Whitehaven Coal Mining Pty Ltd

(ABN: 65 086 246 253)

Environmental Impact Statement

For the

Whitehaven Siding Coal Handling and Preparation Plant

Volume 1 - Main Text

June 2002

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(ABN: 65 086 246 253)

ENVIRONMENTAL IMPACT STATEMENT

For the

Whitehaven Siding Coal Handling and Preparation Plant

Volume 1 - Main Text

Prepared for:
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FORM 2

Submission of
Environmental Impact Statement (EIS)
prepared under the Environmental Planning and Assessment Act, 1979
Section 78A

EIS prepared by:

name:	**Robert John Corbett**
qualifications:	B. Sc. (For.)
address:	Lot 6, Enterprise Crescent SINGLETON N.S.W. 2330
in respect of:	Construction and operation of a coal handling and preparation plant and associated facilities; road transportation of coarse and fine coal rejects and coal.

development application:

applicant name:	Whitehaven Coal Mining Pty Ltd (ABN: 65086 426 253)
applicant address:	Level 20, 10 Eagle Street BRISBANE QLD 4000
land to be developed:	
lot no., DP/MPS, vol/fol etc proposed development	Lot 678, DP 705086; Lot 1, DP 723509; Lots 111, 120, 472, 473, 474, 475 and 498 DP, 755503; Lot 1 DP 810271; Lot 3, DP 875874; North-Western railway line corridor, all within Parish of Gunnedah, County of Pottinger, Shire of Gunnedah.

Environmental Impact Statement:

[✔] an Environmental Impact Statement (EIS) is attached

certificate

I, Robert John Corbett, of Lot 6, Enterprise Crescent, Singleton, N.S.W., hereby certify that I have prepared the contents of this Statement and to the best of my knowledge

- it is in accordance with clauses 72 and 73 of the Environmental Planning and Assessment Regulation, 2000; and
- it is true in all material particulars and does not, by its presentation or omission of information, materially mislead.

signature: Robert J. Corbett

name: Robert John Corbett

date: 12 June 2002.

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EXECUTIVE SUMMARY

Whitehaven Siding Coal Handling and Preparation Plant

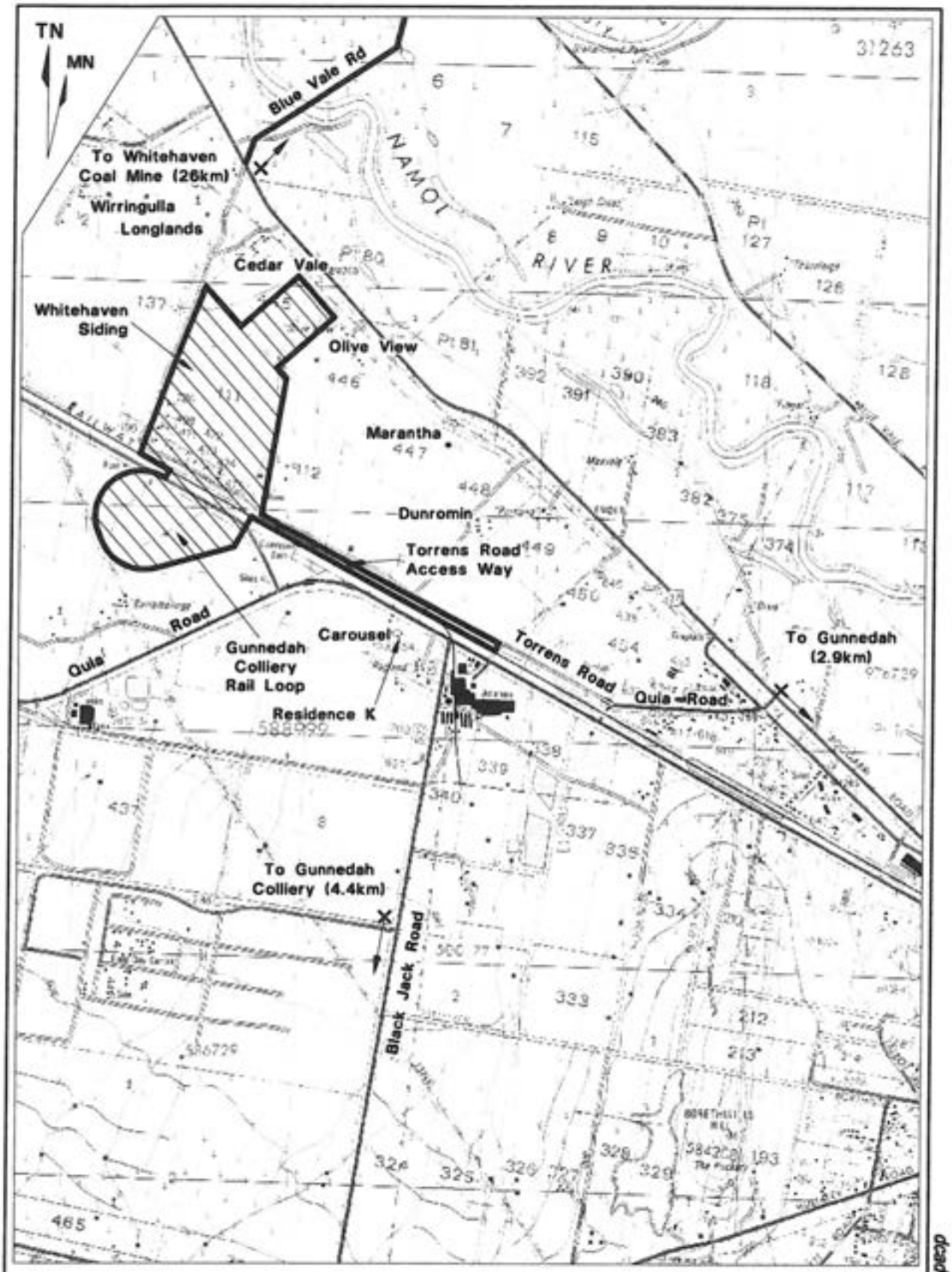
This Environmental Impact Statement (EIS) has been prepared to accompany a Development Application by Whitehaven Coal Mining Pty Ltd (WCM) to Gunnedah Shire Council. The Development Application seeks approval for the installation and operation of a coal handling and preparation plant (washery) (CHPP) and associated facilities on and adjacent to the former Vickery rail siding/train loader, approximately 6 km west of Gunnedah (the Project Site – **Figure A**).

The former Vickery rail siding/train loader is now owned by WCM and was selected as the location for the proposed CHPP because of the prior disturbance on the site, the extensive infrastructure, services and environmental controls already in place and its proximity to the State Highway network and a number of radiating roads which provide access to areas to the north.

In the short-term, the CHPP would be used for the processing and despatch of coal from WCM's Whitehaven Coal Mine, approximately 30 km to the north-north-west. However, in the medium to longer term, it is planned that the CHPP would be used to process coal from other future mine developments within the Gunnedah/Boggabri area, to the north of the North-Western railway line.

Lodgment of this Development Application is consistent with the conditions of the Whitehaven Coal Mine Development Consent (72-03-2000) which requires WCM to:

i) submit an application for approval of a coal preparation plant (in lieu of the continued use of the Gunnedah Colliery facility) once the quantity of coal from the Whitehaven Coal Mine requiring washing reaches a threshold of 200 000 tpa; and



Base Map Source:
EMERALD HILL 8936-III-S 1:25 000
Central Mapping Authority

REFERENCE

Project Site Boundary

SCALE 1:25 000

250 0 250 500 750 1000 1250 m

Figure A
LOCAL SETTING

ii) pursue other haulage options to minimize the movement of heavy vehicles on Quia and Black Jack Roads.

Approval of the Development Application would enable the activities outlined below to be undertaken for a minimum period of 20 years.

i) Road delivery and stockpiling of raw coal.

ii) Preparation (sizing, washing, blending) of coal.

iii) Stockpiling of product coal.

iv) Despatch of export coal via rail and of limited domestic coal by road.

v) Temporary stockpiling and subsequent despatch of coarse washery rejects.

vi) Development of a combination of permanent and temporary on-site storages for fine washery rejects.

vii) Road despatch of temporarily-stored fine rejects.

Activities (i), (iii) and (iv) are already approved by virtue of the Whitehaven Coal Mine or Vickery Coal Mine Development Consents, albeit for periods less than that sought in this Development Application.

The Project Site (**Figures A** and **B**) covers an area of approximately 68 ha and, for descriptive purposes within this EIS, has been sub-divided into three component areas, namely the siding, rail loop and Torrens Road access way.

The siding area would be the site of the coal preparation plant, domestic coal screening plant and all ROM and product coal stockpiles and support facilities for the plant, while the rail loop component of the Project Site would be the site of the proposed fine reject ponds. The Torrens Road access way would provide a private access route to Torrens Road and hence Quia and Black Jack Roads, thereby enabling project-related heavy vehicles to avoid passing a number of residences on the Kamilaroi Highway and Quia Road which lie on the existing approved coal transport route for the Whitehaven Coal Mine.

The three component areas of the Project Site comprise freehold land owned by WCM, Crown land under perpetual leasehold or Council-owned land under lease to WCM.

WCM, consultants specializing in the fields of flora, fauna, archaeology, noise and air quality, Australian Coal Technology and the Department of Land and Water Conservation have provided assistance in the development of WCM's proposal. Gunnedah Shire Council, seven Government Authorities, FreightCorp, Red Chief Local Aboriginal Land Council, surrounding residents and the local community have been consulted and involved to varying degrees in the design of the proposal, either directly or indirectly.

THE PROPONENT COMPANY

Whitehaven Coal Mining Pty Ltd is a private company which owns and operates the Whitehaven Coal Mine, approximately 27 km north-north-west of the Project Site.

The Company is owned by the Directors and staff of Namoi Mining Pty Ltd, owners of the Gunnedah Colliery, approximately 6 km south of the Project Site, and Namoi Hunter Pty Ltd, part-owner of the Glennies Creek Coal Mine north of Singleton.

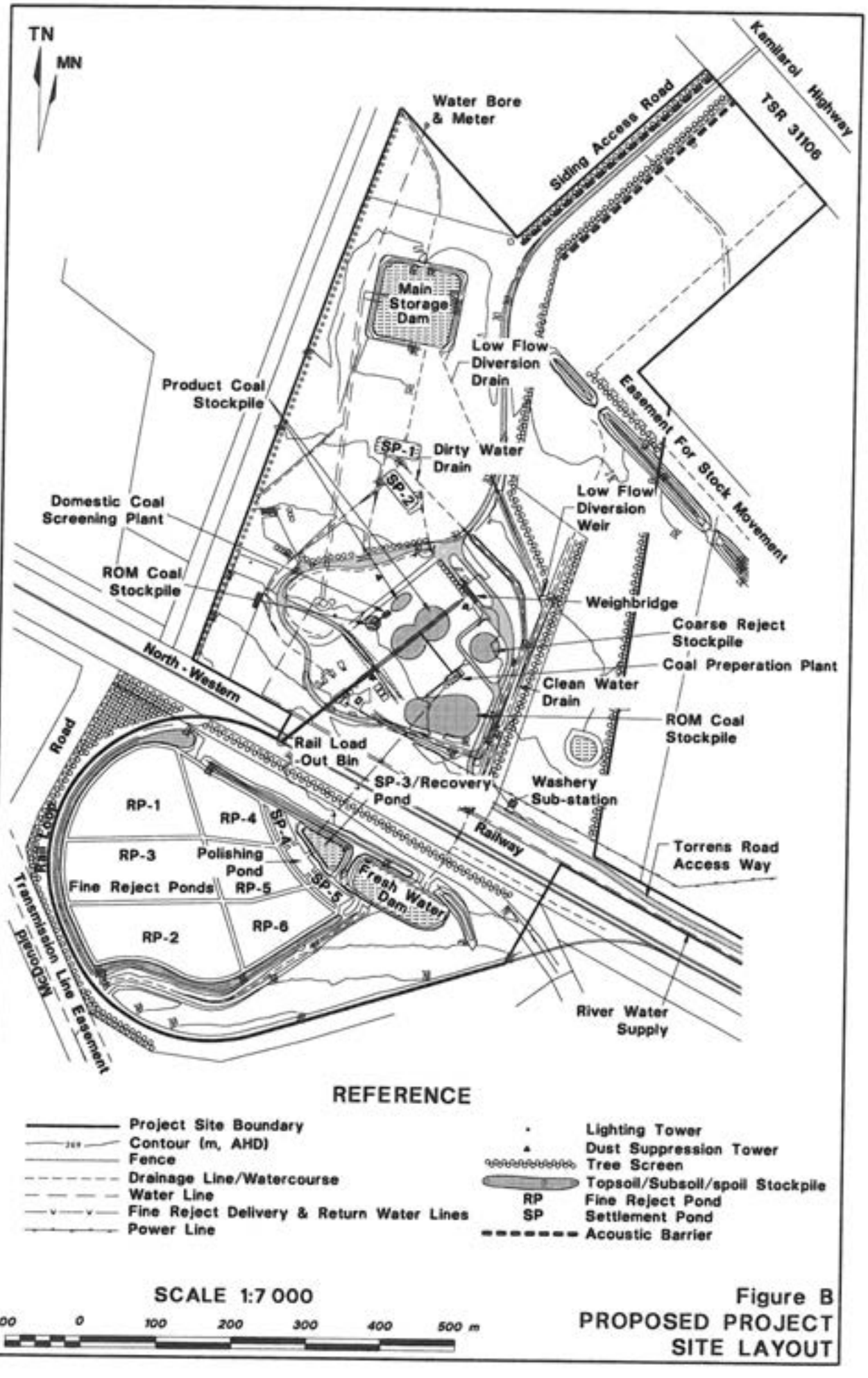


Figure B
PROPOSED PROJECT SITE LAYOUT

THE PROPOSAL

The proposed development would involve the following activities.

i) Construction and operation of a CHPP in lieu of the continued use of the existing 25-year-old plant at the Gunnedah Colliery. Coal preparation would involve limited size reduction of the coal, and screening and separation of product coal from poorer quality (reject) materials. Processing would be at a nominal rate of 400 tph and to a maximum of 2 Mtpa.

ii) Despatch of all export product coal (clean Run-of-Mine [ROM] and washed coal) via the former Vickery train loader in lieu of the continued use of the Gunnedah Colliery train loader.

iii) Screening of domestic coal and its despatch from the Project Site by road.

iv) Transport of coarse reject to the Whitehaven Coal Mine (or other originating mines) for disposal, to the rail loop for fine reject pond construction and/or to the Gunnedah Colliery to assist post-mining landform creation and site rehabilitation.

v) Storage of fine reject in a series of ponds to be constructed within the Gunnedah Colliery rail loop. Construction of the ponds would initially use coarse reject transported from the Gunnedah Colliery via Black Jack and Quia Roads. Subsequent coarse reject requirements for fine reject pond refurbishment would be sourced from the CHPP and transported via the private Torrens Road access way, Torrens and Quia Roads.

vi) The excavation and transport of consolidated fine reject to the Whitehaven Coal Mine or other originating mines for disposal and/or to the Gunnedah Colliery to assist site rehabilitation activities.

vii) Augmentation of existing services and facilities.

viii) Utilization and/or augmentation of existing systems for air quality and surface water management.

ix) Long-term rehabilitation of all areas of disturbance.

Figure B presents the proposed Project Site layout. With the exception of the fine reject ponds within the rail loop, all components of the Project Site represent existing features or are located within areas of prior Vickery-related disturbance.

On-site construction and commissioning of the CHPP and associated facilities would be undertaken over a period of approximately 12 weeks, with the majority of activities undertaken between 7.00 am and 6.00 pm Monday to Saturday. Approval is sought for 24 hour/7 day per week coal preparation plant operation and train loading, albeit that train loading has historically been undertaken mainly during daylight hours. All other CHPP activities would be undertaken during day-time or day-time and evening periods.

For the CHPP development as proposed within this EIS, WCM requires:

- Development Consent from Gunnedah Shire Council (under delegation from the Department of Planning); and

- an amendment (by the Environment Protection Authority – EPA) to the existing Environment Protection Licence which applies to the siding area.

THE EXISTING ENVIRONMENT

The Project Site lies within the Namoi River Basin on shallow north-easterly sloping land which grades to the Namoi River at slopes ranging from 2° to less than 0.5°. Both the topography on the Project Site and the natural drainage patterns have been modified by the construction of the Gunnedah Colliery rail loop, the former Vickery rail siding/train loader, water storages, and a network of drainage channels which divert water around, or direct water to the various storages. Although the 1:100 year flood line encroaches on the Project Site, the majority of the site, including all existing and proposed facilities, are located above this level.

The vegetation of those components of the Project Site to be utilized for the proposed development has been extensively disturbed by prior earthworks/construction activities and spoil/waste/coal disposal or stockpiling, with the remaining vegetation dominated by introduced species (including weeds). One Threatened plant species only was identified on the Project Site. This species, Lobed Bluegrass, was identified within the fenced area incorporating the Torrens Road access way and would not be disturbed by the proposed activities.

A fauna survey undertaken on the Project Site identified 49 vertebrate species comprising one frog, 35 bird and thirteen mammal species of which seven species (two bird and five mammal species) were exotic. Of the native species identified in the survey, two species are listed as Vulnerable in the Threatened Species Conservation Act 1995: Blue-Billed Duck and Yellow-bellied Sheathtail Bat. The Project Site area, though containing Koala feed tree species outside the areas of proposed activity, does not constitute core Koala habitat.

The siding area and Torrens Road access way components of the Project Site are located within an area zoned 1 (a) General Rural within the Gunnedah Shire Local Environmental Plan (LEP) 1998, while the rail loop component of the Project Site is located in an area zoned 4 (b) Offensive Industry within the LEP.

A number of rural residences are located within the vicinity of the Project Site, primarily to the north-west, north-east and east (adjacent to the Kamilaroi Highway) or to the south-east (adjacent to Quia Road). Both the Kamilaroi Highway and Quia Road form part of the existing approved coal haulage route between the Whitehaven Coal Mine and the Gunnedah Colliery coal preparation plant and train loader. The two closest residences to the centre of the siding area ("Cedar Vale" and "Olive View") are located at distances of approximately 950 m and 750 m respectively.

The component areas and existing features of the Project Site are located between the Kamilaroi Highway or Quia Road and the North-Western railway line and are visible to varying degrees from these vantage points and some local residences, with the extent of visibility determined principally by the extent of intervening vegetation. Of the existing features, the existing 28 m high rail load-out bin dominates visually, but is consistent with the industrial nature and existing developments adjacent to Quia Road.

With the exception of the rail loop area, all components of the Project Site to be developed comprise Class M (mining disturbed) land. The rail loop area theoretically comprises Class III land. However, as a consequence of the construction of the rail loop and the use of this area for disposal of waste rock and earth spoil materials, the area has not been used or suitable for any agriculture-related purpose since c.1988.

The noise climate in the vicinity of the Project Site is generally controlled by traffic on the Kamilaroi Highway and, to a lesser extent, Quia Road, with insect noise also a controlling influence in the warmer months. Ambient noise ($L_{Aeq\ (period)}$) levels at residences in the vicinity of the Project Site approximate 51 dB(A) to 56 dB(A) during day-time and evening periods, and between 49 dB(A) and 53 dB(A) at night-time.

Following data processing in accordance with the EPA's Industrial Noise Policy in order to establish a basis for subsequent impact assessment, background noise levels were determined to range between 31 dB(A) and 35 dB(A) during day-time, between 32 dB(A) and 37 dB(A) during the evening and between 33 dB(A) and 41 dB(A) during night-time periods.

The local air quality in the vicinity of the Project Site is influenced or potentially influenced by a number of agricultural, domestic, industrial and transport-related sources with background deposited dust, total suspended particulate and PM_{10} levels determined to be 2 g/m^2/month, 20 $\mu g/m^3$ and 10 $\mu g/m^3$ respectively.

An archaeological/cultural assessment identified no evidence of Aboriginal occupation or utilization within any component area of the Project Site, thus confirming the results of a prior survey undertaken during the preparation of the Vickery EIS. Remnants of a former rabbit abattoir are located external to the rail loop component of the Project Site but would be unaffected by the proposed activities.

SAFEGUARDS AND IMPACTS

WCM's proposal to construct and operate a CHPP on the Project Site has been planned with a range of design and operational safeguards to ensure the environment

in the vicinity of the Project Site is not adversely affected and the level of impact meets specified criteria, statutory guidelines or reasonable community expectations, that is, given the nature of the surrounding environment.

The principal safeguards that have been incorporated into the design of the CHPP proposal, and the main impacts, are as follows.

i) The proposal would result in minor extensions of what already represent substantial modifications of the natural landform in the local area, these modifications having occurred as a consequence of the development of the siding component of the Project Site to service the Vickery Coal Mine, the construction of the North-Western railway line and Gunnedah Colliery rail loop, and the use of the area within the rail loop for the disposal of spoil.

   The principal additional long-term modification to the landscape would be the development of a low knoll within the rail loop (in the area of the fine reject ponds) and the enlargement and extension of the existing rail loop pond system. The peripheral slopes of the knoll would be no steeper than 1:4 (V:H) or 14°, with the upper surface exhibiting gradients ranging from 1:10 (V:H) or 6° to 1:70 (V:H) or less than 1°.

ii) A range of additional soil erosion and sediment control and water management structures or measures would be installed within the rail loop component of the Project Site to ensure that the proposed fine reject storage and management activities do not adversely impact upon the physical or chemical water quality in the Namoi River or on the local groundwater resource. Sufficient capacity would be available within the various dirty water storages with the rail loop to contain greater than a

1:100 year rainfall event while management procedures would ensure that the siding area water storages would at all times contain the run-off from a 1:20 year rainfall event.

More than adequate CHPP process make-up water would be available under WCM's existing Namoi River and groundwater allocations.

iii) The proposal would necessitate the progressive removal of 7.5 ha of vegetation within the rail loop. However, the community to be affected is dominated by weed species and is of low conservation significance. The restriction of fine reject pond development to such an area, together with cyclic pond cleanout and refurbishment would, however, preclude extensive pond development elsewhere on or in areas removed from the Project Site.

The long-term rehabilitation of the former reject pond area, the extension of the water storages, the provision of fauna refuges and the development of wetland vegetation surrounding the ponds would also have a positive impact on local fauna.

iv) A range of air quality controls would be implemented to minimize the generation and dispersal of atmospheric pollutants including water application, minimizing areas of potential dust generation, progressive rehabilitation of areas of disturbance, tree plantings, load coverage, vehicle speed restrictions, minimizing mobile equipment useage (consistent with operational requirements) and equipment maintenance. The level of deposited dust at the nearest residences may increase marginally but would readily comply with the EPA guidelines

and not adversely affect residential amenity. The predicted levels of total suspended particulates and PM_{10} at the nearest residences would similarly satisfy EPA Guidelines with a substantial margin of safety.

The proposed CHPP development would also have indirect positive impacts on local air quality through a reduction in truck exhaust emissions. The reduction in the distance travelled by heavy vehicles between the Whitehaven Coal Mine (and other future mine developments) and the CHPP and train loader of up to 1 million ilometres annually would result in a reduction of approximately 550 kL annual diesel fuel useage and an annual reduction in CO_2, NO_X, SO_X and VOC emissions of approximately 2.3 t, 11.9 t, 0.4 t and 1.5 t respectively

v) A range of noise mitigation measures including enclosure of the coal preparation plant, utilization of low-noise CHPP componentry, installation of acoustic barriers, acoustic treatment to the 992 front-end loader, coal stockpile positioning and management to maximize acoustic shielding, and restriction of hours of operation for specific activities would be implemented throughout the life of the CHPP.

WCM would also regularly consult with the local residents to seek feedback on performance and areas of concern.

Noise from the CHPP construction activities, though audible at some residences under some conditions, would satisfy the noise assessment criteria at all residences. Noise emissions from the operating CHPP under calm and/or adverse conditions would satisfy the relevant intrusiveness criteria at "Longlands", "Marantha", "Dunromin",

"Wirringulla" (**Figure A**) and more distant residences during day-time, evening and night-time periods but exceed the relevant criteria at "Cedar Vale", "Olive View", "Carousel" and Residence K (**Figure A**) during day-time and evening periods by between 1 dB(A) and 5 dB(A). During night-time operations, the relevant night-time criteria at "Cedar Vale" and "Olive View" would be exceeded by up to 8 dB(A) during periods of adverse meteorological (inversion) conditions, but satisfy the criteria under calm conditions.

The predicted noise levels would, however, be similar to or less than those currently experienced at all local residences.

vi) The proposed development would not increase traffic noise levels on the State or local road network. Rather, with the reduction in heavy vehicle movements on the Kamilaroi Highway east of the siding access road, and on Quia, Torrens and Black Jack Roads, traffic noise levels at the adjacent residences would decrease.

vii) No Threatened plant species, Endangered Ecological Communities or plant populations would be affected by the proposed development. Rather, WCM's proposal to undertake extensive native enrichment/screen plantings on the Project Site using native species, to limit its activities to areas of existing disturbance in lieu of developing a similar facility on a "greenfields" site, and for weed management would potentially represent a positive impact.

viii) A range of safeguards and controls would be implemented in order to minimize any potential impacts on native fauna including:

- minimizing the extent of vegetation removal;
- seasonal restrictions on vegetation maintenance;
- weed and feral animal control programmes;
- fauna habitat establishment around water storages and the construction of fauna refuges within the rail loop final landform; and
- implementation of erosion, sediment and water management controls to avoid downstream sedimentation/pollution.

Although the Vulnerable Blue-Billed Duck and Yellow-Bellied Sheathtail Bat were identified as occurring on or in the vicinity of the Project Site, it has been assessed that it is unlikely that the proposed activities would have any significant effect on those species or their habitats. The proposed activities would not affect any wildlife corridor nor any potential or core Koala habitat.

ix) The 15 m high CHPP structure and associated coal stockpiles would be visible to varying degrees from a number of residences, primarily to the north-west, north-east and east of the Project Site, with the extent of visibility dependant on the occurrence of intervening natural vegetation, growth of existing tree screens, the landscape and its coloration, the nature and form of the background and the angle of view. The proposed extension of screen plantings along the eastern and western margins of the Project Site would, over time, obscure or obstruct views of the majority of coal stockpiles and the CHPP structure from these residences.

Views of the fine reject ponds would be possible from McDonald Road and the eastern extent of Emerald Hill Road but, from McDonald Road would be ameliorated by the development of screen plantings.

x) The proposed activities would not impact upon any known Indigenous or non-Indigenous site.

xi) Other than during concrete pours, the proposed development would result in an imperceptible increase in heavy vehicle movements on the Kamilaroi Highway during the coal preparation plant construction phase. During concrete pours, peak hourly heavy vehicle movements on the Kamilaroi Highway east of the Project Site may increase by up to 20 per cent. However, such increases would be expected to occur on a maximum of three occasions. The number of heavy vehicle movements daily along Black Jack Road and Quia Road during the eight-week fine reject pond construction phase would be similar or less than the level currently experienced with WCM's coal transportation activities.

For a period of approximately six weeks during the CHPP construction phase, concurrent coal and reject haulage activities would be undertaken along Black Jack and Quia Roads. Although representing a short duration increase in traffic levels over that currently experienced, the number of truck movements would be similar to that experienced previously when the Gunnedah Colliery was operating at its peak.

During CHPP operations, project-related heavy vehicle movements along Torrens, Quia and Black Jack Roads would be reduced substantially, with periods of activity primarily associated with fine reject pond clean-out

and refurbishment activities and infrequent coarse reject deliveries to the Gunnedah Colliery.

As is currently the case, no project-related heavy vehicle movements would occur along Torrens, Quia and Black Jack Roads during periods when school buses are operating on these roads.

SOCIO-ECONOMIC ASSESSMENT

The proposed development of the CHPP would enable WCM to process up to 2 Mtpa coal for the domestic and export markets in a more efficient manner than can currently be achieved through the 25-year-old Gunnedah Colliery coal preparation plant, with a range of positive socio-economic benefits to WCM, its employees and contractors, local and regional communities, New South Wales and the Commonwealth.

- WCM would benefit directly through more efficient and cost-effective transportation and processing of the coal, thereby enabling it to maintain or increase its competitiveness in the domestic and export coal markets. Any such increase in competitiveness would improve the overall viability of the Whitehaven Coal Mine and other potential mine developments, increase the amount of coal which can be economically extracted at those mines, ie resource utilization, and hence the life of the mines and the duration of worker and contractor employment.

- The local and regional communities would benefit through the short-term employment for up to 15 construction personnel at any one time and long-term employment for up to 10 CHPP operational and supervisory personnel. Improved efficiencies as identified above would also potentially extend the

economic life of the Whitehaven Coal Mine and improve the viability of other potential future mine developments, with attendant increases in employment duration and opportunities. Wages alone at the CHPP would approximate up to $(2002) 500 000 pa while at the mine sites supplying coal to the plant, wages would average about $(2002) 50 000 pa per employee, a substantial component of which would be spent within Gunnedah and surrounding Shires on housing, food, clothing, entertainment and services. Much of the money outlayed on consumables at the CHPP and source mines would also be spent locally.

The reduction in the distance travelled by coal trucks on the public road network would result in a corresponding reduction in the potential for conflict with other road users and a proportional reduction in road wear and tear, and hence the frequency and cost of road maintenance activities. Use of the modified coal haulage route would also substantially reduce the number of heavy vehicles passing residences on the Kamilaroi Highway, Quia, Torrens and Black Jack Roads.

- The State would benefit directly from the construction and operational employment provided at the CHPP and the source mines, associated payroll tax and other charges and flow-ons as well as from royalties for the coal produced from the mines supplying the plant. Indirect benefits would accrue to other regions or businesses in New South Wales as a consequence of CHPP equipment purchases and service use.

- The Commonwealth would benefit in the form of PAYE and other Federal taxes and duties, together with the export earnings which would be maintained or enhanced through the operation of a more efficient CHPP and development of new mines.

CONCLUSION

The proposed Whitehaven siding CHPP as identified in this EIS has been designed to:

- utilize areas which have been subject to extensive disturbance in the past and facilities remaining from a mining-related activity on a site which is ideally located with respect to the regional road and rail networks and existing and potential future mine developments;

- enable resource recovery maximization at the source mines as a consequence of reduced coal preparation and transportation costs; and

- ensure that the surrounding physical, biological and social environments are not significantly affected in an adverse manner by the proposal.

Although some adverse impacts would occur, it is assessed that the level of impact would meet specified criteria or reasonable community expectations and be outweighed by the benefits of the proposal to the local community, region, State and Nation.

Section 1

INTRODUCTION

PREAMBLE

This section introduces the proposal to construct and operate a coal handling and preparation plant (CHPP) on and adjacent to the former Namoi Valley (Vickery) rail siding/train loader near Gunnedah, and identifies the:

- format of the document;
- Project Site;
- proponent;
- background to the proposal;
- details of existing approvals and operations at the CHPP site; and
- consultation undertaken under relevant Government Authorities and the local community.

The personnel involved in the design of the proposal and the preparation of this and supporting documentation are also identified.

1.1 SCOPE

This Environmental Impact Statement has been prepared to accompany a Development Application by Whitehaven Coal Mining Pty Ltd (WCM) to Gunnedah Shire Council. The Development Application seeks approval for the installation and operation of a coal handling and preparation plant and associated facilities on and adjacent to the former Namoi Valley (Vickery) rail siding/train loader, approximately 6 km west of Gunnedah.

For the purposes of this document, the land incorporating the proposed plant and associated facilities is referred to as the Project Site and is shown in its regional context on **Figures 1.1** and **1.2. Figure 1.3** places the Project Site in its local setting.

In the short-term, the CHPP would be used for the preparation of coal from WCM's Whitehaven Coal Mine (**Figure 1.2**). However, in the medium- to longer-term, it is planned that the facility would be used to prepare coal produced from other future coal mine developments within the Gunnedah/Boggabri area. Accordingly, Development Approval is sought for a minimum period of 20 years. The plant would have a nominal capacity of 400 tph.

The Vickery rail siding/train loader was used for the storage and despatch of coal produced at the former Vickery Coal Mine (**Figure 1.2**) and was maintained under care and maintenance from December 1998, ie following the closure of the Vickery Coal Mine, until late January 2002. The siding is now owned by WCM and is referred to on **Figure 1.2** and hereafter as the "Whitehaven siding".

Lodgement of the Development Application is consistent with Condition 2.2 of the Whitehaven Coal Mine Development Consent (72-03-2000) which states that WCM is "..... to submit an application in accordance with the requirements of the Environmental Planning and Assessment Act, 1979 for the approval of a coal

preparation plant once the quantity of coal from the mine to be washed reaches a threshold of 200 000 tpa". **Table 1.1** presents a number of abbreviations and symbols which have been used throughout this document. A more extensive glossary of terms and symbols is presented following Section 5.

Table 1.1
Frequently Used Abbreviations and Symbols

Terms		Symbols	
CHPP	Coal Handling and Preparation Plant	ha	Hectare
Council	Gunnedah Shire Council	km	Kilometre
DLWC	Department of Land and Water Conservation	kV	Kilovolt
EIS	Environmental Impact Statement	L	Litre
EP&A Act 1979	Environmental Planning and Assessment Act 1979	ML	Megalitre
EPA	Environment Protection Authority	M	Million
EP&A Regulation 2000	Environmental Planning and Assessment Regulation 2000	Mtpa	Million tonnes per annum
NPWS	National Parks and Wildlife Service		
ROM	Run-of-Mine	tpa	Tonnes per annum
the Department	The Department of Planning		
the Minister	The Minister for Planning	t	Tonnes
Vickery	Namoi Valley (Vickery) Coal Project		
WCM	Whitehaven Coal Mining Pty Ltd		

If approved, the proposal would enable the following activities to be undertaken for the duration of the consent.

i) Road delivery and stockpiling of raw coal from the Whitehaven Coal Mine or other coal mine developments within the Gunnedah/Boggabri area.

ii) Preparation (sizing, washing, blending) of the coal to satisfy customer specifications.

iii) Stockpiling of product coal.

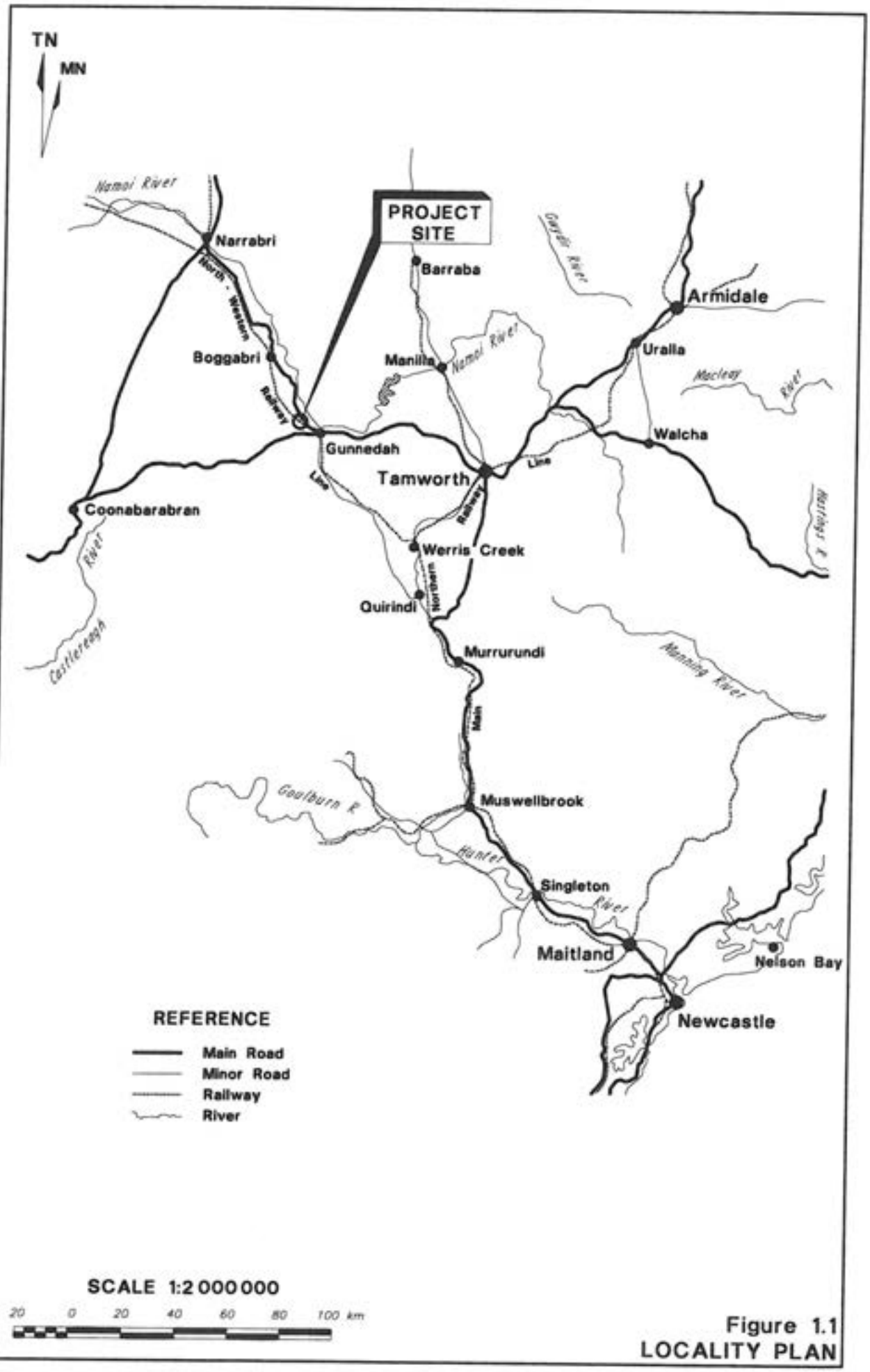
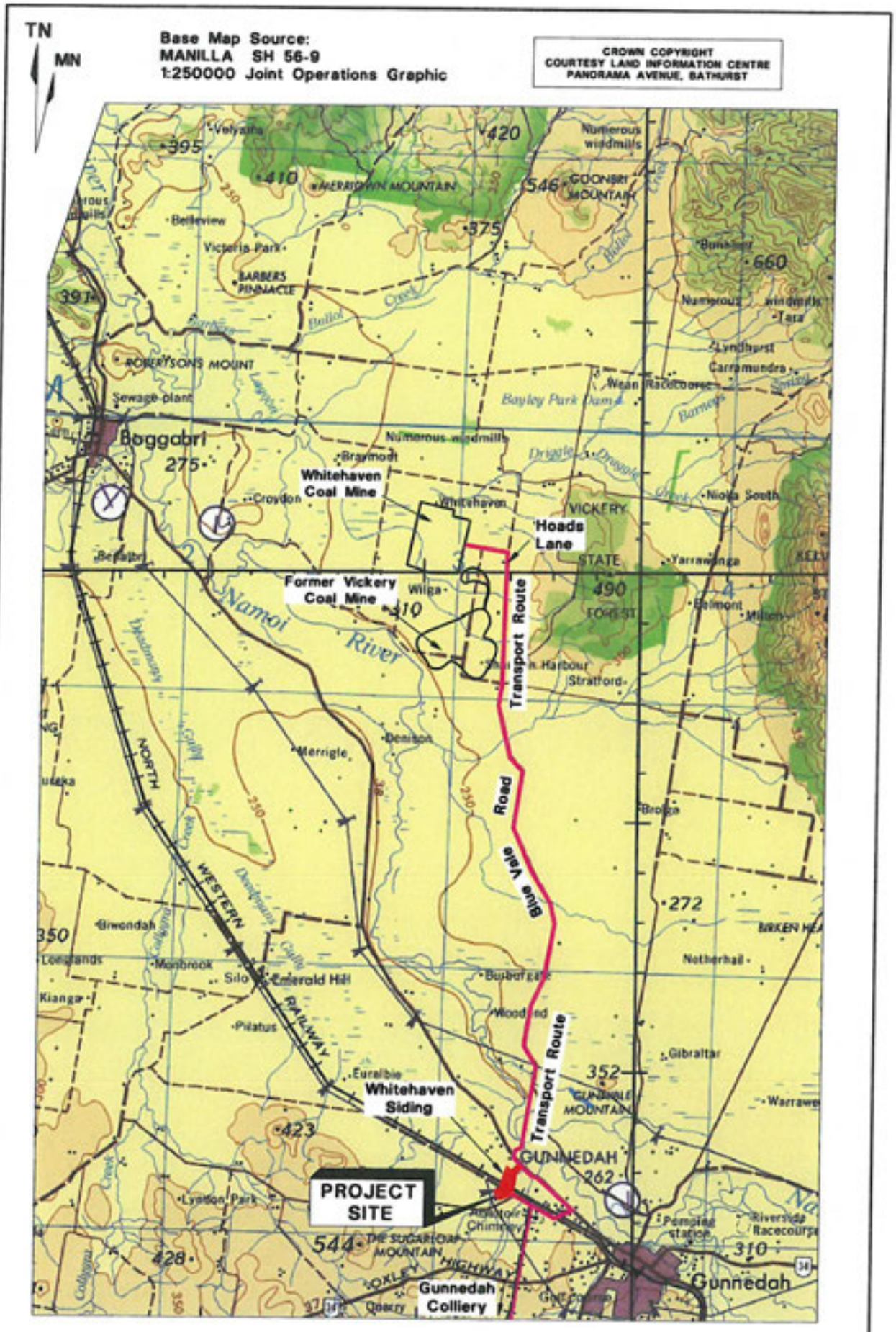
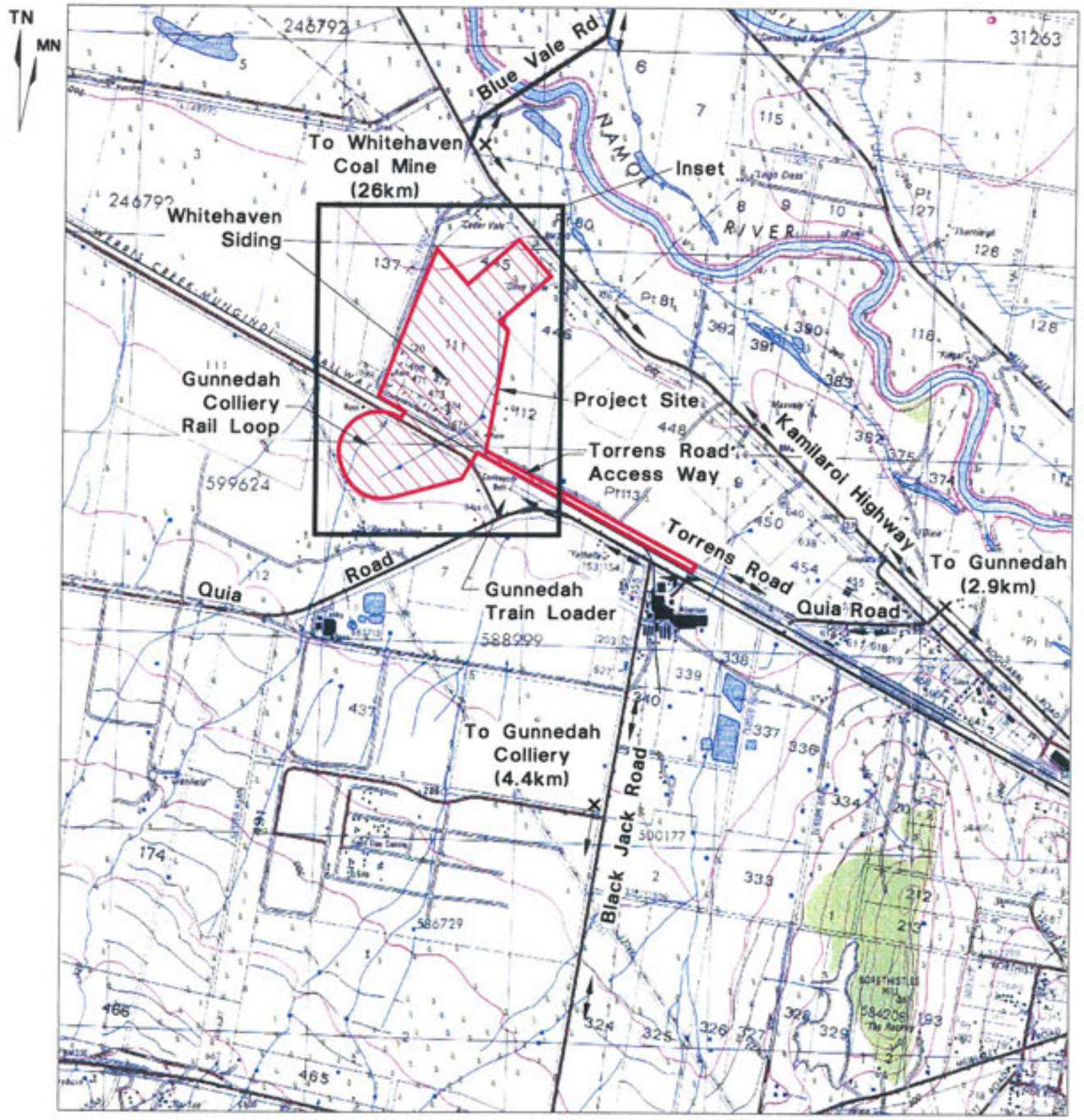


Figure 1.1
LOCALITY PLAN



dcad graphics (0414 637 559)

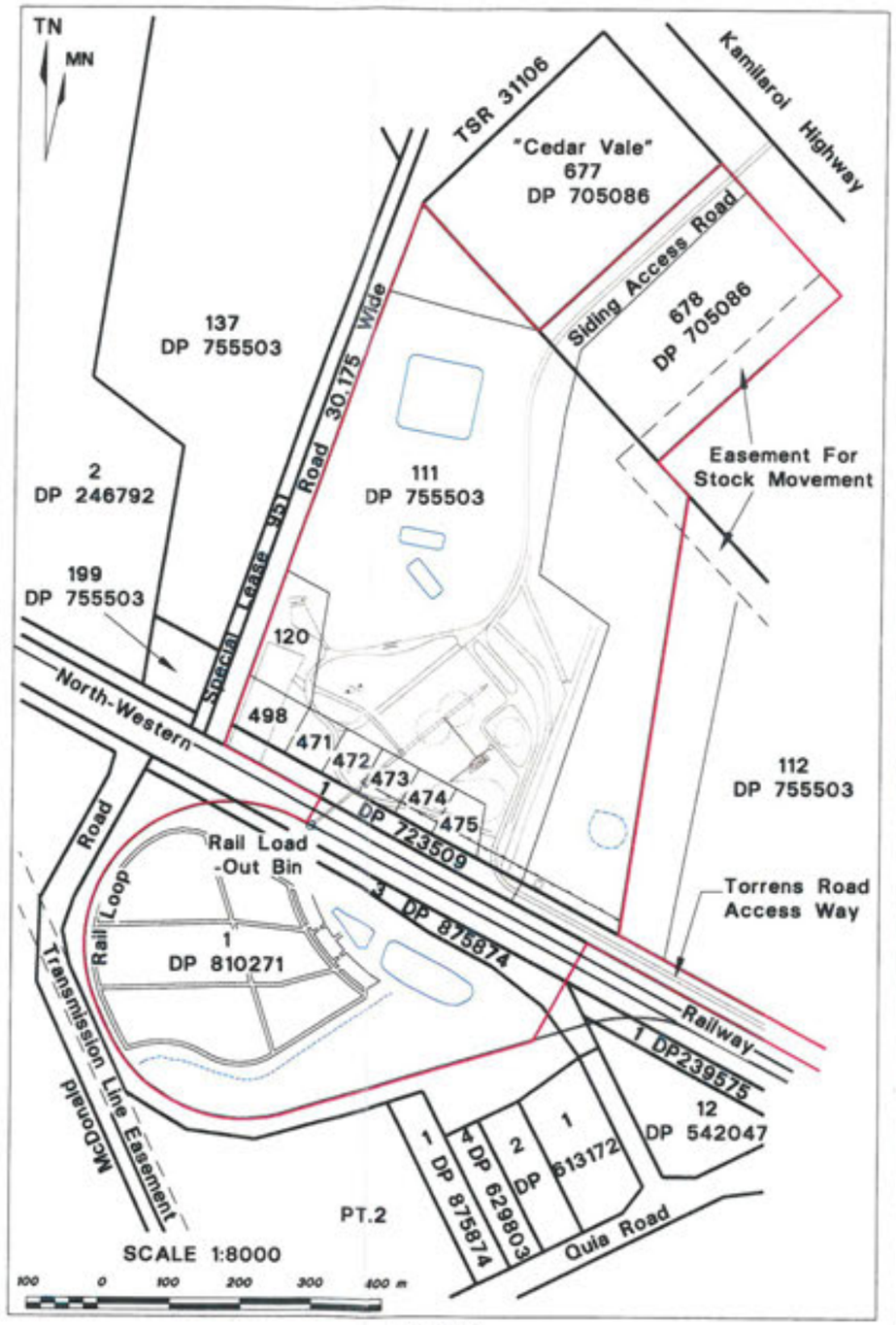
Figure 1.2
REGIONAL SETTING



Base Map Source:
EMERALD HILL 8936-III-S 1:25 000
Central Mapping Authority

SCALE 1:25 000

250 0 250 500 750 1000 1250 m



INSET

REFERENCE

- Project Site Boundary
- Watercourse / Water Storage
- CHPP Facilities

Figure 1.3
LOCAL SETTING

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iv) Rail despatch of export coal via the existing train loader and of limited domestic coal by road.

v) Temporary stockpiling and subsequent despatch of coarse washery rejects to the originating mine for disposal or to the Gunnedah Colliery to assist final landform creation and colliery rehabilitation activities.

vi) A combination of permanent and temporary on-site storages for fine washery rejects, and the despatch of temporarily-stored fine reject to the originating mine or the Gunnedah Colliery for disposal.

It should be noted, however, that a number of activities identified above are already approved by virtue of the Whitehaven and/or Vickery Development Consents, albeit for a duration less than the 20 years sought in this Development Application. A summary of these activities is presented in **Table 1.2**.

Table 1.2
Existing Approved Activities

Activity No.	Detail	Applicable Development Consent	Expiry of Existing Approval
(i)	The approved road transport route for Whitehaven coal passes the entrance to the Project Site on the Kamilaroi Highway.	Whitehaven	7 September 2015
(ii)	Transport of coal from the Kamilaroi Highway and within the former siding component of the Project Site.	Vickery	18 October 2007
(iii)	Stockpiling of coal within the siding component of the Project Site.	Vickery	18 October 2007
(iv)	Despatch of export coal by train.	Vickery	18 October 2007

In light of the existing approvals, WCM commenced delivery and stockpiling of limited ROM coal at the Whitehaven siding in February 2002.

The preparation of an EIS is required under the provisions of the EP&A Act 1979, as the construction and operation of a facility which stores and handles the volume of coal proposed, is considered a "Designated Development" within the provisions of the EP&A Regulation 2000.

The Development Application is to be assessed as "Integrated Development" under Section 91 of the EP&A Act 1979. Integrated Development requires Development Consent and one or more approvals from other Government Authorities (see Section 2.1.4).

Apart from presenting WCM's proposal, this EIS also provides relevant background information and provides a description of the existing environment within and surrounding the Project Site. The environmental safeguards and procedures that would be adopted to minimise or ameliorate the impacts associated with all proposed activities are outlined, together with the predicted impacts once those safeguards are adopted.

The information presented in this EIS covers all aspects of the planning, development, operation, environmental monitoring and rehabilitation at a level of detail consistent with industry standards, the scale of the proposed operation and the potential for environmental impact. These aspects are presented in a manner that addresses the specific requirements of the Department, Council and other Government Authorities, together with those issues raised during the community consultation process.

1.2 FORMAT OF THE STATEMENT

This EIS comprises two volumes and has been prepared with due regard for the "EIS Guideline for Coal Mines and Associated Infrastructure" issued by the Department of Planning (April 2000), and the matters identified in Schedule 2 of the EP&A Regulation 2000. Volume 1, the Main Text, has been written in five sections and also includes a glossary of technical terms and symbols and relevant references. Volume 2 comprises a set of Appendices to the Main Text. The format of Volume 1 is as follows:

Section 1

Introduces the proposal and the proponent company and outlines the background to the proposal. Information is provided on the existing approved facilities, activities and operations on the Project Site together with an outline of the consultation undertaken with Government Authorities and the local community.

