AUBURN CITY COUNCIL

MANY CULTURES ONE COMMUNITY

Consistency with s.117 Direction 4.3 Flood Prone Land

Report to satisfy the Director General or delegate that the planning proposal is consistent with s.117 Direction 4.3 Flood Prone Land.

January, 2012

T006095/2013

CONTENTS

1. INTRODUCTION

1.1 Background – gateway determination for PP-3/2010

This report has been prepared in response to the conditions of a gateway determination issued by the NSW Department of Planning and Infrastructure (DP&I) on 28th November 2011(**appendix C**). The determination relates to a planning proposal (PP-3/2010) submitted by Auburn City Council seeking to increase the Floor Space Ratio (FSR) of certain land zoned R4 High Density Residential, or B4 Mixed Use (**Appendix D**). Condition 3 of the determination requires Council to demonstrate that the planning proposal be amended to sufficiently address Section 117 Direction 4.3 Flood Prone Land.

1.2 Section 117 Direction 4.3 Flood Prone Land

Parts of the land to which the planning proposal applies are affected by flooding. In particular, parts of the Lidcombe town centre and a small portion of Auburn are affected (see **figures 2, 3 & 4**). Some land in Berala is also minimally affected. All other land specified in the proposal is unaffected.

By seeking to increase the floor space ratio in a flood planning area, and thereby increasing the potential for an increase in the density of development on the land, the proposal needs to demonstrate consistency with Section 117 Direction 4.3 Flood Prone Land.

Section 117 Direction 4.3 Flood Prone Land states the following:

(6) A planning proposal must not contain provisions that apply to the flood planning areas which:

(c) permit a significant increase in the development of that land,

In order to achieve consistency with this provision the directive further states:

(9) A planning proposal may be inconsistent with this direction only if the relevant planning authority can satisfy the Director-General (or an officer of the Department nominated by the Director-General) that:

*(a) the planning proposal is in accordance with a **Floodplain Risk Management Plan** prepared in accordance with the principles and guidelines of the Floodplain Development Manual 2005,*

1.3 Purpose of report

The purpose of this report is to demonstrate that the planning proposal has been prepared in accordance with a relevant Floodplain Risk Management Plan. It provides reasoning for an increase in the FSR on flood affected land within the Auburn Local Government Area by demonstrating that any risks associated with higher density development will be effectively dealt with through flood planning development controls at the development assessment stage. Further to this, it establishes a nexus between those flood planning controls and an existing Floodplain Risk Management Plan.

2. HASLAMS CREEK FLOODPLAIN RISK MANAGEMENT PLAN (2003)

In 2003, a Floodplain Risk Management Plan (FRMP) for the Haslams Creek catchment was brought into effect. The purpose of the FRMP was to investigate what could be done to minimise flooding in the Haslams Creek catchment, and to provide a strategy which recommended measures to reduce flood risk. The FRMP was based on a flood study conducted in 1999 and was developed in accordance with the NSW Government's Floodplain Management Manual (2001). The final plan released in 2003 recommended a suite of measures to address flood risks in the catchment including detention basins, drainage works, new flooding policies, and new development controls for flood prone land.

2.1 History of the FRMP

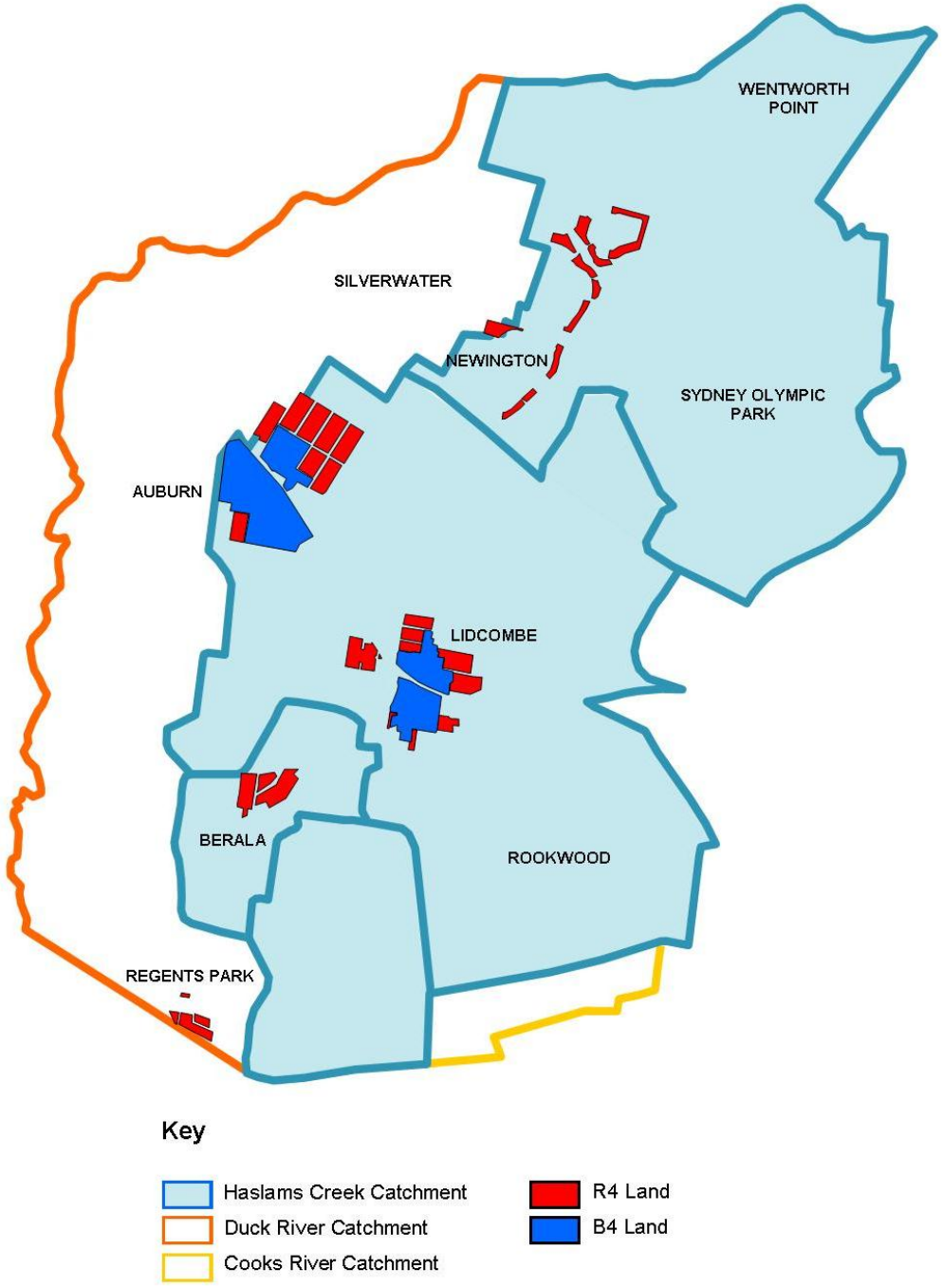
The following table sets out the history of the FRMP.

