WARNING
No part of this plan should be used for original design dimensions. Confirmation of critical positions should be obtained from RPS Newcastle

LEGEND

- Development Estate Boundary
- Site Boundary

N

13.86 degrees

14.41 degrees

12.3 degrees

14.47 degrees

5.71 degrees

4.18 degrees

Cross-slope

9.26 degrees

13.28 degrees

11.95 degrees

12.41 degrees

10.65 degrees

0 250 500m

SCALE: 1: 5000 AT A3 SIZE

TITLE: FIGURE 3-2 SLOPE DEGREE MAP A-A3

LOCATION: CHB

DATUM: DATUM
PROJECTION: MGA ZONE 56 (GDA 94)

DATE: 8/10/2010
PURPOSE: BTA

LAYOUT REF: 24530\DRAFT\BUSHFIRE\NORTH\ALLWORKSPACES\2010 \GWAND\FIGURE 2-1 VEGETATION 2010 A3
VERSION (PLAN BY): MD

CLIENT: COAL & ALLIED INDUSTRIES LTD
JOB REF: 24530-1

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

4 Asset Protection Zones

4.1 Definitions

4.1.1 APZs

An APZ is defined as an area surrounding a development zone that is managed to reduce the bushfire hazard to an acceptable level. The required width of the APZ varies with slope and the type of hazard. An APZ can consist of both an Inner Protection Area (IPA) and an Outer Protection Area (OPA). The respective IPA and OPA widths for the APZ's required under this proposal are as detailed in Section 4.2 and Figure 4-1.

An APZ can include the following:

- Lawns;
- discontinuous gardens;
- swimming pools;
- driveways;
- detached garages,
- open space / parkland;
- car parking;
- swales; and
- cycleways and formed walkways.

4.1.2 Inner Protection Area (IPA)

The IPA extends from the edge of the development to the OPA. The IPA aims to ensure that the presence of fuels which could contribute to a fire event / intensity, are minimised close to the development. The performance of the IPA must be such that:

- there is minimal fine fuel at ground level which could be set alight by a bushfire; and
- any vegetation in the IPA does not provide a path for the transfer of fire to the development – that is, the fuels are discontinuous.

The presence of a few shrubs or trees in the IPA is acceptable provided that they:

- do not touch or overhang any buildings;
- are well spread out and do not form a continuous canopy;
- are not species that retain dead material or deposit excessive quantities of ground fuel in a short period or in a danger period; and
- are located far enough away from any dwelling so that they will not ignite the dwelling by direct flame contact or radiant heat emission.

Woodpiles, wooden sheds, combustible material storage areas, large areas / quantities of garden mulch, stacked flammable building materials etc. should not be permitted in the IPA.

4.1.3 Outer Protection Area (OPA)

The OPA is located adjacent to the hazard. Within the OPA any trees and shrubs should be maintained in a manner such that the vegetation is not continuous. Fine fuel loadings should be kept to a level where the fire intensity expected will not impact on adjacent developments.

4.2 Determining APZs

In accordance with Table A2.4 within PBP (RFS, 2006), the appropriate width setbacks (depicted in Table 4-1, Table 4-2 and Figure 4-1) have been calculated based on the topography and the vegetation present in and around the Development Estate. These prescribed distances will be required between neighbouring vegetation and the proposed residential development within the site. It is expected this area will be maintained to an APZ standard with minimal fuel loads and appropriate landscaping.

Table 4-1: APZ Widths for Development Estate A

Vegetation Type	Direction from Development Estate	Slope	APZ
Open Forest	North	Cross-slope	20m
Open Forest	South	Cross-slope	20m
Open Forest	East	12.3° upslope	20m
Open Forest	East	13.86° upslope	20m
Open Forest	East	14.41° upslope	20m
Open Forest	East	14.47° upslope	20m
Open Forest	West	4.18° downslope	25m
Open Forest	West	5.° downslope	35m

Table 4-2: APZ Widths for Development Estate B

Vegetation Type	Direction from Development Estate	Slope	APZ
Open Forest	North	Cross-slope	20m
Open Forest	South	10° downslope	50m
Open Forest	South	11.95° downslope	50m
Open Forest	South	12.41° downslope	50m
Open Forest	South	9.26° upslope	20m
Open Forest	South	13.28° upslope	20m
Open Forest	West	Cross-slope	20m

WARNING
No part of this plan should be used for original design dimensions. Confirmation of critical positions should be obtained from RPS Newcastle