Section 2

Describes WCM's objectives and proposed activities, the coal preparation plant infrastructure and coal preparation process, transportation, waste management and rehabilitation. The feasible alternatives to the proposed activities which were considered during the planning phase are also outlined.

Section 3

Describes the components of the existing environment on and around the Project Site that has been reviewed during the planning stages of the proposal. The results of the studies and the potential constraints taken into consideration when planning the proposal are identified.

Section 4

Presents the design and operational safeguards and, where appropriate, the management procedures that have been incorporated into the proposal to protect

the local environment. This section also analyses the potential impact the proposal would have on the environment on and around the Project Site once the safeguards and procedures are adopted, the effectiveness of the measures to protect the environment, and identifies ongoing monitoring programmes.

Section 5

Justifies the proposal in terms of biophysical, economic and social considerations, evaluates the proposal in terms of the goals and guidelines of Ecologically Sustainable Development and examines the consequences of not proceeding with the development.

References

List the various source documents for information and data used during the preparation of this EIS.

Glossary of Technical Terms, Symbols and Abbreviations

Explains the technical terms, symbols and units used throughout this EIS.

Volume 2 presents:

- a copy of the Development Application - **Appendix 1**;
- correspondence from the Department and the Approval Bodies and a summary table identifying where each of the requirements of Clause 72 of the EP&A Regulation 2000 and the Director-General's and individual Approval Body's requirements is addressed in the EIS - **Appendix 2**;
- a table identifying the specific requirements of the other Authorities consulted and the relevant section(s) in the EIS where each of those requirements is addressed - **Appendix 3**;

A complete copy of correspondence received from the various Local and State Government Authorities is held by the Department, Council and WCM and is available or review on request during normal business hours throughout the period of exhibition;

- an Energy Statement - **Appendix 4**;
- a Traffic Impact Statement - **Appendix 5**;
- a Noise Assessment - **Appendix 6**;
- an Air Quality Assessment - **Appendix 7**;
- a Flora Assessment - **Appendix 8**;
- a Fauna Assessment -**Appendix 9**; and
- an Archaeological Assessment - **Appendix 10**.

The content of Appendices 6 to 10 have been summarised in the Main Text.

1.3 PROJECT SITE

The Project Site covers an area of approximately 68 ha and incorporates the following parcels of land as shown on **Figure 1.3**.

- Lot 678, DP 705086.
- Lot 1, DP 723509.
- Lots 111,120, 472, 473, 474, 475 and 498, DP 755503.
- Lot 1, DP 810271.
- Lot 3, DP 875874, and
- that component of the North-Western railway line corridor adjacent to Lot 3, DP 875874 incorporating the Whitehaven siding rail load-out bin,

all within the Parish of Gunnedah, County of Pottinger and Shire of Gunnedah. Details of land ownership are presented in Section 3.8.2.

For descriptive purposes, the Project Site has been sub-divided into three component areas, namely the siding, the rail loop and Torrens Road access way (**Figure 1.3**).

1.4 THE PROPONENT

The proponent, Whitehaven Coal Mining Pty Ltd (WCM), is a private company which owns and operates the Whitehaven Coal Mine approximately 30 km north-north-west of Gunnedah (**Figure 1.2**). WCM is owned by the Directors and staff of Namoi Mining Pty Ltd, owners of the Gunnedah Colliery which is located approximately 7 km south-west of Gunnedah (see **Figure 1.2**), and Namoi Hunter Pty Ltd, part-owner of the Glennies Creek Coal Mine north of Singleton in the Hunter Valley.

In addition to the Whitehaven Mining Leases, WCM and/or Namoi Mining Pty Ltd holds a number of tenements within the Gunnedah/Boggabri area which are subject to varying forms of assessment activity, and are actively pursuing other tenements in order to maintain a long-term coal mining presence in the Gunnedah Basin. WCM and Namoi Mining Pty Ltd are the only companies currently engaged in coal mining/processing activities in the Gunnedah Basin.

1.5 BACKGROUND TO THE PROPOSAL

Coal mining in the Gunnedah Basin commenced in the late 1890's with the opening of the Gunnedah and Centennial (later known as Preston) Collieries. The mines continued throughout most of the 20th century producing high quality thermal and some soft coking coal for the domestic and export markets and, in the early 1990's employed approximately 500 persons and contributed significantly to the local economies.

As a consequence of increasing mining costs and exhaustion of economic reserves, the Preston Colliery closed in 1998. In mid-2000, mining also ceased at the Gunnedah Colliery for the same reasons.

The Vickery Coal Mine, located adjacent to the Whitehaven Coal Mine (**Figure 1.2**), was developed in the early 1990's but ceased operations in May 1998.

WCM's Whitehaven Coal Mine was developed in two stages commencing in January 2000. The first stage, a trial mine, was developed to supplement and maintain continuity of supply to the Gunnedah Colliery's domestic customers and enable domestic and export coal quality evaluation and an assessment of market acceptability. Based on the success of the trial mine, a Development Application for the Stage 2 (750 000 tpa) mine (and an accompanying EIS) were lodged with the then Department of Urban Affairs and Planning in March 2000. The Application was approved in August 2000 subject to a number of general, operational and statutory conditions. Stage 2 mining commenced in September 2000.

The EIS and/or Development Consent for the Stage 2 Whitehaven Coal Mine incorporated a number of aspects/conditions which are of relevance to this current Development Application including:

- the nomination of the former Vickery rail siding/train loader site as the preferred location for the despatch of export Whitehaven coal not requiring washing. Transportation of coal to that site was recognised as having a number of socio-economic and environmental advantages over the route ultimately adopted (Kamilaroi Highway, Quia Road and Torrens Road to the Gunnedah Colliery train loader – see **Figures 1.2** and **1.3**) including:

i) a reduction in the truck haulage distance to the rail despatch point of approximately 9 km per round trip, and a reduction in public road usage of approximately 11 km per round trip;

ii) a substantial reduction in coal truck movements on Quia and Torrens Roads,and in particular, past the 10 residences located at distances between 8 m and 60 m from the pavement edge. Under the preferred option, Whitehaven coal truck movements along Quia and Torrens Roads (and Black Jack Road) would have been generally limited to those hauling coal to the Gunnedah Colliery coal preparation plant for washing.

iii) the existence of all necessary infrastructure and services at the former Vickery site to enable the receipt and despatch of clean coal; and

iv) a faster train loading capacity than the Gunnedah Colliery train loader, thereby reducing the duration and cost of train loading activities.

Despite extensive negotiations, WCM was unable to negotiate a satisfactory purchase or lease arrangement with Namoi Valley Coal Pty Ltd (Namoi Valley), the then owners of the site, thereby forcing WCM to adopt the less desirable current route;

- condition 7.1(c) of the Whitehaven Development Consent required WCM to continue to pursue other coal haulage options in order to minimise the movement of heavy vehicles on Quia and Black Jack Roads; and

- a limitation on the volume of Whitehaven coal transported to the Gunnedah Colliery for washing, and a requirement to lodge a Development Application

for a new coal preparation plant once the volume of coal requiring washing reached a threshold of 200 000 tpa. The Whitehaven EIS identified the potential construction of the new CHPP at the Whitehaven Coal Mine or at some alternative site.

Given the requirements of Consent Condition 7.1(c); the advantages of the former Vickery rail siding/train loader area identified above; the greater than expected demand for Whitehaven coal (production in the initial year of Stage 2 operations approximated 680 000 t); the achievement of the washery threshold identified in Condition 2.2; the suitability of the Whitehaven siding for an integrated coal handling and preparation facility suitable for Whitehaven and other future coal mine developments, and the disadvantages of alternative sites for a CHPP (see Section 2.13.2), WCM continued to negotiate with Namoi Valley over access to the siding/train loader area. Negotiations culminated in the formulation of a purchase agreement in late 2001, with settlement ultimately occurring in February 2002.

1.6 CONSULTATION

1.6.1 Government Consultation

The following Authorities and organizations were consulted by WCM and/or its specialist consultants during the preparation of this EIS.

- Department of Planning (Sydney)
- Gunnedah Shire Council (Gunnedah)
- Department of Mineral Resources (Sydney and Singleton)
- Department of Land and Water Conservation (Gunnedah and Tamworth)
- Environment Protection Authority (Armidale)
- Roads and Traffic Authority (Grafton)
- NSW National Parks and Wildlife Service (Dubbo)
- Red Chief Local Aboriginal Land Council (Gunnedah)

- Rail Access Corporation (Newcastle)
- FreightCorp (Sydney).

Correspondence from the Department of Planning and the Approval Bodies, ie Gunnedah Shire Council and the EPA, is included as **Appendix 2**, together with a summary table identifying where each specific issue is addressed in the EIS. A summary of issues raised by the other Authorities consulted is presented in **Appendix 3**.

A full copy of the correspondence received from the Authorities is held by the Department of Planning, Gunnedah Shire Council and WCM.

1.6.2 Community Consultation

During the preparation of this EIS, representatives of WCM consulted on a one-to-one basis with the following landowners/residents in the immediate vicinity of the Project Site. During this process, the nature of the proposal was explained and issues of concern were ascertained and discussed.

- RJ & C Southorn ("Wirringulla")
- RW Tibbs ("Longlands")
- J & N Sword ("Cedar Vale")
- RJ & HM Cruickshank ("Olive View")
- JC & JE Wilkinson ("Marantha")
- MS & S Chatfield ("Dunromin")
- PA & DL Rankin ("Portland")
- Mr T Ross
- JL Torrens ("Roslyn")
- JC Kent & TL Denham
- B Finlay
- WP Small

Land ownership and residential details in the vicinity of the Project Site are discussed further in Section 3.8.

The issues/concerns raised during the one-to-one community consultation process were primarily related to:

- hours of operations, in particular, the delivery of coal to the Project Site;
- dust;
- noise;
- visibility, in particular, the restriction of night lighting to periods when activities are being undertaken on-site;
- drainage and site water management and the potential for project-induced flooding on adjacent properties. During the period to 1998, uncontrolled releases of water from the main storage dam had reportedly caused localised flooding of adjacent land; and
- the future of the Gunnedah Colliery train loader.

Each of these aspects has been addressed in the relevant section(s) of this document.

All residents consulted on a one-to-one basis were, however, supportive of the re-commissioning of the siding site, the installation of a CHPP and a reduction in coal transportation on the local road network and were bewildered that the former Vickery rail siding/train loader had remained idle for such an extensive period.

In addition to the one-to-one consultation, articles advising of WCM's acquisition of the siding area and the proposed development of the CHPP on the Project Site were published in the local newspaper and feedback, ie comments, questions and

issues of concern, sought from residents and local community groups. No matters, other than expressions of interest for employment, were received.

1.7 ONGOING DOCUMENTATION AND MANAGEMENT

1.7.1 Ongoing Documentation

WCM is committed to undertaking all component activities in a responsible and pro-active manner which enables the co-existence of the various land uses in the area, is environmentally and socially responsible, and minimises any real or perceived impacts on other members of the community. Central to this approach would be regular contact with neighbours, an open door policy, and a willingness to openly discuss actual or perceived problems and implement appropriate changes to operational procedures if required.

Successful environmental management invariably involves regular, organised documentation to ensure that, irrespective of personnel changes, all aspects of planning, environmental control, monitoring and responses to problems are properly recorded. An Environmental Management System (EMS) would be developed for the Project Site to:

- provide an overall framework for the management of environmental impacts;
- ensure that all impact mitigation measures and monitoring are effectively and systematically implemented; and
- document procedures for activities. The documentation would provide sufficient information to enable the relevant personnel to understand and act to meet their individual environmental responsibilities, manage environmental issues and identify and manage environmental risks. The various procedures would be regularly reviewed (and amended if necessary) to maintain relevance as legislation and practices change.

Preparation of the EMS would commence within six months of the commissioning of the CHPP.

1.7.2 Environmental Management

Ongoing environmental management at the CHPP, including the performance with respect to this EIS, any licence or Development Consent conditions and the EMS would be the ultimate responsibility of WCM's Managing Director. WCM's Area Manager and Washery Manager would be responsible for day-to-day on-site supervision including the integrated implementation of all environmental safeguards and procedures identified in this EIS and the EMS. Assistance and regular reviews would be undertaken by Whitehaven's Environmental Officer.

1.8 MANAGEMENT OF INVESTIGATIONS

The investigations and report writing for this Statement have been coordinated by Mr Bob Corbett, B.Sc.(For), Manager – Environmental Services with AMCI Australia Pty Ltd. Assistance with the preparation of this document has also been provided by:

- Mr Keith Ross (B.E. (Mining)): Managing Director, Whitehaven Coal Mining Pty Ltd.;
- Mr Chris Burgess : Area Manager, Whitehaven Coal Mining Pty Ltd;
- Mr Eddie Heap : Washery Manager, Whitehaven Coal Mining Pty Ltd; and
- the staff of Australian Coal Technology Pty Ltd (ACT), CHPP design and construction specialists.

A number of components of the proposal including the description of the existing environment, development of safeguards and management procedures, and the assessment of impacts, have been the subject of specific studies undertaken by consultants specialising in the fields of noise, air quality, flora, fauna and pre- and post-European heritage (see Section 1.2).

Additional information was sourced from Gunnedah Shire Council, the Department of Land and Water Conservation, the Bureaus of Meteorology and Census and Statistics, and a range of relevant documents pertaining to the Vickery and Whitehaven Coal Mines. The assistance of the Environment and Planning and Engineering staff of Gunnedah Shire Council, in particular, is gratefully acknowledged.

Section 2

DESCRIPTION OF THE PROPOSAL

Preamble

This section outlines WCM's proposal and objectives for the development and operation of a CHPP on and adjacent to the site of the former Vickery rail siding/train loader. The approvals required, site layout, construction activities and CHPP operations, waste management, hours of operation, employment, infrastructure and service requirements, safety and security management, the life of the facility and rehabilitation are described. For completeness, information is also presented on the transportation of coal from Whitehaven to, and rail despatch of coal from the site, albeit that these represent existing approved activities. The section concludes with a review of feasible alternatives considered during the planning for the proposal.

The proposal is described in sufficient detail to provide Council and the EPA (the Approval Bodies), the Department of Planning, other Government Authorities and the public with an understanding of the nature and extent of the activities planned, how the various activities would be undertaken, and to assess the potential impact on the local environment. The local environment is described in Section 3 of the document, while the proposals for the minimization and management of impacts on the various components of the local environment are set out in Section 4.

2.1 INTRODUCTION

2.1.1 Objectives

WCM's objectives for the installation and operation of the CHPP are to:

- construct and operate a safe, modern and efficient plant in a location which is strategic to the Whitehaven Coal Mine, other potential coal mine developments within the Gunnedah/Boggabri area and the national rail network;

- maximize the use of existing infrastructure and areas of existing disturbance;

- reduce the extent of coal haulage undertaken on the public road network and substantially reduce the movement of coal trucks past residential premises on Quia, Torrens and Black Jack Roads; and

- improve the efficiency of the Whitehaven Coal Mine and economic potential for other future coal mine developments through reduced coal haulage and preparation costs.

2.1.2 Outline of the Proposal

WCM's proposal involves the following principal activities.

i) Construction and operation of a CHPP in lieu of the continued use of the existing 25-year-old plant at the Gunnedah Colliery. Coal preparation would involve limited size reduction of the coal, and screening and separation of product coal from poorer quality (reject) materials. Processing would be at a nominal rate of 400 tph and to a maximum of 2 Mtpa.

ii) Despatch of all export product coal (clean Run-of-Mine [ROM] and washed coal) via the former Vickery train loader in lieu of the continued use of the Gunnedah Colliery train loader.

iii) Screening of domestic coal and its despatch from the Project Site by road.

iv) Transport of coarse reject materials to the Whitehaven Coal Mine (or other originating mines) for disposal, to the rail loop for fine reject pond construction and/or to the Gunnedah Colliery to assist post-mining landform creation and site rehabilitation.

v) Storage of fine reject materials in a series of ponds to be constructed within the Gunnedah Colliery rail loop.

vi) The excavation and transport of consolidated fine reject to the Whitehaven Coal Mine or other originating mines for disposal and/or to the Gunnedah Colliery to assist site rehabilitation activities.

vii) Augmentation of existing services and facilities.

viii) Utilization and/or augmentation of existing systems for air quality and surface water management.

ix) Long-term rehabilitation of all areas of disturbance.

2.1.3 CHPP Site Layout

Figures 2.1 and **2.2** present the existing and proposed layouts of the Project Site. The existing layout (**Figure 2.1**) shows:

TN
MN

Water Bore & Meter
Siding Access Road
TSR 31106
Kamilaroi Highway
Main Storage Dam
Low Flow Diversion Drain
Settlement Pond 1 (SP-1)
Settlement Pond 2 (SP-2)
Dirty Water Drain
Low Flow Diversion Weir
Truck Wash
Hardstand Area
Weighbridge
Coal Pad B
Coal Pad C
TUNNEL
RECLAIM
Feed Bunker
Escape Hatch
Coal Pad A
North - Western
CONVEYOR
Clean Water Drain
Rail Load -Out Bin
Railway
Road
Rail Loop
Bund
Culvert
Torrens Road Access Way
Settlement Pond 3 (SP-3)
Transmission Line Easement
McDonald
Fresh Water Dam
Easement For Stock Movement

REFERENCE

- Project Site Boundary
- Contour (m, AHD) — 269
- Fence
- Drainage Line/Watercourse
- Water Line
- Power Line (Overhead)
- Lighting Tower
- Dust Suppression Tower
- Tree Screen

STRUCTURE REFERENCE

① Administration Building	⑤ Fire Shed
② Fire/Water Tanks	⑥ Ramp & Dump Hopper
③ Sub-station/Switchroom	⑦ Workshop
④ Office/Lunchroom/ Store/Bathhouse	⑧ Bunded 20,000 L Fuel Tank

Note: For cadastral boundaries and details, see Figure 1.3.

SCALE 1:5000

50 0 50 100 150 200 250 m

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Figure 2.1
EXISTING PROJECT SITE LAYOUT

TN
MN

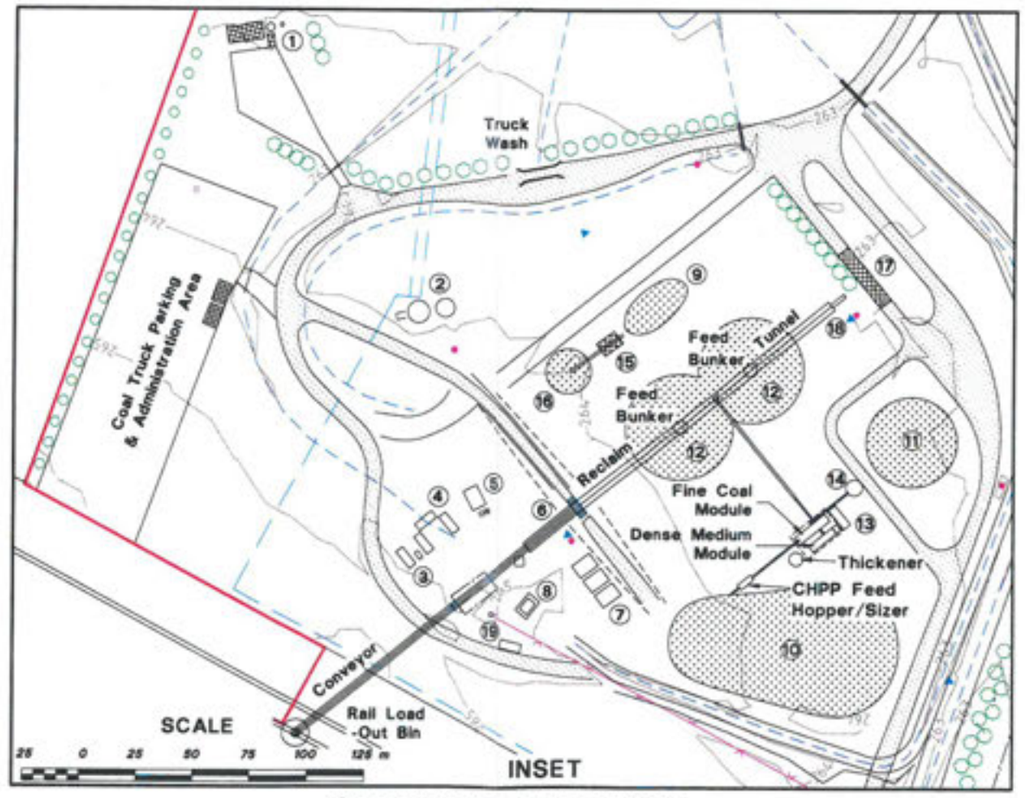
Water Bore & Meter
Siding Access Road
TSR 31106
Kamilaroi Highway
Main Storage Dam
Low Flow Diversion Drain
Easement For Stock Movement
SP-1
Dirty Water Drain
SP-2
Refer Inset
Low Flow Diversion Weir
North - Western
Clean Water Drain
Road
Rail Loop
Recovery Pond
Railway
Bund
Washery Sub-station
Culvert
RP-1
RP-4
SP-4
Fine Reject Ponds RP-3
Polishing Pond
RP-5
SP-5
RP-2
RP-6
Fresh Water Dam
Barrier
Torrens Road Access Way
To Existing Washery & Gunnedah Rail Siding
River Water Supply
McDonald Transmission Line Easement

SCALE 1:5000
50 0 50 100 150 200 250 m

dcad graphics (0414 637 559)

REFERENCE

- Project Site Boundary
- Contour (m, AHD)
- Fence
- Drainage Line/Watercourse
- Water Line
- Fine Reject Delivery & Return Water Lines
- Power Line
- Lighting Tower
- Dust Suppression Tower
- Tree Screen
- Topsoil/Subsoil/spoil Stockpile
- Acoustic Barrier



STRUCTURE REFERENCE

① Administration Building	⑦ Workshop	⑬ Coal Preparation Plant (Washery)
② Fire/Water Tanks	⑧ Bunded 20,000 L & 50,000 L Fuel Tanks	⑭ Live Coarse Reject Storage
③ Sub-station/Switchroom	⑨ ROM Stockpile (Clean Coal)	⑮ Domestic Coal Screening Plant
④ Office/Lunchroom/ Store/Bathhouse	⑩ ROM Stockpile (Dirty Coal)	⑯ Screened Product Stockpiles
⑤ Fire Shed	⑪ Coarse Reject Stockpile	⑰ Weighbridge
⑥ Ramp & Dump Hopper	⑫ Product Coal/Blending Stockpiles	⑱ Escape Hatch
		⑲ Wash Bay & Oil Seperator

Figure 2.2
PROPOSED PROJECT SITE LAYOUT

- three coal pad areas (identified as coal pads A, B and C);

- a reclaim tunnel with two feed bunkers and an associated inclined conveyor to the 28 m high, 1 000 t capacity rail load-out bin and load-out control station. The load-out control station incorporates a toilet and septic system. An escape hatch and forced ventilation fan are located at the northern (tail) end of the reclaim tunnel;

- an elevated ramp and dump hopper. The ramp and dump hopper were formerly used whenever possible in order to place coal directly onto the inclined conveyor to the rail load-out bin, thereby reducing the need for coal stockpiling and subsequent double-handling;

- an automatic truck wash;

- a fire and a general purpose water supply tank;

- a bunded 20 000 L above-ground diesel storage tank;

- a 22 kV/415 V electricity sub-station and switch room;

- a fire shed;

- an administration building with hardstand car parking;

- an office, lunchroom/store and toilet/bathhouse building;

- a workshop and various storage containers;

- a hardstand area between coal pad C and the administration building;
- a weighbridge;
- a network of channels/drains for 'clean' and 'dirty' water management;
- two 0.6 ML capacity settlement ponds on the siding area (settlement ponds SP-1 and SP-2). SP-1 collects potentially dirty water from the coal pads and hardstand areas while SP-2 collects water from the truck wash;
- a turkey's nest-type "main storage dam". The main storage dam has a capacity of 20 ML to the invert of the valve-controlled low flow discharge, and a total storage capacity to spillway discharge level in excess of 30 ML. All discharges from the settlement ponds, together with water which may be diverted from the clean water management system, are collected in this dam;
- 2 ML capacity settlement pond (SP-3) and 7 ML capacity fresh water dam located towards the eastern end of, and within the rail loop;
- an access road from the Kamilaroi Highway and around coal pads A and B (the 'siding access road'). With the exception of that section of road adjacent to pad A, the siding access road is sealed;
- six 20 metre-high lighting towers which illuminate coal pads A and B and the adjacent siding access road surface;
- four 10 metre-high towers fitted with dust suppression water sprays. The sprays may be operated manually but are also linked with an anemometer which may be

used to automatically initiate the sprays once the wind speed exceeds approximately 5 m/s;

- an unsealed private access way between the siding area and Torrens Road. The Torrens Road access way incorporates a culvert adjacent to the siding area, and a causeway, and is isolated from Torrens Road by a locked gate;

- a 100 mm diameter water line which extends from the existing supply line between the Namoi River and the Gunnedah Colliery washery to the Project Site. The water line lies adjacent to the Torrens Road access way;

- a 22 kV power line which extends from Torrens Road to the conveyor substation; and

- planted tree screens.

Plates 2-1, **2-2** and **2-3** present views of the Project Site from the top of the rail load-out bin.

Proposed components/features to be installed and/or developed in association with the current proposal are shown on **Figure 2.2** and comprise a:

- clean ROM stockpile. The clean coal would not require washing;

- dirty ROM stockpile. This coal requires washing;

- CHPP feed hopper/sizer. The sizer, a tertiary crusher, would reduce the top size of the CHPP feed from 150 mm to 50 mm;

- domestic coal screening plant and screened product stockpiles;
- washery with integrated control room and switch room. The washery would comprise a dense medium and a fine coal module within a free-standing building, a thickener and a clarified water tank;
- coarse reject stockpile area and a live coarse reject storage;
- 22 kV/11 kV washery sub-station with 11 kV/415V transformer;
- fenced coal truck administration and parking area incorporating office and ablutions buildings. The parking area would have a capacity sufficient for approximately 20 semi-trailers;
- a 50 000 L (nominal) bunded diesel fuel tank for refuelling coal trucks;
- wash bay and associated oil separator. All equipment refuelling would be undertaken in the wash bay;
- series of export product stockpiles;
- six fine reject ponds, three settlement ponds, a polishing pond and a recovery pond within the rail loop. Reject ponds 1, 2 and 3 (RP-1, 2 and 3) would be constructed initially, while ponds RP-4, 5 and 6 would be constructed on an as-needs basis;
- fine reject delivery and return water pipelines; and

Plate 2-1: **An elevated view of the siding component of the Project Site panning from west to north-east. (Ref: S4/10,11,12)**

Plate 2-2: **An elevated view of the siding component of the Project Site panning from north-east to south-east. (Ref: S4/6,7)**

Plate 2-3: **An elevated view of the rail loop component of the Project Site. The fresh water dam and settlement pond SP-3 lie to the left of the montage. (Ref: S1/24, 25, 26, 27)**

- acoustic barriers adjacent to the northern segment of the siding access road.

2.1.4 Approvals required

Schedule 2(4)(d) of the Environmental Planning and Assessment Regulation 2000, requires that this EIS list the approvals that must be obtained under any Act or Law before the proposed activities can lawfully be carried out.

In consultation with the relevant Authorities, WCM has determined that the following approvals are required to enable the proposed activities to proceed.

i) **Development Consent – Gunnedah Shire Council**

The Minister for Planning has declared the proposed CHPP as State Significant Development under Section 76A(7)(b)(iii) of the Environmental Planning and Assessment Act 1979 as it provides essential infrastructure to the State Significant Whitehaven Coal Mine and has the potential to provide essential infrastructure to future State Significant coal mines in the area. The Minister has subsequently delegated his authority for determination of the Development Application to Gunnedah Shire Council.

ii) **Environment Protection Licence – Environment Protection Authority**

The EPA has advised that although WCM holds an existing Environment Protection Licence (No. 3637) for a 'coal works' on the siding, an amendment would be required under the Protection of the Environment Operations Act 1997 to account for the change in premises

details and a likely requirement for additional conditions which reflect the specific nature of the activities proposed.

No approval is required under the Native Vegetation Conservation Act 1997 (NVCA) as all proposed vegetation removal is to be undertaken within land zoned "industrial" under the Gunnedah Local Environmental Plan 1998. Under Clause 9 of the NVCA, land zoned "industrial" under an environmental planning instrument is excluded from the operation of the Act.

A Dangerous Goods licence issued by WorkCover NSW would only be required should the proposed coal truck fuel tank have a storage capacity exceeding 50 000 L.

2.2 CHPP CONSTRUCTION

2.2.1 Introduction

A range of construction activities would be undertaken on the various component areas of the Project Site, including limited vegetation and soil removal, assembly and installation of CHPP structural elements and fine reject pond construction. The following sub-sections describe each of the above activities, the duration of construction, employment, equipment, and construction waste management.

2.2.2 Vegetation Removal

Vegetation removal activities would be limited to the areas of the proposed fine reject ponds within the rail loop where the vegetation is dominated by introduced cover species and native or exotic shrub species (see Section 3.7). No mature trees would be removed.

Vegetation removal would be undertaken in conjunction with the soil stripping activities (see Section 2.2.3).

2.2.3 Soil Removal

The area of the proposed fine reject ponds within the rail loop has been extensively disturbed by past rail loop, settlement pond and drainage construction, and earth/rock spoil disposal activities, with only an estimated 4 500 m^3 undisturbed topsoil, and 13 500 m^3 subsoil materials available. The topsoil and subsoil materials would be separately stripped to nominal depths of 10 cm and 30 cm respectively, and placed in separate stockpiles or windrows around the perimeter of the proposed ponds. Topsoil stockpiles would generally not exceed one metre and be a maximum of two metres in height. Subsoil stockpiles would be a maximum of three metres in height.

The previously dumped spoil materials within the area of the proposed ponds carries a well-developed vegetation cover and would be suitable for the progressive capping/rehabilitation of completed ponds. These materials, totalling approximately 25 000 m^3, would be placed in separate stockpiles or windrows around the perimeter of the ponds to a maximum height of three metres. Nominal topsoil, subsoil and spoil stockpile/windrow locations are shown on **Figure 2.2**.

All rail loop stockpiles would be positioned external to the perimeter pond drainage system, thus avoiding concentrated flows which might otherwise result in stockpile erosion.

In the event that an adequate vegetation cover does not establish naturally on the stockpiles/windrows within a period of three months, they would be seeded with a

selection of grass and legume species. The seed mix to be employed would be seasonally dependant, but would include a mixture of grass and leguminous species as identified in Section 2.12.

Stockpile/windrow locations and the nature of the materials stockpiled, would be identified on a plan retained on site.

2.2.4 Construction Method

2.2.4.1 CHPP Structure

The CHPP structural elements comprising a hopper, tertiary crusher, feed conveyor, drain and rinse screens, pumps, spirals, cyclones, conveyors and a thickener tank, would be primarily fabricated off site and delivered to the Project Site in modular form for erection on previously installed reinforced concrete footings and slabs. Materials excavated to enable footing/slab installation, would be retained on site, and used for minor landform re-profiling in low-lying areas and/or landscaping works. **Figure 2.2** presents the proposed layout of the CHPP and **Figure 2.3**, elevations of the CHPP dense medium and fine modules. The modules would be enclosed within a free-standing building.

The plant building would be approximately 15 m in height, that is, approximately one half of the height of the existing coal load-out bin, have a footprint of approximately 300 m^2 and be painted to blend with the natural coloration of the background.

2.2.4.2 Fine Reject Ponds

Construction of the fine reject ponds would involve the following activities.

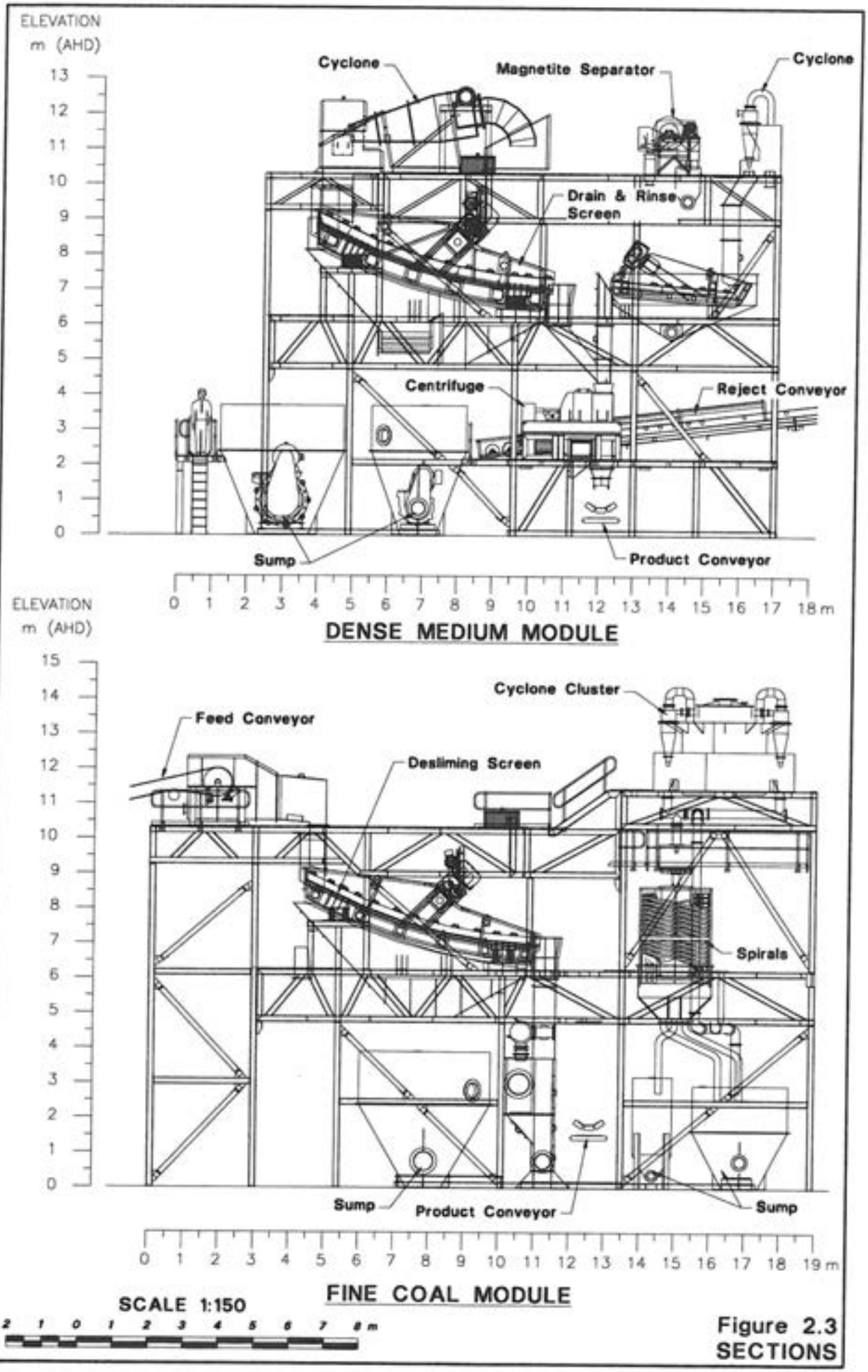


Figure 2.3
SECTIONS

- Vegetation and soil/spoil removal.

- Shaping/grading of the pond floor to achieve a minimum gradient of 2 per cent to the east.

- Construction of the pond walls using coarse reject. The walls would be approximately 3 m in height, have a toe width of approximately 11 m and batter slopes of 1:1.5 (V:H). The 1 m to 2 m wide crest of the walls would provide access for discharge pipe relocation. The walls would be constructed in a manner which minimizes the compaction of the reject walls, eg using a front-end loader from the pond floor or natural surface, thereby maximizing their permeability.

- Placement of a 0.3 m to 0.5 m thick drainage blanket of coarse reject on the floor of each pond. Coarse reject for the construction of the RP-1, 2 and 3 walls, and drainage blanket would be sourced from the Gunnedah Colliery, with construction materials for RP-4, 5 and 6 and for periodic pond refurbishment sourced directly from the CHPP.

- Settlement, polishing and recovery pond excavation and/or maintenance.

- Installation of peripheral V-drains to collect water filtering through the walls of each pond and direct it to the settlement ponds, the polishing pond and finally, to the recovery pond for recirculation to the CHPP. The drains would be approximately 5 m wide to allow maintenance by a grader, with the drain invert below the level of the adjacent reject pond floor. A maintenance access way would be positioned between the peripheral drain and the toe of the external pond walls. Ponds RP-1, 2 and 3 would each have a storage capacity of

approximately 20 000 m^3, that is, sufficient capacity for approximately 8 months' fine reject production from the Whitehaven Coal Mine. Management of fine rejects to be produced at the CHPP, including the sequential development/refurbishment of the fine reject ponds, is discussed in Section 2.4.3.3.

2.2.5 Equipment

Table 2.1 identifies the major items of equipment likely to be used during the various construction activities to be undertaken on the Project Site, together with their primary function and the nature and duration of their use. Not all equipment would be operating concurrently.

Table 2.1
Equipment

ACTIVITY	ITEM	NO	FUNCTION	DURATION
Plant Assembly/Construction	Grader	1	Pad preparation *	Intermittent
	Excavator/Backhoe	1	Footing excavation*	1 week
	Crane	3	Assembly/erection of structures	8 weeks
Fine Reject Pond Construction	Bulldozer (D9)	1	Soil stripping; bulk Earthworks	2 weeks
	Scraper	1	Bulk earthworks	1 week
	Excavator	1	Settlement, polishing and recovery pond excavation	1 week
	Front-end Loader (Cat 988)	1	Spoil/topsoil removal; pond wall construction	2 weeks
	Grader	1	Floor shaping; perimeter drain construction.	1 week
	Semi-tipper	4	Coarse reject delivery	5 weeks

* *prior to delivery/assembly of structures*

Additional miscellaneous equipment such as welders would be used for varying periods during the plant construction phase. An under-borer would be required for approximately one day to bore the required hole beneath the North-Western railway line and rail loop for the fine reject delivery and return water pipelines.

Approximately 200 m^3 concrete (40 transit mixer loads) would be delivered to the site for plant footings, slabs etc, while an estimated 30 semi-trailer loads of plant components would be delivered to the site.

2.2.6 Construction Duration and Work Hours

2.2.6.1 Construction Duration

Construction and testing/commissioning of the CHPP is scheduled for a total period of 22 weeks including a period of 12 weeks for off-site preparatory works and 12 weeks for on-site preparatory works, plant assembly and installation, testing and commissioning. The estimated times for the various on-site activities are:

i) footing/pad installation - 1 week;

ii) assembly and installation of plant components and services - 8 weeks;

iii) construction of fine rejects ponds RP-1, 2 and 3 and associated dirty water collection, clean water diversion, fine reject delivery and process water recovery systems - 8 weeks; and

iv) plant and fine reject system testing and commissioning - 2 weeks.

Activity (iii) would be undertaken concurrently with activities (i) and (ii) and commence prior to the delivery of plant componentry to the site.

2.2.6.2 Hours of Construction Activity

The proposed hours for the various construction activities to be undertaken on the Project Site are presented in **Table 2.2**.

Table 2.2
Construction Hours

Activity	Hours		Days
	Normal	Contingency	
Plant componentry and equipment delivery	7.00 am – 6.00 pm	8.00 am – 6.00 pm	Monday to Saturday Sunday
Site preparation/earthworks*	7.00 am – 6.00 pm	8.00 am – 6.00 pm	Monday to Saturday Sunday
Plant assembly/installation	7.00 am – 6.00 pm 8.00 am – 6.00 pm	6.00 pm – 10.00 pm 6.00 pm – 10.00 pm	Monday to Saturday Sunday
Commissioning	7.00 am – 10.00 pm	24 hours/day	Monday to Saturday 7 days/week

* *Includes clearing, soil removal, footing excavation; fine reject pond, settlement pond, recovery pond and drainage construction.*

Although activities would generally be undertaken with the 'normal' hours nominated in **Table 2.2**, limited activities may be required within the nominated contingency hours in the event of periods of unfavourable weather which delay critical path construction activities, to allow for the receipt of componentry from interstate and/or to enable the completion of particular phases of installation or commissioning activity which cannot be readily terminated mid-stream.

2.2.7 Employment

The number of personnel engaged in the various activities involved in the assembly, installation and commissioning of the CHPP would vary depending on the activities

in progress at any one time. However, it is projected that between approximately 4 and 15 construction personnel would be working on the site at any one time.

2.2.8 Construction Waste Management

Waste materials produced during or as a consequence of the proposed CHPP construction activities would be limited to earth materials from footing excavations, concrete, steel off-cuts and miscellaneous items such as welding rods. Materials from footing excavations would be retained on site and used to fill low-lying areas within the plant area and/or placed in mounds and revegetated to assist site landscaping and/or provide visual/acoustic screening.

Bulk concrete delivered to the Project Site which is in excess of that required for a particular concrete pour would be retained within the transit mixer and returned to the batch plant for appropriate disposal. Any minor concrete wastes on the Project Site would be set aside and transported to the Gunnedah landfill for disposal. Concrete trucks would not be permitted to wash out on the Project Site.

Steel off-cuts and miscellaneous construction wastes, eg welding rods, would be separated into recyclables and non-recyclables and placed in separate bins or dumpsters. Non-recyclable materials would be disposed of to the Gunnedah landfill, while the recyclable materials would be placed with similar materials generated during the siding/train loader recommissioning activities to await collection by an appropriate recycling contractor.

Previously dumped waste materials in the area of the proposed fine reject ponds would be pushed aside into stockpiles or windrows for use in the capping of the completed fine reject ponds.

2.3 CHPP OPERATIONS

2.3.1 Description of the Process

The coal preparation process is designed to separate the saleable coal from the unsaleable material using the difference in the specific gravity of coal and non-coal materials and would incorporate coal handling, pre-treatment, coarse and fine coal cleaning, washed coal handling and coarse and fine reject management components.

A conceptual flow diagram showing the various circuits and major components within the proposed plant is presented in **Figure 2.4** and described below.

ROM coal, reduced in size at the source mine to <150 mm, would be retrieved from the ROM stockpile and loaded into a 50 t capacity feed hopper using a front-end loader (Cat 992 or equivalent) or bulldozer (D9 or equivalent). The raw coal would then pass by conveyor to a tertiary crusher which would reduce the ROM coal to <50 mm in size. The <50 mm coal would then pass via the plant feed conveyor to the coal preparation plant.

Within the coal preparation plant, the <50mm raw coal would initially be mixed with water before passing to desliming screens where the ROM coal would be separated into <50 mm >1.5 mm and <1.5 mm size fractions.

The <50mm >1.5 mm raw coal product from the desliming screens would be mixed with magnetite to gain the correct specific gravity for processing and then pumped to the dense medium cyclone where the required quality product coal would be separated from the material to be discarded.

The washed coal would be discharged to the combined product drain and rinse screen where the adhering magnetite would be washed from the coal. The coal would then be passed to coarse coal centrifuges which would dewater the product prior to it being conveyed to the product stockpiles. Coal within the product stockpiles would be dozed over or to areas adjacent to the reclaim tunnel to enable blending (if required) or loading onto trains. The material discarded from the dense medium cyclone would also report to the drain and rinse screen for magnetite recovery, and then be conveyed to the live coarse reject storage for loading and despatch from the site. The coarse reject storage would generally have a live capacity of approximately 300 t. However, prior to fine reject pond refurbishment activities, the storage and adjacent coarse reject stockpile capacity may increase to 5 000 t.

The fine (<1.5 mm) raw coal separated at the desliming screen would be passed to a cluster of primary classifying cyclones, with the overflow being directed to a 16 m diameter fine reject (tailings) thickener. The cyclone underflow would pass to spiral separators, cyclones and a dewatering screen which would enable the separation and dewatering of the entrained coal and reject particles and their delivery to the coarse coal and fine reject streams respectively.

Fine reject delivered to the thickener would be dosed with flocculant, the clarified water reclaimed for re-introduction to the plant and the thickened underflow pumped to the active fine reject pond as a 30 per cent solids slurry.

The plant would be erected on a concrete slab with a sloping floor that directs any spillages or hose-down to a central floor sump. Any slurry collecting in the floor sump would be returned to the process.

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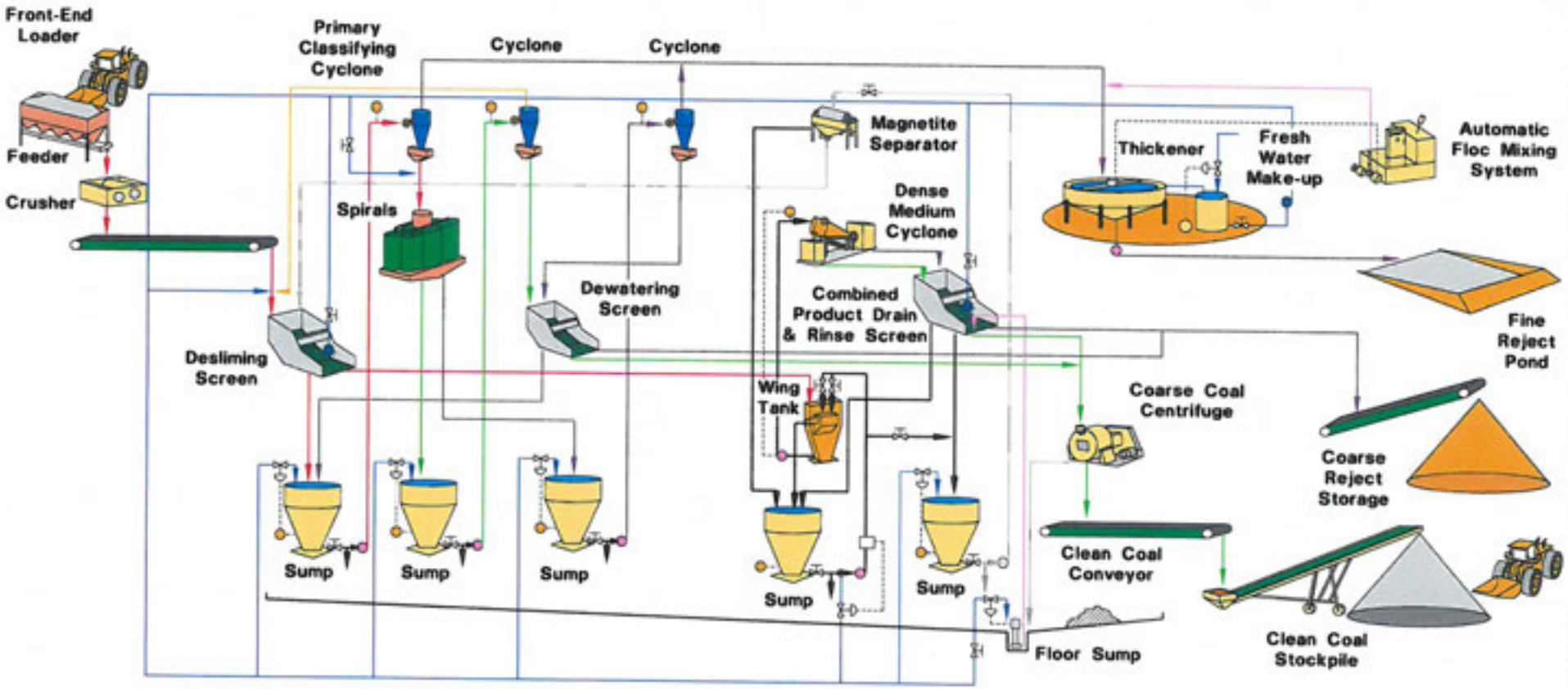


Figure 2.4
CONCEPTUAL FLOW DIAGRAM

2.3.2 Products

The number of products produced at the CHPP would depend on the number of sources of raw coal and customer product quality and size specifications. However, it is currently envisaged that up to six principal products may be present on the site at any one time which may be despatched as is, or as blends. The principal product types would comprise:

- four screened raw (unwashed) coal products; and
- two washed coal products.

2.3.3 Stockpile Volumes

Up to 60 000 t ROM coal and 90 000 t product coal may be stockpiled on the siding area at any one time, with the estimated maximum volumes as follows.

- ROM coal awaiting coal preparation – 50 000 t.
- Clean raw coal awaiting screening only – 10 000 t.
- Washed product coal – 2 x 25 000 t.
- Screened coal – 40 000 t.

Up to 5 000 t coarse reject may also be stockpiled on the site prior to fine reject pond refurbishment activities. However, under normal operational conditions, the live coarse reject storage would approximate 300 t.

Raw coal, product coal and coarse reject storage and stockpile management, and introduction of coal to the coal preparation plant or clean raw coal screening plant, would be undertaken by one or a combination of two front-end loaders (Cat 992 and Cat 980 or equivalent) and bulldozer (Cat D9 or equivalent). Use of the bulldozer would generally be restricted to 7.00 am to 6.00 pm Monday to Saturday and 8.00 am to 6.00 pm on Sundays, with bulldozer use outside these hours associated with infrequent train loading activities only (see Sections 2.5 and 3.13.4).

2.4 WASTE MANAGEMENT

2.4.1 Nature of Wastes

The principal non-production and production wastes generated on the Project Site during, or in association with CHPP operations, would be as follows.

Non-production Wastes

- general domestic-type wastes from the offices and administration buildings, lunch rooms, store and bathhouses, and routine maintenance consumables;
- oils and grease; and
- sewage.

Production Wastes

- coarse and fine coal rejects; and
- return water pumped from the fine reject pond drainage system.

Management of non-production wastes is presented in Section 2.4.2, and of production wastes, in Section 2.4.3. The management of the return water from the fine reject ponds is discussed in Section 4.2.5.

It should be noted that each form of non-production waste is already generated and managed at the existing approved siding/train loading facility.

2.4.2 Management of Non-production Wastes

2.4.2.1 Domestic-type Wastes and Routine Maintenance Consumables

All paper and general wastes from the existing administration and office, lunchroom/storeroom and bathhouse buildings, together with routine maintenance consumables from the servicing of fixed and mobile plant and equipment, eg grease cartridges, are disposed of in garbage bins/dumpsters located adjacent to the various buildings and elsewhere on the site. The bins/dumpsters are regularly collected and the contents disposed of at the Gunnedah landfill. Management of domestic-type wastes and routine maintenance consumables from the CHPP and associated buildings would be undertaken in a similar manner.

2.4.2.2 Oils and Grease

Oils and grease from the day-to-day servicing of mobile and fixed plant and equipment within the workshop would be collected and stored in a tank for subsequent collection by a licensed waste recycling contractor. The tank would be positioned within a bund to contain any spillages.

Major routine maintenance of plant and equipment would be undertaken at equipment maintenance facilities away from the Project Site. However, in the event of emergency or breakdown maintenance of equipment on the Project Site, the oil

and grease would be pumped or drained from the equipment into leak-proof containers and the contents transferred to the storage tank.

2.4.2.3 Sewage

The existing administration building is serviced by a septic system which was used by the Vickery siding personnel and truck drivers, while the office and toilet/bathhouse buildings and the rail load-out bin are serviced by separate septic systems. The systems are pumped out on an as-needs basis by a licensed waste disposal contractor. The new toilet/ablutions (bathhouse) building to be installed within the coal truck administration and parking area would also be connected to a pump-out septic system in accordance with Council requirements. Additional temporary pump-out and/or chemical toilet and ablution facilities sufficient for a workforce of 15, would be installed on the Project Site during the construction phase. These facilities would be removed following CHPP commissioning.

2.4.3 Reject Management

2.4.3.1 Nature of Rejects

The beneficiation of the coal processed through the CHPP would produce two forms of solid waste for disposal – a coarse reject component and a fine reject or tailings component. Both forms of reject comprise a mixture of coal and non-coal materials, eg sedimentary rocks such as shale, mudstone or claystone, and sand, silts and clays which either occur naturally within the coal seam or represent overburden or interburden materials which are incorporated with, and dilute the coal during mining. These materials are rejected during the coal preparation process on the basis of their specific gravity and would have an average ash content of approximately 65 per cent. The coarse reject particle sizes from the CHPP would nominally range

between 1.5 mm and 50 mm, with approximately 60 per cent being of a 4 mm to 25.4 mm particle size. The fine reject particles from the CHPP would range from near zero to 1.5 mm in size. The amount and form of rejects produced is a function of the inherent ash content of the coal seam or plies within the coal seam, the extent of dilution which occurs during mining and the ash specification and relative proportions of the various domestic and export coal products produced. For example, within the Whitehaven coal seam, ash contents in the various plies range from approximately 6 per cent to 17 per cent, while for Whitehaven product coal, ash specifications range from approximately 5 per cent to 10 per cent.