History of the Haslams Creek Floodplain Risk Management Plan	
1996	• Data Collection for Haslams Creek Flood Study undertaken
1999	• Flood Study for Haslams Creek catchment undertaken (Bewsher Consulting)
2002	• Draft Floodplain Risk Management Study & Plan prepared (Bewsher Consulting) • Report on planning issues prepared as an appendix to the draft FRMP (Don Fox Planning) • Draft FRMP recommends upgrades to drainage infrastructure for specific branches of Haslams Creek, as well as catchment wide development control policy changes • Report by Don Fox Planning recommends changes to the LEP and DCP; includes changes as appendix to the report.
2003	• Final Floodplain Risk management Plan & Study adopted • 5th February 2003, Council adopts a new section to the Stormwater Drainage DCP to deal with flood risk management (as detailed in the report by Don Fox Planning).
2010	• Flood risk management controls rolled over unchanged in to Auburn Development Control Plan 2010 • Existing LEP controls rolled over into ALEP 2010 with some changes • Clause 54: 'Flood Liable Land' is abandoned and replaced by clause 6.1 of ALEP 2010 as per the standard instrument. The effect of the clause remains the same.
2011	• Funding received from NSW Government to undertake review of the FRMP
2012	• Review of FRMP to be undertaken (yet to commence). Along with updated flood modelling, the measures, recommendations and outcomes of the existing FRMP will be assessed and updated where necessary. This review is due to be undertaken in 2012.

2.2 Where the FRMP applies

The Auburn LGA comprises the following three drainage catchments: Duck River catchment; Haslams Creek catchment; and the Cooks River catchment. The majority of the land to which the planning proposal applies falls within the Haslams Creek catchment (see **figure 1**). A small portion of R4 land in Regents Park is situated in the Duck River catchment, however this is unaffected by flooding. Flood studies for the Duck and Cooks River catchments have not yet been undertaken. The Haslams Creek FRMP currently applies to all land in the Local Government Area in the interim while flood studies for the other two catchments are being prepared.

Figure 1: Haslams Creek Catchment and land to which the planning proposal applies



2.3 Consistency with State policies

The FRMP for Haslams Creek was developed in accordance with the NSW Government's Flood Prone Land Policy, and Floodplain Management Manual (2001).

The primary objective of the Flood Prone Land Policy is to:

"reduce the impacts of flooding and flood liability on individual owners and occupiers of flood-prone property, and to reduce private and public losses resulting from floods, utilising ecologically positive methods wherever possible."

The primary objectives of the Floodplain Management Manual are:

- "*to reduce the social and financial costs that result from the risks of occupying the flood plain;*
- *to increase the sustainable social, economic, and ecological benefits of using the floodplain;*
- *to improve or maintain the diversity and well being of native riverine and flood plain ecosystems".*

In order to achieve these objectives, the Floodplain Management Manual recommends a risk management approach utilising the following hierarchy of risk management measures:

1. Avoidance of flood risk;
2. Minimisation of the flood risk using appropriate planning controls;
3. Mitigation of the flood risk (this is considered to be the least preferred option, as it is often costly and is most likely to adversely affect the natural environment).

As will be shown, the FRMP and the subsequent development control changes which emerged from it are underpinned by these principles; providing a clear nexus between the objectives of NSW Flood Management Manual, the FRMP and the planning proposal to increase the FSR on flood affected land.

2.4 Status of the FRMP recommendations

Part 9 of the FRMP recommended a range of measures to address flood risk in the catchment. Some of the measures, particularly policy recommendations, have since been implemented by Council. The current status of those measures is tabulated in **appendix A** of this report.

3. KEY PLANNING CONTROLS

3.1 Flood Risk Precincts

Recommendation 9.1.3 of the FRMP was that Council create a set of graded planning controls for different land uses relative to the level of hazard on flood affected land (see **appendix A**). The first step in achieving this recommendation was the identification and mapping of a series of 'Flood Risk Precincts' within the catchment. These precincts serve to delineate areas of low, medium and high flood risk.

The flood risk precincts are defined as follows:

High Flood Risk
The area within the envelope of and subject to a high hydraulic hazard (*in accordance with the criteria in the Floodplain Management Manual*) in a 100 year flood together with all land in a corridor 10m from the top of the creek bank. This 10m corridor was chosen based on environmental considerations. The high flood risk precinct is generally where high flood damages, potential risk to life, or evacuation problems would be anticipated. Most development should be restricted in this precinct.
Medium Flood Risk
This has been defined as land below the 100 year flood (plus freeboard) but not within the High Flood Risk Precinct. In this precinct there would still be a significant risk of flood damage, but these damages could be minimised with the application of appropriate development controls.
Low Flood Risk
This has been defined as all other land within the floodplain (i.e. within the extent of the probable maximum flood) but not identified as either a High or Medium Flood Risk Precinct. The Low Flood Risk Precinct would be where risk of damages and personal injury would be low for most land uses. Most land uses in this precinct would be permitted without any development controls.

3.2 Flood Planning Matrix

In partnership with the three Flood Risk Precincts was the provision of new development controls for flood prone land. Based on the recommendations of the FRMP, a new section to Council's Stormwater and Drainage DCP was prepared by a specialist consultant and was adopted by Council in February 2003. This new section introduced a flood planning 'matrix' which applies graded controls to different land uses and development types depending on the level of flood hazard (**see appendix B**).

