooding. Other organisations normally provide assistance, including the Bureau of Meteorology, council, police, fire brigade, ambulance and community groups. Emergency management operations are outlined in the Fairfield Local Flood Plan. This Plan should be reviewed to include additional flood data that has been prepared as part of this study, including revised flood level data and the database of flood affected properties.

A thorough review of the Local Flood Plan is recommended, particularly in relation to existing evacuation capabilities. Whilst this is normally the responsibility of the SES, assistance could be offered through Council's Five Creeks' Committee. A nominal allowance of say $30,000 could also be provided under the Prospect Creek Floodplain Management Plan to assist with this review.

7.8 CLIMATE CHANGE CONSIDERATIONS

There is increasing evidence that the earth's atmospheric and ocean temperatures have increased over the last century, and that the accumulation of greenhouse gases in the earth's environment will accelerate this process in future years. Current estimates indicate that the annual average temperature for Australia could increase by about 1.0°C by 2030 (relative to 1990) and by between 1.8°C to 3.4°C by 2070 (Climate Change in Australia, CSIRO, 2007).

Future climate change can potentially affect flood behaviour through:

i) increased sea levels; and

ii) increased severity of flood producing storms or other weather systems.

A global increase in mean sea level of between 0.18 and 0.79m has been predicted by 2100 (IPCC, 2007). The impact of climate change on rainfall is less certain. Evidence to date suggests that whilst mean annual rainfall over Australia is likely to reduce, the intensity of extreme daily rainfall could increase.

An increase in sea level is unlikely to have a significant impact on flood behaviour within the Prospect Creek catchment. Previous studies have shown that flood levels on the Georges River upstream of East Hills are relatively insensitive to varying ocean levels during major flood events (PWD, 1991). The impact of increased rainfall intensities, however, could have a more significant impact on flood behaviour, both within the Georges River and Prospect Creek.

The Lower Prospect Creek Floodplain Management Study (Willing & Partners 1990) noted the potential for an increase in the normal water level in the tidal reaches of the Georges River and Prospect Creek, and the possibility of increased storm rainfall intensities as a result of future climate change. It was considered that these uncertainties could appropriately be incorporated within a 0.5m freeboard allowance to be added to design flood levels for all structural or house raising proposals.

Further consideration of the potential impact of climate change on flood behaviour throughout Prospect Creek, and the floodplain management plan itself, is beyond the scope of this review. Nevertheless, additional sensitivity tests are recommended to verify the adequacy of the 0.5m freeboard to cater for the potential impacts of climate change in addition to other modelling uncertainties that freeboard would normally cater for.

Climate change investigations are recommended to assess the impact of elevated ocean levels and increased rainfall intensities on flood levels in the Georges River and Prospect Creek. Once the potential range in flood levels has been determined, the impact for Council's floodplain management plan should be reviewed. In particular, this would include:

i) the adequacy of the existing 0.5m freeboard allowance to continue to cater for potential climate change impacts;

ii) whether higher flood planning levels (or additional freeboard allowance) should be included for all new building approvals and/or flood mitigation works;

iii) whether houses previously identified for house raising, but subsequently shown to be at or slightly above the 100 year flood, should continue to remain in the house raising scheme; and

iv) whether minimum height requirements for houses to be raised should be increased.

The cost of the climate change investigations and review is estimated at $50,000.

7.9 POTENTIAL DEVELOPMENT WITHIN THE CATCHMENT

The Prospect Creek catchment is heavily urbanised, with industrial development in the upper catchment area, the Fairfield commercial centre in the mid catchment area, and residential development through the mid to lower catchment. There is limited scope within the catchment for any major future development, with a few exceptions noted below. The majority of new development is anticipated to comprise redevelopment of existing premises and occasional infill development of a relatively minor number of vacant lots. Development of this nature will be required to be consistent with flood risk management development controls that have been formulated for Council's floodprone areas, which will ensure that any new development is compatible with the flood risk of the area that it is located. In this manner, redevelopment provides a positive opportunity to gradually reduce the extent of existing problems over time.

There are three wider scale potential development scenarios that have been identified within the Prospect Creek catchment, including:

i) development of the former Lansdowne caravan park, upstream of the Hume Highway (currently in progress);

ii) development of the Greystanes Estate, at the site of the Boral quarry in the upper catchment; and

iii) potential development of the Lansvale Peninsula.

A development application was lodged with Fairfield City Council for the redevelopment of Lansdowne Caravan Park during the course of this study. The site is adjacent to Prospect Creek, on the upstream side of the Hume Highway, and was largely affected by the 100 year flood. The proposal included the removal of all caravan park facilities, filling the site above the 100 year flood, and subdivision of the land to create approximately 64 home sites. A flood impact assessment prepared by the developer's consultants was reviewed on behalf of Council as part of a Land and Environment Court appeal pursued by the applicant. The original proposal was subsequently modified to address a number of issues including the provision of balanced cut and fill earthworks on site to minimise any potential impact on flood behaviour. The Court ultimately granted approval to a modified proposal and the site has since been filled and is currently being developed.

Potential development has also been identified in the Greystanes Estate area, near the top end of the Prospect Creek catchment, adjacent to Prospect Reservoir. Greystanes Estate includes 350 hectares of land owned by Boral and Sydney Water, which has been used for quarrying and associated activities over the last 100 years, but is now nearing the end of its economic life. The site was rezoned for urban development in 1999 through State Environmental Planning Policy No. 59 – Central Western Sydney Economic and Employment Area. An area of 134 hectares, known as the Southern Employment Lands, will drain to Prospect Creek and could potentially have an impact on flood behaviour. Previously, runoff from the site was either contained within the quarry, or flowed north to Greystanes Creek. The proposed stormwater management measures include diversion of surface runoff from the Southern Employment Lands to a detention basin prior to discharge to Prospect Creek.

A flood impact assessment was prepared for Boral Recycling Pty Ltd and Fairfield City Council to determine the impact of various stormwater discharge rates on flood behaviour in Prospect Creek (Bewsher Consulting, Dec 2006). The assessment determined that a discharge limit of $0.2m^3/s$ would be required to ensure that no part of the Prospect Creek floodplain would experience an increase in flood levels of more than 10mm for the 20 year, 50 year and 100 year floods. It is understood that the Greystanes detention basin will be sized to this criteria.

Potential redevelopment strategies for the Lansvale Peninsula were also reviewed as part of a separate discussion paper commissioned by Council (Don Fox Planning, draft, 2008). This investigation looked at two areas:

i) a western precinct, including the existing and residential areas of Lansvale, between Prospect Creek and Cabramatta Creek; and

ii) an eastern precinct, including the largely open space and recreational areas east of Willow Close, between Prospect Creek and Chipping Norton Lakes.

The discussion paper found that redevelopment options for the western precinct are extremely limited due to the extent of existing development and fragmented ownership patterns. Some potential for larger scale redevelopment options exist in the eastern precinct, given the relatively few land owners and minimal existing development. This area was noted as having significant physical attributes, with extensive frontage to Chipping Norton Lakes, the Georges River and Prospect Creek. It is also centrally located to established areas of south-west Sydney with access to a number of major arterial roads. Notwithstanding these attributes, the area is significantly affected by flooding from both the Georges River and Prospect Creek, which has been a major constraint to development in the past. Redevelopment options for the western precinct could rely on major earthworks to provide a development footprint above the 100 year flood and the provision of a suitable evacuation route during floods. It was noted that any redevelopment proposals for the area would need to be examined as part of Council's overall planning strategy review, and would require further detailed assessments, particularly in relation to the impact on flooding, geotechnical assessments, and financial feasibility.

7.10 OTHER POTENTIAL FLOOD RISKS IN THE CATCHMENT

The study investigates the flood risk in the Prospect Creek catchment due to severe storms that may be experienced over the Prospect Creek catchment. It also considers the risk of flooding in the Georges River, which has a major influence on flood conditions in Lower Prospect Creek.

Another potential flood risk within the catchment, which is not included in the scope of these investigations, is from potential dam or detention basin failure. There are a number of flood mitigation detention basins that have been constructed within the Prospect Creek catchment, and there exists a possibility that one or more of these basins might fail during an extreme flood. The sudden release of water impounded in the basin may significantly increase the flood risk to people located downstream of these basins. Basins within the catchment are reviewed in **Section 7.3**, and a recommendation was made to verify the performance of these basins in floods more extreme than the 100 year event. An assessment of the impact of basin failure on downstream flooding during an extreme flood is also warranted, particularly for the four larger basins within the catchment (Hassall Street Basin, Rosford Street Basins, Smithfield Road Basin, and King Road Basin). There may also be merit it having these basins prescribed with the Dam Safety Committee.

The potential failure of Prospect Reservoir is also a major flood risk within the catchment that can not be overlooked. Prospect Reservoir sits at the very top end of the Prospect Creek catchment, and is used as a holding or redistribution reservoir for Sydney's water supply. The reservoir was constructed in 1888, with a storage capacity of 50,000 megalitres. The dam wall is up to 26m in height, and consists or an earth and clay core embankment. The Sydney Catchment Authority has responsibility for the dam, and it is also prescribed with the Dam Safety Committee. The Dam Safety Committee 2005/06 annual report notes that the embankment was stabilised in 1997 to account for increased earthquake loading. Further information on potential failure risks, and the impact on downstream residents, should be sought from the Sydney Catchment Authority.

7.11 REVIEW OF PLANNING ISSUES

7.11.1 Review of Planning Controls

Land use planning and development controls are key mechanisms by which Council can manage flood-affected areas within the Prospect Creek catchment. Such mechanisms will influence future development (and redevelopment) and therefore the benefits will accrue gradually over time. Without comprehensive floodplain planning, existing problems may be exacerbated and opportunities to reduce flood risks may be lost.

A comprehensive review of flood risk management policies was undertaken as part of the Georges River Floodplain Risk Management Study and Plan for Fairfield, Liverpool, Bankstown and Sutherland Councils (Bewsher Consulting and Don Fox Planning, 2004). Consistent planning and development controls were recommended for each of the four councils, to be applied through flood risk management Development Control Plans (DCPs). The proposed DCP controls were prepared in a generic form to allow application across the entire LGA of each Council area. A matrix of planning controls for use in the assessment of individual development applications was formulated specifically for the Georges River floodplain, and an interim matrix prepared for other floodplains within the LGA pending the completion of flood risk management studies in these other areas. The current study provides an opportunity to review those planning controls that have been recommended for other floodplains throughout Fairfield City, and to prepare a new matrix of planning controls that is specific to Prospect Creek.

The matrices provide a graded set of planning controls tailored to the proposed land use and flood level, and which recognise flood risks up to and including the probable maximum flood. Three different categories of flood risk were adopted – namely the *High*, *Medium* and *Low* flood risk precincts. These same flood risk precincts were defined for Prospect Creek, as detailed in **Section 4.2**.

Fairfield City Council formally adopted the flood risk management DCP provisions recommended from the Georges River Study, and incorporated these into the Fairfield City Wide DCP (2006).

The interim matrix of controls for 'Other floodplains' is generally considered to be applicable to the Prospect Creek floodplain, with a couple of minor changes:

i) Vertical evacuation within a dwelling or building is not considered to be appropriate evacuation strategy for that part of the floodplain below the Granville Railway Line. This part of the floodplain is largely influenced by flood behaviour within the Georges River, where flood levels in the PMF event can be as much as 4m higher than the 100 year flood. The practicality of providing a refuge area within the building that is above the PMF is therefore limited. The duration of flooding is also significantly longer in a Georges River type flood, which can typically extend 24 hours or longer, and it is not desirable for people to be isolated within their homes for this period of time (without power, water or sanitary services). Early evacuation is the preferred management strategy for all homes and businesses in this area;

ii) A sizeable voluntary house raising program has been established in the Prospect Creek catchment. Raising or redevelopment of homes at a higher level has been identified as an appropriate strategy for these dwellings, despite some areas being identified in the *high flood risk* precinct. Development controls applicable for raising or redevelopment of these dwellings should be based on the controls applicable to the 'concessional development'.

A new matrix has been prepared for the Prospect Creek floodplain accounting for the differences noted above. The new matrix would be included in Council's DCP provisions as a new schedule (Schedule 6). The schedule for *Other Floodplains* should then be promoted to Schedule 7.

The proposed matrix for Prospect Creek is included in **Figure 7.6**.

The Georges River Floodplain Management Study and Plan also recommended an amendment to the LEP provision of the four Councils to incorporate consistent definitions and a clause requiring general consideration of flood related issues. Fairfield City Council is currently in the process of preparing a new LEP in accordance with the Standard Instrument (Local Environmental Plans) Order 2006. An updated set of definitions and clause that Council can consider for inclusion in the new LEP is provided at **Appendix E**.

7.11.2 Flood Planning Guidelines

On 31st January, 2007 the NSW Planning Minister announced a new guideline for development controls on floodplains (the "2007 Flood Planning Guideline"). This guideline was issued subsequent to Fairfield City Council's adoption of their flood risk management DCP provisions, but requires some consideration when reviewing the Prospect Creek Floodplain Management Plan.

An overview of the new guideline and associated changes to the Environmental Planning and Assessment Act and Regulation was issued by the Department of Planning in a Circular dated 31st January, 2007 (Reference PS 07-003). The new guideline issued by the Minister in effect relate to a package of directions and changes to the EPA Act, Regulation and Floodplain Development Manual, the implications of which are summarised as follows:

a) *Guideline on Development Controls in Low Flood Risk Areas – Floodplain Development Manual*

A discreet Guideline has been issued to provide additional guidance on matters dealt with in the Floodplain Development Manual. This Guideline effectively provides an amendment to the Manual. The Guideline confirms that unless there are "exceptional circumstances", Council's are to adopt the 100 year flood as the flood planning level (FPL) for residential development, with the exception of some sensitive forms of residential development such as seniors living housing. The Guideline does provide that controls on residential development above the 100 year flood may be imposed subject to an "exceptional circumstances" justification being agreed to by the Department of Natural Resources (now Department of Environment, Climate Change and Water) and the Department of Planning prior to the exhibition of a Draft LEP or Draft DCP.

The Guideline provides conflicting statements in regard to what is the residential flood planning level for the purpose of applying the directions in the Guideline. Despite noting the flood planning level for typical residential development would generally be based around the 100 year flood plus a freeboard of typically 0.5m, the Guideline "confirms" that "unless there are exceptional circumstances, Councils should adopt the 100 year flood as the flood planning level for residential development." Senior officers of the Department of Planning have subsequently advised that the flood planning level is inclusive of freeboard, and this has been included in a draft Q&A document issued to the Floodplain Management Authorities of NSW in a letter dated 28th March 2008 from the Department of Planning.

b) *Amendment to Regulation on Section 149 Certificates*

Schedule 4 of the Environmental Planning and Assessment Regulation was amended, commencing on 16th February, 2007, to specify flood related information that can be shown on Section 149(2) Certificates. The amendment will require Councils to distinguish between the situation where there are flood related development controls on nominated types of "residential development" and all other development. More sensitive land uses such as group homes or seniors living is excluded from the limitation of notations for residential development.

Clause 7(A)(1) of the Regulation means that Council should not include a notation for residential development on Section 149(2) Certificates in "low risk areas" if no flood related development controls apply to the land. Under Clause 7(A)(2) Council can include a notation for critical infrastructure or more flood sensitive development on Section 149(2) Certificates in low flood risk areas if flood related development controls apply. Low flood risk areas are undefined, but in the context of the Circular it is assumed to be a reference to that part of the floodplain between the 100 year flood (plus freeboard) and the PMF extents. This would be a different definition to the 'Low Flood Risk' precinct contained in Council's DCP provisions, which were adopted prior to the 2007 Flood Planning Guideline.

c) *Section 117 Ministerial Direction No. 4.3 – Flood Prone Land*

Section 117 Direction No. 15 – Flood Prone Land was revised on 31st January, 2007 and is now known as Section 117 Direction No. 4.3. The principal implication of the revision of the Direction was to introduce provisions to limit the imposition of LEP controls on residential development within that part of the floodplain above the 100 year flood level. This limitation is specifically set out in Clauses (4) and (5) of the Direction as follows:

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

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

Clause (6) of the Direction specifies circumstances which must be satisfied in order for the Director-General or nominee to allow for a variation to the Direction, as follows:

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

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

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

The flood risk maps and proposed matrix of development controls prepared for Prospect Creek are compatible with the Fairfield City Wide DCP (2006) provisions, but potentially in conflict with the 2007 Flood Planning Guideline. The DCP provisions allow for controls on residential land within the "low flood risk" precinct, although the main intent of these controls is to include minimum floor level and other controls that would apply up to the 100 year flood level plus freeboard. The main discrepancy lies in the different definitions of the "low flood risk"' precinct in the Fairfield DCP (defined as the 100 year flood) and the definition of "low risk area" in the 2007 Flood Planning Guideline (which we presume is defined as the 100 year flood plus freeboard).

As the Fairfield DCP was adopted prior to the 2007 Flood Planning Guideline it is effectively exempt from its provisions. However there is some uncertainty as to whether amendment to the DCP which perpetuates any inconsistency with the Guideline would be considered to be allowable without receiving authorisation from the relevant Departments under the "exceptional circumstances" provisions. Therefore, for the purpose of caution, it is recommended that Council seeks the concurrence of the Department of Planning and the Department of Environment, Climate Change and Water to the continued application of the Fairfield City Wide DCP (2006) and the planning controls that are recommended as part of that DCP for Prospect Creek. The endorsement of the recommended DCP amendments by the Departments and the ultimate adoption would effectively allow for their notification on Section 149 Certificates, without uncertainty as to whether there is a contravention of the new Guideline.

The relevant grounds to justify "exceptional circumstances" in this case are summarised as follows:

i) The approach to flood risk management throughout the Fairfield City LGA was adopted during the Georges River Floodplain Risk Management Study and Plan, in cooperation with Liverpool City Council, Bankstown City Council and Sutherland Shire Council. Specific controls were adopted for the Georges River floodplain, with interim controls adopted for other floodplains pending the completion of Floodplain Risk Management Studies for these areas. The DCP provisions for Fairfield were adopted in 2006, prior to the 2007 Flood Planning Guideline.

ii) The Georges River Floodplain Risk Management Study and Plan was subject to considerable debate by the Georges River Floodplain Management Committee, which included representatives from the four Councils, the (then) Department of Infrastructure, Planning and Natural Resources, the State Emergency Service and various community representatives.

iii) Approximately 10,000 property owners (4,000 of whom were within the Fairfield City LGA) were mailed a community notification pack, advising of the study; the proposed flood risk mapping; and details of the proposed planning controls. Ten community workshops were also held, and were all relatively well received.

iv) Continued public consultation has occurred during the review of the Prospect Creek Floodplain Risk Management Plan, including the proposed development controls for Prospect Creek.

v) Those controls to be imposed upon residential development in that relatively small portion of the floodplain between the 100 year extent and PMF primarily relate to the setting of floor levels at the 100 year plus freeboard level, requiring flood compatible building components below that level, ensuring the structure is sound and impacts on other development in the floodplain are considered, and most importantly to address emergency evacuation issues.

vi) The exclusion of controls on residential development between the 100 year flood and PMF extents would principally have the effect of not requiring floor level and similar controls on residential development in the "shadow zone" (ie. in that part of the floodplain between the 100 year extent plus freeboard) which would apply in exactly the same manner to residential development within the 100 year flood extent. More critically, there would be an absence of consideration on an integrated and comprehensive basis of evacuation issues for all residential development across the floodplain.

vii) The alternative of defining the "Low Flood Risk" precinct as that area above the 100 year flood plus 0.5m freeboard would have the effect of increasing the number of properties that would be categorised as "Medium Flood Risk", and therefore subject to more stringent development controls, from approximately 2,000 properties to 3,467 properties.

FIGURE 7.6
Matrix of Prescriptive Controls for Prospect Creek

Templat V4.4

Flood Risk Precincts (FRP's)

Low Flood Risk

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

Medium Flood Risk

Planning Consideration	Critical Uses & Facilities	Sensitive Uses & Facilities	Subdivision	Residential	Commercial & Industrial	Tourist Related Development	Recreation & Non-Urban	Concessional Development
Floor Level				2,6,7	5,6,7	2,6,7	1,6	4,7
Building Components				1	1	1	1	1
Structural Soundness				2	2	2	2	2
Flood Effects			1	2	2	2	2	2
Car Parking & Driveway Access				1,3,5, 6,7	1,3,5, 6,7	1,3,5, 6,7	2,3,4, 6,7	6,7,8
Evacuation			5	2,3	1,3	2,3	4,3	2,3
Management & Design			1		2,3,5	2,3,5	2,3,5	2,3,5

High Flood Risk

Planning Consideration	Critical Uses & Facilities	Sensitive Uses & Facilities	Subdivision	Residential	Commercial & Industrial	Tourist Related Development	Recreation & Non-Urban	Concessional Development
Floor Level							1,6	4,7
Building Components							1	1
Structural Soundness							1	1
Flood Effects							1	1
Car Parking & Driveway Access							2,3,4, 6,7	6,7,8
Evacuation							4,3	2,3
Management & Design							2,3,5	2,3,5

COLOUR LEGEND: Not Relevant | Unsuitable Land Use

General Notes

1	*Freeboard* equals an additional height of 500mm.
2	The relevant environmental planning instruments (generally the Local Environmental Plan) identify development permissible with consent in various zones in the LGA. Notwithstanding, constraints specific to individual sites may preclude Council granting consent for certain forms of development on all or part of a site. This matrix identifies where flood risks are likely to determine where certain development types will be considered "unsuitable" due to flood related risks.
3	Filling of the site, where acceptable to Council, may change the FRP considered to determine the controls applied in the circumstances of individual applications.
4	Refer to Section 11.9 of the DCP for planning considerations for proposals involving only the erection of a fence. Any fencing that forms part of a proposed development is subject to the relevant flood effects and Structural Soundness planning considerations of the applicable landuse category.
5	Refer to Section 11.10 of the DCP for special considerations such as for house raising proposals and development of properties identified for voluntary acquisition.
6	Terms in italics are defined in the glossary of this plan and Schedule 2 specifies development types included in each land use category. These development types are generally as defined within Environmental Planning Instruments applying to the LGA.
7	From time to time, Council may adopt mapping showing the *Boundary of Significant Flow* and/or *Flood Storage Areas* for this floodplain. Refer to Council to find out if these areas have been defined and mapped for this floodplain.
8	Property identified for voluntary house raising that are located within the *High Flood Risk Precinct* shall be assessed in terms of concessional development.

Floor Level

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

Building Components & Method

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

Structural Soundness

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

Flood Effects

1	Engineer's report required to certify that the development will not increase flood effects elsewhere, having regard to: (i) loss of flood storage; (ii) changes in flood levels and velocities caused by alterations to the flood *conveyance*; and (iii) the cumulative impact of multiple potential developments in the floodplain.
2	The flood impact of the development to be considered to ensure that the development will not increase flood effects elsewhere, having regard to: (i) loss of flood storage; (ii) changes in flood levels and velocities caused by alterations to the flood *conveyance*; and (iii) the cumulative impact of multiple potential developments in the floodplain. An engineer's report may be required.

Note: (1) If a *Boundary of Significant Flow* has been defined for this floodplain, any development inside this area will normally be unacceptable as it will reduce flood *conveyance* and increase flood effects elsewhere. (2) If a *Flood Storage Area* has been defined for this floodplain, any filling of the floodplain inside this area (except where this occurs by compensatory excavation), will normally be unacceptable as it will reduce the volume of flood storage available on the floodplain and increase flood effects elsewhere. (3) Even where a *Boundary of Significant Flow* and/or a *Flood Storage Area* have been defined, development outside these areas may still increase flood effects elsewhere and therefore be unacceptable.

Car Parking and Driveway Access

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

Note: (1) A flood depth of 0.3m is sufficient to cause a small vehicle to float. (2) *Enclosed car parking* is defined in the glossary and typically refers to carparks in basements.

Evacuation

1	Reliable access for pedestrians or vehicles required during a 100 year flood.
2	Reliable access for pedestrians or vehicles is required from the building, commencing at a minimum level equal to the lowest *habitable floor* level to an area of refuge above the *PMF level.* In the case of property upstream of the Granville Railway Line, this refuge can be on site provided a minimum of 20% of the gross floor area of the dwelling is above the *PMF* level.
3	The development is to be consistent with any relevant *flood evacuation strategy* or similar plan.
4	The evacuation requirements of the development are to be considered. An engineers report will be required if circumstances are possible where the evacuation of persons might not be achieved within the *effective warning time*.
5	Applicant to demonstrate that evacuation in accordance with the requirements of this DCP is available for the potential development flowing from the subdivision proposal.

Management and Design

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

8 REVISED FLOODPLAIN MANAGEMENT PLAN

8.1 PROGRESS TO DATE

The magnitude of the flood problem on Prospect Creek is considerable, and was partly realised by major flooding that was experienced through the catchment in 1986 and 1988. Studies were commenced shortly after these floods, and a plan of flood mitigation measures prepared for both Lower Prospect Creek (Willing & Partners, 1990) and Upper Prospect Creek (Willing and Partners, 1993). The total cost of the scheme was estimated to be in excess of $34M (1990). This includes a mix of voluntary purchase, house raising, road raising, bridge works, creek improvements, and detention basin works.