Based on WCM's experience to date in the preparation of Whitehaven coal through the Gunnedah Colliery coal preparation plant, coarse and fine rejects would constitute approximately 10 per cent and 7 per cent of the coal preparation plant feed respectively, with CHPP feed representing approximately 60 per cent of ROM coal production. The 7 per cent fine reject component is primarily a function of the higher than average clay content in the Whitehaven coal seam.

At he maximum approved production rate from the Whitehaven Coal Mine, ie 750 000 tpa, annual coarse and fine reject production would average 45 000 t and 31 500 t respectively.

With the planned development of other potentially higher ash coal deposits in the Gunnedah/Boggabri area, it is possible that coarse and fine reject production could change to 20 per cent and 5 per cent of CHPP throughput respectively. At an annual plant throughput of 2 Mt as sought under this Development Application, these rates would equate to 400 000 tpa coarse reject and 100 000 tpa fine reject respectively. **Table 2.3** presents physical and chemical analysis of coarse and fine reject generated

from the preparation of Whitehaven coal through the existing Gunnedah Colliery coal preparation plant.

Table 2.3
Whitehaven Open Cut Coal Mine – Coarse and Fine Reject Analysis

Proximate Analysis - per cent	Coarse Reject	Fine Reject
Air Dried Moisture (adb)	1.2	2.4
Ash (adb)	69.7	39.6
Volatile Matter (adb)	18.7	22.3
Fixed Carbon (adb)	10.4	35.7
Ash Constituent Analysis (per cent db)		
Silicon as SiO_2	55.4	61.8
Aluminium as Al_2O_3	21.0	23.9
Iron as Fe_2O_3	7.3	3.9
Calcium as CaO	10.1	4.3
Magnesium as MgO	2.2	1.7
Sodium as Na_2O	0.24	0.32
Potassium as K_2O	2.1	2.2
Titanium as TiO_2	0.94	0.88
Manganese as Mn_3O_4	0.05	0.03
Sulphur as SO_3	1.7	0.21
Phosphorus as P_2O_5	0.79	2.2
Barium as BaO	0.08	0.08
Strontium as SrO	0.07	0.10
Zinc as ZnO	0.01	0.01
Vanadium as V_2O_5	0.02	0.02
adb – air dried basis		db – dry basis

The chemical and physical properties of rejects from future mine developments in the Gunnedah/Boggabri area are unknown but are likely to be similar to those from the Whitehaven Mine, albeit with a lower clay content.

2.4.3.2 Coarse Reject Management

Coarse reject produced from the CHPP would be conveyed to a live storage area from which it would principally be loaded into coal trucks for transport back to the source mines for disposal. At the mine(s), the reject would be emplaced in layers with the overburden to minimize the risk of spontaneous combustion. Limited coarse reject may also be transported via the Torrens Road access way, Torrens Road and Black Jack Road to the Gunnedah Colliery where it would be used to assist final landform creation and site rehabilitation, eg in the area of the former North Cut/Melville Underground entry, or be transported to the rail loop for use in fine reject pond construction or refurbishment (see Section 2.4.3.3).

2.4.3.3 Fine Reject Management

The thickened fine reject from the CHPP (a 30 per cent solids slurry) would be pumped to the active fine reject pond via a pipeline bored beneath the North-Western railway line and rail loop in a location which would ensure any spillage or line breakage would be contained within the "dirty" water management system (see Section 4.2.2). The nominal location of the pipeline is shown on **Figure 2.2**.

Commencing from the western pond margin, the fines would be discharged via spigots in a manner which facilitates the surface drainage of the supernatant water and any rainfall run-off, and promotes the consolidation of the fine reject particles. Water contained within the fine reject would also move laterally through the pond walls.

The spigot points would be progressively moved in an easterly direction once the deposited fines reach the design storage height, ie 0.5 m from the wall crest, along the western boundary of the pond until the total pond area is filled to its design level.

Discharge of the fine reject in this manner would maintain a free draining surface to the east and minimize the potential for water infiltration into the previously deposited and partially consolidated materials.

Water draining through the walls of the ponds and/or via the under-drainage blanket, would be collected in the peripheral drains and directed to one of two 2 ML capacity settlement ponds (SP-4 and SP-5 – **Figure 2.2**) where the majority of any contained sediment would settle. Discharges from the settlement ponds would then flow to the 1.5 ML capacity polishing pond (**Figure 2.2**), with clarified discharges from the polishing pond flowing to the 5 ML capacity recovery pond (**Figure 2.2**). The water within the recovery pond would be recirculated to the CHPP plant by a return water pipeline to be installed beneath the railway line and rail loop. The settlement ponds and polishing pond would be a maximum of 30 m wide, thereby enabling removal of accumulated sediment/fines with a long-reach excavator as necessary.

The presence of fines within the water draining from the reject pond walls would be a short duration occurrence following construction and refurbishment activities, with the water rapidly clarifying as the fines create a blinding/filtering layer on the internal reject pond walls. For example, at the Gunnedah Colliery where a similar method of fine reject drainage and consolidation is employed, water passing through the coarse reject pond walls has a suspended solids loading of 2 mg/L.

Figure 2.2 shows the conceptual development of six fine reject ponds over the life of the CHPP (RP-1 to RP-6). RP-1, 2 and 3 each have a storage capacity of approximately 20 000 m^3 while RP-4, 5 and 6 each have capacities of approximately 8 000 m^3 . RP-1, 2 and 3 would be the principal reject ponds, with the areas assigned for RP-4, 5 and 6 retained primarily as contingency storages, eg in the event of substantially slower than projected fines consolidation within RP-1, 2 and 3 or protracted wet or poor drying conditions. Based on previous experience with the

proposed form of fine reject pond construction, the fine reject within any pond would have consolidated sufficiently to enable cleanout and refurbishment to commence approximately four months following the cessation of fine reject deposition.

Ponds RP-1, 2 and 3, and if required, one or more of ponds RP-4, 5 and 6, would be operated cyclically such that at any one time, one pond would be receiving fine reject, one pond would be awaiting receipt of fine reject or be in the process of consolidated fines removal/pond refurbishment, and the other previously filled pond(s) would be consolidating. If not required previously, ponds RP-4, 5 and 6 would be constructed towards the end of CHPP life to provide permanent storage for the last fine reject produced from the facility and enable the commencement of RP-1, 2 and 3 rehabilitation.

Figure 2.5 shows the progressive development and operation of each of ponds RP-1 to RP-3.

Refurbishment of individual fine reject ponds would involve the:

- removal of the consolidated fines, together with the coarse reject drainage blanket and the inner layer of coarse reject from the pond wall;
- installation of a new drainage blanket;
- replacement of the inner pond wall with fresh coarse reject; and
- settlement pond cleanout.

Refurbishment would generally commence approximately two months prior to the pond again being required for fine reject disposal.

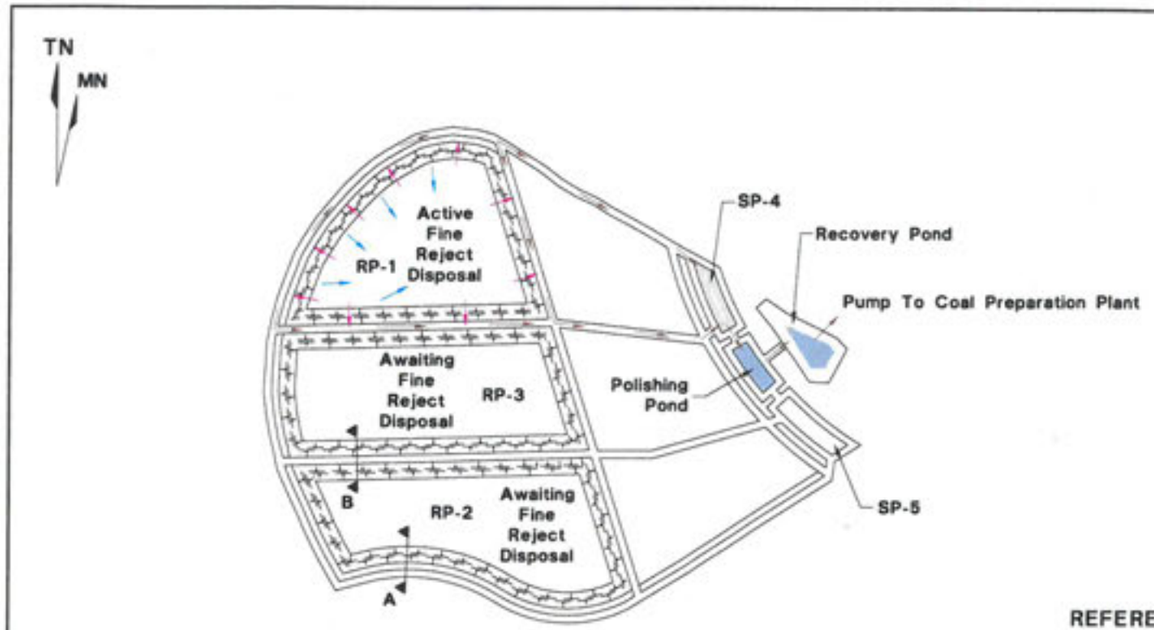
Materials removed from the pond during refurbishment would be transported to the source mine for disposal with the overburden or to areas at the Gunnedah Colliery requiring materials for post-mining landform creation. Material removed during settlement pond cleanout would be placed within the active fine reject pond. Approximately 5 000 m^3 coarse reject would be required for each pond refurbishment and would be transported from the CHPP.

2.5 HOURS OF OPERATION

Table 2.4 presents the proposed hours of operation for the various routine activities to be undertaken at, or in association with the CHPP, together with salient comments.

Table 2.4
Hours of CHPP Operation

Activity	Hours	Days	Comment
Coal Preparation Plant Operation	24	7	
Train Loading (export coal despatch)	24	7	Train scheduling by Freight Corp. It is essential under the terms of the contract with Freight Corp that coal can be loaded any hour of any day although historically, most trains have been loaded during daylight hours.
Domestic coal screening and despatch	7.00am – 10.00 pm	Monday – Saturday	
Coarse reject despatch to Whitehaven or Gunnedah Colliery	7.00am – 9.30 pm	Monday – Saturday	Hours consistent with Whitehaven Development consent. Hours for back-loading coarse reject to other future mine developments would be consistent with the approved hours for coal haulage from those mines.
Fine reject pond cleanout and despatch of consolidated fines to Whitehaven or Gunnedah Colliery	7.00am – 9.30pm	Monday – Saturday	Hours consistent with Whitehaven Development consent. Hours for back-loading fine reject to other future mine developments would be consistent with the approved hours for coal haulage from those mines.
Fine reject pond refurbishment	7.00am – 6.00 pm 8.00am – 6.00 pm	Monday – Saturday Sunday	Sunday activities in emergency only.



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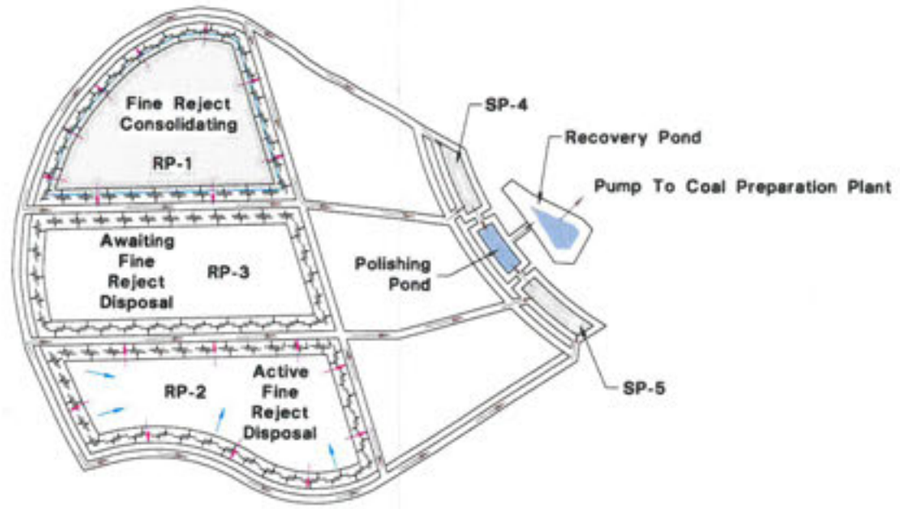

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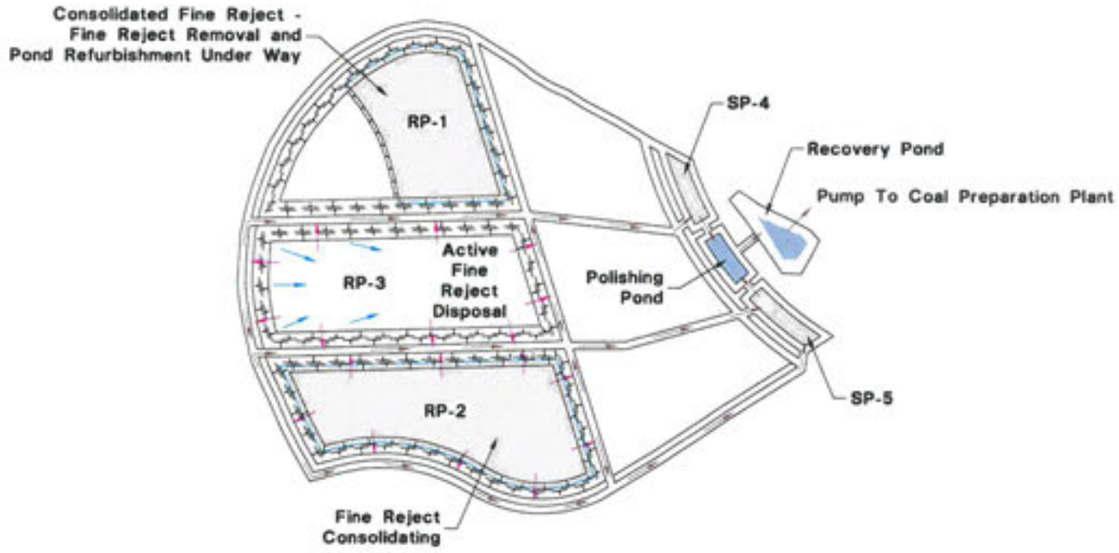

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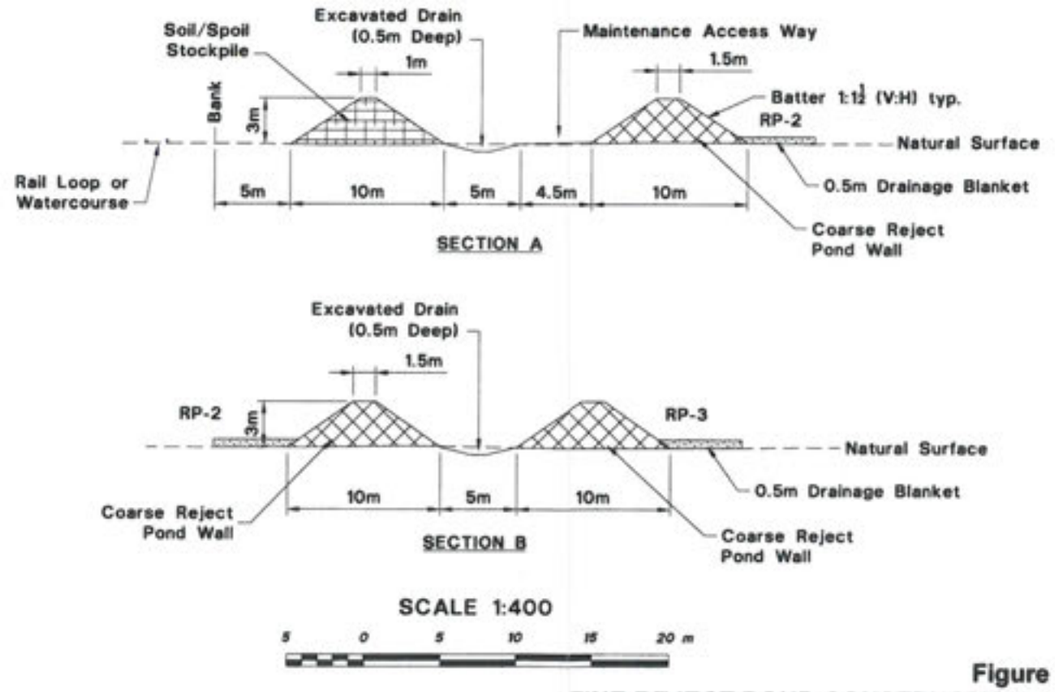

Figure 2.5
FINE REJECT POND CONSTRUCTION AND OPERATIONAL SEQUENCE (RP-1 TO RP-3)

Although approval is sought for 24 hour, seven day/week operation of the coal preparation plant, during the initial years of plant operations, that is, while the plant is only processing Whitehaven coal or until such time as plant throughput reaches an equivalent of 1.5 Mtpa, plant operations would generally be undertaken on one to two shifts per day, on up to six days per week.

2.6 LIFE OF THE PLANT

The operational life of the CHPP on the Project Site would be governed by the coal reserves within an economic haulage distance of the plant and the receipt of the necessary approvals for future mine developments. Independent of the above, a CHPP of the type proposed would have an operational life expectancy of approximately 15 to 20 years without major refurbishment in response to improved technology and/or efficiencies. Consequently, development approval for a minimum period of 20 years is sought.

2.7 EMPLOYMENT

During the initial years following plant commissioning, ie when only processing Whitehaven coal, the CHPP would provide employment for an estimated four to six permanent persons.

At the maximum projected throughput sought under this Development Application, the CHPP would provide full-time employment for approximately ten persons.

2.8 TRANSPORTATION

2.8.1 Routes

The routes to be used for the transportation of the various materials to and from the component areas of the Project Site are shown as **Figure 2.6**. With the exception of coarse reject deliveries from the Gunnedah Colliery to enable construction of the initial fine rejects pond; coarse reject deliveries from the CHPP for construction and refurbishment of the reject pond, reject pond construction equipment deliveries and the infrequent despatch of coarse and fine reject from the CHPP to the Gunnedah Colliery for disposal, all CHPP construction equipment and components, coal deliveries, backloads of coarse and fine rejects and despatches of domestic coal, would be via the Kamilaroi Highway and the existing approved siding access road.

Reject deliveries from the Gunnedah Colliery for the construction of fine reject ponds RP-1, 2 and 3, to the Gunnedah Colliery for disposal or to the rail loop for fine reject pond refurbishment, would be via all or a combination of the private Torrens Road access way, Torrens, Quia and Black Jack Roads, and internal roads within the Gunnedah Colliery holding. The North-Western railway line would be traversed via the Quia Road underpass which is to be modified to enable its use by semi-trailers. Modification of the underpass has been adopted by Council, the RTA, the Rail Access Corporation and WCM in preference to the upgrading of the existing rail crossing as previously planned, and is due for completion in mid-2002. Access to within the Gunnedah Colliery rail loop would be via an existing private rail crossing adjacent to the Gunnedah Colliery train loader. Coal deliveries from the Whitehaven Mine to the siding access road, and reject backloads to the Whitehaven Mine, would continue to be via the Kamilaroi Highway, Blue Vale Road, Hoads Lane and the private mine access road, all of which are components of the existing approved route. The route(s) for the delivery of coal from, and reject deliveries to future, yet to be approved mine developments, would form part of the relevant Development

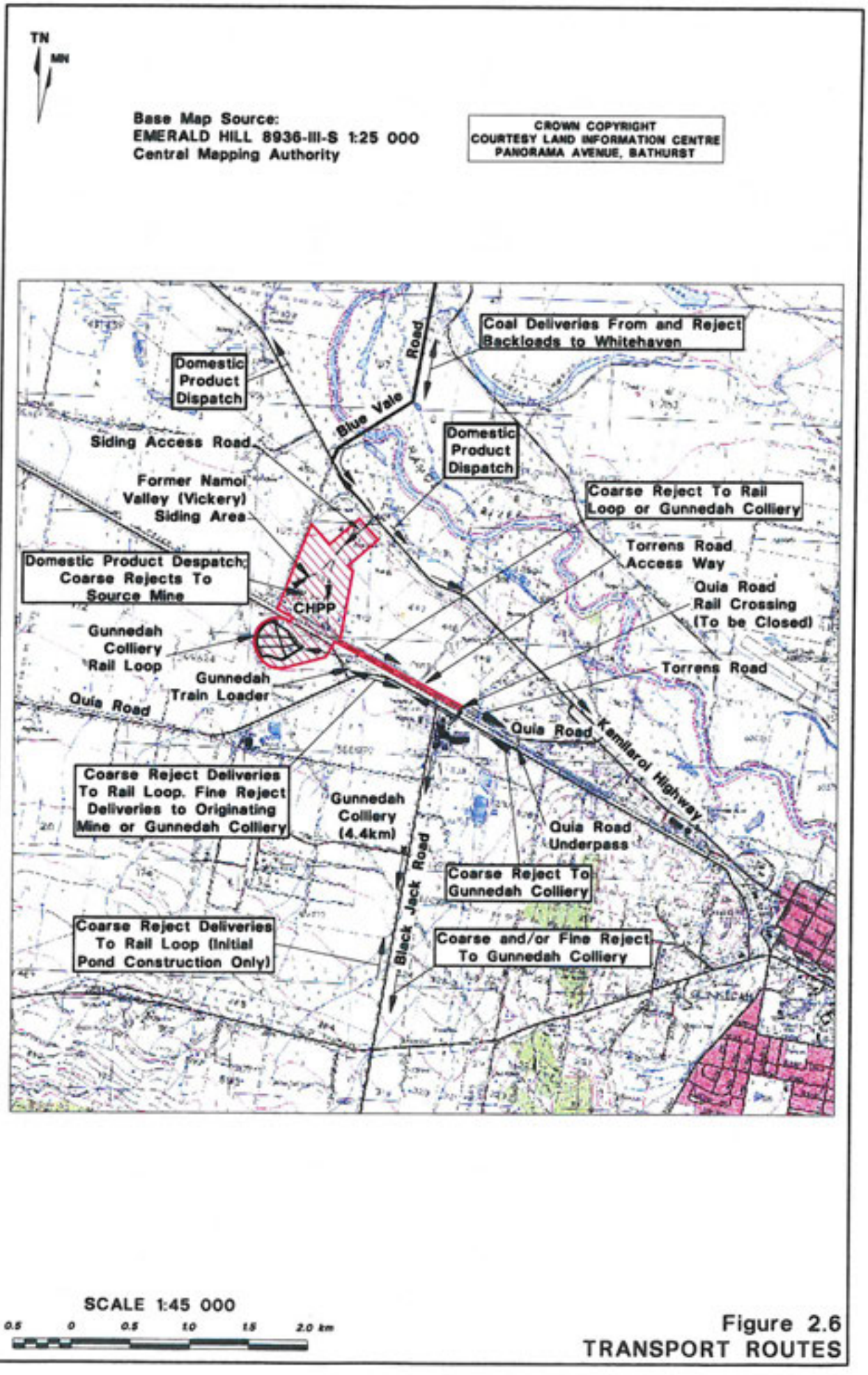

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Figure 2.6
TRANSPORT ROUTES

Applications. Domestic coal despatches averaging 50 000 tpa to 70 000 tpa and primarily destined for markets in the Gunnedah/Tamworth and Narrabri areas, would be via the siding access road to the Kamilaroi Highway and hence via the Highway towards Narrabri or towards and beyond Gunnedah.

2.8.2 Traffic Levels

Table 2.5 presents the estimated daily heavy and light vehicle movements to and from the CHPP and rail loop components of the Project Site during:

- the initial construction phase;
- CHPP operations; and
- fine reject pond cleanout and refurbishment.

The estimated average daily and maximum hourly heavy vehicle movements for coal delivery, reject backloading and fine reject pond cleanout and refurbishment assumes the use of 27 t capacity semi-trailers. However, with the potential future use of some truck and super dog trailers and B-doubles for raw and domestic product coal transportation and reject back-loading, this approach is considered to be conservative.

Table 2.5
Estimated Construction and Operational Traffic Movements

Activity	Route *1	Average Daily Vehicle Movements		Worst Hourly Case Heavy Vehicle Movements	
		Heavy Vehicles	Light Vehicles	Heavy Vehicles	Light Vehicles
SITE DEVELOPMENT/CONSTRUCTION PHASE					
CHPP component delivery to siding	Kamilaroi Highway	6	-	4	-
Construction equipment . to siding . to rail loop	Kamilaroi Highway Kamilaroi Highway and Quia Road or Oxley Highway, Black Jack and Quia Roads.	< 1 < 1	- -	4 4	- -
Transit mixer	Kamilaroi Highway	14	-	8	-
Coarse rejects delivery to rail loop	Black Jack Road, Quia Road	88	-	10 *6	-
Workforce . to siding . to rail loop	Kamilaroi Highway Black Jack Road, Quia Road	N/A N/A	30 12	N/A N/A	10 6
OPERATIONAL PHASE					
Coal Delivery . 750000 tpa *2 . 2Mtpa *3	Kamilaroi Highway Kamilaroi Highway	186 *6 424 *6	- -	16 *6 Unknown *4	- -
Reject backloading *5	Torrens Road, Quia Road, Black Jack Road	5 *6	-	4 *6	-
Fine reject pond cleanout and re-furbishment	Quia Road, Black Jack Road	88 *6	8	14 *6	6
WORKFORCE . 750000 tpa *2 . 2Mtpa *3	Kamilaroi Highway Kamilaroi Highway	- -	10 24	- -	6 10

*1 - To siding access road or Torrens road access way.
*2 - Whitehaven Coal Mine maximum approved production.
*3 - Maximum throughput sought under Development Application – assumed 7 day delivery/350 days pa
*4 - Maximum hourly movements would depend on approved hours of transport which, in turn, would be subject to the individual Development Approvals.
*5 - To Gunnedah Colliery only. Coarse and fine reject backloads to Whitehaven or other source mines would not generate additional traffic movements.
*6 - Assuming 27 t payload.

2.9 INFRASTRUCTURE AND SERVICES

2.9.1 Infrastructure

Additional infrastructure to be installed on the Project Site, together with the relevant Building Code of Australia (BCA) classifications are as follows:

i)	50 tonne capacity feed hopper	(BCA Class 10 b)
ii)	crusher	(BCA Class 10 b)
iii)	coal preparation building	(BCA Class 10 a)
iv)	feed conveyor	(BCA Class 10 b)
v)	office building	(BCA Class 5)
vi)	toilet/bathhouse building	(BCA Class 10 a)
vii)	sub-station and transformer	(BCA Class 10 b).

Each of items (v) and (vi) would comprise ATCO-type transportable buildings which would be placed on block or concrete foundations and anchored to the ground to prevent dislocation during periods of high winds.

2.9.2 Services

2.9.2.1 Water

Potable Water

Potable water is currently transported to the Project Site by truck from Gunnedah to supplement water collected from the Administration building roof. As part of this current Development Application, WCM proposes to extend the existing town water supply line which services the nearby Gunnedah Colliery train loader. The extension would comprise a 50 mm diameter poly line which would pass beneath the North-Western railway line via an existing box culvert, and hence along the Torrens Road access way to the siding area and the appropriate buildings. The pipeline would be positioned in the culvert so as not to either directly or indirectly impede flows.

Process Water

At the maximum throughput sought under this Development Application, an estimated 210 ML pa water would be required to account for dust suppression and process water make-up requirements (see Section 4.2.6) and would be supplied on a daily basis from the main storage dam. Water within the main storage dam would comprise a combination of:

- clarified surface run-off which discharges from settlement ponds SP-1 and SP-2, together with any diverted clean water flows originating from the rail loop and areas to the south;

- reticulated water supplied via the existing branch line which extends from the private Namoi River to Gunnedah Colliery pipeline. WCM, through Namoi Mining Pty Ltd has a current allocation of 350 ML pa for industrial/mining

purposes sourced from the Namoi River and an adjacent bore (No. GW60356); and

- a groundwater bore (No.GW60356) located on the adjacent "Cedar Vale" property. This bore, with a permitted annual extraction of 104 ML, was formerly used to supply dust suppression water requirements to the Vickery rail siding/train loader area. WCM has an agreement in place with the owners of "Cedar Vale" for the use of this bore if required.

2.9.2.2 Power

Power to the siding site is currently supplied by a 22 kV line which supplies the existing coal loader and administration building via a 22 kV/415V sub-station. The existing sub-station would be retained with an additional 22 kV/11 kV sub-station with an 11 kV/415 transformer installed to provide coal preparation plant and ancillary requirements.

Power to the recovery pond pump would be supplied via an extension to the existing supply which crosses the North-Western railway line and rail loop and services the rail load-out bin.

2.9.2.3 Sewage

A pump-out-type septic system would be installed to service the proposed new bathhouse/toilet building within the coal truck parking and administration area, with pump-outs undertaken on an 'as needs' basis, that is, as is currently the case with the existing facilities on the Project Site.

2.9.2.4 Communications

The six (6) telephone land lines currently servicing the siding area, together with mobile telephones, are considered adequate for CHPP operations and off-site communications. UHF radio communication is also used for contact between the existing administration building and the Whitehaven Coal Mine, and between trucks, light vehicles and mobile equipment. The radio system would be extended to incorporate the coal preparation and all appropriate buildings.

2.9.2.5 Fuel

Diesel fuel requirements for the Project Site-based mobile equipment and the coal haulage trucks would be supplied from the existing bunded 20 000 L and a proposed 50 000 L diesel fuel storage tank respectively. The additional tank would be bunded and signage installed in accordance with EPA and WorkCover fuel storage requirements (see Sections 4.2.5.3 and 4.2.8.1). Unused oils and grease would also be stored within the bund, as would the waste oil collection tank.

Equipment and truck refuelling would be undertaken within a wash bay connected to an oil separator. Water discharging from the separator would be directed to settlement pond SP-1 (**Figure 2.2**) and then flow to the main storage dam from which it would be reclaimed for use in the CHPP. Waste oil from the separator would be stored within the bunded waste oil collection tank.

2.10 SAFETY/SECURITY MANAGEMENT

WCM would adopt a pro-active approach towards employee and public safety in the various component areas of the Project Site, as well as complying with the

requirements of the WorkCover NSW, the Occupational Health and Safety Act 2000 and other relevant legislation. Safety management systems, similar to those currently in place at the Gunnedah Colliery coal preparation plant and train loader, would be developed to cover all aspects of the proposed operations. These systems would include a requirement for permits to undertake specific activities, eg digging of trenches, lifting in the vicinity of power lines.

Specific safety/security measures to be implemented during the construction and operation of the various components of the CHPP would include:

- employee induction in safe working practices and regular follow-up toolbox safety meetings and reviews;

- regular employee training in all aspects of CHPP operations including hazard identification and risk management, fire fighting system and equipment use. A risk assessment would be undertaken prior to individual activities being undertaken;

- maintenance of existing stock fencing around the various component areas of the Project Site. Additional security fencing would be provided around the coal truck parking and administration compound;

- maintenance of lockable gates on the various access points to the Project Site, ie at the access road/Kamilaroi Highway, Torrens Road access way/Torrens Road and Gunnedah Colliery train loader/Quia Road intersections. The individual gates would be locked whenever the relevant component area is unoccupied or not being utilized. Locked gates would also be maintained on the footway and access ladders to the train load-out bin;

- installing security/warning signs at strategic locations around and within the Project Site. The nature and position of the warning signs would be determined by the activity undertaken and the potential risks. For example, around the rail loop, signs indicating the presence of water and low-bearing capacity (fine reject) materials would be installed, whereas on the siding component of the Project Site, signs would include warnings relating to the movement of trucks and heavy machinery, the presence of power lines, and hearing, eye protection and hard hat requirements in specific areas;

- ensuring all mobile equipment is fitted with appropriate safety equipment, is well-maintained and operated in a safe manner at all times;

- ensuring all transportation activities are undertaken in accordance with WCM's Transport Policy and Code of Conduct; and

- design, construction, installation and maintenance of all buildings in accordance with relevant requirements of the Building Code of Australia.

2.11 FUTURE OF THE GUNNEDAH COLLIERY COAL PREPARATION PLANT AND TRAIN LOADING FACILITY

WCM's current proposal represents an opportunity to improve the efficiencies of its existing Whitehaven operation through the employment of more modern coal preparation technology and reduced direct and indirect transportation and operating costs. These improvements would also reflect positively on the feasibility of future potential coal mine developments to the north of the North-Western railway line.

However, as the potential still exists for future development of further coal reserves within the Gunnedah Colliery leases and elsewhere to the south of the railway line, WCM proposes to maintain both the existing Gunnedah Colliery coal preparation plant and siding area under a care and maintenance regime pending reserve evaluation: decommissioning and rehabilitation of the existing facilities prior to that time would adversely affect the economic feasibility of any such future developments.

Notwithstanding, WCM recognizes that placement of these facilities under care and maintenance would necessitate it (through Namoi Mining Pty Ltd) undertaking a range of environmentally-based activities to reflect the reduced presence on the two sites. The nature and timing of the activities to be undertaken would be determined in consultation with the staff of Council, the Department of Mineral Resources, Environment Protection Authority, Department of Land and Water Conservation and other relevant Authorities.

2.12 REHABILITATION

2.12.1 Introduction and Objectives

WCM is committed to the concept of rehabilitation of areas of disturbance and where practicable, would progressively undertake the works required to achieve the following short-and/or long-term objectives.

i) Ensure all earthworks, including temporary stockpiles of soil and other erodable materials are stable and not subject to erosion.

ii) Minimize the areas of disturbance and hence the quantity of potentially sediment-laden run-off generated on the Project Site.

iii) Separate clean and potentially sediment-laden ("dirty") water.

iv) As far as practicable, blend any created landforms with the surrounding land fabric.

v) In the longer term, leave the land affected by the various CHPP activities in a safe and stable condition which is commensurate to a range of potential land uses.

However, given that all areas of existing or proposed disturbance or activity, or existing or proposed features on the Project Site which may ultimately be subject to some form of rehabilitation activity would be required for the life of the CHPP, rehabilitation works during the life of the CHPP would be primarily of a maintenance and/or aesthetic nature.

The following sub-sections describe the final landform on completion of all CHPP activities and identify the procedures to be employed in the rehabilitation of the fine reject pond and siding components of the Project Site. Routine maintenance activities and enrichment plantings/visual screening to be undertaken throughout the life of the CHPP are also discussed.

2.12.2 Final Landform

Figure 2.7 presents the final landform on the Project Site following the decommissioning of the CHPP, assuming the utilization of all identified available fine reject storage capacity within the rail loop, ie fine reject ponds RP-1 to RP-6 inclusive.

Major features of the final landform as presented on **Figure 2.7** include:

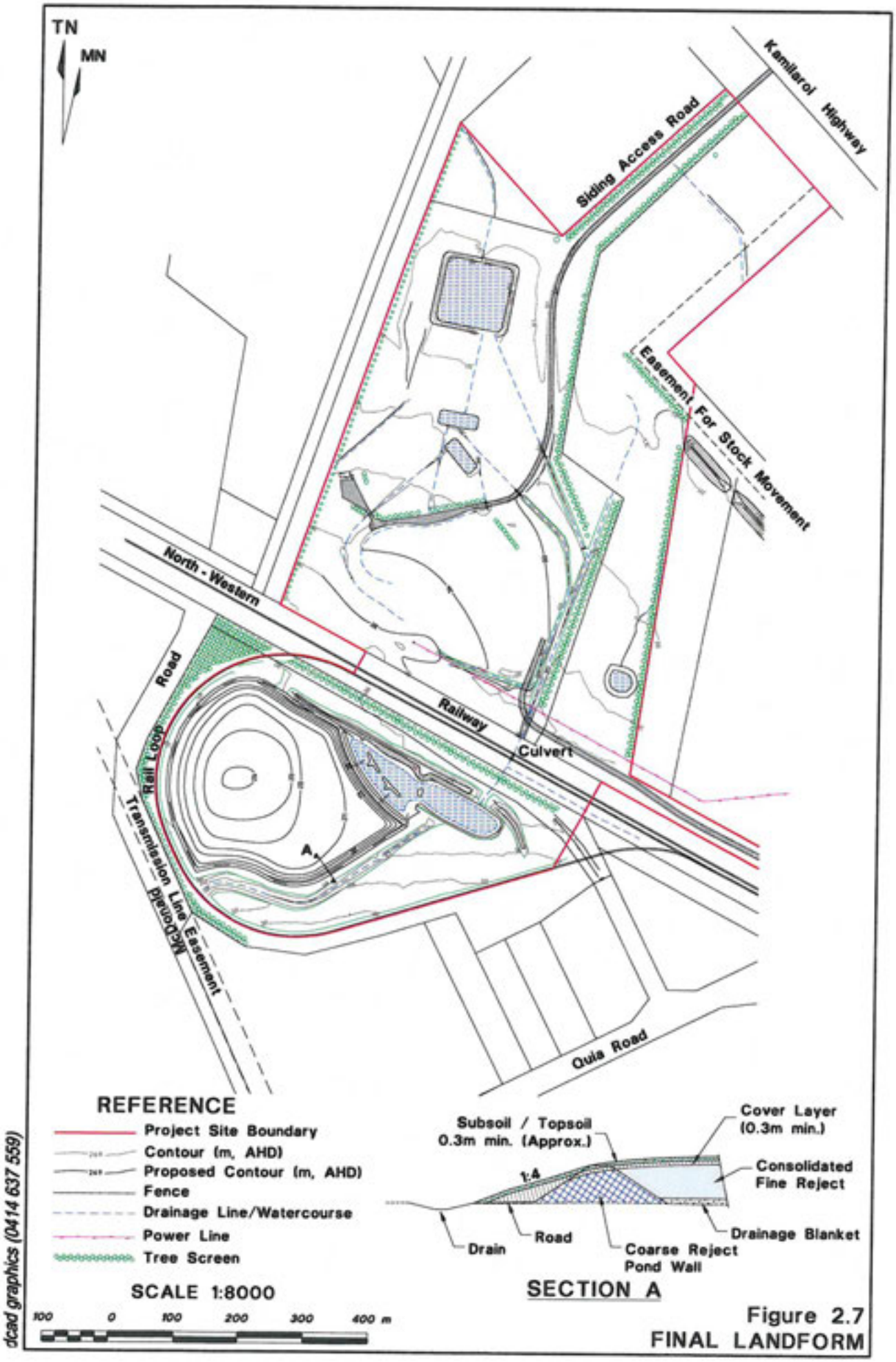


Figure 2.7
FINAL LANDFORM

- a 7.3 ha elevated knoll within the area of the former fine reject ponds. The knoll would have peripheral batter slopes of 1:4 (V:H) or less to approximately 3.5 m above the pre-development natural landform and a crest height of up to 274 m AHD;

- the rail loop settlement, polishing and recovery ponds interlinked with the existing rail loop fresh water dam and the diversion channel which currently passes through the loop. Sections of the former internal pond walls would be battered down and retained as refuges for fauna. Both the existing diversion channel and fresh water dam would be undisturbed by CHPP operations; and

- the siding area access road, main storage dam, settlement ponds SP-1 and SP-2 and associated channels/drains, the Torrens Road access way and the former CHPP administration building, all of which would be of benefit to any future land use or uses for the area. Subject to the proposed land use at the time, additional features may also be retained.

Screen plantings established by the former owners or WCM (see Section 2.12.4) would be retained.

2.12.3 Rehabilitation Procedures

2.12.3.1 Fine Reject Ponds and Rail Loop Water

Management Structures

Based on experience at the Gunnedah Colliery and elsewhere, it is estimated that a period of approximately one to two years would be required for 2 m thick fine reject to consolidate sufficiently to allow the safe movement of earthmoving equipment. Rehabilitation of all fine rejects ponds would be undertaken concurrently

commencing approximately 2 years following the cessation of CHPP operations and involve the following activities.

- Reduction of external pond batter slopes to 1:4 (V:H). Batter slope reduction would be achieved by either, or a combination of:

  i) placement of additional coarse reject fill materials against the batter toe and re-profiling to achieve the desired final batter gradient; and/or

  ii) battering-down the pond wall and consolidated fines.

- Filling the internal voids and drainage lines between the individual reject ponds with coarse and/or fine rejects.

- Placement of a minimum 0.3 m cover layer over the pond and batter surfaces. The thickness of the cover layer would be determined at the time and designed to function as bridging layer which would assist the safe movement of earthmoving equipment. The bulk of the cover/bridging layer would comprise previously deposited earth and rock spoil removed during pond preparation activities, with any shortfall in materials sourced from the dump hopper ramp or remaining stockpiled coarse reject at the siding. The bridging layer would then be capped with previously stockpiled subsoil and topsoil giving a minimum total cover thickness of approximately 0.6 m over the consolidated fine reject (**Figure 2.7**). In the absence of available subsoil and topsoil, a capping of previously dumped and stockpiled spoil which is known to support a vegetative cover may be used.

- Installation of contour or graded banks on the upper surface and re-profiled batters to reduce run-off velocity and direct flows to the natural surface.

- Pasture sowing using a mixture of species appropriate to the season. The seed mixture would include fast-growing non-persistent cover species and perennial grasses and legumes. A list of suitable warm and cool season grasses and cool season legumes is presented in **Table 2.6**. A suitable fertilizer would be applied at the time of seeding, with maintenance applications as necessary.

Table 2.6
Rehabilitation Species

Species	Rate (kg/ha)
Warm Season Grasses – Bombatsi Panic	1 – 2
Green Panic	2 – 4
Rhodes Grass	1 – 2
Purple Pidgeon Grass	1 – 2
Cool Season Grasses - Phalaris (Sirolan or Holdfast)	1 – 2
Wallaby Grass	0.3 – 1
Cool Season Legumes – Barrel (Sephi) Medic	2 – 4
Snail (Sava) Medic	3 – 5
Woolly Pod Vetch	4 – 6
Serradilla (Elgara)	1 – 2
Lucerne	0.5

Following the rehabilitation of the former fine reject ponds, the external drains and former settlement, polishing and recovery ponds would be desilted, earthworks undertaken to interlink these ponds with the fresh water dam (while retaining sections of the former internal pond walls as fauna refuges), topsoil applied, and the surfaces seeded with species such as Green Panic, Rhodes Grass, Snail Medic or other species which have a specific soil conservation application. Wetland species

such as *Juncus* sp would be planted around the former ponds and on the faunal refuges.

2.12.3.2 Siding Area

The rehabilitation procedures to be employed on the siding area following the completion of all coal handling and preparation activities would be determined at the time based on the planned use of the land by WCM or others, but would potentially involve:

- removal of all buildings other than the Administration building. Building removal would include the excavation and disposal of concrete foundations;
- removal of the washery structure and componentry (including foundations);
- removal of the coal load-out conveyor structure and bin. The reclaim tunnel would be exposed and filled using materials from the elevated ramp;
- removal of all on-site roads other than the siding access road to the Administration building and the private Torrens Road access way;
- following removal of any remnant coal, removal and/or ripping of compacted materials in the area of the coal pads, truck parking and hardstand areas;
- removal of the truck wash;
- removal of the fuel tanks and bunding, water tanks, surface water pipelines, any electrical sub-stations and other infrastructure owned by WCM;

- back-filling septic tanks;

- removal of any accumulated sediment in the settlement ponds;

- installation of appropriate drainage controls to prevent erosion and maximise water storage within the settlement ponds and main storage dam; and

- application of available subsoil and topsoil and seeding all disturbed surfaces. The soil materials would be sourced from the bunds within the north-eastern corner of Lot 111.

2.12.4 Enrichment Planting and Visual Screening

Figure 2.1 shows the location of extensive tree plantings in the siding area which were primarily undertaken by the former owners in order to reduce the visibility of their facilities and activities from the Kamilaroi Highway. The tree heights currently range up to 8 m. Further such plantings would be undertaken by WCM following receipt of development approval, with emphasis on:

- screening the fine reject ponds from McDonald Road and the North-Western railway line: extensive natural vegetation between Quia Road and the rail loop provides effective screening from Quia Road;

- establishment of tree lots to the north and east of the truck wash; and

- establishment of vegetation screens along the western and eastern boundaries of the siding area. Indicative location of the additional plantings are shown in **Figure 2.2**.

The species planted would comprise a selection of those occurring naturally within the local area including Bimble Box, Pilliga Grey Box, Wilga, White Cypress Pine, River She-Oak and Yarran.

2.12.5 Rehabilitation Maintenance

WCM's commitment to effective rehabilitation of areas of existing and proposed disturbance, minimization of erosion and visual screening, would involve an ongoing maintenance programme both during CHPP operations and following plant decommissioning including:

- regular inspections of all drainage lines and controls for evidence of erosion or sedimentation and implementation of appropriate rectification works. Rectification works (if required) would potentially involve a combination of physical and vegetative treatments and would be designed on a case-by-case basis in consultation with the Department of Land and Water Conservation;

- monitoring of vegetation establishment on the former fine reject ponds and if required, re-topsoiling, re-seeding and additional fertilizer applications;

- installation of tree guards around screen plantings should grazing by native animals be excessive. No domestic stock would be permitted within the Project Site during, or for a period of at least two years following the rehabilitation of the various component areas;

- in-fill screen plantings to replace mortalities; and

regular inspection of all areas of the Project Site for excessive weed growth. Noxious weed eradication programmes would be undertaken in consultation with the local Noxious Weeds Inspector. Nine weed species listed as Noxious for Gunnedah Shire are known to occur on or in the vicinity of the Project Site (see Section 3.7).

2.13 DEVELOPMENT ALTERNATIVES

2.13.1 Introduction

The EP&A Regulation 2000 requires that any feasible alternative to carrying out the proposed designated development be addressed as part of the environmental impact assessment process.

The consideration of feasible alternatives to the proposal as presented in this EIS related primarily to the site for the CHPP and the "no development option", ie not proceeding with a coal preparation plant. Alternative sites for the CHPP are discussed in Section 2.13.2 while the "no development option" is discussed in Section 5.3 of this Statement.

2.13.2 Alternative Sites for the CHPP

During the planning for a CHPP, WCM investigated the installation of the CHPP within ML 1471, that is, the site of the Whitehaven Coal Mine, as well as undertaking a preliminary search for other potential sites in the Gunnedah/Boggabri area. Though having the short-term advantages of being in close proximity to the source of Whitehaven coal, reducing the number of coal truck movements to and from the Whitehaven Coal Mine by approximately 15 per cent and being further removed from residential premises than the proposed site, location of a CHPP at

Whitehaven was ultimately rejected in favour of the Project Site for the following reasons.

i) A CHPP at Whitehaven would necessitate development of a "greenfields" site with the disturbance of land and vegetation which would otherwise be unaffected by mining. Conversely, the siding area, Torrens Road access way and rail loop comprised existing areas of disturbance;

ii) a lack of available water at Whitehaven for CHPP operations. To obtain a reliable supply of water, a pipeline would need to be installed from the Namoi River: water was readily available on the Project Site;

iii) a lack of reticulated power and the cost of extending a power line from south of the former Vickery Mine: reticulated power was already installed to the Project Site;

iv) a plant at Whitehaven would not necessarily be suitably located or readily accessible to future coal mine developments in the Gunnedah/Boggabri area and would potentially necessitate relocation on cessation of mining operations at the Whitehaven Coal Mine. The long-term use of a plant at Whitehaven would also delay the rehabilitation of the site and lease relinquishment. The proposed site, though located further from the Whitehaven Coal Mine, lies adjacent to both the State highway network and a number of radiating roads with access areas to the north, and to the North-Western railway line, as well as incorporating the necessary train loading facilities for the despatch of export coal;

v) apart from power and water and train loading facilities, the siding area also incorporates an extensive array of controls for water and air quality which would otherwise have to be installed at the Whitehaven site.

No other site was found which had more advantages and/or less disadvantages than the proposed site.

Section 3

DESCRIPTION OF THE EXISTING ENVIRONMENT

Preamble

This section examines a wide range of components that collectively form the existing environment on and around the Project Site.

The extent of description and data collection and specialist studies undertaken varies throughout the section and is related to the potential for impacts to occur in association with the development of the proposed CHPP at the Whitehaven siding.

3.1 TOPOGRAPHY

3.1.1 Regional Topography

The regional topography is shown on **Figure 3.1**. The Project Site lies within the basin of the Namoi River, in an area representative of the transition from the higher broken country to the east (in the area of Tamworth) and the open plains to the west (in the Wee Waa and Coonamble areas).

Natural slopes within the region vary from less than 1° along the flood plains of Namoi and Mooki River Valleys to in excess of 20° on the slopes of isolated mountains to the south, east and north of Gunnedah.

Elevations in the region range from 761 m, AHD on King Jack Mountain (approximately 12 km south-south-west of the Project Site) and 886 m, AHD within Kelvin State Forest (25 km north of the Project Site) to less than 260 m, AHD along the Namoi River valley immediately north of the Project Site.

3.1.2 Local Topography

The topography on and within the vicinity of the Project Site is also shown on **Figure 3.1** and shows the Project Site to be located on shallow north-easterly sloping land which grades towards the Namoi River at slopes ranging from 2° to less than 0.5°.

Within the Project Site, the natural topography has been modified to varying degrees in association with the development of the former Vickery facilities on the siding area, eg coal pads, ramps and roads, the construction of the North-Western (Werris Creek – Mungindi) railway line and the Gunnedah Colliery rail loop, and various water management or containment structures.

3.2 DRAINAGE, FLOODING POTENTIAL AND GROUNDWATER

3.2.1 Regional Drainage

Figure 3.2 shows the Project Site is located within the Namoi River Basin in mid-Northern NSW. The Namoi River Basin covers an area of approximately 43 000 km^2 and incorporates the centres of Walcha, Tamworth, Gunnedah, Narrabri and Walgett. The Namoi River, one of the main tributaries of the Barwon-Darling River system, flows into the Darling River immediately west of Walgett.

Major rivers upstream of the Project Site contributing to the flows within the Namoi River in the Gunnedah area include the Manilla, MacDonald, Peel and Mooki Rivers. The Manilla and MacDonald Rivers flow via Keepit Dam.