LEGEND

- Development Estate
- Site Boundary
- Required APZ

N

0 250 500m

SCALE: 1: 5000 AT A3 SIZE

TITLE:	FIGURE 4-1 APZ MAP	LOCATION:	CHB	DATUM: PROJECTION:	DATUM MGA ZONE 56 (GDA 94)	DATE: PURPOSE:	8/10/2010 BTA

LAYOUT REF: 24530\DRAFT\BUSHFIRE\NORTH\ALLWORKSPACES
VERSION (PLAN BY): \2010 \GWAND\FIGURE 2-1 VEGETATION 2010 A3
MD

CLIENT: COAL & ALLIED INDUSTRIES LTD
JOB REF: 24530-1

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

5 Water Supply

Associated with any kind of development upon the land, it is expected that water mains will be extended into the site. Access to this supply should be provided for fire-crews in the form of readily accessible and easily located fire hydrants. Fire hydrant spacing, sizing and pressure should comply with AS 2419.1 – 2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles. Hydrants are not to be located within any road carriageway. All above ground water and gas service pipes external to the building are metal, including and up to any taps.

6 Access / Egress (Evacuation)

PBP (RFS, 2006) recommends a perimeter road be designed between any bushfire hazard and future residential development. A perimeter road forms part of the APZ and will provide a separation between the building line and the boundary of the bush fire hazard. This **perimeter road** should be fully sealed and have a minimum road reserve width of 8m minimum kerb to kerb with the following design specifications:

- roads should be two wheel drive, all weather roads;
- roads should be two-way: i.e. at least two traffic lane widths with shoulders on each side, allowing traffic to pass in opposite directions;
- roads should be through roads where possible, any dead end roads should not be more than 200m in length with a 12m radius turning circle and clearly sign posted as such; and
- the capacity of road surfaces and bridges should be sufficient to carry fully loaded fire fighting vehicles (approximately 28 tonnes or 8 tonnes per axle).

Development Estate A

A perimeter road is not necessary along the western boundary of Development Estate A due to the existing road Flowers Drive that runs along this boundary. A perimeter road is provided on the northern and southern boundaries of the site. Along the eastern boundary there are 4 lots that do not have a perimeter road between the lots and the adjacent vegetation. However, access to this vegetation is able to be gained via the two east-west running culs-de-sac and their turning heads that extend beyond the housing line. The culs-de-sac are less than 200m in length (and have a minimum 12m radius turning circle?) and therefore comply with PBP (RFS, 2006).

Development Estate B

The Concept Plan indicates that a perimeter road will be developed around the development estate. The perimeter road complies with the above design specifications in accordance with PBP (RFS, 2006).

According to PBP (2006), the design specifications for **internal public road** require that roads:

- be two-wheel drive all weather roads;
- non perimeter roads comply with Table 6-1 (below) – Road widths for Category 1 Tanker;

Table 6-1: Minimum widths for fire fighting access of non-perimeter public roads

Curve radius (inside edge metres)	Swept Path (metres width)	Single land (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

- the perimeter road is linked to the internal road system at an interval of no greater than 500m in urban areas;
- not be hindered by an overuse of traffic calming devices such as speed humps and chicanes;
- public roads do not have a cross fall exceeding 3 degrees;
- all roads are through roads, but if unavoidable then dead ends should be not more than 200m in length, incorporate a minimum 12m turning circle and should be clearly sign posted as dead ends;
- curves of roads (other than perimeter roads) are a minimum inner radius of 6 metres and minimal in number, to allow for rapid access and egress;
- the minimum distance between inner and outer curves is 6m;
- maximum grade for sealed roads do not exceed 15^{o} and an average grade of not more than 10^{o} or other gradient specified by road design standards, whichever is the lesser gradient;
- there is a minimum vertical clearance to a height of 4m above the road at all times;
- the capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles (approximately 15 tonnes for areas with reticulated water, 28. Bridges clearly indicate load rating;
- public roads between 6.5m and 8m wide are no parking on one side with the services (hydrants) located on the side to ensure accessibility to reticulated water for suppression;
- one way public access roads are no less than 3.5m wide and provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression;
- parking bays are a minimum of 2.6m wide from kerb edge to road pavement. No services or hydrants are located within the parking bays; and
- public roads directly interfacing the bush fire hazard vegetation should provide roll top kerbing to the hazard side of the road.

The Concept Plan provides for a number of internal public roads within the Development Estates. All proposed internal public roads comply with the above design specifications in accordance with PBP (RFS, 2006).