Council has been steadfastly implementing the floodplain management plan over the last 15 years, with financial support provided through the State Government and Commonwealth Government (during the earlier years). The Plan is ambitious, yet considerable progress has been made to date.

Those properties that experience the greatest flood risk were included in a voluntary purchase scheme, providing an opportunity for home owners to sell their properties to Council. Once purchased, the dwelling is removed and the property converted to open space. A total of 96 properties have been included in the scheme at an estimated cost of $9.5M (1990). To date 76 of these properties have been purchased, with 20 remaining on the scheme. Many of the remaining property owners have declined to participate in the scheme at this stage.

Voluntary house raising is also a major component of the Plan. There are some 464 dwellings currently included in the scheme, of which 204 have been raised or otherwise treated. There are also 30 dwellings that may not need to be raised as a result of other flood mitigation works undertaken in the catchment and revised flood modelling during this study. Completion of the house raising scheme remains a considerable challenge for Council, as many of the remaining houses are difficult to raise or are in the lower priority group. If the remaining 230 dwellings were all to receive the maximum subsidy of $81,000 currently on offer, the total cost would amount to $18.6M. A reduced subsidy of say $20,000 has been proposed for the lower priority HR-1 houses, which would reduce the total estimated cost to $14.0M.

There are numerous detention basins that have been constructed within the catchment to reduce downstream flood conditions. Two of these basins on Upper Prospect Creek (at Hassall Street and Rosford Street) were modified under the Plan to improve their hydraulic performance. Other works constructed in Upper Prospect Creek include a high level floodway upstream of the Cumberland Highway and other selective stream clearing measures.

Various Flood Mitigation Works have also been constructed throughout the Lower Creek, including the Vine Street bridge amplification, Fairfield Park floodway, selective stream clearing and raising low sections on a number of roads. These measures have substantially reduced flood levels along various parts of the creek.

Further flood modelling has been undertaken using a more sophisticated 2-dimensional computer model. The model was calibrated to the January 2001 flood, and incorporates flood mitigation works implemented within the catchment since the previous investigations were undertaken. Updated information on flood behaviour is included in **Appendix A**.

8.2 THE RECOMMENDED MEASURES

The recommended measures for the revised Prospect Creek Floodplain Management Plan are based on the review of previous measures included in the original Plans for Upper Prospect Creek and Lower Prospect Creek (Section 6) and an assessment of other floodplain management considerations throughout the catchment (Section 7). The recommended measures, which are summarised below, are listed in **Table 8.1**, and also shown on **Figure 8.1**.

8.2.1 Voluntary House Raising Program

A total of 464 dwellings have been identified for voluntary house raising within the Prospect Creek catchment. To date, 204 of these have been raised or otherwise treated to reduce the flood risk. A further 30 properties may no longer be eligible as a result of reduced flood levels or recent rezoning. Subject to further climate change investigations, these properties could be removed from the house raising program.

The remaining 230 dwellings eligible for house raising can be categorised as follows:

HR-5 category: 52 dwellings (highest priority)

HR-2 category: 102 dwellings

HR-1 category: 76 dwellings (lowest priority).

The maximum subsidy for house raising is currently limited to $81,000 for HR-5 and HR-2 category dwellings. No limit has formally been adopted for the lower priority HR-1 category dwellings, although a reduced subsidy is considered to be appropriate given the reduced flood liability of these dwellings.

The present value of flood benefit from raising the remaining 230 dwellings is estimated at $6.6M. The total cost of continuing with a full cost subsidy of up to $81,000 per dwelling is a maximum of $18.6M (2009) and provides a benefit/cost ratio of 0.35. The benefit/cost ratio is relatively low, and is a result of increased house raising costs and higher subsidy offers to home owners than originally envisaged in the scheme. It highlights the need to review subsidy limits, especially for the lower priority category houses, to provide a more reasonable economic return.

On the basis of HR-1 category dwellings receiving a maximum subsidy of say $20,000, the total cost to complete the house raising program would be reduced to $14.0M (2009). This would provide an improved benefit/cost ratio of 0.47. Further improvement would require reduced subsidies to the HR-2 category houses, which may not be equitable given the number of houses in this category that have already been raised at the higher subsidy amounts.

There is limited scope to consider alternative flood mitigation measures to the continuation of the house raising scheme. Flood levels are dominated by flood conditions in the Georges River and can not be feasibly reduced. The option of providing protection through levee banks is also not viable due to high costs and potential impacts on other properties.

Given the considerable investment already undertaken on the house raising scheme, and the absence of any other viable solution, continuation of the scheme is recommended with a reduced subsidy limit for the lower priority HR-1 category houses. Further review of the scheme is recommended once climate change sensitivity investigations have been undertaken on Prospect Creek.

A list of eligible houses in the house raising program that are still to be raised is included in **Appendix D**.

8.2.2 Voluntary Purchase Scheme

A total of 96 properties were previously identified for voluntary purchase in the Prospect Creek catchment, of which 76 have been purchased to date.

There are 20 properties that have not yet been acquired, largely due to the reluctance of the owners of these properties to participate in the scheme. The situation may change over time, particularly if another major flood is experienced in the catchment. The total cost to complete the voluntary purchase scheme, based on an average acquisition cost of $350,000, is estimated at $7.0M (2009).

The present value of flood benefit from acquiring the remaining 20 properties in the voluntary purchase scheme and removing these from the floodplain is estimated at $1.5M. This provides a benefit/cost ratio of 0.21. The economic benefit is low, but does not recognise intangible losses and the risk to life of continuing to occupy hazardous parts of the floodplain.

Abandonment of the voluntary purchase scheme is not seen as a viable option. There remains a risk to life of continuing to occupy these homes. Many of the homes remaining in the scheme are now remote from other houses due to previous acquisitions, with a consequent increase in the risk that these remaining homes are exposed to.

Acquisition of the remaining 20 properties in the voluntary purchase scheme is recommended. There is an opportunity to further review the scheme following climate change sensitivity investigations on Prospect Creek, however it is considered unlikely that there would be any significant change to the current scheme.

A list of eligible houses in the voluntary purchase program that have not been acquired is included in **Appendix D**.

8.2.3 Road Raising

Several roads within the floodplain were proposed to be raised under the previous Plan to improve access during floods. Several roads have already been raised, including Vine Street and Hollywood Drive.

Road raising is considered to be an important supplement to the house raising scheme, where early evacuation of occupants from raised homes is clearly desirable given the range in flood heights in more extreme floods and the long duration of inundation that is possible. Road raising aims to remove low sections of roads to provide an access route that continually rises in the direction of evacuation. Roads identified for raising include:

i) Orchard Road (120m);

ii) Artie Street (60m);

iii) Waterside Crescent (330m);

iv) Cook Avenue (250m);

v) Knight Street (600m);

vi) Day Street (200m); and

vii) Willis Street (100m).

The total cost of road raising identified in the catchment is estimated at $2.6M (2009).

8.2.4 Stream Clearing Measures

The previous Plan included selective stream clearing of various reaches of the creek to improve its conveyance, by the removal of dense undergrowth, noxious weeds and other debris from the creek corridor. Areas not yet completed, or where further stream clearing measures to improve the capacity of the creek may be warranted, include:

i) Upstream of the Cumberland Highway;

ii) Downstream of Polding Street (north bank, in Holroyd City Council);

iii) Fairfield Street to Burns Creek;

iv) Orphan School Creek downstream of the Fairfield Railway line.

The cost of these measures will largely be dependent on adopted strategies and the availability of volunteer groups that may be able to offset labour costs. An indicative total cost of $1.2M (2009) has been provided.

8.2.5 Bank Stability Measures at Bell Crescent

The previous Plan listed bank stabilisation measures on the north bank of the creek adjacent to Bell Crescent (Holroyd Council), and noted that some existing structures may collapse and potentially block downstream structures within this area.

Subject to further stability assessments and a review of the condition of existing structures, an allowance of $600,000 (2009) has been provided for potential works.

8.2.6 Floodproofing of Home Units

A number of unit blocks in Sandal Crescent and Ruby Street, Carramar are affected by flooding, particularly basement parking areas and first floor units. Floodproofing was previously proposed, including raising entry points, installing flood gates and sealing other areas where floodwater may enter. A test case at 162 Sandal Crescent revealed some problems associated with maintaining awareness of those measures that require manual operation, and the on-going maintenance of these facilities. Nevertheless, there may be some maintenance free measures that can still be implemented that will reduce property damage, particularly modifications to basement car parking areas through raising entry points and sealing walls. A building inspection of unit blocks in Sandal Crescent and Ruby Street that are potentially affected by flooding is recommended to determine the most appropriate measures to be implemented on a case by case basis. Subject to these property inspections, an allowance of $1.6M (2009) has been provided for potential measures.

8.2.7 Vincent Crescent Urban Renewal

A levee was originally proposed to provide protection to property at Vincent Crescent, Togil Street and Bonham Street. The levee was contingent on dredging Lower Prospect Creek to compensate for the loss in flood storage and flood conveyance that would be caused by the levee. It was subsequently determined that dredging was unlikely to be feasible due to stability concerns along the banks of Prospect Creek. The weight of the proposed structure and increase in flood velocities within the creek could also compromise the stability of the existing banks, both at this location and further downstream. Another problem is the need to store local runoff behind the levee whilst the creek is in flood, which would require considerable excavation from Parkes Reserve to provide a temporary flood storage area and a pumping station to pump local stormwater to the creek. This introduces further maintenance and reliability concerns for both Council and the residents.

House raising has been proposed as an alternative option for this area in the past, although many of the homes in this area would be difficult to raise due to their construction type. It is also understood that the majority of property owners do not favour house raising.

Given the problems noted above, raising existing low lying dwellings through urban renewal is considered the most appropriate management strategy for the Vincent Crescent area. A partial subsidy offer to eligible home owners would act as an incentive to encourage redevelopment at a higher level. Further review of redevelopment options, and subsidies that may be provided to encourage this, is recommended.

A total of 60 homes may be eligible for the scheme, with a total cost (based on a subsidy of $20,000 per dwelling) estimated at $1.2M (2009). The present value of flood benefits is estimated at $1.14M, providing a benefit/cost ratio of 0.95 based on this subsidy.

8.2.8 Georges River Deflector Wall

A deflector wall along the bank of the Georges River near Ferry Street was proposed in an earlier report to delay the onset of flooding and provide additional time for flood evacuation.

Inclusion of the deflector wall in the Prospect Creek Floodplain Management Plan is recommended, at an estimated cost of $400,000 (2009).

8.2.9 Widemere Road Wetland/Channel Extension

Flooding problems are experienced at Widemere Road and the industrial area upstream of this road. An existing concrete channel, which drains the Wetherill Park Industrial area, terminates about 200m upstream of Widemere Road. Completion of the channel through to Widemere Road was deferred pending the consideration of alternative environmental measures, including the construction of a sediment basin and a series of inter-connected wetlands.

The cost of the proposed environmental measures is relatively high, and very much dependent on the type of material to be excavated from the proposed basin and wetlands, and where this material can be disposed. It will also be dependent of future management strategies for Widemere Road, which could be upgraded in the future. Further investigations are recommended, including soil sampling and a review of disposal options, prior to determining the extent of future works. A nominal allowance of $3M (2009) has been proposed in the Plan for future works, subject to findings from the review.

8.2.10 Cumberland Highway Waterway Amplification

Despite various measures previously undertaken upstream of the Cumberland Highway, significant flooding is still experienced between the Highway and Justin Street. Stream clearing measures have been proposed along the southern bank upstream of the highway. Further amplification of the waterway area under the Cumberland Highway bridge, and immediately upstream, is also proposed to complement the stream clearing measures.

Further hydraulic modelling will be required to establish the extent of these measures and the impact on flood behaviour. An amount of $80,000 (2009) is proposed for the model investigations, with a nominal $500,000 (2009) proposed for construction costs.

8.2.11 Basin Safety Review

A total of 18 detention basins have been constructed throughout the Prospect Creek catchment to reduce downstream flood problems. Most of these basins were designed and constructed at a time when the main focus was on the 100 year flood, with little attention to flood behaviour in more extreme floods.

A review of the safety of these basins to adequately pass floods more extreme than the 100 year flood is recommended, particularly for the four largest basins in the catchment (Hassall Street Basin, Rosford Street Basin, Smithfield Road Basin and King Road Basin). A review of the hydraulic performance of the King Road Basin has also been recommended. There would also be merit in including the four larger basins in the list of dams that are prescribed with the Dam Safety Committee.

Further information on potential failure risks associated with Prospect Reservoir, and the impact on downstream residents, should also be sought through the Sydney Catchment Authority.

The estimated cost of the basin safety review is $100,000 (2009).

8.2.12 Flood Warning Measures

A flood warning service is operated by the Bureau of Meteorology for the Georges River. Flood warnings are provided to the SES who has responsibility for evacuation and other emergency management response actions. A flood warning database was recently developed for the SES to link the flood level predictions with a database of potentially flood affected buildings. The database can be used during a flood to determine which properties within the floodplain are likely to be inundated by the predicted flood level.

The flood warning database currently includes property on Prospect Creek downstream of the Hume Highway. There is an opportunity to expand this database further upstream, to at least the Granville Railway Line, using data collected as part of this study. This area is largely influenced by flood conditions in the Georges River and flood predictions provided for the Georges River will also be relevant for much of this area. The estimated cost of this addition is $30,000 (2009).

Further enhancement of the Georges River flood warning scheme to provide specific predictions for Prospect Creek should also be pursued with the Bureau of Meteorology. This includes a review of existing catchment instrumentation, installation of some additional monitoring equipment, and the development of algorithms to represent flood behaviour throughout the catchment. The estimated cost of flood warning enhancements is $100,000 (2009).

8.2.13 Public Awareness

Fairfield Council has been proactive in raising community awareness of the flood risk, by writing to all residents potentially affected by flooding, providing flood information sheets and other advice on Section 149 certificates, and through other community programs implemented over the last 10 years or more. Continuation of these community awareness initiatives will ensure that the flood risk in the community is well understood. Much of these activities are part of Council's normal operating costs. A nominal amount of $20,000 (2009) is suggested to cover other community initiatives.

8.2.14 Review of Local Flood Plan

Emergency Management operations are an important component of the floodplain management plan. Residents will need to be evacuated prior to local roads being inundated. It is anticipated that many residents, particularly those with homes that have been raised as part of the house raising scheme, may be reluctant to evacuate their homes on the belief that their homes are no longer affected by flooding as a result of being raised. However, under more extreme floods, many of these raised homes are still at risk of inundation. Early evacuation of all residents is considered to be imperative.

The State Emergency Service has formal responsibility for emergency management operations in response to flooding. Emergency management operations are outlined in the Fairfield Local Flood Plan. This Plan should be reviewed to include additional flood data that has been prepared during this study, including revised flood level data and the database of flood affected properties.

A thorough review of the Local Flood Plan is recommended, particularly in relation to evacuation requirements. An allowance of $30,000 (2009) to assist the SES with this review is recommended.

8.2.15 Climate Change Investigations

Climate change investigations are recommended to assess the impact of elevated ocean levels and increased rainfall intensities on flood levels in the Georges River and Prospect Creek. Once the potential range in flood levels has been determined, the impact on the floodplain management plan may need to be reviewed, particularly in relation to flood planning levels, freeboard allowance, and the house raising scheme. The cost of climate change investigations is estimated at $50,000 (2009).

8.2.16 Development and Planning Controls

Land use planning and development controls are key mechanisms by which Council can manage flood-affected areas within the Prospect Creek catchment. This will ensure that new development is compatible with the flood risk, and allows for existing problems to be gradually reduced over time through sensible redevelopment.

A comprehensive review of flood risk management policies was undertaken in 2004 as part of the Georges River Floodplain Risk Management Study and Plan for Fairfield, Liverpool, Bankstown and Sutherland Councils. The adopted approach provides for consistent planning controls to manage the flood risk across the four local government areas. A graded set of planning controls were adopted based on the type of development and the flood risk at that site (classified as High, Medium or Low).

The current study defines the three different flood risk precincts across the Prospect Creek Floodplain. It also provides a matrix of development controls for Prospect Creek as a new schedule to Council's City Wide DCP (2006), that is consistent with the overall approach to floodplain management across the Fairfield Local Government Area, and which considers the specific nature of this catchment. The proposed matrix is provided at **Figure 7.6**.

On 31st January 2007 the NSW Planning Minister announced a new Guideline for development controls on floodplains, which provides certain restrictions on the type of controls that can be applied to residential property above the 100 year flood, and the notifications that can be included on Section 149 Certificates. The flood risk maps and proposed matrix of development controls prepared for Prospect Creek are compatible with the Fairfield City Wide DCP (2006) provisions, but potentially in conflict with the 2007 Flood

Planning Guideline. It is recommended that Council seeks the concurrence of the Department of Planning and the Department of Environment, Climate Change and Water (under the "exceptional circumstances clause" to the continued application of the Fairfield City Wide DCP (2006) and the planning controls that are recommended as part of that DCP for Prospect Creek. The relevant grounds for "exceptional circumstances" are noted in **Section 7.11.2**.

8.3 FUNDING AND IMPLEMENTATION

The total estimated cost to complete the revised Floodplain Management Plan is $32M (2009). This is largely dominated by the voluntary house raising scheme ($14.0M) and the voluntary purchase scheme ($7.0M). To date the house raising scheme is approximately 47% complete and the voluntary purchase scheme 79% complete.

There are a variety of sources of potential funding that could be considered to implement the Plan. These include:

i) Council funds;

ii) Section 94 contributions;

iii) State funding for flood risk management measures through the Department of Environment, Climate Change and Water;

iv) State Emergency Service, either through volunteered time or funding assistance for emergency management measures;

v) The Bureau of Meteorology for flood warning instrumentation and procedures.

Council can expect to receive the majority of financial assistance through the Department of Environment, Climate Change and Water. These funds are available to implement measures that contribute to reducing existing flood problems. Funding assistance is likely to be available on a 2:1 (State:Council) basis.

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.

8.4 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.

A thorough review every 5 to 10 years is warranted to ensure the ongoing relevance of the Plan.

TABLE 8.1
Recommended Floodplain Management Plan

Item	Description	Estimated Cost ($)	Funding Sources*	Priority
8.2.1	Voluntary House Raising Program HR-5 Category (52 dwellings) HR-2 Category (102 dwellings) HR-1 Category (76 dwellings)	 $4.2M $8.3M $1.5M	 1,3 1,3 1,3,6	 On-going On-going Low
8.2.1	Voluntary Purchase Scheme 20 Properties	 $7.0M	 1,3	 On-going
8.2.3	Road Raising	$2.6M	1,3	On-going
8.2.4	Stream Clearing Measures	$1.2M	1,3,6	Medium
8.2.5	Bank Stability Measures at Bell Crescent	$600,000	3,6	High
8.2.6	Floodproofing of Home Units (subject to property inspections)	$1.6M	1,3	Low
8.2.7	Vincent Crescent Urban Renewal (Partial subsidy to encourage redevelopment by owers)	$1.2M	1,3,6	Low
8.2.8	Georges River Deflector Wall	$400,000	1,3	Medium
8.2.9	Widemere Road Wetland/Channel Extension (subject to geotechnical investigations)	$3.0M	1,2,3	Medium
8.2.10	Cumberland Highway Waterway Amplification	$500,000	1,3,6	Medium
8.2.11	Basin Safety Review	$100,000	1,3	High
8.2.12	Flood Warning Measures	$130,000	1,3,5	High
8.2.13	Public Awareness	$20,000	1,3	On-going
8.2.14	Review of SES Local Flood Plan	$30,000	1,3,4	High
8.2.15	Climate Change Investigations	$50,000	1,3	High
8.2.16	Development and Planning Controls	On-going	1	On-going

TOTAL: $32.4M

* Potential funding sources are as follows:

1 Fairfield City Council
2 Section 94 Contributions
3 Department of Environment, Climate Change and Water
4 State Emergency Service
5 Bureau of Meteorology
6 Other (volunteer, home owner, Holroyd Council)

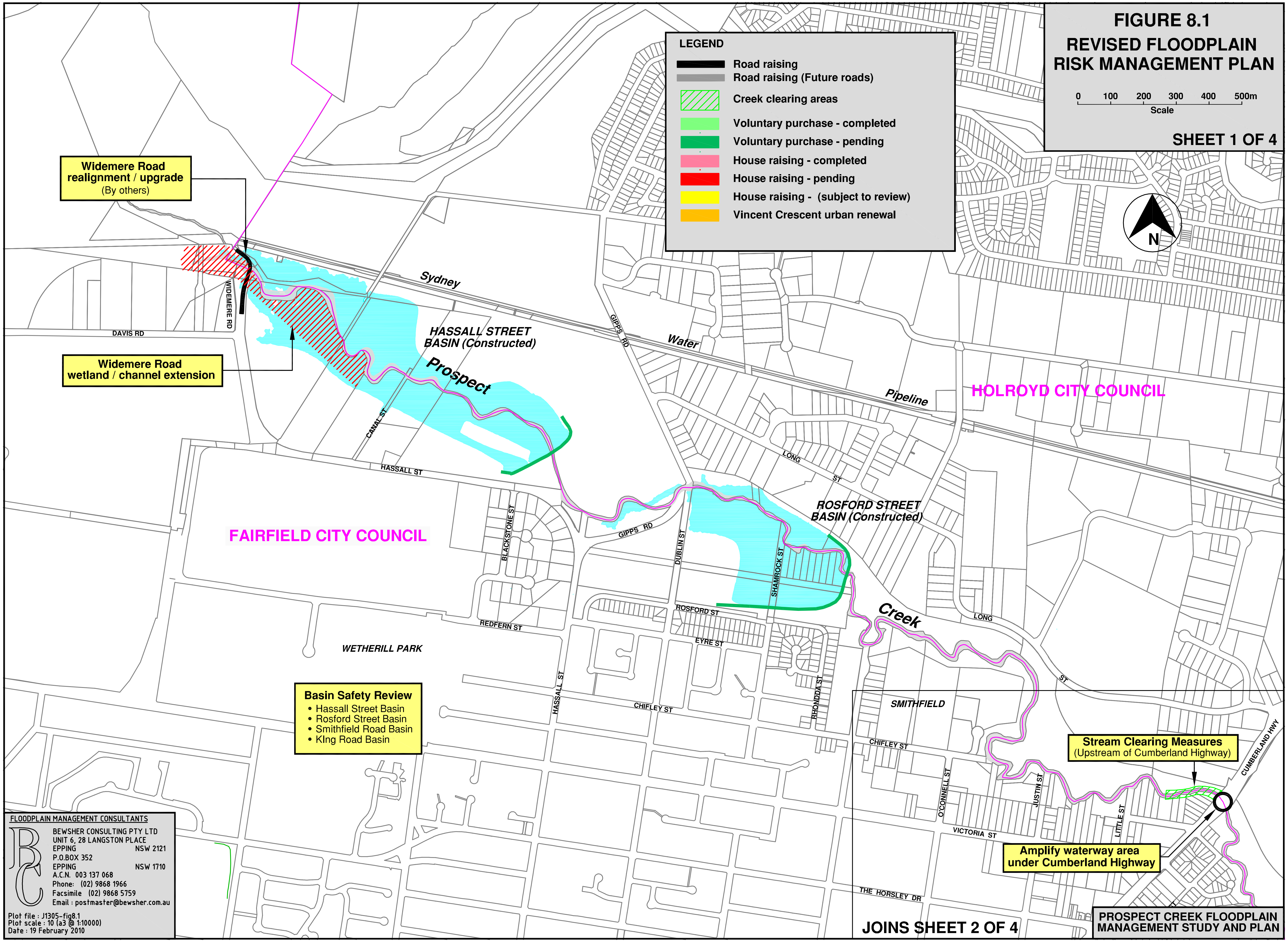
FIGURE 8.1
REVISED FLOODPLAIN
RISK MANAGEMENT PLAN
0 100 200 300 400 500m
Scale
SHEET 1 OF 4
LEGEND
Road raising
Road raising (Future roads)
Creek clearing areas
Voluntary purchase - completed
Voluntary purchase - pending
House raising - completed
House raising - pending
House raising - (subject to review)
Vincent Crescent urban renewal
N
Widemere Road
realignment / upgrade
(By others)
Widemere Road
wetland / channel extension
HASSALL STREET
BASIN (Constructed)
ROSFORD STREET
BASIN (Constructed)
Sydney Water Pipeline
Prospect Creek
HOLROYD CITY COUNCIL
FAIRFIELD CITY COUNCIL
WETHERILL PARK
SMITHFIELD
DAVIS RD
WIDEMERE RD
CANAL ST
HASSALL ST
GIPPS RD
LONG ST
BLACKSTONE ST
DUBLIN ST
SHAMROCK ST
ROSFORD ST
EYRE ST
REDFERN ST
HASSALL ST
CHIFLEY ST
RHONDDA ST
O'CONNELL ST
JUSTIN ST
LITTLE ST
VICTORIA ST
THE HORSLEY DR
CUMBERLAND HWY
Basin Safety Review
• Hassall Street Basin
• Rosford Street Basin
• Smithfield Road Basin
• KIng Road Basin
Stream Clearing Measures
(Upstream of Cumberland Highway)
Amplify waterway area
under Cumberland Highway
JOINS SHEET 2 OF 4
PROSPECT CREEK FLOODPLAIN
MANAGEMENT STUDY AND PLAN
FLOODPLAIN MANAGEMENT CONSULTANTS
BEWSHER CONSULTING PTY LTD
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Plot file : J1305-fig8.1
Plot scale : 10 (a3 @ 1:10000)
Date : 19 February 2010