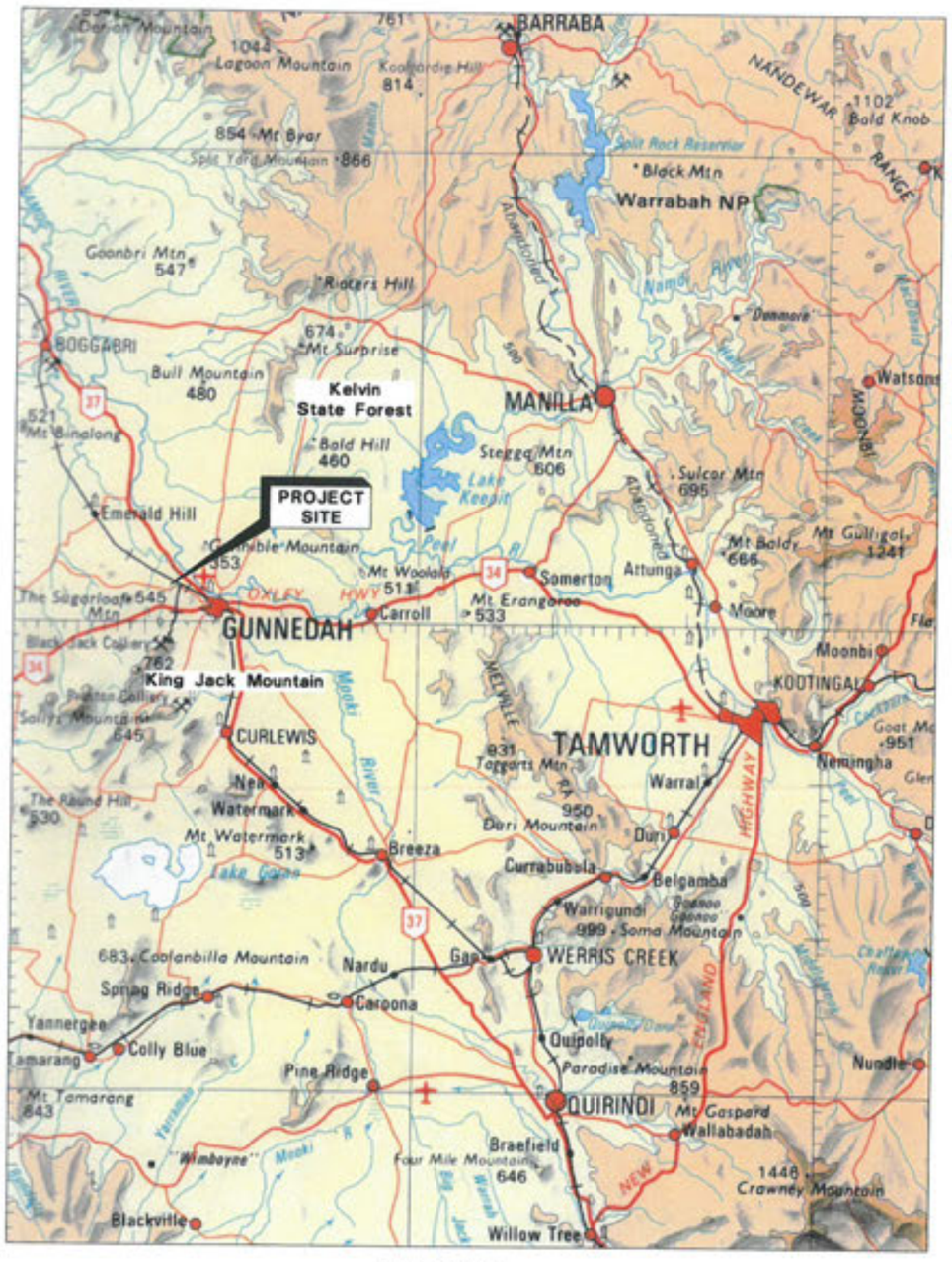
The Namoi River catchment upstream of the Project Site covers an area of approximately 17 100 km^2.

3.2.2 Local Drainage

The local drainage in the area of the Project Site is also presented on **Figure 3.2**. **Figures 3.2** and **2.1** show the natural drainage patterns to have been substantially modified by the construction of the Gunnedah Colliery rail loop and former Vickery siding area, water storages, and a network of drainage channels which were installed to divert water around, or direct water to the various storages.

Surface water run-off from within the rail loop (and from a natural drainage line which emanates from the south of the loop) flows to the internal settlement pond (SP-3 – **Figure 3.2**) and/or the fresh water dam, with any overflow diverted via a box

Base Map Source:
Sheet 83 - Tamworth
Readers Digest Atlas of Australia



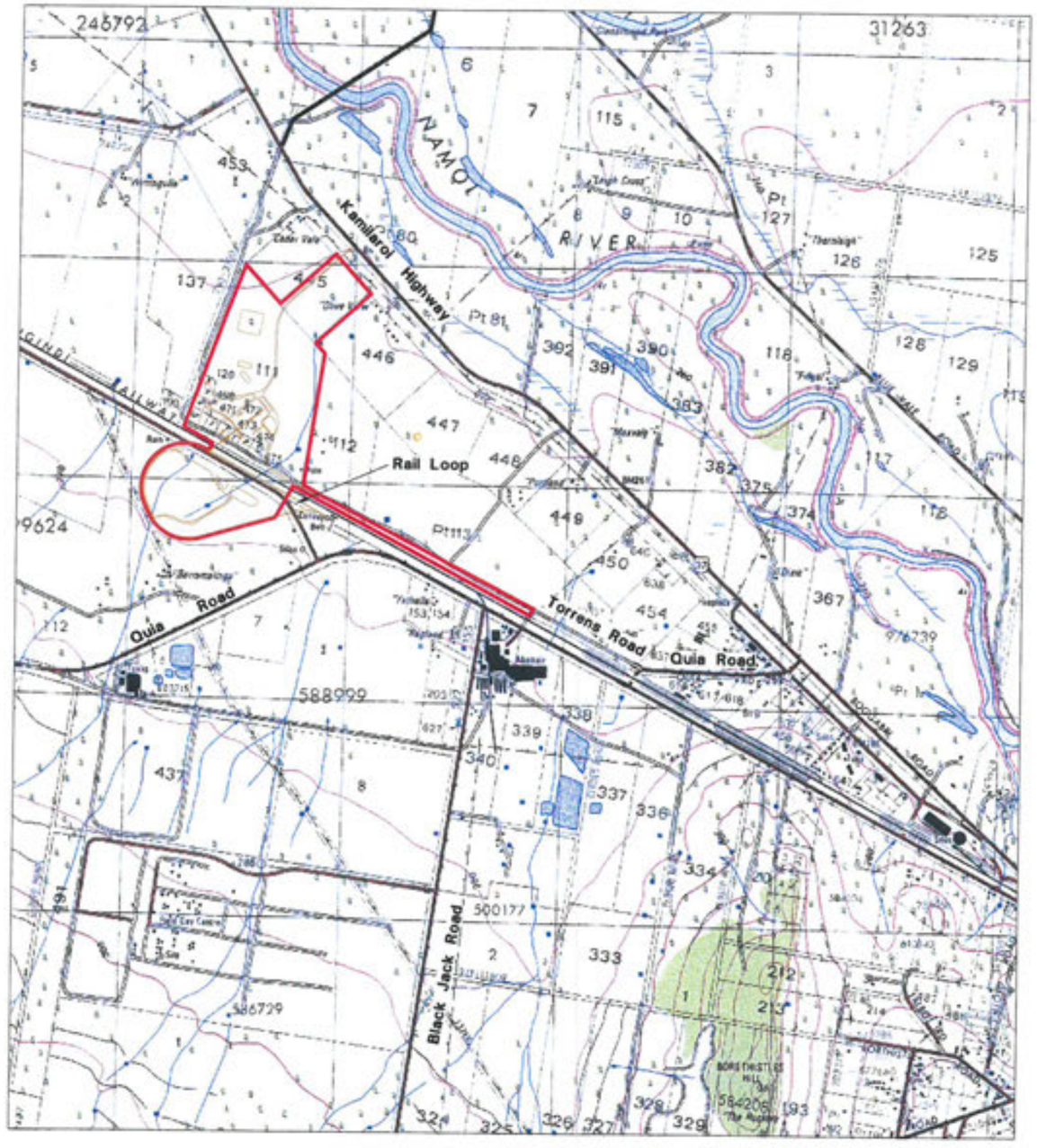
REGIONAL

SCALE 1:750 000

5 0 10 20 30 40 50 km

TN
MN

Base Map Source:
EMERALD HILL 8936-III-S 1:25 000
Central Mapping Authority



LOCAL

SCALE 1:25 000

0.5 0.25 0 0.5 1 1.5 km

Note: For Existing Contour Details In Project Site See Figure 2.1

Figure 3.1
TOPOGRAPHY

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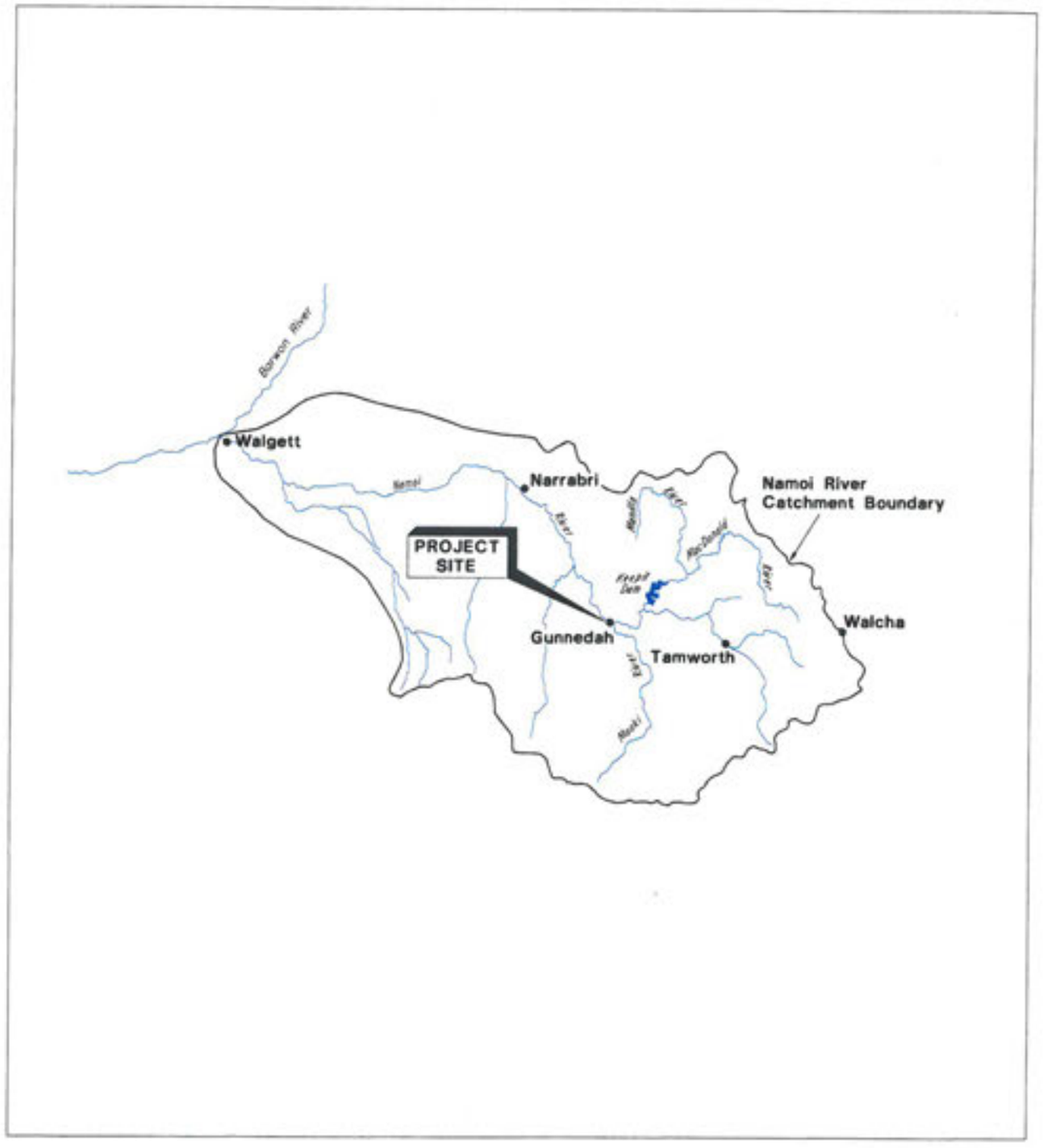


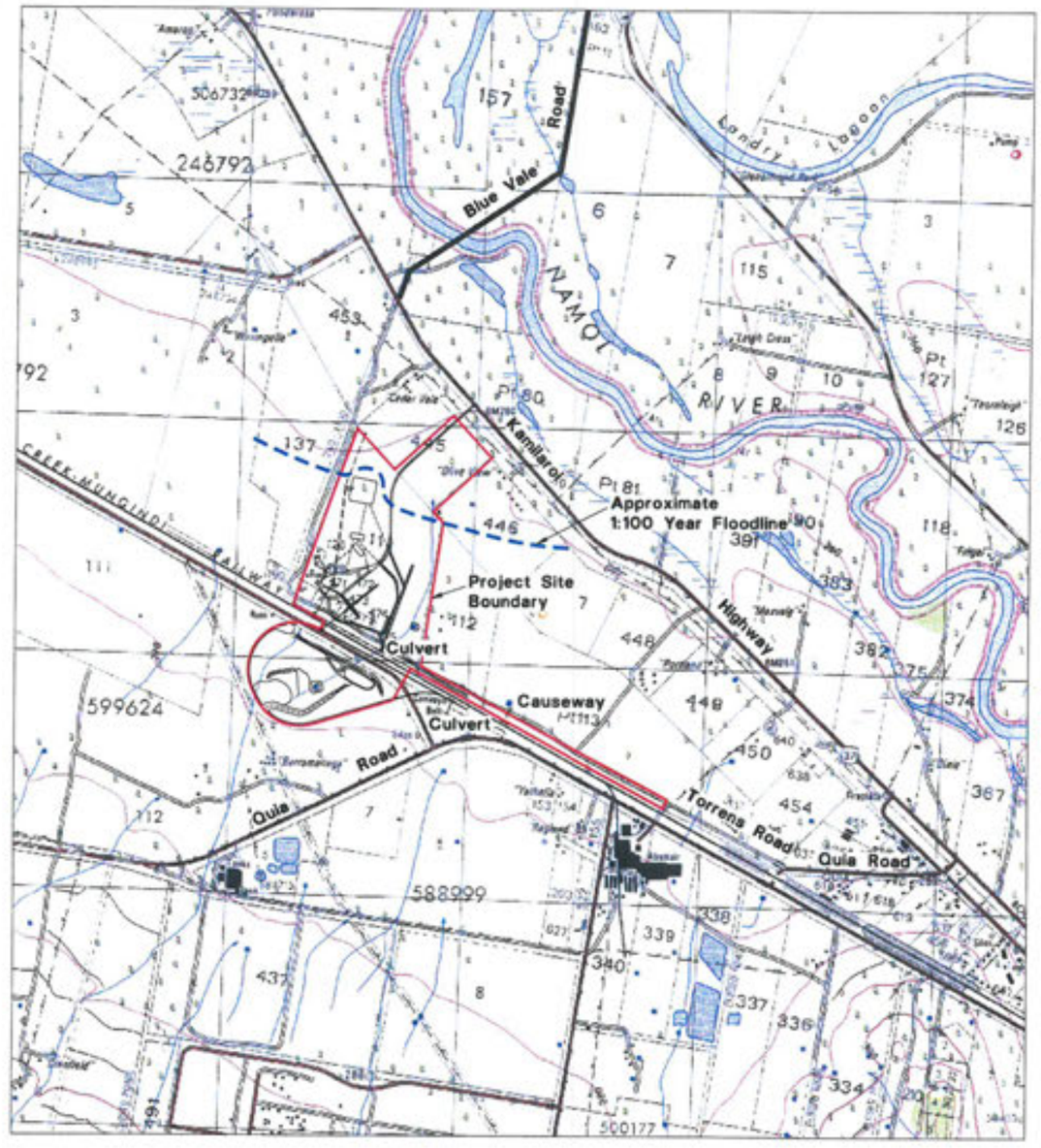
REGIONAL DRAINAGE

SCALE

50 0 50 100 km

TN
MN

Base Map Source:
EMERALD HILL 8936-III-S
1:25 000 Central Mapping Authority



LOCAL DRAINAGE

SCALE 1:25 000

250 0 250 500 750 1000 1250 m

REFERENCE

Project Site Boundary

CHPP Facilities

dcad graphics (0414 637 559)

Figure 3.2
DRAINAGE AND FLOODING POTENTIAL

culvert below the North-Western railway line. Water passing from the culvert then flows in a northerly direction to the east of the siding area and hence, either towards the main storage dam or the Namoi River. During the period to 1998, a concrete diversion weir and gate was used to direct water to the main storage dam under low flow conditions. Under high flow conditions or periods when all flows were assessed to satisfy discharge criteria, the gate was closed and the flows directed towards the river. The main storage dam, a turkey's nest structure with walls projecting up to 2 m above the surrounding natural surface, incorporates a 600 mm diameter discharge pipe approximately 1.5 m below the dam wall crest. High level flows from the dam, if occurring, are to the south and west of the structure via natural depressions within the landform.

All water originating from areas of disturbance within the siding area is directed to the two 0.66 ML capacity settlement ponds (SP-1 and SP-2 – **Figure 3.2**) which also discharge to the main storage dam. The settlement ponds currently contain extensive reed growth which assists in the filtration of sediments from the run-off.

External to the former siding water management system, surface run-off flows in a north-easterly direction, with box culverts and causeways directing flows from areas to the south beneath the North-Western railway line and the Torrens Road access way. The railway culvert capacities (cross-sectional areas of approximately 3 m^2), control the rate of stormwater flow from south of the railway line onto and through the Project Site and adjacent lands.

3.2.3 Flooding Potential

Much of the Gunnedah Shire comprises a natural floodplain and has always been associated with flooding at times of high flow in the Namoi, Peel and Mooki River sub-catchments. The most extensive floods occur when high flows in the Mooki and

Namoi Rivers coincide. The Namoi River is also influenced by the Manilla and Peel Rivers upstream. Downstream of the Gunnedah township, the low river gradient and flat topography can combine to cause widespread shallow inundation on both sides of the main Namoi River channel.

Occurrence of floods is irregular, with critical flood levels having been recorded in every month of the year. The most severe floods have occurred during the months of January and February when summer cyclonic systems reach the area, or in June and July following the influence of upper low pressure cells. Flood levels can be modified to some degree by the management of Keepit Dam, 55 kms upstream of Gunnedah town (**Figure 3.2**). Keepit Dam, the largest storage on the Namoi River system, is primarily operated as a conservation storage. However, it can be used for flood mitigation by controlling releases of water before and after flood levels peak, and preventing any release coinciding with high flood levels in the Peel River, a major tributary joining the Namoi between Keepit Dam and Gunnedah.

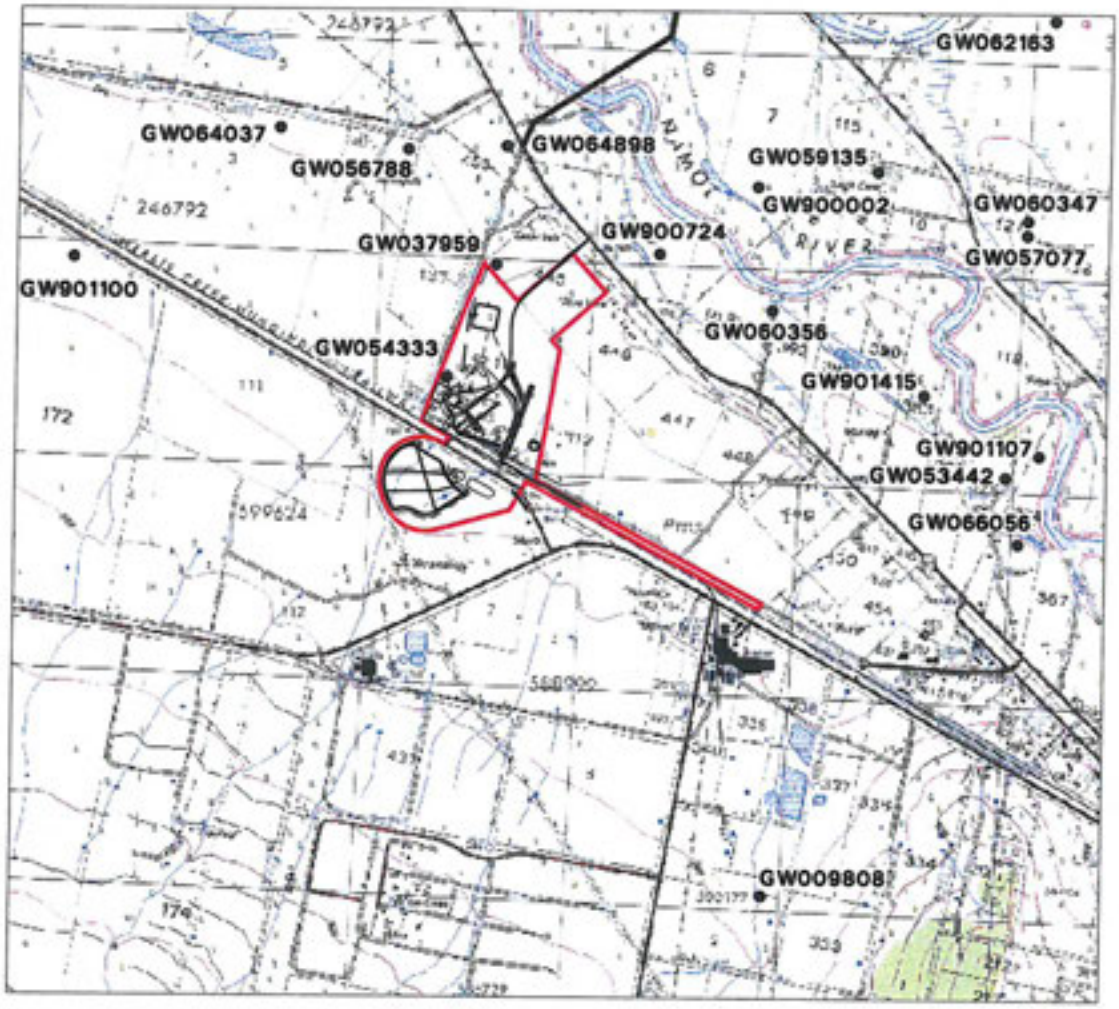
Local flooding can occur within Gunnedah town itself but, even during a 1 in 100 year event, is confined to areas to the north of the North-Western railway line. **Figure 3.2** shows that although the 1:100 year floodline encroaches on the Project Site, the majority of the site, including all facilities on the former siding, remain above this level.

3.2.4 Groundwater Resources

A review of the DLWC groundwater database indicates that there are 18 registered groundwater bores within 1.5 km of the Project Site as shown on **Figure 3.3**. Available information for each of the registered bores is provided in **Table 3.1**. The majority of the bores are located to the north-east of the Project Site, are in close proximity to the Namoi River and used for irrigation purposes. With the exception

TN
MN

Base Map Source:
EMERALD HILL 8936-III-S
1:25 000 Central Mapping Authority



REFERENCE

Project Site Boundary

• GW009808 Registered Groundwater Bore

SCALE 1:35 000

500 0 500 1000 1500m

dcad graphics (0414 637 559)

Figure 3.3
GROUNDWATER BORES

of bore GW054333 which lies adjacent to WCM's administration building and bore GW37959, the former mine production bore on the "Cedar Vale" property which was used to supply dust suppression water to the Vickery siding operations, there are no bores within 1 km of the siding area or 1.5 km of the proposed fine reject storages within the rail loop. Bore GW37959 has an existing allocation of 104 ML pa.

Yields from the bores identified on **Table 3.1** are variable, ranging from less than 1 l/s to 56 l/s while the limited quality data indicates that the groundwater quality is variable, ranging from good to moderately saline.

Within the Project Site the groundwater occurs within the overlying alluvium or in aquifer zones within solid rock below the alluvium.

Table 3.1
Registered Groundwater Bores Within 1.5 km of the Project Site

Bore No. (see Figure 3.3)	Depth (m)	SWL (m)	Aquifer(S)	Yield (l/s)	Quality (Salinity) (mg/L)	Authorised Purpose	Principal Purpose
90110	20.00	1.40	Sandstone/siltstone	ND	8100	Test	Monitoring
064037	43.50	8.00	Sandstone/mudstone	1.12	ND	Domestic, stock	Domestic stock
056788	16.00	9.00	Sand,clay,sandstone	ND	ND	Domestic, stock	Domestic stock
064898	18.00	9.00	ND	ND	ND	Domestic irrigation, stock	Irrigation
054333	17.00	3.00	Sandy gravel	0.28	ND	Domestic, stock	Domestic stock
900724	21.50	9.00	Gravel	ND	ND	Domestic, stock, irrigation	Irrigation
900002	24.30	8.50	Clay and gravel, Gravel and sand	1.20	Good	Domestic, irrigation, stock	Irrigation
060356	25.00	7.30	Sand, gravel	ND	ND	Mining	Mining
059135	29.80	8.50	Sand, gravel	56.00	ND	Domestic, irrigation, stock	Irrigation
901415	20.00	6.50	Sandy gravel, gravel	1.20	Good	Domestic, stock, irrigation	Domestic stock, irrigation
053442	23.00	6.00	Sandy gravel, sand	ND		Domestic, stock	Irrigation
066056	11.00	ND	ND	ND	ND	Irrigation, domestic, stock	Irrigation
009808	99.40	18.30	Clay, shale	0.63	ND	-	Stock
901107	4.00	ND	ND	ND	ND	Domestic, irrigation, stock	Domestic irrigation, stock
060347	21.30	8.30	Gravel	ND	0.500 ppm	Domestic, stock	Irrigation
057077	8.50	0.80	ND	ND	ND	-	Domestic stock. Dry since 1983.
062163	10.00	ND	ND	ND	ND	Domestic, farming, irrigation, stock	ND
037959	17.60	10.60	Gravel	13.89	Good	Domestic, industrial irrigation, stock	Irrigation

Source: Department of Land and Water Conservation

ND – No details recorded or unknown

3.3 GEOLOGY, SOILS, LAND CAPABILITY AND LAND USE

3.3.1 Geology

The Project Site is situated on the Boggabri Volcanics of Early Permian age, and late Permian Porcupine Formation, with a thin alluvial cover present in the areas closer to the Namoi River.

There are no coal resources beneath the Project Site. The Porcupine Formation laps directly onto the Boggabri Volcanics in this locality and the Maules Creek formation (lower coal measures) is not present. The upper coal measures, or Blackjack Group, are stratigraphically higher and have been removed by erosion. There are no mining tenements covering the Project Site.

3.3.2 Soils

Three dominant soil types occur within or adjacent to the Project Site, namely Euchrozems, Euchrozems overlain by recent alluvium (in low lying areas) and Brown clay soils overlain by recent alluvium.

The Gunnedah District Technical Manual prepared by the Soil Conservation Service of NSW (now DLWC) provides the following general morphological descriptions for Euchrozems and Brown clay soils.

Euchrozems – strongly structured soils with a somewhat lower clay content near the surface, weak horizon differentiation and a neutral to slightly alkaline reaction trend. The surface soil is clearly defined and consists of reddish brown to dark-brownish red clay loam on a light clay. The Euchrozems pose no special erosion control problems.

Brown Clay Soils – generally weakly differentiated light to medium clays with a brown to grey brown colour throughout the profile; a neutral surface pH and alkaline at depth.

Areas of the Project Site undisturbed by prior development activities carry an extensive vegetative cover, with little evidence of erosion. However, in the 1986 Namoi Valley Coal Project (Vickery) EIS, it was noted that the area had been

heavily cultivated and that minor gully and sheet erosion was evident at that time. Existing evidence of erosion on or adjacent to the Project Site is limited to minor scouring in some drainage channels, at exit points from culverts beneath the North-Western railway line and in other areas of concentrated flows, eg in causeways on the Torrens Road access way.

3.3.3 Land Capability

3.3.3.1 Introduction

Land capability is defined by the NSW Soil Conservation Service (Houghton & Charman, 1986) as "the ability of land to accept a type and intensity of use permanently, or for specified periods under specific management, without permanent damage. It is an expression of the effect of biophysical land resources, including climate, on the ability of land to sustain use without damage under various uses. Land capability involves consideration of:

- the various land resource attributes;
- the production to be obtained from the land;
- the activities or inputs required to achieve that production;
- the risks of damage to the land … resulting from those activities; and
- the inter-relations of the above".

Based on this concept, a system of land capability classifications was developed in the United States and modified to suit local conditions by the former Soil Conservation Service of NSW.

This classification system was based on an assessment of the biophysical characteristics of the land, the extent to which these would limit a particular type of land use, and the technology that was available at the time for the management of that land. The classification system is described in Emery (undated).

The method of land capability classification takes into account a range of factors including the local climate, soils, geology, geomorphology, soil erosion, topography and the effects of past land uses. The classification does not necessarily reflect the existing land uses. Rather, it indicates the potential of the land for such uses as crop production, pasture improvement and grazing.

A summary table from Emery's article which defines each of the eight classes, together with interpretations and implications of each class, is presented in **Table 3.2**. The classification presented in **Table 3.2** has a hierarchical sequence, ranging from Class I land, i.e. land with the greatest potential for agricultural or pastoral use, to Class VIII land, i.e. land which is entirely unsuitable for either. It is also worth noting that the classification recognizes land that has been disturbed by past or current mining activities.

Table 3.2
Land Use Capability

Classification	Soil Conservation Practices	Interpretations and Implications
I	• No special soil conservation works or practices	Land suitable for a wide variety of uses on fertile soils, with the highest potential for agriculture. Includes "prime agricultural land".
II	• Soil conservation practices such as strip cropping, conservation tillage and adequate crop rotation.	Usually gently sloping land suitable for a wide variety of agricultural uses. Has a high potential for production of crops on fertile soils similar to Class 1, but increasing limitations to production due to site conditions. Includes "prime agricultural land".
III	• Structural soil conservation works such as graded banks, waterways and diversion banks, together with soil conservation practices such as conservation tillage and adequate crop rotation	Sloping land suitable for cropping on a rotational basis. Generally used for the production of the same type of crops as listed for Class 1, although productivity will vary depending upon soil fertility. Individual yields may be the same as for Classes I and II, but increasing restrictions due to the erosion hazard will reduce the total yield over time. Soil erosion problems are often severe. Generally fair to good agricultural land.
IV	• Soil conservation practices such as pasture improvement, stock control, application of fertilizer and minimal cultivation for the establishment or re-establishment of permanent pasture. • Occasional cultivation. • Suitable for grazing.	Land not suitable for cultivation on a regular basis owing to limitations of slope gradient, soil erosion, shallowness or rockiness, climate, or a combination of these factors. Comprises the better classes of grazing land of the State and can be cultivated for an occasional crop, particularly a fodder crop, or for pasture renewal.
V	• Structural soil conservation works such as absorption banks, diversion banks and contour ripping, together with the practices as in Class IV. • Occasional cultivation. • Suitable for grazing.	Land not suitable for cultivation on a regular basis owing to limitations of slope gradient, soil erosion, shallowness or rockiness, climate, or a combination of these factors. Soil erosion problems are often severe.
VI	• Soil conservation practices including limitation of stock, broadcasting of seed and fertilizer, prevention of fire and destruction of vermin. May include some isolated structures • No cultivation • Suitable for grazing	Productivity will vary due to the soil depth and the soil fertility. Comprises the less productive grazing lands.
VII	• Land best protected by green timber.	Generally comprises areas of steep slopes, shallow soils and/or rock outcrop. Adequate ground protection must be maintained by limiting grazing and minimizing damage by fire. Destruction of trees is not generally recommended.
VIII	• Cliffs, lakes or swamps and other lands unsuitable for agricultural and pastoral production.	Land unusable for agricultural or pastoral uses. Recommended uses are those compatible with the preservation of the natural vegetation, namely: water supply catchments, wildlife refuges, National and State parks and scenic areas.
M	• Mining and Quarrying areas	
Source: Emery (Undated)		

3.3.3.2 Land Capability Classification

The 1:100 000 scale Land Capability map of the Boggabri area prepared by the former Soil Conservation Service of NSW (unpublished) shows the areas of the Project Site not disturbed by prior coal stockpiling or construction activities to comprise mainly Class II and III land, with areas of prior mining-related disturbance being classified as Class M.

Under a similar classification system used by NSW Agriculture for the assessment of land suitability for agriculture (Department of Environment and Planning, 1981), the undisturbed areas of the Project Site would be classified primarily as Class II land.

3.3.4 Land Use

3.3.4.1 Project Site Land Uses

The siding area and Torrens Road access way components of the Project Site facility formerly comprised part of a larger landholding owned by Vickery and which, prior to siding development, was used for seasonal crop production and the grazing of sheep. With the construction and operation of the siding and train loader, the siding component of the Vickery landholding was used for mining-related purposes (stockpiling and despatch of coal) or left fallow, with all remaining areas of their landholding leased for grazing purposes. During the care and maintenance period between 1998 and 2002, the siding area was used intermittently for cattle grazing.

The rail loop component for the Project Site has in the past, been used for the disposal of earth and waste rock materials from road and rail loop construction activities. Since the construction of the rail loop in 1988 the area has not been used for any agriculture-related purpose.

3.3.4.2 Surrounding Land Uses

A range of agricultural and industrial land uses occur within the vicinity of the Project Site including small rural holdings used for grazing and/or cultivation activities (including a market garden), larger holdings used for grazing and crop production, the Council Landfill/garbage depot, a tannery, a stockfeed manufacturing plant, a civil contractor's yard and workshop, the Gunnedah Colliery rail siding and train loader and isolated residential buildings (see Section 3.8.3). The abandoned former Gunnedah Abattoir is located approximately 1.7 km south-east of the siding.

3.4 METEOROLOGY

3.4.1 Source of Data

The following summaries of meteorological information for the Project Site have been derived primarily from long-term data collected by the Bureau of Meteorology from Station No. 055023 (Gunnedah Composite) located approximately 5 km east-south-east of the Project Site, Station No. 055024 (Gunnedah Soil Conservation Research Station), located approximately 10 km south-east of the Project Site and the Whitehaven Coal Mine station, approximately 22 km west of the Project Site. The comments on the climate have also been sourced, in part, from the Soil Conservation Service of NSW, Gunnedah Technical Manual.

Although comprehensive recordings are now undertaken at the Gunnedah Airport, the Whitehaven Coal Mine station is the only station in the local area which has been recording a range of hourly meteorological parameters for more than one year.

Data collected from Station No. 055023 comprised:

- temperature;
- rainfall;
- relative humidity;
- fog and frost frequency; and
- wind (9.00 am and 3.00 pm).

Pan evaporation data was sourced from the Soil Conservation Research Station at Gunnedah, the nearest available source of that information.

With the exception of wind data from Station No. 055023, all meteorological data is presented in **Table 3.3**.

3.4.2 Climatic Characteristics

Gunnedah Shire is situated between the tropical and temperate climatic zones, between the belts of the sub-tropical highs and the zone of mid-latitude westerlies. In summer, synoptic highs dominate the climate. Low pressure systems pass at regular intervals bringing milder temperatures and winds from the southerly quadrant. The climate is also influenced by the substantial mountain ranges located to the east, and to a lesser extent, the south of the region.

3.4.3 Temperature

The data summarized in **Table 3.3** show the area to be characterized by mild to hot summers and cool winters. December, January and February are the warmest

months with mean daily maximum temperatures approximating 33°C. July is the coldest month with a mean daily minimum of 3°C. Autumn and spring are generally mild with occasional erratic temperature fluctuations. Mean diurnal temperature variation is relatively constant throughout the year at about 15°C.

3.4.4 Rainfall

Rainfall in the Gunnedah area results from the passage of one of three major synoptic systems across the area, or from localised convective thunderstorms:

- the regular passage of cold fronts across NSW, whenever these fronts extend north into the area; or
- the passage of moist upper atmosphere low cells into the area from Queensland; or
- the passage of inland tropical cyclones or low pressure systems which have been located over the Pacific Ocean.

Of these, the latter two principally occur in the warmer months when convectional storms are also most frequent. These produce the majority of the area's total rainfall and are often of high intensity.

Mean and median monthly rainfall are presented in **Table 3.3**, with the difference between the median and mean rainfalls due to the influence of very high or very low rainfall events which are not expected with sufficient frequency to affect the median, but which have a significant effect on the mean. Consequently the median value is considered to be a better estimate of monthly rainfall expectancy. **Table 3.3** shows

highest rainfalls occur in the period between November and February, December having the highest median rainfall of 58 mm. May and July are the driest months with median rainfalls of 29 mm and 32 mm respectively. However, winter rainfalls are more reliable.

On average, Gunnedah experiences 72 rain days per year.

Table 3.3
Monthly Meteorological Data*

Month	Parameter									
	Temperature		Rainfall			Relative Humidity		Frost	Fog	Evaporation
	Mean Daily Max (°C)	Mean Daily Min (°C)	Mean (mm)	Median (mm)	Mean Rain-days	Mean 9.00 am (%)	Mean 3.00 pm (%)			Mean (mm)
January	33.6	18.3	72.3	49	6.5	61.5	42.4	0	0.2	254.2
February	32.7	18.0	65.6	44	6.0	66.1	42.8	0	0	207.2
March	30.6	15.6	48.7	34	4.6	66.0	44.9	0	0	207.7
April	26.2	11.1	38.2	34	4.3	68.2	46.2	0	0.1	141.0
May	21.3	7.2	44.2	20	5.3	74.6	52.1	1	0.3	93.0
June	17.5	4.3	43.0	38	6.2	79.9	55.9	3.8	0.4	63.0
July	16.8	3.0	42.6	32	6.2	79.9	55.9	3.8	0.4	65.1
August	18.7	4.1	42.0	38	6.2	72.5	47.5	5	0.1	93.0
September	22.6	6.8	39.4	34	5.8	65.8	43.8	1.2	0.3	129.0
October	26.4	10.6	56.0	52	6.9	61.2	42.7	0	0.1	176.7
November	29.8	13.8	60.0	50	6.7	57.4	38.5	0	0	213.0
December	32.8	16.5	66.7	58	6.9	57.5	38.4	0	0.1	263.5
Annual	25.8	10.8	618.7	562	71.6	67.4	45.7			1898.0
Years of Record	74	74	120	118	118	26 – 32	26 - 32	32	32	26 – 29

*All data other than evaporation sourced from Station 55023 (Gunnedah Composite). Evaporation data from Station 55024 (Gunnedah Soil Conservation Research Station)

3.4.5 Wind

The combined seasonal 9.00 am and 3.00 pm wind speed and direction data recorded at Station No. 055023 are graphically presented on **Figure 3.4** while seasonal day-time (0700 to 1800 hours), evening (1800 to 2200 hours) and night-time (2000 to 0700 hours) wind speed and direction data at the Whitehaven Coal Mine are presented graphically in Richard Heggie Associates (2002 (a)) – **Appendix 6**.

Figure 3.4 shows that calm conditions in Gunnedah average approximately 12 per cent, 13 per cent, 15 per cent and 10 per cent of morning (9.00 am) winds and 8 per cent, 9 per cent, 12 per cent and 8 per cent of afternoon (3.00 pm) winds in each of summer, autumn, winter and spring.

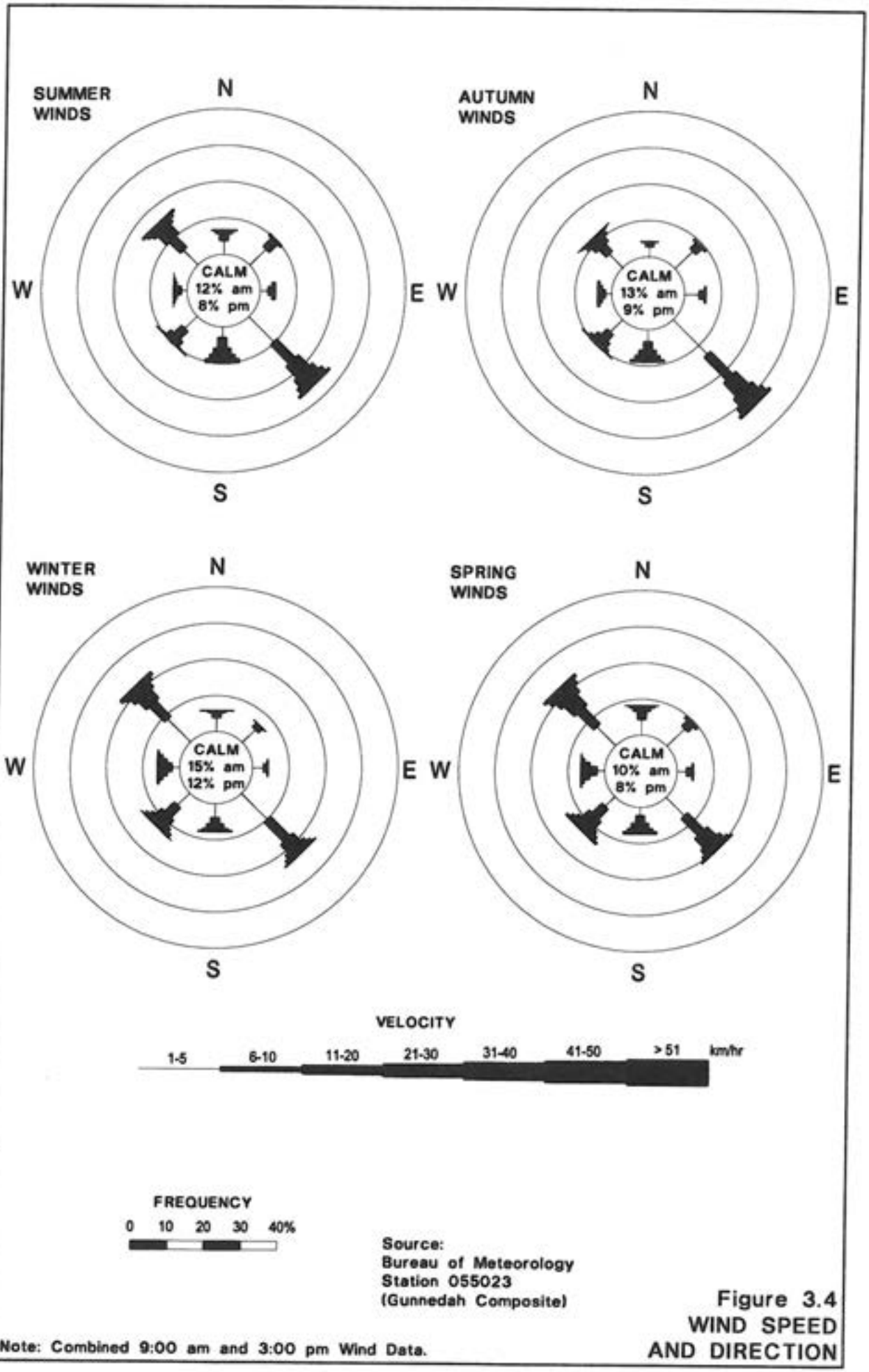
In order to ascertain if the wind data from the Whitehaven Coal Mine station is representative of the wind climate within the Gunnedah area and assess the suitability of Whitehaven data for use in the air quality and noise impact assessments (see Sections 4.1 and 4.3), an analysis of 9.00 am and 3.00 pm wind data from Station No. 055023 and Whitehaven was undertaken by Richard Heggie Associates Pty Ltd (see **Appendix 6**). The analysis showed a good correlation between both sites.

3.4.6 Relative Humidity

The relative humidity in the Gunnedah area is typical of a warm temperate climate. Mean 9.00 am relative humidities range from approximately 55 per cent in late spring and early summer to nearly 80 per cent in early winter. Mean 3.00 pm relative humidities range from between 35 and 40 per cent in late spring and early summer to 50 to 55 per cent in late autumn and early winter.

3.4.7 Evaporation

Mean monthly evaporation is greatest from November to March and corresponds to the months of highest temperatures and lowest relative humidities. During each of these months evaporation exceeds 200 mm. Mean monthly evaporation is least



Note: Combined 9:00 am and 3:00 pm Wind Data.

Figure 3.4
WIND SPEED
AND DIRECTION

during June and July at 63 mm and 65 mm respectively. Average evaporation exceeds rainfall in all months and exceeds median annual rainfall by a factor of nearly four.

3.4.8 Temperature Inversions

Temperature inversions are often expressed as fogs and/or frosts and invariably occur during calm, clear, cool nights. After sunrise, the inversions normally increase in height before being broken down by solar heating of the land surface.

Table 3.3 shows that frosts generally occur in the Gunnedah area between May and September. Fogs may occur at any time of year but are a rare phenomenon. Based on these records alone, it may be concluded that temperature inversions could occur on up to 20 per cent of days each year. However, in a detailed review of the meteorology of the Gunnedah area, Garradd (1997) noted that "surface inversions might be expected on 50 per cent or more nights throughout the year".

An assessment of inversion occurrence at the Whitehaven Coal Mine during 2001 showed a similar result to that identified in Garradd, with weak to strong inversions occurring on 42 per cent, 46 per cent, 54 per cent and 47 per cent of nights in summer, autumn, winter and spring. Night-time inversions generally prevail from about 8.00 pm.

During day-time, ie 7.00 am to 6.00 pm, weak to strong inversions occurred on less than 1 per cent of summer, autumn and spring days and on approximately 3 per cent of winter days, but only prevailed to approximately 8.00 am before dissipating.

3.5 EXISTING NOISE LEVELS

3.5.1 Introduction

The noise climate in the vicinity of the Project Site is generally controlled by traffic on the Kamilaroi Highway and, to a lesser extent, Quia Road, with insect noise also a controlling influence in the warmer months.

The following sub-sections outline the statistical descriptors used when describing and/or assessing environmental noise levels and impacts, and the approach taken to establish noise design goals for the proposed CHPP. An assessment of the proposed activities on the acoustic climate in the vicinity of the Project Site is presented in Section 4.3.

The contents of this Section have been summarized from Richard Heggie Associates (2002(a)) – **Appendix 6**.

3.5.2 Statistical Descriptors

Environmental noise levels vary with time, and consequently it is necessary to describe the noise in terms of statistical descriptors. The statistical noise exceedance levels L_{AN} in dB(A) are the levels exceeded for N per cent of the measurement period. For example, L_{A90} is the noise level which is exceeded for 90 per cent of the measurement period and approximates the average minimum noise level. This is often referred to as the "background" noise level. L_{A10} is the level exceeded for 10 per cent of the measurement period and approximates the average maximum noise level. L_{Aeq} provides a measure of the total noise energy during the measurement period and is used in the EPA's documents entitled "NSW Industrial Noise Policy" (INP) and "Environmental Criteria for Road Traffic Noise" to assess annoyance.

The A-weighting is a standard electronic weighting applied to the measurement of sound to approximate the frequency response characteristics of the human ear when judging the loudness of a sound. **Table 3.4** presents a list of typical noise levels.

Table 3.4
Typical Noise Levels*

Noise Level (dB(A))	Typical Noise	Noise Level (dB(A))	Typical Noise
0	Threshold of hearing for a youth	75	Average Street traffic noise @ 7 m
20	Bedroom	80	Motor car at 7 m, telephone ringing
30	Soft whisper @ 2 m, clock ticking	90	Heavy truck at 7 m, pneumatic drill
40	Quiet refrigerator	100	Angle grinder
50	Trees and grass rustling	110	Pop group
55	Inside an average home	120	Jet plane taking off at 100 m
60	Inside a large store, birds whistling	130	Jet engine at 25 m
		140	Threshold of pain

* Adapted from EPA Environmental Noise Control Manual (June 1994), Chapter 17 and EPA Environmental Criteria for Road Traffic Noise (May 1999) Figure C1

3.5.3 Ambient Noise Environment

Ambient noise surveys to characterize and quantify the existing acoustical environment in the area surrounding the Project Site were undertaken in February/March 2002 and utilized:

- unattended noise loggers for 14 days at each of the "Wirringulla", "Cedar Vale" and "Olive View" residences, and adjacent to the "Carousel" residence. "Wirringulla", "Cedar Vale", "Olive View" and "Carousel" correspond to Residences A, C, D and L on **Figure 3.5**; and

- operator-attended day-time, evening and night-time surveys at the four logging locations plus "Longlands" (Residence B – **Figure 3.5**), "Portland" (Residence G – **Figure 3.5**) and adjacent to "Yathella" (Residence J – **Figure 3.5**). The attended monitoring was undertaken on 19 February to assist in identifying the character and duration of ambient noise sources. The results of the unattended and attended noise programmes, once processed in accordance with the INP, are presented in **Tables 3.5** and **3.6** respectively.

Table 3.5
Logged Ambient Noise Environment

Property	Ambient (L_{A90}) Noise Level			$L_{Aeq\ (period)}$ All Noise Sources		
	Day-time	Evening	Night-time	Day-time	Evening	Night-time
"Cedar Vale"	35.3	37.3	37.0	52	53	52
"Olive View"	34.5	40.0	39.5	51	51	49
"Wirringulla"	30.6	37.0	43.5	56	56	52
"Carousel"(adjacent)	34.0	35.0	36.5	55	55	53

Source: Richard Heggie Associates (2002(a)) – **Appendix 6**

Table 3.6
Operator-Attended Ambient Noise Environment

Property	$L_{A90(15minute)}$ Ambient Level			$L_{Aeq\ (15\ minute)}$ All Noise Sources		
	Day-time	Evening	Night-time	Day-time	Evening	Night-time
"Wirringulla"	29	50	47	42	51	50
"Longlands"	36	50	45	51	54	55
"Cedar Vale"	34	49	42	50	60	54
"Olive View"	39	44	45	50	55	54
"Portland"	38	43	42	50	49	50
"Carousel" (adjacent)	38	40	41	49	60	45
"Yathella" (adjacent)	32	39	37	55	44	42

Source: Richard Heggie Associates (2002(a)) – **Appendix 6**

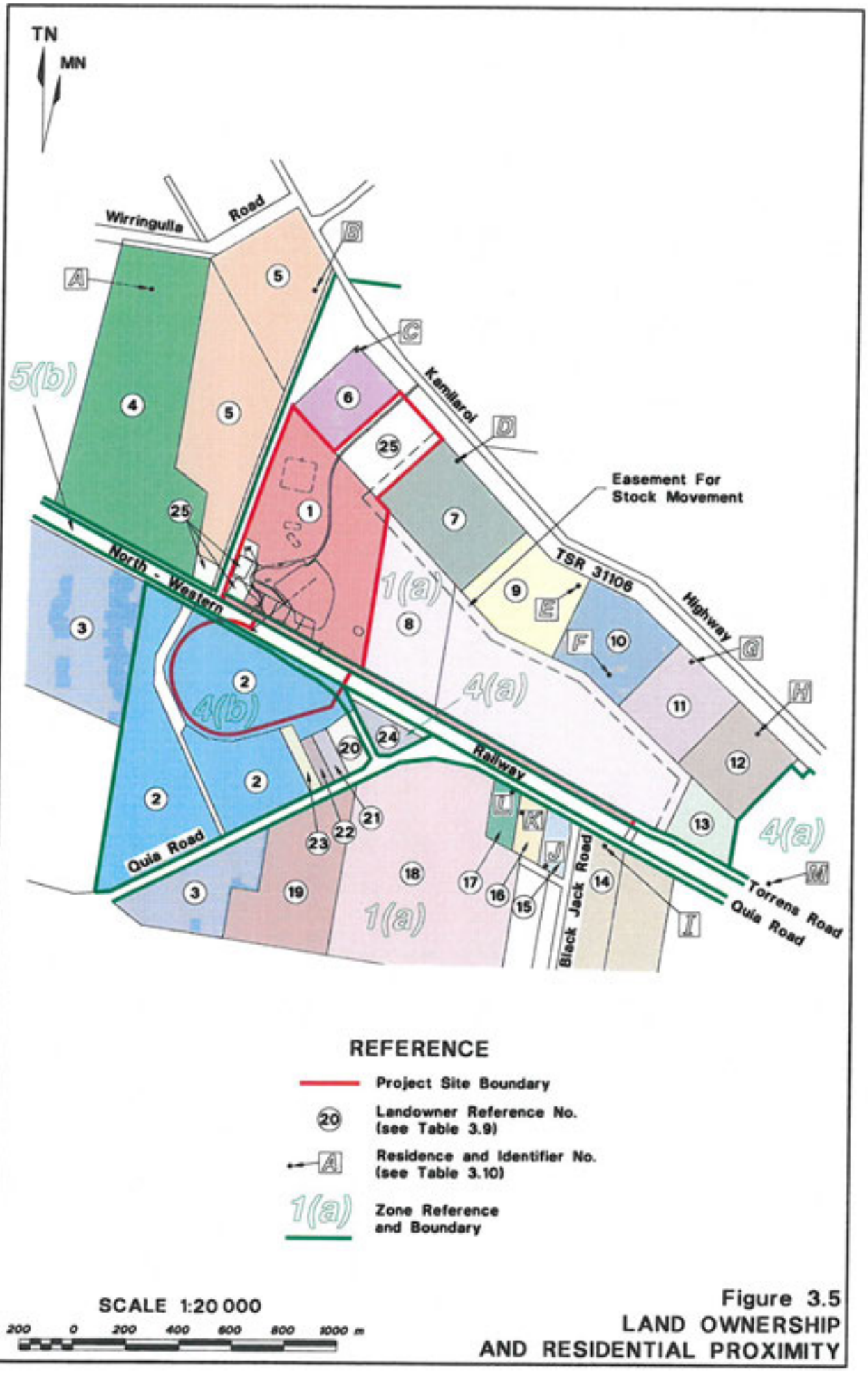


Figure 3.5
LAND OWNERSHIP
AND RESIDENTIAL PROXIMITY

The ambient noise data was subsequently distilled into two general areas for the purposes of noise impact assessment.

