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bushfire & ecology

Bushfire Protection Assessment

Industrial Development at Coopers Paddock

Lot 42 in Proposed Plan of Subdivision of
Lot 4 DP 1172051
Governor Macquarie Drive, Warwick Farm



March 2015
(REF: A15009B)



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A handwritten signature in black ink, appearing to read "John Travers".

Date: 26 March 2015
File: A15009B

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The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

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Executive Summary

A bushfire protection assessment has been undertaken for the proposed warehouse development at Governor Macquarie Drive, Warwick Farm.

The proposed industrial development is categorised by the NSW Rural Fire Service (RFS) planning policy document *Planning for Bush Fire Protection 2006 (PBP)* as being other development.

The RFS requires that development applications should satisfy the aims and objectives of *PBP*, propose a combination of bushfire protection measures and provide evidence that the intent of each measure can be satisfied.

The assessment found that bushfire can potentially affect the site from the grassland / remnant trees located within Sydney Water land (sewerage treatment plant) to the west and to a greater extent the foreshore forest vegetation adjoining Georges River to the south and east resulting in possible ember attack, radiant heat and, potentially, flame attack.

The bushfire risk can be mitigated if appropriate bushfire protection measures are put in place and managed in perpetuity.

In conclusion, the assessment has concluded that the proposed development will provide compliance with the aims and objectives of *PBP*.

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Schedule 1 - Bushfire Protection Measures

List of Abbreviations

APZ	Asset protection zone
AS1596	<i>Australian Standard – The storage and handling of LP Gas</i>
AS2419	<i>Australian Standard – Fire hydrant installations</i>
AS3745	<i>Australian Standard – Planning for emergencies in facilities</i>
AS3959	<i>Australian Standard – Construction of buildings in bushfire-prone areas 2009</i>
BAL	<i>Bushfire attack level</i>
BCA	Building Code of Australia
BSA	Bushfire safety authority
DCP	Development control plan
DoPI	Department of Planning and Infrastructure
EEC	Endangered ecological community
EIS	Environmental impact statement
<i>EP&A Act</i>	<i>Environmental Planning & Assessment Act 1979</i>
<i>EPBC Act</i>	<i>Environmental Protection & Biodiversity Conservation Act 1999</i>
FDI	Fire danger index
IPA	Inner protection area
LPG	Liquefied petroleum gas
LEP	Local Environmental Plan
OPA	Outer protection area
<i>PBP</i>	<i>Planning for Bush Fire Protection 2006</i>
<i>RF Act</i>	<i>Rural Fires Act 1997</i>
RFS	NSW Rural Fire Service
SFPP	Special fire protection purpose
<i>TSC Act</i>	<i>Threatened Species Conservation Act 1995</i>



Introduction

1

Travers bushfire & ecology has been requested by *Stockland Pty Ltd* to undertake a bushfire protection assessment in support of the proposed construction of a warehouse development at Governor Macquarie Drive, Warwick Farm.

1.1 Aims of the assessment

The aims of the bushfire protection assessment are to:

- review the bushfire threat to the landscape
- undertake a bushfire attack assessment in accordance with *PBP*
- provide advice on mitigation measures, including the provision of asset protection zones (APZs), construction standards and other specific fire management issues
- review the potential to carry out hazard management over the landscape

1.2 Project synopsis

The project involves the construction of four (4) warehouses, a central access road and perimeter fire trail (refer Figure 1.1).



Figure 1.1 – Master plan (source: Nettleontribe, 23/1/2015)

1.3 Information collation

To achieve the aims of this report, a review of the information relevant to the property was undertaken prior to the initiation of field surveys. Information sources reviewed include the following:

- Masterplan prepared by *Nettleontribe*, 23/1/2015 (Ref: 4429_DA-01)
- Spot survey by Land Partners Limited
- Vegetation Management Plan prepared by *Travers bushfire & ecology*, March 2015.
- *NearMap* aerial photograph
- topographical maps *DLPI of NSW* 1:25,000
- *Australian Standard 3959 Construction of buildings in bushfire-prone areas 2009 (AS3959)*
- *Planning for Bush Fire Protection 2006 (PBP) (NSW RFS)*.

An inspection of the proposed development site and surrounds was undertaken to assess the topography, slopes, aspect, drainage, vegetation and adjoining land use. The identification of existing bushfire measures and a visual appraisal of bushfire hazard and risk were also undertaken.

1.4 Site description

The site is located to the south of Governor Macquarie Drive, Warwick Farm within the Liverpool local government area (LGA). The legal description of the property is Lot 42 in the proposed plan of subdivision of Lot 4 DP 1172051. The property is bounded by Governor Macquarie Drive to the north, the Georges River to the east and south and the Liverpool sewage treatments works to the west.

The property has been used over a long period of time for the training of racehorses. The site currently supports two groups of derelict buildings comprising of old stables. In addition several horse training tracks occur on the western side of the site.



Figure 1.2 – Aerial appraisal (source: *NearMap*)

1.5 Legislation and planning instruments

1.5.1 Environmental Planning and Assessment Act (EP&A Act)

The *Environmental Planning and Assessment Act (EP&A Act)* governs environmental and land use planning and assessment within New South Wales. It provides for the establishment of environmental planning instruments, development controls and the operation of construction controls through the Building Code of Australia (BCA). The identification of bushfire prone land is required under Section 146 of the *EP&A Act*.

1.5.2 Bushfire prone land

Bushfire prone land maps provide a trigger for the development assessment provisions.

