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17 Broughton St, Strathfield NSW
Flood Risk Management Plan
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Approval and Authorisation

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1 INTRODUCTION

1.1 Foreword

A Flood Risk Management Plan [FRMP] is a technical document which identifies and assesses the severity of flood affection of a site from existing records and flood studies. Assessing the development against available data, a FRMP provides recommendations to reduce the impact of flooding and flood liability on the individual owner and occupants of the proposed development.

1.2 Background

Broadcrest Pty. Ltd. Have been engaged by Lei Ma to produce an FRMP for 17 Broughton St, Strathfield NSW (the site). This report will accompany a Development submission for a proposed boarding house; and addresses the general controls of the Strathfield Council *Interim Flood Prone Lands Policy* (1999) and Stormwater Management Code (1994).

1.3 Scope of Works

The Flood Risk Management Plan [FRMP] will include the following considerations:

- Assessment of available contemporary literature and data of the catchment
- Explicitly consider the impact of a 1:100-year flood events upon the development
- Evaluate the proposed development against local government flood planning policies, and provide recommendations to achieve compliance
- Recommend actions to reduce or exclude occupants from flood associated hazards
- Recommend actions to reduce or prevent flood damage / losses to private property
- Provide guidance in the flood readiness and response of occupants

1.4 Compliance

This Flood Risk Management Plan [FRMP] has been prepared in accordance with:

- Strathfield Council (1999) *Interim Flood Prone Lands Policy*
- Strathfield Council (1994) *Stormwater Management Code*
- Australian Rainfall and Runoff (ARR, 2019)
- The NSW Government's Flood Policy, as detailed in the NSW Flood Development Manual (NSW Government, 2005)
- ABCB Standard – Construction of Buildings in Flood Hazard Areas (ABCB, 2012)



2 Site Information

Address / Locality:	17 Broughton St, Strathfield NSW
Council / LGA:	Strathfield
Proposed Development:	Boarding House

2.1 Site Details

Flood Planning:

Adopted Study Land below Flood Planning Level (FPL) per:

Strathfield Council Flood Advice Letter (Date: 19/05/2020) per *Powells Creek and Saleyards Creek Revised Flood Study* (WMAwater, 2016) [1]

2.2 Site Description

17 Broughton St is situated within a limited sub-catchment roughly delineated by Broughton St to the south, Beresford Rd to the east, and Abbotsford Rd to the north. The catchment landform falls westward from a local peak west of the intersection of Beresford Rd and Homebush Rd with a ~4% linear slope. Following the site, the landform becomes convergent around Rochester St draining northward towards major trunk drainage west of Homebush Station. The site itself has a southern boundary onto Broughton St for vehicular and pedestrian access. The site has a west-northwest fall, with major storm surface drainage modelled to enter the site central to the eastern boundary.



Figure 2.1 & 2.2 – Site Locality and 1m topography

The site is currently occupied by an existing residence situated at 15.160m AHD floor level (see Appendix A). Site access and car parking is located within the southern roadside extent of the site, with minor shed structures in the northern site extent.

2.3 Proposed Development

The proposed boarding house development is for both the alteration of the existing residence and a two-storey addition with basement parking located within the northern extent of the site (see Appendix A). A driveway access to the basement carpark is to be located central and west within the lot, with access and entrance ways to the ground floor of the proposed additions situated at F.F.L. 15.160m AHD (to match the existing ground floor level). Internal alterations of the existing residence are to maintain the existing F.F.L of 15.160m AHD. The first floor of the proposed addition is to be accommodation suites, accessed via the stairway leading off the ground floor lounge room. Basement pedestrian access is via a stairway off the common courtyard set at F.F.L of 15.160m AHD.

2.4 Flood Impact & Known Flood Levels

Powells Creek and Saleyard Creek Revised Flood Study (WMAwater, 2016) presents the most current flood information available for this site catchment. Flood data specific to the site has been extracted from the 2016 model by Strathfield Council and provided in the Flood information extract attached in Appendix C. The 1% AEP flood-water details are presented within Table 2.1. Note that the data presented represent minimum and maximum 1% AEP general to the lot.