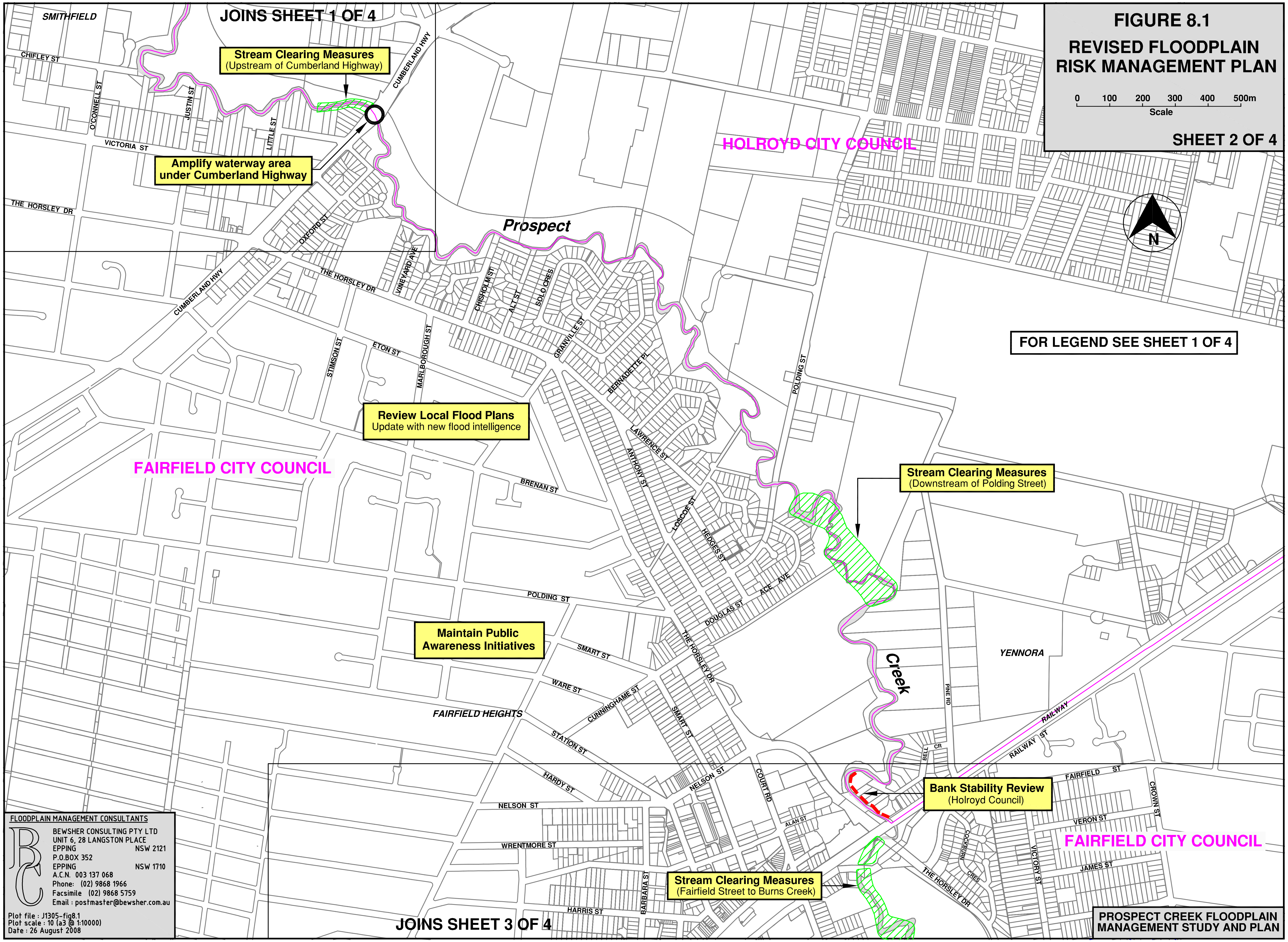
FIGURE 8.1
REVISED FLOODPLAIN RISK MANAGEMENT PLAN
0 100 200 300 400 500m
Scale
SHEET 2 OF 4
JOINS SHEET 1 OF 4
JOINS SHEET 3 OF 4
FOR LEGEND SEE SHEET 1 OF 4
N
Stream Clearing Measures
(Upstream of Cumberland Highway)
Amplify waterway area
under Cumberland Highway
Review Local Flood Plans
Update with new flood intelligence
Maintain Public
Awareness Initiatives
Stream Clearing Measures
(Downstream of Polding Street)
Bank Stability Review
(Holroyd Council)
Stream Clearing Measures
(Fairfield Street to Burns Creek)
HOLROYD CITY COUNCIL
FAIRFIELD CITY COUNCIL
FAIRFIELD CITY COUNCIL
Prospect
Creek
SMITHFIELD
YENNORA
FAIRFIELD HEIGHTS
CHIFLEY ST
VICTORIA ST
THE HORSLEY DR
O'CONNELL ST
JUSTIN ST
LITTLE ST
CUMBERLAND HWY
OXFORD ST
VINEYARD AVE
CHISHOLM ST
ALT ST
SOLO CRES
GRANVILLE ST
BERNADETTE PL
LAWRENCE ST
ANTHONY ST
LOSCOE ST
HEDGES ST
ACE AVE
DOUGLAS ST
POLDING ST
STIMSON ST
ETON ST
MARLBOROUGH ST
BRENAN ST
POLDING STREET
SMART ST
WARE ST
CUNNINGHAME ST
STATION ST
HARDY ST
NELSON ST
WRENTMORE ST
HARRIS ST
BARBARA ST
COURT RD
ALAN ST
PINE RD
BELL CR
RAILWAY
RAILWAY ST
FAIRFIELD ST
CROWN ST
VERON ST
COCKBURN CRES
VICTORY ST
JAMES ST
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Plot file : J1305-fig8.1
Plot scale : 10 (a3 @ 1:10000)
Date : 26 August 2008
PROSPECT CREEK FLOODPLAIN
MANAGEMENT STUDY AND PLAN

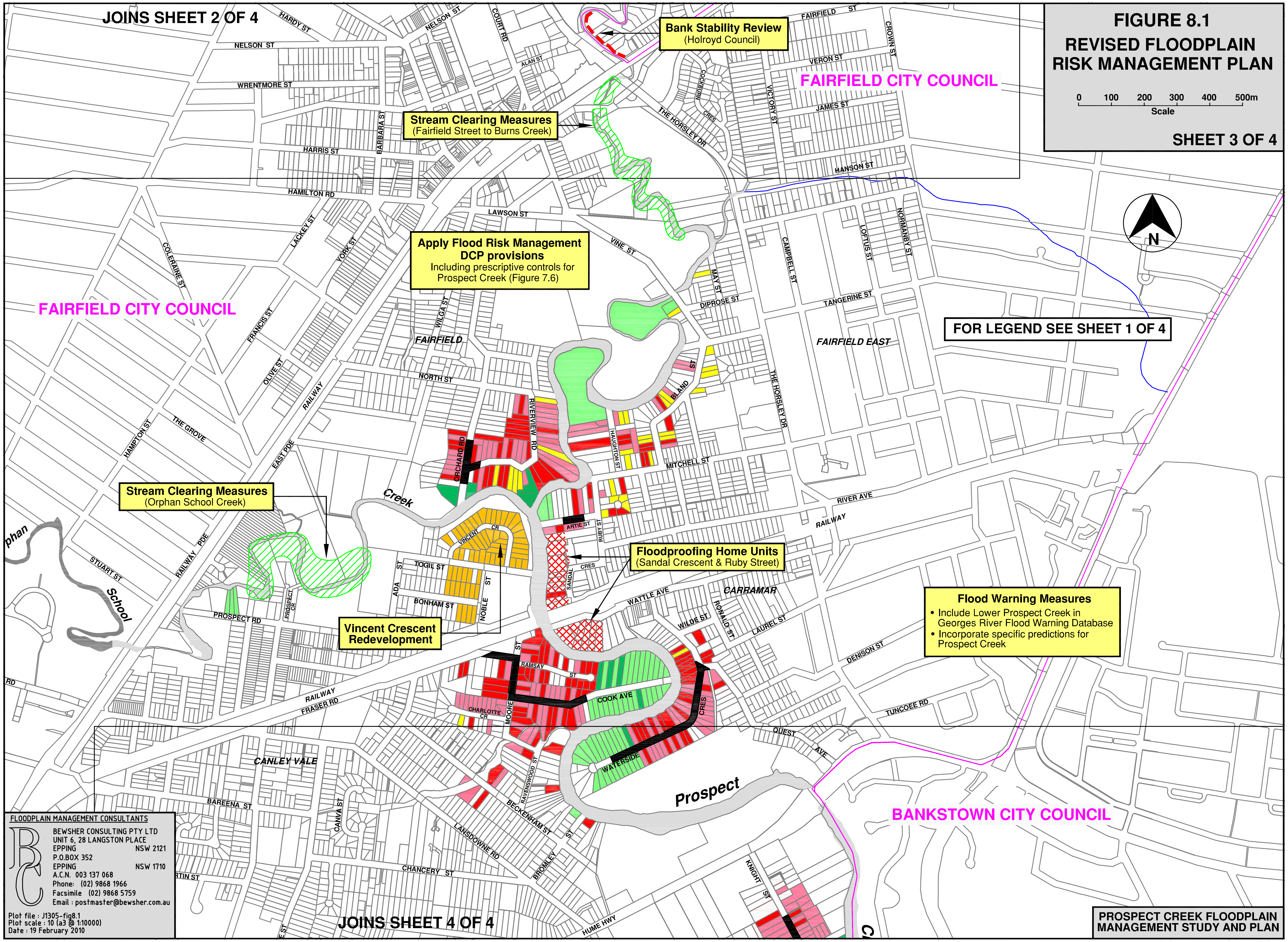
FIGURE 8.1
REVISED FLOODPLAIN RISK MANAGEMENT PLAN
0 100 200 300 400 500m
Scale
SHEET 3 OF 4
JOINS SHEET 2 OF 4
JOINS SHEET 4 OF 4
FAIRFIELD CITY COUNCIL
FAIRFIELD CITY COUNCIL
BANKSTOWN CITY COUNCIL
FOR LEGEND SEE SHEET 1 OF 4
N
Bank Stability Review
(Holroyd Council)
Stream Clearing Measures
(Fairfield Street to Burns Creek)
Apply Flood Risk Management DCP provisions
Including prescriptive controls for Prospect Creek (Figure 7.6)
Stream Clearing Measures
(Orphan School Creek)
Floodproofing Home Units
(Sandal Crescent & Ruby Street)
Vincent Crescent Redevelopment
Flood Warning Measures
• Include Lower Prospect Creek in Georges River Flood Warning Database
• Incorporate specific predictions for Prospect Creek
FAIRFIELD
FAIRFIELD EAST
CARRAMAR
CANLEY VALE
Prospect
Creek
School
FLOODPLAIN MANAGEMENT CONSULTANTS
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Plot file : J1305-fig8.1
Plot scale : 10 (a3 @ 1:10000)
Date : 19 February 2010
PROSPECT CREEK FLOODPLAIN MANAGEMENT STUDY AND PLAN

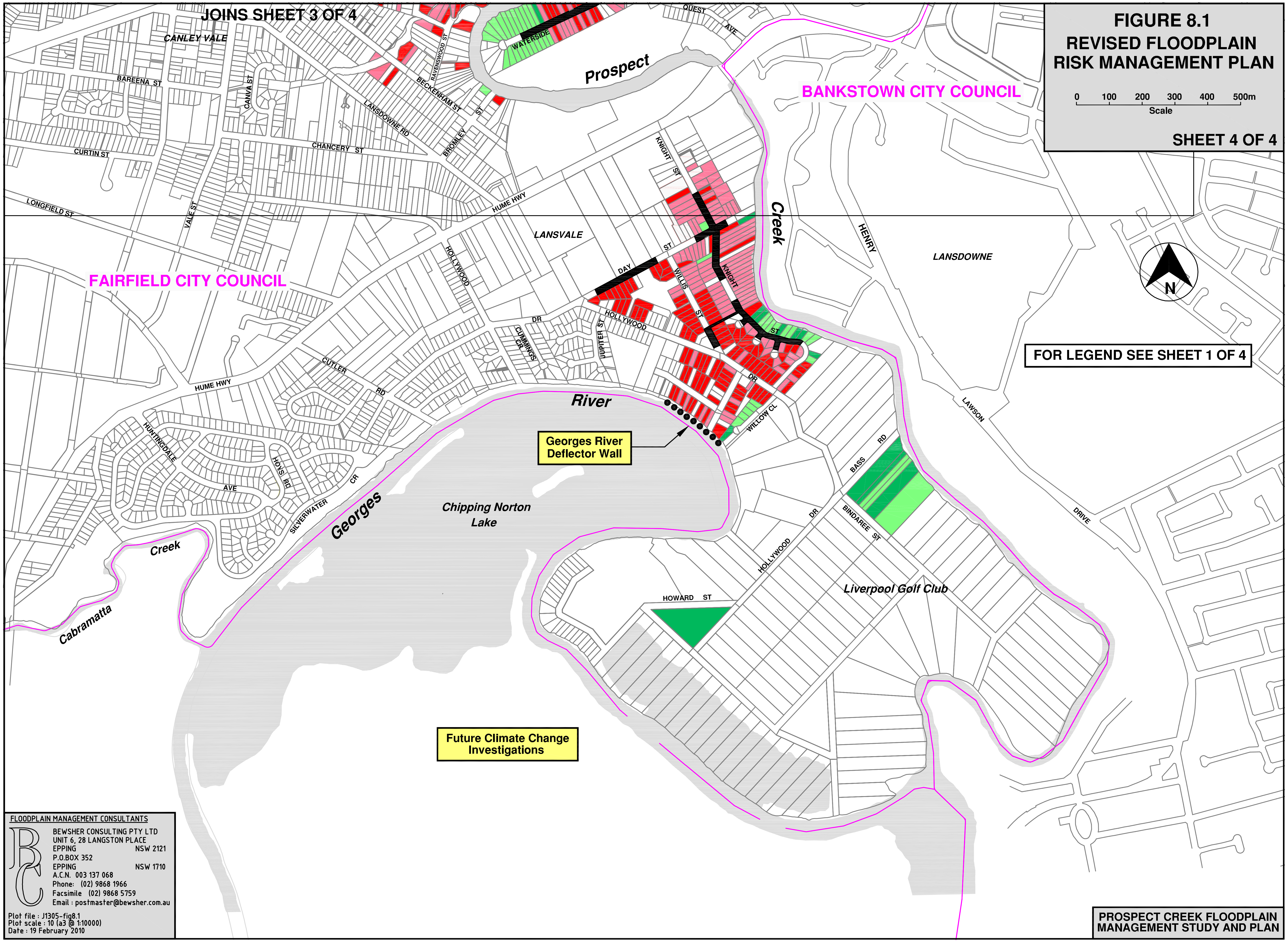

FIGURE 8.1
REVISED FLOODPLAIN RISK MANAGEMENT PLAN
0 100 200 300 400 500m
Scale
SHEET 4 OF 4
JOINS SHEET 3 OF 4
FOR LEGEND SEE SHEET 1 OF 4
BANKSTOWN CITY COUNCIL
FAIRFIELD CITY COUNCIL
CANLEY VALE
LANSVALE
LANSDOWNE
N
Prospect
Creek
Georges
River
Cabramatta
Creek
Chipping Norton
Lake
Liverpool Golf Club
Georges River
Deflector Wall
Future Climate Change
Investigations
BAREENA ST
CANVA ST
CURTIN ST
CHANCERY ST
LONGFIELD ST
VALE ST
HUME HWY
WATERSIDE
RAVENSWOOD ST
BECKENHAM ST
LANSDOWNE RD
BROMLEY ST
QUEST AVE
KNIGHT ST
HENRY
DAY ST
WILLIS ST
HOLLYWOOD DR
HOLLYWOOD
CUMMINGS CR
JUPITER ST
CUTLER RD
WILLOW CL
HUNTINGDALE AVE
HOYS RD
SILVERWATER CR
BASS RD
BINDAREE ST
HOWARD ST
LAWSON
DRIVE
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PROSPECT CREEK FLOODPLAIN
MANAGEMENT STUDY AND PLAN

9 REFERENCES

ANU, 1990, *'Losses and Lessons from the Sydney Floods of August 1986'*, Volumes 1 and 2, prepared by the Australian National University.

Bewsher & Grech, May 1997, *'A New Approach to the Development of Floodplain Controls for Floodplains'*, paper presented to the 37th Annual Floodplain Management Conference, Maitland.

Bewsher, Grech & Maddocks, May 1998, *'Using Flood Certificates to Raise Flood Awareness'*, paper presented to the 38th Annual Floodplain Management Conference, Moama, NSW.

Bewsher Consulting and Don Fox Planning, May 2004, '*Georges River Floodplain Risk Management Study & Plan'*, Volumes 1 and 2, prepared for Liverpool, Fairfield, Bankstown and Sutherland Councils.

Bewsher Consulting, October 2004, *'Cabramatta Creek Floodplain Management Study & Plan'*, prepared for Liverpool and Fairfield City Councils.

Bewsher Consulting, December 2006, *'Modelling of Stormwater Discharge from Greystanes Estate Southern Employment Lands to Prospect Creek – Flood Impact Assessment*, prepared for Boral Recycling Pty Ltd and Fairfield City Council.

Cardno Willing, 2001, *'Prospect Creek Analysis of January 2001 Flood'*, prepared for Fairfield City Council.

Cardno Willing, 2002, *'Fairfield Park Floodway – Flood Impact Assessment'*, supplementary report prepared for Fairfield City Council.

Cardno Willing, 2004 *'Review of Prospect Creek Flood Levels'*, prepared for Fairfield City Council.

CSIRO, October 2007, *'Climate Change in Australia'*, projections developed by CSIRO and the Australian Bureau of Meteorology for the Australian Climate Change Science Programme.

Dalland & Lucas, 1994, *'Vincent Crescent Levee – House Rasing Alternative'*, correspondence from Dalland & Lucas to Fairfield City Council.

DECC, 2007, *'Residential Flood Damages'*, Flood Risk Management Guidelines prepared by the Department of Environment and Climate Change.

DIPNR, 2004, *'Floodplain Management Guideline No. 4: Residential Flood Damage Calculation'*, guidelines issued by the Flood Management Branch of the Department of Infrastructure, Planning & Natural Resources.

Don Fox Planning and Bewsher Consulting, (draft) August 2008, *'Lansvale Peninsula Flood Risk Reduction Strategy'*, Discussion paper prepared for Fairfield City Council.

EMA (ed.) 1999, *'Flood Warning'*, Australian Emergency Manuals Series, Part III Emergency Management Practice, Volume 3 – Guidelines, Guide 5 (Second Edition), Emergency Management Australia, Canberra.

Kinhill, 1988, *'Flood Evacuation Study – Hollywood Drive Precinct, Lansvale'*, prepared by Kinhill Engineers for Fairfield City Council.

Kinhill, 1989, *'Wetherill Park Channel Extension'*, preliminary investigation prepared by Kinhill Engineers for Fairfield City Council.

MHL, 1994, *'Proposed Dredging of Prospect and Orphan School Creeks'*, prepared by Manly Hydraulics Laboratory for Fairfield City Council.

NSW Government, April 2005, *'Floodplain Development Manual: the management of flood liable land'*.

PWD, 1991, *'Georges River Flood Study'*, prepared by the University of NSW for the NSW Public Works Department.

Robinson, J. & McKay, G., 2003, *'WWW of flood warning'*, in Flood Mitigation without the Barriers: Floodplain Management Authorities of NSW 43rd Annual Conference, Feb 25-28 2003, Forbes.

SMEC, 1985, *'Fairfield Flood Mitigation Study'*, prepared by Snowy Mountains Engineering Corporation in association with Sinclair Knight & Partners for Fairfield City Council.

Storm Consulting, 2001, *'Davis Road Wetland for RTA Transitway, Wetherill Park'*, prepared for Fairfield City Council.

Willing & Partners, 1990, *'Lower Prospect Creek Floodplain Management Study'*, prepared for Fairfield City Council.

Willing & Partners, 1990, *'Report on Vincent Crescent Levee, Canley Vale'*, report prepared for Fairfield City Council.

Willing & Partners, 1993, *'Upper Prospect Creek Floodplain Management Study'*, prepared for Fairfield City Council.

Willing & Partners, 1996, *'Carrawood Park Deflector Levee – Preliminary Concept, Options Report'*, prepared for Fairfield City Council.

Willing & Partners, 2001, *'Assessment of Upper Prospect Creek Flood Mitigation Works'*, prepared for Fairfield City Council.

10 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. It is a means of describing how likely a flood is to occur in a given year. For example, a 1% AEP flood is a **flood** that has a 1% chance of occurring, or being exceeded, in any one year. 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 the long-term average number of years between floods of a certain magnitude. 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.
DNR	Department of Natural Resources, formerly the Department of Infrastructure, Planning & Natural Resources (DIPNR).
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.
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**.
flood liable land	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**.
flood planning levels (FPLs)	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.
flood prone land	Land susceptible to flooding up to the **probable maximum flood (PMF**). Also called **flood liable land**.
flood proofing	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**.
Flood risk precinct	An area of land with similar flood risks and where similar development controls may be applied by a council to manage the flood **risk**. (The flood risk is determined based on the existing development in the precinct or assuming the precinct is developed with normal residential uses). Usually the floodplain is categorised into three flood risk precincts – 'low', 'medium' and 'high' – although other classifications can sometimes be used. (See also risk).
Flood Study	A study that investigates flood behaviour, including identification of flood extents, **flood levels** and flood velocities for a range of flood sizes.

floodplain	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**.
Floodplain Risk Management Plan	The outcome of a **Floodplain Risk Management Study**. (Note that the term 'risk' is often dropped in common usage.
Floodplain Risk Management Study	Studies carried out in accordance with the *Floodplain Development Manual* (NSW Government, 2005) that assesses 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**.
floodway	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**.
flow	see **discharge**
foreshore building line	A line fixed by resolution of Council in respect of land fronting any bay, river, creek, lagoon, harbour or ocean, which provides a setback distance where buildings or other structures would normally be prohibited.
freeboard	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 and 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.
high flood hazard	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.
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).
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 AHD	metres **Australian Height Datum (AHD)**.
m/s	metres per second. Unit used to describe the **velocity** of floodwaters.

m^3/s	Cubic metres per second or 'cumecs'. A unit of measurement for creek or river 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 Development Manual* (NSW Government, 2005) 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**.
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 **effective warning time**, having regard to the depth and **velocity** of floodwaters, the suitability of the evacuation route, and other relevant factors.
risk	Risk is measured in terms of consequences and likelihood. In the context of floodplain management, it is the likelihood and consequences arising from the interaction of floods, communities and the environment. For example, the potential inundation of an aged person's facility presents a greater flood risk than the potential inundation of a sports ground amenities block (if both buildings were to experience the same type and probability of flooding). Reducing the probability of flooding reduces the risk, increasing the consequences increases risk. (See also **flood risk precinct**).
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**.
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.

APPENDIX A

FLOOD MODELLING REVIEW

Fairfield City Council

PROSPECT CREEK FLOODPLAIN MANAGEMENT PLAN

Flood Study Review

February 2006

Prepared by:

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TABLES

FIGURES

1.0 BACKGROUND

Flood behaviour throughout the Prospect Creek catchment was previously documented in the Lower Prospect Creek Floodplain Management Study (Willing & Partners, 1990) and the Upper Prospect Creek Floodplain Management Study (Willing & Partners, 1993).

A review of Prospect Creek Flood Levels was completed in 2004 by Cardno Willing. The study was based on a RAFTS hydrologic catchment model and a TUFLOW 2-dimensional hydraulic model.

A further review of these models was undertaken as part of the current floodplain management plan being prepared by Bewsher Consulting. Some of the RAFTS modelling assumptions were varied to ensure consistency with other concurrent studies being prepared elsewhere in Fairfield City Council. Several changes to the TUFLOW model were also made, based on recommendations made by WBM Pty Ltd, who are the authors of this model.

Changes that have been made to both models are outlined in Sections 2.0 and 3.0. The changes also necessitated further model calibration, which is discussed in Section 4.0. Design flood behaviour has been presented as flood extents and flood contours for the 20 year, 50 year, 100 year and PMF floods, whilst the floodplain has been divided into three flood risk areas (high, medium and low). These results are provided on Figures A3 to A7. The information has also been provided in digital format for incorporation in Council's GIS computer system.

2.0 HYDROLOGIC REVIEW

A review of the RAFTS modelling assumptions included in the 2004 Prospect Creek Study was undertaken by Fairfield City Council in 2005, in conjunction with a number of overland flood studies to be undertaken throughout the LGA.

The review recommended a number of changes to the 2004 Prospect Creek RAFTS model to simplify future assessments and ensure consistency between the various studies. Changes that were subsequently made to the modelling assumptions are outlined below.

