

DA 2021-129 – File Note Flood Impact Assessment

Authors: Peter Chambers (Chief Engineer) & Hamish McTaggart (Development Coordinator)
Date: 24 February 2023
Reviewed by: Sharon Pope Director (Director Environment & Planning)

1. Background/Details of the Proposed Development

DA 2021-129 involves the establishment of a boarding kennel and re-training establishment for retired racing greyhounds at 1949 Martindale Road Martindale (Lot DP 1088704). The proposed development would be constructed over 4 Stages. Once fully constructed the facility would have the capacity to care for 400 greyhounds.

The site is accessed via a causeway crossing across Martindale Creek. The ability for the crossing to be safely used can be affected when the Creek is in flood.

When fully constructed the facility would employ the equivalent of 24 full time staff. Volunteers could attend the site as well.

2. Summary of Potential Flooding Impact Related to the Development

1. Potential for the proposed development to be directly impacted by building inundation or flood forces from the 1% AEP flood event.
2. Potential for the proposed development to be directly impacted by the Probable Maximum Flood event, and the unique aspects of the development that may require additional consideration to be given to this type of event than other forms of development.
3. Frequency and duration of property access disruption during various flood conditions (the issue of site access being affected by more frequent flooding events was considered to present the two sub-issue categories relevant to the assessment of the proposal referenced below):
 - 3.1 Ability of site operations and greyhound welfare to be maintained during periods where site access is restricted.
 - 3.2 Risk and management of persons employed or working at the facility inadvertently or deliberately entering flood waters and putting themselves or others at risk.

3. DA 2021-129 Flood Information Timeline

Date	Action	Agent
18 October 2021	Development Application Lodged accompanied by EMM Flood Risk Assessment, dated August 2021	Applicant
2 November 2021 – 23 November 2021	Public notification of development application. Submissions received included submissions raising concerns related to the impact of flooding on site access.	Council/Public submissions
21 January 2022	Request for additional information regarding planning matters – comments from Council Engineers pending. Request sought additional information on the proposed flying fox emergency access.	Council
28 February 2022	Request for additional information regarding Engineering matters. RFI requested additional information related to flood modelling, frequency of flood access restriction further information related to site access management.	Council
1 March 2022	Partial RFI response/progress information provided by applicant. Reference to flying fox emergency access deleted from application/plan of management.	Applicant
3 June 2022	Comprehensive additional information response and DA amendment submitted by Applicant The additional information/amendment included: <ul style="list-style-type: none"> ○ Confirmation of the removal of any flying fox from the project ○ Submission of updated Flood Assessment, SoEE Appendix 21(b), EMM Flood Risk Assessment (May 2022) ○ Provided updated plans of management with provisions related to flooding. The information included in the updated Flood Risk Assessment is examined in Section 4 and 6 of this File Note.	Applicant
27 June 2022 – 27 July 2022	Renotification of the development as amended. Submissions received included submissions raising concerns related to the impact of flooding on site access.	Council/public submissions
28 July 2022	Regional Planning Panel public listening exercise – site access and flooding were among the concerns	Public Submissions

	raised by members of the public who spoke in relation to this application.	
14 October 2022	<p>Engineering referral comments received and request for additional information following review of amended application.</p> <p>Flood related queries include:</p> <ul style="list-style-type: none"> ○ Request for consideration of the frequency access is restricted and duration of time that this would occur, and impacts this presents to the operation of the facility and the safety of staff. ○ Request for further consideration of flood free access being provided. ○ Request for additional information related to any flood warning system and management strategies referenced by the Flood Assessment recommendations. 	Council
3 November 2022	<p>Follow up request for information including additional/updated commentary related to flood assessment considerations and information requested.</p> <p>Correspondence issued following 2 November 2022 Regional Planning Panel Assessment briefing.</p>	Council
30 November 2022	<p>Response to additional information requests received updating information related to flood management including:</p> <ul style="list-style-type: none"> ○ EMM Memorandum dated 30 November 2022, responding to with information related to site constraints, stream flow and flood travel times, details of flood warning system and details of flood warning and response planning. ○ Indication of location of part of the site suitable for helicopter landing. ○ Updated Daily Operations Plan including details of operating parameters during emergency (such as site access flooding) and periods when reduced staffing of 5-6 staff per 400 dogs is required. <p>This information is examined in greater detail in Section 4 and 6 of this File Note.</p>	Applicant
14 December 2022	Correspondence from applicant with stream gauge details/information.	Applicant

10 February 2023	Confirmation of owner's consent and agreement in principle to easement from the owner of Lot 20 DP 75394 where stream gauge proposed.	Applicant
------------------	---	-----------

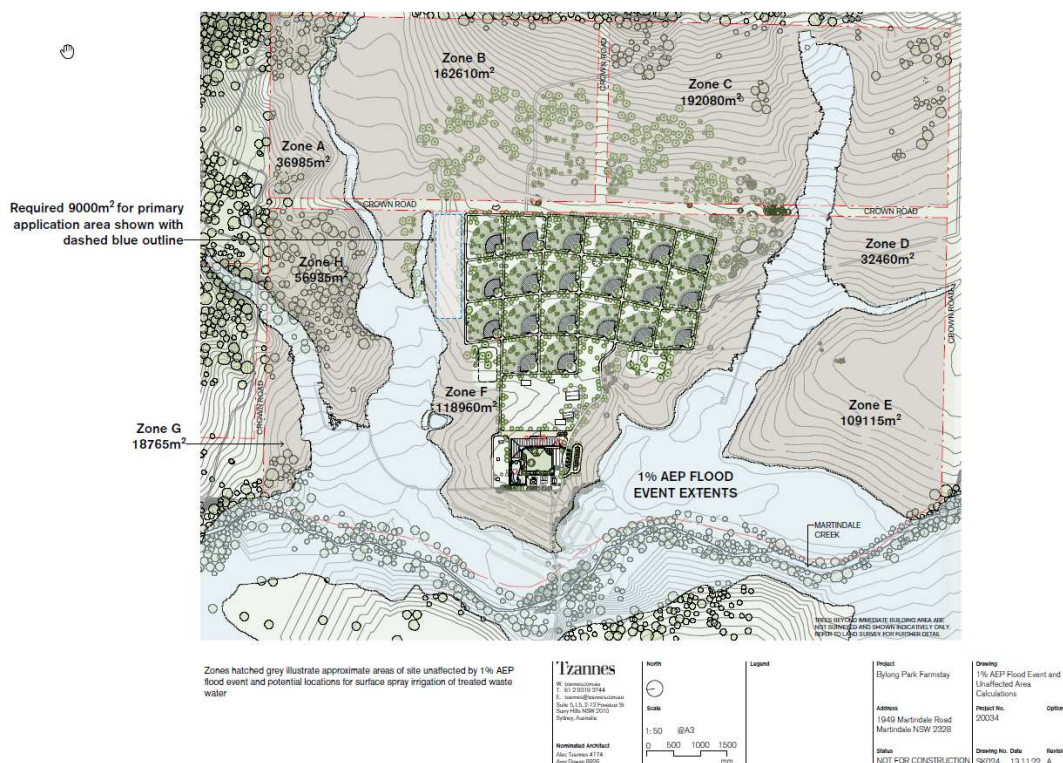
A further bullet point summary of the key applicant submitted documents that have informed the assessment of flood impacts has been included below:

- EMM Flood Risk Assessment, dated August 2021
- EMM Flood Risk Assessment, dated May 2022
- EMM Memorandum, dated 30 November 2022
- Plan of Management – Daily Operations Plan (including emergency operating parameters) submitted 30 November 2022
- Bylong Park Farmstay Operational Plan (submitted June 2022)

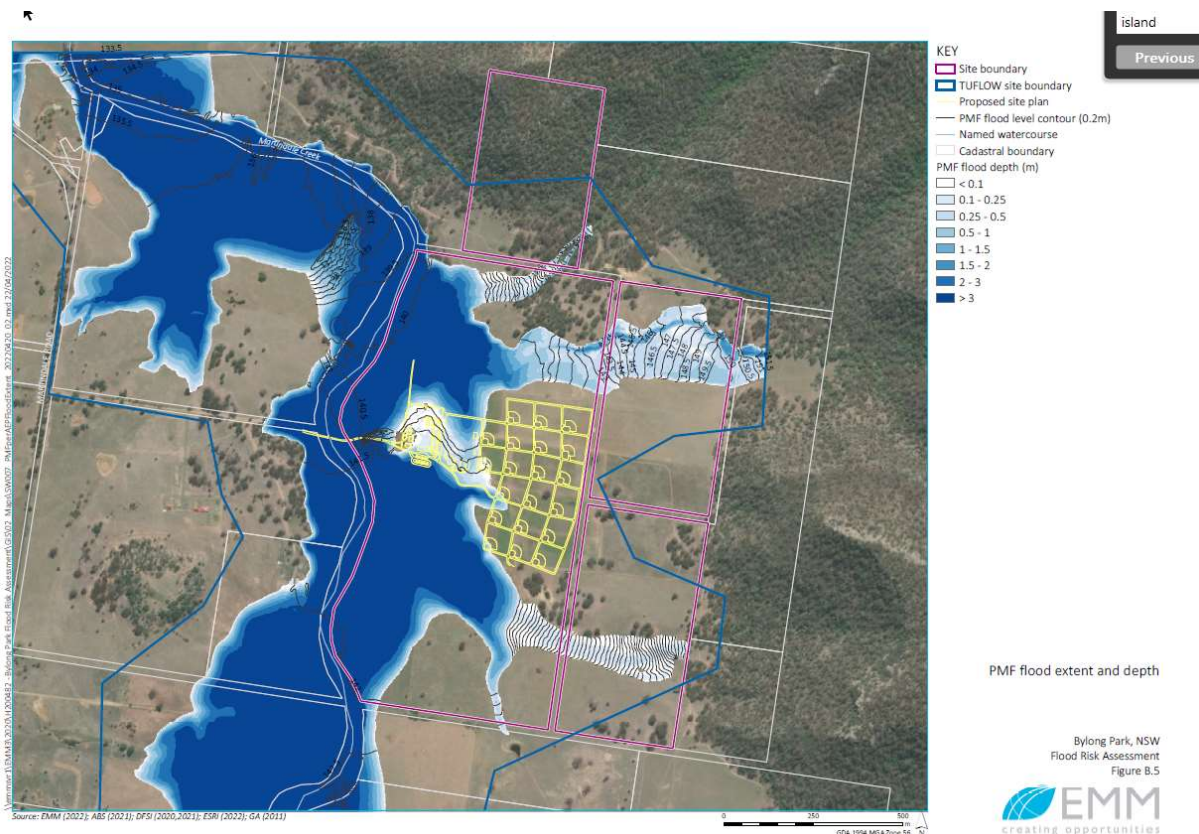
4. Summary of key findings/information from review of Flood Risk Assessment documents

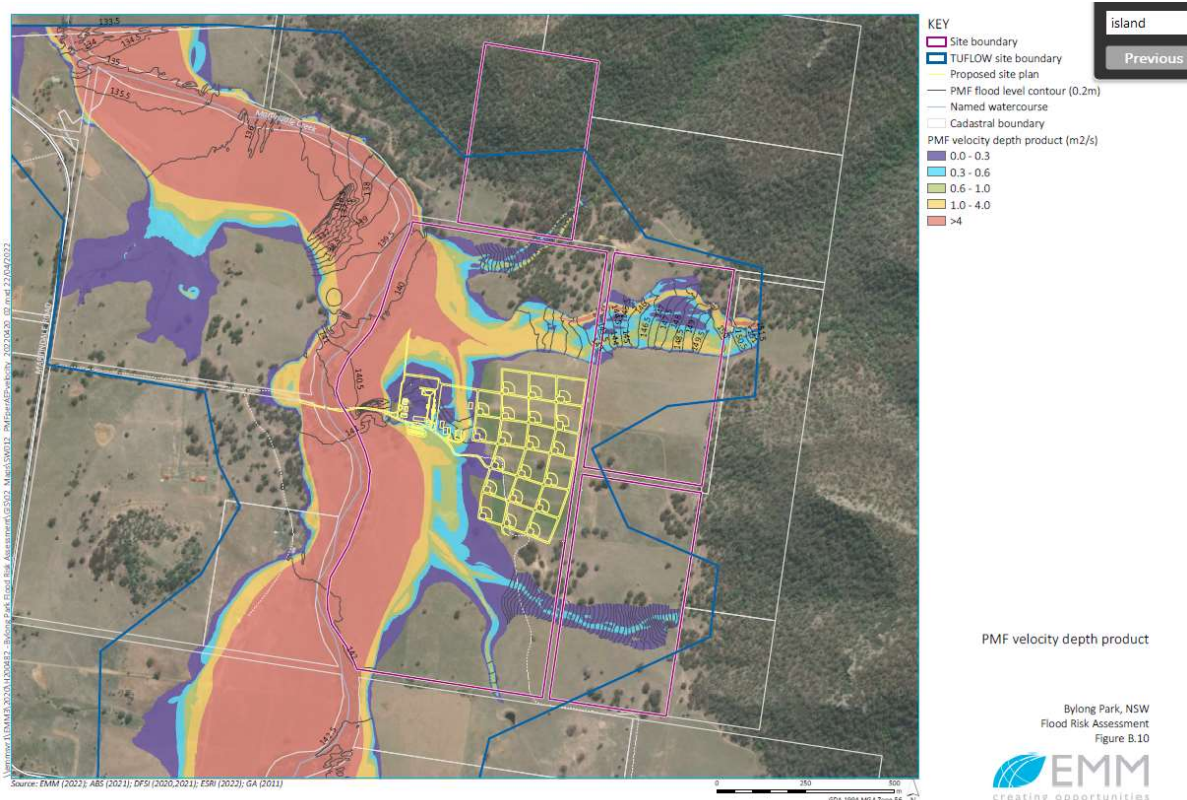
4.1 Flooding/site inundation

- Modelling was undertaken for the 63.2%, 20%, 5% 1% AEP and PMF events in context with Martindale Creek and the subject site. Appendix B of the EMM Flood Risk Assessment, dated May 2022 includes maps of each model.
- The part of the site on which greyhound kennel buildings and ancillary structures are proposed is outside the extent of the anticipated 1% AEP flood event. The extent of this flood event in relation to the proposed development can be seen in the image below.



