

Our Ref: ID2713  
Your Ref:

12 November 2024

Gabrielle Coleman  
Department of Planning, Housing & Infrastructure  
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Parramatta NSW 2124

email: gabrielle.coleman@dpie.nsw.gov.au

Dear Gabrielle,

### Gateway Review for 146 Newbridge Road, Moorebank

Thank you for the opportunity to provide comment on the additional responses by Mirvac, Tooker and Associates and Risk-e-Business Consultants in support to the Gateway Review for 146 Newbridge Road, Moorebank. We refer also to our previous advice dated 29 January 2024 and 29 April 2024.

#### In summary NSW SES:

- **Reiterate the flood risk at the site poses a risk to human life and property.** While we acknowledge that the proposed floor levels are raised, the land on which the buildings are proposed is impacted by floods as frequently as 5% AEP events, below the current Flood Planning Level. In 1% AEP events, the flood depth in parts of the site can reach above 5 metres<sup>1</sup> and the flood hazard level reaches H5 – H6,<sup>2</sup> which is “*unconditionally dangerous and unsuitable for any type of development.*”<sup>3</sup> In a Probable Maximum Flood (PMF), the flood depth on the entire site can reach above 10 metres,<sup>4</sup> with a flood hazard level of H6 for the entire site,<sup>5</sup> and parts of the site becoming a floodway.<sup>6</sup>
- **Reiterate this proposal would restrict the number of vehicles able to safely evacuate from Chipping Norton<sup>7</sup>.**

<sup>1</sup> BMT, 2020, *Georges River Flood Study - Final Draft Mapping Compendium*, Figure A-05.

<sup>2</sup> BMT, 2020, *Georges River Flood Study - Final Draft Mapping Compendium*, Figure A-13.

<sup>3</sup> BMT, 2020, *Georges River Flood Study - Final Draft Report*, Section 7.4 - Flood Hazard, Page 140.

<sup>4</sup> BMT, 2020, *Georges River Flood Study - Final Draft Mapping Compendium*, Figure A-8.

<sup>5</sup> BMT, 2020, *Georges River Flood Study - Final Draft Mapping Compendium*, Figure A-15.

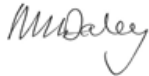
<sup>6</sup> BMT, 2020, *Georges River Flood Study - Final Draft Mapping Compendium*, Figure A-11.

<sup>7</sup> Molino Stewart, 2022. *Georges River Evacuation Modelling – Planning Proposals*, Table iii Constraints on Future Development, Page vii.

- **Support the recommendation made in the Gateway Determination (11 July 2024) for Council to “revisit the vision for the redevelopment of this precinct holistically” and “investigate and deliver road infrastructure to support the redevelopment of this precinct as per the Molino Stewart 2022 Georges River Evacuation Report”.**
- **Emphasise the increasing frequency of flood events due to climate change, and the potential risks associated with not considering the most current information available.**

Please feel free to contact Peter Cinque via email at [rra@ses.nsw.gov.au](mailto:rra@ses.nsw.gov.au) should you wish to discuss any of the matters raised in this correspondence. The NSW SES would also be interested in receiving future correspondence regarding the outcome of this referral via this email address.

Yours sincerely,

A handwritten signature in black ink that reads 'Melissa Daley'.

Melissa Daley  
A/ Director Emergency Management  
**NSW State Emergency Service**

## Appendix A – NSW SES Detailed Advice

### Georges River Flooding

The Mirvac letter states *“The Georges River floodplain acts significantly different to other floodplains in NSW in that it is a slow rising flood. The PMF event (which is estimated to occur every 1.6 million years) as modelled by Stantec in the supporting package, shows that it takes up to 36 hours, meaning there is a long period of time to provide flood warnings and enact any evacuation requirements (if ever required)”*<sup>8</sup>.

Flood forecasts during actual events are provided by the Bureau of Meteorology with a forecast timeframe of 12 hours for a height in excess of 4 metres for both the Liverpool and Milperra gauges, the closest gauges to the site.<sup>9</sup>

The provided Stantec hydrographs **do not support** an available warning and evacuation time of 36 hours for this development, but rather show a duration of 36 hours until flooding recedes, or passes the peak of flooding in the respective modelled locations.<sup>10</sup>

Further, the previously provided Tooker and Associates letter dated 6 March 2024 includes a table (page 3) showing there is only 13.6 hours warning time available before the car evacuation via Brickmakers Drive is cut and 14.6 hours until pedestrian evacuation via the footbridge is also unsafe for people to evacuate.<sup>11</sup>

As stated in the 2022 Flood Inquiry *“Rates of rise will vary across a flood event, depending on the specific time period in question, and also depending on the catchment characteristics and intensity of rainfall”*.<sup>12</sup> This is demonstrated in hydrographs included in both the 2004<sup>13</sup> and 2020<sup>14</sup> Georges River Flood Studies which show past flood events with varying rates of rise, with some progressing from the start of water rising to the peak of the flood in as little as 10 hours at the Milperra gauge, the closest gauge to the site.