2.1 Areal Reduction Factors (ARFs)

Areal reduction factors are applied to point rainfall estimates derived from Australian Rainfall & Runoff (AR&R) to account for the likely variability of rainfall over the catchment. As catchment areas increase, a greater reduction is usually required.

The 2004 Prospect Creek model adopted an ARF of 0.877 when considering the 9 hour storm over the whole Prospect Creek catchment, and an ARF of 0.906 when considering the 2 hour storm over the upper catchment. A subsequent discussion paper (Cardno Willing, 2004) recommended areal reduction factors for local studies that varied from 0.92 (1 hour storm) to 0.877 (9 hour storm).

AR&R also notes that point rainfall may be taken to represent the total rainfall over small areas (eg $4km^2$), implying that no areal reduction factor is required for small catchment areas or where short duration floods are critical.

A simple, consistent approach to estimating areal reduction factors that can be applied over all catchments within the Fairfield LGA is desirable. Since the range in values is small (for durations between 1 and 9 hours), a uniform value of 0.9 has been adopted for all catchments where the critical duration is 1 hour or more, and no areal reduction factor applied where the critical duration is less than 1 hour.

Results from sensitivity modelling indicate that this change would increase peak flows in Prospect Creek for the 9 hour 100 year flood by +2 to +3%.

2.2 Embedded Design Storms

Design storms for the 2004 Prospect model were derived by embedding the 2 hour or 9 hour storm burst within the observed 2001 flood. This made little difference to the 9 hour flood, but tended to mask the effects of shorter duration floods in smaller catchment areas. Effectively, small duration events such as the 2 hour storm became very similar to the longer 9 hour design storm.

Replacement of the embedded storm approach with the standard AR&R rainfall bursts was considered desirable for consistency with other studies underway. The effect of longer duration storms and additional runoff volume was considered by testing storm durations ranging from 25 minutes to 36 hours.

In relation to Prospect Creek, this change tended to reduce 100 year peak flows for the 9 hour flood by -2% to -3%, whereas the impact in the upper catchment areas for the 2 hour storm saw larger reductions of up to -12%.

2.3 Rainfall Patterns

Rainfall patterns used to describe the 9 hour storm burst in the 2004 Prospect Creek model were found to contain some discrepancies for the 50 and 100 year floods when compared to data provided in AR&R. These patterns were amended for consistency with AR&R.

The effect of this change was to reduce peak flows throughout the catchment for the 9 hour 100 year flood by -4% to -6%.

2.4 Intensity-Frequency-Duration Curves

The 2004 Prospect Creek model incorporated design rainfall bursts derived from data included in AR&R. However, Council has subsequently adopted standardised rainfall intensity-frequency-duration curves throughout the LGA, and adoption of these standard values was considered desirable for consistency with other studies that are underway.

The effect of adopting the standard rainfall-intensity-duration values leads to a reduction in peak flows of around -2% to -3% for the 100 year flood.

2.5 Rainfall Loss Method

Rainfall losses were determined in the 2004 Prospect Creek model using the ARBM loss model. The ARBM loss model is influenced by antecedent wetness conditions, which in itself is influenced by assumptions with embedded storms. It was also noted that the assumed start time of the storm affected the results from the model (presumably as a result of higher evaporation during the middle of the day).

A simple approach, independent of storm duration, embedded storms and commencement time was preferred for the overland flood studies currently underway. It was subsequently decided to adopt an initial/continuing loss rate method for all RAFTS models.

Adopted loss rates, after review of the model calibration to the 2001 flood, were as follows:

Pervious areas	IL=15mm	CL=1.5mm/hr
Impervious areas	IL=1.5mm	CL= 0mm/hr
Lumped areas	IL= 7mm	CL=1.0mm/hr

The different approach to rainfall losses was found to affect results by less than 1% in the 100 year flood. Some small increases were evident in the upper catchment, whilst small reductions occurred in the lower catchment.

2.6 Review of Detention Basins

The representation of the detention basins in the RAFTS model was also briefly reviewed, in particular the two largest basins at Hassall Street and Rosford Street.

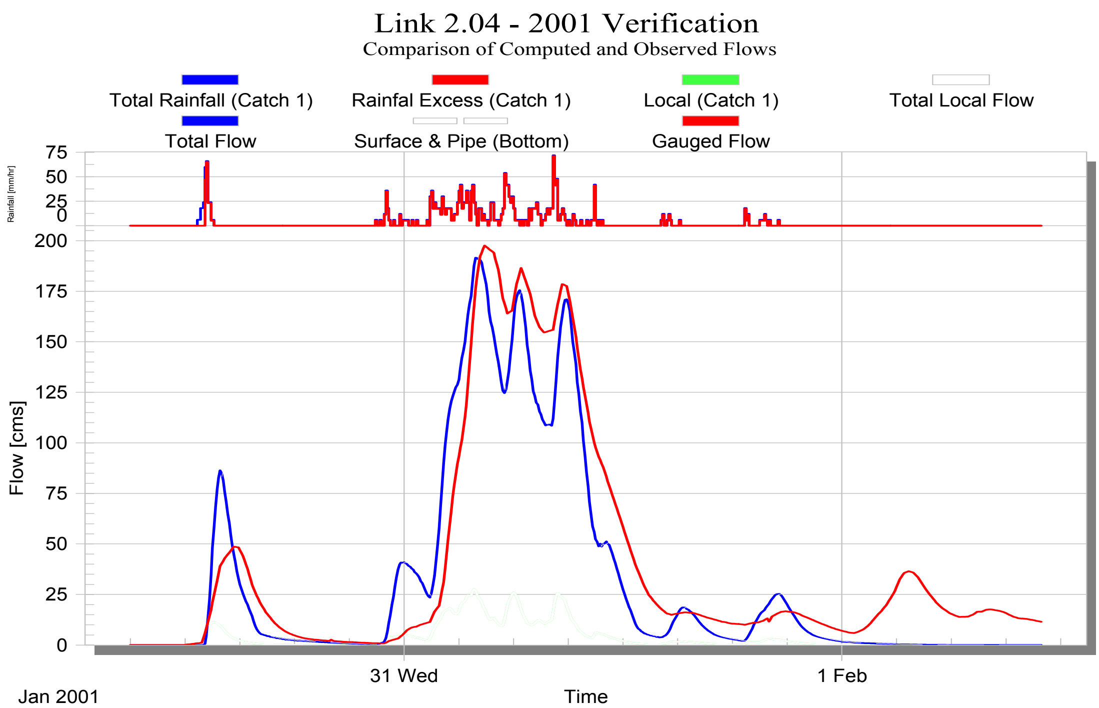
The outlets from these two basins were specified as stage-discharge relationships. The stage-discharge curve specified for the Hassall Street basin appeared to be based on the old outlet configuration for this basin, prior to two of the four cell culverts being blocked. This led to lower predictions of water levels within the basin.

The stage-discharge curve for the Hassall Street basin was therefore reduced to account for the current outlet conditions. No change was considered necessary for the Rosford Street Basin, which recently had one of five cells blocked.

2.7 Model Verification

The changes to the RAFTS modelling approach outlined above could potentially affect the performance of the model to predict historical flood behaviour. The 2004 RAFTS model had previously been calibrated to a hydrograph recorded on Orphan School Creek in the January 2001 flood. A review of the updated RAFTS model was also made by comparing computed flows with observed flows.

The comparison of computed and observed flows for the January 2001 flood is illustrated below.



The overall shapes of the calculated and recorded flow hydrographs are consistent, and the calculated peak flow is within 3% of the recorded peak. This was considered to be suitable verification of the revised RAFTS model.

2.8 Revised Flow Estimates

The 2004 Prospect Creek RAFTS model was updated to include the changes listed above. The sub-catchment boundaries and other catchment parameters were unchanged from the 2004 model. A map showing these subcatchment areas and their node numbers is illustrated in Figure A1.

The updated model was then used to generate new flow hydrographs throughout the Prospect Creek catchment for the 20 year, 50 year and 100 year floods. A range in storm durations from 25 minutes to 36 hours was tested to determine the critical storm duration at various locations throughout the catchment. No changes were made to the estimates previously provided for the PMF flood.

Peak flow estimates from the model are provided in Table A1.

Table A1
Peak Flow Estimates from Updated RAFTS model

Link Label	PMF Peak Inflow (m^3/s)	PMF Critical Storm (mins)	100 Year Peak Inflow (m^3/s)	100 Year Critical Storm (mins)	50 Year Peak Inflow (m^3/s)	50 Year Critical Storm (mins)	20 Year Peak Inflow (m^3/s)	20 Year Critical Storm (mins)
ReC1	30.0	60	5.2	120	4.5	120	3.9	360
ReC2	42.2	60	7.2	360	6.3	360	5.4	360
ReC3	29.7	60	5.8	120	5.1	120	4.4	360
ReC4	28.3	60	5.6	120	4.9	120	4.2	360
ReC5	27.8	60	5.5	120	4.8	120	4.1	360
ReC6&7	36.7	60	7.2	360	6.3	360	5.4	360
ReC8	15.4	60	3.2	120	2.8	120	2.3	120
ReC9	28.7	60	5.7	120	5.0	120	4.2	360
ReC10	29.4	60	5.1	120	4.4	120	3.8	360
ResDum	268.0	60	50.1	120	43.8	120	37.6	360
Reserv	637.0	60	219.1	25	194.8	25	173.5	25
P2	49.6	60	18.2	25	16.2	25	15.0	25
P4U	79.8	60	22.6	30	20.0	30	17.4	30
Dum130.6	79.8	60	22.6	30	20.0	30	17.4	30
A4-1	17.3	60	5.6	25	5.0	25	4.7	25
H1	32.4	60	12.8	25	11.4	25	10.5	25
A4	107.3	60	40.4	25	36.1	25	33.2	25
A3	211.5	60	81.3	25	72.9	25	67.0	25
G2	65.6	60	25.8	25	23.2	25	21.5	25
G1	144.7	60	46.8	25	42.0	25	37.4	25
A2	450.0	60	145.2	25	130.4	25	115.5	25
A1	484.8	60	152.4	25	136.5	25	120.7	25
P3	564.8	60	163.4	25	146.7	25	128.4	30
T1	564.8	60	163.4	25	146.7	25	128.4	30
U130.6	641.5	60	179.8	25	161.5	25	141.8	30
R-I01C	4.5	60	1.4	120	1.2	90	1.1	120
P5C	27.1	60	9.8	25	8.9	25	8.4	25
U130	27.1	60	9.8	25	8.9	25	8.4	25
dumP5	664.1	60	182.6	30	164.1	30	143.9	30
R-F01C	7.1	60	2.1	120	1.8	120	1.5	120
R-G01C	2.9	60	1.0	120	0.8	120	0.7	120
P5B	21.7	60	5.4	120	4.6	120	3.8	90
P5	18.3	60	5.9	25	5.3	25	5.0	25
U129.7	39.2	60	8.9	120	7.8	25	7.1	25
P6	61.2	60	19.5	25	17.3	25	15.7	25
dumP6	762.3	60	194.9	30	174.8	30	151.7	30
Hassal	762.3	60	194.9	30	174.8	30	151.7	30
R-D01C	5.5	60	1.6	120	1.4	120	1.2	120
R-E01C	6.7	60	2.0	120	1.7	120	1.5	120
R-C01C	4.4	60	1.2	120	1.1	120	0.9	120
R-B01C	12.7	60	3.1	120	2.6	120	2.1	120
R-A01C	3.3	60	0.9	120	0.8	120	0.6	120
P5A	67.0	60	13.0	120	11.6	25	10.8	25
Basin14	40.7	60	12.8	25	11.4	25	10.4	25
F1	94.3	60	17.9	25	15.9	25	14.3	25
P7	151.1	60	28.6	30	25.8	30	22.4	120
U128.6	151.1	60	28.6	30	25.8	30	22.4	120
dumP7	957.1	60	81.5	540	75.0	540	66.5	540
P8	83.7	60	30.8	25	27.6	25	25.0	25
U128.5	184.0	60	63.2	25	56.3	25	50.9	25
dumP8	1083.6	60	104.8	540	95.2	540	84.9	540
Rosford	1083.6	60	104.8	540	95.2	540	84.9	540
C1	40.6	60	11.4	25	10.2	25	9.4	25
P9	129.2	60	32.4	25	29.1	25	26.0	25
U125.5	129.2	60	32.4	25	29.1	25	26.0	25
dumP9	1135.7	60	98.4	540	91.4	540	81.3	540
B1	41.4	60	15.2	25	13.6	25	12.6	25
P10	147.7	60	46.3	25	41.3	25	36.3	25
U124.9	147.7	60	46.3	25	41.3	25	36.3	25
dumP10	1218.2	60	114.3	540	104.0	540	94.0	540
P11	136.7	60	45.2	25	40.2	25	36.1	25
U124.4	136.7	60	45.2	25	40.2	25	36.1	25
dumP11	1248.9	60	126.0	540	115.5	540	104.1	540
D1	93.1	60	25.6	25	22.8	25	20.5	25
P12	181.3	60	40.9	25	36.8	25	32.0	25
U123	181.3	60	40.9	25	36.8	25	32.0	25
dumP12	1347.1	60	155.2	120	137.6	120	121.3	720
P13	71.4	60	26.9	25	24.2	25	22.0	25
U121.3	71.4	60	26.9	25	24.2	25	22.0	25
dumP13	1379.8	120	156.9	540	142.3	540	127.7	540
P14	119.0	60	42.4	25	38.4	25	35.0	25
U121	119.0	60	42.4	25	38.4	25	35.0	25

Link Label	PMF		100 Year		50 Year		20 Year	
	Peak Inflow (m^3/s)	Critical Storm (mins)	Peak Inflow (m^3/s)	Critical Storm (mins)	Peak Inflow (m^3/s)	Critical Storm (mins)	Peak Inflow (m^3/s)	Critical Storm (mins)
dumP14	1466.1	120	175.5	540	158.6	540	141.5	540
P15	62.4	60	24.4	25	21.8	25	19.8	25
U117.4	62.4	60	24.4	25	21.8	25	19.8	25
dumP15	1500.6	120	183.4	540	165.7	540	147.6	540
E1	49.1	60	18.1	25	16.1	25	14.5	25
P16	79.2	60	28.3	25	25.4	25	23.0	25
U115.8	79.2	60	28.3	25	25.4	25	23.0	25
dumP16	1560.2	120	196.1	540	176.8	540	157.5	540
P17	71.0	60	21.8	25	19.5	25	17.8	25
U115.5	71.0	60	21.8	25	19.5	25	17.8	25
dumP17	1611.0	120	205.4	540	185.0	540	164.5	540
P18	33.5	60	12.0	25	10.7	25	9.7	25
U113.5	33.5	60	12.0	25	10.7	25	9.7	25
dumP18	1626.4	120	207.3	540	186.6	540	165.3	540
Basin18	90.1	60	26.3	120	22.9	120	19.5	120
Basin17	40.0	60	13.1	120	11.6	120	10.2	120
6.03	151.3	60	24.3	120	20.8	120	17.8	120
6.00	561.1	60	130.4	120	113.5	120	94.6	120
6.04	911.7	60	206.0	120	179.0	120	150.5	120
L5	911.7	60	206.0	120	179.0	120	150.5	120
Dum8	2062.5	120	347.4	120	304.8	120	268.1	540
Basin11	166.7	60	34.4	120	29.8	120	25.2	120
Basin8	147.3	60	46.7	120	41.1	120	35.3	120
Basin9	433.0	60	82.5	120	73.0	120	62.9	120
Dum3	488.9	60	81.6	120	67.5	120	62.0	120
Basin10	669.0	60	111.6	120	102.6	120	92.8	120
2.02	756.2	60	96.1	120	87.6	360	79.9	360
Basin4	158.4	60	48.7	120	42.7	120	36.5	120
Basin5	284.1	60	65.9	120	55.2	120	45.3	120
4.02	287.2	60	57.3	120	48.3	120	37.9	120
4.03	322.5	60	63.1	120	52.7	120	41.4	120
4.04	71.6	60	22.7	120	20.1	120	17.2	120
Basin7U	94.9	60	29.1	120	25.3	120	21.9	120
Basin7D	91.5	60	22.2	120	18.6	120	14.6	120
4.06	130.5	60	25.6	120	21.0	120	19.2	120
Dum1	447.4	60	88.7	120	73.0	120	56.3	120
4.07	628.5	60	120.0	120	100.8	120	77.6	360
Basin6	1356.6	60	213.7	120	185.9	120	157.0	360
2.03	1357.4	60	182.6	360	153.1	360	140.4	360
Basin1	159.4	60	44.3	120	38.3	120	32.6	120
Basin2	215.4	60	51.0	120	45.3	120	39.9	120
Basin3	418.2	60	98.2	120	87.8	120	76.9	120
5.03	484.3	60	102.4	120	91.6	120	82.1	120
Dum2	1782.8	60	254.6	120	226.7	120	202.9	120
2.04	1902.1	60	286.0	120	263.2	120	235.7	120
2.10	166.0	60	31.3	120	27.0	120	22.9	120
2.06	207.4	60	41.0	120	35.7	120	30.4	120
2.05	2018.6	60	337.6	120	306.3	120	270.3	120
L21	2018.6	60	337.6	120	306.3	120	270.3	120
1.01	140.4	60	26.9	120	23.4	120	19.9	120
L27	140.4	60	26.9	120	23.4	120	19.9	120
dum1.01	4126.1	120	690.3	120	615.8	120	539.0	540
1.02	129.3	60	39.5	120	34.4	120	29.3	120
L46	129.3	60	39.5	120	34.4	120	29.3	120
1.021	124.0	60	38.0	120	33.1	120	28.2	120
dum1.02	3843.8	120	622.1	540	560.8	540	497.9	540
1.03	100.4	60	21.8	120	19.2	120	16.0	120
L64	100.4	60	21.8	120	19.2	120	16.0	120
dum1.03	3709.1	120	599.8	540	539.2	540	477.1	540
1.03A	54.9	60	14.1	120	12.1	120	10.1	120
1.03B	68.4	60	22.4	90	20.0	120	17.7	120
L70	115.8	60	35.9	120	31.4	120	27.0	120
Dum5	3692.7	120	593.8	540	533.5	540	470.9	540
Dum6	3686.2	120	590.8	540	530.4	540	468.2	540
1.03C	84.8	60	26.0	120	22.7	120	19.6	120
L71	84.8	60	26.0	120	22.7	120	19.6	120
Dum7	3683.1	120	590.2	540	530.1	540	467.5	540
1.04	62.5	60	13.1	120	11.3	120	9.4	120
L73	62.5	60	13.1	120	11.3	120	9.4	120
dum1.04	3636.4	120	579.4	540	519.8	540	458.0	540
Out	3636.4	120	579.4	540	519.8	540	458.0	540

3.0 HYDRAULIC REVIEW

The 2004 Prospect Creek Study used the TUFLOW hydraulic model to convert flow hydrographs into flood levels and velocities throughout the floodplain. Separate TUFLOW models were developed for the upper catchment area (upstream of Widemere Road) and the main catchment area (from Widemere Road to the Hume Highway). A separate model was also developed for the PMF flood, with a larger grid size of 20m.

Council sought a review of the TUFLOW model by the authors of the software (WBM Pty Ltd) in late 2004. This included an overall review of the model structure and advice concerning the potential amalgamation of the individual models into a single TUFLOW model.

Following the model review, a single TUFLOW model was developed for the whole study area, capable of modelling all flood events. Some refinements to the TUFLOW model were also made directly by WBM, whilst a number of other recommendations were provided.

Further refinement of the TUFLOW model was also undertaken during 2005, to provide more detailed representation of flood behaviour in the channel upstream of Widemere Road. This included additional survey and modifying the model to account for channel clearing that was undertaken by Council in 2005.

Finally, the model was recalibrated to the January 2001 flood, and revised flood behaviour determined for a range of design floods.

3.1 WBM Review of TUFLOW model

The WBM review indicated that on the whole, the Prospect Creek TUFLOW model was set up satisfactorily. There were, however, a number of measures proposed to improve the model structure, including the amalgamation of the individual models into a single model.

These model refinements were subsequently implemented by WBM. Some of the changes made to the model were a result of additional features recently developed in the TUFLOW software. All the latest TUFLOW model runs are based on the TUFLOW Build (2004-11-AK).

The description of the refinements made to the Prospect Creek TUFLOW model by WBM, and other recommendations that were proposed for further consideration, are listed in Table A2.

Table A2
WBM TUFLOW model updates and recommendations

Original Model	Updated Model
The exit losses on circular culverts Rosfp, Wide Rd and Has-lowp, and rectangular culverts RosB, GibbsB1, GibbsB2 and Has Box are all well below 1.0 (0.2, 0.2, 0.1, 0.2, 0.2, 0.2, 0.1 respectively). Where the flow velocity from culvert to receiving waterway does not change greatly, these exit losses may be justified. In the case of Has Box, for example, which is the outlet from a detention basin, and the velocities at the flood peak are in excess of 6m/s, it is our view that the full (or close to full) exit loss of 1.0 should apply. Sensitivity testing on the Has Box culvert shows that using an exit loss of 1.0 increases flood levels upstream by ~0.45m, and causes flow over the detention basin's spillway. The other culverts mentioned above have not been investigated further.	The exit losses have been left unchanged, however, it is strongly recommended that validation of these losses are made given their significant influence on upstream flood levels.
Culvert contraction coefficients for all culverts was 0.	The height culvert contraction coefficient has been set at 0.6 and the width culvert contraction coefficient has been set at 1.0
As identified in our review, cross-section top widths have been adjusted to more appropriately represent the width of the 2D domain they replace. However, Channels L26 and OSC2 remain wider than the 2D domain. The data for these channels are from a MIKE 11 processed cross-section data file that cannot be easily adjusted as the profiles for these channels are not included in the file.	Channels L26 and OSC2 have remained unchanged, and remain wider than the 2D domain they replace. If the profiles for these cross-sections can be found, the cross-sections can be trimmed accordingly. Alternatively, manual manipulation of the processed data is an option.
A significant number of channels are less than 20m long, particularly in the Widem model. Many of these may not be necessary.	Originally very short channels were removed as part of the process to increase the computation timestep to 5s. However, as the 2s timestep is required for continuity at high velocity culverts such as Has Box, the short channels have been reinstated and are in the updated model.
RosB rectangular culvert and RosBw weir.	The HX boundary connected to the RosB rectangular culvert and RosBw weir has been changed to a SX boundary connected to RosB culvert, with the HX boundary acting as the weir, providing an improved model schematisation.
Conversion of S channels to B channels at bridges.	It is recommended that bridge decks be checked to ensure the maximum elevation of the B channel cross section coincides with the underside of the deck. It has been assumed that the top of the S channel is the underside of the bridge deck.

Original Model	Updated Model
	FairfieldSt and VineB (formerly S channels but changed to B channels) have zero flow width at the top of the cross-section – it is recommended that these be checked (this is normally only carried out where the bridge deck slopes or is arched).
Z-lines (3D breaklines) at Embankments and Road/Railway crossings.	These should be checked as they may require extending (at present they do not extend the whole way across the floodplain). An example is the Hume Highway where flood water is flowing over the road to the west of the creek crossing. Z lines do not use the RIDGE (or MAX) flag attached, and are significantly lowering Zpts in some locations, particularly 2d_zln_noFairSchLeve. It is recommended that the elevations on these Z lines are checked, as normally Z lines raise elevations (unless using the GULLY option). In the updated model, the Z lines do not have the RIDGE option, but should be included following elevation checking.
Reducing conveyance with height warnings.	The updated model utilises a new feature in TUFLOW that forces a parallel channel analysis for all 1d_tab XZ cross-sections. This ensures that reducing conveyance does not occur when the wetted perimeter suddenly increases compared with a small increase in the flow area. The conveyance of the cross-sections using this approach is slightly higher, and there is a justification for increasing the Manning n values by around 10% to compensate for this. The 1d network Manning's n values have been increased by 10% in the updated model.

3.2 Other WBM Recommendations

Other recommendations included in WBM's review, but not implemented, were subsequently considered by Bewsher Consulting. Those recommendations that were subsequently implemented include:

- Exit loss coefficients on all circular and rectangular culverts were increased to 1.0, with the exception of the Hassall Street and Rosford Street detention basin outlets where a coefficient of 0.5 was adopted;
- Channel sections L26 and OSC2, which were noted as being wider than the 2D domain where they are located, were reduced in width by manual manipulation of the processed data;
- The close spacing of 1D cross sections upstream of Widemere Road were replaced with more typically spaced cross sections, based on actual survey undertaken by Council;

- Representation of the Fairfield Street and Vine Street bridges in the model were reviewed, with amendments being made to the Vine Street bridge based on the available design drawings for this structure;
- Z-lines (3D breaklines) at embankments and road/railway crossings were reviewed. Most of these were considered to be providing a suitable supplement to the DEM in order to represent the top of bridges or embankments across the creek or basin outlets, otherwise missing from the DEM. The one exception was the z-line across the Rosford Street Basin, which was found to be artificially raising ground levels immediately in front of the basin outlet and restricting basin outflows. This problem was rectified by slightly adjusting the entrance location to the basin outlet.
- Manning's coefficients were reviewed as part of further model calibration.

