# Flood Impact Assessment

Hobartville Planning Proposal

59919066

Prepared for Hobartville Stud Pty Ltd

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### **Document History**

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## 1 Introduction

Hobartville Stud Pty Ltd proposes to rezone a portion of the Hobartville property at 16 William Cox Drive, Richmond to permit residential dwellings. The indicative scheme proposes a residential subdivision surrounding the existing Hobartville Estate, including vehicle access.

The proposed development site lies on the northern side of Castlereagh Road, between the existing properties and the Hawkesbury River floodplain, as shown in Figure 1-1.

This report assesses the flood risk management issues relating to the proposed rezoning. It includes the following:

- > Consideration of the Hawkesbury-Nepean Valley Flood Risk Management Strategy;
- New flood level information for the site from the recently completed Hawkesbury-Nepean Valley Regional Flood Study (WMA Water, 2019);
- Assesses the proposed development in accordance with Hawkesbury Councils' current planning controls and policies;
- > Considers flood related State Government guidelines including the Section 9.1 Ministerial Direction
- > Recommends a local evacuation route from the proposed development to the regional evacuation route;
- > Provides an overview of regional evacuation issues.

Figure 1-1 Locality Plan



## 2 Background Information

### 2.1 Hawkesbury Residential Land Strategy

This strategy aimed to provide an additional 5000 to 6000 additional dwellings with the Hawkesbury Local Government Area. These additional dwellings were primarily within existing urban areas. The Hobartville Stud was one of the sites identified where additional dwellings could be accommodated.

"Flood prone land and flood evacuation resolution" were identified as major challenges to be overcome for implementation of the strategy.

#### 2.2 Hawkesbury-Nepean Valley Flood Risk Management Strategy

In 2016 an inter-agency taskforce was established, chaired by Infrastructure NSW, to prepare a revised Flood Strategy for the Hawkesbury-Nepean Valley. The taskforce was to build on previous infrastructure strategies (2012) and flood management review (2013). In January 2017, the taskforce released "*Resilient Valley, Resilient Communities* — *Hawkesbury-Nepean Valley Flood Risk Management Strategy*" (HNVFMS). The HNVFMS aims to achieve the following outcomes:

- 1. Coordinated flood risk management;
- 2. Reduced flood risk in the valley by raising Warragamba Dam Wall;
- 3. Regional land use and road planning framework. Urban development approvals will consider the cumulative impact of population growth on road evacuation capacity.
- 4. Accessible contemporary flood risk information;
- 5. Improving the awareness and preparedness of the community;
- 6. Improved weather predictions and flood forecasting;
- 7. Continuous improvement of emergency response and recovery planning;
- 8. Upgrading of local roads to support evacuations; and
- 9. Ongoing monitoring and evaluation, reporting and improvement of the Flood Strategy.

These outcomes all have the potential to reduce flood risk in the Valley. Of particular relevance to the Hobartville planning proposal is Item No.3, which is likely to result in development restrictions where there is insufficient evacuation road capacity to cater for increased population.

At present the NSW government is funding Phase 1 of the above strategy which is proposed to be completed in 2020. Phase 1 includes the following:

- > flood risk management to be coordinated across multiple local government areas by a central agency.
- > community awareness and education;
- > improved weather predictions and flood forecasting;
- > new flood evacuation road signage;
- > regional land use and road planning framework;
- > detailed planning for local road upgrades. This will consist of planning for a package of road infrastructure upgrades to be incrementally delivered over time.
- > A new regional flood study for the Hawkesbury Nepean Valley which will include an atlas of flood maps available to the public. There is a small risk this might result in revised flood levels at Hobartville, especially if climate change is considered.
- > flood emergency response and recovery exercises.

It needs to be kept in mind that Stage 1 of the strategy does not include construction of infrastructure such as local road upgrades. Items No.2 and No.8 are subject to the approval of their business cases and future funding.

## 3 Flood Behaviour

The Hawkesbury Nepean valley has unique natural characteristics that make it susceptible to significant flood risk. Narrow downstream gouges act as choke points causing water to back up while many evacuation routes are cut by flood waters long before inhabited areas are inundated, thus isolating communities.