Area A – residences generally bounded by the Namoi River, Quia Road and the proposed CHPP site; and

Area B – residences external to Area A.

Table 3.7 presents the adopted day-time, evening and night-time background noise levels (the rating background levels – RBLs) adopted for the assessment of impacts as presented in Section 4.3. The adopted levels incorporate a reduction of 3 dB(A) in the logged evening and night-time background noise levels to reflect the observed influence of insects on the ambient noise climate.

Table 3.7
Background Noise Levels for Assessment of Impacts

Location	Rating Background Level (dB(A))		
	Day-time	Evening	Night-time
AREA A			
"Cedar Vale"	35	34	34
"Olive View"	35	37	37
All other residences	35	36	35
AREA B			
"Wirringulla"	31	34	41
"Carousel"	34	32	34
All other residences	32	33	37

Source: Richard Heggie Assocites (2002(a)) – **Appendix 6**

3.6 AIR QUALITY

3.6.1 Introduction

The Project Site is located adjacent to the Kamilaroi Highway and North-Western railway line, in an area exhibiting a mixture of agricultural and industrial land uses.

The air quality is therefore influenced or potentially influenced by a diversity of activities or sources including:

- dust from agricultural pursuits such as market gardening, ploughing, harvesting, stock and vehicle movements on unsealed roads and farm access roads;
- seed, pollen and smoke from farm and domestic activities;
- exhaust fumes from vehicles travelling on the adjacent road network and from trains on the North-Western railway line;
- movement of vehicles on unsealed surfaces;
- wind erosion and dispersal of coal dust from the Gunnedah Colliery train loader and the coal pads on the Project Site; and
- emissions from other industrial ventures in the local area, eg the tannery on Quia Road.

Air quality is described in terms of:

- total insoluble solids – a measure of the total atmospheric dust;
- ash content – the mineralogical component of atmospheric dust;
- total combustible solids – the organic component of the deposited dust, eg pollen, fine insect or plant remains;

- total suspended particulates (TSP) - airborne particles with an aerodynamic diameter of 0.1 μm to 50 μm;

- PM_{10} – a component of TSP with particles of 10 μm aerodynamic diameter or less;

- $PM_{2.5}$ – a component of TSP with particles of 2.5 μm aerodynamic diameter or less. PM_{10} and $PM_{2.5}$ particles are referred to hereafter as "fine" and "superfine" particles respectively.

3.6.2 Existing air quality

A review of the following air quality data was undertaken by Richard Heggie Associates Pty Ltd (2002(b) – **Appendix 7**) in order to quantify background air quality for subsequent impact assessment purposes.

- Deposited dust data (1984-1985) collected prior to the development of the Vickery rail siding/train loader facilities.

- Deposited dust data for 1998 (the last year of Vickery siding operations).

- Year 2000 suspended particulate data from the EPA's Northern Tablelands monitoring station at Tamworth.

The review showed:

- total insoluble solids levels on properties surrounding the Project Site prior to Vickery rail siding/train loader development to range from approximately 2 g/m^2/month to 2.3 g/m^2/month;

- the Vickery siding operations did not result in any significant increase in particulate loading external to the siding area. Although there was a slight increase in the percentage of total combustible solids during 1998, the increase could not be assumed to be entirely attributable to siding operations; and

- average PM_{10} concentrations at the Tamworth monitoring site range between 10 ppm and 14 ppm for all hours in October, November and December. Fine particles typically comprise 50 per cent of TSP in the ambient air of regions when road traffic is not the dominant source of particulates.

Table 3.8 identifies the values for background air quality adopted by Richard Heggie Associates Pty Ltd (2002(b)) for impact assessment purposes (see Section 4.1).

Table 3.8
Background Air Quality for Impact Assessment Purposes

Parameter	Unit	Adopted Level
Deposited dust	g/m^2/month	2
TSP	$\mu g/m^3$	20
PM_{10}	$\mu g/m^3$	10

3.7 ECOLOGY

3.7.1 Introduction

Investigations of the flora and fauna on the various components of the Project Site were undertaken by Geoff Cunningham Natural Resource Consultants Pty Ltd (GCNRC) and Countrywide Ecological Service (CES) in February and March 2002 respectively. The following sub-sections outline the outcomes of the investigations

while recommended safeguards and an assessment of the impacts of the proposed activities with the safeguards in place, are presented in Section 4.5.

The investigations included both desktop and field components. Copies of the flora and fauna assessments are presented in **Appendices 8** and **9** respectively.

3.7.2 Project Site Flora

3.7.2.1 Survey Methodology

Prior to fieldwork being undertaken, searches of the NSW National Parks and Wildlife Service Atlas of NSW Wildlife and Commonwealth Environment Protection and Biodiversity Conservation Act (CEPBC Act) databases were undertaken for records of Threatened species occurrence within the local area, and details obtained of Protected species recorded in the area. The areas of proposed activity within each of the three components of the Project Site, ie rail loop, siding area and Torrens Road access way, were then surveyed on foot and species noted. During the field survey, particular attention was given to the potential occurrence of Threatened and Protected plant species.

A list of species observed in each area is presented in GCNRC (2002) – **Appendix 8**.

3.7.2.2 Vegetation

Rail Loop

The vegetation within the rail loop component of the Project Site was noted to have been heavily disturbed by prior construction and spoil/waste dumping activities, with

the vegetation comprising:

- a few Bimble Box trees adjacent to the perimeter of the rail loop and a number of White Cedar and Pepper trees. Isolated Yarran and Wilga trees and some Western Boobialla shrubs were also observed;

- a ground cover dominated by introduced grass and weed species, together with scattered patches of native grass species; and

- Eastern Cottonbush and Galvanized Burr commonly occurring.

Siding Area

The siding area component of the Project Site was noted to comprise a largely altered landscape with some parts elevated to prevent flood impacts, and with the vegetation comprising:

- a few remnant Bimble Box trees, planted Eucalypt saplings and some White Cedars;

- Bimble Box, Wilga and Pepper trees in the south-eastern corner, with Western Boobialla shrubs present under the taller trees; and

- a grassland with Red Grass and Rhodes Grass dominant.

Torrens Road Access Way

Within the fenced access way, the vegetation comprises:

- Bimble Box trees at 5 m to 20 m centres, occasional Pilliga Grey Box and Yarran trees; and

- a ground cover comprising a mixture of native and introduced species.

3.7.2.3 Noxious Weeds

GCNRC (2002) noted that the Project Site is relatively heavily invaded by weed species, nine of which are listed as noxious for Gunnedah Shire on the NSW Agriculture website, namely:

- Patersons Curse;
- African Boxthorn;
- Prickly Pear;
- Long-style Feathergrass;
- Galvanized Burr;
- Silver-leaf Nightshade;
- a Sorghum (probably Silk Forage Sorghum);
- Noogoora Burr; and
- Bathurst Burr.

3.7.2.4 Conservation Significance

"Atlas of NSW Wildlife" Database listings

Five collections of two threatened flora species are recorded for the Boggabri 1:100,000 map sheet, namely *Bothriochloa biloba* (from 9 km north of Gunnedah) and *Hakea pulvinifera* (from downstream of the Keepit Dam wall). One collection of *B. biloba* was made within the Torrens Road access way, but would be undisturbed by the proposed activities.

The endangered "White Box, Yellow Box, Blakely's Red Gum Woodland" ecological community, though occurring in the broader region around Gunnedah, does not occur on the Project Site. Similarly, the Project Site does not represent a remnant of the endangered "Native Vegetation on Cracking Clay Soils of the Liverpool Plains" Community.

Predicted Occurrences (Ayres *et al*, 1996)

Ayres *et al* (1996) indicated the possible occurrence of eight threatened flora species in the region around Gunnedah while details of recorded occurrences for thirteen additional species listed in the schedules of the Threatened Species Conservation Act 1995 (TSC Act 1995) were also checked to assess their likely occurrence within the Project Site. Of the eight species identified by Ayres *et al*, six are additional to those identified in the Atlas of NSW Wildlife database.

With the exception of *B. biloba*, no species listed as possibly occurring was identified on the Project Site. An assessment of the likelihood of occurrence of the six species is presented in GCNRC (2002) – **Appendix 8**.

Commonwealth Environment Protection and Biodiversity Conservation Act Database

The CEPBC Act database identifies seven Threatened species (including three listed in the Atlas of NSW Wildlife database or Ayres *et al*) as occurring within 30 km of Gunnedah, together with the Endangered "Grassy White Box Woodland" Ecological Community. However, none was identified within the Project Site. The likelihood of occurrence of these species is presented in GCNRC (2002) – **Appendix 8**.

Protected Plant Species

No Protected plant species were recorded during the field survey.

3.7.2.5 Conclusion

On the basis of the desktop and field investigations undertaken, GCNRC (2002) concluded:

- there was one Threatened plant species (*Bothriochloa biloba*) recorded from the

Project Site during field survey and this record was from an area that would not be impacted by the proposed development;

- of the species listed as possibly occurring or likely to occur, there is no habitat suitable for 12 species; four species, if occurring, would be away from their normal range; two species were considered unlikely to occur, four species though possibly occurring, were not identified, and two species comprised distinctive trees/shrubs which were not identified within the area surveyed;

- much of the Project Site has been cleared for many years, with parts having been subjected to modification by earthmoving operations, facility construction and spoil dumping. Some areas have been grazed and mown. The site has also been heavily invaded by introduced plant species that form the bulk of the vegetation present on most parts: of the 106 pasture plant species identified in GCNRC (2002), 50 are introduced;

- there are no occurrences of Endangered Ecological Communities or Plant Populations listed for the Project Site or surrounding area in the Schedules of the Threatened Species Conservation Act or the CEPBC Act; and

- there is no critical habitat listed for the Project Site or its environs.

3.7.3 Project Site Fauna

3.7.3.1 Fauna Sampling Methodology

The fauna survey of the Project Site was undertaken on 19/20 March 2002 and employed a variety of techniques to identify protected fauna living in or around, or utilizing, the various component areas of the Project Site. Given the extent of prior

disturbance on the siding component of the Project Site and that no further disturbance is proposed within the Torrens Road access way, the sampling primarily targeted the area within the rail loop, that is, the area potentially most affected by the proposed activities.

The survey methods employed were as follows.

- **Amphibians**
  - Call identification
  - Nocturnal ground searches
  - Searches for tadpoles and egg masses in ponds and other moist areas on the Project Site
- **Birds**
  - Incidental observations
  - Waterbird-targeted observations at the fresh water and main storage dams
  - Nocturnal call broadcasts (for the Powerful, Barking and Masked Owls, and Bush Stone-curlew)
  - Spotlight searches
- **Mammals**
  - Spotlight searches
  - Call broadcasts (for the Koala and Squirrel Glider)
  - Predator scat collection and analysis
  - Anabat V ultrasonic microbat call recording
  - Call identification
- **Reptiles**
  - Random searches

3.7.3.2 Survey Results

A total of 17 amphibian, 34 reptile, 105 bird and 50 mammal species are listed within NPWS' NSW Wildlife database and various pubished and unpublished sources as occurring or potentially occurring in the Gunnedah region. None of the amphibians are listed as Threatened while of the reptiles, two species are listed as Vulnerable. Of the 105 bird species, five are listed as Endangered, 29 are listed as Vulnerable and a further three species are "exotic". Of the mammal species, seven are listed as Endangered – (presumed extinct), one is listed as Endangered and nine are listed as Vulnerable. There are also twelve introduced mammal species recorded as occurring in the region. There are no threatened invertebrates listed for the region.

A review of the Environment Australia on-line database for a 10 km radius centred upon the Project Site was also undertaken by CES and identified two bird, three mammal and one reptile species as possibly occurring. Of these species, all but one bird and two mammal species are also listed under the TSC Act 1995. There are no World Heritage areas nor Ramsar sites in the vicinity of the Project Site.

During the survey:

- no tadpole or egg masses were observed – a reflection of the high predation pressure from water birds;

- one frog species was observed but no frog calls heard;

- 35 bird species, including two exotic and one Vulnerable species (the Blue-billed Duck) were observed. Neither the Threatened owls nor the Bush Stone-curlew responded to the call broadcasts;

- 13 mammal species (including seven Microbat species and five exotic species) were recorded. The bat recordings included two calls only from a Vulnerable Yellow-bellied Sheathtail Bat, indicating that it was over-flying or foraging over the area only infrequently. No nocturnal arboreal native mammal species were observed nor was there any response to the call broadcasts. No fresh Koala scratch marks or faecal pellets were observed. Fox scat samples indicated that those animals were feeding almost exclusively on grasshoppers; and

- no reptiles were observed.

3.8 PLANNING ASPECTS, LAND OWNERSHIP AND NEARBY RESIDENCES

3.8.1 Planning Aspects

3.8.1.1 Local Planning Instruments

The Gunnedah Shire Local Environmental Plan (LEP) 1998 covers proposed developments within the Shire and, for the various zones, identifies the objectives and the forms of development which are allowable without Development Consent, allowable with Development Consent and those which are Prohibited.

The zonings within and adjacent to the Project Site are presented on **Figure 3.5**. The siding area and Torrens Road access way components of the Project Site lie within land zoned 1(a).

Rural (Agricultural Protection) while the rail loop component of the Project Site lies within land zoned 4 (b), Offensive Industry.

The objectives of the 1 (a) and 4 (b) zones are as follows.

Zone 1 (a) – Rural (Agricultural Protection)

(a) "to protect the use and efficiency of prime agricultural land while permitting appropriate development subject to suitable subdivision controls,

(b) to permit other forms of development which are ancillary to rural land uses or that, as a result of their nature, require siting outside the urban area,

(c) to avoid further fragmentation and alienation of useable rural land,

(d) to retain the low density nature of settlement within the rural areas and ensure that any future development does not create unreasonable demands on the existing infrastructure or available services,

(e) to provide for the requirements of the rural community,

(f) to maintain safety and convenience along main roads by discouraging uses that are likely to generate traffic volumes which disrupt traffic flow,

(g) to ensure that the existing level of scenic amenity is maintained by requiring development to have regard for significant ridgelines and hilltops."

Zone 4 (b) – Offensive Industry

(a) "to provide adequate and appropriate land for the accommodation and development of industrial land uses which are offensive,

(b) to encourage industrial development which will contribute to the local economy,

(c) to locate offensive industries in areas that will minimize conflict in regard to potential impact on the surrounding environment or local amenity,

(d) to recognize and provide for a range of industrial development and to ensure adequate infrastructure for the long term viability of such development,

(e) to encourage offensive development to be located on land within this zone only so that it may be concentrated and co-ordinated."

Development of the CHPP as proposed, is permissible under the Gunnedah LEP 1998, with the consent of Council.

3.8.1.2 Development Control Plans

Development Control Plans (DCPs) are made by Council to deal with selected areas or aspects of an LEP in a more detailed manner. DCPs are not legally binding. However, their objectives should be taken into consideration when planning a development.

Council has advised that there are no DCPs relevant to the Project Site.

3.8.1.3 Regional Environmental Plans (REPs)

REPs provide a framework for the consistent environmental planning and management within regions or parts of regions.

Council has advised that there are currently no REPs relevant to the proposed activities on the Project Site.

3.8.1.4 State Environmental Planning Policies (SEPPs)

SEPPs which apply, or could potentially apply to the proposal identified in this EIS include:

- SEPP 11 - Traffic Generating Developments;
- SEPP 33 - Hazardous and Offensive Development;
- SEPP 34 - Major Employment Generating Development; and
- SEPP 44 - Koala Habitat Protection.

SEPP 11

WCM's proposal involves an activity ancillary to mining, which falls within Schedule 1 of SEPP 11. This policy requires that the Roads and Traffic Authority (RTA) be:

- made aware of the proposed development by the Consent Authority; and
- given an opportunity to make representations about the proposed development.

The RTA was formally consulted during the preparation of this EIS and a summary of the specific issues raised during that process is presented in **Appendix 3**. A Traffic Impact Statement in **Appendix 5**. It is noted however, that following the construction/installation phase, the proposal would be unlikely to generate additional traffic on either the local or State road networks over and above that which was

previously approved in association with the Namoi Valley (Vickery) Coal Project and/or Whitehaven Coal Mine.

SEPP 33

SEPP 33 links the permissibility of a proposed industrial development to safety and environmental performance objectives and applies to any development proposals which are considered to constitute potentially hazardous or potentially offensive industries. Under Clause 3, a potentially hazardous industry is defined as a development that "would pose a significant risk in relation to the locality; to human health, life or property; or to the biophysical environment and includes a hazardous industry and a hazardous storage establishment". A potentially offensive industry is defined as a development that "would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment".

Given that no hazardous material will be stored on the Project Site in a quantity which exceeds the maximum screening threshold, the proposed activities are not considered potentially hazardous.

In assessing whether a proposed development is potentially offensive the Department of Planning (1994) recommends that the following matters be considered.

i) Does the proposal require a licence under any pollution control legislation administered by the Environment Protection Authority? If so, the proposal should be considered to be potentially offensive.

ii) Does the proposal require any pollution control approval pursuant to any legislation or by-laws administered by the council?

iii) If such a pollution control licence is not required, does the proposal cause offence having regard to the sensitivity of the receiving environment?

The development and operation of the CHPP, ie a coal works, is a scheduled activity under the Protection of the Environment Operations Act 1997 and hence may be considered potentially offensive. However, the proposed CHPP is not considered to constitute an offensive industry for the following reasons.

i) WCM already holds an Environment Protection Licence (No. 3637) for a coal works on the site of the former Vickery siding.

ii) Department of Planning (1994) states that: "Typically, the level of offense would not be considered significant if relevant EPA licences can be obtained."

iii) There will be no change to the nature or scale of the scheduled activity to be undertaken, with the only changes to the existing licence being to the boundary of the premises licenced, and the possible addition of some activity-specific conditions.

SEPP 34

The proposal does not satisfy either the $20 million capital expenditure or 100 person employment criteria applicable to this policy. Hence SEPP 34 does not apply.

SEPP 44

Gunnedah Shire Council is identified within Schedule 1 of SEPP 44, that is, Local Government Areas to which the policy applies and for which an investigation is

required to determine the presence of core Koala habitat within these areas to be disturbed in association with the proposed Development Application.

Although one species (Bimbil Box) listed as a Feed Tree within Schedule 2 of SEPP 44 occurs within and adjacent to the Project Site, none would be removed in association with the proposal: all activities would be restricted to areas of existing disturbance and/or areas which are devoid of Koala feed trees. Consequently the areas of proposed disturbance do not constitute core Koala habitat.

3.8.2 Land Ownership

Details of land ownership on and in the vicinity of the Project Site are presented in **Table 3.9** and shown on **Figure 3.5**. Ownership details were primarily sourced from the Gunnedah Shire Council Rating Database.

An easement for stock movement, referred to as DP 641102, passes along the eastern boundary of Lot 678, DP 705086 and along the northern boundary of Lot 111, DP 755503. The 40 m wide strip of land incorporating the North-Western railway line is owned/administered by the Rail Infrastructure Corporation.

All land described on **Table 3.9** and identified on **Figure 3.5** lies within the Parish of Gunnedah and County of Pottinger.

Table 3.9
Land Ownership

Identifier (see Figure 3.5)	Description	Landowner
1	Lot 1, DP 723509, Lots 111, 471, 472,473,474, 475, DP 755503	Whitehaven Coal Mining Pty Ltd
2	Lot 1, DP 810271*, Lots 2,3, DP 875874	Gunnedah Shire Council
3	Lot 11, DP 599624; Lot 5, DP 587712	G.H. Mitchell & Sons Pty Ltd
4	Lot 2, DP 246972	R.J. & C. Southorn
5	Lots 137 and 453, DP 755503; Lot 688, DP 1040449	R.W. Tibbs
6	Lot 677, DP 755503	J. Sword
7	Lot 466, DP 755503	R.J. & H.M. Cruickshank
8	Lots 112 & 113, DP 755503	Namoi Valley Coal Pty. Limited
9	Lot 447, DP 755503	J.C. & J.E. Wilkinson
10	Lot 448, DP 755503	M.N. & S. Chatfield
11	Lot 449, DP 755503	P.A. & D.L. Rankin
12	Lot 450, DP 755503	R.S. Brown
13	Lot 1, DP 402537	J.L. Torrens
14	Lots 338 & 340, DP 755503	Gunnedah Abattoir Holdings - Edmonds Meat Exports
15	Lot 155, DP 755503	W.P. Small
16	Lot 154, DP 755503	J.C. Kent & T.L. Denham
17	Lot 153, DP 755503	B. Finlay
18	Lot 10, DP 701400; Lots 203 & 522, DP 755503	G.S. & H.A. Finlay
19	Lot 9, DP 701400	Darcox Pty Ltd
20	Lot 1, DP 613172	Manildra Flour Mills Pty Ltd
21	Lot 2, DP 613172	Prydes Tucker Bag Pty Ltd
22	Lot 4, DP 629803	Ryleend Pty Ltd
23	Lot 1, DP 875874	P.E. & R. Harris
24	Lot 12, DP 54207	Whitehaven Coal Mining Pty Ltd
25	Lot 678**, DP 705086; Lots 120, 498, DP 755503** Lot 199, DP 755503	Crown
*Leased to Whitehaven Coal Mining Pty Ltd **Held by WCM under perpetual lease		
Source: Gunnedah Shire Council		

3.8.3 Surrounding Residences

Figure 3.5 shows the locations of the residences in the vicinity of the Project Site and **Table 3.10**, the distance from each residence to the centre of activity on the siding component of the Project Site, the nearest part on the Torrens Road access way and the centre of the proposed fine reject ponds within the rail loop.

Table 3.10
Residences Surrounding the Project Site

Residence Identifier (see Figure 3.5)	Direction from CHPP	Distance to Centre of Siding Area (m)	Distance to Torrens Road Access Way (m)	Distance to Centre of Fine Reject Ponds (m)
A	NW	1320	1500	1500
B	NW	1160	1360	1480
C	NNE	960	1150	1320
D	NE	760	880	1170
E	E	1020	690	1370
F	E	1180	450	1450
G	E	1480	640	1750
H	E	1780	580	2030
I	SSE	1500	130	1580
J	SSE	1380	310	1420
K	SSE	1160	170	1240
L	SSE	1100	120	1180
M	ESE	2600	560	2020

With respect to **Table 3.10** and **Figure 3.5** the following are noteworthy.

- Residences B, C, D, E, F, G and H are located at distances of approximately 120 m, 100 m, 90 m, 120 m, 450 m, 100 m and 120 m respectively from the centre of Kamilaroi Highway. Residences B, C and D are located approximately 520 m, 240 m and 320 m from the siding access road respectively.

- With the commissioning of the CHPP, coal trucks from the Whitehaven Coal Mine would no longer travel past residences D, E, F, G and H, nor would they pass the four residences on Quia Road east of the railway underpass which are adjacent to the existing approved transport route to the Gunnedah Colliery coal preparation plant and train loader. The residences on Quia Road to the east of the underpass are located at distances ranging from approximately 8 m to 22 m from the road centreline.

Project-related truck movements past the six residences to the west of the railway underpass would be an infrequent occurrence only, primarily during periods of fine reject pond refurbishment.

- Residences I, K and L are located approximately 130 m, 170 m and 120 m south of the Torrens Road access way but approximately 25 m, 50 m and 20 m south of Quia Road, that is, the approved haulage route between the Whitehaven Coal Mine and the Gunnedah Colliery train loader. Residence J, located approximately 310 m from the Torrens Road access way, lies approximately 60 m west of Black Jack Road, the approved haulage route to/from the Gunnedah Colliery coal preparation plant.

3.9 CULTURAL HERITAGE

3.9.1 Pre-European Archaeology

3.9.1.1 Introduction

An assessment of the pre- and post-European archaeology and cultural heritage on and surrounding the three component areas of the Project Site was undertaken in February 2001 by Consultant Archaeologist, Mr John Appleton of Archaeological Surveys and Reports Pty Ltd (AS & R), with the assistance of Messrs Les Field and Wayne Martin, sites officers and nominated representatives of the Red Chief Local Aboriginal Land Council (LALC). The following sub-sections present a summary of the investigation method and the survey results. A full copy of the report is presented in AS & R (2002) - **Appendix 10**.

3.9.1.2 Investigation Methodology

The archaeological and cultural heritage assessment involved:

- an examination of the Aboriginal Sites Register maintained by the NSW National Parks and Wildlife Service (NPWS). The register recorded no Aboriginal sites in the local area;
- a review of relevant studies undertaken in the area;
- liaison with Ms Ellen Draper, Chairperson of the Red Chief LALC; and
- a detailed study to investigate the occurrence and, if occurring, to enable an assessment of the significance of any Aboriginal cultural material. Details of the field survey are provided in Section 3.9.1.3.

3.9.1.3 Field Survey

In order to design a field survey, a predictive model for possible archaeological site location was first developed to enable the survey to observe and record sufficient of the archaeological record present that it could be considered representative of the area surveyed.

Factors considered in the design of this and any pre-European archaeological field survey include:

- the likelihood, specific location and frequency of Aboriginal use of an area. This aspect is determined by the richness of resources such as water, food, stone material resources, shelter, etc, the proximity to mythological natural features, and factors such as seasonal accessibility;

- the degree to which evidence is likely to be observable. This in turn is affected by the durability of likely artefactual evidence and the extent of post-European land use; and

- the recognition that the majority of sites identified throughout Australia previously, have been stone artefacts located:

  i) on or adjacent to sedimentary deposits containing quartz, quartzite, jasper, silcrete, chert, chalcedony, metamorphosed greywacke and other siliceous sedimentary rocks, or redeposited fine-grained volcanics; or

  ii) on river banks or adjacent to river banks where the watercourse contained river pebbles of quartz, quartzite, jasper, silcrete, chert, chalcedony, fine-grained volcanics, basalt, etc, and particularly, at the junctions of watercourses;

  iii) on ridges and spurs overlooking watercourses or on high vantage points affording uninterrupted views of swamps, waterholes, saddles, passes and other likely access paths into the observer's area; or

  iv) in the vicinity of outcrops of suitable raw materials for tool production, etc, such as igneous rocks.

Given the extent of disturbance on the Project Site as a consequence of prior earthworks (excavation, landform construction and dumping of coal and fill), the survey comprised an examination of:

- natural and man-made exposures, eg within drainage lines/channels and cuttings within and surrounding the rail loop;
- the reformed landform to the north of the coal pad areas, erosion strips along fence lines, in drainage lines and throughout areas of remnant woodland to the north-west of the siding area; and
- trees, large scalds and termite pans within the access way to Torrens Road.

Topography, vegetation cover and conditions were recorded in a field log.

3.9.1.4 Results and Discussion

No evidence of Aboriginal occupation or utilization was found within any component area of the Project Site and, for the siding area itself, confirms the results of the survey undertaken in 1985 by Haglund on behalf of the Vickery Joint Venture during the preparation of the Namoi Valley Coal Project EIS. Furthermore, the sites officers were unaware of any specific Aboriginal association with the area.

3.9.2 Post-European Archaeology

There are no features of post-European archaeological significance within the areas of proposed activity on the Project Site. The remains of a former rabbit abattoir (scrap metal, bottles and bottle fragments, a cast iron pressing iron, concrete pits, etc)

are located immediately north-east of and external to the rail loop but would be unaffected by the proposed activities.

3.10 SOCIO-ECONOMIC PROFILE

3.10.1 Introduction

Data for this section of the EIS has been drawn primarily from information on Gunnedah Shire obtained from the Australian Bureau of Statistics 1996 Census, and Gunnedah Shire Council. Gunnedah Shire covers an area of 5 020 km^2.

Given the duration since the collection of the 1996 Census data, the information from that Census is supplied principally to outline overall trends and general features of the local community. At the time of compilation of this document, no information was available from the 2001 Census.

Where relevant, 1996 Census data for the State of NSW is also provided.

3.10.2 Population

Table 3.11 presents the 1996 Census population statistics for Gunnedah Shire and the State of NSW. In 1996, the population of Gunnedah Shire was 12 819 persons, or approximately 0.2 per cent of the State's population. Though no data has yet been released, it is expected that the 2001 Census population will show a decline over the 1996 to 2001 inter-censal period, a continuation of a general trend which had been evident since the 1986 Census. The likely reduction in population in the most recent inter-censal period would, to a large extent, be directly and indirectly attributable to

the closure of the Preston, Gunnedah and Vickery coal mines, and of the Gunnedah Abattoir.

Table 3.11
1996 Census Population Statistics – NSW and Gunnedah Shire

Parameter	NSW	Gunnedah Shire
	1996	1996
Total Population	6 038 696	12 819
Population Density	7.5	2.6
Persons over 15	4 748 778	9 573
Persons in Labour Force	2 558 875	5 530
Persons not in Labour Force	1 785 967	3 823
Unemployed	247 669	524
Source: Australian Bureau of Statistics		

The contributions of different age groups to the populations of NSW and Gunnedah Shire at the time of the 1996 Census are presented in **Table 3.12.**

Table 3.12
Age Characteristics (% of Population) – 1996 Census

Area	0-14	15-19	20-29	30-39	40-54	55-64	65+
NSW	21.3	6.8	14.6	15.7	19.7	8.5	12.6
Gunnedah Shire	25.3	6.5	11.3	14.1	19.4	9.5	12.8
Source: Australian Bureau of Statistics							

At the time of the 1996 Census, the "dependant" age group (0-19) represented 31.8 per cent of the population in Gunnedah Shire compared with the State average of 28.1 per cent. The 20 to 29 year age group represented 14 per cent of the State's population but only 11.3 per cent of the population within Gunnedah Shire indicating a trend towards outward migration of this age group from the area. Although no data

is available from the 2001 Census, it is considered likely that this outward migration would have accelerated with the closure of a number of major employment generators since 1996.

3.10.3 Employment

Table 3.13 presents industry employment statistics for New South Wales and Gunnedah Shire at the time of the 1996 Census.

Table 3.13
Employment by Major Industries – 1996 Census

Industry	Gunnedah Shire		New South Wales	
	No.	%	No.	%
Agriculture/Forestry/Fishing	984	19.7	92 160	3.6
Mining	163	3.3	21 446	0.8
Manufacturing	564	11.3	311 944	13.6
Wholesale/Retail Trade	954	19.1	501 230	21.8
Finance/Property/Business	345	6.9	393 614	17.1
Government Administration/Defence	202	4.0	131 994	5.7
Health/Community Services/Education	785	15.7	411 986	17.9
Construction/Transport	359	7.2	284 674	12.4
Recreation/Cultural/Personal	173	3.5	150 925	6.6
Source: Australian Bureau of Statistics				

Table 3.13 shows that agriculture-related fields were the major employment industry within Gunnedah Shire accounting for 19.7 per cent of the workforce. By comparison, agriculture-related employment accounted for only 3.6 per cent of the State's workforce.

Within Gunnedah Shire the wholesale/retail industry was the most important employment sector apart from agriculture and, together with public services (health/community/services/education) and construction/transport, accounted for a further 42 per cent of employment. These figures reflect the rural base of the area and the importance of Gunnedah as a local business centre.

Notwithstanding the opening of the Whitehaven Coal Mine, since the time of the 1996 Census, the number of people engaged in mining and agriculture-related activities would have reduced substantially from that identified in **Table 3.13** with the closure of the Preston, Vickery and Gunnedah coal mines and the permanent closure of the abattoir.

The unemployment rate is the proportion of all those who wish to have a job (the labour force) and those who are not able to find one. At the time of the 1996 Census the unemployment rate in Gunnedah Shire was 9.5 per cent compared with the State average of 8.8 per cent. The unemployment level within Gunnedah Shire would, however, be expected to have increased since that time as a consequence of the closure of a number of major employment generators.

3.11 VISUAL ASPECTS

Figure 3.1 shows that the three component areas of the Project Site are located between the Kamilaroi Highway or Quia Road and the North-Western railway line and, as such, are potentially visible from these local vantage points and a limited number of local residences. The rail loop area is also bounded to the west by the infrequently-used McDonald Road.

Views of the existing facilities on the Project Site from the Kamilaroi Highway, Quia Road and local residences, eg the rail load-out bin and associated conveyor assembly and stockpiles, lighting towers (at night, when operating) and trains moving on the rail loop, are obscured to varying degrees by intervening natural vegetation, planted tree screens (see **Figure 2.1**) and the low relief of the site (see **Plates 3-1** to **3-8**). Views of the facilities on the Project Site from McDonald Road and the eastern end of Emerald Hill Road are essentially unobstructed (**Plate 3-9**).

The rail load-out bin and conveyor structures, though dominant features of the visual environment from a number of vantage points, are consistent with the industrial nature of the area adjacent to Quia Road (see **Plate 2-3**). Other nearby prominent local industrial features include the Gunnedah Colliery train load-out bin, conveyor and associated coal stockpiles, grain silos, tanks and buildings at the Pryde's animal feed production plant and the Harris earthmoving building.

Extensive views of the Project Site are possible from trains passing along the North-Western railway line, with unobstructed views of the existing structures, buildings, stockpile areas and major water management structures possible. However, passenger trains passing are generally travelling at in excess of 100 kph and accordingly, the duration of visibility is minimal.

More distant views of the Project Site are available from elevated publicly accessible vantage points to the south-east, south and south-west including Borethistles Hill (4 km), Little Sugarloaf Mountain (5.5 km), Black Jack Mountain (8 km), Pyramid Hill (5 km) and Sugarloaf Mountain (6 km). However, in each case the views are obscured by the vegetation at the vantage points and/or the facilities on the Project Site are essentially indistinguishable by virtue of their scale, the distance from the vantage point and/or the presence of other industrial developments in the immediate vicinity.

Plate 3-1: A view towards the Project Site from the "Wirringulla" (Residence A – **Figure 3.5**) with the top height of the proposed coal preparation building identified (Ref: S2/12).

Plate 3-2: A view towards the Project Site from the "Longlands" residence (Residence B – **Figure 3.5**). All siding facilities are effectively obscured by vegetation on the adjacent TSR (Ref: S2/13).

Plate 3-3: A view towards the Project Site from the "Cedar Vale" residence on the Kamilaroi Highway (Residence C – **Figure 3.5**) with the top height of the proposed coal preparation building identified. (Ref: S2/14).

Plate 3-4: A view towards the Project Site from the rear of the "Olive View" residence (Residence D – **Figure 3.5**) with the top height of the proposed coal preparation building identified. (Ref: S2/15).

Plate 3-5: The view of the Project Site from the "Portland" residence. (Residence G - **Figure 3.5**). (Ref: S3/11).

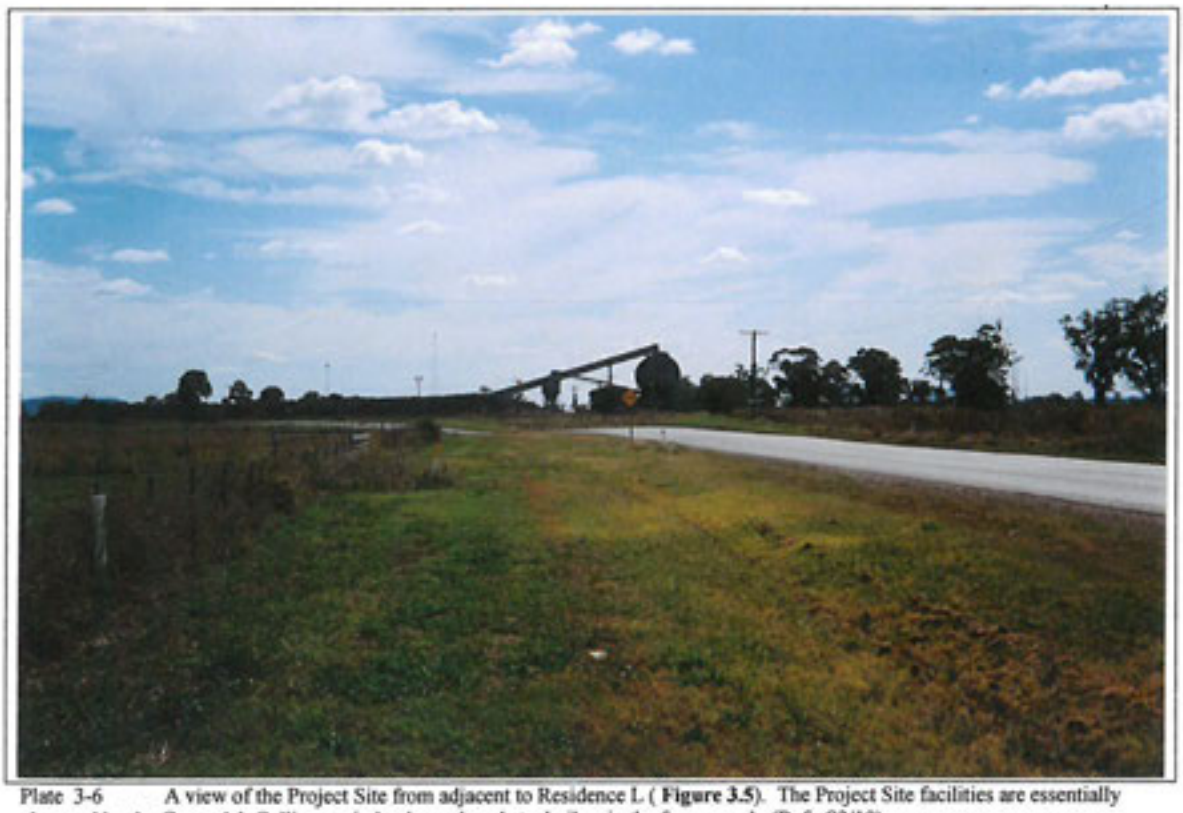


Plate 3-6 A view of the Project Site from adjacent to Residence L (**Figure 3.5**). The Project Site facilities are essentially obscured by the Gunnedah Colliery train loader and coal stockpiles in the foreground. (Ref: S3/10).

Plate 3-7: The Project Site from Quia Road, immediately west of the Harris Earthmoving facility (**Figure 3.5**). (Ref: S2/19).

Plate 3-8: A typical view towards the Project Site from the more elevated sections of Quia Road, west of the **Plate 3.7** vantage point. (Ref: S2.17).

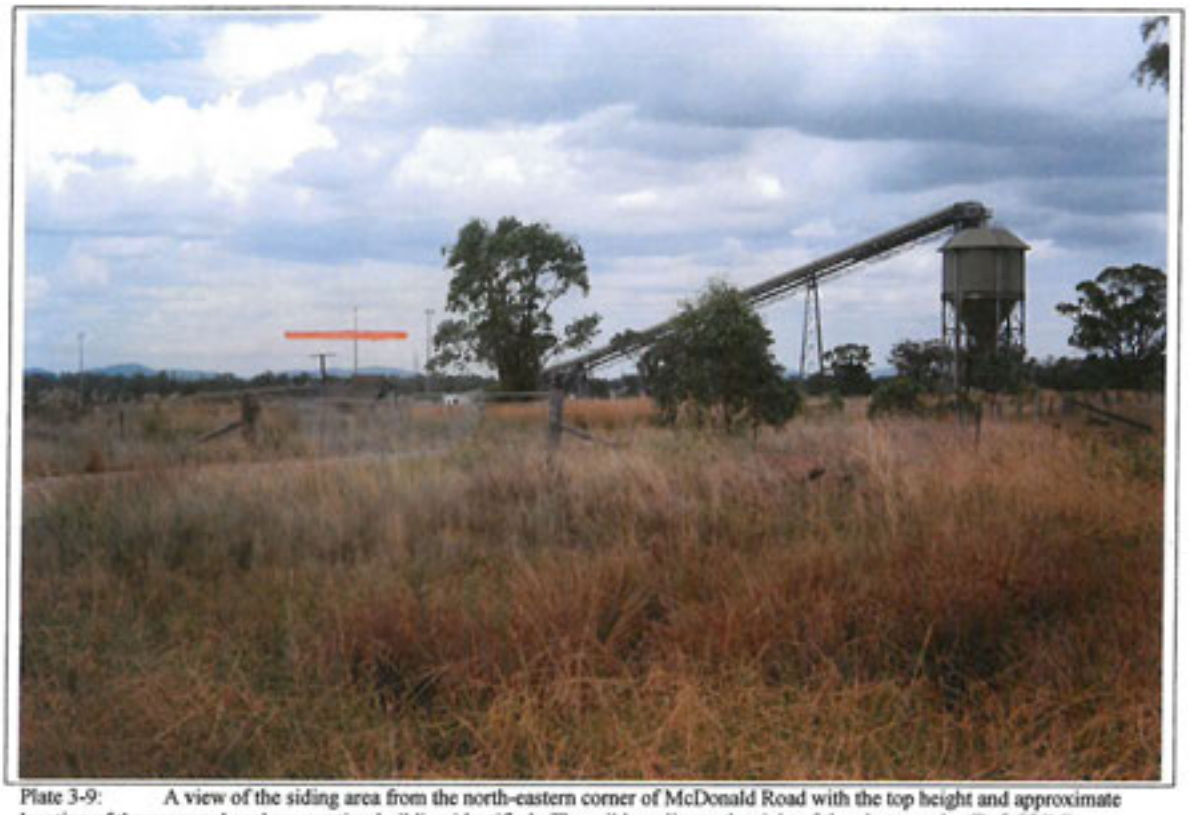


Plate 3-9: A view of the siding area from the north-eastern corner of McDonald Road with the top height and approximate location of the proposed coal preparation building identified. The rail loop lies to the right of the photograph. (Ref: S2/16).

3.12 SERVICES

The following services are currently provided to the siding and rail loop components of the Project Site.

Siding
- 22 kV power
- reticulated process water
- six telephone lines
- two septic sewage systems
- two-way radio communication.

Rail Loop
- 22 kV power
- a septic sewage system
- two-way radio communication.

3.13 TRANSPORTATION NETWORK

3.13.1 Road

3.13.1.1 Introduction

The Project Site lies adjacent to and is accessed directly from the Kamilaroi Highway, with supplementary access/egress provided to Torrens Road via the private Torrens Road access way.

The following sub-sections provide a description of the road conditions along the various components of the public road network which would be used for the haulage of coal from and rejects to the Whitehaven Coal Mine, and rejects to and from the rail loop and the Gunnedah Colliery, ie Hoads Lane, Blue Vale Road, Kamilaroi Highway, Quia Road/Torrens Road, Black Jack Road. Available traffic data is also presented.

It should be noted that the movement of coal trucks along each of the above roads is an approved activity by virtue of the Whitehaven Coal Mine Development Consent. Blue Vale Road and the Kamilaroi Highway, and Black Jack and Quia Roads, were also the approved haulage routes for coal trucks moving to and from the Vickery Coal Mine and Gunnedah Colliery respectively.

3.13.1.2 Hoads Lane

The Hoads Lane component of the transport route (**Figure 1.2**) is 5.2 km in length and has been upgraded by WCM in accordance with Condition 7.3(a) of Development Consent 72-03-2000 to include an 8 m wide crowned bitumen pavement with 'V' drains and mitre drains. The northernmost 1.3 km of this road lies within Narrabri Shire, with the remaining 3.9 km being located within Gunnedah Shire. Agreements are in place with both Narrabri and Gunnedah Shire Councils for the maintenance of their component sections of this road.

3.13.1.3 Hoads Lane/Blue Vale Road Intersection

The Hoads Lane/Blue Vale Road intersection was modified in accordance with DA 72-03-2000 and provides for the uninterrupted movement of vehicles from Hoads Lane to/from Blue Vale Road. A T-intersection and 'Give Way' sign has been installed on Hoads Lane to cater for local traffic entering and leaving Blue Vale Road to/from the west.

3.13.1.4 Blue Vale Road

The Blue Vale Road component of the transport route from the Whitehaven Coal Mine (**Figures 1.2** and **2.6**), ie between its intersections with Hoads Lane and the Kamilaroi Highway, is 18.4 km in length and comprises a 6 m to 7 m wide sealed

pavement with 1 m wide gravel shoulders. Pavement condition is generally good, with only minor areas exhibiting pavement deformation/swelling/breakup as a consequence of poor sub-grade and basecourse conditions and flooding damage. An agreement is in place between WCM and Gunnedah Shire Council for routine inspection and maintenance of Blue Vale Road. The speed limit on Blue Vale Road is signposted at 100 kph.

3.13.1.5 Blue Vale Road/Kamilaroi Highway Intersection and Kamilaroi Highway

The intersection of Blue Vale Road and the Kamilaroi Highway (**Figure 2.6**) comprises:

- a free flow slip lane and acceleration lane for eastbound vehicles leaving Blue Vale Road;

- a lane for west-turning vehicles leaving Blue Vale Road. The right turn lane and free flow slip lanes are separated by a concrete barrier and island;

- a deceleration lane for eastbound vehicles on the Highway entering Blue Vale Road; and

- separate slip-through lane for eastbound vehicles on the Kamilaroi Highway. The eastbound slip-through and acceleration lanes extend from the intersection to the east of the entrance to the Project Site. Dual westbound 3.5 m wide lanes extend from approximately 200 m west of the Blue Vale Road entrance to the siding access road. Visibility east and west along the Kamilaroi Highway at the intersection exceeds 1 000 m. The left-turn free flow slip lane at the intersection

is in poor condition, with extensive pavement stripping, pot-holing, edge break-off and gravel build-up as a consequence of both light and heavy vehicles turning the corner at speed and drainage problems/flooding damage. Maintenance of the intersection forms part of the agreement between WCM and Council.

The highway pavement between Blue Vale Road and the Project Site entrance, though generally in good condition, does exhibit areas of pavement deformation, principally in the northern-most lane.

East and west of the Project Site entrance – Blue Vale Road dual lanes, the Kamilaroi Highway comprises a minimum 6 m wide sealed pavement in good condition, with barrier and centre line marking provided. The speed limit is 100 kph to 0.6 km west of Quia Road (on the outskirts of Gunnedah) where it initially reduces to 80 kph.

3.13.1.6 Kamilaroi Highway/Siding Access Road Intersection

The Kamilaroi Highway/siding access road intersection (**Figure 2.6**) is similar in form to the intersection of the Kamilaroi Highway and Blue Vale Road and was designed and installed to service the Vickery rail siding/train loader and a projected 690 coal truck movements per day. The intersection comprises:

- a free flow slip lane, merge taper and secondary lane for west-bound vehicles leaving the siding access road;

- a lane for right-turning vehicles leaving the siding access road. The right turn lane and the free flow left slip lane are separated by an island with concrete kerbing to the north and east and by an 0.9 m high concrete barrier to the west; and

- a deceleration taper for west-bound vehicles on the Highway entering the siding access road.

Visibility at this intersection is 600 m to the west, and approximately 800 m to the east. Warning signs indicating trucks crossing are positioned to the east of the siding access road intersection. Lighting is provided at the intersection.

Kamilaroi Highway/iding access road intersection pavement conditions within the Highway easement are variable with minor areas of pavement cracking and deformation evident on the left turn into and right turn lanes from the siding access road. Minor pavement deformation, cracking, pavement stripping and gravel buildup is evident in the left turn slip lane, with pavement stripping and gravel buildup a consequence of heavy vehicles leaving the siding access road at speed to join west-bound traffic on the Highway. The results of frequent pavement repair works are also evident in this area.

3.13.1.7 Torrens Road Access Way/Torrens Road Intersection

The Torrens Road access way represents a straight line westerly extension of Torrens Road, intersecting Torrens Road on what is currently, a southerly right angle bend to the Quia Road rail crossing. This rail crossing, the only means by which most heavy vehicles can currently cross the North-Western railway line, is to be decommissioned in mid-2002 following the lowering of the existing Quia Road rail underpass and associated re-alignment works.

The intersection incorporates a sealed bell mouth to prevent pavement edge damage from vehicles entering the Torrens Road access way from the south.

3.13.1.8 Torrens Road

The Torrens Road component of the transport route (**Figure 2.6**) is approximately 600 m in length and extends from the rail underpass to the junction of the private Torrens Road access way adjacent to the crossing over the North-Western railway line. Pavement widths range from 6 m to 7 m with pavement conditions ranging from good, to fair in isolated areas. Minor pavement edge break-off and deformation is evident in sections.

3.13.1.9 Quia Road

The Quia Road component of the transport route (**Figure 2.6**) is approximately 1.6 km in length and extends from the rail underpass to the entrance to the Gunnedah Colliery train loader and rail loop. Quia Road comprises a 6 m wide sealed pavement with centre line marking. Pavement conditions range from poor to good.

The intersection of Quia Road and Black Jack Road, ie the road which leads to the Gunnedah Colliery, is positioned approximately 0.7 km west of the rail underpass.

3.13.1.10 Black Jack Road

Black Jack Road is 6.6 km in length and runs from Quia Road at its northern extent to the intersection of the Gunnedah Colliery private mine road and Bushes Road (at its southern extent). Black Jack Road comprises a 6 m to 7 m wide sealed pavement between barrier marking lines, with 1 m to 2 m gravel shoulders and graded drains on both sides of the road.

With the exception of the intersection adjacent to the Gunnedah Colliery, pavement conditions are generally good with minor areas only of crocodile cracking, edge break-off and pavement settling/rutting (principally associated with culverts). Double white lines and "Stop" signs are positioned on Black Jack Road at the Oxley Highway intersection and tapered splays are provided on the Oxley Highway east and west of Black Jack Road to allow for vehicles turning into Black Jack Road from either an easterly or westerly direction. At the intersection with the Gunnedah Colliery private mine road, the pavement is in poor condition, with extensive pot-holing and pavement edge break-off.

Visibility at the intersection of Black Jack Road and Quia Road is 450 m to the west and 800 m to the east, while at the intersection with the Oxley Highway, visibility exceeds 1 km in both easterly and westerly directions.

With the exception of the northern-most one kilometer, the speed limit on Black Jack Road is 100 kph. Approximately one kilometer from Quia Road, the speed limit on Black Jack Road reduces from 100 kph to 80 kph.

3.13.2 Traffic Levels

Table 3.14 presents classified traffic data collected by Gunnedah Shire Council in February/March 2002 for the Kamilaroi Highway between the Blue Vale Road and siding access road intersections, and for Quia Road, adjacent to the former Gunnedah Abattoir (Landowner Reference No. 14 - **Figure 3.5**). Coal truck movements past each of the counter locations are also presented.

Table 3.14
Traffic Levels

Location	Traffic Count Period	Total Vehicle Movements	Light Vehicles	Heavy Vehicles			5- day average		7-day average	
				Total	Coal	Other	Light	Heavy	Light	Heavy
Kamilaroi Highway	04-03-02 to 10-03-02	14846	10745	4100	888	3212	1570	698	1535	585
Quia Road	25-02-02 to 03-03-02	7949	5930	2018	1262	756	907	355	847	288

Table 3.14 shows that during the respective counting periods:

- heavy vehicle movements constituted approximately 28 per cent and 25 per cent of total vehicle movements on each of the Kamilaroi Highway and Quia Roads respectively; and

- on the Kamilaroi Highway and Quia Road, coal truck movements represented approximately 22 per cent and 63 per cent of all heavy vehicle movements.

A review of the raw data used to derive **Table 3.14** also shows that:

- peak hourly heavy vehicle movements on the Kamilaroi Highway ranged up to 60 over the Monday to Saturday period, ie when coal haulage may be undertaken, whereas on Sundays, a peak of 23 heavy vehicle movements was recorded in one hour; and

- peak hourly heavy vehicle movements on Quia Road ranged up to 42 over the Monday to Saturday period while on Sundays, a peak of 7 heavy vehicles in any one hour was recorded.

3.13.3 Bus Services

Quia and Black Jack Roads, that is, roads which would be used for the transportation of coarse reject to the Project Site during fine reject pond construction activities, and periodically during CHPP operations for the transportation of rejects between the component areas of the Project Site and between the Project Site and the Gunnedah Colliery, form part of the local school bus route, with the collection and delivery of children occurring between 7.55 am and 8.30 am and 3.35 pm and 4.00 pm respectively (on school days). This route is, however, also currently used for the transportation of coal to the Gunnedah Colliery coal preparation plant from the Whitehaven Coal Mine and from the Gunnedah Colliery plant to the train loader. Both WCM and Namoi Mining currently cease coal truck movements on these roads during those periods when school buses are on or in their vicinity.

Traffic along the Kamilaroi Highway, a main link between Gunnedah (and areas east) and Boggabri/Narrabri (and areas west) includes both tourist and school buses.