3.3 Changes upstream of Widemere Road

A number of model refinements were made in the upper catchment, between Widemere Road and Davis Road, to provide greater definition in this part of the model. The changes include:

- Improved representation of flows over Widemere Road by including the longitudinal road profile as a weir;
- Inclusion of surveyed channel cross sections in the model in lieu of data extracted from the ALS survey, which was thought to be erroneous due to dense vegetative cover;
- Modification of channel sections to account for the removal of silt and vegetation from within the concrete channel, undertaken by Council during 2005;
- More refined representation of overbank roughness, at a detail sufficient to include individual buildings (n=0.2), paved areas (n=0.02), and other vegetative cover (n=0.07 to 0.10);
- Inclusion of the above ground pipeline on the north side of the stormwater channel, which tends to restrict flow onto the northern floodplain. This was included in the model by setting a 0.3m 'lid' on top of those cells intersected by the pipeline.

3.4 Model Calibration

The 2004 Prospect Creek TUFLOW model had previously been calibrated to the January 2001 flood. Due to the number of changes made to this model, it was considered appropriate to further check this calibration.

The January 2001 flood was the largest flood recorded in Prospect Creek since at least 1988. In the upper catchment areas, the flood was estimated to be between a 20 year and 50 year flood event. The flood was less severe in Lower Prospect Creek as it coincided with lower flooding from the Georges River. The 2004 Prospect Creek study provided tabulated flood height observations throughout the catchment. This data has been supplemented with additional data from Council reports and files. The complete list of available data is provided in Table A3.

Table A3
TUFLOW Calibration to January 2001 Flood

Location	Source	Observed Level	Calculated Level	Difference	Comment
Widemere Rd - Edge of bitumen	FS Review - Table A8	31.51	31.64	0.13	
D/S Widemere LHS		31.24	31.27	0.03	
Outlet of Hassal St Basin		28.45	30.65		Unlikely to represent peak level
Underside of Gas sign		28.38	30.65		Unlikely to represent peak level
High water mark on tree	Council field notes & Table	25.09	25.25	0.16	
Gipps Rd Bridge		24.63	25.11	0.48	
Casuarina tree at Rosford St low flow	Table A8	23.4	24.23		Dubious reading & uncertain location
Outlet of Rosford St Basin		22.35	22.44	0.09	
Rosford St - Low flow outlet	Table A8	22.33	22.35	0.02	
Water level mark Rosford St	Table A8	22.32	22.31	-0.01	
Justin St		20.1	19.95	-0.15	
Paint mark on sewer vent	Table A8	19.74	19.30	-0.44	
End Little St near creek		19.62	19.30	-0.32	
127 Oxford St	Surveyed level (external)	18.43	17.81	-0.62	
115 Oxford St	Surveyed level (external)	18.4	17.46	-0.94	
13 Vineyard St	Surveyed level (external)	18.27	17.29		Inconsistent with adjacent observations
Gauge at Kenyons Bridge LB		18.25	18.38	0.13	
119 Oxford St	Surveyed level (external)	18.05	17.81	-0.24	
Cumberland Highway Smithfield	Services Committee report	17.77	18.17	0.40	
Cumberland Highway Bridge		17.62	18.17	0.55	
3 Kiola St	Surveyed level (external)	17.53	17.48	-0.05	
19 Vineyard St	Surveyed level (external)	17.5	17.30	-0.20	
20 Vineyard St	Surveyed level (external)	17.38	17.30	-0.08	
16 Vineyard St	Surveyed level (external)	17.38	17.29	-0.09	
18 Chisolm St	Surveyed level (external)	17.28	16.75		Inconsistent with adjacent observations
9 Kaluna St	Surveyed level (external)	17.12	16.97	-0.15	
13 Braemar St	Surveyed level (external)	16.94	16.97	0.03	
27 Chisolm St	Surveyed level (external)	16.88	16.57	-0.31	
7 Braemar St	Surveyed level (external)	16.69	16.91	0.22	
22 Alt St	Surveyed level (external)	16.57	16.23	-0.34	
4 Cooper St	Surveyed level (external)	16.56	16.29	-0.27	
31 Chisolm St	Surveyed level (external)	16.49	16.45	-0.04	
29 Chisolm St	Surveyed level (external)	16.46	16.53	0.07	
2 Cooper St	Surveyed level (external)	16.43	16.24	-0.19	
20 Alt St	Surveyed level (external)	16.41	16.23	-0.18	
33 Alt St	Surveyed level (external)	16.39	16.16	-0.23	
25 Alt St	Surveyed level (external)	16.31	16.23	-0.08	
24 Alt St	Surveyed level (external)	16.23	16.22	-0.01	
31 Alt St	Surveyed level (external)	16.22	16.23	0.01	
6 Cooper St	Surveyed level (external)	16.19	16.33	0.14	
38 Hemingway St	Surveyed level (external)	14.93	14.81	-0.12	
43 Hemingway St	Surveyed level (external)	14.63	14.30	-0.33	
41 Hemingway St	Surveyed level (external)	14.6	14.29	-0.31	
Pathway U/S Fairfield Rd Bridge		13.18	12.64		Inconsistent with adjacent observations
16 Jervis	Surveyed level (external)	12.76	12.69	-0.07	
14 Jervis St	Surveyed level (external)	12.68	12.72	0.04	
Cawarra Pl	Wet carpet 1.59m above garage	12.67	12.78	0.11	
Cawarra St - mark on tree	Table A8	12.58	12.78	0.20	
38 Ace Ave	Surveyed level (external)	12.55	12.12		Inconsistent with adjacent observations

Location	Source	Observed Level	Calculated Level	Difference	Comment
Peg near path U/S bridge		12.51	12.64	0.13	
46 Ace Ave	Flood level 0.40m above floor	12.34	12.24	-0.10	
44 Ace Ave	Flood level 0.40m above floor	12.33	12.21	-0.12	
42 Ace Ave	Flood level 0.36m above floor	12.32	12.17	-0.15	
48 Ace Ave	Flood level 0.25m above floor	12.29	12.25	-0.04	
Polding Street North, Fairfield	Services Committee Report	12.18	12.56	0.38	
D/S Fairfield Rd bridge	Approximate location	12.17	12.27	0.10	
40 Ace Ave	Surveyed level (external)	12.15	12.15	0.00	
Fairfield High School	Approximate location	11.96	11.81	-0.15	
u/s Fairfield Railway Bridge	2001 Report	9.01	9.08	0.07	
The Horsley Drive, Fairfield	Services Committee Report	8.62	8.76	0.14	
upstream bridge	Mark Rice	7.26	7.10	-0.16	
Vine St Bridge, Fairfield	Services Committee Report	6.44	6.11	-0.33	
34 Vincent Cr	2001 Report	5.45	5.42	-0.03	
13 Artie St	2001 Report	5.42	5.45	0.03	
Sandal Crescent, Carramar	Services Committee Report	5.02	5.22	0.20	
Upstream side of Lansdowne Bridge	Services Committee Report	4.23	4.32	0.09	
Day Street, Lansvale	Services Committee Report	3.62	3.65	0.03	
				-0.048	Mean
				26	Number above
				33	Number below
				0.246	Standard Deviation
				-0.035	50 percentile difference

One of the main changes to the model was the method of calculating conveyance in the 1D channel elements. This was introduced via a software upgrade by WBM, which significantly improved stability within the Prospect Creek model. As a consequence, however, the new method increases channel conveyance and so tends to reduce flood levels. To compensate for this reduction, WBM increased channel roughness coefficients by 10%. On review of the calibration data, and in conjunction with other changes made to the TUFLOW model, it was considered that a further increase in channel roughness was warranted to achieve an adequate match with flood levels recorded from the 2001 flood. The exception was the area downstream of Orphan School Creek, where coefficients were actually reduced. It was considered that the roughness coefficients were previously too high in this region to compensate for a model stability problem that was occurring in this vicinity. Roughness coefficients across the floodplain remained unchanged.

The comparison of computed and observed flood heights in provided in Table A3. The location of these points is also shown on Figure A2, along with a colour coding showing where agreement in values to ±0.2m has been achieved, where calculated levels exceed +0.2m, and where calculated levels are less than -0.2m from observed levels. There are also a number of outliers in the data set where the observed levels are considered unreliable based on a comparison of adjacent levels or by comparison with ground levels at these locations.

A statistical assessment of the difference between calculated and observed flood heights is included in Table A3. Of the 67 observed flood heights, 7 were excluded from this assessment due to reliability concerns. Of the remaining 60 observations, the mean difference between calculated and observed levels is -0.05m, with roughly similar numbers of points where calculated levels overestimate the observed levels (26) to those that underestimate it (33).

Based on these results, it can be concluded that the model is adequately calibrated to the January 2001 flood.

3.5 Design Boundary Conditions

Design boundary conditions are required for the TUFLOW model. These consist of inflow hydrographs at the upper end of the model and at other intermediate points within the catchment, and stage hydrographs at the downstream end of the model.

Inflow hydrographs were determined from the RAFTS hydrologic model described in Section 2. Various storm durations were included in each model run to determine which duration provided the highest flood levels at different locations within the study area.

The downstream stage hydrograph was based on flood hydrographs provided in the Georges River Flood Study (PWD, 1991) at the junction of Prospect Creek and the Georges River. This is the same boundary condition as adopted in the 2004 Prospect Creek Study. Another important consideration is the phasing difference between peak flood heights in the Georges River and the timing of flood flows in Prospect Creek. Initial sensitivity testing indicated that flood levels in Lower Prospect Creek (downstream of Vine Street) were sensitive to both the level in the Georges River and the phasing difference between the two floods.

This aspect of flood behaviour was extensively studied in the 1990 Lower Prospect Creek Flood Study (Willing & Partners, 1990). The approach adopted in the 1990 study was to adjust the timing of the Prospect Creek storm so that the peak rainfall intensity of the Prospect Creek storm (9 hour duration) coincided with the peak rainfall intensity from the Georges River storm (36 hour duration). The embedded storm approach adopted in the 2004 Prospect Creek Study yielded a similar outcome. This same philosophy was adopted in the current review for floods up to the 100 year event. The PMF was adjusted so that peak flows in Prospect Creek coincided with peak flood heights in the Georges River.

4.0 DESIGN FLOOD BEHAVIOUR

The TUFLOW model was used to generate flood conditions for the 20 year, 50 year, 100 year and PMF floods. A range of storm durations was included in each assessment, and maximum flood heights extracted. The critical storm duration for the 100 year flood ranged from 25 minutes or 2 hours in the upper catchment and smaller tributaries; 9 hours through the majority of the middle parts of the catchment; and 12 hours through the lower parts of the river (downstream of Vine Street).

TUFLOW can directly map the extent of flood inundation by producing a flood grid of 'wet' cells. The grid size in the Prospect Creek TUFLOW model is 10m, which results in a fairly coarse representation of the extent of flooding. To improve this resolution, each flood grid was extrapolated across the floodplain and then subtracted from the surface DEM to define the extent of flooding more precisely. This approach led to an improved mapping resolution of 2m (horizontally).

Maps showing the extent of flood inundation and flood level contours for the 20 year, 50 year, 100 year and PMF floods are included on Figures A3 to A6. The floodplain has further been delineated into three flood risk precincts (high, medium and low).

All mapping has been provided to Council as A1 hard copy plans and in digital format for inclusion in their GIS computer system. Additionally, flood data has been extracted for each property within the floodplain and assigned to Council's cadastre database.

Comparison of the revised flood level estimates with those previously adopted by Council indicates that:

- There is little difference in design flood levels in the lower reaches of Prospect Creek (downstream of Vine Street) due to the dominant influence of tailwater levels from the Georges River;
- New estimates upstream of Vine Street have generally been reduced by between 0.1 to 0.2m for floods up to the 100 year event, due mainly to a reduction of design flows;
- Some localised regions have seen flood level increases of up to 0.2m for floods up to the 100 year event, due to consideration of shorter duration floods on tributary creeks and other changes to the model including re-calibration;
- The extent of flooding in the PMF has not varied significantly;
- On a property basis, flood levels for the 100 year flood have:
  - remained the same (within ±0.1m) for 1,056 properties (53%);
  - reduced by more than 0.1m for 693 properties (35%); and
  - increased by more than 0.1m for 251 properties (12%).
- On a property basis, an additional 190 properties (2.5%) will include a flood notation that it is affected by the PMF (ie a low flood risk) where previously no flood notation would have been provided. Some properties may no longer receive a flood notification.

5.0 REFERENCES

Public Works Department, 1990, "Georges River Flood Study"

Willing & Partners, 1990, "Lower Prospect Creek Floodplain Management Study"

Willing & Partners, 1993, "Upper Prospect Creek Floodplain Management Study"

Cardno Willing, 2004, "Review of Prospect Creek Flood Levels"

FIGURES

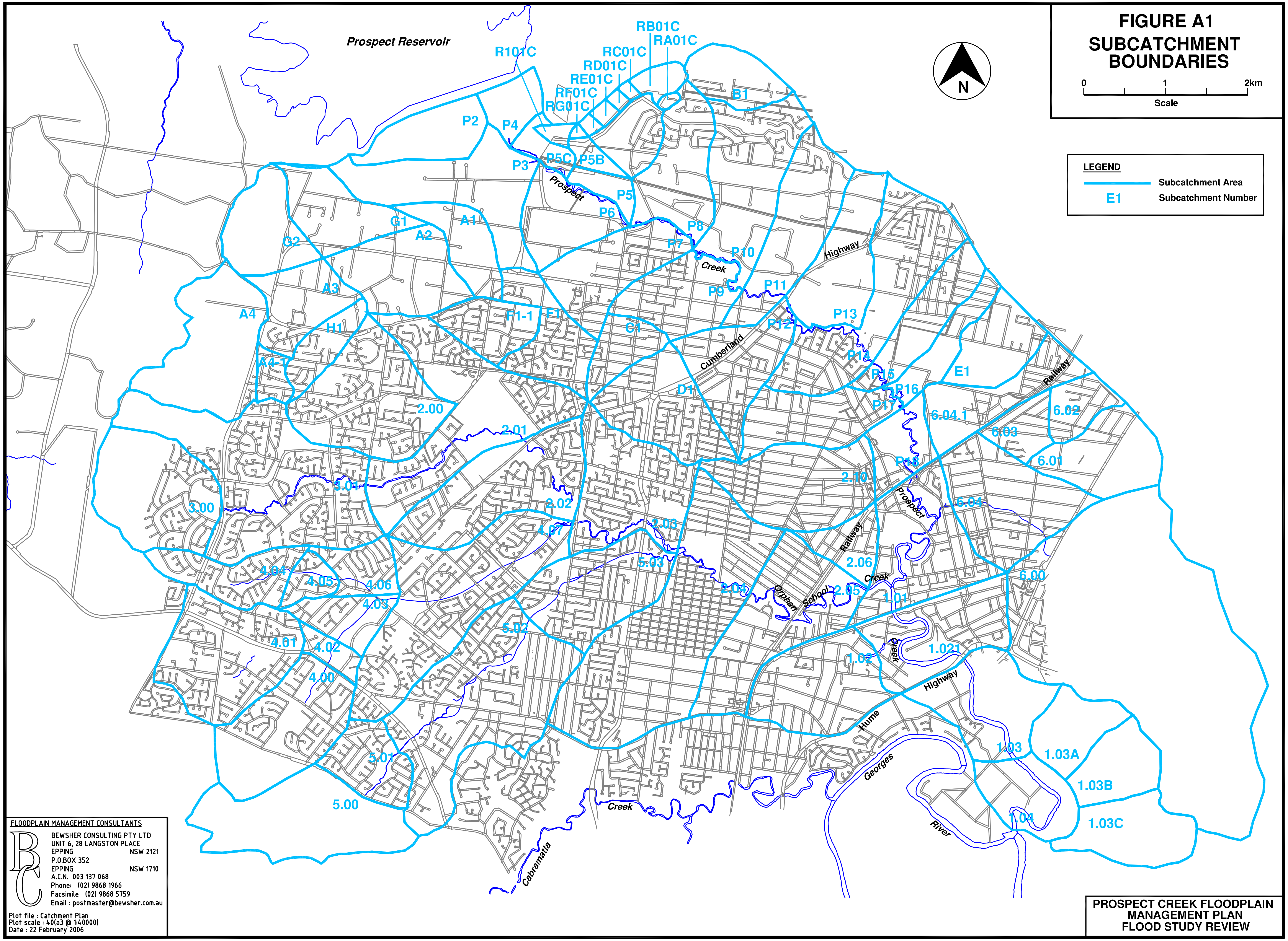


FIGURE A1
SUBCATCHMENT BOUNDARIES

LEGEND

(line)	Subcatchment Area
E1	Subcatchment Number

FLOODPLAIN MANAGEMENT CONSULTANTS

BEWSHER CONSULTING PTY LTD
UNIT 6, 28 LANGSTON PLACE
EPPING NSW 2121
P.O.BOX 352
EPPING NSW 1710
A.C.N. 003 137 068
Phone: (02) 9868 1966
Facsimile (02) 9868 5759
Email : postmaster@bewsher.com.au

Plot file : Catchment Plan
Plot scale : 40(a3 @ 1:40000)
Date : 22 February 2006

PROSPECT CREEK FLOODPLAIN MANAGEMENT PLAN FLOOD STUDY REVIEW


FIGURE A2
'TUFLOW' MODEL
CALIBRATION
TO JANUARY 2001 FLOOD
0
0.5
1km
N
Legend
January 2001 computed flood extents
0.07 Computed level - Observed level
0.07 Computed level within ±0.2m
-0.23 Computed level <0.2m (too low)
0.22 Computed level >0.2m (too high)
-0.98 Observed level considered unreliable
Prospect Reservoir
Limit of Mapping
Prospect
Creek
Orphan
School
Creek
Georges
River
FLOODPLAIN MANAGEMENT CONSULTANTS
BEWSHER CONSULTING PTY LTD
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A.C.N. 003 137 068
Phone: (02) 9868 1966
Facsimile (02) 9868 5759
Email : postmaster@bewsher.com.au
Plot file : J1305-model calibration
Plot scale : 15 (a1 @ 1:15000)
Date : 22 February 2006
PROSPECT CREEK FLOODPLAIN
MANAGEMENT PLAN
FLOOD STUDY REVIEW


FIGURE A3
20 YEAR FLOOD LEVEL
CONTOURS AND EXTENTS
N
0
0.5
1km
Legend
20 year flood extents
22
20 year flood contour (1 metre interval)
20 year flood contour (0.1 metre interval)
Prospect Reservoir
Limit of Mapping
Prospect
Creek
Prospect
Creek
Orphan
School
Creek
Limit of Mapping
Limit of Mapping
Creek
Prospect
Limit of Mapping
Creek
Georges
River
FLOODPLAIN MANAGEMENT CONSULTANTS
BEWSHER CONSULTING PTY LTD
UNIT 6, 28 LANGSTON PLACE
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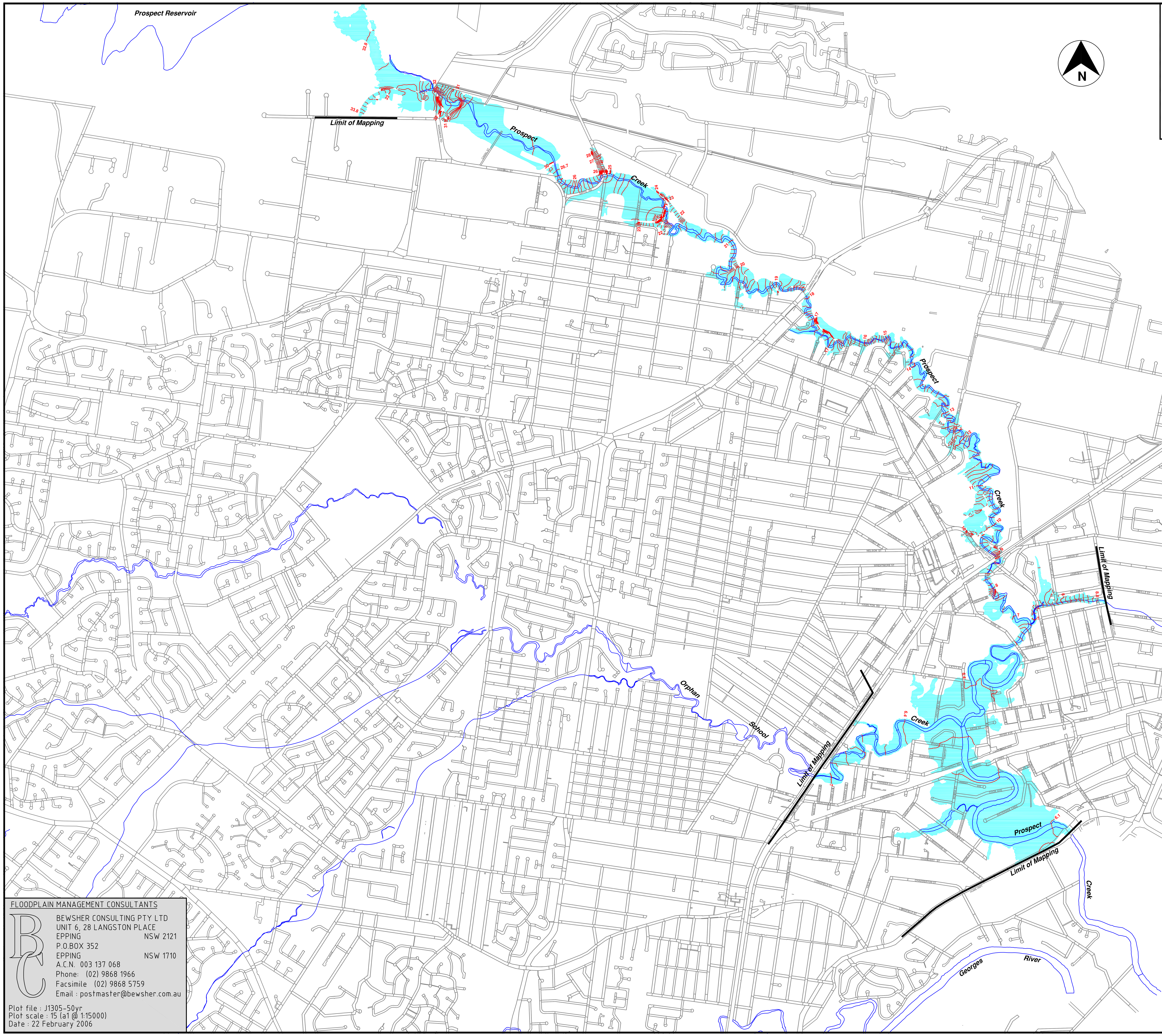
EPPING NSW 1710
A.C.N. 003 137 068
Phone: (02) 9868 1966
Facsimile (02) 9868 5759
Email : postmaster@bewsher.com.au
Plot file : J1305-20yr
Plot scale : 15 (a1 @ 1:15000)
Date : 22 February 2006
PROSPECT CREEK FLOODPLAIN
MANAGEMENT PLAN
FLOOD STUDY REVIEW

FIGURE A4
50 YEAR FLOOD LEVEL CONTOURS AND EXTENTS



Legend

- 50 year flood extents
- 22 — 50 year flood contour (1 metre interval)
- 50 year flood contour (0.1 metre interval)

FLOODPLAIN MANAGEMENT CONSULTANTS

BEWSHER CONSULTING PTY LTD
UNIT 6, 28 LANGSTON PLACE
EPPING NSW 2121
P.O.BOX 352
EPPING NSW 1710
A.C.N. 003 137 068
Phone: (02) 9868 1966
Facsimile (02) 9868 5759
Email : postmaster@bewsher.com.au

Plot file : J1305-50yr
Plot scale : 15 (a1 @ 1:15000)
Date : 22 February 2006

PROSPECT CREEK FLOODPLAIN MANAGEMENT PLAN
FLOOD STUDY REVIEW

FIGURE A5
100 YEAR FLOOD LEVEL
CONTOURS AND EXTENTS
0
0.5
1km
N
Legend
100 year flood extents
22
100 year flood contour (1 metre interval)
100 year flood contour (0.1 metre interval)
Prospect Reservoir
Limit of Mapping
Prospect
Creek
Prospect
Creek
Limit of Mapping
Orphan
School
Creek
Limit of Mapping
Creek
Prospect
Limit of Mapping
Creek
Georges
River
FLOODPLAIN MANAGEMENT CONSULTANTS
BEWSHER CONSULTING PTY LTD
UNIT 6, 28 LANGSTON PLACE
EPPING NSW 2121
P.O.BOX 352
EPPING NSW 1710
A.C.N. 003 137 068
Phone: (02) 9868 1966
Facsimile (02) 9868 5759
Email : postmaster@bewsher.com.au
Plot file : J1305-100yr
Plot scale : 15 (a1 @ 1:15000)
Date : 22 February 2006
PROSPECT CREEK FLOODPLAIN
MANAGEMENT PLAN
FLOOD STUDY REVIEW

FIGURE A6
PROBABLE MAXIMUM FLOOD LEVEL CONTOURS AND EXTENTS

FLOODPLAIN MANAGEMENT CONSULTANTS
BEWSHER CONSULTING PTY LTD
UNIT 6, 28 LANGSTON PLACE
EPPING NSW 2121
P.O.BOX 352
EPPING NSW 1710
A.C.N. 003 137 068
Phone: (02) 9868 1966
Facsimile (02) 9868 5759
Email : postmaster@bewsher.com.au

Plot file : J1305-pmf
Plot scale : 15 (a1 @ 1:15000)
Date : 22 February 2006

PROSPECT CREEK FLOODPLAIN MANAGEMENT PLAN
FLOOD STUDY REVIEW

APPENDIX B

Letter to Residents and Community Consultation Results

Fairfield City
Celebrating diversity

Fairfield City Council, Administration Centre, 86 Avoca Road, Wakeley 2176
Tel: (02) 9725 0222 Fax: (02) 9725 4249
All communications to:
Fairfield City Council, PO Box 21, Fairfield NSW 1860
Email address: mail@fairfieldcity.nsw.gov.au

In reply please quote: G03-28-002
Your Ref: Prospect Creek

Contact: Nilmini De Silva on 9725 0881

14 October 2002

SAMPLE
[illegible]
[illegible]
Wakeley NSW 2176

Dear Sir/Madam,

PROSPECT CREEK FLOOD STUDY

Prospect Creek has created a beautiful environment, but the very nature of the landscape leaves it prone to flooding. The recent floods in Europe, which were much larger than most people had ever experienced, should remind us all of the importance of being prepared for such risks. Significant floods have also occurred on the Georges River and in Prospect Creek in the 1980s, and in 1956, and much larger floods also occurred in the late 1800s.