Although the 1 in 100 Annual Exceedance Probability (AEP) flood is used to set residential floor levels, the 1867 flood would have been 2 metres higher than 1 in 100 AEP while the Probable Maximum Flood would be 9m higher.

The most recent flood study for the Hawkesbury Nepean River is the *Hawkesbury-Nepean Valley Regional Flood Study* (July 2019) undertaken by WMA Water for Infrastructure NSW.

The flood study includes maps showing flood extents, depths and contours, provisional flood hazard, and hydraulic categorisation. However, the very small scale of these maps means they are inadequate to assess the proposed development. Therefore, Cardno has created site specific flood maps for the site based on the reported floods levels and detailed site survey as described below.

The flood contours in the regional flood study show that the flood levels at the site are similar to those at the Richmond Bridge. The design flood levels are given in Table 3-1.

1 in X chance per year flood	Flood Level (mAHD)
5	11.4
10	13.7
20	15.4
50	16.5
100	17.6
200	18.6
500	19.8
1000	20.7
PMF	26.8

Table 3-1 Design Flood Levels

Table 3-2

The flood extents for the 1 in 20, 1 in 100 and 1 in 200 year Annual Exceedance Probability (AEP) floods are shown on Figure 3-1.

Provisional flood hazard in the 100 year are shown in Figure 3-2. The flood hazard categories are based on *Managing the Floodplain: a guide to best practice in flood risk management in* Australia (AIDR, 2017) and *Australian Rainfall and Runoff* (Ball et al., 2019). Table 3-2 describes the flood hazard categories.

	- 0
Category	Description
H1	Safe for people, vehicles and buildings
H2	Unsafe for small vehicles
H3	Unsafe for vehicles, children and the elderly
H4	Unsafe for people and vehicles
H5	Unsafe for people and vehicles. All building susceptible to structural damage and less robust building types considered vulnerable to failure
H6	Unsafe for people and vehicles. All building types considered vulnerable to failure.

Figure 3-2 shows the proposed lots are outside the 1 in 100 AEP flood extent. Planning of internal access roads will need to ensure that vehicles can access dwellings without the need to drive through areas with a hazard category of H2 or higher. Recreational infrastructure such as walking paths and maintenance tracks in the higher hazard areas are appropriate.

Flood Hazard Categories

#### Figure 3-2 Flood Extents





#### Figure 3-3 Hazard Map for 1 in 100 AEP Flood Event



### 3.1 Climate Change

The new regional flood study has also modelled the potential impact of climate change. Projected increases in greenhouse gases are classified by Representative Concentration Pathways (RCPs). Australian Rainfall and Runoff (2019) recommends that RCP 4.5 and RCP 8.5 be used for impact assessment. RCP 4.5 is a low emission scenario. RCP 8.5 scenario is a high emission scenario that is considered when the expense can be justified. The Regional Flood Study estimates that under the RCP 4.5 scenario design rainfall will increase 9.1% by the year 2090 and the 1 in 100 AEP flood level at the Richmond Bridge will increase to 18.2mAHD. Under the RCP 8.5 the estimated design rainfall increase is 18.6% and the 1 in 100 AEP flood level at the Richmond Bridge will increases to 18.9mAHD.

## 4 Flood Risk Planning

### 4.1 Flood Related Planning Controls and Policies

#### 4.1.1 Hawkesbury Council

Hawkesbury Council's flood related development controls are described in Development of Flood Liable Land Policy (2012) and Hawkesbury DCP (2002).

It is noted that Bewsher Consulting and Grech Planners recommended more comprehensive controls for Flood Liable Land in the *Hawkesbury Floodplain Risk Management Study and Plan* (2012). Although Council has adopted the Study and Plan, the changes to Council's Planning Instruments have not been adopted to date. Table 4-1 compares the current Council controls with those recommended by Bewsher Consulting and Grech Planners (2012).

