- 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 not 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 does not exceed 15^{o} and an average grade of not more than 10^{o} of 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 tonnes. 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 estate. All proposed internal public roads are through roads thereby providing two points of access/ egress for both fire fighters and residents evacuating their dwelling. It is considered that if the above design specifications are considered in the design of the public roads, then they will comply with PBP (RFS, 2006).

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

- 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.

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 development estate would be attended in the first instance by the Gwandalan branch of the NSW Fire Brigade.

Consideration must be given to the provision of adequate turning circles for any fire tanker that services the development estate. The proposed perimeter roads and internal public roads within the Preliminary Structure Plan would satisfactorily serve such a function.

To facilitate quick and efficient action by the Fire Brigade 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 are 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 shows the required BAL.

Table 8-1: Recommended Construction Standards

Vegetation Type	Direction from Development Estate	Slope	APZ	Distance from Vegetation	Construction Level
Open Forest	North	Cross-slope	20m	20-25m	BAL 40
				25-35m	BAL 29
				35-48m	BAL 19
				48-100m	BAL 12.5
Open Forest	South	1.37^0 downslope	25m	25-32m 32-43m 43-57m 57-100m	BAL 40 BAL 29 BAL 19 BAL 12.5
Open Forest	East	1.05^0 downslope	25m		
		1.24^0 downslope	25m		
		1.49^0 downslope	25m		
		1.6^0 downslope	25m		
		2.18^0 downslope	25m		
		2.29^0 downslope	25m		
		3.21^0 downslope	25m		
		3.58^0 downslope	25m		
		4.08^0 downslope	25m		
Woodland	West	Cross-slope	10m	10-16m	BAL 40
				16-24m	BAL 29
				24-33m	BAL 19
				33-100m	BAL 12.5
		0-4^0 upslope	10m	10-16m	BAL 40
				16-24m	BAL 29
				24-33m	BAL 19
				33-100m	BAL 12.5

To Note: The construction requirements for the next lower BAL than that determined for the site may be applied to an elevation of the building where the elevation is not exposed to the source of bushfire attack. An elevation is deemed to be not exposed to the source of bushfire attack if all straight lines between that elevation and the source of bushfire attack are obstructed by another part of the building.

Given the information in the above tables, all future dwellings within the proposed allotments will comply with AS3959 - 2009.

9 Conclusion and Recommendations

It is clear from the investigation and assessment the Gwandalan development estate, in part constitutes BFPL. Therefore, the proposed residential development estate and the Seniors Living facility will have to be carried out in accordance with the specifications contained within PBP (RFS, 2006) as assessed and presented within this report.

If the recommendations contained within this report are duly considered and incorporated, it is considered that the fire hazard present is containable to a level necessary to provide an adequate level of protection to life and property on the development estate.

In summary, the following key recommendations have been generated to enable the development estate to meet the relevant legislative requirements:

- APZ's from 10 metres to 25 metres will be required from vegetation external to the development estate and future residential dwellings. The Concept Plan indicates that proposed roadways are directly adjacent to vegetation surrounding the development estate and vegetation to be retained within the development estate. The proposed perimeter and public roads within the development estate are therefore likely to provide either the entire or part of the required APZ's, with the remaining part of the APZ being located within allotments if required.
- Any proposed development should be linked to mains pressure water supply and that suitable hydrants be clearly marked and provided for the purposes of bushfire protection. Fire hydrant spacing, sizing and pressure should comply with AS2419.1, 2005.
- Roads should be constructed in accordance with section 4.1.3 (1), PBP as outlined in section 6 of this report. Any lessening of these requirements will require a performance-based assessment to be undertaken.
- Any future dwelling within the proposed development estates should have due regard to the specific considerations given in the BCA, which makes specific reference to the Australian Standard (AS3959 – 2009) construction of buildings in bushfire prone areas. Assessment in accordance with AS 3959-2009 has shown that any future dwelling will comply with this standard.
- It is recommended that a Fuel Management Plan (FMP) be prepared for the development estate. This plan will detail the required strategies to create the required APZ's and management of these APZ's in such a manner as to preserve the natural and cultural features of the development estate, while reducing the risk of bushfire.

Finally, it is believed that the implementation of the measures and recommendations forwarded within this report would contribute to the amelioration of the potential impact of any bushfire upon this site, but they do not and cannot guarantee that the area will <u>not</u> be affected by bushfire at some time.