Under the State Government's new Floodplain Management Manual, Councils now have a responsibility to manage land that could be potentially affected by all floods, up to what is known as the "probable maximum flood". A flood study on Prospect Creek is currently underway, which will look at ways to manage the risk of flooding. **This letter has been sent to you because your property could be affected by flooding some time in the future.**

Fairfield City Council together with consultants are preparing this Study. Outcomes from the flood study as well as the floodplain management plan that will follow, will include:

- improved public awareness of flooding;
- improved flood warning times and evacuation procedures, thereby ensuring better security for our residents;
- an assessment of the impacts of recent development on flood conditions;
- an investigation of measures to reduce the flood risk;
- development of a strategic plan to manage the flood risk within the catchment.

The study will also categorise all land that could be at risk of flooding into three different flood risk areas (high, medium and low). Land above Council's previous standard (the 100 year flood), would generally be categorised as having a "low flood risk".

Council is now seeking the views of the community on how to manage land that may be subject to flooding. This is your opportunity to participate in the study. Please fill in the attached questionnaire and return it in the enclosed envelope (no stamp required). If you would like to attend the workshop planned for your area (see insert) or would like more information please contact Ms. Nilmini De Silva on 9725-0881.

Yours faithfully

S. Frost.

STEVE FROST
CATCHMENT MANAGEMENT CO-ORDINATOR

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Lower Prospect

Fairfield City Council
Prospect Creek Flood Study Review

Results from Community Survey

1. Introduction

Fairfield City Council is undertaking a review of the Prospect Creek Floodplain Management Study, and other floodplain management measures in general, within the Prospect Creek catchment.

As part of this review, a community survey was distributed to all residential and business owners with property located in the Prospect Creek catchment that could be potentially affected by flooding from Prospect Creek or its tributary creeks. The survey was distributed to some 5,800 residents during October 2002.

A total of 822 surveys were completed and returned to Council, which represents a response rate of just over 14%. The time and effort taken by all that responded to the survey is gratefully appreciated. Fairfield Council will be considering the response and other issues raised carefully, as floodplain management activities in Prospect Creek are reviewed.

Statistical results from the survey are included with this paper, with some of the pertinent points also summarised below.

2. Flood Experience

One third of respondents had previously experienced a flood on their property. Most of these people had experienced either the 1986 or 1988 floods. Slightly fewer referred to the January 2001 flood. This suggests that the 1986 and 1988 floods affected more people, and therefore were more severe, than the more recent 2001 flood. A few of the longer-term residents referred to the 1956 flood.

10% of respondents had experienced flooding above the floor level of their house. The average depth of water above floor level was just over 0.5m.

One third of respondents expect that their property could be flooded some time in the future. This is the same number as those that have experienced a previous flood. This suggests that only those people who have already experienced a flood on their property expect that they could be affected in the future (despite the fact that many residents may be relatively new to the area).

3. Opinions on Floodplain Management Measures

Few respondents (9%) were aware of floodplain management measures that Council had been considering in their area. Many more (31%) suggested floodplain management measures that they would like Council to consider. The most frequently suggested measures were:

(i)	Clean creek of rubbish, debris or vegetation	(97 times)
(ii)	Dredge or widen the creek	(45 times)
(iii)	Better maintenance of the creek corridor	(36 times)
(iv)	Better maintenance of stormwater drainage	(28 times)
(v)	Amplification of stormwater drainage	(25 times)
(vi)	Construction of levee banks	(23 times)
(vii)	Upstream basins, On-site detention or water tanks	(13 times)
(viii)	Better development controls on future development	(12 times)
(ix)	More public information about the flood risk	(9 times)
(x)	Increase the capacity of the creek	(7 times)

Many people (51%) thought that house raising was a good way to prevent flooding. However opinions on whether it looks good were varied (28% yes 32% no), and less people thought that it increased property values in an area (29% yes, 39% no).

4. Opinions on Development Controls

Many respondents (49%) believed that new development should be prohibited within the floodplain, whilst some (25%) disagreed. A slightly higher number (51%) thought that new development should be prohibited in the most dangerous parts of the floodplain, with fewer people (16%) disagreeing. The majority of people (59%) were in favour of development controls such as minimum floor levels.

There was reasonably high support (58% yes, 11% no) for Council advising of the possibility of flooding through the provision of a flood certificate. There was quite high support (63% yes, 6% no) for information on flooding to be provided on flood maps that could be inspected at Council. Other methods of informing of the possibility of flooding (through real estate agents, community education programs, flood action plans, and flood markers) also scored more than 50% approval.

5. Properties included in the Survey

Most properties included in the survey (73%) contain a house. Other properties largely comprise units, flats, apartments, villas or townhouses (16%).

The majority of property owners included in the survey are the residential owner of the property (78%).

The average length of time that the owner has resided at this property is 22 years. The average number of people per household within the survey group is 3.6.

6. Further Information

Just over half of the respondents to the survey (54%) would like to be included on a mailing list to be provided more information about the study. Fewer people would like to be involved through a community workshop (18%) or through Council's floodplain management committee (15%).

The preferred means of providing information to the public, and for getting feedback about proposals that could be considered, are as follows:

(i)	Articles in local newspapers	(54%)
(ii)	Mail outs to all residents in the study area	(50%)
(iii)	Formal Council meetings	(40%)
(iv)	Council's web site	(27%)
(v)	Public meetings	(22%)
(vi)	Community workshops	(18%)
(vii)	Open Days	(18%)

FAIRFIELD CITY COUNCIL
PROSPECT CREEK FLOOD STUDY
IMPORTANT COMMUNITY SURVEY

Fairfield City Council is conducting a new flood study on Prospect Creek. You have been sent this survey because you are a resident or business owner of the project study area.
This survey will help us find out the flood issues that are important to you.

Please place your completed survey in the postage paid envelope and return it.
No postage stamp is required.

Total Replies 822

FLOOD EXPERIENCE - Please tick the boxes

		Yes	No
1	**Have you ever experienced a flood at this property?**	32%	67%
2	**If yes, which flood?**	Yes	No
	August 1986	21%	10%
	April 1988	20%	9%
	January 2001	15%	12%
	Other (please specify) 5%		
3	**In the biggest flood you have experienced, did the water rise above your floor level?**	10%	66%

4 **If yes, how deep was the water in your house?**
average = 0.54 metres

If yes, how deep was the water covering your garden?
average = 0.75 metres (average)

In what year did this occur?
18% year

		Yes	No
5	**Do you expect your property to be flooded in the future?**	32%	61%
6	**If yes, what type of flooding do you expect?**	Yes	No
	garden flooding	30%	8%
	garages and out buildings	22%	8%
	flooding above floor level	9%	14%
7	**If you experienced flooding at your property what was damaged?**	Yes	No
	Carpets/kitchen cupboards/walls/tiles/power points	9%	18%
	Books/Photos	6%	15%
	Clothes/toys	6%	15%
	White goods/furniture	10%	13%
	Damage to fences/ gardens	20%	9%
	Damage to garages/outbuildings	14%	12%
	Damage to car	7%	13%
	Other (please specify) 7%		

FLOODPLAIN RISK MANAGEMENT MEASURES - Please tick the boxes

8 Are you aware of any works that Council has done to reduce flooding at your property or in your area?

	Yes	No
8 Are you aware of any works that Council has done to reduce flooding at your property or in your area?	27%	59%
If yes, answer the following:		
House built at specified level	10%	13%
House raised	12%	13%
Flood compatible materials used	6%	14%
Flood proofing measures installed	9%	14%
Area 'protected' by levees (flood wall)	14%	12%
Channel capacity enlarged by widening and/or dredging	17%	12%
Road raised to provide an evacuation route	4%	15%
Other (please specify) 5%		

	Yes	No
9 Are you aware of any works that Council has proposed that will reduce flooding at your property or in your area?	9%	75%
If yes, then answer the following:		
My house has been identified in Council's House Raising Program.	5%	12%
I propose to raise my house independently.	1%	12%
My house/unit has been identified in the flood proofing program.	3%	12%
A levee has been proposed for my area.	2%	12%
Channel widening and/or dredging works have been proposed.	6%	10%
Road raising works are proposed near my home for evacuation.	2%	11%
Other (please specify) 2%		

	Yes	No
10 Are there any other works that you think Council should consider to reduce the flooding problems at your property or in your area?	28%	47%
If yes, please specify 31%		

	Yes	No
11 Has your property been flood proofed? (Flood proofing - a combination of measures incorporated in the design, construction and alteration of buildings subject to to flooding to reduce or eliminate flood damages).	11%	73%

	Yes	No
12 The next set of questions relate to your opinions on flood proofing.		
Is it a good thing?	59%	10%
Do you like the look of it?	31%	15%
Do you think it minimises damages?	45%	8%

	Yes	No
13 The next set of questions relate to your opinions on house raising.		
Do you know what we mean by house raising?	61%	21%
Has your house been raised?	9%	68%
Do you think it looks good?	28%	32%
Is it a good way to prevent flooding?	51%	17%
Do you think it increases the property values in an area?	29%	39%
Have you seen a house that has been raised?	52%	21%
Do you think it is better to demolish & re build a house rather than raise it?	31%	31%

DEVELOPMENT CONTROLS - Please tick the boxes

14 These are some questions on Flood Policy.

	Yes	No
Are you aware that there is a new NSW Floodplain Management Manual?	12%	79%
Have you seen the NSW Floodplain Management Manual?	1%	84%
Are you aware that Council has a Flood Policy?	27%	58%
Have you seen it?	2%	83%

15 How should Council control development to reduce flood related risks?

	Yes	No
Stop new development on the flooplain?	49%	25%
Stop new development only in the most dangerous areas of the floodplain	51%	16%
Place limits on development such as minimum floor levels	59%	10%
Provide advice about the flood risk but let people choose how they would reduce flood damage	55%	14%

16 How should Council inform you about the possibility of flooding?

	Yes	No
Through a flood certificate	58%	11%
Through maps that are available in Council	63%	6%
Through the web site	43%	14%
Through real estate agents, when purchasing property	59%	10%
Through community education	52%	10%
Through a Flood Action Plan	55%	7%
By installing markers showing the levels of previous floods	58%	10%

YOUR PROPERTY - Please tick the boxes

17 What type of property do you live/own?

	Yes	No
House	73%	5%
Business	6%	18%
Villa/Townhouse	6%	18%
Unit/Flat/Apartment	10%	16%
Caravan	1%	19%
Vacant Land	0%	17%

Other (please specify) 3%

18 What is the ownership status of your property?

	Yes	No
Residential owner	78%	3%
Owner-operated business	6%	15%
Residential tenant	5%	15%
Tenant operated business	2%	15%

Other (please specify) 2%

19 How long have you owned, lived at or conducted business at this property?

avg = 21.69 years

20 How many people live in your house

avg = 3.63 people

21 What information about flooding have you already received about the property?

	Yes	No
No information at all	36%	37%
General advice from Council	18%	35%

Flood levels from Council	9%	39%
Viewed a Council Planning Certificate	7%	39%
Information from Real Estate Agent	9%	39%
Information from relatives, neighbours, friends or the previous owner	18%	29%
Experienced flood myself	18%	24%
Other (please specify) 4%		

INFORMATION - Please tick the boxes

22 How would you like to become more involved in this project?

	Yes	No
Please put me on your mailing list	54%	22%
Through community workshops to be held later on in the study.	18%	28%
Through the Floodplain Management Committee	15%	29%
Other (please specify) 2%		

23 What do you think is the best way for us to continue to get information to you & feedback from you about the proposals from the Prospect Creek flood study?

	Yes	No
Council's website	27%	18%
Articles in local newspaper	54%	8%
Open days or drop-in days	18%	19%
Community workshops	18%	19%
Public meetings	22%	18%
At formal Council meetings	40%	16%
Mail outs to all residents in study area	50%	5%
Other (please specify) 2%		

24 If you would like us to contact you, please provide your details below. (see privacy note at end)

Name: 46%
Address: 46%
Phone (Home) 34% Best time: 24%
Phone (Work) 12% Best time: 9%
Mobile 11%
Fax No. 7%
Email: 9%
Are you a member of any local community group?
If yes, please specify: 6%

Thank you for being part of this study

Privacy Note: You can be assured that any personal details you give us are for use in this study only and will not be shared with other organisations. Information provided in this survey will only be reported in an aggregate form.

For more information about the Prospect Creek Flood Study, please contact: Ms. Nilmini De Silva on 9725-0881.

APPENDIX C

FREQUENTLY ASKED QUESTIONS

(as distributed at community meetings)

FLOODPLAIN MANAGEMENT STUDIES

FREQUENTLY ASKED QUESTIONS

Why do flood levels change over time?

There is a chance that floods of various magnitudes will occur in the future. As the size of a flood increases, the chance that it will occur becomes rarer. Because some of these rare floods have never been experienced since European settlement, the height of future floodwaters is normally predicted using computer models. These computer models simulate flood levels and velocities for a range of flood sizes and flood probabilities. Given the importance of estimating flood levels accurately, councils and the NSW Department of Land and Water Conservation (DLWC) engage experts to establish and operate the computer models.

From time to time the computer models are revised and predicted flood levels can change. The resultant change in flood levels however is normally very small. The reasons why the computer models are revised can include:

- new rainfall or ground topography information becomes available;
- new floods occur which provide additional data from which to fine-tune the models;
- better computer models become available as the science of flood modelling improves and computer capabilities increase; or
- flood mitigation works may have been carried out, or development within the catchment may have occurred, that was not previously simulated in the models.

How are these studies funded?

These types of studies are normally carried out under State Government guidelines and are funded on a 2:1 basis between the State Government and councils. This funding arrangement is also available for the construction of flood mitigation works.

My property is in a Low Flood Risk Precinct. What does this mean?

The classification of a ‘Low Flood Risk Precinct’ can differ slightly between councils. Generally it means that your property would not be inundated in a 100 year flood but still has a very slight risk of inundation from larger (i.e. rarer) floods.

If you are a residential property owner, there will be virtually no change to how you may develop your property. However, there may be controls on the location of essential services such as hospitals, evacuation centres, nursing homes and emergency services.

My property is in a Medium Flood Risk Precinct. What does this mean?

The classification of a 'Medium Flood Risk Precinct' can differ slightly between councils. Generally it means that your property is inundated in a 100 year flood, however conditions are not likely to be hazardous. If you are a residential property owner development controls will probably be similar to those that currently exist.

My property is in a High Flood Risk Precinct. What does this mean?

The classification of a 'High Flood Risk Precinct' can differ slightly between councils. Generally it means that your property will be inundated in a 100 year flood and that hazardous conditions may occur. This could mean that there would be a possible danger to personal safety, able bodied adults may have difficulty wading to safety, evacuation by trucks may be difficult, or there may be a potential for significant structural damage to buildings. This is an area of higher hazard where stricter controls may be applied.

Will my property value be altered if I am in a Flood Risk Precinct?

Any change in a council's classification of properties can have some impact on property values. Nevertheless, councils normally give due consideration to such impacts before introducing a system of flood risk classifications or any other classification system (e.g. bushfire risks, acid sulphate soil risk, etc). If your property is now classified as being in a Flood Risk Precinct, the real flood risks on your property have not changed, only its classification has altered. A prospective purchaser of your property could have previously discovered this risk if they had made enquiries themselves.

If you are in a Low Flood Risk Precinct, generally there will be no controls on normal residential type development. Previous valuation studies have shown that under these circumstances, your property values will not alter significantly over the long term. Certainly, when a new system of classifying flood risks is introduced, there may be some short-term effect, particularly if the development implications of the precinct classification are not understood properly. This should only be a short-term effect however until the property market understands that over the long-term, the Low Flood Risk Precinct classification will not change the way you use or develop your property.

Ultimately, however, the market determines the value of any residential property. Individual owners should seek their own valuation advice if they are concerned that the flood risk precinct categorisation may influence their property value.

My property was never classified as 'flood prone' or 'flood liable' before. Now it is in a Low Flood Risk Precinct. Why?

The State Government changed the meaning of the terms 'flood prone', 'flood liable' and 'floodplain' in 2001. Prior to this time, these terms generally related to land below the 100 year flood level. Now it is different. These terms now relate to all land that could possibly be inundated, up to an extreme flood known as the probable maximum flood (PMF). This is a very rare flood.

The reason the Government changed the definition of these terms was because there was always some land above the 100 year flood level that was at risk of being inundated in rarer and more extreme flood events. History has shown that these rarer flood events can and do happen (e.g. the 1990 flood in Nyngan, the November 1996 flood in Coffs Harbour, the August 1998 flood in Wollongong, the 1998 flood in Katherine, the 2002 floods in Europe, etc).

Will I be able to get house and contents insurance if my house is in a Flood Risk Precinct?

In contrast to the USA and many European countries, flood insurance is generally not available for residential property in Australia. Following the disastrous floods in Coffs Harbour in November 1996 and in Wollongong in August 1998, some insurance companies are now offering very limited flood cover. The most likely situation is that your insurer does not offer you flood cover. If limited flood cover is offered, the classification of your property within a Flood Risk Precinct is unlikely to alter the availability of cover. Obviously insurance policies and conditions may change over time or between insurance companies, and you should confirm the specific details of your situation with your insurer.

Will I be able to get a home loan if my land is in a Flood Risk Precinct?

Most banks and lending institutions do not account for flood risks when assessing home loan applications unless there is a very significant risk of flooding at your property. The system of Flood Risk Precinct classification will make it clear to all concerned, the nature of the flood risks. Under the previous system, if a prospective lending authority made appropriate enquiries, they would have identified the nature of the flood risk and considered it during assessment of home loan applications. As a result, it is not likely that the classification of your property within a Flood Risk Precinct will alter your ability to obtain a home loan. Nevertheless, property owners who are concerned about their ability to obtain a loan should clarify the situation with their own lending authority.

How have the flood risk maps been prepared?

Because some large and rare floods have often not been experienced since European settlement commenced, computer models are used to simulate the depths and velocities of major floods. These computer models are normally established and operated by flooding experts employed by local and state government authorities. Because of the critical importance of the flood level estimates produced by the models, such modelling is subjected to very close scrutiny before flood information is formally adopted by a council. Maps of flood risks (e.g. 'low', 'medium' and 'high') are prepared after consideration of such issues as:

- flood levels and velocities for a range of possible floods;
- ground levels;
- flood warning time and duration of flooding;
- suitability of evacuation and access routes; and
- emergency management during major floods.

What is the probable maximum flood (PMF)?

The PMF is the largest flood that could possibly occur. It is a very rare and improbable flood. Despite this, a number of historical floods in Australia have approached the magnitude of a PMF. Every property potentially inundated by a PMF will have some flood risk, even if it is very small. Under the State Government changes implemented during 2001, councils must now consider all flood risks, even these potentially small ones, when managing floodplains. As part of the State Government changes, the definitions of the terms 'flood liable', flood prone' and 'floodplain' have been changed to refer to land inundated by the PMF.

What is the 100 year flood?

A 100 year flood is the flood that will occur or be exceeded on average once every 100 years. It has a probability of 1% of occurring in any given year. If your area has had a 100 year flood, it is a fallacy to think you will need to wait another 99 years before the next flood arrives. Floods do not happen like that. Some parts of Australia have received a couple of 100 year floods in one decade. On average, if you live to be 70 years old, you have a better than even chance of experiencing a 100 year flood.

Why do councils prepare floodplain management studies and plans?

Under NSW legislation, councils have the primary responsibility for management of development within floodplains. To appropriately manage development, councils need a strategic plan which considers the potential flood risks and balances these against the beneficial use of the floodplain by development. To do this, councils have to consider a range of environmental, social, economic, financial and engineering issues. This is what happens in a floodplain management study. The outcome of the study is the floodplain management plan, which details how best to manage flood risks in the floodplain for the foreseeable future.

Floodplain management plans normally comprise a range of works and measures such as:

- improvements to flood warning and emergency management;
- works (e.g. levees or detention basins) to protect existing development;
- voluntary purchase or house raising of severely flood-affected houses;
- planning and building controls to ensure future development is compatible with the flood risks; and
- measures to raise the community's awareness of flooding so that they are better able to deal with the flood risks they face.

Will the Flood Risk Precinct maps be changed?

Yes. All mapping undertaken by council is subjected to ongoing review. As these reviews take place, it is conceivable that changes to the mapping will occur, particularly if new flood level information or ground topography information becomes available. However, this is not expected to occur very often and the intervals between revisions to the maps would normally be many years. Many councils have a policy of reviewing and updating floodplain management studies and plans about every five years. This is the likely frequency at which the maps may be amended.

APPENDIX D

List of Property Eligible for Voluntary House Raising and Voluntary Purchase

Note: The majority of surveyed floor levels were provided from field survey by Fairfield City Council during 2005, whilst some others were extracted from previous reports. Floor levels should be confirmed prior to proceeding with action on any individual property.