3.13.4 Rail Network and Useage

The Gunnedah/Narrabri region is serviced by the North-Western railway line which extends from Walgett to immediately south of Werris Creek (**Figure 1.1**). Near Werris Creek, the North-Western railway line meets the Main Northern line which extends through to Newcastle.

The Rail Access Corporation has advised that in 2000/2001 there were an average of 9 train movements (or paths) per day along the North-Western railway line in the vicinity of Gunnedah, comprising an average one 42 wagon (3 200 t) coal train, six general freight (wheat, cotton, etc) and two passenger train movements. The current

rail timetable incorporates four dedicated coal train paths per day to service the WCM facilities, one arriving at about 7.30 am and the other at about 11.30 am. Additional paths, dedicated to other purposes, eg grain transport, are available for coal transportation from time to time.

3.14 FIRE HAZARD

The fire hazard for the areas to be disturbed in association with WCM's proposal has been assessed using the method first described in Circular 74 (Department of Environment and Planning 1984). Circular 74, entitled "Planning in Fire Prone Areas" was designed to ensure that the hazard of bush fires and its implications for new developments were recognized by Local Government Planners. The Project Site lies within the Central Fire Zone of New South Wales where forest and grass fires are the principal forms of fire experienced.

The potential fire hazard on the vegetated areas of the Project Site has been assessed by rating the two main factors influencing fire, ie vegetation (fuel) and terrain (slope), and their relative contributions to a potential fire. Fuel type is translated to an index of fire intensity when burning and slope is translated into an index relating to the rate of spread of fire. The hazard index of 3.9 for "improved pasture" is conservatively multiplied by slope index (SI) of 1.0, this being the index for a slope of 0 to 5 per cent (SI – 1), to give an overall index of 3.9 and a hazard ranking of "high".

It should be noted however, that the potential fire hazard of a particular vegetation type is based on the maximum build-up of fuel and hence pre-supposes neglectful management and a long absence of fire. Conversely, routine slashing of the Project

Site and the proximity of Quia Road, the North-Western railway line and the Kamilaroi Highway, together with the grazing/cropping of the majority of the surrounding areas, would preclude maximum fuel build-up and hence reduce the actual fire hazard rating within the Project Site in total to low to moderate. It is also noteworthy that Circular 74 states that "pasture (natural and introduced) are only considered to be a genuine hazard in the Western Fire Zone".

Section 4

ENVIRONMENTAL SAFEGUARDS AND IMPACTS

Preamble

This section describes the design and operational safeguards together with the management procedures that WCM either already has in place at the Whitehaven siding (and which would continue) or would adopt throughout the development and operation of the CHPP. The safeguards and management procedures have been developed to ensure the area within and surrounding the Project Site is not significantly affected by the proposal and that the level of impact is minimized and meets specified criteria, statutory guidelines or reasonable community expectations. In many cases, the safeguards arise from recommendations provided by or developed in consultation with specialist consultants advising WCM.

This section also includes the predicted impacts upon the relevant components of the existing environment once the various safeguards and operating procedures are adopted, and identifies programmes to monitor the effectiveness of the safeguards/procedures and/or verify predictions, that is, where appropriate.

4.1 AIR QUALITY

An assessment of the air quality aspects of the proposed CHPP has been undertaken by Richard Heggie Associates Pty Ltd and is presented in **Appendix 7.** This section briefly examines the potential air contaminants and their sources; the guidelines adopted by the EPA for assessing air quality; identifies the controls already in place and those which would be applied in association with the construction and operation of the CHPP, and assesses the impact of the proposed construction and operational activities on local air quality. An air quality monitoring programme to determine the effectiveness of the controls is also identified.

4.1.2 Potential Air Contaminants

Atmospheric dust of various size categories would be the main component of air emissions from the activities identified in this EIS, and would potentially originate from:

- vegetation removal, soil stripping and transport;
- dumping of coal on ROM coal stockpiles;
- crushing of coal prior to its entry to the coal preparation plant;
- domestic coal screening;
- dust lift-off from the surface of the CHPP feed conveyor, feed and discharge conveyors at the domestic coal screening plant and associated transfer points;

- dust lift-off from the exposed surfaces of ROM or product coal stockpiles, the dried surface of the consolidated fine reject ponds, hardstand and exposed coal pad areas, the Torrens Road access way and other unsealed surfaces;

- product coal and reject despatch, including loading domestic coal product trucks, trains and/or trucks transporting coarse reject off-site;

- vehicle movements on unsealed surfaces;

- dust lift-off from any dried accumulation of materials on sealed roads.

Coal preparation (washing) is primarily a wet process and, as such, would not be a potential source of dust generation. Similarly, the transfer and discharge of washed coal (moisture content approximately 12 – 14 per cent) onto product coal stockpiles would not be a source of dust generation.

Other potential sources of air emissions from, or associated with the proposed activities would include:

- exhaust fumes from fuel driven mobile and processing equipment on the Project Site, coal product and reject trucks and coal train locomotives; and

- odorous gases in the event of any spontaneous combustion incidents.

Agricultural pursuits undertaken on adjacent landholdings, eg ploughing, cropping, stock movement, certain day-to-day domestic activities, the movement of vehicles on the Kamilaroi Highway and other local roads, and the passage of general freight and

passenger trains along the North-Western railway line, are also sources of atmospheric emissions.

4.1.3 Air Quality Guidelines

4.1.3.1 Introduction

The EPA requires the assessment of impact of activities that may adversely affect air quality to be undertaken in accordance with a range of guidelines related either to amenity or health-related factors. In the case of dust, distinction is made between dust particles that are sufficiently small and can remain airborne with the potential to enter a person's lungs, and dust particles that are sufficiently large to readily fall out of the atmosphere and be deposited on surfaces, eg window sills, parked cars and washing.

The guidelines that relate to equipment and vehicle exhausts are drawn from the EPA guidelines for the road transport industry.

4.1.3.2 Dust Deposition

Deposited dust (dust fall), though not affecting public health can, if present at sufficiently high levels, cause nuisance by reducing the amenity of an area to such an extent that activities cease to be either enjoyable or viable. The principal nuisance effects contributing to this degradation of amenity include the presence of visible dust either in the air or on surfaces, and soiling of those surfaces.

The EPA has adopted the criteria set out in **Table 4.1** to assess the impact of deposited dust upon amenity. The maximum acceptable increase in the mean annual dust deposition rate is identified as 2 g/m^2/month in those areas in which the existing

rate of dust deposition does not exceed 2 g/m^2/month, such as in the vicinity of the Project Site.

Table 4.1
EPA Guidelines for Deposited Dust

Existing Deposited Dust Level (g/m^2/month)	Maximum Acceptable Increase Over Existing Deposited Dust Level (g/m^2/month)	Maximum Total Deposited Dust Level (g/m^2/month)
2	2	4
3	1	4
4	0	4
Note: If the existing deposited dust level is greater than 4 g/m^2/month, then no increase in dust fallout is acceptable as a result of any proposed dust emitting works.		

Source: EPA (2001)

4.1.3.3 Total Suspended Particulates

Health effects of atmospheric dust are generally related to the concentration of suspended particulates in the air as distinct from dust fallout. Total suspended particulates (TSP) relates to all particles in the size range of 0.1 μm to 50 μm and includes fine (PM_{10}) and super-fine ($PM_{2.5}$) components. The larger particles, (ie >10 μm are too large to be inhaled and thus cannot give rise to health effects. Conversely, fine and super-fine particles can penetrate the respiratory system.

The air quality goals which are applicable to TSP and PM_{10} are presented in **Table 4.2**. There is currently no National goal for $PM_{2.5}$.

Table 4.2
Air Quality Standards/Goals for Particulate Matter Concentrations

Parameter	Standard	Agency
TSP	90µg/m^3 - (annual mean)	NHMRC
PM_{10}	150 µg/m^3 - should not be exceeded more than once per year.	US EPA
	50 µg/m^3 - (annual mean).	US EPA
	50 µg/m^3 - (24 hour maximum)	NSW EPA
	50 µg/m^3 - 24 hour average. Should not be exceeded more than 5 times per year – 10 year goal	NEPC
	30 µg/m^3 – long-term reporting goal.	NSW EPA

In summary, the air quality goals to be adopted for the proposed Whitehaven Siding CHPP would therefore be:

- deposited dust - mean annual increment of 2g/m^2/month
- TSP - mean annual maximum of 90 µg/m^3
- PM_{10} - 24 hour maximum of 50 µg/m^3.

4.1.3.4 Equipment and Vehicle Exhausts

The EPA is currently applying the same requirement for exhausts from mobile equipment, eg front-end loaders, bulldozers, and vehicles travelling within the Project Site, as they do for cars and trucks on public roads, that is, exhaust gases should not be visible for more than 10 seconds continuously.

4.1.4 Air Pollution Controls

4.1.4.1 Dust Control Measures

WCM would apply a wide range of air pollution control measures to ensure air quality standards are not compromised by its activities and satisfy the requirements of the Protection of the Environment Operations Act 1997.

The individual sources of dust and the proposed controls are identified below.

i) **Vegetation removal, soil stripping and transport**

With the exception of isolated small trees/large shrubs which would require removal to enable fine reject pond development, vegetation would be collected with, and incorporated with the topsoil/spoil.

The isolated small trees/large shrubs would be separately pushed over and, to avoid being a harbour for vermin, would be stockpiled and burnt. Where practicable, any soil stripping required would be undertaken at a time when here is sufficient soil moisture to prevent significant lift-off of dust. This control measure would also minimize the structural degradation of the soil during stripping activities. Additionally, WCM would avoid stripping soil during periods of high winds.

In the unlikely event that soil stripping is required during periods when inadequate soil moisture is present within the soil to prevent dust lift-off, and/or dust dispersal beyond the immediate area of activity is observed, dust suppression would be by water application using a water truck.

ii) **Dumping of Coal on ROM Stockpiles**

ROM coal (nominally <150 mm in diameter) transferred from the source mine to the Project Site for processing (washing or screening), would be dumped on or adjacent to the clean or dirty ROM coal stockpiles (depending on whether it requires screening only, or washing) for subsequent transferral to either the domestic coal screening plant or to the coal preparation plant. Stockpile management would be by bulldozer or front-end loader, with use of the bulldozer outside day-time hours associated with infrequent train loading activities only.

The inherent moisture content of the ROM coal, together with the additional water applied to the coal during crushing operations at the mine, results in a delivered ROM coal moisture content of approximately 7 per cent. Dust generation during dumping and stockpile management activities would therefore be minimal.

iii) **Coal crushing**

All coal to be processed through the coal preparation plant would initially be passed through the tertiary crusher to reduce the top particle size to <50 mm. Dust controls to be implemented during this phase would include:

- minimizing the fall distance when the ROM coal is being dumped into the feed hopper;

- automatic spray application of water to the feed hopper and crusher at a rate of approximately 0.75 L/t processed; and

- installation of a windshield over the crusher discharge CHPP feed conveyor.

iv) **Domestic Coal Screening**

The domestic coal screening plant would be fitted with water sprays at the feed hopper, the screens and at all conveyor transfer and discharge points.

v) **Conveyors and Transfer Points**

All conveyors carrying, or potentially carrying materials which would be a potential source of dust, eg CHPP feed conveyor and the screening plant conveyors, together with any associated transfer points, would be fitted with water sprays and/or covered with windshields. Additionally, all conveyors would be fitted with appropriate cleaning and collection devices to minimize the amount of coal falling from return conveyor belts.

vi) **Exposed Surfaces**

Dust lift-off from the various exposed surfaces on the Project Site would be controlled by:

- minimizing the extent of clearing/site preparation in advance of fine reject pond construction;

- use of the existing four tower-mounted water sprays located around the perimeter of coal pads A and B (**Figure 2.1**). These sprays would minimize dust generation from all ROM and product stockpile areas and associated hardstand areas. The sprays are linked to an anemometer with a manual override capability which enables the sprays to be activated during periods of observed dust

generation below a wind speed of approximately 5 m/s or to be de-activated during windy wet periods or when the pad areas are sufficiently moist to prevent dust generation. Trials undertaken on the Project Site to date have demonstrated that ten minutes of spray operations is sufficient to control dust generation for more than four hours;

- installation of water sprays along the unsealed Torrens Road access way. These sprays would be activated during periods of access way use and/or if dust lift-off and dispersal from the access way surface is evident. Application of water by water truck and/or sprays, or the use of commercial dust suppressants would be used to minimize dust generation from other exposed surfaces such as the coal truck parking and administration area;

- crusting of the surface of the consolidating fine reject would generally minimize the potential for dust lift-off and dispersal from this source. However, in the event of observed dust, eg during periods of concurrent hot, dry and windy conditions, water sprays would be operated, drawing water from the polishing or recovery ponds;

- progressive rehabilitation of available areas of disturbance such as topsoil, subsoil and spoil stockpiles; and

- planting of additional tree screens.

vii) **Product Coal and Reject Despatch**

Dust control measures to be applied during product coal and coarse reject despatch activities would include:

- maintenance of coal and coarse reject stockpiles in a damp condition;

- use of the reclaim facility to load the rail load-out conveyor. The reclaim facility draws the coal from the base of the stockpile into the tunnel and as such is not a source of dust dispersal. Dust generation during periods when screened coal is being added to the rail load-out conveyor would be controlled by water sprays on the conveyor or at the dump hopper (**Figure 2.2**);

- minimizing the fall distance between the front-end loader bucket and the bodies of trucks carrying domestic coal or coarse reject;

- requiring all trucks carrying domestic coal or coarse reject to cover their loads with efficient sand covers. A covered load policy already applies to ROM coal transportation activities.

Dust generation during train loading from the load-out bin would be minimized by the low fall distance to the rail wagons and the moist nature of the coal.

Excavation, loading and transport of consolidated fine reject would not be a source of dust as these materials, although sufficiently dried to allow excavation, would still have a high moisture content.

viii) **Vehicle Movements on Unsealed Surfaces**

Dust generation from vehicle movements on unsealed surfaces would be controlled through a combination of water and/or dust suppressant applications as identified in (vi) above and by limiting speeds on all other unsealed surfaces to 30 kph.

ix) **Dried accumulated materials on sealed roads**.

Controls to be implemented to prevent the accumulation of materials on sealed surfaces which would potentially become a source of dust once dried, would include:

- routine use of the existing automatic truck wash to remove any accumulated materials from the coal truck bodies prior to the departing trucks moving onto the siding access road and public road network. All trucks would be required to pass through the truck wash on every trip;

- maintaining the Torrens Road access way in a sufficiently moist condition to control dust generation but prevent an accumulation of mud on the truck bodies; and

- limiting vehicle speeds on the Torrens Road access way and within the rail loop.

4.1.4.2 Control Measures for Other Potential Air Contaminants

i) **Exhausts**

Earthmoving equipment and on-site vehicles would be fitted with exhaust controls which satisfy EPA emission requirements. The

exhausts of all equipment would be directed upwards or to the side so as not to impinge on the ground and cause dust lift-off. WCM would also ensure that all equipment is properly maintained and only operated when necessary in order to minimize greenhouse gas emissions, and commit to the standing-down or removal of any vehicle or item of mobile equipment which is observed not to comply with NSW EPA guidelines.

ii) **Odour**

Spontaneous combustion can result in the release of odorous gases including oxides of sulphur and hydrocarbons. Coal from the Whitehaven Coal Mine has a low percentage of inorganic sulphur and hence a low potential for exothermic oxidation reactions, with a single incidence only of spontaneous combustion recorded at the mine to date. There has been no evidence of spontaneous combustion in Whitehaven coal stockpiled at the Gunnedah Colliery coal preparation plant or train loader, nor have there been any instances of spontaneous combustion within the high clay/low carbon Whitehaven coarse reject materials deposited at the Gunnedah Colliery. Nevertheless, a Spontaneous Combustion Management Plan is in place.

Notwithstanding the above, WCM would progressively despatch stockpiled coal in order to minimize stockpile residence time. Should market conditions result in a build-up of coal stocks, WCM would:

- reduce the stockpile batter angles in the direction of the prevailing winds;
- compact stockpiles using the mobile equipment on-site;

- use pyrometers or similar equipment to monitor stockpile temperatures; and

- in the event a stockpile begins to generate heat, spread the stockpile out to allow the heat to dissipate.

4.1.5 Air Quality Impact Assessment

4.1.5.1 Method

Predictions of deposited dust, TSP and PM_{10} emissions during the CHPP construction and operational phases were undertaken by Richard Heggie Associates Pty Ltd using the AUSPLUME dispersion model developed by the Victorian EPA. AUSPLUME is an advanced Gaussian dispersion model and is the approved model for the majority of applications in NSW. The model utilizes estimates of particulate emission rates for the various activities which would be undertaken on the Project Site, together with relevant meteorological and topographical information, to predict ground level concentrations of particulate matter. In order to reflect a worst-case scenario for airborne emissions over a 24 hour period, the emission inventory used in the modelling for both the construction and operational phases assumed all equipment to be operating concurrently with only limited control measures, and as such represented a conservative estimation.

In the absence of a full year's data from a closer station, the weather data used in the model was derived from WCM's Whitehaven Coal Mine station following an assessment of its applicability. The topography in the local area is uncomplicated and would not have any significant impact on the modelled concentrations. Consequently, this aspect was not considered in the model.

The relevant meteorological data, emission factors and an emission inventory are presented in **Appendix 7**.

4.1.5.2 Deposited Dust

The conservatively predicted increases in deposited dust levels during the CHPP construction and operational phases are presented as contour plots in **Appendix 7**. The contour plots show that the increase in mean monthly dust deposition rates as a consequence of the proposed activities, would be less than 1g/m^2/month at all residences, giving a mean annual total deposited dust level at those residences of less than 3g/m^2/month and thereby satisfying both the incremental and total deposited dust criteria identified in **Table 4.1**. Although the contour plots show the increase in the dust deposition rates in the south-eastern corners of the "Wirringulla" and "Longlands" properties (in excess of 800 m from those residences) to exceed 2g/m^2/month, Richard Heggie Associates Pty Ltd (2002(b)) noted that the modelling assumed:

- "Conservatively high levels of site activity, (ie the model assumes continuous 24-hour use of the front-end loader for this scenario).

- Minimal mitigation measures (only water sprays to the tertiary crusher have been assumed)".

In view of the above, and with standard mitigation measures as described in Section 4.1.4.1, Richard Heggie Associates Pty Ltd (2002(b)) noted that "....the actual levels of dust deposition are expected to satisfy the dust deposition criterion".

4.1.5.3 Total Suspended Particulates

Contour plots of average annual TSP concentrations, ie background plus incremental levels, are presented in **Appendix 7**. The contour plots show that during both

construction and operational phases, the incremental and total TSP concentrations at all adjacent residences would be less than 20 $\mu g/m^3$ and 40 $\mu g/m^3$ respectively and thus readily satisfy the 90 $\mu g/m^3$ goal.

4.1.5.4 PM_{10}

Appendix 7 also presents contour plots for total 24-hour PM_{10} concentrations assuming a PM_{10} background level of 10$\mu g/m^3$. The plots show that at all adjacent residences, the peak 24-hour PM_{10} concentrations (background plus CHPP contribution) would be less than 30$\mu g/m^3$ during CHPP construction and operations.

A peak concentration of less than 30$\mu g/m^3$ readily satisfies the 50 $\mu g/m^3$ guideline value.

4.1.5.5 Short-Term Dust Episodes

Short-term dust episodes relate to temporary increases in the amount of dust raised mainly from disturbed surfaces and other dust containing areas by strong winds in dry weather conditions.

As a rule, dust episodes are more frequent and lead to higher short-term concentrations of wind-blown dust in those areas for which the long-term predictions of annual dust levels indicate a reduction in amenity. Given that the amenity criterion of 2 g/m^2/month (mean annual increment) is not predicted to be reached at any residence, it would not be expected that atmospheric dust would escape during short-term dust episodes and reach the nearest residences in such quantities which could cause temporary dust nuisance in high winds.

4.1.5.6 Greenhouse/Exhaust Gas Emissions

Greenhouse gas emissions from the proposed CHPP would comprise.

- Carbon monoxide (CO) and Carbon Dioxide (CO_2). CO and CO_2 are produced as a result of the oxidation of the carbon content within diesel fuel; and

- Methane (CH_4), Oxides of Nitrogen (NO_X) and Volatile Organic Compounds (VOCs), all of which are produced from incomplete fuel combustion, reactions between air and fuel constituents, and post-combustion reactions.

Greenhouse and exhaust gas emissions on the Project Site would be minimized by the maintenance of equipment and use of diesel equipment only when required for operational purposes, and were considered by Richard Heggie Associates (2002(b)) to be negligible. In a local context, there would be no increase in emissions from the CHPP as the development of the proposed facilities would use no more diesel fuel than is currently used with the similar operations at the Gunnedah Colliery coal preparation plant and train loader, both of which would be replaced by the proposed development (see **Appendix 4**). Rather, the development of the proposed CHPP would result in a nett decrease in greenhouse and exhaust emissions by virtue of the reduction in the distance travelled annually by coal trucks. At the maximum production rate sought under this Development Application, there would be an annual reduction in CO, NO_X, SO_2, VOC and PM_{10} emissions from diesel exhausts of 2.32 t, 11.90 t, 0.36 t, 1.47 t and 0.51 t respectively.

4.1.6 Monitoring

In order to monitor the effectiveness of the air quality controls implemented on the Project Site and verify the outcomes of the predictions identified in Sections 4.1.5.2, 4.1.5.3, 4.1.5.4 and 4.1.5.5, WCM would, with landowner permission, install deposited dust gauges at or adjacent to the "Wirringulla" and "Carousel" residences and the siding access road, and to the south of the fine reject ponds (see **Figure 4.1**). All gauges would be positioned in accordance with AS 3580.10.1.1991 "Methods of Sampling and Analyses of Ambient Air". High volume sampling would only be undertaken in the event of routine exceedances of the deposited dust criterion.

Given the proximity of the recently-commissioned Gunnedah Airport meteorological station (4 km east of the Project Site) and the nature of the intervening terrain, no site-specific meteorological station is considered warranted.

4.2 WATER MANAGEMENT

4.2.1 Introduction

The following sub-sections briefly outline the potential sources of water pollution from the Project Site, the impact assessment criteria adopted, describe the existing and proposed water management controls and assess the impact of the proposed activities on surface and groundwater.

Management of water within each of the component areas of the Project Site is required to ensure that:

- the quality of water contaminated with suspended solids is minimized;
- erosion within and around the Project Site is minimized;

- the potential for groundwater contamination through spillages of fuels or other contaminants is minimized;

- the water management systems employed within the Project Site do not adversely affect downstream water resources or users in terms of either quality or quantity, that the ecological integrity of the catchment is maintained, and that any water leaving the Project Site complies with the appropriate EPA criteria; and

- the water that drains from the Project Site when CHPP operations cease is non-polluting.

A water management system installed as part of the former Vickery operations on the siding component of the Project Site, and shown to be effective in the satisfaction of the above objectives, remains in place and operational and is discussed in Section 4.2.4.

4.2.2 Potential Sources of Water Pollution

The principal potential sources of water pollution from the component areas of the Project Site are:

i) run-off from disturbed areas within the siding and rail loop;

ii) run-off from topsoil, subsoil and spoil stockpiles;

iii) surface run-off from the siding area and reprofiled fine reject ponds prior to their stabilization with vegetation;

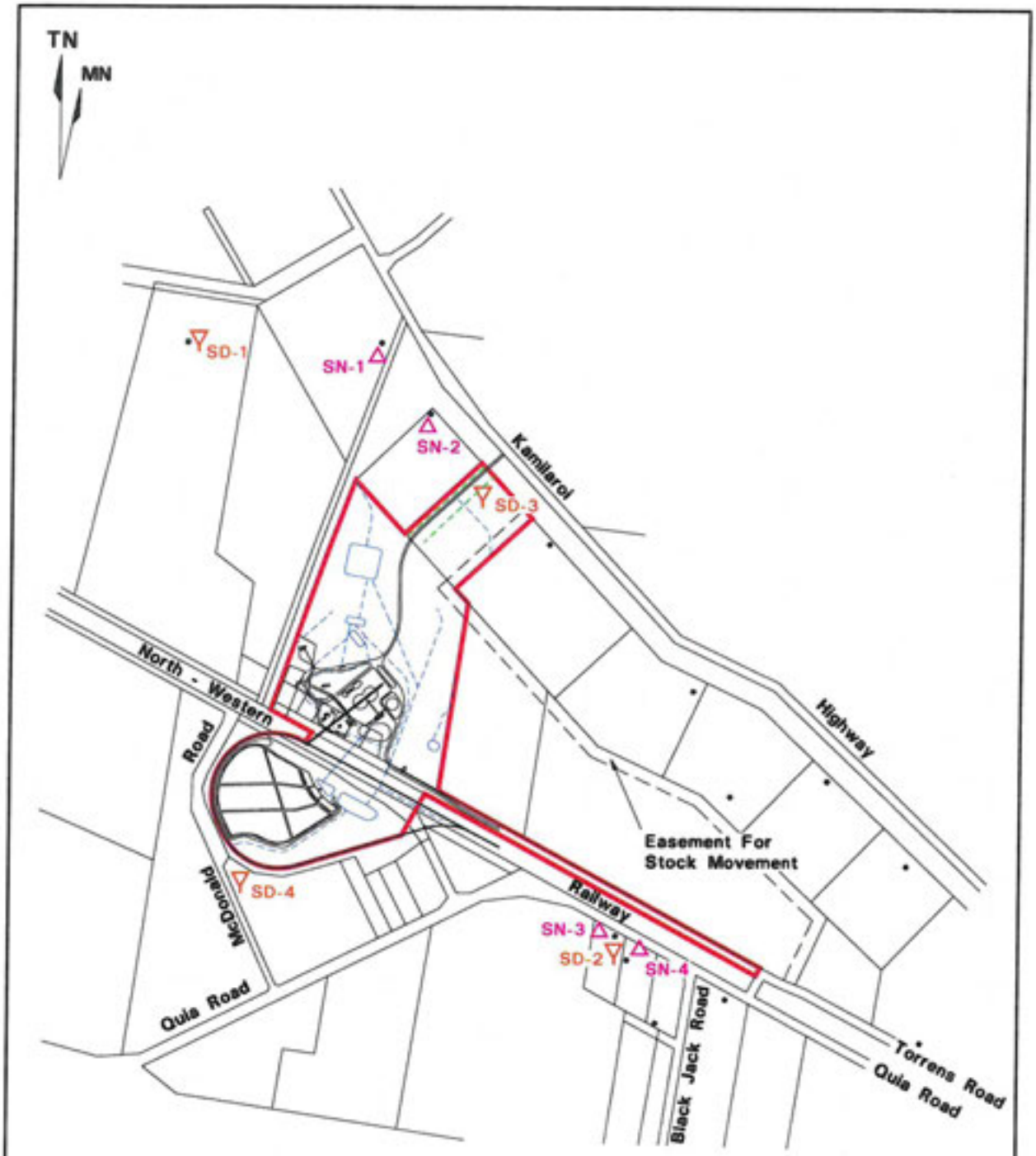


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Figure 4.1
PROPOSED ENVIRONMENTAL MONITORING SITES

iv) slurry from fine reject and return water pipeline boring and fine reject pipeline breakage;

v) surface run-off from roads;

vi) fine reject leachate migration to groundwater; and

vii) spillage of fuel, oil or lubricants.

The principal potential contaminant in all but items (vi) and (vii) would be suspended solids, that is, coal, sand, silt or clay particles in water.

For management purposes, the water on the Project Site has been divided into two classes:

- "Clean" – surface run-off from catchments which are undisturbed or relatively undisturbed by on-site activities; and

- Potentially Sediment-laden ("Dirty") – surface run-off from areas such as the coal pads, coal truck administration and parking area; topsoil, subsoil and spoil stockpiles; fine reject ponds and rehabilitated surfaces (until stabilized).

4.2.3 Impact Assessment Criteria

The principal water quality criteria that are appropriate for the assessment of impacts from any surface water flowing from the Project Site, and the required level of compliance, are as follows.

pH	-	6.5 – 8.5
suspended solids	-	< 50 mg/L
grease and oil	-	no visible grease and oil nor contain more than 10 mg/L grease and oil

In the absence of specific treatments to the floor of the fine reject ponds to reduce permeability, leachate from the fine rejects should not exceed the Guideline Values for Health as identified in the Australian Drinking Water Guidelines (NHMRC & ARMCANZ 1996) nor the groundwater investigation levels as identified in the National Environment Protection Measure 1999.

4.2.4 Existing Water Management System

An extensive water management system remains on the Project Site from the prior operations, with the major features shown on **Figure 4.2** and including:

- three settlement ponds (SP-1, SP-2 and SP-3), a main storage dam and a fresh water dam;

- dirty water drains which lie to the south, east, west and north of the existing coal pads and direct all flows from the pads, and from the hardstand area south of the administration building, to the 0.66 ML capacity SP-1 and hence to the 20 ML capacity main storage dam;

- a drive-through truck wash. All water from the truck wash flows to the 0.66 ML capacity SP-2 and hence to the main storage dam. The truck wash prevents the transfer of sediment onto the sealed siding access road surface;

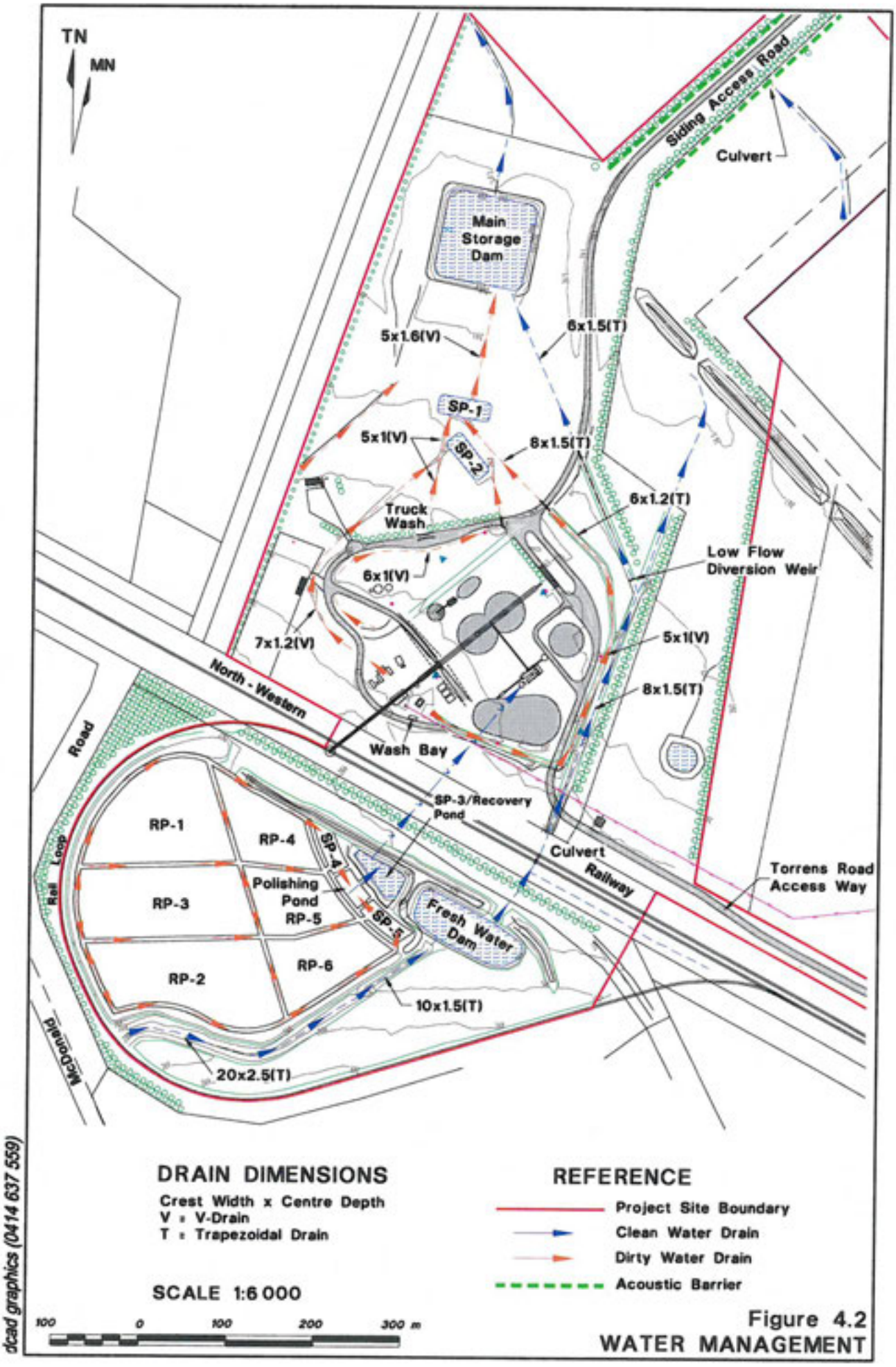

Figure 4.2
WATER MANAGEMENT

- a 2 ML capacity settlement pond (SP-3) within the rail loop. Discharges from the settlement pond flow to the 7 ML capacity fresh water dam and then via a box culvert under the North-Western railway line to a clean water drain located to the east of the existing coal pads. The clean water drain incorporates a low flow diversion weir comprising two 300 mm pipes and a gate which enables flows within the drain to be directed to the main storage dam or to pass directly to the Namoi River. The fresh water dam within the rail loop also receives flows from areas to the south-west of the rail loop.

  The dimensions of the various drains are shown in **Figure 4.2**.

- a concrete bunded fuel storage with a capacity of more than 24 000 L, ie greater than 120 per cent of the 20 000 L diesel fuel tank within the bund.

Water draining from the gravel surface of the Torrens Road access way is collected in roadside V-drains and hence flows to the natural drainage system to the north of the road.

4.2.5 Proposed Water Management System

4.2.5.1 Clean Water Management

With the exception of minor earthworks within the rail loop component of the Project Site, the clean water management system would remain unchanged from that currently in place.

Within the rail loop, minor earthworks required to maintain the integrity of the existing clean water management system would be limited to the installation of barriers to the east and north of SP-5 (**Figure 4.2**), thereby ensuring that under all circumstances flows from SP-5 are towards the polishing and recovery ponds and

that potentially dirty water leaching from the fine rejects ponds to the peripheral drainage system cannot enter the fresh water dam.

4.2.5.2 Dirty Water Management

Additional controls to be implemented for the management of dirty water would include:

- as appropriate, the installation of silt-stop fencing adjacent to the topsoil, subsoil and spoil stockpiles, that is, until the stockpiles are vegetated and no longer a potential source of sediment. The fencing would be installed and maintained in accordance with the manufacturer's specifications;

- increasing the capacity of SP-3 to approximately 5 ML. Water collecting within the enlarged SP-3, referred to as the "recovery pond", would be returned to the CHPP either directly, or indirectly via the main storage dam, for re-use in the coal preparation process;

- excavation of two 2 ML capacity settlement ponds (SP-4 and SP-5) and a 1.5 ML capacity polishing pond. SP-4 and SP-5 would act as the primary settlement structures for water emanating from the fine reject ponds. Discharges from each of SP-4 and SP-5 would be via a spillway to the polishing pond and from the polishing pond via a spillway to the recovery pond. The invert of the polishing pond/recovery pond spillway would be lower than the inverts of the spillways from each of SP-4 and SP-5. Each spillway would have a minimum cross-sectional area of 5 m^2;

- construction of nominal 5 m-wide V-drains around the perimeter and between each of fine reject ponds RP-1 to RP-6 inclusive. Flows within these drains would report to SP-4 or SP-5;

- positioning the fine reject discharge pipeline such that in the event of any line leakage or breakage, the fines would remain within the dirty water management system. Any slurry generated during the under-boring for the reject discharge and return water pipelines would be collected and placed within the fine reject ponds;

- construction of fine reject pond walls using coarse reject and incorporating a 0.5 m coarse reject blanket on the pond floor to assist fine reject drainage and consolidation; and

- limiting operational water storage within the main storage dam to 12 ML, thereby providing storage to the invert of the low flow discharge pipe sufficient to contain a minimum 1:20 year ARI event.

4.2.5.3 Fuel and Oil Management

WCM would undertake the following additional measures to ensure that neither fuel nor oil contaminates surface or groundwater.

- Construction of a concrete wash bay and associated oil separator. All equipment refuelling would be undertaken within the wash bay.

- Construction of one or more additional concrete bunded areas to incorporate the 50 000 L coal truck fuel tank, waste oil storage tank and stored grease and oils.

The bund(s) would each have a capacity of at least 120 per cent of the stored fuel/oil volume and incorporate a sump to enable the drainage of any spills or accumulated rainwater to the wash bay and oil separator. Fuel/oil removed by the oil separator would be pumped to the waste oil tank.

- All fuel and oil would be securely stored on site.

- Any spillages of fuel or oils occurring on the Project Site would be immediately cleaned up and the affected material transported to an approved waste depot or bio-remediated.

4.2.6 Water Budget

Australian Coal Technology Pty Ltd advises that water useage in the CHPP would approximate 100 L/t coal processed, with an annual make-up water requirement of approximately 80 per cent to account for losses by evaporation, incorporation within the fine reject and absorption/incorporation with the washed coal. At the maximum production rate of 2 Mtpa sought under this Development Application, annual make-up water requirements for the coal preparation plant would therefore approximate 160 ML.

The volume of water required for dust suppression activities would depend primarily on climatic factors, in particular wind and temperature. Based on WCM's experience at the Gunnedah Colliery coal preparation plant and train loader, at the Whitehaven siding to date and at the Whitehaven Coal Mine, total dust suppression requirements on the Project Site would approximate 50 ML pa, resulting in a total annual process water useage of approximately 210 ML. As noted in Section 2.9.2.1, WCM, through Namoi Mining Pty Ltd, has a current annual allocation of 350 ML from the Namoi River and an adjacent bore, with up to a further 104 ML pa being

available from a bore on the adjacent "Cedar Vale" property under agreement with the landowner.

4.2.7 Run-off Volume and Storm Storage Assessment

Assessments of the existing water management/storm storage system on the Whitehaven siding and of the proposed water management system within the rail loop were undertaken by the Gunnedah office of the Department of Land and Water Conservation (DLWC).

Peak discharges for each area were determined using the Deterministic Rational Method, the method assessed as being most appropriate for small heavily altered catchments. Run-off volumes were calculated using an empirical method for short duration storm events based on peak discharge and time of concentration. Rainfall intensities were based on Intensity-Frequency-Duration curves for the calculated times of concentration for each area.

For the rail loop area, the assessment conservatively assumed disturbance over the total area that would be potentially developed over the life of the CHPP, but without the storage which would be provided by constructed fine reject ponds. For the siding area, the assessment assumed the isolation of the main storage dam from the clean water diversion drain.

The results of the assessments for 2, 5, 10, 20, 50 and 100 year ARI time of concentration rainfall events are presented in **Tables 4.3** and **4.4**.

The results presented in **Tables 4.3** and **4.4** show that:

- by maintaining the main storage dam at approximately 60 per cent capacity when retaining the dam's low flow discharge valve in an open position, the combined siding area storages would capture and contain greater than a 1:20 year run-off event from that catchment. With the low flow discharge valve closed, the main storage dam would have sufficient capacity to contain greater than a 1:100 rainfall event without discharging; and

- with a combined storage of 9.5 ML, the proposed storages within the rail loop would have a capacity of approximately 4.5 ML in excess of that required to contain a 1:100 year ARI event.

Table 4.3
Peak Discharge and Expected Run-off Volumes – Siding Area. Catchment [*1]

Parameter	Average Recurrence Interval (years)					
	2	5	10	20	50	100
Co-efficient of run-off	0.55	0.60	0.65	0.70	0.85	0.95
Rainfall intensity (mm/hr)	41	59	64	75	92	105
Peak Discharge (m^3/sec)	1.02	1.60	1.88	2.38	3.54	4.52
Run-off volume (m^3) [ML]	3300 [3.3]	5180 [5.18]	6090 [6.09]	7710 [7.71]	11470 [11.47]	14650 [14.65]
[*1] Catchment Area = 16.3 ha; Time of concentration = 27 minutes						

Table 4.4
Peak Discharge and Expected Run-off Volumes –Rail Loop Catchment [*1]

Parameter	Average Recurrence Interval (years)					
	2	5	10	20	50	100
Co-efficient of run-off	0.55	0.60	0.65	0.70	0.85	0.95
Rainfall intensity (mm/hr)	58	77.5	89.5	106	129	148
Peak Discharge (m^3/sec)	0.66	0.97	1.21	1.55	2.28	2.93
Run-off volume (m^3) [ML]	1100 [1.1]	1630 [1.63]	2030 [2.03]	2600 [2.6]	3830 [3.83]	4920 [4.92]
[*1] Catchment = 7.5 ha; Time of concentration = 14 minutes						

4.2.8 Assessment of Impacts

4.2.8.1 Impacts on Surface Water

The range of existing and proposed water management measures, in particular the ability to contain all water from greater than a 1:100 rainfall event, together with a regular inspection and maintenance programme, would ensure that WCM's site water management objectives are achieved. Hence there would be no impact on the water quality within, nor on the use or ecological integrity of the Namoi River.

4.2.8.2 Impacts on Groundwater

The potential for the proposed activities to impact adversely on groundwater quality is dependent upon the storage and use of liquid or soluble potential contaminants on the Project Site such as hydrocarbons, pesticides, herbicides and soluble inorganic salts, and upon the quality of water which drains or leaches from the stored fine reject.

With the exception of diesel fuel and minor quantities of other petroleum products, no substance capable of contaminating groundwater would be used on the Project Site. The strategy to deal with fuel, oil and lubricant spillage as described in Section 4.2.5.3 would ensure that local groundwater is not adversely affected by these potential contaminants.

The potential for contamination of groundwater from water which drains or leaches from the stored fine reject is a function of the chemistry of the component coal and non-coal materials. **Table 4.5** presents an analysis of the leachate draining from the pond which is currently being used for the storage of Whitehaven Coal Mine fine reject at the Gunnedah Colliery, together with the relevant available Guideline Values for drinking water and agricultural (irrigation and livestock) uses.

A review of **Table 4.5** shows that the leachate from Whitehaven Coal Mine fine reject is of a quality which satisfies drinking water (health), irrigation and livestock uses, and hence would not contaminate nor adversely affect local groundwater.

Prior to the disposal of fine reject from any other mine development to the CHPP fine reject ponds, leachate water analyses would be undertaken to assess the potential for groundwater contamination and the need for, for example, treatments to reduce the permeability of the pond floors.

4.2.9 Water Monitoring

The proposed CHPP would be a nett consumer of water and would operate as a closed system with make-up water inputs as required. There would be no discharges from the site other than that water which enters the rail loop from areas to the south of Quia Road and passes through to the Namoi River via the clean water diversion drain. Accordingly, no long-term surface water monitoring programme is considered warranted.

Table 4.5
Whitehaven Coal – Coal Preparation Plant Fine Reject Leachate Analysis

Parameter	Unit	Analysis	Guideline Value			
			Drinking Water *1		Agriculture *2	
			Health	Aesthetics	Irrigation	Livestock
pH		8.48	6.5 – 8.5			
EC	µS/cm	1780				
TSS	mg/L	2				
Alkalinity-Bicarbonate	mg/L	280				
Chloride	mg/L	142	**	250	700	
Sulphates	mg/L	400	500	250*		
Iron (tot)	mg/L	0.05		0.3	1.0	
Zinc (tot)	mg/L	0.04		3.0	2.0	20.0
Manganese (tot)	mg/L	0.04	0.5	0.1		
Calcium (tot)	mg/L	74				
Magnesium (tot.)	mg/L	82				
Sodium (tot)	mg/L	204	**	180*		
Potassium (tot)	mg/L	14.0				
Phosphorous	mg/L	0.04				
Arsenic	mg/L	<0.002	0.007		0.1	0.5
Cadmium	mg/L	0.00005	0.002		0.01	0.01
Barium	mg/L	0.040	0.7			

*1 From Australian Drinking Water Guidelines (NHMRC & ARMCANZ, 1996).

*2 From National Environment Protection Measure 1999, Schedule B-1, Table 5-B, "Groundwater Investigation Levels".

* Taste threshold

** No health-based guideline considered necessary.

4.3 NOISE

4.3.1 Introduction

The impact of the proposed development of the CHPP on the noise climate around the Project Site has been assessed by Richard Heggie Associates Pty Ltd. This section, the contents of which primarily represent a summary of information presented in Richard Heggie Associates Pty Ltd, (2002(a)) – **Appendix 6**, initially reviews the noise criteria the EPA recommends to assess the impact of noise generating activities and the controls/mitigation measures to be employed, and subsequently assesses the impact upon the local noise climate.

4.3.2 Guidelines for Assessing Noise Impact

4.3.2.1 Approach to Guidelines

The guidelines for assessing the impact of the proposed activities within the Project Site are drawn from the NSW Industrial Noise Policy (INP) (January 2000 – document 00/01) prepared by the EPA, the regulatory authority for the control of noise from scheduled premises under the Protection of the Environment Operations Act 1997. The EPA's principal aims in controlling environmental noise are to minimize the occurrence of intrusive noise in the community and to preserve amenity for specific land uses, ie to promote environmental well-being through preventing and managing noise, whilst at the same time, striking a feasible and reasonable balance between the establishment and operation of industrial activities.

The INP incorporates the following specific policy objectives.

- To establish noise criteria that would protect the community from excessive intrusive noise and preserve the amenity for specific land uses.

- To use the criteria as the basis for deriving project-specific noise levels.

- To promote uniform methods to estimate and measure noise impacts, including a procedure for evaluating meteorological effects.

- To outline a range of mitigation measures that could be used to minimize noise impacts.

- To provide a formal process to guide the determination of feasible and reasonable noise limits for consents or licences that reconcile noise impacts with the economic, social and environmental considerations of industrial development.

- To carry out functions relating to the prevention, minimization and control of noise from premises scheduled under the Act.

Notwithstanding the above, to be both effective and equitable, the EPA accepts that the determination and application of environmental noise control measures must take into account many factors including the:

- variation in response between individuals to any noise;

- inherently noisy characteristics of many activities;

- circumstances under which the noise occurs;

- technical and economic feasibility for noise control; and

- social and economic worth of the proposed development.

4.3.2.2 Noise Emission Criteria

As noted in Section 4.3.2.1, the EPA's INP identifies two separate noise criteria to meet environmental noise objectives, one to account for intrusive noise and the other to protect the amenity of particular land uses.

For the proposed Whitehaven Siding CHPP, the intrusiveness criterion requires that the equivalent continuous noise level (L_{Aeq}) of the plant should not be more than five decibels above the rating background noise level (RBL). However, when dealing with construction noise it is recognised that a higher level of noise is likely to be acceptable if the duration of the noise is known to be limited. In summary, the EPA's approach to the control of noise from such activities involves level restrictions, time restrictions and silencing, with the level restrictions related to the duration and hours of construction activities: for periods up to four weeks, the L_{A10} noise level should not exceed the L_{90} noise level by more than 20 dB(A) while for construction periods of between five weeks and 26 weeks, the L_{A10} noise level should not exceed the L_{A90} level by more than 10 dB(A).

Table 4.6 presents the amenity criteria for residences in a predominantly rural environment while **Table 4.7** summarizes the criteria applicable to the assessment of noise impact from the CHPP at various residential locations or areas around the Project Site during the construction and operational phases of the CHPP.

Table 4.6
Amenity Criteria for Noise Assessment (dB(A))

Type of Receiver	Time of Day	Recommended Limit (L_{Aeq})	
		Acceptable	Maximum
Residence in rural environment	Day-time	50	55
	Evening	45	50
	Night-time	40	45

The RBLs used to determine the intrusiveness criteria are also presented in **Table 4.7**. The amenity criteria presented in **Table 4.7** correspond to the acceptable limits presented in **Table 4.6**.

For Monday to Saturday, day-time, evening and night-time hours are defined as the periods from 7.00 am to 6.00 pm, 6.00 pm to 10.00 pm and 10.00 pm to 7.00 am respectively. On Sundays and public holidays, day-time corresponds to 8.00 am to 6.00 pm, evening from 6.00 pm to 10.00 pm and night-time from 10.00 pm to 8.00 am.

Areas A and B as referred to in **Table 4.7** are as follows.

Area A - the area generally bounded by the Namoi River, Quia Road and the CHPP.

Area B - the area generally external to Area A.

The CHPP noise assessment criteria presented in **Table 4.7** have been selected to protect at east 90 per cent of the population in the vicinity of the Project Site from the adverse effects of noise for at least 90 per cent of the time. Consequently, it does

not automatically follow that all people exposed to noise in excess of the criteria would find that noise unacceptable. For example, although the day-time intrusiveness criterion at "Cedar Vale" is 40 dB(A), the ambient day-time noise level over the 14 day unattended monitoring period was $L_{Aeq\ (11\ hour)}$ 52 dB(A). **Table 4.7** shows that at all residences, the $L_{Aeq\ (15\ minute)}$ intrusive criterion is the controlling noise limit during CHPP operations.

Table 4.7
CHPP Construction and Operational Noise Assessment Criteria (dB(A))

Residence (See Figures 3.1 and 3.5)	Period	RBL	Criterion			
			Construction		Operation	
			Weeks 1 – 4 $L_{A10\ (15\ minute)}$	Weeks 5 – 12 $L_{A10\ (15\ minute)}$	Intrusiveness $L_{Aeq\ (15\ minute)}$	Amenity $L_{Aeq\ (15\ minute)}$
AREA A						
"Cedar Vale"	Day	35	55	45	40	50
	Evening	-	-	-	39	45
	Night	-	-	-	39	40
"Olive View"	Day	35	55	45	40	50
	Evening	-	-		42	45
	Night	-	-		42	40
All others	Day	35	55	45	40	50
	Evening	-	-	-	41	45
	Night	-	-	-	40	40
AREA B						
"Wirringulla"	Day	31	51	41	36	50
	Evening	-	-	-	39	45
	Night	-	-	-	46	40
"Carousel"	Day	34	54	44	39	50
	Evening	-	-	-	37	45
	Night	-	-	-	38	40
All others	Day	32	52	42	37	50
	Evening	-	-	-	38	45
	Night	-	-	-	42	40

Source: Richard Heggie Associates (2002(a)) – **Appendix 6**

4.3.2.3 Road Transportation Noise

The noise assessment procedure for coal trucks whilst operating within the Project Site is outlined in Section 4.3.2.2, that is, the predicted L_{Aeq} contributions are added to the predicted L_{Aeq} noise level of items of mobile equipment and the coal preparation plant and compared to the design goals as presented in **Table 4.7**.

Away from the Project Site, when vehicles travel on public roads, different criteria apply for vehicle noise impact assessment depending on the type of development.

In June 1999, the EPA issued a document entitled Environmental Criteria for Road Traffic Noise. The policy addresses traffic noise for local and arterial roads in terms of an $L_{Aeq\ (1\ hour)}$ and $L_{Aeq\ (15\ hours)}$ respectively for day-time periods. The policy suggests levels for a number of different functional categories including "Land use developments with the potential to create additional traffic on collector roads" (such as Torrens and Quia Roads) and "land use developments with the potential to create additional traffic on existing freeways/arterials" (such as the Kamilaroi Highway). The proposed CHPP development would fall within these categories. The relevant assessment criteria identified in that document are presented in **Table 4.8**.

Table 4.8
Traffic Noise Criteria

ROAD	POLICY	DESCRIPTOR	TRAFFIC NOISE GOAL [1]
Torrens Road/Quia Road	Land use developments with the potential to create additional traffic on a collector road (or principal haulage route).	$L_{Aeq\ (1\ hour)}$ day-time	60 dB(A)
Kamilaroi Highway	Land use developments with the potential to create additional traffic existing on freeways/arterials.	$L_{Aeq\ (15\ hour)}$ day-time (7.00 am to 10.00 pm)	60 dB(A)
Note [1]: In all cases (where criteria are already exceeded), traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB(A)			

Source: EPA (May 1999) Environmental Criteria for Road Traffic Noise.

4.3.3 Noise Mitigation Measures

The following range of design and operational procedures would be adopted when undertaking the various activities within the Project Site in order to minimize the noise generated.