10 Bibliography

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Appendix 1

DGEAR's

Director-General's Requirements

Section 75F of the Environmental Planning and Assessment Act 1979

Project	**Concept Plan (MP10_0084)** for a residential subdivision of the Gwandalan site for up to 623 dwellings over approximately 62 hectares and the dedication of approximately 205 hectares for conservation.
Site	**Gwandalan** Lot 2 DP 1043151 and Lot 57 DP 755266
Proponent	Coal & Allied Industries Pty Ltd
Date of Issue	19 August 2010
Date of Expiration	(2 years from date of issue)
General Requirements	The Environmental Assessment (EA) must include: (1) An executive summary. (2) A detailed description of the project including the: (a) strategic justification for the project; (b) alternatives considered; and (c) various components and stages of the project in detail (and should include infrastructure staging). (3) A consideration of the following with any variations to be justified: (a) all relevant State Environmental Planning Policies, with particular regard to SEPP *Major Development 2005, SEPP 44, SEPP 55, SEPP 71* and *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*; (b) applicable planning instruments; and (c) relevant legislation and policies, including the *NSW Coastal Policy 1997*, *Lower Hunter Regional Strategy,* and *Lower Hunter Regional Conservation Plan*. (4) A consideration of the proposal and cumulative impacts in relation to the development of other future urban land identified in the Lower Hunter Regional Strategy. (5) A draft Statement of Commitments, outlining specific commitments to the project's management, mitigation and monitoring measures with a clear identification of the timing and responsibility for these measures. (6) A conclusion justifying the project, taking into consideration the environmental impacts of the proposal, mitigation measures to address these impacts, the cumulative impacts of the proposal, the suitability of the site, and whether or not the project is in the public interest. (7) Identify the development contributions applicable to the site between (a) the Proponent and Wyong Shire Council; (b) the Proponent and State Government agencies for State infrastructure in accordance with *Planning Circular PS 07-018;* and (c) if relevant, any public benefits to be provided with the development. (8) A signed statement from the author of the EA certifying that the information contained in the report is neither false nor misleading. (9) A report from a quantity surveyor identifying the correct capital investment value for the concept plan and the four project applications.
Key Assessment Requirements	**Urban design and built form** (1) Provide an assessment against the *Coastal Design Guidelines for NSW* and *NSW Coastal Policy (1997)*. (2) Propose development controls and design guidelines for the site which ensure that the future development responds to the site location appropriately. (3) Provide details of proposed treatment of all public domain areas. (4) Identify opportunities to link the proposed development to the existing village and surrounding areas, including through appropriate pedestrian and cycleway connections.

	(5) Address the principles of *Crime Prevention Through Environmental Design.* **Coastal Foreshore and Public Access** (1) Outline measures to protect and enhance existing public access through the site to and along the foreshore and provide, where appropriate, new opportunities for public access that is compatible with the natural attributes of the coastal foreshore. **Biodiversity impact** (1) Identify impacts of the development on threatened species and their habitats having regard to the draft *Threatened Species Assessment Guidelines* (DEC July 2005) and outline measures to avoid or mitigate impacts on threatened species and their habitat. (2) Demonstrate that biodiversity impacts can be appropriately offset in accordance with the NSW Government's policy for 'improvement or maintenance' of biodiversity values. (3) Consider and identify measures to manage interface impacts on land proposed to be dedicated for conservation., (4) Provide an assessment of the cumulative impacts on biodiversity of the proposed development, and other development proposed in the area. (5) Demonstrate consistency with the approval granted by the Commonwealth Department of Environment, Water, Arts and Heritage under the *Environmental Protection and Biodiversity Conservation Act 1999.* **Transport and Accessibility** (1) Prepare a Traffic Study in accordance with RTA's *Guide Traffic Generating Developments* that includes (but is not limited to) the following: (a) an identification of all relevant vehicular traffic routes and intersection for access to/from the area, (b) current traffic counts for all of the above traffic routes and intersections, (c) the anticipated vehicular traffic generated from the proposed development and associated trip distribution on the road network, (d) consideration of the traffic impact on the existing and proposed intersections and the capacity of the local and classified road network to safely and efficiently cater for the additional vehicular traffic generated, (e) an analysis of the cumulative traffic and transport impacts of the development taking into consideration other proposed developments, (f) details of necessary road network infrastructure upgrades required to maintain existing levels of service both on the local and classified road network, (g) an intersection analysis, using SIDRA or similar traffic model, as well as a micro simulation model to determine the need for intersection and mid block capacity upgrades and to ensure traffic signal co-ordination, (h) proposed pedestrian and cycleway access within and to the site that connects to all relevant transport services, nearby settlements, and other key off-site locations having regard to the *NSW Planning Guidelines for Walking and Cycling* (2004), and the *NSW Bike Plan* (2010), (i) Timing of delivery of proposed transport infrastructure including road and intersection upgrades, pedestrian and cycle paths, and public transport infrastructure, and (j) Consideration of impacts on existing property access. (2) Assess the proposal against the objectives of the Integrating Land Use and Transport policy package.

Mining Activities

(1) Identify the requirements of previous consents, approvals, lease arrangements, and current legal and financial responsibilities in relation to the mine operation and closure and the impact approvals will have on these arrangements.

(2) Provide a risk analysis examining the risk factors associated with the former mining use of the site and what effects it may have on future development, including mine subsidence.