Property Eligible for Inclusion in the Voluntary House Raising Scheme

Area	Property Address			Legal Description			Status	Surveyed	Maximum flood level on property				Flood Risk Precints over property				Revised
	No.	Street	Suburb	Lot No.	Sec	DP		Floor Level	PMF	100 Year	50 Year	20 Year	High Risk	Med Risk	Low Risk	No Risk	Category
Northern	7	Artie St	Carramar	7		9049	VHR - Pending	6.46	10.8	6.7	6.4	6.0	1	1	0	0	HR-1
Northern	8	Artie St	Carramar	11		558990	VHR - Pending	6.16	10.8	6.6	6.3	5.9	1	0	0	0	HR-2
Northern	3	Benson St	Carramar	2		27510	VHR - Pending	6.57	10.8	6.7	6.3	0.0	0	1	0	0	HR-1
Northern	5	Benson St	Carramar	3		27510	VHR - Pending	6.665	10.8	6.7	6.3	0.0	0	1	0	0	HR-1
Northern	20	Bland St	Carramar	37		12955	VHR - Pending	6.405	10.8	6.7	0.0	0.0	0	1	1	0	HR-1
Northern	27	Bland St	Carramar	64		12955	VHR - Pending	6.665	10.8	6.7	6.4	6.0	1	1	1	0	HR-1
Northern	28	Bland St	Carramar	41		12955	VHR - Pending	6.645	10.8	6.7	6.4	0.0	0	1	1	0	HR-1
Northern	39	Bland St	Carramar	52		12955	VHR - Pending	6.63	10.8	6.7	6.4	6.0	0	1	0	0	HR-1
Northern	41	Bland St	Carramar	51		12955	VHR - Pending	6.565	10.8	6.7	6.4	6.0	0	1	0	0	HR-1
Northern	4	Haughton St	Carramar	8		16458	VHR - Pending	6.54	10.8	6.7	6.4	6.0	0	1	0	0	HR-1
Northern	6	Haughton St	Carramar	7		16458	VHR - Pending	6.52	10.8	6.7	6.4	6.0	0	1	0	0	HR-1
Northern	9	Haughton St	Carramar	2	J	4136	VHR - Pending	6.54	10.8	6.7	6.4	6.0	1	1	0	0	HR-1
Northern	101	Mitchell St	Carramar	49		12955	VHR - Pending	6.62	10.8	6.7	6.4	6.0	0	1	1	0	HR-1
Northern	103	Mitchell St	Carramar	50		12955	VHR - Pending	6.685	10.8	6.7	6.4	6.0	0	1	1	0	HR-1
Northern	108	Mitchell St	Carramar	17		9049	VHR - Pending	6.675	10.8	6.7	0.0	0.0	0	1	1	0	HR-1
Northern	43	North St	Fairfield	33		11658	VHR - Pending	6.395	10.8	6.7	6.4	6.0	0	1	0	0	HR-2
Northern	20	Orchard Rd	Fairfield	52		11658	VHR - Pending	6.15	10.8	6.7	6.4	6.0	1	1	0	0	HR-2
Northern	27	Orchard Rd	Fairfield	420		557798	VHR - Pending	5.16	10.8	6.7	6.4	6.0	1	1	1	0	HR-5
Northern	31	Orchard Rd	Fairfield	422		557798	VHR - Pending	5.67	10.8	6.7	6.4	6.0	1	0	0	0	HR-5
Northern	33	Orchard Rd	Fairfield	423		557798	VHR - Pending	6.03	10.8	6.7	6.4	6.0	1	0	0	0	HR-2
Northern	45	Orchard Rd	Fairfield	9		215608	VHR - Pending	5.97	10.8	6.7	6.4	6.0	1	0	0	0	HR-5
Northern	1	Riverview Rd	Fairfield	35A		379603	VHR - Pending	6.61	10.8	6.7	6.4	6.0	1	1	0	0	HR-1
Northern	3	Riverview Rd	Fairfield	36		11658	VHR - Pending	6.58	10.8	6.7	6.4	6.0	1	1	0	0	HR-1
Northern	5	Riverview Rd	Fairfield	37		11658	VHR - Pending	6.435	10.8	6.7	6.4	6.0	1	1	0	0	HR-1
Northern	7	Riverview Rd	Fairfield	38		11658	VHR - Pending	6.54	10.8	6.7	6.4	6.0	1	1	0	0	HR-1
Northern	9	Riverview Rd	Fairfield	39		11658	VHR - Pending	6.345	10.8	6.7	6.4	6.0	1	1	0	0	HR-2
Northern	11	Riverview Rd	Fairfield	40		11658	VHR - Pending	6.485	10.8	6.7	6.4	6.0	0	1	0	0	HR-1
Northern	14	Riverview Rd	Fairfield	64		11658	VHR - Pending	6.465	10.8	6.7	6.4	6.0	1	1	0	0	HR-1
Northern	19	Riverview Rd	Fairfield	44		11658	VHR - Pending	6.13	10.8	6.7	6.4	6.0	1	1	0	0	HR-2
Northern	23	Riverview Rd	Fairfield	46		11658	VHR - Pending	5.82	10.8	6.7	6.4	6.0	1	0	0	0	HR-5
Northern	28	Riverview Rd	Fairfield	71		11658	VHR - Pending	6.36	10.8	6.7	6.4	6.0	1	1	0	0	HR-2
Northern	30	Riverview Rd	Fairfield	72		11658	VHR - Pending	6.24	10.8	6.7	6.4	6.0	1	1	0	0	HR-2
Northern	33	Riverview Rd	Fairfield	A		417337	VHR - Pending	5.965	10.8	6.7	6.4	6.0	1	0	0	0	HR-5
Northern	34	Riverview Rd	Fairfield	74		11658	VHR - Pending	5.625	10.8	6.7	6.4	6.0	1	1	0	0	HR-5
Northern	46	Riverview Rd	Fairfield	80		11658	VHR - Pending	6.55	10.8	6.7	6.4	6.0	1	1	0	0	HR-1
Northern	48	Riverview Rd	Fairfield	81		11658	VHR - Pending	6.495	10.8	6.7	6.4	6.0	1	1	0	0	HR-1
Northern	52	Riverview Rd	Fairfield	83		11658	VHR - Pending	6.175	10.8	6.7	6.4	6.0	1	1	0	0	HR-2
Northern	54	Riverview Rd	Fairfield	84		11658	VHR - Pending	5.73	10.8	6.7	6.4	6.0	1	0	0	0	HR-5
Northern	58	Riverview Rd	Fairfield	2		546966	VHR - Pending	6.36	10.8	6.7	6.4	6.0	1	0	0	0	HR-2
Northern	2	Ruby St	Carramar	A		349320	VHR - Pending	6.565	10.8	6.7	6.4	6.0	1	1	0	0	HR-1
Northern	178	Sandal Cres	Carramar	187		9050	VHR - Pending	6.32	10.8	6.6	6.3	5.9	1	1	0	0	HR-1
Central	57	Beckenham St	Canley Vale	64		7183	VHR - Pending	5.77	10.7	6.5	6.1	5.7	1	1	0	0	HR-2
Central	64	Beckenham St	Canley Vale	D		369876	VHR - Pending	6.465	10.7	6.5	6.1	5.7	0	1	1	0	HR-1
Central	2	Bromley St	Canley Vale	5		316826	VHR - Pending	6.29	10.7	6.5	6.1	5.7	1	1	0	0	HR-1
Central	10	Charlotte Cres	Canley Vale	11		28447	VHR - Pending	6.2	10.7	6.5	6.2	5.7	1	1	1	0	HR-2
Central	3	Cook Ave	Canley Vale	22		10281	VHR - Pending	5.105	10.7	6.5	6.2	5.7	1	0	0	0	HR-5
Central	6	Cook Ave	Canley Vale	6		10281	VHR - Pending	5.505	10.7	6.5	6.2	5.7	1	0	0	0	HR-5
Central	9	Cook Ave	Canley Vale	25		10281	VHR - Pending	4.865	10.7	6.5	6.2	5.7	1	0	0	0	HR-5
Central	11	Cook Ave	Canley Vale	26		10281	VHR - Pending	5.07	10.7	6.5	6.2	5.7	1	0	0	0	HR-5
Central	15	Cook Ave	Canley Vale	28		10281	VHR - Pending	5.365	10.7	6.5	6.2	5.7	1	0	0	0	HR-5
Central	16	Cook Ave	Canley Vale	11		10281	VHR - Pending	6.18	10.7	6.5	6.2	5.7	1	0	0	0	HR-2
Central	17	Cook Ave	Canley Vale	29		10281	VHR - Pending	5.08	10.7	6.5	6.2	5.7	1	0	0	0	HR-5
Central	20	Cook Ave	Canley Vale	13		10281	VHR - Pending	5.49	10.7	6.5	6.2	5.7	1	0	0	0	HR-5
Central	22	Cook Ave	Canley Vale	14		10281	VHR - Pending	5.715	10.7	6.5	6.2	5.7	1	0	0	0	HR-2
Central	4	Fraser Rd	Canley Vale	4		11445	VHR - Pending	5.915	10.7	6.5	6.2	5.7	1	0	0	0	HR-2
Central	14	Fraser Rd	Canley Vale	1		339857	VHR - Pending	6.16	10.8	6.5	6.2	5.7	1	1	0	0	HR-2
Central	16	Fraser Rd	Canley Vale	C		369832	VHR - Pending	6.42	10.8	6.5	6.2	5.7	1	1	0	0	HR-1
Central	2	Moore St	Canley Vale	4		25921	VHR - Pending	4.69	10.7	6.6	6.2	5.8	1	0	0	0	HR-5
Central	4	Moore St	Canley Vale	2		25921	VHR - Pending	6.115	10.7	6.5	6.2	5.8	1	0	0	0	HR-2

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Area	Property Address			Legal Description			Status	Surveyed	Maximum flood level on property				Flood Risk Precints over property				Revised
	No.	Street	Suburb	Lot No.	Sec	DP		Floor Level	PMF	100 Year	50 Year	20 Year	High Risk	Med Risk	Low Risk	No Risk	Category
Central	9	Moore St	Canley Vale	6		11445	VHR - Pending	5.33	10.7	6.5	6.2	5.7	1	0	0	0	HR-5
Central	10	Moore St	Canley Vale	3		579656	VHR - Pending	5.765	10.7	6.5	6.2	5.7	1	0	0	0	HR-2
Central	11	Moore St	Canley Vale	7		11445	VHR - Pending	5.565	10.7	6.5	6.2	5.7	1	0	0	0	HR-5
Central	14	Moore St	Canley Vale	2		10281	VHR - Pending	5.785	10.7	6.5	6.2	5.7	1	0	0	0	HR-2
Central	15	Moore St	Canley Vale	8		11445	VHR - Pending	5.51	10.7	6.5	6.2	5.7	1	0	0	0	HR-5
Central	20	Moore St	Canley Vale	16		10281	VHR - Pending	5.19	10.7	6.5	6.2	5.7	1	0	0	0	HR-5
Central	22	Moore St	Canley Vale	17		10281	VHR - Pending	5.975	10.7	6.5	6.2	5.7	1	0	0	0	HR-2
Central	24	Moore St	Canley Vale	18		10281	VHR - Pending	5.02	10.7	6.5	6.2	5.7	1	0	0	0	HR-5
Central	28	Moore St	Canley Vale	1		559115	VHR - Pending	6.25	10.7	6.5	6.1	5.7	1	0	0	0	HR-1
Central	34	Moore St	Canley Vale	3		580382	VHR - Pending	5.145	10.7	6.5	6.1	5.7	1	0	0	0	HR-5
Central	5	Quest Ave	Carramar	X		404910	VHR - Pending	6.145	10.7	6.5	6.1	5.7	1	1	0	0	HR-1
Central	1	Ramsay St	Canley Vale	27		25921	VHR - Pending	6.02	10.7	6.5	6.2	5.7	1	0	0	0	HR-2
Central	1A	Ramsay St	Canley Vale	1		579656	VHR - Pending	5.93	10.7	6.5	6.2	5.7	1	0	0	0	HR-2
Central	1B	Ramsay St	Canley Vale	2		579656	VHR - Pending	5.625	10.7	6.5	6.2	5.7	1	0	0	0	HR-5
Central	2	Ramsay St	Canley Vale	2		511882	VHR - Pending	5.815	10.7	6.5	6.2	5.8	1	0	0	0	HR-2
Central	2A	Ramsay St	Canley Vale	5		25921	VHR - Pending	6.105	10.7	6.6	6.2	5.8	1	0	0	0	HR-2
Central	4	Ramsay St	Canley Vale	6		25921	VHR - Pending	6.48	10.7	6.6	6.2	5.8	1	0	0	0	HR-1
Central	5	Ramsay St	Canley Vale	25		25921	VHR - Pending	6.07	10.7	6.5	6.2	5.7	1	0	0	0	HR-2
Central	7	Ramsay St	Canley Vale	24		25921	VHR - Pending	6.1	10.7	6.5	6.2	5.7	1	0	0	0	HR-2
Central	8	Ramsay St	Canley Vale	8		25921	VHR - Pending	6.45	10.7	6.6	6.2	5.8	1	0	0	0	HR-1
Central	12	Ramsay St	Canley Vale	10		25921	VHR - Pending	6.33	10.7	6.6	6.2	5.8	1	0	0	0	HR-1
Central	15	Ramsay St	Canley Vale	20		25921	VHR - Pending	6.29	10.7	6.5	6.2	5.7	1	0	0	0	HR-1
Central	17	Ramsay St	Canley Vale	19		25921	VHR - Pending	6.325	10.7	6.5	6.2	5.7	1	0	0	0	HR-1
Central	18	Ramsay St	Canley Vale	13		25921	VHR - Pending	6.525	10.7	6.6	6.2	5.8	1	0	0	0	HR-1
Central	19	Ramsay St	Canley Vale	18		25921	VHR - Pending	6.1	10.7	6.5	6.2	5.7	1	0	0	0	HR-2
Central	20	Ramsay St	Canley Vale	14		25921	VHR - Pending	6.16	10.7	6.6	6.2	5.8	1	0	0	0	HR-2
Central	21	Ramsay St	Canley Vale	17		25921	VHR - Pending	6.06	10.7	6.5	6.2	5.7	1	0	0	0	HR-2
Central	22	Ramsay St	Canley Vale	15		25921	VHR - Pending	6.12	10.7	6.6	6.2	5.8	1	0	0	0	HR-2
Central	23	Ramsay St	Canley Vale	16		25921	VHR - Pending	5.98	10.7	6.5	6.2	5.7	1	0	0	0	HR-2
Central	3	Ravenswood St	Canley Vale	1		1005706	VHR - Pending	5.94	10.7	6.5	6.1	5.7	1	1	0	0	HR-2
Central	4	Ravenswood St	Canley Vale	4		616922	VHR - Pending	5.76	10.7	6.5	6.1	5.7	1	0	0	0	HR-2
Central	16	Ravenswood St	Canley Vale	3		504555	VHR - Pending	6.295	10.7	6.5	6.1	5.7	1	1	1	0	HR-1
Central	16	Waterside Cres	Carramar	1		205244	VHR - Pending	5.615	10.7	6.5	6.1	5.7	1	1	0	0	HR-5
Central	17	Waterside Cres	Carramar	9		11548	VHR - Pending	6.46	10.7	6.5	6.2	5.8	1	1	0	0	HR-1
Central	18	Waterside Cres	Carramar	2		205244	VHR - Pending	5.95	10.7	6.5	6.1	5.7	1	1	0	0	HR-2
Central	20	Waterside Cres	Carramar	72		19311	VHR - Pending	6.135	10.7	6.5	6.1	5.7	1	0	0	0	HR-1
Central	21	Waterside Cres	Carramar	27		13022	VHR - Pending	6.285	10.7	6.5	6.2	5.8	1	1	0	0	HR-1
Central	23	Waterside Cres	Carramar	28		13022	VHR - Pending	6.49	10.7	6.5	6.2	5.8	1	1	0	0	HR-1
Central	25	Waterside Cres	Carramar	29		13022	VHR - Pending	6.18	10.7	6.5	6.2	5.8	1	1	0	0	HR-2
Central	27	Waterside Cres	Carramar	30		13022	VHR - Pending	6.11	10.7	6.5	6.2	5.8	1	1	0	0	HR-2
Central	29	Waterside Cres	Carramar	1		19311	VHR - Pending	6.035	10.7	6.5	6.2	5.8	1	1	0	0	HR-2
Central	31	Waterside Cres	Carramar	2		19311	VHR - Pending	5.99	10.7	6.5	6.2	5.8	1	1	0	0	HR-2
Central	33	Waterside Cres	Carramar	3		19311	VHR - Pending	6.035	10.7	6.5	6.2	5.8	1	1	0	0	HR-2
Central	39	Waterside Cres	Carramar	6		19311	VHR - Pending	5.77	10.7	6.5	6.2	5.8	1	0	0	0	HR-5
Central	41	Waterside Cres	Carramar	7		19311	VHR - Pending	5.825	10.7	6.5	6.2	5.8	1	0	0	0	HR-2
Central	42	Waterside Cres	Carramar	61		19311	VHR - Pending	5.38	10.7	6.5	6.1	5.7	1	0	0	0	HR-5
Central	44	Waterside Cres	Carramar	60		19311	VHR - Pending	5.51	10.7	6.5	6.1	5.7	1	0	0	0	HR-5
Central	47	Waterside Cres	Carramar	10		19311	VHR - Pending	5.62	10.7	6.5	6.2	5.8	1	0	0	0	HR-5
Central	48	Waterside Cres	Carramar	58		19311	VHR - Pending	5.56	10.7	6.5	6.1	5.7	1	0	0	0	HR-5
Central	52	Waterside Cres	Carramar	56		19311	VHR - Pending	5.215	10.7	6.5	6.1	5.7	1	0	0	0	HR-5
Central	53-55	Waterside Cres	Carramar	14		19311	VHR - Pending	5.73	10.7	6.5	6.2	5.7	1	0	0	0	HR-2
Central	57	Waterside Cres	Carramar	15		19311	VHR - Pending	5.715	10.7	6.5	6.2	5.7	1	0	0	0	HR-2
Central	61	Waterside Cres	Carramar	17		19311	VHR - Pending	6.215	10.7	6.5	6.2	5.7	1	0	0	0	HR-1
Central	62	Waterside Cres	Carramar	51		19311	VHR - Pending	5.215	10.7	6.5	6.1	5.7	1	0	0	0	HR-5
Central	65	Waterside Cres	Carramar	19		19311	VHR - Pending	5.685	10.7	6.5	6.2	5.7	1	0	0	0	HR-5
Central	67	Waterside Cres	Carramar	20		19311	VHR - Pending	5.715	10.7	6.5	6.2	5.7	1	0	0	0	HR-2
Central	69	Waterside Cres	Carramar	21		19311	VHR - Pending	5.59	10.7	6.5	6.2	5.7	1	0	0	0	HR-5
Central	8	Wilde St	Carramar	12		11548	VHR - Pending	6.13	10.7	6.5	6.1	0.0	0	1	0	0	HR-1

Property Eligible for Inclusion in the Voluntary House Raising Scheme

Area	Property Address			Legal Description			Status	Surveyed	Maximum flood level on property				Flood Risk Precints over property				Revised
	No.	Street	Suburb	Lot No.	Sec	DP		Floor Level	PMF	100 Year	50 Year	20 Year	High Risk	Med Risk	Low Risk	No Risk	Category
Southern	2A	Day St	Lansvale	E		16606	VHR - Pending	5.01	10.7	6.5	6.1	5.5	1	0	0	0	HR-5
Southern	14	Day St	Lansvale	12		28221	VHR - Pending	6.3	10.6	6.5	6.1	5.6	1	0	0	0	HR-1
Southern	16	Day St	Lansvale	11		28221	VHR - Pending	6.09	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	18	Day St	Lansvale	10		28221	VHR - Pending	5.7	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	28	Day St	Lansvale	8		28221	VHR - Pending	5.13	10.6	6.5	6.1	5.6	1	0	0	0	HR-5
Southern	30	Day St	Lansvale	7		28221	VHR - Pending	5.8	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	32	Day St	Lansvale	6		28221	VHR - Pending	5.88	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	34	Day St	Lansvale	5		28221	VHR - Pending	5.96	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	36	Day St	Lansvale	4		28221	VHR - Pending	6.06	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	38	Day St	Lansvale	3		28221	VHR - Pending	6.1	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	40	Day St	Lansvale	2		28221	VHR - Pending	6.29	10.6	6.5	6.2	5.6	1	1	0	0	HR-1
Southern	42	Day St	Lansvale	1		28221	VHR - Pending	6.46	10.6	6.5	6.2	5.7	1	1	0	0	HR-1
Southern	3	Erna Ave	Lansvale	3		216060	VHR - Pending	5.91	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	4	Erna Ave	Lansvale	4		216060	VHR - Pending	5.78	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	5	Erna Ave	Lansvale	5		216060	VHR - Pending	5.78	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	2	Ferry Rd	Lansvale	3		203389	VHR - Pending	5.9	10.6	6.5	6.1	5.7	1	0	0	0	HR-2
Southern	3	Ferry Rd	Lansvale	7		12953	VHR - Pending	6.07	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	4	Ferry Rd	Lansvale	X		414774	VHR - Pending	6.17	10.6	6.5	6.1	5.7	1	0	0	0	HR-1
Southern	5	Ferry Rd	Lansvale	8		12953	VHR - Pending	5.46	10.6	6.5	6.1	5.7	1	0	0	0	HR-5
Southern	6	Ferry Rd	Lansvale	B		29725	VHR - Pending	5.92	10.6	6.5	6.1	5.7	1	0	0	0	HR-2
Southern	7	Ferry Rd	Lansvale	9		12953	VHR - Pending	6.16	10.6	6.5	6.1	5.7	1	0	0	0	HR-1
Southern	9	Ferry Rd	Lansvale	10		12953	VHR - Pending	5.54	10.6	6.5	6.1	5.7	1	0	0	0	HR-5
Southern	10	Ferry Rd	Lansvale	D		29725	VHR - Pending	5.75	10.6	6.5	6.1	5.7	1	0	0	0	HR-2
Southern	12	Ferry Rd	Lansvale	E		29725	VHR - Pending	5.63	10.6	6.5	6.1	5.7	1	0	0	0	HR-5
Southern	15	Ferry Rd	Lansvale	13		12953	VHR - Pending	5.94	10.6	6.5	6.1	5.7	1	0	0	0	HR-2
Southern	20	Ferry Rd	Lansvale	4		216603	VHR - Pending	6.3	10.6	6.6	6.3	5.8	1	0	0	0	HR-1
Southern	78	Hollywood Dr	Lansvale	41		28221	VHR - Pending	6.39	10.6	6.5	6.2	5.7	1	1	0	0	HR-1
Southern	80	Hollywood Dr	Lansvale	40		28221	VHR - Pending	6.41	10.6	6.5	6.1	5.7	1	1	0	0	HR-1
Southern	82	Hollywood Dr	Lansvale	39		28221	VHR - Pending	6.24	10.6	6.5	6.1	5.7	1	1	0	0	HR-1
Southern	86	Hollywood Dr	Lansvale	44		28221	VHR - Pending	5.69	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	88	Hollywood Dr	Lansvale	38		28221	VHR - Pending	6.29	10.6	6.5	6.1	5.7	1	0	0	0	HR-1
Southern	90	Hollywood Dr	Lansvale	37		28221	VHR - Pending	6.31	10.6	6.5	6.1	5.6	1	1	0	0	HR-1
Southern	92	Hollywood Dr	Lansvale	36		28221	VHR - Pending	6.4	10.6	6.5	6.1	5.6	1	1	0	0	HR-1
Southern	110	Hollywood Dr	Lansvale	29		28221	VHR - Pending	6.22	10.6	6.5	6.1	5.6	1	0	0	0	HR-1
Southern	111	Hollywood Dr	Lansvale	B		403560	VHR - Pending	6.38	10.6	6.5	6.1	5.6	1	1	0	0	HR-1
Southern	112	Hollywood Dr	Lansvale	28		28221	VHR - Pending	6.34	10.6	6.5	6.1	5.6	1	0	0	0	HR-1
Southern	113	Hollywood Dr	Lansvale	2		28481	VHR - Pending	6.1	10.6	6.5	6.1	5.6	1	1	0	0	HR-2
Southern	114	Hollywood Dr	Lansvale	27		28221	VHR - Pending	5.98	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	117	Hollywood Dr	Lansvale	4		28481	VHR - Pending	6.07	10.6	6.5	6.2	5.6	1	0	0	0	HR-2
Southern	119	Hollywood Dr	Lansvale	1		12953	VHR - Pending	6.5	10.6	6.5	6.1	5.6	1	0	0	0	HR-1
Southern	121	Hollywood Dr	Lansvale	2		12953	VHR - Pending	5.88	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	124	Hollywood Dr	Lansvale	7		205704	VHR - Pending	6.18	10.6	6.5	6.1	5.6	1	0	0	0	HR-1
Southern	126	Hollywood Dr	Lansvale	8		205704	VHR - Pending	6.15	10.6	6.5	6.1	5.6	1	0	0	0	HR-1
Southern	127	Hollywood Dr	Lansvale	4		12953	VHR - Pending	5.96	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	129	Hollywood Dr	Lansvale	5		12953	VHR - Pending	5.97	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	130	Hollywood Dr	Lansvale	10		205704	VHR - Pending	5.87	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	132	Hollywood Dr	Lansvale	11		205704	VHR - Pending	5.82	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	134	Hollywood Dr	Lansvale	12		205704	VHR - Pending	5.93	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	136	Hollywood Dr	Lansvale	13		205704	VHR - Pending	5.76	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	138	Hollywood Dr	Lansvale	14		205704	VHR - Pending	5.67	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	140	Hollywood Dr	Lansvale	15		205704	VHR - Pending	5.88	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	142	Hollywood Dr	Lansvale	16		205704	VHR - Pending	5.55	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	143	Hollywood Dr	Lansvale	11		584660	VHR - Pending	5.64	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	144	Hollywood Dr	Lansvale	17		205704	VHR - Pending	5.5	10.6	6.5	6.1	5.5	1	0	0	0	HR-5
Southern	145	Hollywood Dr	Lansvale	1		201015	VHR - Pending	5.53	10.6	6.5	6.1	5.6	1	0	0	0	HR-5
Southern	147	Hollywood Dr	Lansvale	2		201015	VHR - Pending	5.44	10.6	6.5	6.1	5.6	1	0	0	0	HR-5
Southern	148	Hollywood Dr	Lansvale	20		205704	VHR - Pending	4.96	10.6	6.5	6.1	5.5	1	0	0	0	HR-5
Southern	149	Hollywood Dr	Lansvale	3		201015	VHR - Pending	5.58	10.6	6.5	6.1	5.6	1	0	0	0	HR-5
Southern	16C	Knight St	Lansvale	4		238490	VHR - Pending	6	10.7	6.5	6.1	5.5	1	0	0	0	HR-2