The proposed industrial development is located on land mapped by *Liverpool City Council* as being bushfire prone. This triggers assessment of the development in accordance with *PBP*, as required by Section 79BA of the *EP&A Act*.

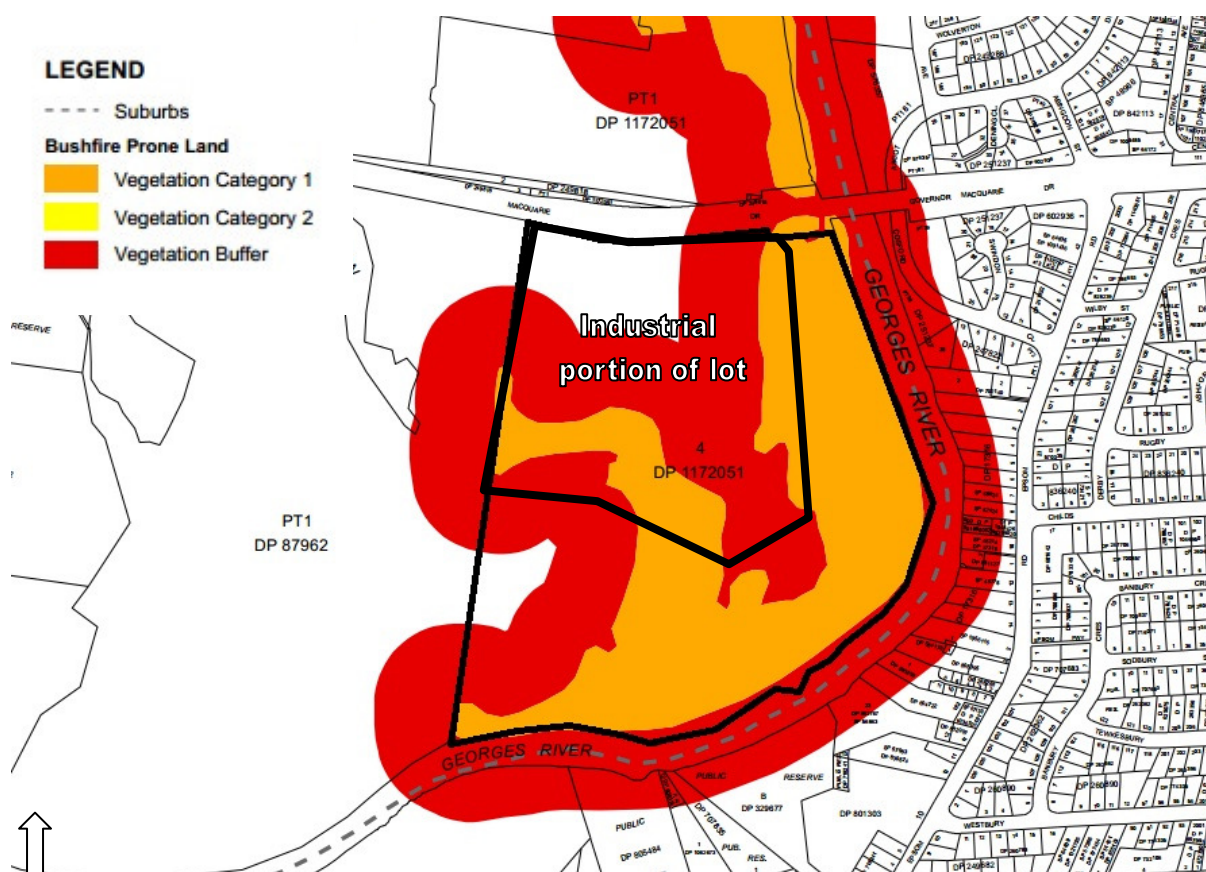


Figure 1.3 – Bushfire prone land map (date: 15 December 2014)

1.5.3 *Liverpool Local Environmental Plan 2008 (LEP)*

A LEP provides for a range of zonings which list development that is permissible, or not permissible, as well as the objectives for development within a zone.