Table 2.1 - 1% AEP Flood Water extract and modified values

FLOOD DETAIL	MAXIMUM VALUE	MINIMUM VALUE
Overland Flow Depth	14.740m AHD	14.128m AHD
Minimum Floodwater Depth	0.0172m	0
Floodwater Velocity through site	0.1864 m/s	0.0075 m/s
Overland Flow Depth (with modifications)	14.705m AHD	13.959m AHD
Minimum Floodwater Depth (with modifications)	0.0320m	0
Floodwater Velocity through site (with modifications)	0.415 m/s	-

1% AEP flood information provided in Appendix C has been overlayed upon the proposed site plans (See Appendix A). The catchment flood path runs westward entering the site via neighbouring 15 Broughton St, with flood waters limited to the northern site extent. The flood affectation of the site is limited and pluvial in nature, described in mapping to be of Low Hazard Flood Fringe. Appendix B flood study extracts indicate the site flood affectation is likely resultant from upstream residential catchments, as well as surface flows exceeding the conveyance capacity of Melrose St drainage infrastructure. The site flood information indicates that the existing residence lies outside the 1% AEP flood extent, with the proposed addition likely to interact with the minor overland flow being both within and perpendicular to the overland flow path.

Site modifications discussed in Section 5 and detailed within Appendix A are proposed to address routing of flood waters around the proposed structure whilst preventing redirection of waters into neighbouring lots. As a result of the routing, adjusted flood levels and values have been appended to Table 2.1.



3 Flood Classification

Flooding within the SCS LGA is managed in accordance with the NSW Government Flood Prone Land Policy, as outlined within the *NSW Government Floodplain Development Manual* (2005). Classification of floodplain and Flood Hazard categories within the SCS LGA thereby follows *Appendix L* of the Manual (NSW Gov., 2005) with further controls within the SCS (1999) Interim Flood Policy.

Within *Appendix L4 & L5* of the Manual (NSW Gov., 2005) provisional flood risk classification follows three hydraulic categories with two hydraulic hazard classes:

3.1 Hydraulic Risk Categories

HYDRAULIC CATEGORIES
FLOODWAYS Are areas where a significant volume of water flows during floods and are often aligned with obvious natural channels. They are areas that, even if only partially blocked, would cause a significant increase in flood levels and/or a significant redistribution of flood flow, which may in turn adversely affect other areas. They are often, but not necessarily, areas with deeper flows or areas where higher velocities occur.
FLOOD STORAGE Are areas of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. If the capacity of a flood storage area is substantially reduced by, nearby areas may rise and the peak discharge downstream may be increased.
FLOOD FRINGE The remaining area of land affected by flooding, after floodway and flood storage areas have been defined. Development in flood fringe areas would not have any significant effect on the pattern of flood flow and/or flood levels.

HYDRAULIC HAZARD
HIGH Possible danger to personal safety; evacuation by trucks difficult; able-bodied adults would have difficulty in wading to safety; potential for significant structural damage to buildings.
LOW Should it be necessary, trucks could evacuate people and their possessions; able-bodied adults would have little difficulty in wading to safety.



3.2 Provisional Hydraulic Risk

The initial hydraulic risk classification for the development is presented with reference to Figure 2 a) & b) below (Figure L1 & L2 of NSW Gov., 2005).

PROVISIONAL HYDRAULIC RISK:	*LOW HAZARD – FLOOD FRINGE
JUSTIFICATION:	

- Classification as indicated by WMAwater (2016) mapping in Appendix C
- Appendix B & C indicates the site in general to be of 'Low Flood Hazard' for the 1% AEP; with the flood affectation described to be limited in depth and velocity.
- Velocity*Depth relationship based upon maximal values is 0.0032, well within hazard thresholds
- Redirection of overland flow around proposed addition may alter risk profile, resultant V*D and flowrate estimated presented in Appendix A

* Hazard category determined via Figure 2.a) is provisional only and should not be viewed in isolation of final hazard determination of Section 3.3 below.

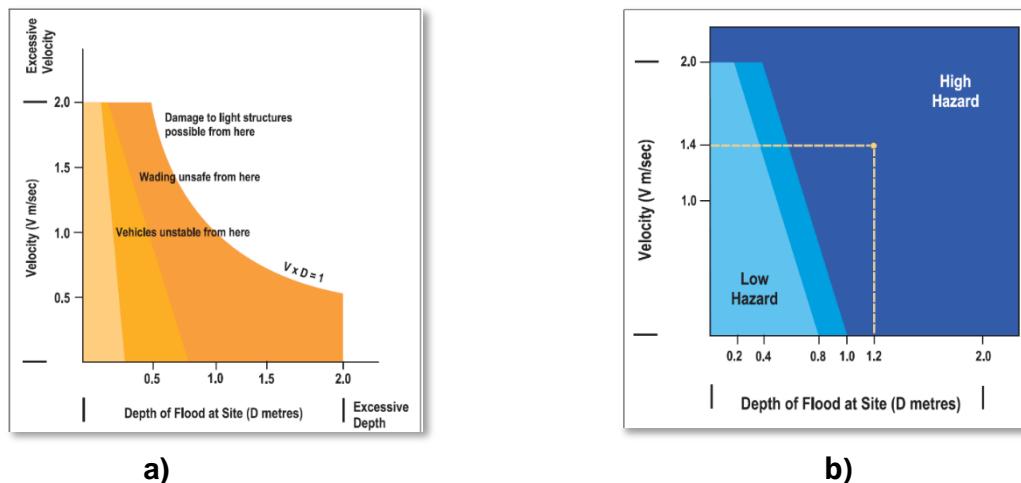


Figure 2. a) Velocity & Depth Relationships, and b) Provisional Hydraulic Hazard Categories (NSW Gov., 2005)