Property Eligible for Inclusion in the Voluntary House Raising Scheme

Area	Property Address			Legal Description			Status	Surveyed	Maximum flood level on property				Flood Risk Precints over property				Revised
	No.	Street	Suburb	Lot No.	Sec	DP		Floor Level	PMF	100 Year	50 Year	20 Year	High Risk	Med Risk	Low RIsk	No Risk	Category
Southern	17	Knight St	Lansvale	8		21655	VHR - Pending	5.19	10.7	6.5	6.1	5.5	1	0	0	0	HR-5
Southern	22	Knight St	Lansvale	3		27786	VHR - Pending	5.48	10.7	6.5	6.1	5.5	1	0	0	0	HR-5
Southern	32	Knight St	Lansvale	2		508310	VHR - Pending	6.03	10.7	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	40	Knight St	Lansvale	42		13962	VHR - Pending	5.37	10.7	6.5	6.1	5.5	1	0	0	0	HR-5
Southern	67	Knight St	Lansvale	21		216060	VHR - Pending	3.49	10.6	6.5	6.1	5.5	1	0	0	0	HR-5
Southern	68	Knight St	Lansvale	44		216060	VHR - Pending	4.87	10.6	6.5	6.1	5.5	1	0	0	0	HR-5
Southern	69	Knight St	Lansvale	22		216060	VHR - Pending	5.66	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	77	Knight St	Lansvale	26		216060	VHR - Pending	6	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	100	Knight St	Lansvale	31		216060	VHR - Pending	5.51	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	102	Knight St	Lansvale	30		216060	VHR - Pending	5.6	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	104	Knight St	Lansvale	29		216060	VHR - Pending	5.95	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	2	Lucy Ave	Lansvale	8		216060	VHR - Pending	6.46	10.6	6.5	6.1	5.5	1	0	0	0	HR-1
Southern	3	Lucy Ave	Lansvale	9		216060	VHR - Pending	5.61	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	4	Lucy Ave	Lansvale	10		216060	VHR - Pending	5.59	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	5	Lucy Ave	Lansvale	11		216060	VHR - Pending	5.71	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	6	Lucy Ave	Lansvale	12		216060	VHR - Pending	5.83	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	3	Mena Ave	Lansvale	16		216060	VHR - Pending	6.09	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	4	Mena Ave	Lansvale	17		216060	VHR - Pending	5.7	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	6	Mena Ave	Lansvale	19		216060	VHR - Pending	5.55	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	3	Riverside Rd	Lansvale	15		12953	VHR - Pending	5.97	10.6	6.5	6.1	5.7	1	0	0	0	HR-2
Southern	4	Riverside Rd	Lansvale	24		12953	VHR - Pending	6.08	10.6	6.6	6.3	5.8	1	0	0	0	HR-2
Southern	5	Riverside Rd	Lansvale	16		12953	VHR - Pending	5.83	10.6	6.5	6.1	5.7	1	0	0	0	HR-2
Southern	7	Riverside Rd	Lansvale	17		12953	VHR - Pending	6.14	10.6	6.5	6.1	5.7	1	0	0	0	HR-1
Southern	8	Riverside Rd	Lansvale	22		12953	VHR - Pending	5.5	10.6	6.6	6.3	5.8	1	0	0	0	HR-5
Southern	11	Riverside Rd	Lansvale	6		28481	VHR - Pending	6.33	10.6	6.5	6.1	5.7	1	0	0	0	HR-1
Southern	12	Riverside Rd	Lansvale	20		12953	VHR - Pending	5.43	10.6	6.6	6.2	5.8	1	0	0	0	HR-5
Southern	13	Riverside Rd	Lansvale	7		28481	VHR - Pending	6.39	10.6	6.5	6.1	5.7	1	1	0	0	HR-1
Southern	14	Riverside Rd	Lansvale	19		12953	VHR - Pending	5.43	10.6	6.6	6.2	5.8	1	0	0	0	HR-5
Southern	18	Riverside Rd	Lansvale	16		28481	VHR - Pending	5.99	10.6	6.6	6.2	5.8	1	0	0	0	HR-2
Southern	22	Riverside Rd	Lansvale	14		28481	VHR - Pending	6.08	10.6	6.6	6.2	5.8	1	1	0	0	HR-2
Southern	24	Riverside Rd	Lansvale	13		28481	VHR - Pending	6.4	10.6	6.6	6.2	5.8	1	1	0	0	HR-1
Southern	5	Willis St	Lansvale	13		28221	VHR - Pending	5.93	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	6	Willis St	Lansvale	3		245607	VHR - Pending	4.25	10.6	6.6	6.0	5.5	1	0	0	0	HR-5
Southern	7	Willis St	Lansvale	14		28221	VHR - Pending	5.48	10.6	6.5	6.1	5.6	1	0	0	0	HR-5
Southern	13	Willis St	Lansvale	17		28221	VHR - Pending	6.02	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	15	Willis St	Lansvale	18		28221	VHR - Pending	6.29	10.6	6.5	6.1	5.6	1	0	0	0	HR-1
Southern	17	Willis St	Lansvale	19		28221	VHR - Pending	6.37	10.6	6.5	6.1	5.6	1	1	0	0	HR-1
Southern	19	Willis St	Lansvale	20		28221	VHR - Pending	6.45	10.6	6.5	6.1	5.6	1	1	0	0	HR-1
Southern	20	Willis St	Lansvale	7		13962	VHR - Pending	5.74	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	21	Willis St	Lansvale	21		28221	VHR - Pending	6.3	10.6	6.5	6.1	5.6	1	1	0	0	HR-1
Southern	22	Willis St	Lansvale	6		13962	VHR - Pending	5.8	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	23	Willis St	Lansvale	22		28221	VHR - Pending	6.11	10.6	6.5	6.1	5.6	1	0	0	0	HR-1
Southern	24	Willis St	Lansvale	5		13962	VHR - Pending	6.22	10.6	6.5	6.1	5.5	1	0	0	0	HR-1
Southern	25	Willis St	Lansvale	23		28221	VHR - Pending	6.1	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	26	Willis St	Lansvale	4		13962	VHR - Pending	6.26	10.6	6.5	6.1	5.5	1	0	0	0	HR-1
Southern	27	Willis St	Lansvale	24		28221	VHR - Pending	6.22	10.6	6.5	6.1	5.6	1	0	0	0	HR-1
Southern	28	Willis St	Lansvale	3		13962	VHR - Pending	6.12	10.6	6.5	6.1	5.5	1	0	0	0	HR-1
Southern	30	Willis St	Lansvale	2		13962	VHR - Pending	6.1	10.6	6.5	6.1	5.5	1	0	0	0	HR-2
Southern	32	Willis St	Lansvale	1		13962	VHR - Pending	6.06	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	34	Willis St	Lansvale	1		205704	VHR - Pending	6.04	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	36	Willis St	Lansvale	2		205704	VHR - Pending	6	10.6	6.5	6.1	5.6	1	0	0	0	HR-2
Southern	38	Willis St	Lansvale	3		205704	VHR - Pending	6.11	10.6	6.5	6.1	5.6	1	0	0	0	HR-1
Southern	40	Willis St	Lansvale	4		205704	VHR - Pending	6.16	10.6	6.5	6.1	5.6	1	0	0	0	HR-1
Southern	42	Willis St	Lansvale	5		205704	VHR - Pending	6.06	10.6	6.5	6.1	5.6	1	0	0	0	HR-2

Property Previously Included for Voluntary House Raising now Subject to Review

Area	Property Address			Legal Description			Status	Surveyed	Maximum flood level on property				Flood Risk Precints over property				Revised
	No.	Street	Suburb	Lot No.	Sec	DP		Floor Level	PMF	100 Year	50 Year	20 Year	High Risk	Med Risk	Low RIsk	No Risk	Category
Northern	3	Atkins Ave	Carramar	11		16458	VHR - Subject to review	6.865	10.8	6.7	6.4	6.0	1	1	0	0	N/A
Northern	5	Atkins Ave	Carramar	12		16458	VHR - Subject to review	6.9	10.8	6.7	6.4	6.0	1	1	0	0	N/A
Northern	1	Benson St	Carramar	1		27510	VHR - Subject to review	6.815	10.8	6.7	6.3	0.0	0	1	0	0	N/A
Northern	4	Benson St	Carramar	6		27510	VHR - Subject to review	6.755	10.8	6.7	6.3	0.0	0	1	0	0	N/A
Northern	6	Benson St	Carramar	5		27510	VHR - Subject to review	6.86	10.8	6.7	6.3	0.0	0	1	0	0	N/A
Northern	7	Benson St	Carramar	4		27510	VHR - Subject to review	6.875	10.8	6.7	6.3	0.0	0	1	0	0	N/A
Northern	2	Bland St	Carramar	1		12955	VHR - Subject to review	7.3	10.8	6.8	0.0	0.0	0	0	1	0	N/A
Northern	8	Bland St	Carramar	4		12955	VHR - Subject to review	7.34	10.8	6.7	0.0	0.0	0	1	1	0	N/A
Northern	10	Bland St	Carramar	5		12955	VHR - Subject to review	7.385	10.8	6.7	0.0	0.0	0	1	1	0	N/A
Northern	16	Bland St	Carramar	8		12955	VHR - Subject to review	7.33	10.8	6.8	0.0	0.0	0	0	1	0	N/A
Northern	23	Bland St	Carramar	66		12955	VHR - Subject to review	6.85	10.8	6.7	6.4	6.0	1	1	1	0	N/A
Northern	24	Bland St	Carramar	39		12955	VHR - Subject to review	6.835	10.8	6.7	0.0	0.0	0	1	1	0	N/A
Northern	25	Bland St	Carramar	65		12955	VHR - Subject to review	6.93	10.8	6.7	6.4	6.0	1	1	1	0	N/A
Northern	26	Bland St	Carramar	40		12955	VHR - Subject to review	6.87	10.8	6.7	6.4	0.0	0	1	1	0	N/A
Northern	35	Bland St	Carramar	54		12955	VHR - Subject to review	6.97	10.8	6.7	6.4	0.0	0	1	1	0	N/A
Northern	37	Bland St	Carramar	53		12955	VHR - Subject to review	6.845	10.8	6.7	6.4	0.0	0	1	0	0	N/A
Northern	10	Haughton St	Carramar	5		16458	VHR - Subject to review	6.905	10.8	6.7	6.4	6.0	0	1	0	0	N/A
Northern	12	May St	Fairfield	8	3	7761	VHR - Subject to review	8.19	10.9	7.0	6.7	6.3	1	1	1	0	N/A
Northern	99	Mitchell St	Carramar	48		12955	VHR - Subject to review	6.77	10.8	6.7	6.4	6.0	0	1	1	0	N/A
Northern	109	Mitchell St	Carramar	2		210454	VHR - Subject to review	6.795	10.8	6.7	6.4	0.0	0	1	0	0	N/A
Northern	112	Mitchell St	Carramar	15		9049	VHR - Subject to review	6.89	10.8	6.7	6.3	0.0	0	1	0	0	N/A
Northern	2	Riverview Rd	Fairfield	58		11658	VHR - Subject to review	6.805	10.8	6.7	6.4	6.0	1	1	0	0	N/A
Northern	22	Riverview Rd	Fairfield	68		11658	VHR - Subject to review	6.865	10.8	6.7	6.4	6.0	1	1	0	0	N/A
Northern	40	Riverview Rd	Fairfield	1		563805	VHR - Subject to review	6.8	10.8	6.7	6.4	5.9	1	1	0	0	N/A
Northern	42	Riverview Rd	Fairfield	78A		387187	VHR - Subject to review	6.83	10.8	6.7	6.4	5.9	1	1	0	0	N/A
Northern	44	Riverview Rd	Fairfield	79		11658	VHR - Subject to review	6.77	10.8	6.7	6.4	5.9	1	1	0	0	N/A
Northern	50	Riverview Rd	Fairfield	82		11658	VHR - Subject to review	6.71	10.8	6.7	6.4	6.0	1	1	0	0	N/A
Northern	99	Vine St	Fairfield	B		421667	VHR - Subject to review	7.55	10.8	6.7	6.4	6.0	1	1	1	0	N/A
Central	14	Charlotte Cres	Canley Vale	13		28447	VHR - Subject to review	6.53	10.7	6.5	6.2	5.7	1	1	1	0	N/A
Central	19	Waterside Cres	Carramar	10		11548	VHR - Subject to review	6.61	10.7	6.5	6.2	5.8	1	1	0	0	N/A

Vincent Crescent Voluntary House Raising - Urban Renewal Option

Area	Property Address			Legal Description			Status	Surveyed	Maximum flood level on property				Flood Risk Precints over property				Revised
	No.	Street	Suburb	Lot No.	Sec	DP		Floor Level	PMF	100 Year	50 Year	20 Year	High Risk	Med Risk	Low Risk	No Risk	Category
Vincent Crescent	1	Bonham St	Canley Vale	14		15023	VHR - Redevelopment	5.975	10.8	6.6	6.3	5.9	1	1	0	0	HR-2
Vincent Crescent	2	Bonham St	Canley Vale	41		15023	VHR - Redevelopment	6.01	10.8	6.6	6.3	5.9	1	1	0	0	HR-2
Vincent Crescent	3	Bonham St	Canley Vale	15		15023	VHR - Redevelopment	6.115	10.8	6.6	6.3	5.9	1	1	0	0	HR-2
Vincent Crescent	4	Bonham St	Canley Vale	40		15023	VHR - Redevelopment	6.41	10.8	6.6	6.3	5.9	1	1	0	0	HR-1
Vincent Crescent	5	Bonham St	Canley Vale	16		15023	VHR - Redevelopment	6.3	10.8	6.6	6.3	5.9	1	1	0	0	HR-2
Vincent Crescent	6	Bonham St	Canley Vale	39		15023	VHR - Redevelopment	6.595	10.8	6.6	6.3	5.9	1	1	1	0	HR-1
Vincent Crescent	7	Bonham St	Canley Vale	17		15023	VHR - Redevelopment	6.29	10.8	6.6	6.3	5.9	1	1	0	0	HR-2
Vincent Crescent	8	Bonham St	Canley Vale	38		15023	VHR - Redevelopment	6.525	10.8	6.6	6.3	5.9	0	1	1	0	HR-1
Vincent Crescent	9	Bonham St	Canley Vale	18		15023	VHR - Redevelopment	6.21	10.8	6.6	6.3	5.9	0	1	0	0	HR-2
Vincent Crescent	11	Bonham St	Canley Vale	19		15023	VHR - Redevelopment	6.18	10.8	6.6	6.3	5.9	0	1	0	0	HR-2
Vincent Crescent	13	Bonham St	Canley Vale	20		15023	VHR - Redevelopment	6.56	10.8	6.6	6.3	5.9	0	1	0	0	HR-1
Vincent Crescent	1	Togil St	Canley Vale	14		30996	VHR - Redevelopment	5.62	10.8	6.6	6.3	5.9	1	0	0	0	HR-5
Vincent Crescent	2	Togil St	Canley Vale	13		15023	VHR - Redevelopment	6.01	10.8	6.6	6.3	5.9	1	1	0	0	HR-2
Vincent Crescent	3	Togil St	Canley Vale	13		30996	VHR - Redevelopment	5.89	10.8	6.6	6.3	5.9	1	0	0	0	HR-5
Vincent Crescent	5	Togil St	Canley Vale	12		30996	VHR - Redevelopment	5.71	10.8	6.6	6.3	5.9	1	0	0	0	HR-5
Vincent Crescent	6	Togil St	Canley Vale	6		35126	VHR - Redevelopment	6.225	10.8	6.6	6.3	5.9	1	1	0	0	HR-2
Vincent Crescent	7	Togil St	Canley Vale	11		30996	VHR - Redevelopment	5.59	10.8	6.6	6.3	5.9	1	0	0	0	HR-5
Vincent Crescent	8	Togil St	Canley Vale	5		35126	VHR - Redevelopment	6.25	10.8	6.6	6.3	5.9	1	1	0	0	HR-2
Vincent Crescent	9	Togil St	Canley Vale	10		30996	VHR - Redevelopment	5.85	10.8	6.6	6.3	5.9	1	0	0	0	HR-5
Vincent Crescent	10	Togil St	Canley Vale	4		35126	VHR - Redevelopment	6.17	10.8	6.6	6.3	5.9	1	1	0	0	HR-2
Vincent Crescent	11	Togil St	Canley Vale	9		30996	VHR - Redevelopment	6.235	10.8	6.6	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	11A	Togil St	Canley Vale	8		30996	VHR - Redevelopment	6.235	10.8	6.6	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	12	Togil St	Canley Vale	3		35126	VHR - Redevelopment	6.03	10.8	6.6	6.3	5.9	1	1	0	0	HR-2
Vincent Crescent	14	Togil St	Canley Vale	2		35126	VHR - Redevelopment	6.04	10.8	6.6	6.3	5.9	1	1	0	0	HR-2
Vincent Crescent	15	Togil St	Canley Vale	A		445739	VHR - Redevelopment	6.33	10.8	6.6	6.3	5.9	1	0	0	0	HR-1
Vincent Crescent	17	Togil St	Canley Vale	7		30996	VHR - Redevelopment	6.63	10.8	6.6	6.3	5.9	1	0	0	0	HR-1
Vincent Crescent	19	Togil St	Canley Vale	6		30996	VHR - Redevelopment	6.515	10.8	6.6	6.3	5.9	1	0	0	0	HR-1
Vincent Crescent	23	Togil St	Canley Vale	4		30996	VHR - Redevelopment	6.315	10.8	6.6	6.3	5.9	1	0	0	0	HR-1
Vincent Crescent	25	Togil St	Canley Vale	3		30996	VHR - Redevelopment	6.45	10.8	6.6	6.3	5.9	1	0	0	0	HR-1
Vincent Crescent	3	Vincent Cres	Canley Vale	37		31897	VHR - Redevelopment	6.305	10.8	6.7	6.3	5.9	1	0	0	0	HR-1
Vincent Crescent	5	Vincent Cres	Canley Vale	38		31897	VHR - Redevelopment	6.44	10.8	6.7	6.3	5.9	1	0	0	0	HR-1
Vincent Crescent	6	Vincent Cres	Canley Vale	35		31897	VHR - Redevelopment	6.34	10.8	6.7	6.4	6.0	1	1	0	0	HR-2
Vincent Crescent	7	Vincent Cres	Canley Vale	39		31897	VHR - Redevelopment	6.48	10.8	6.7	6.3	5.9	1	0	0	0	HR-1
Vincent Crescent	9	Vincent Cres	Canley Vale	1		506747	VHR - Redevelopment	6.325	10.8	6.7	6.3	5.9	1	0	0	0	HR-1
Vincent Crescent	10	Vincent Cres	Canley Vale	33		31897	VHR - Redevelopment	5.83	10.8	6.7	6.4	6.0	1	1	0	0	HR-5
Vincent Crescent	11	Vincent Cres	Canley Vale	2		506747	VHR - Redevelopment	6.17	10.8	6.7	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	12	Vincent Cres	Canley Vale	32		31897	VHR - Redevelopment	6.42	10.8	6.7	6.4	6.0	1	1	0	0	HR-1
Vincent Crescent	13	Vincent Cres	Canley Vale	3		506747	VHR - Redevelopment	6.22	10.8	6.7	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	14	Vincent Cres	Canley Vale	31		31897	VHR - Redevelopment	6.44	10.8	6.7	6.4	6.0	1	1	0	0	HR-1
Vincent Crescent	15	Vincent Cres	Canley Vale	43		31897	VHR - Redevelopment	6.14	10.8	6.6	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	16	Vincent Cres	Canley Vale	30		31897	VHR - Redevelopment	6.14	10.8	6.7	6.4	6.0	1	1	0	0	HR-2
Vincent Crescent	17	Vincent Cres	Canley Vale	44		31897	VHR - Redevelopment	6.1	10.8	6.6	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	18	Vincent Cres	Canley Vale	29		31897	VHR - Redevelopment	6.235	10.8	6.7	6.4	6.0	1	0	0	0	HR-2
Vincent Crescent	19	Vincent Cres	Canley Vale	45		31897	VHR - Redevelopment	5.915	10.8	6.6	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	20	Vincent Cres	Canley Vale	28		31897	VHR - Redevelopment	6.46	10.8	6.7	6.4	6.0	1	0	0	0	HR-1
Vincent Crescent	21	Vincent Cres	Canley Vale	46		31897	VHR - Redevelopment	5.58	10.8	6.6	6.3	5.9	1	0	0	0	HR-5
Vincent Crescent	22	Vincent Cres	Canley Vale	27		31897	VHR - Redevelopment	6.56	10.8	6.7	6.3	6.0	1	0	0	0	HR-1
Vincent Crescent	23	Vincent Cres	Canley Vale	47		31897	VHR - Redevelopment	5.72	10.8	6.6	6.3	5.9	1	0	0	0	HR-5
Vincent Crescent	24	Vincent Cres	Canley Vale	26		31897	VHR - Redevelopment	6.23	10.8	6.7	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	26	Vincent Cres	Canley Vale	25		31897	VHR - Redevelopment	6.315	10.8	6.7	6.3	5.9	1	0	0	0	HR-1
Vincent Crescent	28	Vincent Cres	Canley Vale	24		31897	VHR - Redevelopment	6.13	10.8	6.7	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	30	Vincent Cres	Canley Vale	23		31897	VHR - Redevelopment	6.285	10.8	6.7	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	32	Vincent Cres	Canley Vale	22		31897	VHR - Redevelopment	6.15	10.8	6.7	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	34	Vincent Cres	Canley Vale	21		31897	VHR - Redevelopment	6.145	10.8	6.7	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	36	Vincent Cres	Canley Vale	20		31897	VHR - Redevelopment	5.93	10.8	6.7	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	38	Vincent Cres	Canley Vale	19		31897	VHR - Redevelopment	6.045	10.8	6.6	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	40	Vincent Cres	Canley Vale	18		31897	VHR - Redevelopment	6.02	10.8	6.6	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	42	Vincent Cres	Canley Vale	17		31897	VHR - Redevelopment	6.11	10.8	6.6	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	44	Vincent Cres	Canley Vale	16		31897	VHR - Redevelopment	6.03	10.8	6.6	6.3	5.9	1	0	0	0	HR-2
Vincent Crescent	46	Vincent Cres	Canley Vale	15		31897	VHR - Redevelopment	6.2	10.8	6.6	6.3	5.9	1	0	0	0	HR-2

Property Eligible for Inclusion in the Voluntary Purchase Program

Area	Property Address			Legal Description			Status	Surveyed	Maximum flood level on property				Flood Risk Precints over property				Revised
	No.	Street	Suburb	Lot No.	Sec	DP		Floor Level	PMF	100 Year	50 Year	20 Year	High Risk	Med Risk	Low RIsk	No Risk	Category
Northern	24	Orchard Rd	Fairfield	3		546966	VP - Pending	6.25	10.8	6.7	6.4	6.0	1	0	0	0	N/A
Northern	51	Orchard Rd	Fairfield	13		215608	VP - Pending	5.44	10.8	6.7	6.4	6.0	1	0	0	0	N/A
Northern	36	Riverview Rd	Fairfield	76		11658	VP - Pending	5.67	10.8	6.7	6.3	5.9	1	0	0	0	N/A
Central	26	Cook Ave	Canley Vale	1		12019	VP - Pending	5.7	10.7	6.5	6.2	5.8	1	0	0	0	N/A
Central	30	Cook Ave	Canley Vale	3		12019	VP - Pending	5.585	10.7	6.5	6.2	5.8	1	0	0	0	N/A
Central	34	Cook Ave	Canley Vale	5		12019	VP - Pending	5.78	10.7	6.5	6.2	5.8	1	0	0	0	N/A
Central	45	Cook Ave	Canley Vale	43		10281	VP - Pending	4.95	10.7	6.5	6.2	5.7	1	0	0	0	N/A
Central	73	Waterside Cres	Carramar	23		19311	VP - Pending	9999	10.7	6.5	6.2	5.7	1	0	0	0	N/A
Southern	1	Bindaree St	Lansvale	15	M	2151	VP - Pending	0	10.6	6.5	6.1	5.5	1	0	0	0	N/A
Southern	7	Bindaree St	Lansvale	A		312787	VP - Pending	0	10.6	6.5	6.1	5.5	1	0	0	0	N/A
Southern	13	Bindaree St	Lansvale	A		346923	VP - Pending	0	10.6	6.5	6.1	5.5	1	0	0	0	N/A
Southern	2	Day St	Lansvale	1		508310	VP - Pending	6.52	10.7	6.5	6.1	5.5	1	0	0	0	N/A
Southern	70	Knight St	Lansvale	1		245686	VP - Pending	4.35	10.6	6.5	6.1	5.5	1	0	0	0	N/A
Southern	72	Knight St	Lansvale	2		245686	VP - Pending	4.41	10.6	6.5	6.1	5.5	1	0	0	0	N/A
Southern	82	Knight St	Lansvale	41		216060	VP - Pending	4.16	10.6	6.5	6.1	5.5	1	0	0	0	N/A
Southern	88	Knight St	Lansvale	38		216060	VP - Pending	4.11	10.6	6.5	6.1	5.5	1	0	0	0	N/A
Southern	90	Knight St	Lansvale	37		216060	VP - Pending	5.69	10.6	6.5	6.1	5.5	1	0	0	0	N/A
Southern	96	Knight St	Lansvale	33		216060	VP - Pending	8.3	10.6	6.5	6.1	5.5	1	0	0	0	N/A
Southern		Rowley Point Rd	Lansvale	K	K	2151	VP - Pending	4.8	10.7	6.6	6.2	5.7	1	0	0	0	N/A
Southern	6	Willow Cl	Lansvale	6		244796	VP - Pending	6.23	10.6	6.6	6.3	5.8	1	0	0	0	N/A

APPENDIX E

Standard Recommended LEP Inclusions

DEFINITIONS

[To be inserted into the Dictionary of the Template LEP in alphabetical order}

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

Consideration could be given to expanding the definition to refer to flood liable land …."as identified on a map held in the office of Council as may be amended from time to time" or "as identified on a development control plan adopted by Council"

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

STANDARD CLAUSE

[To be inserted as Clause 5.13 in the LEP Template]

5.13 Development on Flood Liable Land

(1) The objective of this clause is to ensure that the risk to human life and damage to property due to flooding is appropriately managed by controlling development.

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

(3) Consent must not be granted to development on flood liable land unless the development:

- (a) is consistent with any floodplain risk management plan adopted by Council in accordance with any relevant Manual as published by the State Government;
- (b) is consistent with any development control plan adopted by Council to manage flood risks;
- (c) does not detrimentally increase the potential flood effect on other development or property;
- (d) will not result, to a substantial degree, in an increased risk to human life; and
- (e) is unlikely to result in additional economic and social cost which could not reasonably be managed by potentially affected persons and the general community.