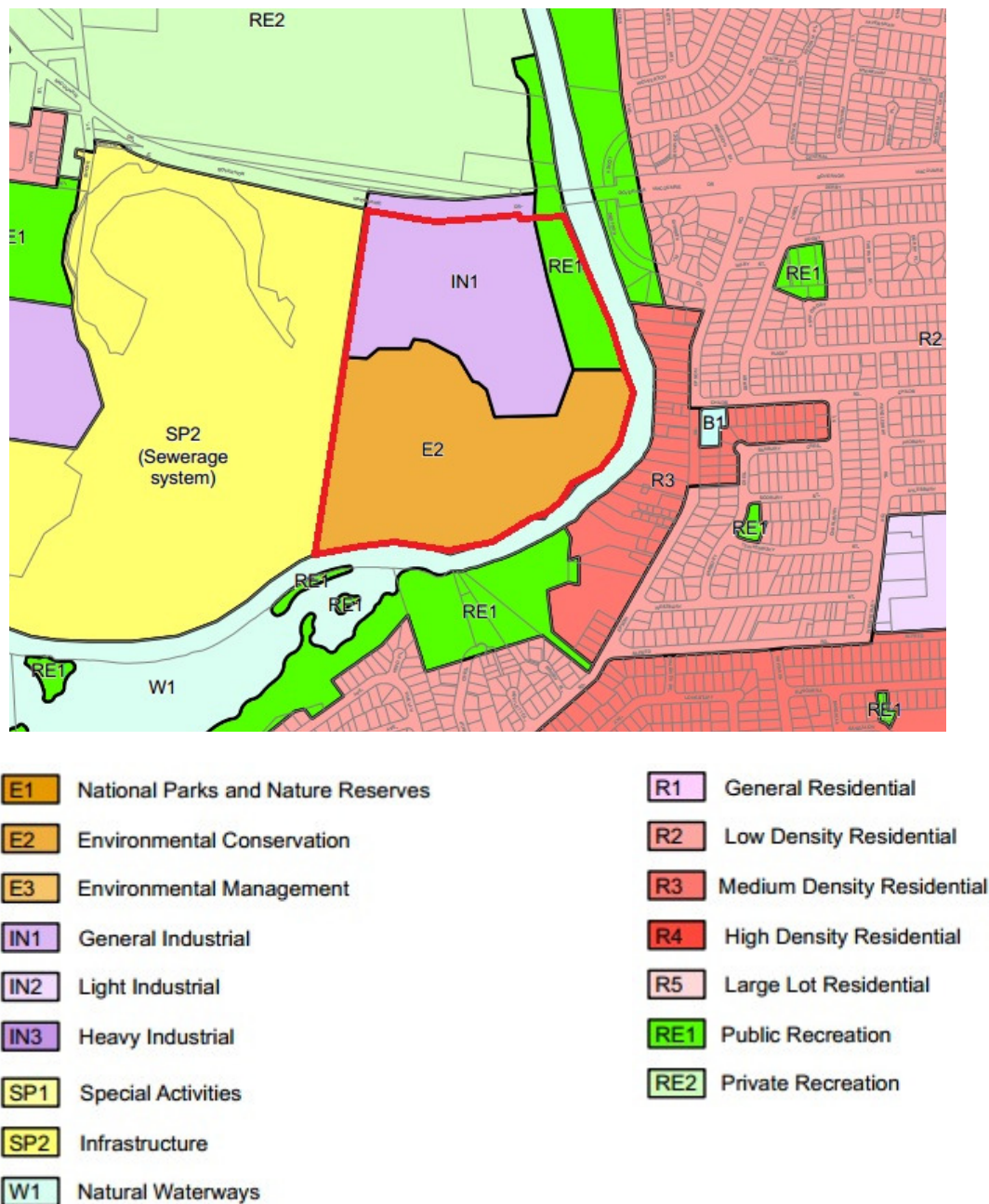


Figure 1.4 – Zoning map
(source: Liverpool LEP, 2008)

The proposed development is zoned under the LEP as IN1 – General Industrial. The land to the east is zoned as RE1 – Public Recreation, with the land to the south zoned as E2 Environmental Conservation.

The proposal, including the provision of APZs, is consistent with the objectives of the IN1 zoning.

1.5.4 Building Code of Australia (BCA) and the Australian Standard AS3959

The *BCA* is given effect through the *EP&A Act* and forms part of the regulatory environment of construction standards and building controls. The *BCA* outlines objectives, functional statements, performance requirements and deemed to satisfy provisions.

In NSW, the construction of buildings in bushfire prone areas relates to Classes 1, 2, 3, 4 and Class 9 buildings that are a special fire protection purpose (*SFPP*) or a Class 10a building or deck associated with the aforementioned building classes. The design and construction manual for the deemed to satisfy requirements is the Australian Standard *AS3959 Construction of buildings in bushfire-prone areas 2009* (AS3959). These classes of buildings must therefore be constructed in accordance with AS3959.

The *BCA* does not provide for any bushfire specific performance requirements for commercial and industrial buildings (Classes 5–8) and, as such, AS3959 does not apply as a set of deemed to satisfy provisions. The general fire safety construction provisions are taken as acceptable solutions.

1.5.5 Planning for Bush Fire Protection 2006 (PBP)

PBP outlines the bushfire protection measures required to be assessed for new development in bushfire prone areas. The range of bushfire protection measures include:

- asset protection zones (APZs)
- building construction and design
- access arrangements
- water supply and utilities
- landscaping, and
- emergency management arrangements.

PBP stipulates that applications that are not residential / rural subdivision, *SFPPs* or residential infill should:

- note the range of available bushfire protection measures (refer dot points above)
- satisfy the aims and objectives of *PBP* (refer Section 2 and Section 4): and
- propose an appropriate combination of bushfire protection measures, with evidence that the intent of each measure (with reference to Sections 4.1.3 and 4.2.7 of *PBP*) is satisfied (refer Section 3 below).



Bushfire Threat Assessment

2

Bushfire protection planning requires the consideration of the RFS planning document entitled *Planning for Bush Fire Protection 2006 (PBP)*. *PBP* provides planning controls for building in bushfire prone areas, as well as guidance on effective bushfire protection measures.

The policy aims to provide for the protection of human life (including fire fighters) and to minimise impacts on property and the environment from the threat of bushfire, while having due regard to development potential, on site amenity and protection of the environment. More specifically, the aims and objectives for all development (including industrial and commercial buildings) located on bushfire prone land should:

1. afford occupants of any building adequate protection from exposure to a bushfire.
2. provide for a defensible space to be located around buildings.
3. provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition.
4. ensure that safe operational access and egress for emergency service personnel and residents is available.
5. provide for ongoing management and maintenance of bushfire protection measures, including fuel loads in the APZ.
6. ensure that utility services are adequate to meet the needs of fire fighters (and others who may assist in bushfire fighting).

Development in bushfire prone areas requires consideration of the overall threat upon a site and the way occupants of a site are potentially able to cope in the event of a bushfire.

To assess the bushfire threat that is likely to occur and thus affect the subject site, a review of the elements that comprise the overall threat needs to be completed. These elements include the potential hazardous landscape that may affect the site, the subsequent extent of the bushfire risk and the expected level of vulnerability that is likely to affect occupants and / or fire fighters.