- Overbank flooding inundates low lying areas along the western boundary of the site. The remainder of the site is unaffected by mainstream flooding from Martindale creek in events up to but not including the PMF.
- Existing site dwellings and infrastructure (141m AHD) are situated approximately 6m above the Martindale Creek 1% AEP flood level.
- The PMF extent inundates the location of the proposed farmstead building by up to 0.3m. The corresponding velocity depth is less than 0.3m² indicating a low flood hazard category (category H1) near the proposed building.
- The PMF flood extent is shown to inundate four of the proposed animal kennel areas. Flooding in the PMF primarily impacts the outdoor areas of the kennels and not the buildings. Only one kennel building experiences flooding in the PMF with depths up to 0.1 m. The 2022 Flood Risk Assessment references that it is expected the finished floor level of the kennel buildings will be above the PMF flood level.
- The peak velocity depth product at the existing site access road causeway exceeds the safe access thresholds established in Section 4.2 in all events modelled, ranging from 3.4 m²/s in the 63.2% AEP event to 7.2 m²/s in the 1% AEP event.
- The images below are taken from Appendix B of the EMM Flood Assessment and show PMF flood depth and velocity depth product.





4.2 Site Access restriction/streamflow investigation

- Methodology for the streamflow analysis is set out in Section 3.3 of the EMM Flood Risk Assessment May 2022 and by available data referenced in Section 3.2 of that report. It is noted that stream gauge data had been obtained from the Water NSW operated, Macdonald River at Howes Valley gauge. There is no available stream gauge data for Martindale Creek. While the streamflow regime of the two river systems is not anticipated to be identical, Section 4.3.2 of the Report provides contextual information as to why the data would be appropriate for use for this site and Martindale Creek. This section of the report also notes higher maximum stream flow rates and volumes would be expected for the Macdonald River gauge than the Martindale Creek site location, and the hydraulic engineer has not sought to adjust the model to account for these higher streamflow rates anticipated at the data point compared to the subject site. In addition to the use of the streamflow data, Section 3.3 of the report notes that the local data related to the existing causeway to analyse streamflow was used to inform the model. Council Officers have accepted the streamflow analysis provided as acceptable and reasonably informed based on the information available, and the inbuilt conservative level of the model predictions given the Macdonald River streamflow rates and volumes have not been adjusted down to account for the smaller Martindale Creek catchment.
- The analysis of the streamflow regime modelling and safe access thresholds identified the following key information related to site access restrictions:
 - The streamflow rate can rise quite rapidly for both low flow and large flow events and restrict site access within a matter of hours.

- Typical streamflow events result in site access being restricted for several hours to several days depending on the magnitude of the event and rainfall distribution. Site access is generally re-established within 3 days of the rainfall event occurring.
- Large streamflow events result in site access being restricted for longer periods of time but are rarer events, with site access generally re-established within 10 days.
- It was anticipated that streamflow events that would restrict safe site access for large 4WD and small vehicles would occur more than five and six times per year in 50% of years.
- More than 10 events per years are expected to occur in 10% of years.
- For 50% of events, safe access would be restricted to approximately 1 day for large 4WD vehicles and 1.5 days for small cars.
- Approximately 10% of events would restrict site access for more than 6 days.
- The graphs below have been taken from the EMM Flood Risk Assessment May 2022 and respectively the number of site access restricting streamflow events per year and the duration of site access restrictions during streamflow events.