3.3 Development Based Flood Risk

The provisional hydraulic risk classification of Section 3.2 is recommended by the Manual (NSW Gov., 2005) for initial guidance only. Additional site and land-use factors, which may reduce or increase risk exposure, are considered for the proposed development:

SITE FACTORS INFLUENCING THE RELATIVE SITE FLOOD HAZARD	
<i>FLOOD READINESS</i>	<ul style="list-style-type: none"> ○ General pre-emptive measures per Section 5, & Emergency Response per Section 6
<i>DEPTH AND VELOCITY OF FLOODWATERS</i>	<ul style="list-style-type: none"> + No floodwater or hazard within southern extent of site ○ Some structure in flood storage, limited depth & likely point for sediment/debris deposition. Compensatory cut proposed to balance storage ○ Redirection and hydraulic capacity of proposed O.F redirection have been determined, cut and retaining will prevent redirection of flood waters into adjacent upstream properties + Site is not adjacent to trunk drainage or primary catchment flow path
<i>DURATION OF FLOODING</i>	<ul style="list-style-type: none"> + Limited (site specific) delay on emergency medical access
<i>EVACUATION PROBLEMS</i>	<ul style="list-style-type: none"> - Multiple occupancy development - Below ground-level parking + Trucked vehicular evacuation achievable during flood event + Habitable floors are flood free for the 1% AEP + No requirement for flood specific evacuation equipment
<i>EFFECTIVE FLOOD ACCESS</i>	<ul style="list-style-type: none"> + Immediate access to Broughton St via light vehicle during peak + PMF emergency evacuation via roadside of property achievable
<i>TYPE OF DEVELOPMENT</i>	<ul style="list-style-type: none"> ○ Development may require special evacuation/emergency needs, this can be address via administrator additions to flood preparation and response plan + General occupant awareness suitable + Development not associated with hazardous industry/storage + Development structure to be fixed and immobile ○ Development within flood fringe, adjustments to redirect surface flows per Appendix A

The flood hazard adjusted for the proposed development modifications and land-use is presented below:

DEVELOPMENT FLOOD RISK CLASSIFICATION:	<i>Development Footprint: LOW RISK, LOW HAZARD – WITHIN FLOOD FRINGE EXTENT</i>
JUSTIFICATION:	
<p>Mapping and extract data indicate that the site is flood affected during the 1% AEP with inundation of the northern site extent. As the proposed development is to be located north of the existing dwelling, interaction with 1%AEP floodwaters is anticipated. Whilst interaction is anticipated to occur, the flood affection of the site is limited to local sub-catchment flows on a gently inclined planar topography; as such depths are limited to 0.017m with sub 0.2m/s maximum velocities.</p> <p>Given suitable site modification are undertaken (detailed in Appendix A) to convey surface flows around the proposed structure, increase of the site and neighbouring lots flood affection can be maintained within safe hazard thresholds. Further details of recommended practices and modification are presented in Section 5.</p>	



4 Development Controls

4.1 Local Government

Controls for the proposed development within Strathfield Council generally defers to the NSW Government Flood Prone Lands Manual, with DCP freeboard specifications (Section 5.3, Strathfield Stormwater Code 1994) as well as the Strathfield Council (1999) Interim Flood Prone Lands Policy. Extract of the requirements for the development category are detailed below:

Design Floor Level

(SCS, 1999) Mandatory Requirement 2.: Freeboard to habitable floor level equal to the 1:100yr flood level + 500mm at minimum

(SCS, 1999) Mandatory Requirement 2.: Freeboard to non-habitable floor level equal to the 1:100yr flood level at minimum

(SCS, 1994) Stormwater Management Code, Section 5.3: Freeboard ranging from 1% AEP + 0.3m to 0.5m against channels, mainstream flows, or in areas where significant overland flow occurs. In all other circumstances minimum freeboard of F.G.L + 150mm.

Flood Effects

(SCS, 1999) Mandatory Requirement 1.: Demonstrate the development has no adverse impact upon the overland flow path

(SCS, 1999) Fencing & other obstructions: All fencing and gates designed so as not to impede the overland flow path.

Qualification of the differing Flood Policy to stormwater code FPL instructions was sought with the Strathfield Development Control Engineering team; the following commentary being provided (20.05.20):

"BCA allows for ground slab thicker than the maximum flooding depth (17mm) hence freeboard requirement can be disregarded."