### Flood Risk of the Site

The Tooker and Associates Gateway Review Flooding Response states *“it is incorrect to strictly apply the BMT 2020 report, which was never adopted by Council”* and further that *“how the*

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<sup>8</sup> Mirvac, 2024, *Gateway Review – Mirvac Cover Letter*, Page 1.

<sup>9</sup> Bureau of Meteorology, 2024, *Service Level Specification for Flood Forecasting and Warning Services for New South Wales and the Australian Capital Territory – Version 3.15*, Georges River and Sydney Coast, Page 23.

<sup>10</sup> Tooker and Associates, 2024, *Gateway Review Flooding Response - Tooker & Assoc (incl. Structural & Stantec)*, Pages 17, 20, 23, 26, 29.

<sup>11</sup> Tooker and Associates, 2024, *Proponents Flood Consultants response to pre-Gateway SES and BCS state Agency comments - 6 March*, Page 3.

<sup>12</sup> NSW Government, July 2022, *2022 Flood Inquiry – Volume Two: Full Report*, Page 34

<sup>13</sup> Bewsher, 2004, *Georges River Floodplain Risk Management Study*, Figure 5.5 Stage Hydrograph at Milperra, Page 69.

<sup>14</sup> BMT, 2020, *Georges River Flood Study*, Section 5.4.1.2 Water Level Data, Page 112.

*mapping is being considered and applied is critically incorrect*".<sup>15</sup> We note, however that the 2020 Flood Study agrees with earlier reports adopted by council as to the flood risk on the site and, while it was not adopted was used as the basis for the Council-commissioned Evacuation Study from Molino Stewart. These studies are:

- Georges River Flood Study 1991 – adopted by Council
- Georges River Floodplain Risk Management Study and Plan 2004 – adopted by Council
- Georges River Flood Study 2020 – commissioned by Council via NSW Floodplain Risk Management grant funding but not yet adopted by Council.

### Building Structure

Figure 7 in the Tooker and Associates response shows building piers, below the podium level inconsistent with the statement *"The structural assessment concludes that: "Based on this, we are satisfied that columns above podium level which the super-structure of apartments, and the lower walls of townhouses which are below habitable rooms, will be adequate to resist lateral forces"*.<sup>16</sup> As these below podium supports are frequently exposed to flood forces it is essential they are included in any assessment of building stability and not only those supports above podium level.

Further, in regard to the thresholds for building stability in flood extracted from Flood Risk Management Guideline the report states *"In interpreting that graph our building platform and first 'floor' is proposed at RL7.6m, thus it would therefore only be when the flood level reaches RL11.6m (4m above the building platform) that the extreme hazard to structure threshold is met. However, this is unlikely to ever occur as the Probable Maximum Flood Level is lower at RL10.20m"*.<sup>17</sup> This again can not be applied to the below podium pylons shown in figure 7 as they are exposed to as much as 10 metre depths of water as demonstrated in the hydrograph provided by Stantec within the Tooker and Associates response,<sup>18</sup> far exceeding the 4 metre limit which marks extreme hazard to structures.<sup>19</sup>

We recommend seeking further advice from NSW DCCEEW regarding these matters.

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<sup>15</sup> Tooker and Associates, 2024, *Gateway Review Flooding Response*, Section 1 Council Flood Mapping, Page 1.

<sup>16</sup> Tooker and Associates, 2024, *Gateway Review Flooding Response*, Section 4 Extreme Damage to Structures, Page 5.

<sup>17</sup> Tooker and Associates, 2024, *Gateway Review Flooding Response*, Section 4 Extreme Damage to Structures, Page 5.

<sup>18</sup> Tooker and Associates, 2024, *Gateway Review Flooding Response - Tooker & Assoc (incl. Structural & Stantec)*, Attachment A3 Flood Depths at Location GC1 – Proposed Conditions, Page 23.