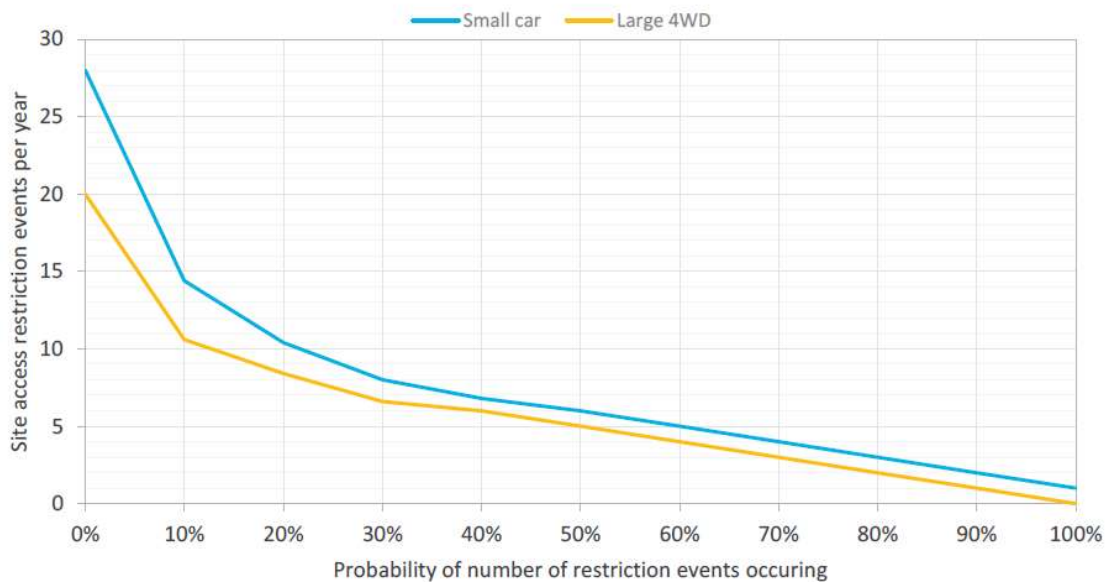


Figure 4.7 Number of site access restricting streamflow events per year

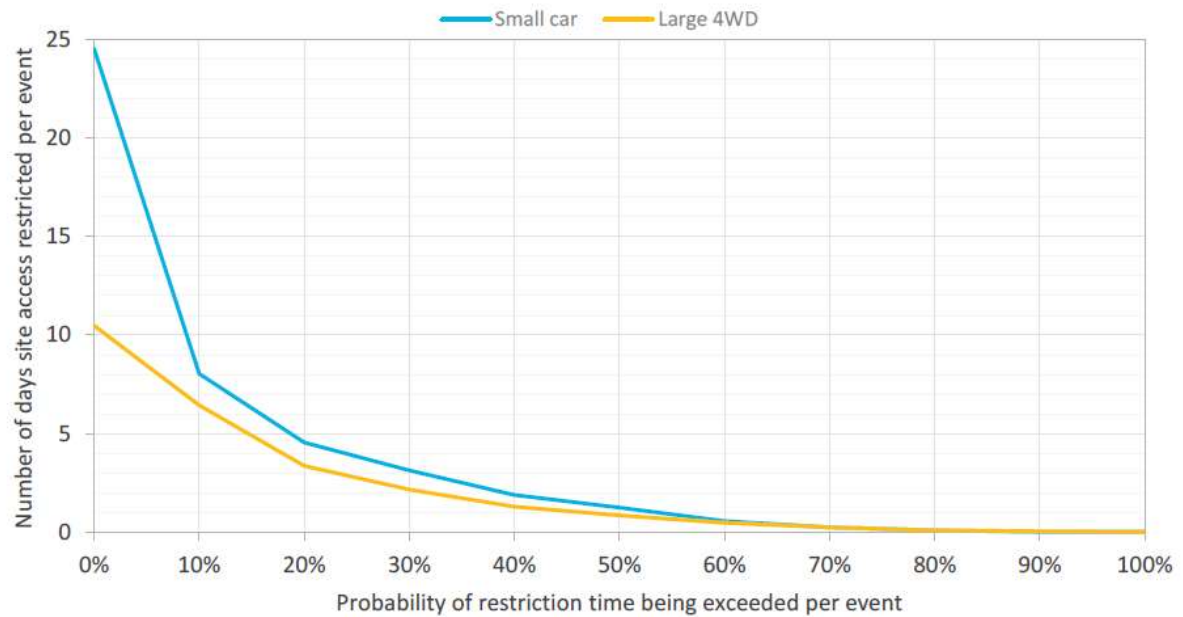


Figure 4.8 Duration of site access restrictions during a streamflow event

- The figure below have been taken from EMM Flood Risk Assessment May 2022. The figures relate to streamflow events in the Macdonald River that exceed the safe access threshold. These have been included as a good indication of how rapidly streamflow can rise and remain elevated.

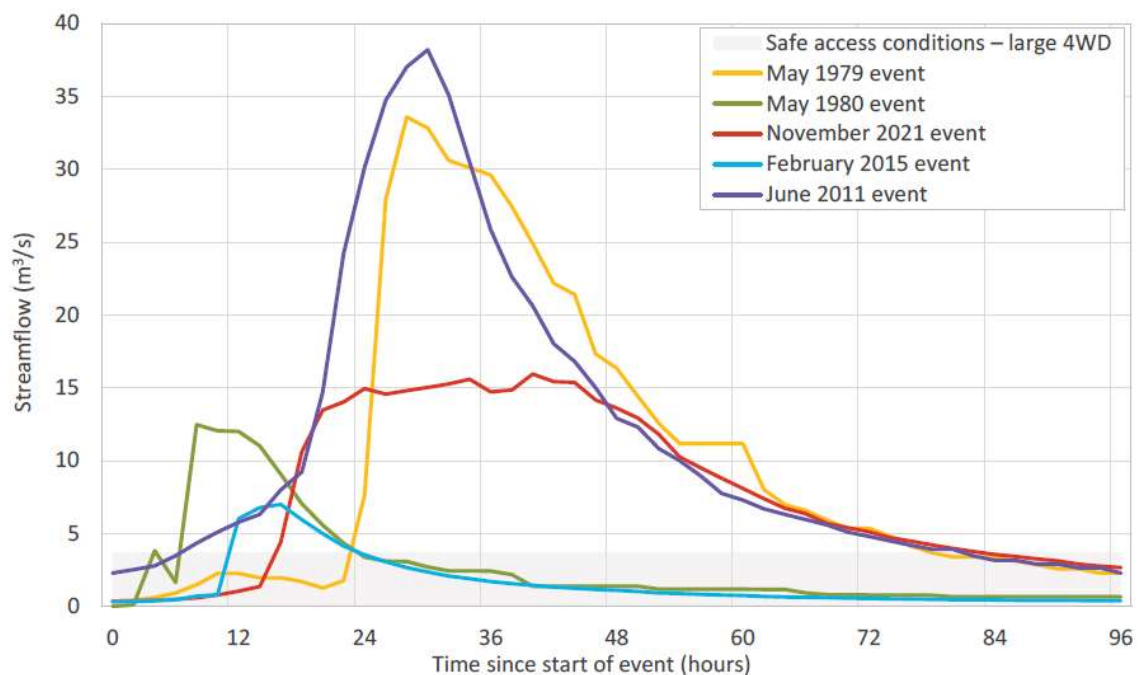


Figure 4.4 Observed streamflow hydrographs – typical streamflow events

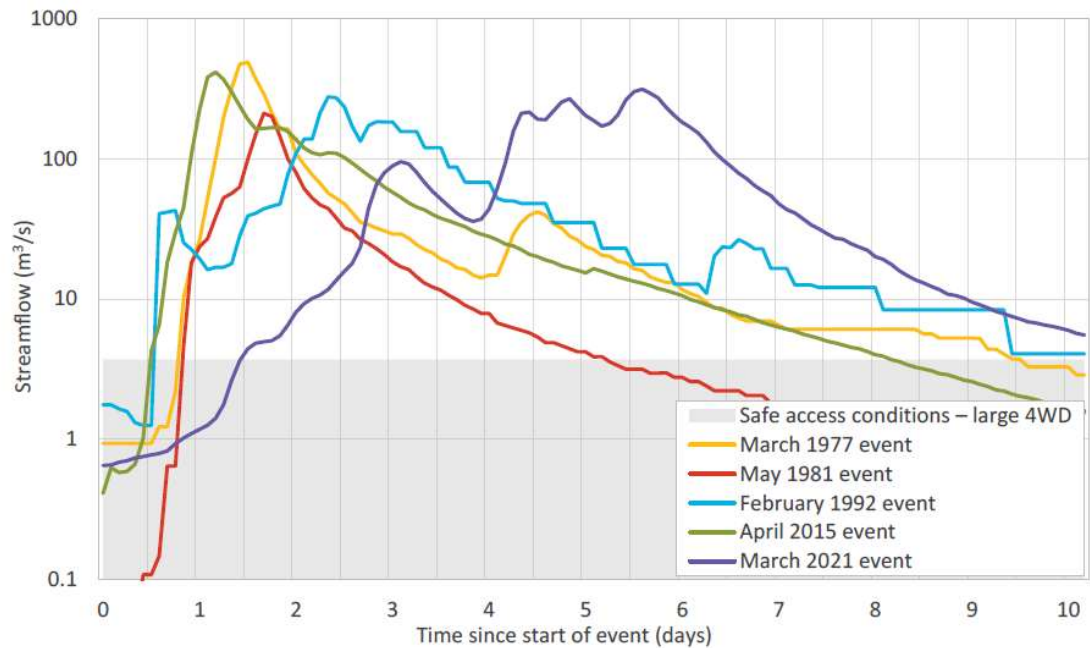


Figure 4.5 Observed streamflow hydrographs – largest streamflow events

- The EMM Memorandum (30 November 2022) provided additional information around the anticipated timing of changes to the river access safety in response to rainfall events. The study was again informed by the larger Macdonald River catchment and its river gauge given the absence of any river gauge records for Martindale Creek. This investigation provided useful key dot point information and an accompanying graph that can be found in Section 3 of the Memorandum, pages 4-6. The conclusion of this investigation was:

The streamflow response to rainfall in the Martindale Creek catchment is expected to be variable and hard to predict. The variability in rainfall distribution across the catchment in any given event means rainfall data from a single point cannot be used to reliably predict elevated streamflow conditions. Accordingly, catchment wide rainfall forecasts combined with real-time water level monitoring are considered to be the most reliable methods of identifying and responding to elevated streamflow conditions in Martindale Creek.