3.3 Foreshore Building Line

The imposition of a foreshore building line (FSBL) along some of the branches of Haslams Creek was recommended in the planning report attached to the FRMP. This recommendation was adopted by council and was subsequently rolled over into clause 6.4 of Auburn Local Environmental Plan 2010.

The FSBL effectively prohibits inappropriate development from occurring in the foreshore area of open channels and streams which experience High Flood Risk. **Figure 3** indicates that the FSBL is present in certain parts of Lidcombe. Because the FSBL accords with the High Risk Flood Precinct, it has the effect of strengthening the provisions of the Flood Risk Management Controls in the DCP.

3.4 Other works

No additional drainage or mitigation works have yet been undertaken as a result of the FRMP. Council has recently completed preliminary designs to create a drainage basin at Phillip Park as specified in recommendation 9.6.2 (**appendix A**) however a final implementation decision has yet to be announced.

4. EFFECT OF THE CONTROLS

The flood controls are consistent with the risk management approach adopted by the FRMP (see section 2.3), and form the primary justification for increasing the FSR on flood affected land. They seek to initially *avoid* flood risk by restricting the land use types which can occur (particularly in High Flood Risk Precincts); and secondly, to *minimise* flood risk through the application of appropriate controls for new development on flood affected land. The controls take the following six planning considerations into account:

- Floor Levels;
- Building Components;
- Structural Soundness;
- Flood Affectation;
- Evacuation;
- Management and Design.

In High Flood Risk Precincts, most land uses (such as new residential or commercial development) are deemed as unsuitable. In practice, this means that new development which is of a higher intensity than the existing land use is unlikely to be granted consent. Where a particular land use is incompatible with an associated Flood Risk Precinct, assessment officers can use the controls in the DCP as justification for refusing a development application. The controls are further strengthened by clause 6.3 of ALEP 2010 'Flood planning' which requires new development to be compatible with the flood hazard of the land. In medium risk areas the controls aim to minimise flooding impacts through the application of graded controls which affect the design and construction of new buildings. In low risk areas the controls have minimal impact, only affecting the provision of critical utilities and essential community facilities.

Specifically, the controls affect new development in flood prone areas by:

- Restricting certain land uses in high flood risk areas;
- Setting standards on the minimum floor levels for car parks and habitable dwellings;
- Setting standards on the building components used;
- Setting standards on the structural soundness of development;
- Requiring an engineer's report to certify that development will not increase flood affectation elsewhere;
- The requirement to ensure that the building is compliant with a flood evacuation plan;
- The requirement that any storage facilities be located above the relevant flood level;
- Setting standards for fencing design and construction.

4.1 Status of the controls

In October 2010, Auburn City Council introduced a new standard instrument based LEP along with a new DCP framework. The flood planning development controls were rolled directly over into the new DCP with no changes; therefore the content and effect of the controls has remained unchanged.

The rollover into a new standard instrument based LEP did affect the content of clauses relating to the Foreshore Building Line, however the effect of the clause has remained substantially unchanged. Previously, clause 55 of ALEP 2000 allowed council to alter or abolish the foreshore building line for any particular land were site features made it expedient to do so, a feature not present in the new clause 6.4. Despite this, a similar level of flexibility is given by the new clause which now allows for the construction of new buildings in the foreshore area, subject to a range of environmental considerations.

5. FLOOD AFFECTED LAND

5.1 Nature of local flooding

The Haslams Creek catchment is a highly urbanised area, and consists primarily of a network of drainage channels which flow northwards to the Parramatta River. Over the years many structures have been built over the channels which can act as obstructions to flood flows. This is known to be the major cause of local flooding. Overbank flows occur when pipes, bridges or culverts become blocked by debris, or when there is insufficient capacity to handle excessive flows.

5.2 Location and extent of flooding

5.2.1 St Hilliers Road Branch

In Auburn, the flood risk is contained to a narrow strip of land running parallel to the St Hilliers Road Branch of Haslams Creek (see **figure 2**). This is a concretised drainage channel which is partially enclosed by a culvert. Residential development extends over the top of the culvert in one section. The FRMP has noted that this culvert does not have adequate capacity; overland flows can occur on properties on the western side of Dartbrook Road.

5.2.2 Haslams Creek and Joseph Street Branch

In Lidcombe, the flood risk is more extensive and covers a wider area across the town centre (see **figure 3**). Approximately 65% of the land south of the railway line is subject to low, medium or high flood risk from either Haslams Creek or the Joseph Street Branch. Adjacent to the railway line, the Joseph Street branch and Haslams Creek converge north of Railway Parade. The drainage pipes which carry flows from the two channels under the railway line do not have sufficient capacity to accommodate a flooding event. This can cause flows to break banks, resulting in localised flooding around Railway Parade and Samuel Street.

The Joseph Street Branch runs diagonally across the southern extent of the Lidcombe town centre. Down-stream of the headwall at James Street floodwaters follow a separate overland flow path. This path runs through Remembrance Park and across a number of commercial sites, including a McDonald's restaurant facing Vaughan Street and Olympic Drive.

In Berala the flood risk is minimal. Approximately 30% of the R4 land specified in the proposal is affected however it falls within the Low Flood Risk Precinct. This precinct indicates a low risk to life or property, and most development types would be permitted here without any additional controls. For completeness, the flood risk in Berala is indicated in **figure 4**, however it has been excluded from the more detailed investigations contained in part 6 of this report.

Figures 2, 3 & 4 (following pages) indicate what parts of the land to which the planning proposal applies are flood affected. In both Lidcombe and Auburn some of the land falls within the Medium to High Risk Flood categories.