Book 9 Runoff in Urban Areas of ARR (2019) provides the following commentary in the application and interpretation of two-dimensional modelling and mapping for Pluvial (overland) urban flooding:

"Caution should always be employed when interpreting the mapping of results for stormwater flows and inundation as there may be significant uncertainties about the results caused by:

- *obstructions to flow paths such as buildings and fences;*
- *rapidly changing flow conditions throughout a flow path;*
- *limitations in the accuracy of survey information; and*
- *limited opportunity for calibration.* "(Page 36)

Following this commentary Section 3.4.1 of ARR (2019) prescribes for pluvial flooding "*A typical minimum value of 0.3 m above a flood surface is suggested*". In consideration of the site limited flood affectation, local LGA FPL feedback, and industry guidelines, it is the recommendation of this report to adopt ARR (2019) best practice of a minimum 1% AEP +0.3m freeboard for habitable levels, and 1% AEP for non-habitable.



5 Aspects of the Development

To manage the potential flood risk of a proposed development, *Appendix J2.1.2-3* of the Manual (NSW Gov., 2005) identifies a list of necessary aspects to be evaluated and achieved as part of a FRMP. The assessed and evaluated aspects of the development are as follows:

5.1 Floor Levels, Site Access & Parking

Flood Planning Level (FPL) controls indicate a minimum floor level base on a selected flood event, to reduce the frequency and extent of flood damage. The additional freeboard clearance ensures the reduced level of risk exposure is provided (given the range of variabilities associated with a flood event). Section 4.1 FPLs as applied to the proposed development are presented in Table 5.1 below:

Table 5.1. – Flood Planning Levels

LOCATION	FPL CAT.	FPL CONTROL	CURRENT FLOOR LEVEL (m, AHD)	MINIMUM FLOOR LEVEL (m, AHD)	VARIATION REQUIRED (m)
Existing Structure Ground Floor (Suites and Dining areas)	Habitable	1% AEP +0.3m	15.160	15.005	NIL
Existing Structure Ground Floor (Terrace)	Non-Habitable	1% AEP	15.160	14.705	NIL
Proposed Addition (Suite 4, LVL-1 access, common room)	Habitable	1% AEP +0.3m	15.160	15.005	NIL
Proposed Addition (Suite 3)	Habitable	1% AEP +0.3m	15.160	15.005	NIL
Basement Parking	Non-Habitable	Nil. Above 5% AEP typically.	12.360	-	-
Vehicular Access	Non-Habitable	Nil. Above 1%AEP-0.3m typically.	14.52 to 14.120 (at roadside egress)	-	-

The current site access via Broughton Rd with a minimum egress path elevation of 14.12m AHD is not indicated within the WMAwater (2016) 1% AEP mapping to exceed 0.3m flood depth and therefore suitable for vehicular access. Whilst lost specific 5% flood elevations are not available within the received data; carpark assess is above the adjacent 1% AEP of 14.128m AHD, with the ramp peak at 14.420m AHD and the wall surrounds to be set at 15.160m AHD. With the proposed basement access configuration protected from the 1% AEP by inference the configuration is considered suitable against 5% AEP levels. As suitable egress via Broughton Rd can be achieved during the 1% AEP and considered suitable, no variation is required to the parking, garage or access is recommended.

The FFLs of the proposed additions and alterations exceeds all design storm (up to the 1% AEP) and FPL requirements, therefore no modification are recommended the existing or proposed ground floor levels.

5.2 Building components

Buildings within flood control lots per the ABCB (2012) and requires all development below the adopted FPL (1% AEP + 0.3m) to be of flood compatible building components. Per *Section 2.10 Requirements of Egress*

of the ABCB standard (2012) balconies, verandas, decks, doors, windows within the development must allow a person in the building to be rescued by emergency services. Implementation of the ABCB recommended materials up to a height of 15.005m AHD will satisfy ABCB flood recommendations for the proposed development.

5.3 Structural Soundness When Flooded

Flood water have the potential to compromise the structural soundness of a building that is subject to flood water velocities, depths and associated debris loading. Per *Section 2.8* (ABCB, 2012) material used for structural purposes located below the FPL for the proposed development must be sufficient to:

"resisting damage, deterioration, corrosion or decay taking into account the likely time the material would be in contact with flood water and the likely time it would take for the material to subsequently dry out."

The proposed structural components below the FPL (1% AEP + 0.3m) of 15.005m AHD are to be verified against the ABCB Standard (2012) methodology. All footing below the FPL specified is to comply with Section 2.5 Footing System Requirements (ABCB, 2012).