4.3 Flood Impact Management Measures Discussion

- The EMM Flood Risk Assessment, May 2022 evaluates 5 options related to managing the impact associated with the restriction of the site's access due to flood water. The assessment reviews constraints and benefits of each option. A summary of each option has been included below:
 - **Option 1** – maintain the existing causeway access and manage flood risks through operating procedures. **The applicant has pursued this option for managing flood access issues related to the proposed development.**

- **Option 2** – maintain the existing causeway access and obtain flood free alternate access through adjoining properties. The report does not recommend this option due to logistical issues related to obtaining a flood free alternate access.
 - **Option 3** – maintain the existing causeway access and provide additional access via a pedestrian bridge. Option 3, 4 & 5 were not recommended as while they decrease the frequency and duration of safe access restrictions, restrictions would still occur in most years and would need to be managed operationally.
 - **Option 4** – construct a new trafficable bridge to the site across the causeway. Option 3, 4 & 5 were not recommended as while they decrease the frequency and duration of safe access restrictions, restrictions would still occur in most years and would need to be managed operationally.
 - **Option 5** – construct a new trafficable culvert to the site. Option 3, 4 & 5 were not recommended as while they decrease the frequency and duration of safe access restrictions, restrictions would still occur in most years and would need to be managed operationally.
- The table below is an excerpt from the EMM Flood Risk Management Plan dated May 2022 (page 51) summarising the flood risk management approach proposed by that document. The EMM Memorandum dated 30 November 2022 and Plan of Management 30 November 2022 provide supplementary flood risk management measures and strategies, the core approach remains compatible with the approach outlined in the table.

Table 7.1 Flood risk management approach summary

Identified risk	Key risks	Risk management approach
1 – Restricted site access		
a) Martindale Creek crossing	<ul style="list-style-type: none"> • Risks to life associated with using the crossing when unsafe. • Risks to the staff, animals and the operation due to extended periods of restricted access. 	<ul style="list-style-type: none"> • The FRMP will include practical measures that can be implemented prior to, during, and after flood events to manage risks. An example site access management plan is provided in Appendix C. • Flood depth markers and signage will be installed at the crossing that clearly identify safe and unsafe streamflow conditions. • The development will provide safe flood refuge for both staff and animals for all flood events up to and including the PMF. • The operation will be provisioned to allow for 14 days of operation without resupply – see Section 6.5.3 for details.
b) Regional flooding	<ul style="list-style-type: none"> • As per 1a) 	<ul style="list-style-type: none"> • As per 1a)
c) Emergency access during flood events	<ul style="list-style-type: none"> • Access restrictions may prevent safe emergency access and/or require the need for speciality emergency services (ie flood rescue). 	<ul style="list-style-type: none"> • Flood free emergency access is possible via third party properties (subject to road conditions and access). • The facility will be able to provide health support to animals using trained staff, stockpiled medicine, and remote veterinary assistance. • Providing adequate area for helicopter access to the site should weather permit.
2 – Martindale Creek flooding		
	<ul style="list-style-type: none"> • Restricted access (addressed in Item 1). • Damage to infrastructure and property. 	<ul style="list-style-type: none"> • The proposed development is located several meters above the 1% AEP flood level. • The development will provide safe flood refuge for both staff and animals for all flood events up to and including the PMF.

- Following the review of the flood management strategy proposed in the EMM Flood Risk Assessment May 2022, Council Officers retained reservations related to aspects of the proposed access management strategy. These reservations related to concerns and queries related to the:
 - Practicality of the solutions proposed.
 - Unresolved issues related to the risk of individuals entering floodwaters.
 - Practicality from a timing perspective of flood risk being identified and decisions being taken around maintaining site operation.
 - Further detail related to ensuring site function and animal welfare during periods of isolation and restricted operation.
 - Council Engineer's indicating a preference for the provision of flood free access.

The EMM Memorandum (30 November 2022) and Emergency Operations Management Plan was submitted by the applicant in response to Council's related request for information.

- The EMM Memorandum (30 November 2022) gave additional consideration to the anticipated timing of changes to access safety in response to rainfall events and updated the flood warning and response approach proposed informed by these findings. This strategy is detailed in Section 4 of the Memorandum. The table below excerpted from the Report provides an overview of the various system components and functions.



Table 4.1 Flood warning and response system components

Component	Description
Rainfall forecasts	<ul style="list-style-type: none">Local and regional rainfall forecasts will be monitored daily during dry conditions and as needed (eg hourly) during wet weather conditions to adequately track and respond to any updates to the forecasted weather conditions.Monitoring rainfall forecasts will provide early identification of significant weather systems to allow the site and personnel to prepare for site access restrictions ahead of time.
Stream monitoring (upstream of the site)	<ul style="list-style-type: none">A streamflow monitoring system will be installed on a third-party property approximately 3 km upstream of the site to monitor real-time flow conditions. A formal agreement between Greyhounds NSW and the third party has been sought and will be signed to allow ongoing and future use of the streamflow monitoring system.The system would provide between 50 to 90 minutes warning time before site access restrictions are applied. The final placement of the stream monitoring system will be determined by a specialist flood warning and response system contractor as part of the detailed design and installation process. An indicative location for the proposed streamflow monitoring location is shown in Figure 4.1.The system will provide automated notifications to site personnel and relevant staff once streamflow conditions exceed a trigger level to allow non-essential personnel to safely leave the site. The trigger levels will be developed by the flood warning and response system contractor based on the specific creek characteristics (ie cross-section) at the monitoring location and will be verified overtime.The proposed streamflow monitoring location captures rainfall and runoff from 95% of the contributing catchment upstream of the existing site access causeway.
Stream monitoring (at the site)	<ul style="list-style-type: none">A real-time water level monitoring system will be installed to measure water levels at the existing concrete causeway.The water level monitoring system will be connected to automated boom gates that will restrict access to the causeway when the safe access thresholds are exceeded. Stream depth markers and appropriate signage will also be applied.
Automated boom gates	<ul style="list-style-type: none">Automated boom gates will be installed either side of the existing causeway to prevent personnel driving through Martindale Creek when access restrictions are in place. The boom gates will be triggered by the water level monitoring sensor described above.The boom gates will likely be located within the 1% AEP flood extent but outside of the main flood way. Hence, the risk of damage from debris or localised flood impacts are considered low. The final location of the boom gates will be determined by the flood warning and response system contractor with consideration of access to power andFlashing lights will be installed on the top of or near the boom gates and operate when the boom gates are in operations (ie down).
Exclusion barriers	<ul style="list-style-type: none">Exclusion barriers are proposed to prevent errant drivers from bypassing the boom gates and attempting to cross Martindale Creek during unsafe streamflow conditions.Exclusion barriers may comprise of bollards, sandstone logs, barrier gates, or other appropriate vehicle prevention devices. Exclusion barriers will be installed at 1.2–1.5 m spacing to allow flood waters to pass through and around the structures but still prevent vehicle access.The exclusion barriers are not anticipated to result in any material impacts to flood conditions. Any residual impacts would be highly localised (ie immediately adjacent to the barrier).
Flood markers	<ul style="list-style-type: none">Permanent flood markers will be installed along the access road on each side of Martindale Creek. At a minimum, the flood markers will be installed either side of the causeway, at the boom gate location and at the 1% AEP flood extent. Intermediate flood markers may be required if line of site is not possible between the boom gate and causeway.