Figure 2 – Auburn: Flood Risk Precincts and land to which the planning proposal applies

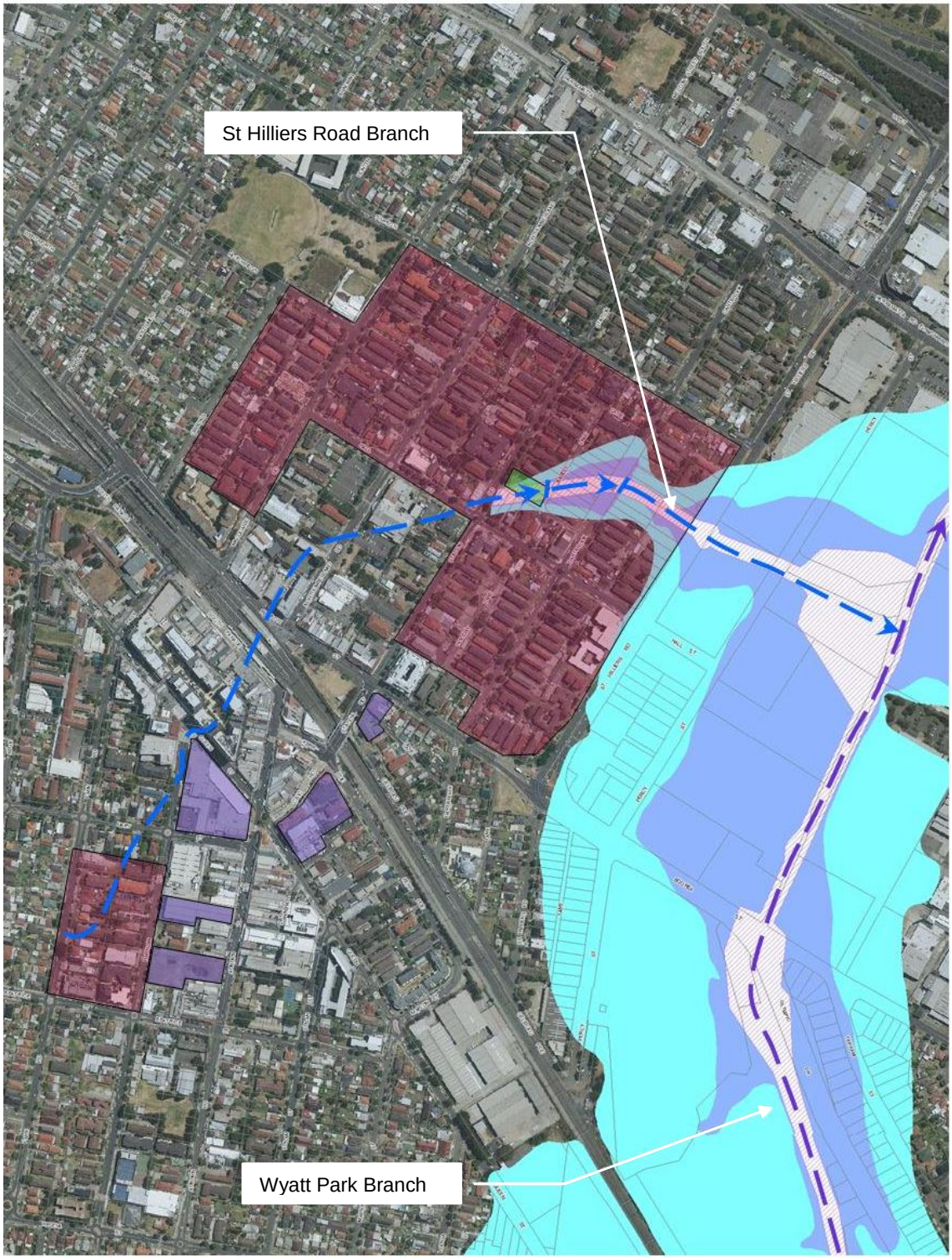


Figure 3 – Lidcombe: Flood Risk Precincts and land to which the planning proposal applies