<sup>19</sup> Tooker and Associates, 2024, *Gateway Review Flooding Response*, Figure 6: Thresholds for building stability in flood extracted from Flood Risk Management Guideline, Page 5.

## Rare and Extreme Floods

While we acknowledge the PMF flood is a rare and extreme event, extreme floods can and do happen and must be planned for in order to protect life and property.

Recent investigations of flood behaviour in 2022 have stated that in Eugowra *“the November 2022 flood likely had an equivalent AEP of between 0.1% (1 in 1,000) and 0.05% (1 in 2,000)”*.<sup>20</sup> While the Lismore Post Flood Event Analysis finds *“The February 2022 flood event levels sit above the 1:2,000 AEP flood event and just below the 1:10,000 AEP flood event levels.”*<sup>21</sup> The provided flood levels for this site would see the vehicle evacuation route cut at the 1 in 100 year level and pedestrian evacuation routes proposed cut during, or before a *“1 in 2000-year flood event”*<sup>22</sup>

Further the NSW SES is advised that due to climate change, current science and the latest flood engineering guidance indicates that the 1 in 100 AEP flood determined when the most recent flood study adopted by Council was commissioned, in 2004, is now approximately a 1 in 54 AEP event and becoming increasingly more frequent over the coming decades. As a result, there will be an increase in flood risk and demand on emergency services, including the NSW SES.

As extreme flood events, such as those seen in 2022 are likely to be seen again in the future it is essential planning decisions protect current and future communities from risk and *“ensure that the strategic land use frameworks and related controls permit new developments only in line with the evacuation capacity both individually and cumulatively”*<sup>23</sup> as recommended by the 2022 Flood Inquiry.

## Other Development in High Hazard Areas

The developments cited in the Tooker and Associates letter should not be used as precedent to justify other development in high hazard areas.

These *“Examples where multi-storey residential buildings have been approved and either constructed or are under construction in areas mapped as H6 hazard in the PMF include multiple developments in the Parramatta River and Clay Cliff Creek confluence area (west of James Ruse Drive) and in Summer Hill (beside Hawthorne Canal)”*<sup>24</sup> were approved between 2020 and 2022, prior to the release of the 2022 Flood Inquiry findings, the updated Parramatta Flood Study (2024) and the Flood Risk Management Manual (2023). More recent development

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<sup>20</sup> Lyall & Associates, 2023, *Investigation of Flood Behaviour at Eugowra*, s1.5 Magnitude and Frequency of Flow in Mandagery Creek at Eugowra, Page 11.

<sup>21</sup> Engeny Water Management, 2024, *Lismore 2022 Post Flood Event Analysis Report*, Section 6.1 Peak Flood Levels, Page 45.

<sup>22</sup> Tooker and Associates, 2024, *Proponents Flood Consultants response to pre-Gateway SES and BCS state Agency comments - 6 March*, Page 3.

<sup>23</sup> NSW Government, 2022, *Flood Inquiry Summary Report*, Recommendation 21, Page 37 .

<sup>24</sup> Tooker and Associates, 2024, *Annexure A Stantec Flood Modelling*, Page 11.

proposals, particularly in the Parramatta River and Clay Cliff Creek confluence (west of James Ruse Drive) have been primarily for industrial uses, not residential.

Further the duration of inundation in both these areas is far shorter, across all flood extents, than in the Moorebank area. The hydrograph provided in the Camellia Precinct Drainage and Flooding Study for the Hassall Street / James Ruse Drive intersection, closest to this development location, shows a total duration for above road flooding of 7 hours for the 1% ARI event and 9.5 hours during the PMF.<sup>25</sup> While the Flood Risk Assessment provided as part of the planning proposal for 120c Old Canterbury Road, Summer Hill states *“the indicative duration of PMF levels exceeding the basement car parking driveway crest level and the Level 01 habitable floor level is around 55 minutes”*.<sup>26</sup>

Risk-e Business says in their response *“one must consider contemporary research, the practical application of lessons learnt and the findings of the NSW Flood Inquiry (2022).”*<sup>27</sup> This should also be applied to land use planning decisions. The Flood Inquiry stated *“Planning system should play a significant role in avoiding placing people and property in harm’s way”*<sup>28</sup> and consideration should be given to studies, reports and policies released following the 2022 floods to inform future planning decisions to improve the safety of existing and future communities.