Component	Description
Alternative access	<ul style="list-style-type: none"> While the proposed flood warning and response system is expected to reduce the risk of non-essential personnel remaining on site during elevated streamflow conditions, an alternative flood free access arrangement is required to provide redundancy if streamflow conditions exceed the safe access thresholds unexpectedly or more rapidly than predicted. Flood free access will also be required to rotate essential staff, resupply the operations, and provide medical assistance (if required) when site access restrictions occur for extended periods of time. Greyhounds NSW propose to provide alternative flood free access via a chartered helicopter. An area of the site will be maintained to allow helicopter access on an as needs basis. It is noted that helicopter access would be weather dependent and may take some time to arrange. Accordingly, the flood preparedness aspects of the response plan will be essential to minimise risks and potential inconveniences for staff.

The information around the flood warning and response system was accompanied by a provisional plan included in attachment A of the May 2022 Flood Risk Assessment outlining how the flood warning triggers, and associated actions, would be managed across the site. This plan was provided in a provisional format with the plan to be finalised followed detailed design.

- The Operational Plan of Management details staff numbers and operational functions during emergency and restricted access periods. This plan indicates that a total of 5-6 staff would need to be maintained on-site to ensure function during periods where access is restricted.

5. Assessment Criteria and supplementary policy documents considered

- Muswellbrook LEP 2009 Clause 5.21 –
- Section 13 of the Muswellbrook Development Control Plan
- Likely Environmental Impacts – Natural Hazards (EP&A Act 1979 S4.15(1)(b))
- Suitability of the site for development (EP&A Act 1979 S4.15(1)(c))

Council Officers have also had regard to the following NSW State Government resource documents relating to floodplain risk management. These supplementary resource documents have primarily been reviewed by Council Officers to inform the risk-based assessment of the site's access considerations and related management procedures:

- Floodplain Development Manual – NSW Department of Planning and Environment
- Flood Risk Manual – NSW Department of Planning and Environment
- Floodplain Risk Management Guideline Flood Emergency Response Planning Classification of Communities – NSW Department of Planning and Environment
- Floodplain Risk Management Guideline SES Requirements from the FRM Process – NSW Department of Planning and Environment
- NSW State Flood Plan – NSW SES

6. Section 4.15 Flooding Assessment Considerations

6.1 Muswellbrook LEP 2009 Clause 5.21 provisions

The table below considers the matters specified by Clause 5.21(2) of the Muswellbrook LEP 2009:

Control	Planning Comment	Complies
The development is compatible with the flood behaviour and function on the land.	The proposed development will have a negligible impact on the flood behaviour or function on the land. The part of the site proposed for development is situated above the 1% AEP flood event with a small portion within the PMF. Accordingly, the proposal will have minimal impact on flood pattern, function, or behaviour for most flood events.	Yes
The development will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties	The proposed development will have a negligible impact on flood behaviour. The part of the site proposed for development is situated above the 1% AEP flood event with a small portion within the PMF. Noting the site's rural context, the proposal is not anticipated to increase flood affectation of other development or properties.	Yes
The development will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood	<p>The submitted flood assessment documentation has had regard to the impact of flooding on operational staff, the need for appropriate warning to be enacted to ensure staff shelter in place to support the operation of the site and those required to leave are duly notified with sufficient time.</p> <p>The measures proposed and their suitability are considered in detail under the Likely Environmental Impacts sub-heading of the report. Council Officers are satisfied that the measures proposed are reasonable and proportionate to the causeway hazard, acknowledging that this hazard has been safely managed during the site's operation as a farm and horse stud without the implementation of safety measures.</p> <p>Council Officers consider that the flood warning, evacuation management and control measures (where un-safe to exit or enter the site) will support the safe management of evacuation and/or occupation of the site as required during instances of local flooding.</p>	Yes
The development incorporates appropriate measures to manage risk to life in the event of a flood	<p>The applicant's proposed approach to managing this issue has been detailed in Section 4.3 and is considered in detail under the Likely Environmental Impacts heading of this report. The measures proposed include:</p> <ul style="list-style-type: none"> ○ Monitoring of rainfall forecast to identify rainfall predictions which may cause site access restriction. ○ Stream monitoring upstream of the site to identify impending conditions that may cause site access restriction. 	Yes

	<ul style="list-style-type: none"> ○ Stream monitoring at the site to identify when the causeway streamflow has become unsafe. ○ Automated boom gates and drive around barriers to restrict site access once site access has become unsafe ○ Installation of flood markers at site access. ○ Alternate access options for emergency and possible work crew relief where required in instances that the site access is restricted for several days. <p>Related to flooding risks to life, such as if individuals driving into unsafe water over the causeway to enter or exit the site, the proposed measures would be:</p> <ul style="list-style-type: none"> ○ Providing education on the site access flood risks and response procedures. ○ Providing reasonable warning ahead of days which site access would potentially be restricted, with ability for altered operations or staffing to be organised ahead of time. ○ Providing notice of impending restriction to the site's access with ability to make decisions about operational staff staying or leaving prior to site access being closed. ○ Physically restricting the ability to enter or leave the site once the parameters for safe causeway access had been exceeded. ○ Re-establishing access once safe to do so. ○ Retaining an ability for the site to be accessed once causeway access was restricted. <p>Council Officers are satisfied that the proposed development has incorporated reasonable flood risk measures relative to the flood risk at the site.</p>	
The development will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.	The proposed development does not involve direct works to alter a drainage channel or waterway. Council Officers consider there will be no potential to adversely affect the environment or cause erosion or siltation of the Martindale Creek system.	Yes

Summary Comment: Council Officers are satisfied that the proposed development would be compatible with each of the relevant considerations if flood safety measures are incorporated into the proposed development in accordance with the measures set out by the EMM Flood Risk Assessment May 2022, EMM Memorandum (November 2022) and conditions of consent recommended by Council Officers related to flood risk management.

Clause 5.3(3) specifies additional matters which a consent authority must have regard to when determining a development application to which the Clause applies.

Control	Planning Comment	Complies
the impact of the development on projected changes to flood behaviour as a result of climate change.	<p>Climate change is likely to see an increase in extreme weather events, both long dry periods and intense storms and related flooding.</p> <p>The impacts of such events on the flood liability of the proposed development are anticipated to be limited in terms of any increased risk of site/development inundation, noting the sites location in the upper part of the Martindale Creek catchment and the location of the proposed development footprint outside the 1% AEP.</p> <p>Changes to the frequency and duration of storm events has the potential to affect the frequency and duration of time that access to the site may be restricted via the Martindale Creek causeway crossing.</p> <p>The scope of resulting change was not considered to render the EMM streamflow model unreliable for the purpose of this assessment. Streamflow/inundation restricting site access was not considered likely to so significantly alter the site operating conditions that climate change would inhibit the ability for the development to be continued given the mitigation and management practices proposed.</p>	Yes
the intended design and scale of buildings resulting from the development	In this instance the buildings proposed would be outside the anticipated extent of the 1% AEP flood event and thereby would be compatible with this clause.	Yes
whether the development incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood	<p>The applicant has investigated flood risk and put forward measures to manage the safe movement of people from the site or support the safety of those remaining on-site under flood conditions.</p> <p>These measures are reviewed in greater under the Section 6.3 sub-heading of this File Note.</p> <p>Overall Council Officers are satisfied that the measures proposed are reasonable and</p>	Yes