The principal control measures to be adopted are described below. The necessity for, and efficiency of these controls when in place, was determined using RTA Technology's Environmental Noise Model (ENM).

i) Enclosing the major components of coal preparation plant.

ii) Installation of 3 m high acoustic barriers to the east and west of the siding access road (within Lot 678) (see **Figure 2.2**).

iii) All mobile construction and operational plant and equipment would be fitted with appropriate mufflers and would be properly maintained to ensure they are effective at all times. In the event that reversing alarm noise is reported to be a source of disturbance to surrounding residents during CHPP operations, WCM would either fit manually-adjustable alarms or alternative approved warning devices to all machines. The use of adjustable reversing alarms would enable the alarm emission to be adjusted to suit the background noise conditions without compromising safety. These alarms, if installed, would be directed downwards to reduce the propagation of the sound.

iv) Installation of a package of controls on the 992 front-end loader (or equivalent) to achieve a sound power level of 111 dB(A).

v) Positioning the ROM and product coal stockpiles to provide additional acoustic shielding to the south-east, north-east, north and north-west.

vi) Restricting hours of domestic coal screening plant operations.

vii) Bulldozer operation during day-time hours, except when loading trains.

viii) Limiting vehicle speeds on the siding access road, Torrens Road access way and on sealed roads within the Project Site to 60 kph. On unsealed areas, vehicle speeds would be limited to 30 kph.

ix) Regular maintenance of all sealed and unsealed surfaces to minimize truck body noise, particularly from unladen coal trucks.

x) Undertaking a regular community consultation programme to inform residents of the various activities being undertaken and to seek feedback on performance and assess concerns.

xi) Strict adherence to the proposed hours of operation for the various construction and operational activities.

xii) Use of modern, low noise componentry within the CHPP

Coal truck speed restrictions, hours of operation and general behavioural expectations are the subject of WCM's existing Transport Policy and Code of Conduct for the Whitehaven Coal Mine. A similar Policy and Code would be developed for any future mine development utilizing the Whitehaven Siding CHPP.

4.3.4 Assessment of Impacts – Construction and Operational Noise Levels

4.3.4.1 Introduction

In order to determine the acoustical impact of the proposed CHPP during the construction and operational phases, a computer model was developed incorporating the significant proposed noise sources and the intervening terrain to the nearby potentially affected residential receivers. The "Whitehaven Siding" Computer Model was prepared using "ENM", a commercial software system developed in conjunction with the NSW Environment Protection Authority, and recognized by the Australian and New Zealand Environment and Conservation Council and all State environmental authorities throughout Australia as representing one of the most appropriate predictive methodologies currently available.

For the purposes of presenting the noise emission levels during the proposed construction and operational phases of the CHPP, the following four scenarios were assessed.

1.	Construction	-	Weeks 1 to 4
2.	Construction	-	Weeks 5 – 12
3.	Operations	-	Day-time and evening - 2 Mtpa throughput
4.	Operations	-	Night-time - 2 Mtpa throughput.

Each scenario conservatively assumed all items of plant and equipment to be operating concurrently to simulate the overall maximum L_{Aeq} noise emission.

Meteorological conditions, principally wind speed and direction and temperature inversions, can potentially increase noise levels in the vicinity of a noise source. For example, wind has the potential to increase noise at a receiver when it is light and

stable and flows from the direction of the noise source. Conversely, as the wind strength increases, the noise produced by the wind itself obscures the noise from most sources. Temperature inversions, when they occur, have the ability to increase noise levels by focusing sound waves. Temperature inversions occur predominantly at night.

The EPA's INP requires that wind effects be considered when wind is a prevailing feature of the area under consideration, ie when the wind blows from the source to the receiver at speeds up to 3 m/s for more than 30 per cent of the time in any season.

Prevailing winds at the CHPP site are:

- summer - day-time (nil), evening (nil), night-time (nil);
- autumn - day-time (nil); evening (NE, E, E); night-time (NE, ENE);
- winter - day-time (nil); evening (NNE, NE, ENE, E); night-time (NNE, NE, ENE, E)
- spring - day-time (nil); evening (NE, ENE); night-time (NNE, NE, ENE, E).

ENM noise model input data sheets for each scenario modelled are presented in Richard Heggie Associates Pty Ltd (2002 (a) – **Appendix 6**).

4.3.4.2 Construction Noise

The predicted noise emissions at a selection of residences in the vicinity of the Project Site during CHPP construction activities (Scenarios 1 and 2 – Section 4.3.4.1) are presented in **Table 4.9**. Noise contour diagrams are presented in **Appendix 6**.

Table 4.9
Predicted Construction $L_{Aeq\ (15\ minute)}$ Noise Emissions (dB(A))[*1]

Residence	Construction Weeks 1 to 4		Construction Weeks 5 – 12	
	Predicted Emission	Day-time Assessment Criteria	Predicted Emission	Day-time Assessment Criteria
AREA A				
"Longlands"	30	55	28	45
"Cedar Vale"	33	55	34	45
"Olive View"	37	55	35	45
"Marantha"	30	55	31	45
"Dunromin"	29	55	28	45
AREA B				
"Wirringulla"	28	51	38	41
"Carousel"	34	54	35	44
Residence K	31	52	31	42
"Yathella"	25	52	25	42

[*1] Predictions pertain to calm conditions. (see Section 4.7.4.1)

Source: Richard Heggie Associates (2002 (a)) – **Appendix 6**

A review of **Table 4.9** shows that construction activities would readily satisfy the relevant criteria.

4.3.4.3 Operational Noise

The predicted day-time, evening and night-time noise emissions at a selection of residences in the vicinity of the Project Site during normal CHPP operations (Scenario's 3 and 4 – Section 4.3.4.1), together with the project-specific assessment criteria are presented in **Table 4.10**. Figures in bold correspond to predicted noise emissions which exceed the appropriate project-specific design goals.

The predicted noise emissions incorporate the relevant noise mitigation measures nominated in Section 4.3.3. Noise contour diagrams are presented in **Appendix 6**.

Table 4.10
Predicted Normal *[1] Operational $L_{Aeq\ (15\ minute)}$ Noise Emissions (dB(A))

Residence *[2]	Day-time Operations			Evening Operations			Night-time Operations		
	Calm	Adverse	Criteria	Calm	Adverse	Criteria	Calm	Adverse	Criteria
AREA A									
"Longlands"	40	40	40	39	36	41	36	38	40
"Cedar Vale"	**41**	**41**	40	**41**	39	39	39	**46**	39
"Olive View"	**45**	**45**	40	**45**	42	42	42	**48**	42
"Marantha"	37	37	40	37	35	41	35	38	40
"Dunromin"	36	40	40	36	33	41	34	36	40
AREA B									
"Wirringulla"	34	34	36	34	34	39	33	33	46
"Carousel"	**42**	**42**	39	**41**	**40**	37	39	**41**	39
Residence K	**40**	**40**	37	**40**	**39**	38	35	37	42
"Yathella"	34	34	37	34	33	38	32	34	42

*[1] Without train loading operations at night.
*[2] See **Figure 3.5**

Table 4.10 shows that under normal operational conditions, the predicted noise emissions would:

- satisfy the relevant intrusiveness criteria at "Longlands", "Marantha", "Dunromin", "Wirringulla" and "Yathella" during day-time, evening and night-time periods;

- exceed the relevant intrusiveness criteria at "Cedar Vale", "Olive View", "Carousel" and Residence K during day-time and evening periods by between 1 dB(A) and 5 dB(A) under calm and/or adverse meteorological conditions; and

- exceed the relevant intrusiveness criteria at "Cedar Vale", "Olive View" and "Carousel" during night-time by up to 7 dB(A) during adverse meteorological

conditions. Under calm night-time conditions, the noise emissions would comply with the criteria.

During train loading operations at night, if and when occurring, the predicted noise emission levels at each of "Cedar Vale", "Olive View" and "Carousel" would:

- increase by a further 1 dB(A) to 2 dB(A) to 41 dB(A), 43 dB(A) and 41 dB(A) respectively during calm conditions; and

- increase by 1 dB(A) (at "Cedar Vale" and "Olive View") and by 3 dB(A) (at "Carousel") to 47 dB(A), 49 dB(A) and 44 dB(A) respectively during adverse conditions.

At all other residences, noise emission levels would satisfy the relevant night-time intrusiveness criteria under both calm and adverse conditions.

It should be noted, however, that at all but the "Olive View" residence during night-time, the predicted $L_{Aeq\ (15\ minute)}$ noise emission levels during day-time, evening and night-time periods under both calm and adverse conditions, and during both normal (no train loading) and abnormal (night-time train loading) operations, are less than the L_{Aeq} period noise levels experienced, even after adjustment to reflect likely seasonal insect noise influences (see **Table 3.5**). At "Olive View" during night-time, the predicted noise emissions are less than or equal to the ambient ($L_{Aeq\ (period)}$ noise levels established in February/March 2002.

In view of the above, and in accordance with the recommendations within the INP, WCM has discussed the potential for exceedances of the relevant intrusiveness criteria with the residents of each of "Cedar Vale", "Olive View", "Carousel" and Residence K. As a consequence of these discussions, it has been agreed by all

parties that should the actual CHPP noise emissions experienced at those residences exceed the criteria and be considered by those residents to be intrusive, WCM would:

- implement agreed acoustical mitigation treatments to the affected residences; and/or

- enter into negotiated agreements with the affected residents.

4.3.4.4 Road Traffic Noise

An assessment of the impact of the proposed CHPP on road traffic noise levels experienced at the nearest residence adjacent to each of the Kamilaroi Highway and Torrens/Quia Roads on the proposed transport route to the siding and rail loop areas (ie "Olive View" and "Carousel") was undertaken by Richard Heggie Associates Pty Ltd using the UK Calculation of Road Traffic Noise (CORTN) method. The assessment showed that the proposed CHPP development would not result in any increase in traffic noise levels at the closest residences to the Kamilaroi Highway west of the siding access road, nor at the closest residences to Torrens and Quia Roads between the Torrens Road access way and the rail loop components of the Project Site, that is, while the CHPP is processing coal from the Whitehaven Coal Mine. At other residences adjacent to the existing approved transport route for coal from the Whitehaven Coal Mine, traffic noise levels would be expected to decline by 1 to 2 dB(A) as a consequence of the reduction in heavy vehicle movements.

As noted in Section 2.8, the impact of CHPP-related vehicles on traffic noise levels experienced at individual residences as a consequence of any future coal mine development(s) would be determined by the location of the mine(s) and hence the transport route(s), the configuration of coal transportation vehicles employed and the

hours of haulage, and would be assessed as part of each future Development Application.

4.3.5 Monitoring

In order to verify the predictions presented in Section 4.3.4.3 and provide a basis for future discussions with the adjacent residents, WCM would undertake attended operational noise monitoring programmes at each of "Cedar Vale", "Olive View", "Carousel" and Residence K. In the first instance, it is proposed that monitoring be undertaken:

i) twice within the initial year following commissioning of the CHPP to assess day-time and, if occurring, evening operational noise emissions (during summer and winter);

ii) during the initial six months of evening operations, if not occurring within the initial year of CHPP operations;

iii) during the initial six months of night-time operations; and

iv) during concurrent night-time operations and train loading, if occurring.

The results of the various programmes, and the outcomes of discussions with the local residents during the ongoing community consultation programme, would be used to determine the necessity for additional or more extensive monitoring programmes and/or amelioration works.

4.4 SOIL MANAGEMENT

4.4.1 Controls

WCM is conscious of the need to conserve the limited soil resources available on those areas of the Project Site to be disturbed in association with the development of the CHPP (or previously stockpiled on site) in order to ensure they are responsibly managed, are not eroded in the natural or stockpiled state and are available for rehabilitation. In many cases, water management controls (see Section 4.2.5) also duplicate as a means of soil erosion control.

Specific soil management controls to be employed on the Project Site would include:

- minimizing the area within the rail loop stripped of its stable vegetative cover consistent with operational requirements. During the CHPP construction phase, vegetation removal and surface disturbance within the rail loop would be limited to the areas required for construction of ponds RP-1, 2 and 3 the polishing pond and associated drains. Disturbance of the RP-4, 5 and 6 area would be delayed, possibly to within the last two years of CHPP operations;

- separate stockpiling of subsoil, topsoil and spoil materials within the rail loop. All stockpiles would be left with a rough surface, be aligned to minimize the potential for erosion from run-off waters and be placed in mounds not exceeding 2m, 3m and 3m in height respectively;

- applying a thin veneer of topsoil to subsoil stockpiles;

- seeding of all new stockpiles if an adequate vegetation cover does not establish naturally within a period of three months;

- restricting vehicle movements to defined access tracks on the Project Site to avoid soil compaction or destruction of the existing vegetation cover;

- rehabilitating any existing or proposed areas of disturbance once they are no longer required for operational purposes; and

- not disturbing the existing, stable stockpiles remaining from the former Vickery operations prior to their requirement for rehabilitation purposes.

4.4.2 Assessment of Impacts

The limited area of proposed additional disturbance on the Project Site, together with the approach taken to stripping and stockpiling on the available "soil" resource and water management, would ensure that the proposal has a negligible short- or long-term impact on the soil resources. The development of the CHPP on a site which has been extensively disturbed by prior earthworks activities also represents a positive outcome with respect to soil management on a regional scale.

4.5 FLORA AND FAUNA

4.5.1 Safeguards

The following safeguards, developed in consultation with Geoff Cunningham Natural Resource Consultants Pty Ltd and Countrywide Ecological Service, would be adopted to minimize any potential adverse impacts on flora and fauna.

i) Minimizing the extent of vegetation removal consistent with operational requirements and undertaking vegetation removal and soil removal in

campaigns on an as-needs basis. Should any trees or branches with hollows require removal over the life of the CHPP, eg for maintenance or safety reasons, these would be undertaken in late summer or early autumn to avoid affecting spring and summer nesting birds and/or over wintering bats.

ii) Undertaking noxious weed eradication programmes in all areas of the Project Site.

iii) Undertaking enrichment plantings and establishing vegetation screens using locally occurring species. Though primarily for visual screening purposes, these plantings would, in the medium- to longer-term, provide habitat for native fauna and corridors for fauna movement between areas north and south of the Project Site.

iv) Undertaking vertebrate pest control programmes to reduce predation on native fauna, particularly around the fresh water and main storage dams. Baiting programmes would be undertaken in accordance with the requirements of the Tamworth Rural Lands Protection Board.

v) Establishing fauna refuges in the SP-4, SP-5, polishing and recovery pond and fresh water dam area as part of the final rehabilitation programme. If consistent with the future use of the site, habitat would also be established around the fringes of all water management structures as part of the final site rehabilitation programme.

vi) Implementation and maintenance of erosion, sediment and water management controls as described in Section 4.2.5.

4.5.2 Impacts on Flora

The CHPP development would be primarily confined to the existing areas of disturbance on the Whitehaven siding area which are essentially devoid of vegetation, with further disturbance limited to an area of approximately 7.5 ha within the Gunnedah Colliery rail loop. Though vegetated, this area has also been extensively disturbed in the past and carries a vegetation cover which is dominated by introduced species. No mature trees would be removed to facilitate the development.

On the basis of the flora survey conducted in February 2002, the assessment of the data obtained from the National Parks and Wildlife Service database, details of Endangered Ecological communities provided by the Scientific Community and the data within the Schedules of the CEPBC Act, GCNRC (2002 – **Appendix 8**) concluded that:

- only one Threatened flora species, Lobed Bluegrass, occurs on the Project Site but that its occurrence is limited to an area where no disturbance is proposed. An 8-part test for this species is presented in **Appendix 8**;

- no Endangered Ecological Communities or plant populations occur on the Project Site; and

- there would be no significant impact on Threatened flora species, Endangered Ecological Communities or Endangered flora populations resulting from the proposed development.

4.5.3 Impacts on Fauna

Although some individual animals utilizing the CHPP site may be expected to be lost or displaced as a consequence of the development, and some changes in foraging patterns may result, CES (2002 – **Appendix 9**) concluded that the proposed development would:

- not result in any substantial modification of native fauna habitat;

- not result in any significant adverse impact on any Threatened fauna species, population or community. 8-part tests of the significance of impact on each of the Vulnerable Blue-Billed Duck and Yellow-Bellied Sheathtail Bat, that is, the two listed Threatened species identified on the Project Site during the March 2002 survey, are presented in CES (2002). CES (2002) considered that no other listed Threatened species is expected to reside on or adjacent to the site; and

- not affect any wildlife corridor nor potential nor core koala habitat.

4.6 VISUAL ASPECTS

4.6.1 Safeguards

As noted in Section 3.11, the three component areas of the Project Site are located between the Kamilaroi Highway, Quia Road and the North-Western railway line and, as such, are potentially visible from local vantage points and a number of local residences.

The existing 28 m high coal load-out bin and the associated conveyor structure are dominant features of the visual environment, albeit masked to varying degrees by

their olive colour, the background provided by the forested mountains and hills to the south of the Oxley Highway and the vegetation adjacent to Quia Road, the proximity of other nearby local industrial features and from some vantage points, the intervening vegetation.

Notwithstanding that the proposed CHPP building and associated structures and stockpiles would be substantially lower than the existing load-out bin, and that land disturbance such as that associated with the construction of the fine reject ponds is consistent with the agricultural activities undertaken in the area, WCM would implement the following safeguards.

- Minimize the extent of new land disturbance consistent with operational requirements. No disturbance, other than in the rail loop, would be required.

- Undertake further screen plantings to the west and east of the siding area and adjacent to McDonald Road.

- Restrict the height of the fine reject pond walls to approximately 3 m.

- Select a colour for the CHPP building and structural elements which blends with the surrounding landscape.

- Implement air quality controls as identified in Section 4.1.4.

- Maintain the site in a clean and tidy condition at all times.

- Restrict the use of night-lighting to periods of CHPP operations. Outside these periods the lights would be turned off. The tower lights would be directed downwards onto the work area and not directly at any residence.

4.6.2 Impacts

Throughout the life of the CHPP, the structures and activities on the Project Site would be visible to varying degrees both from local and distant vantage points, with the extent of visibility dependant on the proximity and elevation of the vantage points, the degree of existing screening and the growth of the existing and proposed additional tree screens. Development of these screens would, in the short- to medium-term, effectively obscure views of the coal stockpiles, ground level activities and the majority of the CHPP buildings from the Kamilaroi Highway and Quia Road and reduce the visibility of the fine reject ponds from McDonald Road. All features/activities on the Project Site would, however, remain visible from the North-Western railway line and from the eastern-most end of Emerald Hill Road for the life of the facility.

Coal trucks entering and leaving the Project Site via the siding access road would be visible to the residents of "Cedar Vale" and "Olive View" when crossing the TSR. However, when travelling on the Project Site, the trucks would be obscured by the existing and proposed additional tree screens and the 3 m high acoustic barrier (**Figure 2.2**).

Trucks using the Torrens Road access way, and Torrens, Quia and Black Jack Roads during periods of reject haulage or fine reject pond refurbishment, would similarly be visible from some residences adjacent to these roads. However, as Torrens, Quia and Black Jack Roads each form part of the currently-approved Whitehaven Coal

Mine coal haulage route, truck movements comprise a feature of the local visual environment.

Operation of the proposed CHPP would enable the placement of the Gunnedah Colliery train loader under a care and maintenance regime and the removal of the associated coal stockpiles, thereby having a positive impact on the visual environment, particularly from adjacent residences on Quia Road.

4.7 INDIGENOUS AND NON-INDIGENOUS HERITAGE

4.7.1 Safeguards

Notwithstanding the absence of any artefacts or sites of Indigenous origin within the Project Site, nor of any features of non-Indigenous heritage within the areas of proposed disturbance, WCM would:

i) advise all contractors and employees of their obligations under the National Parks and Wildlife Act 1974; and

ii) cease work in the event that any bone, stone artefacts or discrete observations of shell are unearthed during the CHPP construction activities and inform the Red Chief LALC and NPWS. Work would not recommence until permission has been given to proceed.

Screen plantings to be established in the area of the former rabbit abattoir, that is, external to the Gunnedah Colliery rail loop, would be undertaken by hand thereby avoiding any disturbance to the remnants of this activity.

4.7.2 Impacts

Both Archaeological Surveys and Reports Pty Ltd (2002) and Red Chief Local Aboriginal Land Council (**Appendix 10**) consider that, subject to the implementation of safeguards (i) and (ii) identified in Section 4.7.1, any impacts would be minimal and that no archaeological grounds exist to prevent the CHPP development proceeding. The area was assessed to be of low cultural significance and, in the absence of any artefactual evidence in a depositional context, to have a low research potential.

4.8 SAFETY

4.8.1 Safeguards

WCM is conscious of the need to ensure the safety of their own and contracted employees, adjacent landowners and land users and the public during both CHPP construction and operations, and after the CHPP operations cease. The controls to be implemented which were discussed in Section 2.10 and are summarized below, generally represent an extension of the existing safety policy and proceduresimplemented at the Gunnedah Colliery coal preparation plant and train loader.

Central to CHPP safety management would be the adoption of a pro-active approach to all aspects of safety and regular liaison with the relevant authorities on safety issues.

- Compliance with the requirements of WorkCover NSW, the Occupational Health and Safety Act 2000 and other relevant legislation at all times.

- Implementation of a Safety Management Plan.

- Employee induction and regular follow-up toolbox safety meetings and reviews.
- Hazard identification and risk management training.
- Fencing and gating to deter unauthorized entry to the Project Site or its facilities.
- Installation of security/warning signs.
- Maintenance and safe operation of all plant and equipment.
- Continued implementation of the Whitehaven Transport Policy and Code of Conduct. Similar Policies and Codes would be developed for any future mining operations which would potentially provide coal to the CHPP.

4.8.2 Impacts

The implementation of the safeguards identified in Sections 2.10 and 4.8.1 would ensure the safety of the workforce, adjacent land users and residents and the public.

Use of the proposed CHPP would also benefit the general public with respect to road safety by reducing the number of coal truck kilometers travelled on the public road network, and hence the potential for conflict with other road users. For the Whitehaven Coal Mine alone, use of the proposed CHPP would result in an annual reduction of approximately 350 000 coal truck kilometers. Should CHPP throughput achieve 2 Mtpa, this reduction would potentially increase to up to 1 million coal truck kilometers annually.

4.9 SOCIO-ECONOMIC SETTING

The development of the proposed CHPP would result in a number of positive socio-economic benefits for Gunnedah (and potentially surrounding) Shires, NSW and Australia. These aspects are discussed in Section 5, but would include the following.

i) Short-term employment for up to 15 personnel at any one time during the CHPP construction/installation/commissioning phases. Of the personnel/contractors employed, it is envisaged that the majority would be sourced locally. Similarly, equipment and supplies, other than the CHPP plant componentry, would be sourced locally wherever possible.

ii) Direct full-time employment for up to 10 CHPP operational and supervisory personnel. The availability of a modern, high efficiency CHPP located on the northern side of the North-Western railway line would also improve the economic viability of the Whitehaven Coal Mine and the feasibility of future mine developments in the area, and hence the potential for substantial associated increases in mining-related employment.

iii) A reduction in heavy vehicle movements on the public road network and a corresponding reduction in the potential for conflict with other road users, fuel usage and pollutant emissions (see Sections 4.1.5.6 and 4.8). The reduction in heavy vehicle movements along Quia, Torrens and Black Jack Roads would also have a range of air quality, noise and safety benefits to the residents adjacent to those roads.

iv) WCM's financial contributions to Local, State and Federal economies.

With the possible exception of operational noise levels at a limited number of adjacent residences (see Section 4.3.4), there are no apparent negative socio-economic outcomes associated with the proposal.

4.10 FIRE MANAGEMENT

Experience has shown there to be a very low incidence of bushfires in either the agricultural or forested land in the vicinity of the Project Site. However, WCM is conscious of the need to ensure adequate fire controls are maintained so that its activities:

- do not increase the potential for fires on and surrounding the Project Site; and
- its own operation is safeguarded.

WCM already has in place a range of safeguards for the prevention and control of bush, equipment and spontaneous combustion fires at its Gunnedah Colliery coal preparation plant and train loader, all of which have been shown to be effective to date and would be adopted for the proposed CHPP site.

These, and Project Site-specific safeguards, would include:

- maintaining all earthmoving and coal handling equipment in good working order with efficient exhaust systems and spark arrestors;
- ensuring all mobile equipment is fitted with appropriately-sized and approved fire extinguishers suitable for the control of flammable liquid and electrical fires. All heavy machinery would be fitted with two extinguishers and all light vehicles fitted with one extinguisher;

- installation of approved 80 BE rated fire extinguishers at various locations around the CHPP including at the fuel bay and workshop, the offices, crib rooms and bathhouses;

- not undertaking clearing operations within the rail loop during periods of extreme fire danger as defined by the Bureau of Meteorology's Severe Weather section;

- maintenance of firebreaks around the Project Site;

- restriction of vehicle movements to defined tracks within uncleared areas within the Project Site;

- making access available to the various CHPP water storages for fighting local fires;

- training site personnel in the use of appropriate fire fighting equipment;

- coal stockpile monitoring and management to minimize the potential for, and control of, any spontaneous combustion incidences; and

- coarse and fine reject management and disposal in accordance with DMR guidelines. Reject disposal at the Whitehaven Coal Mine and other future source mines would involve its emplacement in layers with the overburden.

4.11 TRANSPORTATION ASPECTS

4.11.1 Safeguards

WCM would implement a range of safeguards to ensure that throughout the life of the CHPP, the impact of light and heavy vehicle movements to and from the plant would remain within reasonable community expectations and not adversely impact upon other road users, the condition of the local road network or on residential amenity. It should be noted however, that:

i) the Whitehaven Coal Mine is WCM's only currently-approved mining development which would supply coal to the CHPP and that that mine has approval for a maximum annual product coal production rate of 0.75 Mtpa. Although WCM is investigating further mine development opportunities which would provide coal to the CHPP beyond the remaining life of the Whitehaven Coal Mine, no final decision to proceed with any development has yet been made. Rather, exploration and economic evaluation are continuing, with the decision to proceed to the Development Application stage subject to the outcomes of these investigations.

   Given that the transport-related impact of any such future developments would be determined by their individual production rates, mine location, hours of haulage and the coal haulage route, these aspects, together with any required road/intersection improvement works would be addressed in the relevant Development Application(s) and Environmental Impact Statement(s);

ii) the coal transport route and access to the proposed CHPP lie on the existing approved haulage route for coal from the Whitehaven Coal Mine and are

the same as approved for the haulage of coal from the Vickery Coal Mine;

iii) the intersection of the siding access road and the Kamilaroi Highway was constructed to service the Vickery Coal Mine and an average of 690 coal truck movements per day; and

iv) agreements are already in place with each of Gunnedah and Narrabri Shire Councils for the maintenance of those components of the local road network travelled by coal trucks moving to and from the Whitehaven Mine.

The proposed safeguards are as follows.

- Undertaking all transportation activities strictly in accordance with the Development Consents and Environment Protection Licences for the source mines and the CHPP. Deliveries of any "oversize" loads, eg coal preparation plant componentry or large earthmoving equipment for fine reject pond construction, would be undertaken in accordance with RTA and Council restrictions on transport hours and safety/warning requirements.

- Applying a covered load policy to all trucks transporting coal and coarse reject to and from the component areas of the Project Site.

- Ensuring all trucks hauling coal and reject are well maintained and that the drivers act in a courteous manner at all times. Trucks assessed as unroadworthy or not carrying covers would not be loaded at the source mine or CHPP.

- With Gunnedah Shire Council, undertaking regular inspections of the siding access road/Kamilaroi Highway intersection and the various components of the

road network to be used in association with the CHPP, and initiating maintenance works as required. Maintenance works would potentially include pavement repairs and, at the Kamilaroi Highway intersection in particular, removal of any accumulation of gravel which may be caused by accelerating trucks departing the siding access road to join the west-bound Kamilaroi Highway traffic.

- Conducting all activities in accordance with WCM's existing Whitehaven Transport Policy and Code of Conduct and/or similar Codes and Policies to be developed for any future mines. Both the existing Whitehaven Policy and Code and all future Policies and Codes, would identify aspects such as travelling speeds, general behaviour, load coverage, hours of operation, complaints and disciplinary procedures.

- Restricting periods of coarse and fine reject haulage on Black Jack Road to avoid periods of the day when the school bus would be on or in the vicinity of the road.

- Routine liaison with local residents to ensure their satisfaction with WCM's performance and to identify any areas or issues of concern.

4.11.2 Assessment of Impacts

4.11.2.1 CHPP Construction/Installation

Site works and delivery of CHPP componentry over the 12 week on-site construction period would involve a total of approximately 180 heavy vehicle movements onto the Project Site via the Kamilaroi Highway and siding access road, with a projected maximum of 20 heavy vehicle movements in any one day and 10 heavy vehicle movements in any one hour. An increase of 20 heavy vehicle movements per day would equate to an increase of less than 3 per cent in heavy vehicle movements on the Kamilaroi Highway and be well within the normal variability in heavy vehicle

numbers currently travelling that road west of Gunnedah. The maximum hourly increase of 10 heavy vehicle movements would represent an increase of up to 20 per cent on peak hourly rates currently experienced. However, given that such hourly rates would be associated with the delivery of concrete and that a total of only 200 m^3 concrete would be required on the Project Site, such maximum rates and increases would be expected to occur on a maximum of three occasions.

Construction of fine reject ponds RP-1, 2 and 3 would involve a total of approximately 3 700 truck movements over the eight week construction period, or an average of approximately 77 movements per day. Delivery of coarse reject from the Gunnedah Colliery to the rail loop, ie via Black Jack and Quia Roads would be undertaken over a period of approximately 7 weeks at an average of approximately 44 loads (88 movements per day) and at a projected maximum rate of 5 loads (10 movements) in any one hour. Eighty-eight movements per day would be equivalent to:

- half the current number of daily truck movements along Quia Road to the Gunnedah train loader;

- a similar number of truck movements as currently pass daily along Black Jack Road to and from the Gunnedah Colliery; and

- approximately one third of the number of daily truck movements on Black Jack and Quia Roads experienced during the mid-1990s, that is, when the Gunnedah Colliery was at maximum production.

Although some coal deliveries to the CHPP site would be undertaken during the period of fine reject pond construction, that is, in preparation for plant

commissioning, there would be a period of up to six weeks of concurrent movement of trucks carrying coarse reject to the rail siding and trucks carrying coal to and from the Gunnedah Colliery coal preparation plant and to the train loader. During these periods, truck movements along Black Jack Road and between Black Jack Road and the Gunnedah Colliery train loader would approximate the level experienced during the mid-1990s.

The increase in light vehicle movements to and from the component areas of the Project Site during the construction phase would be imperceptible when compared with the existing light vehicle movements on the Kamilaroi Highway.

4.11.2.2 CHPP Operations

The operation of the CHPP as proposed would result in the following.

- A reduction in coal truck movements along the Kamilaroi Highway between the siding access road and Quia Road. Coal truck movements along this section of road would be restricted to those carrying coal to domestic clients within or east of Gunnedah. At an annual throughput of 750 000 t, the distance travelled by coal trucks on the public road network would decrease by approximately 350 000 km annually while at a throughput of 2 Mtpa, a reduction of approximately 1 million truck kilometers would result annually.

- The cessation of coal haulage along Quia, Torrens and Black Jack Roads to the Gunnedah Colliery coal preparation plant and/or train loader.

- Overnight parking of coal trucks on the Project Site in lieu of their travelling to the No. 2 Entry at the Gunnedah Colliery. Truck movements to the No. 2 Entry would be for maintenance purposes only.

- Coarse reject disposal activities to the Gunnedah Colliery or to the rail loop for fine reject pond refurbishment (when occurring), would be via the Torrens Road access way, Torrens Road, Quia Road and/or Black Jack Roads, with an average of five reject truck movements per day occurring when reject is being delivered to the Gunnedah Colliery. During periods of fine reject pond refurbishment, up to 88 truck movements per day could potentially occur. However, such periods of activity would be infrequent and of limited duration: initial refurbishment of pond RP-1 would commence between 14 and 22 months following commencement of CHPP operations, with sequential refurbishment of each of the operational ponds undertaken approximately once every four to eight months thereafter depending on CHPP throughput and the quality of the coal being processed. Each pond refurbishment cycle, ie removal of consolidated fines, the drainage blanket and pond wall lining, and replacement of the drainage blanket and pond wall lining, would take between 15 and 25 days.

4.12 LANDOWNERS, RESIDENTS AND LAND USES

4.12.1 Adjacent Landowners and Residents

The preceeding sub-sections have evaluated the impact of a range of environmental issues that would collectively influence the impact the proposed CHPP would have on adjacent landowners and residents. These issues relate principally to noise, air quality and visibility.

Notwithstanding the implementation of a range of design and operational safeguards, the surrounding landowners and residents, in particular those within a 1 km radius or

adjacent to existing approved transport routes have already or would become aware of the CHPP operation to varying degrees as a consequence of:

- the recommencement of activities on the siding component of the Project Site and of certain noise-producing activities: from November 1998 to February 2002, the site was under care and maintenance, with no coal truck deliveries, front-end loader or bulldozer activity and no coal train loading activity from the site;

- a marginal change in local air quality as a consequence of the activities on the Project Site, including minor increases in deposited dust and total suspended particulate levels (albeit within permitted levels) at all adjacent residences. These increases would, however, be offset by the cessation of coal stockpiling and train loading activities at the nearby Gunnedah Colliery train loader;

- changes in the visual outlook from some residences and local vantage points, primarily as a consequence of the construction of the 15 m high coal preparation plant building and re-establishment of coal stockpiles on the site. This change in visual outlook would, for many residents and particularly those to the east of the Project Site, be compensated for by the removal of the coal stockpiles at the Gunnedah Colliery train loading facility. There would be no apparent difference in the visibility of coal trains as both the Whitehaven siding and Gunnedah Colliery load-out bins are positioned on the same rail loop.

  Passers-by on McDonald Road, the eastern end of Emerald Hill Road and rail travellers would also observe the progressive removal of vegetation, disturbance and construction and operation of the fine reject ponds within the rail loop.

- change in the acoustic environment within the immediate vicinity of the Project Site. Notwithstanding, the implementation of all feasible acoustic safeguards, predicted operational noise emission levels at each of "Cedar Vale", "Olive View", "Carousel" and Residence K would exceed the relevant intrusiveness criteria during day-time and evening periods by between 1 dB(A) and 5 dB(A) under calm and/or adverse meteorological conditions. At "Cedar Vale", "Olive View" and "Carousel" the predicted night-time operational noise emission levels would exceed the relevant criteria by up to 8 dB(A) during adverse meteorological conditions.

- At all other residences in the vicinity of the Project Site, the noise emission from the CHPP would be within permitted levels.

  The predicted noise emission levels from the CHPP would, however, be similar to or less than the noise levels currently experienced at all local residences.

  The proposed CHPP development would not result in any increase in traffic noise levels at residences adjacent to the Kamilaroi Highway west of the siding access road, nor at residences adjacent to Torrens and Quia Roads between the Torrens Road access way and the rail loop. At all other residences adjacent to the existing approved transport route for coal from the Whitehaven Coal Mine, traffic noise levels would be expected to decline by 1 to 2 dB(A) as a consequence of the reduction in heavy vehicle movements.

  The impact of CHPP-related vehicles on traffic noise levels from future mine developments would be assessed as part of the relevant Development Applications.

- a change in heavy vehicle activity levels on the local road network, in particular, a substantial reduction in coal truck movements on the Kamilaroi Highway on the outskirts of Gunnedah and on Quia, Torrens and Black Jack Roads.

4.12.2 Site's Land Use

The proposed CHPP would, with the exception of the 7.5 ha area to be disturbed within the rail loop, be confined to an area of Class M land which has been disturbed extensively for prior coal stockpiling and handling activities. The area within the rail loop has also been extensively disturbed by past rail loop construction and spoil disposal activities, and although theoretically classified as Class III land, has not been used or suitable for grazing purposes since the time of rail loop construction (c.1988). WCM's proposals for Project Site rehabilitation would, subject to there being no further requirement or use of the CHPP facilities, enable the land to be returned to a grazing land use, with the large water storages providing advantages for such a land use over the pre-Vickery development situation. The extensive earthworks undertaken prior to WCM's acquisition of the former Vickery siding and train loader would preclude a return to a rotational grazing and cropping land use.

Notwithstanding WCM's commitment to site rehabilitation, it is considered unlikely that the siding component of the Project Site would again be used for agriculture: the provision of reticulated power and water, large water storages and access routes to both the Kamilaroi Highway and Torrens Road would make this area ideally suitable for a range of agricultural or industrial ventures which may be permissible at the time.

Development of the CHPP would not disturb or otherwise impede the use of the existing easement for stock movement within Lots 678 and 111, nor TSR 31106.

4.12.3 Surrounding Land Uses

With the implementation of the nominated safeguards with respect to noise, air quality and water, it is assessed that the capability and use of adjoining lands would not be adversely affected by the proposed CHPP.

4.12.4 Crown Lands

As noted in Section 3.8.2, each of Lot 678, DP 705086 and Lots 120 and 498, DP 755503 (**Figure 3.5**) comprise Crown Land under perpetual lease to WCM. In accordance with regional policy for the Management of Crown Lands, WCM would, on receipt of Development Approval, make application to the Department of Land and Water Conservation for their conversion to freehold.

4.13 SERVICES

With the exception of a reticulated potable water supply, all required services are currently provided to the Project Site, with only minor augmentation or extensions required to service the new facilities.

The potable water supply would be extended from the existing Gunnedah Colliery train loader town water line and would not result in any increase in demand on that system. Rather, with the placement of the Gunnedah Colliery train loader under care and maintenance, WCM's demand for town water would likely decrease: town water is currently used at the Gunnedah Colliery train loader for potable, dust suppression and truck washing purposes whereas dust suppression and truck washing on the Project Site would utilize water derived directly or indirectly from the Namoi River or groundwater bores.

4.14 MITIGATION STRATEGY

The implementation of all mitigation measures and commitments presented within this EIS and the requirements identified by conditions of the Development Consent or contained within any other licences or approvals issued for the CHPP, would be allocated to relevant staff to ensure the achievement of the expectations and commitments at all times. Task allocation would be undertaken by the Company's General Manager and/or Managing Director in consultation with the Area Manager, Washery Manager and the CHPP employees. Such an approach would result in the development of an environmentally responsible culture within all levels of the CHPP workforce and a sense of project "ownership".

Reviews/audits of the procedures to ensure the satisfaction of commitments and obligations identified within this document and the Development Consent, approvals and licences would be undertaken on a regular basis.

4.15 CUMULATIVE IMPACTS

Attachment 2 of the Director-General's requirements (**Appendix 2**) requires this document to address the cumulative impacts which may result from a number of activities with similar impacts interacting with the environment in a region.

The nature of the existing environment in the vicinity of the Whitehaven Siding CHPP and the extent to which relevant aspects of the existing environment are determined or stressed by development within the local area were discussed in Section 3. The question of short-term and long-term cumulative impacts of WCM's proposed operations with respect to air, noise, water, flora, fauna, traffic and other aspects of the existing environment once the proposed safeguards have been implemented, have been addressed within the relevant sub-sections within Section 4.

It is also noteworthy that the criteria established by Authorities such as the EPA for the assessment of impacts on aspects such as noise, air quality and water quality, take into consideration both incremental and cumulative effects.

Section 5

EVALUATION OF THE PROPOSAL

Preamble

This section has been prepared in accordance with Schedule 2, Clauses 3 (a) and 6 of the EP&A Regulation 2000 and concludes this EIS with an evaluation of the proposal to develop a coal handling and preparation plant on the site of the Whitehaven siding. The evaluation firstly justifies the proposal in terms of the biophysical, economic and social considerations and then assesses the proposal in the context of the principles of Ecologically Sustainable Development. The section concludes with an outline of the consequences of not proceeding with the CHPP on the proposed site.

5.1 JUSTIFICATION OF THE PROPOSAL

5.1.1 Introduction

Schedule 2(6) of the EP&A Regulation 2000, requires this Environmental Impact Statement to justify the proposed development of the Whitehaven Siding CHPP in the manner proposed having regard to biophysical, social and economic considerations and the principles of Ecologically Sustainable Development (ESD).

5.1.2 Biophysical Considerations

The proposed Whitehaven Siding CHPP development would be safeguarded throughout its construction and operational phases in order to minimize any impacts on the environment in the vicinity of the Project Site. The safeguards to be implemented:

- represent an extension of those employed at the Gunnedah Colliery coal preparation plant and train loader which have been proven to be effective in minimizing impacts;

- have been shown to be effective at other similar facilities;

- arise from recommendations provided by specialist consultants advising WCM or from comments received during the consultation phase; and

- in the case of operational noise minimization, represent the adoption of all feasible and reasonable methods of noise reduction.

Although some impacts would occur, it has been determined that the level of these impacts would be within reasonable community expectations given the nature of the

surrounding environment and, with the exception of noise emission at some residences, be within specified criteria.

The main impacts of the proposal are as follows.

i) The proposal would result in minor extensions of what already represent substantial modifications of the natural landform in the local area, these modifications having occurred as a consequence of the development of the siding component of the Project Site to service the Vickery Coal Mine, the construction of the North-Western railway line and Gunnedah Colliery rail loop, and the use of the area within the rail loop for the disposal of spoil.

   The principal additional long-term modification to the landscape would be the development of a low knoll within the rail loop (in the area of the fine reject ponds) and the enlargement and extension of the existing rail loop pond system. The peripheral slopes of the knoll would be no steeper than 1:4 (V:H) or 14°, with the upper surface exhibiting gradients ranging from 1:10 (V:H) or 6° to 1:70 (V:H) or less than 1°.

ii) A range of additional soil erosion and sediment control and water management structures or measures would be installed within the rail loop component of the Project Site to ensure that the proposed fine reject storage and management activities do not adversely impact upon the physical or chemical water quality in the Namoi River or on the local groundwater resource. Sufficient capacity would be available within the various dirty water storages within the rail loop to contain greater than a 1:100 year rainfall event while management procedures would ensure that the siding area water storages would at all times contain the run-off from a

1:20 year rainfall event. More than adequate process make-up water would be available under WCM's existing Namoi River and groundwater allocations.

iii) The progressive removal of 7.5 ha of vegetation within the rail loop. However, the community to be affected is dominated by weed species and is of low conservation significance. WCM's restriction of fine reject pond development to such an area, together with cyclic pond cleanout and refurbishment in lieu of more extensive pond development elsewhere on or in areas removed from the Project Site, is considered to be an environmentally responsible option.

The long-term rehabilitation of the former fine reject pond area, the extension of the water storages, the provision of fauna refuges and the development of wetland vegetation surrounding the ponds would also have a positive impact on local fauna. The alternative, that is, development of a CHPP on a greenfields site such as at Whitehaven, would necessitate the disturbance of a much larger area of vegetation of higher conservation significance and potentially, have a far greater impact on native fauna.

iv) The level of deposited dust at the nearest residences may increase marginally but would readily comply with the EPA guidelines and not adversely affect residential amenity. The predicted levels of total suspended particulates and PM_{10} at the nearest residences would similarly satisfy the EPA Guidelines with a substantial margin of safety.

The substantial reduction in heavy vehicle movements on the Kamilaroi Highway and Quia, Torrens and Black Jack Roads would also have a positive impact on the air quality (deposited dust levels, TSP, PM_{10} and other emissions from exhausts) at the adjacent residences. The reduction in the distance travelled by heavy vehicles to and from the Whitehaven Coal Mine and other future mine developments of up to 1 million kilometres annually would result in a reduction of approximately 550 kL annual diesel fuel useage and an annual reduction in CO_2, NO_X, SO_X and VOC emissions of approximately 2.3 t, 11.9 t, 0.4 t and 1.5 t respectively.

v) Noise from the construction of the CHPP and fine reject ponds, would satisfy the construction noise assessment criteria at all residences.

vi) Noise emissions from the operating CHPP under calm and/or adverse conditions would satisfy the relevant intrusiveness criteria at "Longlands", "Marantha", "Dunromin", "Wirringulla" and more distant residences during day-time, evening and night-time periods but exceed the relevant criteria at "Cedar Vale", "Olive View" "Carousel", and Residence K (**Figure 3.5**) during day-time and evening periods by between 1 dB(A) and 5 dB(A). During night-time operations, the relevant night-time criteria at "Cedar Vale", "Olive View" and "Carousel" would be exceeded by up to 8 dB(A) during periods of adverse meteorological (inversion) conditions, but be satisfied under calm conditions.

The predicted noise levels would, however, be similar to or less than those currently experienced at all local residences.

vii) The proposed development would not result in any increase in traffic noise levels at residences adjacent to the Kamilaroi Highway west of the siding access road, nor at residences adjacent to Torrens and Quia Roads between the Torrens Road access way and the rail loop. At all other residences adjacent to the existing approved transport route for coal from the Whitehaven Coal Mine, traffic noise levels would be expected to decline by 1 to 2 dB(A) as a consequence of the reduction in heavy vehicle movements.

viii) No Threatened plant species, Endangered Ecological Communities or plant populations would be affected by the proposed development.

ix) Although the Vulnerable Blue-Billed Duck and Yellow-Bellied Sheathtail Bat were identified as occurring on or in the vicinity of the Project Site, it has been assessed that it is unlikely that the proposed activities would have any significant effect on those species or their habitats. The proposed activities would not affect any wildlife corridor nor any potential or core Koala habitat.

x) The CHPP structures and associated coal stockpiles would be visible to varying degrees from a number of residences, primarily to the north-west, north-east and east of the Project Site, with the extent of visibility dependant on the occurrence of intervening natural vegetation, growth of existing tree screens, the landscape and its coloration, the background and the angle of view. From the north-west and south-east in particular, the background also includes other features representative of the industrial nature of the area. The proposed extension of screen plantings along the eastern and western margins of the Project Site would, over time, obscure

or obstruct views of the majority of coal stockpiles and the CHPP structures from these residences.

Views of the fine reject ponds would be possible from McDonald Road and the eastern extent of Emerald Hill Road but, from McDonald Road, would be ameliorated by the development of screen plantings.

xi) The proposed activities would not impact upon any known Indigenous or non-Indigenous site.

xii) Other than during concrete pours, the proposed development would result in an imperceptible increase in heavy vehicle movements on the Kamilaroi Highway during the coal preparation plant construction phase. During concrete pours, peak hourly heavy vehicle movements on the Kamilaroi Highway east of the Project Site may increase by up to 20 per cent. However, such increases would be expected to occur on a maximum of three occasions. The number of heavy vehicle movements daily along Black Jack Road and Quia Road during the fine reject pond construction phase would be similar or less than the level currently experienced with WCM's coal transportation activities.

For a period of approximately six weeks during the CHPP construction phase, concurrent coal and reject haulage activities would be undertaken along Black Jack and Quia Roads. Although representing a short duration increase in traffic levels over that currently experienced, the number of truck movements would be similar to that experienced previously when the Gunnedah Colliery was operating at its peak.

During CHPP operations, project-related heavy vehicle movements along Torrens, Quia and Black Jack Roads would be reduced substantially, with periods of activity primarily associated with fine reject pond clean-out and refurbishment activities and infrequent coarse reject deliveries to the Gunnedah Colliery.

5.1.3 Economic Considerations

The proposed CHPP would enable WCM to process up to 2 Mtpa coal for the domestic and export markets in a more efficient manner than can currently be achieved through the 25 year-old Gunnedah Colliery coal preparation plant. The economic considerations of the proposal are assessed in the context of direct and indirect benefits to the economy if the Development Application is approved and the indirect impacts upon the economy if the Development Application is not approved.

Approval of the Development Application would result in a number of direct and indirect benefits to WCM, its employees and contractors, as well as to local and regional communities and State and Federal Authorities and Governments. The benefits are set out in the following sub-sections.

5.1.3.1 WCM, its Employees and Contractors

i) More efficient and cost-effective transportation and processing of the coal from the Whitehaven Coal Mine, thereby enabling WCM to maintain or increase its competitiveness in the domestic and export coal markets. Any such increase in competitiveness would improve the overall viability of the Whitehaven Coal Mine and other potential mine developments, increase the amount of coal which can be economically extracted at those mines, ie

resource utilization, and hence potentially extend the life of the mines and the duration of worker and contractor employment.

5.1.3.2 Gunnedah and Surrounding Shires

i) Short-term employment for up to 15 construction personnel at any one time and long-term employment for up to 10 CHPP operational and supervisory personnel. Improved efficiencies as identified in 5.1.3.1 (i) would also potentially extend the economic life of the Whitehaven Coal Mine and improve the viability of other potential future mine developments, with attendant increases in employment duration and opportunities. WCM recognizes that increased employment numbers and security are important in rural areas which are subject to population stagnancy or decline or experience higher than average unemployment levels.

ii) The local communities and businesses would benefit financially (both directly and indirectly) as a consequence of the construction and operation of a CHPP with a life of some 20 years, and indirectly through the possible extension of the existing Whitehaven Coal Mine life and the increased potential for future mine developments. Wages alone at the CHPP would approximate up to $(2002) 500 000 pa while at the mine sites supplying coal to the plant, wages would average about $(2002) 50 000 pa per employee. Given that the majority of CHPP construction and operational personnel and mine employees would reside locally, a substantial component of this money would be spent within Gunnedah and surrounding Shires on housing, food, clothing, entertainment and services. Much of the money outlayed on consumables at the CHPP and source mines would also be spent locally.

iii) The reduction in the distance travelled by WCM-related coal trucks on the local and State road networks would result in a proportional reduction in road wear and tear and hence the frequency and cost of road maintenance activities.

With the possible exception of operational noise levels at a limited number of residences (see Section 4.3.4), there are no apparent negative socio-economic outcomes to members of the Gunnedah community.

5.1.3.3 New South Wales

i) The New South Wales Government would benefit directly from the construction and operational employment provided at the CHPP and the source mines associated payroll tax and other charges and flow-ons, as well as from royalties for the coal produced from the mines supplying the plant.

ii) Indirect benefits would accrue to other regions or businesses in New South Wales as a consequence of CHPP equipment purchases and service use, eg rail freight charges.

5.1.3.4 Australia

The Commonwealth would benefit in the form of PAYE and other Federal taxes and duties, together with the export earnings which would be maintained or enhanced through the operation of a more efficient CHPP and development of new mines.

A failure to secure Development Consent would mean that the benefits mentioned above would be less likely to eventuate.

5.1.4 Social Considerations

The principal social considerations arising from the proposal would include:

- direct and indirect construction and operational employment at the CHPP;
- potential direct and indirect employment benefits at the Whitehaven Coal Mine and increased potential for other future mine developments;
- a reduction in the distance travelled by coal trucks on the public road network, with a corresponding reduction in the potential for conflict with other road users. Use of the modified coal haulage route would also substantially reduce the number of heavy vehicles passing residences on the Kamilaroi Highway, Quia, Torrens and Black Jack Roads;
- support of local services in the Gunnedah, Boggabri and Narrabri areas through expenditure by CHPP, mine and contractor employees.

The proposal to develop the CHPP at the selected location has been designed to ensure that all adverse impacts are minimized to the extent which is practical and feasible which, in turn, would result in adverse social impacts being minimized.

5.2 EVALUATION OF ECOLOGICAL SUSTAINABILITY

5.2.1 Introduction

Schedule 2(6) of the EP&A Regulation 2000, requires the justification of the proposal in terms of the principles of Ecologically Sustainable Development. ESD can be defined as development which uses, conserves and enhances the community's resources in such a way that ecological processes are maintained and present and

future quality of life can be improved. An alternative definition is a development which aims to meet the needs of Australians today, while conserving our ecosystems for the benefit of future generations.

Coal mining, including related activities such as coal preparation, contribute substantially to the material well-being of Australians through the direct or indirect provision of a range of products or services used in their daily lives. Mining is also important for regional development and employment. However, exploration, extraction and processing of mineral resources do involve some degree of environmental disturbance. In the context of ESD, the issue of whether environmental impacts are irreversible or affect long-term ecological sustainability is important. For this reason it is the overall objective of the ESD process to ensure compatibility between these activities and the environment. Because coal mining involves the extraction and processing of a non-renewable resource, the first step towards achieving ESD involves ensuring efficient use of the resource and therefore achieving maximum economic resource utilization. A modern, efficient coal preparation plant and its positive impact on the potential for new coal mine developments would assist the attainment of this objective.