We also note the Gateway Determination states *“Council should undertake further strategic planning work on this precinct to inform future planning proposals. Council should re-visit its vision for the redevelopment of this precinct holistically, determine appropriate land uses for this precinct and allocate development potential based on evacuation capacity. If development is to exceed evacuation capacity, investigate and deliver upgrades to road infrastructure to support the redevelopment of this precinct as per the Molino Stewart 2022 Georges River Evacuation report.”*<sup>29</sup>

### Alignment with the Flood Risk Management Manual

We recommend seeking advice from NSW DCCEEW regarding the alignment of the proposal with the Flood Risk Management Manual, however we note it does not currently align with the supporting guideline EM01: Support for Emergency Management Planning in several areas.

The Guideline EM01 was issued under section 733 of the *Local Government Act, 1993*. Following the Guidelines provides Councils with indemnity regarding flood risk decisions.

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<sup>25</sup> Cardno, 2015, *Camellia Precinct – Drainage and Flooding Study*, Figure 6-4 100 yr ARI and PMF Flooding at Hassall St / James Ruse Drive Intersection, Page 60.

<sup>26</sup> Cardno, 2020, *Flood Risk Assessment 120c Old Canterbury Road Summer Hill*, Section 4.4 Duration of Inundation, Page 19.

<sup>27</sup> Risk-e Business, 2024, *Evacuation Strategy Review Moorebank Marina*, Page 3.

<sup>28</sup> NSW Government, 2022, *2022 Flood Inquiry – Volume Two: Full Report*, Table 7-2: Relationship with the planning system during the four stages of an emergency, Page 280.

<sup>29</sup> NSW Department of Planning, Housing and Infrastructure, 2024, *Gateway Determination*, page 1.

The imposition of development consent conditions requiring private flood evacuation plans is not a substitute for the application of sound land use planning and flood risk management. As stated in EM01 *“Many considerations for EM planning are beyond the scope, scale or influence of a development proposal. Considerations such as long-term maintenance, EM arrangements and exercising of plans as well as situations beyond the control of the impacted community in the development are unlikely to be successfully managed.”*<sup>30</sup>

Further the guidelines explain *“Decisions to place new development or to redevelop in the floodplain need to consider the EM constraints. They should also consider the current EM response strategy of the existing community and a range of other factors to ensure the realities of flooding and evacuation are adequately considered. This includes considering the inherent risks to the population needing evacuation, including the possibility of evacuees being trapped and overwhelmed by floodwaters while evacuating”*<sup>31</sup>. These risks and NSW SES consideration of them have been discussed at length in our previous advice dated 29 January 2024 and 29 April 2024.

### Adoption of Timeline Evacuation Model

Regarding the statement *“NSW SES adoption of the TEM (Timeline Evacuation Model) as the guide for evacuation management even though it is not research based and has not been peer reviewed and the results published. Research and methodology are not contemporary”*.<sup>32</sup> It is understood that Mr David Owens has been accepted by the NSW Land and Environment Court, inter alia, as a Subject Matter Expert in Emergency and Evacuation Management.<sup>33</sup>

In *CWO Pty Ltd v Muswellbrook Shire Council [2024] NSWLEC 61*, the site suitability issue was raised in relation to emergency management, specifically the potential of an emergency incident at the EO Depot affecting emergency response at the site. In this context, **evacuation modelling** was discussed, and it was agreed (by Mr David Owens and Dr Tony Green/ADF representative) that *“the Timeline Evacuation Model developed by the NSW State Emergency Service provided an acceptable model for the purposes of evacuation calculations concerning motor vehicles.”*<sup>34</sup>

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<sup>30</sup> NSW Department of Planning and Environment, 2023, *Support for Emergency Management Planning Flood Risk Management Guideline EM01*, Section A2.4.2 Site Specific Flood Response Plans as a Development Consent Condition, Page 12.

<sup>31</sup> NSW Department of Planning and Environment, 2023, *Support for Emergency Management Planning Flood Risk Management Guideline EM01*, Section D3 Considering Emergency Management in Land-use Planning, Page 51.

<sup>32</sup> Risk-e Business, 2024, *Evacuation Strategy Review Moorebank Marina Planning Proposal*, 27 September 2024, page 1.

<sup>33</sup> Risk-e Business, 2024, *Evacuation Strategy Review Moorebank Marina Planning Proposal*, 27 September 2024, Dave Owens APM – CV, Page 7.