2.1 Hazardous fuels

The bushfire hazard is defined as the potential severity of a bushfire and is measured in terms of the potential fire intensity and the resultant radiant heat flux emanating from the fire.

The factors that influence bushfire hazard are primarily the type of vegetation (fuel) and the effective slope that contributes to increasing bushfire behaviour. Factors such as wind velocity and fuel dryness also significantly contribute to the hazard achieving maximum intensity levels.

The hazardous fuels are categorised according to vegetation descriptions identified by David Keith, 2004. These units have been defined in accordance with their ability to cause different levels of fire intensity based essentially on their sustained flammability. This arises from the extent of fine fuel presence and weight.

Hazardous fuels include the:

- Forest vegetation associated with Georges River to the east and south of the development site within RE1 and E2 zoned land. The bushfire risk posed from this vegetation is reduced by the presence of a 2.8m wide cycle way which will be constructed adjacent to the eastern and southern boundary.
- Grassland / remnant trees within Sydney Water sewerage treatment plant to the east.

2.2 Bushfire attack assessment

The RFS requires that a development application must include a bushfire attack assessment to determine the possible impact or vulnerability of a structure from fire.

PBP provides a methodology to determine the size of any APZ that may be required to offset possible bushfire attack. The assessment uses the vegetation type and slope gradient to determine the size of the APZ. Vegetation type is assessed for a distance of 140m external to the proposed development area, whilst the effective slope is assessed for up to 100m. Effective slope refers to that slope which provides the most effect upon likely fire behaviour. A mean average slope may not in all cases provide sufficient information such that an appropriate assessment can be determined.

The slope within the hazardous vegetation affecting the proposed development can be summarised as

- 2-3° within the forest vegetation (RE1 & E2 zoned land) to the east and south.
- 2° within the grassland / remnant trees to the west

A fire danger index (FDI) of 100 has been used to calculate bushfire behaviour on the site based on its location within the Greater Sydney region.

Table 1 provides a summary of the bushfire attack assessment and the minimum required APZs for the development.

Note: There are no predetermined minimum APZ requirements for industrial development under *PBP*. The distances provided in Column 5 (of Table 1) will provide appropriate defensible space for the industrial building. The defensible space is designed to allow fire fighters room and safety to fight fires.

Table 1 – Bushfire attack assessment

Aspect	Vegetation within 140m of development	Effective slope of land	APZ recommended to avoid Flame Zone contact (metres)	Defendable space provided (metres)
North	Managed lands	Level to upslope	N/A	N/A
East	Forest	2-3° ^D	23	8 - 12 Refer Note 1
South	Forest	2-3° ^D	23	6 - 67 Refer Note 1
West	Grassland / remnant trees	2° ^D	9	6-9

Notes: * Slope is either 'U' meaning upslope or 'C' meaning cross slope or 'D' meaning downslope

Note 1: A Performance based assessment was undertaken to address the following aims and objectives of PBP.

- Provide for a defensible space to be located around buildings.
- Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition.
- Ensure that safe operational access and egress for emergency service personnel and residents is available.

The 6 - 8m APZ, coupled with a 3m high radiant heat barrier, will provide sufficient defensible space. Due to the non-combustible materials used for the building construction the impact of ember attack radiant heat is moderated. Building egress is on the opposite side of the building meaning no egress is required on the exposed aspect. Active fire fighting operations would not be required given the industrial nature of Warehouse/s 3 and 4 on the eastern aspect. Notwithstanding that a 7m wide access corridor is provided. The fire trail will be utilised by fire vehicles only with the provision of locked gates at each entry / exit point preventing public access. The 3m high barrier will provide protection for fire fighters to work in and around the truck, during mop up operations. Access gates are provided every 50m to allow access into the bushland to mop up.