It is intended in this section to address how the proposed CHPP has been planned and would operate in a manner that is consistent with the principles of ESD. It is also necessary for the proposal to be prepared **and** evaluated with an approach that is consistent with the two main features of the National Strategy for Ecologically Sustainable Development (NSESD) namely:

i) the need to consider in an integrated way the wider economic, social and environmental implications of our decisions and actions for Australia, the international community and the biosphere; and

ii) the need to take a **long-term** rather than a short-term view when taking those decisions and actions.

5.2.2 Principles of ESD

As defined under Schedule 2(6) of the EP&A Regulation 2000, ESD consists of the following four inter-related principles:

- the precautionary principle;
- the principle of inter-generational equity;
- the principle of the conservation of biodiversity and ecological integrity; and
- the principle for the improved valuation and pricing of environmental resources.

The Precautionary Principle

This principle states that "where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:

1. careful evaluation to avoid wherever practicable, serious or irreversible damage to the environment; and
2. an assessment of the risk-weighted consequences of various options". (IGAE, 1992)

To satisfy this principle of ESD, emphasis must be placed on anticipation and prevention of environmental damage, rather than reacting to it. During the planning phase for the proposal and throughout the preparation of this EIS, WCM has engaged specialist consultants to examine the existing environment, predict possible impacts and recommend safeguards in order to ensure that the level of impact satisfies statutory requirements or reasonable community expectations. Environmental safeguards, as discussed in Section 4 of this document, are measures that have been planned with a comprehensive knowledge of the existing environment and an appreciation of the potential impacts, in order to prevent environmental degradation. Throughout the development of the proposal, WCM and its consultants have adopted an anticipatory approach to risk, particularly the risk of irreversible ecological damage, by undertaking an appropriate level of research, baseline studies and environmental evaluation.

After a full evaluation of the potential environmental impacts of the proposed development, there are no activities or features of the proposal for which there is a level of uncertainty in achieving an acceptable standard of environmental performance.

Intra- and Inter-Generational Equity

The objective of this ESD principle is that "the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations". (IGAE, 1992)

This principle includes both intra-generational equity (equity within generations) and inter-generational equity (equity between generations).

Equity within generations requires that the economic and social benefits of the development be distributed appropriately among all members of the community.

The proposed CHPP, and particularly the safeguards with respect to air quality, noise, water and visibility, has been designed to ensure that no part of the community would be unacceptably disadvantaged. Rather, the proposed development would, by utilizing and further developing existing facilities and areas of disturbance located closer to the Whitehaven Coal Mine and likely future mine developments than is the case with the existing Gunnedah Colliery facilities, have direct and indirect benefits to many community members.

The non-material well-being or "quality of life" of existing and future residents of the local and broader areas would continue to be maintained throughout and beyond the life of the project through implementation of all practical and feasible safeguard measures to mitigate environmental impacts. The proposed CHPP would also be more efficient in terms of energy use and coal recovery than would be the case with the continued use of the Gunnedah Colliery coal preparation plant and train loader.

The coal processed through the CHPP would be primarily used overseas for specialized purposes in steel mills and industrial plants, the products of which typically have a long use life and benefit both present and future generations. The use of the coal to convert raw materials into finished infrastructure and materials for use in domestic and industrial applications is both a process of value adding and a long-term investment in the materials, and consequently has beneficial consequences with respect to intra- and inter-generational equity. The use of the coal in local industry, hospitals, etc also provides both tangible and intangible benefits to existing and future generations.

Conservation of Biological Diversity and Ecological Integrity

Biological diversity or biodiversity describes the variety of life forms and is usually considered at three levels: genetic diversity, species diversity and ecosystem diversity. Ecological integrity describes the condition of an ecosystem that is

relatively unaltered from its natural state and, as such, is not relevant to this particular Development Application: all areas of proposed activity have been extensively disturbed by past agriculture, construction and industrial activity and bear little resemblance to their pre-development state.

For the purposes of this assessment, biodiversity is considered in the context of the Project Site, and where appropriate, beyond the Project Site.

Although minor impacts would occur on a local scale, primarily in the area of the fine reject ponds, it is assessed that in the short- and medium-term, the biodiversity of the Project Site and the surrounding area would not be adversely affected. With the adoption of recommendations to minimize impact, the altered nature of the vegetation to be disturbed, and the rehabilitation of the Project Site on completion of all activities, the biodiversity and ecological integrity of the area would, in the longer term be maintained or more probably improved.

Improved Valuation and Pricing of Environmental Resources

This principle involves consideration of the materials proposed to be processed and the surrounding environmental resources (eg air, water, land and living things) which may be affected. The valuation and pricing of mined and manufactured materials comprises the cost of mining, processing and manufacture, rehabilitation costs, profit, delivery costs and the final cost to the customer.

The value placed by WCM on environmental resources, other than the coal, is evident in the selection of the site for the CHPP and the extent of research, planning and design of environmental safeguards and measures to prevent irreversible damage of these resources.

5.2.3 Overview

The proposed Whitehaven Siding CHPP as presented within this EIS has been designed to assist in the efficient and environmentally responsible processing of one of the State's mineral resources. The proposed development is also consistent with the requirements of the Development Consent for the Whitehaven Coal Mine in terms of establishment of a dedicated CHPP in lieu of the continued utilization of the Gunnedah Colliery plant, and the minimization of coal truck movements on Quia and Black Jack Roads. The approach taken in planning the proposal has been multi-disciplinary and involved consultation with potentially affected local residents, the community and various Government Authorities. Throughout the project planning, emphasis has been placed on the application of safeguards to minimize potential environmental, social and economic impacts.

On the basis of the information presented in this and previous sections of this EIS, it has been assessed that the proposal would have only limited adverse impact on the surrounding physical or social environments.

The economic and social benefits of the development are also considered to outweigh any possible short-term economic, social or environmental "costs" which may be perceived by some members of the broader community.

5.3 CONSEQUENCES OF NOT PROCEEDING WITH THE DEVELOPMENT

Schedule 2(3) of the EP&A Regulation 2000 requires that this Environmental Impact Statement address the consequences of not proceeding with the proposal. Such consequences would include the following.

i) WCM would be forced to continue processing its coal from the Whitehaven Coal Mine through the existing Gunnedah Colliery Coal preparation plant and the haulage of coal via the local road network to that facility, that is, pending the identification of a feasible alternative site. However, investigations undertaken as part of planning for the current Development Application identified no site which would have more advantages and less disadvantages than that proposed. Haulage of coal via the existing approved route would also necessitate a continuation of coal truck movements past residences adjacent to the local road network, particularly Quia, Torrens and Black Jack Roads.

ii) The owners of WCM would receive a reduced return on their investment at the Whitehaven Coal Mine and Whitehaven siding and a reduced opportunity for profit and payment of taxes.

iii) The potential for the development of other coal mines in the Gunnedah/Boggabri area would be adversely affected due to the higher transport and operational costs associated with the continued use of the Gunnedah Colliery coal preparation plant or a requirement to use a CHPP in a less desirable location.

iv) The opportunity to create employment for up to 15 persons at any one time during the CHPP construction phase and up to 10 persons for plant operations in an area of NSW which has been subject to a decline in mining, mining-related and some agriculture-related ventures would not eventuate, at least in the short-term. Similarly, the higher coal transport and processing costs which would be associated with the continued use of the Gunnedah Colliery facilities or some alternative location, would

adversely impact upon the potential for new mine developments and hence, future employment opportunities and/or duration.

v) Foregoing disposable wages to the CHPP construction and operational personnel and personnel at the source mines, together with associated PAYE taxes.

vi) WCM would forgo the opportunity to enhance its share and competitiveness in the export and domestic coal markets.

vii) The minor impacts on the environment would not eventuate.

5.4 CONCUSION

The proposed Whitehaven Siding CHPP as identified in this EIS has been designed to:

- utilize areas which have been subject to extensive disturbance in the past, and facilities remaining from a former mining-related activity, on a site which is ideally located with respect to the regional road and rail networks and existing and potential future mine developments;

- enable resource recovery maximization at the source mines as a consequence of reduced coal preparation and transportation costs; and

- ensure that the surrounding physical, biological and social environments are not significantly affected in an adverse manner by the proposal.

Although some adverse impacts would occur, it is assessed that the level of impact would meet specified criteria or reasonable community expectations and be outweighed by the benefits of the proposal to the local community, region, State and Nation.

REFERENCES

Archaeological Surveys & Reports Pty Ltd (2002), *The Archaeological Investigation of the site of a proposed Coal Handling and Preparation Plant, West of Gunnedah, Northern NSW. (Volume 2 – **Appendix 10**).*

Austroads (1988), *Guide to Traffic Engineering Practice, Part 5 – Intersections at Grade.*

Austroads (1988), *Guide to Traffic Engineering Practice, Part 2 – Roadway Capacity.*

Countrywide Ecological Service (2002), *Fauna Study and Assessment - Proposed Coal Washery and Loading Facility - Whitehaven Siding, Gunnedah, NSW. (Volume 2 – **Appendix 9**).*

Department of Environment and Planning (1981), *Rural Land Evaluation Manual.* Woodward, R. & Neilson, F. (eds).

Department of Environment and Planning (1984), *Planning in Fire Prone Areas* – Circular No. 74.

Department of Mineral Resources (1996), *Gunnedah Coalfield South Regional Geology 1:100000 Geological Map.*

Department of Urban Affairs and Planning (1994), *Applying SEPP 33. Hazardous and Offensive Development Application Guidelines.*

Department of Urban Affairs and Planning (2000), *Coal Mines and Associated Infrastructure EIS Guidelines.*

Department of Urban Affairs and Planning (2000), *Development Consent 72-03- 2000 Stage 2 Whitehaven Open Cut Coal Mine.*

Emery, K.A., (Undated), *Rural Land Capability Mapping.* Soil Conservation Service of NSW 41:6-11.

Environment Protection Authority (1994), *Environmental Noise Control Manual.*

Environment Protection Authority (1999) *Environmental Noise Management – Environmental Criteria for Road Traffic Noise.* (Doc. EPA 99/3).

Environment Protection Authority (2000), *NSW Industrial Noise Policy.* (Doc. EPA 00/1).

Environment Protection Authority (2001), *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW.*

Garradd, G. (1997), *A review of the Climatology and Weather Monitoring in the Gunnedah Region.*

Geoff Cunningham Natural Resource Consultants Pty Ltd (2002), *Flora Study of the Proposed Whitehaven Coal Handling and Preparation Plant Near Gunnedah, NSW* (Volume 2 – **Appendix 8**).

Gunnedah Shire Council (1999), *Gunnedah Local Environmental Plan 1998* (as amended).

Gunnedah Shire Council (1999), *Prospectus, A Guide for Prospective Investors and Developers.*

Houghton, P.D., and Charman, P.E.V., (1986), *Glossary of Terms used in Soil Conservation.* Soil Conservation Service of NSW.

IGAE, (1992), *Inter-Government Agreement on the Environment.* Agreement signed and dated 1 May 1992.

National Association of State Road Authorities (NAASRA) (1974), *NAASRA Roads Study.*

National Environment Protection Council Service Corporation (1999), *National Environment Protection (Assessment of Site Contamination) Measure 1999.*

NHRMC & ARMCANZ (1996), *Australian Drinking Water Guidelines.*

NSW Department of Housing (1998), *Managing Urban Stormwater, Soils and Construction.*

Richard Heggie Associates 2002(a), *Whitehaven Siding Coal Handling and Preparation Plant, Gunnedah NSW - Construction, Operation and Transportation Noise Impact Assessment.* (Volume 2 - **Appendix 6**).

Richard Heggie Associates 2002(b), *Whitehaven Siding Coal Handling and Preparation Plant, Gunnedah NSW - Construction and Operation Air Quality Impact Assessment.* (Volume 2 – **Appendix 7**).

Rio Tinto (1988), *Vickery Open Cut, Namoi Valley Rail Siding Environmental Management Report 1998.*

Roads and Traffic Authority of New South Wales (1993), *Guide to Traffic Generating Developments.*

R.W. Corkery & Co. Pty. Limited (2000), *Environmental Impact Statement for the Stage 2 "Whitehaven" Open Cut Coal Mine Development Near Boggabri.*

R.W. Corkery & Co. Pty. Limited (1999), *Whitehaven Coal Mining Pty Ltd, Statement of Environmental Effects for the Trial Mining of Coal on "Whitehaven" near Boggabri.*

R.W. Corkery & Co. Pty. Limited (1996), *Namoi Mining Pty Ltd, Environmental Impact Statement for the Proposed "Brickworks Paddock" Open Cut Coal Mining Development at the Gunnedah Colliery.*

Soil Conservation Service of New South Wales (1976), *Gunnedah District Technical Manual.*

Soil Conservation Service of New South Wales (1982), *Design Manual for Soil Conservation Works.* (Technical Handbook No. 5).

Vickery Joint Venture (1986), *Environmental Impact Statement, Namoi Valley Coal Project.*

GLOSSARY OF TECHNICAL TERMS, SYMBOLS AND ABBREVIATIONS

TECHNICAL TERMS

A2 horizon – part of soil profile immediately below the topsoil.

A-weighted – an electronic filter having the frequency response corresponding approximately to that of human hearing.

AADT – Annual Average Daily Traffic.

ABS - Australian Bureau of Statistics.

abundance of a species – the number of individual animals of a species.

acceleration lane – a lane used for increasing speed before merging with the through lanes.

acid – substance with a pH less than 7.0; the lower the pH, the higher the corrosive ability of the substance.

acid formation – the process whereby acid is formed by the oxidation of minerals (particularly sulfides) exposed to air and water.

acidic – having a pH less than 7.0.

acoustical shielding – a natural or artificial structure (e.g. a hill or a bund) that inhibits the transmission of sound.

acoustics – the science of sound and vibration.

adb - air dried basis; a standard or benchmark basis for comparing coal qualities where free moisture is air dried from a crushed sample.

adverse weather conditions (in respect of noise and dust) – conditions, such as high wind, that assist the movement of dust or propagation of noise away from the mine towards receptors.

AHD - Australian height datum (in metres).

air-dry – to dry naturally via exposure to the atmosphere.

air pollutant - a substance in ambient atmosphere, resulting from the activity of man or from natural processes, causing adverse effects to man and the environment (also called "air contaminant").

air pollution - presence of air pollutants.

air pollution emissions inventory – all information, collection and processing systems containing data on emissions of, and sources of, air pollution from both man-made and natural causes.

algorithm – a mathematical equation devised to solve a particular type of problem.

alkaline – having a pH greater than 7.0.

alkalinity – in water analysis a measure of the carbonates, bicarbonates, hydroxides and occasionally the borates, silicates and phosphates in the water.

alluvial – pertaining to material, such as sand or silt, deposited by running water (e.g. a creek or river).

alluvium – a general term for stream-deposited sediment (sand, silt, gravel, etc.) within stream beds or on flood plains or alluvial fans.

ambient air quality criteria – quantitative relationship between a pollutant's dose, concentration, deposition rate or any other air quality-related factors, and the related effects on receptors, e.g. humans, animals, plants, or materials. Air quality criteria serve as the scientific basis for formulating ambient air quality standards or objectives.

ambient level – existing level of a phenomenon without the influence of the proposal.

ambient monitoring – monitoring of conditions outside the active project area (e.g. noise levels, water quality parameters).

amenity – the desirability of an area.

amphibians – animals (such as frogs) adapted to live both on land and in water.

anaemometer - an instrument for measuring the speed of wind.

anecdotal evidence – informal, oral or written evidence of an event.

anion – a negatively charged ion that migrates to an anode.

anthropogenic – affected by, or relating to, human beings.

ANZECC – Australian and New Zealand Environment and Conservation Council.

aquatic – pertaining to water.

aquifer - rock or sediment capable of holding and transmitting groundwater.

arboreal – pertaining to tree habitats.

archaeology – the scientific study of human history, particularly the relics and cultural remains of the distant past.

ARI – see average recurrence interval.

artefact – anything made by human workmanship, particularly by previous cultures (such as chipped and modified stones used as tools).

AS – Australian Standard.

assay – a chemical analysis.

association – an aggregation of botanically-related types which also have similar structure.

atmospheric stability - a measure of turbulence which determines the rate at which a pollutant is dispersed as it is transported by the wind.

attenuation – reduction in sound pressure levels between two locations.

audio-visual bund – an earthen wall or bund formed to reduce noise and visual impact of quarrying and processing activities.

average annual daily traffic (AADT) – unit of assessment of traffic flow along a road.

average annual rainfall – the average amount of rain to fall at a specific location over the period of 1 year (measured in millimetres).

Average Recurrence Interval (ARI) - statistical period in years for a design storm event.

avifauna – birds.

B horizon – subsoil material located below the A horizon material and above the parent rock.

background dust level – dust level in the absence of mining and processing activities.

background noise levels - the level of the ambient sound indicated on a sound level meter in the absence of the sound under investigation (eg sound from a particular noise source; or sound generated for test purposes).

baseline data – a body of information collected over time to define specific characteristics of an area (e.g. species occurrence or noise levels) prior to the commencement of an activity (e.g. a mining operation); baseline data allows any impacts arising from the activity to be identified by comparison with previously existing conditions.

baseline monitoring – monitoring performed prior to site development.

basement rock – unweathered rock lying below the soil and weathering profile.

basic – having a pH greater than 7.0.

basin – the drainage area of a river and its tributaries or of a groundwater system.

batter – An engineered slope of soil or rock fill on either side upslope or downslope of a road, embankment or mine waste storage.

bcm – bank cubic metre – a volume of 1 m^3 in the ground prior to disturbance.

bedrock – unweathered rock lying below the soil and weathering profile.

berm – a low bank or steep slope built onto a slope to improve its structural stability and reduce erosion.

best management practice – the most effective actions which minimise human impact on the environment.

biological diversity/biodiversity – a concept encompassing the diversity of indigenous species and communities occurring in a given region; biological diversity includes genetic diversity, which is the diversity of genes and genotypes within each species; species diversity, which is the variety of living species; and ecosystem diversity which is the diversity of the different types of communities formed by living organisms and the relations between them.

biomass – the quantity of living material present at a given time within a given area. Synonymous with standing crop, stock and standing stock.

biota – living components of a habitat.

bore – a well, usually of less than 20 cm diameter, sunk into the ground and from which water is pumped.

breeding population – that proportion of the population of a species that is mature enough to breed.

breeding range – the geographical distribution of habitat suitable for a particular faunal species to breed in.

broadleaf – pertaining to trees that have broad, as opposed to needle-shaped, leaves. Generally, broadleaf trees produce hardwood.

buffering – the chemical process by which some substances or mixtures can resist or retard changes to their pH.

bulk density – for aggregate is the mass in the air of surface-dry particles divided by the saturated by surface-dry volume.

bund - embankment of clay or weathered rock emplaced for visual or acoustic screening.

c./c.a. – abbreviation for about or proximity.

canopy – the highest vegetation layer of a plant community, in the case of forests, it is formed by the crowns of trees.

catch drains – drains used to intercept and redirect runoff.

catchment area - the area determined by topographic features within which rainfall will contribute to runoff at a particular point.

cation – an ion having a positive charge and characteristically moving toward a negative electrode.

channel – river or irrigation channel, includes bed and bank.

chemically inert – a chemical substance that does not easily react with other substances.

chemically stable – a chemical substance that does not readily decompose.

chloride – the univalent negative ion of the element chlorine.

Class A pan evaporation record – Bureau of Meteorology standard method of measuring evaporation.

clay - a size term denoting particles, regardless of mineral composition, with diameter less than 0.004 mm.

claystone – a non-fissile rock of sedimentary origin composed primarily of clay-sized particles (less than 0.004 mm).

coal preparation – the separation of coal into various product streams of different inherent quality by the use of water or wet processes.

colliery - coal mine.

colluvial deposit – deposit of weathered material (soil and rock) transported by gravity.

colluvium – unconsolidated soil and rock material moved largely by gravity, deposited on lower slopes and/or at the base of a slope.

colonise – to establish a species in an area in which it was not previously found.

community – a combination of plants that are dependant on their environment and influence one another and modify their own environment. They form together, with their common habitat and other associated organisms, an ecosystem, which is also related to neighbouring ecosystems and to the macroclimate of the region.

competent rock – rock having substance strength characteristics requiring significant energy to dislodge or fracture.

compliance monitoring – monitoring to determine whether standards are being complied with (e.g. whether particulate concentrations in a river or lake are less than, or equal to, an agreed level).

concentration – the amount of a substance, expressed as mass or volume, in a unit volume of air.

concentration of runoff – the channelling of runoff over a wide area into a narrower flow with greater depth and/or velocity.

conductivity – the measurement of the ability of a substance (either a measure of solid, liquid or gas) to transmit electricity; a measure of the salt content.

conglomerate – sedimentary rock consisting of poorly sorted grains (typically pebbles surrounded by finer material, such as sand or silt).

conservation – the management of resources in a way that will benefit both present and future generations.

consolidation – the process whereby loose or soft sedimentary material (e.g. an alluvial deposit) becomes a compacted, harder sedimentary material (e.g. a sandstone).

contaminant – a chemical compound or element which has been introduced as a result of human activity. It is noted, however, that some chemical compounds and elements also occur naturally in water and sediments.

contingency procedures – procedures put in place to handle an event considered unlikely to occur.

contour bank - an earth bank constructed across a slope parallel to contours.

conversion factor – a factor used to convert one quantity (e.g. conductivity) into another quantity (e.g. salinity).

conveyor - a device fitted with an endless rubber belt used for moving crushed rock within the processing plant.

critical storm – storm of a duration that will result in the peak discharge for a given recurrence interval.

cross-section – a two-dimensional diagram of an object presented as if the object had been cut along its length.

crown – the portion of a tree above the main trunk, made up of branches, twigs and leaves.

crusher – that part of an ore-processing plant where the ore is mechanically crushed into smaller pieces.

crushing – the mechanical process of reducing rock size usually by pressure or impact.

culvert – large pipe or channel carrying water underneath a structure (e.g. a road or railway track) or underneath the ground.

cumulative – increasing by successive additions.

curtilage – the area of land occupied by a dwelling and its yard and outbuilding, actually enclosed or considered as enclosed.

cyclone - a conical shaped vessel designed to separate particles from a moving stream of either air or water.

daylighting – a point on a void where a road or bench meets the natural surface on the perimeter of that void.

dB(A) – decibels, A-weighted scale; unit used for most measurements of environmental noise; the scale is based upon typical responses of the human ear to sounds of different frequencies.

deceleration lane – a lane used for decreasing speed before leaving the road.

decibel - unit expressing difference in power between acoustic signals.

density – 1. The mass of a substance (e.g. sediment) divided by its volume; water has a density of exactly 1 kilogram per litre; gold has a density of 19.3 kilograms per cubic metre. 2. The coverage of vegetation (e.g. trees) per unit of distance (along a linear transect) or unit of area (in an area transect).

depauperate – containing fewer species than would be expected for that vegetation or faunal community or habitat.

deposition – laying down of particulate material (e.g. sediment in a lake or tailings solids in a tailings storage).

dessication – the process of becoming dry or dehydrated.

Development Application - an application to the local council or other Authority for approval of an activity deemed to require an approval prior to commencement.

dispersibility - a characteristic of soils relating to their structural breakdown in water into individual particles.

distribution of species – the entire area in which a population of a species, subspecies or other taxon is found.

diversion bank – an earth bank constructed to divert water away from disturbed areas.

DLWC – Department of Land and Water Conservation.

DMR – Department of Mineral Resources.

drainage line – a passage along which water concentrates and flows towards a stream, drainage plain or swamp intermittently during or following rain.

drainage structures – artificial structures to control and direct drainage and prevent erosion or flooding.

dry density – the density of a substance (e.g. a soil) after it has been dried.

dS/cm – decisiemens per centimetre; a measure of conductivity.

duplex soils – soil profiles with a significant contrast in texture between the upper and lower horizons.

dust - particles of mostly mineral origin generated by erosion of surfaces and the mining and handling of materials.

dust concentration – the amount of a substance, expressed as mass or volume, in a unit volume of air.

dust gauge – instrument set up to record the rate of deposition of dust.

dust suppressant – any substance used to prevent dust disturbance.

EC - see electrical conductivity.

ecology – the relationship between living things and their environment.

ecologically sustainable development (ESD) – using, conserving and enhancing the community's resources so that ecological processes on which life depends are maintained and the total quality of life, now and in the future can be increased.

ecosystem - the totality of biological processes and interactions within a specified physical environment.

ecotone – a region of transition between two plant communities, characterised by a transition between either the floristic components of the communities or the structures of the communities.

electrical conductivity (EC) – the ability of a substance (either solid, liquid or gas) to transmit electricity.

elevated concentration – a concentration of an element that substantially exceeds the average crustal abundance of that element.

eluvial – an eluvial deposit consists of weathered material which is still at, or near its point of formation.

emission – a discharge of a substance (e.g. dust) into the environment.

emission factor – an expression for the rate at which a pollutant is generated as a result of some activity, divided by the level of that activity.

empirical evidence – evidence based on, and verifiable by, observation and experiment.

environment – a general term for all the conditions (physical, chemical, biological and social) in which an organism or group of organisms (including human beings) exists.

environmental constraints - limitations on a project by components of the environment.

Environmental Impact Statement (EIS) – a formal description of a project and an assessment of its likely impact on the physical, social and economic environment. It includes an evaluation of alternatives and an overall justification of the project. The EIS is used as a vehicle to facilitate public comment and as the basis for analysing the project with respect to granting approval under relevant legislation.

EPA – Environment Protection Authority.

ephemeral – not permanent, e.g. a stream that flows only seasonally or after rainfall or a lake that periodically dries out.

erodibility – the tendency of soil, earth or rock to erode.

erosion – the wearing away of the land surface (whether natural or artificial) by the action of water, wind and ice.

erosion hazard – the susceptibility of a parcel of land to the prevailing agents of erosion. It is dependent on a combination of climate, landform, soil, land use and land management factors.

erosion risk – the intrinsic susceptibility of a parcel of land to the prevailing agents of erosion. Note that determination of erosion risk differs from that of erosion hazard in that land management factors are ignored.

erosivity – potential ability to cause erosion. The amount of erosion at a site is dependent on the erosivity of the eroding agent (rainfall, running water, wind etc). The term is commonly applied to rainfall.

evaporation – the loss of water as vapour from the surface of a liquid that has a temperature lower than its boiling point.

evapotranspiration – loss of water from a land mass through transpiration from plants and evaporation from the soil.

existing air quality – the quality of the ambient air near ground level, expressed as concentrations or deposition rates or air pollutants – also expressed as ambient air quality.

exotic - introduced or foreign, not native.

extinction – the extinction of a species occurs when the entire population of the species (across the world) has died out.

fallout – the sedimentation of dust or fine particles in the atmosphere.

fallow land – agricultural land left unused for a period to allow the soil to improve.

fauna – a general term for animals (birds, reptiles, marsupials, fish etc.) particularly in a defined area or over a defined time period.

Fauna Impact Statement (FIS) – document detailing the impact of a proposed project on the local fauna and their habitat.

feasibility study – a preliminary technical and economic study to assess the viability of a project.

fill – material imported and emplaced to raise the general surface level of a site.

filterable material – dissolved material able to pass through a filter, normally having a pore size of 0.45 micron.

fines – material such as clay or silt sized particles.

fire regime – the history of fire at a particular place expressed in terms of frequency, intensity and season of occurrence; may relate to wildfires or prescribed burning.

FIS – Fauna Impact Statement.

fixed stacker conveyor – a conveyor which is in a fixed position from which material is discharged onto the ground to form a stock pile of product.

flocculent - additive to fine material suspended in water which causes fine particles to agglomerate together resulting in a larger "flocculated particle" which will naturally settle out of the suspension to result in clean water.

flora – plants including trees, shrubs, grasses and herbs.

fluvial – pertaining to or produced by a river.

forest – plant community dominated by trees having a mature height exceeding 5 metres and whose crowns shade more than 30 per cent of the ground.

freeboard – the vertical distance between a dam spillway or overflow and the top of a dam's embankment.

"free digging" material – ore and waste which can be excavated without prior blasting.

fresh rock – rock unaffected by natural weathering processes.

friable – easily crumbled as in poorly cemented rocks.

fugitive emissions – emissions not entering the atmosphere from a stationary vent (stack). Examples of fugitive dust sources include vehicular traffic on unpaved roads, handling of raw materials, wind erosion of dusty surfaces, etc.

genetic diversity – a term to describe the variety of gene pools within an ecosystem.

germination – the time at which a seed sprouts and the embryonic plant begins to grow.

gradient – rate of change of a given variable (such as temperature or elevation) with distance.

grassland – an extensive area of largely treeless land covered mainly by natural grasses.

gravel – particles with a maximum diameter exceeding 2mm.

gravitational fall – the downward settling of particles in the atmosphere due to the effects of gravity. The rate of descent of a particle depends on the balance between the aerodynamic drag and the gravitational acceleration (Stokes law). For particles with approximately the density of water and a diameter of less than 20 microns the fall velocity is small compared with the vertical velocities in the atmosphere, so that these particles can remain aloft.

ground level concentration – applied to the concentration, calculated or observed, in the neighbourhood of the ground surface.

groundcover – vegetation that grows close to the ground (such as grasses and herbs) providing protection from erosion.

groundwater – all waters occurring below the land surface; the upper surface of the soils saturated by groundwater in any particular area is called the water table.

groundwater depression – localised lowering of the regional water table.

groundwater surface – the upper surface of the water table.

gully erosion – a complex of processes whereby the removal of soil is characterised by large incised channels in the landscape. Such channels are generally more than 30 centimetres in depth.

habitat – the place where an organism normally lives; habitats can be described by their floristic and physical characteristics.

hardwood – trees belonging to the angiosperm group of plants, generally having broad leaves and including eucalyptus and wattles; also wood produced by such trees regardless of species.

heritage – the things of value which are inherited.

heritage significance – of aesthetic, historic, scientific, cultural, social, archaeological, natural or aesthetic value for past, present or future generations.

homogeneous – composed of parts all of the same kind or nature.

human comfort threshold value – the value above which it is predicted that discomfort will be experienced by humans.

hydraulic gradient - the direction of flow of groundwaters.

hydrology – the study of water, particularly its movement in streams, rivers, or underground.

in-situ – a term sued to distinguish material (e.g. rocks, minerals, fossils, etc.) found in its original position of formation, deposition, or growth, as opposed to transported material.

indicator – any physical, chemical, or biological characteristic of the environment used to assess (i.e. indicate) environmental condition.

indigenous – belonging to, or found naturally in, a particular environment (see also exotic).

infiltration – the process of surface water soaking into the soil.

inflow – flow directed into a particular feature, such as a lake or a mine pit.

infrastructure - the supporting installations and services that supply the needs of a project.

inter-generational equity – the principle that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

interbedded – two or more types of sediment rock deposited alternately to build up a sequence.

intermittent - flows periodically, irregularly.

internal drainage – drainage confined to the Project Site.

intra-species genetic diversity – genetic variation within the population of a particular species.

inversion - generally used in meteorology with respect to an increase of temperature with height in contrast with the usual decrease of temperature with height in the troposphere. An inversion layer is distinguished by its large stability, which limits the turbulence and therefore the dispersion of pollutants.

invertebrates – commonly, animals without a backbone (jellyfish, worms, molluscs, etc.).

ion – an atom or compound that has gained or lost an electron, so that it is no longer electrically neutral but carries a positive or negative charge.

iso-pach – contour lines on a plan representing a line of equal coal seam thickness based upon spot measurements.

jaw crusher – a crusher which uses the pressure applied to the rock between the fixed and moving plate to reduce rock size.

jointing - planes of discontinuity in rock mass which exhibit no evidence of relative movement.

katabatic – topographically generated wind; flow of cold air down slope onto valleys at night.

landform – a specific feature of a landscape (such as a hill) or the general shape of the land.

leachate – the liquid which has percolated through solid waste and has dissolved soluble components.

LEP – local environmental plan.

levee – a natural or artificial bank running alongside a waterway (e.g. a river); a natural river levee is formed as a result of deposition during flooding.

lift – each separate layer placed in the construction of an embankment or waste rock emplacement.

lineament – a large scale, straight line fracturing expressed on the surface; generally observable from satellite imagery.

linear shrinkage – a measure of the shrinkage that occurs in a soil sample prepared and dried under laboratory conditions.

liquid limit – the maximum water content possible in a clay soil before it becomes fluid.

lithic – sediments and rocks in which rock fragments are more important proportionally than feldspar grains.

lithology – refers to the general characteristics of sediments.

lithosol – one of a group of azonal soils having no clear soil morphology and consisting of a freshly and imperfectly weathered mass of rock fragments.

loam - loose soil composed of clay and sand, especially a kind containing organic matter and of great fertility.

Local Environmental Plan (LEP) - a plan developed by a council to control development in part or all of their shire or municipality.

long-term – a period of time associated with annual air quality standards. Long-term models usually address pollutant concentrations over several seasons to one year.

low loader – is a trailer which has a relatively low carrying deck and used to transport large items of equipment such as bulldozers or scrapers.

low-yielding – an aquifer which yields water at a low rate.

macroinvertebrate – animals without backbones and visible to the naked eye.

macrophyte – a plant that can be seen by the unaided eye.

mammal – animal of the class mammalia, distinguished by the presence of hair and mammary glands.

management strategy – a policy or direction that assists in actions required to address issues.

matrix – fine grained constituent of some sedimentary rocks containing coarser grains and fragments.

Mesozoic – a geological time era from 230 to 70 million years before present.

metamorphosed rocks – rocks changed from their composition and/or texture by heat and pressure.

metasediments – slightly metamorphosed sedimentary rock.

micro-organisms – organism such as bacteria not visible to the naked eye.

migratory – passing, usually predictably (based on aquatic species), from one region or climate to another, for purposes of feeding, breeding, or other biological purposes

mine water – all water used in mining and processing (for dust suppression, in leach tanks, etc.).

Mining, Rehabilitation and Environmental Management Process (MREMP) – process prepared under the auspices of the NSW Department of Mineral Resources as a vehicle for government agency control of the environmental management of a mining project from construction through operations to decommissioning, final rehabilitation and relinquishment of the mining lease.

mitigation measures – measures employed to reduce (mitigate) an impact (such as the construction of a perimeter bund to reduce sound emissions).

MLA - mining lease application.

mobile equipment - wheeled or tracked self propelled equipment such as trucks and front-end loaders.

monitoring – systematic sampling and, if appropriate, sample analysis to record changes over time caused by impacts such as mining.

mottling - multi-coloured effect in soils - grey and yellow-brown is common.

mudstone – sedimentary rock formed from the consolidation of silt and clay.

mulch - straw, leaves, loose earth, etc. spread on the ground or produced by tillage to protect the roots of newly planted trees, crops, etc.

National Park - an area set aside for the protection of flora and fauna and for public recreation.

native title – Aboriginal land title which has survived European settlement.

natural – existing in, or formed by, nature (generally excludes anything obviously modified by human beings).

natural succession – natural replacement of an animal or plant species with another in the same habitat.

nature reserve – an area set aside for the conservation of flora and fauna and managed by the National Parks and Wildlife Service.

neutral – neither acidic nor basic (e.g. a pH equal to 7.0).

neutral atmosphere – the atmospheric condition for which the vertical temperature profile is equal to the adiabatic lapse rate over the whole boundary layer. Vertical air motions are neither enhanced nor suppressed. The turbulence intensity is moderate.

neutral weather conditions – weather conditions that neither particularly exacerbate nor mitigate the dispersal of pollutant emissions (dust, noise etc.) from the project area.

NHMRC – National Health and Medical Research Council.

noise contours – theoretical lines connecting points of equal noise value.

non-combustible residue – dust residue that cannot be burnt (i.e. free of organic litter).

noxious – introduced species considered to be harmful to native species or to the habitat of native species.

nuisance dust – relatively large dust particles which settle out – not detrimental to health.

nutrients – generally refers to nitrogen and phosphorus, which are essential for biological growth.

operational phase – that period of the project, after construction and prior to decommissioning, during which CHPP operations take place.

overburden (waste rock) – in the mining context refers to non-economic material to be removed to allow access to the resource.

overstorey – the tallest structural layer in a plant community.

oxidation – the process of combining with oxygen.

participation rate – percentage of those people aged 15 and over who wish to participate in the labour force.

particle size distribution – the relative proportions of particles (e.g. in a sediment) that fall within specific size categories.

particulate matter - small solid or liquid particles suspended in or falling through the atmosphere - sometimes expressed by the term particulates.

ped - an individual, natural soil aggregate.

pedal – a soil in which some or all of the soil material occurs in the form of peds in the moist state.

perennial - refers to stream which has flow throughout the year.

permeability - a material property relating to the ability of the material to transmit water.

pH – a measure of the degree of acidity or alkalinity of a solution; expressed numerically (logarithmically) on a scale of 1 to 14, on which 1 is most acid, 7 is neutral acid, and 14 is most basic (alkaline).

piezometer – a core drilled specifically for the monitoring of groundwater levels and water quality.

podzolic – soil descriptive term for soils that are strongly acid and highly differentiated.

pollution – the alteration of air, soil, or water as a result of human activities such that it is less suitable for any purpose for which it could be used in its natural state.

population – a group of organisms all of the same species occupying a particular area.

porous - containing voids, pores, interstices or other openings which may or may not be interconnected.

potable - water suitable for human consumption.

precautionary principle – a principle of ESD which states that decisions about any proposed development should be guided by careful management to avoid serious and irreversible damage to the environment.

precipitation – natural water phenomena producing quantities of water measurable by standard methods (e.g. rainfall, snow).

proactive – anticipating a situation and reacting to it before it occurs.

progressive rehabilitation – rehabilitation of mine or disturbed areas as soon as practicable after they are released during the life of the mine.

Project Site – the total area covered by the project, including processing plant, buildings, roads, stockpiles, bunds, ponds, etc.

propagation – reproduction of plants by the natural or artificial germination of seeds or cuttings.

provenance – place or nature of origin.

qualitative test – a test that indicates the nature of, rather than produces a measure of, an impact.

quantify – to determine the quantity or amount of a component in a substance.

radial stacker conveyor – a conveyor that can be rotated which discharges onto the ground to form a crescent shaped stockpile of product.

rating background level – a background noise level determined in accordance with Chapter 3 of the EPA's Industrial Noise Policy for a specific period i.e. day, evening, night.

reagent – substance used to produce or control a chemical reaction.

receptor – a designated place at which an impact may occur (e.g. a dwelling).

recharge – the addition of water to an aquifer, directly from the surface, indirectly from the unsaturated zone, or by discharge from overlying or underlying aquifer systems.

recolonise – the process of animal and plant species re-establishing themselves in a disturbed area.

Regional Environmental Plan (REP) - a plan prepared by the State Government Department responsible for planning where controls on development are considered on a regional and/or state-wide basis.

regrowth – a forest stand established by natural regeneration after major disturbance of the previous forest canopy by wildfire, wind-throw or logging.

rehabilitation - the preparation of a final landform after project cessation and its stabilisation with e.g. grasses, trees and shrubs.

reject – solid material from a coal preparation plant comprising coarse and fine rock fragments, carbonaceous shales, other sedimentary rocks and clays.

relative humidity – the ratio of actual moisture in the air to the amount the air could hold if saturated, at a given temperature.

relief – the variation in landscape elevation over a region.

remnant bushland – native bushland remaining after widespread clearing has taken place.

reptiles – cold-blooded vertebrates, including lizards, snakes, turtles, and crocodiles.

reserves - in the mining context refers to those parts of a resource where sufficient information is available to undertake mine planning.

resource – an estimate of potentially usable coal in a defined area based on preliminary information.

respirable dust – dust that is capable of being breathed in.

return period - a statistical term in years to describe the likely recurrence of an earthquake of a given magnitude.

revegetation - replacement of vegetation, principally grasses and legumes on areas disturbed by mining activities.

riparian – pertaining to or situated on the bank of a river or creek.

riparian flows - the natural flow in a creek.

rip rap – armour rock protection for water retention structures.

routine monitoring – monitoring performed on a regular basis, with the same observations and tests conducted each time.

RTA – Roads and Traffic Authority (NSW).

runoff – that portion of the rainfall falling on a catchment area that flows from the catchment past a specified point.

run-of-Mine (ROM) - ore or overburden in condition as loaded from open cut.

saline – water with high salt concentration.

salinity – the dissolved content of water expressed in terms of milligrams per litre.

sampling period – range of time over which samples are taken.

sand - sediment comprising particles in 0.063mm to 2mm size range.

sandstone - general term for sedimentary rock with grain size from 0.063mm to 2mm - grains may be minerals or rock fragments.

scarify – to stir the soil without altering its form, or disturbing its sequence of layers.

scarred tree – tree with cuts in its bark or wood made by Aborigines.

scraper – irregularly shaped artefact that has been modified in a manner that suggests use in scraping activities, notably woodworking.

scour – erosional feature.

screening - a process which separates crushed rock into various size fractions – this usually involves a mechanical vibration of the rock over a series of decks fitted with steel mesh, steel plate or polyurethane or rubber mats with fixed sized apertures.

settlement pond – a small excavation designed to trap the coarse material washed from disturbed areas.

sedimentary rocks - rocks formed from material derived from pre-existing rocks or by chemical precipitation.

sedimentation – process or rate of depositing of sediment.

SEPP – State Environmental Planning Policy.

shale - fine grained sedimentary rock types such as siltstone or mudstone which part readily along well-defined bedding planes.

sheet flow – runoff that is of substantial lateral extent and relatively uniform depth (rather than concentrated in channels).

short-term – a period of time associated with air quality standards for pollutant exposures ranging between one hour and twenty four hours.

silt – a classic sediment, most of the particles of which are between 0.063mm and 0.004mm in diameter.

siltstone – general term for sedimentary rock with grain size from 0.004 mm to 0.063 mm – individual grains not discernible with unaided eye.

silt-stop fencing – fine mesh fencing normally installed down-slope of a sediment source, designed to trap silt and sediment and allow the water to pass through.

soil erosion hazard – the susceptibility of an area of land to erosion and includes rainfall erosivity, slope, soil erodibility and cover.

soil organisms – plants and animals that live in soil, including worms, bacteria, insects, and other invertebrates.

soluble salts – salts that are capable of being dissolved.

source – the place where pollutants are emitted into the atmosphere. Sources may be point, area or line sources. Often the term "source" is used for a whole plant or an installation. In air pollution modelling, the terms "continuous source" and "instantaneous source" are used:continuous source: source which emits pollution continuously over a time period much larger than the travel time to a point where the concentration is considered. Usually it is assumed that during this time period the emission is constant.

instantaneous source: source which emits pollution over a time period much shorter than

the travel time of the emission to a point where its concentration is considered.

species – a taxonomic grouping of organisms that are able to interbreed with each other but not with members of other species.

species diversity – a measure of the number of different species in a given area.

specific gravity – the weight of any body or substance considered with regard to the weight of an equal bulk of pure water.

stable – used with respect to the atmospheric boundary layer, when the vertical temperature gradient is greater than the adiabatic lapse rate. Vertical air motions are suppressed. The turbulence intensity is low resulting in poor dispersion conditions.

standing water – water that is pooled and still.

station – a specific location established for repeated sampling, gauging, weather measurements, etc.

stockpile – a pile used to store material (such as low-grade ore) for future use.

storage capacity – the maximum volume of liquid able to be retained in a container (e.g. a reservoir or lake).

stripping – removal of vegetation and topsoil.

structure (soil) – the physical texture of the soil arising from the interrelationship between the grain size, composition, and organic nature of a soil.

subcatchment – a smaller area within a catchment drained by one or more tributaries of the main waterbody.

subsoil – the layer of soil lying below the topsoil; usually contains less organic matter and is less fertile.

substrate – an underlying layer (e.g. of sediment under water).

surface waters – all water flowing over, or contained on, a landscape (e.g. runoff, streams, lakes etc).

suspended solids - analytical term applicable to water samples referring to material recoverable from the sample by filtration.

sward – vegetated land surface.

temperature gradient – the rate that temperature changes with distance, expressed in degrees per unit length.

temperature inversion - an increase in air temperature with height.

temporal - related to time.

tenure – the ownership status of a tract of land.

terrestrial – of or relating to the land, as distinct from air or water.

texture (of soil) – variations in composition, grain size distribution, and structure.

topography – the physical relief and contour of a region.

topographic maps – maps that show the variation in elevation of a landscape.

topsoil – the upper layer of soil, usually containing more organic material and nutrients than the subsoil beneath it.

total sulfur – the total mass of all forms of sulfur in a sample.

total suspended particulates (TSP) – the mass of all particulate matter suspended in a solution.

total suspended solids – a common measure used to determine suspended solids concentrations in a waterbody and expressed in terms of mass per unit of volume (e.g. milligrams per litre).

transect – a fixed line along which observations are made of flora and fauna.

trapezoidal drain – a drain with a horizontal base and inclined walls.

tributary – a stream or river that flows into a larger river or lake.

tubestock – tree seedlings supplied with roots enclosed in soil.

turbidity – discolouration of or suspension of particles in water resulting in a reduction in clarity.

turbulence – any irregular or disturbed flow in the atmosphere that produces gusts and eddies.

unconsolidated – loose or soft, not compacted (particularly soil or sediment).

understorey – the layer of forest vegetation between the over-storey (or canopy) and the ground layer.

undulation – the gentle rise and fall or wave-like structure of a landscape.

unweathered – fresh rock, unchanged by either mechanical or chemical weathering processes.

variability – degree or amount of change.

vegetated – covered with plants.

vehicle movement – a one-way trip.

velocity – speed in a given direction.

vertebrate fauna – animals with a backbone or spinal cord, includes mammals, birds, reptiles, amphibians and fish.

visual amenity – attractiveness to the eye.

volcanic rocks – rocks that have formed from molten rock extruded near to or over the surface of the earth (lava).

washery - the colloquial term applied to describe a Coal Preparation Plant where coal is separated into various product streams of differing inherent qualities by the use of water or wet processes.

waste oils – old oils and lubricants retrieved from machinery.

water chemistry – the interaction of the chemical constituents (dissolved metals, suspended particles, etc) of water.

water clarity – a measure of the transmission of light through water.

water quality criteria – generally refers to numeric levels specified for key water quality variables, such as dissolved metals or pH, which can be measured to determine the suitability of water for human consumption, supporting aquatic life, etc.

water table – the upper limit of the saturated zone within a rock mass, generally at atmospheric pressure. It is characteristic of unconfined aquifers.

waterbody – any expanse of water, such as a sea, river, swamp, lake, or dam.

watercourse – stream or river, running water.

waterlogging – excessive saturation of soil with water.

weathering – the in-situ physical disintegration and chemical decomposition of rock materials at or near the earth's surface.

weed – any plant (in particular an herbaceous one) that survives in an area where it is harmful or troublesome to the desired land use.

wetland – a low-lying area regularly inundated or permanently covered by shallow water.

wildfire – an unplanned, generally intense and difficult-to-control fire, in contrast to a prescribed burn.

wildlife – non-domesticated fauna.

wildlife corridor – a strip of vegetation that has a design purpose of allowing animals to pass from one area to another and acting as an undisturbed area for wildlife preservation.

wind direction – the direction from which the wind, averaged over a certain period of time, is blowing.

wind erosion – wearing away of exposed soil, earth, or rock surfaces by the abrasive action of wind-blown particles (e.g. grains of sand).

wind rose – diagrammatic representation of wind direction, strength, and frequency of occurrence over a specified period.

woodland – plant communities dominated by trees whose crowns shade less than 30% of the ground.

worst-case scenario – a sequence of events likely to result in the worst-case effects on the environment.

yield – (of a water bore) 1) the capacity of the bore to produce water. 2) the amount of water actually withdrawn.

SYMBOLS AND ABBREVIATIONS

°C – degrees Celsius.

°C/100 m – degrees Celsius per 100 m.

µg/g – micrograms per gram

µg/L – micrograms per litre.

µg/m³ – micrograms per cubic metre.

µm – micron, one millionth of a metre (one thousandth of a millimetre).

µS/cm – microsiemens per centimetre; a measure of conductivity.

% - percentage.

$M – one million dollars.

3-D – three dimensional.

100 year flood limit – predicted extent of a 1 in 100 year flood occurrence.

'000 t – multiples of one thousand tonnes.

< - less than.

≤ - less than or equal to.

> - greater than.

≥ - greater than or equal to.

95% exceedance – a value that is exceeded by 95% of sample values.

AADT – Average Annual Daily Traffic.

AHD – Australian Height Datum; (in metres above mean sea level).

ANZECC – Australian and New Zealand Environment and Conservation Council.

ARI – average recurrence interval.

AS – Australian Standard.

A-Scale – a sound level measurement scale. It disseminates against low frequencies. It approximates the human ear.

bcm – Bank cubic metre – a volume of $1m^3$ in the ground prior to disturbance.

cm – centimetre (unit of measure).

CSIRO – Commonwealth Scientific and Industrial Research Organisation.

dB – decibel, unit used to express sound intensity.

dB(A) – the unit of measurement of sound pressure level heard by the human ear, expressed in "A" scale.

DLWC – Department of Land and Water Conservation.

DMR – Department of Mineral Resources.

dS/cm – decisiemens per centimetre; a measure of conductivity.

dS/m – decisiemens per metre; a measure of conductivity.

EC – see electrical conductivity.

EIS – Environmental Impact Statement.

EP&A Act – Environmental Planning and Assessment Act 1979 (NSW).

EP&A Regulation – Environmental Planning and Assessment Regulation 2000 (NSW).

EPA – Environment Protection Authority (NSW).

ESD – Ecologically Sustainable Development.

FIS – Fauna Impact Statement.

g – gram (= 0.001 kilogram).

g/m²/month – grams per square metre per month unit for deposited dust.

g/t – grams per tonne.

ha – hectare (100 m x 100 m).

ha/year – hectares per year.

Hz – Hertz – a unit of frequency.

INP – Industrial Noise Policy.

kg – kilogram (weight measure).

kg/ha – kilograms/hectare

kL – kilolitre (thousand litre).

km – kilometre (= 1 000 metres).

km^2 – square kilometres.

km/hr – kilometres per hour.

kV – thousand volts (Electrical Potential Unit).

kVA – kilovolt amps.

kW – thousand Watts (energy unit).

kWh – kilowatt hours.

L – litre.

L/s – litres per second.

LEP – Local Environmental Plan.

L_{A10} – sound level exceeded 10 per cent of the sampling time.

L_{A90} – sound level exceeded 90 per cent of the sampling time.

L_{Aeq} – the L_{Aeq} is the "equal energy" average noise levels, and is used in some instances for the assessment of traffic noise effects or the risk of hearing impairment due to noise exposures.

$L_{Aeq\ T}$ – Sound level of continuous noise which emits the same energy as the fluctuation sound over a given time period (T).

L_{Amax} – the absolute maximum noise level measured in a given time interval.

L_{AN} – the A-weighted sound pressure level exceeded by N% of a given measured period.

LEP – Local Environmental Plan.

m – metre.

M – million.

m^2 – square metre.

m^3 – cubic metre.

m^3pa – cubic metres per annum.

mg – milligram (weight unit).

mg/L – milligrams per litre (parts per million).

MJ – mega joules (energy unit).

ML – megalitre.

mm – millimetre (= 0.001 metres).

Mt – million tonnes (metric tonne = 1 000 kg).

Mtpa – million tonnes per annum.

MW – megawatt.

NEPC – National Environment Protection Council.

NFR – non-filterable residue of suspended solids.

NHRMC – National Health and Medical Research Council.

NP&W Act – National Parks and Wildlife Act 1974 (NSW).

NP&WS – National Parks and Wildlife Service (NSW).

NSW EPA – New South Wales Environment Protection Authority.

pH – a measure of the degree of acidity or alkalinity of a solution; expressed numerically (logarithimically) on a scale of 1 to 14, on which 1 is most acidic, 7 is neutral acid, and 14 is most basic (alkaline).

PM10 – particulate matter <10µm in diameter.

ppm – parts per million.

RBL – Rating Background Level

SG – specific gravity.

swl – standing water level.

t – tonnes.

TDS – total dissolved solids expressed in mg/L

t/m^3 – tonnes per cubic metre.

tpa – tonnes per annum.

USA EPA – United States Environmental Protection Agency.

V – volt.