<sup>34</sup> *CWO Pty Ltd v Muswellbrook Shire Council [2024] NSWLEC 61*, accessed via <https://www.caselaw.nsw.gov.au/decision/190341ba7bb39a8cfd98be66>, Paragraph 31.

However, we reiterate, as stated in previous correspondence, NSW SES does not solely rely on the TEM which is only designed for areas which have only one evacuation route with no interaction with adjacent or nearby evacuation areas.

Instead, an agent-based model is more appropriate. The Hawkesbury Nepean FEM was developed to address the need to better model complex areas. The FEM is being applied to other areas in the future.

In the case of the Georges River, we support the findings from Molino Stewart's evacuation model and his expertise in developing appropriate agent-based models to understand complex evacuation scenarios. This evacuation model report is independent of the publicly available NSW SES Flood Plan, cited as out of date and incomplete.

The development of the FEM model, research into evacuation flow rates and the road conditions for the identified evacuation route for this development were discussed in detail in NSW SES previous correspondence dated 29 April 2024.

The FEM has developed significantly since 1997 and 2010, incorporating agent based modelling techniques and consideration of converging traffic.

In addition to NSW SES significant experience in developing flood evacuation models and undertaking emergency evacuations in the Georges River catchment there is a large body of academic research supporting significantly reduced capacities for evacuation. Studies on evacuation traffic dynamics from Dixit and Wolshon have found *"there exists a consistent and fundamental difference between traffic dynamics under evacuation conditions and those under routine non-emergency periods."*<sup>35</sup> For this reason, as outlined in NSW SES comments dated 29 April 2024 it is not appropriate to base traffic evacuation on non-emergency road conditions.

While the Risk-e Business Gateway Review Response critiques the application of current evacuation modelling it provides no suitable alternative and fails to adequately consider emergency conditions when applying non-emergency highway capacities to the local streets identified as the evacuation route for this development.

### Evacuation approaches

Regarding the statement inferring a *"failure to adopt or consider a phased approach to evacuation management and different evacuation approaches"*.<sup>36</sup> This statement is incorrect. The NSW SES does phase evacuation by areas.

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<sup>35</sup> Vinayak Dixit and Brian Wolshon, 2014, *Evacuation traffic dynamics*, Transportation Research Part C: Emerging Technologies, Volume 49, Pages 114-125.

<sup>36</sup> Risk-e Business, 2024, *Evacuation Strategy Review Moorebank Marina Planning Proposal*, 27 September 2024, page 1.



NSW SES evacuations are typically phased based on geographic location, with communities at the highest risk during any individual flood event evacuated first. As documented in the State Emergency Management Plan Evacuation Management Guidelines, *“Some evacuations may be phased to avoid congestion, support co-ordination arrangements due to lack of resources or to ensure that people most at risk can be safely evacuated in time. Phasing may be by geographical area or segments of the community.”*<sup>37</sup>

The NSW SES approach to phased evacuation involves analysing the risk to communities across the floodplain and developing discrete geographic subsectors up to the PMF extent and when each of these areas lose their last evacuation route. During flood events, NSW SES uses the Australian Warning System (AWS) to communicate the flood risk to communities. AWS levels and actions statements are selected for each subsector, with tailored and specific information being provided that is contextualised for each warning area. This methodology has been documented, with a paper presented by SES staff at industry conferences.<sup>38</sup>

The addition of private evacuation plans adopting phased evacuation using different methods of evacuation for occupants of a single development, as proposed by this development, are not consistent with the current approach and add additional complications to an already complex evacuation.

Although NSW SES encourage residents to be prepared, a private emergency plan is not a substitute for appropriate land use planning, as outlined in the Support for Emergency Management Planning Guideline EM01. Requiring a site-specific flood response plan as a condition of consent for development is not considered a genuine attempt to manage flood risk to future occupants. The vulnerability or capability of occupants, their ability to enact a plan, and the flood characteristics of a future event are not known at the time of the plan’s creation. Unless occupants can self-evacuate for all possible flood events in consideration of future development, and the plan is owned, understood, practised and uncertainties of flooding understood by occupiers, it will almost certainly be forgotten or fail to be effective, particularly in events where the plan assumptions are overwhelmed.<sup>39</sup>

### **Evacuation trigger**

As previously addressed, NSW SES’ Moorebank East C Subsector encompasses the Georges Cove residential development and the proposed Georges Cove marina development. The evacuation routes for the proposed development leads on to Spinnaker Drive, through the

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<sup>37</sup> SEMC Evacuation Working Group, 2014, *State Emergency Management Plan Evacuation Management Guidelines*, Section 11.1 Staged/Phasing, Page 21.