Planning Consideration	Hawkesbury City Council - Development of Flood Liable Land Policy (2012). and Hawkesbury DCP (2002)	Bewsher Consulting and Grech Planners (2012)
Floor Level	Habitable floor levels must be above the 100-year ARI flood level.	Floor levels to be no lower than the 1 in 200 flood level for single story residence or no lower than 1 in 100 for multistorey dwellings
Building Components & Methods	Any parts of a building below the 100 year ARI flood level are to be constructed of flood compatible materials.	All structures to have flood compatible building components and flood compatible building methods below the 1 in 200 flood level.
Structural Soundness	Council has no requirements	Engineers report to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to the design floor level or the 100 year flood level, whichever is higher.
Flood Affectation	Hawkesbury DCP (2002) requires that the filling does not result in adverse impacts on nearby development.	Impact of development on flooding elsewhere to be considered. Compensatory cut and fill may be a means to ensure no net loss of flood water storage.
Car Parking & Driveway Access		Enclosed car parking (e.g. basement) must be protected from inundation by flood waters up to the 100 year level. Where the floor level is more than 0.8m below the 100 year level, an aural & visual flood warning system is to be provided.
Evacuation	Suitable access and egress during flood events must be provided, and should not require travel through areas of higher flood risk. The development should not result in occupants becoming isolated in flood events.	The ability to safety evacuate from the development to the defined regional evacuation route in accordance with any applicable flood evacuation strategy, is to be demonstrated.

 Table 4-1
 Comparison of Flood Development Controls

#### 4.1.2 Floodplain Management Manual and Section 9.1 Ministerial Direction

The Floodplain Manual provides councils with a framework for implementing the NSW government Flood Prone Land Policy. It also presents general principles and a process for floodplain risk management. Thus, the Manual provides principles rather than statutory requirements. These principles include the need to consider the full range of flood risk (including events greater than the 1 in 100 AEP) and consideration of emergency management measures such as evacuation. The Section 9.1 ministerial direction are a mandatory consideration for a planning proposal.

In January 2007 the Department of Planning issued a new guideline regarding development above the residential flood planning level. The guideline advised that:

- The 1 in 100 AEP plus an appropriate freeboard (typically 0.5m) was to be adopted as the Flood Planning Level (FPL) for residential development, unless there are exception circumstances; and
- > Councils should not impose flood related development controls on land above the residential FPL.

The Section 9.1 (formerly Section 117) *Ministerial Direction No.* 15 – Flood Prone Land was also revised so that it was consistent with the guideline.

#### 4.1.3 Department of Planning, Industry and Environment

The Department of Planning, Industry and Environment has indicated that they are considering changes to floodplain management policies. Some of the policy changes being considered relate specifically to the Hawkesbury Nepean Valley. The changes being considered include the following:

- > No cut and fill below the 1 in 100 AEP;
- Number of dwellings in a particular location to be linked to evacuation constraints as per the HNVFMS; and
- Development controls above the 1 in 100 AEP. This includes reviewing the 2007 Planning Guideline and Section 117 (now Section 9.1) direction. Under the 2007 guidelines the 1 in 100 AEP flood was specified as the Flood Planning Level for residential development and unless there were exceptional circumstances flood related development controls above the 1 in 100 AEP were discouraged.

#### 4.2 Assessment of Proposed Masterplan

The proposed development consists of 87 double storey terrace houses and 31 cottages with an attic space.

Table 4.2 assesses the proposed development and demonstrates that it complies with the development controls in Section 4.1 above.

Planning Consideration	Assessment of Proposed Development
Floor Level	The majority of buildings are located above the 1 in 200 AEP flood level and all buildings are located above the 1 in 100 AEP flood level. Most of the buildings below the 1 in 200 AEP flood level are two storey terraces.
Building Components & Methods	This can be considered in more detail as part of the development application for the buildings. Most buildings are located above the 1 in 200 AEP flood level.
Structural Soundness	All buildings are located above the 1 in 100 AEP flood level. This can be considered in more detail as part of the development application for the buildings.
Flood Affectation	Filling is not required below the 1 in 100 AEP flood level.
Car Parking & Driveway Access	Cardno is not aware of any enclosed car parking below the 1 in 100 AEP flood.
Evacuation	Evacuation to the regional flood evacuation route is available above the 1 in 100 AEP flood level. Refer <b>Section 5.2</b> for more details.