5.4 Fencing & Minor Structures

No stockpiling or temporary structures has been proposed within or beneath the 1% as part of the proposed development. It is recommended that any proposed fencing is to be of open construction to allow the free passage of potential flood waters. To meet typical flood safe requirements, the following general measures are recommended:

1. Located all hazardous or valuable goods above the FPL (1% AEP + 0.3m).
2. Location, storage, and stockpile of goods / structures within the eastern property extent (rear yard) should be kept to a minimum where possible; thereby limiting the creation of potential flood debris during a 1% AEP event.
3. Secure all objects located below the FPL (1% AEP +0.3m) that are likely to float and cause damage.

It is recommended to make all fencing and gates within the lot to be of open construction, or undercut by 200mm to facilitate the free passage of floor waters. Implementing such measures will satisfy the material storage and fencing requirements of Strathfield Council (1999) Interim Flood Policy.

5.5 Services

All utilities within the site (i.e. power, potable water, sewerage, drainage, and communication services) that pass through or beneath the FPL height are required to meet the minimum ABCB Standards criteria (2012). Guidance per the ABCB (2012) requirements, as well as general recommended design practices is present below:



Table 4. – ABCB Requirements & General recommended practices for flood prone sites

SERVICE	REQUIREMENT / RECOMMENDATION
1. General	<p>ABCB Standard (2012):</p> <ul style="list-style-type: none"> a) Utilities and their associated equipment must not be placed below the FPL (1% AEP) unless designed specifically to cope with flood water inundation. b) Buried systems must be placed at depth sufficient to prevent damage due to scour and erosion during the 1% AEP. <p>General recommendations:</p> <ul style="list-style-type: none"> + Buried conduit assembly and trenchwork is to be self-draining + Corrosion resistant material and components used where possible
2. Electrical	<p>ABCB Standard (2012):</p> <ul style="list-style-type: none"> a) All electrical switches are to be placed above the FPL (1% AEP + 0.3m). b) Electrical conduits and cables installed below the FPL (1% AEP + 0.3m) must be waterproofed or placed in waterproof enclosures. <p>General recommendations:</p> <ul style="list-style-type: none"> + Mount fixed electrical equipment as high as possible + Locate house wiring in the roof space and extend down the wall + Avoid house wiring in the slab or under suspended floors + Ensure conduit assembly and trenchwork allows free draining of water
3. Mechanical, HVAC, & Gas	<p>ABCB Standard (2012):</p> <ul style="list-style-type: none"> a) Tanks, cylinders, and ductwork to be placed above the FPL (1% AEP + 0.3m). b) The above must be designed, constructed & anchored to resist floor related action during the 1% AEP with additional load factors (see ABCB (2012)). c) Consideration must be given to tank buoyancy whilst empty during the 1% AEP.
4. Water Tanks (aboveground)	<p>General recommendations:</p> <ul style="list-style-type: none"> + Tank inlets to be as high as possible + Tank situation, supports, and anchoring per point 3 requirements above + Secure and fasten exposed components and pipes + Attention to be paid to buoyancy potential per ABCB standards (2012)

5.6 Fill or Excavation in the Floodplain

Introduction of cut/fill or excavation within a floodplain has the potential to change the flow pattern of a flood within the proposed development and downstream sites (NSW Gov., 2005). Variation to the existing ground level and flow path has been proposed within the the 1% AEP flood extent. Compensatory cut and routing calculations have been provided in Appendix A to address the modification to the overland flow path. Following routing, overland flow has been returned to the direction consistent with the site topography and as such limited variance is anticipated for downstream flow conveyance.



5.7 Impact on Flood Behaviour

In determination of the impact of the proposed redevelopment, the following conditions were considered:

1. Minor variation or development is proposed within, and adjacent to, the 1% AEP flood extents identified within Appendix C.
2. The footprint of the existing dwelling outside of the development is to be maintained and undisturbed.
3. The footprint of the proposed addition is within the overland flow path and anticipated to interact with the overland flow. Routing and compensatory cut has been proposed per Appendix A to address this matter.
4. The drainage and surface regime are to be modified as a result of the proposed development. The modifications are limited to minor surface routing of limited overland flow. Retaining and compensatory cut has been proposed to limit the impact of site modification on adjoining lots, and to return the overland flow to surface conveyance following the structure.

In consideration of the above factors, the proposed development is not anticipated to produce a significant change in flood behaviour within the catchment or downstream allotments.

5.8 Runoff

The extent of the proposed development will modify the impermeable surface ratio associated with the additional roof-space and parking. On-site detention and retention measures have been proposed to limit site generate discharge to applicable control levels. Given the limited scale and run-off due to the development with the OSD measures proposed, the site is not anticipated to produce any meaningful variation in downstream flood affectation due to run-off as a result of the development.