<sup>38</sup> NSW SES. 2024. *Piecing the Puzzle Together: Using Subsectors to Optimise Flood Emergency Management and Warning Strategies*. AFAC Conference, Sydney, available at <<https://www.afacconference.com.au/2024-afac-conference-program/piecing-puzzle-together-using-subsectors-optimise-flood-emergency-management-warning-strategies>>.

<sup>39</sup> NSW Department of Planning and Environment, 2023, *Flood risk management guideline EM01 Support for emergency management planning*, A2.4.2 page 6.

approved development Georges Cove residential area, to Promontory Way and then on to Brickmakers Drive.

The height of Promontory Way bridge from Spinnaker Drive to Brickmakers Drive has a low point of 5.6m AHD at Brickmakers Drive and a high point of 10.04m at Spinnaker Drive. Therefore, residents and visitors of this area would need to evacuate prior to 5.6m AHD which is at the 1:100 AEP flood level.

### **Mode of evacuation**

We reiterate that it is unacceptable to rely on people to evacuate from flooding on foot. Designing in a reliance on pedestrian evacuation is flawed, particularly at this site where the prevailing weather conditions during a flood would not be favourable for walking. All future residents should have equal rights to the road infrastructure to evacuate, including through external transport assistance e.g. taxi's and rideshare services, friends and family, etc.

### **When people start evacuating**

The Risk-e Business letter questions the assumption, as stated in the State Flood Plan that it takes two hours for people to start evacuating once they have received a warning. While research undertaken for Infrastructure NSW by Newgate Research, surveying residents of the Hawkesbury-Nepean Valley, did find *“that 75% of participants stated it would take them 30 minutes to evacuate”*<sup>40</sup>, this does not consider the fact that *“On average, respondents had lived at their current property for 20 years, with 48% having lived there for 20 or more years”*.<sup>41</sup> The survey also found that *“Those who had experienced a flood in the past were somewhat more confident they knew what to do if they heard or received an evacuation order than those who had not experienced a flood before”*.<sup>42</sup> The land the proposed development is located on is currently not residential land and while some residents may come from the wider area, it is likely many will not have experienced a flood before and can not be counted on to be able to be able to make the decision to evacuate far faster than average.

### **Evacuation timeframe**

Regarding the time available to undertake evacuation, the Mirvac Cover Letter asserts *“The Georges River floodplain acts significantly different to other floodplains in NSW in that it is a slow rising flood. The PMF event (which is estimated to occur every 1.6 million years) as modelled by Stantec in the supporting package, shows that it takes up to 36 hours meaning there is a long period of time to provide flood warnings and enact any evacuation requirements*

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<sup>40</sup> Risk-e Business, 2024, *Evacuation Strategy Review Moorebank Marina Planning Proposal*, 27 September 2024, Page 4.

<sup>41</sup> Newgate Research, 2014, *Social Research on Floods in the Hawkesbury Nepean Valley Quantitative Research Report*, Key Findings, Page 15.

<sup>42</sup> Newgate Research, 2014, *Social Research on Floods in the Hawkesbury Nepean Valley Quantitative Research Report*, Confidence in Knowing What to Do: Evacuation Order, Page 38.

(if ever required)",<sup>43</sup> however the Hawkesbury-Nepean River Flood Study 2024 does not support this showing durations in excess of 100 hours for numerous design events<sup>44</sup> and historic flood events.<sup>45</sup>

Further, as discussed above, the total duration of a flood event should not be conflated with available warning time. The hydrographs and timings provided by the proponent demonstrate there is less than 15 hours warning time available for evacuation of any sort for this site.<sup>46</sup>

### Shelter in place

In relation to the use of Shelter In Place as the final stage of the proposed 'phased evacuation' of this site, the Risk-e Business Gateway Review Response letter cites the Australian Disaster Resilience Handbook – Flood Preparedness (2009) guideline and 2017 correspondence from NSW SES regarding Shelter in Place as a response strategy. However, it fails to adequately contextualise these comments. As stated in the AIDR guideline "*Evacuation is a suitable strategy only when, by evacuating, people are not exposed to greater risks than they would face by remaining where they are. Due to the limited warning time available and the dangerous nature of **flash flooding**, in most flash flood catchments it may be more dangerous for people to evacuate than to shelter in place*".<sup>47</sup>

In flash flood environments, which are environments subject to floods in 6 hours or less, Shelter In Place may form a suitable strategy, however, as demonstrated in the proponents Flood Assessment "*The proposed development could experience flood durations longer than 6 hours*"<sup>48</sup> with the hydrographs provided in the response from Tooker and Associates inc. Stantec and Structural showing durations of up to 60 hours,<sup>49</sup> ten times longer than that of a flash flood environment where shelter in place may be an appropriate response.