### 4.3 Regional Land Use and Road Planning Framework

As noted in Section 4.1.3, development approval in the Hawkesbury-Nepean Valley will be linked to evacuation constraints. The new Regional Planning Framework being developed by Department of Planning, Industry and Environment will consider new region-wide flood and evacuation modelling and analysis. Roads and Maritime Services with assistance from the NSW State Emergency Service, Infrastructure NSW and CSIRO is currently developing a purpose-built model for this model.

### 5 Evacuation

#### 5.1 People and Vehicles to be evacuated

Table 5-1 provides upper bound estimates of the number of people and vehicles that will require evacuation from the proposed development. These estimates are based on the following assumptions:

- > Five occupants for each 4 bedroom dwelling and four occupants for each 3 bedroom dwelling. This is a conservative assumption as household sizes are much more variable and change over time; and
- > Two vehicles per dwelling as adopted plus 24 visitor vehicles as adopted by the *Transport Impact Assessment* by GTA Consultants (2019).

Type of Dwelling	No of Dwellings	No of Bedrooms	No of Occupants	No of Vehicles
Terrace Houses	87	4	435	174
Cottages	31	3	124	62
Visitors	n.a.	n.a.		24
Total	118		559	260

 Table 5-1
 Estimate of People and Vehicles to be Evacuated

Table 5-2 compares the evacuation traffic from the proposed development to 2010 base case estimated by Bewsher Consulting and Grech Planners (2012) and Molino Stewart (2012) for the proposed. It noted that Molino Stewart estimate is almost double that of Bewsher & Grech. However whatever base case estimate is adopted, the increase in evacuation traffic as a result of the proposed development is relatively small.

Table 5-2 Estimated Evacuation Traffic from Richmond

Source	No. of Vehicles (2010 Base Case)	Increase due to Proposed Development
Bewsher and Grech (2012)	5127	5.1%
Molino Stewart (2012)	8998	2.9%

### 5.2 Local Evacuation Route

Local evacuation is evacuation from the proposed developed to the Regional Evacuation Route which is Castlereagh Road. Figure 5-1 shows the recommended evacuation routes. These are as follows:

- The western portion of the proposed development is via Grand Flaneur Avenue and William Cox Drive. The north-west corner of William Cox Drive is below the 1 in 100 AEP level so it should be avoided during flood events.
- > There are two possible evacuation routes for the eastern portion of the property. The normal access to this part of the development is via Chapel Street. However Chapel Street may become congested due to evacuation the Uniting Hawkesbury Retirement Village and Nursing Home. Residents of the nursing home are likely to require assistance to evacuate.

A flood evacuation route through the heritage portion of the Hobartville property to William Cox Drive will avoid this potential congestion. This later route is recommended for flood emergencies only and is consistent with the recommendations of GTA Consultants (2019).

#### 5.3 Regional Evacuation Route

The regional evacuation route from Richmond is via Castlereagh Road (SES 2015), a significant portion of which is above the PMF level. The route is cut at The Driftway when the Richmond Bridge gauge height is 20.05m which is above the 1 in 500 AEP flood level.

The most recent publicly available evacuation modelling report is by Molino Stewart (2012). This report found that under 2010 development conditions, the estimated number of vehicles needing to evacuate from the Richmond area (8998) exceeds the number of vehicles (8700) able to evacuate. The capacity constraint occurs at the suburb of Cranebrook due to converging traffic from Waterside Green. Queuing times of half an hour were estimated.

Upgrades of this evacuation have been identified by the HNVFMS to be completed before 2040. However, these road upgrades are subject to approval of their business cases which are currently being prepared.

Figure 5-1 Local Evacuation Route from the Proposed Development



Figure 5-2 Regional Evacuation Route Source: SES (2015)



## 6 Conclusion

Flood impacts for the proposed rezoning at the Hobartville Stud have been assessed. This assessment used flood level estimates from the recently completed *Hawkesbury-Nepean Valley Regional Flood Study* (July 2019). It was found that the proposed development complies with Hawkesbury Council flood related development controls and S9.1 Ministerial Direction.

The most significant flood management risk is the capacity of the regional flood evacuation route. This needs to be considered on a regional basis by state government agency including the Department of Planning, Industry and Environment, Roads and Maritime Services and NSW State Emergency Services. As such an assessment of regional evacuation issues is outside the scope of this report.

### 7 References

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