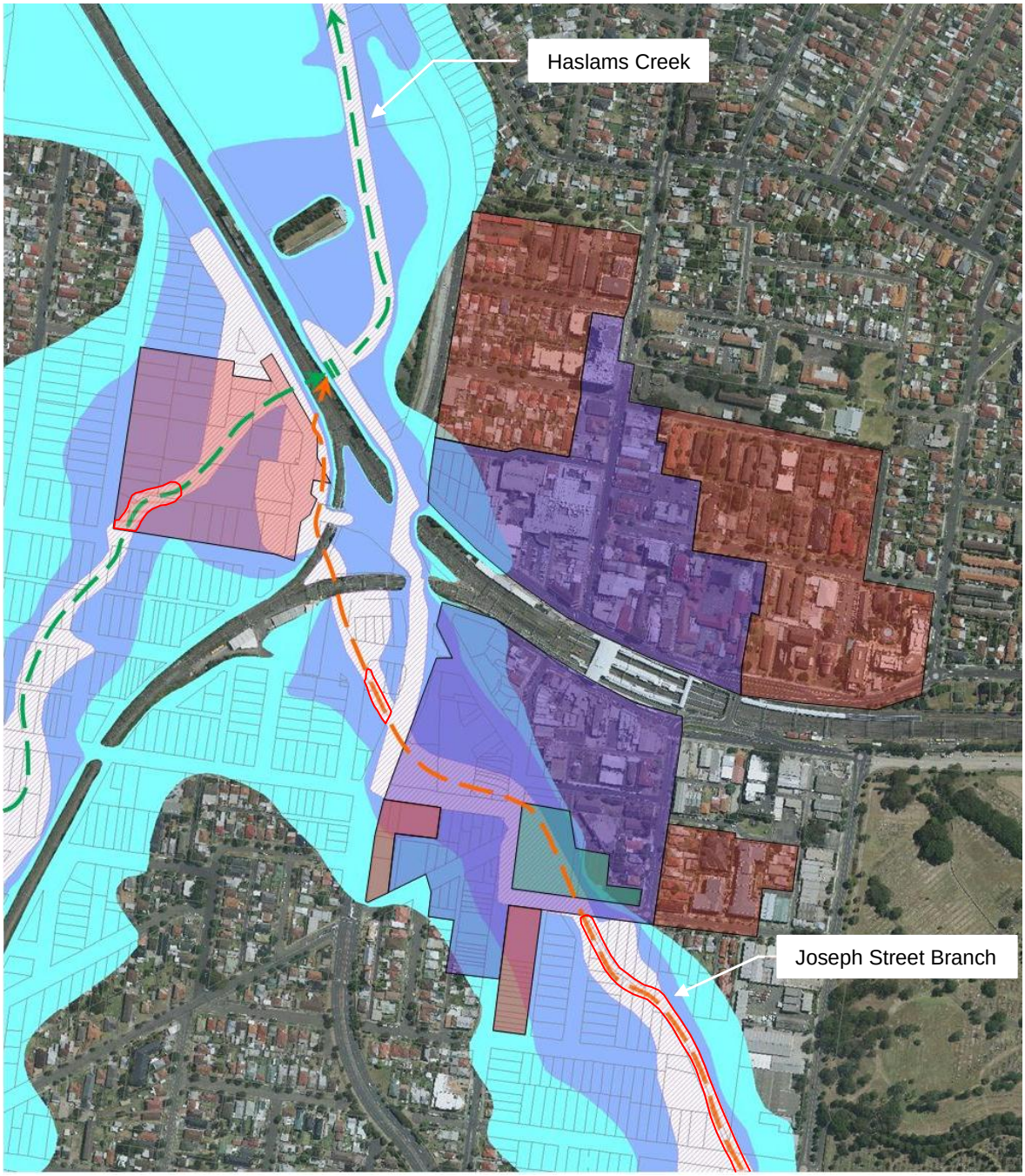
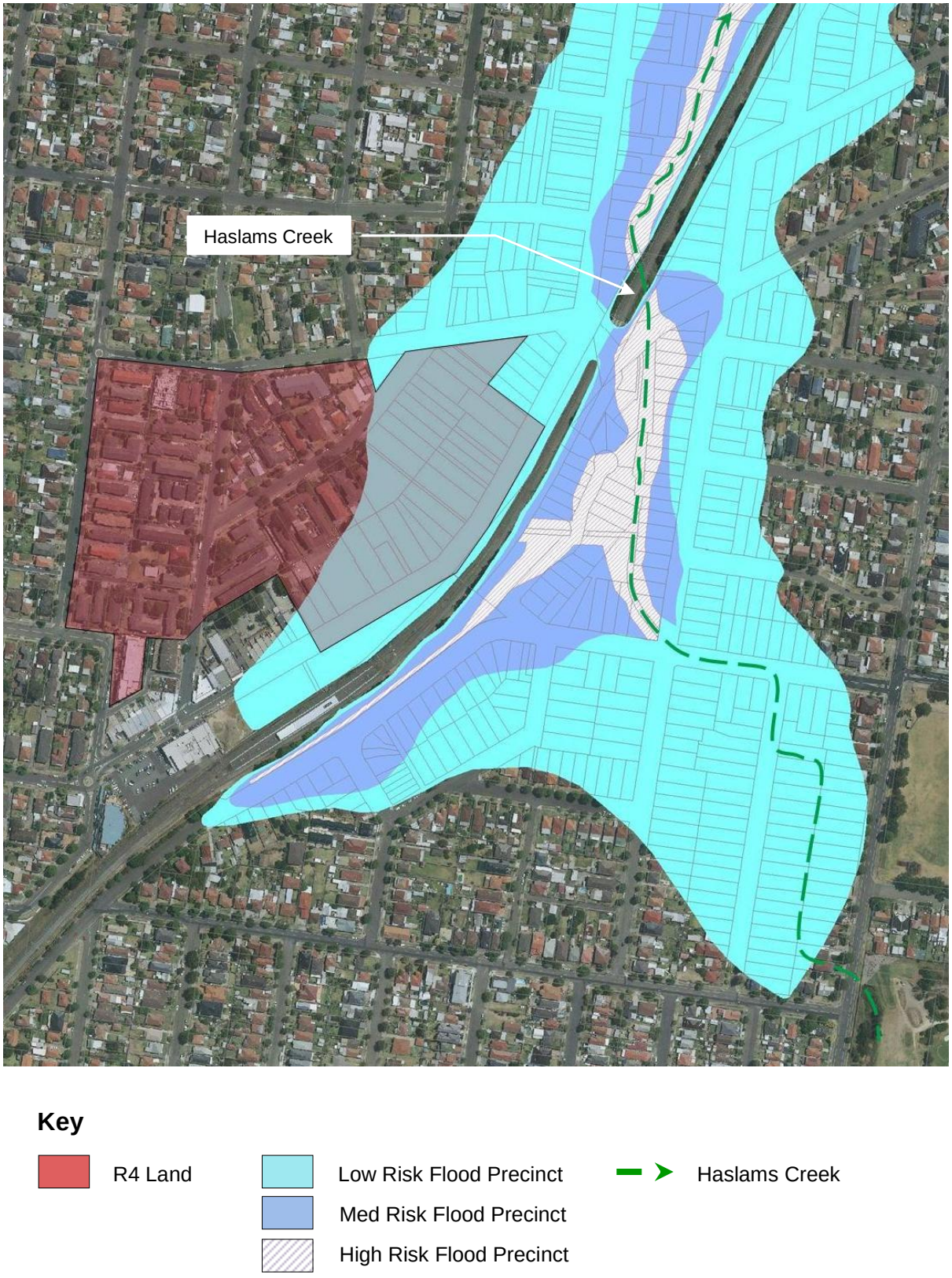


Figure 4 – Berala: Flood Risk Precincts and land to which the planning proposal applies



6. WORST AFFECTED SITES

Sites which fall within the High Flood Risk Precinct are examined below. The High Flood Risk Precinct is generally where high flood damages, potential risk to life or evacuation problems would be anticipated as a result of higher density development. This land is also the most significantly affected by Council's flood planning controls.

6.1 Site 1: Lidcombe (R4 land)

Bounded by Railway Parade, Samuel Street, Water Street, and Livingstone Road

Key

- R4 Land
- Low Flood Risk Precinct
- Med Flood Risk Precinct
- High Flood Risk Precinct
- R4 Land
- Haslams Creek
- Joseph Street branch

6.1.1 Flood risk

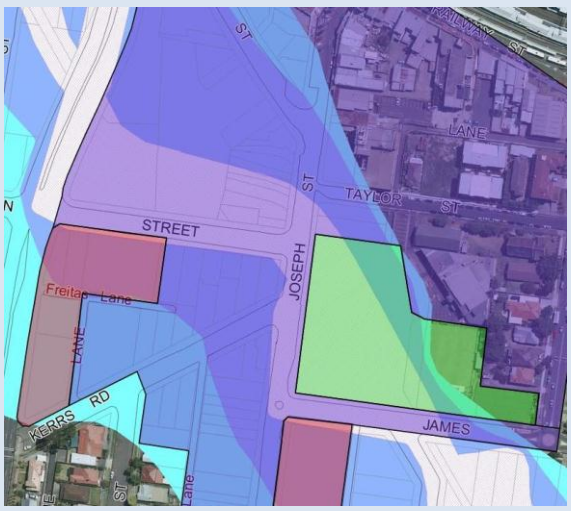
The R4 land to the north-west of the Lidcombe town centre is likely to be adversely affected during a flood event. The Haslams Creek channel runs diagonally across the site, eventually converging with the Joseph Street Branch at Railway Parade on the north eastern boundary of the block (see above). According to Council's development engineer, the pipe at this point has insufficient capacity, resulting in localised inundation during a flood event. A significant portion of the land near this junction falls within the High Flood Risk Precinct, while the remainder is medium risk.