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<sup>43</sup> Mirvac, 2024, *Gateway Review – Mirvac Cover Letter*, Page 1.

<sup>44</sup> NSW Reconstruction Authority, 2024, *Hawkesbury-Nepean River Flood Study*, Figure 5-11. 1 in 20 AEP Inflows and Peak Water level at Victoria Bridge, Page 77.

<sup>45</sup> NSW Reconstruction Authority, 2024, *Hawkesbury-Nepean River Flood Study*, Figure 5-10. March 2021 Inflows and Peak Water Level at Victoria Bridge, Page 77.

<sup>46</sup> Tooker and Associates, 2024, *Proponents Flood Consultants response to pre-Gateway SES and BCS state Agency comments - 6 March*, Page 3.

<sup>47</sup> Australian Institute for Disaster Resilience, 2009, *Flood Preparedness*, Evacuation v Sheltering in Place, Page 57.

<sup>48</sup> Tooker and Associates, 2023, *Flood Impact Assessment Report and Flood Emergency Response Plan*, 13.

<sup>49</sup> Tooker and Associates, 2024, *Gateway Review Flooding Response - Tooker & Assoc (incl. Structural & Stantec)*, Pages 17, 20, 23, 26, 29.

## Policy on Shelter in Place

The letter further states *“There is no formal government policy that states that shelter in place is not a viable or acceptable mode of emergency response in floods. Therefore, it must be considered as an input into any flood modelling.”*<sup>50</sup>

This statement is incorrect.

Shelter In Place is discussed in detail in Flood Risk Guideline EM01 which forms part of the Flood Risk Management Toolkit and is *“the NSW Government’s manual relating to the management of flood liable land in accordance with section 733 of the Local Government Act 1993 (LG Act).”*<sup>51</sup> This guideline is issued under Section 733 of the Local Government Act.

In addition the peak emergency services industry body, The Australian Fire and Emergency Services Authorities Council (AFAC), provides a national guideline on ‘Emergency Planning and Response to Protect Life in Flash Flood Events’ ([‘AFAC guideline’](#)).. These note the inherent risks of seeking ‘refuge’ or ‘sheltering-in-place’. Page 3 of the guideline states, *‘...remaining in buildings likely to be affected by flash flooding is not low risk and **should never be a default strategy**...even if the buildings are considered likely to withstand the impact of flash flooding. Where the available warning time and resources permit, evacuation should be the primary response strategy’.*<sup>52</sup>

The guideline furthers discusses the risks of Shelter In Place explaining *“some deaths – 25% of the total – occur among people trapped inside buildings. Details are not well documented, and these deaths could be the result of the building filling with flood water to a depth occupants cannot survive or because those trapped inside are swept away when the building fails. Other causes of death could be serious injury or an emergency medical condition while access to emergency assistance is compromised. Fires might also break out in buildings surrounded by floodwater, in which case occupants might not be able to evacuate as they would usually do.”*<sup>53</sup>

## NSW SES is not a consent authority

Regarding the statement that NSW SES is not the legislated authority on flood planning development.<sup>54</sup> NSW SES is not the consent authority for planning matters. However, NSW SES is the combat agency for flooding (*SES Act, 1989*) and has a legislated responsibility *“to protect persons from dangers to their safety and health, and to protect property from*

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<sup>50</sup> Risk-e Business, 2024, *Gateway Review Evacuation Response*, Page 15.

<sup>51</sup> NSW Department of Planning and Environment, 2023, *Flood Risk Management Manual*, Page 7.

<sup>52</sup> Australasian Fire and Emergency Service Authorities Council Limited, 2018, *Emergency Planning and Response to Protect Life in Flash Flood Events*, Page 3.

<sup>53</sup> Australasian Fire and Emergency Service Authorities Council Limited, 2018, *Emergency Planning and Response to Protect Life in Flash Flood Events*, Page 3.

<sup>54</sup> Risk-e Business, 2024, *Evacuation Strategy Review Moorebank Marina Planning Proposal*, 27 September 2024, Page 1.