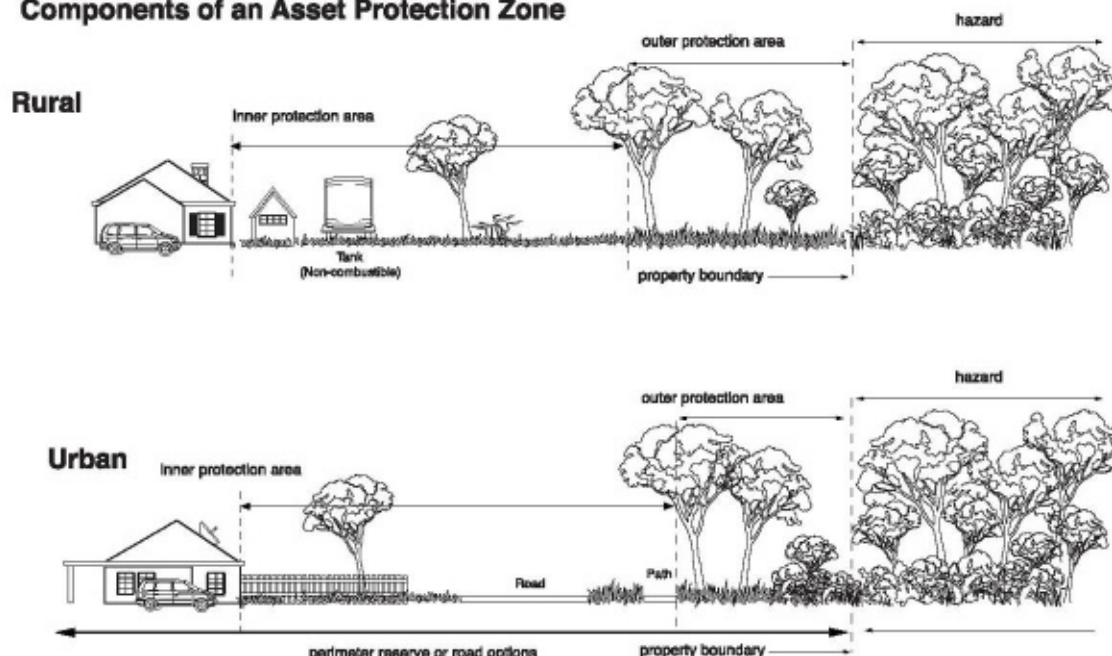
Specific Protection Issues

3

3.1 Asset protection zones

APZs are areas of defensible space separating hazardous vegetation from buildings. The APZ generally consists of two subordinate areas, an inner protection area (IPA) and an outer protection area (OPA). The OPA is closest to the bush and the IPA is closest to the building. A typical APZ and therefore defensible space is graphically represented below:

Components of an Asset Protection Zone



APZs and progressive reduction in fuel loads (Source: RFS, 2006)

Note: Vegetation management as shown is for illustrative purposes only. Specific advice is to be sought in regard to vegetation removal and retention from a qualified and experienced expert to ensure APZs comply with the RFS performance criteria.

The APZs provided for the industrial development will consist of fire trails, hardstand and car parking areas. The APZ (minimum 6 - 8m provided), coupled with a 3m high radiant heat barrier allows for a defensible space for fire fighter access, however will expose the eastern elevation of warehouse 4 and a portion of the southern elevation of warehouse 3 to potential flame contact. As a result appropriate building construction standards will apply to the facility (refer Section 3.2 for detail).

In accordance with *PBP*, appropriate defensible space has been provided between hazardous vegetation and the industrial development to comply with the aims and objectives of *PBP*.

3.2 Building protection

The BCA does not provide any bushfire specific requirements for Classes 5-8 industrial / commercial buildings. The general fire safety construction provisions are taken as acceptable solutions.

PBP recommends that bushfire construction standards for Classes 5-8 buildings should be considered on a case by case basis. Bushfire construction recommendations are dependent on the level of bushfire risk and the provision of adequate access opportunities. Although adequate access is provided around the perimeter of the development, there is a risk posed by the adjoining vegetation, as a result of its close proximity to warehouse 3 and 4. As a result, the following construction requirements are recommended:

- The eastern elevation of warehouse 4 and a portion of the southern elevation of warehouse 3 (within 23m of the vegetation) are to be constructed with non-combustible materials (i.e. concrete panels & metal deck sheeting). If windows are provided to these aspects a shutter is to be provided in accordance with BAL Flame Zone construction. The roof structure is steel and is therefore non-combustible.
- Openable windows (including louvres) and doors (eastern and southern elevations of warehouse 4 & southern elevation of warehouse 3) shall be externally screened with metal mesh screens having a max aperture size of 3mm.
- All external doors are fitted with weather strips (where the doors do not close on a rebated edge) (eastern and southern elevations of warehouse 4 & southern elevation of warehouse 3).
- Roller doors are to be boxed in or sealed in a manner that restricts ember penetration e.g. screening (eastern and southern elevations of warehouse 4 & southern elevation of warehouse 3)

There are no construction requirements for warehouse 1 as it is located over 100m from bushfire prone vegetation.

3.3 Landscaping and hazard management

Should the development be approved, the owner or occupier of the building / development will be required to manage the APZs to the specifications of Council's approval.

In terms of implementing and / or maintaining APZs, there is no physical reason that would constrain hazard management from being successfully carried out mainly due to the fact that the APZ consists of proposed fire trails and car parking areas.

3.4 Access for fire fighting operations

Access to the site will be provided from Governor Macquarie Drive in the north. The proposed internal access road will traverse the central portion of the site with a 6m wide perimeter fire trail provided in the east, south and west.

The proposed access complies with the performance criteria of *PBP* as outlined in Table 3.1.

A fire trail will be provided along the eastern, southern and western boundaries of the site. The proposed fire trail is to comply with the performance criteria of *PBP* as outlined in Table 3.3.

Table 3.1 – Performance criteria for public roads (*PBP* guidelines pg. 20)

Performance criteria	Acceptable solutions	Complies
Fire fighters are provided with safe all weather access to structures (thus allowing more efficient use of fire fighting resources).	Public roads are two-wheel drive, all weather roads.	Yes
Public road widths and design that allow safe access for fire fighters while residents are evacuating an area.	<p>Urban perimeter roads are two way, that is, at least two traffic lane widths (carriageway 8m minimum kerb to kerb) allowing traffic to pass in opposite directions. Non perimeter roads comply with Table 3.2.</p> <p>Perimeter road is linked with the internal road system at an interval of no greater than 500m in urban areas.</p> <p>Traffic management devices are constructed to facilitate access by emergency services.</p> <p>Public roads have a cross fall not exceeding 3°.</p> <p>All roads are through roads. If unavoidable, dead end roads are not more than 200m in length, incorporate a minimum 12m outer radius turning circle, sign posted dead end and direct traffic away from the hazard.</p> <p>Curves of roads (other than perimeter) have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress.</p>	<p>A 6m fire trail will provide perimeter access for fire fighting vehicles. This will allow safe access for fire fighters as it will not be used by the public for evacuation purposes (i.e. locked gates will be installed)</p> <p>Yes a fire trail system is provided with interval links of less than 500m</p> <p>Yes</p> <p>Yes</p> <p>Although the internal public access road is over 200m in length, the fire trail will provide through access for fire fighting vehicles. In addition the public road can safely evacuate via the internal road as it provides access away from the direct threat of bushfire. It is located in the central portion of the site and is therefore protected by the surrounding industrial buildings which separate the road from vegetation by 130m.</p> <p>Yes</p>