	proportionate to the understood flood risk at the site.	
The potential to modify, relocate or remove buildings resulting from development if the surrounding area is impacted by flooding or coastal erosion	<p>This Clause enables consideration of the ability of buildings to be removed or relocated where their locality is impacted/anticipated to be impacted by sustained flooding, related land slip and/or coastal erosion.</p> <p>No such impacts are anticipated noting the siting of the proposed buildings.</p>	Yes
Summary Comment: Council Officers have had regard to the matters for consideration specified by sub-clause 5.21(3). Except for 5.21(3)(c) – risk to life and safety – these matters have no significant bearing on the proposed development. In considering 5.21(3)(c), Council Officers have had regard for potential risky behaviour of entering flood waters to access or leave the site and related evacuation considerations. The proposed flood warning and related safety measures proposed include reasonable measures to ensuring safety of workers within the development, maintain its safe operation during periods of flood related isolation.		

6.2 Muswellbrook DCP Section 13 – Floodplain Management

The EP&A Act 1979 requires Development Control Plans to be considered when determining a development application. The provisions of Section 13 of the Muswellbrook DCP which relate to flooding are considered and commented on in the table below:

Control	Planning Comment	Complies
13.6.1 Development must be consistent with the current version of the NSW Floodplain Development Manual, any relevant local flood study, floodplain management study and plan applying to the land that has been endorsed by Council, or the recommendations of a Flood Impact & Risk Assessment completed for the development.	There is no local flood study related to flooding in the Martindale Creek catchment. The Flood Risk Assessment prepared by EMM Consulting developed models anticipated flooding. This Risk Assessment was considered appropriate for the purpose of informing this development assessment.	Yes
13.6.2 Generally, buildings and other structures, including fences, must be designed so as not to impede the flow of floodwaters or entrap debris.	<p>Buildings are not proposed within the flood area.</p> <p>Structures related to ensuring the causeway closure during periods of high velocity will present a minimal obstruction to flood waters and flow.</p>	Yes
<p>13.6.3 Filling within the floodplain must be supported by a detailed flood risk & impact assessment certified by a suitably qualified consulting engineer that can adequately demonstrate.</p> <p>a) Filling is not within a core riparian zone.</p>	<p>The proposed development would not involve filling likely to have a significant impact on the dispersal of floodwaters.</p> <p>The proposed development does involve the construction of earth mounds proposed as a noise barrier, parts of the mounds would be within the 1% AEP flood area modelled by the EMM Flood Risk Assessment. Noting the mound location and the rural context, these earthworks are</p>	Yes

<p>b) Filling will not substantially impede the flow of floodwater and not contribute to flooding or ponding of water on any other property; and</p> <p>c) For a dwelling pad in a rural area, filling is minimal and is balanced by a borrow pit on the same site, and neither are situated in high hazard floodwaters (H3 or higher in a 1% AEP flood).</p>	<p>not anticipated to have any significant impact on the flood profile of the locality. Given the noise barriers are not prescribed by the Acoustic Report their final location or construction could be altered by conditions where their location is deemed an issue.</p> <p>A Flood Risk Assessment has been prepared in relation to the proposed development.</p>	
13.6.4 New structures are to meet the flood planning levels and floor heights specified in the Table 2	The relevant flood height for the proposed development is the 1% AEP flood height. All buildings would be above this height.	Yes
13.6.5 Flood planning levels and floor heights for additions or alterations to existing residential development will be assessed on the merits of the situation, having regard to meeting an acceptable level of risk to life and flood damage. In general, additions that will increase the existing floor area by more than 20% as it existed on 1 January 2022 will be required to meet the floor heights in Table 2.	The residential buildings are situated above the 1% AEP flood height. No extension to the buildings is proposed.	Yes
13.6.6 The construction methods and materials that form part of the development that will be below the flood planning level, including filling, must be capable of withstanding the force of flowing floodwaters, including debris and buoyancy forces and immersion for a prolonged period.	The proposed development would be constructed above the flood planning level.	Yes
13.6.7 Development on land below the 1% AEP will only be permitted where effective warning time and reliable access is available for evacuation to an area free of risk from flooding. Evacuation should be consistent with any relevant flood evacuation strategy	<p>While the footprint of the proposed development is above the 1% AEP Flood, consideration has been given to how the site's operation and evacuation would be managed during periods of isolation because of flooding. These strategies are commented on in greater detail under the Likely Environmental Impacts and Site Suitability sub-headings of this File Note.</p> <p>Council Officers are satisfied that the proposed strategies suitably demonstrate that the safe evacuation of non-essential personal can be managed, and that planning has been undertaken to enable a reduced crew of 5-6 staff members to safely remain on-site to support the operation of</p>	Yes

	the premises where site isolation occurs due to flooding. These plans also include the contingency of a charter helicopter to provide further relief or respond to significant issues that may occur on-site as an available option to support staff in the less frequent instances where the site may be affected by longer periods of isolation due to unsafe access conditions.	
13.6.8 Evacuation Plans, when required, are to be prepared to Council's satisfaction demonstrating the Plan provides for: a) Low flood hazard emergency vehicle road access (NSW SES, NSW RFS) during a 1% AEP flood event; and b) Failsafe, comprehensive flood-alert measures.	A Provisional Flood Risk Warning Response Plan outlining a flood warning and response system to be enacted to proactively monitor weather events that may affect site access and trigger actions to ensure non-essential staff leave the site, and essential staff retained or returned to the site, prior to the use of the access causeway being restricted by flooding.	Yes
13.6.9 No Torrens Title subdivision that may result in intensification of development is to occur on land wholly inundated by flooding during the PMF.	The proposed development does not involve the subdivision of land.	Not Applicable

Summary comment: Council Officers have reviewed the proposed development against the provisions of Section 13 of the Muswellbrook DCP. Council Officers are satisfied that the proposed development is generally in accordance with the related development controls.

6.3 Likely Environmental Impacts – Natural Hazards (EP&A Act 1979 S4.15(1)(b))

The consideration of likely environmental impacts as part of the development assessment requires the consent authority to have regard to natural hazards including that of flooding. Commentary has already been given to the impact of flood events up to and exceeding the 1% AEP Flood.

This issue of impacts related to site access and associated public/staff safety considerations is explored and commented on in greater detail below.

The access causeway to the site across Martindale Creek is subject to streamflow's and inundation depths that render it unsafe for use for periods of time. In more extreme (and less common events in line with the modelling prepared by EMM) this can see access to the site cut for 4WD vehicles for periods of time up to and including 10 days (with light vehicle access restricted for longer). Further information related to the modelled impact of flooding on the causeway crossing can be seen in Section 4 of this report.

Council Officer's review of the related information suggests that the restrictions to the site's access due to flooding would present an operational challenge, particular in wetter years where the frequency of access restriction is increased.