(3) Identify measures that would that would be implemented to avoid, minimise or remediate potential mine subsidence issues encountered on the site.

(4) Investigate the impacts on future mining activities.

Heritage

(1) Provide an archaeological assessment and heritage impact statement in accordance with NSW Heritage Office guidelines. The statement should assess the impacts of the application on the area and any significant components of the site, including indigenous heritage.

(2) Provide an assessment in accordance with the d*raft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC 2005).

Water quality

(1) Provide appropriate detailed information on the drainage and stormwater management measures to be incorporated on site, including on site stormwater detention, water sensitive urban design measures, and drainage infrastructure.

(2) identify future management arrangements for proposed stormwater infrastructure including, where relevant, in consultation with Council.

(3) Assess the impact of the proposal on the hydrology of the site and surrounding areas including impacts on quality of surface water, groundwater, a coastal lake, a coastal creek or other similar body of water, or a rock platform) in accordance with the *NSW Groundwater Dependant Ecosystems Policy.*

Flooding

(1) Develop suitable flood planning levels for the proposed development and identify flood evacuation requirements for land up to the Probable Maximum Flood level. Demonstrate consistency with the *NSW Floodplain Development Manual: the management of flood liable land (2005)*, the *DECCW Floodplain Risk Management Guideline – Practical Consideration of Climate Change*, the *NSW Sea Level Rise Policy Statement (DECCW 2009),* and *Draft NSW Coastal Planning Guideline: Adapting to Sea Level Rise* (Department of Planning 2009).

Visual

(1) Assess and provide mitigation measures in response to the visual impacts of the project in the context of adjoining development, impact on any heritage items (on-site or in the vicinity) and the development as viewed from publicly accessible areas and the natural environment.

Bushfire

(1) Identify how the proposed concept plan addresses the requirements of *Planning for Bush Fire Protection* and *Australian Standard 3959 (Building in Bush Fire Prone Areas)*.

(2) Outline ongoing management arrangements of any proposed APZs, including through negotiation with relevant agencies where APZs are proposed to be located on land to be dedicated for a public purpose.

	Impact on Crown Land (1) Identify potential direct and indirect impacts arising from development on the adjacent Munmorah State Conservation Area, Point Wollstonecraft State Recreation Area and Lake Macquarie State Recreation Area. **Infrastructure and utilities** (1) Identify and address the impacts of additional demand created by the development on existing infrastructure including public transport, open space, and recreation facilities, retail facilities and other social and community facilities. Identify the need for additional facilities through negotiation with State or local government agencies. This should inform the scope of proposed State and local infrastructure contributions. (2) Prepare a utility and infrastructure servicing report and plan for the Site that includes (but is not limited to): (a) Identification and assessment of the capacity of existing utility and infrastructure servicing the site, and (b) Identification and assessment of all necessary augmentation works to service the site and whether these works can sustain this and others development foreshadowed for the Wallarah Peninsula shown in the *Lower Hunter Regional Strategy*. **Ecologically Sustainable Development (ESD)** (1) Demonstrate how the development will commit to ESD principles in design, construction and ongoing operation phases. (2) Demonstrate that the development is capable of achieving the requirements of BASIX. **Site preparation works** (1) Identify the likely extent of site preparation works with respect to cut and fill activities to cater for the proposed residential development. In particular, assess how the proposed built form will respond to final levels of the site and demonstrate consideration to minimise the extent of cut and fill required. **Subdivision** (1) Provide a subdivision plan to identify all covenants, easements and notations proposed for each title, for the proposed subdivision to facilitate transfer of lands to Government agencies. **Future Public Land** (1) Identify any proposed open space or conservation lands and outline arrangements for ownership and control, management and maintenance, funding, public access, revegetation and rehabilitation works, and bushfire management.
Consultation Requirements	An appropriate and justified level of consultation should be undertaken. Where consultation has already been undertaken this should be documented in the EA. Consultation must be undertaken with the following relevant agencies: • Wyong Shire Council • Hunter Water • Local Aboriginal Land Councils • Catchment Management Authority - Hunter – Central Rivers • NSW Department of Industry and Investment • NSW Department of Environment, Climate Change and Water • NSW Office of Water • Transport NSW • Roads and Traffic Authority

	• NSW Emergency Service agencies, namely NSW Police Department, the Ambulance Service of NSW, the State Emergency Service, NSW Rural Fire Service, and NSW Fire Brigades • Utility providers The consultation process and the issues raised should be described in the Environmental Assessment.
Deemed refusal period	60 days

Appendix 2

Vegetation Formations

GWANDALAN VEGETATION FORMATIONS

Coastal Sheltered Apple - Peppermint Forest

Coastal Plains Scribbly Gum Woodland

Woodlands

Dominated by an open sparse layer of eucalypts with the crowns rarely touching. Typically 15-35m high. Diverse ground-cover of grasses and herbs. Shrubs are sparsely distributed. Usually found on flat and undulating ground.