*destruction or damage, arising from floods, storms and tsunamis*".<sup>55</sup> and therefore has an interest in development that may put communities at risk.

The Floodplain Risk Management Manual encompasses the NSW Flood Prone Land Policy.

The NSW SES endeavours to provide unbiased risk-based emergency management advice to planning and consent authorities in accordance with its legislated role to protect life and property from flooding and in accordance with the Flood Risk Management Manual.

This extends to the responsibility to protect the life, health and safety of SES volunteers who are affected by land use planning decisions as they enter flood affected areas to ensure the safety of their communities.

### Vehicle Ownership

The Risk-e Business Gateway Evacuation Response states "*In the Liverpool LGA, 7.4% of resident do not own a motor vehicle*",<sup>56</sup> however according to the ABS Census data linked in the Risk-e business letter,<sup>57</sup> only 3.6% of dwellings in the Chipping Norton/Moorebank have no registered vehicles. The majority of dwellings (68.1%) have 2 or more vehicles registered to them.

As discussed in our previous correspondence dated 29 April 2024, during inclement weather, people without a motor vehicle often request assistance with evacuation via other means (for example neighbours, taxi or ride share) or from NSW SES. In the latter case, transport services would be provided for people without vehicles consistent with the approach taken in NSW SES evacuation planning. During flood operations the Transport Services Liaison Officer would coordinate additional transport options.

While the use of public transport remains an option, as previously discussed evacuating from this site via public transport poses significant difficulties. The closest bus stops in the vicinity of the site are on Newbridge Road and are served by bus route M90, which operates from Liverpool Station to Burwood Station via Bankstown.<sup>58</sup> Newbridge Road at Brickmakers Drive becomes inundated with flood water up to 2m in depth as frequently as a 5% AEP event.<sup>59</sup> This means evacuees would need to travel a greater distance to access public transport which is running out of the area.

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<sup>55</sup> State Emergency Service Act 1989 ss 8(1)(aa).

<sup>56</sup> Risk-e Business, 2024, Evacuation Strategy Review Moorebank Marina Planning Proposal, 27 September 2024, Page 4.

<sup>57</sup> Australian Bureau of Statistics, 2021, *Chipping Norton - Moorebank*, 2021 Census All persons QuickStats. Available online at: <<https://www.abs.gov.au/census/find-census-data/quickstats/2021/127031523>>.

<sup>58</sup> EEM, 2023, *Georges Cove Marina Modified Planning Proposal*, Section 5.3.4 Traffic, i Existing traffic and transport.

<sup>59</sup> BMT, 2020, *Georges River Flood Study, Final Draft Mapping Compendium*, Figure A-3 5% AEP Modelled Peak Flood Depths, Velocities and Water Levels.

Additionally the reliability of the Sydney Rail network can be severely impacted in storms and floods. For example, in April 2015, Sydney Trains estimates nearly 200 significant incidents to Sydney Trains and NSW Trains, and approximately 585 peak and non-peak services were affected during a 3-day period of storms.<sup>60</sup> Compounding on this, is the increased complexity in evacuation operations arising from this strategy. For example, it would require significant resources to manage, coordinate and appropriately communicate to the community and provide adequate infrastructure and essential services while evacuees are waiting at the train station, for example toilets. People would also be attempting to carry large amounts of luggage and supplies with them, potentially with children or other vulnerable members of the community.

### Early Warnings

As discussed in our previous correspondence dated 29 April 2024, NSW SES uses a variety of delivery methods for warnings including radio, TV, SMS, Hazards Near Me app, SES website, Council emergency web sites, email to key networks and social media. We also know that telecommunications can degrade during large flood events. Doorknocking is a strategy to do one final check of the area to be evacuated to ensure all residents have received the message to evacuate, also referred to as the “belts and braces” approach.

The use of warnings should not be used as a substitute for strategic land use planning. As stated in EM01 *“From an EM perspective, minimising the risks during flooding to both the existing and future community, as well as the potential risks to rescuers, is paramount. This relies on the effective consideration of EM risks when making decisions on FRM for the existing community and for the future community as it grows through development and redevelopment.”*<sup>61</sup>

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<sup>60</sup> Transport for NSW, 2016, *Climate Risk Assessment Guideline*.

<sup>61</sup> NSW Department of Planning and Environment, 2023, *Flood risk management guideline EM01 Support for emergency management planning*, Section D4 Testing and Emergency Response Strategy, Page 59.