6 Flood Preparation & Response

6.1 Flood preparation

In addition to the planning requirements detailed in Section 4, the following pre-emptive measures are recommended by the SES for flood-prone sites:

SES FLOOD PREPARATION ADVICE	
+ Be aware and discuss with all occupants the flood source, hazards, and warning signs of the property (see Sections 2 & 3)	+ Plan accommodation / refuge if required to evacuate
+ Maintain and practice a Home Emergency Plan (see Section 5.4)	+ Maintain sufficient levels of supplies & foodstuffs in the event of isolation
+ Create and maintain an Emergency Kit (see Sections 5.3)	+ Plan for the loss of services & amenities
+ Check your insurance for adequate coverage	

It is recommended that the owner and occupants of the site become familiarised with the flood information and preparation literature provided below:

ADDITIONAL INFORMATION	
EMA brochure – Floods, warning, preparedness, & safety	Appendix E
NSW SES brochure – Community flood safety	Appendix F
NSW SES – Storm readiness	www.ses.nsw.gov.au/get-involved/get-ready-nsw/

6.2 Emergency Contacts & Information

The following list of emergency contacts is to be included within an Emergency Kit:

EMERGENCY CONTACTS	
Life threatening emergency	000
NSW SES – Emergency assistance in flood & storms	132 500
NSW SES – Information line	1800 201 000

Occupant specific emergency contact details should be included in the above list. Consider inclusion of utility suppliers (electricity, water, gas, building manager/owner) in the event of issue / required shut-off of local utilities. This Emergency Contact list should be made known and available to all occupants for use in the event of an emergency.

For information related to storm & flood events, suggested sources are listed below:



FLOOD & STORM INFORMATION	
NSW SES – News & information	www.floodsafe.com.au
BOM – NSW Warnings	www.bom.gov.au/nsw/warnings/
BOM – Rainfall & river conditions	www.bom.gov.au/nsw/flood/
SES – Local risks	www.ses.nsw.gov.au/your-local-risk/
Radio – Emergency alters & coverage*: Sydney 2BL	702 AM
Disaster Welfare Service	1800 018 444

*Per ABC Frequency Information advice for the postcode

Note: All information was current at the time of publishing

6.3 Emergency Kit

SES guidelines recommend the preparation of an Emergency Kit in the event of prolonged power/service loss. The Emergency Kit is to be kept in a waterproof container, in a location known and accessible to all occupants. General contents of an Emergency Kit should include:

FLOOD EMERGENCY KIT	IN CASE OF EVACUATION
<ul style="list-style-type: none"> + Portable radio & spare batteries + Torch{es} & spare batteries + First Aid kit & medical supplies specific to occupants + Candles & waterproof matches + A local map & copy of Home Emergency Plan(s) + Emergency contact details & personal documents + Waterproof bag for valuables 	<p>In the event of evacuation of the property, the additional items should be readily available and added to the Emergency Kit:</p> <ul style="list-style-type: none"> + A Good supply of personal medication (where required) + Appropriate clothing & footwear + Basic food items & bottled water + Communication devices + Specific items required by infants, the elderly, or infirm occupants

6.4 Flood Emergency Response Plan

During 1% AEP storm conditions the ground and ground and first floors of the facility will be suitable for refuge at 15.16m AHD, with the point of site access (Broughton St) likely to remain trafficable by light vehicle despite floodwaters. During a PMF or greater storm event inundation of the habitable ground floor level may occur (site specific PMF depths were not made available). Due to the possible (yet unlikely) occurrence of this event, a Site Flood Emergency Response Plan is recommended. Occupants are encouraged to generate a plan via the SES web-service:

www.ses.nsw.gov.au/get-involved/get-ready-nsw/

Additional site-specific information to include in the self-generated Flood Emergency plan as a result of this flood risk report is provided below:

ADDITION TO FLOOD EMERGENCY RESPONSE PLAN

Given the catchment topography and overland flow dimensions, minor flooding will occur during or following a ≥1% AEP storm event. During storm/flood conditions attention by the occupants should be given to surface waters accumulating in Broughton Rd and Melrose St. Where upstream flood waters exceed the capacity of Melrose St drainage, floodwaters may be perceived ingressing the site via the eastern adjacent properties. Due to the potential for flood waters entering the site, the following general precautions are recommended:

WARNING SIGNS	WARNING TIME
+ Present heavy rainfall + BOM forecast storm event - Visible rise in water level, swell or tidal conditions	+ Moderate urbanised catchment size with gently inclined topography; pluvial flood profile, response to short storm bursts