Performance criteria	Acceptable solutions	Complies
	<p>The minimum distance between inner and outer curves is 6m.</p> <p>Maximum grades for sealed roads do not exceed 15° and an average grade of not more than 10°.</p> <p>Minimum vertical clearance of 4m above the road at all times.</p>	Yes
The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles.	The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles (15 tonnes for reticulated water and 28 tonnes for all other areas). Bridges clearly indicate load rating.	Yes – Can be made a condition of consent.
Roads that are clearly sign posed (with easily distinguishable names) and buildings / properties that are clearly numbered.	<p>Public roads >6.5m wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water.</p> <p>Public roads 6.5 - 8m wide are No Parking on one side with the hydrant located on this side to ensure accessibility to reticulated water.</p> <p>Public roads <6.5m wide provide parking within parking bays and locate services outside of parking bays to ensure accessibility to reticulated water.</p> <p>One way only public access are no less than 3.5m wide and provide parking within parking bays and locate services outside of parking bays to ensure accessibility to reticulated water.</p>	Yes – Can be made a condition of consent.
There is clear access to reticulated water supply. Parking does not obstruct the minimum paved width	<p>Parking bays are a minimum of 2.6m wide from kerb edge to road pavement. No services or hydrants are located within parking bays.</p> <p>Public roads directly interfacing the bushfire hazard are to provide roll top kerbing to the hazard side of the road.</p>	Yes

Table 3.2 – Minimum widths for public roads that are not perimeter roads (*PBP* guidelines pg. 20)

Curve radius (inside edge) (metres)	Swept Path (metres width)	Single lane (metres width)	Two way (metres width)
<40	3.5	4.5	8.0
40-69	3.0	3.9	7.5
70-100	2.7	3.6	6.9
>100	2.5	3.5	6.5

Table 3.3 – Performance criteria for fire trails (*PBP* guidelines pg. 24)

Performance criteria	Acceptable solutions	Compliant or not compliant
The width and design of the fire trails enables safe and ready access for fire fighting vehicles.	A minimum carriageway width of 4m with an additional 1m strip on each side of the trail clear of bushes and long grass.	Yes – The fire trail width is 6m wide.
	Sealed trails have a maximum grade of 15° and not more than 10° for unsealed roads.	Yes. The grade is less than 5 degrees.
	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches.	Yes
	The cross fall of the trail is not more than 10°.	Yes
	<p>The trail has the capacity for passing by:</p> <ul style="list-style-type: none"> reversing bays using the access to properties to reverse fire tankers, which are 6m wide & 8m deep to any gates, with a minimum turning radius of 6m and outer minimum radius of 12m and / or a passing bay every 200m, 20m long x 3m wide, making a minimum trafficable width of 7m at the passing bay. 	<p>Yes – reversing opportunity is provided between warehouse 2 & 3 via a hardstand area adjacent to the locked gate (refer Schedule 1 for location)</p> <p>Yes – passing opportunity is provided in two locations along the fire trail (refer Schedule 1 for location)</p>

Performance criteria	Acceptable solutions	Compliant or not compliant
Fire trails are trafficable under all weather conditions. Where the fire trail joins a public road, access shall be controlled to prevent use by unauthorised persons.	<p>The fire trail is accessible to fire fighters and maintained in a serviceable condition by the owner of the land.</p> <p>Appropriate drainage and erosion controls are provided.</p> <p>The fire trail system is connected to the property access road and / or through road system at intervals of at least 200m.</p> <p>Fire trails do not traverse a wetland or other land subject to periodic inundation (other than a flood or storm surge).</p> <p>Gates for fire trails are provided and locked with a key / lock system authorised by the local RFS.</p>	<p>Yes – the fire trail will be maintained by the owners of the industrial zoned land. The fire trail along the western development extent is to be transferred over to Council with future usage also proposed as a cycleway link.</p> <p>Yes</p> <p>A fire trail system is provided that circumscribes the development and returns to the proposed public roadway/car park in five (5) locations.</p> <p>The fire trail system however does not comply with the acceptable solution i.e. the provision of a link to the internal public road at 200m intervals. The system however does satisfy the performance criteria as they will be trafficable under all weather conditions and access shall be controlled to prevent use by unauthorised persons through the provision of locked gates.</p> <p>The provision of a central road access surrounding by cleared and managed land provides a safe development plan.</p> <p>Yes</p> <p>Yes – locked gates will be provided.</p>
Fire trails designed to prevent weed infestation, soil erosion and other land degradation.	<p>Fire trail design does not adversely impact on natural hydrological flows.</p> <p>Fire trail design acts as an effective barrier to the spread of weeds and nutrients.</p> <p>Fire trial construction does not expose acid-sulphate soils.</p>	<p>Yes – can be made a condition of consent.</p>

3.5 Water supplies

Town reticulated water supply is available to the development in the form of an underground reticulated water system. The performance criteria for reticulated water supply is that '*water supplies are easily accessible and located at regular intervals*'. The acceptable solutions are:

- reticulated water supply uses a ring main system for areas with perimeter roads
- fire hydrant spacing, sizing and pressures comply with AS2419.1 (2005)
- hydrants are not placed within any road carriageway
- all above ground water and gas pipes external to the building are metal, including and up to taps
- the provisions of parking on public roads are met.