According to PBP (2006), the design specifications for **property access roads** require:

- at least one alternative property access is provided for individual dwellings (or group of dwellings) that are located more than 200m from a public through road;
- a minimum carriageway width of four metres for rural-residential areas, rural landholdings or urban area with a distance greater than 70 metres from the nearest hydrant point to the most external part of the proposed building;

Note: No specific access requirements apply in a urban area where a 70m unobstructed path can be demonstrated between the most distant part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency fighting vehicles (i.e. a hydrant or water supply).

- a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches;
- on forest, woodland and heath situations, rural property access roads have passing bays every 200m that are 20 metres long by two metres wide;
- internal roads for rural properties have a loop road around any dwelling or incorporate a turning circle with a minimum 12 metre outer radius;
- curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress;
- the crossfall is not more than 10^{o};
- maximum grades for sealed roads do not exceed 15^{o} and not more than 10^{o} for unsealed roads; and
- access to a development comprising more than three dwellings have formalised access by dedication of a road and not by right of way.

To note the above road specifications are the acceptable solutions as detailed within PBP (RFS, 2006).

Deviations from the above acceptable solutions for access may be considered (depending on the situation) through a performance-based assessment.

7 Fire Fighting Capability

Any fire within the site would be attended in the first instance by the Catherine Hill Bay RFS or Swansea branch of the NSW Fire Brigade.

The public roads and internal road system must ensure that safe operational access and egress for emergency personnel and residents is available. The perimeter roads that have previously been recommended within this report would satisfactorily serve such a function. Any other roads / trails should be connected to other access/egress points, or provide a suitable turning circle at termination points.

To facilitate quick and efficient action by the Fire Brigade / Rural Fire Service upon arrival, it is recommended that all necessary connections / pumps etc be clearly marked and visible, and in good working order.

8 Dwelling Design and Construction

On 6 March 2009 Council of Standards approved the revised Australian Standard AS3959-2009 *Construction of buildings in bushfire prone areas* (AS3959-2009). This standard was published by Standards of Australia on 10 March 2009 and replaces the 1999 version of the document.

AS3959-2009 was formally adopted by the BCA as the national standard on 1 May 2010.

Building design and the materials used for construction of future dwellings should be chosen based on the information contained within AS3959-2009, and accordingly the designer/architect should be made aware of this recommendation. It may be necessary to have dwelling plans checked by the architect involved to ensure that the proposed dwelling meets the relevant Bushfire Attack Level (BAL) as detailed in AS3959-2009.

The determinations of the appropriate BAL are based upon parameters such as weather modelling, fire-line intensity, flame length calculations, as well as vegetation and fuel load analysis. The determination of the construction level is derived by assessing the:

- Relevant FDI = 100
- Flame temperature
- Slope
- Vegetation classification; and
- Building location.

The following BAL, based on heat flux exposure thresholds, are used in the standard:

(a) **BAL – LOW** The risk is considered to be **VERY LOW**

There is insufficient risk to warrant any specific construction requirements but there is still some risks.

(b) **BAL – 12.5** The risk is considered to be **LOW**

There is a risk of ember attack.

The construction elements are expected to be exposed to a heat flux not greater than 12.5 k/m^2.

(c) **BAL – 19** The risk is considered to be **MODERATE**

There is a risk of ember attack and burning debris ignited by wind borne embers and a likelihood of exposure to radiant heat.

The construction elements are expected to be exposed to a heat flux not greater than 19 kW/m^2.

(d) **BAL-29** The risk is considered to be **HIGH**

There is an increased risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to an increased level of radiant heat.

The construction elements are expected to be exposed to a heat flux no greater than 29 kW/m^2.

(e) **BAL-40** The risk is considered to be **VERV HIGH**

There is much increased risk of ember attack and burning debris ignited by windborne embers, a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front.

The construction elements are expected to be exposed to a heat flux no greater than 40 kW/m^2.

(f) **BAL-FZ** The risk is considered to be **EXTREME**

There is an extremely high risk of ember attack and burning debris ignited by windborne embers, a likelihood of exposure to an extreme level of radiant heat and direct exposure to flames from the fire front.

The construction elements are expected to be exposed to a heat flux greater than 40 kW/m^2.

Using the Addendum: Appendix 3 (NSW Rural Fire Service, 2010), the information relating to vegetation, slope as presented within this report and according to Table 2.4.2 of AS3959-2009 the BAL for future lots within the Development Estate was calculated. Table 8-1 and Table 8-2 show the required BAL.