IMMEDIATE PREPARATION

1. Ensure all occupants are on or above the FPL (1% AEP + 0.3m)
2. Ensure first aid, Emergency Kit, and contact information is in order and assembled
3. Prepare additional items required in the event of an evacuation
4. Stack possessions, stock, and equipment currently below the 1% AEP on benches and tables; placing electrical equipment on top

DURING THE FLOOD EVENT

In the event that flood waters are identified externally or are seen to ingress into the site, the occupants should take the following actions:

1. Stay on or above floor levels known to be above the 1% AEP flood waters (15.005m, AHD); i.e. the ground and upper floors.
2. Monitor flood waters levels
3. Avoid all contact/exposure to flood water and debris.
4. Monitor radio and available sources for current flood warnings
5. Follow any instructions issued by emergency authorities

EVACUATION

Evacuation of the residence during a flood event which exceeds the 1% AEP is suitable under the following conditions:

- a) Where issued evacuation advice by emergency personnel

Under such conditions, the following steps are recommended (where it is timely and safe to do so) *:

1. Add any additional documentation and supplies to your Emergency Kit
2. Turn off all electricity, water, and gas as the switchboard/mains
3. Prepare all dependants and pets for evacuation
4. Make known your evacuation plan to others
5. Follow the evacuation route nominate by emergency personal; bring your Emergency Kit

*Note: Excluding where actions are against personnel advice, or where evacuation is immediately advised



7 Conclusion

This report has determined the proposed development will comply with the flood risk management controls of the local government authority where all recommendations of Section 5 & 6 are implemented. General controls of the Strathfield Interim Flood Policy (1999) and Stormwater Code (1994).

The proposed development is anticipated to have limited influence on the existing flood behaviour depths, hazard, or flood storage capacity within the catchment given the modifications recommended in Appendix A are undertaken. Whilst minor surface flooding is anticipated to interact with the proposed addition, no flood waters were determined to enter the proposed development FFLs under 1%AEP flood conditions and hazard values are low. This report subsequently provides details as to the emergency response, site modifications, and actions required of the occupants of the building before and during a flood event.

The flood emergency response, and contacts should be readily visible and be made known to occupants of the building before and during a flood event. It is recommended that the details of this flood risk management plan be reviewed within a minimum of 5 years; or following a major flood event.

8 Limitations of this Report

This report has been prepared subject to a number of limitations. These include:

The application of conditions of approval or impacts of unanticipated future events could modify the outcomes described in this document. In particular, the occurrence of significant site modification, variations in upstream catchment or the effects of climate change have not been considered but should they occur, may have a significant impact on the site. The client agrees that such events are possible but nevertheless accepts the risk that they pose;

The findings contained in this report are the result of discrete/specific methodologies used in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site in question. Under no circumstances, however, can it be considered that these findings represent the actual state of the site/sites at all points;

In preparing this report, Broadcrest Consulting has relied upon certain verbal information and documentation provided by the client, council, and/or third parties. Broadcrest Consulting did not attempt to independently verify the accuracy or completeness of that information. To the extent that the conclusions and recommendations in this report are based in whole or in part on such information, they are contingent on its validity. Broadcrest Consulting assume no responsibility for any consequences arising from any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to Broadcrest Consulting; and

This report is not to be relied upon for any purpose other than that defined in this report.

9 Resources

9.1 List of Abbreviations

Note: For an expanded list of definitions, refer to Glossary contained within the NSW Government Floodplain Development Manual – April 2005 edition.

AEP – Annual Exceedance Probability

AHD – Average Height Datum

ARI – Average Recurrence Interval

FFL – Finished Flood Level

FPL – Flood Planning Level

PMF – Probable Maximum Flood

WSE – Water Surface Elevation

9.2 References

ABCB, (2012) *Construction of Buildings in Flood Hazard Areas: Handbook*

ABCB, (2012) *Construction of Buildings in Flood Hazard Areas: Standard*

Holroyd City Council, (2013) *Development Control Plan*

Geoscience Australia, (2016) *Australian Rainfall and Runoff: A guide to Flood Estimation*

HNFMSC (2006) *Reducing vulnerability of buildings to flood damage: guidance on building in flood prone areas*

New South Wales Government, (2005) *Floodplain Development Manual: the management of flood liable land*



9.3 Flood Compatible Material

Flood Suitability of Building Materials (HNFMSC, 2006)