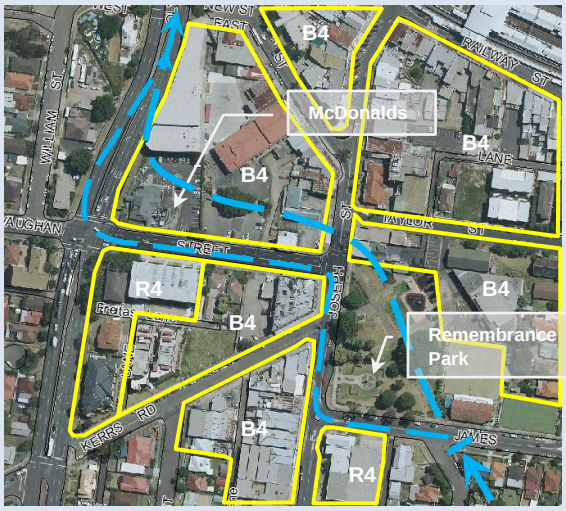
6.1.2 Effect on future development

The subject land is currently covered by a mix of 3-4 storey residential flat buildings, 2 storey townhouses and single detached dwellings of various ages and characters. The application of flood planning controls (Part 6 of ADCP 2010 – Stormwater Drainage) will effectively prevent new development in the High Risk Precinct from realising the higher FSRs, particularly along Samuel Street and Railway Parade. In practice, any new development in the high risk areas would not be able to achieve an increase in development density unless measures were taken to reduce the flood risk by raising the site (and in doing so changing the Flood Risk Precinct). The remainder of the block, particularly the western edge facing Livingstone Road, would be able to realise the higher FSRs under the current flood planning controls.

6.2 Site 2: Lidcombe (B4 land)

Bounded by James Street, Joseph Street, Vaughan Street and Olympic Drive





Key

- R4 Land
- B4 Land
- RE1 Land
- Low Flood Risk Precinct
- Med Flood Risk Precinct
- High Flood Risk Precinct
- R4& B4 Land
- Joseph Street branch

6.2.1 Flood risk

Some of the B4 land south of the railway line in Lidcombe falls within the High Flood Risk Precinct. During an inundation event flood waters pass through Remembrance Park and down Vaughan Street, traversing some existing commercial sites and a McDonald's Restaurant which faces Olympic Drive. This flow path corresponds to the High Risk Flood Precinct marked above.

6.2.2 Effect on future development

The McDonalds site and the two commercial buildings behind it would encounter considerable difficulty in being redeveloped to achieve consistency with Council's flood planning controls. Expensive mitigation works or an innovative design response would be required if compliance could be achieved. All other B4 zoned land south of the railway line would likely be able to realise the higher FSRs.

6.3 Site 3: Auburn (R4 Land)

Bounded by Station Street, St Hillers Road, Hall Street and Simpson Street

6.3.1 Flood Risk

The St Hilliers Road branch of Haslams Creek runs diagonally across several blocks of R4 land north-east of the Auburn Town Centre. The branch is partially covered by a culvert which has been built over by residential flat buildings. The flood risk in this area is limited to a narrow corridor within 10m of the channel as indicated above.

6.3.2 Effect on future development

The area is predominantly characterised by older 2-3 storey residential flat buildings built between the 1950s and the 1980s. Some single detached dwellings remain on a few lots adjacent to Hall and Simpson Streets. Because the flood risk is confined to a narrow channel, only a small number of the total sites in this area would be adversely affected during a flood event.

Lots that are affected by the High Flood Risk Precinct are all currently developed with residential flat buildings. Redeveloping these sites may be difficult due to fragmented Strata Plan ownership, however additional mitigation works or innovative designs might potentially facilitate future redevelopment that complies with Council's flood planning controls.

The sites most likely to experience redevelopment are those remaining blocks that contain single detached dwellings. None of those sites are subject to flood risk and as such would be able to realise the proposed increase to the FSRs.

7. JUSTIFICATION

In relation to satisfying s.117 Direction 4.3 Flood Prone Land, it is necessary to establish that:

(1) The planning proposal is in accordance with a Floodplain Risk Management Plan, and

(2) Any increase in the density of development as a result of higher FSRs will not result in an increased risk to life or property.

In both instances, the primary justification used is Council's flood planning controls (Part 6 of ADCP 2010 Stormwater Drainage), which were established in 2003 as a direct result of the Haslams Creek FRMP (**appendix B**).

7.1 Increased bulk / scale and flood risk

The proposed increase in FSR is likely to result in a moderate increase in the bulk and scale of new development, particularly for new mixed use development in the B4 zone. Despite this, it is unlikely to have a significant impact on local flooding. Physical impacts, brought about by increases to building footprints or the presence of walls and fences which might interfere with overland flows will be effectively dealt with by Council's flood planning controls. The requirement to provide an engineer's report which indicates what impact the development will have on local flooding and neighbouring properties will ensure that no additional local flooding is caused by new development in flood affected areas.

7.2 Increased population and flood risk

Accompanying the increase in development density will be a minimal increase in population and commercial activity in the Lidcombe and Auburn town centres. In areas of high flood risk there will be no additional risk to life or property as the controls will effectively restrict new residential or commercial development from occurring. Population increases in flood affected areas will be minimal, and will be limited to the medium and low risk precincts. New development which occurs here will be developed in such a way as to effectively avoid, minimise, or mitigate the flood risk according to the individual circumstances of each site. The requirement for a flood evacuation strategy or a site emergency response flood plan (**see appendix B**) will ensure that no additional risk to life or property occurs in these areas as a result of increased population density.