The situation of rural properties being isolated by flood waters is not unique and occurs in various locations including for other properties in the Martindale area with similar access arrangements. However, limited site access to this development presented a risk management issue more consequential to that of similar operating farms. This site has additional logistical

challenges/considerations due to the welfare of animals and decisions needed to ensure people reside at the site to support operations

Small and medium farming operations regularly manage these logistical operating issues with logical and practical decision making by the site operators. The applicant has put forward a procedure which incorporates this logical and practical decision making with a more structured and documented approach to account for the nature of the site's operations, staffing and animal care responsibility.

Council Officers were concerned about the effectiveness of managing the safety of staff operating at the facility. Where not managed appropriately it was perceived that the proposed development could create opportunity for staff to take risky behaviour and enter unsafe flood waters to avoid being stranded on or off site.

The approach put forward by the applicant is multi-faceted and detailed in depth in the Flood Risk Assessment, May 2022, EMM Memorandum, November 2022 and Section 4.3 of this File Note. A summary of the plan's components has been included below:

- Monitoring of rainfall forecasts to identify rainfall which may cause site access restriction.
- Monitoring creek flows upstream of the site to identify impending conditions that may cause site access restriction.
- Stream monitoring at the site to identify when the causeway has become unsafe.
- Automated boom gates and drive around barriers to restrict site access once unsafe.
- Installation of flood markers at site access.
- Availability of alternate access options for emergency and possible work crew relief where required in instances that the site is inundation for several days.

Council Officers have accepted that the flood risk warning and response plan would establish operating conditions and measures at the proposed development which would:

- Take reasonable proactive steps to manage the likelihood of large numbers of staff being located at or isolated on the site during events where access is restricted.
- Provide reasonable warning and decision-making time for staff.
- Include physical measures to restrict the ability of staff members to make poor decisions to enter flood waters.
- Would see the staff left on-site to maintain site operations in a safe manner. It is noted that the site is free from flooding at the 1% AEP Flood, with residential buildings above the PMF AEP flood height, and accommodation to house the 5-6 operational staff. It is possible for sufficient supplies and amenities to be kept on-site to sustain and support the people staying. The method for ensuring and maintaining these supplies would be required to be detailed in final Flood Risk Management Plans to be specified in any consent.

Council Officers are satisfied that measures proposed would provide suitable and proportionate controls relative to the risk of individuals being exposed to flood waters/flooding.

6.4 Suitability of the site for development (EP&A Act 1979 S4.15(1)(c))

As outlined above, site access would be periodically limited water depth at the site's Martindale Creek causeway crossing. Proactive weather and streamflow monitoring would be employed to identify times that this may potentially occur so suitable arrangements can be made in advance to prevent staff from putting themselves at risk in floodwaters.

The EMM Flood Risk Assessment May 2022 includes information around the frequency of events affecting access to the site.

In smaller scale events access would be restored more readily with less complications for the operation than the less frequent longer lasting events. To be satisfied that the proposed development could be supported from a site suitability perspective, Council Officers required the applicant to not

only demonstrate suitable protective measures for staff during such events, but that the operation of the facility and the welfare of animals kept on-site could be managed during these periods.

Key strategies related to the management of this issue are set out in the EMM Flood Risk Assessment May 2022, Daily Operations Plan November 2022, Operational Plan of Management (submitted June 2022), EMM Memorandum November 2022. These strategies include:

- Provide sufficient onsite storage of dog food, veterinary medicine, and other dog related supplies for 14 days. Appendix C of the Operational Management Plan (June 2022) provides information around food storage.
- Ensure sufficient accommodation is available to allow staff to stay onsite to care for the animals during periods of limited access. Staff accommodation would be stocked with sufficient supplies for 5–6 people for 10 days.
- Ensuring other items required by staff are maintained on-site as set out in Appendix C of the Operational Management Plan (June 2022).
- Reducing the scope of site operations to allow the site to be administered of a crew of 5-6 individuals. Reduced operational requirements are set out in the Daily Operations Plan November 2022.
- Subject to specific needs, the applicant has indicated that the site operator would have capacity to use a chartered helicopter to access the site to support arrangements to refresh crews or support the site's operation.
- Proactively monitor weather patterns and make decisions about impending flooding conditions.

Provided that materials are maintained on-site to support its operation during periods of isolation, Council Officers are of the view that it would be possible to maintain site operation during the anticipated periods where site access would be limited by causeway flooding. The contingency of a chartered helicopter to support site operators on a needs basis provides a further level of protection.

Council Officers are of the view that subject to the implementation of these measures the site access/flooding limitation would not render the site unsuitable for the proposed development.

7. Conclusion and Recommendations

Within this File Note Council Officers have:

- Setout a detailed timeline of information requested, provided and other steps related to the consideration of flooding issues,
- Provided a detailed summary and review of the information submitted related to flooding and site access restriction
- Reviewed and assessed the likely flooding and site access restrictions of the proposed development in context with the heads of consideration relevant to the assessment and determination of the proposed development under Section 4.15 of the *Environmental Planning and Assessment Act 1979*.

In assessing the proposed development against the relevant Section 4.15 heads of considerations Council Officers have formed the view that:

- The proposed development would be in accordance with Clause 5.21 provisions of the Muswellbrook LEP 2009 related to flooding.
- The proposed development is generally in accordance with the related development controls and that the provisions of Section 13 Flood Plain Management of the Muswellbrook DCP do not inhibit the granting of development consent to the application.
- That suitable consideration has been given regarding the impact of flood hazards on the proposed development.

- The applicant has demonstrated that suitable measures would be incorporated into the proposed development to ensure its function could be maintained during periods of site isolation and flooding.
- Subject to the implementation of site/staff safety measures are implemented and the operational practices to support the site's operation during periods where site access is limited, flooding of the causeway does not render the site unsuitable to the proposed development.

The following conditions of consent should be applied:

- Requirement for the dog kennel within the PMF area to be constructed above the anticipated extent of the PMF (draft condition 20).
- Detailed design of Flood Warning Response system with the Construction Certificate and implementation through development (draft condition 15).
- Submission of final Flood Risk Management Plan with Construction Certificate and implementation during the operation phase (draft condition 15c).
- Updating the Flood Risk Management Plan so it is a 'living document' subject to review and learnings from significant flood events to improve site operation (draft condition 16).
- Requirement for 88B Instrument to be put in place permitting the maintenance of the flood stream gauge up-stream property (owner's consent has been provided by relevant party) (draft condition 44).
- Staff and contractor induction on flood risk management procedures (draft condition 58).
- Ensuring flood emergency supplies are proactively maintained on-site and regularly checked/inspected by operating staff (condition 59).
- Requirement for flood markers to be installed prior to work physically commencing at the site and always maintained (draft condition 26).
- Requirement for all physical components of the Flood Warning and Response Management System to be physically installed and tested (where appropriate or a Certificate prepared by a suitably qualified person as to the functionality) prior to the issue of an Occupation Certificate. Annual testing to be required after commissioning (draft condition 36).
- Requiring a Construction Management Plan for the construction of the development that has regard to the impact of streamflow's and flooding on site access and management measures regarding this issue (draft condition 19).
- Requiring a satellite phone, long range radio or similar communication device to be kept on-site to enable off-site emergency communication with NSW Greyhound Racing management to coordinate any actions required by those operating from the site during periods of isolation (draft condition 60).