Table 4.3.1.3 Materials for 96-Hour Immersion

COMPONENT	SUITABLE*	MILD EFFECTS*	MARKED EFFECTS*	SEVERE EFFECTS*
FLOOR, SUB-FLOOR STRUCTURE	<ul style="list-style-type: none"> • slab-on-ground • suspended concrete 	<ul style="list-style-type: none"> • timber T&G (with ends only epoxy sealed and provision of side clearance for board swelling) or plywood 	<ul style="list-style-type: none"> • standard grade plywood 	<ul style="list-style-type: none"> • timber floor close to the ground and particleboard flooring close to the ground
WALLS SUPPORT STRUCTURE	<ul style="list-style-type: none"> • reinforced or mass concrete 	<ul style="list-style-type: none"> • full brick/block masonry cavity brick 	<ul style="list-style-type: none"> • brick/block veneer with venting (stud frame) 	<ul style="list-style-type: none"> • inaccessible openings • large windows low to the ground
WALL AND CEILING LININGS	<ul style="list-style-type: none"> • fibre cement sheet • face brick or blockwork • cement render • ceramic wall tiles • galvanised steel sheet • glass and glass blocks • stone, solid or veneer • plastic sheeting or tiles with waterproof adhesive 	<ul style="list-style-type: none"> • common bricks • solid wood, fully sealed • exterior grade plywood • fully sealed • non ferrous metals 	<ul style="list-style-type: none"> • exterior grade particleboard • hardboard • solid wood with allowance for swelling • exterior grade plywood • plasterboard 	<ul style="list-style-type: none"> • particleboard • fibreboard or strawboard • wallpaper • cloth wall coverings • standard plywood • gypsum plaster
ROOF STRUCTURE	<ul style="list-style-type: none"> • reinforced concrete • galvanised metal construction 	<ul style="list-style-type: none"> • timber trusses with galvanised connections 	<ul style="list-style-type: none"> • traditional timber roof construction 	<ul style="list-style-type: none"> • inaccessible flat floor • ungalvanised structural steelwork • unsecured roof tiles
DOORS	<ul style="list-style-type: none"> • solid panel with waterproof adhesive • flush marine ply with closed cell foam • aluminium or galvanised steel frame 	<ul style="list-style-type: none"> • flush or single panel marine ply with waterproof adhesive • painted metal construction • timber frame, full epoxy sealed before assembly 	<ul style="list-style-type: none"> • standard timber frame 	<ul style="list-style-type: none"> • standard flush hollow core with PVA adhesives and honeycomb paper core <p>Note: lowest cost and generally inexpensive to replace</p>



COMPONENT	SUITABLE*	MILD EFFECTS*	MARKED EFFECTS*	SEVERE EFFECTS*
WINDOWS	<ul style="list-style-type: none"> aluminium frame with stainless steel or brass rollers 	<ul style="list-style-type: none"> timber frame, full epoxy sealed before assembly with stainless steel or brass fittings 		<ul style="list-style-type: none"> timber with PVA glues mild steel fittings
INSULATION	<ul style="list-style-type: none"> plastic/polystyrene boards closed cell solid insulation 	<ul style="list-style-type: none"> reflective foil perforated with holes to drain water if used under timber floors 		<ul style="list-style-type: none"> materials which store water and delay drying open celled insulation (batts etc)
BOLTS, HINGES NAILS & FITTINGS	<ul style="list-style-type: none"> brass, nylon/stainless steel, removable pin hinges 	<ul style="list-style-type: none"> galvanised steel, aluminium 		<ul style="list-style-type: none"> mild steel <p>** see Note below</p>
FLOOR COVERING	<ul style="list-style-type: none"> clay/concrete tiles epoxy or cementitious floor toppings on concrete rubber sheets (chemically set adhesives) vinyl sheet (chemically set adhesive) 	<ul style="list-style-type: none"> terrazzo rubber tiles (chemically set adhesives) vinyl tiles (chemically set adhesive) polished floor & loose rugs ceramic tiles 	<ul style="list-style-type: none"> loose fit nylon or acrylic carpet (closed cell rubber underlay) 	<ul style="list-style-type: none"> wall to wall carpet wall to wall seagrass matting cork linoleum

* KEY

SUITABLE

these materials or products are relatively unaffected by submersion and flood exposure and are the best available for the particular application.

MILD EFFECTS

these materials or products suffer only mild effects from flooding and are the next best choice if the most suitable materials or products are too expensive or unavailable.

MARKED EFFECTS

these materials or products are more liable to damage under flood than the above category.

SEVERE EFFECTS

these materials or products are seriously affected by floodwaters and have to be replaced if inundated.

** Note: For nominal fixings in timber framing, AS 1684.2 requires nails used in joints that are continuously damp or exposed to the weather to be hot dip galvanised, stainless steel or monel metal.

Note: Use of non-listed componentry below the FPL must be verified by the material manufacture or suitably qualified certifying authority.



Appendix A – Flood Extent Overlay and Plan

Appendix B – Extract of Available Council Flood Mapping

Appendix C – Council Supplied Flood Information

Appendix D - EMA Flood warning, preparedness, safety

Appendix E - SES, NSW community FloodSafe brochure