7.3 Consistency with the Haslams Creek FRMP and the NSW Floodplain Management Manual

The overarching objective of the planning proposal (PP-3/2010 – 'FSR PP') is to 'enable the redevelopment of land for higher density residential and mixed used development'. As will be shown, the application of the Council's flood planning controls makes this objective consistent with the risk management measures of the NSW Floodplain Management Manual; which in turn forms the basis of the FRMP. This allows the objectives of both the FRMP and the planning proposal to be concurrently achieved. The following table sets out the risk management measures of the NSW Floodplain Management Manual (the basis of the FRMP), and assesses whether the planning proposal achieves consistency with them.

7.3.1 Justification Table

Risk Management Measure (NSW Floodplain Management manual and Haslams Creek FRMP)	**Consistent?**	**Justification**
1. Avoidance of flood risk	✓	The Flood Planning Matrix and the FSBL will effectively prevent inappropriate development from occurring in High Flood Risk Precincts, thereby avoiding flood risk from the outset. In instances where the site can be filled or raised, this may change the Flood Risk Precinct. Preventing development in some areas does not diminish the credibility of the planning proposal because only a small portion of the total land falls within the high risk category. Although some sites in these areas will not be able to realise the higher FSR's, most other sites will, and the general objective of the planning proposal will still be achieved. By avoiding potential flood risk, the application of the controls ensures that planning proposal is in accordance with the provisions and recommendations of the Haslams Creek FRMP.
2. Minimisation of the flood risk using appropriate planning controls	✓	Flood risk in the Low to Medium Precincts will be minimised through the imposition of a graded set of planning controls (see **appendix B**). For the most part, these controls will not prevent appropriate development from occurring and will enable the objectives of the planning proposal and the FRMP to be met. In most cases the application of the controls will not constrain the density of new development, however where flood risks are present these will be minimised or mitigated. The controls primarily affect the minimum floor levels for car parking and habitable dwellings, along with additional requirements for building components and structural soundness. The mandatory provision of an engineer's report which indicates whether the development is likely to increase the risk of flooding on neighbouring properties, along with requirements for the provision of a flood evacuation plan seeks to minimise the risk of local flooding brought about by an increase to the density of new development.

3. Mitigation of the flood risk	✓	Works to drainage infrastructure which were recommended by the FRMP such as the Phillip Park basin (see **appendix A**) collectively aid in reducing the flood risk facing new development brought about by an increase to the FSR.

8. CONCLUSION

This report has demonstrated that the planning proposal, which relies on Part 6 of ADCP 2010 Stormwater Drainage, has been prepared in accordance with a floodplain risk management plan, and is consistent with the principles of the NSW governments Flood Policy and the NSW Floodplain Development Manual.

It has provided reasoning for an increase to the FSR on flood affected land by demonstrating that any risks associated with higher density development will be effectively dealt with through flood planning development controls at the DA stage. Furthermore, it has established a nexus between those flood planning controls and the Haslams Creek Floodplain Risk Management Plan.

Additional flooding risks resulting from an increase to development density will be addressed during the DA process by section 6 of the Stormwater Drainage part of ADCP 2010. In areas of high flood risk such as Lidcombe, the application of the controls will effectively prevent new development from realising the higher FSRs. As a result, significant increases to population density and commercial activity in these locations are unlikely to occur. Population growth in the flood affected areas is expected to be minimal, and will be limited to the medium and low risk precincts. This restriction does not diminish the credibility of the planning proposal as only a small percentage of the sites in question fall within the High Flood Risk Precinct. The majority of sites will be able to achieve the higher FSRs without bringing an increased risk to life or property.

As a result of the investigation undertaken to produce this report, it is contended that condition 3 of the gateway determination has been satisfied. It has been demonstrated that the planning proposal is consistent with s.117 direction 4.3 flood prone land; being in accordance with a floodplain risk management plan developed on the principles of the NSW governments Flood Policy and the NSW Floodplain Development Manual.

APPENDIX A

Status of the Measures Recommended by the Haslams Creek FRMP (2003)

FRMP Measures	Work undertaken?	Comments
9.1 Catchment Wide Measures		
9.1.1 Chanel Bend Recommendation - Minor Extension of outside wall of channels to contain super elevation of floodwaters and as necessary channel repairs	***X***	This measure has not yet been implemented. Further investigation into the viability of this measure will occur during the review of the FRMP in 2012.
9.1.2 Study to assess worst affected properties Recommendation – The study should commence immediately given that it could potentially alter some components of the draft plan	***X***	This measure has not yet been implemented. Unlikely to occur in the near future.
9.1.3 Planning Controls and policy issues		
Development Control Plan: Amendments to Council's draft Development Control Plan that outlines appropriate measures to be applied to development in the floodplain. Appendix A3 provides suggested DCP amendments for consideration and adoption. Flood related development controls within existing DCPs should be replaced with a reference to this DCP.	✓	Implemented - see section 3 of this report
Planning Matrix: The consideration of the application of a graded set of planning controls for different land uses relative to different levels of flood hazard within the study area. This would involve the adoption of Low, Medium, and High flood risk precincts as described in section 4.6.	✓	Implemented - see section 3 of this report
Local Environmental Plan The consideration by council of the following for inclusion in the Auburn LEP - Standard definitions, objectives and standard clauses generally as outlined in appendix A2 - The identification of the extent of the 'Flood Prone Land' on Council's LEP maps.	✓	Implemented - see section 3 of this report
Foreshore Building Line A resolution by Council to adopt a foreshore building line along all creeks within the study area in accordance with the boundaries of the high risk flood precinct. This process should involve a review of the appropriateness of the zoning of individual land parcels, should the combined flood risk and setback criteria result in a foreshore building line that substantially affects reasonable development	✓	Implemented - see section 3 of this report