The proposal must comply with the above requirements.

3.6 Gas

PBP outlines the following performance criteria for gas services:

- location of gas services is not to lead to the ignition of surrounding bushland land or the fabric of buildings
- gas bottles are to be maintained in accordance with AS1596 (2002). Metal piping is to be used
- all fixed LPG tanks are to be kept clear of flammable materials and located on the non-hazard side of the building
- if gas cylinders are to be kept close to the building, the release valves must be directed away from the building
- polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used.

The proposal must comply with the above requirements.

3.7 Emergency and evacuation planning

Given that the site is exposed to a high bushfire risk, it is recommended that an emergency / evacuation plan is prepared consistent with the RFS *Guidelines for the Preparation of Emergency / Evacuation Plan*.



Conclusion & Recommendations

4

A bushfire protection assessment has been undertaken for the proposed warehouse development at Governor Macquarie Drive, Warwick Farm.

The assessment found that bushfire can potentially affect the site from the foreshore forest vegetation adjoining Georges River to the south and east resulting in possible ember attack, radiant heat and, potentially, flame attack.

The assessment has concluded that the proposed development will provide:

- Compliance with the aims and objectives of *Planning for Bush Fire Protection, 2006 (PBP)*.

The following illustrates the proposals compliance with the aims and objectives of *PBP*.

Afford occupants of any building adequate protection from exposure to a bushfire

Response: Adequate defensible space, coupled with a radiant heat barrier has been provided for the development and building construction standards have been recommended for the facility.

Provide for a defensible space to be located around buildings

Response: APZs and a radiant heat barrier have been provided to ensure a minimum defensible space can be provided, enabling safe fire fighting access.

Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition

Response: APZs have been recommended in accordance with *PBP* and building construction measures will be applied in accordance with the recommendations of this report.

Ensure that safe operational access and egress for emergency service personnel and residents is available

Response: Adequate internal access has been provided with the provision of a perimeter fire trail.

Provide for ongoing management and maintenance of bushfire protection measures, including fuel loads in the APZ

Response: Fuel management can be undertaken by the land owners in accordance with Appendix 5 of *PBP* and as outlined within *NSW RFS* publications such as *Standards for Asset Protection Zones* available from the *RFS* website at www.rfs.nsw.gov.au.

Ensure that utility services are adequate to meet the needs of fire fighters (and others who may assist in bushfire fighting).

Response: Water supply and access to roadside water hydrants can be assured by a condition consent.

The following recommendations are provided to ensure that the development is in accord with, or greater than, the requirements of *PBP*.

Recommendation 1 – APZs are to be provided for future development. The APZs, as recommended within Table 1, are to be measured from the exposed wall of the facility toward the hazardous vegetation.

Recommendation 2 – Fuel management within the APZs will be maintained by regular maintenance of the landscaped areas. Any future landscaping plan is to comply with Appendix 5 of *PBP* and, given the high bushfire risk posed to the site, should comply with the following:

- planting of trees and shrubs should not occur within 10m of the warehouses
- planting outside of the 10m APZ and within the industrial zoned area is to be minimal, using plants that are less flammable in preference to highly flammable species. Less flammable species include those that have a high moisture content, high levels of salt, low volatile oil content of leaves, smooth barks without ‘ribbons’ hanging from branches or trunks, dense crown and elevated branches (RFS *Standards for Asset Protection Zones* 2006).

Recommendation 3 – The following building construction standards are to be applied to reduce the impact of radiant heat, flame and ember attack on the facility.

- The eastern elevation of warehouse 4 and a portion of the southern elevation of warehouse 3 (within 23m of the vegetation) are to be constructed with non-combustible materials (i.e. concrete panels & metal deck sheeting). If windows are provided to these aspects a shutter is to be provided in accordance with BAL Flame Zone construction. The roof structure is steel and is therefore non-combustible.
- Openable windows (including louvres) and doors (eastern and southern elevations of warehouse 4 & southern elevation of warehouse 3) shall be externally screened with metal mesh screens having a max aperture size of 3mm.
- All external doors are fitted with weather strips (where the doors do not close on a rebated edge) (eastern and southern elevations of warehouse 4 & southern elevation of warehouse 3).
- Roller doors are to be boxed in or sealed in a manner that restricts ember penetration e.g. screening (eastern and southern elevations of warehouse 4 & southern elevation of warehouse 3)

There are no construction requirements for warehouse 1 as it is located over 100m from bushfire prone vegetation.

Recommendation 4 – A hydrant water supply will be installed in accordance with Australian Standard AS2419.1. The mains and static water supply is to comply with Section 3.5 of this report. This equates to a standard industrial facility water supply and requires no additional bushfire type water storage facilities.

Recommendation 5 – Given that the site is exposed to a high bushfire risk, it is recommended that an emergency / evacuation plan is prepared consistent with the RFS *Guidelines for the Preparation of Emergency / Evacuation Plan*.

Recommendation 6 – The landowner / manager is to be made aware of their liability to manage the development lands for the ongoing protection of themselves and their neighbours (refer Section 63(2) *Rural Fires Act (RF Act)*).