expectations. Section 149(2) certificates The incorporation by Council of notations on section 149 (2) Certificates that identify the flood affectation by the DCP. Conduit Blockage Policy Introduction of a policy that all conduit systems (with open waterway systems of less than $20m^2$) be designed for 50% blockage. The policy should also recognise that culvert blockages may actually reduce flood levels at some locations (e.g. downstream of a blocked structure where the flood waters have been diverted elsewhere) and the importance of determining whether a blocked or unblocked structure would create the worst flood situation.	✓ X	Implemented. The S149 Certificates contain a provision which identifies the Flood Risk Precinct for the lot in question. This measure has not yet been implemented. Further investigation into the viability of this measure will occur during the review of the FRMP in 2012.
9.1.4 Improved emergency management planning Recommendation – Unfortunately there is limited scope to increase the flood warning in the Haslams creek catchment as this relatively small urbanised catchment experiences 'flash flooding'. As such the Met. Bureau would be unable to provide a specific flood warning service to this catchment. Therefore, improved emergency management planning and support for the continued development of the Local Flood Plan is considered to be an important component of the draft FRMP.	X	
9.1.5 Improved Community Flood Awareness Recommendation – • Updating of Council's GIS with flood data from study • Issuing of flood certificates • Production of a brochure on Flood risk Precincts • Distribution of SES flood safe brochures	✓ X X X	Undertaken – used to inform Council's LEP maps. These maps are available on the Council's website, helping to provide easily accessible flooding information to the community. Not undertaken Not undertaken Not undertaken
9.1.6 Improved Mapping Accuracy Recommendation : • Preparation of improved catchment maps (based on used of airborne laser scanning and or aerial photogrammetry • Floor Level surveys of balance of properties in the 100 year floodplain.	✓ X	Partially done. This measure has not yet been implemented. Further investigation into the viability of this measure will occur during the review of the FRMP in 2012.

9.1.7 Establish taskforce to oversee Development Options Recommendations –		
• Establish two taskforces, one for Haslams Creek and St Hillier Road branches, and the other for the Joseph Street Branch.	***X***	Not implemented. Unlikely to be implemented in the future
• Taskforces to be comprised of representatives of Council SWC and local landholders/developers	***X***	Not implemented. Unlikely to be implemented in the future
• Role of taskforces is to oversee assessment of feasibility and implementation of potential development options.	***X***	Not implemented. Unlikely to be implemented in the future
• Taskforces to report back to FRMP committee	***X***	Not implemented. Unlikely to be implemented in the future
• Feasibility to be implemented by a special Council/SWC/developer taskforce.	***X***	Not implemented. Unlikely to be implemented in the future
9.2 HASLAMS CREEK BRANCH		
9.2.1 Voluntary purchase, Reconstruction/Redevelop It is recommended that 10 houses be included in Council's Voluntary House Purchase Scheme (this is tentative recommendation)	***X***	This measure has not yet been implemented. At this stage there is no Voluntary house purchasing scheme and no plans to implement one.
9.2.2 Remove Wilfred Street Culvert It is recommended that Wilfred street be closed vehicular traffic and the culvert be removed	***X***	Not implemented. Unlikely to be implemented in the future
9.2.3 Potential development options It is recommended that the following flood mitigation options be considered to facilitate future development:		
• A flood detention basin in Wyatt Park; and /or	***X***	These measures have not yet been implemented. Further investigation into the viability of this measure will occur during the review of the FRMP in 2012.
• Channel widening from Parramatta Road to Boorea Street	***X***	
• Upgrading of Parramatta Road culvert; Tooheys Bridge and the Great Western Highway and Railway Parade Culverts.	***X***	

9.3 ST HILLIERS ROAD BRANCH		
9.3.1 Potential development options It is recommended that the upgrading of the Percy Street culvert be considered to facilitate future development.	***X***	This measure has not yet been implemented. Further investigation into the viability of this measure will occur during the review of the FRMP in 2012.
9.4 JOSEPH STREET BRANCH AND OVERLAND FLOW PATH		
9.4.1 Voluntary purchase, Reconstruction/Redevelop It is recommended that 7 houses and 2 units be included in Council's Voluntary House Purchase, Reconstruction/ Redevelopment Scheme (This is a tentative recommendation).	***X***	This measure has not yet been implemented. Further investigation into the viability of this measure will occur during the review of the FRMP in 2012.
9.4.2 Construction Rookwood Cemetery (west) Basin It is recommended that a detention Basin be constructed subject to the approval of the two cemetery trusts	***X***	This measure has not yet been implemented. Further investigation into the viability of this measure will occur during the review of the FRMP in 2012.
9.4.3 Potential Development Options <u>Recommendation:</u> it is recommended that construction of a duplicate culvert from James Street to Church Street be considered to facilitate future development. Feasibility and implementation to be oversighted by special Council/SWC/Developer Taskforce	***X***	This measure has not yet been implemented. Further investigation into the viability of this measure will occur during the review of the FRMP in 2012.
9.5 VIVIAN CRESCENT		
9.5.1 Voluntary House purchase It is recommended that 1 house be included in Council's Voluntary House purchase Scheme to facilitate trunk system upgrade works	***X***	This measure has not yet been implemented. At this stage there is no Voluntary house purchasing scheme and no plans to implement one.
9.5.2 Culvert and channel system upgrade It is recommended that works be constructed to alleviate Vivian Crescent and (and Kerr's Road) flood damages. (Exact nature of works to be determined).	***X***	This measure has not yet been implemented. Further investigation into the viability of this measure will occur during the review of the FRMP in 2012.

9.6 ARTHUR STREET BRANCH		
9.6.1 Voluntary purchase, Reconstruction/Redevelop It is recommended that 8 houses be included in Council's Voluntary House purchase. Reconstruction/Redevelopment Scheme (This is a tentative recommendation).	***X***	This measure has not yet been implemented. At this stage there is no Voluntary house purchasing scheme and no plans to implement one.
9.6.2 Construction Phillip Park Basin This option also included as part of 9.6.5	✓	Design work undertaken; awaiting final decision as whether works will commence.
9.6.3 Enlarge 3 Culverts/Bridges from Bombay Street to upstream of Parramatta Road This option also included as part of 9.6.5	***X***	See below
9.6.4 Construct a new Culvert under the M4 Motorway and Widen/Deepen Downstream Channel This option also included as part of 9.6.5	***X***	See below
9.6.5 Combined works – options 9.6.2, 9.6.3, 9.6.4 It is recommended that the combined works be constructed to alleviate Bombay Street area flood damages. (Exact nature of works to be determined).	***X***	This measure has not yet been implemented. At this stage there is no voluntary house purchasing scheme and no plans to implement one.