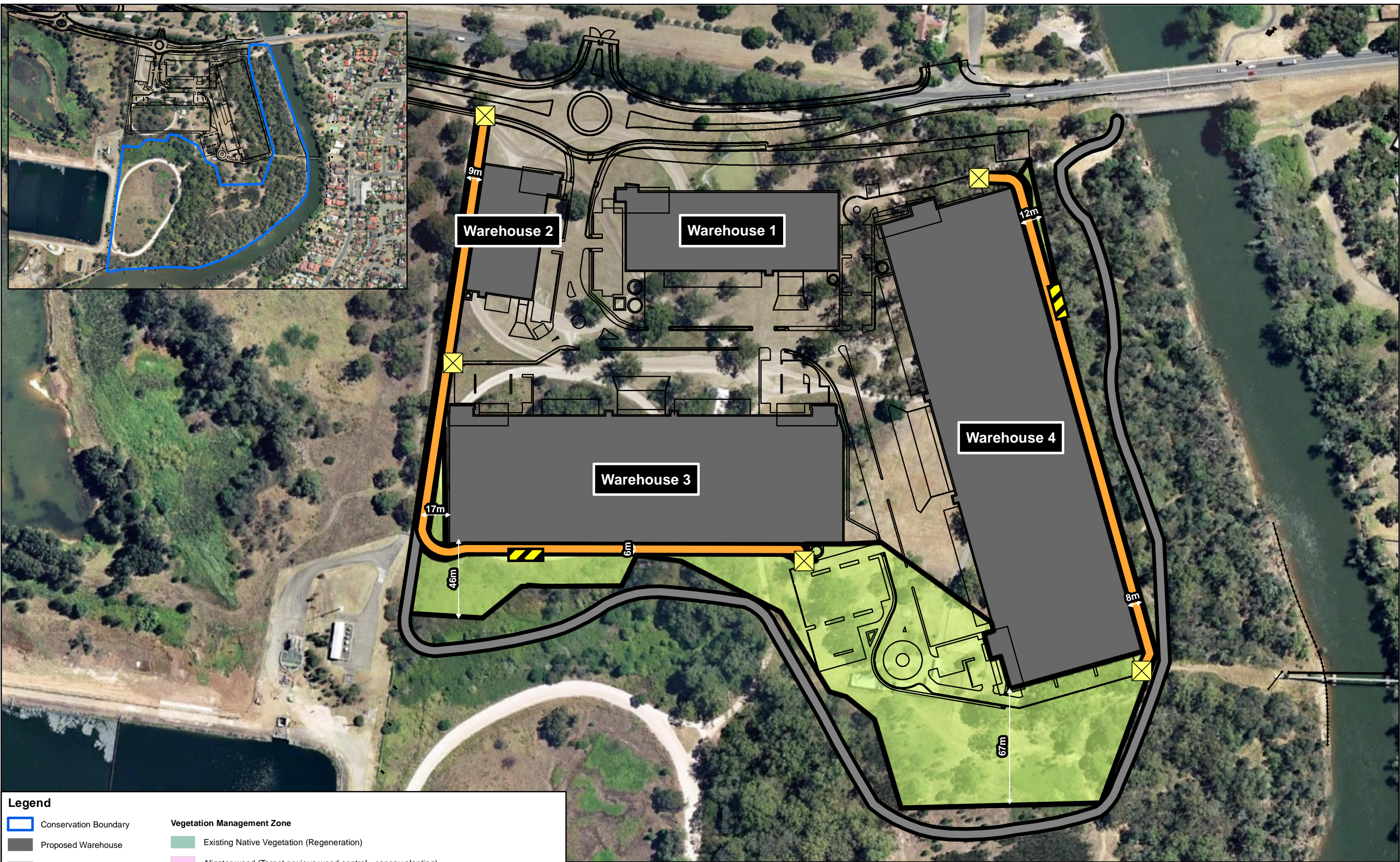
References

- Australian Building Codes Board (2010) – *Building Code of Australia*, Class 1 and Class 10 Buildings Housing Provisions Volume 2
- Chan, K.W. (2001) – *The suitability of the use of various treated timbers for building constructions in bushfire prone areas*. Warrington Fire Research
- Councils of Standards Australia AS3959 (2009) – *Australian Standard Construction of buildings in bushfire-prone areas*
- Keith, David (2004) – *Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT*. The Department of Environment and Climate Change
- Rural Fire Service (2006) - *Planning for Bush Fire Protection – a guide for councils, planners, fire authorities and developers*. NSW Rural Fire Service
- Rural Fire Service (2006) - Bushfire Attack Software on *RFS* web site
- Tan, B., Midgley, S., Douglas, G. and Short (2004) - *A methodology for assessing bushfire attack*. *RFS* Development Control Service



Plan of Bushfire Protection Measures

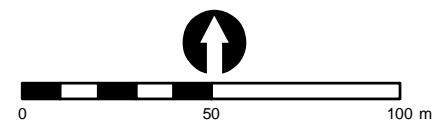
S1



Legend

- | | |
|-------------------------------|--|
| Conservation Boundary | Vegetation Management Zone |
| Proposed Warehouse | Existing Native Vegetation (Regeneration) |
| Cycleway (2.5m wide) | Alligator weed (Target noxious weed control - canopy planting) |
| Locked Gate | Canopy and shrub revegetation with seedlings (Direct seeding of grasses) |
| Firetrail Passing Bay (7x20m) | Canopy planting only |
| Firetrail (6m wide) | Carex Sedgeland (Canopy and shrub planting only) |
| Asset Protection Zone | Existing wetland (Targeted weed control) |
| | Wetland inlet (Enrichment planting of SOF) |

Aerial source: Google Earth Pro



Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

PROJECT & MXD REFERENCE
Coopers Paddock, Warwick Farm
A15009_BF002

DATE & ISSUE NUMBER
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Issue 1

SCALE & COORDINATE SYSTEM
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GDA 1994 MGA Zone 56

TITLE
Schedule 1 - Bushfire Protection Measures

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